

**MINISTRY OF PUBLIC WORKS AND TRANSPORT
LAO PEOPLE'S DEMOCRATIC REPUBLIC**

**THE PREPARATORY SURVEY
ON
THE PROJECT FOR IMPROVEMENT OF
SOLID WASTE MANAGEMENT IN
ENVIRONMENTAL SUSTAINABLE CITIES
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC**

MARCH 2014

**JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)**

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to Kokusai Kogyo Co., Ltd.

The survey team held a series of discussions with the officials concerned of the Government of Lao People's Democratic Republic, 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 Lao People's Democratic Republic for their close cooperation extended to the survey team.

March, 2014

Masami Fuwa
Director General,
Global Environment Department
Japan International Cooperation Agency

Summary

1. Overview of Lao P.D.R.

(1) Natural Conditions

Lao P.D.R is located in the centre of the Indochina Peninsula and is bordered Thailand, Cambodia, Myanmar and China. The land area is approximately 236,000 km², which is roughly equal to the main island of Japan. Vientiane capital (hereinafter “VTE”) is located in the centre of Lao P.D.R, in a depositional plain formed by the Mekong River and is bordered by Thailand. Luang Prabang District (hereinafter “LPB”) is an ancient city located in the north of Laos and designated as World heritage town of UNESCO, while Xayabouri District (hereinafter “XYB”) is located between Mekong River and Thailand border in the north western of the Laos.

The climate in Lao P.D.R. is designated as savannah climate and is in an equatorial low pressure belt in summer and is in horse latitudes or subtropical highs in winter, therefore it is divided clearly into rainy season from May to November and dry season from December to April.

(2) Socio-Economic Conditions

Lao government has maintained a stable political condition since 1975 under the dominant one-party system of the Lao People’s Revolutionary Party and has promoted new economic mechanisms since 1986 with a new policy called “The New Thinking”, however Lao P.D.R. is still in Least Developing Country (LDC) position and is ranked 138th out of 187 countries in regards to Human Development Indicators (HDI) (Human Development Report 2011 by UNEP) and Gross Domestic Product per capita (2011-2012) in Lao P.D.R was \$1,263 USD (Statistical Yearbook 2012 referred by Ministry of Planning and Investment, the Lao P.D.R).

Although the economic development of Lao P.D.R has been delayed due to geographic restrictions, past civil war and so on, Lao government has changed its mind-set from “Land-Locked Country” to “Land-Linked Country” and has focused on the geographic priority that it is located in the centre of the Indochina Peninsula for accomplishing economic development by improving physical distribution inside the peninsula. Lao P.D.R was not affected seriously by Global Financial Crisis in 2008 since its domestic financial market was still in an immature state. Therefore it has maintained stable growth, with a real GDP growth rate of 8.0% from 2011 to 2012 on the back of growth industries such as natural resource extraction and hydroelectric power generation (Statistical Yearbook 2012, Ministry of Planning and Investment, the Lao P.D.R). IMF predicted that economic growth of Lao P.D.R would be 8.35% and Lao government could maintain favourable economic growth continuously in 2013. Based on the presumption of continued favourable economic and social conditions in Lao P.D.R, the Lao government predicted that the country would achieve economic growth of 8% per annum and GDP growth of 1,700 USD per capita in 2015 in the 7th five-year plan for national economic and

social development (enacted Oct. 2011, period 2011-2015).

With regards to GDP by industry in Lao P.D.R, that of agriculture, forestry, and fisheries has decreased, on the other hand that of natural resource extraction and commerce has increased. Lao P.D.R has abundant wood and exports electricity generated by hydro power to surrounding countries centred upon Thailand because most of the land is mountainous. It also has plentiful mineral resources such as gold, copper, bauxite and iron ores. However, 70% of its population in 2010 was still engaged in agriculture. The proportion of primary, secondary and tertiary industries to GDP in 2012 was 27.6%, 33.1% and 39.3% respectively (Reference: Key Indicators to Asia and the Pacific 2013, <http://www.adb.org/LaoPDR/main.asp>).

2. Background of the Project

(1) Background

The increasing of waste generation is predicted in Lao P.D.R. in accordance with population growth especially; it is expected to be double or triple the current amount (2013) in the target project sites by 2020. Accordingly, the urgent enhancement of the ability of waste disposal by improving the efficiency of waste collection and transportation is required in the project sites in addition to solution of the current problems.

