

**METROPOLITAN CEBU WATER DISTRICT (MCWD)
THE REPUBLIC OF PHILIPPINES**

**THE PREPARATORY SURVEY
ON
THE PROJECT FOR THE SEPTAGE MANAGEMENT
OF METRO CEBU WATER DISTRICT
IN THE REPUBLIC OF THE PHILIPPINES**

FINAL REPORT

JUNE 2019

JAPAN INTERNATIONAL COOPERATION AGENCY

**YACHIYO ENGINEERING CO., LTD.
YOKOHAMA WATER CO., LTD.
CROWN AGENTS JAPAN CO.,LTD.**

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to the consortium consisting of Yachiyo Engineering Co., Ltd., Yokohama Water Co., Ltd. and Crown Agents Japan Co., Ltd.

The survey team held a series of discussions with the officials concerned of the Government of Philippines, and conducted a field investigations. As a result of further studies in Japan, 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.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Philippines for their close cooperation extended to the survey team.

June, 2019

Megumi Muto
Director General
Global Environment Department
Japan International Cooperation Agency

Summary

Summary

1. Outline of the Philippines

The Philippines consist of 7,109 islands and locate in a zone of oceanic and tropical climate. Its area is approximately 300 km² and the population reaches around 101 million in 2015. Cebu Island is located at Bisayas in middle of the Philippines. Its area is around twice wider than Tokyo at 4,422km². Metro Cebu having 1,163km² of area and 2,849 thousand of population (2015) consists of 13 local government units (hereinafter referred to as “LGUs”), and it is the second largest economic zone in the Philippines.

Metro Cebu is located in a zone for high temperature and high humidity through a year. In a period from May to October, much rainfall is recorded, and over 400mm/month of rainfall is occasionally recorded.

As for geological conditions, sedimentary rocks such as lime stone, sand stone and conglomerate are widely spread in Cebu Island.

2. Background of the Project

Sewerage system has not yet been introduced in Metro Cebu Area. Onsite sanitation through septic tanks is, therefore, widely spread in the area. Although septage in septic tanks is necessary to be collected regularly and treated adequately, septage treatment plants are not sufficiently available. As a result, the situation causes negative impacts for sanitation conditions and groundwater quality as well as odor in the area due to long retaining period of septage and / or overflow of septic tanks.

Under the circumstances, to overcome the capacity shortage for wastewater management, LGUs of Metro Cebu as well as Metropolitan Cebu Water District (hereinafter referred to as “MCWD”) prepare a regional goal to treat wastewater adequately at 50% in 2030 and 90% in 2050, in “Mega Cebu Roadmap 2050” which was prepared in 2015 with a corroboration of Japan International Cooperation Agency (hereinafter referred to as “JICA”) and City of Yokohama, Japan. It includes an urgent project to commence the septage management system, which is equipped with a septage treatment plant (hereinafter referred to as “STP”).

In parallel of Mega Cebu Roadmap 2050, JICA conducted “Pilot Survey for Applicability of Dewatering Equipment for Septage Management of Cebu City” from 2014 to 2016. As a result of the pilot survey, effectiveness of the de-watering equipment was reported. The constructed facility as a pilot project was handed over to Cebu City and functions as the exiting septage de-watering plant.

MCWD is franchised for water supply and wastewater management services in Metro Cebu Area. Although MCWD provides water supply in 8 LGUs, no sewerage service is undertaken. Since the wastewater in Metro Cebu is managed by on-site sanitation system, MCWD is required to provide an appropriate septage management service. As of December 2018, its provision of septage management service is limited to two (2) LGUs (Lapu-Lapu City and Cordova) located in Mactan Island through a private contractor activity under Design- Build- Finance- Operation (hereinafter referred to as “DBFO”) contract with MCWD.

For the remaining 6 LGUs (Compostela, Liloan, Consolacion, Mandaue City, Cebu City and City of Talisay), the septage is treated in the above mentioned existing septage de-watering plant. The present management ratio of septage is estimated at only 8.1%. Moreover, the infiltrate generated in de-watering process has not been treated appropriately.

To improve the septage management conditions and to realize the Mega Cebu Roadmap 2050, City of Yokohama proposed a project to construct STPs and to procure vacuum trucks for scheduled septage collection as a Japan’s Grant Aid Project for the 6 LGUs, i.e. Compostela, Liloan, Consolacion, Mandaue City, Cebu City and City of Talisay. In response to the proposal, MCWD requested the Project to the Government of Japan in May 2016. The requested components of the Grant Aid is as shown in Table 1.

Table 1 Component of Requested Grant Aid

Category	Component	Remark
Facility	STP-1	For north of Cebu City, Mandaue City
	STP-2	For Liloan, Consolacion, Compostela
	STP-3	For south of Cebu City, City of Talisay
Equipment	57 of vacuum trucks	

Source: Request of Japan's Grant Aid

3. Result of the Preparatory Survey and Contents of the Project

In response to the Grant Aid request, JICA conducted five (5) times of field survey in periods of 1) November 2 to 25, 2017, 2) January 28 to March 10, 2018, 3) April 22 to 28, 2018, 4) December 2 to 8, 2018 and 5) January 6 to 12, 2019.

As a result of the surveys, it is confirmed that MCWD is to be the implementing agency and the 6 LGUs in the Project area are planning to implement the septage collection at 5-year frequency. Moreover, planned septage collection area is also confirmed for 470 thousand households / entities to be same as MCWD's water service area and its adjacent areas. Based on the proposed plan, the generated septage is estimated as 565m³/d (2017). The other hand, the presently collected septage volume is evaluated at 46m³/d in 2017 which is only 8.1% of the generated one.

In aspect of water quality, it is confirmed that the effluent of a lagoon equipped with the existing septage de-watering plant does not comply with the effluent quality standards of the Philippines in biochemical oxygen demand (hereinafter referred to as "BOD").

Accordingly, urgency to improve the capacity of septage collection and treatment is confirmed in the preparatory survey.

To treat the septage, a similar process taken in the existing STP in the Philippines is evaluated to be appropriate. The similar process means that de-watering is firstly conducted and then infiltrate is treated before discharge to the adjacent river. Since the effluent quality standards was revised in 2016 by the Government of Philippines, the Project will introduce an advanced treatment system which is able to remove nitrogen and phosphorus although less example available in the Philippines.

Year 2030 is proposed as the middle term target of the aforementioned Mega Cebu Roadmap 2050. However, year 2025 is proposed for the Project considering a principle of the Japan's Grant Aid scheme to assist urgently required projects. Furthermore, the planned volume of septage collection is determined at 392.4m³/d for 100% of MCWD's water supply customers and 20% of non-customers for water supply based on following concepts:

- Tariff for septage management will be collected together with ones for water supply to maintain the accounting efficiency. It is desirable for the septage management customers to be same as water supply customers.
- Septage collection is also necessary for non-customers of water supply. And it is potential customers for septage management. To reduce impact of septage to the environment, it is also necessary to be collected periodically. Accordingly, the Project should have an additional capacity for the septage of the non-customers of water supply. However, the capacity to be installed additionally in the Project is for 20% of the non-customers of water supply, because the capacity is able to be expanded in the future in several steps.

In the original concept of the Project, it was planned to divide the Project area into three (3) as well as constructing three (3) STPs. However, only one (1) site is available as an appropriate candidate site for the STP. Therefore, it is selected for the Project that the one STP serves for the whole Project area.

It is remarkable for the identified site for STP that it is in lagoon of the existing septage de-watering plant. The Philippine side will reclaim it before construction of STP in the Project.

As a result of the survey, components of the Project are planned as shown in Table 2. As for the capacity of vacuum trucks, it is designed for 332.4 m³/d because maximum volume of collected septage by the existing private de-sludgers is approximately 60m³/d. Those private activities will be incorporated

with the Project.

Table 2 Components of the Project

Category	Purpose	Component
Construction of Facility	Septage treatment	Septage treatment plant (STP): 1 site (Septage Receiving Area, Biological treatment area, Administration building, Disinfection facility: Capacity: 400m ³ /d)
Procurement of Equipment	Septage collection	3m ³ Vacuum trucks: 21 trucks 9m ³ Vacuum trucks: 14 trucks
	Transportation of de-watered cake	8m ³ Dump trucks: 4 trucks
Soft Component	Technical guidance for management of septage collection and treatment system	Technical guidance for management of outsourcing works to collect and treat septage and for enhancement of public awareness

Source: JICA Study Team

4. Period and Cost for the Project

This part is closed due to the confidentiality until final verification of the contract of the contractor. The cost of implementing this Project to be borne by the Philippine side is estimated at JPY 81 million (under exchange rate of USD 1.00 = JPY111.69 and PHP1.00=JPY2.05).

Implementation periods of the Project are 6 months for detailed design, 6 months for bidding procedures and 24 months for construction / equipment procurement / soft component.

5. Project Evaluation

Relevance of the Project is summarized below:

- (1) The Project is planned in line with NSSMP and it will contribute to achievement of NSSMP, which is an upper plan in the Philippines aiming at provision of appropriate septage management systems for all LGUs by 2020.
- (2) The Project will contribute to achievement of Mega Cebu Roadmap 2050 in a field of septage management, which aims at 50% and 90% in population for appropriate wastewater management in 2030 and 2050 respectively.
- (3) In the Japanese assistance policy to the Philippines, “Solving the environmental problems including water supply and wastewater management fields” is listed. The Project is planned in line with the said policy.
- (4) The Project beneficiaries are the general public which include poor classes in population, and its population will reach 2.24 million in 2025 within the Project Area.
- (5) The objective of the Project is to improve the collection and treatment system of the septage which may affect the sanitary environment of residents and water environment in Metro Cebu Area. Implementation of the Project is urgently required to improve basic human needs and living standards of the residents in an aspect of the human security.
- (6) The Project is to collect, treat and dispose with septage safely. It contributes to achievement of Sustainable Development Goal 6.2.1 (SDG6.2.1), “Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water”*.

*According to “Progress on Drinking Water Sanitation and Hygiene 2017 Update and SDG Baseline” reported by WHO and UNICEF, following measures are indicated as septage management systems satisfying the safely managed sanitation. The Project which conducts scheduled de-sludge service is categorized in 2).

- 1) Treated and disposed of in situ,
- 2) Stored temporarily and then emptied, transported and treated off-site, or
- 3) Transported through a sewer with wastewater and then treated off-site.

Effectiveness of the Project is summarized below:

Quantitative Effect

Indicators for expected quantitative effects as well as base lines and targets are shown in Table 3.

Table 3 Expected Quantitative Effectiveness of the Project

Indicator	Baseline (Actual record in 2017)	Target (2025) 【 3 years later after the Project 】
Number of households realizing the scheduled de-sludge	4,631	43,702
Volume of collected septage (m ³ /year)	13,895	109,877

Source: JICA Study Team

Qualitative Effect

Following qualitative effects are expected for the Project.

1) Improvement of Water Environment

- a) Because of the scheduled septage collection, effluent quality of septic tanks will be improved and illegal dumping of septage will be reduced. Accordingly, the Project will contribute to improvement of the water environment in Metro Cebu Area.
- b) Infiltrate generated in the STP will be treated to comply with the designated effluent quality standards. Accordingly, the Project will contribute to improvement of water quality of the river which is the discharge destination of effluent of the STP (the existing septage de-watering plant presently).

2) Improvement of Sanitary Conditions for Residential Areas

- a) Because of the scheduled septage collection, loading conditions to septic tank will be appropriate for treatment. It will contribute to reduction of odors in residences / residential areas.
- b) Sanitary improvement will heighten the value of Metro Cebu. It will bring the appreciation of real estate value and further development of socio-economic activities.

Preparatory Survey on the Project for the Septage Management of Metro Cebu Water District

FINAL REPORT

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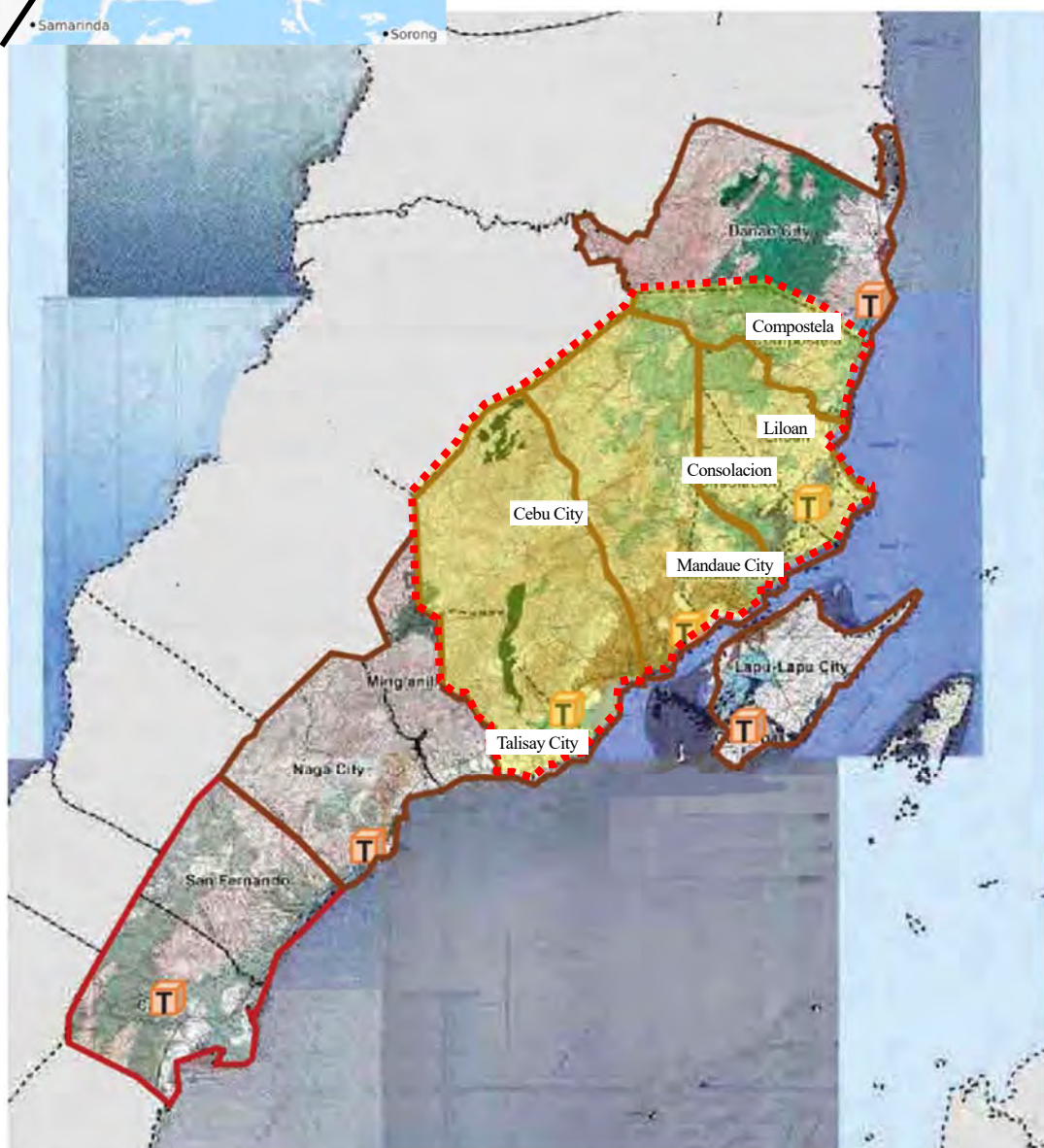
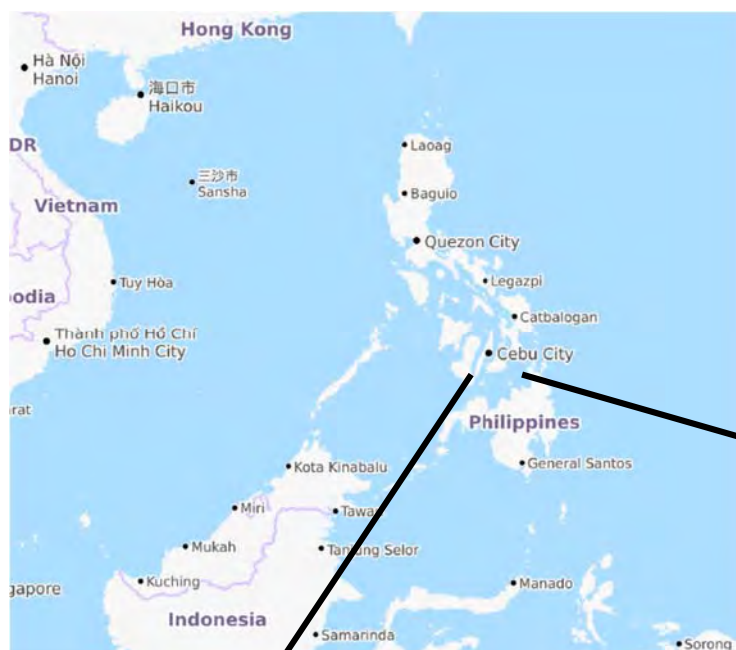
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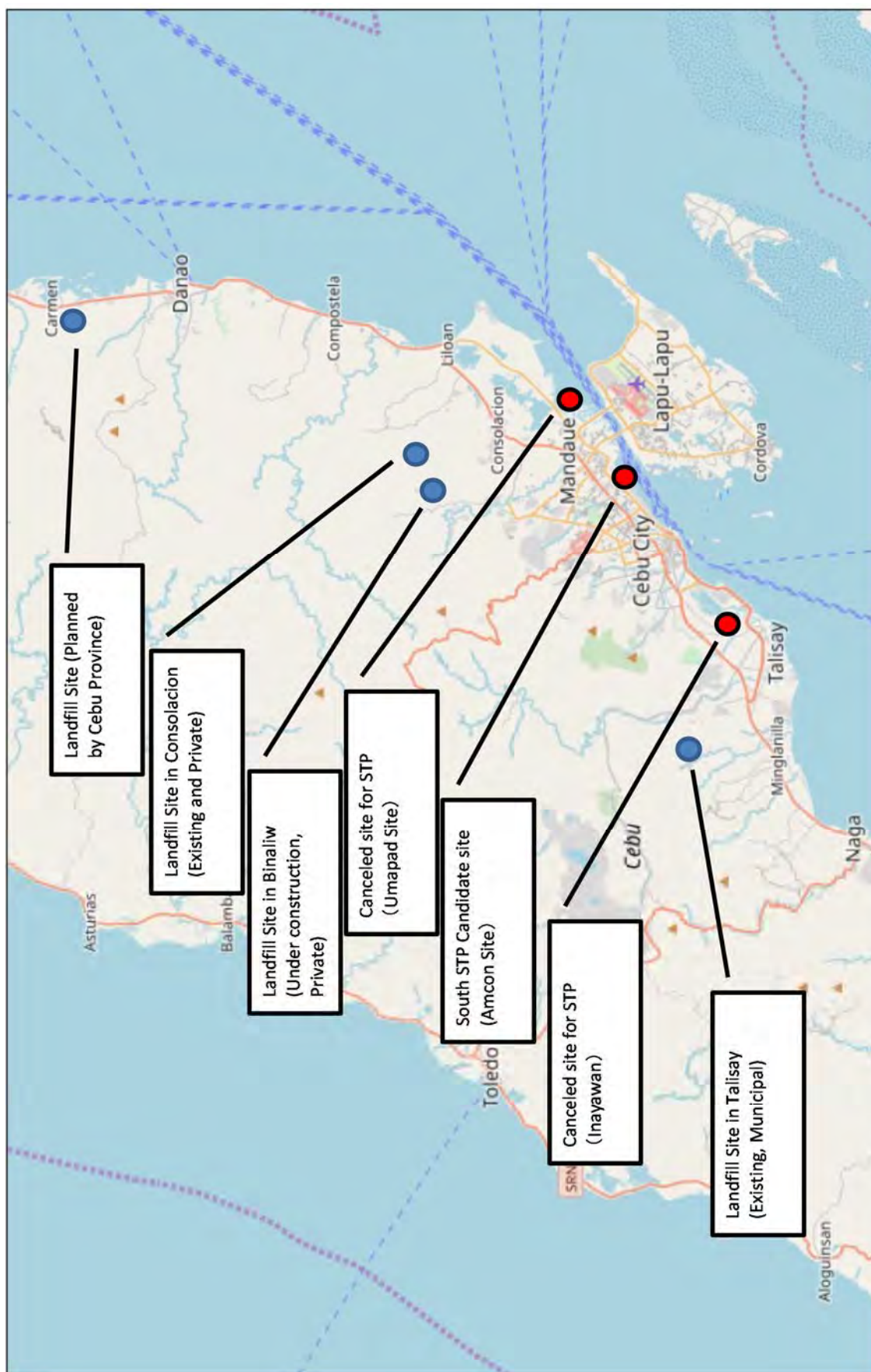
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Location of Project Area



<http://openstreetmap.org/copyright> <http://openstreetmap.org>

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CHAPTER 3 PROJECT EVALUATION

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ABBREVIATIONS

[Organization]

CCA	Cebu Contractors Association
CCENRO	Cebu City Environment and Natural Resources Office
CEO	City Engineering Office
CPDO	City Planning and Development Office
CSSB	City Septage and Sewerage Board
DENR	Department of Environmental and Natural Resources
DOF	Department of Finance
DPWH	Department of Public Works and Highways
GOJ	Government of Japan
ISO	International Organization for Standardization
JICA	Japan International Cooperation Agency
LGUs	Local Government Units
MCDCB	Metro Cebu Development Coordinating Board
MCENRO	Environment and Natural Resources Office
MCWD	Metropolitan Cebu Water District
NGO	Non Governmental Organizations
OBO	Office of Building Officer
PPDO	Province Planning and Development Office
PSA	Philippine Statistics Authority
USAID	United States Agency for International Development
WHO	World Health Organization
VECO	Visayan Electric Company

[General]

A2/O	Anaerobic-Anoxic-Oxic
ABS	Acrylonitrile Butadiene Styrene
A/P	Authorization to Pay
B/A	Banking Arrangement
BOD	Biochemical Oxygen Demand
CoA	Commission on Agreement
COD	Chemical Oxygen Demand
DBFO	Design Build Finance Operation
D/D	Detailed Design
DO	Dissolved Oxygen
DBFO	Design Build Finance Operate
E/N	Exchange of Notes
ECC	Environmental Compliance Certificate
ECP	Environmentally Critical Project
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
F/S	Feasibility Study
G/A	Grant Agreement
GL	Ground Level
HRT	Hydraulic Retention Time
IEE	Initial Environmental Examination
M/D	Minutes of Discussion
MLSS	Mixed Liquor Suspended Solids
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
N/A	Not Applicable

NPK	Nitrogen Phosphorus Kalium
NSCP	National Structural Code of the Philippines
NSSMP	National Sewerage and Septage Management Program
O&M	Operation and Management
OJT	On-the-job Training
OTE	Oxygen Transfer Efficiency
PAC	Poly Aluminum Chloride
PC	Pre-stressed Concrete
PEP	Philippines Environmental Policy
PEISS	Philippines Environmental Impact Statement System
pH	Potential of Hydrogen
PMR	Project Monitoring Report
PPP	Public Private Partnership
PR	Public Relations
PTO	Power Take-off
SBR	Sequencing Batch Reactor
SCADA	Supervisory Control and Data Acquisition
SS	Suspended Solids
STP	Septage Treatment Plant
T-N	Total Nitrogen
T-P	Total Phosphorus
TSS	Total Suspended Solids
UV	Ultraviolet
VAT	Value Added Tax

[Unit]	
%	percentage
°C	degrees Celsius
dB	decibel
ha	hectare
hr/day	hour per day
Hz	hertz
JPY	Japanese Yen
kg/day	kilogram per day
kg/kWh	kilogram per kilowatt hour
km	kilometer
km ²	square kilometer
kN	kilo newton
kVA	kilo volt ampere
kW	kilowatt
lb/ft ³	libra per cubic foot
m	meter
m ³	cubic meter
m ³ /d	cubic meter per day
mg	milligram
mg/kg	milligram per kilogram
mg/L	milligram per liter
min	minute
mm	millimeter
MM	Man-month
mm/h	millimeter per hour

MPa	mega pascal
MPN/100mL	most probable number per 100 milliliter
MT	ton
PHP	Philippines Peso
psi	pound per square inch
rpm	revolution per minute
t	ton
USD	United States Dollar
V	Volt

CHAPTER 1

Background of the Project

CHAPTER 1 BACKGROUND OF THE PROJECT

1-1 Background and Outline of the Project

1-1-1 Introduction

Metro Cebu is the second largest economic metropolitan area in the Philippines. Its estimated population exceeds 3 million in 2017.

Sewerage system, however, has not been introduced yet. Onsite sanitation through septic tanks is, therefore, widely spread in Metro Cebu. Although septage in septic tanks is necessary to be collected regularly and treated adequately, septage treatment plants are not sufficiently available. As a result, the situation causes negative impacts for sanitation conditions and groundwater quality as well as odor in the area due to long retaining period of septage and / or overflow of septic tanks.

Under the circumstances, to overcome the capacity shortage for wastewater management, local government units (hereinafter referred to as “LGUs”) of Metro Cebu area as well as Metropolitan Cebu Water District (hereinafter referred to as “MCWD”) prepare a regional goal to treat wastewater adequately at 50% in 2030 and 90% in 2050, in “Mega Cebu Roadmap 2050” which was prepared in 2015 with a corroboration of Japan International Cooperation Agency (hereinafter referred to as “JICA”) and City of Yokohama, Japan. It includes an urgent project to commence the septage management system, which is equipped with a septage treatment plant (hereinafter referred to as “STP”).

In parallel of Mega Cebu Roadmap 2050, JICA conducted “Pilot Survey for Applicability of Dewatering Equipment for Septage Management of Cebu City” from 2014 to 2016 under assistance with City of Yokohama. As a result of the pilot survey, effectiveness of the de-watering equipment was reported. The constructed facility as a pilot project was handed over to Cebu City and functions as the exiting septage de-watering plant.

MCWD is franchised for water supply and wastewater management services in Metro Cebu Area. Although MCWD provides water supply in 8 LGUs, no sewerage service is undertaken. Since the wastewater in Metro Cebu is managed by on-site sanitation system, MCWD is required to provide an appropriate septage management service. As of December 2018, its provision of septage management service is limited to two (2) LGUs (Lapu-Lapu City and Cordova) located in Mactan Island through a private contractor activity under Design- Build- Finance- Operation (hereinafter referred to as “DBFO”) contract with MCWD.

For the remaining 6 LGUs (Compostela, Liloan, Consolacion, Mandaue City, Cebu City and City of Talisay), the septage is treated in the above mentioned existing septage de-watering plant. The present management ratio of septage is estimated at only 8.1%. Moreover, the infiltrate generated in de-watering process has not been treated appropriately.

To improve the septage management conditions and to realize the Mega Cebu Roadmap 2050, City of Yokohama proposed a project to construct STPs and to procure vacuum trucks for scheduled septage collection as a Japan’s Grant Aid Project for the 6 LGUs, i.e. Compostela, Liloan, Consolacion, Mandaue City, Cebu City and City of Talisay. In response to the proposal, MCWD requested the Project to the Government of Japan in May 2016.

1-1-2 Requested Component

The originally requested components by MCWD are as shown in Table 1-1.

Table 1-1 Component of Requested Grant Aid

Category	Component	Remark
Facility	STP-1	For north of Cebu City, Mandaue City
	STP-2	For Liloan, Consolacion, Compostela
	STP-3	For south of Cebu City, City of Talisay
Equipment	57 of vacuum trucks	

Source: Request of Japan’s Grant Aid

1-2 Natural Conditions

1-2-1 Temperature and Rainfall

The Philippines are located in a zone of oceanic and tropical climate. Annual average temperature is around 26.0 and the highest average temperature is usually recorded in May at around 27.0 . Temperature fluctuation is not large through a year.

As for the monthly rainfall, it is recorded at around 100mm - 300mm. The maximum monthly rainfall is usually recorded in July at around 300mm.

1-2-2 Soil

According to the soil condition survey conducted in this preparatory survey, there is a soil layer having N value for 50 or more at approximately -20m from the ground level. The survey result is shown in Appendix 6-4.

1-3 Environmental and Social Consideration

1-3-1 Environmental Impact Assessment

1-3-1-1 Summary of Project Component

The project components and anticipated impacts to environment and society are shown in Table 1-2.

Table 1-2 Project Component Summary

Category	Activity	Content	Environmental and Social Impacts
Facility Construction	Construction of septage treatment plant	Septage receiving area 435m ³ /day (145m ³ /day x 3 lines), Biological treatment area, Administration building, Disinfection facility	Under construction: Gas emission, Turbid water, Noise, Accident During Operation: Water pollution by effluent, Accident
Equipment Procurement	Procurement of septage collection vehicles and de-watered cake transport vehicles	21 Vacuum trucks of 3m ³ 14 Vacuum trucks of 9m ³ 4 Dump trucks of 8m ³	During Operation: Traffic jam by septage collection vehicles
Soft Component	Technical guidance for management of septage collection and treatment system	Technical guidance for management of outsourcing works to collect and treat septage and for enhancement of public awareness	Not applicable

Source: JICA Study Team

1-3-1-2 Basic Information of Environmental and Social Situation

(1) Land Acquisition

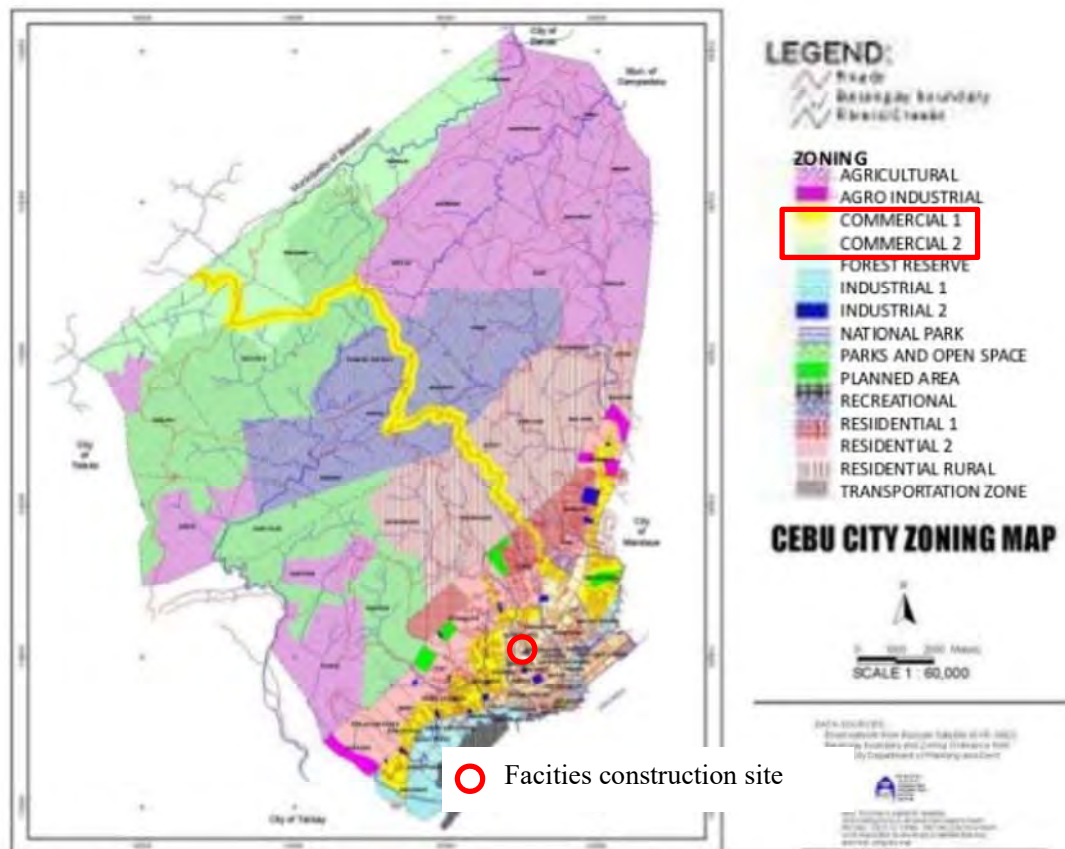
Construction site of the facility is located in the existing de-watering plant of septage (hereinafter referred to as “construction site”). As shown in Figure 1-1, the construction site is presently in lagoon (4m depth). The lagoon is planned to be filled with compacted soil by MCWD.



Source: JICA Study Team

Figure 1-1 Lagoon in Construction Site

In the construction site, no public complaint is raised by neighboring residents although the septage de-watering plant is located. And the land is categorized for commercial area in the present land use plan shown in Figure 1-2. No natural conservation area is located around the construction site and destination of effluent discharge form the planned septage treatment plant.



Source : https://www.cebucity.gov.ph/images/stories/physical_maps_cebucity/land_forms_map.jpg

Figure 1-2 Land Use Plan

The construction site belongs to Cebu Province. Cebu Province agrees that the land will be allocated to MCWD for the Septage Treatment Plant (hereinafter referred to as “STP”) of the Project for a period of 50 years. As for March 2019, Cebu Province and MCWD are in progress of usufruct agreement for the land.

(2) Natural Environment, Flora and Fauna

No serious impact is anticipated for the natural environment, flora and fauna in the construction site.

(3) Traffic

Access road to STP is enough in width for heavy vehicles. It is anticipated, however, that operation of septage collection trucks (vacuum trucks) may cause traffic jams in adjacent area since more than 100 trucks will be operated per day. Therefore, time management should be appropriately conducted for trucks' operation not to concentrate in a particular time zone.

1-3-1-3 System of Environmental and Social Consideration

(1) General

Any project should be examined by Department of Environment and Natural Resources (hereinafter referred to as "DENR") in environmental impact according to "the Philippine Environmental Impact Statement (EIS) System". Presently, "Revised Guidelines for Coverage Screening and Standardized Requirement under the Philippine Environmental Impact Statement (EIS) System (July, 2014)" is applicable to obtain "Environmental Compliance Certificate" (hereinafter referred to as "ECC").

(2) Environment Category

The STP of the Project is categorized in Category B: Non ECP (Environmentally Critical Project), as described in Table 1-3, according to "Revised Guidelines for Coverage Screening and Standardized Requirement under the Philippine Environmental Impact Statement (EIS) System (July, 2014)", since the planned capacity of STP is in a range of 30 - 5,000 m³/day. Therefore, the Project will be required to submit "Initial Environmental Examination" (hereinafter referred to as "IEE") to obtain the ECC.

Table 1-3 Condition of Environmental Category

Projects/Description	Covered (Required to secure ECC)			Not covered (may secure CNG)	Project size parameters / Remarks
	Category A:ECP EIS	Category B: Non-ECP EIS	IEE Checklist	Category D PD (Part I only)	
3.8.3 Compost/fertilizer making	None	None	> 3,750 MT	≤3,750 MT	Annual rated/production rate
3.8.4 Materials Receiving and Recovery Facilities (for paper, plastics and other materials)	None	None	With composting facilities >3,750 MT annual rated/production rate	≤3,750 MT (compost annual production rate) or no composting facility (material segregation/sorting only)	
3.8.5 Domestic wastewater treatment facility (including septage treatment facility)	None	≥ 5,000 m ³	> 30 m ³ but < 5,000 m ³	≤ 30 m ³	Based on system capacity
3.8.6 Material recovery using pyrolysis or similar technology (e.g., tire pyrolysis)	None	≥ 10.0 MT	< 10.0 MT	None	Annual treatment/processing capacity
3.8.7 Hazardous waste treatment, recycling, and/or disposal facilities (for recycling of lead, see details in Heavy Industries)	None	≥ 10.0 MT OR projects with radioactive materials (regardless of amount/quantity)	< 10.0 MT (without radioactive materials)	None	Annual treatment/processing capacity (for conversion of volume to mass: use 1 kg/L as the factor)
3.8.8 Industrial and hospital waste (non-hazardous) materials treatment facilities	None	≥ 50 m ³	< 50 m ³	None	Daily treatment/processing capacity (for conversion of volume to mass: use 1 kg/L as the factor)
3.8.9 Recycling facilities for paper, plastic, and other non-hazardous materials	None	≥ 50,000 MT and involving the use of chemicals	> 15,000 MT but < 50,000 MT (with or without chemicals) OR ≥ 50,000 MT and does not involve the use of chemicals	≤ 15,000 MT AND does not involve the use of chemicals	Annual treatment/processing capacity
4. GOLF COURSE AND OTHER TOURISM PROJECTS					
4.1 Golf course projects/complex	Regardless of number of holes	None	None	Driving Range only Regardless of area	Number of holes
4.2 Resort and other tourism/helisure projects	None	≥ 5 ha	> 0.1 ha but < 5 ha	≤ 0.1 ha	Project / gross floor area shall be the sum/total of total/gross floor area (of structures) plus open areas and other facilities (e.g., landscape, parking, pool) For hotels in urban areas, refer to categories for Building
5. OTHER PROJECTS					
Cut-flower Industry/Projects	None	None	None	regardless of capacity or area	

Source: Revised Guidelines for Coverage Screening and Standardized Requirement under the Philippine EIS System, July 2014

(3) Standards on Air Quality

Euro-4 should be applicable for the emission gas of the trucks to be procured by the Project.

(4) Standards on Noise and Vibration

The standards on noise are as shown in Table 1-4. Class D is applicable for the facility construction site. No standard is available for vibration.

Table 1-4 Standards on Noise

Time	Class				
	AA	A	B	C	D
Daytime (9AM-6PM)	50 dB	55 dB	65 dB	70 dB	75 dB
Evening (6PM-10PM)	45 dB	50 dB	60 dB	65 dB	70 dB
Night Time (10PM-5AM)	40 dB	45 dB	55 dB	60 dB	65dB
Morning (5AM-9AM)	45 dB	50 dB	60 dB	65 dB	70 dB
Class AA – a section of contiguous area which requires quietness, such as areas within 100 m from school sites, nursery schools, hospitals and special homes for the aged. Class A – a section or contiguous area which is primarily used for residential purposes. Class B – a section or contiguous area which is primarily a commercial area. Class C – a section primarily zoned or used as light industrial area. Class D – a section which is primarily reserved, zoned or used as a heavy industrial area					

For areas directly facing a public transportation route or an urban traffic artery, an additional correction factor equivalent to the following shall apply:

- 1) Areas directly fronting or facing a four-lane road + 5 dBA
- 2) Areas directly fronting or facing a four-lane or wider road + 10 dBA

Source: The National Pollution Control Commission's Memorandum Circular No. 002 (NPCC MC002), May 1980

(5) Standards on Water Pollution

Quality of effluent of STP should be managed according to "Water Quality Guidelines and Effluent Standards of 2016" (hereinafter referred to as "DAO2016-08"). 7 parameters shown in Table 1-5 are listed in DAO2016-08 as significant ones for effluent quality management. Water quality classification of Mahiga Creek, where STP discharges the effluent, has not yet been designated by DENR. However, DENR indicated in January 2019 that the water quality classification will be Classification D.

Table 1-5 Effluent Standards on Wastewater from STP

Parameters	Unit	Water Body Classification						
		A	B	C	D	SB	SC	SD
BOD	mg/L	20	30	50	120	30	100	150
Fecal Coliform	MPN/100mL	4	200	400	800	200	400	800
Ammonia as NH ₃ -N	mg/L	0.5	0.5	0.5	7.5	0.5	0.5	7.5
Nitrate as NO ₃ -N	mg/L	14	14	14	30	20	20	30
Phosphate	mg/L	1	1	1	10	1	1	10
Oil and Grease	mg/L	5	5	5	15	5	10	15
Surfactants(MBAS)	mg/L	2	3	15	30	3	15	30

Source: DAO2016-08

(6) Management of De-Watered Cake

De-watered cake generated in STP is allowed to be disposed in a solid waste landfill site if it is derived from septic tanks and not polluted by industrial wastewater. 50 t/day of de-watered cake is estimated to be generated by the Project. The Project plans to dispose of it at Binaliw landfill site in Cebu City.

Although Binaliw landfill site is under preparation for commencement of operation as of December 2018, the first cell for landfill was almost completed in construction and ECC has been already issued by DENR. Total area of the landfill site is 23 ha (5 ha is being developed as phase-1) and the capacity of phase-1 facility is estimated to be enough for approximately 5 years, assuming the disposed waste as follows:

- De-watered cake: 50 t/day

- Solid waste collected in Cebu City: 390 t/day (estimated volume by Mega Cebu Road Map 2050)

(7) Odor

No specific standard is available for odor. The Project, however, plans to install deodorization device in STP.

1-3-1-4 Comparison of Alternative Plan (Including Zero Option)

Comparison of alternatives (including zero option) is as shown in Table 1-6.

Table 1-6 Project Plan Comparison Table

Alternative	Component of the Project	Evaluation
Zero Option	No construction of STP. No additional procurement of septage vacuum trucks.	Approximately 50m ³ /day of septage is de-watered. Inappropriate treatment of effluent will be continued, as present. Approximately 350m ³ /day of septage will not be collected and treated, so that impacts to water and living environment will be continued.
Plan-1	STP is constructed. Septage will be collected adequately by vacuum trucks to be additionally procured.	Septage will be collected and treated comprehensively. Effluent of STP will be adequately treated.
Plan-2	No construction of STP. However, septage will be collected adequately by vacuum trucks to be additionally procured.	Additionally 350m ³ /day of septage will be collected. However, septage and effluent will not be adequately treated, so that impacts to water and living environment will be continued.
Evaluation	From technical and environmental view points, Plan-1 is the appropriate alternative.	

Source: JICA Study Team

1-3-1-5 Scoping for Environmental and Social Consideration

Scoping for environmental and social considerations, based on JICA Guidelines for Environmental and Social Considerations (April, 2010) (hereinafter referred to as “Guidelines”) is described in Table 1-7.

Table 1-7 Scoping for Environmental and Social Considerations

Environmental Items		Assumed Environmental Impacts	Survey method
Natural Environment	Air pollution	During construction: emission gases from construction machines and generators. During operation: emission gases from vacuum trucks to transport septage to STP and dump trucks to transport de-watered cake to landfill site.	Field confirmation on surrounding area of STP. Confirmation of component of construction works and construction machines / trucks to be used by the Project.
	Water pollution	During construction: Turbid water caused by construction works. During operation: water pollution caused by effluent of STP.	Field confirmation on surrounding area of STP. Confirmation of component of construction works and treatment process of effluent of STP.
	Soil contamination	During construction: N/A. No harmful chemical is utilized for construction. During operation: N/A. No harmful chemical is utilized for operation.	Field confirmation on surrounding area of STP. Confirmation of component of construction works and chemicals to be used in STP.
	Waste	During construction: Waste is generated by construction. During operation: De-watered cake is generated in STP.	Field confirmation on surrounding area of STP.
	Noise and vibrations	During construction: Noise and vibrations generated by construction. During operation: N/A. Little noise and vibration is generated.	Field confirmation on surrounding area of STP. Confirmation of environmental standards.
	Ground subsidence	During construction: N/A. No extraction of ground water. During operation: N/A. No extraction of ground water.	Result of soil investigation. Confirmation of construction / operation plan.

Environmental Items		Assumed Environmental Impacts	Survey method
	Odors	During construction: N/A. No harmful chemical is utilized. During operation: Odors generated by septage.	Confirmation of countermeasures to be applied by the Project.
	Geographical features	During construction: N/A. No serious modification for geography. During operation: N/A. No modification for geography.	Confirmation of component of construction works.
	Soil erosion	During construction: N/A. No activity causing soil erosion. During operation: N/A. No activity causing soil erosion.	Confirmation of component of construction works.
	Sediment	During construction: Turbid water is generated. During operation: Effluent of STP is discharged.	Confirmation of component of construction works.
	Groundwater	During construction: N/A. No extraction of ground water. During operation: N/A. No extraction of ground water.	Confirmation of component of construction works.
	Lake, swamp and river basin	During construction: N/A. No activity modifying lake, swamp and river basin is conducted. During operation: N/A. No activity modifying lake, swamp and river basin is conducted.	Confirmation of component of construction works.
	Coastal areas	During construction: N/A. No activity affecting coastal areas is conducted. During operation: N/A. No activity affecting coastal areas is conducted.	Confirmation of component of construction works.
	Flora and Fauna	During construction: N/A. No activity affecting flora and fauna is conducted. During operation: N/A. No activity affecting flora and fauna is conducted.	Confirmation of component of construction works.
	Climate	During construction: N/A. No activity affecting climate is conducted. During operation: N/A. No activity affecting climate is conducted.	Confirmation of component of construction works.
	Landscape	During construction: N/A. The Project is to rehabilitate the existing septage de-watering plant. Therefore, landscape is not affected. During operation: N/A. The Project is to rehabilitate the existing septage de-watering plant. Therefore, landscape is not affected.	Confirmation of the facilities appearance to be constructed.
	Accidents	During construction: Accident in construction works. Traffic accident by operation of construction vehicles. During operation: Traffic accident by operation of vacuum and dump trucks.	Confirmation of component of construction and operation works for possibility of accidents and countermeasures to be applied.
	Global warming	During construction: Emission from construction machines and vehicles. During operation: Emission from vacuum and dump trucks, and emergency generator.	Confirmation of component of construction works.
Social Environment	Involuntary resettlement	During construction: N/A. No residence in construction site. Land is owned by Cebu Province. During operation: N/A. No residence in construction site. Land is owned by Cebu Province.	Field confirmation on surrounding area of STP.
	Local economies, such as employment, livelihood, etc.	During construction: Employment is increased. During operation: Existing private business for septage collection is regulated / controlled.	Confirmation of countermeasures for utilization of the exiting private de-sludgers of septage.
	Land use and utilization of local resources	During construction: N/A. Land of STP belongs to Cebu Province. Cebu Province agrees to allocate the land to MCWD for 50 years. Land is categorized in commercial area	Confirmation of land use plan.

Environmental Items		Assumed Environmental Impacts	Survey method
		for land use. During operation: N/A. Land of STP belongs to Cebu Province. Cebu Province agrees to allocate the land to MCWD for 50 years. Land is categorized in commercial area for land use.	
	Social institutions such as social infrastructure and local decision-making institutions	During construction: N/A. Cebu Province agrees to allocate the land to MCWD. During operation: N/A. The Project activity is operated by MCWD's finance. Related LGUs agree on septage management program of MCWD.	Confirmation of organization for implementing agency for decision process and finance.
	(1) Existing social infrastructure and social service	During construction: Traffic jam by trucks to be used for construction. During operation: Traffic jam by vacuum and dump trucks to be used for transporting septage and de-watered cake	Field confirmation on surrounding area of STP.
	Splitting of communities	During construction: N/A. Construction works do not split the community. During operation: N/A. STP and operation works do not split the community.	Confirmation of the Project operation plan.
	Poor, indigenous, or ethnic people	During construction: N/A. Construction site is not located in specific areas for poor, indigenous, or ethnic people. During operation: N/A. Construction site is not located in specific areas for poor, indigenous, or ethnic people.	Hearing for existence of specific people.
	Misdistribution of benefits and damages	During construction: N/A. No misdistribution of benefits and damages is anticipated. During operation: N/A. Septage is collected and treated equally for the general public.	Confirmation of the Project operation plan.
	Local conflicts of interest	During construction: N/A. Septage is collected and treated equally for the general public. Therefore, no local conflict is anticipated. During operation: N/A. Public sanitation is improved equally in the Project target area.	Confirmation of the Project operation plan.
	Water usage	During construction: N/A. Water supplied by public water distribution network is utilized. During operation: N/A. Water supplied by public water distribution network is utilized.	Confirmation of the Project operation plan.
	Gender	During construction: N/A. No activity affecting gender. During operation: N/A. No activity affecting gender.	Confirmation of the Project operation plan.
	Children's rights	During construction: N/A. No activity affecting children's rights During operation: No activity affecting children's rights. Sanitation conditions for children are improved.	Confirmation of the Project operation plan.
	Cultural heritage	During construction: N/A. No cultural heritage is located in the construction site. During operation: N/A. No cultural heritage is located in the construction site.	Hearing for existence of specific cultural heritage.
	Infectious diseases such as HIV/AIDS	During construction: N/A. No infectious material is used. During operation: No infectious material is used. Sanitation conditions are improved.	Confirmation of the Project operation plan.

Source: JICA Study Team

1-3-1-6 Survey Results for Environmental and Social Considerations

(1) Air Pollution

Construction works will generate emission gases due to operation of construction machines. Impacts of emission gases will be reduced by engine stops during idling time and equalization of working schedule. And the Contractor will be encouraged to use low emission models of the construction machines, so that

the generation of emission gases will be reduced. When generation of dusts is anticipated in construction works, the Contractor will be encouraged to sprinkle water appropriately to prevent the dusts. If necessary, dust prevention sheet will be utilized for construction works.

During operation, emission gases are anticipated to be generated due to operation of vacuum trucks, dump trucks and emergency generator. Impacts of such emission gas will be also regulated by engine stops during idling time and introduction of low emission models for the equipment (satisfying the emission standards in the Philippines). As for the emergency generator, little impact is anticipated since it will be operated in emergency time only.

Accordingly, the impacts to air pollution are anticipated to be little.

(2) Water Pollution

Turbid water is anticipated to be generated from construction works. It will be prevented by installing gutter and catch basin of suspended solid.

During operation, filtrate is generated by de-watering machines of the septage. In present, effluent quality of the existing de-watering plant is not satisfied with DAO2016-08 for significant parameters as shown in Table 1-8. In the Project, the filtrate will be treated in STP before discharging into Mahiga Creek, according to the effluent quality standards. Therefore, the impacts to water pollution are anticipated to be little.

Table 1-8 Effluent Quality Analysis for Significant Parameter (Sampled in February - March 2018)

Parameter	Symbol	Unit	DAO2016-08 Effluent Standards Class D (mg/L)	After Lagoon (Effluent of Existing De-watering Plant)			
				1st (mg/L)	2nd (mg/L)	3rd (mg/L)	Average (mg/L)
Biochemical Oxygen Demand	BOD	mg/L	120.00	183.00	179.00	236.00	199.33
Ammonium Nitrogen	NH ₃ -N	mg/L	7.50	85.33	120.56	105.58	103.82
Nitrate Nitrogen	NO ₃ -N	mg/L	30.00	1.10	1.44	1.04	1.19
Total Phosphorus	T-P	mg/L	10.00	38.49	27.71	35.01	33.74
Oil and Grease	T-P	mg/L	15.00	38.49	27.71	35.01	33.74
Surfactant		mg/L	30.00	15.86	8.94	8.39	11.06

Source: JICA Study Team

As for heavy metals, they are anticipated to be discharged little from the STP, since the STP will receive the septage generated from human excreta only. However, heavy metals were detected in de-watered cakes of the existing de-watering plant as shown in Table 1-9. Reasons of such heavy metals are observed as follows:

- A lot of solid waste is observed in collected septage. Accordingly, heavy metals are contained in the collected septage.
- Due to long retention period in septic tank (less frequency of de-sludge), heavy metals are concentrated in septic tank.

Although such heavy metals will be caught almost in de-watered cake and concentration in effluent is expected to be less than the effluent quality standards, promotion of public awareness not to throw solid waste into septic tank should be enhanced. So that the impact of heavy metals contained in effluent will be mitigated.

Table 1-9 Metals Analysis Result (Sampled in February - March 2018)

Parameter		De-watered Cake (mg/kg)			
		1st	2nd	3rd	Average
Arsenic	As	3.00	7.00	0.00	3.33
Cadmium	Cd	3.00	2.00	3.00	2.67
Mercury	Hg	2.00	1.00	0.90	1.30
Nickel	Ni	20.00	20.00	7.00	15.67
Chromium	Cr	50.00	40.00	50.00	46.67
Lead	Pb	30.00	40.00	90.00	53.33
Zinc	Zn	1800.00	1700.00	2500.00	2000.00
Copper	Cu	200.00	300.00	300.00	266.67

Source: JICA Study Team

(3) Waste

The Contractor will adequately dispose of waste generated by construction works, in accordance with rules of Cebu city.

De-watered cake will be generated during operation of STP. It will be disposed of adequately in Binaliw landfill located in Cebu City.

(4) Noise and Vibration

Noise and vibrations are anticipated to be generated by construction machines during construction stage. The noise due to construction works will be controlled by the Contractor according to the noise standards, applying soundproof walls, low noise and vibration construction machines and equalization of construction schedules in accordance with requirements.

No device generating significant noise and vibration is planned to be installed and operated at STP. Little noise and vibration are generated during operation.

Therefore, the impacts to noise and vibrations are anticipated to be little.

(5) Odors

No material generating significant odors will be used for construction works. Odors, however, is anticipated during operation due to received septage. To mitigate the negative impact due to odors, STP will be equipped with deodorization devices.

Therefore, the impacts of odors are anticipated to be little in construction stage and mitigated in operation stage.

(6) Sediment

Turbid water may be generated due to excavation in the construction site, during construction. Filtrate will be generated by de-watering machine at STP. They will be treated as aforementioned in the paragraph (2) before discharging into river.

Therefore, little impact is anticipated to bottom sediment.

(7) Accidents

Accidents, including traffic ones, are anticipated in both construction and operation stages. To prevent the accidents, wearing accident protectors such as gloves and helmet as well as safety trainings for construction works and truck operations will be encouraged.

Therefore, the impacts of accidents are mitigated in both construction and operation stages.

(8) Global Warming

Emission gases will be generated in both construction and operation stages. They will be mitigated as aforementioned in the paragraph (1). Necessary electricity for STP operation will be provided through the existing electricity networks. No electricity generator will be operated except in emergency cases. As a result, emission gases will be regulated and controlled. Impact is not in a level to menace the global

warming.

(9) Local Economies

Construction works will create jobs' opportunities in Cebu City and neighboring areas. Positive impact is anticipated in construction stage.

The Project procures newly vacuum trucks to collect and transport the septage. When the Project commences the de-sludge services for septic tanks, business opportunity of the exiting private de-sludgers will be reduced. To avoid such reduction of the business opportunity, the Project involves the activity of the exiting private de-sludgers in the operation plan and to ensure the present level of working quantity.

(10) Existing Social Infrastructure and Social Service

Presently, Metro Cebu has been suffered from chronic traffic congestions in daytime. Worse congestions is anticipated to be derived by operation of construction vehicles in the construction stage. It is also anticipated in the operation stage due to operation of vacuum and dump trucks to transport septage / de-watered cake. To mitigate the traffic jam, operation schedule of trucks will be controlled adequately.

Therefore, the impacts for traffic jam are mitigated in both construction and operation stages.

(11) Children's Right

The Project will introduce scheduled de-sludge services at 5 years frequency. The scheduled de-sludge services will improve sanitation conditions in residential areas. In operation stage, positive impact is therefore anticipated.

(12) Infectious Diseases

No infectious material will be used for the Project. Since sanitation conditions will be improved, the Project will create positive impacts for sanitation.

1-3-1-7 Impacts Evaluation

Based on the survey results and according to Guidelines, impacts are summarized in Table 1-10 and 1-11.

Table 1-10 Impacts Evaluation (Natural Environment)

Table 1-10 Impacts Evaluation (Natural Environment)				
No.	Impact items	Evaluation		Evaluation reasons
		During Construction	During Operation	
Impacts to natural environment				
1	Air Pollution	C-	C-	During Construction: Emission gases and dusts are generated by operation of construction vehicles and machineries. Nevertheless, it is minimized by engine stop in idling time and sprinkling water. During Operation: Vacuum and dump trucks transporting septage and de-watered cake, and an emergency generator generate emission gases. Such emissions gases are minimized by engine stop in idling time and procurement of low emission models (EURO-4).
2	Water Pollution	C-	B-	During Construction: Installing gutters and basins to catch turbid water, discharge of turbid water is prevented. During Operation: Effluent of STP is treated to satisfy effluent quality standards issued by DENR.
3	Soil contamination	D	D	During Construction: Chemicals causing soil contaminations are not used in the construction stage. During Operation: Chemicals causing soil contaminations are not used in the operation stage.
4	Waste	D	B-	During Construction: Waste generated by construction works is disposed according to rules of Cebu City. During Operation: De-watered cakes are disposed adequately in landfill site.

No.	Impact items	Evaluation		Evaluation reasons
		During Construction	During Operation	
5	Noise and vibrations	C-	D	During Construction: Noises and vibrations are generated by construction machines. In order to minimize the noises and vibrations, the Contractor installs soundproof walls, uses low noise and vibration construction machines, and equalizes construction schedules. During Operation: STP generates little noise and vibration.
6	Ground subsidence	D	D	During Construction: No groundwater extraction is conducted. During Operation: No groundwater extraction is conducted.
7	Odor	D	C-	During Construction: No odor is anticipated. During Operation: The Project installs deodorization devices in STP for odor from septage.
8	Geographical features	D	D	During Construction: No serious modification is conducted for geography. During Operation: No modification is conducted for geography.
9	Soil erosion	D	D	During Construction: No activity causing soil erosion is conducted. During Operation: No activity causing soil erosion is conducted.
10	Bottom sediment	D	D	During Construction: Installing gutters and basins to catch turbid water, discharge of turbid water is prevented. During Operation: Effluent of STP is treated to satisfy effluent quality standards issued by DENR.
11	Groundwater	D	D	During Construction: No groundwater extraction is conducted. During Operation: No groundwater extraction is conducted.
12	Lake, swamp and river basin	D	D	During Construction: No activity modifying lake, swamp and river basin is conducted. During Operation : No activity modifying lake, swamp and river basin is conducted.
13	Coastal areas	D	D	During Construction: No activity affecting coastal areas is conducted. During Operation: No activity affecting coastal areas is conducted.
14	Flora and Fauna	D	D	During Construction: No activity affecting flora and fauna is conducted. During Operation: No activity affecting flora and fauna is conducted.
15	Climate	D	D	During Construction: No activity affecting climate is conducted. During Operation: No activity affecting climate is conducted.
16	Landscape	D	D	During Construction: The Project is to rehabilitate the existing septage de-watering plant. Therefore, landscape is not affected. During Operation: The Project is to rehabilitate the existing septage de-watering plant. Therefore, landscape is not affected.
17	Accidents	C-	C-	During Construction: To prevent the accidents, wearing accident protectors such as gloves and helmet as well as safety trainings / monitoring for construction works and truck operations are conducted. During Operation: Safety trainings / monitoring for truck operations are conducted.
18	Global warming	D	D	During Construction: No serious impact is anticipated for CO ₂ emission from construction machines. No activity is conducted to affect seriously global warming. During Operation : No serious impact is anticipated for CO ₂ emission from STP. Electricity is provided from the existing networks.

A± : The item which serious positive or negative influence is assumed

B± : The item which positive or negative influence is assumed

C± : The item which slight positive or negative influence is assumed,

D : The item which influence is not assumed

Source: JICA Study Team

Table 1-11 Impacts Evaluation (Social Environment)

Table 1-11 Impacts Evaluation (Social Environment)				
No.	Impact items	Evaluation		Evaluation reasons
		During Construction	During Operation	
Impacts to social environment				
1	Involuntary resettlement	D	D	During Construction: Land of construction site is owned by Cebu Province. Involuntary resettlement is not anticipated. During Operation: No additional land is necessary in operation stage. Involuntary resettlement is not anticipated.
2	Local Economy (Employment and Livelihood, etc.)	C+	B-	During Construction: Employment is increased. During Operation: The existing private business for septage collection is regulated / controlled. The existing private de-sludgers are involved in operation of the Project activity.
3	Land use and utilization of local resources	D	D	During Construction: Land of STP belongs to Cebu Province. Cebu Province agrees to allocate the land to MCWD for 50 years. Construction site is categorized in commercial area in land use plan. During Operation: No additional land is necessary in operation stage.
4	Social institutions such as social infrastructure and local decision-making institutions	D	D	During Construction: Cebu Province agrees to allocate the land to MCWD. No issue is anticipated for land ownership. During Operation: The Project activity is operated by MCWD's finance. Little affect is anticipated to social infrastructure and regional decision maker for finance.
5	Existing social infrastructure and social services	C-	C-	During Construction: Traffic jam by construction vehicles is anticipated. To prevent it, vehicles operation schedule is adequately controlled. During Operation: Traffic jam by vacuum and dump trucks to transport septage and de-watered cake is anticipated. Operation schedule is adequately controlled.
6	Splitting of communities	D	D	During Construction: Splitting of communities is not anticipated. During Operation: Splitting of communities is not anticipated.
7	Poor, indigenous, or ethnic people	D	D	During Construction: No impact is anticipated for poor, indigenous, or ethnic people. During Operation: No impact is anticipated for poor, indigenous, or ethnic people.
8	Misdistribution of benefits and damages	D	C+	During Construction: No misdistribution of benefits and damages is anticipated. During Operation: Septage is collected and treated equally for the general public. Misdistribution of benefits and damages is anticipated.
9	Local conflicts of interest	D	D	During Construction: Septage is collected and treated equally for the general public. Therefore, no local conflict is anticipated. During Operation: Public sanitation is improved equally in the Project target area.
10	Water usage	D	D	During Construction: Water supplied by the existing water distribution networks is utilized. No extraction of groundwater. During Operation: Consumption of water by STP is around 20m³/day and it is fed from the existing water distribution networks. Therefore, little impact is anticipated to water utilization.
11	Gender	D	D	During Construction: No affect is anticipated to gender. During Operation: No affect is anticipated to gender.
12	Children's rights	D	C+	During Construction: No activity affecting children's right is conducted. During Operation: Public sanitation for children is improved by the Project.
13	Cultural heritage	D	D	During Construction: No cultural heritage is located in construction site. During Operation: No cultural heritage is located in construction site.
14	Infectious diseases such as HIV/AIDS	D	C+	During construction: No infectious material is used. Little impact of construction works is anticipated for public health and sanitation. During Operation: No infectious material is used. Since public sanitation is improved, positive impact is expected.

A± : The item which serious positive or negative influence is assumed

B± : The item which positive or negative influence is assumed

C± : The item which slight positive or negative influence is assumed,

D : The item which influence is not assumed

Source: JICA Study Team

1-3-1-8 Mitigation Measures

Mitigation measures of the significant environmental and social impacts are as described in Table 1-12.

Table 1-12 Mitigation Measures of Environmental and Social Impacts

Classification	Items	Mitigation Measures	Implementing Organization	Cost
During Construction	1. Air pollution	Sprinkling water. To use low emission gas models of construction machines.	The Contractor	Included in construction cost
	2. Water pollution	To discharge water after collection by gutters and catch basins of suspended solid.	The Contractor	Included in construction cost
	3. Noise and vibrations	To install soundproof walls. To use low noise and vibration models of construction machines.	The Contractor	Included in construction cost
	4. Accidents	To wear safety protector such as gloves, helmet, safety belt, etc. To implement safety management meeting.	The Contractor	Included in construction cost
	5. Existing social infrastructure and social services	To provide adequate operation schedule of construction vehicles.	The Contractor	Included in construction cost
During Operation	1. Air pollution	To stop engines during idling time for vacuum and dump trucks.	Contractor for operation & maintenance	Included in operation & management cost
	2. Water pollution	To discharge effluent of STP after treatment satisfying the effluent quality standards.	Contractor for operation & maintenance	Included in operation & management cost
	3. Waste	To dispose de-watered cake at landfill site adequately.	Contractor for operation & maintenance	Included in operation & management cost
	4. Odor	To maintain deodorizing devices.	Contractor for operation & maintenance	Included in operation & management cost
	5. Accidents	To provide safe driving instruction to trucks' drivers	Contractor for operation & maintenance	Included in operation & management cost
	6. Local Economy (Employment and Livelihood, etc.)	To involve the existing private de-sludgers into the operation of the Project activity.	MCWD	Included in operation & management cost
	7. Existing social infrastructure and social services	To provide adequate operation schedule of vacuum and dump trucks.	MCWD Contractor for operation & maintenance	Included in operation & management cost

Source: JICA Study Team

1-3-1-9 Environmental Management Plans and Monitoring Plans

Based on ECC issued by DENR, environmental management and monitoring should be implemented during construction and operation stages. According to anticipated environmental impacts, environmental management described in Table 1-13 is required. Environmental management plan (draft) and monitoring plan (draft) are described in Table 1-14 and Table 1-15 respectively.

Table 1-13 Items on Environmental Management

	Before and During Construction	During operation
Dealt by facilities and / or construction method	- To minimize emission gases and dusts from construction trucks and construction activity.	- To provide prevention devices of odor.
Dealt by quotidian activities (subjects to be monitored)	- To minimize emission gases and dusts from construction trucks and construction activity. - To prevent water pollution due	- To minimize emission gases from vacuum and dump trucks. - To prevent water pollution by effluent of STP. - To dispose adequately de-

	Before and During Construction	During operation
	to drained water from construction site. - To minimize noise and vibrations due to operation of construction machines. - To prevent accidents during construction. - To minimize traffic jam by construction vehicles.	watered cake. - To prevent accidents due to operation of trucks. - To ensure working quantity of the existing private de-sludgers. - To minimize traffic jam by construction vehicles.

Source: JICA Study Team

Table 1-14 Environmental Management Plan (draft)

No	Category	Impact	Countermeasures	(1) Responsible Organization (2) Supervising Agency	Responsible Organization for Cost
Construction Stage					
1	Air Pollution	Emission gases and dusts are generated by operation of construction vehicles and machineries.	Pollution will be minimized by sprinkling water. The Contractor will use the latest type of construction machinery in good condition of emission gas.	(1) Contractor (2) Consultant, MCWD	Included in construction cost
2	Water Pollution	Turbid water is drained in rivers.	The Contractor will install gutters and basins to catch turbid water and to reduce turbidity before draining.	(1) Contractor (2) Consultant, MCWD	Included in construction cost
3	Noise and Vibration	Noise and vibration are generated by construction machinery.	The Contractor will install fence to minimize the noise and will use low noise / vibration machinery.	(1) Contractor (2) Consultant, MCWD	Included in construction cost
4	Existing Social Infrastructure and Social Services	Traffic jam due to construction vehicles.	Traffic condition will be controlled around the sites. Operation time will be scheduled adequately.	(1) Contractor (2) Consultant, MCWD	Included in construction cost
5	Accident	Traffic accident due to construction vehicles. Accident in construction works.	The Contractor will provide safe driving instructions. Based on occupational safety and health standards, the Contractor will make workers wear safety protector such as gloves, helmet, safety belts, etc.	(1) Contractor (2) Consultant, MCWD	Included in construction cost
Operation Stage					
1	Air Pollution	Emission gases are generated by operation of vacuum and dump trucks.	Engine will be turned off during idling time.	(1) Contractor for O&M (2) MCWD	Included in operation & maintenance cost
2	Water Pollution	Wastewater (effluent) from STP.	Wastewater will be treated to satisfy effluent quality standards before discharge.	(1) Contractor for O&M (2) MCWD	Included in operation & maintenance cost
3	Waste	De-watered cake from STP.	De-watered cakes will be disposed adequately in Landfill site.	(1) Contractor for O&M (2) MCWD	Included in operation & maintenance cost
4	Odor	Odor from STP.	Deodorization devices will be installed and maintained.	(1) Contractor (2) Consultant, MCWD	Included in operation & maintenance cost
5	Local Economy (Employment and Livelihood, etc.)	Business opportunity of the existing private de-sludgers will be reduced.	The existing private de-sludgers will be involved in the Project operation.	(1) MCWD (2) MCWD	Included in operation & maintenance cost

No	Category	Impact	Countermeasures	(1) Responsible Organization (2) Supervising Agency	Responsible Organization for Cost
6	Accident	Traffic accident due to operation of vacuum and dump trucks.	Safe driving instructions will be provided to drivers.	(1) Contractor for O&M (2) MCWD	Included in operation & maintenance cost

Source: JICA Study Team

Table 1-15 Environmental Monitoring plan (draft)

Time	Classification	Monitoring Item	Point	Frequency	Method	Responsible Institution	Cost
Construction Stage	1. Water Quality	Suspended Solids	Point before discharge into river	During construction work Once a week	Sampling water and analyze by portable meters	Contractor MCWD	Included in the Construction cost
	2. Existing Social Infrastructure and Social Services	Traffic conditions	Construction site	When necessary during construction period	Visual check Photographic records Monthly work report	Contractor MCWD	Included in the construction cost
	3. Accident	Safety training to prevent accidents	Construction site office	When necessary during construction period	Visual check Photographic records Monthly work report	Contractor MCWD	Included in the construction cost
Operation Stage	1. Water Quality	Effluent quality: BOD, Fecal Ammonia, Nitrate, Phosphate, Oil and Grease, Surfactants	Points before discharge into river	During operation work Once a week	Sampling water and analyze in laboratory (needed to be suitable for effluent standards)	Contractor for operation & maintenance MCWD	Included in the operation & maintenance cost
	2. Existing Social Infrastructure and Social Services	Assignment of private de-sludgers for septage collection	Assigned volume for de-sludge	Once a month	Confirmed by operation records	MCWD	Included in the operation & maintenance cost
	3. Accident	Safety training to prevent accidents	STP and / or around STP	When necessary	Visual check Photographic records Monthly work report	Contractor for operation & maintenance MCWD	Included in the operation & maintenance cost
	4. Waste	Volume of generated and disposed de-watered cake	STP and Binaliw landfill site	Once a month	Management by manifest Monthly work report	MCWD	Included in the operation & maintenance cost

Source: JICA Study Team

1-3-1-10 Stakeholders Meeting

Following meetings have been conducted until February 2018.

(1) Meeting with private de-sludgers

On 1 February 2018, meeting with private de-sludgers was conducted. Since the Project may affect business opportunity of the private de-sludgers, it was confirmed that MCWD and the private de-sludgers will make agreement for involvement of the private de-sludgers into the Project. Contents of the meeting is as shown in Table 1-16.

Table 1-16 Stakeholders Meeting with Private De-Sludgers

Date	Participants	Content of Meeting
1 February 2018	10 persons from 5 de-sludge companies, 1 person from a STP operation company, 4 persons from MCWD, 10 persons from JICA Study Team	(1) MCWD explained its plan to commence septage management program as a public service, including de-sludging service. It also explained that the business opportunities of the exiting private de-sludgers will be reduced if MCWD will provide fully de-sludge service. Therefore, MCWD proposes to cooperate the de-sludge service with the exiting private de-sludgers. (2) JICA study team explained a rough plan for STP and forecasted septage volume to be managed in the Project, as well as service area of the Project. (3) The private de-sludgers showed discontents with the MCWD's plan. However, they agree on the Project if MCWD secures the business opportunities of the private de-sludgers for the existing level of septage volume. (4) MCWD and the private de-sludgers agreed that they will continue discussions for cooperation in the Project such as allocation of septage volume, service area, contracting system.

Source: JICA Study Team

(2) Meeting with LGUs

On 2 and 19 February 2018, meetings with LGUs were conducted. MCWD explained its plan to commence the septage management program and the participants confirmed that all of 6 LGUs will join the Project and accept the MCWD's services for septage management. Since the Project obliges scheduled de-sludging of septic tanks to residents, it was also confirmed that each LGU enacts a proper ordinances specifying responsible agency and necessity of de-sludge. At this point, it was confirmed that Compostela has not yet prepared the ordinance. To facilitate the ordinance preparation of Compostela, MCWD will prepare a draft ordinance. After then, Compostela will discuss and finalize the ordinance by themselves.

Contents of the meeting is as shown in Table 1-17.

Table 1-17 Stakeholders Meeting with LGUs

Date	Participants	Content of Meeting
2 February 2018	23 persons from related LGUs, 1 person from DENR 2 persons from MCWD, 1 person from Metropolitan Cebu Development Coordinating Board, 9 persons from JICA Study Team	(1) MCWD explained its plan to commence septage management program as a public service, including tentative areas of de-sludging service, tentative locations of STPs, tentative volume of septage, tentative treatment process of effluent. (2) JICA study team explained a rough plan for STP design and planned frequency of septage collection. (3) MCWD and JICA study team asked priority area and / or priority component of the Project to the related LGUs. (4) The LGUs raised a question for tariff rate as well as tariff collection system. (5) MCWD showed the example of the existing system being conducted in Mactan island. The LGUs understood the MCWD's plan. (6) MCWD and the LGUs agreed that they will make official agreements for septage management. (7) As for detail plans such as priority of components and frequency of septage collection, the participants agreed to have another discussions.
19 February	11 persons from related LGUs,	(1) The related LGUs said that they are able to agree following:

Date	Participants	Content of Meeting
2018	2 persons from MCWD, 8 persons from JICA Study Team	1) planned locations of STP 2) septage collection frequency should be 5 years 3) although approval of city councils is necessary, LGUs agree on MCWD's plan basically (2) The participants agreed that MCWD and JICA study team conduct further detail study for the Project plan.

Source: JICA Study Team

(3) Meeting with relevant agencies such as LGUs, DENR, NGOs, etc.

On 28 February 2018, meeting among related organizations, such as LGUs, DENR, environmental NGO and septage treatment companies was conducted. Participants confirmed the necessity of the Project and agreed to implement the Project. Contents of the meeting is as shown in Table 1-18.

Table 1-18 Stakeholders Meeting with LGUs, DENR, NGOs, etc.

Date	Participants	Content of Meeting
28 February 2018	17 persons from related LGUs, 3 persons from Department of Health, 1 person from DENR, 1 person from Department of Public Works and Highway, 1 person from Metropolitan Cebu Development Coordinating Board, 10 persons from MCWD, 5 persons from JICA Study Team, 16 persons from others, such as private companies related to septage management, construction and NGOs	(1) MCWD explained its plan to commence septage management program as a public service, as well as present conditions of septage management and environmental impact. (2) JICA study team explained a rough plan for STP and forecasted septage volume to be managed in the Project, as well as service area of the Project. (3) Cebu City declared its opinion to support the Project implementation. (4) DENR also declared that the Project is urgently necessary and DENR supports the Project. (5) A question was raised for a plan / schedule of sewerage development. MCWD answered that it will be planned in a later stage. Since no sewerage master plan is available, it is difficult to develop sewerage immediately. (6) Another question was raised for a possibility of PPP in construction and operation. MCWD answered that private companies will be hired for operation of the Project. (7) No negative comment on the Project was raised.

Source: JICA Study Team

1-3-2 Land Acquisition and Residents

Land for STP belongs to Cebu Province. MCWD and Cebu Province have agreed that the land will be allocated to MCWD for 50 years under lease conditions, in a tripartite agreement among Cebu Province, Cebu City and MCWD, signed in January 2019, for transfer of land and operation of the existing septage de-watering plant. As for involuntary resettlement, it will not occur in the site.

1-3-3 Others

1-3-3-1 Monitoring Form (Draft)

Monitoring form (draft) is shown in appendix-6-1.

1-3-3-2 Environmental Checklist

Environmental checklist is shown in appendix-6-2.

CHAPTER 2

Contents of the Project

CHAPTER 2 CONTENTS OF THE PROJECT

2-1 Basic Concept of the Project

In conditions of 1) coverage of sewerage is less than 10%, 2) availability of sanitary toilets is for around 33% of population, 3) scheduled de-sludge service is little conducted although septic tanks are widely spread in the country, and 4) collected septage is rarely treated appropriately, the Government of the Philippines prepared National Sewerage and Septage Management Program (hereinafter referred to as “NSSMP”) aiming at introducing appropriate septage treatment systems for all LGUs by 2020. It also aims at introducing sewerage systems for much urbanized LGUs.

In Metro Cebu Area, it is estimated that the septic tanks are spread for approximately 90% of the population. However, no proper management system of septage is conducted. Mega Cebu Roadmap 2050 prepared in 2015, therefore, raises a target of appropriate wastewater management coverage to be 50% in 2030 and 90% in 2050 respectively for population. It includes an urgent project to commence the septage management system, which is equipped with STPs.

In the circumstances, the Project aims at improvement of septage treatment from 8% to 58% (100% of MCWD water supply customers and 20% of non-customers of water supply) in the MCWD water supply service area.

To achieve the above mentioned target, the Project is to construct facilities and to procure equipment necessary for septage collection and treatment. And by the Project, it is expected for the septage management capacity to be 392m³/d (2025) for the 6 LGUs consisting of Compostela, Liloan, Consolacion, Mandaue City, Cebu City, City of Talisay. In the Project, the components of Japanese assistance are 1) construction of a STP (400m³/d) and 2) procurement of 21 of vacuum truck (3m³), 14 of vacuum truck (3m³) and 4 of dump truck (8m³).

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Basic Policy

The Project is to provide necessary facility and equipment for increasing proper treatment ratio of septic tank septage in Metropolitan Cebu, where adequate septage collection/treatment rate is 8.1%.

The Project target area consists of Compostela, Liloan, Consolacion, Mandaue city, Cebu city, and City of Talisay; 6 LGUs in Metropolitan Cebu. MCWD is an implantation agency for water supply for the mentioned area and its mandate includes wastewater management. Therefore, MCWD intends to widen its service fields to septage management as the implementation agency of this Project, by utilizing the facility and equipment to be constructed / procured in the Project and providing the septage collection / treatment service as well as tariff collection from households and business entities in the Project area.

Before establishing the Project, United States Agency for International Development (hereinafter referred to as “USAID”) conducted Feasibility Study (Metro Cebu Septage Management Project Feasibility Study, 2011, USAID : hereinafter called F/S) in 2011. After then, septage management in Metropolitan Cebu has been planned based on the F/S. In the circumstance, the Project is also formulated according to the mentioned F/S.

Six (6) LGUs in the Project target area and MCWD have reached agreement that the frequency of the septage collection is to be once per 5 years and the proposed design target year is to be 2025. Thus, necessary facility, equipment and activity for collecting (de-sludging septic tank)/treating the septage is planned for 5 years frequency in the Project. The 5 years frequency is the same as the frequency planned in the F/S.

The Project consists of 1) Procurement vacuum trucks for de-sludging and collecting septage, 2) Construction STP to treat collected septage, 3) Procurement dump trucks to carry de-watered cake generated in the STP and 4) Soft Component (technical assistance) to enhance the septage management organization. MCWD has no experience and no implementation system of the sequential process to

collect/treat septage and dispose of de-watered cake. Therefore, operation and maintenance (hereinafter referred to as “O&M”) work for the facilities and equipment will be outsourced to experienced private company(ies). MCWD, accordingly, will conduct contract management, confirmation of work achievement and monitoring of outsourced works as the Project implementation body.

2-2-1-2 Natural Environment Conditions

(1) Rainfall

The rainfall intensity curve in Figure 2-1 shows that approximately 130mm/h of intense rainfall occur over 15 minutes probably once every five years in Cebu City based on “Surface water drainage for low-income communities” published by the World Health Organization (WHO). However, no rainwater discharging facility is necessary to be installed in the STP by the Project because the internal roads in the STP is finished with gravel layer for following reasons. After completion of the Project, MCWD will pave the road with asphalt or concrete and install rainwater discharge facilities according to site subsidence conditions.

- In the Project, as described elsewhere, the STP and roads will be built on the reclaimed lagoon. Since the facilities construction will be conducted just after the reclamation, the ground for the STP may possibly subside.
- Thus, if asphalt or concrete is laid, it may be affected by differential settlement after installation. Therefore, the ground surfaces in the STP yard is finished with a gravel covering in the Project.
- When the ground subsidence is judged to have ceased, it is ideal that MCWD lays asphalt or concrete and installs discharge facilities in the STP yard accommodating 130mm/h of intense rainfall.

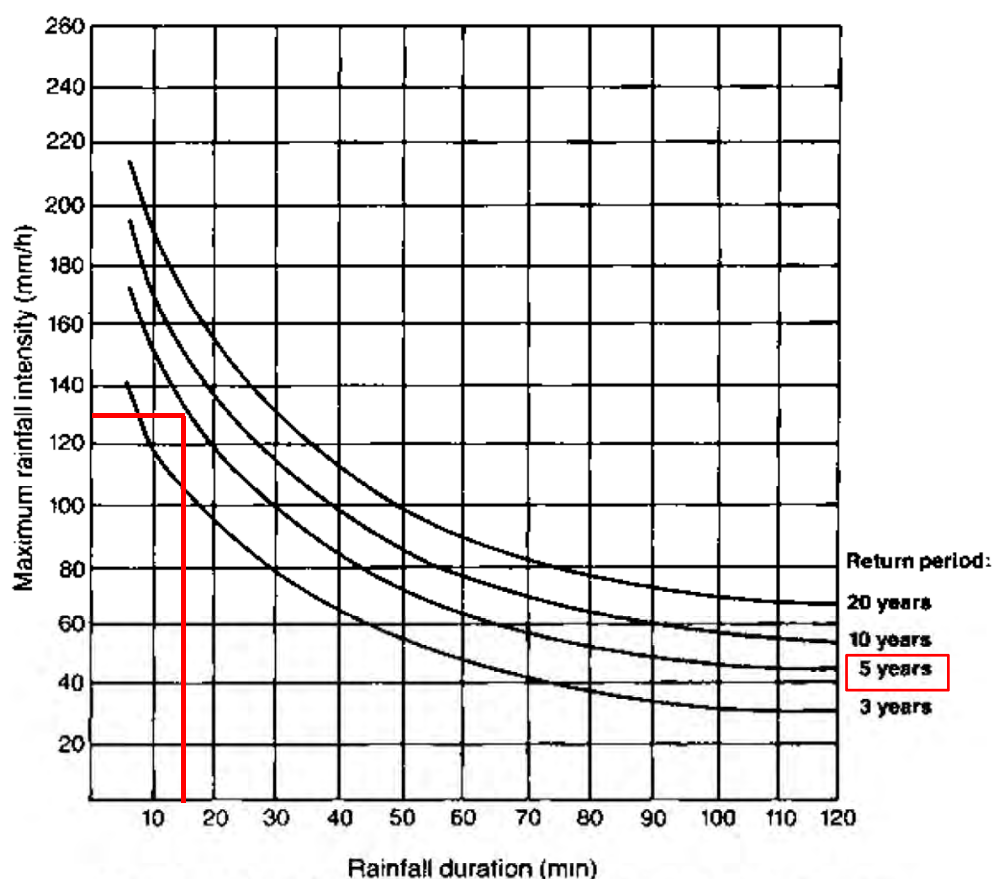


Fig. A2.1. Rainfall intensity-duration graph for Cebu, Philippines

Source: Surface water drainage for low-income communities, World Health Organization (WHO)

Figure 2-1 Cebu Rainfall Intensity Curve

(2) Temperature

Metro Cebu is situated at lat. 10°17'N (Cebu City), where the average annual temperature is around 26 degree Celsius; whereas the average annual temperature in Yokohama is 16 degree Celsius. Temperature of Metro Cebu is approximately 10 degree Celsius higher in comparison.

When treating the filtrate generated in the septage treating process, the temperature of the filtrate is a key factor to that processing – hence, considering the existing record for received septage in the Philippines and the temperature in Metro Cebu, the design filtrate temperature is determined as 30 degree Celsius for the Project.

(3) Wind Force

In the Philippines, for structures, administrative procedures move ahead in accordance with the National Building Code and related regulations as the applicable law. Wind load is necessary to be complied with the National Structural Code of the Philippines (hereinafter “NSCP”). As the STP is categorized in “Essential Facilities”, the design wind speed is instructed as 280km/h in the Metro Cebu region. However, it is not applicable for low height constructions of less than 14m high, so there is no need to take into consideration a special level of wind load because the STP in the Project is planned for less than 14m high.