The increasing of waste generation is predicted in Lao P.D.R. in accordance with population growth especially; it is expected to be double or triple the current amount (2013) in the target project sites by 2020. Accordingly, the urgent enhancement of the ability of waste disposal by improving the efficiency of waste collection and transportation is required in the project sites in addition to solution of the current problems.

The amount of collected waste in VTE was 166.7 ton/day in 2013, consisting of 69.3 ton/day by Vientiane Urban Development Administration Authority (hereinafter “VUDAA”) and 97.4 ton/day by private sector; this is expected to increase to 564.1 ton/day by 2020, consisting of 259.3ton/day by VUDAA and 304.8 ton/day by private sector. In LPB, 36.6 ton/day of waste was collected in 2013, consisting of 20.6 ton/day by Urban Development Administration Authority (hereinafter “UDAA”) and 16.0 ton/day by private sector, and this is expected to increase to 75.6 ton/day by 2020, consisting of 54.4 ton/day by UDAA and 21.2 ton/day by private sector. XYB collected 22.7 ton of waste per day in 2013, consisting of 19.2 ton/day by UDAA and 3.5 ton/day by private sector, while this is expected to increase to 44.3 ton/day by 2020, consisting of 39.14 ton/day by UDAA and 5.2 ton/day by private sector. Since the amount of collected waste in the project sites increases drastically, taking measures such as addition of collection vehicles is necessary. In regards to VTE, the construction of solid waste transfer station to transport collected waste increasing is required, because of the long distance from the city centre to final disposal site, approximately 32 km for direct hauling. And furthermore, supplying heavy machines and collection vehicles is requested to properly dispose solid waste at final disposal site of every city.

(2) Assistance from Other Projects

Japanese government has already done Official Development Assistance related to the waste management field for Lao P.D.R. First one was Grant Aid project in 1996 and second one was “Environmental Management Component of Laos Pilot Project (hereinafter LPP-E) (2011-2015)”. Heavy machines and vehicles were donated and the workshop was constructed in former project with the aim to improve waste collection and waste transportation and to enhance the waste management in final disposal site. The latter project had a purpose of improving the waste management capacity in VTE, LPB and XYB. LPP-E, as a technical cooperation project, is, by nature of the scheme focused on strengthening the capacity of human resources, and provides minimal assistance with respect to physical resources. The grant aid project is intended to make up for this lack of provision of physical resources in LPP-E.

(3) Objective of the Project

The objective of project is to construct the solid waste transfer station in VTE, to procure the heavy machineries for the final disposal sites and waste collection and transportation vehicles for each project sites, and to carried out the technical guidance (soft component) for achieving sustainability in the operation and maintenance of the solid waste transfer station. Accordingly, LPP-E and the project are in tandem to be mutually beneficial to improve the capacity of solid waste management in project sites.

3. Results of Preparatory Survey and Scope of Project

(1) Results of Preparatory Survey

JICA dispatched a preparatory survey team two times to Lao P.D.R. as follows.

- ✓ The 1st survey: from 22 August 2013 to 4 October 2013
- ✓ The 2nd survey: from 3 December to 12 December 2013

The preparatory survey team conducted the survey at candidate site for solid waste transfer station including topography, geography and social and environmental consideration in VTE, moreover survey for procurement of equipment in VTE, LPB and XYB. The results of the survey in Lao P.D.R., analysis of those and plan are described as follows;

1) Contents of improvement plan

To improve the solid waste management at project sites, the procurement of new vehicles for capacity upgrading of waste collection and the establishment of the solid waste transfer station for enhancement of work efficiency are implemented in accordance with the increasing of population and economic growth. The preconditions of the improvement plan are as follows;

- ✓ The target year of the grant aid Project is set as 2020 so as to aid in cooperation with the technical cooperation project (LPP-E) that is being conducted simultaneously.
- ✓ Reference material such as on population and waste volume estimates will use newly considered data based on the surveys already implemented in LLP-E.
- ✓ The procurement of collection vehicles is planned in accordance with the increased waste collection amount by VUDDA and UDAA of LPB and XYB between 2013 and 2020.
- ✓ The target of collection vehicles at the solid waste transfer station is only skip loaders (5m³) and compactor trucks (6m³) belonging to VUDAA. The maximum amount of waste transferred there in 2020 is approximately 50 tons per day.

2) Plan of buildings

Japanese standards and codes for the design of buildings are applied for the plan since there are no relevant standards or codes in Laos.

3) Procurement of equipment

The top priority of waste collection vehicles and heavy machinery in terms of emergency and necessity is considered according to the SWM at pilot project site.

4) The requested equipment or facilities not covered by the project

The requested large scale incinerator for health care waste in VTE is not covered in the project since the proper collection system and rule of health care waste has not yet been established in VTE in spite of pilot project of LPP-E, which included the installation of a small-scale incinerator in 2012. The requested vehicle for collection of health care waste in LPB is not covered in the project because one was already procured by JICA in September 2013.

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

1) Building Site/ Facility Location Plan

The solid waste transfer station that will be constructed under this project is to be built on land owned by the Laos government located in Nahai Village, VTE. The facility access is through a connecting road of about 800 m to the north of the main road of Nahai Village. The site area is 160 m × 80 m, or 1.28 ha and consists of;

- ✓ a weight bridge administrative building,
- ✓ a solid waste transfer station building, entrance ramp,
- ✓ a toilet block,
- ✓ a vehicles washing area and
- ✓ others exterior facilities.

The main objective of the solid waste transfer station building is to transfer properly the wastes by driving the machinery and equipment which receives, supplies, stores, discharges and deodorizes the waste and consists of the three following sections 1) Reloading Section, 2) Management Section, 3) Other Sections. And the objectives of these three sections are: Reloading Section is to house the

machinery and equipment, the Management Section is to operate and manage the machinery and equipment and to manage the personnel and vehicle drivers who are involved with the transfer of waste. In addition, the Other Sections contains the entrance and toilets, stairs, warehouse and so on.

Table S-1: Area Planning List of Waste Transfer Facility Building

Sections	FL	Rooms	Floor space (m ²)	Details/Remarks
Transfer Section	1	Storage and Discharge Equipment Room	336.00	Space to house equipment of 2 systems: Storage drum (rotating drum method) and discharge conveyor (belt conveyor type).
	2	Collection Vehicle Turning Space	252.00	Required space to turn around small and medium-sized collection vehicles (skip loader vehicles (5m ³) or compactor vehicles (6 m ³)) which have come up the slope (entrance ramp).
	2	Platform	189.00	Required space for the collection vehicles to discharge the collected waste into the feed hopper.
	2	Monitoring Room	25.50	Room of operation and monitoring personnel of storage drum
Subtotal			802.5	
Management Section	1	1 Floor Office	84.00	Total area of required office space (174 m ²)-- Director-General office area (16.5 m ²) = 157.5 m ² To install 157.5 m ² /2=78.75 m ² per floor.
	2	Director Office	16.5	Director General office space of 16.5 m ² which will also be used as a visitor's room.
	2	2 Floor Office	84.00	Total area of required office space (174 m ²)-- Director-General office area (16.5 m ²) = 157.5 m ² To install 157.5 m ² /2=78.75 m ² per floor.
Subtotal			184.50	
Others Sections	1	Entrance Hall/ Stairs / Toilets	42.00	Toilets will be installed by gender for managerial personnel who work on the first floor.
	2	Hall/Stairs Toilet	42.00	Toilets will be installed by gender for managerial personnel who work on the second floor.
	1	Warehouse	24.00	Storage warehouse for spare parts, etc.
	1	Electrical Room	18.00	Space to house power switchboard, etc.
Subtotal			126.00	
Total			1,113.00	

2) Outline of selected equipment

The outline of selected equipment is shown in the table below.

Table S-2: Outline of Selected Equipment

Category	Item	VTE	LPB	XYB	Total
Collection of waste	Compactor truck (20m ³)	3	-	-	3
	Compactor truck (10m ³)	16	-	2	18
	Compactor truck (6m ³)	17	4	-	21
	Compactor truck (6m ³ 4 WD)	4	-	-	4
	Dump truck (10m ³)	2	3	1	6
	Skip loader (5m ³)	4	1	1	6
	Vehicle for Health care waste collection	1	-	-	1
Heavy machinery	Bulldozer (21t)	1	-	-	1
	Bulldozer(10t)	-	1	-	1
	Excavator(0.6m ³)	-	-	1	1
Equipment for solid waste transfer station		2	-	-	2
Others	Water tanker	1	1	1	3
	Water tanker for waste water (6m ³)	1	-	-	1
	Car washing machine	2	1	1	4

(3) Soft Component (Technical Assistance) Plan

The project will be the first such solid waste transfer station to be built in Laos, therefore, it will be the counterparts' first experience in planning, designing, constructing and operating such a facility. In particular, the Soft Component will have to give technical assistance in operational capacity in 1) establishing a waste collection vehicle (provided by the Project) deployment plan regarding vehicles transporting waste into the new solid waste transfer station as part of the expanded collection area, 2) appropriate organizational management of the solid waste transfer station, and 3) securing an access route into the final disposal sites by large compactor trucks transporting waste from the solid waste transfer station.