(4) Earthquakes

The earthquake load is regulated in Chapter 2, Section 208 of NSCP, a STP is categorized as “Essential Facilities” and 1.5 is applied as the construction standard shearing force coefficient.

Cebu City is located in seismic zone 4 and 0.4 is applied as seismic zone coefficient. As for examination on liquefaction, Chapter 3, Section 303 of NSCP states that “the seismic zone factor can be applicable for the peak ground acceleration”. Thus, as described below in “(6) Soil Resistance”, the competent coefficient 0.4 is utilized, which is the equivalent of the value for Class III ground classification with Level 2 Type I seismic movement in Japan.

(5) Current Condition of Facility Construction Site

The Project was originally requested to implement by three (3) divided areas and to construct STPs in each area. As for the STPs construction sites, MCWD suggested Inayawan Landfill site, Umapad Landfill site, and a site for existing septage de-watered plant in Cebu city (Amcon site). However, Inayawan Landfill site and Umapad Landfill site are unsuitable due to following reasons. Therefore, a STP will be constructed in Amcon site only for the Project area. Not dividing the Project areas into three (3), one (1) STP at Amcon site will cater to whole the Project area.

- Collected solid waste in Inayawan Landfill is loaded up to 10 -15 meters height and it is difficult to conduct topographic survey and geotechnical survey necessary for the study of the Project.
- Umapad landfill is closed for solid waste landfill. The ground surface is leveled and covered with soil. However, it has been for only 2 years since the site closure for solid waste landfill. Thus, burnable and toxic gas can be generated. Since measurement and / or treatment on the gas has not been implemented, there is a risk for occurrence of accidents during the construction and operation stages.

(6) Soil Resistance

As of January 2019, the proposed STP site is in lagoon used for the existing septage de-watering plant in Cebu City. The lagoon is scheduled to be reclaimed at the expense of the Philippine side by the time of commencement of construction work of the Project. The earthworks related to this reclamation work is complied with the “Standard specifications for highways, bridges and airports” (hereinafter referred to as “Blue Book”) prescribed by the Department of Public Works and Highways (hereinafter referred to as “DPWH”) in the Philippines.

As a result of the study for allowable bearing capacity of soil and liquefaction at time of earthquakes for applying the direct foundation method on reclaimed ground, the ground bearing capacity is insufficient and a liquefaction countermeasure is needed. This is because the ground water level is high and there is a wide spread of sandy soil at the intended STP construction site. It is necessary to conduct soil

stabilization to fulfill bearing resistance and counter liquefaction if direct foundation is applied on the facility.

Conversely, results of boring survey on soil resistance of the intended STP construction site confirmed that there is a soil layer having N value for 50 or more at approximately -20m from the ground level (GL). This means that pile foundation is a suitable way of countering liquefaction and the lack of bearing capacity in the landfill ground.

According to results of comparative examinations on the direct foundation system (including stabilizing/improving soil) and pile foundation, the direct foundation system (including improving soil) is less expensive – therefore, the direct foundation system (including improving soil) is adopted for this Project. It is noted that there is no clear design standard pertaining to liquefaction in the Philippines, aseismic design calculations for constructing sewerage works in Japan (Japan Sewage Works Association) is adhered to.

2-2-1-3 Social and Economic Conditions

(1) Conditions to Existing Water Supply Service Connection

MCWD is mainly dealing with water supply services. The Project area is basically same as water supply service area of MCWD. MCWD is planning to impose a little amount of septage treatment fees in the existing water tariff. Therefore, the present management system for customers and fee collections are applied to the septage management. To maintain affordable amount of septage management fees for the customers, the septage collection at 5 years frequency will be applied for the Project.

As of 2017, it is assumed that 56 % of the households in the Project area have no connection to water supply system of MCWD. MCWD is not able to manage such potential customers for septage management by the present customer management system. It is also not able to impose monthly the septage management fees for non-customers of water supply. To improve sanitary environment, it is necessary to involve such non-customers of water supply in the Project. Therefore, MCWD will provide the septage management services to non-water customers on call basis and the fee is collected by every septage collection time.

(2) Existing Private De-sludgers of Septage and Existing De-watering Plant

There is presently a septage de-watering plant which serves around 46 m³/day of septage for the Project area. The plant is operated by Cebu City and MCWD (until February 2019 by Cebu City, from March 2019 by MCWD), and the proposed STP to be established by the Project is planned in the existing plant site. Since the existing plant needs to be operated during the construction stage of the Project, countermeasures will be taken into the Project to maintain the operation of the existing plant.

Present septage collection / transportation to the existing de-watering plant is not conducted by public agency. It is done by private companies. Since the Project may reduce business opportunities of the private companies, the Project will involve such private companies in septage collection / transportation activities.

(3) Septage Collection on Narrow Roads

Since there are many narrow roads and dense houses in the Project area, it is difficult for a large sized septage collection vehicle to keep the efficient workability for septage collection. The Project provides, therefore, small vacuum trucks for narrow roads and congested areas in addition to large vacuum trucks having more transportation efficiency.

2-2-1-4 Condition on Construction and Material Procurement

Since 145 companies registered in Cebu Contractors Association implement various kinds of construction works in Metro Cebu and they have enough man-powers and construction machineries, local contractor can be utilized in construction works of the Project. Construction materials necessary for usual civil and / or building works are also available in Metro Cebu. Therefore, local construction companies and material suppliers will be suggested for the Project.

However, goods which are difficult to be procured locally due to available quality and stability of local market such as de-watering machine and water treatment plant equipment will be procured from Japan.

2-2-1-5 Local Company Utilization on Vehicles Equipment

Japanese truck manufacturers have locally established affiliated companies as well as local factories in the Philippines. Some lineup models of their products are manufactured locally. Since these vehicles are manufactured according to Japanese companies' standards and quality, the vehicle procurement form local market is also applicable. Even if no truck is locally manufactured, manufacturers have already developed a system for inspection, repair and spare-parts supply. Therefore, it is possible to correspond to needs for the O&M of truck by the local resources.

2-2-1-6 O&M Conditions

The main business of MCWD is presently water supply. Wastewater management is also a part of its mandates, but there is no direct activity in present regarding septage collection / transportation in MCWD as well as treatment. Although there is a service for septage collection, transport and treatment in Mactan Island, it is a Private - Public Partnership (PPP) activity under DBFO contract for a capacity of 150m³/day. Therefore, MCWD outsources all major activities such as design, construction, finance, business license, septage collection, de-watering, filtrate treatment and de-watered cake disposal. Thus, MCWD does not have the capacity and organization to conduct the septage management directly as well as actual experiences and practical works.

Although MCWD plans to organize a septage management unit to implement the Project, it is difficult to prepare the direct O&M management unit for STP and vehicle equipment in a short time. Accordingly, MCWD will outsource O&M work to private companies for STP and vehicle equipment. In the circumstances, MCWD will undertake to monitor the achievement and activity of the private companies as the Project responsible.

2-2-1-7 Grade of Facility

(1) Power Receiving and Distributing Equipment

Electrical power (3 phase 440V 60Hz) to the proposed STP is supplied by the local power company, Visayan Electric Company (VECO). Since the STP needs to conduct 24-hour consecutive operation even power outages occur, an emergency generator (1 unit) is installed in the STP.

(2) Instrumentation

Instrumentation will include label switches for running and stopping pumps as well as preventing idle running, and the use of electromagnetic flowmeters to measure each flow, including received septage, septage feeding to de-watering machine, filtrate after de-watering and discharge volume. Differential pressure airflow meters will be installed to measure aeration air volume. Differential pressure water gauges will be also installed to measure water level of septage holding tanks. Control of each flow volume and water level will be based on the measured data, in order to save energy and to treat filtrate in a stable manner.

Reactor tank will be configured with DO and pH meters to ensure comprehension of the treatment condition. Thus, proper water treatment will be achieved by operating optimum equipment.

(3) Monitoring Control

As the STP needs to be run continuously 24 hours a day with a small number of staff, a supervisory control and data acquisition (SCADA) system is necessary. It gathers measuring values from all the meters and operating signals from all the equipment for monitoring the STP while also providing data printouts for managing reports. The system also monitors operating status and malfunction status of all facilities, to enable quick actions for countermeasures for troubles.

(4) Number of Major Equipment

For the STP, types of device are selected carefully to keep the cost efficiency for construction and O&M. The number of devices to be installed is to be the necessity minimum.

Considering continuity during breakdowns repair, two (2) devices each for vital works such as de-watering machine and receiving unit are installed. However, as devices run for 8 hours a day, there is no backup devices, instead the operating time is extended in cases of breakdown.

Regarding the effluent treatment facility, a triple train is applied to enable continuous operation even during maintenance work. Due to the complicated operation for organic substances, nitrogen and phosphate removal, alignment of the facilities is to be enable for individual operation per train for responding to differences in treatment circumstances.

(5) Effluent Standards

The effluent standards stipulated by DENR are applied to the effluent of STP. The applicable standards are stipulated in DAO2016-08, revised in 2016. Table 2-1 shows the standards values pertaining to effluent discharge from sewage treatment plants regulated by the Administration Order. The revision now means that nitrogen and phosphate are regulated.

DENR indicated in January 2019 to MCWD by a written document that the environmental classification of the discharge destination (Mahiga Creek) for the facility construction site will be Class D.

Seven (7) Items shown on Table 2-1 (BOD, fecal coliform, ammonia, nitrate, phosphate, oil and grease, and surfactants) are designated as important monitoring parameters for effluent quality.

Table 2-1 Effluent Standards (Extract from DAO2016-08: Table 9. Effluent Standards)

Parameters	Unit	Water Body Classification						
		A	B	C	D	SB	SC	SD
BOD	mg/L	20	30	50	120	30	100	150
Fecal Coliform	MPN/100mL	4	200	400	800	200	400	800
Ammonia as NH ₃ -N	mg/L	0.5	0.5	0.5	7.5	0.5	0.5	7.5
Nitrate as NO ₃ -N	mg/L	14	14	14	30	20	20	30
Phosphate	mg/L	1	1	1	10	1	1	10
Oil and Grease	mg/L	5	5	5	15	5	10	15
Surfactants(MBAS)	mg/L	2	3	15	30	3	15	30

Source: DENR

2-2-1-8 Methods of Construction, Procurement and Construction Period

(1) Construction Method

Proposed facility construction site is in lagoon for the existing de-watering plant of Cebu City. Therefore, reclamation work of the site will be conducted by the Philippines side before construction commencement of the Japanese side. Direct foundation with open cut method is applied for the Project, but countermeasures for allowable bearing capacity on foundation and liquefaction are necessary. As the countermeasure, middle layer mixing process system is applied for soil stabilization. However, to checking the quality of reclamation to be conducted by the Philippine side as well as appropriateness of design for foundation, check boring (3 piles, 30 meters depth) is conducted during detailed design stage.

(2) Procurement Method

As the facility to be constructed is the STP. In additions to general civil / building construction works, a plant construction is therefore required. Since the plant construction needs specific technical knowledges and skills which are owned by wastewater treatment plant manufacturer, it is necessary to accept a joint venture / consortium constituted by general contractor and wastewater treatment plant manufacturer in the bidding stage.

(3) Construction Period

The construction work in the Project takes 36 months from the Grant Agreement (G/A) including

Detailed Design. Only STP is the facility to be built and it is difficult to build the facility dividing into several stages. Thus, it is necessary to apply the national bonds system.

2-2-2 Basic Plan (Construction Plan / Equipment Plan)

2-2-2-1 Basic Conditions

2-2-2-1-1 Basic Design Conditions

Basic design conditions for the Project are shown in Table 2-2. Processes to determine the conditions are described in next paragraphs.

Table 2-2 Design Parameters of the Project

Items	Figures	Remarks
Design Target year	2025	
Design population	2,244,091	Population in the Project areas
Design households for planned septage collection	469,841	Households in planned septage collection area
Design volume of septage collection	392.42m ³ /day	Planned working days: 280 days per year
Design treatment volume of septage in STP	400m ³ /day	
Design volume of de-watered cake generation	55m ³ /day	

Source: JICA Study Team

2-2-2-1-2 Design Target Year

Design target year is recommended as 2025. However, the capacity of facility and equipment is determined to cover significant parts of the middle term plan year (2030) targeted in Mega Cebu Road Map 2050.

2-2-2-1-3 Project Areas and Planned Septage Collection Area

Proposed septage collection area in F/S is for 8 LGUs, i.e. Compostela, Liloan, Consolacion, Mandaue City, Cebu City and City of Talisay in Cebu Island, and Lapu-Lapu City and Cordova in Mactan Island. Septage management system has been commenced in 2 LGUs of Mactan Island by the PPP project, described in Chapter 2-2-1-6. Therefore, it is appropriate that the Project covers the remaining 6 LGUs, which are Compostela, Liloan, Consolacion, Mandaue City, Cebu City and City of Talisay according to the Grant Aid request from the Philippine side. Planned septage collection area, however, is necessary to be more narrowed according to following conditions based on F/S;

- Barangay¹ where MCWD provides water supply service.
- Even if a Barangay is not in water supply service area of MCWD, neighboring Barangays to water supply service area are included in septage collection area.
- Customers for water supply service of MCWD are targets of septage regular collection.
- Households and entities which are non-customers for water supply service of MCWD are not targets of septage regular collection. Such septage are only a target of on-call collection.

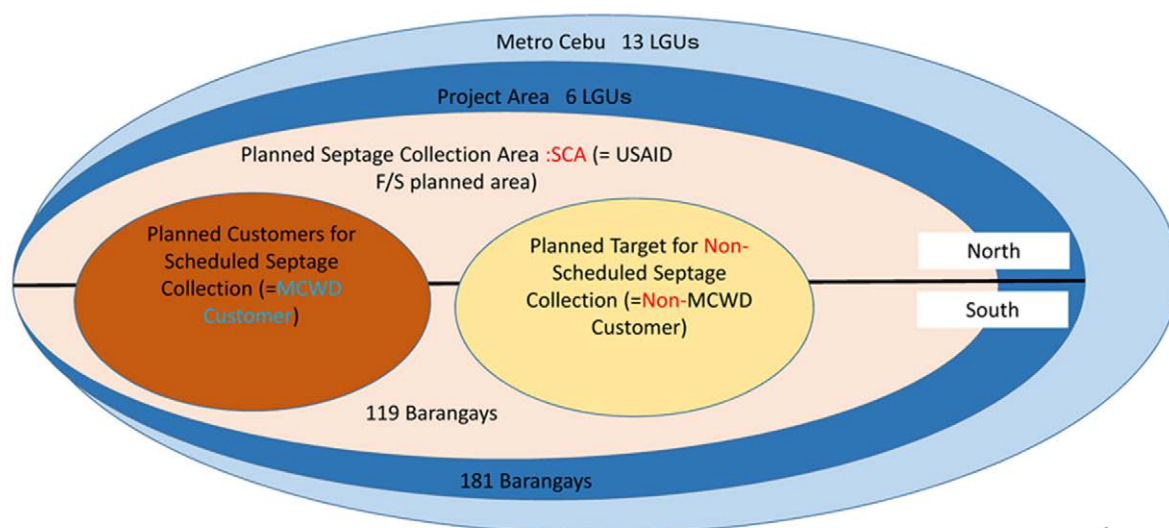
As a result, planned septage collection area consist of 119 barangays described in Table 2-3. Based on population census, it covers 88% of population in the Project area. Concept on the planned septage collection area is described in Figure 2-2 and 2-3.

¹ Administration unit under City and Municipality

Table 2-3 Septage Collection Areas

	Project areas (all LGUs)			Septage Collection Areas (SCA)					SCA ratio by population
	Population in 2015	Acreage (ha)	Number of Barangays	Population in 2015	Acreage (ha)	Number of Barangays			
						Total	MCWD service	Not MCWD service	
Compostela	47,898	6,890	17	32,325	1,002	6	4	2	67%
Liloan	118,753	4,509	14	108,312	2,542	8	8	0	91%
Consolacion	131,528	4,205	21	113,493	2,206	12	11	1	86%
Mandaue	362,654	3,487	27	362,654	3,487	27	27	0	100%
Cebu	922,611	29,120	80	771,532	6,562	50	50	0	84%
Talisay	227,645	4,222	22	202,098	2,430	16	16	0	89%
Total	1,811,089	52,433	181	1,590,414	18,229	119	116	3	88%

Source: JICA Study Team (Population is from census in 2015)



Source: JICA Study Team

Figure 2-2 Concept of Planned Septage Collection Area

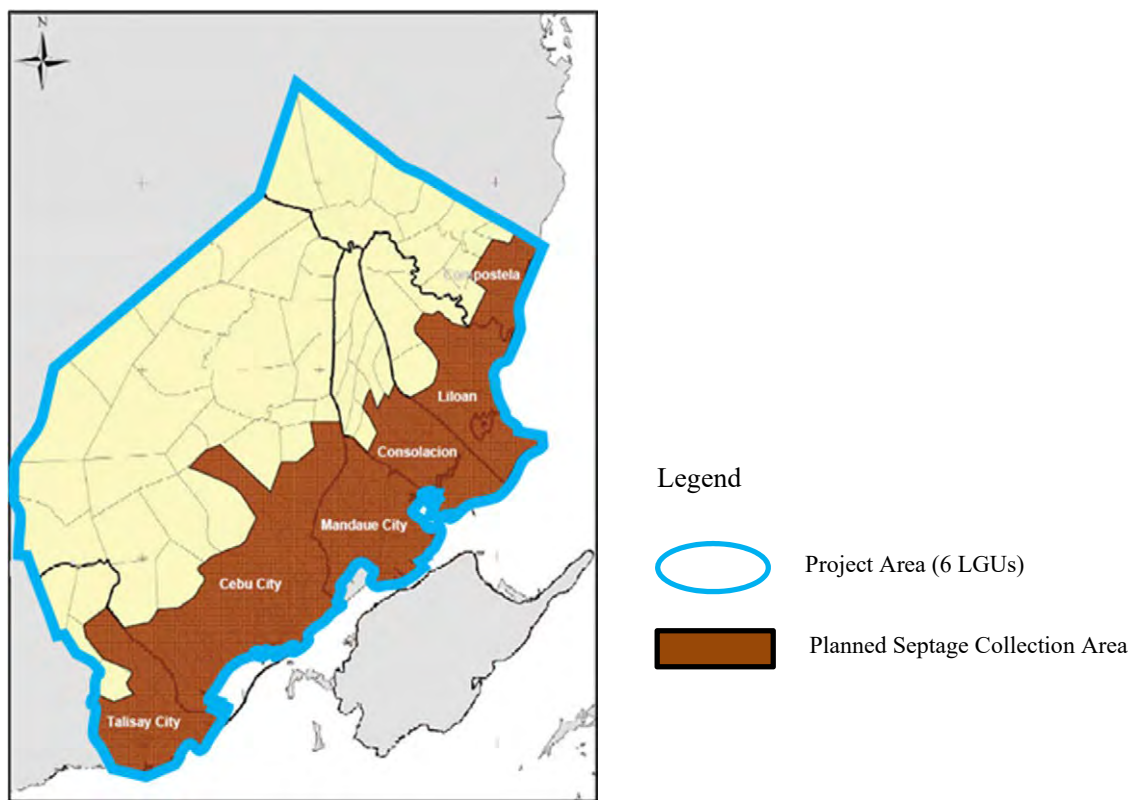


Figure 2-3 Location of Planned Septage Collection Area

2-2-2-1-4 Planned Population and Households

(1) Metropolitan Cebu and the Project area

Table 2-4 shows the population and the number of households in Metropolitan Cebu. Forecasted population in the Project area in 2017, 2025, and 2030 are 1,920,334, 2,244,091, and 2,473,829 respectively calculated by quadratic regression equation estimated up to the population in 2030 based on census of 1990, 1995, 2000, 2007, 2010, and 2015.

The number of average family members on each LGU is publicized in census in 2015 and the number of households is calculated by the average family members. Average family number is defined as the number of people who live in a house at a time of census survey.

(2) Planned Septage Collection Area

The population and households in the above-mentioned planned septage collection area is estimated as Table 2-5 by MCWD's customers list. The numbers of households in septage collection area in 2017, 2025, and 2030 are 402,412, 469,841, and 517,214 respectively. This number of households is target households for planned septage collection.

Planned septage collection area is basically same as the water supply service area of MCWD. However, households and offices are not always MCWD water service customers. The population and households in the planned septage collection area are divided into water supply customers and non-customer of water supply.

Table 2-4 Population and the Number of Households in Metropolitan Cebu

LGU	Population				average number of persons consisting of households	Number of households			
	2015	2017	2020	2025		2015	2017	2020	2025
Project areas (6 LGUs)	Compostela	47,898	50,426	54,033	60,238	66,684	11,460	12,280	13,690
	Liloan	118,753	128,457	141,710	165,374	191,004	29,874	32,956	38,459
	Consolacion	131,528	145,156	165,850	204,400	248,025	33,757	38,570	47,555
	Mandaue	362,654	380,225	399,885	431,041	460,181	100,059	105,233	113,432
	Cebu	922,611	976,611	1,007,667	1,094,165	1,186,441	227,119	234,341	254,457
	Talisay	227,645	239,459	257,588	288,873	321,494	54,423	58,543	65,653
Other LGUs in Metropolitan Cebu	Sub total	1,811,089	1,920,334	2,026,733	2,244,091	2,473,829	456,692	481,923	533,226
	Danao	136,471	141,764	151,774	169,510	188,560	32,968	35,296	39,421
	Minglanilla	132,135	141,281	154,762	178,734	204,588	33,638	36,848	42,556
	Naga	115,750	120,823	129,312	144,251	160,176	27,460	29,389	32,784
	San Fernando	66,280	69,393	73,544	80,577	87,753	15,085	15,988	17,517
	Carcar	119,664	123,831	131,158	144,016	157,686	28,143	29,809	32,731
	Lapu-Lapu	408,112	446,632	499,761	596,971	705,009	108,935	121,893	145,603
	Cordova	59,712	64,154	70,801	82,750	95,786	14,256	15,734	18,389
Sub total		1,038,124	1,107,878	1,211,112	1,396,809	1,599,558	260,485	284,957	329,001
Total in Metropolitan Cebu		2,849,213	3,028,212	3,237,845	3,640,900	4,073,387	717,177	766,800	862,227

Source: LGU population (1960-2015) and Barangay population (as of 1st August, 2015) are from Census of Population 2015 (National Statistics Authority).

Table 2-5 Predicted Number of Households in Septage Collection Area

LGU	2015			2017			2020			2025			2030		
	MCWD Customer	Non MCWD Customer	Total	MCWD Customer	Non MCWD Customer	Total	MCWD Customer	Non MCWD Customer	Total	MCWD Customer	Non MCWD Customer	Total	MCWD Customer	Non MCWD Customer	Total
Compostela	1,339	6,007	7,346	1,435	6,299	7,734	1,574	6,714	8,288	1,797	7,443	9,240	1,989	8,239	10,228
Liloan	6,207	18,982	25,189	6,578	20,669	27,247	7,077	22,981	30,058	7,813	27,265	35,078	9,023	31,491	40,514
Consolacion	676	25,718	26,394	737	28,391	29,128	831	32,450	33,281	985	40,032	41,017	1,195	48,576	49,771
Mandaue	30,274	65,161	95,435	31,958	68,101	100,059	33,920	71,313	105,233	36,438	76,994	113,432	38,901	82,199	121,100
Cebu	112,464	66,962	179,426	124,633	65,295	189,928	136,739	59,228	195,967	160,437	52,352	212,789	173,967	56,767	230,734
Talisay	12,267	33,664	45,931	13,419	34,896	48,315	15,208	36,765	51,973	18,359	39,926	58,285	20,433	44,434	64,867
Total	163,227	216,494	379,721	178,760	223,651	402,411	195,349	229,451	424,800	225,829	244,012	469,841	245,508	271,706	517,214

Source: MCWD

2-2-2-1-5 Number of Septic Tanks

Septic tank installation rate on each LGU in Metropolitan Cebu is predicted as Table 2-6. The number of septic tanks are calculated to multiply predicted number of households by the septic tanks installation rate shown on Table 2-7. As a result, there are approximately 420 thousands septic tanks in the Project area in 2017.

Table 2-6 Septic Tank Installation Rate in each LGU (%)

LGU	2015	2017	2020	2025	2030
Compostela	91%	91%	92%	93%	93%
Liloan	96%	96%	97%	98%	98%
Consolacion	91%	91%	92%	93%	93%
Mandaue	91%	91%	92%	93%	93%
Cebu	89%	89%	90%	91%	91%
Talisay	96%	96%	97%	98%	98%

Note 1: The numbers of 2015, 2020, 2025 are predicted numbers in F/S.

Note 2: The value in 2017 is interpolated value between the value in 2015 and the value in 2020.

Note 3: Since sewage system is planned, the value in 2030 is the same as the number of 2025.

Source: F/S, 2011, USAID (Predicted values are added by JICA Study Team)

The number of septic tanks in planned septage collection area are predicted in Table 2-8, Table 2-9, and Table 2-10 based on the composition rate of MCWD water supply customers by each Barangay, large commercial and public entities. The number of septic tanks are predicted 439 thousands in 2025, and 483 thousands in 2030.

Table 2-7 Number of Domestic Septic Tank in the Project Area

LGU	2017			2020			2025			2030		
	Number of households	Septic tanks installation ratio	Number of septic tanks	Number of households	Septic tanks installation ratio	Number of septic tanks	Number of households	Septic tanks installation ratio	Number of septic tanks	Number of households	Septic tanks installation ratio	Number of septic tanks
Compostela	11,460	91%	10,429	12,280	92%	11,298	13,690	93%	12,732	15,155	93%	14,094
Liloan	29,874	96%	28,679	32,956	97%	31,967	38,459	98%	37,690	44,420	98%	43,532
Consolacion	33,757	91%	30,719	38,570	92%	35,484	47,535	93%	44,208	57,680	93%	53,642
Mandaue	100,059	91%	91,054	105,233	92%	96,814	113,432	93%	105,492	121,100	93%	112,623
Cebu	227,119	89%	202,136	234,341	90%	210,907	254,457	91%	231,556	275,917	91%	251,084
Talisay	54,423	96%	52,246	58,543	97%	56,787	65,653	98%	64,340	73,067	98%	71,606
Total in the Project areas	456,692	91%*	415,263	481,923	92%*	443,257	533,226	93%*	496,018	587,339	93%*	546,581

Source: JICA Study Team, based on F/S, 2011, USAID

Table 2-8 Number of Septic Tank in Planned Septage Collection Areas (Domestic)

LGU	2015			2017			2020			2025			2030		
	MCWD Customers	Not MCWD Customers	Total	MCWD Customers	Not MCWD Customers	Total	MCWD Customers	Not MCWD Customers	Total	MCWD Customers	Not MCWD Customers	Total	MCWD Customers	Not MCWD Customers	Total
Compostela	1,218	5,466	6,684	1,320	5,795	7,115	1,448	6,177	7,625	1,671	6,922	8,593	1,850	7,662	9,512
Liloan	5,959	18,223	24,182	6,315	19,842	26,157	6,865	22,292	29,157	7,657	26,720	34,377	8,843	30,861	39,704
Consolacion	615	23,403	24,018	671	25,836	26,507	765	29,854	30,619	916	37,230	38,146	1,111	45,176	46,287
Mandaue	27,549	59,297	86,846	29,082	61,972	91,054	31,206	65,608	96,814	33,887	71,604	105,491	36,178	76,445	112,623
Cebu	100,093	59,596	159,689	110,923	58,113	169,036	123,065	53,305	176,370	145,998	47,640	193,638	158,310	51,658	209,968
Talisay	11,776	32,317	44,093	12,882	33,500	46,382	14,752	35,662	50,414	17,992	39,127	57,119	20,024	43,545	63,569
Total	147,210	198,302	345,512	161,193	205,058	366,251	178,101	212,898	390,999	208,121	229,243	437,364	226,316	255,347	481,663

Source: JICA Study Team, based on F/S, 2011, USAID

Table 2-9 Number of Septic Tank in Planned Septage Collection Area (Large commercial entities)

LGU	2015			2017			2020			2025			2030		
	MCWD Customers	Not MCWD Customers	Total	MCWD Customers	Not MCWD Customers	Total	MCWD Customers	Not MCWD Customers	Total	MCWD Customers	Not MCWD Customers	Total	MCWD Customers	Not MCWD Customers	Total
Compostela	12	0	12	13	0	13	15	0	15	17	0	17	19	0	19
Liloan	20	0	20	22	0	22	24	0	24	28	0	28	32	0	32
Consolacion	3	0	3	3	0	3	3	0	3	4	0	4	5	0	5
Mandaue	121	0	121	130	0	130	144	0	144	167	0	167	190	0	190
Cebu	353	0	353	380	0	380	420	0	420	487	0	487	554	0	554
Talisay	132	0	132	142	0	142	157	0	157	182	0	182	207	0	207
Total	641	0	641	690	0	690	763	0	763	885	0	885	1007	0	1007

Source: JICA Study Team based on F/S, 2011, USAID

Table 2-10 Number of Septic Tank in Planned Septage Collection Area (Public entities)

LGU	2015			2017			2020			2025			2030		
	MCWD Customers	Not MCWD Customers	Total	MCWD Customers	Not MCWD Customers	Total	MCWD Customers	Not MCWD Customers	Total	MCWD Customers	Not MCWD Customers	Total	MCWD Customers	Not MCWD Customers	Total
Compostela	5	7	12	5	7	12	6	7	13	7	7	14	8	7	15
Liloan	9	8	17	10	8	18	11	8	19	13	8	21	15	8	23
Consolacion	5	11	16	5	11	16	6	11	17	7	11	18	8	11	19
Mandaue	23	27	50	25	27	52	27	27	54	31	27	58	35	27	62
Cebu	202	50	252	217	50	267	240	50	290	278	50	328	316	50	366
Talisay	4	16	20	4	16	20	5	16	21	6	16	22	7	16	23
Total	248	119	367	266	119	385	295	119	414	342	119	461	389	119	508

Source: JICA Study Team based on F/S, 2011, USAID

2-2-2-1-6 Number of Septic Tanks to be Managed (Domestic)

Due to the obstacles on septic tanks or no opening on septic tank, there are some septic tanks which are not able to access for de-sludge work in Metropolitan Cebu.

Since it is difficult to de-sludge such septic tanks, the target number of de-sludge management for septic tanks is estimated by multiplying the number of septic tank and accessibility of septic tank. Based on the F/S, the accessibility to septic tank is estimated as shown in Table 2-11. It is confirmed in the preparatory survey through a sub-contracted interview survey to residents. The result of the interview survey shows 89% for the accessibility.

Table 2-11 Estimated Accessibility to Septic Tank (%)

LGU	Accessibility of septic tank (%)
Compostela	90
Liloan	90
Consolacion	90
Mandaue	80
Cebu	85
Talisay	95

Source: F/S, 2011, USAID

2-2-2-1-7 Number of Septic Tanks to be Managed (Large commercial and Public Entities)

Since commercial and public entities are built to be capable for septic tanks de-sludging, the number of septic tanks to be managed is calculated at 100 % in accessibility.

2-2-2-1-8 Septage Collection Volume per Septic Tank

De-sludge volume from the septic tank is 2.5m³ per collection on average from each domestic household and 5m³ on average from each large commercial and public entity.

2-2-2-1-9 Annual Working Days

Considered holidays and maintenance days on facilities and equipment as follows, 280 days per year is planned for the Project.

- Six (6)-day work per week (313 days per year)
- The number of Holidays per year (21 days per year)
- Inspection day once a month (12 days per year)
- 280 working days per year (= 313 - 21 - 12 days)

2-2-2-1-10 Planned Frequency of Septage Collection

LGUs in the Project area plan the septage collection frequency for every three (3) to five (5) years as shown on Table 2-12 in LGUs' ordinances.

Table 2-12 Frequency of Septage Collection in Ordinances

LGU	Frequency
Compostela	Not yet formulated
Liloan	3-5 years
Consolacion	5 years
Mandaue	5 years
Cebu	3-5 years
Talisay	4 years (Domestic) 2 years (Commercial entities)

Source: Ordinance of each LGU

Since implementation organization of the Project is MCWD and fair service for the collection to all LGUs is required, capacities of facilities and equipment are designed by a unified septage collection

frequency. In the Project, 5 years frequency is selected by following reasons:

- If septage is collected by 3 years frequency, the size of the Project is 1.67 times bigger than 5 years frequency and the costs of construction, equipment, and O&M would be more expensive,
- Existing PPP project in Mactan Islands is implemented by 5 years frequency on septage collection. The PPP project imposes septage collection fee, 2.20PHP per water usage 1 m³, and the fee is affordable for the residents. To maintain the cost at the same level of the price, the septage collection frequency is planned for 5 years,
- Previous F/S is planned 5 years frequency for septage collection,
- 5 years frequency satisfies almost LGUs' ordinances. Furthermore, the ordinances are able to be modified in accordance with the Project,
- And 6LGUs in the Project area agree the plan of MCWD to collect septage every 5 years.

The result of the research in Vietnam conducted by Assistant Professor Dr. Harada Hidenori, Graduate School of Global Environmental Studies in Kyoto University, Japan, shows that a relation of retention period of septage in septic tank and BOD reduction as follows. BOD reduction ratio for 5 years frequency is predicted to be 80% of 3 years frequency as shown in Table 2-13. Between the two frequency cases, there is little gap although a small difference on water environmental improvement efficiency is anticipated.

$$Y = -0.61 X + 90.59$$

Y : BOD reduction ratio (%)

X : Retention period (Months)

Table 2-13 Predicted Congestion Times and BOD Extraction

Retention Period (Years)	Retention Period (Months)	BOD Reduction ratio (%)
3	36	68.63
5	60	53.99

Source: JICA Study Team

2-2-2-1-11 Septage Volume to be Managed

Considering the septic tanks in planned septage collection area described in 2-2-1-5, the accessibility to septic tanks described in 2-2-2-1-6 to 2-2-2-1-10, septage collection volumes per septic tank, STP working days per year, and the frequency of septage collection, planned volume of septage management per working day is estimated in Table 2-14.

Table 2-14 Planned Volume of Septage Management (m³/day)

Planned year	2025	2030
Septage volume to be managed	676.67	746.35

Source: JICA Study Team

Calculation process is as follows. Calculated results for each LGU are also shown in Table 2-15, Table 2-16, Table 2-17, Table 2-18 and Table 2-19.

Domestic household

- 1) The number of Target Septic Tanks to be managed = The number of septic tanks in planned septage collection area x the accessibility to septic tank
- 2) The number of annual target of septage tank to be de-sludged = The number of Target Septic Tanks to be managed / 5 years
- 3) The number of target septic tanks per working day = The number of annual target of septage tank to be de-sludged / 280 days
- 4) The volume of septage to be managed per working day = The number of target septic tanks per working day x 2.5m³

Large commercial and public entities

- 1) The number of Target Septic Tanks to be managed = The number of septic tanks in planned septage collection area
- 2) The number of annual target of septage tank to be de-sludged = The number of Target Septic Tanks to be managed / 5 years
- 3) The number of target septic tanks per working day = The number of annual target of septage tank to be de-sludged / 280 days
- 4) The volume of septage to be managed per working day = The number of target septic tanks per working day x 5m³

Table 2-15 Volume of Septage to be Managed in Each LGU (m³/day) (Domestic)

	2015				2017				2020				2025				2030			
	MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total	
Compostela	1.96	8.79	10.75		2.13	9.31	11.44		2.33	9.93	12.26		2.69	11.13	13.82		2.97	12.31	15.28	
Liloan	9.58	29.29	38.87		10.15	31.89	42.04		11.04	35.83	46.87		12.30	42.95	55.25		14.21	49.60	63.81	
Consolacion	0.99	37.62	38.61		1.08	41.52	42.60		1.23	47.98	49.21		1.47	59.83	61.30		1.79	72.61	74.40	
Mandaue	39.36	84.71	124.07		41.54	88.54	130.08		44.58	93.72	138.30		48.41	102.29	150.70		51.68	109.21	160.89	
Cebu	151.93	90.46	242.39		168.37	88.21	256.58		186.79	80.91	267.70		221.61	72.31	293.92		240.29	78.41	318.70	
Talisay	19.97	54.82	74.79		21.86	56.83	78.69		25.03	60.50	85.53		30.52	66.38	96.90		33.97	73.88	107.85	
Total	223.79	305.69	529.48		245.13	316.30	561.43		271.00	328.87	599.87		317.00	354.89	671.89		344.91	396.02	740.93	

Source: JICA Study Team

Table 2-16 Volume of Septage to be Managed in Each LGU (m³/day) (Large Commercial Entities)

	2015				2017				2020				2025				2030			
	MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total	
Compostela	0.04	0.00	0.04		0.05	0.00	0.05		0.05	0.00	0.05		0.05	0.00	0.05		0.07	0.00	0.07	
Liloan	0.07	0.00	0.07		0.07	0.00	0.07		0.09	0.00	0.09		0.11	0.00	0.11		0.11	0.00	0.11	
Consolacion	0.02	0.00	0.02		0.02	0.00	0.02		0.02	0.00	0.02		0.02	0.00	0.02		0.02	0.00	0.02	
Mandaue	0.43	0.00	0.43		0.46	0.00	0.46		0.52	0.00	0.52		0.59	0.00	0.59		0.68	0.00	0.68	
Cebu	1.27	0.00	1.27		1.36	0.00	1.36		1.50	0.00	1.50		1.73	0.00	1.73		1.98	0.00	1.98	
Talisay	0.46	0.00	0.46		0.50	0.00	0.50		0.55	0.00	0.55		0.64	0.00	0.64		0.73	0.00	0.73	
Total	2.29	0.00	2.29		2.46	0.00	2.46		2.73	0.00	2.73		3.14	0.00	3.14		3.59	0.00	3.59	

Source: JICA Study Team

Table 2-17 Volume of Septage to be Managed in Each LGU (m³/day) (Public Entities)

	2015				2017				2020				2025				2030			
	MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total	
Compostela	0.02	0.02	0.04		0.02	0.02	0.04		0.02	0.02	0.04		0.02	0.02	0.04		0.04	0.02	0.06	
Liloan	0.04	0.04	0.08		0.04	0.04	0.08		0.04	0.04	0.08		0.05	0.04	0.09		0.05	0.04	0.09	
Consolacion	0.02	0.04	0.06		0.02	0.04	0.06		0.02	0.04	0.06		0.02	0.04	0.06		0.04	0.04	0.08	
Mandaue	0.09	0.09	0.18		0.09	0.09	0.18		0.09	0.09	0.18		0.11	0.09	0.20		0.13	0.09	0.22	
Cebu	0.71	0.18	0.89		0.77	0.18	0.95		0.86	0.18	1.04		1.00	0.18	1.18		1.13	0.18	1.31	
Talisay	0.02	0.05	0.07		0.02	0.05	0.07		0.02	0.05	0.07		0.02	0.05	0.07		0.02	0.05	0.07	
Total	0.90	0.42	1.32		0.96	0.42	1.38		1.05	0.42	1.47		1.22	0.42	1.64		1.41	0.42	1.83	

Source: JICA Study Team

Table 2-18 Volume of Septage to be Managed in Each LGU (m³/day) (Total)

	2015				2017				2020				2025				2030			
	MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total	
Compostela	2.02	8.81	10.83		2.20	9.33	11.53		2.40	9.95	12.35		2.76	11.15	13.91		3.08	12.33	15.41	
Liloan	9.68	29.33	39.02		10.26	31.93	42.19		11.17	35.87	47.04		12.46	42.99	55.45		14.37	49.64	64.01	
Consolacion	1.03	37.66	38.69		1.12	41.56	42.68		1.27	48.02	49.29		1.51	59.87	61.38		1.85	72.65	74.50	
Mandaue	39.88	84.80	124.68		42.09	88.63	130.72		45.19	93.81	139.00		49.11	102.38	151.49		52.49	109.30	161.79	
Cebu	153.91	90.64	244.55		170.50	88.39	258.89		189.15	81.09	270.24		224.34	72.49	296.83		243.40	78.59	321.99	
Talisay	20.45	54.87	75.32		22.38	56.89	79.26		25.60	60.55	86.15		31.18	66.43	97.61		34.72	73.93	108.65	
Total	226.98	306.11	533.09		248.58	316.72	565.27		274.78	329.29	604.07		321.36	355.31	676.67		349.91	396.44	746.35	

Source: JICA Study Team

Table 2-19 Volume of Septage to be Managed by Type of Facility (m³/day) (Total)

	2015				2017				2020				2025				2030			
	MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total		MCWD Customers	Non MCWD Customers	Total	
Ordinary homes	223.79	305.69	529.48		245.13	316.30	561.43		271.00	328.87	599.87		317.00	354.89	671.89		344.91	396.02	740.93	
Large commercial facilities	2.29	0.00	2.29		2.46	0.00	2.46		2.73	0.00	2.73		3.14	0.00	3.14		3.59	0.00	3.59	
Public facilities	0.90	0.42	1.32		0.96	0.42	1.38		1.05	0.42	1.47		1.22	0.42	1.64		1.41	0.42	1.83	
Total	226.98	306.11	533.09		248.55	316.72	565.27		274.78	329.29	604.07		321.36	355.31	676.67		349.91	396.44	746.35	

Source: JICA Study Team

2-2-2-1-12 Volume of Septage to be Collected in the Project

It is ideal to collect/treat 676.67 m³/day amount of septage in 2025. It is however too rapid improvement to achieve immediately due to the following circumstances to the existing septage management.

- MCWD has no organization and experience to collect / treat septage directly.
- Though Cebu City conducts around 46m³/day of septage management as public services, there is no filtrate treatment plant and it is insufficient for wastewater treatment experience.
- PPP Project (capacity 150m³/day) in Mactan Islands is implemented under MCWD's business but the main implementation body for design, construction and O&M is a private company. MCWD is not involved in the O&M directly.

Therefore, the target volume of septage to be collected in 2025 by the Project is further narrowed to urgent level and easier level for the O&M although the planned volume of septage collection in 2030 is maintained to be 746.35 m³/day.

(1) Relationship between the Project and Mega Cebu Road Map

Mega Cebu Road Map 2050 proposes that adequate wastewater management ratio would be improved up to 50 percent of its population ratio by 2030. There is no sewerage system presently in Metropolitan Cebu, and domestic wastewater from kitchen (gray water) and night soil (black water) are basically disposed separately. In a difficult circumstances for introducing the sewerage system by 2030, it is difficult to treat both gray water and black water integrated immediately. Therefore, gray and black water is required to be treated separately until the sewerage system is introduced.

To contribute the achievement of Mega Cebu Road Map 2050, it is appropriate to treat the septage in Metro Cebu to be 50 percent or more in 2030 as an upper goal.

The septage amount in Metropolitan Cebu in 2030 is estimated 1,611m³/day as shown below and in Table 2-20.

- The septage volume from domestic household is calculated by average septic tank installation rate and estimated number of the household in a same manner for the Project area.
- The septage volume for large commercial and public entities are considered for Mactan Island (Lapu-Lapu and Cordova)
- Since there are few commercial and public entities in other LGUs, septage from those facilities are not necessary to be especially considered.

Table 2-20 Predicted Volume of Septage in Metropolitan Cebu (m³/day)

Items	2017	2020	2025	2030
Number of domestic households in 13 LGUs Metropolitan Cebu	717,177	766,880	862,227	964,459
Septic tank Installation rate	91%	92%	93%	93%
The predicted number of septic tank in Metropolitan Cebu	652,631	705,530	801,871	896,947
Estimated volume of septage for domestic households (m ³ /day)	1,165	1,260	1,432	1,602
Estimated volume of septage for large commercial and public entities (m ³ /day)	6	7	8	9
Total (m ³ /day)	1,171	1,267	1,440	1,611

Source: JICA Study Team

Therefore, the collection volume on the upper goal is satisfied if more than 806m³/day of septage is collected in whole Metropolitan Cebu in 2030.

In case to narrow it to the Project area, the treatment capacity is required to be 611 m³/day or more in 2030 as follows. If the septage treatment volume in 2030 is 746.35 m³/day for the Project area as aforementioned, it contributes to the achievement of the upper goal.

- Generated septage volume in Metropolitan Cebu in 2030 is 1,611m³/day.
- If treating 50% or more, 806m³/day is required for septage treatment.

- The capacity of the exiting plant in Mactan Islands and Naga city² is 195 m³/day in total.
- Since the existing septage de-watering plant in Cebu City is replaced to the Project, such capacity is not counted for a capacity in 2030.
- If the STP of the Project caters the treatment for 611 m³/day or more (= 806 m³/day - 195 m³/day) in 2030, the goal described Mega Cebu Road Map would be satisfied in an aspect of septage.

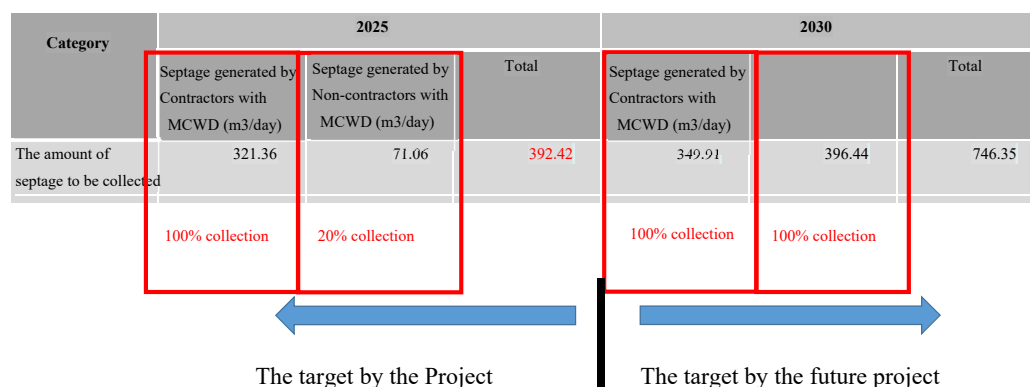
(2) Volume of Septage to be Collected by the Project (2025)

Since MCWD is the implementation organization and septage treatment fee is collected together with water tariff, it is reasonable that MCWD's customers for water supply are main customers for septage collection. Firstly, septage from MCWD's customers for water supply in the planned septage collection area is planned to be collected. However, septage is generated in non-customers for MCWD water supply and there is a certain demand of de-sludge / collection services in these households. Thus, the capability for treatment of septage from 20% of non-MCWD customers is incorporated in the Project. Table 2-21 shows the design volume of septage collection by the Project (2025). Concept is shown in Figure 2-4.

Table 2-21 Design Volume of Septage Collection by the Project (2025)

Item	2025		
	Volume of Septage to be Managed (m ³ /day)	Collection Ratio	Design Volume of Septage Collection (m ³ /day)
Customers of MCWD water supply	321.36	100%	321.36
Non-customer for MCWD water supply	355.31	20%	71.06
Total	676.67		392.42

Source: JICA Study Team



Source: JICA Study Team

Figure 2-4 Septage Treatment Capacity in the Project

2-2-2-1-13 Plan for 2030 or after and Zoning of Septage Collection Area

Although the design volume of septage collection in 2025 is 392.42 m³/day, required septage collection volume is 746 m³/day in 2030. Due to the area constraint of the facility construction site, it is difficult to expand the size of facility which exceeds 450 m³/day. Therefore, it is required to conduct the divided zoning management for septage collection / treatment, i.e. for North and South at least.

The implementation plan for the Project is therefore proceeded according to following concept.

- 1) Since the STP construction site in the Project locates in the south of the Project area, the proposed STP in the Project is named "the South STP".
- 2) This Project provides the South STP only in 2025. The service area of the Project facilities and equipment cover both the North and the South of the Project area. Therefore, their capacity is enough for 392.42 m³/day, which is the planned septage collection amount in the Project in 2025.

² In Naga city of Metropolitan Cebu, there is STP managed by LGU for a capacity of 45m³/day.

- 3) Table 2-22 shows the Southern / Northern dividing plan for septage management after 2030. Mandaue City, which is the second largest city in the Project area, is to be included in the Northern part of the divided zoning management.
- 4) Since the septage collection volume from Southern part is expected to exceed 430 m³/day in 2030, it is accounted for the design capacity for the Project.
- 5) It is expected that the septage volume in the Project area exceeds 746 m³/day in 2030. Accordingly, the North STP is necessary in 2030 to cater the septage service for 316 m³/day or more. The construction work of the North STP is separately planned from the Project. MCWD is required to develop the construction plan for such STP after the Project.
- 6) The South STP is to be exclusive for the South part of area after the construction of the North STP.

Table 2-22 Southern/Northern Divided Management Plan after 2030

Northern area	Southern Area
1. Compostela	1. Cebu City
2. Liloan	2. City of Talisay
3. Consolacion	
4. Mandaue City	

Source: JICA Study Team

Table 2-23 shows the required capacity of septage collection (m³/day) for the North / South STP.

Table 2-23 Treated Septage Amount (m³/day) for the Northern/Southern STP

STP	2025	2030
Northern Area	392	316
Southern Area	(South STP covers total septage amount)	430
Total	392	746

Source: JICA Study Team

2-2-2-1-14 De-watered Cake Disposal

(1) Disposal Method

Filtrate from de-watered septage is discharged to the river after treatment followed by the effluent standard. On the other hand, de-watered cake, which is generated as solid matter after de-watering, is required to be disposed of as solid waste at a landfill site.

There are recycling technologies such as fuelification, composting and construction material for de-watered cake. It is, however, difficult to establish the recycle plan for de-watered cake before introducing the Project since no actual record for the quantity/quality of the de-watered cake is available. Thus, the de-watered sludge is planned to be disposed of at a landfill site.

(2) Landfill Disposal Site

In present, a landfill site (private facility) in Consolacion is widely utilized for Metro Cebu. Although it is the 1st candidate for disposing of the de-watered cake, the solid waste has been piled up at the site by open dumping. The landfill site in Consolacion is inappropriate for the Project.

Table 2-24 shows other alternatives for de-watered cake landfill site. As Binaliw disposal site (Cebu City, Private) is advantageous in the view of distance, road width and acceptance capacity, the de-watered cake is planned to be disposed at Binaliw landfill site.

If de-watered cake is from the septic tank which does not contain industrial wastewater, it is within the scope of ECC to dispose of the cake at the landfill site. Accordingly there is no problem to dispose of it under ECC.

Table 2-24 Alternatives for De-watered Cake landfill site

Alternatives No.	Summary	Pros/Cons
1	<u>Carmen regional landfill site (PPP project with Cebu Province)</u> Cebu Province and a private company are preparing a plan for new landfill site. It is assumed that the size and equipment of the facility is sufficient but Feasibility Study of the project is not started yet. But, it would take 12 months to complete for starting landfill on first stage once the construction work starts.	The landfill site is under design and there is a risk that delay for the completion of the construction and it is late for the project. Therefore, it is inappropriate for the plan based on this landfill site.
2	<u>Talisay landfill site (Owned by Talisay City, Operated by a private company)</u> The facility has a leachate treatment system and there is enough space for accepting the cake. Since the leachate treatment facility is not in operation, it is necessary to be repaired. Talisay City says that it is possible to provide the service if MCWD agrees the treatment agreement with the outsourcing company. However, there are issues 1) it is far from STP and 2) width of the access road is narrow. It is necessary to transport the cake perpetually by 3 ton dump truck in case using the landfill site.	The landfill site is operative and it is possible to be used immediately. However, the location of the site is far and the width of the access road is narrow so that transportation efficiency is low. Thus, it is appropriate for the site as the second candidate site.
3	<u>Binaliw landfill site (Cebu City, private facility)</u> The landfill site is planned and constructed by a private company. ECC is issued and the first cell of the landfill site is almost completed. Liner sheet and leachate treatment facility are ready for operation. The site plans to receive the solid waste mainly and it is possible for the site to receive the de-watered cake.	The access of the site is better than Talisay and a large sized vehicle can be accepted. It is under construction but it is almost done. Thus, the site is the first candidate.

Source: JICA Study Team

(3) Effective Utilization of Cake

Hearing result from famers shows there is an opinion that some farmers would like to utilize the cake for compost if the quality is suitable. It is, however, difficult for the Project to guarantee the quality and quantity of the compost before implementing the Project. In addition, it is difficult to produce the compost for all the generated de-watered cake. Accordingly, re-utilization plan of the cake is not included in the Project.

There are some alternatives such as composting and fuelization for de-watered cake. And it is possible to reduce transportation and disposal amount of the cake. Therefore, it is expected that MCWD plan to conduct the study for effective utilization of the case after commencement of the Project operation.

2-2-2-2 Facility Design

2-2-2-2-1 Design Capacity and Number of Trains

Table 2-25 shows the design volume for the STP (m³/day). Since the Project target year is 2025, the required capacity of the facility is 400m³/day.

Table 2-25 Design Volume for the South STP (m³/day)

Planned septage collection amount in 2025			2030 (Reference)
MCWD User	MCWD Non-user	Total	
321.36	71.06	392.42	430.64

Note 1: Planned septage collection amount in 2025 is for the whole Project area

Note 2: Planned septage collection amount in 2030 is for only south part of the Project area.

Source: JICA Study Team

To avoid a complete suspension of STP in the inspection or emergency situation, multiple trains are installed at the treatment facility. The number of trains and the volume of each train of STP is proposed considering the necessary capacity in 2030. Table 2-26 shows the number of trains in STP. Since, the target year of the Project is 2025, the capacity of installed equipment is 400m³/day.

Table 2-26 Number of Trains in STP

2025			2030		
Size (m ³ /Day)	Number of Trains	Size per train (m ³ /day)	Size (m ³ /Day)	Number of Trains	Size per train (m ³ /day)
400 (435)*	3	145*	435	3	145

Note: Civil/Architectural facility is designed for the size of 435m³/day in 2025. Mechanical/electrical equipment is designed for 400m³/day and is expanded in 2030.

Source: JICA Study Team

On the other hand, de-watered sludge cake volume is estimated approximately 55m³/day for 400m³/day of septage treatment amount as described below:

- Solid contained in received septage: 10,000kg/day (Receive 400m³/day, concentration 25,000mg/L)
- Returned sludge: 160kg/day
- Coagulant: 274kg/day
- Solid contents input in de-watering machine: 10,000kg/day + 160kg/day + 274kg/day = 10,434kg/day
- Solid collecting rate by de-watering (transferred to de-watered cake): 95%
- Solid in de-watered cake: 10,434 kg/day x 95/100 = 9,912kg/day

Solid content in de-watered sludge cake is estimated at 9,912kgDS/day. Assuming the water content ratio of de-watered cake at 80%, the weight of the de-watered sludge cake is 49.56t.

$$9,912\text{kgDS/day} / (100-80)\%/100 = 49,560\text{kg} \rightarrow 49.56\text{t}$$

The volume of de-watered sludge cake is 55m³ in case of the apparent specific gravity with uncompressed de-watered cake when it is loaded on the truck. Table 2-27 shows de-watered cake volume (m³/day).

$$49.56\text{t} / 0.9\text{t/m}^3 = 55.06 \rightarrow 55\text{m}^3$$

Table 2-27 De-watered Cake Volume (m³/day)

Size of the Facility (m ³ /day)	De-watered Cake (m ³ /day)
400	55

Source: JICA Study Team

2-2-2-2-2 Treatment Process

(1) Water Quality and Nature of Received Septage

As to the STP plan for water quality, data of the existing septage plant in the Philippines is utilized. However, a reference is made to documented records related to Japanese night soil that is similar in nature, for cases that local data is unavailable or insufficient for analysis.

In the preparation survey, the following 3 types of water quality data are obtained.

- Data 1: 3 samples at the existing septage de-watering plant in Cebu City by a local sub-contracted consultant.
- Data 2: 16 samples of past data from the existing septage de-watering plant (same as Data 1) recorded in Summary Report of "Pilot Survey for Disseminating SME's Technologies for Applicability of De-watering Equipment for Septage Management of Cebu City (January 2016)".
- Data 3: 20 samples from Alabang-Zapote Septage Treatment Plant in Las Pinas City of Metro Manila (hereinafter "Ala-Zap")

Note that the water quality terminology used in this document are defined in Table 2-28 and Table 2-29.

Table 2-28 Water Quality Terminology Explanation

Item	Explanation
Septage	Septage delivered to STP by vacuum truck
Filtrate	Liquid from a de-watering machine after solid-liquid separation process to be treated at filtrate treatment facility
Removal efficiency	Proportion of water concentration retrieved from sludge cake de-watered by de-watering machine

Source: JICA Study Team

Table 2-29 Explanation of Water Quality Items

Water Quality Item	Explanation
TSS	Total suspended solids
BOD	Biochemical oxygen demand
COD	Chemical oxygen demand (Using potassium dichromate as oxidant)
T-N	Total nitrogen
T-P	Total phosphorus

Source: JICA Study Team

Table 2-30 shows the average values for the 3 blocks of data. Note that water quality analysis results for each set of data are shown in Appendix-6-3.

Table 2-30 Water Quality Data Obtained from Survey this Time

		Data 1 Sampling & Analysis (3 Samples)	Data 2 Work Completion Report (16 Samples)	Data 3 Ala-Zap (20 Samples)
Septage (mg/L)	TSS	11,063	* (23,812)	13,535
	BOD	7,127	4,235	3,204
	COD	14,290	13,099	13,204
	T-N	1,337	No data	No data
	T-P	445	No data	No data
Filtrate (mg/L)	TSS	158	* (202)	No data
	BOD	374	481	No data
	COD	972	863	No data
	T-N	378	No data	No data
	T-P	55	No data	No data
Removal efficiency (%)	TSS	98.6	* (99.2)	No data
	BOD	94.8	88.6	No data
	COD	93.2	93.4	No data
	T-N	71.7	No data	No data
	T-P	87.6	No data	No data

Note: Data in parentheses are average values for 6 sets of data with data of 1,000mg/L or less removed

Source: JICA Study Team

1) TSS, BOD, COD

Regarding the 3 types (TSS, BOD, COD) of water quality items, as Table 2-31 shows, the average values are applied for design quality of TSS, BOD and COD based on all 39 sets of data for data 1 to 3. As nature of septage varies depending on storage circumstances at collection points, a safety factor of 50% has been calculated into data averages as the planned values.

Nevertheless, to calculate the averages for TSS, figures of 1,000mg/L or less in septage are removed as such data are deemed clearly unreliable.

Table 2-31 Design Values for TSS, BOD and COD

Water Quality Items	Data Average (mg/L)	Average Value × 1.5 (mg/L)	Design Value (mg/L)
TSS	15,406	23,109	25,000
BOD	3,929	5,894	6,000
COD	13,244	19,866	20,000

Source: JICA Study Team

2) T-N, T-P

Regarding the water quality items T-N and T-P, they are not metered at the exiting de-watering plant. Only the data obtained in this preparatory survey are available. As shown in Table 2-30, data of 3 samples are obtained. However, the values vary greatly and they are considered to be unreliable. Therefore, reference is made to documented records in “2006 edition of planning and design manual for sludge treatment plant by Japan Waste Management Association” and the average value of Japanese night soil is adopted.

With the filtrate treatment facility planned for this time round, a recycled nitrification/denitrification process is used as water treatment to biologically remove nitrogen. Because of this biological treatment, variations in the quality of water treated is unavoidable, so the average value has been set to 3,000mg/L for nitrogen, taking into account a safety factor of approximately 10%.

Phosphorus treatment is stable because a removal process uses chemical precipitation. Thus, the average value is set as 350mg/L, without consideration of safety factor.

Table 2-32 Design Values for T-N and T-P

Water Quality Item	Literature Value (mg/L)	Design Value (mg/L)
T-N	2,700	3,000
T-P	350	350

Source: JICA Study Team

3) Water Quality Design Factors in Receiving Septage

From the above results, water quality components are calculated as shown in Table 2-33 for design purposes in receiving septage at STP.

Table 2-33 Water Quality Design Factors in Receiving Septage

Item	Septage Influent Quality (mg/L)
TSS	25,000
BOD	6,000
COD	20,000
T-N	3,000
T-P	350

Source: JICA Study Team

(2) TSS, BOD and COD Removal Efficiency by De-watering

As there are no data of filtrate at Ala-Zap, the data from Data 1 and Data 2 are used to set removal efficiency. Table 2-34 shows design values for removal efficiency of TSS, BOD and COD by de-watering.

Table 2-34 TSS, BOD and COD Removal Efficiency by De-watering

Water Quality Item	Data Average(%)	Design Value (%)
TSS	99.0	95
BOD	89.6	90
COD	93.4	90

Source: JICA Study Team

(3) T-N and T-P Removal Efficiency by De-watering

Regarding T-N and T-P, sampling and analysis were conducted on only one set of data by water quality survey at the existing septage de-watering plant. Therefore, taking into consideration the fact that T-N and T-P removal efficiency varies depending on the type of de-watering machine used, experienced value of multiplate screw press de-watering machine which is selected for the Project is adopted to the Project design. It is shown in Table 2-34.

Table 2-35 T-N and T-P removal Efficiency by De-watering

Water Quality Item	Average Value (%)	Design Value (%)
T-N	85	85
T-P	80	80

Source: JICA Study Team

(4) Filtrate Quality

The quality of the filtrate that flows into the treatment facility is set in consideration of the above described water quality of receiving septage, the water quality items for the de-watering machine as well as the excess activated sludge and added coagulant in the treatment plant.

Table 2-36 shows water quality design factors for filtrate that will flow into water treatment facility.

Filtrate concentration = receiving septage concentration x (100 – removal efficiency) / 100(mg/L)

Table 2-36 Water Quality Design Factors for Filtrate

Item	Receiving Septage (mg/L)	Removal Efficiency (%)	Filtrate Quality (mg/L)
TSS	25,000	95	1,250
BOD	6,000	90	600
COD	20,000	90	2,000
T-N	3,000	85	450
T-P	350	80	70

Source: JICA Study Team

(5) Basic Treatment Processes

The function of the STP is broadly divided into the following processes.

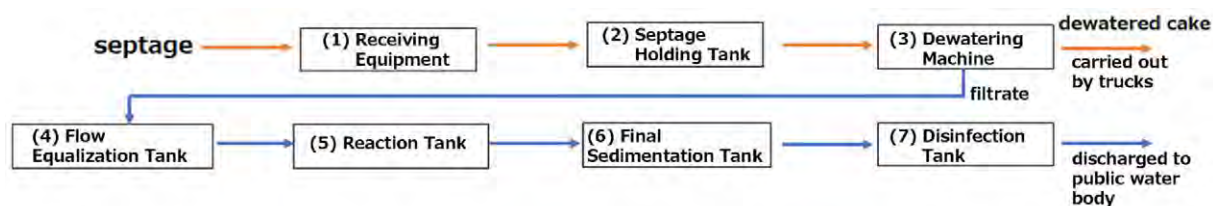
1. Receiving collected septage
2. De-watering
3. Water treatment

The existing septage de-watering plant was built to propagate and validate de-watering devices. The plant uses multidisc screw-press de-watering machines to de-water received septage, and transfers filtrate to existing lagoon before discharging. Likewise, existing STPs in Mactan Island, and Ala-Zap use the same process.

The same kind of systems for this Project is adopted for expecting sharing the O&M know-how. Therefore, the basic treatment processes for this Project will be as follows.

- Receive collected septage
- Pretreat (screening and grit collecting)
- De-watering
- Filtrate treatment

Note that deodorization equipment is installed for receiving equipment, holding tanks and de-watering machines where odor concentrations are comparatively high.



Source: JICA Study Team

Figure 2-5 Treatment Process (Direct De-watering Method)

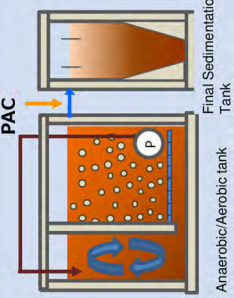
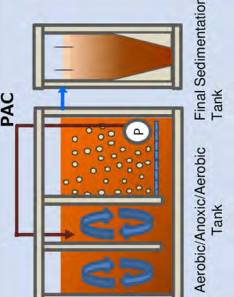
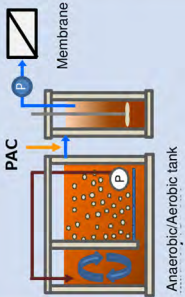
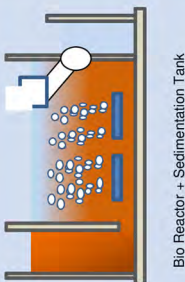
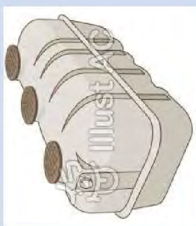
(6) Consideration of Wastewater Treatment Method

Effluent from the infiltrate treatment facility is discharged into the adjacent Mahiga Creek. The quality of discharged water is regulated by DAO2016-08. As nitrogen and phosphorus have been added to standards with the enactment of this ministerial ordinance, comparative examinations of 5 treatment systems that can meet the requirements of DAO2016-08 as shown in Figure 2-6 is conducted. As a result, the recycled nitrification/denitrification process (with combined use of coagulant) is selected.

- Recycled nitrification / denitrification process (with combined use of coagulant)
- Anaerobic-Anoxic-Oxic (A₂/O) Process
- Membrane Filtration Denitrication Process
- Sequencing Batch Reactor (SBR) Process
- Johkasou

Recently, the anammox biological treatment has been developing for practical application. The anammox treatment is to change nitrogen as ammonia and as nitrate to nitrogen gas directly, utilizing biological reaction of anammox. This process is expected to save energy more than others. While several pilot plants are operated in Japan, Osaka City introduced it in 2017 for the practical operation. The anammox treatment system, however, is not recommended for the Project due to following:

- C-BOD₅ exceeds 100mg/L in the design filtrate quality. A removal facility of organic matters is required to be installed.
- Ammonia - nitrogen is less than 300mg/L in the design filtrate quality. It is not applicable for the treatment system using anammox.
- The Project is to treat septage which contains much nitrogen. It is anticipated that sufficient removal of nitrogen is difficult to be done by only anammox process. Since another treatment system is required after the anammox process, the application of the anammox process is more costly for construction and O&M.
- When anammox process is introduced, a lot of kinds of additional water quality meters are necessary to be installed in STP such as meters for ammonia and nitrate. Accordingly, the operation of STP becomes more sophisticated.

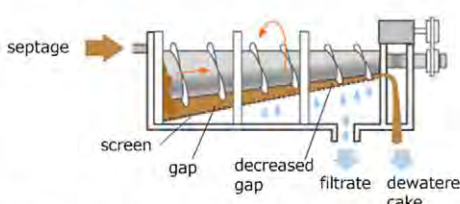
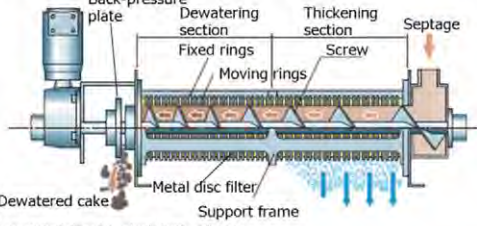
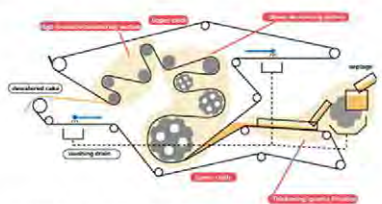
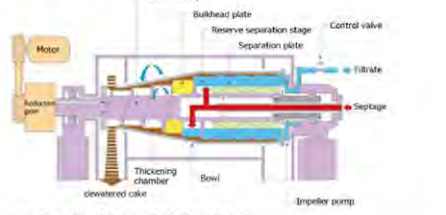
Item	Recycled Nitrification /Denitrification Process (with Chemical dosing)	Anaerobic-Anoxic-Oxic (A2/O) Process	Membrane Filtration Denitrification Process	Sequencing Batch Reactor (SBR) Process	“Johkasou”
Flow (Image Diagram)					
Features	- Removes nitrogen biologically - Coagulant added to remove phosphorus	- Removes nitrogen biologically - Phosphate absorbed into activated sludge, and coagulant used to remove phosphate	- Solid-Liquid separation process using membrane filtration device	- Bioreaction and solid-liquid separation in the same tank	- Unitized products are installed
Nitrogen/Phosphate Processes	Nitrogen: Biological treatment Phosphate: Chemical treatment	Nitrogen: Biological treatment Phosphate: Biological treatment + Chemical treatment	Nitrogen: Biological treatment Phosphate: Chemical treatment	Nitrogen: Biological treatment Phosphate: Chemical treatment	Nitrogen: Biological treatment Phosphate: Chemical treatment
Rough Estimates of Construction Costs (%)	100%	106%	104%	105%	140%
Operation and Maintenance	- Operational management is comparatively easy because coagulant is added to remove phosphate	- Operational management is bothersome in order to fully eliminate phosphate in anaerobic tank	- Washing frequency care required to prevent membrane blockages	- Care needs to be taken for discharge device breakdown and deterioration in sludge settleability	- Multiple tanks make management bothersome
Merits	- Inexpensive to build - Operational management is easy	- Biological removal of phosphate uses small-amounts of chemical in injections (consumption is small)	- Installation footprint is small - High SS removal ratio	- Processes can be accomplished in 1 tank	- Building period is shortened because unitized products are installed
Demerits	- Chemical expenses are great because coagulant is used to remove phosphate	- Greater number of tanks needed, so building cost goes up, and operation is bothersome (management of anaerobic tank)	- Power costs are high because of membrane process supply pump and membrane cleaning blower are used - Membrane replacement is expensive	- Treatment is slightly unstable because aeration is intermittent - Management of process water discharge device is bothersome - No track record of high-level processing	- Multiple treatment tanks needs to be installed - Cost is high - Operation and management are bothersome
Evaluation	☆☆☆☆☆	☆☆☆☆☆	☆☆☆☆	☆☆	☆

Source: JICA Study Team

Figure 2-6 Comparison of Filtrate Treatment Method

(7) Consideration of Specifications for De-watering Facility

There are multiple types of de-watering machines, and each has different features. Figure 2-7 shows the representative types of machines currently being used to de-water sewage sludge. Of those, the multiplate screw press de-watering machine is often used in small-scale facilities in Japan, and, with a slow rotating speed it has a simple structure, featuring excellent specifications in terms of water saving, low noise, low vibration and energy saving. What is more, this type of machine has a good proven track record of utilization at the existing septage de-watering plant in Cebu City. Hence, as the operating and maintenance know how already has been achieved from its use, the multiplate screw press de-watering machine is applied for the Project.

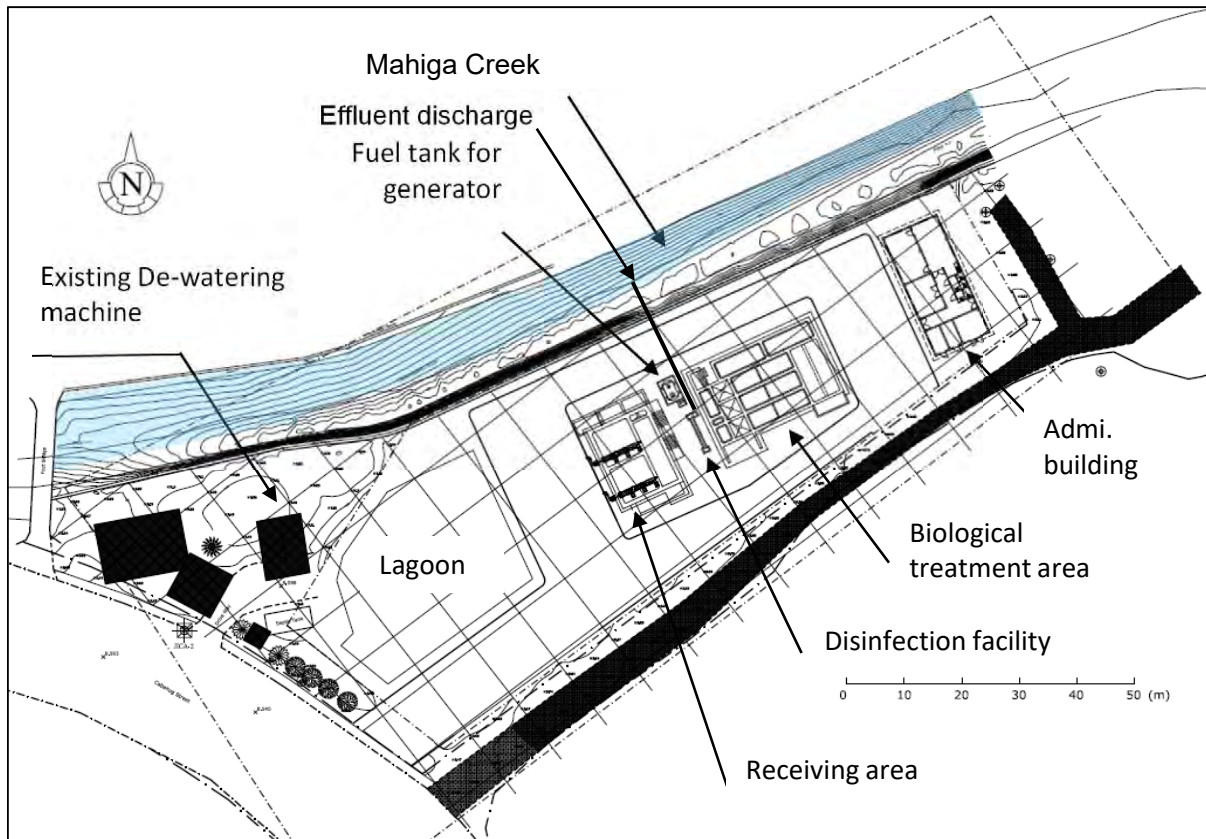
Dewatering Method	(1) Screen Type Screw Press	(2) Multiplate Screw Press
Principle	Coagulation sludge is fed into machine between constantly rotating cylindrical screen and conical screw shaft to compress and dewater.	Same dewatering principle as (1), but instead of a screen there is a metallic multi-outer-barrel disc filter alternately layered over fixed rings and moving rings to compress and dewater.
Image & Configured Instruments	 - Polymer coagulant dissolving tank (with agitator) - Coagulant conditioning tank (with agitator) - Dewatering machine (drive motor, variable speed gearbox, screen, screw)	 - Polymer coagulant dissolving tank (with agitator) - Coagulant conditioning tank (with agitator) - Dewatering machine (drive motor, variable speed gearbox, metal disc filter, screw)
Features	Compact, hardly any noise or vibration and runs continuously. Unmanned operation possible. Cylindrical screen of perforated metal filters out water from slurry being compressed by screw. This dewatering machine suffers from comparatively high number of sludge leaks and requires a high ratio of chemical injections. Dewaterers using metal screen and metal screw, so tends to wear out quickly if sludge is very sandy.	Compared to (1) on left, filter blocking is less. Also capable of stably dewatering even low-concentration sludge (0.2-0.4%).
Dewatering Method	(3) Belt Press	(4) Centrifuge
Principle	After coagulation sludge is gravity filtered by continually traveling filter cloth, it is squeezed between 2 rollers in a rotary pressure dewatering process.	Spins coagulant sludge at high speed in a cylindrical bowl to apply centrifugal force that separates solids and liquid.
Image & Configured Instruments	 - Polymer coagulant dissolving tank (with agitator) - Coagulant conditioning tank (with agitator) - Dewatering Machine (drive motor, variable speed gearbox, filter cloth, rollers)	 - Polymer coagulant dissolving tank (with agitator) - Coagulant conditioning tank (with agitator) - Dewatering machine (drive motor, variable speed gearbox, screw conveyor, bowl)
Features	Capable of continual treatment, and comparatively good process efficiency. Filter cloth selection is influential but capture efficiency of minute particles is poor. Release units are numerous, and odors easily dispersed but dewatering situation can be checked visually, and power consumption is comparatively small.	Good process efficiency thanks to continuous processing at high-speed rotation. Uses centrifugal force to dewater, so dewatering is easy even if sludge concentration is low or sludge quality is varied. Can be adjusted (capture rate lowered) to improve moisture content. Can dewater without chemical injections, but filtrate is dirtier. However, power consumption is large, and it is noisy and vibrates a lot.

Source: JICA Study Team

Figure 2-7 Typical De-watering Machines

2-2-2-2-3 Layout of Facilities

Figure 2-8 shows the layout of the principle facilities.



Source: JICA Study Team

Figure 2-8 General Layout on STP

The basic plan for the STP is to have 400m³/day of delivered septage by vacuum trucks during the daytime. After the septage flows into the septage holding tank, the septage is de-watered by de-watering machines. Both the operating time of the de-watering machines and the receiving time for septage are determined as 8 hours. However, the filtrate generated in the de-watering process is treated continuously over 24 hours.

The following are outlines of principle facilities and equipment to be configured in the STP.

1. Receiving equipment: Removes debris and grit from septage delivered by vacuum trucks as well as measures the volume of septage using an electromagnetic flowmeter.
2. Septage holding tank: Stores septage (after removal of floatable solids and grit by receiving equipment) as well as agitates septage to achieve even consistency.
3. De-watering machine: De-waters septage to approximately 80% of moisture content, reducing volume to about 10%. Separates received septage into de-watered cake and filtrate.
4. Flow equalization tank: Installed as a pre-step to 24-hour even flow of filtrate for treatment.
5. Reactor tank: Treats filtrate (after de-watering) to fulfill DAO2016-08 standards.
6. Final sedimentation tank: Separates activated sludge and filtrate treated by biological treatment.
7. Disinfection tank: Disinfects bacteria remaining in treated filtrate and separated out from final sedimentation tank, to enhance safety of final effluent.

2-2-2-2-4 Processing Capacity per Hour of Principle Equipment

Having considered the need for multiple trains of equipment to continue operation during maintenance periods, the facilities and equipment capacities / abilities needed to treat 400m³/day of septage in 8 hours are assessed and listed up in Table 2-37. Note that the assessment process is described later from 2-2-2-2-8 onward.

Table 2-37 Principle Facilities and Equipment Capacities

Facility/Equipment	Item	Unit	Capacity/Ability
Receiving septage	Receiving amount	m ³ /day	400m ³ /day
Receiving equipment	Ability Operating time	m ³ /min hr/day	1.0 m ³ /min × 2 units (8hr/day)
Septage holding tank	Capacity	m ³	218m ³ × 2 tanks (1-day's load)
De-watering machine	Ability	m ³ /hr	25m ³ /h or more × 2 units
Flow equalization tank	Capacity	m ³	158m ³ /tank × 2 tanks
Reactor tank	Capacity	m ³	Facility scale: 162m ³ (aerobic tank 72m ³ + anoxic tank 90m ³) /train × 3 trains Equipment Capacity/Ability: 145m ³ × 3 train = 435 m ³
Final sedimentation tank	Capacity	m ³	45m ³ × 3 train
Disinfection tank	Ability	m ³ /day	1.2m ³ /tank × 1 tank

Source: JICA Study Team

2-2-2-2-5 Standard Specifications Applying to Construction and Design

The design and construction of public facilities in the Philippines are regulated by DPWH standards in the “Standard Specifications for Highways, Bridges and Airports” (Blue Book). The facility design of the Project conforms to those standards.

For structures, a permission must be obtained from the LGU’s Office of Building Officer (hereinafter referred to as “OBO”), and any procedures prescribed in the National Building Code (the basis law) and any other “implementing rules and regulations” must be carried out, while also the NSCP laid out in ordinances must be referred to.

To ascertain the suitability of construction and materials in obtaining permission from each LGU’s OBO requires a review by the Engineering Office of each LGU. The standards for usable materials differ at each LGU. As the STP in this Project will be located in Cebu City, the standards for materials shown in Table 2-38 will be applied.

Table 2-38 Cebu City Standards for Materials

Item	Standard
Concrete compressive strength	27MPa (4,000psi)
Steel yield strength	414MPa (60,000psi)
Concrete weight	23.5kN/m ³ (150lb/ft ³)

Source: JICA Study Team

2-2-2-2-6 Landfill of STP Site and Temporary Filtrate Treatment Plan

To construct the STP in the Project, the filtrate treatment lagoon in the existing septage de-watering plant in Cebu City is reclaimed and the STP is constructed on the reclaimed ground. MCWD designs and carries out that reclaim work based on Blue Book. The plan is that soil needed for reclamation is provided by Cebu City and the construction equipment needed for the work is provided by Cebu Province.

The existing septage de-watering plant must be kept operating while the landfill and STP construction work take place, so MCWD will rehabilitate the lagoon because its surface area is insufficient due to the reclamation work, in order to maintain filtrate even during landfill and STP construction work.

The maximum volume of filtrate from the existing facility’s de-watering machine is approximately 100m³/day. To ensure that the quality of this separation liquid is BOD 120mg/L or less in conformance with the effluent standard of DAO2016-08, rehabilitation must take place to install a temporary aerator and sedimentation tank. As the existing lagoon is approximately 4 meters deep, installation of 300m³ aerating tank and 200m³ sedimentation tank are necessary. Moreover, to ensure stable aerator treatment, the installation of an aerator device (0.7kw x 1 unit) is also necessary.

The following are the required facilities and equipment capacities.

(1) Planning Conditions

- When maximum receiving septage of 90m³/day (maximum ability of the existing de-watering machine), the volume of filtrate from the de-watering machine is expected to be 104.5m³/day over 8 hours of operation.
- Filtrate's BOD is assumed as 600mg/L.
- Final effluent's BOD is to be 120mg/L.
- Assuming volume of generated sludge is 5% of generated filtrate, the generated sludge is 104.5 x 0.05 = 5.225m³/day.
- BOD volumetric loading is to be 0.2kg/m³/day.