4. Project Implementation Schedule and Project Cost Estimate

(1) Project Implementation Schedule

Project Implementation Schedule is prepared for single fiscal year considering scope of the project and time required for respective implantation phases. Project implementation schedule consists of detailed design for 3 months, tendering for 3 months, and procurement and construction for 14 months.

(2) Project Cost Estimation

Total Project Cost borne by the Lao side is approximately 665,964USD (66.1 Million Japanese Yen).

5. Project Evaluation

(1) Relevance

The main objective of the Project is to increase the efficiency of solid waste collection and transportation, and it contributes to the improvement of solid waste management in project sites, thus the implementation of the project is significant. Moreover, synergetic effect between LPP-E is expected by the Project. The details of relevance of the Project implementation are described as follows;

1) Improvement of urban environment and sanitary condition

The objective of the Project is to contribute the improvement of urban environment and sanitary condition by the construction of the solid waste transfer station and the procurement of waste collection vehicles at VTE, LPB and XYB which are registered as 'Environmentally Sustainable Cities' in Laos.

2) Necessity of the project in accordance with development policy of solid waste management sector in Laos

Lao government set the priority of sustainable economic and social development with environmental considerations in the ‘7th five-year national economic and social development plan (enacted Oct. 2011, period 2011-2015)’ and ‘National Environmental Strategy (enacted 2004, period 2004-2020)’ and also emphasizes the necessity of strengthening solid waste management capacity in the three cities in ‘Environmental Management Action Plan (2011-2015)’ enacted by MONRE. Accordingly, this Project corresponds in direction of the strategy and the plans of Lao government.

- 3) Conformity to Japanese ODA policy related to the sector of solid waste management of Lao P.D.R.

The Project is categorized as “Development of economic and social infrastructure”, significant policy to Japanese ODA for Lao P.D.R., which belongs to the development subject of “Realization of comfortable society harmonized with environment”.

- 4) Assistance and coordination of other donors or other projects

LPP-E, as a technical cooperation project, is by nature of the scheme focused on strengthening the capacity of human resources, such as the operation of final disposal site, collection of waste fees and establishment of collection rules at the project sites. However, it provides minimal assistance with respect to physical resources. In order to improve this; LPP-E contributes to upgrading the capacity of solid waste management, and the Project is intended to make up for this lack of provision of physical resources in LPP-E.

- 5) Facilitation of poverty reduction

The new jobs created by the construction of solid waste transfer station and new access road contribute to the facilitation of poverty reduction.

(2) Effectiveness

Expected effectiveness of the Project implementation consists of quantitative effects and qualitative effects as follows.

- 1) Quantitative effect

This Project is expected to bring the following quantitative effects

Table S-3: Quantitative Effect of the Project

Indicator	Project site	Base line data (2013) ton/day	Target (2020) ton/day
Amount of waste collection	VTE	69.3	259.7
	LPB	20.6	54.4
	XYB	19.2	39.1
Population waste collection service covered	VTE	70,495	199,596
	LPB	33,362	48,319
	XYB	31,099	47,594

2) Qualitative Effects

This Project is expected to bring about the following qualitative effects.

- ✓ The capacities of solid waste collection of VUDAA and UDAA's in LPB and XYB are improved.
- ✓ The efficiency of solid waste collection by small capacity vehicles is improved due to solid waste transfer station in VTE
- ✓ LPP-E and the Project in tandem to be mutually beneficial is expected because of above mentioned improvement of solid waste management at three project sites

Due to the reasons above, the high relevance and sufficient effects are expected by the Project.