(2) Aeration Tank

- $600\text{mg/L (g/m}^3) \times 104.5 \text{ m}^3/\text{day} \times 1 / 1000 \div 0.2\text{kg/m}^3\text{m}^3/\text{day} = 313.5 \text{ m}^3 \approx 300 \text{ m}^3$

(3) Sedimentation Tank

- $5.225\text{m}^3/\text{day} \times 30\text{days} = 156.75 \text{ m}^3 \approx 200 \text{ m}^3$

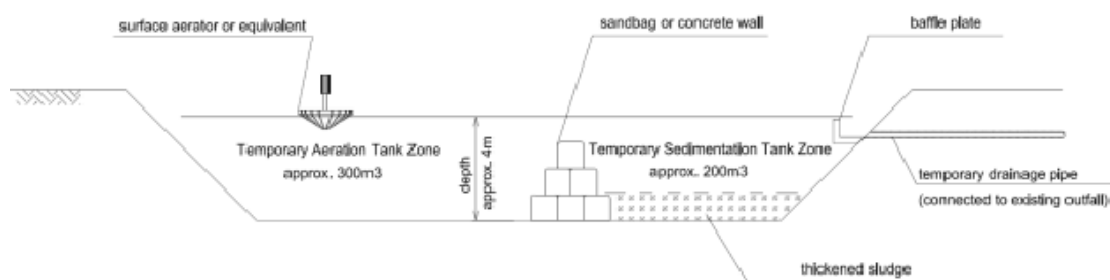
(4) Aerator (0.75kW x 1 unit)

- Necessary amount of oxygen (kgO₂/day) for oxidation of BOD is expected to be 0.5 to 0.7 (kg/O₂/kgBOD) x removed BOD (kgBOD/day) in a scenario where consideration is not given to the loss of amount of BOD due to consumption by denitrification.
- Necessary amount of oxygen is calculated to be 0.5 to 0.7 x (600-120) mg/L x 104.5m³/day x 1/1000 = 25.08 to 35.112kgO₂/day
- When the oxygen transfer efficiency Ep of mechanical agitation system is 2kg/kWh (vertical model 1.8-2.3), the power need (P) will be as follows.

$$P(\text{kW}) = \text{necessary amount of oxygen} / (\text{Ep} \times 24) = 0.5225 \text{ to } 0.7315\text{kW} \approx 0.75\text{kW} \times 1 \text{ unit}$$

(5) Concept for Temporary Filtrate Treatment

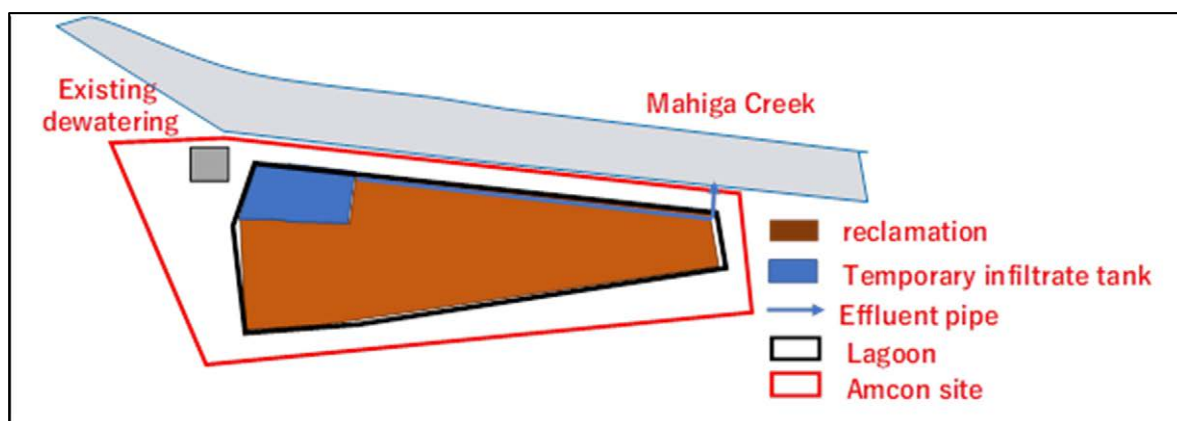
The abovementioned aerator and sedimentation tank is installed in an area cordoned off by sandbags, concrete walls or sheet piles, and the lagoon is filled in apart from the area needed for the aerator and sedimentation tank. Figure 2-9 shows the work concept.



Source: JICA Study Team

Figure 2-9 Image Diagram of Temporary Lagoon

Figure 2-10 shows an image of the scope of landfill and water treatment facilities.



Source: JICA Study Team

Figure 2-10 Image Diagram of Landfill (Reclamation) of STP Site

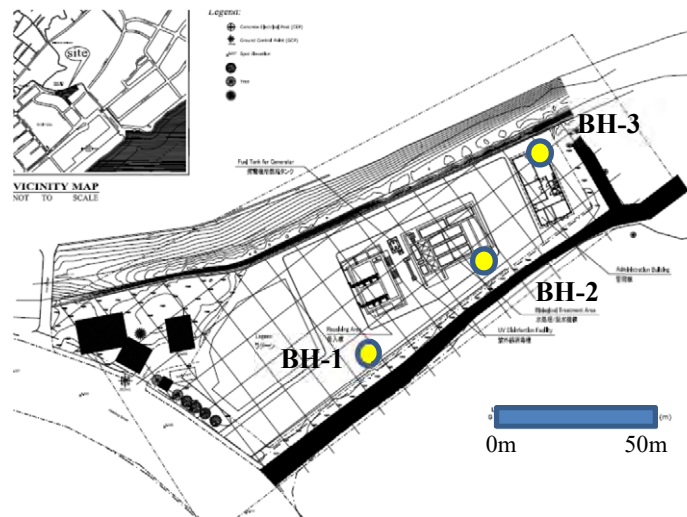
2-2-2-2-7 Soil Condition, Foundation Type and as well as Soil Improvement

Table 2-39 shows soil conditions for the facility construction site from results of the soil survey (boring survey) undertaken locally for the Project. Also, Figure 2-11 shows the soil survey locations. Note that the boring survey confirmed that a stable layer for N value of 50 or more is located at a level 20 meter below from the existing ground level (GL).

Table 2-39 Soil Properties

	BH-1	BH-2	BH-3
Soil outline	0.0m-1.0m: Sandy Lean Clay 1.0m-2.0m: Silty Clayey Gravel 2.0m-3.0m: Sandy Silt 3.0m-4.0m: Silty Gravel 4.0m-6.0m: Lean Clay 6.0m-7.0m: Fat Clay 7.0m-8.0m: Elastic Silt 8.0m-9.0m: Sandy Lean Clay 9.0m-11.0m: Clayey Sand 11.0m-12.0m: Sandy Lean Clay 12.0m-15.0m: Silt 15.0m-19.0m: Sandy Lean Clay 19.0m-20.0m: Silty Gravel 20.0m-21.0m: Sandy Lean Clay 21.0m-22.0m: Clayey Gravel 22.0m-24.0m: Lean Clay 24.0m-30.0m: Clayey Gravel	0.0m-1.0m: Gravelly 1.0m-2.0m: Silty Gravel 2.0m-3.0m: Clayey Gravel 3.0m-4.0m: Lean Clay 4.0m-16.0m: Fat Clay 16.0m-18.0m: Lean Clay 18.0m-24.0m: Clayey Sand 24.0m-30.0m: Clayey Gravel	0.0m-1.0m: Silty Gravel 1.0m-2.0m: Clayey Gravel 2.0m-3.0m: Clayey Sand 3.0m-4.0m: Silty Gravel 4.0m-6.0m: Sandy Silt 6.0m-7.0m: Sandy Lean Clay 7.0m-12.0m: Clayey Sand 12.0m-19.0m: Fat Clay 19.0m-22.0m: Clayey Sand 22.0m-25.0m: Clayey Gravel 25.0m-26.0m: Sandy Lean Clay 26.0m-30.0m: Clayey Gravel
N value	0.0m-1.0m: 41 1.0m-2.0m: 56 2.0m-3.0m: 6 3.0m-4.0m: 4 4.0m-5.0m: 11 5.0m-6.0m: 13 6.0m-7.0m: 18 7.0m-8.0m: 23 8.0m-9.0m: 24 9.0m-10.0m: 55 10.0m-11.0m: 40 11.0m-12.0m: 29 12.0m-13.0m: 38 13.0m-14.0m: 34 14.0m-15.0m: 26 15.0m-16.0m: 36 16.0m-17.0m: 93 17.0m-18.0m: 88 18.0m-19.0m: 82 19.0m-20.0m: 105	0.0m-1.0m: 6 1.0m-2.0m: 86 2.0m-3.0m: 32 3.0m-4.0m: 9 4.0m-5.0m: 9 5.0m-6.0m: 18 6.0m-7.0m: 14 7.0m-8.0m: 23 8.0m-9.0m: 30 9.0m-10.0m: 25 10.0m-11.0m: 47 11.0m-12.0m: 57 12.0m-13.0m: 38 13.0m-14.0m: 51 14.0m-15.0m: 39 15.0m-16.0m: 43 16.0m-17.0m: 42 17.0m-18.0m: 30 18.0m-19.0m: 38 19.0m-20.0m: 58	0.0m-1.0m: 20 1.0m-2.0m: 15 2.0m-3.0m: 25 3.0m-4.0m: 17 4.0m-5.0m: 2 5.0m-6.0m: 8 6.0m-7.0m: 22 7.0m-8.0m: 27 8.0m-9.0m: 31 9.0m-10.0m: 30 10.0m-11.0m: 62 11.0m-12.0m: 42 12.0m-13.0m: 34 13.0m-14.0m: 43 14.0m-15.0m: 30 15.0m-16.0m: 27 16.0m-17.0m: 24 17.0m-18.0m: 17 18.0m-19.0m: 31 19.0m-20.0m: 50

Source: JICA Study Team



Source: JICA Study Team

Figure 2-11 Soil Survey Locations

Regarding the Receiving facility, De-watering and filtrate treatment facility and the Administration Building, as a result of examining allowable bearing capacity and liquefaction for each area / building, it is appropriate to undertake soil improvement and to adopt a direct foundation system for the following reasons. Note that soil improvement will be a medium layer mixing treatment method at a depth of 6.0-6.5m from the base surface of direct foundation.

Table 2-40 shows the relationship between vertical load and allowable bearing capacity of structures.

Table 2-40 Vertical Load and Allowable Bearing Capacity of Structures

Item	Vertical Load (kN/m ²)	Allowable Bearing Capacity (kN/m ²)
Receiving facility	77.4	69.8
De-watering and filtrate treatment facility	87.2	72.2
Administrative Building	112.3	123.6

Source: JICA Study Team

- Regarding the Receiving Area and De-watering and filtrate treatment Area, it is assumed that the ground layer directly below the structures has an N value of 8 to 9. If the direct foundation is adopted, the bearing capacity of the ground is less than the vertical load.
- For the Administration Building, the allowable bearing capacity of a footing foundation is slightly less than the vertical load. Moreover, although the plan is to put a direct load onto a soil layer showing N values of 15 to 25, part of that soil layer will be the reclaimed lagoon, so the supporting soil will not be uniform.
- All 3 buildings could be affected by liquefaction because the ground water level is high and there is a wide spread of sandy soil at the intended STP construction site. Therefore, the ground must be improved to counter liquefaction.
- If pile foundations are used, pre-stressed concrete (PC) piles are necessary to be driven into a ground layer with N value is 50 or more at approximately -20m from ground level (GL). Here, using 400mm × 400mm PC piles, the Receiving facility would require approximately 50 piles, 110 piles for the De-watering and filtrate treatment facility and 40 piles for the Administrative Building as well.
- Stabilizing/ improving the soil and using a direct foundation is less expensive than using piles driven down to a soil layer that is GL -20m.

1) Receiving facility

Against the presumed dead load (77.4kN/m²), the allowable bearing capacity of a soil layer (around GL -5.8m) with N value of 8 is presumed to be approximately 69.8kN/m². Therefore,

the soil needs to be improved using a medium layer mixing treatment method to a depth of 6.0m.

2) De-watering and filtrate treatment facility

Against the presumed dead load (87.2kN/m^2), the allowable bearing capacity of a soil layer (around GL -3.4m) with N value of 9 is presumed to be approximately 72.2kN/m^2 . Therefore, the soil needs to be stabilized/improved using a medium layer mixing treatment method to a depth of 6.5m.

3) Administrative Building

Against the presumed dead load (123.6kN/m^2), the allowable bearing capacity of a soil layer (around GL -4.0m) with N value of 20 is presumed to be approximately 112.3kN/m^2 . Therefore, the soil needs to be stabilized/improved using a medium layer mixing treatment method to a depth of 6.0m.

4) Liquefaction

With a ground water level of 1.5m, as there is a sandy layer at approximately GL -4.0-6.0m, liquefaction may occur at times of earthquake. To prevent such liquefaction, soil must be improved together with the abovementioned measures to counter lack of load bearing capacity.

5) Soil Improvement Depth

Table 2-41 shows the required soil stabilization depth based on above results.

Table 2-41 Soil Stabilization Depths

Item	Soil Improvement Length (m)	Soil Improvement Depth from GL (m)
Receiving facility	6.0	GL -4.0-10.0
De-watering and filtrate treatment facility	6.5	GL -1.1-7.6
Administrative Building	6.5	GL -1.5-8.0

Source: JICA Study Team

2-2-2-2-8 Receiving Facility

(1) Receiving Method and Pretreatment

2 receiving methods are available for the STP: 1) septage is transferred to the septage holding tank via a subsidiary septage holding tank and 2) septage is transferred to the septage holding tank by a pressured discharge function of vacuum truck. To improve work efficiency and work environment as well as to prevent odors from septage by vacuum trucks, in principle, the trucks will be required to use a pressure discharge function. Nevertheless, some of the trucks used by the existing septage collection companies do not have such a function. Also, additional procurements of vacuum trucks by MCWD may include trucks that do not have the pertinent function. Therefore, a semi-underground subsidiary septage holding tank will be installed to handle septage deliveries by trucks without the pressure discharge function. The following show the scale and functions of the receiving subsidiary septage holding tank.

- The existing septage collection companies use vehicles with 3 different collection tank sizes: 3m^3 , 6m^3 and 15m^3 . Subsidiary septage holding tank capacity can sufficiently handle a 15m^3 load of septage, the maximum amount to be delivered.
- Screens are installed to the front section of the subsidiary septage holding tank to remove debris contained in the septage.
- From the perspective of the planned configuration for the entire facility, the effective capacity is calculated as $W2.3\text{m} \times L3.0 \times H2.2\text{m} = 15.18\text{m}^3$.
- Height will be 3m to provide installation space for screens and leeway from top plate.
- Capacity of subsidiary septage holding tank is: $W2.3 \text{ m} \times L3.0\text{m} \times H3.0\text{m} = 20.7\text{m}^3 \approx 20 \text{ m}^3$.
- Note that septage consistency varies greatly. As it also could conceivably contain screenings and sand, it is initially left to stand, then pumped by a septage transfer pump (capable of $0.3\text{m}^3/\text{min}$ pressure pumping) to an oil separator. After then, the septage goes to the receiving

septage holding tank to be agitated.

Septage delivered by vacuum trucks with pressure discharge function will make its way to the holding tank via an electromagnetic flowmeter to measure volume. Trash and grit, which impede later processes such as de-watering, will be removed at the receiving facility. For the daytime septage receiving plan, in principle, the receiving facility will have the capacity to handle 400m³ per 8-hour day. Moreover, to ensure STP operation during maintenance, 2 receiving facilities will be installed.

Assuming the work efficiency for receiving septage from vacuum trucks to be 0.5 (time needed for pre-post-work such as connecting/disconnecting hose is the same as the time needed to discharge septage from vacuum truck), the receiving unit capacity can be calculated as follows.

$$- 400\text{m}^3/\text{day} / 2 \text{ units} / 8\text{hr}/\text{day} / 60\text{min}/\text{hr.} / 0.5 = 0.83\text{m}^3/\text{min}/\text{unit} = 1\text{m}^3/\text{min}/\text{unit}$$

Thus, basic specifications of the receiving equipment will be as follows.

- 1.0 m³/min (60m³/hr) × 2 units
- Operable for 8 hours

Table 2-42 shows the basic specifications for receiving unit.

Table 2-42 Receiving Equipment's Basic Specifications

Item	Specification
Type	Receiving unit with integrated screen
Capacity	1m ³ /min
Quantity	2 units

Source: JICA Study Team

(2) Septage Holding Tanks

Septage, removed of floatable solids and sand at the receiving units, flows to storage tank. According to the existing local records about delivery of septage by vacuum trucks, the consistency of septage varies greatly. Therefore, the storage tank secures one-day amount of septage. And the tanks are equipped with mechanical agitators to secure the septage with an even consistency before sending to the de-watering machine.

The storage tank is a civil structure and it is difficult to expand after construction. Therefore, the specifications are based on the projected treatment volume of 435m³/day for 2030. To ensure continuous operation at the STP even during times of maintenance, 2 tanks are installed. Thus, the following is the basic specifications for the received sludge storage tanks.

- 218m³ × 2 tanks

2-2-2-2-9 De-watering and Filtrate Treatment Facility

(1) De-watering Machines

Same as the receiving units, the de-watering machines are operated for 8 hours a day. The basic specifications are based on the planned treatment volume of 400m³/day for 2025. Also, to ensure continuous operation at the STP even during times of maintenance, 2 de-watering machines are installed. And, if it is necessary to expand capacity from 2025 onward, the plan is to accommodate that expansion by extending operating time and upgrading the machinery. Thus, the following is the basic specifications for the de-watering machines.

- 25m³/hr x 2 machines
- Operable for 8 hours

To enhance septage de-watering performance, two-agent condition are adopted; a coagulant (polymer) and inorganic coagulant (poly aluminum chloride, or PAC). Using such coagulants, a 95% solid capture rate is prospected and the load placed on later processes is reduced for the filtrate treatment facility. Thus, equipment to inject these 2 chemical liquids are to be included.

For de-watered cakes, the moisture content becomes 80% in the de-watering process, and the resulting

de-watered cakes forwarded by conveyor belt to the storage tank. That storage tank has the capacity to hold 4 days' worth of generated de-watered sludge cake, so that even if trucks cannot carry out sludge cake during rest days (holidays), or cases for some troubles at the landfill disposal site.

As 1-days' worth of de-watered cake volume to 55m^3 , 4 days' worth is as follows.

$$- 55\text{m}^3/\text{day} \times 4 \text{ days} = 220\text{m}^3$$

Therefore, one tank that can hold that capacity of de-watered cake is installed. Note, in fact, that because of configuration plans for the civil engineering structure, the tank for this project has the capacity of 234m^3 .

$$- 234\text{m}^3/\text{day} \times 1 \text{ tank}$$

(2) Filtrate Treatment Facility (Reactor Tank)

The filtrate generated from septage de-watering process contains high concentrations of BOD, COD, nitrogen and phosphate, etc. As explained earlier, nitrogen and phosphorus must be removed, so an advanced wastewater treatment method known as the recycled nitrification/denitrification process is used. Thus, the Reactor tank becomes in a train with 2 tanks, an anaerobic tank and an aerobic tank.

In principle, equipment runs continuously for 24 hours a day. Thus, it is difficult to entrust the work in maintenance period to other trains by extending operation time. Therefore, to minimize the impact of stopping 1 equipment train, the Project is to install 3 equipment trains.

The recycled nitrification/denitrification process features an anaerobic tank at the front end of the Reactor tank and an aerobic tank in the back end. A circulation pump is used to pump nitrified liquid from the aerobic tank back to the anaerobic tank, to further reduce nitrogen.

The capacity of the reactor tank is decided in the following way. Table 2-43 shows the capacities of a reactor tank train.

- In the aerobic tank, organic matter is decomposed, while ammonia nitrogen is oxidized into nitrate nitrogen by nitrification reaction, which requires hydraulic retention time (HRT) of approximately 12 hours for the expected septage amount of $145\text{m}^3/\text{day}/\text{train}$ (overall treated amount $435\text{m}^3/\text{day}/3 \text{ trains}$). Thus, a capacity of approximately 70m^3 is required. In terms of a civil structure, the dimensions are W3.0m x L4.8m x D5.0m.
- The anaerobic tank uses organic matter to reduce nitrate nitrogen (in the nitrified liquid returned by the aerobic tank) into nitrogen gas. As future plans for received septage volume is expected to be $145\text{m}^3/\text{day}/\text{train}$ (overall treated amount $435\text{m}^3/\text{day}/3 \text{ trains}$), the required HRT is approximately 15 hours. For the anaerobic tank, a capacity of approximately 90m^3 is required. In terms of a civil engineering structure, the dimensions are W3.0m x L6.0m x D5.0m.

Table 2-43 Reaction Tank Capacity in 1 Train

Item	HRT	Capacity	Dimensions
Aerobic tank	Approx. 11hr	Approx. 72m^3	W3.0m x L4.8m x D5.0m
Anaerobic tank	Approx. 14hr	Approx. 90m^3	W3.0m x L6.0m x D5.0m
Reactor tank (Total)	Approx. 25hr	Approx. 162m^3	W3.0m x L10.8m x D5.0m

Source: JICA Study Team

(3) Filtrate Treatment Facility (Aeration Equipment)

As the liquid separated from highly concentrated septage needs to be treated in the Reactor tanks, a whole floor aeration with fine bubble system is installed to cover the entire floor of the Reactor tank, to enhance oxygen transfer efficiency (hereinafter referred to as "OTE"). As an aerator device, a membrane

system with high OTE is used to save energy.

The amount of oxygen needed to treat filtrate is the total of the following items.

- Amount of oxygen necessary to oxidize organic matter
- Amount of oxygen necessary to nitrify nitrogen
- Amount of oxygen necessary for endogenous respiration of activated sludge
- Amount of oxygen necessary to maintain dissolved oxygen concentration

It is assumed that the amount of oxygen necessary for one train in the filtrate treatment facility of the STP in the Project will be 19.3kg/hr. Assuming aerator device OTE is 26%, the aeration air volume necessary for 1 train is 4.8m³/min.

Table 2-44 shows the specifications for aeration devices.

Table 2-44 Aeration Device Specifications

Item	Specification/Capacity
Aerator system	Whole floor aeration
Aerator device	Membrane system
Aerator device OTE	26%
Aerator air volume	4.8m ³ /min (per train)

Source: JICA Study Team

(4) Sand Filter

The concentrations of received septage in the Project are expected to be higher than ones for ordinary sewage treatment plant at nitrogen: 3,000mg/L and phosphorus: 350mg/L for received septage, 415mg/L and 65mg/L respectively after de-watering process. Whereas, final discharge from the STP is to be regulated as D class by DENR for nitrogen and phosphate, so concentrations must fulfill the targets of 7.5mg/L for ammonia nitrogen, 30mg/L for nitrified nitrogen and 10mg/L for phosphate.

Therefore, compared to ordinary sewage treatment, the needs to add chemicals is greater - for example: a PAC coagulant needs to be added to remove phosphate and methanol as an organic matter supply is need for denitrification. Yet, to cover for cases where chemical additives reduce the activity of activated sludge or make treatment unstable, 1 sand filtration device (steel plate, cylindrical type, with diameter of 1,400mm) is installed.

(5) Disinfection Tank

After filtrate is treated at the treatment facility, it is disinfected and discharged. Methods of disinfection include chlorine, UV and ozonation, each with its own special features. Table 2-45 shows the disinfection methods. In line with the simplicity, a UV disinfectant system is adopted because the only periodic maintenance work simply involves replacing the UV lamps, so it is advantageous over other disinfection system in terms of total cost. Table 2-46 shows the specifications of the disinfection devices.

Table 2-45 Comparison of Disinfection Methods

Item	Sodium hypochlorite	UV	Ozonation
Construction cost ratio	0.7	1.0	2.0
Annual maintenance cost ratio	3.2	1.0	1.7
Total cost ratio (Service life: 15yr)	1.3	1.0	1.9
Special feature of equipment	Construction is inexpensive, but maintenance is expensive	Maintenance is easy and inexpensive	Construction is the most expensive
Evaluation	2nd	1st	3rd

Source: JICA Study Team

Table 2-46 Disinfection Device Specifications

Item	Specification/Capacity
Disinfection system	UV system
Coliform bacterium inactivation rate	99.9% or higher
Quantity	1

Source: JICA Study Team

(6) Chain Blocks

Chain blocks are necessary at the Receiving facility and the De-watering and filtrate treatment facility to handle the equipment for maintenance tasks. Table 2-47 shows the specifications for the chain blocks.

Table 2-47 Specifications of Chain Blocks

Installation Location	Spec	Number	Main Purpose
Receiving facility: Receiving equipment room	5t	2	Hoisting receiving unit (gross wt: 11.0t, but heaviest part is 4.5t when dismantled)
Receiving facility: Pump room	1t	1	Hoisting sludge supply pump (max wt: 0.7t)
De-watering and filtrate treatment facility: De-watering machine room	5t	2	Hoisting de-watering machine (gross wt: 7.0t, but heaviest part is 4.5t when dismantled)
De-watering and filtrate treatment facility: Generator room	3t	1	Hoisting generator (gross wt: 4.0t, but heaviest part is 3.0t when dismantled)
De-watering and filtrate treatment facility: Blower room	1t	1	Hoisting blower (gross wt: 1.0t, but heaviest part is 0.7t when dismantled)

Source: JICA Study Team

(7) Emergency Generator and Fuel Tank

Aeration needs to be running continually for 24 hours a day for water treatment equipment. If there is a power outage and aeration devices stop, the aerobic tank becomes anaerobic. In such cases, appropriate treatment is not possible, toxic gas and a harmful odor are generated, having a worse effect on the environment in the vicinity. Therefore, an emergency generator is installed.

The capacity of the power load equipment for the entire STP is approximately 200kW. Of that, 150kVA (120kW, power-factor 0.8) of the capacity of the generator is required to run the necessary equipment continually for 24 hours even during a power outage. Therefore, a 150kVA diesel-driven emergency generator (1 unit) is installed.

Furthermore, because power outages could be prolonged due to typhoons, etc., the generator which is able to run continuously for 2 days is adopted and a 3m³ steel plate fuel tank is installed as well.

2-2-2-2-10 Administrative Building**(1) Layout of Rooms and Floor Area**

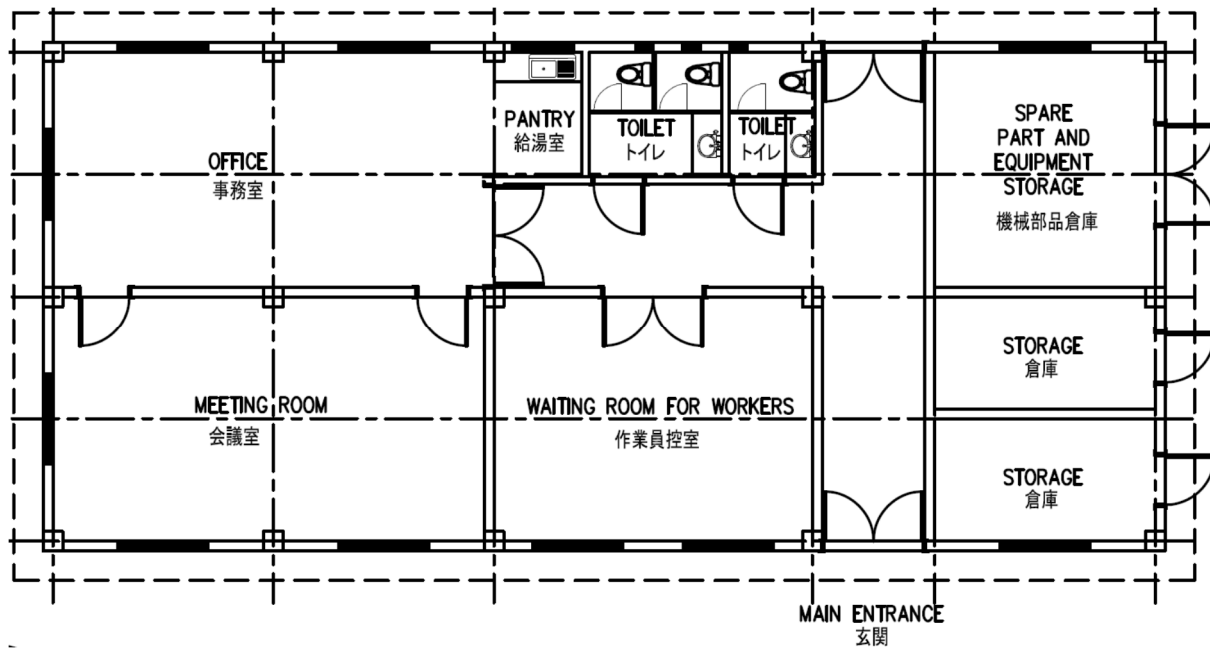
The Administrative Building comprises an office, meeting room, waiting room for workers, spare part and equipment storage, multi-purpose storage (2 rooms), pantry and toilets. Total floor area for the Administrative Building is 215m² as shown in Table 2-48. Also, Figure 2-12 shows a conceptual diagram of layout of Administrative Building.

Table 2-48 Rooms and Floor Areas of Administrative Building

Rooms	Floor Areas
Office	Approx. 43m ²
Meeting room	Approx. 44 m ²
Waiting room for workers	Approx. 32 m ²
Spare part and equipment storage	Approx. 22 m ²

Rooms	Floor Areas
Storage (2 rooms)	Approx. 22 m ²
Pantry	Approx. 5 m ²
Toilets	Approx. 12 m ²
Main entrance and corridor	Approx. 35 m ²
Total	Approx. 215 m ²

Source: JICA Study Team



Source: JICA Study Team

Figure 2-12 Conceptual Layout of Administrative Building

(2) Operation Control System

On a screen on the supervisory control and data acquisition (SCADA) system, various data is shown, including flow data (septage flow, filtrate flow and discharge flow, etc.), water level data (receiving holding tank and sand filtration treatment water tank, etc.), air volume data (aeration air, etc.), water quality data (DO and pH meters), data on run / stop status of equipment, and data on breakdown status. It makes possible to swiftly grasp the operating status of equipment and allow quick responses to breakdowns.

Regarding equipment with accessories that is operated in connection to main units of instruments, such as chemical injectors on de-watering equipment, the system is geared to enable accessories to operate automatically. Further, the system is geared to enable automatic operation of pumps and blowers, etc., in accordance with metered values of water level, septage flows, and air volume, etc.

The digital data on run/stop of each piece of equipment is stored in a server and put to use as maintenance information for the equipment. Based on each type of digital data and analog data and in addition to digitalized date, daily STP processing status printouts are made as reports, which are used to manage the status of operation.

(3) Water Analysis Devices

DO and pH meters are installed on the discharge sides of each reaction tank.

DO meters measure the dissolved oxygen concentration necessary for nitrification reaction in Reactor tank and aeration blowers are operated based on DO meter readings with controlling the DO value. By maintaining the DO value at about 1ppm, the necessary air volume for nitrification is provided, which is enable energy saving on the blowers.

To prevent pH values falling below the lower-limit of 6, pH value is monitored by pH meters. Since the pH value decreases by nitrification reaction process, pH values are controlled by sodium hydroxide injectors according to pH monitoring results.

2-2-2-2-11 Water Quality Apparatus in Central Laboratory

Daily water quality control on the STP is operated by abovementioned water quality apparatus. MCWD monitors the result of the water quality analysis at the MCWD's central laboratory on regular basis. Since MCWD operates presently only water supply business, MCWD does not have any equipment specialized to monitor wastewater quality. Therefore, necessary water quality apparatus for regular monitoring of the condition on septage / effluent quality management are provided in the central laboratory.

(1) Basic Condition

1) Items to be analyzed in Central Laboratory

Water quality samples are taken in each treatment process in the STP once a week. They are brought to MCWD's central laboratory and then confirmed on required water quality items by official analytical method.

BOD, E. coli, ammonia, nitrate, phosphate, oil and surfactant which are stipulated as significant water quality items in effluent quality standards in the Philippines, and water temperature, pH, suspended solid, COD, total nitrogen and moisture content which are required for operation management on the STP are to be analyzed.

Table 2-49 shows the water quality analysis item in MCWD's central laboratory (once a week).

Table 2-49 Water Quality Analysis Item in MCWD's Central Laboratory (Once a week)

Item	Receiving Tank	Pretreatment (De-water)		Reactor Tank		Final Sedimentation	Effluent
		De-watered Sludge	De-watered Thickened Sludge	Aeration Tank	Return Sludge	Secondary Treated Water	
Water Temperature	○		○	○	○	○	○
pH	○		○	○	○	○	○
SS	○		○			○	
MLSS				○	○		
BOD	○		○			○	
COD _{Cr}	○		○			○	
T-N	○		○			○	
NO ₃ -N + NO ₂ -N						○	
NH ₄ -N						○	
T-P	○		○			○	
Moisture Content		○					
Oils and Fats	○		○				○
Surfactant	○		○				○
E. Coli							○

Source: JICA Study Team

1) Analysis Method

Analysis method for each water quality item is based on Standard Method for the Examination of Water and Wastewater by United States Public Health Service or related official analytical method in Japan according to JIS0102.

Table 2-50 shows the analysis method on each water quality item.

Table 2-50 Analysis Method on Each Water Quality Item

Item	Method	Major Equipment to be Required
Water temperature	-	(water thermometer)
pH	Electrode method	pH meter
SS, MLSS	Filter paper method, centrifuging method	Electrical balance, Filter, Vacuum pump, centrifuge (thermostat (for 105°C))
BOD	BOD: Five-day method, DO measurement: Winkler sodium azide method	(thermostat (For 20°C)), Furan bottle, auto burette
COD _{Cr}	Potassium dichromate reflux method	COD _{Cr} Reflux device, auto burette
T-N	Raw water: Kjeldahl nitrogen method + Indophenol blue absorption spectrophotometry Secondary treated water: aggregative method (Distillation method, reduction distillation method, Kjeldahl nitrogen method + indophenol blue absorption spectrophotometry)	(spectrophotometer), Kjeldahl decomposition device, Kjeldahl distillation device
NH ₄ -N	Distillation method + indophenol blue absorption spectrophotometry	(spectrophotometer), Kjeldahl distillation device
NO _x -N (NO ₂ -N+NO ₃ -N)	Reduction distillation method + indophenol blue absorption spectrophotometry	(spectrophotometer), Kjeldahl distillation device
T-P	Potassium peroxodisulfate decomposition molybdenum blue absorbance method	(spectrophotometer), Autoclave
Water Content	Weight method	Electrical Balance, (thermostat (for 105°C))
Oils and fats	n-hexane extraction method	Solvent extraction and recovery device, shaker, (Dryer (for 80 °C))
Surfactant	Methylene blue absorbance method	(spectrophotometer)
E. Coli	Most probable number method	Thermostat for microbial culture (for 37°C.), an autoclave

Note: Since MCWD owns equipment in the brackets in the table, it is not necessary to procure the ones in the Project.

Source: JICA Study Team

(2) Water Quality Apparatus to be Procured

Table 2-51 shows necessary water quality apparatus to be procured in the Project.

Table 2-51 Water Quality Apparatus to be Procured in the Project

Item	Procured Equipment	Q'ty	Main Specification
pH	pH meter (desktop)	1	Component: main device, pH sensor Type : Desktop Type Measurement range: pH0.00 ~ 14.00
SS/MLSS/water content percentage	Electrical balance	1	Type : Desktop Type weighing: 300g
	Filter	1	Component: funnel, filtration bottle, connector, vacuum pump, tube Filter dia.: 47mm Funnel vol.: 320mL
	Centrifuge	1	Type : Desktop Type Revolving speed: over 4,000rpm centrifuge effect: over 2650g Rotor specification: 50mL x 4sets and more
BOD	Furan bottle	60	Type: grooved with glass collar volume: 200mL
	Auto burette	1	Burette volume: 25mL bottle volume: 1L
COD _{Cr}	COD Reflux device	1	Component: heater, glass equipment (Round bottom flask, Liebig condenser) Number of heaters: 6 units
	Auto burette	1	Burette volume: 25mL bottle volume: 1L
T-N/NH ₄ -N NO _x -N	Kjeldahl distillation apparatus	1	Component: heater, glass equipment (Round bottom flask, Liebig condenser, other connectors) Number of heaters: 6 units
	Kjeldahl decomposition	1	Component: heater, glass equipment (Kjeldahl flask)

Item	Procured Equipment	Q'ty	Main Specification
	apparatus		Number of heaters: 6 units
E. Coli	Incubator for culturing microorganisms (For 37 °C)	1	Type: air jacket typed natural circulation Working temperature: room temperature +5 ~ 80 Volume: more than 150L
	Autoclave	1	Max. working pressure: 0.16MPa working temperature Working Temperature: 105~127 Volume: over 100L
Oils and fats	Solvent extract collection device	1	Component: constant temperature water tank, glass equipment (flask, collection equipment, Allihn condenser) Number of heaters: 6 units
	Separation funnel shaker	1	Revolving velocity: 25 ~ 250rpm Number of glasses: less than 300ml 10 units, 500ml, 1000ml 6units
Others	Cooling water circulation device	1	Temperature range: -20 ~ 30 Cooling capability :1200W (water temp.10 °C)
	Refrigerator	1	Working temperature:+2 ~ 15 °C volume: over 300L
	Hot stirrer	1	Revolving velocity: 300 ~ 1500rpm number of units: 6 consecutive type
Miscellaneous equipment			Beaker, test tube etc.

Source: JICA Study Team

2-2-2-3 Equipment Procurement Plan

Following equipment is procured for septage collection, transportation of de-watered cake generated from the STP to the landfill site.

De-sludge and collection of septage: Vacuum truck

Transportation for de-watered cake to the landfill site: Dump truck

2-2-2-3-1 Vacuum Truck

(1) Utilizing Existing Private De-sludgers

As of December 2018, Cebu City is operating the de-watering plant, while the septage collection is carried out by seven private de-sludgers as private business.

If all septage in the Project area is collected/ transported by MCWD's equipment, business opportunities of the existing private de-sludgers will be reduced and it will be a squeeze on private-sector businesses. Therefore, the existing seven private de-sludgers are to be involved in a part of septage collection plan and the existing business scale will be maintained.

(2) Basic Condition

Table 2-52 shows basic conditions for estimating the necessary number of procured vacuum trucks in the Project.

Since there are narrow streets in the Project area, small type of the vacuum truck such as 3m³ vacuum truck is procured. On the other hand, 9m³ vacuum truck is also procured to collect septage from three households during a trip for work efficiency in wider streets.

Table 2-52 Basic Conditions for Planning Vacuum Truck in the Project

Item	Figure		Remarks
The volume of vacuum truck (m ³)	3	9	Septage collection amount from a household is 2.5m ³ . 120% of collection volume is taken into consideration to include cleaning water.
Average speed of truck operation (km/hour)	15	15	Based on the actual condition confirmed by JICA Study Team
Septage de-sludging time (including preparation time) (hour)	1	1	

Item	Figure		Remarks
The number of septage collection household per trip (household)	1	3	
Septage discharging time at STP (hour)	0.5	1	
Working hour per day (hour)	8	8	
Collection volume to be outsourced to the exiting private de-sludgers (m ³ /day)	60		Maximum collection amount in daily average based on the receiving record at de-watering plant in Cebu City

Source: JICA Study Team

Table 2-53 shows the septage volume collected by the exiting private de-sludgers at the de-watering plant in Cebu City in 2017. Approximately 46m³/daily-average of septage is collected and the highest collection volume is 60m³/day from the exiting private de-sludgers.

Table 2-53 Septage Volume Collected by Private De-sludgers in 2017

Unit: m³/month

No.	Company name	Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	Bonnie and Jane Septic Tank Services	Cebu City	588	480	720	387	792	930	750	1,195	570	855	300	-	7,567
2	Queen Septic Tank & Manual Service	Cebu City	60	30	135	111	66	228	180	30	72	66	36	-	1,014
3	Northern Septic Tank Services	Mandaue City	69	45	84	30	15	75	60	30	30	30	105	-	573
4	Limjohn Septic Tank	Cebu City	30	30	30	30	60	75	75	60	60	30	-	-	480
5	Cebu Septic Tank	Cebu City	315	255	432	180	240	180	270	180	180	270	270	-	2,772
6	A&M Septic Tank Service	Cebu City	15	15	15	15	15	15	-	15	15	15	-	-	135
7	P&J Septic Tank	Mandaue City	-	-	-	-	-	-	-	-	72		93	-	165
	Cebu City		9	-	-	-	-	-	-	-	-	-	-	-	9
	Total		1,086	855	1,416	753	1,188	1,503	1,335	1,510	999	1,266	804		12,715
Unit: m ³ /day															
Daily average sludge collection amount			43	34	57	30	48	60	53	60	40	51	32		46

Note: Septage from public facility in Cebu City was collected by Cebu City in January 2017.

Note: Monthly working days are assume as 25 days in average.

Date Source: Cebu City

Considering the basic conditions and the collection work scale of the private de-sludgers, the specification and the number of procured vehicles in the Project is calculated as follows:

- 1) Number of vacuum trucks to be procured in the Project is calculated by reducing the presently collected septage volume 60m³/day. Required capacity of the vacuum trucks to be procured by the Project is, therefore, 332.42m³/day while the total planned collection volume is 392.42m³/day in the Project.
- 2) Volume of vacuum trucks is to be 120% of the planned septage collection volume, considering water volume to be necessary for cleaning purpose. Since the target collection volume of domestic septage is 2.5m³, capacities for vacuum trucks are 3m³ or 9m³ for the tank volumes.
- 3) Considering the distance between each LGU and the STP, travelling time for one (1) trip of 3m³ and 9m³ vacuum trucks are estimated respectively by LGU.
- 4) The working hour is for eight (8) hours in a day and capable number of trips by 3m³ and 9m³ vacuum trucks in eight (8) hours is calculated.
- 5) The number of procured 3m³ and 9m³ vacuum trucks is calculated by the required collected septage volume from each LGU by each type of vehicle.

(3) Specification and Number of Procured Vacuum Truck

Table 2-54 shows the planned septage collection volume from each LGU.

Table 2-54 Planned Septage Collection Volume from Each LGU

LGU	Planned septage collection volume (A)	(A) – Current septage collection amount (60m ³)	Distance to STP ³
	m ³ /day	m ³ /day	
Compostela	4.99	4.23	19
Liloan	21.06	17.84	14
Consolacion	13.48	11.42	9
Mandaue	69.59	58.95	8
Cebu	238.84	202.32	4.5
Talisay	44.47	37.67	15
Total	392.42	332.42	

Source: JICA Study Team

Table 2-55 shows Calculation for the number of procured vacuum trucks.

Table 2-55 Calculation for Number of Procured Vacuum Trucks

LGU	Travelling time per trip	Travelling time (Including septage collection and discharging)		Number of trip per day		Collection volume per truck per day		Necessary number of Truck		Septage collection volume	
		3m ³	9m ³	3m ³	9m ³	3m ³	9m ³	3m ³	9m ³	3m ³	9m ³
	Hour	Hour	Hour	Trip	Trip	m ³	m ³	Unit	Unit	m ³	m ³
Compostela	2.5	4.0	6.5	2.0	1.2	5.0	9.0	0.4	0.2	2.1	2.1
Liloan	1.9	3.4	5.9	2.4	1.4	6.0	10.5	1.5	0.8	8.9	8.9
Consolacion	1.2	2.7	5.2	3.0	1.5	7.5	11.3	0.8	0.5	5.7	5.7
Mandaue City	1.1	2.6	5.1	3.1	1.6	7.8	12.0	3.8	2.5	29.5	29.5
Cebu City	0.6	2.1	4.6	3.8	1.7	9.5	12.8	10.6	7.9	101.2	101.2
City of Talisay	2.0	3.5	6.0	2.3	1.3	5.8	9.8	3.3	1.9	18.8	18.8
Total								21	14	166.2	166.2

Source: JICA Study Team

(4) Basic Specification of Vacuum Truck

Table 2-56 and Table 2-57 show main specifications of 3m³ and 9m³ vacuum truck respectively.

Table 2-56 Main Specifications of 3m³ Vacuum Truck

Item		Specification
Basic Specification	Handle position	Left
	Drive system	4 x 2 (6 tires, rear drive)
	Transmission	Manual transmission
	Gas Emission level	Euro 4
Chassis	Engine	Water cooling, 4 cycle, diesel engine
	Tire type	Tube tire
	Others	Air conditioner
Body	Tank	Tank shape: cylindrical shape, effective volume: 3m ³ or more
	Vacuum pump	Driving source: PTO Type: oil rotation type
	Hose shape	Suction: 4 inch x 60m (20m x 3 sets) Discharge: 4 inch x 6.5m

³ Distance between STP and each LGU is assumed from following locations;

- Compostela: City hall
- Liloan: City hall
- Consolacion: City hall
- Mandaue: Jagobino
- Cebu: Sabag 1
- Talisay: City hall

Item		Specification
	Others	Equipped with sludge discharging function by tilting the tank under the dump cylinder
	Accessories	Deodorizing device, hose trench, pressure gauge, odometer, connection hose: 4 inch x 40m (20m x 2 sets)

Source: JICA Study Team

Table 2-57 Main Specifications of 9m³ Vacuum Truck

Item		Specification
Basic Specification	Handle position	Left
	Drive system	6 x 2 (10 tires rear driving) or 6 x 4 (10 tires, 4 wheel drive)
	Transmission	Manual transmission
	Gas Emission level	Euro 4
Chassis	Engine	Water cooling, 4 cycle, diesel engine
	Tire type	Tube tire
	others	Air conditioner
Body	Tank	Tank shape: cylindrical shape, effective volume: 9m ³ or more
	Vacuum pump	Driving source: PTO Type: oil rotation type
	Hose shape	Suction: 4 inch x 60m (20m x 3 sets) Discharge: 4 inch x 6.5m
	Others	Equipped with sludge discharging function by tilting the tank under the dump cylinder
	Accessories	Deodorizing device, hose trench, pressure gauge, odometer, connection hose: 4 inch x 40m (20m x 2 sets)

Source: JICA Study Team

2-2-2-3-2 De-watered Cake Transportation Vehicle

(1) Basic Conditions

Table 2-58 shows basic conditions to plan the number of de-watered cake transportation vehicle. Due to the width of the access road to Binaliw landfill site, the container volume for the truck is planned for 8m³.

Table 2-58 Basic Conditions for planning De-watered Cake Transportation Vehicle

Item	Figures/contents
Landfilling site for de-watered cake	Binaliw (Cebu City)
Distance from STP to the disposal site (km)	17
Average speed (km/hour)	15
Dumping time for de-watered cake at landfill site (hour)	0.5
Round trip time (hour)	2.8
De-watered sludge cake generation volume per day (m ³ /day)	55
Working hour per day (hour)	8
De-watered cake generation volume per hour (m ³ /hour)	6.9
De-watered cake loading time per truck (hour)	1.15
Maximum volume loaded on a truck (m ³)	8

Source: JICA Study Team

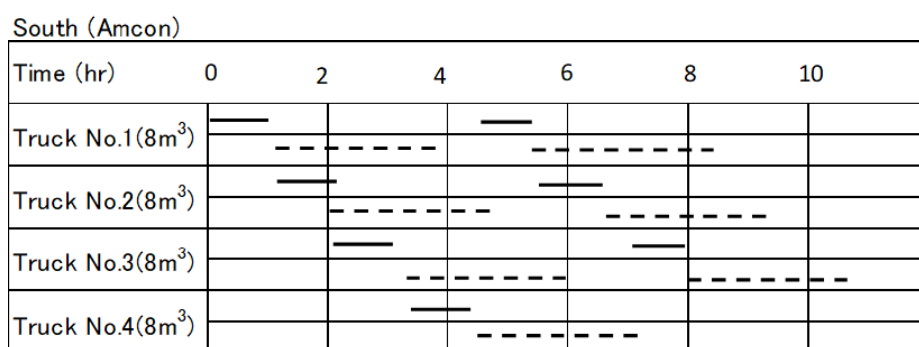
Specification and the number of Procured de-watered cake transportation vehicle in the Project are calculated based on following concept:

- 1) Transportation plan is prepared to realize the minimum number of trucks.
- 2) Truck drivers for transportation is planned to work in scheduled shift. Standard working shift is for two (2) trips in a day and total for eight (8) hours work in a day.

(2) Number of Procured Dump Trucks for De-watered Cake

Planned de-watered cake amount is 55m³/day and seven (7) trips (= 55m³/day/ 8m³) are required in case of transporting the cake by 8m³ dump truck. Figure 2-13 shows a planned time flow for transporting de-watered sludge cake. It is possible to work by 4 units of dump trucks in case of eight (8) hours work

duration of a dump truck



— Sludge Collection - - - - Sludge Transport

Note: working hour in Dump truck exceeds 8 hours. However, septage loading time is a break time for the driver. Therefore, working hour becomes within 8 hours.

Source: JICA Study Team

Figure 2-13 Planned Time Flow for Transporting De-watered Cake

(3) Basic Specification of De-watered Cake Transportation Dump Truck

Table 2-59 shows Main specification for 8m³de-watered sludge cake transportation truck (Dump truck).

Table 2-59 Main Specifications for 8m³ De-watered Sludge Cake Transportation Truck (Dump Truck)

Item		Specification
Basic specification	Handle position	Left
	Drive system	4 x 2 (6 tires rear driving)
	Transmission	Manual transmission
	Gas Emission level	Euro 4
Chassis	Engine	Water cooling, 4 cycle, diesel engine
	Tire type	Tube tire
	Others	Air conditioner
Body	Container	Discharge method: rear discharge method (single door, lower opening type) Effective volume: 8m ³ or more
	Others	Sludge discharging function by tilting the container under the dump cylinder

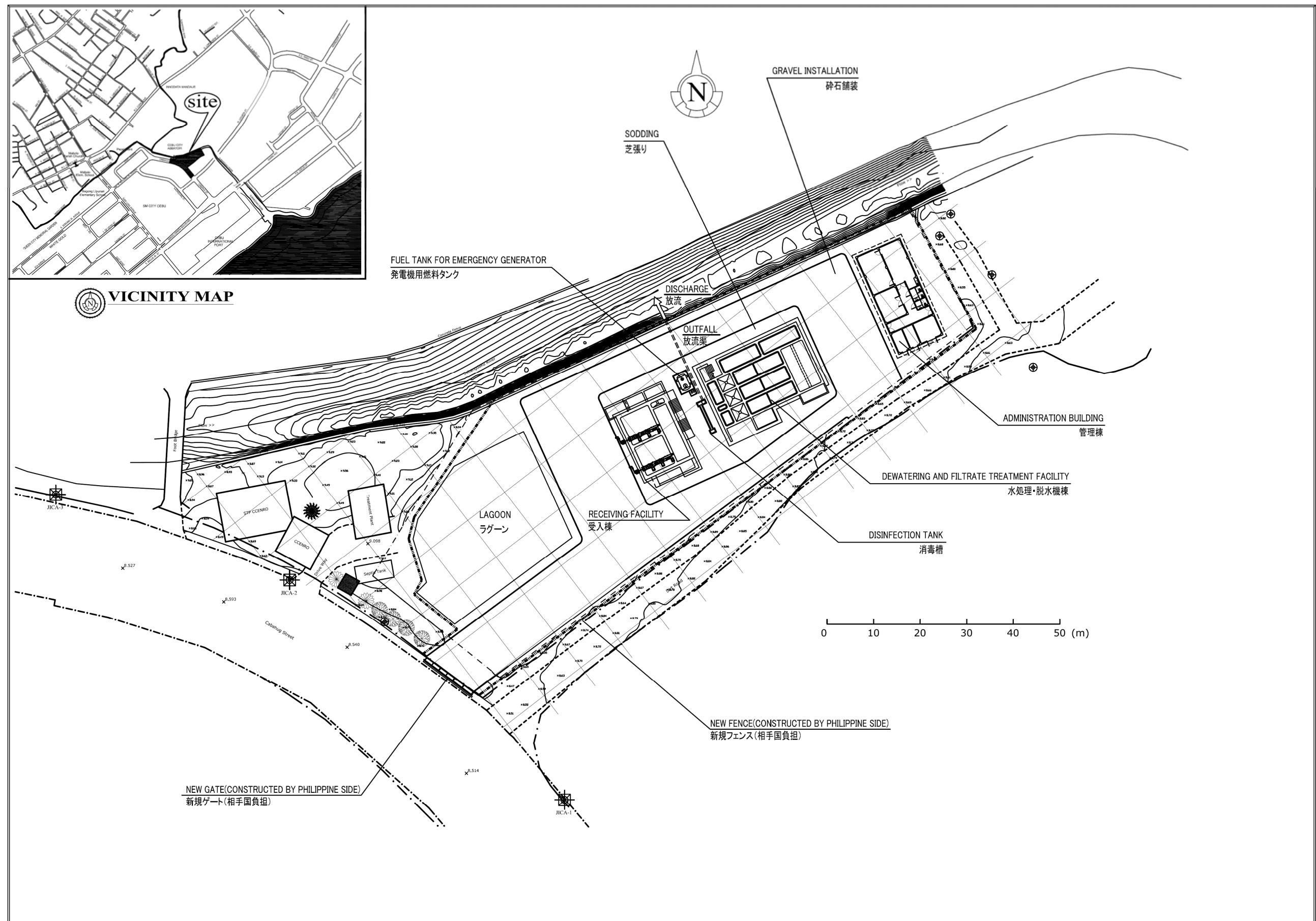
Source: JICA Study Team

2-2-3 Outline Design Drawing

Drawings for the facilities to be constructed in the Project are shown on following pages:

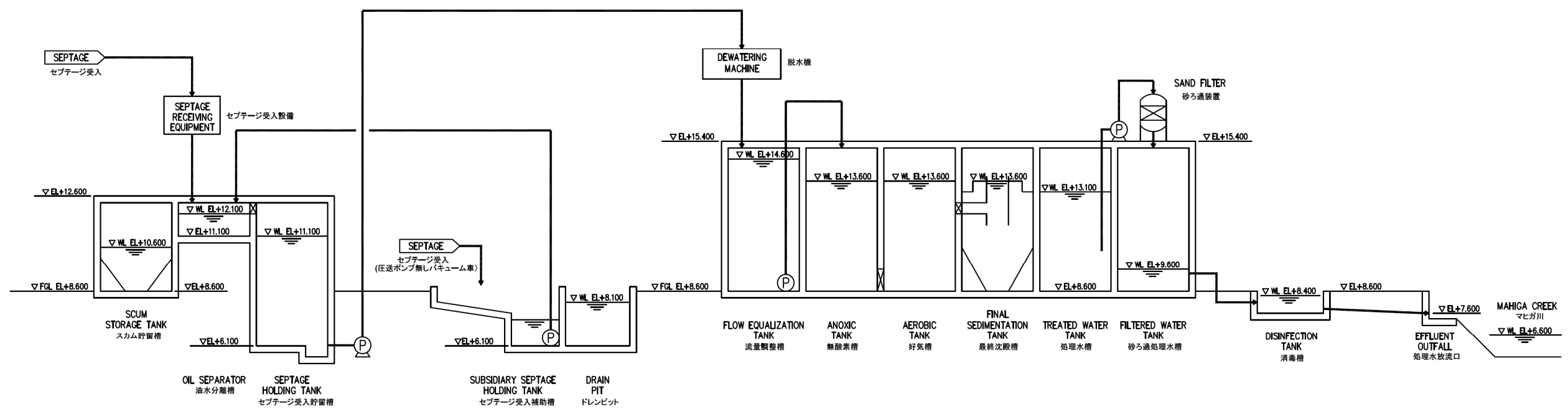
【List of the drawings on Outline Study】

No. 図面	Drawing No. 図面番号	Drawing Name 図面名称	Scale 縮尺
1	P-	1 SOUTH SEPTAGE TREATMENT PLANT GENERAL PLAN 南部処理プラント 一般平面図	1:800
2		2 SOUTH SEPTAGE TREATMENT PLANT FLOW SHEET 南部処理プラント フローシート	-
3		3 HYDRAULIC PROFILE 水位高低図	-
4	C-	1 RECEIVING FACILITY PLAN AND SECTION 受入棟 平断面図	1:250
5		2 DEWATERING AND FILTRATE TREATMENT FACILITY PLAN AND SECTION 水処理・脱水機棟 平面図	1:250
6		3 ADMINISTRATION BUILDING PLAN AND SECTION 管理棟 平断面図	1:200
7	E-	1 SCADA SYSTEM DIAGRAM SCADAシステム図	-
8		2 INSTRUMENTATION DIAGRAM 計装系統図	-
9		3 INSTRUMENTATION DIAGRAM 計装系統図	-
10		4 INSTRUMENTATION DIAGRAM 計装系統図	-
11		5 SINGLE-LINE DIAGRAM (1/3) 単線結線図 (1/3)	-
12		6 SINGLE-LINE DIAGRAM (2/3) 単線結線図 (2/3)	-
13		7 SINGLE-LINE DIAGRAM (3/3) 単線結線図 (3/3)	-

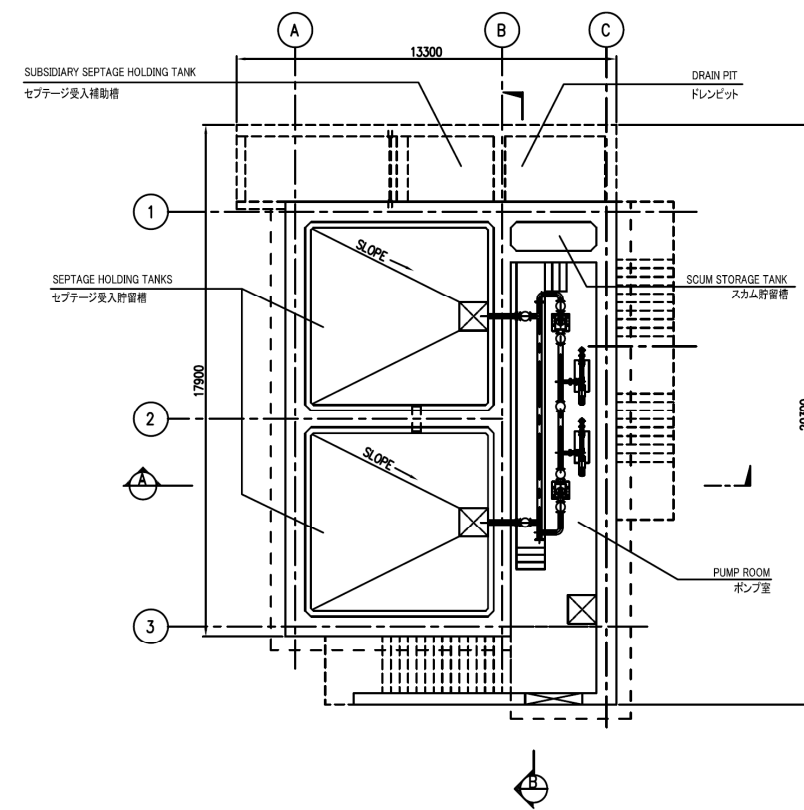


P-1 SOUTH SEPTAGE TREATMENT PLANT GENERAL PLAN
P-1 南部処理プラント 一般平面図

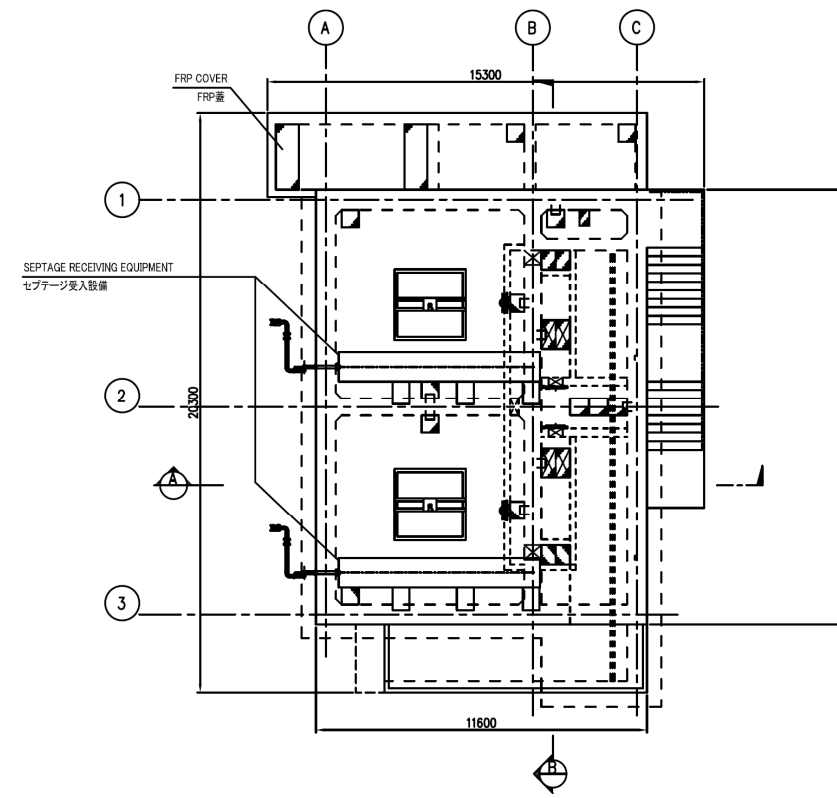




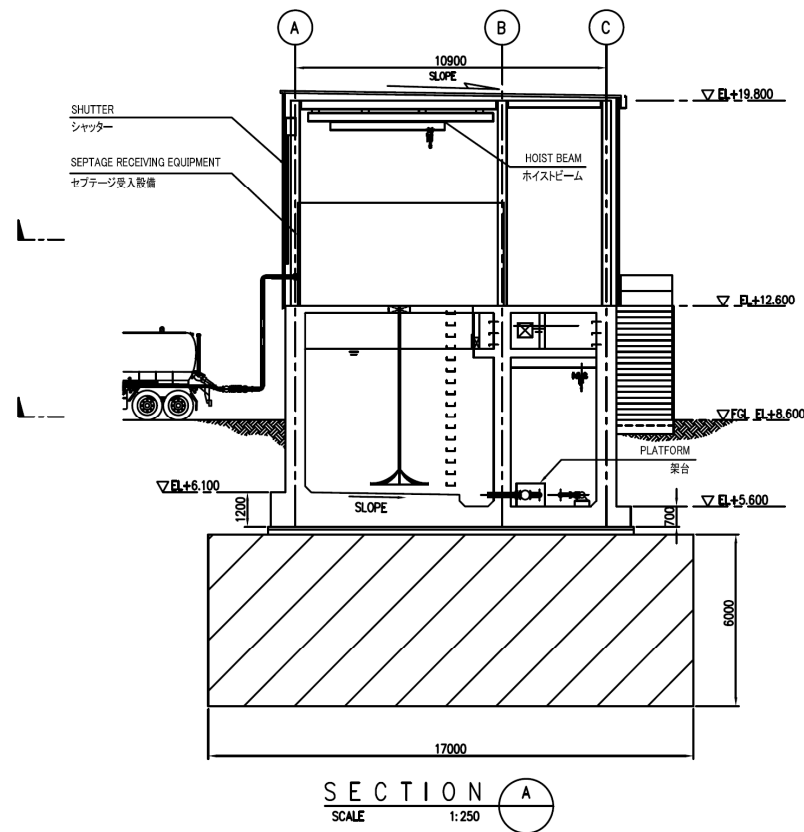
P-3 HYDRAULIC PROFILE
P-3 水位高低図



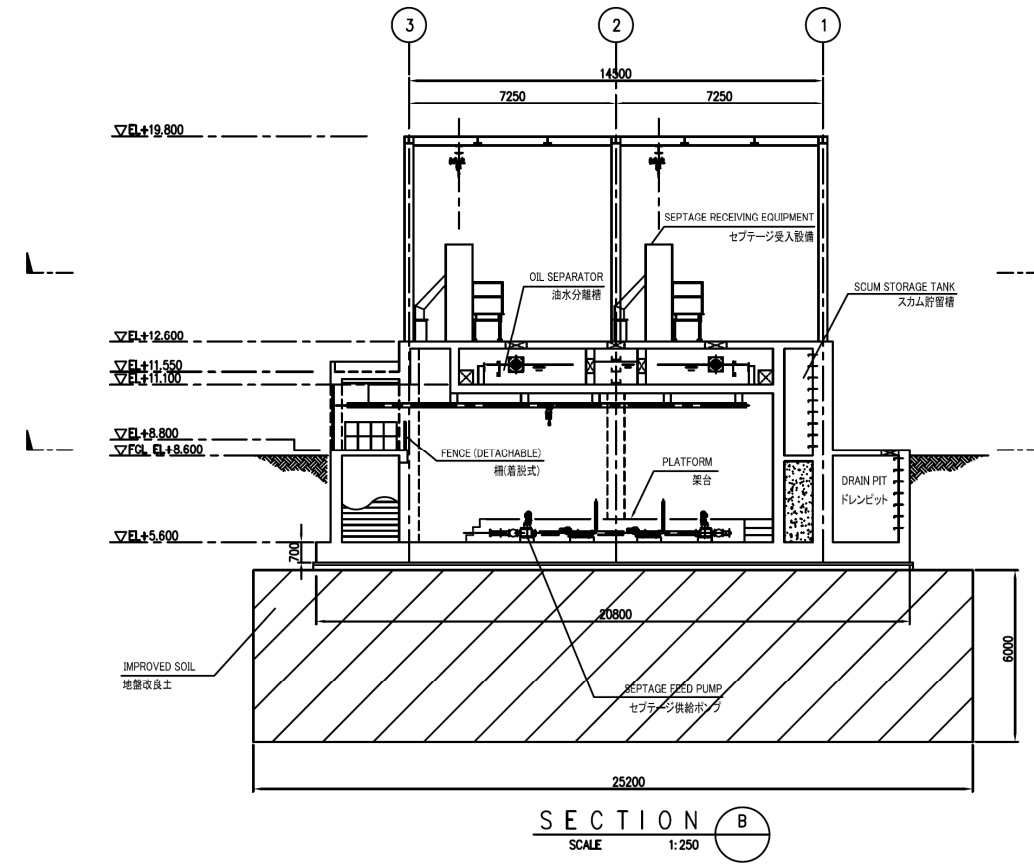
LOWER FLOOR PLAN
SCALE 1:250



UPPER FLOOR PLAN
SCALE 1:250

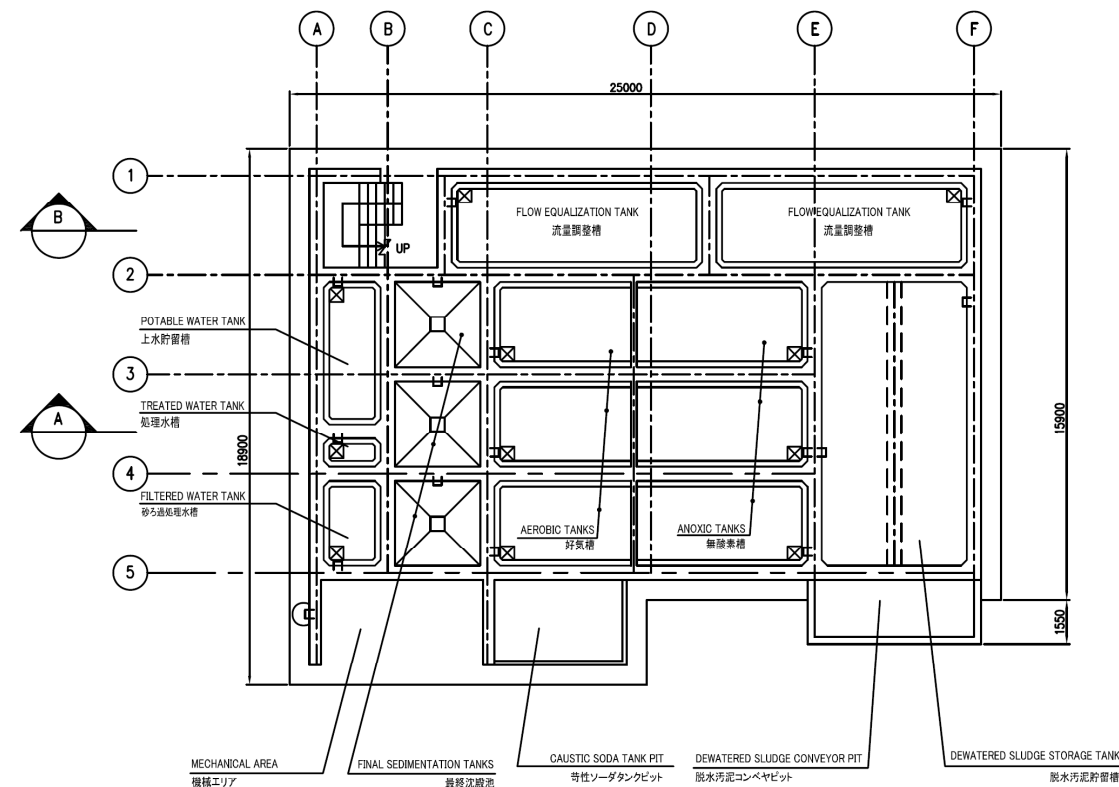


SECTION A
SCALE 1:250

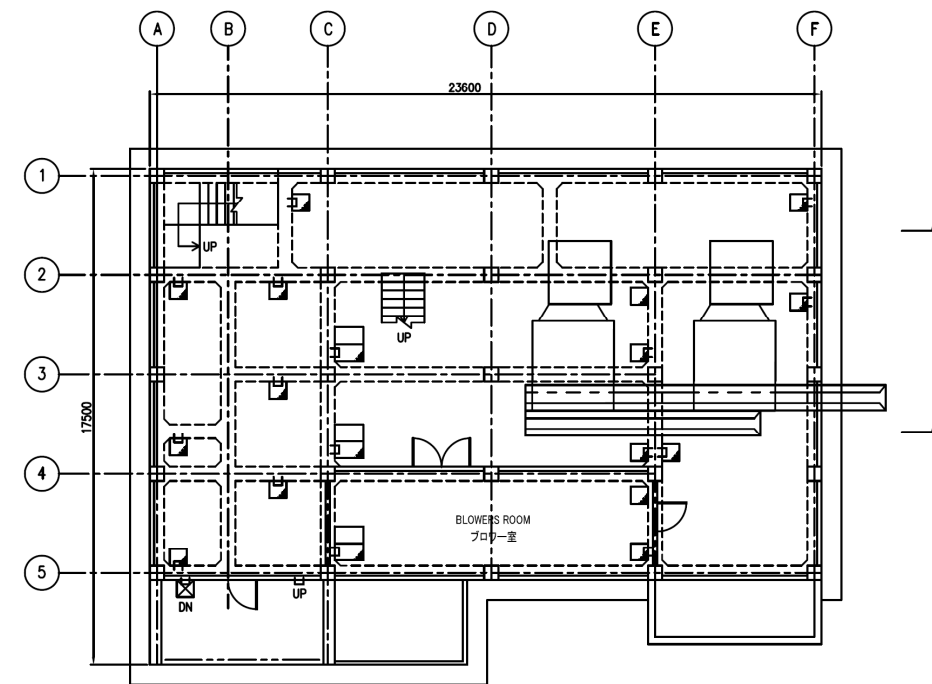


SECTION B
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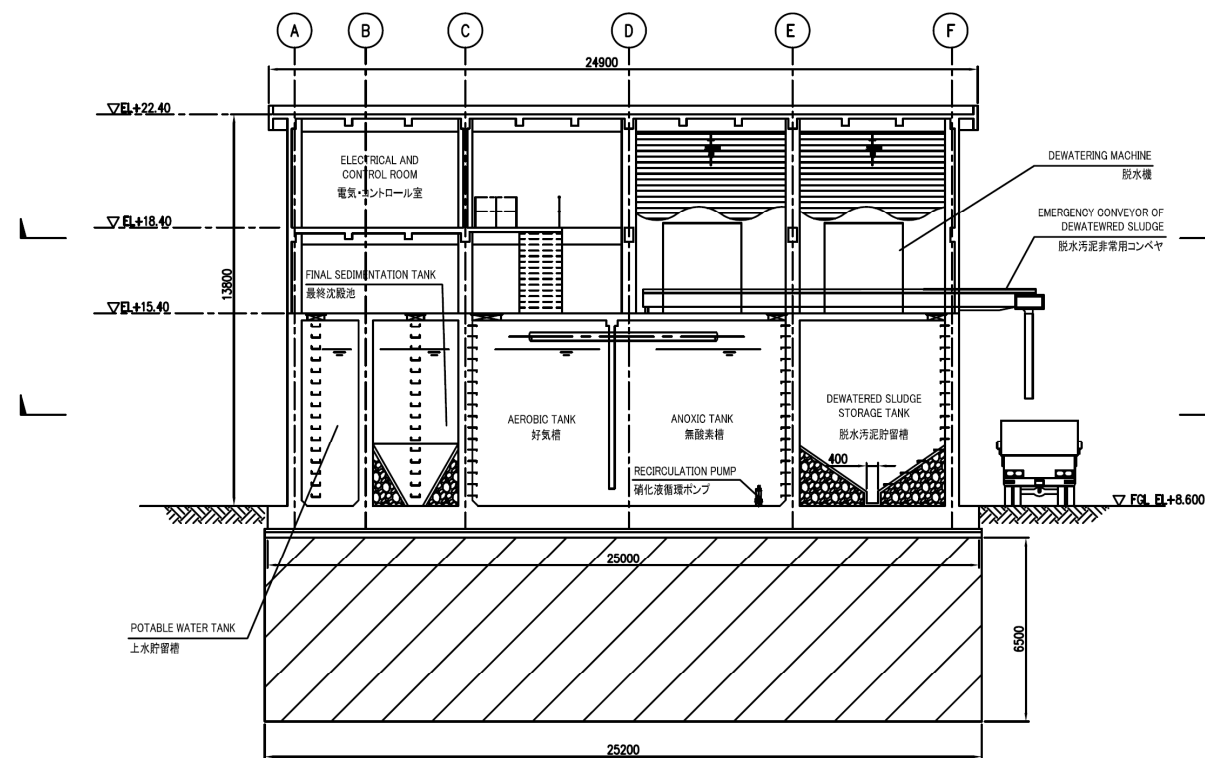
C-1 RECEIVING FACILITY PLAN AND SECTION
C-1 受入棟 平面断面図



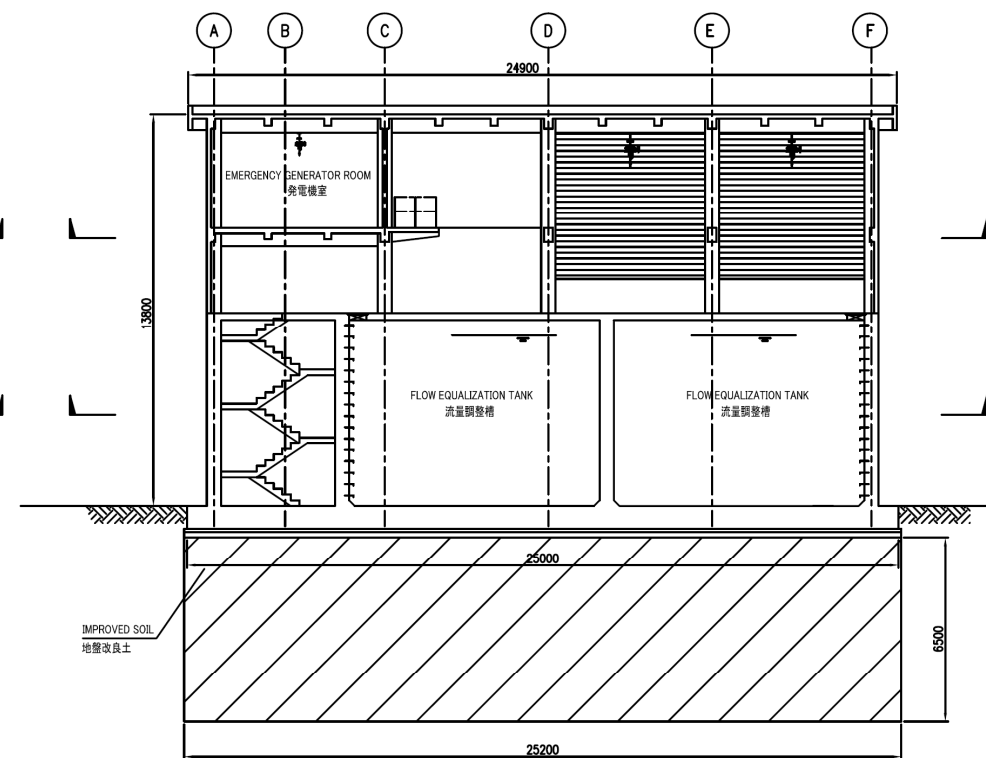
GROUND FLOOR PLAN
SCALE 1:250



EL+15.400 FLOOR PLAN
SCALE 1:250

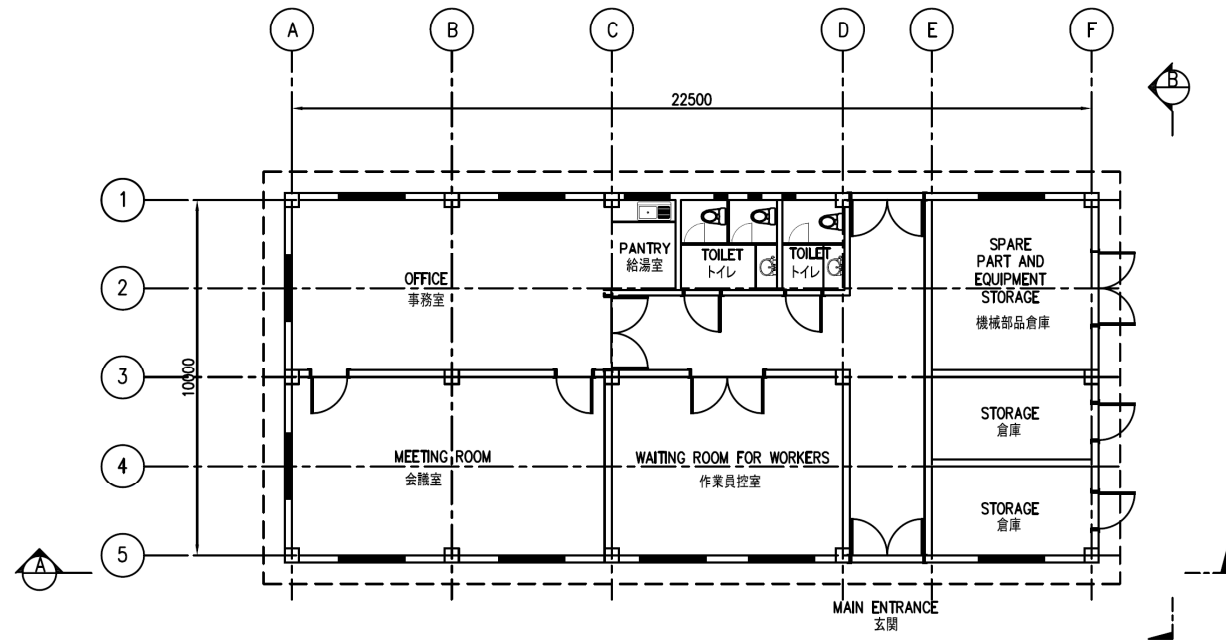


SECTION A
SCALE 1:250

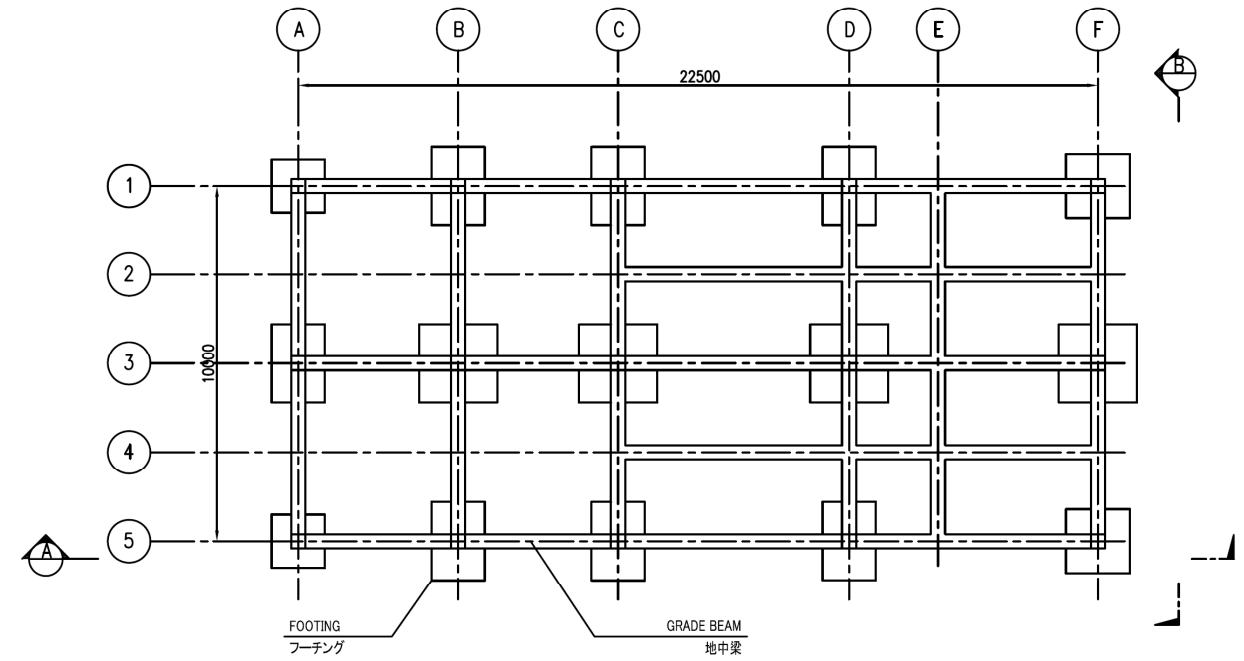


SECTION B
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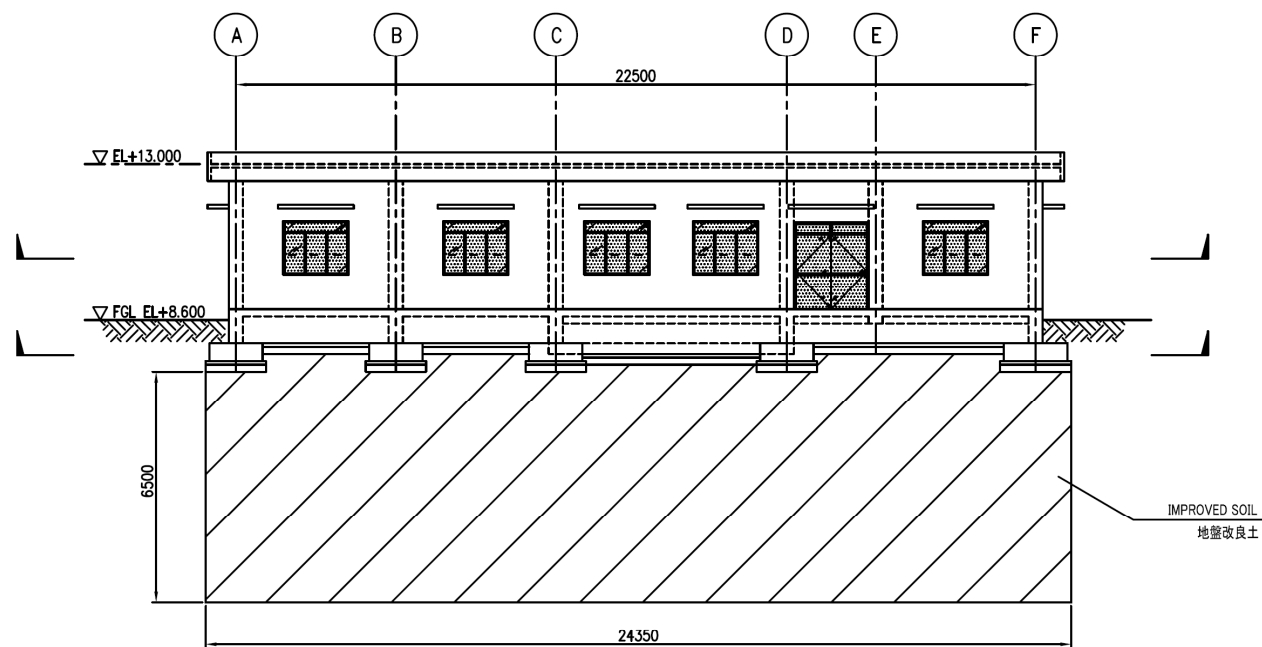
C-2 DEWATERING AND FILTRATE TREATMENT FACILITY PLAN AND SECTION
C-2 水処理・脱水機棟 平面図