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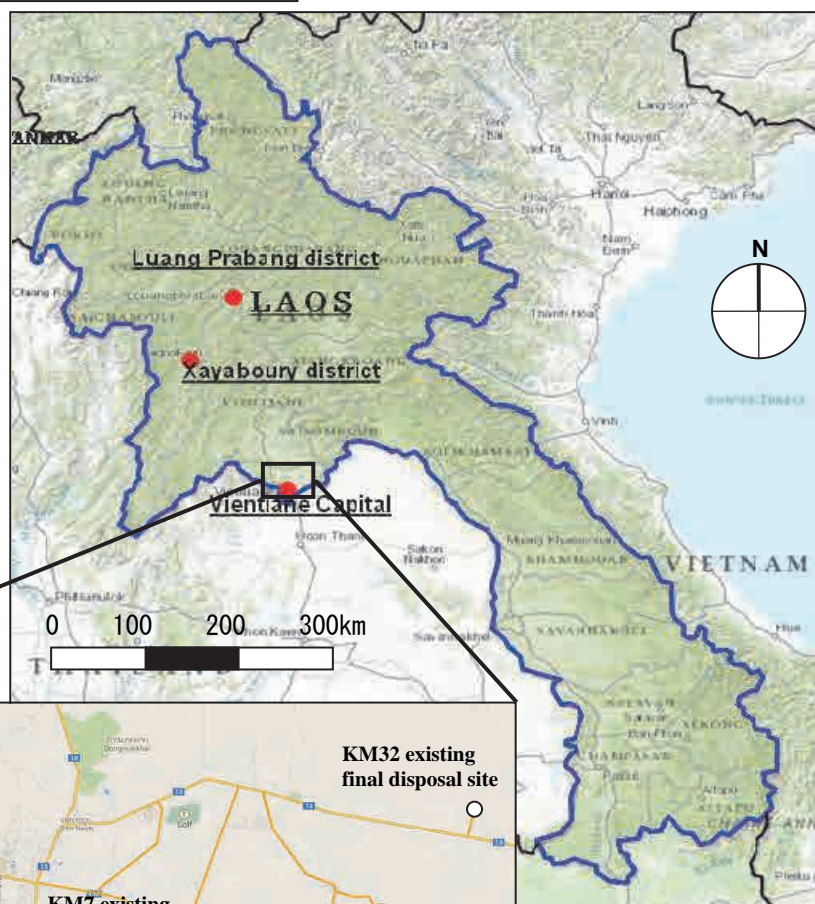
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Lao People's Democratic Republic



Lao People's Democratic Republic



THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN ENVIRONMENTAL SUSTAINABLE CITIES PROJECT SITES



Perspective Solid Waste Transfer Station

Perspective of Solid Waste Transfer Station

Photos



Photo-1

Overview of VTE town. There are many green parks and most households are low rising dwellings in the town. In recent years, many high rise hotels have been constructed.



Photo-2

Waste collection in VTE. The height of deck walls is raised to increase the capacity of waste loading of dump truck (10tonns). A group for collection consists of four workers and a driver.



Photo-3

KM32 final disposal site located 32km distance from city centre in VTE. JICA technical cooperation project has supported to improve the access road and working condition of waste pickers since 2011.



Photo-4

Weight bridge at KM32 final disposal site that measures the weight of incoming collected waste from VTE. It was constructed by Japanese ODA project in 1997



Photo-5

Some collected waste is transferred at rough structure at KM7 workshop without any safety equipment.



Photo-6

Candidate site of solid waste transfer station. The site belongs to VTE and flat filed without household nearby.

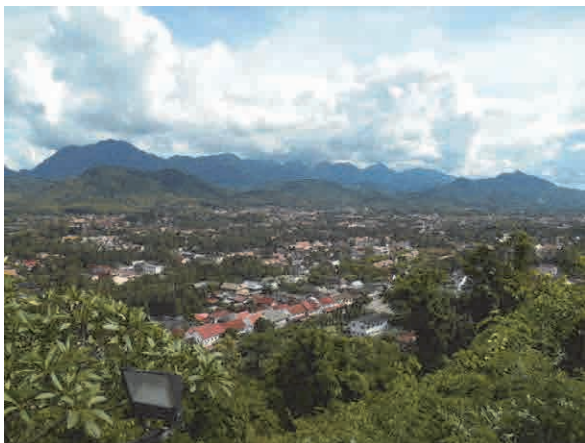


Photo-7

Overview of LPB. There are many green area and most households are low rising dwellings in the town. LPB is designated as UNESCO world heritage ancient town.



Photo-8

Waste collection in LPB. The height of deck walls is raised to increase the capacity of waste loading of dump truck (10tonns). A group for collection consists of four workers and a driver.



Photo-9

KM8 final disposal site located 8km distance from city centre in LPB. JICA technical cooperation project has supported to improve the access road and working condition of waste pickers since 2011.



Photo-10

Overview of XYB. There are many green area and most households are low rising dwellings in the town. In recent years, some high rise hotels have been constructed.



Photo-11

KM9 final disposal site located 9km distance from city centre in XYB. JICA technical cooperation project has supported to establish the administration office since 2011.



Photo-12

Waste collection in LPB. The height of deck walls is raised to increase the capacity of waste loading of dump truck (10tonns). A group for collection consists of four workers and a driver.