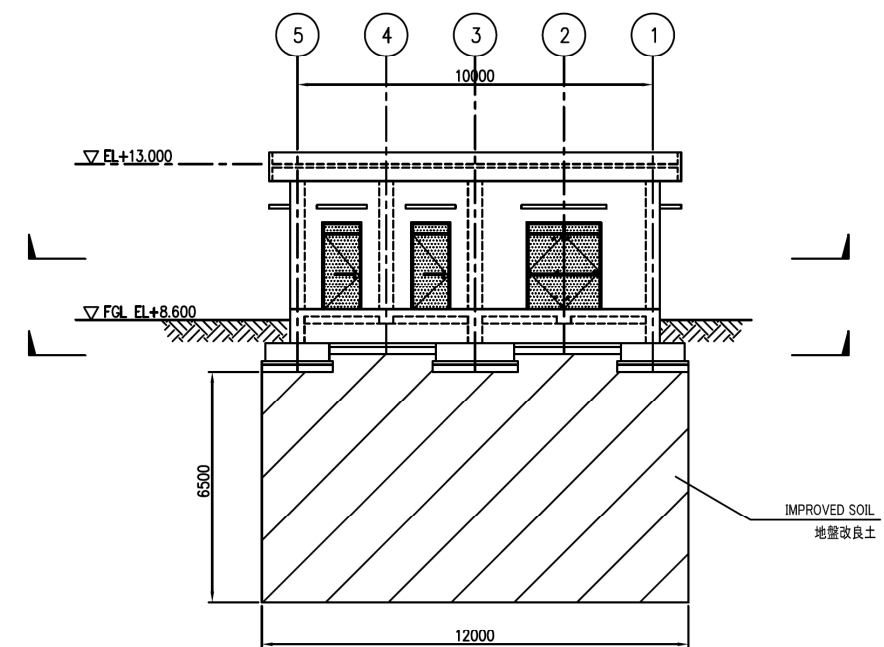
GROUND FLOOR PLAN
SCALE 1:200



FOUNDATION PLAN
SCALE 1:200



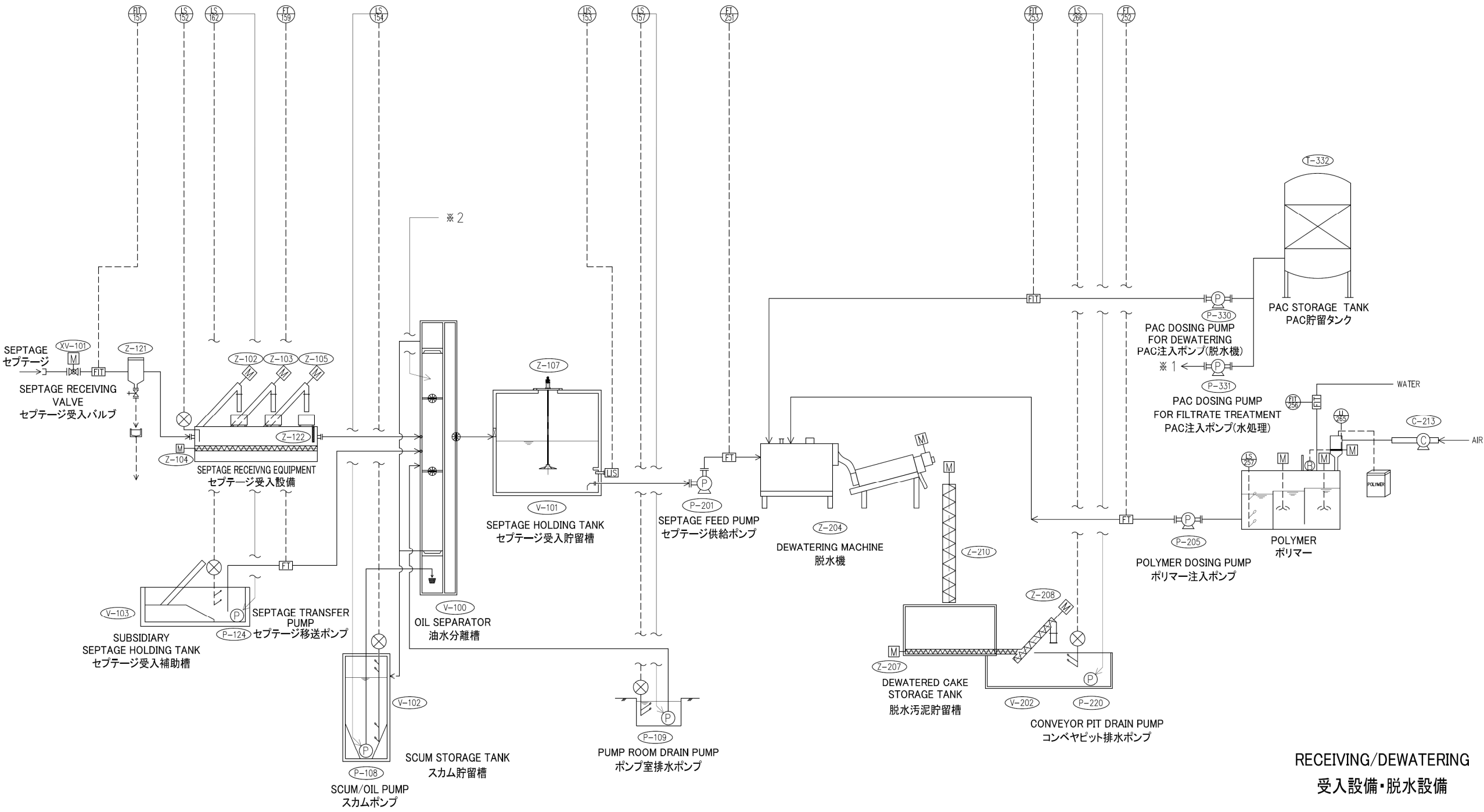
SECTION A
SCALE 1:200



SECTION B
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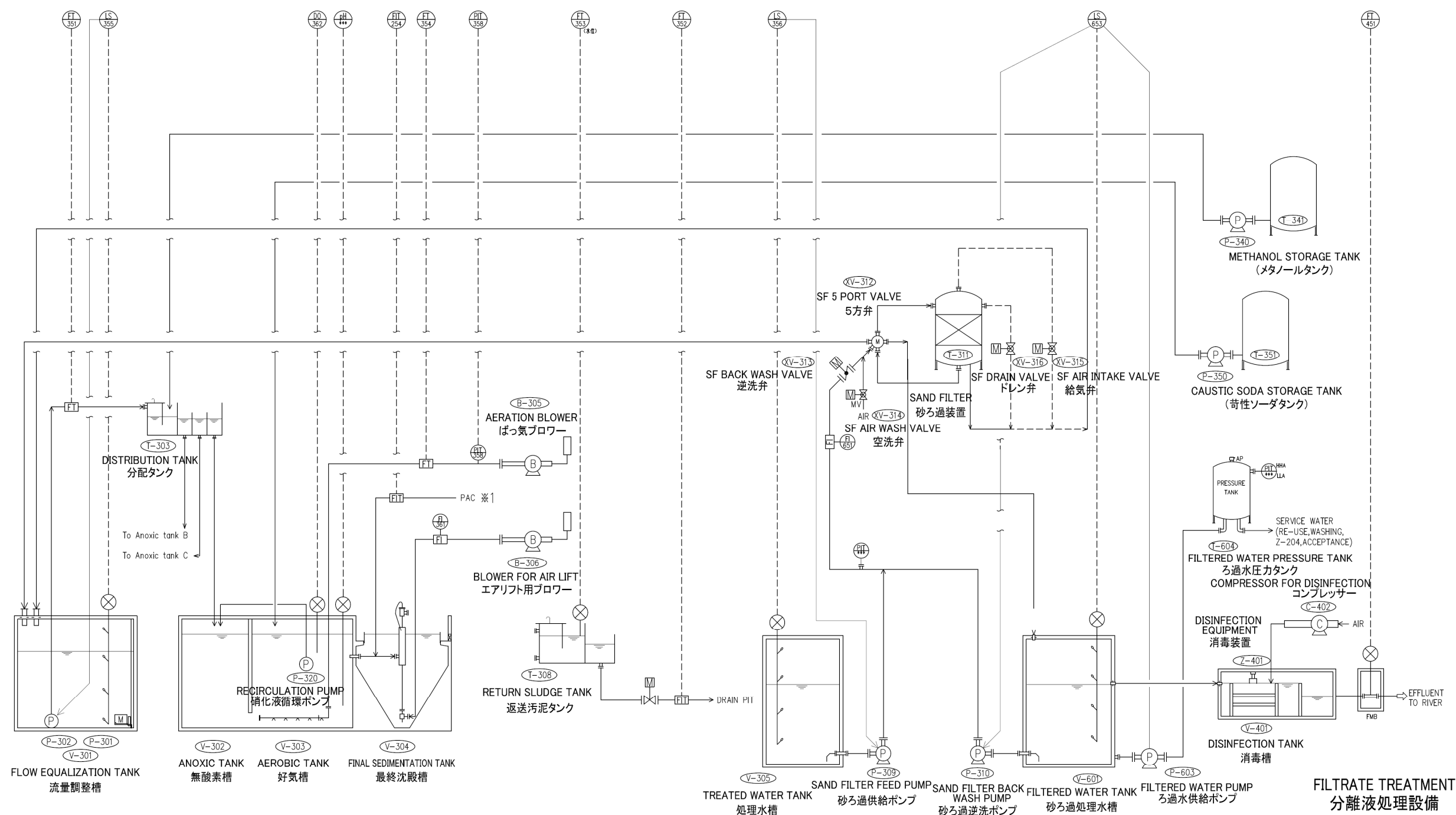
C-3 ADMINISTRATION BUILDING PLAN AND SECTION
C-3 管理棟 平断面図

MEASUREMENT ITEM 計測項目	SEPTAGE FLOW セプテージ流量(A)	SEPTAGE FLOW セプテージ流量(B)	SCUM STORAGE TANK LEVEL スカム貯留槽水位	SEPTAGE HOLDING TANK LEVEL セプテージ受入貯留槽水位	PUMP ROOM DRAIN PIT LEVEL ポンプ室排水槽水位	SEPTAGE FEED FLOW 供給セプテージ流量	PAC FLOW FOR DEWATERING PAC流量(脱水機)	CONVEYOR DRAIN PIT LEVEL コンベヤ排水槽水位	POLYMER FLOW ポリマー流量
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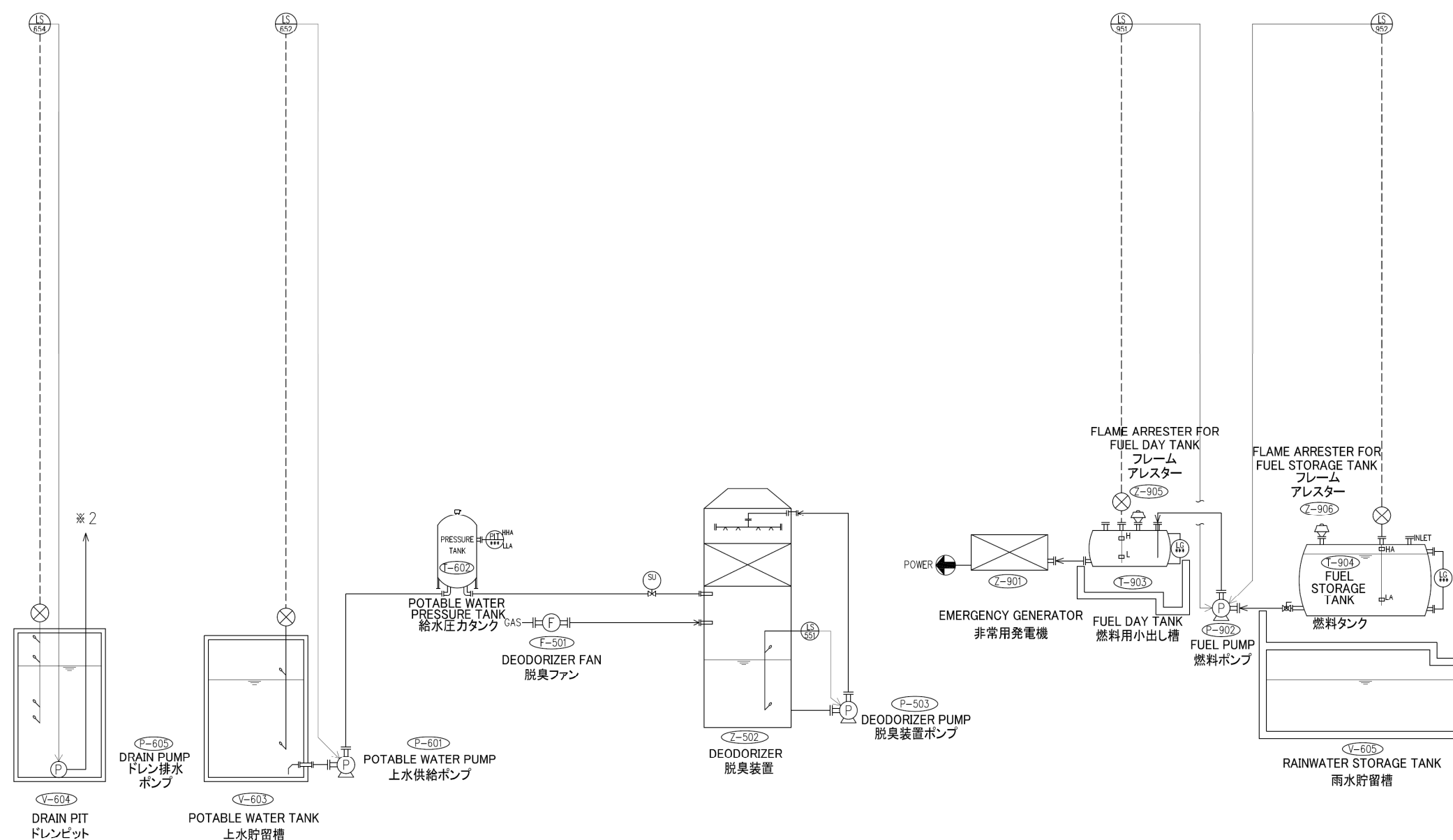
E-2 INSTRUMENTATION DIAGRAM (1/3)
E-2 計装系統図 (1/3)

MEASUREMENT ITEM 計測項目	FILTRATE FLOW 分離液流量	EQUALIZATION TANK LEVEL 流量調整槽水位	DO FOR AERATION TANK DO	PH FOR AERATION TANK I-P	PAC FLOW FOR P-REMOVAL PAC流量(細)	AERATION FLOW 曝気流量	AERATION BLOWER PRESSURE 曝気ブロワー圧力	RETURN SLUDGE FLOW 返送汚泥流量(換算)	EXCESS SLUDGE FLOW 余剰汚泥流量	TREATED WATER TANK LEVEL 処理水槽水位	FILTERED WATER TANK LEVEL 砂ろ過処理水槽水位	EFFLUENT FLOW 放流量
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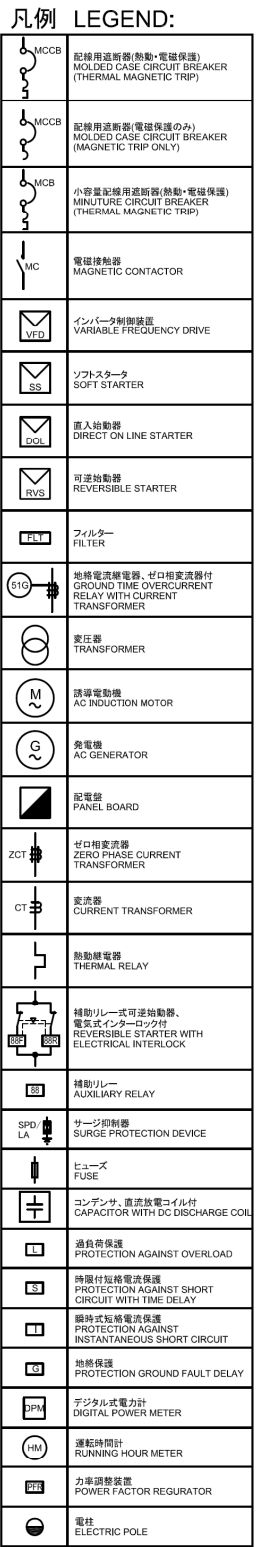
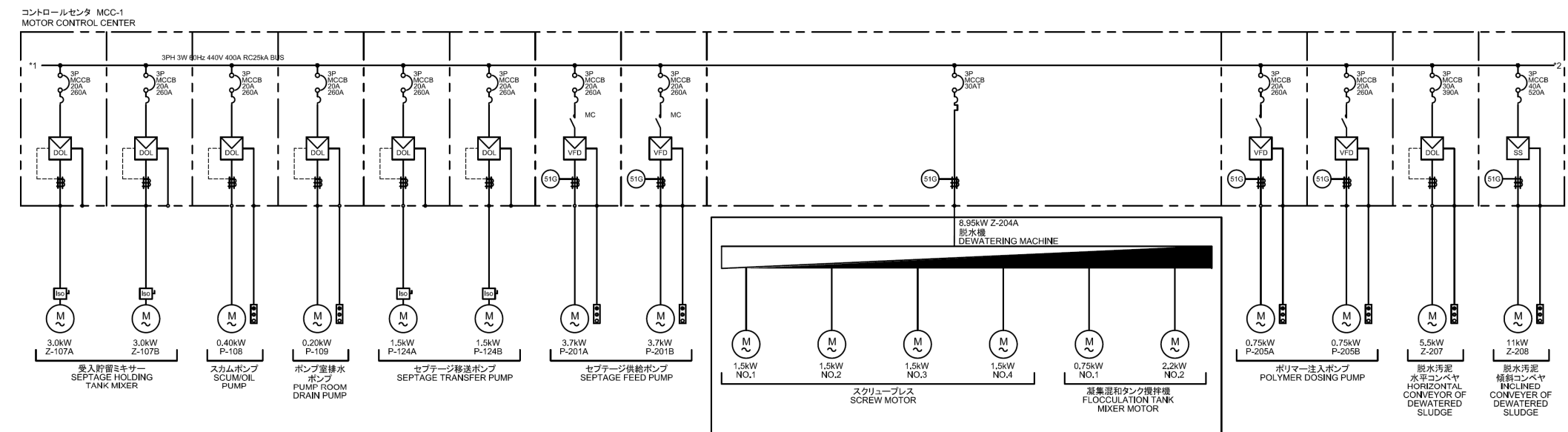


E-3 INSTRUMENTATION DIAGRAM (2/3)
E-3 計装系統図 (2/3)

MEASUREMENT ITEM 計測項目	DRAIN PIT LEVEL 排水坑水位	POTABLE WATER TANK LEVEL 上水貯留槽水位	FUEL DAY TANK LEVEL 小出し槽水位	FUEL STORAGE TANK LEVEL 燃料タンク液位
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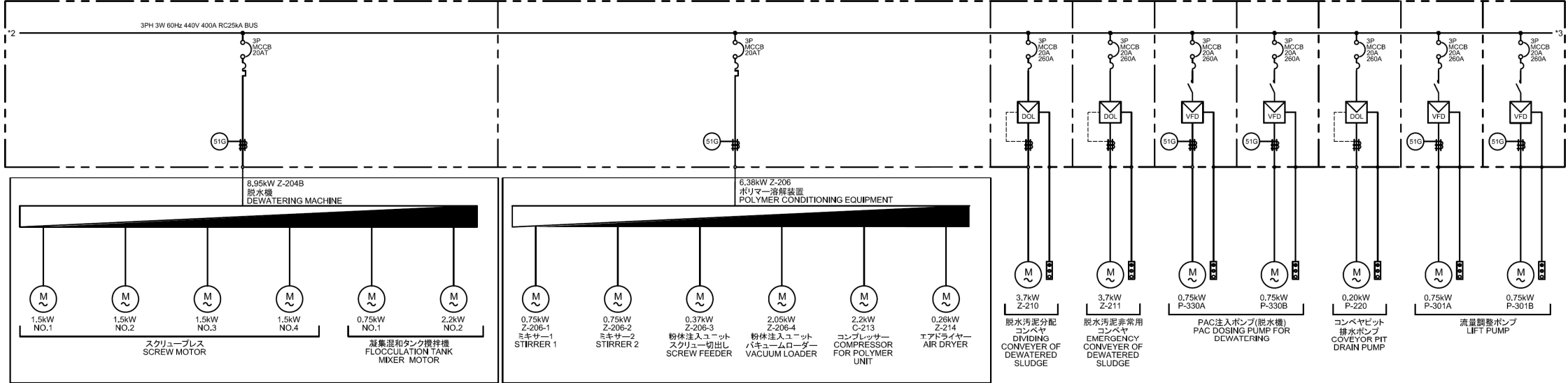


E-4 INSTRUMENTATION DIAGRAM (3/3)
E-4 計装系統図 (3/3)

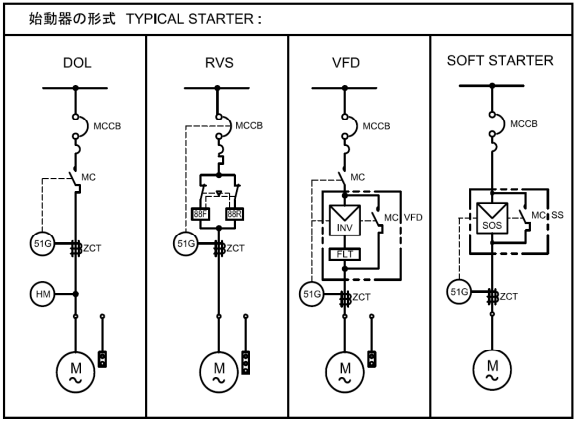
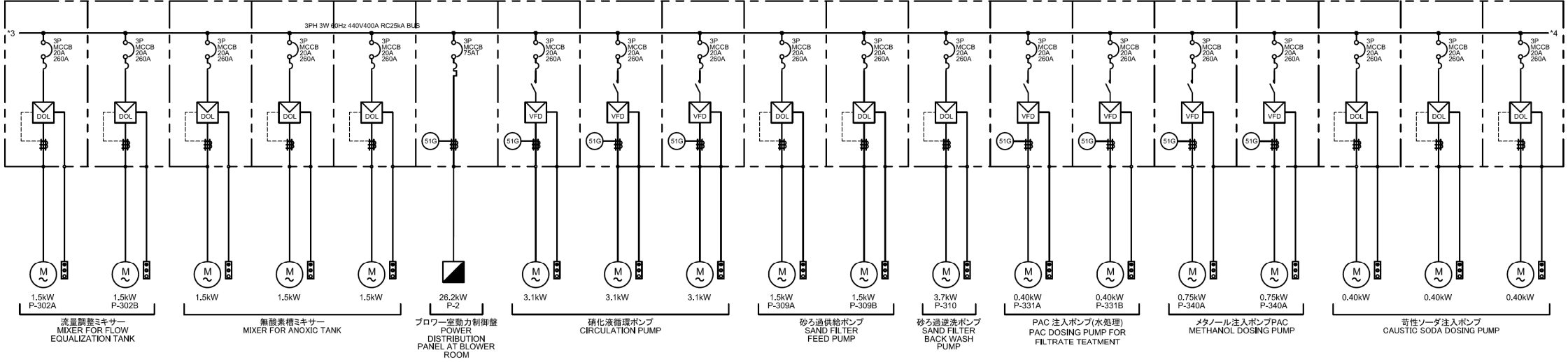


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コントロールセンタ MCC-1
MOTOR CONTROL CENTER



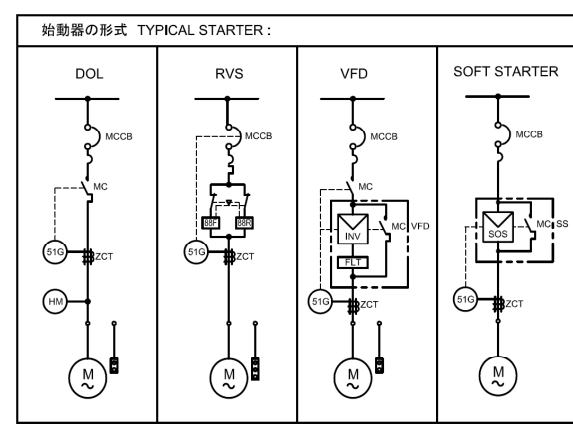
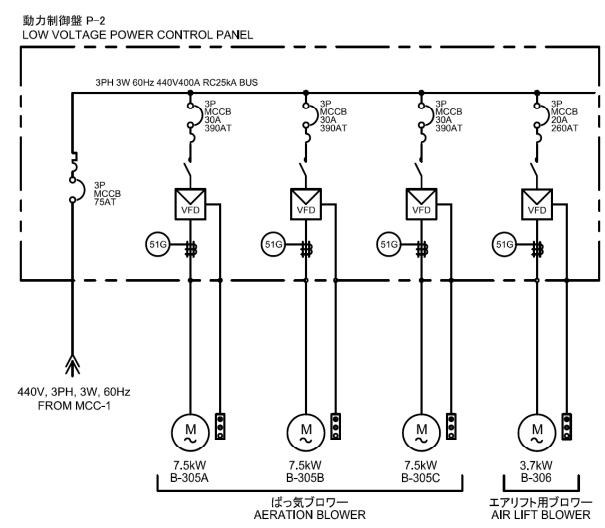
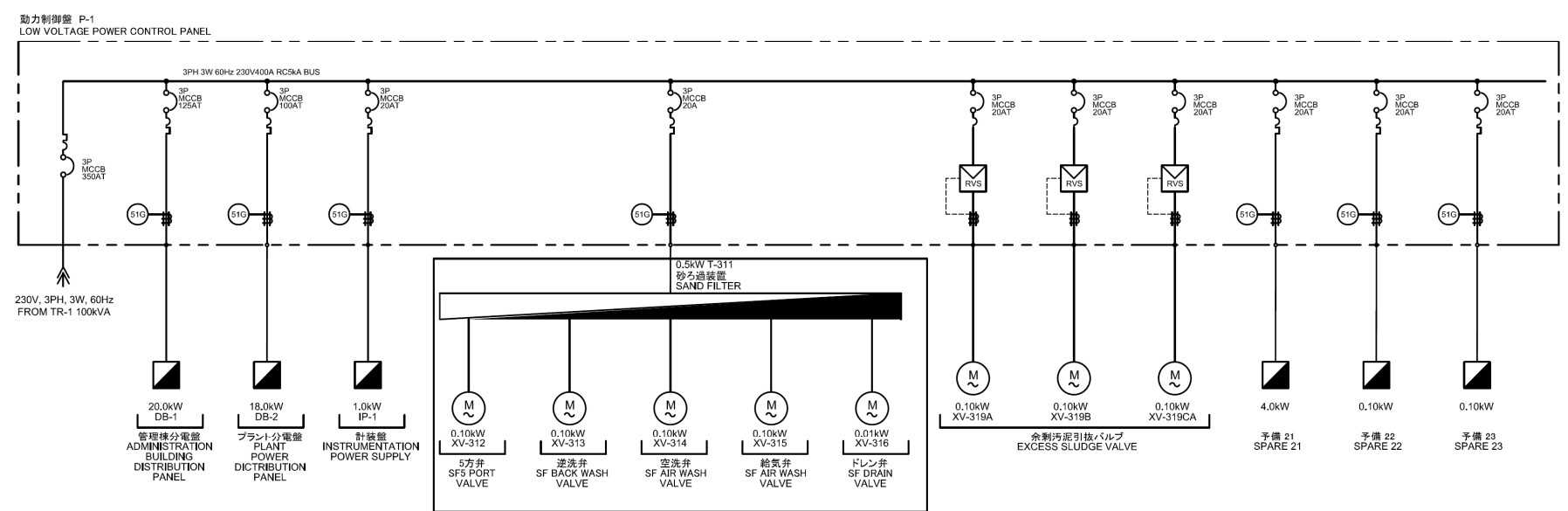
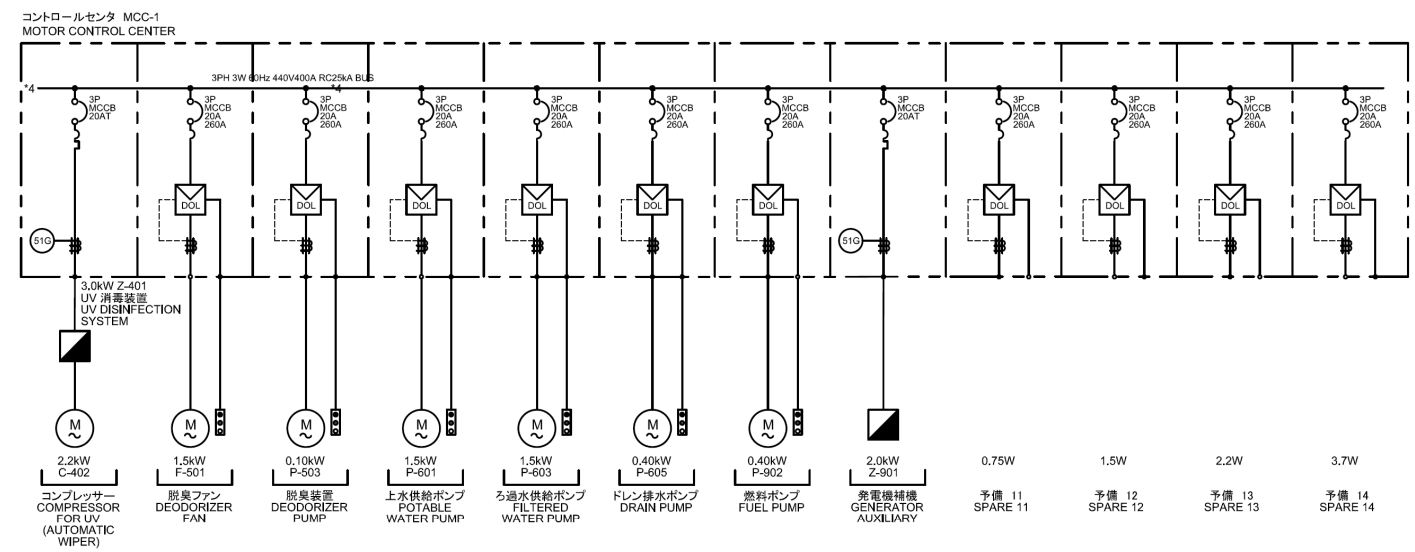
コントロールセンタ MCC-1
MOTOR CONTROL CENTER



凡例 LEGEND:

	MCCB
	記録用遮断器(熱動・電磁保護) MOLDED CASE CIRCUIT BREAKER (THERMAL MAGNETIC TRIP)
	記録用遮断器(電磁保護のみ) MOLDED CASE CIRCUIT BREAKER (MAGNETIC TRIP ONLY)
	MCB
	小容量記録用遮断器(熱動・電磁保護) MINIATURE CIRCUIT BREAKER (THERMAL MAGNETIC TRIP)
	電磁接触器 MAGNETIC CONTACTOR
	インバータ制御装置 VARIABLE FREQUENCY DRIVE
	ソフトスタータ SOFT STARTER
	直入始動器 DIRECT ON LINE STARTER
	可逆始動器 REVERSIBLE STARTER
	フィルター FILTER
	接地電流過電流・ゼロ相変流器付 GROUND TIME OVERCURRENT RELAY WITH CURRENT TRANSFORMER
	変圧器 TRANSFORMER
	誘導電動機 AC INDUCTION MOTOR
	発電機 AC GENERATOR
	配電盤 PANEL BOARD
	ゼロ相変流器 ZERO PHASE CURRENT TRANSFORMER
	変流器 CURRENT TRANSFORMER
	熱動继电器 THERMAL RELAY
	可逆リレー式可逆始動器・ 電気式インターロック付 REVERSIBLE STARTER WITH ELECTRICAL INTERLOCK
	補助继电器 AUXILIARY RELAY
	リージ抑制器 SURGE PROTECTION DEVICE
	ヒューズ FUSE
	コンデンサ・直流放電コイル付 CAPACITOR WITH DC DISCHARGE COIL
	過負荷保護 PROTECTION AGAINST OVERLOAD
	時間付短絡電流保護 PROTECTION AGAINST SHORT CIRCUIT WITH TIME DELAY
	瞬時式短絡電流保護 PROTECTION AGAINST INSTANTANEOUS SHORT CIRCUIT
	地絡保護 PROTECTION GROUND FAULT DELAY
	デジタル電力量計 DIGITAL POWER METER
	運転時間計 RUNNING HOUR METER
	力率調整装置 POWER FACTOR REGULATOR
	電柱 ELECTRIC POLE

E-6 SINGLE-LINE DIAGRAM (2/3)
E-6 単線結線図 (2/3)



凡例 LEGEND:

	記録用遮断器(熱動・電磁保護) MOLDED CASE CIRCUIT BREAKER (THERMAL MAGNETIC TRIP)
	記録用遮断器(電磁保護のみ) MOLDED CASE CIRCUIT BREAKER (MAGNETIC TRIP ONLY)
	小容量記録用遮断器(熱動・電磁保護) MINIATURE CIRCUIT BREAKER (THERMAL MAGNETIC TRIP)
	電磁接触器 MAGNETIC CONTACTOR
	インバータ制御装置 VARIABLE FREQUENCY DRIVE
	ソフトスタータ SOFT STARTER
	直入始動器 DIRECT ON LINE STARTER
	可逆始動器 REVERSIBLE STARTER
	フィルタ FILTER
	地絡電流継電器・ゼロ相電流継電付 GROUND TIME OVERCURRENT RELAY WITH CURRENT TRANSFORMER
	変圧器 TRANSFORMER
	誘導電動機 AC INDUCTION MOTOR
	発電機 AC GENERATOR
	配電盤 PANEL BOARD
	ゼロ相電流継電器 ZERO PHASE CURRENT TRANSFORMER
	変流器 CURRENT TRANSFORMER
	熱動継電器 THERMAL RELAY
	可逆リレー式可逆始動器・電気式インターロック付 REVERSIBLE STARTER WITH ELECTRICAL INTERLOCK
	補助リレー AUXILIARY RELAY
	サージ抑制器 SURGE PROTECTION DEVICE
	ヒューズ FUSE
	コンデンサ・直流放電コイル付 CAPACITOR WITH DC DISCHARGE COIL
	過負荷保護 PROTECTION AGAINST OVERLOAD
	時遅付短絡電流保護 PROTECTION AGAINST SHORT CIRCUIT WITH TIME DELAY
	瞬時式短絡電流保護 PROTECTION AGAINST INSTANTANEOUS SHORT CIRCUIT
	地絡保護 PROTECTION GROUND FAULT DELAY
	デジタル式電力計 DIGITAL POWER METER
	運転時間計 RUNNING HOUR METER
	力率調整装置 POWER FACTOR REGULATOR
	電柱 ELECTRIC POLE

E-7 SINGLE-LINE DIAGRAM (3/3)
E-7 単線結線図 (3/3)

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

The project is implemented in accordance with the framework of Grant Aid Scheme of the Japanese Government. Therefore, designing work, construction work and equipment procurement work for the Project are conducted through agreements / contracts between the Philippine side and Japanese companies after conclusion of Exchange Note (hereinafter referred to as “E/N”) between the Government of Japan and the Government of the Philippines.

Based on the framework of the Grant Aid Scheme and guidelines for facility construction and equipment procurement, an implementation plan for the Project is formulated as follows.

2-2-4-1-1 Implementation Agency

Implementation agency for the Project in the Philippine side is MCWD, which is responsible for executing the Project and being in charge of O&M for the Project after completion of the construction of the facility and equipment procurement. In addition, MCWD assigns the person in charge of the Project for smooth implementation of the Project. The assigned person by MCWD is responsible to communications with a Japanese Consultant and Japanese Contractor / Supplier.

The assigned person in charge of the Project from MCWD is required to explain the contents of the Project to MCWD officers and other stakeholders such as related authorities and residents in the Project area to have their cooperation for the Project.

The role of MCWD in the Project is as follows. MCWD is to be the contracting party for the agreement / contract with Japanese companies in the Project implementation period.

[The Role of MCWD in the Project]

- Confirmation, adjustment and agreement of the scope of the work and contents of the work for both Japan side and Philippine side
- Provision of necessary technical information regarding facility design
- Provision of technical information regarding O&M of STP and management of septage management work
- O&M for constructed facility/ procured equipment in the Project

2-2-4-1-2 The Consultant

The project is implemented by Grant Aid scheme, therefore, it is necessary for MCWD to select Japanese Contractor(s) / Supplier(s) by opened bidding processes. To implement adequate competitive biddings, construction supervision and equipment procurement, and to have proper management of the Grant Aid Project, MCWD is required to conclude the agreement with a Japanese Consultant regarding preparation of bidding documents including detailed design, assistance of the bidding and construction supervision. The selected Japanese Consultant is required to 1) understand the framework of the Grant Aid scheme and 2) fully grasp the contents of the outline design.

2-2-4-1-3 The Contractor / The Supplier

The Contractor / the Supplier are selected by opened bidding procedures in accordance with the framework of Grant Aid scheme. The Philippine side implement fair competitive biddings with the entrusted Consultant for facility construction / equipment procurement. Selected Contractor / Supplier are required following:

The construction and / or equipment procurement works are to be implemented in a foreign country where the social, cultural and historical background and environment are totally different. Therefore, the Contractor / the Supplier need to have sufficient work experiences of the same type of works.

The facility construction work in the Project includes the STP construction. The Contractor is required to have enough experiences of civil engineering work as well as STP construction.

2-2-4-1-4 Necessity of Skilled Worker Assignment

In Metro Cebu, there is Cebu Contractors Association, Inc (hereinafter referred to as “CCA”) established in 1974. 145 companies join in CCA as of March 2018. Contractors in the association have been executed several types of construction work. They also have abundant number of skilled engineers / technicians. Thus, assignment of skilled workers from Japan or the third counties is not required for the Project.

2-2-4-2 Implementation Conditions

Implementation conditions of the Project are as follows.

2-2-4-2-1 Construction Work

- Proposed facility construction site which is presently in lagoon of the existing septage de-watering plant is to be reclaimed with good quality soil by MCWD in accordance with the standards of the Philippines. Since no existing building or underground facilities are located, there is no obstacle for excavation works. Moreover, open-cut method can be applied for excavation work since the ground conditions of surrounding area is stable at 20 of N value. However, as a result of examination for the liquefaction on strata in proposed site, there is a risk of liquefaction in some parts of sand layers in case of earthquakes. Soil improvement, therefore, is necessary as a countermeasure to the liquefaction.
- Adequate construction plan is necessary to maintain the safety management such as protection of the existing plant.
- Traffic controllers and security guards are deployed to the proposed facility construction site to maintain safety management for the third parties as well as for crime prevention. It is required for the Philippine side to take necessary actions for safety measures. In addition to them, a Japanese Contractor also takes actions for safety measures such as installation of the temporary fence at a stock yard and deploys security guards.

2-2-4-2-2 Equipment Procurement

- All of the equipment to be procured in the Project is necessary for O&M of the Project. Such equipment is also utilized during the test-run period of the STP. Therefore, the equipment is procured before the test-run commencement.

2-2-4-3 Scope of Works

Table 2-60 shows the demarcation of scope of works between the Japan side and the Philippine side, considering capacities and impacts to the Project implementation.

Table 2-60 Scope of Works of Japan Side and Philippine Side

Items	Japan side	Philippine side
1. Construction of STP		
- Securing the facility construction site		○
- De-water, de-sludge, reclamation and ground leveling of the lagoon at the existing septage de-watering plant		○
- Rehabilitation of effluent treatment system and operation of the existing septage de-watering plant		○
- Provision of a temporary yard (stock yard and construction office) for the Contractor near the facility construction site		○
- Proper storage and safety management of construction materials at the temporary stock yard	○	
- STP Construction work (receiving facility, filtrate treatment / de-watering building, administration building, disinfection facility, effluent drain, etc.)	○	
- Procurement and installation of mechanical/ electrical devices	○	
- Procurement and installation of water quality apparatus	○	

Items	Japan side	Philippine side
- Piping work and electrical cable installation in the facility construction site	○	
- Installation of power cable (to the power receiving panel)		○
- Installation of power cable (from power receiving panel)	○	
- Installation of water supply pipe		○
- Boundary Fence and gate installation		○
- Lighting work	○	
- Pavement work (gravel pavement)	○	
2. Vehicles		
- Procurement of Vehicles (vacuum truck and dump truck)	○	
3. Transportation of construction material / equipment, custom duties and other tax		
- transportation to the unloading port and airport	○	
- exemption of custom duties in the Philippines		○
- transportation from the unloading port/airport to the facility construction site	○	
- VAT exemption for procured goods and services in local market		○
4. Cost burden for expenses not included in the Grant Aid Scheme		○
5. Acquisition of the permission for the construction from related authorities		○
6. Provision of disposal site for surplus soil and wastewater from the construction work		○
7. Production and procurement of the construction material	○	
8. Installation, adjustment and testing of procured equipment	○	
9. Instruction for initial operation of procured equipment and guidance for O&M	○	

Note: “○” indicates items to be borne

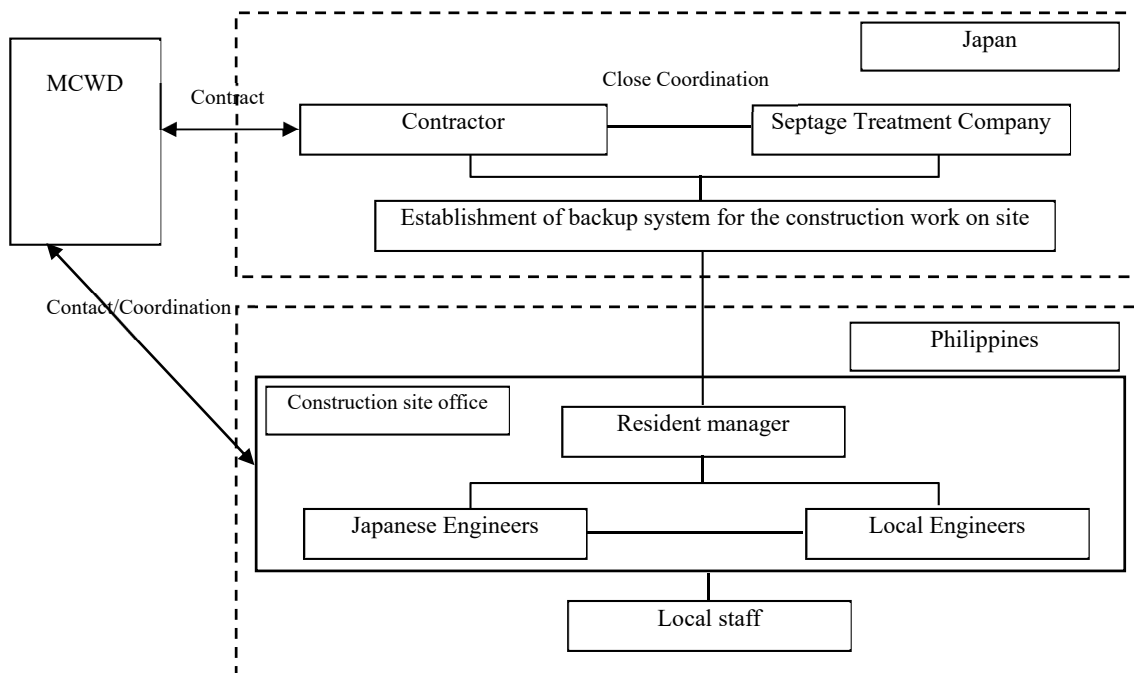
Source: JICA Study Team

2-2-4-4 Consultant Supervision

2-2-4-4-1 Construction Management/ Equipment Procurement Management

(1) Construction Management

Since the Project is to build the STP, the Contractor needs to tie up with septage treatment plant manufacturer. Figure 2-14 shows the planned implementation organization for the Contractor. Proposed facility construction site is in the Philippines, away from Japan. Close communication system is necessary between Japan and the Philippines for the Contractor.



Source: JICA Study Team

Figure 2-14 Contractor's Implementation System

(2) Backup System in Japan

The Contractor establishes a backup system in Japan for the comprehensive arrangement of civil work, architectural work and fabrication/ installation work of STP equipment as well as technical/ financial supports to the local construction management.

(3) Local Construction Office

The Contractor establishes a local construction office as well as a smooth construction system for implementing all construction works such as civil work, architectural work and mechanical installation work for STP. Specialized engineers, operators, drivers, labors and material dealers are employed by the local construction office.

Although it is possible to procure necessary labors and equipment for the construction work in the local market, adequate management by Japanese engineers having enough experiences of Grant Aid is necessary to supervise work schedule, quality control and safety management:

- Since it is necessary to complete the work within the Japan's accounting system and Grant aid scheme, management of the work schedule by skilled engineers is required.
- Since construction technology and construction method are necessary to be transferred to local engineers and labors, the Contractor introduce a construction management system of Japan into possible parts of construction methods, quality controls and safety managements.

(4) Contractor's Construction Management System

Table 2-61 shows a personnel plan for the Contractor. Since the construction work consists of multiple types of work for the limited period, it is necessary to deploy several types of engineers in parallel.

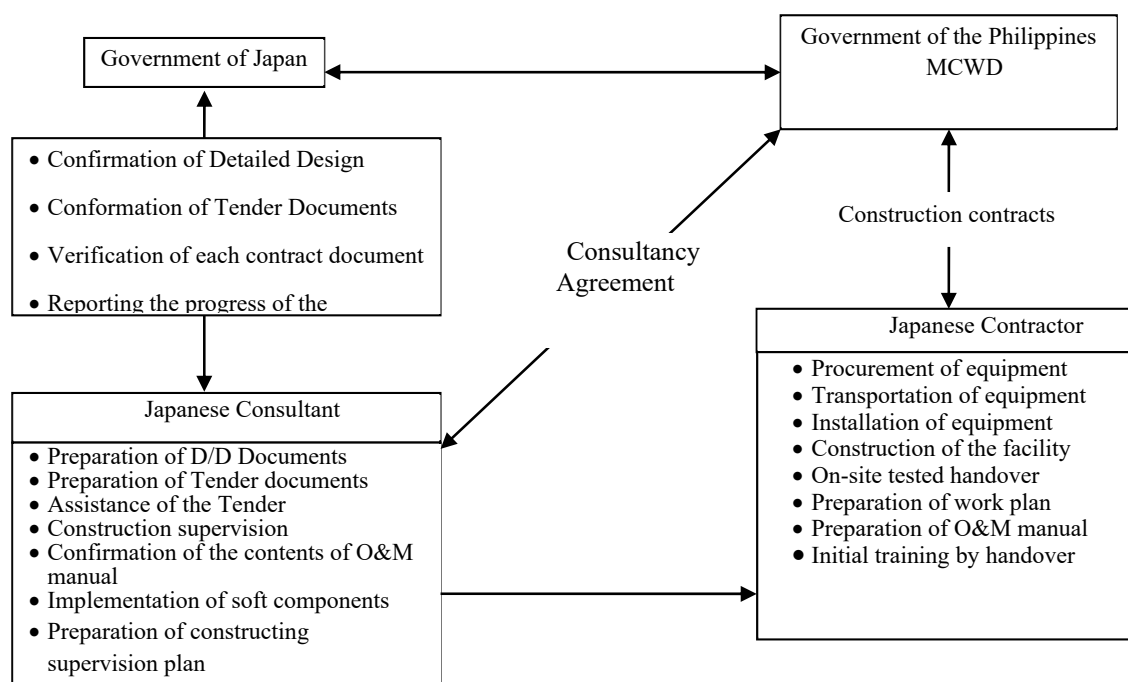
Table 2-61 Construction Management Personnel of the Contractor

Type of job	Work style	Number	Contents of the work
Resident representative (Manager)	Resident	1	Construction management Meeting with the Philippine side regarding the construction Management for procurement, construction, work schedule, quality and safety for the construction work
Chief Engineer/Civil Engineer	Resident	1	Supporting work for the manager regarding technical management Management for procurement, construction, work schedule, quality and safety for the construction work
Architect	On spot	1	Management for procurement, construction, work schedule, quality and safety for the architectural work
Plant engineer	On spot	1	Management for procurement, installation, work schedule, quality and safety for mechanical/ electrical work
Office clerk	Resident	1	Administration work, accounting/taxation work, import/export work and purchase/transportation coordination

Source: JICA Study Team

2-2-4-4-2 Management System for Construction Supervision

The Consultant supervises and manages the construction works 1) to complete the work within prescribed construction period, 2) to secure adequate quality of the work indicated in bidding documents and 3) to maintain safety operation during the work. Figure 2-15 shows relationship among the parties in the Project.



Source: JICA Study Team

Figure 2-15 Relationship Among the Parties in the Project

Based on the Grant Aid Scheme in Japan, the Consultant organizes a consistent Project team and implements the detailed design and construction supervision with consideration of outline design smoothly. The Consultant dispatches the following engineers with adequate engineering skill and conducts construction supervision and safety management.

The Consultant dispatches the following field supervisors with the technology in accordance with construction progress.

- Project Manager: one person (on spot)
- Resident Engineer: one person (resident)
- Civil Engineer: one person (on spot)
- Mechanical Engineer: one person (on spot)
- Electrical Engineer: one person (on spot)

2-2-4-4-3 Basic Policy for Construction Supervision

Basic policy of the construction supervision is to manage / instruct the Contractor adequately for supervising the work progress to finish the construction work within the contracted period and conducting the work in safe. The Consultant implements the construction supervision by utilizing abovementioned Japanese engineers and local engineers hired for the Project.

(1) Construction Supervision

The consultant compares the proposed work schedule submitted by the Contractor with the actual work progress on weekly and monthly basis and clarifies the cause of the delay of work progress. The Consultant instructs the Contractor to submit the countermeasures of the delay with clarification of the cause of delay and finish the work within the contract period of the work.

- Confirmation of the progress of the work
- Confirmation of the procurement conditions of major equipment
- Confirmation of the input of engineers, skilled workers and labors on site

(2) Safety Management

The Consultant confirms the adequacy of the safety management plan prepared by the Contractor and its progress during the work. For preventing the accident during the work, the Consultant conducts the

safety management on site. Safety management is conducted by following measures.

- Confirmation of the preparation of the safety management plan by the Contractor and selection of the safety management officer
- Confirmation of the adequacy for the prepared safety management plan and the selected safety manager
- Confirmation of the implementation status for the safety management plan
- Confirmation of the adequacy of planned transported route/ precaution/ compliance for construction vehicle
- Confirmation of the contents of welfare program of the labor and enforcement of taking rest for labor

(3) Construction Supervision in Japan

By establishing the necessary team as described below for the work in Japan, the Consultant conducts comprehensive construction supervision on site/ in Japan.

- Confirmation of the contents of the contract, work schedule, progress of the construction work and quality of the work
- Consideration of countermeasures for the issues occurred on site and instruction to the Contractor
- Technical/ financial support for the consultant office on site

Following work is conducted in Japan, therefore, formulation of adequate construction supervision system is required.

- Quality management for equipment fabricated in Japan (check the fabrication drawn, attendance of shop inspection and confirmation of the result of material test etc.)

2-2-4-5 Quality Control Plan

Based on the following items, the Consultant confirms work quality whether the quality of work satisfies the bidding documents (Technical specification and Detailed Design documents).

If the quality of the work is not satisfied, the Consultant gives the warning and instruct the Contractor to take necessary action for rectifying/ countermeasures for the issue.

- Check of the catalog, specifications and fabrication drawing for the equipment
- Attendance/ check on the result of shop inspection/ material test
- Check on method statement for installation work, field test, adjustment work, inspection procedure and shop drawing of procured equipment
- Supervision of equipment installation on site and attendance of test-run, adjustment and inspection
- Check the submitted shop drawing from the Contractor
- Site inspection of the compaction, rebar arrangement and strength of the concrete
- Site confirmation of construction implementation and construction method
- Check the shop drawing and finished conditions of the work
- Check the submitted As-built Drawings

Table 2-62 shows contents of major quality management in construction supervision.

Table 2-62 Contents of Major Quality Management in Construction Supervision

Item	Check point	Method	Applied standard/Remarks
Pipe material	Strength/ dimension Appearance/dimension	Confirmation of factory inspection report Visual inspection, dimension measurement, gauge	Procured from Japan-Japanese standard Procured in local market-Local standard
Pipe installation	Torque Water leakage	Torque wrench Water pressure test	Japanese standard ISO standard
Foundation	Ground bearing capacity	Plate bearing test Geotechnical investigation	Japanese standard

Item	Check point	Method	Applied standard/Remarks
	Geotechnical investigation		
Concrete	Aggregate, cement, water Fresh concrete Concrete strength	Physical test, chemical test, particle size analysis, water quality analysis, slump, air amount, fine aggregate chloride content, Compression strength test	Japanese standard ISO Standard
Re-bar	Strength Appearance, dimension	Confirmation of mill sheet Rebar arrangement inspection	Japanese standard ISO Standard
Finished building work		Dimensional inspection	Japanese standard
Water proof work	Material quality Coating film thickness/adhesion force Painting condition Water leakage	Confirmation of quality certificate Coating thickness test/ tension test Visual inspection Filling water test	Japanese standard
Mechanical facility	Installation accuracy Function	Localization of installation Operation test	Japanese standard
Electrical facility	Confirmation of panel installation	Localization of installation	Japanese standard
	IO check	Confirmation of Input and Output	Japanese standard

Source: JICA Study Team

2-2-4-6 Procurement Plan

Taking the O&M after construction of the facility and sustainability of the O&M into consideration, necessary construction materials and equipment are procured in local market as much as possible. In case of 1) difficult to procure in the local market, 2) not satisfied with the quality and specification of standard which is required in the Project, 3) difficult to be available in the local market and 4) difficult to purchase necessary item, such items are procured from Japan. Procurement of the items from the third countries is also considered in case of the price from third country is cheaper than ones from Japan.

2-2-4-6-1 Construction Material

It is easy to procure construction materials for civil work such as aggregate, cement, formwork and fresh concrete from the local market in the Philippines. In addition, it is also easy to procure pipe materials such as ABS, uPVC and stainless pipe in the local market. Mechanical and electrical equipment for the facilities is procured from Japan, considering quality assurance of the equipment. Table 2-63 shows procurement demarcation of major construction materials.

Table 2-63 Procurement Demarcation of Major Construction Materials

Major materials for the construction work		Procurement country			Remarks
		Philippines	Japan	Third country	
Construction material					
1	Cement	○	-	-	
2	Concrete	○	-	-	
3	Sand, gravel and aggregates	○	-	-	
4	Re-bar	○	-	-	
5	Steel material	○	-	-	
6	Formwork	○	-	-	
7	Scaffolding and supporting	○	-	-	
8	Asphalt	○	-	-	
9	Timber	○	-	-	
Pipe material					
1	ABS pipe (ISO standard)	○	-	-	
2	Stainless pipe (ISO standard)	○	-	-	
3	Valves	○	-	-	
Others					

Major materials for the construction work		Procurement country			Remarks
		Philippines	Japan	Third country	
1	Fuel (gasoline, diesel oil)	○	-	-	

Source: JICA Study Team

2-2-4-6-2 Plant Equipment

Major equipment for STP is basically procured from Japan. However, if available in lower prices, appropriate quality / quantity / delivering period, equipment are procured in the Philippines and /or the third countries. Water quality analysis apparatus that requires after sales service are procured in the Philippines as much as possible. Table 2-64 shows procurement demarcation of plant equipment for STP.

Table 2-64 Procurement Demarcation of Plant Equipment

Major equipment		Specification	Procurement country			Remarks
			Philippines	Japan	Third country	
1	De-watering machine	Screw press de-watering machine		○		
1	Septage receiving unit / infiltrate treatment facility	Receiving unit and aeration devices etc.	○	○	○	
3	Water quality test equipment	Ammonia distillation apparatus, COD Reflux device	○	○	-	

Source: JICA Study Team

2-2-4-6-3 Construction Machinery

Local contractors own heavy machineries and transportation vehicles for construction. Major construction machineries are able to be procured in local market. Heavy machineries, however, are procured in Japan or third country in case of necessity of special machinery or economical reason. Table 2-65 shows procurement demarcation of major construction machinery.

Table 2-65 Procurement Demarcation of Major Construction Machinery

Major equipment		Specification	Procurement country			Remarks
			Philippines	Japan	Third country	
1	Truck crane	Hydro type 20t	○	-	-	
2	Backhoe	0.80 m ³ (piled)	○	-	-	
3	Bulldozer	15t	○	-	-	
4	Dump truck	10t	○	-	-	
5	Concrete pump	90 ~ 110m ³ /h	○	-	-	
6	Road roller	10t ~ 12t	○	-	-	
7	Tire roller	8t ~ 20t	○	-	-	
8	Tamper	60-80kg	○	-	-	
9	Motor grader	3.1m	○	-	-	

Source: JICA Study Team

2-2-4-6-4 Procured Equipment

Table 2-66 shows procurement demarcation of equipment (Vehicle). Vehicles are to be fabricated (a set of chassis and body) as a completed ones in Japan or the Philippines.

Table 2-66 Procurement Demarcation of Equipment (Vehicle)

Major equipment		Specification	Procurement country			Remarks
			Philippines	Japan	Third country	
1	Vacuum truck	Finished car (a set of chassis and body)	○	○	-	
2	Dump truck	Finished car (a set of chassis and body)	○	○	-	

Source: JICA Study Team

2-2-4-6-5 Transportation of Construction Material and Procured Equipment

The construction materials for the Project are imported to Cebu International Port through sea transportation in general. The road from the port to the proposed construction site is paved, and it is enough for large truck to access the site. No obstacle is observed for in-land transportation.

2-2-4-7 Operational Guidance Plan

2-2-4-7-1 Initial Operational Guidance for STP

Initial operation guidance is conducted to MCWD staff and STP operators recruited by MCWD during the three-month Test-run of STP.

- (1) O&M instruction of septage de-watering, filtrate treatment and treatment process
- (2) Daily O&M procedure
- (3) Monitoring procedure of the quality of septage and effluent
- (4) Regular check-ups on O&M for STP
- (5) Contact agent for procurement of spare parts and repair of the equipment

2-2-4-7-2 Initial Operational Guidance for Water Quality Analysis Apparatus

Following initial operational guidance is conducted for MCWD staff in the central laboratory in parallel with the STP Test-Run.

- (1) Instruction for procured water quality analysis apparatus
- (2) Regular check-ups on O&M for the apparatus
- (3) Contact agent for procurement of necessary consumables, spare parts and repair of the equipment

2-2-4-7-3 Initial Operational Guidance for Vehicle

Following initial operational guidance is conducted to MCDW staff and drivers/ operators recruited by MCWD when vacuum trucks and dump trucks are procured.

- (1) Vehicle operation method
- (2) Daily check-ups and O&M procedure on Vehicle
- (3) Contact agent for procurement of spare parts and repair of the vehicle

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

The aim of the Project is to start septage treatment in Metro Cebu where most septage is not properly collected and treated at present.

Procurement of the necessary facility and equipment for septage collection and treatment for the Project is one of the issues for MCWD. Septage management is a series of process management which consists of collection, de-watering, filtrate treatment and disposal of de-watered cake. It is impossible to conduct septage management by equipment procurement only without operation / process management. Thus, the Project improves both hardware and software aspects of the management in parallel with the construction of the facility and procurement of equipment.

Table 2-67 shows the scope of activities in Soft Component (Technical assistance). The background of the preparation for the scope of activities in Soft Component (Technical assistance) is attached in Appendix-5.

Table 2-67 Scope of Activities in Soft Component (Technical assistance)

Field	Achievement	Necessary technology	Current situation and required technical level	Contents of activity and training item	Activity method	Necessary input	Output
System for septic management	Achievement 1 De-sludge management	Information for management for septic tank and management for de-sludge schedule	- MCWD does not manage the septic tank information and de-sludge schedule. MCWD does not have the experience and management department. - Septage management unit is established. Technique for preparation of septic tank inventory book and de-sludge schedule is required.	【Activity】 - Preparation of septic tanks inventory for regular collection - Preparation of septic tanks inventory for non-regular collection - Preparation of rounding schedule for septage collection 【Training item】 - Target management items in septic tanks inventory (regular and non-regular collections) and example of the inventory format - Alternative plans for charging the fees for non-regular collection - Draft schedule for septage collection and prioritization method	- Class room lecture and discussion - Preparation of the septic tanks inventory book at pilot area (OJT) - Practical training at test-run period (OJT)	- De-sludge management expert (1 person x 0.90month) - MCWD's septage management unit (leader, sub leader, clerks for collection and inventory book: 4 persons) - MCWD's legal, financial, PR personnel	- Septic tanks inventory book for regular collection (pilot area) - Septic tanks inventory book for non-regular collection (pilot area) - Septage collection schedule sheet - OJT report
	Achievement 2 Management of outsourced work for de-sludge, septage collection and O&M of STP	Management for outsourced work	- MCWD conducts septage treatment on Mactan Island by PPP. However, since MCWD does not own their facility and equipment, MCWD does not have any experience for monitoring management and technical documents on O&M for facility and equipment so that it is insufficient for management on outsourcing. - No wastewater treatment facility operated by MCWD and no accumulated	【Activity】 - Preparation of specification/contract document for outsourcing (including preparation work of septic tanks inventory by comprehensive outsource company) - Establishment of monitoring plan for septage collection - Establishment of monitoring plan for STP O&M 【Training item】 - Example of technical specification/contract document on outsourcing - Example of the selection of the contractor - Monitoring method for collection work (manifest/ actual record/ checklist for	- Class room lecture and discussion - Preparation of the septic tanks inventory book at pilot area (OJT) - Practical training at test-run phase (OJT)	- Outsourcing contract/evaluation expert (1 person x0.43month) - De-sludge management expert (1 person x0.58 month) - STP management (operation) expert (1 person x1.75month) - STP management (water quality) expert (1 person x0.48month) - MCWD's septage management unit (leader, sub leader, clerks for collection and inventory book: 4	- Technical specification for outsourcing/contract document (draft) - Monitoring plan for septage collection - Monitoring plan for STP operation - OJT report

Field	Achievement	Necessary technology	Current situation and required technical level	Contents of activity and training item	Activity method	Necessary input	Output
Public awareness regarding septage management	Achievement 3 Implementation of public awareness activities for introducing the septage management	Effective public awareness technic	knowledge for wastewater treatment and sludge treatment. Therefore, MCWD is not able to instruct the private contractor based on the required water quality Establishment of septage management unit and selection of outsource company under the proper specification are required. Monitoring for the performance of septage treatment is required.	collection work and status of the equipment - Monitoring method for STP operation (de-watering, wastewater treatment, O&M and inspection record, water quality record, de-watered cake record) - Extraction of issues and solutions from the working monitoring result		persons), STP management 2 persons) - MCWD's legal, financial PR personnel - Central laboratory in MCWD	
Public awareness regarding septage management	Achievement 3 Implementation of public awareness activities for introducing the septage management	Effective public awareness technic	- There is no planned public awareness activity in MCWD regarding septage management program. - There is no information regarding septage management and no knowledge on required information disclosure. There is no accumulated knowledge for PR material and example. - Based on the contents of PR for introduction of sewerage project and implementation in Japan, initial technic for starting	【Activities】 - Preparation of PR materials such as leaflet, video - Trial run for the campaign at the starting of the Project 【Training item】 - Example of PR in Japan (contents and media) - Example of campaign and campaign plan/ implementation management	- Class room lecture and discussion - Preparation of PR media - OJT for PR campaign)	- Public awareness expert (1 person x 0.92 month) - MCWD' PR department	- Public awareness activity plan - PR media - OJT report for practical training on the first campaign

Field	Achievement	Necessary technology	Current situation and required technical level	Contents of activity and training item	Activity method	Necessary input	Output
			the efficient public awareness activity is required.				

Source: JICA Study Team

2-2-4-9 Implementation Schedule

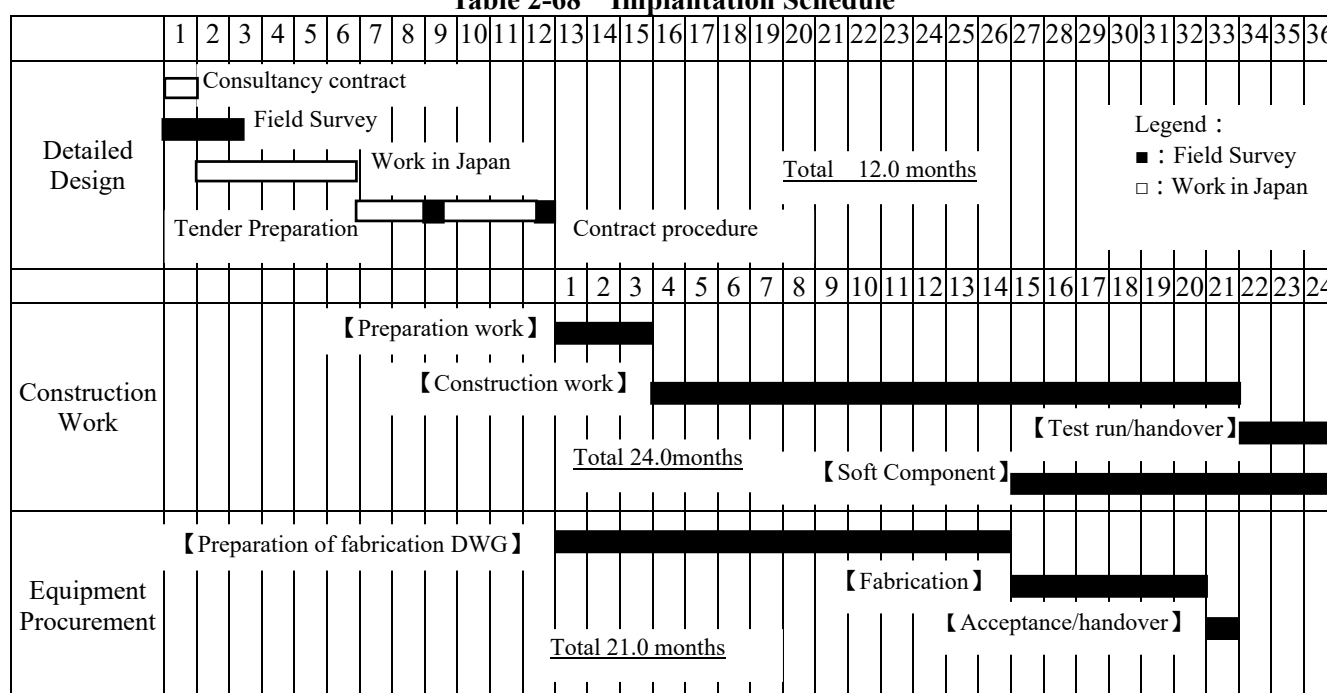
The project starts after the approval of Japanese Government and concluding E/N and Grant Agreement (G/A) between the Governments of Japan and the Philippines. The Project duration takes 36 months after G/A including bidding procedures.

Detailed Design is conducted for preparation of specifications for the bidding and it consists of site survey (confirmation of the contents of the design) and works in Japan. It is assumed that six (6) months is necessary.

After conducting the detailed design, the construction work and procurement work are commenced through bidding procedures. It is considered that the construction work requires approximately twenty four (24) months including preparatory work, construction work inspection and test-run. Equipment procurement work (Vehicle) needs to take twenty one (21) months which including the preparation of the manufacturer drawing, fabrication, inspection and handover.

Table 2-68 shows the Implementation schedule.

Table 2-68 Implantation Schedule



Source: JICA Study Team

2-3 Obligations of Recipient Country

2-3-1 Major Obligations of Recipient Country

The Project consists of the work conducted by Japan side and the Philippine side. The summary of the major obligations of the Philippine side after concluding E/N for the Project are to be implemented by stage, which are 1) Items to be executed by the bidding, 2) Items to be executed during the Project Implementation and 3) Items to be executed after completion of the Project. Table 2-69, Table 2-70 and Table 2-71 show above-mentioned items, respectively.

Table 2-69 Major Obligations of Recipient Country (Items Executed by the Bidding)

No.	Item	Deadline	Execution Agency
1	Preparation of necessary ordinances in the related LGUs and agreement between the LGUs and MCWD for the Project implementation	before G/A	MCWD/ LGUs
2	Agreement on usufruct of the existing de-watering plant and lagoon between MCWD and Cebu City	before G/A	MCWD/ Cebu City
3	Principle agreement between the existing private de-sludgers and MCWD for cooperating the Project implementation	before G/A	MCWD/ the existing

No.	Item	Deadline	Execution Agency
			private de-sludgers
4	Principle agreement between a landfill site operating company and MCWD for de-watered cake disposal	before G/A	MCWD/ a landfill site operating company
5	To acquire approval of EIA and issuance of ECC (Conditions of approval should be fulfilled, if any) and secure the necessary budget for proceeding.	before G/A	MCWD
6	To open bank account (B/A)	within 1 month after the signing of the G/A	MCWD
7	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the consultant	within 1 month after the signing of the contract	MCWD
8	Holding the public explanations with the residents surrounding the proposed construction site and stakeholder meeting, and having the consent from the residents	one (1) month after concluding G/A	MCWD/ Cebu City
9	To secure Project site (land acquisition of the proposed construction site under the legal procedure) and temporary yard (stockyard and construction office).	before preparation of bidding documents	MCWD
10	Rehabilitation and operation of the existing de-watering plant as well as effluent treatment. Rehabilitation includes following activities; - providing aeration device and further separated pond for sedimentation as filtrate treatment - shuttering lagoon with an appropriate wall such as sheet-piles drying lagoon to be reclaimed with appropriate treating of drained water and removed sludge.	before the notice of the pre-qualification for the tender	MCWD
11	Reclamation work at STP site with relevant guidelines in the Philippines and using appropriate fill material.	before preparation of bidding documents	MCWD
12	To submit Project Monitoring Report (with the result of Detail Design)	before preparation of bidding documents	MCWD

Source: JICA Study Team

Table 2-70 Major Obligations of Recipient Country (Items Executed During the Project Implementation)

No.	Item	Deadline	Execution Agency
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the Contractor(s) / the Supplier(s)	within 1 month after the signing of the contract(s)	MCWD/ NEDA
2	To bear the following commissions to a bank in Japan for the banking services based upon the B/A		
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	MCWD
	2) Payment commission for A/P	every payment	MCWD
3	To ensure prompt unloading and customs clearance at ports of disembarkation in recipient country and to assist the Supplier(s) with internal transportation therein	during the Project	MCWD/ NEDA
4	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	MCWD/ NEDA

No.	Item	Deadline	Execution Agency
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted and/or be borne by its designated authority without using the Grant	during the Project	MCWD/ NEDA
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	MCWD/ NEDA
7	1) To submit Project Monitoring Report	every month	MCWD
	2) To submit Project Monitoring Report (final)	within one month after signing of Certificate of Completion for the works under the contract(s)	MCWD
8	To submit a report concerning completion of the Project	within six months after completion of the Project	MCWD
9	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project for the site(s)		
	1) Electricity Installation of power cable to STP (Japanese side is responsible from power receiving facility)	before conducting the Test-run at the STP	MCWD
	2) Water Supply Installation of water supply pipe to STP	before conducting the Test-run at the STP	MCWD
	3) Fence and Gate To construct gates and fences to be necessary for the septage treatment facility and parking lot for the Project.	during conducting the Test-run at the STP	MCWD
	4) Furniture and Equipment General furniture and general office equipment at STP	before conducting the Test-run at the STP	MCWD
10	To prepare / to secure landfill site for de-watered cake	before conducting the Test-run at the STP	MCWD
11	To have agreement between MCWD and comprehensive outsource company / the existing private de-sludgers for O&M of the Project, and/or to hire qualified personnel for O&M of the Project..	before conducting the Test-run at the STP	MCWD/ comprehensive outsource company and the existing private de-sludgers
12	To provide surplus soil storage area	during the construction	MCWD/ Cebu Province
13	To provide necessary reagents at STP Test-run Period	during conducting the Test-run at the STP	MCWD
14	To have on the Job Training (OJT) for proper O&M and its quality assurance on facility and equipment, selection of candidates for soft component and its notification to JICA	before conducting OJT/ soft component	MCWD
15	To take necessary measure for safety construction - traffic control - rope off - control of persons incoming to the construction site	during the construction	MCWD/ Cebu City

No.	Item	Deadline	Execution Agency
16	To implement EMP and EMoP	during the construction	MCWD
17	To submit results of environmental monitoring to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	during the construction	MCWD
18	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report - Period of the monitoring may be extended if affected persons' livelihoods are not sufficiently restored. Extension of the monitoring will be decided based on agreement between MCWD and JICA.	during the construction - until the end of livelihood restoration program (In case that livelihood restoration program is provided) - for two years after land acquisition and resettlement complete (In case that livelihood restoration program is not provided)	MCWD/ Cebu City

Source: JICA Study Team

Table 2-71 Major Obligations of Recipient Country (Items Executed After Completion of the Project)

No.	Item	Deadline	Execution Agency
1	To implement EMP and EMoP	for a period based on EMP and EMoP	MCWD
2	To submit results of environmental monitoring to JICA, by using the monitoring form, semiannually - The period of environmental monitoring may be extended if any significant negative impacts on the environment are found. The extension of environmental monitoring will be decided based on the agreement between MCWD and JICA.	for three years after the Project	MCWD
3	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection 4) Finish the road with asphalt/concrete after confirmation of settlement of land subsidence, if any	After completion of the construction	MCWD

Source: JICA Study Team

2-3-2 Tax Exemption Procedure

According to the Executive Order No.93 issued on December 1986, it became difficult for government authorities and private companies to acquire privileges for exemption of taxation which had been admitted in the Philippines. Therefore, MCWD bears custom duties and Value added tax (VAT) for procured materials / equipment in the Project and refunds them to Japanese Contractor(s) / Supplier(s).

In other Grant Aid Project implemented by MCWD in 2013 (The Project for Improvement of Water Supply System in Metropolitan Cebu Water District), the tax exemptions were not allowed by the Government of the Philippines, and MCWD paid them to the Japanese Contractor from MCWD's budget.

Since the custom duties and VAT are to be paid by MCWD, they are not included in the budget of the Grant Aid.

2-3-3 Estimated Project Cost for Obligations of Recipient Country

Table 2-72 shows estimated cost for obligations of Recipient Country.

Table 2-72 Estimated Cost for Obligations of Recipient Country

No.	Item	Estimated Project Cost (1000PHP)
1	De-water, de-sludge and reclamation of the lagoon for the existing septage de-watering plant	35,263
2	Construction of Temporary effluent treatment facility for the existing septage de-watering plant	1,207
3	Installation of power supply cable and water supply pipe to STP site	250
4	Installation of fence around the border line of STP plot and the gate at STP	2,622
	Total	39,342

Source: JICA Study Team

2-4 Project Operation Plan

2-4-1 O&M Body and Private Outsourcing System

2-4-1-1 Regional Management of Septage and O&M Body

In the Philippines, septage management activities are to be implanted by either water district like MCWD or each LGU. Hence, it is necessary to clarify the implementation body for septage management in Metro Cebu in order to commence the Project. An agreement is moreover necessary among related LGUs for transboundary movement of septage / de-watered cake between LGUs since the Project introduce a centralized treatment system of the septage (collected from 6 LGUs and treated in Cebu City and disposed of in Cebu City for de-watered cake).

In the circumstances, it is appropriate that MCWD is the main implementation body for O&M of the Project due to following reasons:

- The Project is a regional septage management activities, which covers 6 LGUs. It is difficult for each LGU to implement the Project by itself.
- The Project areas is basically same as the water supply service area of MCWD. All customers for water supply in the area are targeted to be covered by the Project. It is efficient that MCWD collect septage management fee by tacking on water tariff.
- 6 LGUs in the Project area and MCWD reaches the agreement that MCWD is the implementation main body for the septage management. The transboundary movement of septage and de-watered cake is also agreed by the 6 LGUs and MCWD.
- Cebu City, Cebu Province and MCWD reach the following agreement:
 - Cebu City transfer the land for the existing septage de-watering plant to Cebu Province .
 - The land is allocated by Cebu Province to MCWD.
 - MCWD builds the STP on the land plot and implements the septage management project.

Table 2-73 shows demarcation between MCWD, LGUs and Cebu Province regarding the Project.

Table 2-73 Relation between MCWD, LGUs and Cebu Province for the Project

Item	MCWD	LGUs	Cebu Province
Proposed STP construction site	- Reclamation of the lagoon at the existing septage de-watering plant in Cebu City - Payment for utilization charge for proposed site to Cebu City and Cebu Province - Rehabilitation of the existing de-watering plant and continuation of de-watering work by STP Test-run	- Cebu City transfers the land of the existing septage de-watering plant and lagoon to Cebu Province. - Cebu City transfers the usufruct of the existing septage de-watering plant and lagoon to MCWD. - Cebu City provides necessary reclamation material to MCWD	- Allocation of the proposed site to MCWD for 50 years - Provision of necessary machinery for reclamation of the lagoon to MCWD

Item	MCWD	LGUs	Cebu Province
Septage Management	- Implementation of septage collection in the Project area - Transportation/treatment of collected septage to/in STP in Cebu City - Disposing the de-watered cake at a landfill site - O&M for septage management activities by collection of septage treatment fee from residents.	- Consent of the septage management in MCWD - Permission to transfer septage and de-watered cake over the LGUs border - Permission to MCWD to access household / entity in LGUs for implementing the Project - Cooperating with MCWD regarding the implementation, permission and PR of the Project	

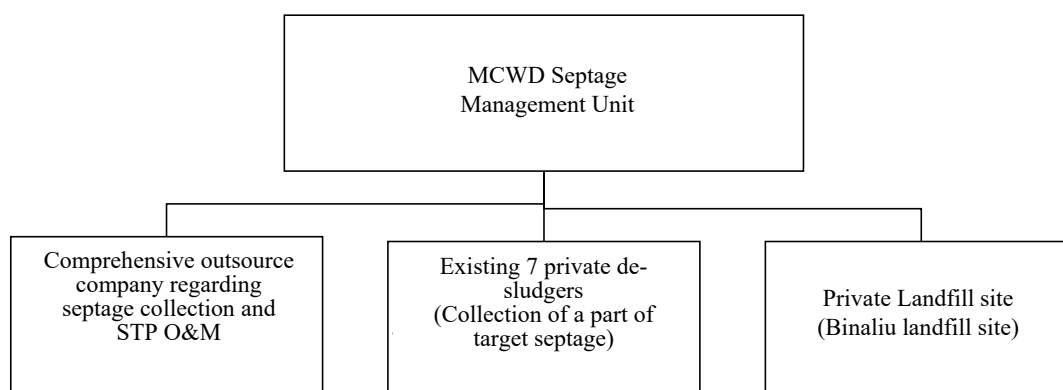
Source: JICA Study Team

2-4-1-2 Private Outsourcing System and Septage Management Unit

Implementation agency of the Project is MCWD. However, MCWD does not have any experience for septage treatment, as well as exclusive department for septage management. Moreover, MCWD does not own a landfill site for solid waste landfill site which is necessary to dispose of de-watered cake. In addition, it is necessary to utilize the existing private de-sludgers to avoid to squeeze the private sector businesses.

Under this circumstances, MCWD plans to 1) outsource the septage collection and O&M of STP, 2) outsource the disposal of de-watered cake to a private landfilling site, 3) manage the outsourcing work by establishing the septage management unit and 4) fulfil the Project implementation with initiative of the septage management unit.

Figure 2-16 shows a relation of MCWD and outsourced companies. Three types of outsourced companies are to be nominated under MCWD and the septage management unit controls and manages these companies.



Source: JICA Study Team

Figure 2-16 MCWD and Outsourced Companies

2-4-1-2-1 Septage Management Unit in MCWD

Table 2-74 shows a summary of the septage management unit. Septage management unit in MCWD needs to consist of eight (8) full-time employees. MCWD needs to secure these eight (8) employees by either new employment or transfer from other existing departments.

Table 2-75 shows a summary of required activities on the existing organization. Staff members in the existing departments need to conduct the assistance of activities for monitoring water quality, legal confirmation, financial provision and public awareness, etc.

Table 2-74 Summary of the Septage Management Unit

Personnel	Full-time/part-time	Number of the staff	Main task
Unit leader	Full-time	1	Comprehensive management of septage management business
Sub Unit Leader	Full-time	1	Comprehensive management of private contractors of the Project for technical implementation status such as septage collection volume, septage treatment volume, water quality, collection frequency and the number of collected/uncollected household
Clerk for vacuum truck assignment and septage collection management	Full-time	2	Management of households for septage collected / uncollected as well as customer / non-customer for water supply, daily assignment schedule of vacuum trucks, record on septage collecting information and manifest management and O&M status for vacuum trucks
Clerk for septic tank inventory	Full-time	2	Investigation of the septic tank information on each household / entity in water customer / non-customer, investigation of opening for de-sludge and facilitation of installation of opening on septic tank, preparation and update of septic tank inventory
Clerk for STP O&M	Full-time	2	Management of STP operation condition, water quality, treatment data, disposal volume of de-watered cake and manifest management
Total	Full-time	8	

Source: JICA Study Team

Table 2-75 Summary of Required Activities on Existing Organization

Activity	Department	Number of the staff	Main task
Quality management of water, septage and de-watered cake	Existing water quality management department is responsible as par-time work	20 persons in total	Regular quality analysis on water / septage / de-watered cake, and STP O&M monitoring in water quality as well as advice for improvement of STP operation depending on water quality
Legal management for private contracts	Existing legal department is responsible as part time work	Personnel in Legal department	Legal management work regarding outsourcing for private contractors
Tariff collection, financial management and payment for private contractor	Existing financial group is responsible as part-time work	Public relation department, accounting department and financial department	Collection of septage management fee in the same time of water tariff collection, fee collection from non-customers for water supply, payment for private contractors and necessary budgetary measures for septage management activities
Public awareness	Existing public relation department is responsible as part-time work	Public relation department	Conducting the public hearing and public awareness activities regarding commencement of the operation for the Project, promotion of understandings of residents for the necessity of septage management and fee collection

Source: JICA Study Team

2-4-1-2-2 Comprehensive Outsource for Septage Collection and O&M on STP

There are companies in the Philippines, which collect and treat septage as a PPP business or as a contractor of LGUs including O&M of vacuum trucks and STP. MCWD, therefore, plans to have O&M service from such private companies (comprehensive outsource) for STP and vacuum trucks which is constructed and procured in the Project. Scope of the comprehensive outsource is planned for 1) septage collection, 2) O&M for STP, 3) transportation of de-watered cake to the landfill site and 4) O&M for

the facilities and equipment. Table 2-76 shows the relationship between MCWD and comprehensive outsource company.