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ABBREVIATIONS

ADB	Asian Development Bank
A/P	Authorization to Pay
DHUP	Department of Housing and Urban Planning
DONRE	Department of Natural Resources and Environment
EEA	Environmental Education and Awareness
EIA	Environmental Impact Assessment
ESC	Environmentally Sustainable Cities
F/S	Feasibility Study
IEE	Initial Environmental Examination
JET	Short-term JICA Expert Team
JICA	Japan International Cooperation Agency
LPB	Luang Prabang District
LPP-E	Environmental Management Component of LPP
MONRE	Ministry of Natural Resources and Environment
MPWT	Ministry of Public Works and Transport
PACSA	Public Administration and Civil Service Authority
Pre-F/S	Prefeasibility Study
SEA	Strategic Environmental Assessment
SWM	Solid Waste Management
TOR	Terms Of Reference
UDAA	Urban Development Administration Authority
VTE	Vientiane Capital
VUDAA	Vientiane Urban Development Administration Authority
XYB	Xayaburi District

1. Background of the Project

1.1. Current Situation of the Relevant Sectors, and Issues

1.1.1. Current Situation and Issues

Lao P.D.R has formed the framework of solid waste management including the flow of waste management, such as waste collection, transportation and disposal by Japanese government assistance, however it faces the issues of waste amount increasing caused by economic and population growth. Vientiane Capital (hereinafter VTE), which has a population of approximately 730,000 people and an area of approx. 3,920km², Luang Prabang District (hereinafter LPB), approx. 78,000 people and approx. 833km², and Xayaburi District (hereinafter XYB), approx. 67,000 people and approx. 2,285km², were registered as ‘Environmentally Sustainable Cities’, a section stipulated in the ASEAN integration roadmap. The strengthening of waste management capacity is one of the targets of the three sites; however the rate of waste collection in each city is still low, namely less than 20% in VTE, approx. 60% in LPB, and approx. 40% in XYB. Uncollected waste is discharged as illegal dumping or open burning and causes disease, insect pests and offensive odors. Furthermore the lack of necessary equipment causes the issues of waste scattering, leachate, offensive odors, disease and insect pests in waste collection areas.

These issues are greatly caused by the inefficient method of transportation and waste collection. The number of waste collection vehicles is 47 vehicles in VTE, 8 vehicles in LPB, and 3 vehicles in XYB, and most of them are just dump trucks, not specified vehicles for waste collection.

The waste collection vehicles in VTE go to the final disposal site, which is a distance of approx. 32km from the city centre of VTE without transferring collected waste on the way or on the return journey every day. Some large dump trucks are collecting waste in the centre of VTE, on the other hand, some small collection vehicles are running for a long distance, which is inefficient transportation.

1.1.2. Development Plan

Lao government set the priority of sustainable economic and social development with environmental considerations in the ‘7th five-year national economic and social development plan (enacted Oct. 2011, period 2011-2015)’ and ‘National Environmental Strategy (enacted 2004, period 2004-2020)’ and also emphasizes the necessity of strengthening solid waste management capacity in the three cities in ‘Environmental Management Action Plan (2011-2015)’ enacted by MONRE. Accordingly, this project corresponds in direction of the strategy and the plans.

1.1.3. Socio-Economic Conditions

Lao government has maintained a stable political condition since 1975 under the dominant one-party system of the Lao People’s Revolutionary Party and has promoted new economic mechanisms since 1986 with a new policy called “The New Thinking”, however Lao P.D.R. is still in

Least Developing Country (LDC) position and is ranked 138th out of 187 countries in regards to Human Development Indicators (HDI) (Human Development Report 2011 by UNEP) and Gross Domestic Product per capita (2011-2012) in Lao P.D.R was \$1,263 USD (Statistical Yearbook 2012 referred by Ministry of Planning and Investment, the Lao P.D.R).

Although the economic development of Lao P.D.R has been delayed due to geographic restrictions, past civil war and so on, Lao government has changed its mind-set from “Land-Locked Country” to “Land-Linked Country” and has focused on the geographic priority that it is located in the centre of the Indochina Peninsula for accomplishing economic development by improving physical distribution inside the peninsula. Lao P.D.R was not affected seriously by Global Financial Crisis in 2008 since its domestic financial market was still in an immature state. Therefore it has maintained stable growth, with a real GDP growth rate of 8.0% from 2011 to 2012 on the back of growth industries such as natural resource extraction and hydroelectric power generation (Statistical Yearbook 2012, Ministry of Planning and Investment, the Lao P.D.R). IMF predicted that economic growth of Lao P.D.R would be 8.35% and Lao government could maintain favourable economic growth continuously in 2013. Based on the presumption of continued favourable economic and social conditions in Lao P.D.R, the Lao government predicted that the country would achieve economic growth of 8% per annum and GDP growth of 1,700 USD per capita in 2015 in the 7th five-year plan for national economic and social development (enacted Oct. 2011, period 2011-2015).

With regards to GDP by industry in Lao P.D.R, that of agriculture, forestry, and fisheries has decreased, on the other hand that of natural resource extraction and commerce has increased. Lao P.D.R has abundant wood and exports electricity generated by hydro power to surrounding countries centred upon Thailand because most of the land is mountainous. It also has plentiful mineral resources such as gold, copper, bauxite and iron ores. However, 70% of its population in 2010 was still engaged in agriculture. The proportion of primary, secondary and tertiary industries to GDP in 2012 was 27.6%, 33.1% and 39.3% respectively (Reference: Key Indicators to Asia and the Pacific 2013, <http://www.adb.org/LaoPDR/main.asp>).

1.2. Background and the Overview of the Grant Aid Request

The increasing of waste generation is predicted in Lao P.D.R. in accordance with population growth especially; it is expected to be double or triple the current amount (2013) in the target project sites by 2020. Accordingly, the urgent enhancement of the ability of waste disposal by improving the efficiency of waste collection and transportation is required in the project sites in addition to solution of the current problems.

The amount of collected waste in VTE was 166.7 ton/day in 2013, consisting of 69.3 ton/day by VUDAA and 97.4 ton/day by private sector; this is expected to increase to 564.1 ton/day by 2020, consisting of 259.3ton/day by VUDAA and 304.8 ton/day by private sector. In LPB, 36.6 ton/day of waste was collected in 2013, consisting of 20.6 ton/day by UDAA and 16.0 ton/day by private sector,

and this is expected to increase to 75.6 ton/day by 2020, consisting of 54.4 ton/day by UDAA and 21.2 ton/day by private sector. XYB collected 22.7 ton of waste per day in 2013, consisting of 19.2 ton/day by UDAA and 3.5 ton/day by private sector, while this is expected to increase to 44.3 ton/day by 2020, consisting of 39.14 ton/day by UDAA and 5.2 ton/day by private sector. Since the amount of collected waste in the project sites increases drastically, taking measures such as addition of collection vehicles is necessary. In regards to VTE, the construction of solid waste transfer station to transport collected waste increasing is required, because of the long distance from the city centre to final disposal site, approximately 32 km for direct hauling. And furthermore, supplying heavy machines and collection vehicles is requested to properly dispose solid waste at final disposal site of every city.

Lao government requested Grant Aid, as shown below, of Japanese government in Aug. 2012 to solve the issues.

Table 1: Requested Items

Requested contents		VTE	LPB	XYB
Facility	Construction of solid waste transfer station	1	—	—
	Compactor truck (10 m ³)	24	0	0
	Compactor truck (6 m ³)	6	2	0
	Dump truck	0	3	5
	Skip Loader (5 m ³)	4	3	2
	Trailer	10	0	0
Machineries and Materials	Bulldozer	1	1	0
	Excavator	1	0	0
	Water tanker	1	1	1
	HCW incinerator	1	0	0
	Vehicle for HCW	1	1	0
	Devices and equipment for workshop	1 set	—	—
	Equipment parts	1 set	—	—

1.3. Trend of Japanese ODA

Japanese government has already done ODA related to the waste management field for Lao P.D.R. First one was Grant Aid project in 1996 and second one was “Environmental Management Component of Laos Pilot Project (hereinafter LPP-E) (2011-2015)”. Heavy machines and vehicles were donated and the workshop was constructed in former project with the aim to improve waste collection and waste transportation and to enhance the waste management in final disposal site. The latter project had a purpose of improving the waste management capacity in VTE, LPB and XYB. Outlines of these projects are shown as below.

Table 2: Trend of Japanese ODA for Waste Management

Content	Year	Project	Details
Grant Aid	1996	Grant Aid Project	Donation of waste collection vehicles and heavy machines in VTE. Construction of workshop, final disposal site and control house. Limit amount: 705 million yen
Technical Cooperation Project	From 2011 to 2015	Environmental Management Component of Laos Pilot Project	Assistance of 3 components shown as below with the aim to promote Environmentally Sustainable Cities(ESC) 1) Preparation of ESC guideline 2) Enhancement of waste management capacity of counterpart's organization. 3) Promotion of participatory environmental management.