Table 2-76 Relationship between MCWD and Comprehensive Outsource Company

Item	MCWD	Comprehensive Outsource Company
General	- Collection of septage management fee from residents / entities - Payment for the comprehensive outsource company based on the septage receiving volume at STP - Acquisition of the Project permissions including ECC - Coordination with LGUs - Conducting public awareness promotion activity - Cost burden for large scale expansion / rehabilitation on facility / equipment	- Claim the cost of outsourced work based on the septage receiving volume at STP in regular basis - Cost burden for the work such as fuel, oils, utility (electricity / water supply), consumables, spare parts and labour
Preparation of Septic tank inventory	- Preparation of format for septic tank inventory book and support to fill in the book - Based on the recorded inventory book, compiling the priority order for septage collection	- Investigation of septic tanks in the Project area in cooperation with MCWD and fill the inventory format with volume of tank, accessibility, availability of openings for de-sludge, etc.
Septage collection	- Lending procured vacuum trucks in the Project - Preparation of daily septage collection schedule based on the inventory book and assignment of vacuum trucks for septage collection - Accepting the request for septage collection from non-customers for water supply, collect the septage management fee form them and assigning vacuum trucks for septage collection - Record the collection log to the inventory book based on manifests - Manage and administrate the O&M condition of vacuum trucks	- Installation of opening on septic tank and update of the inventory book if no opening is available at a septic tank - Collection of septage by vacuum trucks based on the assignment schedule instructed by MCWD - Implementation of manifest record at the septage collection - O&M for vacuum truck
STP O&M	- Lending the newly constructed STP in the Project - Preparation of format for STP operation management - Record management of the septage treatment volume based on manifest and operation management - Management and Administration of O&M on STP - Analysis of water quality and septage on regular basis and monitoring the environmental impact and O&M condition on STP	- O&M for STP based on operation manual - Record the received volume of septage, transportation volume of de-watered cake and STP O&M conditions - Record the manifest when septage treatment and transportation of de-watered cake
De-watered cake transportation	- Lending the procured dump truck - Management of the record for transportation volume of de-watered cake and treatment amount based on the manifest - Management and administration of O&M for dump truck - Payment for private landfill site based on the disposal volume of de-watered cake	- Record the manifest when transportation of de-watered cake - O&M for dump track

Source: JICA Study Team

2-4-1-2-3 Outsourcing to Existing Private De-sludgers

MCWD consigns the septage collection to seven (7) existing private de-sludgers in total volume of septage 60m³ per day, which is based on the present result of collection volume. Assignment of the septage collection vehicle to customers and non-customers for water supply is handled by MCWD, and MCWD pays the collection fee to the private de-sludgers based on the collection volume of septage.

Table 2-77 shows relation between MCWD and the existing private de-sludgers.

Table 2-77 Relation between MCWD and Existing Private De-sludgers

Item	MCWD	Existing Private De-sludgers
General	- Collection of septage management fee from residents and entities - Payment to Existing Private De-sludgers based on the septage receiving volume at STP	- Claim the cost of outsourced work based on the septage receiving volume at STP in regular basis - Cost burden for the work such as fuel, oils, utility (electricity / water supply), consumables, spare parts and labour - Cost burden for necessary renewal of the equipment on continuous work
Septage collection	- Assignment of vacuum trucks - Record the collection log based on the manifest	- Septage collection by vacuum trucks based on the assignment schedule instructed by MCWD - Recording of manifest during the septage collection - O&M and renewal of vacuum trucks

Source: JICA Study Team

2-4-1-2-4 Landfill of De-watered Cake

Landfill of the de-watered cake generated from STP is planned to be disposed of at Binaliu disposal site in Cebu city, which is operated by a private company. MCWD plans to make a contract with the private company by tipping fee method based on receiving volume of the de-watered cake at the disposal site.

The disposal site conducts the landfill of the de-watered cake and treatment of leachate based on the conditions of ECC on the site.

2-4-1-2-5 Collection of Septage Management Fee from Residents and Entities

As aforementioned before, it is MCWD to collect septage management fee from residents and entities. The comprehensive outsource company and the private de-sludgers do not conduct the fee collection directly, and necessary expense for the companies are paid by MCWD in regular basis based on the contract with MCWD.

2-4-2 Operational and Maintenance Activities for STP and Necessary Organization

2-4-2-1 Daily Activities for Plant Operation

Table 2-78 shows the daily inspection items and management items in each treatment process. O&M of all treatment processes incorporated in the facility must be undertaken by STP operators based on O&M manuals to be provided by a Japanese contractor.

Table 2-78 Daily Management Items

Treatment Process	Management Item	Major Daily Inspection Items
Septage Receiving	Volume of septage Septage quality /contained solids	Operating status of receiving flowmeter, operating status of receiving units (trash screen and grit collector), operating time
De-watering	Septage input volume De-watered cake moisture content De-watered cake discharge rate	Operating status/operating time of de-watering machines, operating status of septage feeding pump, operating status of coagulant injection pump, status of conveyor belts
Filtrate treatment	Bio reactor inflow, volume of return sludge / volume of surplus sludge, volume of recycled sludge, volume of aeration, volume of effluent	Operating status/operating time of nitrification liquid circulating pump, operating status/operating time of aeration blowers, operating status of disinfection devices, operating status of sand filtering devices, and operating status of deodorization equipment

Source: JICA Study Team

2-4-2-2 Periodic Inspections & Maintenance Activities

Periodic inspections and maintenance are implemented on STP machinery, electrical equipment and instruments installed in the STP based on user manuals compiled by the relevant manufacturers. Table 2-79 shows the standard periodic inspection items for each machine / instrument.

Table 2-79 Periodic Inspection Items for Each Machine / Instrument

Type	Inspection Frequency	Periodic Inspection Item
Mechanical	Daily inspection (once a day)	Visual inspection of all parts to see whether there is: abnormal noise / vibration, increased bearing temperature and water / air leaking
	Monthly inspection (once a month)	Inspect gland packing, lubricant / grease, tighten bolts on all parts, check intake / discharge pressure, check current values
	Annual inspection (once a year)	Check wear on rotating parts, lubricate / grease or replace, check flow / air volume amounts, painting repairs, inspect auxiliary equipment
Electrical	Daily inspection (once a day)	Visual inspection of all parts to see whether there is: abnormal noise / vibration and all instrument displays
	Monthly inspection (once a month)	Check cleanliness around equipment and discoloration / damage of terminals and connectors
	Annual inspection (once a year)	Check for rust / staining on site, measure insulation resistance and test operation of electrical relays

Source: JICA Study Team

2-4-2-3 Procurement of Consumables and Spare Parts

Components that need to be replaced by device operation are divided into consumables and spare parts for replacing components in repair work on a device / instrument / equipment when breakdown on an accident occurs. The representative consumables for the STP in the Project are: bearings for pumps, V-belts for blowers and UV lamps for disinfection facility. These components must be purchased to replace consumables, regardless of whether or not breakdowns occur.

Note that when procuring consumables and spare parts, in principle, they are able to be procured from vendors / suppliers listed in device / material user manuals to be provided by a Japanese contractor. If it is difficult for the Philippine side to contact a listed vendor / supplier, it is necessary to contact the Japanese contractor to procure the relevant component.

2-4-2-4 Necessary Manpower Structure for Plant Operation to be Provided by Comprehensive Outsource Company

Septage treatment processes involve: Receiving Septage → De-watering → Treatment of Filtrate (process similar to the treatment of sludge from sewage treatment).

Due to the complicated treatment process in general, system for assignment of the operation manager on each process is needed on the facility where sludge is generated from the sewage treatment process. Moreover, since there are many pieces of equipment, updating plans are necessary to deal with scheduled overhauls or repairs where the end of equipment lifespan is approaching. For these reasons, it is ideal that an organization is established where there is a project manager who oversees every activity and a person in charge of maintenance for all equipment and preparation of overhaul plans. Since the equipment for filtrate treatment needs to run 24 hours a day, three (3)-shift in a day is required for the operation. Table 2-80 shows O&M organization for the STP.

Table 2-80 O&M Organization for STP

Work Under Charge	No. of Employees	Remarks
Overall administration		
Project management (manager)	1	Overall management of contracts, including those for vacuum trucks and dump trucks
Maintenance (also oversee water quality)	1	
Guard	4	1 person per shift (3 shifts)
Operators for each block of equipment		
Receiving septage	1	
Dewatering	1	
Filtrate treatment	4	1 person per shift (3 shifts)
Total	12	

Source: JICA Study Team

2-4-3 Regular Water Quality Monitoring in MCWD

MCWD, as the implementing agency of the Project, needs to oversee the comprehensive outsource company based on the regular measurement of STP operation, water quality and septage quality.

Analysis and the evaluation of water quality and septage quality is conducted at the existing central laboratory in MCWD once a week. If it is considered that STP operation is not sufficient based on the result of the evaluation, MCWD instructs the comprehensive outsource company to rectify the STP operation. Table 2-81 shows water quality analysis items at the central laboratory (once a week). Analysis work is planned to be conducted by the present staff in the central laboratory.

Table 2-81 Water Quality Analysis Items at Central Laboratory (once a week)

Item	Receiving tank	Preliminary treatment (de-watering machine)		Reactor tank		Final sedimentation tank	Effluent
		Dewatered sludge	Dewatered thickener effluent	Aerator	Return Sludge	Secondary treated water	
Water temperature	○		○	○	○	○	○
pH	○		○	○	○	○	○
SS	○		○			○	
MLSS				○	○		
BOD	○		○			○	
COD _{Cr}	○		○			○	
T-N	○		○			○	
NO ₃ -N + NO ₂ -N						○	
NH ₄ -N						○	
T-P	○		○			○	
Water Content		○					
Oils and grease	○		○				○
Surfactant	○		○				○
E. Coli							○

Source: JICA Study Team

2-4-4 Necessary O&M Activities for Septage Collection and De-watered Cake Transportation

2-4-4-1 Daily Check-ups and O&M activities

Operation manager of procured vehicles in the Project, belonging to the comprehensive outsource company, provides the regular check-ups and maintenance for the vehicles based on the operation manual prepared by vehicle manufacturers. Table 2-82 shows Regular check-up items for vehicles. If large scale of repair is necessary for the vehicle, the repair is outsourced to private workshops.

Table 2-82 Regular Check-up Items for Vehicles

Component	Inspection frequency	Regular inspection item
Chassis	Daily inspection (once a day)	Abnormal noise, heat and oil leakage from engine / gear /drive unit, confirmation of oil volume, confirmation of lights such as blinker and head lamp, confirmation of tyre pressure and confirmation of spare tyres
	Three-month inspection (once in three months)	Key inspection for daily inspection items, change of engine oil (recommended change frequency, every 5,000km)
	Six-month inspection (one in six months)	Change of engine oil filter (recommended change frequency, every 10,000km))
	Twelve-month inspection (Once a year)	Change other oils (transmission, differential, break, clutch, power steering etc.) (recommended change frequency: 20,000km), change of fuel filter and air filter (recommended change frequency: every 20,000km)
	Twenty four –month inspection (once in two year)	Change of tyre and break pad (recommended change frequency: every 40,000km)

Component	Inspection frequency	Regular inspection item
Body	Daily inspection (once a day)	Vacuum Truck ※before operation Confirmation of closure on drain valve, volume of oil on vacuum pump, leakage of oil and tension of the driving belt for vacuum pump ※after operation Cleaning of hose, tank and vacuum pump, and draining water from drainage pipe Dump Truck ※before operation Checking the oil gage (hydro cylinder), oil leakage and tension of the driving belt ※after operation Cleaning of the container
	Weekly inspection (once in a week)	Change of oil for vacuum pump (only <u>vacuum truck</u>)
	Monthly inspection (one in a month)	Key inspection for daily inspection item and oil injection for PTO (universal joint)
	Six-month inspection (one in six months)	Injection of other oils and lubricant (hydro cylinder oil)

Source: JICA Study Team

2-4-4-1-1 Necessary Staff for Operating the Vehicles on Comprehensive Outsource Company

Table 2-83 shows O&M organization for operation vehicles.

Table 2-83 O&M Organization for Operation Vehicles

Job title and Job description	Number of staff	Remarks
Comprehensive management		
Operation Manger	1	Manager for operation of all vehicles
Driving the vacuum trucks and Septage collection work		
Driver (worker)	70	35 units x 2 persons, conducting the driving the truck, collection work and daily inspection
Driving the dump trucks and transportation of de-watered cake		
Driver (worker)	4	4units x 1 person, conducting the driving the truck, transportation of de-watered cake and daily inspection
Truck maintenance		
Truck mechanic	1	Conduct regular check-ups on all vehicles and conduct simple repair work on the vehicle
Total	76	

Source: JICA Study Team

2-4-5 Public Relations and Public Awareness

Table 2-84 shows the basic concept of the public relations and public awareness in the Project.

Table 2-84 Basic Concept of Public Relations and Public Awareness in the Project

Basic Item	Contents
Responsibilities / coordination on MCWD, related LGUs and Barangay	Although several sections in MCWD, LGUs and Barangay are involved in the septage management. Mutual communication system has not been established. For avoiding the duplication of the work and utilizing the human / financial resource effectively, regular meetings are held by MCWD as a chairperson. In the same time, responsibilities on each organization is clarified and coordination among organizations is tighten by mutual activity.
Improvement of public awareness and sustainability of its awareness	In order to promote the public awareness for appropriate septage management which improves the sanitation environment and water pollution prevention, related organizations conduct continuous public awareness activities in a long term, utilizing every opportunity.

Source: JICA Study Team

MCWD does not conduct any public awareness activity for septage management especially and usually.

However, it deployed meetings with residents and related LGUs in cooperation with the PPP company when septage management project was commenced in Mactan Island.

Local government bodies in Japan conduct public awareness activities to the residents when pay-sewerage-service is newly adopted as public service. Such activities in Japan has been continued even after the commencement stage of service.

For implementing the Project, MCWD needs to plan and execute the public awareness activities in effective and efficient ways by utilizing its previous experience and the experience of the Japanese local government bodies.

For MCWD, it is required to have periodical patrol and notify the police / LGUs for illegal septage dumping as a part of public awareness activities due to the following risks:

- Illegal dumping of residents who do not utilize the fee-based service for septage collection.
- Illegal dumping of non-authorized private de-sludgers who collect septage at lower price than MCWD service.

Public Relation department in MCWD is in charge of public awareness activities and major communications with LGUs and other stakeholders. Table 2-85 shows media plan of Public Relation department in MCWD.

Table 2-85 Media Plan of Public Relation Department in MCWD

Media	Contents
Radio	1. Music theme for MCWD's septage management program 2. Announcement for MCWD's public service 3. Announcement to private contractors
News paper	1. Issue of Press release (English version) 2. Issue of Press release (Visayan version) 3. Public offering 4. Advertisement
Website and Facebook	1. Presentation of MCWD 2. Facebook advertisement
Community base	1. Presentation of septage collection schedule 2. Announcement from the car 3. Distribution of leaflet (English version) 4. Distribution of leaflet (Visayan version) 5. Lunching the campaign in a shopping mall 6. Christmas gifts to the community where STP locates 7. Site visit for sanitation improvement
Forum/ classes	1. Discussion with sanitation officer in Barangay 2. Discussion with main stakeholders 3. Discussion with the media 4. Discussion with universities
Others	1. Advertising by vacuum truck (sticker) 2. Preparation of logo for septage management project 3. Advocator for septage management project 4. Preparation of an environmental blog on the Web 5. Public hearing at related LGUs 6. Explanation of septage management fee

Reference: MCWD

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

This page is closed due to the confidentiality.

2-5-1-1 Project Cost borne by Japan Side

This page is closed due to the confidentiality.

2-5-1-2 Project Cost borne by the Philippine Side

Estimated Project Cost borne by the Philippine side: PHP39,342 thousand (approximately 80.7 million Japanese Yen) (See Table 2-72).

2-5-1-3 Preconditions of the Cost Estimation

- 1) Time point of Cost Estimation: March 2018
- 2) Exchange Rate: Average exchange rate in past 3 months since the end of February 2018
1 US dollar (USD) = 111.69 Japanese Yen (JPY)
1 Philippine Peso (PHP) = 2.05 Japanese Yen (JPY)
- 3) Construction Duration: Construction work and procurement work duration is 4 fiscal years in Japan. The government bond is applied to the Project.
- 4) Others: Project Cost is estimated in accordance with rules stipulated in Grant Aid Scheme.

2-5-2 Operation and Maintenance Cost

Necessary cost for O&M organization and its activities mentioned in the previous Chapter is calculated on Table 2-86 and MCWD needs to allocate the approximately 131 million PHP in annual budget.

Table 2-86 O&M Cost for Septage Management for the Project (annual)

Large category	Medium category	Small category	Item	Q'ty	Unit	Unit price (PHP)	amount (PHP)	Remarks
MCWD	Septage management unit	Labour cost	Unit leader	1	person /year	1,500,000.00	1,500,000.00	
			Sub unit leader	1	person /year	1,000,000.00	1,000,000.00	
			Clerk for vacuum truck assignment and septage collection management	2	person /year	600,000.00	1,200,000.00	
			Clerk for septic tank inventory	2	person /year	600,000.00	1,200,000.00	
			Clerk for STP O&M	2	person /year	600,000.00	1,200,000.00	
			Labour cost (subtotal)				6,100,000.00	
			Office equipment cost and transportation cost etc.	3	%	6,100,000.00	183,000.00	3% of labour cost
		Septage management unit (subtotal)					6,283,000.00	
	Central water quality laboratory	Reagent cost		1	unit	850,000.00	850,000.00	
		Central water quality laboratory (subtotal)					850,000.00	
				112,000	m ³	16.00	1,792,000.00	
				112,000	m ³	16.00	1,792,000.00	
			Dewatered sludge cake disposal	13,900	t	750.00	10,425,000.00	
Comprehensive outsource company	STP	Labour cost					21,142,000.00	
			Manager	1	person /year	1,000,000.00	1,000,000.00	
			Maintenance	1	person /year	600,000.00	600,000.00	
			Guard	4	person /year	400,000.00	1,600,000.00	
			Receiving septage	1	person /year	600,000.00	600,000.00	
			De-watering	1	person • year	600,000.00	600,000.00	
			Filtrate treatment	4	person /year	600,000.00	2,400,000.00	
			Labour cost (Subtotal)				6,800,000.00	

Large category	Medium category	Small category	Item	Q'ty	Unit	Unit price (PHP)	amount (PHP)	Remarks
Comprehensive outsourcing company		Electricity cost		672,000	kWh	9.00	6,048,000.00	
		Water supply cost		17,100	m ³ /year	48.00	820,800.00	
		Chemical cost		1	Unit	26,684,000.00	26,684,000.00	
		Repair cost		1	unit	1,260,000.00	1,260,000.00	
		Direct cost (total)					41,612,800.00	
		Indirect cost		10	%	41,612,800.00	4,161,280.00	10% of direct cost
		STP O&M (total)	Comprehensive outsourcing company				45,774,080.00	
Comprehensive outsourcing company	Vehicle	Labour cost	Operation manager	1	person/year	500,000.00	500,000.00	
			Vacuum truck operation and septage collection	70	person/year	400,000.00	28,000,000.00	
			Dump truck operation and transportation of dewatered sludge cake	4	person/year	400,000.00	1,600,000.00	
			Truck mechanic	1	person/year	400,000.00	400,000.00	
			Labour cost (subtotal)				30,500,000.00	
		Vehicle O&M cost	Vacuum truck (3m ³)	21	unit/year	450,000.00	9,450,000.00	
			Vacuum truck (9m ³)	14	unit/year	730,000.00	10,220,000.00	
			Dump truck	4	unit/year	320,000.00	1,280,000.00	
		Direct cost (total)					51,450,000.00	
		Indirect cost		8	%	51,450,000.00	4,116,000.00	8% of direct cost
		Vehicle O&M company (Total)	Comprehensive outsourcing company				55,566,000.00	
Private De-sludgers	Comprehensive outsourcing cost Total Outsourcing for septage collection to Private De-sludgers						101,340,080.00	
			Outsourcing cost	16,800	m ³ /year	534.00	8,971,200.00	60m ³ /dayx280day
O&M cost (grand total)							131,453,280.00	

Source: JICA Study Team

The contents of the necessary reagent cost for central water quality analysis laboratory in MCWD and O&M cost for STP and vehicles (excluding personnel cost) are as follows.

2-5-2-1 Necessary Reagent Cost for Central Laboratory

Table 2-87 shows the necessary reagent cost for central laboratory.

Table 2-87 Necessary Reagent Cost for Central Laboratory (Annual Cost)

Item	Chemical cost (PHP/year)	Main chemicals and consumables
pH	4,680.00	Potassium hydrogen phthalate, Potassium dihydrogenphosphate, Disodium hydrogenphosphate dodecahydrate, Potassium chloride
SS/MLSS/water content	62,758.00	Filter, Silica gel, Vaseline
BOD	32,383.00	Dipotassium hydrogenphosphate, Potassium dihydrogenphosphate, Disodium hydrogenphosphate dodecahydrate, Ammonium chloride, Magnesium sulfate heptahydrate, Calcium chloride, Iron (III) chloride hexahydrate, Sodium thiosulfate pentahydrate, Sodium carbonate, Potassium iodate, Potassium iodide, Sulfuric acid, Sulfuric acid, Manganese (II) Sulfate Pentahydrate, Sodium hydroxide, Sodium iodide, Sodium azide, Starch
COD Cr	285,795.00	Potassium dichromate, Ammonium iron (II) sulfate hexahydrate, Mercury (II) sulphate, Boiling stone, 1,10-Phenanthroline, Iron (II) sulfate heptahydrate, Sulfuric acid, Silver sulfate
T-N (Organic Nitrogen, NH ₄ -N, NO ₃ , NO ₂)	160,705.00	Ammonium chloride, Boiling stone, Sulfuric acid, Sodium hydroxide, Boric acid, Sodium hydroxide, Phenol, Acetone, Sodium hypochlorite solution (5.0 %), Devarda's alloy
T-P	10,705.00	Potassium dihydrogenphosphate, Potassium peroxodisulfate, Hexaammonium heptamolybdate tetrahydrate, Potassium antimonyl tartrate, Sulfuric acid, Ammonium amidosulfate, L-Ascorbic acid
Oil and Grease	151,203.00	Hydrochloric acid, Sodium sulphate, Methyl orange, Hexane, Filter
Surfactant	45,525.00	Sodiumdodecylbenzenesulfonate, Chloroform, Phenolphthalein, Sodium hydroxide, Sulfuric acid, Methylene blue, Sulfuric acid, Sodium dihydrogenphosphate dihydrate
Fecal. Coliform	52,060.00	Tryptose, Lactose monohydrate, Bile salts, Dipotassium hydrogenphosphate, Potassium dihydrogenphosphate, Sodium chloride, ethanol
Wastewater treatment (COD Cr etc.)	44,060.00	L-Ascorbic acid, Sodium hydroxide (For industry), Sodium dithionite
Total	849,872.00	

Source: JICA Study Team

2-5-2-2 O&M Cost for Septage Treatment Plant

O&M cost for STP constructed in the Project consists of electric power cost, water supply cost, chemical cost and repair cost for each facility (including purchase of consumables) as well as labour cost.

Since STP has a de-watering process and a filtrate treatment process which remove the nitrogen and the phosphate from septage and filtrate, 4 types of chemicals are to be utilized for STP operation. Thus, the chemical cost become a larger proportion in O&M cost and MCWD needs to secure the budget for such chemicals. Table 2-88 shows the annual O&M Cost for STP. It is calculated under following conditions:

Electric power cost : Annual electricity usage x average electricity unit price

Water supply cost : Annual water consumption x average water tariff

Chemical : Annual usage volume x Chemical unit price

Repair cost for each facility : Mechanical Equipment cost x 1%/year

Table 2-88 Annual O&M Cost for STP

Item	Annual Volume	Unit price (PHP)	Estimated annual O&M cost (PHP)
Electricity cost	672,000 kWh/year	9 .00/kWh	6,048,000.00
Water supply cost	17,100 m ³ /year (dissolving polymer coagulant etc.)	48 .00/m ³	820,800.00
Reagent cost	Polymer coagulant: 34,200 PAC: 485,000 kg/year (Dewatering: 427,000, Filtrate treatment: 58,000) Methanol: 88,000 kg/year Caustic soda: 168,000 kg/year	244 .00/kg 15.00/kg 78.00/kg 25.00/kg	26,684,000.00
Repair cost	1% of mechanical equipment cost		1,260,000.00
Total			34,812,800.00

Source: JICA Study Team

2-5-2-3 O&M Cost for Septage Collection and De-watered Cake Transportation Vehicles

O&M cost for vacuum truck and dump truck consists of fuel cost, consumable cost and other spare parts cost, as well as labour cost. Table 2-89, Table 2-90 and Table 2-91 show the annual O&M cost for 3m³ vacuum trucks, 9m³ vacuum trucks and 8m³ dump trucks, respectively.

Table 2-89 Annual O&M Cost for 3m³ Vacuum Truck

Item	Annual O&M cost per vehicle (PHP)	Calculation	Remarks
1.Fuel			
Diesel oil	72,000	<per vehicle> 12,600km/year / 7km/L x 40PHP/L =72,000PHP/YEAR	
2.Consumables			
(1)Chassis			
Engine oil	6,300	<per vehicle> 12,600km/year / 5,000km/time x 20L/ time x 125PHP/L = 6,300PHP/YEAR	
Other oils	1,890	<per vehicle> 12,600km/year / 20,000km/ time x 3,000PHP/ time = 1,890PHP/YEAR	Transmission, differential and break and clutch oil etc.
Engine oil filter	4,410	<per vehicle> 12,600km/year / 10,000km/ time x 3,500PHP/ time =4,410PHP/YEAR	
Other filters	7,560	<per vehicle> 12,600km/year / 20,000km/ time x 12,000PHP/ time = 7,560PHP/YEAR	Fuel, Air filter etc.
Break pad etc.	5,670	<per vehicle> 12,600km/year / 40,000km/ time x 18,000PHP/ time =5,670PHP/YEAR	
(2)Body parts			
Vacuum pump oil	260,714	<per vehicle> 365day/year / 7day/ time x 10L/ time x 500PHP/L =260,714PHP/YEAR	in case of oil rotating vacuum blower
OIL for PTO	6,000	<per vehicle> 12months/year / 1month/ time x 0.5kg/ time x 1000PHP/kg =6,000PHP/YEAR	
Other oils	40,000	<per vehicle> 12month/year / 6 month/ time x 40L/ time x 500PHP/L=4 0,000PHP/YEAR	Hydro cylinder, each circulation parts
3.Other change parts			
Other exchange parts	44,000	<per vehicle> App. 1%/year of equipment cost	
Total	448,544		

Note: annual mileage of the vehicle is 280day/year x 45km/day/unit =12,600km/year.

Source: JICA Study Team

Table 2-90 Annual O&M Cost for 9m³ Vacuum Truck

Item	Annual O&M cost per vehicle (PHP)	Calculation	Remarks
1.Fuel			
Diesel oil	64,400	<per vehicle> 6,440km/year / 4km/L x 40PHP/L =64,400PHP/YEAR	
2.Consumables			
(1)Chassis			
Engine oil	3,220	<per vehicle> 6,440km/year / 5,000km/ time x 20L/ time x 125PHP/L =3,220PHP/YEAR	
Other oils	4,025	<per vehicle> 6,440km/year / 20,000km/ time x 12,500PHP/time =4,025PHP/YEAR	Transmission, differential and break and clutch oil etc
Engine oil filter	3,220	<per vehicle> 6,440km/year / 10,000km/ time x 5,000PHP/time =3,220PHP/YEAR	
Other filters	4,186	<per vehicle> 6,440km/year / 20,000km/ time x 13,000PHP/time =4,186PHP/YEAR	fuel, air filter etc
Break pad etc.	10,143	<per vehicle> 6,440km/year / 40,000km/ time x 63,000PHP/time =10,143PHP/YEAR	
(2)Body parts			
Vacuum pump oil	521,429	<per vehicle> 365day/year / 7day/ time x 20L/ time x 500PHP/L =521,429PHP/YEAR	in case of oil rotating vacuum blower
OIL for PTO	6,000	<per vehicle> 12 month/year / 1 month/time x 0.5kg/time x 1000PHP/kg =6,000PHP/YEAR	
Other oils	40,000	<per vehicle> 12month/year / 6 month/time x 40L/time x 500PHP/L =40,000PHP/YEAR	Hydro cylinder, each circulation parts
3.Other change parts			
Other exchange parts	67,000	<per vehicle> App. 1%/year of equipment cost	
Total	723,623		

Note: annual mileage of the vehicle is 280day/year x 23km/day/unit =6,440km/year

Source: JICA Study Team

Table 2-91 Annual O&M Cost for 8m³Dump Truck

Item	Annual O&M cost per vehicle (PHP)	Calculation	Remarks
1.Fuel			
Diesel oil	168,000	<per vehicle> 16,800km/year / 4km/L x 40PHP/L =168,000PHP/YEAR	
2.Consumables			
(1)Chassis			
Engine oil	8,400	<per vehicle> 16,800km/year / 5,000km/time x 20L/time x 125PHP/L =8,400PHP/YEAR	
Other oils	6,300	<per vehicle> 16,800km/year / 20,000km/time x 7,500PHP/time =6,300PHP/YEAR	Transmission, differential and break and clutch oil etc.
Engine oil filter	8,400	<per vehicle> 16,800km/year / 10,000km/time x 5,000PHP/time =8,400PHP/YEAR	
Other filters	10,920	<per vehicle> 16,800km/year / 20,000km/time x 13,000PHP/time =10,920PHP/YEAR	fuel, air filter etc.
Break pad etc.	23,100	<per vehicle> 16,800km/year / 40,000km/time x	

Item	Annual O&M cost per vehicle (PHP)	Calculation	Remarks
		55,000PHP/time =23,100PHP/YEAR	
(2)Body parts			
OIL for PTO	6,000	<per vehicle> 12month/year / 1month/time x 0.5kg/time x 1000PHP/kg =6,000PHP/YEAR	
Other oils	40,000	<per vehicle> 12month/yea / 6month//time x 40L/time x 500PHP/L =40,000PHP/YEAR	Hydro cylinder, each circulation parts
3.Other change parts			
Other change parts	43,000	<per vehicle> App. 1%/year of equipment cost	
Total	314,120		

Note: annual mileage of the vehicle is 280day/year x 60km/day/unit=16,800km/year

Source: JICA Study Team

2-5-2-4 Outsourcing Cost to Private De-sludgers

To determine the outsourcing cost to seven (7) private de-sludgers, costs for equipment renewal should be taken into account. Since it should be incorporated with the outsourcing price, necessary cost is different from O&M cost for procured equipment in the Project mentioned in 2-5-2-3. It is adequate that the outsourcing cost for the private de-sludgers is PHP534.00 per 1m³ septage collection based on the following reasons. Table 2-92 shows Annual outsourcing cost to the private de-sludgers.

- As of 2018, the private de-sludgers collects around PHP2,500.00 per 3m³ septage collection from the residents.
- PHP900.00 out of PHP2,500.00 is paid as tipping fee at septage de-watering plant, which is charged by Cebu City (MCWD from March 2019) to the private de-sludgers.
- Therefore, income for the private de-sludgers is PHP1,600.00 per 3m³. Thus, it is adequate that the necessary payment to the private de-sludgers is evaluated at PHP534.00/ m³.

Table 2-92 Annual Outsourcing Cost to Private De-sludgers

Item	Annual work load	Unit price (PHP)	Estimated annual cost (PHP)
Unit Price to be Paid	60m ³ /day x 280day = 16,800 m ³ /year	534.00/ m ³	8,971,200.00

Source: JICA Study Team

2-5-2-5 Tariff Collection

MCWD has been charging PHP2.20 per 1m³ of water consumption as septage treatment fee in Mactan Island, where the PPP septage management system is implemented. The fee is charged and collected together with the water tariff at the same time. MCWD plans to charge the same price of septage management fee for the Project, too. MCWD assumes that the average water consumption per household is approximately 20m³. Therefore, a household bears PHP 44.00 per month (PHP 528.00 per year) if selecting unit tariff at PHP2.20/m³. Assuming the collection frequency for 5 years, it is accumulated to be PHP 2,640 for the 5 years.

On the other hand, MCWD takes a different system for non-customers for water supply, it is difficult to collect the tariff monthly together with water charges. Accordingly, MCWD collects the tariff at every time of septage collections directly from the residents. Its price is preferable to fix at PHP 2,640 /time as same as one for MCWD water supply customers.

Assuming the number of MCWD customers and non-customers for water supply as 209,000 households and 8,000 households respectively for 2025, the annual estimated revenue in 2025 is estimated to be approximately PHP131 million as shown in Table 2-93. The amount of estimated revenue is the same as the amount of necessary cost as aforementioned in Table 2-86.

Table 2-93 Annual Estimated Revenue of Septage Management Fee in 2025

Classification	The number of customers (Number of septic tank to be de-sludged)	Unit price (PHP)	Annual estimated income (PHP)
Water user	App. 209,000	528.00	110,352,000
Non water user	App. 8,000 (71.06m ³ /day / 2.5m ³ /day/unit x 280day)	2,640.00	21,120,000
Total			131,472,000

Source: JICA Study Team

In case of water feeder pipe diameter at 1/2 inch and average water consumption at 20m³/month, the water tariff is calculated for PHP320.00/month. In such case, the septage tariff is for PHP44.00/month and a sum of PHP364.00/month is claimed to the customers. Although it becomes a 14% price increase, it is expected to be affordable for the resident since it is same rate as ones for Mactan Island.

CHAPTER 3

Project Evaluation

CHAPTER 3 PROJECT EVALUATION

3-1 Preconditions

Preconditions required to implement the Project are summarized as shown below:

- (1) To implement the Project, MCWD and the related 6 LGUs should form the cooperative system arrangement. The 6 LGUs have established the necessary ordinances and concluded an agreement with MCWD for the Project implementation. MCWD and the 6 LGUs should maintain the cooperative system to manage the Project's activities. Since the Project is to treat the septage through fee collection from the residents, the public consensus for the fee collection should be undertaken by MCWD under cooperation of the 6 LGUs.
- (2) As for the land for the STP, it belongs to Cebu Province. To utilize the land, MCWD has concluded an agreement with Cebu Province for 50 years in leasing period. It is, however, presently in lagoon for the existing septage de-watering plant. MCWD, therefore, should reclaim the lagoon before entering the prequalification process for the Contractor of the STP, in accordance with relevant guidelines / standards of the Philippines for civil construction works.
- (3) To commence the Project, the existing septage de-watering plant which has been operated by Cebu City was handed over to MCWD. Accordingly, MCWD should undertake O&M of the existing plant as well as the STP to be constructed by the Project. Since the lagoon will be reclaimed as aforementioned, MCWD should install a temporary aeration system to be capable to treat the septage in a small pond, so that MCWD continues the operation of the existing plant during construction of the STP.
- (4) A landfill site of the de-watered cake to be generated by the STP in a de-watering process is not included in a component of facility construction. It is a precondition for MCWD to have an appropriate disposal of the de-water cake. To do so, MCWD is required to transport / dispose of the de-watered cake to / in an appropriate landfill site.
- (5) Prior to the commencement of the Project, MCWD should obtain ECC from DENR for the STP construction. Moreover, MCWD should be permitted by Cebu City for the construction works.
- (6) Custom duties to be imposed for imported materials / equipment and VAT to be imposed for procurement of local materials / equipment / services should be exempted by the Government of Philippines. To realize them, MCWD should take necessary procedures. If it is difficult for MCWD, MCWD should bear necessary custom duties and VAT.

3-2 Necessary Inputs by Recipient Country

Necessary inputs by recipient country to realize and to maintain the Project's effectiveness are as follows:

- (1) It is necessary for MCWD to establish an implementing organization through outsourcing to appropriate private companies and / or new employments in order to operate and maintain the STP and the vehicle equipment to be constructed / procured by the Project. The organization should be established prior to commencement of the test-run period.
- (2) It is necessary for MCWD to utilize and maintain appropriately the STP and the vehicle equipment to be constructed / procured by the Project.
- (3) According to the septic tank inventory book, the monitoring plan for septage collection, the monitoring plan for STP operation and the public awareness activity plan, which will be prepared by the soft component, MCWD is required to continue the O&M activities after the Project.
- (4) To minimize environmental impacts, MCWD should take mitigation measures and provide the environment management according to the environmental management and monitoring plans.
- (5) It is necessary for MCWD to expand septage management capacity toward the target of 2030 through reporting / explaining effectiveness of the larger size of STP and contributions to

achievements of SDGs and NSSMP as well as Mega Cebu Roadmap 2050.

- (6) It may be possible that illegal dumping of septage be increased because 1) people against the fee-collected de-sludge may appear, 2) low price and unofficial de-sludgers may appear and provide illegal services inappropriately. To prevent it, MCWD should enhance the patrol system on the illegal dumping under cooperation with the 6 LGUs.

3-3 Important Assumption

The following are important assumptions to realize and to maintain the Project's effectiveness:

- (1) The STP for the Project is designed based on the environmental category class-D for Mahiga Creak which is a discharging point from the STP. If the category is modified, the STP's effluent may be possible not to comply with the effluent quality standards designated by DENR. MCWD, therefore, take necessary countermeasures along with discussions with DENR when the environmental category is to be modified.
- (2) The STP for the Project is designed for 100% of water supply customers and 20% of non-customers for water supply in the planned septage collection area for the year 2025. Moreover, planned frequency of de-sludge service is 5 years. If MCWD collects the septage for more than the designed volume as a result of population increase and business expansion, the STP may fail in over-loaded condition in treatment volume. It may result difficulty to maintain the appropriate treatment. MCWD, therefore, should commence planning and designing facility expansion and / or additional STP to have enough capacity beyond 2025.
- (3) The Project is planned to de-water the collected septage, to dispose of the de-watered cake in landfill site, and to treat infiltrate generated in the de-watering process. Although 55m³/d of de-watered cake is forecasted approximately to be generated, recycling and / or reusing of the de-watered cake are not included in the Project components because estimation of quality and volume of de-watered cake is difficult to be for a required level to facility design and evaluation of feasibility. In the circumstances, MCWD should study on effective utilization of the de-watered cake after commencement of the STP operation according to actual quality and volume of de-watered cake.
- (4) Wastewater to be managed by the Project is the septage collected from septic tanks. Grey water discharged by households and entities is out of subject to be managed. In case of providing comprehensive wastewater management service including the gray water, sewerage system may be required. To upgrade the wastewater management service, MCWD should commence a study for sewerage master plan and activities toward early realization of sewerage.

3-4 Project Evaluation

Relevance and effectiveness of the Project are evaluated as follows:

3-4-1 Relevance

Relevance of the Project is summarized below:

- (1) The Project is planned in line with NSSMP and it will contribute to achievement of NSSMP, which is an upper plan in the Philippines aiming at provision of appropriate septage management systems for all LGUs by 2020.
- (2) The Project will contribute to achievement of Mega Cebu Roadmap 2050 in a field of septage management, which aims at 50% and 90% in population for appropriate wastewater management in 2030 and 2050 respectively.
- (3) In the Japanese assistance policy to the Philippines, "Solving the environmental problems including water supply and wastewater management fields" is listed. The Project is planned in line with the said policy.
- (4) The Project beneficiaries are the general public which include poor classes in population, and its

population will reach 2.24 million in 2025 within the Project Area.

- (5) The objective of the Project is to improve the collection and treatment system of the septage which may menace the sanitary environment of residents and water environment in Metro Cebu Area. Implementation of the Project is urgently required to improve basic human needs and living standards of the residents in an aspect of the human security.
- (6) The Project is to collect, treat and dispose with septage safely. It contributes to achievement of Sustainable Development Goal 6.2.1 (SDG6.2.1), “Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water”*.

*According to “Progress on Drinking Water Sanitation and Hygiene 2017 Update and SDG Baseline” reported by WHO and UNICEF, following measures are indicated as septage management systems satisfying the safely managed sanitation. The Project which conducts scheduled de-sludge service is categorized in 2).

- 1) Treated and disposed of in situ,
- 2) Stored temporarily and then emptied, transported and treated off-site, or
- 3) Transported through a sewer with wastewater and then treated off-site.

3-4-2 Effectiveness

Effectiveness of the Project is summarized below:

(2) Quantitative Effect

Indicators for expected quantitative effects as well as base lines and targets are calculated as follows and shown in Table 3-1.

- a) Baseline in 2017 is based on the actually treated volume in the exiting septage de-watering plant. It is converted by the average collected volume from households of 3.0m³/d.
- b) Target for 2025 is the planned volume of septage to be collected by MCWD in the Project. It is converted by the average collected volume from households and large commercial entity / governmental facilities at 2.5m³/d and 5.0m³/d respectively

Table 3-1 Expected Quantitative Effectiveness of the Project

Indicator	Baseline (Actual record in 2017)	Target (2025) 【 3 years later after the Project 】
Number of households realizing the scheduled de-sludge	4,631	43,702
Volume of collected septage (m ³ /year)	13,895	109,877

Source: JICA Study Team

(3) Qualitative Effect

Following qualitative effects are expected for the Project.

1) Improvement of Water Environment

- a) Because of the scheduled septage collection, effluent quality of septic tanks will be improved and illegal dumping of septage will be reduced. Accordingly, the Project will contribute to improvement of the water environment in Metro Cebu Area.
- b) Infiltrate generated in the STP will be treated to comply with the designated effluent quality standards. Accordingly, the Project will contribute to improvement of water quality of the river which is the discharge destination of effluent of the STP (the existing septage de-watering plant presently).

2) Improvement of Sanitary Conditions for Residential Areas

- a) Because of the scheduled septage collection, loading conditions to septic tank will be appropriate for treatment. It will contribute to reduction of odors in residences / residential areas.

- b) Sanitary improvement will heighten the value of Metro Cebu. It will bring the appreciation of real estate value and further development of socio-economic activities.

APPENDICES

[Appendices]

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Appendix-2 Study Schedule

Appendix-3 List of Parties Concerned in the
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Appendix-4 Minutes of Discussions (M/D)

Appendix-5 Soft Component Plan

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Appendix-6-2 Environmental Check List

Appendix-6-3 Result of Water Quality Analysis

Appendix-6-4 Results of Soil Investigation

Appendix-6-5 Results of Social Survey

Appendix-1

Member List of the Study Team

Appendix-1 Member List of the Study Team

Member List of the Study Team

(1st Field Survey)

Name	Position	Dispatch period	Organization
Mr. Noriaki YOKOUCHI	Planning Management	November 8 th 2017 ~ November 14 th , 2017	Assistant Director, Environmental Management Group, Global Environment Department, JICA
Mr. Chikayuki KOBAYASHI	Advisor / Sludge Management	November 8 th 2017 ~ November 14 th , 2017	Yokohama City Environmental Creation Department
Mr. Katsumi FUJII	Chief Consultant / Institutional Plan / Environmental and Social Considerations 2	November 5 th 2017 ~ November 25 th , 2017	Yachiyo Engineering Co., LTD.
Mr. Yamato NAKAMURA	Vice Chief Consultant / Wastewater Management Plan	November 2 nd , 2017 ~ November 21 st , 2017	Yokohama Water Co., LTD.
Mr. Kozo HAYASHISHITA	Sludge Treatment Facility Design (Civil Work) / Natural Condition Survey	November 2 nd , 2017 ~ November 21 st , 2017	Yokohama Water Co., LTD.
Mr. Yusuke ANDO	Sludge Treatment Facility Design (Facility Work)	November 12 th , 2017 ~ November 25 th , 2017	Yokohama Water Co., LTD.
Mr. Akira KOHARA	Operation & Maintenance of Sludge Treatment Facility	November 12 th , 2017 ~ November 25 th , 2017	Yokohama Water Co., LTD.
Mr. Tsuyoshi ONozATO	Sludge Collection Plan/ Equipment Plan/ Cost Estimation	November 5 th , 2017 ~ November 24 th , 2017	Yachiyo Engineering Co., LTD.

(2nd Field Survey)

Name	Position	Dispatch period	Organization
Mr. Chikayuki KOBAYASHI	Advisor	January 28 th , 2018 ~ February 3 rd , 2018	Yokohama City Environmental Creation Department
Mr. Susumu ARAMI	Advisor	January 28 th , 2018 ~ February 3 rd , 2018	Yokohama City Environmental Creation Department
Ms. Sumiko MORITA	Advisor	January 28 th , 2018 ~ February 3 rd , 2018	Yokohama City Environmental Creation Department

Name	Position	Dispatch period	Organization
Mr. Katsumi FUJII	Chief Consultant / Institutional Plan / Environmental and Social Considerations 2	January 28 th , 2018 ~ March 2 nd , 2018	Yachiyo Engineering Co., LTD.
Mr. Yamato NAKAMURA	Vice Chief Consultant / Wastewater Management Plan	January 28 th , 2018 ~ February 26 th , 2018	Yokohama Water Co., LTD.
Mr. Kozo HAYASHISHITA	Sludge Treatment Facility Design (Civil Work) / Natural Condition Survey	January 28 th , 2018 ~ March 2 nd , 2018	Yokohama Water Co., LTD.
Mr. Yusuke ANDO	Sludge Treatment Facility Design (Facility Work)	January 28 th , 2018 ~ February 23 rd , 2018	Yokohama Water Co., LTD.
Mr. Akira KOHARA	Operation & Maintenance of Sludge Treatment Facility	February 14 th , 2018 ~ March 2 nd , 2018	Yokohama Water Co., LTD.
Mr. Tsuyoshi ONOZATO	Sludge Collection Plan/ Equipment Plan/ Cost Estimation	January 28 th , 2018 ~ February 21 st , 2018	Yachiyo Engineering Co., LTD.
Mr. Hiroshi KUMAGAE	Financial Plan/Economical Analysis	February 4 th , 2018 ~ February 17 th , 2018	Crown Agents Japan Co., LTD.
Mr. Hideyuki IGARASHI	Construction Plan/Procurement Plan/ Cost Estimation	February 4 th , 2018 ~ February 18 th , 2018 March 4 th ~ March 10 th	Yachiyo Engineering Co., LTD.
Mr. Kazuhiro ISHIURA	Environmental Social Consideration 1	February 11 th , 2018 ~ March 2 nd , 2018	Yachiyo Engineering Co., LTD.
Ms. Hiroko KAMATA	Public Awareness	January 28 th , 2018 ~ February 21 st , 2018	Yokohama Water Co., LTD.

(3rd Field Survey)

Name	Position	Dispatch period	Organization
Katsumi FUJII	Chief Consultant / Institutional Plan / Environmental and Social Considerations 2	April 22 nd , 2018 ~ April 28 th , 2018	Yachiyo Engineering Co., LTD.
Mr. Yamato NAKAMURA	Vice Chief Consultant / Wastewater Management Plan	April 22 nd , 2018 ~ April 28 th , 2018	Yokohama Water Co., LTD.
Mr. Kozo HAYASHISHITA	Sludge Treatment Facility Design (Civil Work) / Natural Condition Survey	April 22 nd , 2018 ~ April 28 th , 2018	Yokohama Water Co., LTD.

(4th Field Survey)

Name	Position	Dispatch period	Organization
Katsumi FUJII	Chief Consultant / Institutional Plan / Environmental and Social Considerations 2	December 2 nd , 2018 ~ December 8 th , 2018	Yachiyo Engineering Co., LTD.
Mr. Yamato NAKAMURA	Vice Chief Consultant / Wastewater Management Plan	December 2 nd , 2018 ~ December 8 th , 2018	Yokohama Water Co., LTD.
Mr. Kozo HAYASHISHITA	Sludge Treatment Facility Design (Civil Work) / Natural Condition Survey	December 2 nd , 2018 ~ December 8 th , 2018	Yokohama Water Co., LTD.

(5th Field Survey)

Name	Position	Dispatch period	Organization
Hiromichi MURAKAMI	Leader of Preparatory Survey Team	January 8 th , 2019 ~ January 12 th , 2019	Senior Deputy Director General, Global Environment Department, JICA
Yuta TAKAHASHI	Deputy Leader of Preparatory Survey Team	January 8 th , 2019 ~ January 14 th , 2019	Assistant Director, Environmental Management Group, Global Environment Department, JICA
Takayuki SHIMODAIRA	Project Implementation Management	January 8 th , 2019 ~ January 12 th , 2019	Deputy Director, Grant Aid Project Management Division 3, Financial Cooperation Implementation Department, JICA
Mr. Noriaki YOKOUCHI	Sludge Management Plan	January 9 th , 2019 ~ January 12 th , 2019	Yokohama City Environmental Creation Department
Katsumi FUJII	Chief Consultant / Institutional Plan / Environmental and Social Considerations 2	January 6 th , 2019 ~ January 12 th , 2019	Yachiyo Engineering Co., LTD.
Mr. Yamato NAKAMURA	Vice Chief Consultant / Wastewater Management Plan	January 6 th , 2019 ~ January 12 th , 2019	Yokohama Water Co., LTD.

Appendix-2
Study Schedule

Appendix-2 Study Schedule

Study Schedule

(1st Field Survey)

No.	Date	Day	Activities	Remarks
1	2017.11.2	Thu	Consultant team (Mr. Nakamura and Mr. Hayashishita) departed from Tokyo to Cebu.	PR433Narita-Cebu
2	2017.11.3	Fri	Explanation of outline of the study to MCWD, confirmation of survey schedule and request for grant aid.	
3	2017.11.4	Sat	Data Arrangement/Analysis.	
4	2017.11.5	Sun	Data Arrangement/Analysis. Consultant team (Mr. Fujii and Mr. Onozato) departed from Tokyo to Cebu.	PR433 Narita-Cebu
5	2017.11.6	Mon	Confirmation of the contents of the study and explanation of the Inception Report to MCWD. Explanation of the summary of the study to MDCDB.	
6	2017.11.7	Tue	Site visit to proposed construction site (Inayawan, Amkon site, Umapad) and site visit for existing facility (Mactan Island).	
7	2017.11.8	Wed	Meeting with MCWD. JICA team (Mr. Yokouchi and Mr. Kobayashi) departed from Tokyo to Cebu. Site visit/interview survey to Amkon site.	PR435 Narita-Cebu
8	2017.11.9	Thu	Explanation/ confirmation of the inception report. Meeting with Environment and Natural resource Department, Cebu City. Courtesy call to the mayor of Cebu City.	
9	2017.11.10	Fri	Meeting with MCWD regarding the MoM and signing the MoM. Site Visit/interview survey to Inayawan.	
10	2017.11.11	Sat	Site visit the treatment facility in Mactan Island. Site visit/ interview survey to Amkon site and Umapad site.	
11	2017.11.12	Sun	Data Arrangement/Analysis. Consultant team (Mr. Ando) departed from Manila to Cebu. Consultant team (Mr. Kohara) departed from Tokyo to Cebu.	PR1853 Manila-Cebu PR433 Narita-Cebu
12	2017.11.13	Mon	Courtesy call to the mayor of Consolacion. Internal meeting (JICA team and Consultant team).	

No.	Date	Day	Activities	Remarks
13	2017.11.14	Tue	Report to MDCDCB. JICA team (Mr. Yokouchi and Mr. Kobayashi) departed from Cebu to Tokyo. Research for water quality analysis companies. Field survey at discharging point on the river at Amkon site.	PR436 Cebu-Narita
14	2017.11.15	Wed	Meeting with Mandaue City (land use plan for Umapad). Site visit to the treatment facility in Mactan Island. Research for water quality analysis companies. Site visit for the water quality laboratory in NCWD.	
15	2017.11.16	Thu	Arrangement of the conditions for field investigation. Site visit to Umapad. Information gathering of existing treatment facility. Research for sludge collection companies.	
16	2017.11.17	Fri	Site visit to existing composting facility. Research for candidate outsourcing companies for field investigation. Organization/financial condition survey, procedure investigation for environmental impact assessment.	
17	2017.11.18	Sat	Internal meeting, Data Arrangement/Analysis and research for vehicle companies.	
18	2017.11.19	Sun	Data Arrangement/Analysis. Consultant team (Mr. Fujii, Mr. Nakamura and Mr. Hayashishita) departed from Cebu to Manila.	PR1854 Cebu-Manila
19	2017.11.20	Mon	Reporting/meeting with JICA Philippines office. Site visit to the sludge treatment facility in Manila. Research for vehicle companies and car maintenance companies. Visiting the power company.	
20	2017.11.21	Tue	Meeting with DENR. Site visit/interview investigation to the sludge collection company. Field survey at discharging point on the river at Umapad. Consultant team (Mr. Fujii) departed from Manila to Cebu. Consultant team (Mr. Nakamura and Mr. Hayashishita) departed from Manila to Tokyo.	PR1853 Manila-Cebu PR422 Manila-Haneda
21	2017.11.22	Wed	Meeting with the power company. Research for candidate outsourcing companies for field investigation. Research for vehicle companies and car maintenance companies. Visiting the power company.	

No.	Date	Day	Activities	Remarks
22	2017.11.23	Thu	Site visit to Consolacion landfill site. Researching the water quality analysis laboratory. Field research for sludge collection companies.	
23	2017.11.24	Fri	Reporting to MCDCB, MCWD. Meeting with the Environment and Natural resource department, Cebu City. Research for water quality analysis companies. Consultant team (Mr. Onozato) departed from Cebu to Tokyo.	PR436 Cebu-Narita
24	2017.11.25	Sat	Consultant team (Mr. Fujii, Mr. Ando and Mr. Kohara) departed from Cebu to Tokyo.	PR436 Cebu-Narita

(2nd Field Survey)

No.	Date	Day	Activities	Remarks
1	2018.1.28	Sun	JICA team (Mr. Kobayashi, Mr. Arami, Ms. Morita) and Consultant team (Mr. Fujii, Mr. Nakamura, Mr. Hayashishita, Mr. Ando, Mr. Onozato and Ms. Kamata) departed from Tokyo to Cebu.	PR433Narita-Cebu
2	2018.1.29	Mon	Meeting with MCWD, MCDCB regarding the concept of the Project.	
3	2018.1.30	Tue	Site visit to Amcon site.	
4	2018.1.31	Wed	Site visit to Cordova, Umapad, Amcon sites.	
5	2018.2.1	Thu	Meeting with existing sludge collection companies.	
6	2018.2.2	Fri	• Meeting with MCWD and 6LGUs (except Compostela). • Meeting with DENR.	
7	2018.2.3	Sat	• Data Arrangement/Analysis. • JICA team (Mr. Kobayashi, Mr. Arami, Ms Morita) departed from Cebu to Tokyo.	
8	2018.2.4	Sun	• Data Arrangement/Analysis. • Consultant team (Mr. Kumagae and Mr. Igarashi) departed from Tokyo to Cebu.	
9	2018.2.5	Mon	• Preparation of social survey. • Site visit to Cordova treatment facility in Mactan Island.	
10	2018.2.6	Tue	Meeting regarding natural condition survey.	
11	2018. 2.7	Wed	Site visit to Amcon site.	
12	2018. 2.8	Thu	Field survey in Mandaue City.	
13	2018. 2.9	Fri	• Preparation for natural condition survey. • Internal meeting for reporting the progress of each field and work schedule adjustment.	

No.	Date	Day	Activities	Remarks
14	2018. 2.10	Sat	Data Arrangement/Analysis.	
15	2018. 2.11	Sun	• Data Arrangement/Analysis. • Consultant team (Mr. Ishiura) departed from Tokyo to Cebu.	
16	2018. 2.12	Mon	• Confirmation of the study concept with Compostela and Liloan. • Meeting with MCWD.	
17	2018. 2.13	Tue	Site visit to Umapad.	
18	2018. 2.14	Wed	• Site visit to Naga. • Consultant team (Kohara) departed from Tokyo to Cebu.	
19	2018. 2.15	Thu	Site visit to Talisay.	
20	2018. 2.16	Fri	Meeting with MCWD.	
21	2018. 2.17	Sat	• Data Arrangement/Analysis. • Consultant team (Mr. Kumagae) departed from Cebu to Tokyo.	
22	2018. 2.18	Sun	• Data Arrangement/Analysis. • Consultant team (Mr. Igarashi) departed from Cebu to Tokyo.	
23	2018. 2.19	Mon	Meeting with MCWD and 6LGUs (except Compostela).	
24	2018. 2.20	Tue	Site visit to Binaliw final disposal site.	
25	2018. 2.21	Wed	• Preparation for natural condition survey. • Consultant team (Mr. Onozato and Ms. Kamata) departed from Cebu to Tokyo.	
26	2018. 2.22	Thu	Meeting with MCWD regarding the concept of the Project.	
27	2018. 2.23	Fri	• Site preparation for natural condition survey (Umapad and Amcon site). • Consultant team (Mr. Ando) departed from Cebu to Manila.	
28	2018. 2.24	Sat	Preparation for natural condition survey.	
29	2018. 2.25	Sun	• Data Arrangement/Analysis. • Consultant team (Mr. Fujii, Mr. Nakamura and Mr. Hayashishita) departed from Cebu to Manila.	
30	2018. 2.26	Mon	• Meeting with JICA Philippine office. • Consultant team (Mr. Fujii, Mr. Hayashishita, and Mr. Nakamura) departed from Manila to Cebu.	
31	2018. 2.27	Tue	Compiling the concept of the work and result of the survey.	
32	2018. 2.28	Wed	Meeting with MCWD and 6LGUs.	
33	2018. 3.1	Thu	Meeting with MCWD board members and confirmation meeting with Cebu City.	
34	2018. 3.2	Fri	Consultant team (Mr. Fujii, Mr. Hayashishita, Mr. Kohara and Mr. Ishiura) departed from Cebu to Tokyo.	PR436 Cebu-Narita
35	2018.3.4	Sun	Consultant team (Mr. Igarashi) Departed from Tokyo to Cebu.	PR433 Cebu-Narita

No.	Date	Day	Activities	Remarks
36	2018.3.5	Mon	Market price investigation.	
37	2018.3.6	Tue	Market price investigation.	
38	2018.3.7	Wed	Market price investigation.	
39	2018.3.8	Thu	Market price investigation.	
40	2018.3.9	Fri	Market price investigation.	
41	2018.3.10	Sat	Consultant team (Mr. Igarashi) Departed from Cebu to Tokyo.	PR436 Cebu-Narita

(3rd Field Survey)

No.	Date	Day	Activities	Remarks
1	2018.4.22	Sun	Consultant team (Mr. Fujii, Mr. Nakamura and Mr. Hayashishita) departed from Tokyo to Cebu.	PR433 Cebu-Narita
2	2018.4.23	Mon	• JICA team (Mr. Tomihara) departed from Manila to Cebu. • Confirmation of the situation for preparation of ordinances and agreement and explanation of survey plan in MCWD. • Confirmation of the situation for transferring the proposed site to Cebu City/reclamation plan.	
3	2018.4.24	Tue	• Meeting in Mandaue City regarding the countermeasure for emission gas from Umapad site. • Preparation of draft MoM.	
4	2018.4.25	Wed	• Meeting regarding the method for incorporating private collection companies in the Project. • Meeting with Cebu Province regarding the situation for transferring the proposed site/reclamation plan. • Meeting regarding draft MoM.	
5	2018.4.26	Thu	• Meeting with 6LGUs regarding the work borne by the Philippine side. • Confirmation of the result on natural condition survey. • JICA team (Mr. Tomihara) departed from Cebu to Manila.	
6	2018.4.27	Fri	• Signing the MoM. • Confirmation of the result on natural condition survey and social survey.	
7	2018.4.28	Sat	Consultant team (Mr. Fujii, Mr. Nakamura and Mr. Hayashishita) departed from Cebu to Tokyo.	PR436 Cebu-Narita

(4th Field Survey)

No.	Date	Day	Activities	Remarks
1	2018.12.2	Sun	Consultant team (Mr. Fujii, Mr. Nakamura and Mr. Hayashishita) departed from Tokyo to Cebu.	PR433 Cebu-Narita
2	2018.12.3	Mon	• Confirmation of the situation for preparation of ordinances and agreement and explanation of survey plan in MCWD. • Confirmation of the situation of Ordinance at Compostela.	
3	2018.12.4	Tue	• Meeting in Cebu City regarding the land acquisition and O&M transfer of the exiting de-watering plant. • Site survey. • Meeting with septage management board.	
4	2018.12.5	Wed	• Meeting with a landfill site operating company and landfill site survey.	
5	2018.12.6	Thu	• Meeting for reclamation plan of lagoon. • Meeting with the existing private de-sludgers.	
6	2018.12.7	Fri	• Meeting with DENR on the effluent standards. • Meeting on survey results and issues in MCWD.	
7	2018.12.8	Sat	Consultant team (Mr. Fujii, Mr. Nakamura and Mr. Hayashishita) departed from Cebu to Tokyo.	PR436 Cebu-Narita

(5th Field Survey: Draft Final Report Explanation)

No.	Date	Day	Activities	Remarks
1	2019.1.6	Sun	Consultant team (Mr. Fujii and Mr. Nakamura) departed from Tokyo to Cebu.	PR433 Cebu-Narita
2	2019.1.7	Mon	Explanation of Draft Final Report in MCWD.	
3	2019.1.8	Tue	• Explanation of Draft Final Report in MCWD. • Confirmation of effluent standards with DENR. • JICA team (Mr. Murakami, Mr. Takahashi and Mr. Shimodaira) departed from Tokyo to Cebu.	
4	2019.1.9	Wed	• JICA team (Mr. Tomihara) departed from Manila to Cebu. • Site survey. • Courtesy call to Governor of Cebu Province and report the result to MDCDCB. • Meeting on Minutes of Discussions. • JICA team (Mr. Yokohama City) departed from Tokyo to Cebu.	

No.	Date	Day	Activities	Remarks
5	2019.1.10	Thu	• Meeting with Cebu City for transfer of the existing de-watering plant. • Meeting with the 6 LGUs on the result of the survey.	
6	2019.1.11	Fri	• Site survey on the existing plant in Mactan island. • Courtesy call to Mayor of Cebu City. • Signing Minutes of Discussions.	
7	2019.1.12	Sat	All team members departed from Cebu to Tokyo/Manila.	PR436 Cebu-Narita

Appendix-3

List of Parties Concerned in the Recipient Country

Appendix-3 List of Parties Concerned in the Recipient Country

Preparatory Survey for the Septage Management Project for Metro Cebu Water District's Service

Area

List of Parties Concerned in the Recipient Country

<u>Organization and Name</u>	<u>Position</u>
Metropolitan Cebu Water District (MCWD)	
Mr. Joel Mari Yu	Chairman of the Board
Mr. Renato E. Mercado	Immediate Past Chairman of the Board
Mr. Jose Eugenio B. Singson Jr.	General Manager
Mr. Noel R. Dalena	Acting General Manager
Ms. Rowan E Tenedo	AGM Finance and Administration
Mr. Ferdinand Nicanor	AGM for Pipelines and Maintenance Group
Mr. John Paul Hofilenia Delgado	Division Manager Planning and Monitoring
Ms. Charmaine Kara	Manager, Public Affairs Department
Ms. Helen Aragon	Management Director Chemical Laboratory
Mr. Emmanuel C. Espina	Senior Corporate Planning Specialist
Mr. Edgar Ortega	Production and Distribution Department
Mr. Chito Delgado	Laboratory
Mr. Juanito D. Ando	General Service Department Transport Operation & Equipment Maintenance Division
Metro Cebu Development Coordinating Board (MCD CB)	
Ms. Evelyn N. Castro	Executive Director
Mr. Elizar L. Sabinay Jr.	Capability Training and Education Officer
Mr. Edward Peterkim Yu	Project Assistant, Mega Cebu Planning and Technical Support
Province of Cebu	
Mr. Hilario P. Davide III	Governor
Mr. Atty Jing Laochka	Consultant for Governor
Province Planning and Development Office (PPDO)	
Mr. Andres Suson	
Provincial Environment and Natural Resources Office (PENRO)	
Mr. Thebazile Anthony Monserate	Focal Person EMS Division
Ms. Ma.Rhica C. Evilla	Waste Management Section-Focal
Ms. Lovella L. Nakayama	Administrative Officer-designate
Cebu City	
Mr. Tomas Osmeña	Mayor
Mr. Randy Navarro	Executive Assistant Office of the Mayor

<u>Organization and Name</u>	<u>Position</u>
Mr. Hunez Douglas	Supervisor Repairs and Maintenance Division
Mr. Nigel Paul Villarete	Administrator
Talisay City	
Mr. Edwin Nierbes	Solid Waste Management Office
Mr. Dandi Capistrano	City Planning Office
Liloan	
Mr. Roland Tanunac	Municipal Environment and Natural Resources Office (MENRO)
Cebu City Environment and Natural Resources Office (CCENRO)	
Ms. Nida C. Cabrera	Officer in charge
Mr. Joey Baclayon	Engineer
Ms. Richy R. Honoridez	Binilaw new dumping site
Mr. Gilberto Pranza	STP Supervisor
Cebu City Engineering Office (CEO)	
Mr. Nilo C. Igot	Acting assistant City Engineer
Cebu City Office of Building Officer (OBO)	
Ms. Jeraly Mae M. Lucero	Engineer II
Mandaue City Planning and Development (CPDO)	
Mr. Marlo D. Ocleasa	Officer in charge
Ms. Charlene Canete	
Mr. John Federic Gomez	
Environment and Natural Resources Office (MCENRO)	
Ms. Angelica Alcantara	
Mandaue City Engineering Office (CEO)	
Mr. Robert Alforque	Officer in charge
Mr. Samuel S. Cui	
Mandaue City Office of Building Officer (OBO)	
Mr. Andres C. Suson	OIC
Mandaue City Septage and Sewerage Board (CSSB)	
Mr. Jesse Baring	
Consolacion City	
Ms. Teresa Alegado	Mayor
Department of Environment and Natural Resources - Environment Management Bureau (DENR- EMB Region 7)	
Ms. Cindylyn Pepito	Section Chief for Ambient Quality Monitoring Section – EMB Region 7
Ms. Anecita Q. Dinoy	Chief Environment Management Specialist

<u>Organization and Name</u>	<u>Position</u>
Mr. Julius A. Canonigo	Environment Management Specialist
Philippine Statistics Authority (PSA) Cebu Provincial Statistical Office	
Mr. Firmo C. Diputado	Head, Chief Statistical Specialist
Visayan Electric Company (VECO)	
Mr. Roger C. Montebon	Executive Officer
JICA Philippines Office	
Ayumu Oshima	Vice Director General
Takanori Tomihara	Project Coordinator
Ms. Florida Chan	Section Chief for Environment and Social Development Section Human Security Group
Mr. Kessy A.Reyes	Senior Program Officer for Poverty Reduction Section Human Security Group
Mr. Christian Vic Perez	Program Officer for Training Section

Appendix-4

Minutes of Discussions (M/D)

Minutes of Discussions
on the Preparatory Survey for
Septic Tank Sludge Treatment Construction Project for Metro Cebu Water District

In response to the request from the Government of The Republic of The Philippines (hereinafter referred to as “the Philippines”), Japan International Cooperation Agency (hereinafter referred to as “JICA”) dispatched the Preparatory Survey Team for the Outline Design (hereinafter referred to as “the Team”) of Septic Tank Sludge Treatment Construction Project for Metro Cebu Water District (hereinafter referred to as “the Project”) to the Philippines, including advisers of the Yokohama City Government, headed by Noriaki Yokouchi, Assistant Director, Environment Management Team 1, Environment Management Group, Global Environment Department, JICA Headquarter, from November 8 to 14, 2017. The Team held a series of discussions with the officials of the Government of the Philippines and conducted a field survey. In the course of the discussions, both sides have confirmed the main items described in the attached sheets.

Metropolitan Cebu, November 10, 2017

横内 宣明

Mr. Noriaki Yokouchi
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan



Mr. Noel R. Dalena
Acting General Manager
Metropolitan Cebu Water District
The Republic of The Philippines

小林 史幸

Mr. Chikayuki Kobayashi
Deputy Director
Sewer Management Division, Environmental
Planning Bureau, City of Yokohama

(Witness)



Hilario P. Davide III

Chairperson
Metro Cebu Development and Coordinating Board



Mr. Hon. Gabriel Luis R. Quisumbing
Co-Chairperson
Metro Cebu Development and Coordinating Board

ATTACHMENT

1. Objective of the Project

The objective of the Project is to promote septic tank sludge treatment by/through construction of septic tank sludge treatment facilities and procurement of vacuum trucks, thereby contributing to improvement of contaminated water environment.

2. Title of the Preparatory Survey

Both sides confirmed the title of the Preparatory Survey as “the Preparatory Survey for the Project for Septic Tank Sludge Treatment Construction Project for Metro Cebu Water District”.

3. Project site

Both sides confirmed that the sites of the Project are in Metro Cebu Water District’s service area, which is shown in Annex 1.

4. Responsible authority for the Project

Both sides confirmed the authorities responsible for the Project are as follows:

4-1. The Metropolitan Cebu Water District (hereinafter referred to as “MCWD”) will be the executing agency for the Project (hereinafter referred to as “the Executing Agency”). The Executing Agency shall coordinate with all the relevant authorities to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be managed by relevant authorities properly and on time. The organization charts are shown in Annex 2.

4-2. The line ministry of the Executing Agency is Local Water Utilities Administration (hereinafter referred to as “LWUA”). LWUA shall be responsible for supervising the Executing Agency on behalf of the Government of the Philippines.

5. Items requested by the Government of the Philippines

5-1. As a result of discussions, both sides confirmed that the items requested by the Government of the Philippines are as follows:

- Sludge Treatment Facility including Additional Facilities
- Sludge Re-Use Facility
- Vacuum Trucks

5-2. JICA will assess the feasibility of the above requested items through the survey and will report the findings to the Government of Japan. The final scope of the Project will be decided by the Government of Japan.



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6. Procedures and Basic Principles of Japanese Grant

6-1. The Philippine side agreed that the procedures and basic principles of Japanese Grant as described in Annex 3 shall be applied to the Project.

As for the monitoring of the implementation of the Project, JICA requires Philippine side to submit the Project Monitoring Report, the form of which is attached as Annex 4.

6-2. The Philippine side agreed to take the necessary measures, as described in Annex 5, for smooth implementation of the Project. The contents of the Annex 5 will be elaborated and refined during the Preparatory Survey and be agreed in the mission dispatched for explanation of the Draft Preparatory Survey Report.

The contents of Annex 5 will be updated as the Preparatory Survey progresses, and eventually, will be used as an attachment to the Grant Agreement.

7. Adviser of the Preparatory Survey

Since the Project was proposed by the Yokohama City Government to JICA and utilizing its technology and knowhow is assumed, the Yokohama City Government assigned advisors and provides necessary support to JICA during the Preparatory Survey.

8. Schedule of the Survey

8-1. The Team will continue the 1st period of the survey in the Philippines until November 25, 2017.

8-2. The Team will proceed with further survey in the Philippines until April 2018.

8-3. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to the Philippines in order to explain its contents around August 2018.

8-4. If the contents of the draft Preparatory Survey Report is accepted and the undertakings for the Project are fully agreed by the Philippine side, JICA will finalize the Preparatory Survey Report and send it to the Philippines around November 2018.

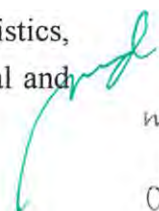
8-5. The above schedule is tentative and subject to change.

9. Environmental and Social Considerations

9-1. The Philippine side confirmed to give due environmental and social considerations before and during implementation, and after completion of the Project, in accordance with the JICA Guidelines for Environmental and Social Considerations (April, 2010).

9-2. The Project is categorized as “B” from the following considerations:

The project is not located in a sensitive area, nor has sensitive characteristics, nor falls into sensitive sectors under the JICA guidelines for environmental and



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social considerations (April, 2010), and its potential adverse impacts on the environment are not likely to be significant.

The Philippine side confirmed to conduct the necessary procedures concerning the environmental assessment (including stakeholder meetings, Environmental Impact Assessment (EIA) /Initial Environmental Examination (IEE) and information disclosure, etc.) and make EIA/IEE report of the Project. The EIA/IEE approval shall be received from the responsible authorities and submitted to JICA by August 2018.

- 9-3. For the Project that will result in involuntary resettlement, the Philippine side confirmed to prepare a Resettlement Action Plan (RAP)/Abbreviated Resettlement Action Plan (ARAP) and make it available to the public. In addition, the Philippine side confirmed to provide the affected people with sufficient compensation and/or support in accordance with RAP/ARAP, which is consistent with JICA Guidelines for Environmental and Social Considerations (April, 2010), in a timely manner.

10. Other Relevant Issues

10-1. Origin of the Project

MCWD explained that the Project requested by MCWD is one of short-term priority projects in the Mega Cebu Roadmap 2050 which was formulated by Metro Cebu Development and Coordinating Board (MCDCB) supported by JICA as well as Yokohama City Government and this Roadmap was approved by the National Economic Development Authority (NEDA) in 2015.

10-2. Assistance from MCDCB

MCDCB offered to support the Preparatory Survey in coordinating with the relevant LGUs, regional line agencies; and private and civil society organizations.

10-3. Inception Report

The contents of Inception Report that the Team explained was understood and accepted in principle by the Philippine side.

10-4. Arrangements for the Survey

As a response to the request by the Team, the Philippine side agreed to provide the Team with the following items in cooperation with other relevant organizations:

- (1) provide an appropriate office space for the Team;
- (2) reply to inquiries by the Team;
- (3) provide the required data and information for the Preparatory Survey;
- (4) organize and assign C/P team;
- (5) arrange the permission on the sites and attend the sites;



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- (6) cooperate with the Team for arrangement of acquiring the data;
- (7) arrange the permission of taking pictures and entrance to the specific facilities; and
- (8) arrange the permission of the specific data to abroad.

10-5. Tax Exemption

Although general undertakings of both sides are shown in Annex-5, the Team emphasized the responsibilities of the Philippine side to execute following matters and the Philippine side agreed to it.

- Both sides confirmed that import tax, customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services will be exempted. The Philippine side will take necessary measures for tax exemption, if any.

10-6. Safety and Security

The Philippine side agreed to take measures to secure the safety of the members of the Team over the survey period.

10-7. Careful Handling of the Survey Reports

The Team explained that certain information in both the draft and the final reports of the Survey should be dealt with confidentially until the tender is closed when the Project proceeds to actual implementation stage, since disclosure of the information would affect fairness of tender procedure. The Philippine side understood the sensitivity in dealing with the Survey reports and agreed on careful handling of the reports for achieving fair tendering.

10-8. Approval Procedure

MCWD agreed that any documents needed to get approval for the Project from the relevant authorities in the Philippines will be prepared by MCWD based on the information to be provided by the Team to MCWD soon after the draft Preparatory Survey Report is explained and shared by JICA. MCWD understood that these documents need to be approved by October 2018, as is required before the approval by Japanese Cabinet. MCWD informed that MCWD will follow the approval process for ensuring timely approval of these documents before the approval of Japanese Cabinet.

10-9. Land for the Project

MCWD explained that the current situations of securing land necessary for the implementation of the Project as below. JICA emphasized the importance of securing the land and asked MCWD to secure the land necessary for the Project and explained that the land needs to be secured by December 2017 so that the land can be considered as the candidate sites for the Project through the Preparatory Survey. MCWD agreed to it.



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(1) Umapad landfill site

According to the commitment letter from Mandaue City to MCWD, one (1) hectare land area in the Umapad Landfill for the Project and the Preparatory Survey was secured and would not be used for any other purpose until the actual required area is determined by the Preparatory Survey. MCWD showed their understanding that Mandaue City has been improving the conditions of the access road and waste picker activities in order to proceed the closure of the landfill site to utilize the site for other purposes such as septage treatment for the Project.

(2) Cebu City's SpTP (Septage Treatment Plant) site

The governor of the Cebu Province committed to secure the land of Cebu City's SpTP site to make available the site in North Reclamation Area to support implementation of the Preparatory Survey. Although the current owner of the land of the site is Cebu City, the ownership of the land is supposed to be transferred from Cebu City to Cebu Province in accordance with the Memorandum of Agreement signed between Cebu City and Cebu Province in December 2016. JICA explained that the procedure for the land transfer needs to be proceeded in order to enable land utilization for the Project by August 2018. Moreover, JICA requested MCWD to complete reclamation of the existing pond in the SpTP site by the Philippine side before the construction of new SpTP for the Project. MCWD agreed to find the way in consultation with the relevant organizations and the Team.

(3) Inayawan Sanitary Landfill site

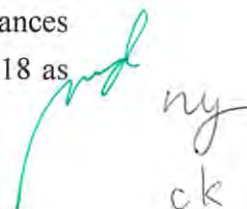
MCWD explained that the candidate site in Inayawan area is still under discussion with Cebu City and the procurement for the clearance works is under procedure. JICA explained that clearance works need to be completed before the topographical and geographical survey to be conducted at the beginning of the 2nd field survey. MCWD understood that.

(4) Other Candidate Site

MCWD showed their intention to continue to find other candidate site for the Project intended for North 2 area.

10-10. Septage Ordinance for Cities and Municipalities and MOU on Septage Management Program

Ordinances for cities and municipalities in the Project area are needed in order to implement the Septage Management Program efficiently. MOU is necessary for clarifying roles of LGUs and MCWD in cases where ordinance does not specify MCWD as implementing unit for septage management. In addition, MOU is also needed to clarify rights and responsibilities regarding use of the land for SpTP between MCWD and LGUs that own the land. MCWD agreed that Ordinances and MOU regarding the Project are expected to be established by June 2018 as



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shown in the Annex 6.

10-11. Establishment of Septage Management Board

Septage Management Board is necessary for preparing MOU in each LGU together with MCWD, and ensuring the effectiveness and proper monitoring of the Project. Current status of Establishment of Septage Management Board in each LGU is as shown in the Annex 6. MCWD agreed that Septage Management Board is expected to be established by March 2018.

10-12. Project Name

MCWD proposed changing the Project name to “The Septage Management Project for Metro Cebu Water District’s Service Area”. The JICA mission took note of it.

10-13. Septage Dewatering Unit

MCWD requested JICA to consider the multidisc screw press dewatering equipment installed in a pilot project conducted in Cebu City in collaboration with Yokohama City Government since the functionality and effectiveness have been observed through the pilot project and the actual operation and it is recommended by the Department of Public Works and Highway (DPWH) for the whole of Philippines. The JICA mission took note of it.

Annex 1 Project Site

Annex 2 Organization Chart

Annex 3 Japanese Grant

Annex 4 Project Monitoring Report (template)

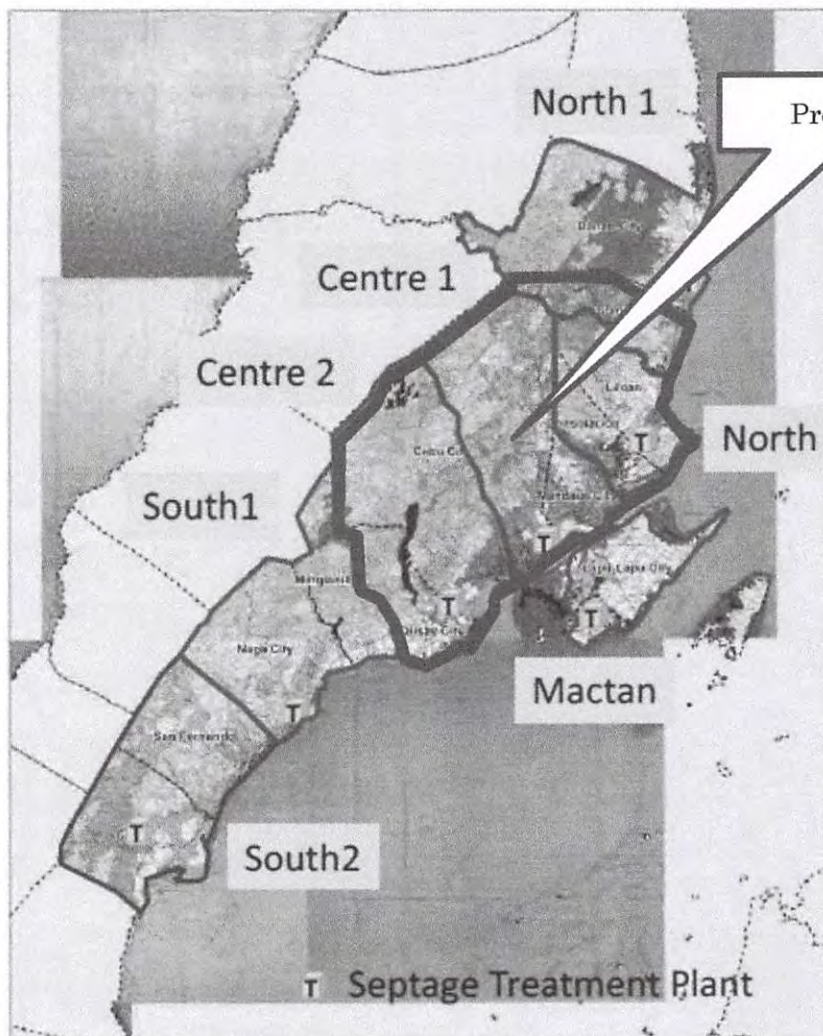
Annex 5 Major Undertakings to be taken by the Government of the Philippines

Annex 6 Status of Ordinance/MOU/Septage Management Board



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Project Site



Coverage areas for septage treatment works proposed as a priority project in the Road Map for Sustainable Urban Development in Metro Cebu

Handwritten signatures and initials:
 [Signature]
 [Initials: ny, ck]
 [Initials: md]

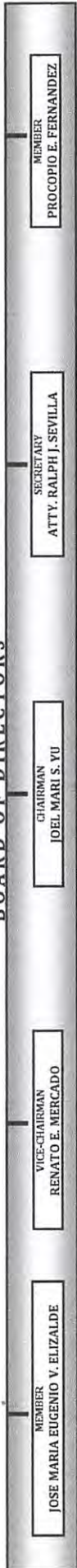
Metropolitan Cebu Water District

Table of Organization

As of November 1, 2017

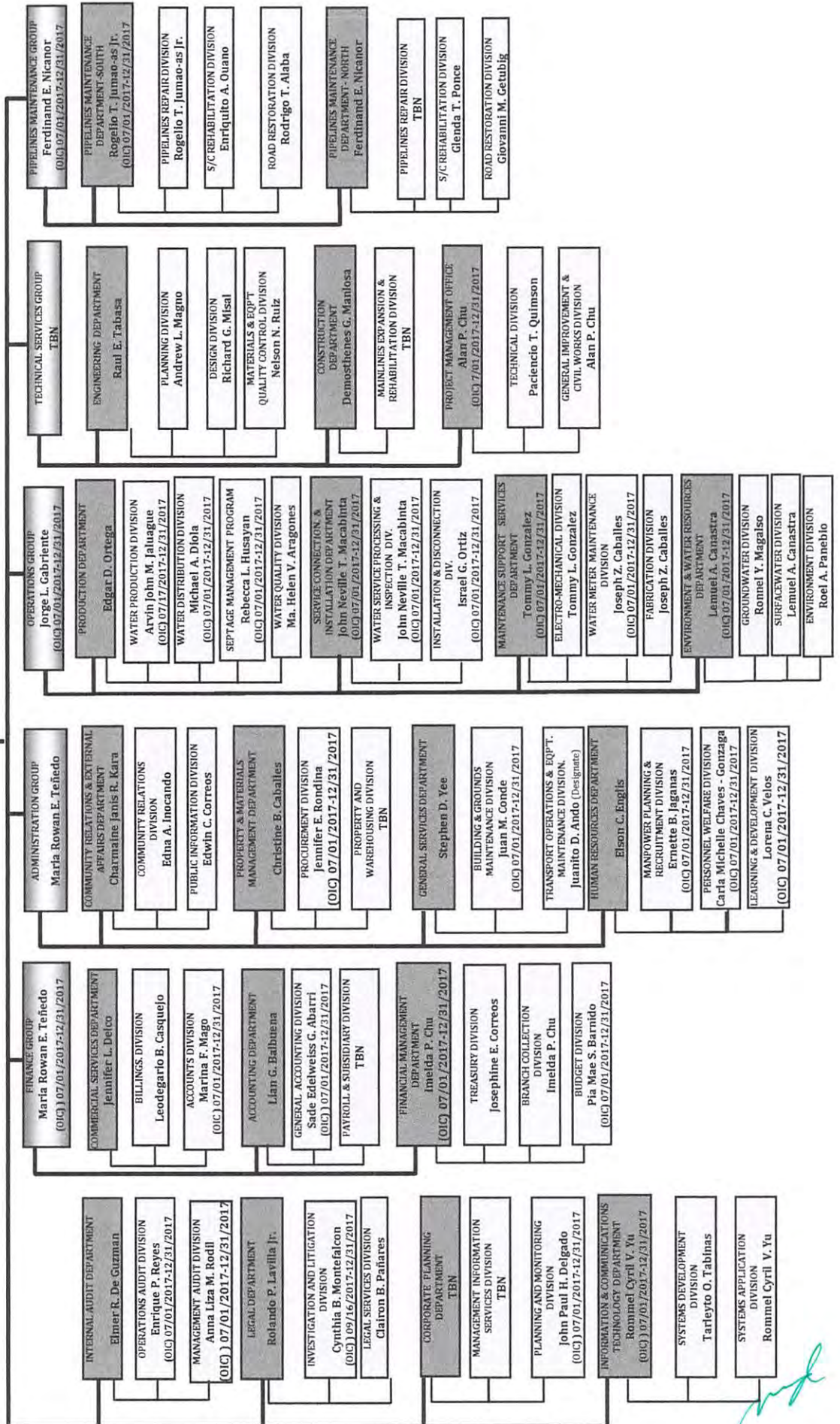
Annex 2

BOARD OF DIRECTORS



ACTING GENERAL MANAGER

Noel R. Dalena
01/01/2017-12/31/2017



JAPANESE GRANT

The Japanese Grant is non-reimbursable fund provided to a recipient country (hereinafter referred to as “the Recipient”) to purchase the products and/or services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. Followings are the basic features of the project grants operated by JICA (hereinafter referred to as “Project Grants”).

1. Procedures of Project Grants

Project Grants are conducted through following procedures (See “PROCEDURES OF JAPANESE GRANT” for details):

(1) Preparation

- The Preparatory Survey (hereinafter referred to as “the Survey”) conducted by JICA

(2) Appraisal

- Appraisal by the government of Japan (hereinafter referred to as “GOJ”) and JICA, and Approval by the Japanese Cabinet

(3) Implementation

Exchange of Notes

- The Notes exchanged between the GOJ and the government of the Recipient

Grant Agreement (hereinafter referred to as “the G/A”)

- Agreement concluded between JICA and the Recipient

Banking Arrangement (hereinafter referred to as “the B/A”)

- Opening of bank account by the Recipient in a bank in Japan (hereinafter referred to as “the Bank”) to receive the grant

Construction works/procurement

- Implementation of the project (hereinafter referred to as “the Project”) on the basis of the G/A

(4) Ex-post Monitoring and Evaluation

- Monitoring and evaluation at post-implementation stage

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide basic documents necessary for the appraisal of the the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of

relevant agencies of the Recipient necessary for the implementation of the Project.

- Evaluation of the feasibility of the Project to be implemented under the Japanese Grant from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.
- Confirmation of Environmental and Social Considerations

The contents of the original request by the Recipient are not necessarily approved in their initial form. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant.

JICA requests the Recipient to take measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the executing agency of the Project. Therefore, the contents of the Project are confirmed by all relevant organizations of the Recipient based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA contracts with (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the feasibility of the Project.

3. Basic Principles of Project Grants

(1) Implementation Stage

1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the Recipient to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Recipient to define the necessary articles, in accordance with the E/N, to implement the Project, such as conditions of disbursement, responsibilities of the Recipient, and procurement conditions. The terms and conditions generally applicable to the Japanese Grant are stipulated in the "General Terms and Conditions for Japanese Grant (January 2016)."

2) Banking Arrangements (B/A) (See “Financial Flow of Japanese Grant (A/P Type)” for details)

- a) The Recipient shall open an account or shall cause its designated authority to open an account under the name of the Recipient in the Bank, in principle. JICA will disburse the Japanese Grant in Japanese yen for the Recipient to cover the obligations incurred by the Recipient under the verified contracts.
- b) The Japanese Grant will be disbursed when payment requests are submitted by the Bank to JICA under an Authorization to Pay (A/P) issued by the Recipient.

3) Procurement Procedure

The products and/or services necessary for the implementation of the Project shall be procured in accordance with JICA's procurement guidelines as stipulated in the G/A.

4) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the Recipient to continue to work on the Project's implementation after the E/N and G/A.

5) Eligible source country

In using the Japanese Grant disbursed by JICA for the purchase of products and/or services, the eligible source countries of such products and/or services shall be Japan and/or the Recipient. The Japanese Grant may be used for the purchase of the products and/or services of a third country as eligible, if necessary, taking into account the quality, competitiveness and economic rationality of products and/or services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm, which enter into contracts with the Recipient, are limited to "Japanese nationals", in principle.

6) Contracts and Concurrence by JICA

The Recipient will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be concurred by JICA in order to be verified as eligible for using the Japanese Grant.

7) Monitoring

The Recipient is required to take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and to regularly report to JICA about its status by using the Project Monitoring Report (PMR).

8) Safety Measures

The Recipient must ensure that the safety is highly observed during the implementation of the Project.

9) Construction Quality Control Meeting

Construction Quality Control Meeting (hereinafter referred to as the “Meeting”) will be held for quality assurance and smooth implementation of the Works at each stage of the Works. The member of the Meeting will be composed by the

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Recipient (or executing agency), the Consultant, the Contractor and JICA. The functions of the Meeting are as followings:

- a) Sharing information on the objective, concept and conditions of design from the Contractor, before start of construction.
- b) Discussing the issues affecting the Works such as modification of the design, test, inspection, safety control and the Client's obligation, during of construction.

(2) Ex-post Monitoring and Evaluation Stage

- 1) After the project completion, JICA will continue to keep in close contact with the Recipient in order to monitor that the outputs of the Project is used and maintained properly to attain its expected outcomes.
- 2) In principle, JICA will conduct ex-post evaluation of the Project after three years from the completion. It is required for the Recipient to furnish any necessary information as JICA may reasonably request.

(3) Others

1) Environmental and Social Considerations

The Recipient shall carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the Recipient and JICA Guidelines for Environmental and Social Considerations (April, 2010).

2) Major undertakings to be taken by the Government of the Recipient

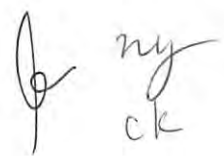
For the smooth and proper implementation of the Project, the Recipient is required to undertake necessary measures including land acquisition, and bear an advising commission of the A/P and payment commissions paid to the Bank as agreed with the GOJ and/or JICA. The Government of the Recipient shall ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

3) Proper Use

The Recipient is required to maintain and use properly and effectively the products and/or services under the Project (including the facilities constructed and the equipment purchased), to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Japanese Grant.

4) Export and Re-export

The products purchased under the Japanese Grant should not be exported or re-exported from the Recipient.



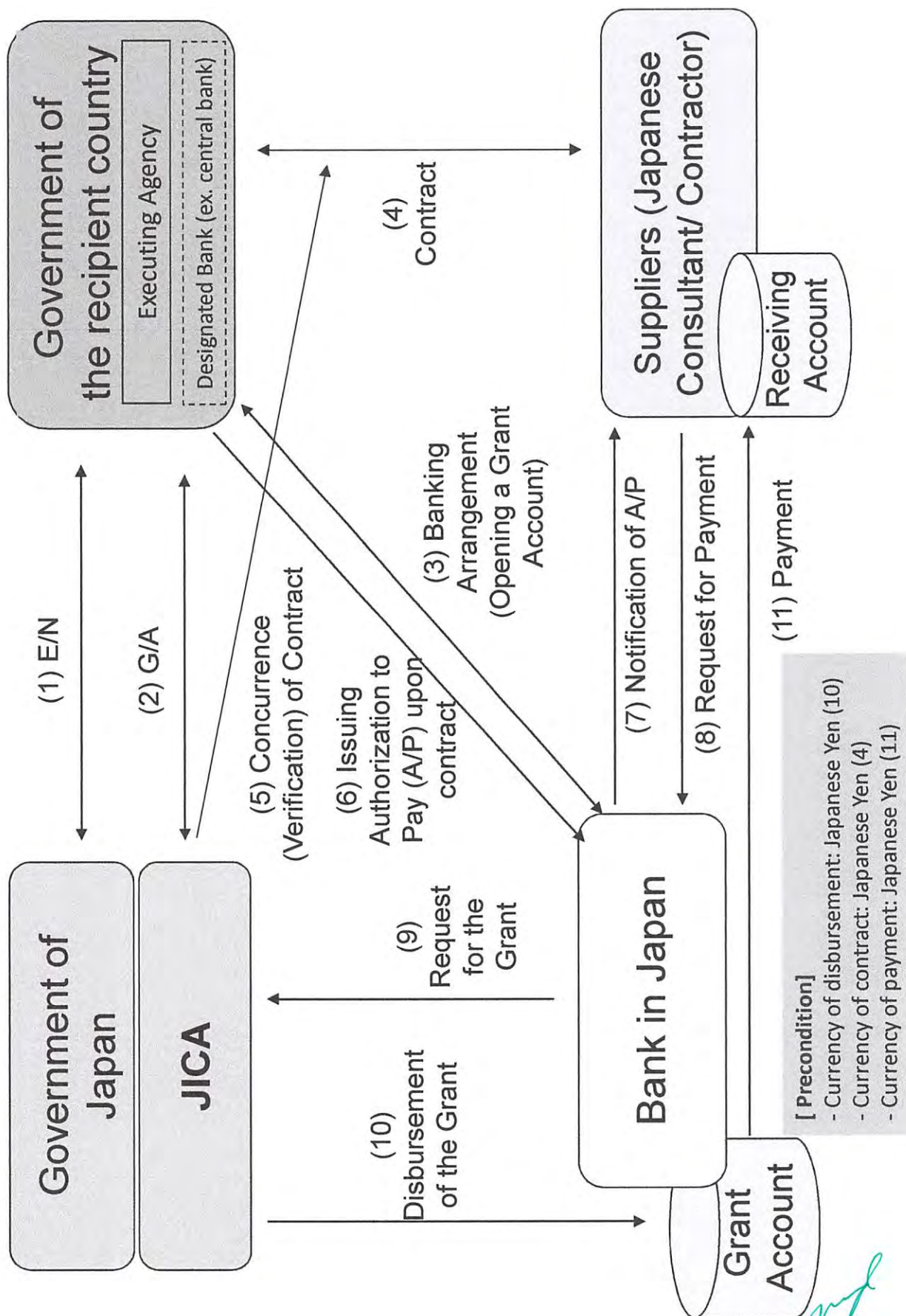
PROCEDURES OF JAPANESE GRANT

Stage	Procedures	Remarks	Recipient Government	Japanese Government	JICA	Consultants	Contractors	Agent Bank
Official Request	Request for grants through diplomatic channel	Request shall be submitted before appraisal stage.	x	x				
1. Preparation	(1) Preparatory Survey Preparation of outline design and cost estimate		x		x	x		
2. Appraisal	(2) Preparatory Survey Explanation of draft outline design, including cost estimate, undertakings, etc.		x		x	x		
	(3) Agreement on conditions for implementation	Conditions will be explained with the draft notes (E/N) and Grant Agreement (G/A) which will be signed before approval by Japanese government.	x	x (E/N)	x (G/A)			
	(4) Approval by the Japanese cabinet			x				
3. Implementation	(5) Exchange of Notes (E/N)		x	x				
	(6) Signing of Grant Agreement (G/A)		x		x			
	(7) Banking Arrangement (B/A)	Need to be informed to JICA	x					x
	(8) Contracting with consultant and issuance of Authorization to Pay (A/P)	Concurrence by JICA is required	x			x		x
	(9) Detail design (D/D)		x			x		
	(10) Preparation of bidding documents	Concurrence by JICA is required	x			x		
	(11) Bidding	Concurrence by JICA is required	x			x	x	
	(12) Contracting with contractor/supplier and issuance of A/P	Concurrence by JICA is required	x				x	x
	(13) Construction works/procurement	Concurrence by JICA is required for major modification of design and amendment of contracts.	x			x	x	
	(14) Completion certificate		x			x	x	
4. Ex-post monitoring & evaluation	(15) Ex-post monitoring	To be implemented generally after 1, 3, 10 years of completion, subject to change	x		x			
	(16) Ex-post evaluation	To be implemented basically after 3 years of completion	x		x			

notes:

1. Project Monitoring Report and Report for Project Completion shall be submitted to JICA as agreed in the G/A.
2. Concurrence by JICA is required for allocation of grant for remaining amount and/or contingencies as agreed in the G/A.

Financial Flow of Japanese Grant (A/P Type)



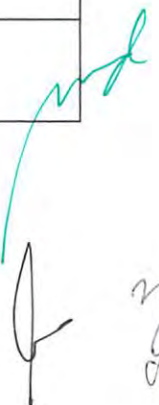
Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXXX
20XX, Month

Organizational Information

Signer of the G/A (Recipient)	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:
Executing Agency	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:
Line Ministry	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:

General Information:

Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

1: Project Description

1-1 Project Objective

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1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

--

1-3 Indicators for measurement of "Effectiveness"

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr)	Target (Yr)
Qualitative indicators to measure the attainment of project objectives		

2: Details of the Project

2-1 Location

Components	Original (proposed in the outline design)	Actual
1.		

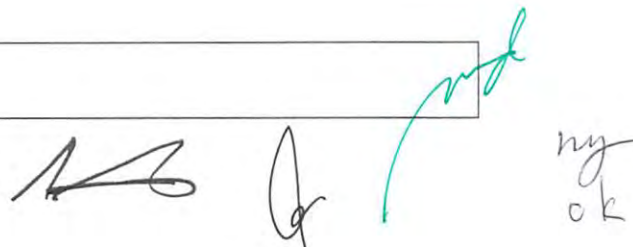
2-2 Scope of the work

Components	Original* (proposed in the outline design)	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

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2-3 Implementation Schedule

Items	Original		Actual
	(proposed in the outline design)	(at the time of signing the Grant Agreement)	

Reasons for any changes of the schedule, and their effects on the project (if any)

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations

See Attachment 2.

2-4-2 Activities

See Attachment 3.

2-4-3 Report on RD

See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant(Confidential until the Bidding)

Components			Cost (Million Yen)	
	Original (proposed in the outline design)	Actual (in case of any modification)	Original ^{1),2)} (proposed in the outline design)	Actual
	1.			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

Components			Cost (1,000 Taka)	
	Original (proposed in the outline design)	Actual (in case of any modification)	Original ^{1),2)} (proposed in the outline design)	Actual
	1.			

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original (at the time of outline design)

name:

role:

financial situation:

institutional and organizational arrangement (organogram):

human resources (number and ability of staff):

Actual (PMR)

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

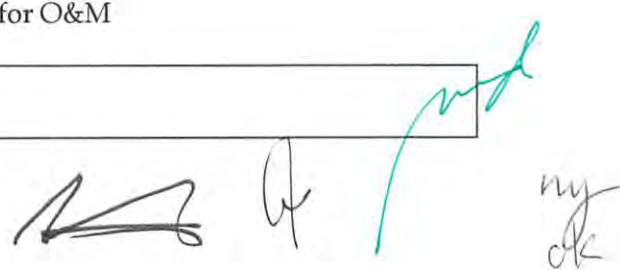
Original (at the time of outline design)

Actual (PMR)

3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

Original (at the time of outline design)



Actual (PMR)

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks (at the time of outline design)

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:

	Contingency Plan (if applicable):
Actual Situation and Countermeasures	
(PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

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5-2 Lessons Learnt and Recommendations

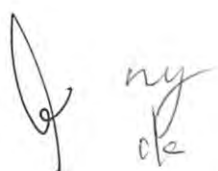
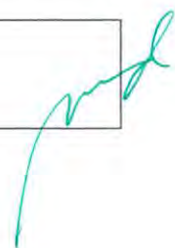
Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

--

5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

--



Attachment

1. Project Location Map
 2. Specific obligations of the Recipient which will not be funded with the Grant
 3. Monthly Report submitted by the Consultant
 - Appendix - Photocopy of Contractor's Progress Report (if any)
 - Consultant Member List
 - Contractor's Main Staff List
 4. Check list for the Contract (including Record of Amendment of the Contract/ Agreement and Schedule of Payment)
 5. Environmental Monitoring Form / Social Monitoring Form
 6. Monitoring sheet on price of specified materials (Quarterly)
 7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final) only)
 8. Pictures (by JPEG style by CD-R) (PMR (final) only)
 9. Equipment List (PMR (final) only)
 10. Drawing (PMR (final) only)
 11. Report on RD (After project)
- 
- 

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

	Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price $C=A \times B$	1% of Contract Price D	Condition of payment	
						Price (Decreased) $E=C-D$	Price (Increased) $F=C+D$
1	Item 1	●●t	●	●	●	●	●
2	Item 2	●●t	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

	Items of Specified Materials	1st month, 2015	2nd month, 2015	3rd month, 2015	4th	5th	6th
1	Item 1	●	●	●			
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)

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Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

Major Undertakings to be taken by the Government of the Philippines

1. Specific obligations of the Government of the Philippines which will not be funded with the Grant**(1) Before the Tender**

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To open bank account (B/A)	within 1 month after the signing of the G/A	MCWD		
2	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the consultant	within 1 month after the signing of the contract	MCWD		
3	To approve EIA(Conditions of approval should be fulfilled, if any) and secure the necessary budget for implementation.	within 1 month after the signing of the G/A	DENR/ LGUs		
4	To secure Project site and temporary yard.	before start of the construction	LGUs/ MCWD		
5	To remove and relocate the following facilities.	before start of the construction	LGUs/ MCWD		
6	To construct gates and fences to be necessary for the septage treatment facility and parking lot for the Project.	before start of the construction	LGUs/ MCWD		
7	To submit Project Monitoring Report (with the result of Detail Design)	before preparation of bidding documents	MCWD		

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the Supplier(s)	within 1 month after the signing of the contract(s)	MCWD		
2	To bear the following commissions to a bank in Japan for the banking services based upon the B/A				
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	MCWD		
	2) Payment commission for A/P	every payment	DOF		
3	To ensure prompt unloading and customs clearance at ports of disembarkation in recipient country and to assist the Supplier(s) with internal transportation therein	during the Project	MCWD		
4	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	MCWD		
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted and/or be borne by its designated authority without using the Grant	during the Project	MCWD		
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	MCWD		
7	1) To submit Project Monitoring Report	every month	MCWD		
	2) To submit Project Monitoring Report (final)	within one month after signing of Certificate of Completion for the works under the contract(s)	MCWD		
8	To submit a report concerning completion of the Project	within six months after completion of the Project	MCWD		
9	To construct access roads wide enough for the operation and maintenance of the sludge treatment facilities	3 months before completion of the construction	LGUs/ MCWD		
	1) Outside the site				
10	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site(s)				
	1) Electricity The distributing line to the site	before start of the construction	LGUs/ MCWD		
	2) Water Supply The city water distribution main to the site	before start of the construction	LGUs/ MCWD		

	3) Furniture and Equipment General furniture	1 month before completion of the construction	MCWD		
11	To take necessary measure for safety construction - traffic control - rope off	during the construction	LGUs/ MCWD		
12	To implement EMP and EMoP	during the construction	MCWD		
13	To submit results of environmental monitoring to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	during the construction	MCWD		
14	To implement RAP (livelihood restoration program, if needed)	for a period based on livelihood restoration program	LGUs/ MCWD		
15	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report - Period of the monitoring may be extended if affected persons' livelihoods are not sufficiently restored. Extension of the monitoring will be decided based on agreement between MCWD and JICA. (if needed)	- until the end of livelihood restoration program (In case that livelihood restoration program is provided) - for two years after land acquisition and resettlement complete (In case that livelihood restoration program is not provided)	LGUs/ MCWD		

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To implement EMP and EMoP	for a period based on EMP and EMoP	MCWD		
2	To submit results of environmental monitoring to JICA, by using the monitoring form, semiannually - The period of environmental monitoring may be extended if any significant negative impacts on the environment are found. The extension of environmental monitoring will be decided based on the agreement between MCWD and JICA.	for three years after the Project	MCWD		
3	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	After completion of the construction	MCWD		

2. Other obligations of the Government of the Philippines funded with the Grant

NO	Items	Deadline	Amount (Million Japanese Yen)*
1	To construct facilities and to procure equipment 1) To conduct the following transportation a) Marine(Air) transportation of the products from Japan to the recipient country b) Internal transportation from the port of disembarkation to the project site 2) To construct access roads a) Within the site 3) To construct the temporary building 4) To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities a) Electricity - The drop wiring and internal wiring within the site - The main circuit breaker and transformer b) Water Supply - The supply system within the site (receiving and/or elevated tanks) c) Drainage - The drainage system within the site d) Furniture and Equipment - Project equipment	Project completion	
2	To implement detailed design, bidding support and construction supervision (Consulting Service)		
	Total		To be estimated

* The Amount is provisional. This is subject to the approval of the Government of Japan.

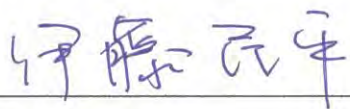
Status of Ordinance/MOU/Septage Management Board

LGUs	Septage Ordinance	Septage Management Board	MCWD's role as Implementing Unit for Septage Management	Necessary Arrangement regarding Ordinance/MOU	Remarks
Compostela	Not yet (In progress)	Not yet	No	To prepare Ordinance	
Liloan	Yes	Not yet (In progress)	Yes (Clarified in Ordinance)	None	In case the site for SpTP is located in the City, MOU regarding use of the land is necessary.
Consolasion	Yes	Not yet (In progress)	Yes (Clarified in Ordinance)	None	In case the site for SpTP is located in the City, MOU regarding use of the land is necessary.
Cebu City	Yes	Yes	Not yet (In progress)	To prepare MCWD-MOU regarding implementing unit and use of the land	Under discussion in City Council board
Talisay City	Yes	Not yet (In progress)	Yes (Clarified in Ordinance)	None	
Mandaue City	Yes	Yes	No	To prepare MCWD-MOU regarding implementing unit and use of the land	Under discussion through Mandaue City Sewerage and Septage Board
Province Of Cebu	Not necessary	Not necessary	Not necessary	To prepare MCWD-MOU regarding use of the land	

Minutes of Discussions
on the Preparatory Survey for
The Septage Management Project for Metro Cebu Water District's Service Area

In response to the request from the Government of The Republic of The Philippines (hereinafter referred to as "the Philippine"), Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") of the Septage Management Project for Metro Cebu Water District's Service Area (hereinafter referred to as "the Project") to the Philippines headed by Mimpei ITO, Director, Environment Management Team 1, Environment Management Group, Global Environment Department, JICA Headquarter, from April 23 to 27, 2018. The Team held a series of discussions with the officials of the Government of the Philippines and conducted a field survey. In the course of the discussions, both sides have confirmed the main items described in the attached sheets.

Metropolitan Cebu, April 27, 2018



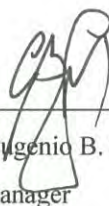
Dr. Mimpei ITO

Leader

Preparatory Survey Team

Japan International Cooperation Agency

Japan



Mr. Jose Eugenio B. Singson Jr.

General Manager

Metropolitan Cebu Water District

The Republic of The Philippines



Mr. Takayuki TOMIHARA

Developing Planning

Preparatory Survey Team

Japan International Cooperation Agency

Japan

ATTACHMENT

1. Risk of generating combustible gas at North Septage Treatment Plant (hereinafter referred to as SpTP) (Umapad site)

(1) Japan side explained the following points about risk of generating combustible gas at Umapad site;

- Umapad site which used to be final disposal site of solid waste was closed 2 years ago. It is risky in fire / explosion due to combustible gas including methane during construction and operation/maintenance of SpTP.
- Around 10 - 15 years are necessary in general for stabilization of the closed waste disposal site. It is difficult for the Team to confirm the safety and stabilization of Umapad site.
- Japanese Ministry of Environment stipulates law and standards for closing final disposal site and utilizing the site for another purpose, which require monitoring combustible gas and confirming the decrease / stabilization of amount of generated combustible gas.
- Gas monitoring as well as gas removal activity have not been conducted in Umapad site. Necessary information to confirm the gas condition is unavailable.

(2) Japan side also explained that North SpTP construction will be out of scope for the requested grant aid project due to following reasons;

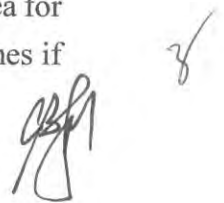
- Conditions of gas generation is not able to be confirmed.
- Construction of North SpTP will not be approved by the Government of Japan and JICA due to risks of accidents derived from gas.

(3) The Philippine side understood the risk and explanation of the Japan side. The Philippine side requested the Japan side to provide following countermeasures;

- South SpTP (Amcon site) should now be larger to cater the septage management service to all 6 LGUs (Compostela, Liloan, Consolacion, Mandaue City, Cebu City and Talisay City).
- Number of septage hauling equipment (vacuum trucks) should be enough to transport the septage from northern zones to South SpTP.

(4) The Japan side agreed to consider the request into the Project design.

(5) The Japan side explains that the site of South SpTP will not be enough in area for further extension. MCWD is recommended to secure a land in northern zones if



further extension of capacity is necessary in the future.

2. Reclamation of lagoon and construction of temporary filtrate treatment facility for South SpTP (Amcon Site)

(1) The Philippine side explained the progress of the reclamation of lagoon and the construction of temporary filtrate treatment facility as follows;

- As of April 26, 2018, the reclamation plan is not yet concrete.
- The site is now under land ownership transfer procedures from Cebu City Government to Cebu Provincial Government, pending the completion of evaluation by Commission on Audit (hereinafter referred to as "CoA") and execution of deed of donation by both parties.
- After approval of CoA, Memorandum of Agreement (hereinafter referred to as "MOA" for land management will be concluded among MCWD, Cebu City and Cebu Province.
- Implementing body of reclamation will be designated by the MOA, as well as for rehabilitation of lagoon (temporary filtrate treatment facility) and operation of the existing de-watering equipment.
- As a preliminary plan, responsibility for the implementation is as follows;
 - MCWD and Cebu Province share the responsibility of reclamation works.
 - Cebu City provides necessary soil for reclamation.
 - Cebu City rehabilitates the lagoon (construction of temporary filtrate treatment facility).
 - Cebu City continues operating the existing de-watering facility as well as the temporary filtrate treatment facility until completion of the Project facility.
- Land property and / or authorization to MCWD on the land utilization will be included in the mentioned MoA, especially leasing period, property management on the land to be constructed, leasing price or donating conditions, etc.
- MCWD will prepare a draft of the MoA by the end of May 2018.

(2) The Japan side requested following actions to be necessary and taken by the Philippine side;

- Reclamation and rehabilitation of lagoon will be conducted by the Philippine side before commencement of construction works to be done by the Japan side.
- In order to treat the septage presently received at the existing facility, the rehabilitation of lagoon, which is the construction of temporary filtrate facility, is necessary.

A handwritten signature in black ink, appearing to be 'J. S. S.', is located at the bottom right of the page. To its left is a small, stylized handwritten mark that resembles a '3' or a checkmark.

- Reclamation will be conducted by appropriate compacted soil and pre-load at least for 6 months.
- Temporary filtrate facility will be equipped with an aerator and a sedimentation pond.
- In case of ground consolidation subsidence after preloading in the Project site, additional soil embankment shall be implemented at the expense of the Philippines side.

(3) The Philippine side agreed to take actions on following;

- The Philippine side understood the requirement for the mentioned works.
- MCWD will decide the implementation structure of the mentioned reclamation and rehabilitation of lagoon through further discussions with Cebu City and Cebu Province, in accordance with the signed MOA, by the end of July 2018.

3. Ordinance for Local Government Units and MOUs on Septage Management Program
Both sides re-confirmed the following Ordinances for Local Government Units (hereinafter referred to as "LGUs") and Agreements are necessary for implementing the Project smoothly and efficiently. The progress of the preparation is summarized in Annex 1.

(1) Septage management ordinances for LGUs

Only Compostela has yet to establish the necessary ordinance. MCWD will facilitate and accelerate its establishment. MCWD will prepare and present the draft ordinance by the end of May 2018. MCWD will submit a copy of the issued ordinance by Compostela Municipality to JICA by the end of July 2018.

(2) Modification of existing ordinances for LGUs or Agreement on stipulating MCWD's role as Implementing Unit for Septage Management among MCWD, MCDCB and LGUs

5 LGUs except Compostela may be required to modify the existing ordinances in order to realize the Project and to permit the MCWD activity for septage management including treatment and intercity transportation of septage and de-watered cake. If necessary, MCWD will prepare MoA among MCWD and 6 LGUs for smooth implementation of the Project. MCWD will prepare and present drafts of the ordinances' modifications and / or MoAs by the end of May 2018.

MCWD will submit copies of the modified ordinances and / or the prepared MoAs by the end of July 2018 to JICA. Moreover, MCWD will submit a list of

required modifications for ordinances and / or contents of MoAs to JICA by the end of May 2018.

(3) Principle Agreement between MCWD and the Existing Private De-Sludgers

MCWD explained as follows;

- Private de-sludgers are planning to form an association for septage hauling for the Project. They will select a representative and the representative will be a window for all negotiations with MCWD.
- Private de-sludgers are planning to continue the business, collaborating with MCWD and under agreement with MCWD.
- Detail agreement conditions will be further discussed. MCWD will submit a copy of the principle agreement to JICA by the end of July 2018.

The Japan side accepted on the explained schedule.

(4) Agreement on accepting De-watered cake in Landfill Site between MCWD and Owner of Binaliw landfill site.

The Philippine side explained that the landfill site is under the final process for permission of business operation to be approved by Cebu City. After approval of the permit, MCWD and the Owner of the landfill side will conclude the agreement. MCWD will submit a copy of the agreement by the end of July 2018 to JICA.

End

Annex 1: Progress of Ordinances and Agreements

Status of Ordinance/MoA/Septage Management Board as of April 26, 2018

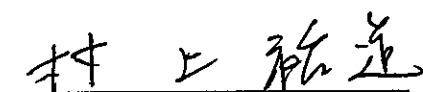
LGUs	Septage Ordinance	Modification of Septage Ordinance	Septage Management Board	MCWD's role as Implementing Unit for Septage Management	Necessary Arrangement regarding Ordinance/MoA	Remarks
Compostela	Not yet (In progress, under draft preparation of MCWD)	Not applicable	Not yet (Municipal planning office is in charge presently.)	Not yet (Clarified in Ordinance / MoA)	To prepare MoA with MCWD and Province.	MCWD prepares draft ordinance / MoA by the end of May 2018, expected finalization in June 2018. To be signed in July 2018
Liloan	Yes	Not yet, but not necessary if MoA is sufficient	Not yet (Municipal Environment and Natural Resources Office is in charge presently)	Not yet (Clarified in Ordinance / MoA)	To prepare MoA with MCWD and Province. To modify Ordinance if necessary	MCWD prepares draft ordinance / MoA by the end of May 2018, expected finalization in June 2018. To be signed in July 2018
Consolacion	Yes	Not yet, but not necessary if MoA is sufficient	Not stipulated in Ordinance (Municipal Building Office and Health Office are in charge presently)	Not yet (Clarified in Ordinance / MoA)	To prepare MoA with MCWD and Province. To modify Ordinance if necessary	MCWD prepares draft ordinance / MoA by the end of May 2018, expected finalization in June 2018. To be signed in July 2018
Cebu City	Yes	Not yet, but not necessary if MoA is sufficient	Yes (But to convene new members)	Not yet (Clarified in MoA)	To prepare MoA with MCWD and Province for septage management. To modify Ordinance if necessary. To prepare MoA regarding land transfer to Cebu Province, location of SpTP and rehabilitation & operation of the existing septage facility.	MCWD prepares draft MoA (or modified ordinance) by the end of May 2018, expected finalization in June 2018. To be signed in July 2018 Under discussion of land transfer between City Government, Provincial Government and MCWD.
Talisay City	Yes	Not yet, but not necessary if MoA is sufficient	Not yet (Ecological and Solid Waste Management Board is in charge presently.)	Not yet (Clarified in MoA)	To prepare MoA with MCWD and Province. To modify Ordinance if necessary	MCWD prepares draft MoA (or modified ordinance) by the end of May 2018, expected finalization in June 2018. To be signed in July 2018
Mandaue City	Yes	Not yet, but not necessary if MoA is sufficient	Yes	Not yet (Clarified in MoA)	To prepare MoA with MCWD and Province. To modify Ordinance if necessary	MCWD prepares draft MoA (or modified ordinance) by the end of May 2018, expected finalization in June 2018. To be signed in July 2018
Cebu Province	Not necessary	Not necessary	Not necessary	Not necessary	To prepare MoA with MCWD and Province for septage management. To prepare MoA regarding land transfer to Cebu Province, location of SpTP and rehabilitation & operation of the existing septage facility.	MOA on land use, reclamation and rehabilitation of lagoon are under discussion among MCWD, Cebu City and Cebu Province

Minutes of Discussions
on the Preparatory Survey for
The Septage Management Project for Metro Cebu Water District's Service Area
(Explanation on Draft Preparatory Survey Report)

With reference to the minutes of discussions signed between Metropolitan Cebu Water District and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on 10th November, 2017 and in response to the request from the Government of the Republic of Philippines (hereinafter referred to as "Philippines") dated 24th August, 2016, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for The Septage Management Project for Metro Cebu Water District's Service Area (hereinafter referred to as "the Project").

As a result of the discussions, both sides agreed on the main items described in the attached sheets.

Metropolitan Cebu, January 11th, 2019



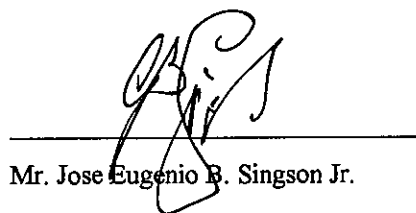
Mr. Hiromichi Murakami

Leader

Preparatory Survey Team

Japan International Cooperation Agency

Japan



Mr. Jose Eugenio B. Singson Jr.

General Manager

Metropolitan Cebu Water District

The Republic of The Philippines

(Witness)

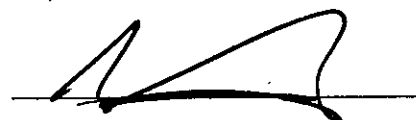


Mr. Norihiko Nomura

Director General

Environmental Planning Bureau,

City of Yokohama



Hon. Hilario P. Davide III

Chairperson

Metro Cebu Development and Coordinating Board

ATTACHMENT

1. Objective of the Project

The objective of the Project is to promote septic tank sludge treatment by/through construction of septic tank sludge treatment facilities and procurement of vacuum trucks, thereby contributing to improvement of contaminated water environment.

2. Title of the Preparatory Survey

Both sides confirmed the title of the Preparatory Survey as “the Preparatory Survey for the Project for The Septage Management Project for Metro Cebu Water District’s Service Area”.

3. Project site

Both sides confirmed that the sites of the Project is/are in the 6 Local government units within Metropolitan Cebu area (Compostela, Liloan, Consolacion, Mandaue City, Cebu City, Talisay City) , which is shown in Annex 1.

4. Responsible authority for the Project

Both sides confirmed the authorities responsible for the Project are as follows:

4-1. The Metropolitan Cebu Water District will be the executing agency for the Project (hereinafter referred to as “MCWD”). The Executing Agency shall coordinate with all the relevant authorities to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be taken care by relevant authorities properly and on time. The organization charts are shown in Annex 2.

4-2. The line ministry of the Executing Agency is the Local Water Utilities Administration.

5. Contents of the Draft Report

After the explanation of the contents of the Draft Report by the Team, the Philippines side agreed to its contents.

6. Cost estimate

Both sides confirmed that the cost estimate described in the Draft Report is provisional and will be examined further by the Government of Japan for its approval. Both sides confirmed that the cost estimate including the contingency explained by the Team is provisional and will be examined further by the Government of Japan for



its approval. The contingency would cover the additional cost against natural disaster, unexpected natural conditions, etc.

7. Confidentiality of the cost estimate and technical specifications

Both sides confirmed that the cost estimate and technical specifications of the Project should never be disclosed to any third parties until all the contracts under the Project are concluded.

8. Timeline for the project implementation

The Team explained to the Philippines side that the expected timeline for the project implementation is as attached in Annex 3.

9. Expected outcomes and indicators

Both sides agreed that key indicators for expected outcomes are as follows. The Philippines side will be responsible for the achievement of agreed key indicators targeted in year 2025 and shall monitor the progress based on those indicators.

[Quantitative indicators]

indicators	Present (2017)	Future(2025):three years after Completion of the Project
Number of households receiving septage regular collection (household)	4,631	43,702
Amount of septage collection/treatment (m ³ /year)	13,895*	109,877**

*Amount of septage collection per household: 3.0m³

**Amount of septage collection per household: 2.5m³, per commercial and public entities: 5.0m³

[Qualitative indicators]

- To promote septic tank sludge treatment through construction of septic tank sludge treatment facilities, procurement of vacuum trucks and establishment of operational structure
- To improve water and sanitation environment through proper collection/treatment of septage with disposing at landfill site and discharge proper treated filtrate to public water

10. Technical assistance ("Soft Component" of the Project)




Considering the sustainable operation and maintenance of the products and services granted through the Project, a series of technical assistance is planned under the Project. The Philippines side confirmed to deploy necessary number of counterparts who are appropriate and competent in terms of its purpose of the technical assistance as described in the Draft Report.

11. Undertakings of the Project

Both sides confirmed the undertakings of the Project as described in Annex 4, which is revised from Annex 5 in “Minutes of Discussions on the Preparatory Survey for Septic Tank Sludge Treatment Construction Project for Metro Cebu Water District” signed on November 10, 2017. With regard to exemption of customs duties, internal taxes and other fiscal levies as stipulated in item No. (2)-5 of Annex 4, both sides confirmed that such customs duties, internal taxes and other fiscal levies, which shall be clarified in the bid documents by MCWD during the implementation stage of the Project.

The Philippines side assured to take the necessary measures and coordination including allocation of the necessary budget which are preconditions of implementation of the Project. It is further agreed that the costs are indicative, i.e. at Outline Design level. More accurate costs will be calculated at the Detailed Design stage.

Both sides also confirmed that the Annex 4 will be used as an attachment of G/A.

12. Monitoring during the implementation

The Project will be monitored by the Executing Agency and reported to JICA by using the form of Project Monitoring Report (PMR) attached as Annex 5. The timing of submission of the PMR is described in Annex 4.

13. Project completion

Both sides confirmed that the project completes when all the facilities constructed and equipment procured by the grant are in operation. The completion of the Project will be reported to JICA promptly, but in any event not later than six months after completion of the Project.

14. Ex-Post Evaluation

JICA will conduct ex-post evaluation after three (3) years from the project completion, in principle, with respect to five evaluation criteria (Relevance, Effectiveness,



Efficiency, Impact, Sustainability). The result of the evaluation will be publicized. The Philippines side is required to provide necessary support for the data collection.

15. Schedule of the Study

JICA will finalize the Preparatory Survey Report based on the confirmed items. The report will be sent to the Philippines side around May 2019.

16. Environmental and Social Considerations

16-1 General Issues

16-1-1 Environmental Guidelines and Environmental Category

The Team explained that 'JICA Guidelines for Environmental and Social Considerations (April 2010)' (hereinafter referred to as "the Guidelines") is applicable for the Project. The Project is categorized as B because the Project is not considered to be a large-scale sewerage project, is not located in a sensitive area, and has none of the sensitive characteristics under the Guidelines, it is not likely to have a significant adverse impact on the environment.

16-1-2 Environmental Checklist

The environmental and social considerations including major impacts and mitigation measures for the Project are summarized in the Environmental Checklist attached as Annex 6. Both sides confirmed that in case of major modification of the content of the Environmental Checklist, the Philippines side shall submit the modified version to JICA in a timely manner.

16-2 Environmental Issues

16-2-1 Environmental Impact Assessment (EIA)

Both sides confirmed that MCWD shall obtain approval of the EIA report and receive Environmental Compliance Certificate (ECC) from Department of Environment and Natural Resources (hereinafter referred as to "DENR") by May 2019.

16-2-2 Environmental Management Plan and Environmental Monitoring Plan

Both sides confirmed Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP) of the Project is as Annex 7, respectively. Both side agreed that environmental mitigation measures and monitoring shall be conducted based on the EMP and EMoP, which may be updated during the detailed design stage.



16-2-3 Other specific environmental issues which need to be confirmed/agreed between the parties.

Both sides confirmed that MCWD shall obtain confirmation from DENR about applying Class D effluent standards which was enacted as “Administrative Order DAO2016-08” to Septage Treatment Plant (hereinafter referred to as “STP”) in the Project. The confirmation is shared by MCWD to JICA before the end of February 2019 for smooth implementation of the Project.

16-3 Social Issues

16-3-1 Land Acquisition and Resettlement

Both sides confirmed the 1.371 ha of land would be borrowed from Cebu province to MCWD. Both sides also confirmed that no households/people would be relocated/affected due to the implementation of the Project.

16-4 Environmental and Social Monitoring

16-4-1 Environmental Monitoring

Both sides agreed that the Philippines side will submit results of environmental monitoring to JICA with PMR by using the monitoring form attached as Annex 8. The timing of submission of the monitoring form is described in Annex 4.

16-4-2 Social Monitoring

Both sides confirmed that the Philippines side will implement social monitoring about Traffic conditions and existing social infrastructure and social services. The Philippines side and the Team agreed that MCWD will submit results of social monitoring to JICA with PMR by using the monitoring form attached as Annex 8.

16-4-3 Information Disclosure of Monitoring Results

Both sides confirmed that the Philippines side will disclose results of environmental monitoring to local stakeholders through their website/in their field offices.

The Philippines side agreed JICA will disclose results of environmental and social monitoring submitted by the Philippines side as the monitoring forms attached as Annex 8 on its website.

17. Other Relevant Issues

17-1. Disclosure of Information

Both sides confirmed that the Preparatory Survey Report from which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey.

The comprehensive report including the project cost will be disclosed to the public after all the contracts under the Project are concluded.

17-2. Ordinance for Local Government Units and MOUs on Septage Management Program

Both sides re-confirmed the following Ordinances for Local Government Units (hereinafter referred to as "LGUs") and Agreements are necessary before the end of February 2019.

17-2-1 Septage management ordinances for LGUs

Only Compostela Municipality has yet to establish the necessary ordinance. MCWD will facilitate and accelerate its establishment. MCWD shall submit a copy of the issued ordinance by Compostela Municipality to JICA before the end of February 2019.

17-2-2 Operation of Existing De-watering Plant

MCWD shall negotiate and agree with Cebu City to transfer the right of operation of existing dewatering plant which was constructed in "Pilot Survey for Disseminating SME's Technologies for Applicability of Dewatering Equipment for Septage Management of Cebu City".

17-2-3 Principle Agreement between MCWD and the Existing Private De-Sludgers

MCWD shall negotiate and agree with existing private de-sludgers to transport collected septage to STP constructed in the Project. MCWD shall submit copy of principle agreement with the existing private de-sludgers before the end of February 2019.

17-2-4 Agreement on accepting De-watered cake in Landfill Site between MCWD and Owner of Binaliw landfill site

MCWD explained that MCWD and the Owner of Binaliw landfill commenced the negotiation for disposal of de-watered cake. MCWD and the Owner of the landfill side will conclude the agreement. MCWD shall submit a copy of the agreement to JICA before the end of March 2019.

17-3. Budget securement for taking actions for Environmental and Social Consideration

Both sides confirmed that MCWD shall secure necessary budget for implementing



actions for environmental and social consideration described in approved EIA report.

17-4. Reclamation of Lagoon for STP site

Both sides confirmed that reclamation of lagoon for utilizing as site of STP shall be executed by MCWD before the notice of the pre-qualification for the tender of construction work. MCWD should manage the reclamation in quality according to the relevant guidelines in the Philippines, such as “Standard specifications for highways, bridges and airports (Blue Book)” prescribed by the Department of Public Works and Highways with using appropriate filling material. In the temporary space for filtrate treatment, an aeration device and a further separated pond for sedimentation will be provided, so that the existing de-watering plant will be operated continuously by MCWD.

In the Project, internal roads of STP will be finished with gravel by the grant aid. MCWD is requested to finish the road with asphalt/concrete after confirmation of settlement of land subsidence.

17-5. Financing the Cost for Tax in the Project

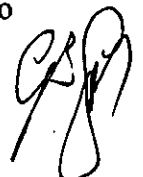
Both sides confirmed that the tax including Value Added Tax (VAT), and custom duty in the Philippines, which is to be arisen from the Project activities, will be ensured by the Philippines side. MCWD will take any necessary procedures to secure the budget for the costs of the tax above.

17-6. Future necessity of capacity expansion of collection/treatment of septage and development of wastewater treatment plant

The capacity of STP constructed in the Project designed to accept volume of septage collection in 2025. After 2025, volume of septage collection will be expected to continuously increase and exceed the capacity of STP constructed in the Project. Therefore MCWD will need to construct additional STP and establish proper collection system as well as plan to develop wastewater treatment plant to improve water and sanitation environment.

17-7. Technical assistance from Yokohama City government

Since the Project was proposed by the Yokohama City government to JICA assuming to utilize their technology and knowhow, the Yokohama City government assigned advisors and has supported JICA during the Preparatory Survey. Both sides agreed that cooperation and participation of the Yokohama City government is essential to



ensure effective implementation of Soft Component during the construction period.

Annex 1 Project Site

Annex 2 Organization Chart

Annex 3 Project Implementation Schedule

Annex 4 Major Undertakings to be taken by the Government of Philippines

Annex 5 Project Monitoring Report (template)

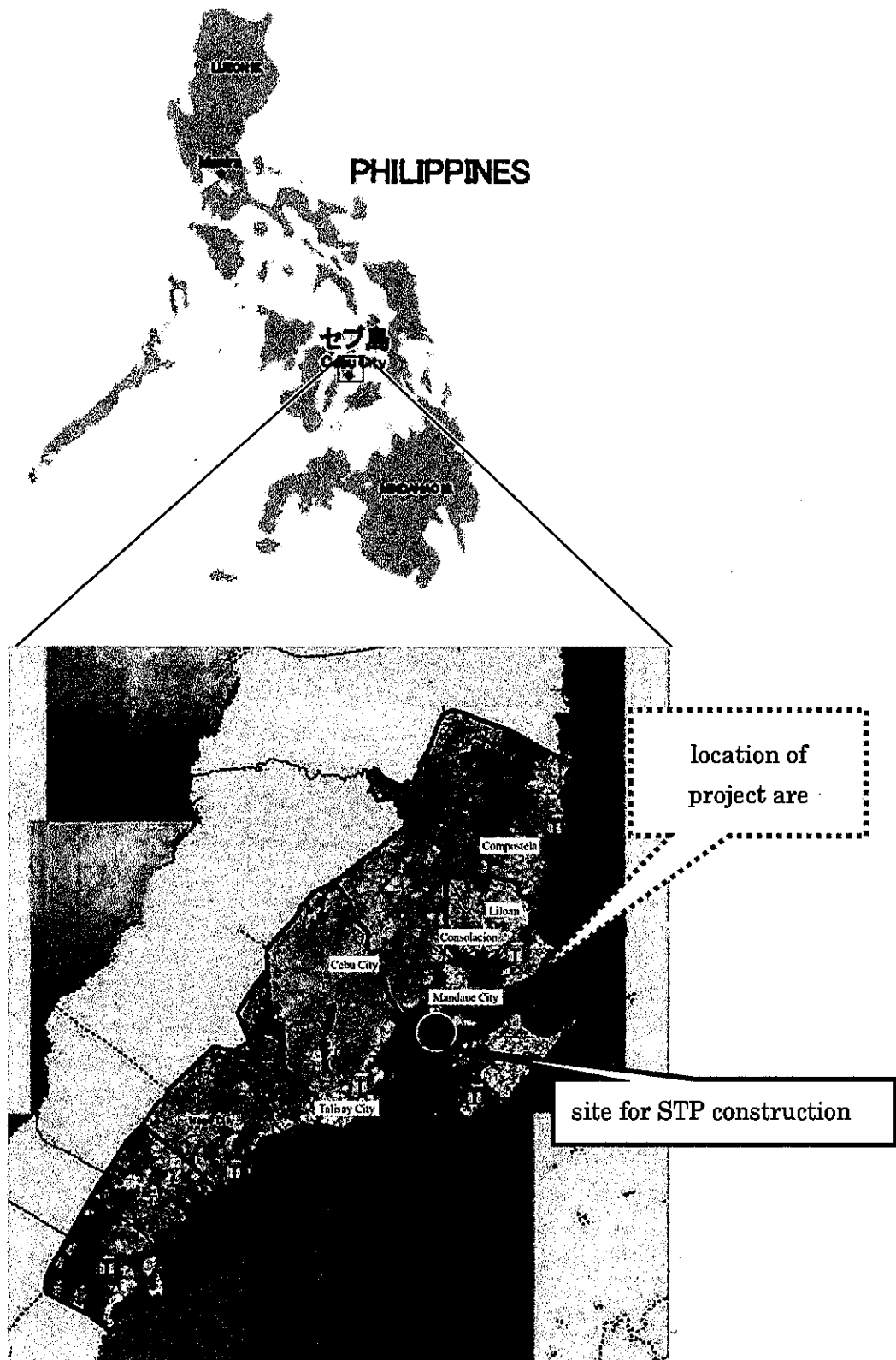
Annex 6 Environmental Check List

Annex 7 Environmental Management Plan/Environmental Monitoring Plan

Annex 8 MONITORING FORM (Construction Stage/Operation Stage)

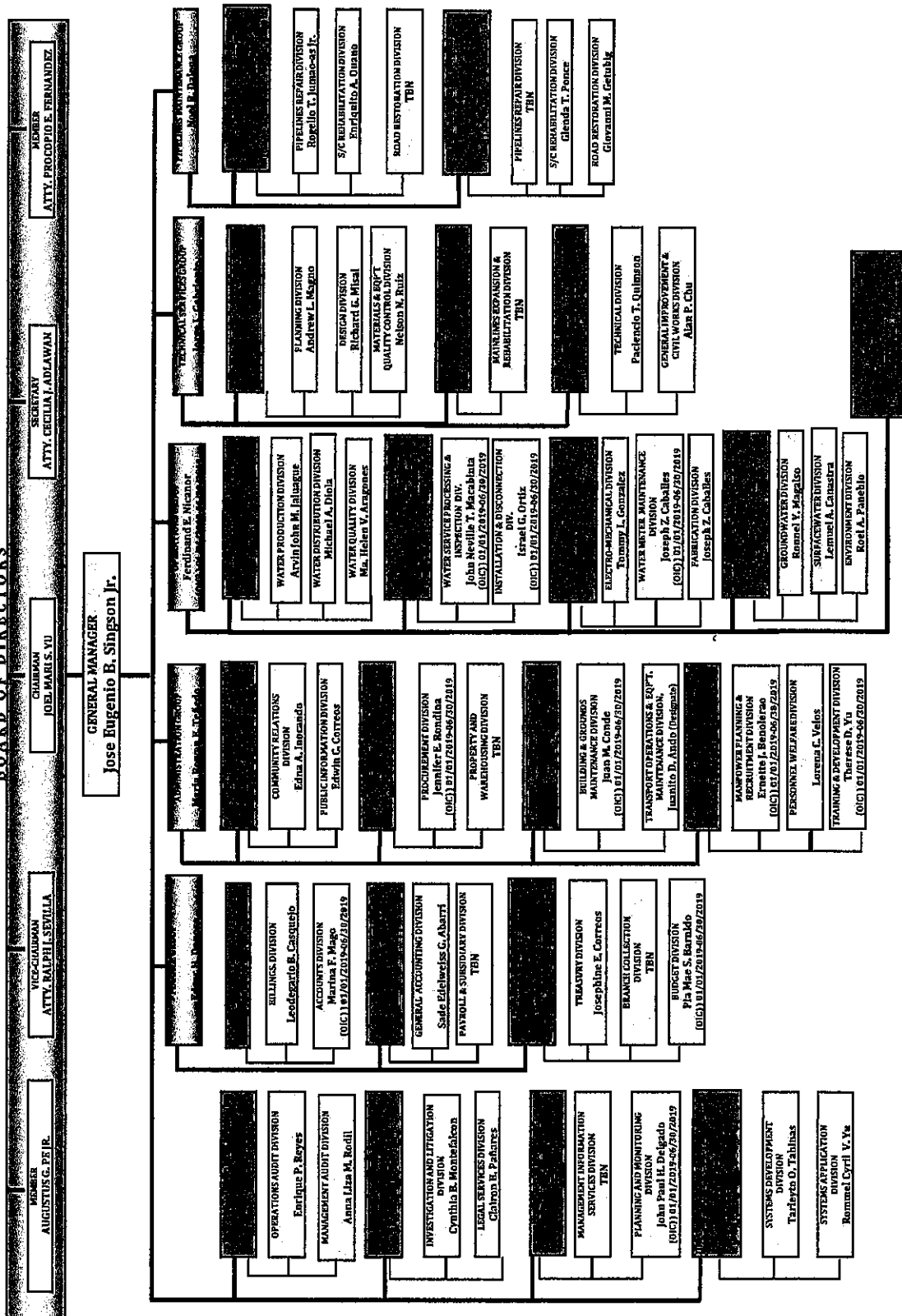


Project Site

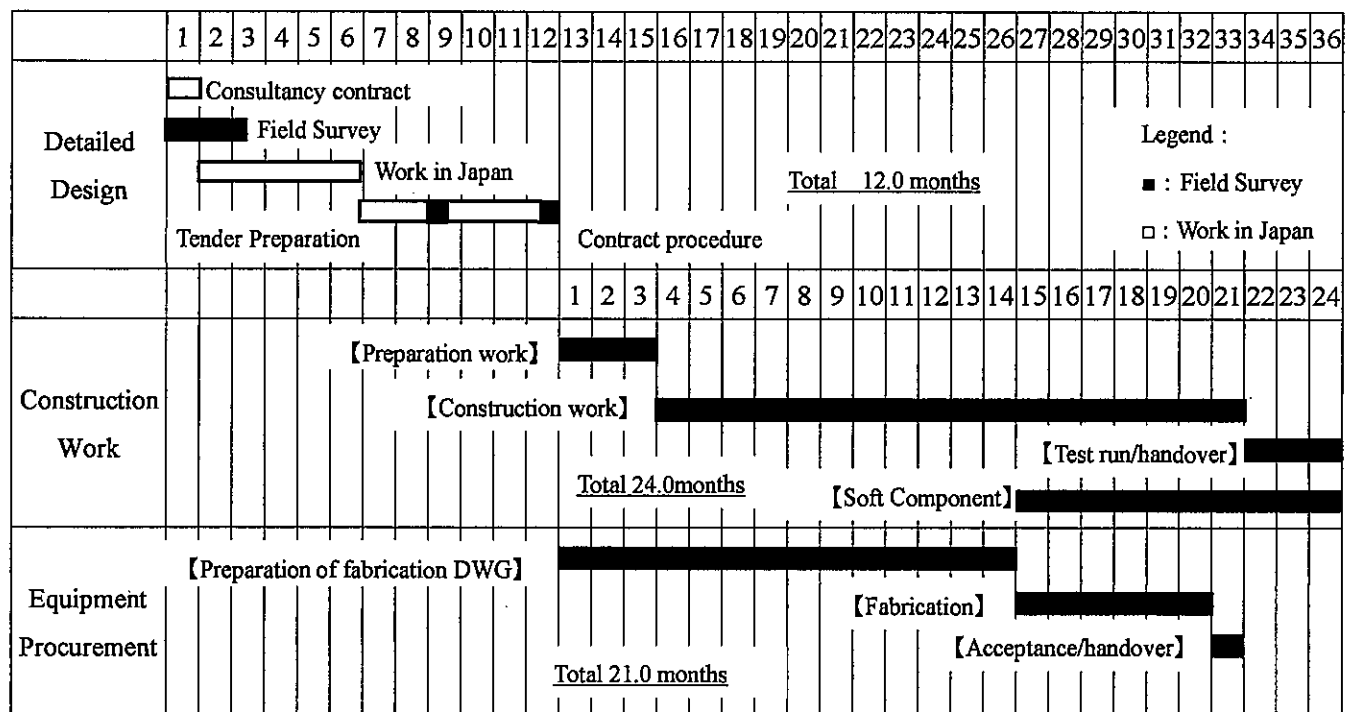


BOARD OF DIRECTORS

GENERAL MANAGER
Jose Eugenio B. Singson Jr.



Project Implementation Schedule



Major Undertakings to be taken by the Government of the Philippines

1. Specific obligations of the Government of the Philippines which will not be funded with the Grant**(1) Before the Tender**

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	Preparation of necessary ordinances in the related LGUs and agreement between the LGUs and MCWD for the Project implementation	Feb, 2019	MCWD/ LGUs	-	
2	Agreement on usufruct of the existing de-watering plant and lagoon between MCWD and Cebu City	Feb, 2019	MCWD/ Cebu City	-	
3	Principle agreement between the existing private de-sludgers and MCWD for cooperating the Project implementation	Feb, 2019	MCWD/ the existing private de-sludgers	-	
4	Principle agreement between a landfill site operating company and MCWD for de-watered cake disposal	Mar, 2019	MCWD/ a landfill site operating company	-	
5	To acquire approval of EIA and issuance of ECC (Conditions of approval should be fulfilled, if any) and secure the necessary budget for proceeding.	before G/A	MCWD	-	
6	To open bank account (B/A)	within 1 month after the signing of the G/A	MCWD	necessary fee	
7	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the consultant	within 1 month after the signing of the contract	MCWD	PHP3 thousand	
8	Holding the public explanations with the residents surrounding the proposed construction site and stakeholder meeting, and having the consent from the residents	one (1) month after concluding G/A	MCWD/ Cebu City	-	
9	To secure Project site (land acquisition of the proposed construction site under the legal procedure) and temporary yard (stockyard and construction office).	before the notice of the pre-qualification for the tender	MCWD	-	
10	Rehabilitation and operation of the existing de-watering plant as well as effluent treatment. Rehabilitation includes following activities; - shuttering lagoon with an appropriate wall such as sheet-piles - providing aeration device and further separated pond for sedimentation as filtrate treatment - drying lagoon to be reclaimed with appropriate treating of drained water and removed sludge.	before the notice of the pre-qualification for the tender	MCWD/ Cebu City	PHP35,263 thousand	
11	Reclamation work at STP site with relevant guidelines in the Philippines and using appropriate filling material.	before the notice of the pre-qualification for the tender	MCWD	PHP1,207 thousand	
12	To submit Project Monitoring Report (with the result of Detail Design)	before preparation of bidding documents	MCWD	-	

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the Contractor(s) / the Supplier(s)	within 1 month after the signing of the contract(s)	MCWD	-	
2	To bear the following commissions to a bank in Japan for the banking services based upon the B/A			-	
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	MCWD	PHP6 thousand	
	2) Payment commission for A/P	every payment	MCWD	PHP1,000 thousand	
3	To ensure prompt unloading and customs clearance at ports of disembarkation in recipient country and to assist the Supplier(s) with internal transportation therein	during the Project	MCWD/ NEDA	-	
4	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	MCWD/ NEDA	-	
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted and/or be borne by its designated authority without using the Grant	during the Project	MCWD/ NEDA	-	
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	MCWD/ NEDA	-	
7	1) To submit Project Monitoring Report	every month	MCWD	-	
	2) To submit Project Monitoring Report (final)	within one month after signing of Certificate of Completion for the works under the contract(s)	MCWD	-	
8	To submit a report concerning completion of the Project	within six months after completion of the Project	MCWD	-	
9	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project for the site(s)			-	
	1) Electricity Installation of power cable to STP (Japanese side is responsible from power receiving facility)	before conducting the Test-run at the STP	MCWD	PHP250 thousand	
	2) Water Supply Installation of water supply pipe to STP	before conducting the Test-run at the STP	MCWD		
	3) Fence and Gate To construct gates and fences to be necessary for the septage treatment facility and parking lot for the Project.	during conducting the Test-run at the STP	MCWD	PHP2,622 thousand	
	4) Furniture and Equipment General furniture and general office equipment at STP	before conducting the Test-run at the STP	MCWD	-	
10	To prepare / to secure landfill site for de-watered cake	before conducting the Test-run at the STP	MCWD	-	
11	To have agreement between MCWD and comprehensive outsource company / the existing private de-sludgers for O&M of the Project, and/or to hire qualified	before conducting the Test-run at the STP	MCWD/ qualified outsource	-	

	personnel for O&M of the Project.		company and the existing private de-sludgers		
12	To provide surplus soil storage area	during the construction	MCWD/ Cebu Province	-	
13	To provide necessary reagents at STP Test-run Period	during conducting the Test-run at the STP	MCWD	PHP213 thousand	
14	To have on the Job Training (OJT) for proper O&M and its quality assurance on facility and equipment, selection of candidates for soft component and its notification to JICA	before conducting OJT/ soft component	MCWD	-	
15	To take necessary measure for safety construction - traffic control - rope off - control of persons incoming to the construction site	during the construction	MCWD/ Cebu City	-	
16	To implement EMP and EMoP	during the construction	MCWD	-	
17	To submit results of environmental monitoring to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	during the construction	MCWD	-	
18	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report - Period of the monitoring may be extended if affected persons' livelihoods are not sufficiently restored. Extension of the monitoring will be decided based on agreement between MCWD and JICA.	during the construction - until the end of livelihood restoration program (In case that livelihood restoration program is provided) - for two years after land acquisition and resettlement complete (In case that livelihood restoration program is not provided)	MCWD/ Cebu City	-	

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To implement EMP and EMoP	for a period based on EMP and EMoP	MCWD	-	
2	To submit results of environmental monitoring to JICA, by using the monitoring form, semiannually - The period of environmental monitoring may be extended if any significant negative impacts on the environment are found. The extension of environmental monitoring will be decided based on the agreement between MCWD and JICA.	for three years after the Project	MCWD	-	
3	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection 4) Finish the road with asphalt/concrete after confirmation of settlement of land subsidence, if any	After completion of the construction	MCWD	-	



<u>Project Monitoring Report</u> on <u>Project Name</u> <u>Grant Agreement No. XXXXXXXX</u> 20XX, Month
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Organizational Information

Signer of the G/A (Recipient)	Person in Charge <u>(Designation)</u> Contacts <u>Address:</u> <u>Phone/FAX:</u> <u>Email:</u>
Executing Agency	Person in Charge <u>(Designation)</u> Contacts <u>Address:</u> <u>Phone/FAX:</u> <u>Email:</u>
Line Ministry	Person in Charge <u>(Designation)</u> Contacts <u>Address:</u> <u>Phone/FAX:</u> <u>Email:</u>

General Information:

Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ <u>mil.</u> Government of (_____): _____




1: Project Description

1-1 Project Objective

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1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

--

1-3 Indicators for measurement of "Effectiveness"

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr)	Target (Yr)
Qualitative indicators to measure the attainment of project objectives		

2: Details of the Project

2-1 Location

Components	Original (proposed in the outline design)	Actual
1.		

2-2 Scope of the work

Components	Original* (proposed in the outline design)	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

2-3 Implementation Schedule

Items	Original		Actual
	(proposed in the outline design)	(at the time of signing the Grant Agreement)	

Reasons for any changes of the schedule, and their effects on the project (if any)

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2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations
See Attachment 2.

2-4-2 Activities
See Attachment 3.

2-4-3 Report on RD
See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant(Confidential until the Bidding)

Components			Cost (Million Yen)	
	Original (proposed in the outline design)	Actual (in case of any modification)	Original ¹⁾²⁾ (proposed in the outline design)	Actual
	1.			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

Components			Cost (1,000 Taka)	
	Original (proposed in the outline design)	Actual (in case of any modification)	Original ¹⁾²⁾ (proposed in the outline design)	Actual
	1.			

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original (at the time of outline design)

name:

role:

financial situation:

institutional and organizational arrangement (organogram):

human resources (number and ability of staff):

Actual (PMR)

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

Original (at the time of outline design)

Actual (PMR)

3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

Original (at the time of outline design)

Actual (PMR)

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks (at the time of outline design)

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:

	Contingency Plan (if applicable):
Actual Situation and Countermeasures (PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

--

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

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5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

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Attachment

1. Project Location Map
2. Specific obligations of the Recipient which will not be funded with the Grant
3. Monthly Report submitted by the Consultant
- Appendix - Photocopy of Contractor's Progress Report (if any)
 - Consultant Member List
 - Contractor's Main Staff List
4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final) only)
8. Pictures (by JPEG style by CD-R) (PMR (final) only)
9. Equipment List (PMR (final) only)
10. Drawing (PMR (final) only)
11. Report on RD (After project)



1. Initial Conditions (Confirmed)

Items of Specified Materials	Initial Volume A	Initial Unit Price (₹) B	Initial total Price $C=A \times B$	1% of Contract Price D	Condition of payment Price (Decreased) $P=C-D$	Price (Increased) $P=C+D$
1 Item 1	●● t	●	●	●	●	●
2 Item 2	●● t	●	●	●		
3 Item 3						
4 Item 4						
5 Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

Items of Specified Materials	1st month, 2015	2nd month, 2015	3rd month, 2015	4th	5th	6th
1 Item 1						
2 Item 2						
3 Item 3						
4 Item 4						
5 Item 5						

(3) Summary of Discussion with Contractor (if necessary)

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

Appendix 6-2 Environmental check list

Annex 6

Category	Environmental items	Main check items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a)(b)(c) According to scale of the Project, approval procedures are taken by IEE checklist. (d) Environmental compliant certificate (ECC) is issued by DENR after examination of IEE checklist.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a)(b) Y	(a)(b) Several stakeholders meetings with local government unit, including leaders of Barangays, have been conducted.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Following 3 cases have been compared: 1. The case not to construct STP, and not to procure additional vacuum trucks 2. The case to construct STP and to procure additional vacuum trucks 3. The case not to construct STP, but to procure additional vacuum trucks
2 Pollution Control	(1) Water Quality	(a) Do pollutants, such as SS, BOD, COD, pH contained in treated effluent from a sewage treatment plant comply with the country's effluent standards? (b) Does untreated water contain heavy metals?	(a) Y (b) N	(a) Effluent of STP is discharged to a public river, after treatment satisfying the effluent standards for classification D of DENR (BOD, Fecal Coliform, Ammonia as NH ₃ -N, Nitrate as NO ₃ -N, Phosphate, and Sulfate). (b) Heavy metals are not included, because only seepage of septic tanks is the subject of treatment.
	(2) Wastes	(a) Are wastes, such as sludge generated by the facility operations properly treated and disposed of in accordance with the country's standards?	(a) Y	(a) De-watered cake is disposed in a landfill site.
	(3) Soil Contamination	(a) If wastes, such as sludge are suspected to contain heavy metals, are adequate measures taken to prevent contamination of soil and groundwater by leachates from the wastes?	(a) Y	(a) As mentioned in (1), heavy metals are not included.
	(4) Noise and Vibration	(a) Do noise and vibrations generated from the facilities, such as sludge treatment facilities and pumping stations comply with the country's standards?	(a) Y	(a) The standards on noise are respected during both construction and operation stages. The standards on vibrations is not available.
	(5) Odor	(a) Are adequate control measures taken for odor sources, such as sludge treatment facilities?	(a) Y	(a) Though no regulation is available for odor, the Project installs deodorization devices at STP.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) The construction site does not belong to national park and / or natural conservation area.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that the project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?	(a)(b)(c) (d) N	(a)(b)(c)(d) The construction site does not belong to conservation areas such as primeval forests, tropical rain forests, ecologically valuable habitats.

Category	Main check items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
Environmental items	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Is the compensation policies going to be paid prior to the resettlement? (e) Is the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a)(b)(c) (d)(e) (f)(g)(h) (i)(j)N	(a)(b)(c)(d)(e)(f)(g)(h)(i)(j) Involuntary resettlement is not anticipated.
(1) Resettlement			
(2) Living and Livelihood	(a) Is there a possibility that changes in land uses and water uses due to the project will adversely affect the living conditions of inhabitants? (b) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?	(a)N (b)N	(a)(b) No modification of land use and water basin is conducted.
(3) Heritage	(a) Is there a possibility that the project will damage the local archaeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a)N	(a) There is no cultural heritage in the construction site.
(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a)N	(a) No impact to landscape is anticipated, because the Project is to rehabilitate the existing sepiage de-watering plant.
(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to lands and resources respected?	(a)N (b)N	(a)(b) The construction site does not belong to areas for minority race and indigenous people.
(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a)Y (b)N (c)N (d)Y	(a) Water is discharged after catch basins of suspended solid not to pollute the river. If necessary, sprinkling water is provided to prevent dusts. Low noise / vibration models of construction machines are used for construction works. (b)(c) Since the Project is to rehabilitate the existing facility, no impacts to natural and social environment is anticipated. (d) Adequate time schedule is prepared for construction works not to concentrate construction vehicles in a particular time zone.
(11) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? (d) If the construction activities might cause traffic congestion, are adequate measures considered to reduce such impacts?		

Category	Environmental items	Main check items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
5 Others	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) N	(a) Monitoring on effluent quality, harmful effects to the existing infrastructure, labor environment, and waste management are implemented. (b) During construction: Effluent quality is metered once per week. Impacts of construction vehicles to traffic conditions and labor environment are observed and reported according to monitoring sheet. During operation: Effluent quality is metered once per week. Impacts of construction vehicles to traffic conditions and labor environment are observed and reported according to monitoring sheet. Volume of de-watered cake is confirmed and reported once per month. (c) The Contractor monitors the above conditions during construction. Operation contractor and MCWD monitor the above conditions during operations. Such costs are included in construction and operation & maintenance costs respectively. (d) According to ECC, MCWD reports metered / observed conditions to DENR.
6 Note	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the destruction of the ozone layer, or global warming).	(a) N	(a) No impact is anticipated to global environment.

Environmental Management Plan

Based on ECC issued by DENR, environmental management and monitoring should be implemented during construction and operation stages.

No	Category	Impact	Countermeasures	(1) Responsible Organization (2) Supervising Agency	Responsible Organization for Cost
Construction Stage					
1	Air Pollution	Emission gases and dusts are generated by operation of construction vehicles and machineries.	Pollution will be minimized by sprinkling water. The Contractor will use the latest type of construction machinery in good condition of emission gas.	(1) Contractor (2) Consultant, MCWD	Included in construction cost
2	Water Pollution	Turbid water is drained in rivers.	The Contractor will install gutters and basins to catch turbid water and to reduce turbidity before draining.	(1) Contractor (2) Consultant, MCWD	Included in construction cost
3	Noise and Vibration	Noise and vibration are generated by construction machinery.	The Contractor will install fence to minimize the noise and will use low noise / vibration machinery.	(1) Contractor (2) Consultant, MCWD	Included in construction cost
4	Existing Social Infrastructure and Social Services	Traffic jam due to construction vehicles.	Traffic condition will be controlled around the sites. Operation time will be scheduled adequately.	(1) Contractor (2) Consultant, MCWD	Included in construction cost
5	Accident	Traffic accident due to construction vehicles. Accident in construction works.	The Contractor will provide safe driving instructions. Based on occupational safety and health standards, the Contractor will make workers wear safety protector such as gloves, helmet, safety belts, etc.	(1) Contractor (2) Consultant, MCWD	Included in construction cost
Operation Stage					
1	Air Pollution	Emission gases are generated by operation of vacuum and dump trucks.	Engine will be turned off during idling time.	(1) Contractor for O&M (2) MCWD	Included in operation & maintenance cost
2	Water Pollution	Wastewater (effluent) from STP.	Wastewater will be treated to satisfy effluent quality standards before discharge.	(1) Contractor for O&M (2) MCWD	Included in operation & maintenance cost
3	Waste	De-watered cake from STP.	De-watered cakes will be disposed adequately in Landfill site.	(1) Contractor for O&M (2) MCWD	Included in operation & maintenance cost
4	Odor	Odor from STP.	Deodorization devices will be installed and maintained.	(1) Contractor (2) Consultant, MCWD	Included in operation & maintenance cost
5	Local Economy (Employment and Livelihood, etc.)	Business opportunity of the existing private de-sludgers will be reduced.	The existing private de-sludgers will be involved in the Project operation.	(1) MCWD (2) MCWD	Included in operation & maintenance cost
6	Accident	Traffic accident due to operation of vacuum and dump trucks.	Safe driving instructions will be provided to drivers.	(1) Contractor for O&M (2) MCWD	Included in operation & maintenance cost




Annex 7

Environmental Monitoring Plan

For items that may be negatively impacted, monitoring would be conducted as shown in below.

Time	Classification	Monitoring Item	Point	Frequency	Method	Responsible Institution	Cost
Construction Stage	1. Water Quality	Suspended Solids	Point before discharge into river	During construction work Once a week	Sampling water and analyze by portable meters	Contractor MCWD	Included in the Construction cost
	2. Existing Social Infrastructure and Social Services	Traffic conditions	Construction site	When necessary during construction period	Visual check Photographic records Monthly work report	Contractor MCWD	Included in the construction cost
	3. Accident	Safety training to prevent accidents	Construction site office	When necessary during construction period	Visual check Photographic records Monthly work report	Contractor MCWD	Included in the construction cost
Operation Stage	1. Water Quality	Effluent quality: BOD, Fecal Coliform, Ammonia, Nitrate, Phosphate, Oil and Grease, Surfactants	Points before discharge into river	During operation work Once a week	Sampling water and analyze in laboratory (needed to be suitable for effluent standards)	Contractor for operation & maintenance MCWD	Included in the operation & maintenance cost
	2. Existing Social Infrastructure and Social Services	Assignment of private de-sludgers for septage collection	Assigned volume for de-sludge	Once a month	Confirmed by operation records	MCWD	Included in the operation & maintenance cost
	3. Accident	Safety training to prevent accidents	STP and / or around STP	When necessary	Visual check Photographic records Monthly work report	Contractor for operation & maintenance MCWD	Included in the operation & maintenance cost
	4. Waste	Volume of generated and disposed de-watered cake	STP and Binaliw landfill site	Once a month	Management by manifest Monthly work report	MCWD	Included in the operation & maintenance cost

MONITORING FORM (Construction Stage)

-If environmental reviews indicate the need of monitoring by JICA, JICA undertakes monitoring for necessary items that are decided by environmental reviews. JICA undertakes monitoring based on regular reports including measured data submitted by the project proponent. When necessary, the project proponent should refer to the following monitoring form for submitting reports.

-When monitoring plans including monitoring items, frequencies and methods are decided, project phase or project life cycle (such as construction phase and operation phase) should be considered.

1. Responses/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
Responses/Actions to Comments and Guidance from Government Authorities	

2. Mitigation Measures

— Water quality (Wastewater measured value)

Item (Unit)	Measured value (Mean)	Measured value (Max.)	Local standards	Reference: Japanese standard	Remarks
SS (mg/L)			150	200	1 time per week before discharge into river

3. Social Environment

— Impact to existing road

Monitoring item	Monitoring results during report periods
Conditions of construction vehicles operation and traffic jams	

— Labor environment

Monitoring item	Monitoring results during report periods
Labor accidents Safety Protector Safety Meeting	




MONITORING FORM (Operation Stage)

-If environmental reviews indicate the need of monitoring by JICA, JICA undertakes monitoring for necessary items that are decided by environmental reviews. JICA undertakes monitoring based on regular reports including measured data submitted by the project proponent. When necessary, the project proponent should refer to the following monitoring form for submitting reports.

-When monitoring plans including monitoring items, frequencies and methods are decided, project phase or project life cycle (such as construction phase and operation phase) should be considered.

1. Mitigation Measures

— Water quality (Effluent measured value)

Item (Unit)	Measured value (Mean)	Measured value (Max.)	Local standard	Reference: Japanese standard	Remarks
BOD(mg/L)			120	160	1 time per week before discharge into river
Fecal Coliform (MPN/100mL)			800	3000	
Ammonia as NH ₃ -N (mg/L)			7.5	100	
Nitrate as NO ₃ -N (mg/L)			30	100	
Phosphate (mg/L)			10	16	
Oil and Grease (mg/L)			15	30	
Surfactants (mg/L)			30	-	

— Waste

Monitoring items	Measured value
De-watered cake: generated volume	
De-watered cake: disposed volume in landfill	

2. Social Environment

— Impact to existing road

Monitoring items	Monitoring results during report periods
Conditions of vacuum trucks operation and traffic jams	
Conditions of dump trucks operation and traffic jams	

— Assignment of Private De-sludgers for Septage Collection

Monitoring items	Measured value
Monthly total volume collected by Private De-sludgers	

— Labor environment

Monitoring items	Monitoring results during report periods
Labor accidents Safety Protector Safety Meeting	

Appendix-5

Soft Component Plan

Republic of the Philippines
The Septage Management Project for Metro Cebu
Water District's Service Area

Plan of Soft Component

December 2018

The Septage Management Project for Metro Cebu Water District's Service Area
Plan of Soft Component

Contents

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The Septage Management Project for Metro Cebu Water District's Service Area
Plan of Soft Component

(1) Background

The Project is to construct a septage treatment plant (STP) and to procure trucks for transporting septage and de-watered cake for adequate management of septage in 6 LGUs area, where MCWD provides the water supply services. It is expected to contribute to improvement of sanitation conditions and water environment in Metro Cebu.

Construction of facilities and procurement of equipment are ones of the largest issues of MCWD for the septage management. However, it is difficult to achieve the satisfied improvement of septage management with just facility construction and equipment procurement. The septage management is a management of process consisting of septage collection, de-watering, filtrate treatment and disposal of de-watered cake. Therefore, improvement of both hardware and software is necessary in parallel.

Present issues of MCWD for the septage management are summarized as follows:

1) Volume of Septage to be Collected

The Project aims at collecting 400m³/day of septage in 2025 as shown in Table-1. It is the volume to be collected by MCWD in the Project. MCWD is planning also to construct another STP in the northern area in the near future to increase the management capacity to 750m³/day for 2030 by a different project.

Table-1 Design Volume of Septage Collection

Item	2025			2030		
	MCWD customers	MCWD non-customers	Total	MCWD customers	MCWD non-customers	Total
Design Volume of Septage Collection (m ³ /day)	321.38	71.07	392.45	349.91	396.44	746.35

Source: JICA Study Team

2) Management System of MCWD for Septage Management

Presently, MCWD's main business activity is the water supply. Although the Septage management is one of its mandates, the present management capacity is only 150m³/day being conducted in Mactan Island by a PPP company while the generated septage volume is 700m³/day (estimated).

The said PPP activity is conducted by a private company through DFBO contract with MCWD. MCWD entrusts the management process from septage collection to de-watered cake disposal through de-watering and filtrate treatment to the PPP company. MCWD, therefore, does not conduct directly the septage management activity.

Moreover, it is difficult for MCWD to conduct a scheduled collection of septage, as well as preparation of schedule, based on septic tanks' information such as volume, material, type, age, location, accessibility, de-sludge log, because of unavailability of septic inventory book.

As of March 2018, the existing activity and organization of MCWD is summarized as follows:

- No exclusive unit for septage management is available. MCWD communicates with the PPP company, assigning administrators at the corporate planning department.
- Septage management fee is collected together with the water tariff. It is, therefore, MCWD who collects the septage management fee from residents.
- MCWD pays monthly remuneration to the PPP company according to the collected volume of septage.
- It is the PPP company who owns the STP and septage collection truck (vacuum trucks) and operates / maintains the STP and vacuum trucks. Accordingly, MCWD has no activity for planning and monitoring operation and maintenance (O&M).
- Environment Compliance Certificate (ECC) is applied by the PPP company. Environmental monitoring is also conducted by the said company. Therefore, MCWD has no system to instruct the STP operation according to filtrate / effluent quality to the PPP company.

Since MCWD has no experience and no organization to manage directly the septage management, MCWD plans to outsource O&M of STP and equipment to be provided by the Project to a private company comprehensively (to a comprehensive outsource company). However, following responsibility and activity are still remained on MCWD:

- a) It is MCWD to own the STP and equipment. MCWD is responsible for O&M of the said STP and equipment.
- b) It is MCWD, as the Project proponent, to apply the ECC, to manage environment and effluent quality and to be responsible for environmental management and O&M. Moreover, MCWD supervises the activity of comprehensive outsource company.

- c) In order to involve the existing private de-sludgers (described in sub-clause 4)), assignment management is to be conducted by MCWD.

Therefore, it is necessary for MCWD to enhance its capacity / organization to supervise the activity of comprehensive outsource company and to undertake the adequate Project management.

3) Existing Septage Management Conducted by Others than MCWD

Other than the aforementioned PPP activity, Cebu City conducts a series of de-watering and filtrate treatment by lagoon in the Project area. Although the Project is to rehabilitate the said facilities, MCWD is not in touch with the said activity of Cebu City.

The activity of Cebu City is simply to receive the septage and to de-water it. Moreover, it is activities of the private de-sludgers to de-sludge septic tanks and to collect / transport the septage. Cebu City, as well as MCWD, has no experience and no skill to de-sludge and collect the septage, and to operate STP equipped with a filtrate treatment devices. Accordingly, MCWD is required to improve its capacity for septage de-sludge / collection and O&M of STP.

4) Involvement of Existing Private De-sludgers

As aforementioned, there are 7 private de-sludgers who transport the septage to the existing de-watering plant of Cebu City. When MCWD commences the septage collection by the comprehensive outsource company in the Project, MCWD's may interfere with the business of the exiting private de-sludgers. To prevent it, MCWD is planning to involve them in the Project and to outsource the septage collection for a certain volume of septage as follows:

- To conclude agreements with the exiting private de-sludgers to outsource the septage collection for a certain volume of septage.
- To conduct directly assignment scheduling of septage collection trucks to maintain the agreed level of septage volume.
- Although the exiting private de-sludgers collect the fee from residents against their de-sludge services in present, they stop it for the Project. It is MCWD to collect the fee from residents.
- The exiting private de-sludgers are paid by MCWD according to volume of collected septage.

5) Preparation of Septic Tanks Inventory

MCWD has a customer management system for water supply. Names, addresses, water usages, history of fee payment, etc. are able to be referred to. If utilizing the existing system, preparation of septic tanks inventory may be relatively easier than the new establishment. However, the septic tanks inventory for non-customers for MCWD water supply should be commenced from registration from names and addresses.

Necessary items to be recorded in the septic tanks inventory are different from ones for water supply. Specific information for septic tanks are necessary such as volume, material, type, age, location, accessibility, de-sludge log, etc., which are not managed by MCWD in present. MCWD, therefore, should newly prepare forms of inventory book.

Preparation of septic tanks inventory should be conducted prior to commencement of septage collection since the inventoried information is necessary to prepare rounding schedules for septage collection. It is however difficult to complete the inventory before the Project as the number of households reaches 470 thousand in 2025 for the planned septage collection area. Selecting only customer for MCWD water supply, it is still in large number at 226 thousand households. MCWD is, therefore, required to prepare the inventory as follows:

- During the construction / equipment procurement stages, MCWD commences the preparation of inventory forms under technical guidance of an experienced expert.
- To expect the stable commencement of septage management, MCWD should prepare the inventory books enabling one-month schedule at least prior to commencement of the test-run of the STP. It requires the information for 3,700 households, and it is undertaken in the soft component period.
- Even in / after the test-run period, the inventory book is necessary 1 - 2 month(s) prior to the de-sludging services to prepare the rounding schedule of septage collection. MCWD continues, therefore, preparing the inventory books even after the soft component.
- Until completion of the inventory book, a lot of resources are required. Since it is difficult for MCWD to complete it by its resources, MCWD plans to outsource it to the comprehensive outsource company.

6) Promotion of Public Awareness

The Project is to commence a fee-based service for septage collection. Since such service has not been conducted by MCWD, MCWD is required to provide adequate explanations for

obtaining public consensus as well as promotion of public awareness. Although MCWD has enough experiences for advertising and improving public awareness, no experience and no plan is available for septage / wastewater management. In the circumstances, major issues are summarized as follows:

- To prepare adequate plan for advertising and improving public awareness, MCWD learns experiences and examples of a Japanese local government which provided during introduction time of fee-based wastewater management.
- Referring to the Japanese experiences and examples, MCWD prepares adequate medias (reef let, movies, etc.) containing information effective to promotion of public awareness.
- Referring to the Japanese experiences and examples, MCWD organizes a campaign to have efficient commencement of septage management.

7) Septage Management Fee to be imposed on Residents

Along with the implementation of the Project, MCWD commences the fee collection. In present, MCWD is planning to impose it to the resident for the same price collected in Mactan Island.

In Mactan Island, it is collected together with the water tariff from customers of MCWD water supply for PHP2.20/m³ of water consumption. Assuming average water consumption at 20m³/month, it is calculated as PHP44.00/month/household. It is also calculated as PHP2,640.00PHP/time for 5 years. The price should be agreed with residents.

In case for non-customers for MCWD water supply, it is difficult for MCWD to collect the fee monthly and little by little. The fee should be collected at de-sludging time for approximately PHP2,640.00/time. Moreover, payment schedule should be also studied to fix a) payment before de-sludge, 2) payment after de-sludge or 3) cash payment at the time of de-sludge. Such alternatives should be discussed and examined together with the comprehensive outsource company and the existing private de-sludgers.

8) Establishment of Septage Management Units

MCWD is planning to establish the septage management unit along with the Project implementation. 8 persons are necessary for the unit as shown in Table-2.

To support the septage management unit, the existing staffs should be in charge of water quality, legal, financial and public relation matters as shown in Table-3.

Table-2 Summary of the Septage Management Unit

Personnel	Full-time/part-time	Number of the staff	Main task
Unit leader	Full-time	1	Comprehensive management of septage management business
Sub Unit Leader	Full-time	1	Comprehensive management of private contractors of the Project for technical implementation status such as septage collection volume, septage treatment volume, water quality, collection frequency and the number of collected/uncollected household
Clerk for vacuum truck assignment and septage collection management	Full-time	2	Management of households for septage collected / uncollected as well as customer / non-customer for water supply, daily assignment schedule of vacuum trucks, record on septage collecting information and manifest management and O&M status for vacuum trucks
Clerk for septic tank inventory	Full-time	2	Investigation of the septic tank information on each household / entity in water customer / non-customer, investigation of opening for de-sludge and facilitation of installation of opening on septic tank, preparation and update of septic tank inventory
Clerk for STP O&M	Full-time	2	Management of STP operation condition, water quality, treatment data, disposal volume of de-watered cake and manifest management
Total	Full-time	8	

Source: JICA Study Team

Table-3 Summary of Required Activities on Existing Organization

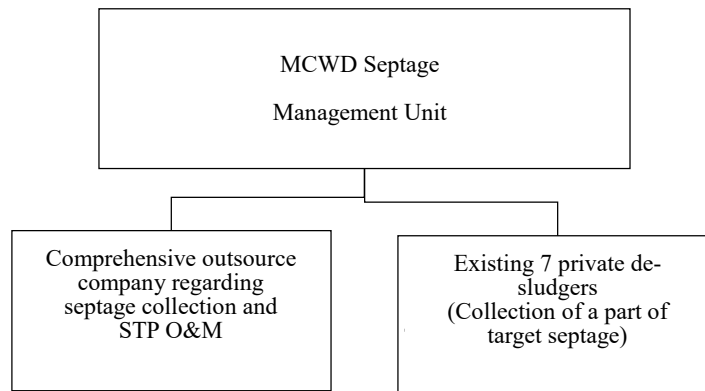
Activity	Department	Number of the staff	Main task
Quality management of water, septage and de-watered cake	Existing water quality management	20 persons in total	Regular quality analysis on water / septage / de-watered cake, and STP O&M monitoring in water

Activity	Department	Number of the staff	Main task
	department is responsible as par-time work		quality as well as advice for improvement of STP operation depending on water quality
Legal management for private contracts	Existing legal department is responsible as part time work	Personnel in Legal department	Legal management work regarding outsourcing for private contractors
Tariff collection, financial management and payment for private contractor	Existing financial group is responsible as part-time work	Public relation department, accounting department and financial department	Collection of septage management fee in the same time of water tariff collection, fee collection from non-customers for water supply, payment for private contractors and necessary budgetary measures for septage management activities
Public awareness	Existing public relation department is responsible as part-time work	Public relation department	Conducting the public hearing and public awareness activities regarding commencement of the operation for the Project, promotion of understandings of residents for the necessity of septage management and fee collection

Source: JICA Study Team

9) Outsourcing Plan for O&M of Facility and Equipment

To fulfil the aforementioned issues, MCWD is planning to outsource O&M of facility and equipment to private contractor(s) as described below and in Figure-1. The outsourcing is divided into two components, i.e. a) comprehensive outsource company and b) existing private de-sludgers.



Source: JICA Study Team

Figure-1 Outsourcing for Septage Collection and Treatment

① Comprehensive Outsource Company

There are several companies dealing with septage collection / treatment by PPP or contracted with a LGU in the Philippines. MCWD is planning to outsource the O&M of STP, vacuum trucks and dump trucks to be constructed / procured by the Project to such private companies. Scopes of the outsourced works include a) septage collection, b) operation of STP, c) transport of de-watered cake to a landfill site and d) maintenance of facility and equipment. Demarcation between MCWD and the comprehensive outsource company is summarized as Table-4.

Table-4 Demarcation between MCWD and Comprehensive Outsource Company

Item	MCWD	Comprehensive Outsource Company
General	- Collection of septage management fee from residents / entities - Payment for the comprehensive outsource company based on the septage receiving volume at STP - Acquisition of the Project permissions including ECC - Coordination with LGUs - Conducting public awareness promotion activity - Cost burden for large scale expansion / rehabilitation on facility / equipment	- Claim the cost of outsourced work based on the septage receiving volume at STP in regular basis - Cost burden for the work such as fuel, oils, utility (electricity / water supply), consumables, spare parts and labor

Item	MCWD	Comprehensive Outsource Company
Preparation of Septic tank inventory	- Preparation of format for septic tank inventory book and support to fill in the book - Based on the recorded inventory book, compiling the priority order for septage collection	- Investigation of septic tanks in the Project area in cooperation with MCWD and fill the inventory format with volume of tank, accessibility, availability of openings for de-sludge, etc.
Septage collection	- Lending procured vacuum trucks in the Project - Preparation of daily septage collection schedule based on the inventory book and assignment of vacuum trucks for septage collection - Accepting the request for septage collection from non-customers for water supply, collect the septage management fee from them and assigning vacuum trucks for septage collection - Record the collection log to the inventory book based on manifests - Manage and administrate the O&M condition of vacuum trucks	- Installation of opening on septic tank and update of the inventory book if no opening is available at a septic tank - Collection of septage by vacuum trucks based on the assignment schedule instructed by MCWD (mainly for customers for MCWD water supply) - Implementation of manifest record at the septage collection - O&M for vacuum truck
STP O&M	- Lending the newly constructed STP in the Project - Preparation of format for STP operation management - Record management of the septage treatment volume based on manifest and operation management - Management and Administration of O&M on STP - Analysis of water quality and septage on regular basis and monitoring the environmental impact and O&M condition on STP	- O&M for STP based on operation manual - Record the received volume of septage, transportation volume of de-watered cake and STP O&M conditions - Record the manifest when septage treatment and transportation of de-watered cake
De-watered cake transportation	- Lending the procured dump truck - Management of the record for transportation volume of de-watered cake and treatment amount based on the manifest - Management and administration of O&M for dump truck - Payment for private landfill site based on the	- Record the manifest when transportation of de-watered cake - O&M for dump truck

Item	MCWD	Comprehensive Outsource Company
	disposal volume of de-watered cake	

Source: JICA Study Team

② Existing Private De-sludgers

There are 7 private de-sludgers in active. When MCWD commences the septage collection by the comprehensive outsource company in the Project, MCWD's may interfere with the business of the exiting private de-sludgers. To prevent it, MCWD is planning to involve them in the Project and to outsource the septage collection for 60m³/day of septage based on the present working records.

As for utilization of the existing private de-sludgers, MCWD is planning to outsource the on-call septage collection (septage collection from non-customers for MCWD water supply) basically. However, MCWD coordinates the outsourced septage volumes with ones for the comprehensive outsource company to maintain the necessary allocation volume to the existing private de-sludgers. The coordination is realized by vacuum trucks assignment schedule to be undertaken by MCWD.

Table-5 shows relation between MCWD and the existing private de-sludgers.

Table-5 Relation between MCWD and Existing Private De-sludgers

Item	MCWD	Existing Private De-sludgers
General	- Collection of septage management fee from residents and entities - Payment to Existing Private De-sludgers based on the septage receiving volume at STP	- Claim the cost of outsourced work based on the septage receiving volume at STP in regular basis - Cost burden for the work such as fuel, oils, utility (electricity / water supply), consumables, spare parts and labor - Cost burden for necessary renewal of the equipment on continuous work
Septage collection	- Assignment of vacuum trucks - Record the collection log based on the manifest	- Septage collection by vacuum trucks based on the assignment schedule instructed by MCWD (mainly for non-customers for MCWD water supply) - Recording of manifest during the septage collection

		- O&M and renewal of vacuum trucks
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Source: JICA Study Team

10) Necessity of Technical Cooperation Project

In a upper plan, i.e. “Mega Cebu Road Map 2050”, introduction of sewerage system is planned to be spread widely. However, no master plan of sewerage is available and it is supposed that 20 - 30 years are necessary until completion of sewerage system. Therefore, master plan for wastewater management describing roles of septage management and sewerage / facility deployment schedule is necessary. And MCWD expects a technical cooperation from JICA to prepare the master plan, inputting the Japanese technology. Moreover, preparation of plan for re-use / re-cycle of de-watered cake to mitigate volume of the landfilled cake. In the circumstances, contents of the technical cooperation are outlined as shown in Table-6.

Table-6 Expected Technical Cooperation by MCWD

No.	Item	Breakdown
1.	Capacity enhancement to extract issues on wastewater / sludge management	Basic study and extraction of issues on wastewater / rainwater management
		Study on coordination mechanism for wider management of wastewater as well as roles of stakeholders
2.	Capacity enhancement to prepare master plan for wastewater / rainwater management	Plan of roles of stakeholders and schedule for improvement of on-site-sanitation, sewerage and septage management
		Public consultation and promotion of public awareness
		Consensus and agreement among stakeholders and LGUs
3.	Capacity enhancement for septage management	Re-use / re-cycle plan of de-watered cake
		Monitoring of the Project activities as well as recommendation for improvement

Source: JICA Study Team

The mentioned technical cooperation aims at integrated master plan for wastewater / rainwater management in Metro Cebu and re-use / re-cycle plan of de-watered cake. It is not to assist the commencement of the Project activities as well as O&M of STP and equipment. In the circumstances, it is required for MCWD to enhance the following capacity promptly.

- To clarify and to arrange scope of works to be outsourced as well as contact conditions
- Preparation and management of septic tanks inventory
- Assignment scheduling of septage collection trucks
- Monitoring management for outsourced works in conditions and performance
- Monitoring management for quantity and quality for septage collection and treatment
- Promotion of public awareness

(2) Objectives

Effluent quality standards for wastewater / septage treatment plant was revised in 2016. Since then regulations for nitrogen and phosphorus were added. The Project introduces, therefore, an advanced treatment system which has not been conducted widely.

Candidate companies to be the comprehensive outsource company has little experience for the advanced treatment system, while they have experiences for ordinary activated sludge method. Since MCWD has also no experience for practical management for wastewater / septage treatment, the capacity enhancement is planned in the Project as follows:

① Initial Operational Guidance to be Conducted by the Contractor

The Contractor / Supplier for the Project facility and equipment provides a series of initial operation guidance for basic O&M procedures. It is conducted for three-month duration in the test-run described in the next sub-clause. Planned counterparts are as follows:

- Clerk for vacuum truck assignment and septage collection management, and Clerk for STP O&M of MCWD.
- STP operators and trucks drivers procured by MCWD (belonging to the comprehensive outsource company)

② On-the-Job-Training (OJT) in Test-run Period

The three-month test-run is conducted in the Project, as well as the above mentioned initial operation guidance. During the test-run, the STP receives the collected septage and commences practices for operation by OJT, including septage de-watering and filtrate treatment.

While the test-run is conducted, MCWD enhances its capacity by OJT for vacuum truck assignment and management / monitoring the outsourced works. Planned counterparts are as follows:

- Clerk for vacuum truck assignment and septage collection management, and Clerk for STP O&M of MCWD.
- STP operators and trucks drivers procured by MCWD (belonging to the comprehensive outsource company)

③ Soft Component

In parallel with aforementioned initial operation guidance and OJT, and considering the inputs, the Project conducts the soft component for MCWD' staffs to enable them to achieve the following. 10 months are planned as the execution period of the soft component.

- Utilizing the septic tanks inventory book, MCWD become enable to prepare rounding schedule for septage collection and to manage fee collection (especially for non-customers for MCWD water supply).
- MCWD become enable to instruct the comprehensive outsource company / the existing private de-sludgers for septage collection and treatment and to manage conditions of the facility and equipment as well as septage / effluent quantity and quality.
- MCWD become enable to take prompt countermeasures to troubles, clarifying scopes of works and work demarcation between MCWD and the comprehensive outsource company / the existing private de-sludgers.
- MCWD become enable to provide adequate activity to promote public awareness, arranging necessary information to have public consensus and cooperation for the septage management program as well as fee payment.

(3) Outputs

Outputs of the soft component are planned as follows:

- System for septage management
 - ✓ MCWD provides de-sludge management.
 - ✓ MCWD provides management of outsourced work for de-sludge, septage collection and O&M of STP.
- Public awareness regarding septage management
 - ✓ MCWD implements public awareness activities for introducing the septage management.

(4) Confirmation of Achievement

Point to confirm achievements of the soft component is whether the necessary organization and preparations are arranged for MCWD to commence smoothly the septage management program. The confirmation of achievement is, therefore, whether planning documents and formats to be recorded are prepared and MCWD commences the septage management program.

Plan to confirm achievements of the soft component is as shown in Table-7.

Table-7 Confirmation of Achievements of Soft Component

Field	Output	Confirmation of Achievements
System for septage management	Achievement 1 De-sludge management	✓ Whether MCWD can prepare the septic tanks inventory book for <u>customers</u> for MCWD water supply. ✓ Whether MCWD can prepare the septic tanks inventory book for <u>non-customers</u> for MCWD water supply. ✓ Whether MCWD can provide adequate vacuum truck assignment based on the septic tanks inventory book. ✓ Whether MCWD can management de-sludge history based on the septic tanks inventory book.
	Achievement 2 Management of outsourced work for de-sludge, septage collection and O&M of STP	✓ Whether MCWD can prepare adequate TOR for outsourcing works as well as evaluation criteria. ✓ Whether MCWD can prepare management formats for outsourced septage collection and O&M of equipment. ✓ Whether MCWD can prepare management formats for outsourced STP operation and O&M of STP. ✓ Whether MCWD can manage the performance of private companies for septage collection and treatment.
Public awareness regarding septage management	Achievement 3 Implementation of public awareness activities for introducing the septage management	✓ Whether MCWD can prepare the public awareness activity plan and necessary media, arranging necessary information and referring Japanese experience / examples. ✓ Whether MCWD can conduct a campaign to advertise efficiently the introduction of septage management program.

Source: JICA Study Team

(5) Activities (Input Plan)

1) Contents of Soft Component

Planned activities (inputs) for the soft component are as shown in Table-8 and Table-9.

Table-8 Activity and Input for Soft Component

Field	Achievement	Necessary technology	Current situation and required technical level	Contents of activity and training item	Activity method	Necessary input	Output
System for septage management	Achievement 1 De-sludge management	Information management for septic tank and management for de-sludge schedule	- MCWD does not manage the septic tank information and de-sludge schedule. MCWD does not have the experience and management department. - Septage management unit is established. Technic for preparation of septic tank inventory book and de-sludge schedule is required.	【Activity】 - Preparation of septic tanks inventory for regular collection - Preparation of septic tanks inventory for non-regular collection - Preparation of rounding schedule for septage collection 【Training item】 - Target management items in septic tanks inventory (regular and non-regular collections) and example of the inventory format - Alternative plans for charging the fees for non-regular collection - Draft schedule for septage collection and prioritization method	- Class room lecture and discussion - Preparation of the septic tanks inventory book at pilot area (OJT) - Practical training at test-run period (OJT)	- De-sludge management expert (1 person x 0.90month) - MCWD's septage management unit (leader, sub leader, clerks for collection and inventory book: 4 persons) - MCWD's legal, financial, PR personnel	- Septic tanks inventory book for regular collection (pilot area) - Septic tanks inventory book for non-regular collection (pilot area) - Septage collection schedule sheet - OJT report
	Achievement 2 Management of outsourced work for de-sludge, septage collection and O&M of STP	Management for outsourced work	MCWD conducts septage treatment on Mactan Island by PPP. However, since MCWD does not own their facility and equipment, MCWD does not have any experience for monitoring management and technical documents on O&M for facility and equipment so that it is insufficient	【Activity】 - Preparation of specification/contract document for outsourcing (including preparation work of septic tanks inventory by comprehensive outsource company) - Establishment of monitoring plan for septage collection - Establishment of monitoring plan for STP O&M 【Training item】 - Example of technical specification/contract document on outsourcing	- Class room lecture and discussion - Preparation of the septic tanks inventory book at pilot area (OJT) - Practical training at test-run phase (OJT)	- Outsourcing contract/evaluation expert (1 person x0.43month) - De-sludge management expert (1 person x0.58 month) - STP management (operation) expert (1 person x1.75month) - STP management (water quality) expert (1 person x0.48month)	- Technical specification for outsourcing/contract document (draft) - Monitoring plan for septage collection - Monitoring plan for STP operation - OJT report

Field	Achievement	Necessary technology	Current situation and required technical level	Contents of activity and training item	Activity method	Necessary input	Output
			- for management on outsourcing. - No wastewater treatment facility operated by MCWD and no accumulated knowledge for wastewater treatment and sludge treatment. Therefore, MCWD is not able to instruct the private contractor based on the required water quality - Establishment of septage management unit and selection of outsource company under the proper specification are required. Monitoring for the performance of septage treatment is required.	- Example of the selection of the contractor - Monitoring method for collection work (manifest/ actual record/ checklist for collection work and status of the equipment - Monitoring method for STP operation (de-watering, wastewater treatment, O&M and inspection record, water quality record, de-watered cake record) - Extraction of issues and solutions from the working monitoring result		- MCWD's septage management unit leader (leader, sub leader, clerks for collection and inventory book: 4 persons), STP management 2 persons) - MCWD's legal, financial PR personnel - Central laboratory in MCWD	
Public awareness regarding septage management	Achievement 3 Implementation of public awareness activities for introducing the septage management	Effective public awareness technic	- There is no planned public awareness activity in MCWD regarding septage management program. - There is no information regarding septage management and no knowledge on required information disclosure. There is no accumulated	【Activities】 - Preparation of PR materials such as leaflet, video - Trial run for the campaign at the starting of the Project 【Training item】 - Example of PR in Japan (contents and media) - Example of campaign and campaign plan/ implementation management	- Class room lecture and discussion - Preparation of PR media - OJT for PR campaign)	- Public awareness expert (1 person x 0.92 month) - MCWD' PR department	- Public awareness activity plan - PR media - OJT report for practical training on the first campaign

Field	Achievement	Necessary technology	Current situation and required technical level	Contents of activity and training item	Activity method	Necessary input	Output
			knowledge for PR material and example. Based on the contents of PR for introduction of sewerage project and implementation in Japan, initial technic for starting the efficient public awareness activity is required.				

Source: JICA Study Team

2) Experts for Soft Component

As experts for the soft component, 5 experts are deployed according to specified engineering fields.

3) Target Grope

Target grope for each output are planned as shown in Table-10.

Table-10 Target Grope for the Soft Component

Output	Activity	Target Grope
Output 1 MCWD provides de-sludge management	• Preparation of septic tanks inventory for regular collection • Preparation of septic tanks inventory for non-regular collection • Preparation of rounding schedule for septage collection	Septage management unit to be established in MCWD Existing department for legal, financial, public relations
Output 2 MCWD provides management of outsourced work for de-sludge, septage collection and O&M of STP	• Preparation of specification/contract document for outsourcing (including preparation work of septic tanks inventory by comprehensive outsource company) • Establishment of monitoring plan for septage collection • Establishment of monitoring plan for STP O&M	Septage management unit to be established in MCWD Existing department for legal, financial, public relations, water quality management
Output 3 MCWD implements public awareness activities for introducing the septage management	• Preparation of PR materials such as leaflet, video • Trial run for the campaign at the starting of the Project	Existing department for public relations Septage management unit to be established in MCWD

Source: JICA Study Team

MCWD will inform JICA Philippine Office of a list of members to be trained one month prior to commencement of the soft component.

(6) Resources

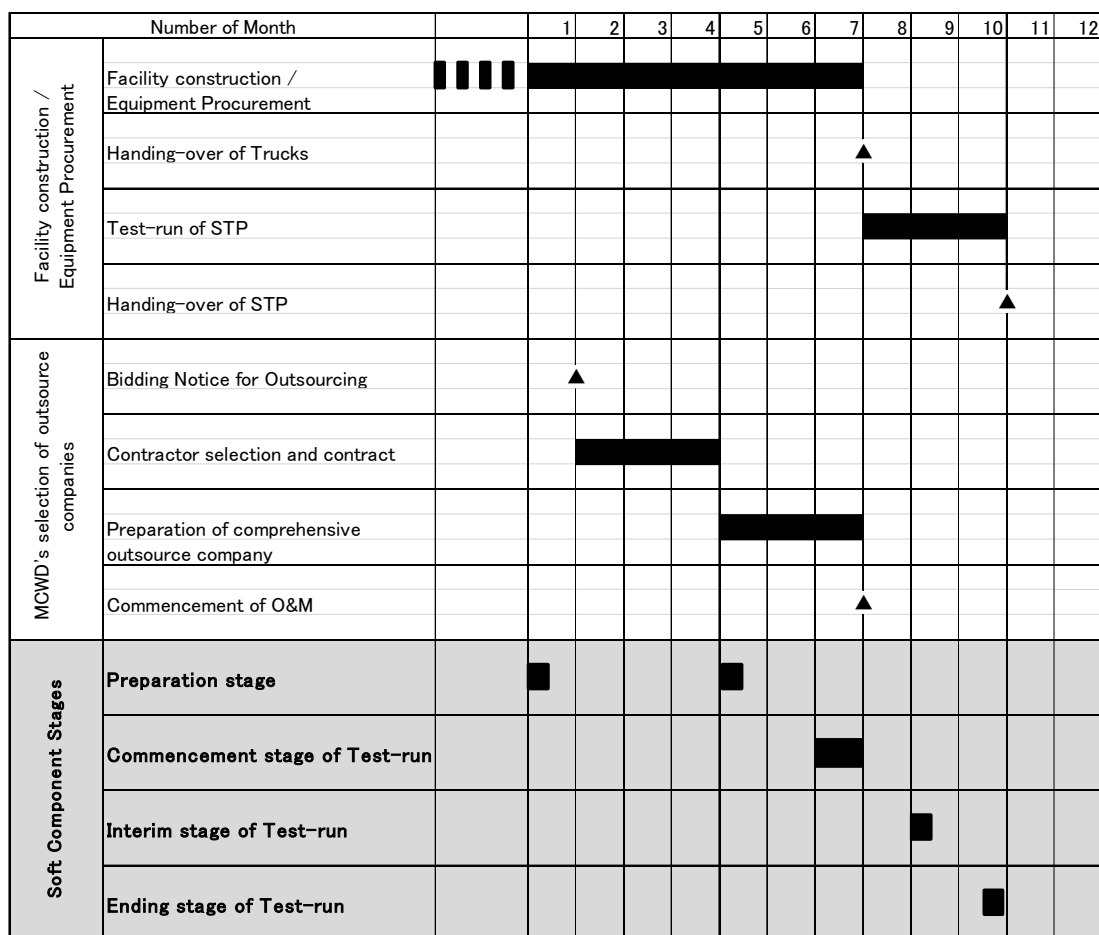
The soft component is planned to transfer the Japanese knowledges, technologies and examples for solid waste management and wastewater management. Since the deployed experts should be good at the Japanese practices, the Japanese experts will be deployed.

(7) Schedule

Practices utilizing the STP and equipment to be constructed / procured are necessary for the soft component. Therefore, the soft component will be implemented along with handing-over of facility and equipment and the test-run.

Considering the schedule for facility construction and equipment procurement and necessary period for MCWD's selection of outsourced companies, the soft component should be

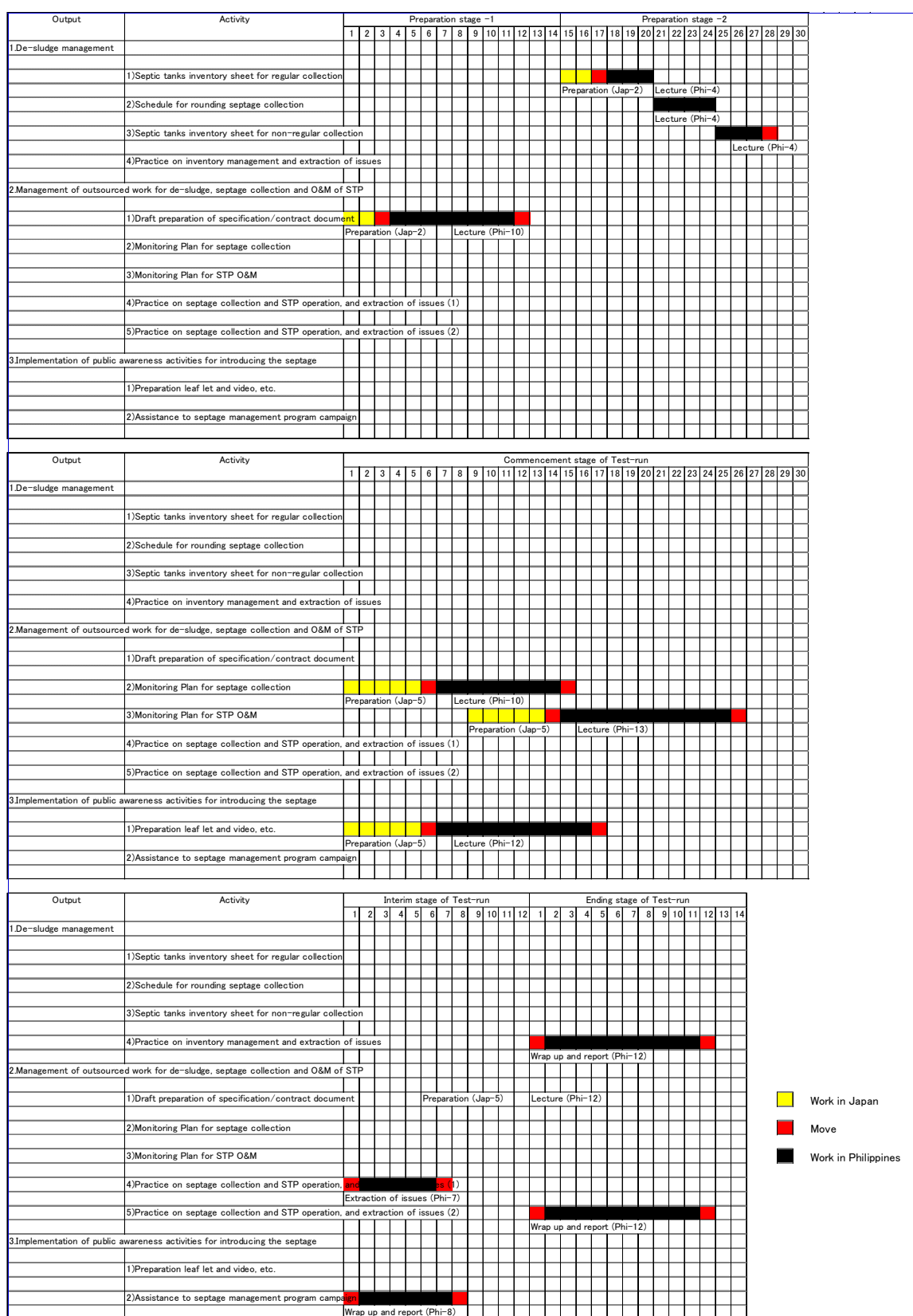
conducted in four stages as shown in Figure-2, i.e., a) Preparation stage, b) Commencement stage of Test-run, c) Interim stage of Test-run, d) Ending stage of Test-run.



Source: JICA Study Team

Figure-2 Stages of Soft Component

Detailed schedule in each stage is shown Figure-3.



 Work in Japan
 Move
 Work in Philippines

Source: JICA Study Team

Figure-3 Schedule of Soft Component (Draft)

(8) Products

Products of the soft component are as shown in Table-11.

Table-11 Products of Soft Component

Output	Products	Content
Output 1 MCWD provides de-sludge management	• Septic tanks inventory book for regular collection (pilot area) • Septic tanks inventory book for non-regular collection (pilot area) • Septage collection schedule sheet • OJT report	Inventory to record septic tanks information including schedule of de-sludge. To examine necessity to include fee collection record.
Output 2 MCWD provides management of outsourced work for de-sludge, septage collection and O&M of STP	• Technical specification for outsourcing/contract document (draft) • Monitoring plan for septage collection • Monitoring plan for STP operation • OJT report	Monitoring plan and monitoring sheets to record / check the performance of outsource companies such as manifest, de-watering, water quality, status of O&M.
Output 3 MCWD implements public awareness activities for introducing the septage management	• Public awareness activity plan • PR media • OJT report for practical training on the first campaign	Activity plan for public awareness including media examples (media to be used, event frequency, information to be disclosed, etc.) and report of the 1st campaign.

Source: JICA Study Team

(9) Undertakings by the Recipient Side

1) Viability

MCWD has no exclusive organization for comprehensive septage management. It recognizes the necessity to establish the exclusive unit as well as staff training to commence the Project. Therefore, it is clear that motivation of MCWD is enough promoted.

However, to achieve the objectives and outputs, it is required for MCWD to prepare necessary organization and finance.

2) Hindrance and Countermeasures

No hindrance is observed for items of the soft component.

The soft component will be conducted in the preparation stage of MCWD to commence the septage management program. Therefore, it is difficult for MCWD to allocate a long hours in a day. Accordingly, lecture and training hours per day should be for 3 - 4 hours. Key persons in the septage management units are required to understand all training programs.

Moreover, the following conditions are required for counterpart members (trainees). Prior to the soft component, MCWD and trainees should fulfill the conditions:

- ✓ Basic skill for computer operation
- ✓ Basic skill for computer application (MS-Excel and MS-Word)
- ✓ Securing enough hours (3 - 4 hours per day) for lecture and site practice
- ✓ Securing a lecture hall

(10) Estimated Cost

Necessary cost for the soft component is estimated at around JPY17,759 thousand as shown in Table-12.

Table-12 Estimated Cost for Soft Component

Item	Amount (JPY thousand)
Labor Cost	4,686
Direct Cost	3,217
Indirect Cost	9,746
Total	17,759

Source: JICA Study Team

Note: It is changeable due to exchange rate, price escalation, etc.

Appendix-6 References

Appendix-6-1

Environmental Monitoring Form

MONITORING FORM (Construction Stage)

-If environmental reviews indicate the need of monitoring by JICA, JICA undertakes monitoring for necessary items that are decided by environmental reviews. JICA undertakes monitoring based on regular reports including measured data submitted by the project proponent. When necessary, the project proponent should refer to the following monitoring form for submitting reports.

-When monitoring plans including monitoring items, frequencies and methods are decided, project phase or project life cycle (such as construction phase and operation phase) should be considered.

1 . Responses/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
Responses/Actions to Comments and Guidance from Government Authorities	

2 . Mitigation Measures

- Water quality (Wastewater measured value)

Item (Unit)	Measured value (Mean)	Measured value (Max.)	Local standards	Reference: Japanese standard	Remarks
SS (mg/L)			150	200	1 time per week before discharge into river

3 . Social Environment

- Impact to existing road

Monitoring item	Monitoring results during report periods
Conditions of construction vehicles operation and traffic jams	

- Labor environment

Monitoring item	Monitoring results during report periods
Labor accidents Safety Protector Safety Meeting	

MONITORING FORM (Operation Stage)

-If environmental reviews indicate the need of monitoring by JICA, JICA undertakes monitoring for necessary items that are decided by environmental reviews. JICA undertakes monitoring based on regular reports including measured data submitted by the project proponent. When necessary, the project proponent should refer to the following monitoring form for submitting reports.

-When monitoring plans including monitoring items, frequencies and methods are decided, project phase or project life cycle (such as construction phase and operation phase) should be considered.

1 . Mitigation Measures

- Water quality (Effluent measured value)

Item 8(Unit)	Measured value (Mean)	Measured value (Max.)	Local standard	Reference: Japanese standard	Remarks
BOD(mg/L)			120	160	1 time per week before discharge into river
Fecal Coliform (MPN/100mL)			800	3000	
Ammonia as NH ₃ -N (mg/L)			7.5	100	
Nitrate as NO ₃ -N (mg/L)			30	100	
Phosphate (mg/L)			10	16	
Oil and Grease (mg/L)			15	30	
Surfactants (mg/L)			30	-	

- Waste

Monitoring items	Measured value
De-watered cake: generated volume	
De-watered cake: disposed volume in landfill	

2 . Social Environment

- Impact to existing road

Monitoring items	Monitoring results during report periods
Conditions of vacuum trucks operation and traffic jams	
Conditions of dump trucks operation and traffic jams	

- Assignment of Private De-sludgers for Septage Collection

Monitoring items	Measured value
Monthly total volume collected by Private De-sludgers	

- Labor environment

Monitoring items	Monitoring results during report periods
Labor accidents Safety Protector Safety Meeting	

Appendix-6-2

Environmental Check List

Appendix 6-2 Environmental check list

Category	Environmental items	Main check items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a)(b)(c) According to scale of the Project, approval procedures are taken by IEE checklist. (d) Environmental compliant certificate (ECC) is issued by DENR after examination of IEE checklist.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a)(b) Y	(a)(b) Several stakeholders meetings with local government unit, including leaders of Barangays, have been conducted.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Following 3 cases have been compared: 1. The case not to construct STP, and not to procure additional vacuum trucks 2. The case to construct STP and to procure additional vacuum trucks 3. The case not to construct STP, but to procure additional vacuum trucks
2 Pollution Control	(1) Water Quality	(a) Do pollutants, such as SS, BOD, COD, pH contained in treated effluent from a sewage treatment plant comply with the country's effluent standards? (b) Does untreated water contain heavy metals?	(a) Y (b) N	(a) Effluent of STP is discharged to a public river, after treatment satisfying the effluent standards for classification D of DENR (BOD, Fecal Coliform, Ammonia as NH3-N, Nitrate as NO3-N, Phosphate, and Sulfate) . (b) Heavy metals are not included, because only septage of septic tanks is the subject of treatment.
	(2) Wastes	(a) Are wastes, such as sludge generated by the facility operations properly treated and disposed of in accordance with the country's standards?	(a) Y	(a) De-watered cake is disposed in a landfill site.
	(3) Soil Contamination	(a) If wastes, such as sludge are suspected to contain heavy metals, are adequate measures taken to prevent contamination of soil and groundwater by leachates from the wastes?	(a) Y	(a) As mentioned in (1), heavy metals are not included.
	(4) Noise and Vibration	(a) Do noise and vibrations generated from the facilities, such as sludge treatment facilities and pumping stations comply with the country's standards?	(a) Y	(a) The standards on noise are respected during both construction and operation stages. The standards on vibrations is not available.
	(5) Odor	(a) Are adequate control measures taken for odor sources, such as sludge treatment facilities?	(a) Y	(a) Though no regulation is available for odor, the Project installs deodorization devices at STP.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) The construction site does not belong to national park and / or natural conservation area.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that the project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?	(a)(b)(c) (d) N	(a)(b)(c)(d) The construction site does not belong to conservation areas such as primeval forests, tropical rain forests, ecologically valuable habitats.

Category	Environmental items	Main check items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Is the compensations going to be paid prior to the resettlement? (e) Is the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a)(b)(c) (d)(e)(f) (g)(h)(i) (j)N	(a)(b)(c)(d)(e)(f)(g)(h)(i)(j) Involuntary resettlement is not anticipated.
	(2) Living and Livelihood	(a) Is there a possibility that changes in land uses and water uses due to the project will adversely affect the living conditions of inhabitants? (b) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?	(a)N (b)N	(a)(b) No modification of land use and water basin is conducted.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a)N	(a) There is no cultural heritage in the construction site.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a)N	(a) No impact to landscape is anticipated, because the Project is to rehabilitate the existing septage de-watering plant.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to lands and resources respected?	(a)N (b)N	(a)(b) The construction site does not belong to areas for minority race and indigenous people.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a)(b)(c) (d)Y	(a)(b)(c)(d) Based on "occupational safety and health standards" by DOLE (Department of Labors and Environment), safe protectors such as gloves, helmet, safety belt are provided.
	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? (d) If the construction activities might cause traffic congestion, are adequate measures considered to reduce such impacts?	(a)Y (b)N (c)N (d)Y	(a) Water is discharged after catch basins of suspended solid not to pollute the river. If necessary, sprinkling water is provided to prevent dusts. Low noise / vibration models of construction machines are used for construction works. (b)(c) Since the Project is to rehabilitate the existing facility, no impacts to natural and social environment is anticipated. (d) Adequate time schedule is prepared for construction works not to concentrate construction vehicles in a particular time zone.

Category	Environmental items	Main check items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
5 Others	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) N	(a) Monitoring on effluent quality, harmful effects to the existing infrastructure, labor environment, and waste management are implemented. (b) During construction: Effluent quality is metered once per week. Impacts of construction vehicles to traffic conditions and labor environment are observed and reported according to monitoring sheet. (c) During operation: Effluent quality is metered once per week. Impacts of construction vehicles to traffic conditions and labor environment are observed and reported according to monitoring sheet. Volume of de-watered cake is confirmed and reported once per month. (d) The Contractor monitors the above conditions during construction. Operation contractor and MCWD monitor the above conditions during operations. Such costs are included in construction and operation & maintenance costs respectively. (e) According to ECC, MCWD reports metered / observed conditions to DENR.
6 Note	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) No impact is anticipated to global environment.

Appendix-6-3

Result of Water Quality Analysis

Appendix-6-3 Result of Water Quality Analysis

Analysis Result for Existing De-watering Plant in Cebu City						
	Item	Unit	Sampling			Ave.
			2018.2.6	2018.2.20	2018.2.27	
Septage	TSS	mg/L	28,900	2,840	1,450	11,063
	BOD	mg/L	19,809	980	591	7,127
	COD	mg/L	34,154	6,733	1,984	14,290
	T-N	mg/L	1,693	1,901	417	1,337
	T-P	mg/L	430	647	258	445
Filtrate	TSS	mg/L	193	192	89	158
	BOD	mg/L	691	175	255	374
	COD	mg/L	1,580	825	511	972
	T-N	mg/L	203	665	265	378
	T-P	mg/L	73	34	59	55
Removal Rate	TSS	%				98.6
	BOD	%				94.8
	COD	%				93.2
	T-N	%				71.7
	T-P	%				87.6

Existing Data for Existing De-watering Plant in Cebu City (2014.4~2015.2)										
	Item	Unit	Sampling							
			2014.3	2014.4	2014.5	2014.6	2014.7	2014.12	2015.1	2015.2
Septage	TSS	mg/L	21,000	210	170	450	300	450	450	850
	BOD	mg/L	3,560	1,000	5,440	3,240	1,440	8,620	6,300	3,520
	COD	mg/L	4,550	18,039	16,924	15,600	11,048	16,924	20,899	29,810
Filtrate	TSS	mg/L	30	<1	2	4	8	1	400	1
	BOD	mg/L	250	125	2,471	668	320	1,004	1,140	256
	COD	mg/L	200	248	4,118	850	715	3,654	2,432	385
Removal Rate	TSS	%								
	BOD	%								
	COD	%								

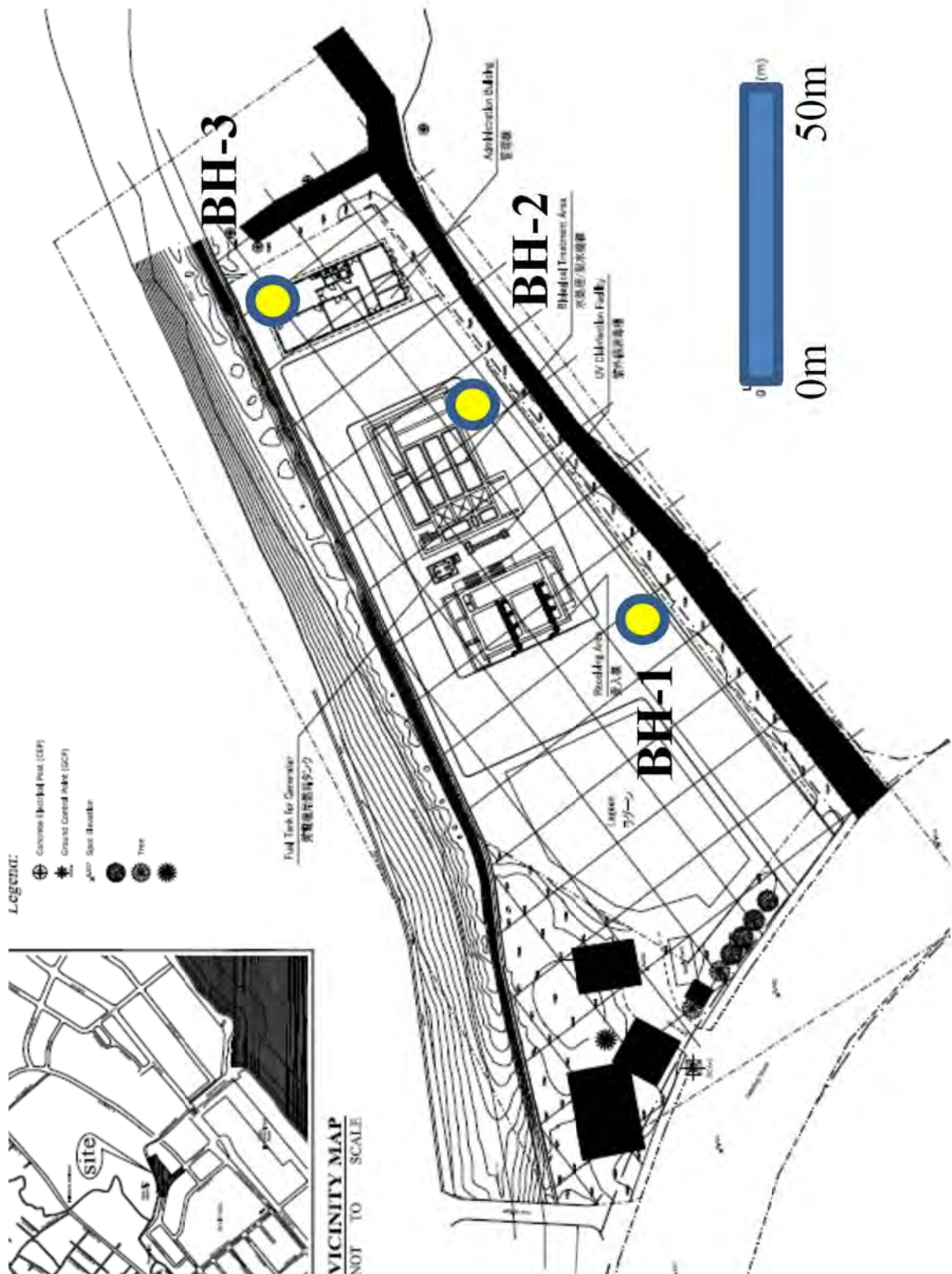
Existing Data for Existing De-watering Plant in Cebu City (2015.3~2015.9)										
	Item	Unit	Sampling							Ave.
			2015.3	2015.4	2015.4	2015.7	2015.7	2015.9	2015.9	
Septage	TSS	mg/L	263	308	11,040	911	26,860	11,869	38,000	23,812
	BOD	mg/L	1,384	1,080	2,600	1,076	3,900	1,600	11,000	4,235
	COD	mg/L	10,598	11,435	4,000	19,261	6,400	4,700	9,400	13,099
Filtrate	TSS	mg/L	1	<1	40	2.7	320	620	80	202
	BOD	mg/L	86	119	240	119	280	210	180	481
	COD	mg/L	120	329	68	352	50	120	81	863
Removal Rate	TSS	%								99.2
	BOD	%								88.6
	COD	%								93.4

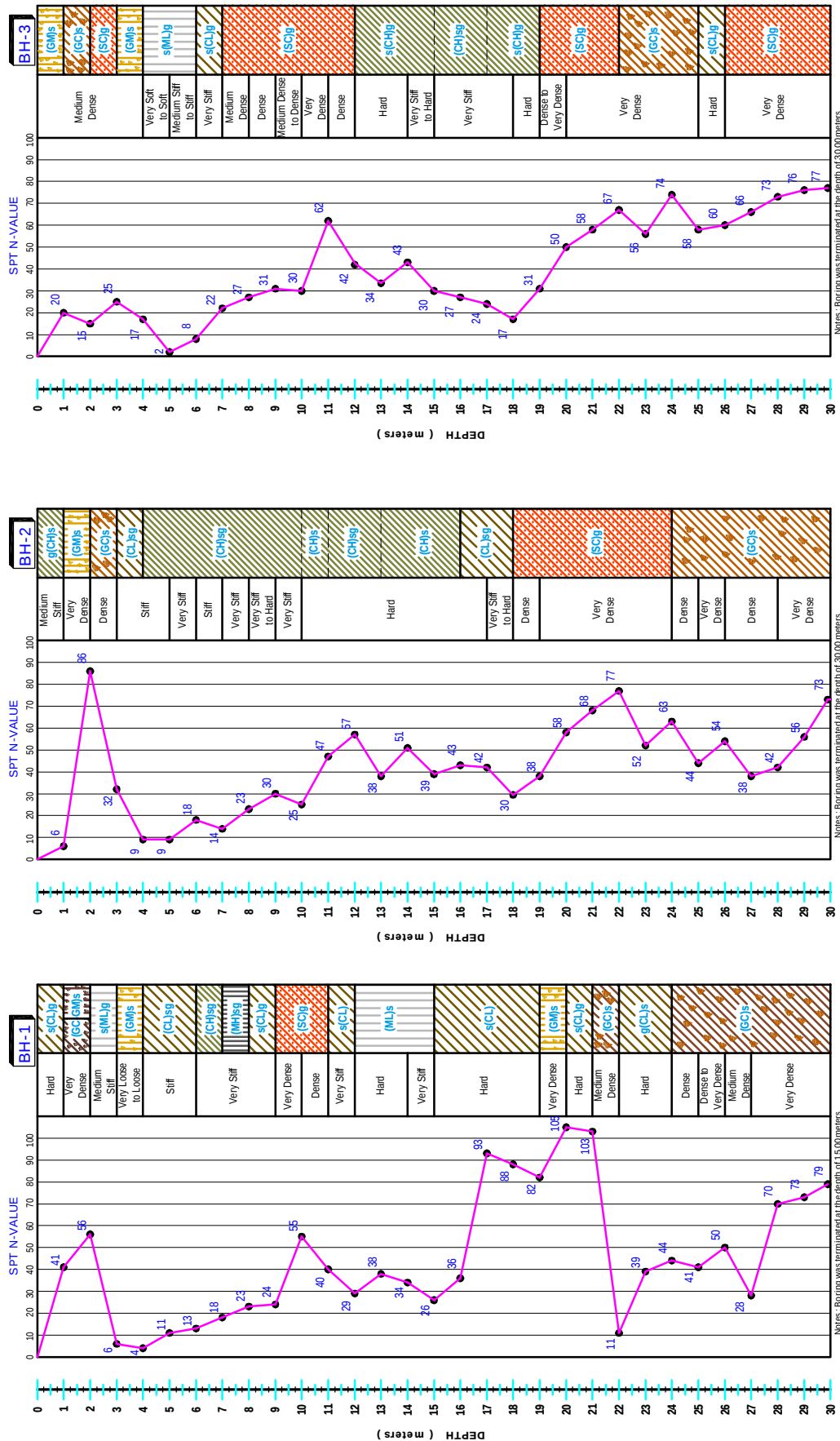
※To calculate average TSS and its removal rate, yellow marked data (1,000mg/L or less) are omitted.

Data of Alabang Zapote STP in Manila			
Quality of Septage			
Sampling	TSS	BOD	COD
year / month	mg/L	mg/L	mg/L
2016.10	18,400	2,292	16,277
2016.10	2,700	2,492	13,127
2016.10	4,500	928	5,113
2016.11	21,700	3,419	27,877
2016.11	15,900	3,465	18,748
2016.11	17,000	4,512	18,132
2016.12	24,800	1,596	14,865
2016.12	32,600	7,047	16,476
2017.1	18,000	3,914	23,709
2017.1	16,400	2,583	7,950
2017.1	18,000	2,712	14,556
2017.1	19,400	2,408	13,841
2017.2	5,600	1,402	7,964
2017.2	4,000	871	5,993
2017.2	2,000	2,060	3,653
2017.2	2,750	1,499	3,645
2017.3	17,900	6,964	14,638
2017.3	4,850	6,800	7,582
2017.3	18,100	3,763	17,527
2017.3	6,100	3,362	12,403
Average	13,535	3,204	13,204

Appendix-6-4

Results of Soil Investigation





LEGEND:

- (GM)s
- (GC)s
- (SC)g
- (GM)s
- s(ML)g
- s(CL)g
- (SC)g
- (CH)g
- (CH)g
- (CH)g
- (SC)g
- (GC)s
- s(CL)g
- (SC)g

Notes: Boring was terminated at the depth of 30.00 meters

LEGEND:

- g(CH)s
- (GM)s
- (GC)s
- (CL)sg
- (CH)sg
- (CH)s
- (CH)sg
- (CH)s
- (CL)sg
- (SC)g
- (GC)s

Notes: Boring was terminated at the depth of 30.00 meters

LEGEND:

- s(CL)g
- (GC)GMs
- (GM)s
- (GC)s
- (CL)sg
- (CH)g
- (ML)s
- s(CL)g
- (GM)s
- s(CL)g
- (GC)s
- g(CL)s
- (GC)s
- (GC)s
- (CL)s
- (ML)s

Notes: Boring was terminated at the depth of 15.00 meters

DRAWN NTS

Figure 3.0
DEPTH vs. SPT N-VALUE & SUBSOIL PROFILE
(BH-1, BH-2 & BH-3)

JICA STUDY TEAM (YAGIYO ENGINEERING CO., LTD.)
PREPARATION SURVEY FOR THE SEPTAGE MANAGEMENT PROJECT FOR MCWD SERVICE AREA
F. CABAHOOG ST., NPA, CEBU CITY
SOUTH AMKON

Appendix-6-5

Results of Social Survey

Septage Management Practices of MCWD and non-MCWD Customers
University of San Jose-Recoletos

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1 Summary

The importance of proper waste disposal is a primordial concern of every household and individual. It should not be taken for granted because it can greatly affect the environment and the balance of nature. This household survey aims to determine the household practices of the selected municipalities and cities of Cebu when it comes to waste water disposal. Furthermore, this study further aims to ascertain on whether or not, waste water (sludge) withdrawn from different households will have a possible use to the farmers as fertilizer.

The following highlights are drawn from the results of the survey:

Household survey

- Most of the respondents were MCWD subscribers; few were customers of local service water provider, while others used deep wells.
- Most of the respondents have their own septic tank or cesspit/latrine as waste water storage facility that is equipped with opening with cover and a bottom slab.
- Respondents who own a waste water storage facility have never experienced withdrawing sludge for a long period of time
- Those who have experienced withdrawing sludge express that the quality of effluent they observed were good. Sludge withdrawal was done by private sector and the only reason that they avail of such service is because the tank became full.
- Respondents were open as to the possibility of sludge withdrawal within 3-5 years as long as it is affordable to them.
- Most of the respondents' waste water from the kitchen is drained to canals while waste water from toilet is going to the septic tank.
- The average size of septic tank is around 5.37 m³

Farmer's Survey

- Most of the farmers are located in the mountain area of Cebu City.
- Most of the farmers owns at least a 1 hectare lot where different kinds of crops (eg. Flowers, vegetables, fruit bearing trees) are cultivated.
- Most of the farmers does not get agricultural water supply from a water service provider but rather sourced it from ground water such as ponds, rivers, and springs.
- Farmers used both commercial and organic fertilizers for their crops.
- Most of the farmers were willing to try the compost from sludge taken from septic tanks as fertilizer to their farm

2 Introduction

Environmental Programs and initiatives are enacted by national policy makers in order to protect the people from health hazards. These national policies are cascaded down to the local government units to formulate ordinances and implementing rules and regulations that suit its locality. In 2014, City Ordinance No. 2398, also known as septage management program ordinance, was enacted to protect the health of the people and the environment by controlling and managing the storage, collection, transport, treatment, and disposal of septage or sludge from various sources in the city of Cebu (Cabrera, 2014). This ordinance includes but not limited to: proper construction of septic tanks and frequent collection of sludge. However, this policy may be in place, but is this implemented or has this reached its implementation in the household level? It is therefore the aim of this study to describe the Septage management practices of the different households in the six (6) municipalities of Cebu.

Republic act 9275, otherwise known as the “Philippine Clean water act of 2004” mandates local government units to prepare a program on septage management and to share the responsibility in the management and improvement of water quality within their respective territorial jurisdictions. Furthermore, the same law mandates local government units to appropriate necessary land for the construction of a sewage and/or septage management facilities. These facilities shall be used in treating withdrawn sludge from different establishments and assures proper disposal of the same. Ingallinella, Sanguinetti, Koottatep, Montangero, Strauss (2002) averred that faecal sludge collected from different home-made sanitary facilities such as septic tanks are usually discharged not treated which poses a great risk to water resources and public health. That is why, it has been well documented that there is a direct relationship between different health diseases such as cholera, hepatitis, and dysentery and the unrestricted discharges of residential sewage system (Robbins, 2007). Until such time that these practices shall be properly managed, people continues to be at risk of these health hazards posed by indiscriminate disposal of household wastes.

With these considerations at hand, proper septage management is an indispensable practice. And this practice should start at home as it is considered as the basic unit of the society. These individual households may not be the major contributor to environmental pollutions, but taking them as a whole poses a big risk to the environment. Therefore, acting on the basic step of identifying the septage management practices of these households is the first priority, and from there, programs and interventions shall be implemented in order to prevent more risks to the environment and the people.

3 Survey

3-1 For Residents

3-1-1 Methodology

This study employed descriptive survey method using a custom-fit questionnaire designed appropriately for the purpose of the study and served as an Interview guide. The same questionnaire has undergone corrections and refinements before the actual survey implementation. These corrections include changing of numbering because of skipping questions and unlocking or changing of terms that can be clearly understood by the respondents. Though questions were in English, these were translated into the local dialect during the conduct of the survey. After the data were gathered, appropriate statistical treatment such as percentage and ranking were employed in order to obtain relevant information.

When it comes to statistical treatment used, a simple percentage and ranking were employed in this study. For questions that a certain range needs to be computed, the highest response of the respondents were deducted by the lowest response and divided by five (5) groups.

3-1-1-1 Questionnaire and contents of the interview

Please see Annex 5-1-1

3-1-1-2 Preparation/Mobilization

1) Resources

A total of 6 Field Interviewers (FI) were deployed in the 6 survey areas. Each FI is assigned to a specific Local Government Unit (LGU) and a number of household respondents that they are supposed to survey. In the conduct of the survey, each FI needs the following resources:

- Interviewer's Kit – containing the questionnaires need for the LGU
- Identification – Survey ID needed for them to be identified by the respondents
- Transportation Allowance and Honorarium

2) Mobilization

During the orientation, they were introduced to the questionnaire and did a simulation interview with one identified respondent in order to get a feel on the flow of questions and other possibilities that they may encounter during the actual survey. After the simulation interview, they were asked to share their experiences and even difficulties in conducting the interview.

During the survey proper, each field interviewer is already assigned to a specific Local Government Unit (LGU) and a barangay where they are supposed to conduct they survey. Upon reaching the barangay, they will proceed to a starting point (*any permanent landmark such as: church, school, medical facility and others*) which were already set and part of the interviewer's kit. From there, a random number is generated to serve as a guide to the first household respondent. After the first household, an interval of one (1) house is observed before the next household is chosen. During the entire conduct of the survey, field interviewers observed the right side rule, meaning, they are supposed to interview respondents from households located on the right side when walking along the road. This process ensures systematic selection and wide area coverage in the conduct of the survey.

3-1-2 Survey Area and Respondents

3-1-2-1 Survey area

Respondents of the survey were residents of the randomly selected households from the following six areas in Cebu: Compostela, Liloan, Consolacion, Mandaue, Cebu City, and Talisay City.

3-1-2-2 Survey Respondents

1) Number of respondents

Number of respondents in each municipality was identified accordingly in proportion to the total population of the municipalities and cities. In order to randomly select the respondents, list of customers from the Metropolitan Cebu Water District (MCWD) was used in the selection process. Using Minitab Statistical Software, random respondents were chosen among the list. Barangay location of these respondents served as a guide in the selection of the actual respondents in the survey. A total of 200 respondents were interviewed in the survey. However, around 20% of the total respondents were non-MCWD subscribers while the remaining were customers of MCWD.

Table 3-1 Number of survey respondents

City\Sample type	MCWD customer	MCWD non-customer	Total	%
Compostela	8	2	10	5.0%
Liloan	11	3	14	7.0%
Consolacion	11	3	14	7.0%
Mandaue	41	9	50	25.0%
Cebu City	73	18	91	45.5%
Talisay City	18	3	21	10.5%
Total	162	38	200	100.0%

2) Average number of household member

Table 3-2 presents the average number of household members per survey area. Taking the total number of household members per locality, divided by the number of households surveyed in the area (ex. Liloan $63/14=4.50$), it was found out that Talisay City had the highest average household members with 5.38 while Liloan got the lowest average household members with 4.50.

Table 3-2 Average number of household member

City	Number of household members	Number of household surveyed	Average number of household members
Compostela	52	10	5.20
Liloan	63	14	4.50
Consolacion	75	14	5.36
Mandaue	242	50	4.84
Cebu City	482	91	5.30
Talisay City	113	21	5.38
Total	1027	200	

Respondents were further asked on how many members of each family that belongs to the each group indicated below.

There were a total of 1,027 individuals listed as part of the members of the household. Of these, more females than males were observed, and more of them were coming from the

age group of 22-27 years old. There were 153 (sum of 0-5 and 6-11) members of the household who were children and 142 (sum of 58-63 and 64 above) who could possibly be senior citizens. With this, septage management is very important because these children and senior citizens could be the one who will be more affected if there is contamination in water system.

Table 3-3 Total Number of family members of the respondents

Age group (years)	Male	Female	Number of persons
0-5	35	35	70
6-11	49	34	83
12-17	46	39	85
18-21	45	61	106
22-27	70	77	147
28-33	48	48	96
34-39	49	35	84
40-45	24	42	66
46-51	36	27	63
52-57	33	52	85
58-63	25	28	53
64 and above	30	59	89
TOTAL	490	537	1,027

3) Religion

Data on the Religion of the Respondents are presented in figure 3-1. As revealed in the figure, one hundred eighty five (185) or 92.5% of the respondents were Roman Catholics. This is the dominant religion in the province of Cebu that is why most of the respondents belong to such religious affiliation.

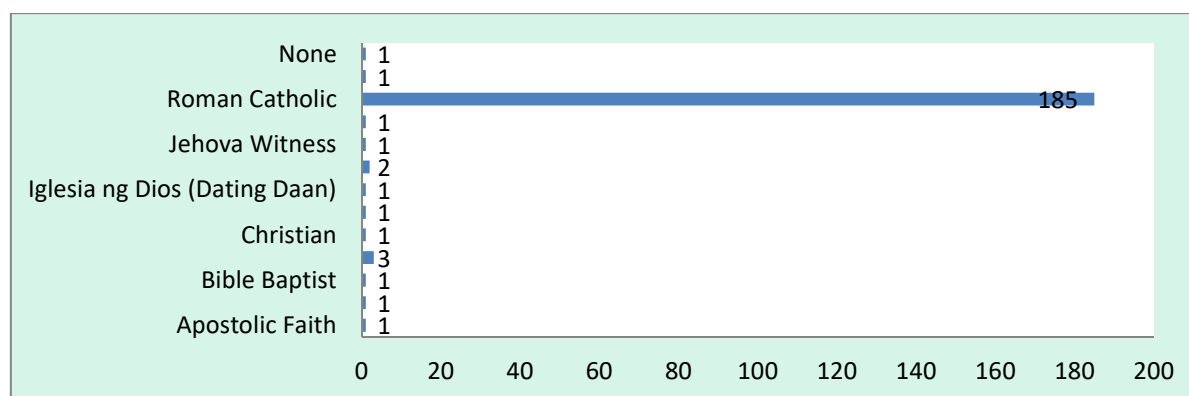


Figure 3-1 Religion of the Respondents (*number of respondents*)

Respondents were asked as to the main source of income of the household.

Figure 3-2 has the results. The figure revealed that majority of the respondent's household main source of income is from salaries and wages of an employed family member. Although, there were also others who got their main source of livelihood from a small business (eg. Sari-sari store (small business), internet café's, vulcanizing shop, some receives a monthly

pension from Social Security System (GSIS) and Government Services Insurance System (GSIS)

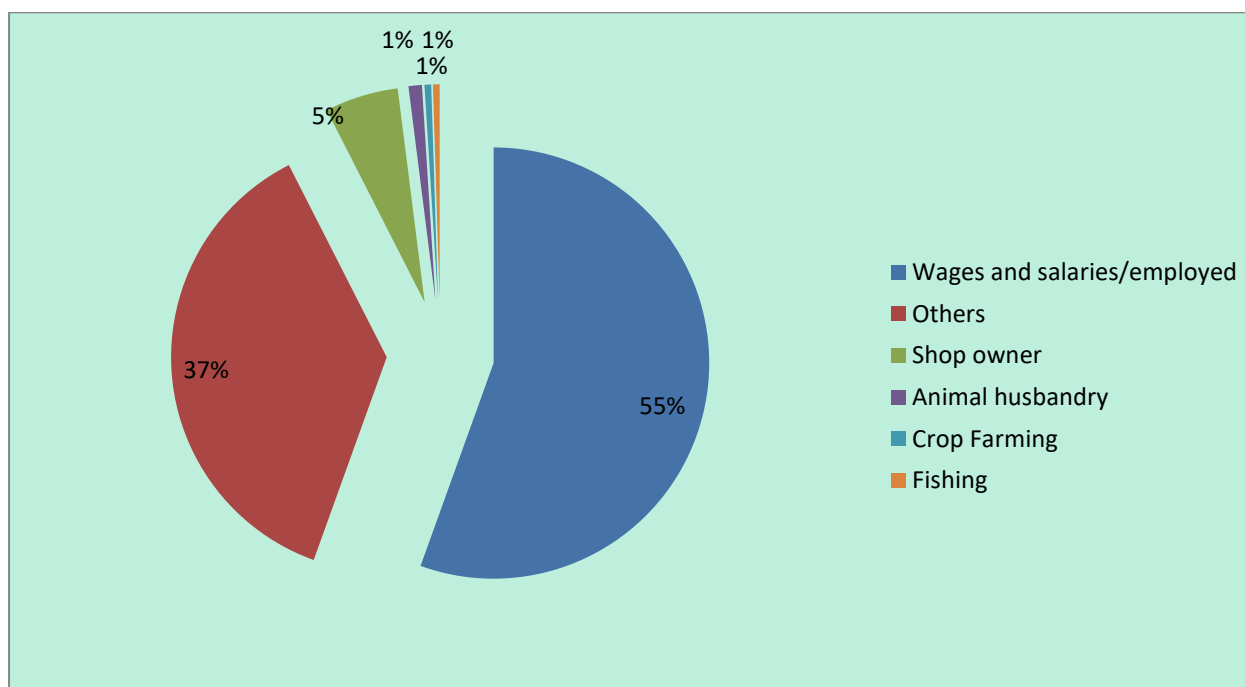


Figure 3-2 Main Source of Income

4) Preference on expense

The next table will reveal the top three expenses of the household. Meaning, after receiving their salaries, wages, and other incomes, where will it go? Respondents were asked to rank (with 1 as the first priority, 2 as second, and so on) the list based on the amount they usually spend for each category. Table 3-4 reveals the results. Taking the average response of the respondents (based on their rankings), table 3-4 revealed that the top 3 categories where household expenses will go were Food, Education, and Utilities. Utilities in this sense includes water, solid waste, energy source for lighting and cooking such as electricity, gas, kerosene, charcoal, and/or firewood. The result simply implies that food for the table will always be the first priority of every household.

Table 3-4 Household expenses

	Average of the rating	Categories
1	1.26	Food
2	2.22	Education
3	2.3	Utilities
4	2.5	Personal Care
5	2.5	Recreation
6	2.55	Health
7	2.76	Housing
8	2.8	Transportation
9	2.92	Clothing

Part of determining the socio-economic standing of a family is through the things that they possess. Some of these things could be very basic while others may also be a luxury. Figure 3-3 has the results. The top 3 common things that each household possess are Television with satellite dish (cable TV) with 187; followed by an electric fan with 180 respondents; and mobile phone with 169. The least commodity that each household possess are mosquito nets with 19; private car with 23; and private bicycle with 37 respondents.

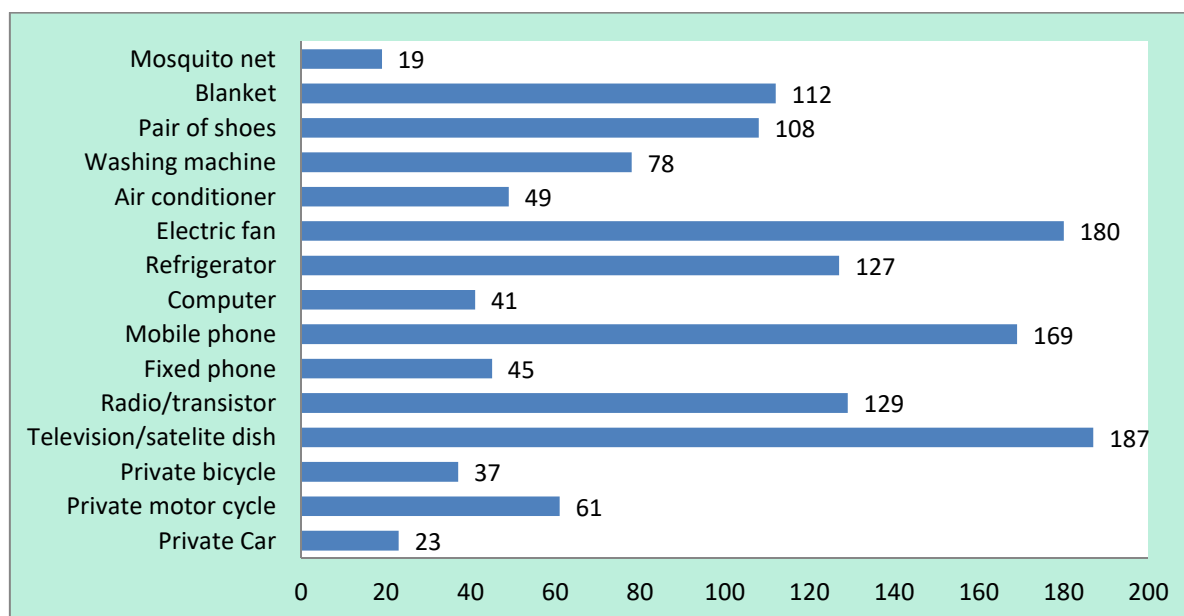


Figure 3-3 Things that respondents possess in the household *multiple response (no. of respondents)

5) Spread of diarrheal diseases

Respondents were asked on whether or not any members of the family have experienced hospitalization due to diarrheic diseases. Figure 3-4 shows the results. Most of the respondents could not anymore remember when was the last time a member of the family have experienced diarrheic diseases. Only few (17) have experienced diarrheic diseases once a year. This result may imply that as of the moment, there is not much contamination in the water supply yet. The availability of a purified drinking water now-a-days may have contributed to a more safe drinking water that is why diarrheic diseases are not anymore that prevalent.

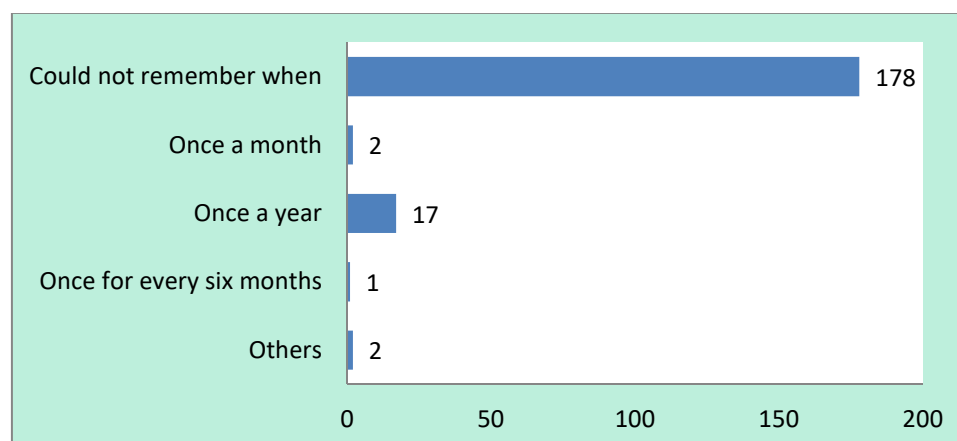


Figure 3-4 hospitalization due to diarrheic diseases (number of respondents)

The next figure shows the some social problem that is experienced by the household within the community. Figure 3-5 shows the results. It was revealed that the most prevalent social problem they have experienced in their community is the presence of solid waste that are scattered in public places or accumulated in drainage. This is the main cause of flooding (the second in rank) which is a frequent occurrence in the area whenever there is a strong pouring of rain. Furthermore, it also not surprising to observe that no job / source of income remains a social problem to most of the people. Although government have problems that would create more employment people, still only few got hired because of the needed skills for the job. While these top 3 social problems remain to be unsolved, others could not decide on which of these social problems they would consider as the biggest. Instead of choosing just one problem, they considered 2 or more problems as the issues they have experienced in their community.

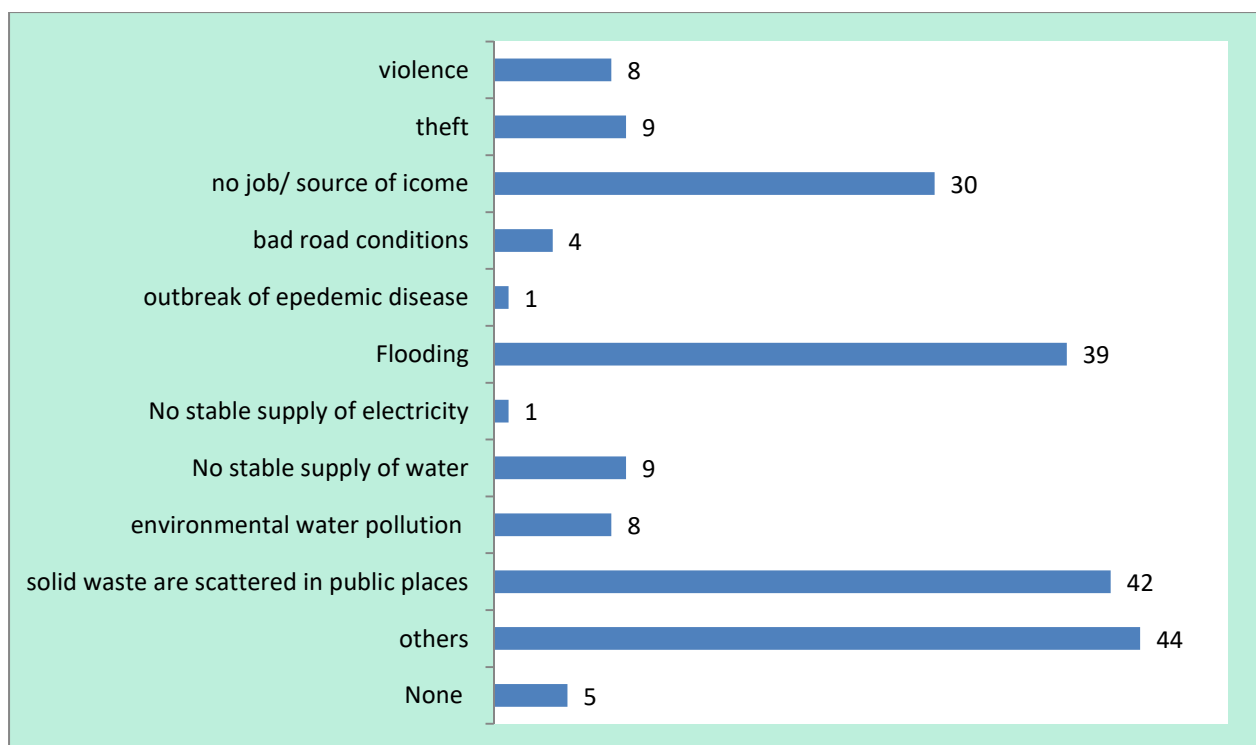


Figure 3-5 Social Problems encountered by the respondents (*number of respondents*)

Aside from being a residence, respondents were asked if there is any other purpose of the house they are living. Figure 3-6 shows the results. As revealed in the figure, most of the respondents used their house exclusively for residence only as indicated by 175 respondents. However, there were others who maximized their place and use a space for small eatery (carenderia), while others have small shops and others offer their residence for rental or boarding house.

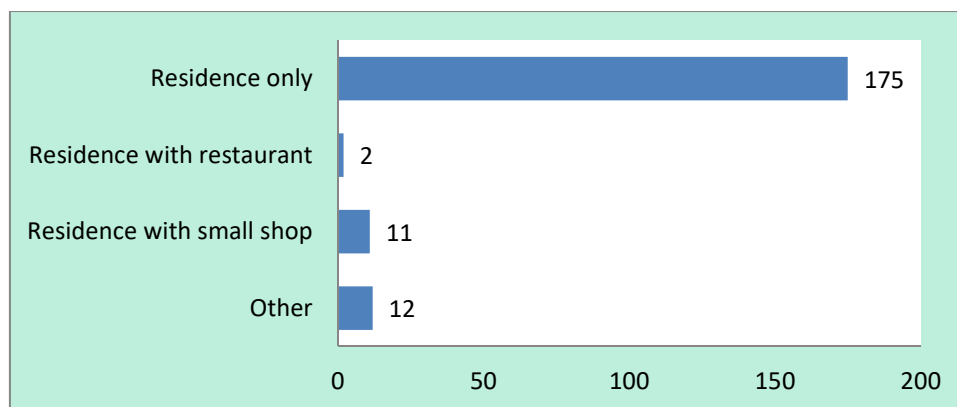


Figure 3-6 Purpose of house aside from residence (*number of household*)

In this question, respondents were asked at the same time observation was employed to determine the type of dwelling of the respondents. Type of dwelling refers to the floor area of the residence, whether it has one or multi-floor dwelling. Figure 3-7 shows the results. Majority of the residences surveyed have only one floor type of dwelling with 116 of the respondents. This was followed by residences that have more than one floor (2 or 3 floors) type of dwelling. In a place where space is so limited, like within the city setup, people are beginning to discover the importance of having a multi-story house in order to save and maximize the little space that they have.

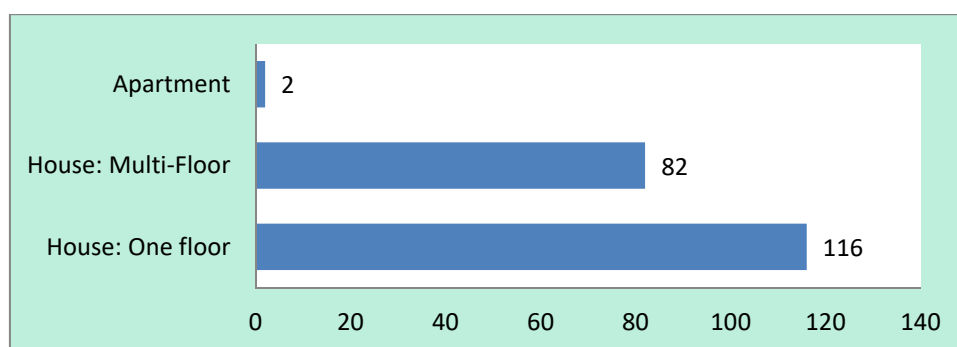


Figure 3-7 Type of dwelling (no. of household)

After determining the type of dwelling that respondents have, they are asked as to the number of rooms they have in their house. Figure 3-8 has the results. It was found out that about 64% of the respondents have three rooms or more in their dwellings. The others have two and one room with 42 and 31 respondents respectively.

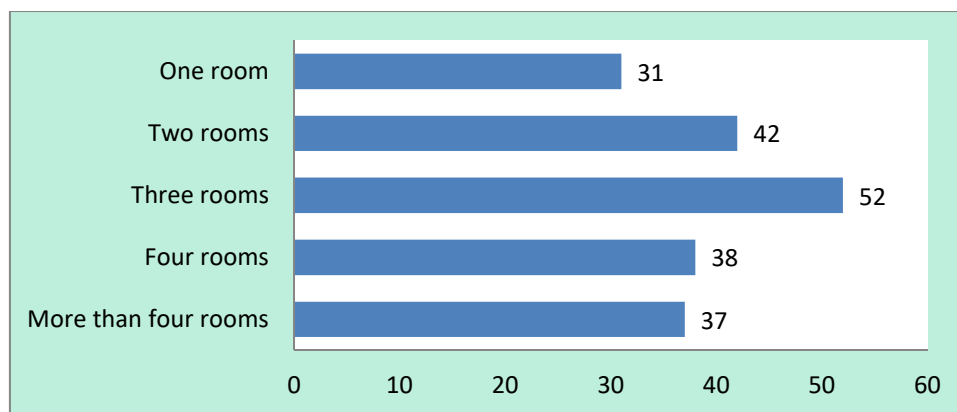


Figure 3-8 Number of rooms and other living service rooms (*no. of households*)

3-1-3 Results

3-1-4 Water and Sanitation

1) Monthly fee for MCWD water provision

The next figure reveals the average monthly expenses of the respondents related to water consumption (*excluding mineral water used for drinking*). The average figures indicated herein includes expenses for water used in kitchen, washing, and toilet. These expenses may be reflected in their bills if they are MCWD subscribers. Figure 3-9 reveals the results. As the figure revealed, more of the respondents paid around 250.00 pesos per month for water consumption which is more or less the minimum amount paid to MCWD. This was followed by those who paid around 500.00 pesos per month. Therefore, most of the respondents (sum of 250.00 and 500.00) paid around 500.00 pesos monthly for water consumption.

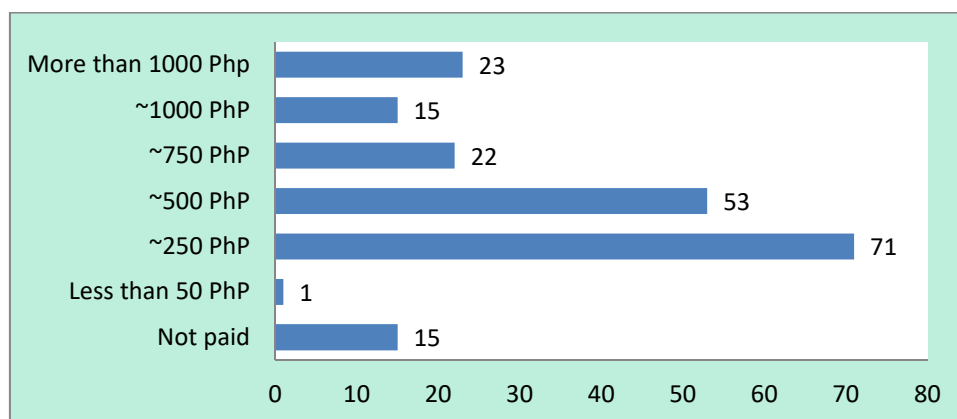


Figure 3-9 Average monthly expenses in water (*in Philippines peso*)

2) Cost for septage removal service

Currently, respondents are not paying a monthly fee for the cost of septage removal because such service will only be availed and paid during the actual removal of the sludge. However, this question asked the respondents to give estimated monthly expenses related to sanitary activities. Sanitary activities relates to disposing of sludge to the septic tank, maintenance of pipes, water used in the toilet, and water used in kitchen for cooking. Figure 3-10 shows the results. More than fifty percent (50%) or 108 out of 200 respondents did not spend any amount for sanitary activities every month. For those who have indicated their answers on the other hand, gave an estimated amount based on their monthly water consumption bill.

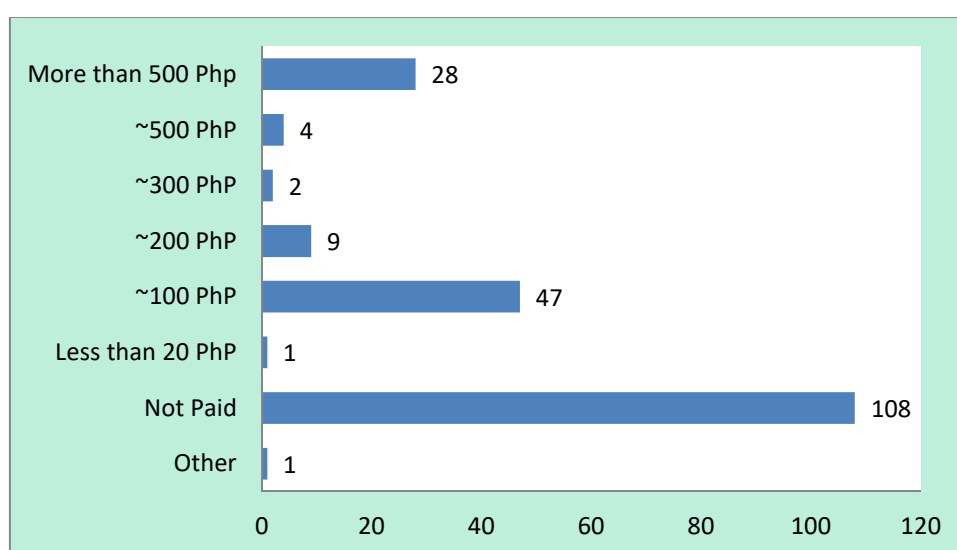


Figure 3-10 Average monthly expenses for sanitary activities (in Philippine peso)

3) Government Services and facilities

Government provides necessary drainage and canals in strategic places in order to prevent floods in the area. However, even with the presence of these infrastructures and facilities, respondents were asked on what are the improvements that they would want to expect more from the government in relation to sanitary fields. Figure 3-11 has the results. As revealed in figure 7, more than fifty percent (50%) of the respondents said that an improvement on the condition of the drainage is of primary importance. Considering that a lot of areas are flooded during rainy season, this is the area where government should improve their services. Although, looking at the situation, it is more on the residence call to make sure that their drainage are passable with water. Most of the time, because of the indiscriminate disposal of garbage by the people, most of the plastic thrown in the canals or drainage block the water that passes through it therefore causing flooding in the area.

Another area that public service should improve more is to lower the price of withdrawing sludge. Since this service (withdrawing of sludge) is currently done by private agencies, it is that not affordable for most of the people (*cost of sludge withdrawal by private sector shown in table 3-5*). The table shows that for every withdrawal of septic tank content, one has to pay around 2500 pesos per truck (with 6m³ capacity) within 20 meters from the location of the truck and additional fee of between 300-500 pesos for every 5 meters in excess of 20 meters. Furthermore, if the customer decides to have the septic tank cleaned by the provider, an additional cost of 4,500 pesos for cleaning the septic tank shall be paid.

Therefore, if the government can create programs and strategies that would lessen the cost of withdrawing sludge, more people would be encouraged to withdraw their sludge frequently and therefore minimizes soil and water contamination.

Table 3-5 Cost of withdrawing septic tank by private sectors (amount in Philippine peso)

Provider	Amount	Additional Cost	Cleaning
Septic Tank Services 1	3000/truck for 20 meters	500 / 5 meters of excess	
Septic Tank Services 2	2500 / truck for 50 meters	300 / 6.3 meters of excess	4,500
Septic Tank Services 2	2500 / truck for 50 meters	300 / 6 meters of excess	4,500

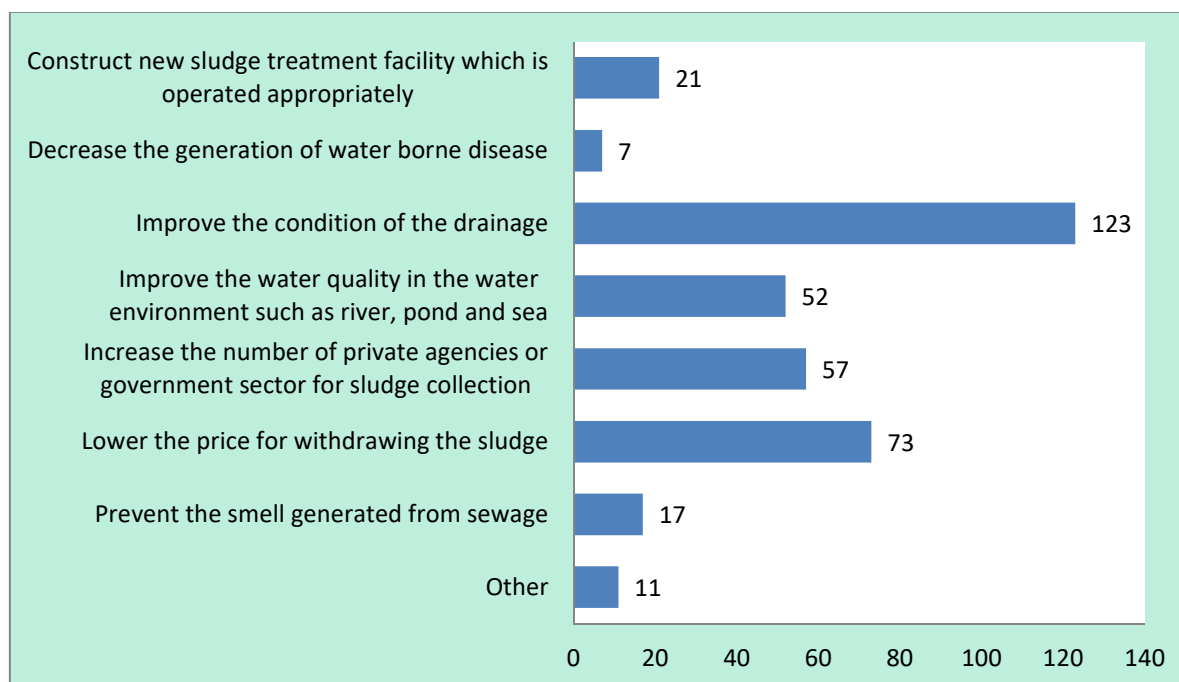


Figure 3-11 Improvements for Public Service regarding Sanitary Field

4) Payment for Additional Government Service

After choosing the kind of improvement that respondents expects from the government, they were asked if they are willing to pay an additional fee for such service/s and how much are they willing to pay. Figure 3-12 and table 3-6 reveals the results respectively.

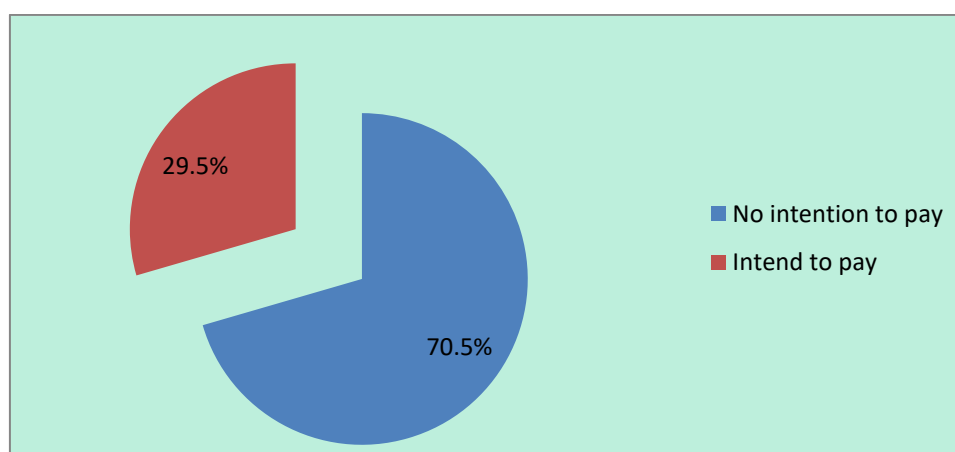


Figure 3-12 willingness to pay

This is the problem with the society, they would want to improve the public service, but do not want to pay additional fee for such service. It seems that they just want to have it for free. As revealed in figure 3-12, most of those who indicated an additional service improvement from public have no intention to pay more. So the next question would be, where should the government get the needed funding to provide these additional services to the people?

On the other hand, for those who indicated that they are willing to pay additional fee for the service/s, can only afford to pay not more than 180.00 pesos for such service as indicated by the sum of 16 and 24 which is around 68%. Others though could not estimate the amount but nevertheless willing to pay for the additional services and probably wait for the appropriate computation.

Table 3-6 additional fees for the service

Additional Fees for Service (in pesos)	Frequency
90 and below	16
91 to 180	24
181 to 270	1
271 to 360	
361 and above	1
Could not estimate	17
TOTAL	59

5) Water Equipment source

Respondents were asked as to the kinds of water equipment that they own in their residence. Figure 3-13 reveals the results. As revealed in the figure, most of the respondents have their own water meter connected to a service provider whether MCWD or their own local water provider. But even though they have their own water meter, others still prefer to have their own storage tank most especially for elevated areas where a schedule water interruption is more frequent. Others have their own deep well as a main source of water.

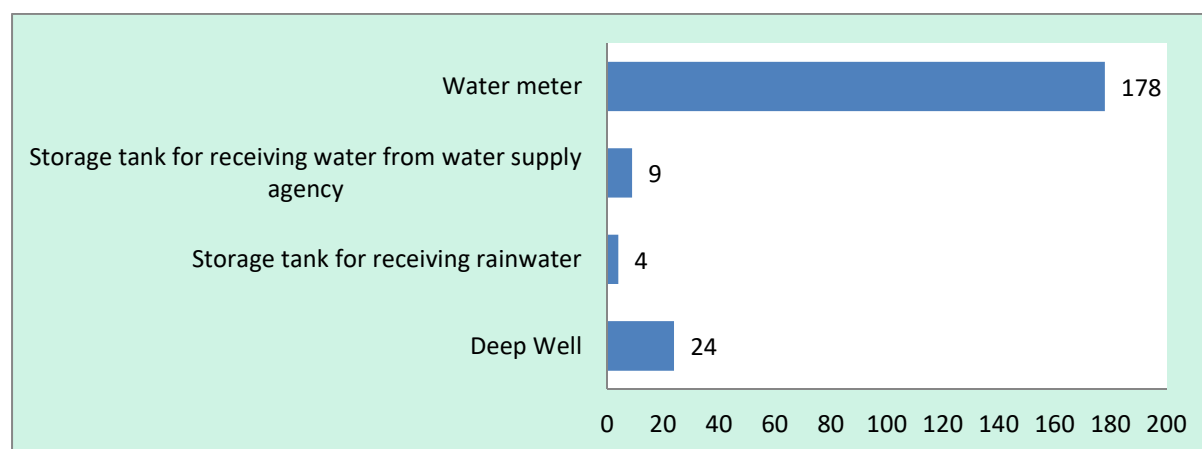


Figure 3-13 Kinds of water equipment *multiple response

6) Toilet type

Respondents of the survey were asked as to the kind of toilet that they have. Whether it is flushed toilet or not. Figure 3-14 has the results. Almost all of the respondents said that they are using flushed toilet in their residence with 99% of the respondents. With this 99% flush kind of toilet, around 82% or 163 of them used water tank / jar and dipper, or water pots for cleaning defecation and bowl.

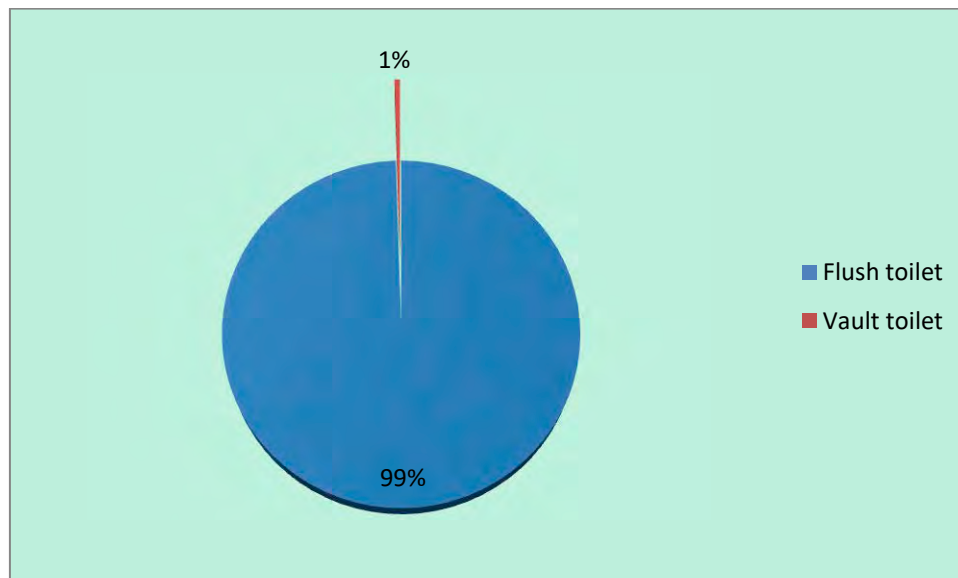


Figure 3-14 Kind of toilet

7) Water used in cleaning the toilet

In cleaning the toilet, respondents were asked on the kind of water do they use. Figure 3-15 reveals the results. Most of the respondents used water from MCWD in cleaning the toilet while others used water from deep wells and other local water service provider.

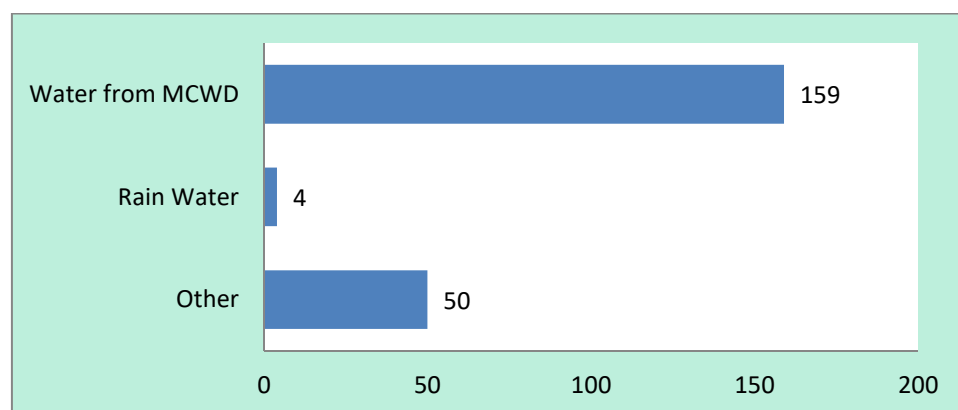


Figure 3-15 Kind of water used in the toilet (*multiple response)

3-1-5 Wastewater discharge and septic tank

In this question, respondents were asked as to the kind of sanitary equipment that the house have. Sanitary equipment in this context refers to the availability of septic tanks or latrine or cesspit, and drain pipes. Figure 3-16 shows the results. Most of the respondents have both drain pipe and septic tanks or latrine or cesspit but waste waters from kitchen are discharged into canal or drainage while only waste from toilet bowls are discharged into the

septic tank or cesspit. On the other hand, some of the respondents have septic /latrine/cesspit only therefore all household drain pipe are connected to the tank that could probably make the tank full faster.

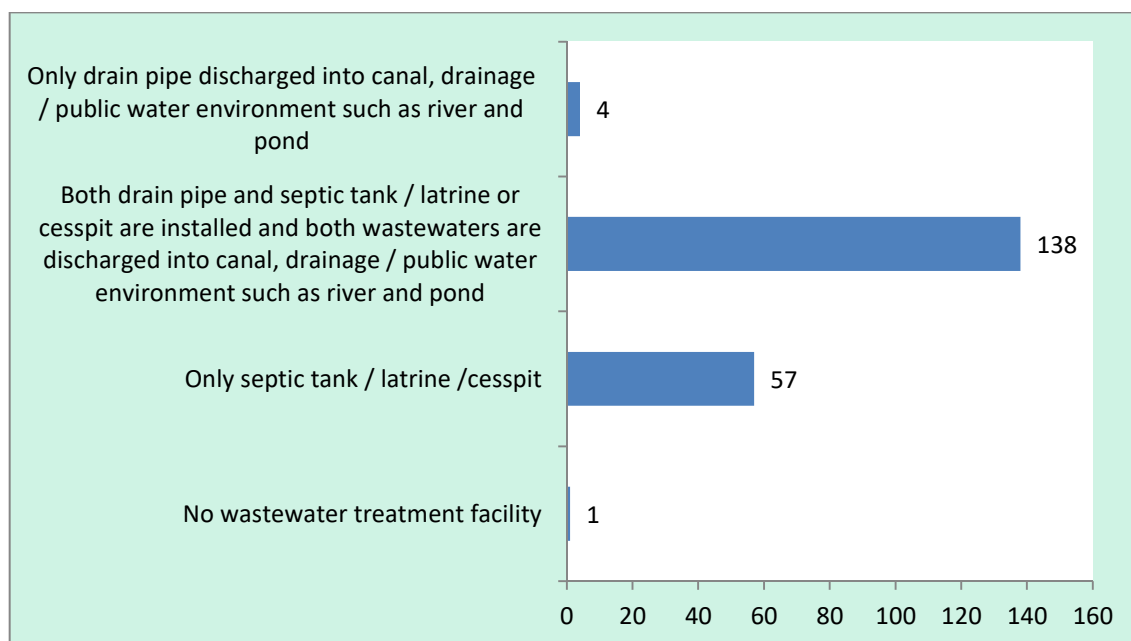


Figure 3-16 kind of sanitary equipment owned by the household

Respondents were asked on the outlet of their waste water at home. Table 3-7 has the results.

As revealed in the table, most of the waste water from the kitchen was discharged to a canal, drain, or even rivers. But for toilet wastewater, more particularly those coming from the toilet bowl; these were disposed into the septic tank /cesspit/latrine.

Table 3-7 Waste water discharged

Water Source	Kitchen	Washing Clothes	Body Washing	Toilet	Other
Public Sewer Pipe	0	0	0	0	0
Septic Tank/Cesspit/Latrine	6	5	13	195	0
Canal, Drain, River, etc.	192	191	184	5	0
Directly soaked into ground	2	4	3	0	6
Other	0	0	0	0	0

Respondents were asked whether they own a septic tank or cesspit/latrine as a wastewater storage facility. This question was explained to them especially the difference between a septic tank and a cesspit/latrine. Figure 3-17 reveals the results. Out of 200 respondents, a total of 195 respondents own an enclosed waste water storage facility. Of these, 130 or 65% own a septic tank while 65 or 32.5% owns a cesspit/latrine.

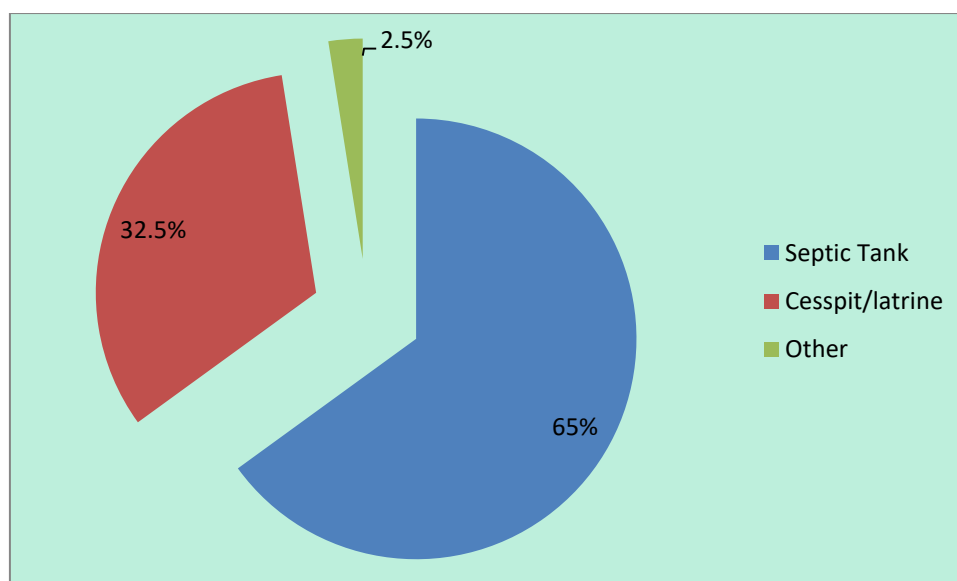


Figure 3-17 Kind of waste water storage facility

Those who indicated that they have septic tank, cesspit or latrine, were asked for an estimate of the volume of the tank. To get an estimate, actual survey of the area where the tank is located is done. This is also to determine the area or location of the septic tank, then estimated length, width, and depth were asked from the respondents. Table 3-8 shows the results. As revealed in table 3-8, the average size of the household's septic tanks or cesspits was about 5.37 cubic meter. Although, it is surprising to see a very small septic tank with only 0.11m³, but looking at the data, it was very deep. It was just that it has a very small length and width that made the volume as such. On the other hand, the maximum size of the septic tank surveyed was 18.16 cubic meter. This septic tank is owned by a respondent who has a business or apartment for rent where at least 20 people are using it.

Table 3-8 Volume of the septic tank

Range (in m ³)	Frequency
1 and below	6
1.1 to 2	9
2.1 to 3	49
3.1 to 4	37
4.1 and above	89
cannot estimate	5
TOTAL	195

Mean	5.37 m ³
Maximum	18.16 m ³
Minimum	0.11 m ³

Putting disinfectant to the sanitary equipment is very important because it can prevent water borne diseases that causes diarrhea and even stomach infection. In this question, respondents were asked on how often they disinfect their sanitary equipment. Figure 3-18

has the results. Most of the respondents continuously disinfect their sanitary equipment with 117 of the respondents. While it is surprising to see group of respondents who never put disinfectant into their sanitary equipment, others put disinfectant more frequently like once a week or twice a week, while others could not anymore remember when the last time they put one.

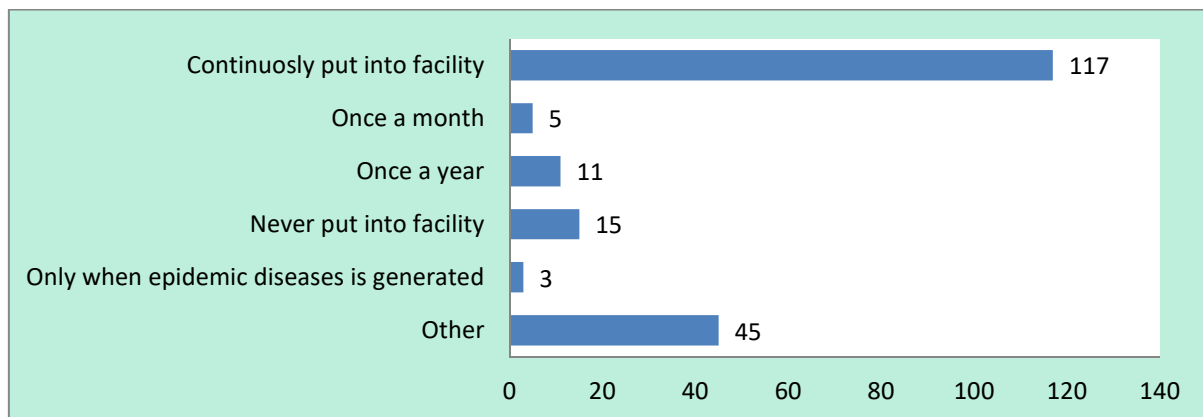


Figure 3-18 Frequency of disinfecting the sanitary equipment

This question reveals on whether or not respondents have experienced withdrawing sludge from their septic tank. Let us see the result on figure 3-19. Considering that some of the septic tanks are bottomless, meaning do not have flooring or bottom slab, it is not surprising to see that most of the respondents have never experienced withdrawing a sludge from their septic tanks. Although, they would say that they are using a closed-type septic tank, the fact that they have never experienced withdrawing sludge for a long period of time, simply means that water from the tank are absorbed by the soil which could pose a great risk to the environment. The absorption of these wastes to the soil could contaminate water supply pumped by a deep well.

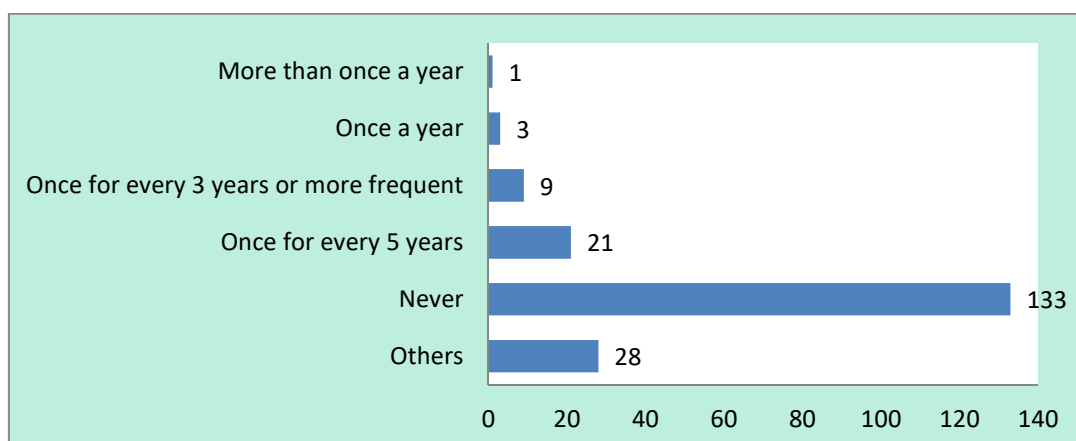


Figure 3-19 Frequency of withdrawing sludge

Those who have experienced withdrawing the content of their septic tank were asked on the agency that did the withdrawal of sludge. Figure 3-20 has the results. Most of the respondents who have experienced withdrawal of sludge from septic tanks availed the service from a private sector. Since this service is not yet offered by the government, the private sector has the monopoly of offering sludge withdrawal services to the household.

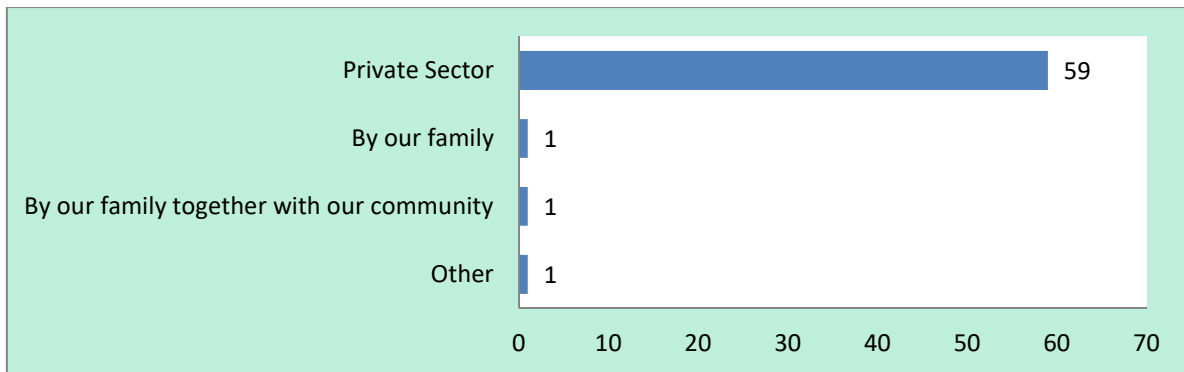


Figure 3-20 Agency requested to withdraw

Withdrawing sludge from a septic tank is not that affordable for many (*actual amount were presented in the table above, Government Services and Facilities*). But how much does it cost for respondents to empty a septic tank by a private sector? Table 3-9 has the range of costs involved. Most of those who experienced withdrawal of sludge from septic tank paid around 2,000.00 to 5,000.00 pesos. This is the average amount charged by private sectors engaged in sludge withdrawal service. Though the amount would also matter depending on the distance of the septic tank from the road where the truck is located. The farther the house from the truck, the more expensive is the charged as it is computed based on distance.

Table 3-9 Cost paid to withdraw sludge

Price Range (in pesos)	Frequency
2800 and below	27
2801 to 5600	23
5601 to 8400	5
8401 to 11200	3
11201 and above	1
Could not determine	3
TOTAL	62

There are certain rules and ordinances that require households to frequently withdraw sludge from septic tanks. But was these followed by the households? Let us see the results in figure 3-21 when respondents were asked on the reason/s for withdrawing the sludge. The most obvious reason why a household need to withdraw sludge from the septic tank is because the tank became full. Since sludge withdrawal is an expensive service, therefore households find no reason for withdrawing sludge more frequently as long as it is not yet full.

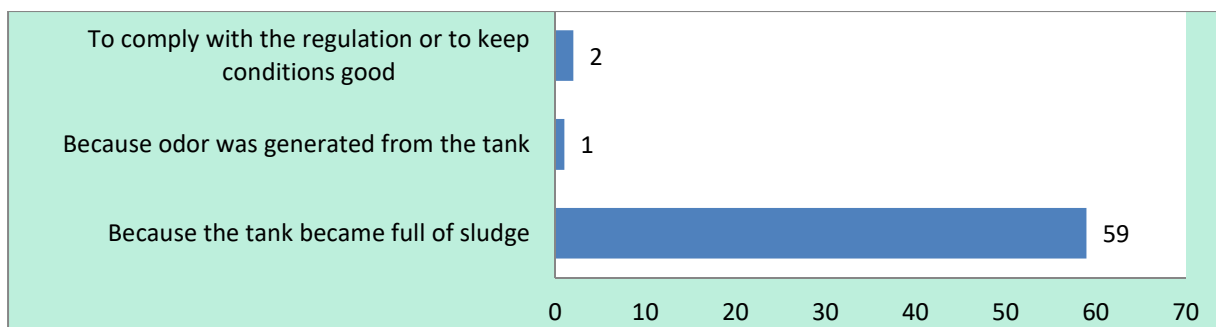


Figure 3-21 Reasons for withdrawing sludge

In order for easy withdrawal of sludge, septic tanks must have a hole or opening with a cover that is big enough for a hose to be inserted when withdrawing sludge. Figure 3-22 shows the statistics of the survey. More than majority of the respondent's septic tanks are equipped with an opening with a cover with 89% or around 178 of them. Without the opening with cover, it would be very hard to withdraw the sludge from the septic tank. If this is the case, then, a hole must be made where the hose will be inserted.

For Cebu City alone, out of 91 respondents 82 or 90.1% has an opening with cover in their septic tanks as revealed in table 3-10.

Table 3- 10 Cebu City Area

	Frequency	
Yes. Opening with cover is installed on the septic tank etc.	82	90.1%

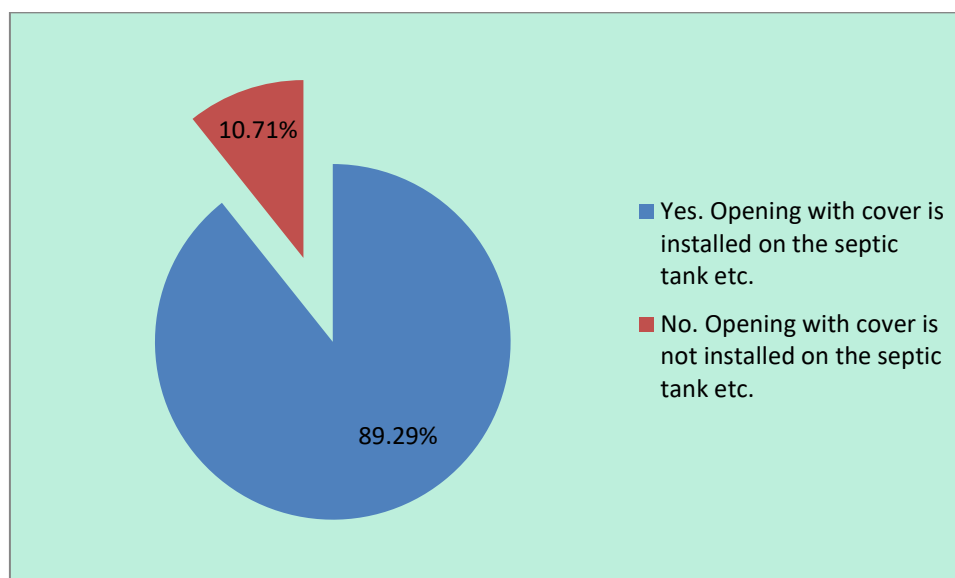


Figure 3-22 Whether or not septic tanks have opening with cover

Figure 3-23 reveals the location of the septic tank / cesspit of the household. Most of the septic tanks of the respondents were located outside the building or house with 114. There were some of them have their septic tank directly under the toilet, while others have them under the floor under than toilet or kitchen. When septic tanks are not located outside the house, it can cause so much inconvenience on the household members because of the dirt and smell that it can emit. Furthermore, when time of sludge withdrawal comes, the process can further because more inconvenience to the household.

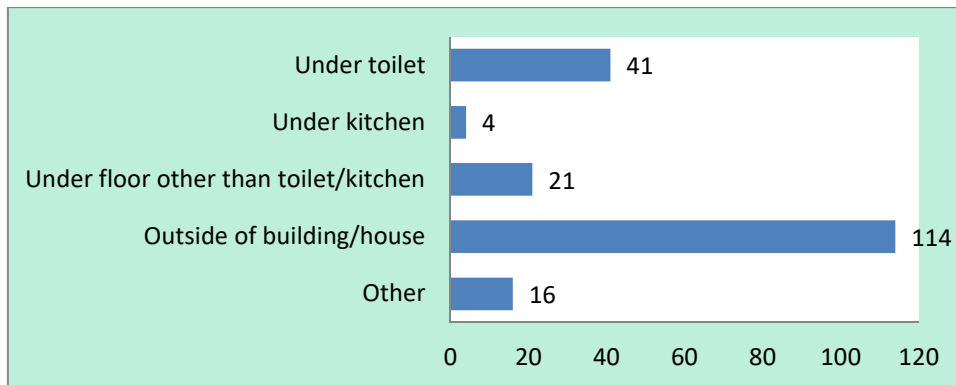


Figure 3-23 Location of Septic Tank

Upon learning that respondents own a septic tank, they were then asked on whether or not the septic tank has a bottom slab (concrete flooring) or not. Figure 3-24 has the results. Most of the respondents said that their septic tank is equipped with bottom slab with 150 answers. However, the result may be somewhat contrary on the previous answers of the respondents considering that most of them have not experienced withdrawing sludge from the septic tank. Now, if the average size of the septic tank is around 5m^3 , then it should not take long enough for the septic tank to become full which therefore need a withdrawal of sludge. With this, one factor that made the septic tank not being full even in a long period of time is because the septic tank is divided into two compartments. One compartment stores the solid waste while the other one contains the liquid with which has no bottom slab. Therefore, only one compartment (where the solid are stored) may have a bottom slab while the other one has none which may directly soak to the ground. On the other hand, respondents may have mentioned that there is a bottom slab of their septic tank but probably, they were not so sure if it is indeed concrete or just soil.

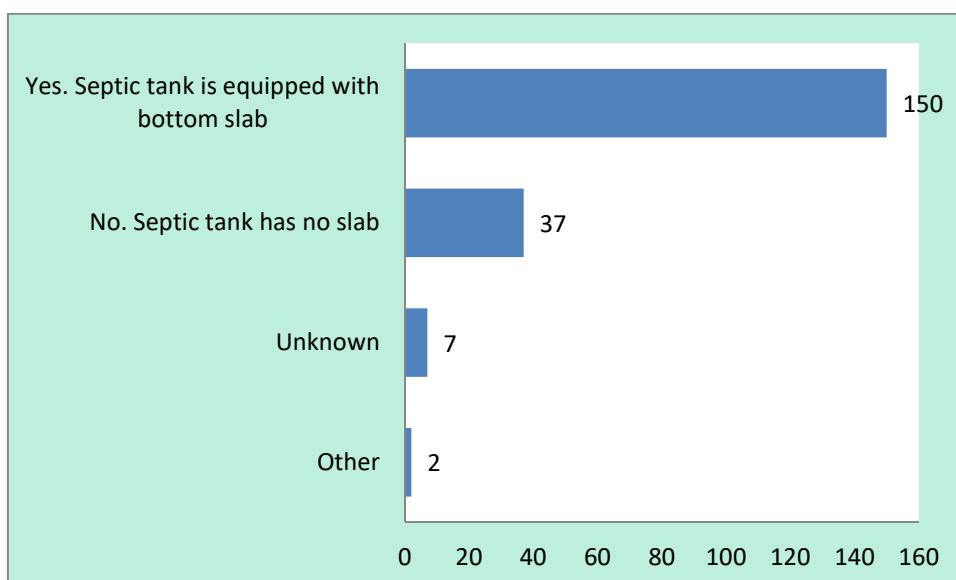


Figure 3-24. Whether or not septic tank has bottom slab

For those who have experienced withdrawing a sludge, they were asked if they have experienced observing effluent from septic tank and what is their impression of the effluent. Figure 3-25 shows the results. Most of the respondents have never experienced or

observed an effluent from a septic tank and therefore could not say anything on the quality of such. Nevertheless, those who have observed have a good feedback on the effluent and said that the effluent's quality is relatively good and acceptable.

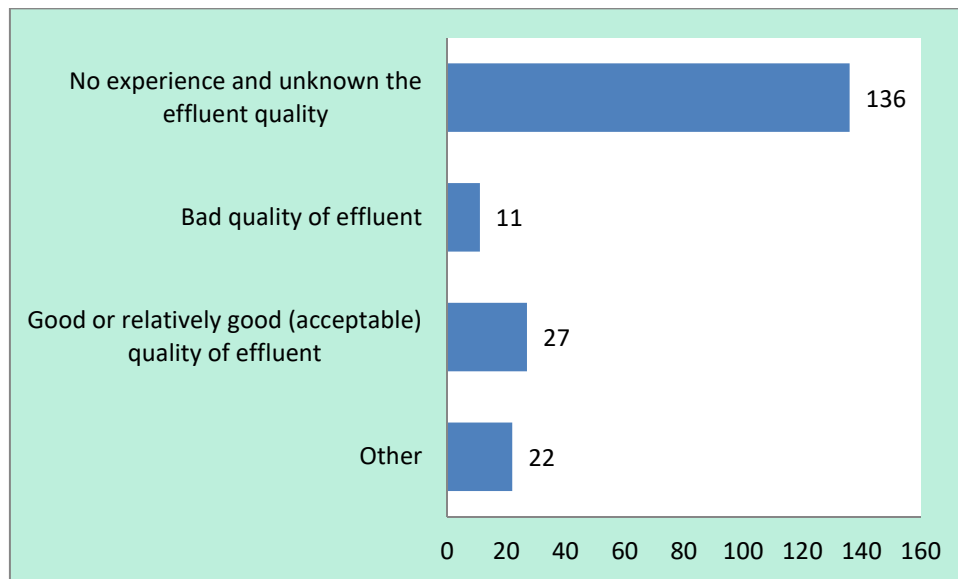


Figure 3-25. Experience of observing effluent from septic tank

Considering that most of the respondents have not experienced withdrawing their sludge for a long period of time, this question would somehow open their minds on the possibility of frequently emptying their septic tank than what they usually do. What is their take about this? Figure 3-26 has the results.

The plan of more frequent de-sludging of septic tanks got a positive feedback from the respondents. Most of them, around 175 (sum of 119 and 56) were in favor of the desludging of septic tanks every 3 to 5 years, however, few considers the price to be paid for them to make a concrete decision. With this, proper strategy on pricing must be carefully considered in order not to burden the consumers for such service.

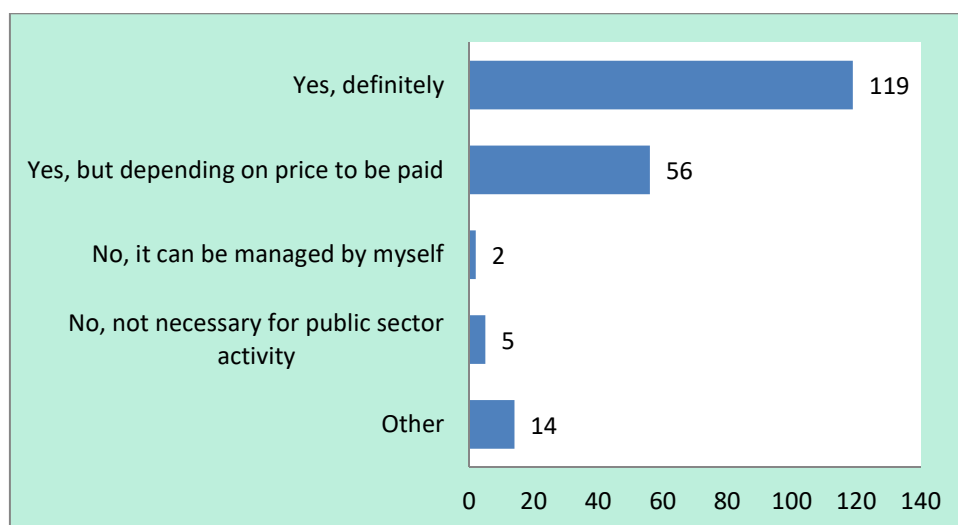


Figure 3-26. Possible de-sludge within 3-5 years

This question asked the respondents if they would allow workers who will de-sludge their septic tanks to enter the house during desludging. Figure 3-27 reveals their answer. Although more than half the respondents would allow entry of workers to de-sludge inside the house, a schedule must be set before the actual desludging. This is to ensure proper coordination and monitoring of the whole process to prevent any untoward incidents to happen.

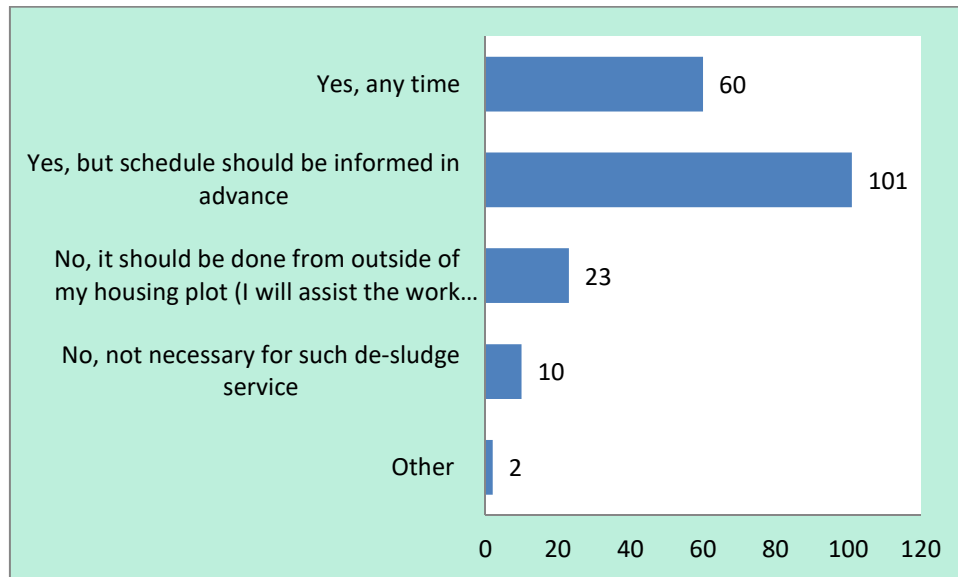


Figure 3-27. Entry of workers for de-sludge

3-1-6 Conclusion

Proper septage management is not the sole responsibility of the local government unit but a concern for the basic unit of the society, the family. Whether how big or small the waste is, when not properly disposed, treated, and withdrawn, it will contaminate the ground leading to a bigger concern, health problems.

This study revealed that, though most of the households in the area have their own waste water treatment facility (septic tank or cesspit); this was not properly managed and maintained. The fact that most of them have never experienced withdrawing sludge from their septic tank would imply that they are more reactive than proactive. Meaning, they will only withdraw their septic tanks when it becomes full when in fact, it should be withdrawn regularly and cleaned. On the other hand, while others would want a regular withdrawal of sludge from their septic tank (like: within 3-5 years), the cost of such service is of important consideration. This is where the intervention of the government should come in. Considering most, if not all services related to withdrawal of sludge is monopolized by the private sector, the services tends to be expensive and unaffordable to most residents in the area.

3-2 For Farmers

After determining the septage management practices of the different households in the selected cities and municipalities of Cebu, this study aims to determine on whether the treated sludge-turned fertilizer from different households will have a potential market for farmers. More particularly, this study aims to determine the interest of farmers in using compost coming from treated sludge taken from household septic tanks.

Farmers play an important role in our daily life. The vegetables that we eat, the meat that we savour, and the rice that will make us full, we owe it to them. But what does a farmer have to do in order to bring all these food to our table? Does all the risk of using pesticides and chemical fertilizers give them enough benefits? These and some other activities that a farmer needs to do in order to provide food to the table is described in this study.

Fertilizers, both chemical and organic, are important source of nutrients for plants and vegetations. When applied moderately, this can further enhance the growth of plants; make the soil more fertile, and therefore increase harvests and productivity. Farmers turn to these fertilizers because these substances contain plant nutrients such as nitrogen, phosphorus, and potassium.

Chemical Fertilizers act fast in providing nutrients needed by plants. They can be absorbed by plants more quickly than organic fertilizers; thus making the plants becomes lush and green faster. Therefore, if there is a need for quick and faster way for plant nourishment, chemical fertilizer may be the best option as this provides nutrients to plant immediately.

Organic fertilizers on the other hand release nutrients more slowly than chemical fertilizers. The benefit of such process is that it provides a steady and continuous flow of nutrients; thus make the plants grow bigger and stronger. This allows plants to hold nutrients and water with ease, which would encourage plant growth (www.ehlingerlawn.com)

While both organic and chemical fertilizers have its share of advantages and disadvantages, these two are indispensable to a farmer's life. Farmers cannot simply rely on the natural nutrients present in soil because there is no assurance of a better harvest. Therefore, with the introduction of this new form of organic fertilizer in Cebu, compost from treated household sludge, it is hoped that farmers will have better access to this kind of fertilizer at price that is affordable.

3-2-1 Methodology

This study made use of descriptive survey method. The design is deemed appropriate for the survey since this study describes the farmer's activity when it comes to maintaining their farmland. In order to gather relevant data, a self-made instrument that served as an interview guide was used and administered to the respondents. Before the actual implementation of the survey, a dry-run of the instrument was done in order to determine whether it captures the data needed in the survey. Part of the dry-run was also to determine the length of time to finish the survey of one respondent.

3-2-2 Questionnaire and interview contents

Please see Annex 5-1-2

3-2-3 Survey area

The survey was conducted in three (3) municipalities and three (3) cities of Cebu. The municipalities includes: Consolacion, Liloan, and Compostela; while the cities were Talisay, Cebu, and Mandaue. However, due to non-available farmers in some survey areas and others have a very small farm, only Cebu city, Talisay City, and Compostela farmers were surveyed and interviewed. These farmers are located in the mountain areas. Although these areas are accessible enough, field interviewers have to go to the place using a motorcycle for more mobility and convenience. In the conduct of the interview, most of the time, farmers are interviewed in their farmlands. Field interviewers introduced themselves to the respondent and asked a little time to conduct the interview. Once consent is given, the interview commences. Respondents were very cooperative in the conduct of the survey and share their experiences as a famer.

3-2-4 Respondents of the Study

The respondents of this study were the selected farmers of the municipalities and cities of Cebu. There were six (6) areas where the survey was supposed to be conducted. List of farmers from these areas were gathered from the Agricultural office of the Local Government Unit. But for those who were not able to provide the researchers with the list, the researchers proceeded to the area where farmers would normally cultivate their farms. Respondent farmers were chosen based on a single criterion, that is: they should have at least a one (1) hectare farm land. This is to ensure a bigger amount of fertilizers used in the farm. After a successful interview with a respondent farmer, the field interviewer would ask the same farmer for a referral to other farmers who at least own a 1 hectare farm. During the entire conduct of the survey, field interviewers made sure that there are variations of the crops cultivated by the farmers. As much as possible, there must be a representative farmer who is cultivating flowers, vegetables, and fruit trees. This is to determine the different types of fertilizers used in the farm.

3-2-5 Result

This section presents the results of the survey conducted in the three municipalities. Although, six (6) municipalities were identified as survey environment, factors like: limited farmland and conversion of agricultural to industrial or residential land reduced the environment to three (3). Of the six survey areas (Talisay city, Cebu City, Mandaue, Consolacion, Liloan and Compostela), only in Compostela, Talisay, and Cebu City where the survey was conducted. Results are presented in charts and tables depending on the nature of data. Simple percentage analyses are employed to give more meaning on the results.

Location of Farmers

Farmers located in six Local government Units were the identified respondents of this survey. However, due to reasons like: limited farmland (*since one criterion for a respondent to qualify is having at least 1 hectare of farm land*) and no available farmers in the area, limited the survey to two cities and a municipality. These two cities were Cebu and Talisay City, while the lone municipality is Compostela located in the northern part of Cebu. Figure 3-28 reveals the proportion of the respondents taken from each area. A total of 30 farmers were interviewed in the study. As the figure revealed, most of the farmers were coming from Cebu city, followed by Compostela, and Talisay City. Cebu city is composed of 80% mountain (cebu.gov.ph), which made a haven for more farmers in the province. Most of these farm lands are located in the mountain area where farmers cultivate at least 1 hectare lot.

A total of 30 farmers were interviewed in the study. Most of these farmers were coming from Cebu city, followed by Compostela, and Talisay City. Cebu city is composed of 80% mountain (cebu.gov.ph), which made a haven for more farmers in the province. Most of these farm lands are located in the mountain area where farmers cultivate at least 1 hectare lot.

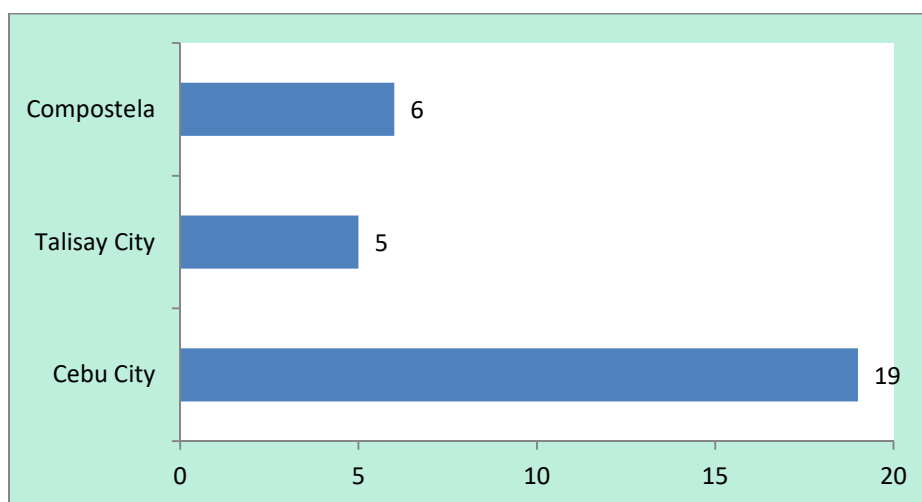


Figure 3-28 Location of Farmers

Respondents of the survey were farmers who own or cultivate at least 1 hectare lot. This criterion is set as these farmers utilized more fertilizers than those with small area. Table 3-11 shows the descriptive results of the lot area of the farmers. A total of 52.3 hectares of agricultural lot were cultivated by the respondent farmers in the study. Of these, most of them own a 1 hectare area where they plant different varieties of flowers and vegetables. There was

one (farmer) who owns an area of 7 hectares with which at least three types of vegetables were planted, while few on the other hand have more than 1.5 hectares of land. On the average, farmers surveyed have an area of 1.45 hectares where they cultivate their crops.

Table 3-11. Lot Area of the Farmers (in hectares)

Indicators	Area (hectares)	Frequency
Minimum	1	24
Maximum	7	1
Average	1.45	
Total	52.3	

Respondents were asked on the type of crops they cultivate in their farm. Table 3-12 reveals the results. It was found out that the top 5 crops cultivated by farmers in the three municipalities were mostly vegetables. Second in the rank is a mango tree plantation which would normally occupy a large area. Mango fruit is a major product in Cebu which comes in different packaging and therefore it is no surprise that it comes second in the rank. Nevertheless, there were variations of crops from cut flowers, vegetables and others that were planted in their farms.

Table 3-12. Types of Crops (sorted from highest to lowest)

Type of Crop	Frequency
Eggplant	7
Mango	6
Sili Espada	6
Banana	5
Corn	5
Tomato	5
Asther	4
Cabbage	4
Cucumber	4
Pechay	4
Rose	4
Alugbate	3
Coconut	3
Wonder White	3
Ampalaya	2
Beans	2
Lettuce	2
Letuce	2
Okra	2
Rice Field	2

Baguio Beans	1
Cacao	1
Cauliflower	1
Chinese Cabbage	1
Chinese Kangkong	1
Daisy	1
Dragon Fruit	1
Eugenia	1
Foxtail Palm	1
French Beans	1
Malunggay	1
Monggo	1
Orchid	1
Parsely	1
Picarra	1
Porea	1
Rambotan	1
SibuyasDahonan	1
Spring Onion	1
Squash	1
String Beans	1
Sweet Potatoes	1
Virginia	1
Yellow Boss	1

When farmers were asked as to the weight of their harvests per year, some if not most of them do not anymore weigh their harvest. Cut Flowers for examples are not weighed when harvested but rather tied in bundles while others have it in per piece basis. However, to get a glimpse of their harvest, they were asked for an estimated weight for each bundle or piece of harvest. Table 3 has the results of the annual yield of the different crops. Table 3-13 revealed that most of the harvests of the farmers weigh less than 1400 kilograms per annum. These harvests were coming from cut flowers, vegetables and fruits which are planted into a 1 hectare area.

Table 3-13. Annual yield of crops

Range Yield per year (kg)	Frequency
1397 and below	72
1398 to 2794	15
2795 to 4191	2
4192 to 5588	4
5589 and above	6

** frequency refers to the different kinds of harvest crops.*

Maintaining different kinds of crops and squeezing them into a 1 hectare area is not an easy job for a farmer. Personnel are needed to monitor, water, and harvest the crops. Let us take a look on how many staff does a farmer has in his farmland. Table 3-14 has the results. Most of the farmers employed eight (8) staff or less in their farm. An average farm area of 1.5 hectare would normally need this number of people to manage the farm and at least lessen the overhead cost. In as much as they would want to employ more people for their farm, as a way of giving back to the community, farmers are also concerned of the costs that will be involved in hiring more personnel.

Table 3-14. Number of Staff employed in the farm

Number of Staff	Frequency	Percentage
8 and below	22	73.33
9 to 17	2	6.67
18 to 26	1	3.33
27 to 35	4	13.33
36 and above	1	3.33
TOTAL	30	100.00

Annual Sales is an indicator that the farm is doing well and may get the return of its investment. After all, the sweat and effort exerted by the farmers will only be put to waste if this is not monitored and properly accounted. Table 3-15 reveals the results. Considering that most of the farmers own an average of 1.45 hectare lot, more of them only get an annual gross sale of 118,000 pesos and below. There were few with a very high annual gross sales that can even reach up to 2 million pesos per annum. Farmers who earns this much are owners of a bigger farm.

On the average, farmers' income per annum is around 250,000.00 pesos. Though only few (3) belong to the average income level, this is due to the fact that data is distorted by two farmers who have an income of 2million pesos per annum.

Table 3-15. Average Annual Gross Sales

Annual Gross Sales (in pesos)	Frequency	percentage
118,000 and below	14	46.67
118,001 to 236,000	8	26.67
236,001 to 354,000	3	10.00
354,001 to 472,000	2	6.67
472,001 and above	3	10.00
TOTAL	30	100.00

Water is Life. The same is true in maintaining a farm. Water is even more important than any other fertilizer. Now, considering that most of these farms are located in the mountain areas, how do farmers get water for their farm? Let us look at the results on table 3-16. The number one source of agricultural water by farmers is from the ground or spring followed by water from a river or pond. Ground water may be in form of a deep well or spring. This is the blessing of being in the mountain area because springs and groundwater sources is so abundant, thanks to the trees. However, for those who are not fortunate enough to find a groundwater or spring in their area, they have to depend on water from rivers and ponds. The challenge though is how to bring this water to their farm. For others, whose farms are located below these rivers or ponds, they can just maximize the law of gravity and divert these waters to their farms when needed. But for those whose farms are located above the water level, they need machines or pumps in order to bring this water to their farm.

Table 3-16. Farmer's source of water

Source of Agricultural Water	Frequency	rank
Water from groundwater	15	1
Water from River or pond	13	2
Water supply from water supply agency	4	3

*multiple response (some famers may have more than one source of agricultural water)

This question may be a little odd to the respondents considering that most of them sourced their water from deep well or springs, however, there are cases that they need to spend some amount just to bring the water into their farm lands. Let us take a look on how much do they spend for agricultural water on the average, every month. Figure 3-29 has the results. Considering that most of the farmers used ground and river or pond water, they do not have to spend anything for such. The challenged though for some is how to bring water to their farm because there are cases wherein their farm is situated on a higher ground than the water source. When such is the case, they need to use pumps and other machine to bring up the needed water. This is where the expense of the water comes in, but only few of them were in this situation.

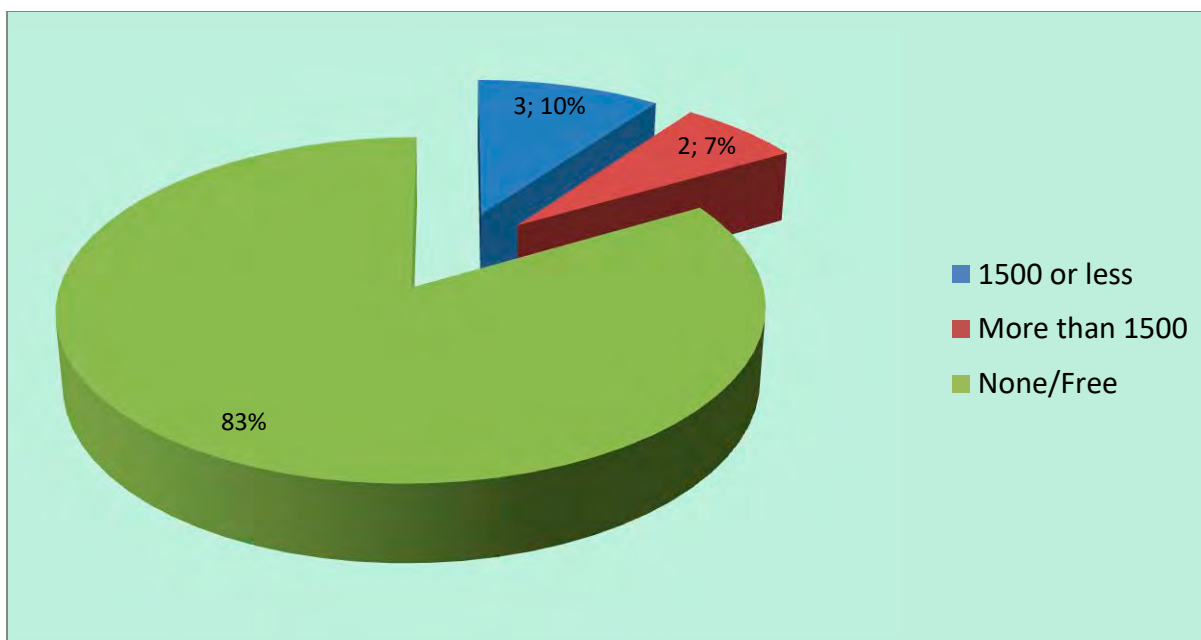


Figure 3-29. Monthly expenses on agricultural water

Though farmers may find it hard to quantify which one goes to the farm and which one goes to the household, they were asked to give an estimate as to their monthly expenses for fuels and electricity in relation to the use of machines and other equipment for their farm. Table 3-17 presents the results. More of the farmers spent an amount of 1,350 pesos and below per month for their electricity, fuels and others. Considering that most of them do not need to use electricity to water their farm, these expenses were primarily for lights and machineries (water pumps) placed on their farm. When it comes to rowing, manual labor is applied therefore not much were spent on fuel and electricity. But there were farmers with big areas that need to use special equipment that would require electricity and fuel to operate, and they are spending a little higher amount for that. On the average, farmers spend around 3500.00 pesos monthly for utilities and fuels used in the farm.

Table 3-17. Average monthly Expenses on Electricity, fuel and others

Monthly expenses (in pesos)	Frequency	Percentage
1350 and below	11	36.67
1351 to 2700	5	16.67
2701 to 4050	3	10.00
4051 to 5400	0	0.00
5401 and above	4	13.33
None	7	23.33
TOTAL	30	100.00

Agricultural equipment is necessary to at least ease the burden of the farmers. But will the farmers trade cost for convenience? Let us see the result in table 3-18. As revealed in the table most of the farmers incur an average annual expense of 14,800.00 pesos and below with 76.67% of the total respondents of the survey for maintenance of agricultural equipment. This is because most of them own a 1.5 hectare farm on the average and apply manual labor than machines. On the other hand, farmers that own a big farm land spend more than 50,000.00 pesos for the maintenance of Agricultural equipment.

Annual Expenses for Pesticides

Table 3-18. Average Annual Expenses for maintenance of Agricultural Equipment

Annual expenses	Frequency	Percentage
14800 and below	23	76.67
14801 to 29600	1	3.33
29601 to 44400	0	0.00
44401 to 59200	0	0.00
59201 and above	3	10.00
Could not estimate	3	10.00
TOTAL	30	100.00

Farmers usually use different types of pesticides for different kinds of crops. These pesticides are used to protect the crops from pests. However, regardless of the kinds of crops they have, how much is their average expenses annually on the use of these pesticides? The next table shows the results. Most of the spent below 20,000.00 pesos annually for pesticides. These pesticides when applied moderately may kill insects and weeds but the disadvantage is that, it may also contaminate the soil and could pose harmful effects to human beings. The table further reveal that farmers used pesticides in their farms in varying degree and amount. Taking on the individual response of the farmers, on average, they spent around 23,000.00 pesos per annum for pesticides.

Table 3-19. Average Annual Expense for the use of Pesticide

Range	frequency	Percentage
19600 and below	19	63.33
19601 to 39200	4	13.33
39201 to 58800	2	6.67
58801 to 78400	1	3.33
78401 and above	3	10.00
could not estimate	1	3.33
TOTAL	30	100.00

Fertilizers are necessary in order to maximize the growth of crops. Farmers have the choice of using organic or chemical fertilizer or may even use both at the same time. Organic fertilizers such as manure and compost are considered to be as old as the time agriculture started. But with the introduction of more advance and sophisticated equipment, chemical fertilizers have been developed and believed to be effective. Most chemical fertilizers composed of nitrogen, phosphorus, and potassium. These three elements are considered to be important for plant nutrition. Now, let us look at the kinds of fertilizers used by farmers in Cebu. Table 3-20 shows the results. As shown in the table, of the two kinds of fertilizers (organic and chemical), it is the chemical fertilizer that is widely used by farmers. The use of chemical fertilizer is inevitable to farmers because of the scarcity and limited supply of organic fertilizers. The abundance of chemical fertilizers which are readily available in the market will give more convenience to the farmers.

But these farmers do not discount the effect of organic fertilizers as well. The use of chicken manure and rice husks were the most widely used organic fertilizers in the farm. This is because, these kinds of organic fertilizers are readily available from poultry and rice farms respectively. Other poultry houses even offer their chicken manure for free because they also have hard time disposing the waste of their chicken. So just to dispose their chicken waste, they will contact a farmer and arrange with them schedule of pick-up for the manure, for free, and it is up to the farmer to make arrangement for transportation. But the same set-up may not be applicable for rice husks because these are sold to the farmers for a certain amount.

Table 3-20. Fertilizers used for crops

ORGANIC		CHEMICAL	
Name	Annual Consumption (kg)	Name	Annual Consumption (kg)
Chicken Manure	6450	18-46-0 (Diammonium phosphate)	6000
Rice Husks	5000	Urea	4600
Black Soil	3600	14-14-14 (NPK)	3050
Pig Manure	300	Perfect	1950
Urea	50	Yara	1570
CltcAgritech	8	Pulyar	600
		Potassium	550
		Winner	300
		Plant Vitamin	250
		21Sulpag	200
		Activa	150
		Asin	150
		Amonium	50
		Philphos	50
		Buswak	30

Whether it is organic or chemical, there will always be cost involved in using fertilizers. From the price per kilogram, to transportation and application, farmers have to spend in one way or another. But what will be presented in table 3-21 are estimated expenses of the farmers with regards to the purchase price or amount of fertilizers. Looking at the table, majority of the farmers spend 15,000.00 pesos and below in the use of fertilizers with seventeen (17) or 56.67% of the respondents. This is because most of them own a small area of farmland between 1 to 1.5 hectares only on average. There were others though who spend more than 60,000.00 pesos for fertilizer. On the average, farmers spend around 30,000.00 pesos for fertilizers used in the farm.

Table 3-21. Average Annual Expenses for the use of Fertilizer

Range (in pesos)	Frequency	Percentage
15000 and below	17	56.67
15001 to 30000	7	23.33
30001 to 45000	0	0.00
45001 to 60000	2	6.67
60001 and above	4	13.33
TOTAL	30	100.00

Even though respondents have been using organic and chemical fertilizers for their farm, they were still asked if they would be interested of using treated compost as fertilizer. Figure 3-30 reveals their answer. Almost all of the respondent farmers (29 out of 30 or 97%) said that they are interested in the compost that is produced by sludge from domestic waste water treatment. However, a single farmer who opted not to try it for now had a bad impression about using compost made from human excreta and he will only be persuaded to use it once it is proven safe already.

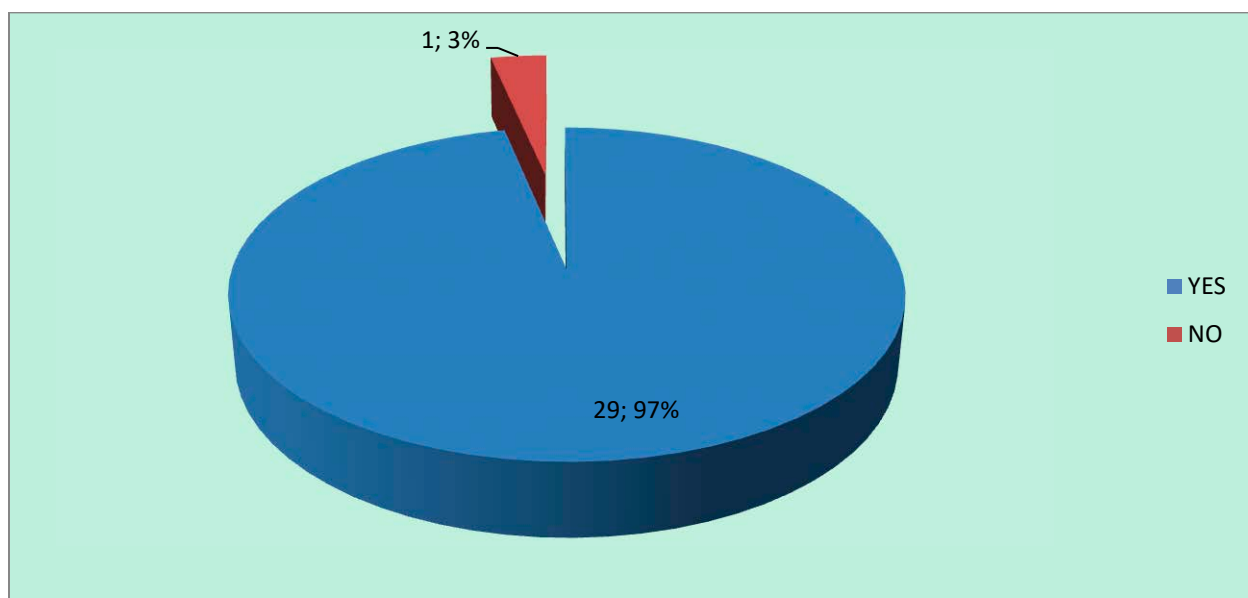


Figure 3-30. Whether or not respondents are interested to use compost as fertilizer

Those who indicated that they are interested to try the compost produced by sludge from domestic waste were asked on the amount per kilogram they are willing to pay for the compost. The next table presents the results. More of the farmers were willing to pay between 20-33 pesos per kilogram of compost to be used as fertilizer in their crops. However, it also noteworthy to look into a much higher price since more than 50% of them were willing to pay an amount of more than 34 pesos per kilogram. But on the average, farmers are willing to pay around 58 pesos per kilogram of the compost.

Table 3-22. Farmers capacity to pay per kilogram of compost

Range	Frequency	Percentage
Below 20 pesos	2	6.90
20 pesos – 33 pesos	10	34.48
34 pesos – 47 pesos	8	27.59
48 pesos – 61 pesos	0	0.00
61 pesos – 75 pesos	7	24.14
Above 75 pesos	2	6.90
TOTAL	29	100.00

*in computing for range, two (2) values were not part of the computation as they are considered an outlier of the values. These values fall under above 75 pesos range.

3-2-6 Conclusion

Using fertilizers has been part of the farmer's life since time agriculture has begun. These fertilizers do not only give farmers monetary benefits but also a sense of security that they can always harvest more from what they have planted. Even with the existence of these chemical fertilizers in the market, farmers are still interested to use the organic one, which is abundant from treated sludge of the different households. Once all these domestic wastes are treated and properly handled, there is a bigger market out there that are willing to make it a try and hope that it will further enhance their yield and productivity.

4 References

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- Robbins, D.M. (2007). Septage management guide for Local Governments.

5 Annex – QUESTIONNAIRES

Annex 5-1-1 (Household Survey Questionnaire)

Survey on the Septage Management Project for Metro Cebu Water District's Service Area

SECTION A1-2: RESPONDENT'S PROFILE

Name of LGU	
Name of Barangay	
Name of Community / Household Head	
Name of Enumerator	
Date of Interview	
Time Interview Started	
Time Interview Ended	

Respondent's Name & Contact Number _____

Enumerator's Name & Signature _____

Supervisor's Name & Signature _____

The questions in this survey are to be administered to the randomly selected households in each of the objective area

SECTION A1-2: SOCIAL SURVEY REGARDING HOUSEHOLD

General Items;

200. How many people from each age range are there in your household? Please indicate below

Age group (Years)	Male	Female	Number of persons
0 – 5			
6 – 11			
12 – 17			
18 – 21			
22 – 27			
28 – 33			
34 – 39			
40 – 45			
46 – 51			
52 – 57			
58 – 63			
64 and above			

201. What kind of religion does your family believe? Please indicate below.

Economic Condition

202. What is the main source income of your household? You can choose **one**.

1. Crop farming
2. Animal husbandry (livestock sales, milk sale)
3. Fishing
4. Manufacture of Industrious Product Name of Product:
5. Shop owner
6. Wages and salaries / employed
7. Other: Please indicate

203. Where do you spend your household income most? You can choose three (rank 1-most to 3-least).

1. Food
2. Education
3. Health
4. Clothing
5. Utilities^{※1}
6. Transportation
7. Personal care
8. Housing^{※2}
9. Recreation
10. Other

※1 Utilities include water, solid waste, and energy source for lighting and cooking, such as electricity, gas, kerosene, charcoal and firewood.

※2 Includes materials for maintenance of dwelling, repair of household appliances, household utensils and cleaning articles

204. What items does your household own? Please choose **one or more**.

1. Private car
2. Private motor cycle
3. Private bicycle
4. Television/satellite dish
5. Radio/transistor
6. Fixed phone
7. Mobile phone
8. Computer
9. Refrigerator
10. Electric Fan
11. Air conditioner
12. Washing machine
13. Pair of shoes
14. Blanket
15. Mosquito net

Sanitary Condition;

205. How often do members of your family go to the hospital due to diarrheic diseases? Please choose **one**.

1. Once a month
2. Once for every six months
3. Once a year
4. Once for every two years
5. Could not remember when

206. How much is paid monthly for water used in kitchen^{※1}, washing (clothes, dishes, body) and toilet on the average? Please choose **one**.

	1	2	3	4	5	6
Not Paid	Less than 50 PhP	~ 250 PhP	~ 500 PhP	~ 750 PhP	~ 1000 PhP	More than 1000 PhP

※1 "Kitchen" means water use for drinking, washing dishes and vegetables etc.

207. How much is paid monthly for sanitary activity^{※1} on the average (estimated)? Please choose **one**.

	1	2	3	4	5	6
Not Paid	Less than 20 PhP	~ 100 PhP	~ 200PhP	~ 300 PhP	~500 PhP	More than 500 PhP

※1 "Sanitary activity" means disposing sludge of sewer pipe and septic tank etc.

208. What kind of improvements do you expect for public service regarding sanitary field. Please choose **one** or more.

1. Lower the price for withdrawing the sludge
2. Increase the number of private agencies or government sector for sludge collection
3. Construct new sludge treatment facility which is operated appropriately.
4. Prevent the smell generated from sewage
5. Decrease the generation of water borne disease
6. Improve the condition of the drainage
7. Improve the water quality in the water environment such as river, pond and sea.
8. Other ()

209. How much are you willing to pay more for the additional service described in **208**? Please choose **one**.

1. No intension to pay more for the additional service
2. Intend to pay additionally for the additional service;
Intend to pay additionally **for one month** (PhP)

Social Problems;

210 What is the biggest social problem for your family? Please choose one.

1. Violence
2. A large number of theft
3. No job / source of income
4. No primary school
5. Bad road condition
6. Outbreak of epidemic diseases
7. Flooding
8. No Stable supply of electricity to no supply at al
9. No stable supply of water to no supply at al
10. Environmental water pollution by domestic or industrial wastewater
11. Solid wastes are scattered in public place or accumulated in the drainage
12. Other ()

SECTION A2: SURVEY FOR WASTEWATER CONDITION ON EACH HOUSEHOLD

General Items;

300. How many people are living in your residence? Please indicate below.
_____ People.

301. Does your house have another purpose aside from a residence? Please choose one.

1. No. Only for residence
2. Yes. Residence with small shop
3. Yes. Residence with restaurant
4. Other ()

Type of dwelling

302. What is the type of your dwelling? Please choose one.

1. House: One Floor
2. House: Multi – Floor
3. Apartment
4. Other(Please specify:_____)

303. How many rooms (bed rooms and other living and service rooms) are there in your dwelling? Please choose one.

1. One room
2. Two rooms
3. Three rooms
4. Four rooms
5. More than four rooms

Water Condition;

304. Are you receiving the water supply service from Metro Cebu Water District (MCWD)?

1. Yes
2. No

305. What kind of water equipment does your house own? Please choose **one or more**.

1. Water meter (for measuring water volume received from water supply agency)
2. Storage tank for receiving water from water supply agency
3. Storage tank for receiving water from water truck
4. Storage tank for receiving rainwater
5. Other
()

Wastewater Condition

306. What kind of toilet does your house have? Please choose one.

1. Flush toilet
1-a Water pipe is connected to the tank with ball tap in the toilet. By raising the lever or pulling the wire connected with the tank, cleaning water is gone out and excrement is washed out.
1-b Water tank / jar and dipper, or water pots etc. for cleaning after defecation are put inside the toilet.
2. Vault toilet (Water is not used after defecation. Water is use only for cleaning toilet pan.)
3. Do not have own toilet
4. Other ()

307. What kind of water do you use in your toilet? Please choose one or more.

1. Water from MCWD
2. Rain Water
3. Water from Pond/River
4. Other ()

308. What kind of sanitary equipment does your house have? Please choose one or more.

1. Only sewer pipe connected with public sewer pipe (excluding canal and city drainage)
2. Only sewer pipe discharged into canal, drainage / public water environment such as river and pond etc.
3. Both Sewer pipe and septic tank^{※1} / latrine or cesspit^{※2} are installed and both wastewaters are discharged into canal, drainage / public water environment such as river and pond etc.
4. Only septic tank / latrine / cesspit
5. No wastewater treatment facility
6. Other ()

※1 "Septic tank" means aerobic / anaerobic wastewater treatment facility with the wall made of reinforced concrete etc. so that the wastewater inside the facility cannot be leaked and soaked into the ground. Treated water is finally discharged into sewer pipe. Accumulated sludge is regularly withdrawn by vacuum truck.

※2 "Latrine or cesspit" means only pit for discharging wastewater. Wastewater is finally soaked into the ground. Accumulated sludge is regularly withdrawn by vacuum truck.

309. Where do you discharge wastewater of the following sanitary equipment?

Water Source	Kitchen	Washing Clothes	Washing Body	Toilet	Other
Public Sewer Pipe	Yes No	Yes No	Yes No	Yes No	Yes No
Septic Tank/Cesspit/Latrine	Yes No	Yes No	Yes No	Yes No	Yes No
Canal, Drain, River, etc.					
Directly soaked into ground	Yes No	Yes No	Yes No	Yes No	Yes No
Other	Please specify ()	Please specify ()	Please specify ()	Please specify ()	Please specify ()

		1			
--	--	---	--	--	--

QUESTIONS 310-322 CAN ONLY BE ANSWERED BY RESPONDENTS WHO OWNS A SPECIFIC TANK, CESSPIT OR LATRINE, ETC. IF FAMILY DOES NOT HAVE THEM, SKIP THESE ITEMS.

310. What kind of wastewater treatment facility does your house own? Please choose **one**.

1. Septic Tank
2. Cesspit/latrine
3. Other ()

311. Please show us the approximate dimension and volume of septic tank, cesspit or latrine etc..

Dimension
Volume m ³
Number of person connected with the tank People

312. How often is the disinfectant put into the sanitary equipment? Please choose **one**.

1. Continuously put into the facility
2. Once a month
3. Once a year
4. Never put into the facility
5. Only when epidemic diseases is generated
6. Other ()

313. How often do you withdraw sludge or clean inside the tank with vacuum truck. ? Please choose **one**.

1	2	3	4	5	6
More than once a year	Once a year	Once for every 3 years or more frequent	Once for every 5 years	Others: (Once for _____ years)	Never

314. Which agency does your family request to withdraw sludge / to clean inside the tank? Please choose **one**.

1. Public sector
2. Private sector
3. By our family
4. By our family together with our community
5. Have never withdrawn sludge
6. Other ()

QUESTIONS 315-317 CAN ONLY BE ANSWERED BY RESPONDENTS WHO OWNS A SPECTIC TANK, CESSPIT OR LATRINE, ETC, AND HAVE EVER WITHDRAWN A SLUDGE. IF FAMILY HAVE NOT DONE THEM, SKIP THESE ITEMS.

315. How much is paid to withdraw sludge or clean inside the tank with vacuum truck **for one time**?

Please show us the cost and the approximate volume discharged.

Cost: _____ (PhP)

Volume withdrawn: _____ (m3)

316. What is the reason you withdrew the sludge? Please choose **one**.

1. Because the tank became full of sludge
2. Because odor was generated from the tank
3. To comply with the regulation or to keep conditions good
4. Other ()

317. Is there an opening with cover on the septic tank, cesspit or latrine, for inserting the hose into the tank and taking the sludge out of the tank? Please choose **one**.

1. Yes. Opening with cover is installed on the septic tank etc.
2. No. Opening with cover is not installed on the septic tank etc. So when we clean the inside of septic tank, we need to make the opening at first
3. Other ()

318. Where is your septic tank / cesspit is located? Please choose **one**.

1. Under Toilet.
2. Under kitchen.
3. Under floor other than Toilet / Kitchen
4. Outside of building / house
5. Other ()

319. Is your septic tank equipped with **bottom slab*** to protect the wastewater infiltration into ground? Or, is your septic tank not equipped with bottom slab and wastewater / sludge is soaked out? Please choose **one**.

1. Yes. Septic tank is equipped with bottom slab.
2. No. Septic tank has no slab.
3. Unknown

4. Other ()

** referring to a concrete flooring of a septic tank*

320. Do you have any experience to observe the effluent from septic tank / cesspit? How did you find the its quality? Please choose **one**.

1. No experience and unknown the effluent quality.
2. Bad quality of effluent.
3. Good or relatively good (acceptable) quality of effluent
4. Other ()

321. Do you feel the need to schedule a de-sludge from your septic tank / cesspit every 3 -5 years? Please choose **one**.

1. Yes, definitely.
2. Yes, but depending on price to be paid.
3. No, it can be managed by myself.
4. No, not necessary for public sector activity
5. Other ()

322. Do you allow de-sludge workers to enter your housing area for de-sludge work? Please choose **one**.

1. Yes, any time.
2. Yes, but schedule should be informed in advance.
3. No, it should be done from outside of my housing plot (I will assist the work in my plot).
4. No, not necessary for such de-sludge service
5. Other ()

ANNEX 5-1-2

Survey on Farmers Utilization of Compost

SECTION A3 RESPONDENT'S PROFILE

Name of LGU	
Name of Barangay	
Name of Household Head	
Name of Enumerator	
Date of Interview	
Time Interview Started	
Time Interview Ended	

Respondent's Name & Contact Number_____

Enumerator's Name & Signature_____

Supervisor's Name & Signature_____

The questions in this survey are to be administered to the randomly selected households (Farmer) in each of the objective area

SECTION A3: SURVEY FOR UTILIZATION OF COMPOST

General Items;

400. How many area and annual production volume do you cultivate for each crop in your farm? Please indicate below.

Name of crop;	(ha)	(kg/year)
Name of crop;	(ha)	(kg/year)
Name of crop;	(ha)	(kg/year)
Name of crop;	(ha)	(kg/year)
Name of crop;	(ha)	(kg/year)
Name of crop;	(ha)	(kg/year)

401. How many staff do you have in your farm? _____

402. What is your average Annual Gross Sales? _____

403. What is the source of water that you use for agriculture? Please choose **one or more**.

- | |
|---|
| 1. Water from river or pond
2. Water from groundwater
3. Rainwater
4. Water supply from water supply agency
5. Others () |
|---|

404. How much is paid **monthly** for agricultural water on the average? Please indicate below.
 _____ (PhP)

405. How much is paid **monthly** for electricity and fuel etc. on the average? Please indicate below.
 _____ (PhP)

406. How much is paid **annually** for maintenance cost for agricultural equipment and machine etc. including replacement of spare parts on the average? Please indicate below.
 _____ (PhP)

407. How much is paid **annually** for pesticide on the average? Please indicate below.
 _____ (PhP)

408. What kind of fertilizer is **annually** used for each crop? Please indicate below.

<u>Name of Crop</u>	<u>Organic fertilizer</u> Name (kg)	<u>Chemical fertilizer</u> Name (kg)	<u>Other</u>
	Name: (kg)	Name: (kg)	Name: (kg)
	Name: (kg)	Name: (kg)	Name: (kg)
	Name: (kg)	Name: (kg)	Name: (kg)
	Name: (kg)	Name: (kg)	Name: (kg)
	Name: (kg)	Name: (kg)	Name: (kg)
	Name: (kg)	Name: (kg)	Name: (kg)
	Name: (kg)	Name: (kg)	Name: (kg)

409. How much is paid **annually** for fertilizer on the average? Please indicate below.
_____ (PhP)

4010. We are planning to produce the compost using the sludge generated from domestic wastewater treatment plant through this project, would you be interested intend to use the compost for your farm? Please choose **one**.

- | |
|---|
| 1. No. I am not interested |
| 2. Yes. I am interested in the compost and would like to study the introduction of the compost. |

If you will use the compost, how much are you willing to pay (per kilogram) at a maximum? Please indicate below.
_____ (PhP / kg)

QUESTIONS 409-411 ARE ONLY FOR THOSE WHO ANSWERED “NO” IN QUESTION NO. 408. IF THE ANSWER IS YES, SKIP THESE QUESTIONS.

4011. Why are you not interested? Please choose **one or more**.

- | |
|---|
| 1. I have bad impression on using the compost made from human excreta |
| 2. Due to religion |
| 3. I do not use fertilizer in my farm |
| 4. I am concerned about the quality of the compost and there might be that toxic substances contained in the compost. |
| 5. Other () |

410 What are the conditions that would make persuade you to use the compost? Please choose **one or more**.

- | |
|---|
| 1. If it is proven that the compost has good effect on the growth of the crop |
| 2. If it is proven safe |
| 3. If it is cheaper than the fertilizer I currently use. |
| 4. Other () |

411 If you are NOT interested with the compost, would you be interested with a **de-watered sludge** and produce the compost yourself to fertilize your farm land?

- | |
|--|
| 1. Yes, I am interested. |
| 2. Yes, if you pay a certain amount of money |
| 3. Yes, if the price is affordable |
| 4. No, I am not interested. |
| 5. Other () |

5-1 Sheet

5-2 Pictures (More pictures are accessible through google drive)



SEPTIC TANKS LOCATED
OUTSIDE THE HOUSE



AT-49

A-6-5-52



TOILET FACILITY



AT-50

A-6-5-53



WITH THE RESPONDENTS



AT-51

A-6-5-54