1.4. Assistance from Other Donors

Assistance from other donors in the waste management field in the target project sites of Lao P.D.R were mainly implemented by ADB. Outline of each project is shown as below.

Table 3: Assistance from Other Donors

Year	Organization	Project	Amount (1,000USD)	Assistant Type	Outline
VTE					
From 1997 to 2006	ADB/French development agency	Vientiane Urban Infrastructure and Services Project	8,000	FA/TC	In VTE 1) Development of social infrastructure and its Service expansion 2) Capacity Enhancement for project implementation 3) Village Development 4) Assistance for improving waste management project and Poverty reduction.
From 2004 to 2007	ADB	Solid Waste Management and Income Generation for Vientiane's Poor	Unknown	FA/TC	1) Improvement of sanitary condition by enhancing waste management system in poor area of VTE. 2) Enhancement of Income generation for poor classes including waste pickers and improvement of employment opportunity.
2010	Asian Institute of Technology (AIT)	Guideline on Domestic Solid waste Management in Vientiane	4.3	TC	Assistance of preparing guideline on domestic solid waste management in VTE
LPB					
1997	ADB/NORRAD/ UNDP	Secondary Towns Urban Development Project	5,892	FA/TC	Assistance of planning for urban development including improvement of waste management.
XYB					
From 2008 to 2010	ADB	Small Towns Development Project	1,276	FA/TC	Assistance of planning for urban development including improvement of waste management.

1.5. Natural Conditions

1.5.1. Location

Lao P.D.R is located in the centre of the Indochina Peninsula and is bordered Thailand, Cambodia, Myanmar and China. The land area is approximately 236,000 km², which is roughly equal to the main island of Japan.

VTE is located in the centre of Lao P.D.R, in a depositional plain formed by the Mekong River and is bordered by Thailand.

1.5.2. Weather Conditions

The climate in VTE is designated as savannah climate and VTE is in an equatorial low pressure belt in summer and is in horse latitudes or subtropical highs in winter. Therefore it is divided clearly into rainy season from May to November and dry season from December to April. The monthly average precipitation is 334.6 mm at its highest in August and is 2.5mm at its lowest in December.

Table 4: Weather Conditions in VTE

Items	Detail
Rainy season	From May to November
Dry season	From December to April
Average Maximum temperature *(From 1951 to 2000)	34.3°C (April)
Average Minimum temperature *(From 1951 to 2000)	16.4°C (January)
Average Maximum Precipitation*(From 1951 to 2000)	334.6 mm (August)
Average Minimum Precipitation*(From 1951 to 2000)	2.5 mm (December)
Average Maximum Humidity**	Approx. 80% (August)
Average Minimum Humidity**	Approx. 60% (March)

Reference: *World Weather Information Service, <http://www.worldweather.org/121/c00235.htm>
**World Weather and Climate, <http://www.weather-and-climate.com/average-monthly-Humidity-perc.Vientiane,Laos>

1.5.3. Natural disasters

Lao P.D.R is subject to inundations around the Mekong River. Most recently, serious flooding occurred in August 2008 with a water level of 13.68 meters recorded, the highest in Laos' history. The natural disaster induced serious flood damage in Nong Da district (Surrounding area of Mekong River), Kaoliou District (Western area of Central VTE) and Bor. O district (Eastern area of Central VTE) which are lowland areas. It was reported that the flood damage occurred in 12 regions other than VTE, there were 228,320 injured persons and 12 dead persons and the total financial damage was about 4.4 million USD (Asian Disaster Reduction Centre

: http://www.adrc.asia/nationinformation_j.php?NationCode=418&Lang=jp&NationNum=19).

The construction site for solid waste transfer station is located 10 km to the north of Tadeua Road, which is near the Mekong River. There was no flood damage reported in this area.

According to ADRC, typhoon damage (tropical storms) are often generated in northern area and the middle area of Lao P.D.R. Other natural disasters to occur include draughts, earthquakes, infectious diseases, abnormal climate, landslides, slope failures, volcanic eruptions, high tides and forest fires. But serious damage by them has not been reported in VTE.

1.5.4. Topography

Topographic survey was implemented at the construction site of solid waste transfer station, with an area of about 2.4 hectares, and at the proposed site for the access road in September 2013. Based on the data obtained by the survey, topographic map with a scale of 1 to 10,000 was prepared. According to the map, the highest point in the construction site has an elevation of about 181 meters at the corner of south-eastern side, and the elevation gradually gets lower from the highest point to north-western side. The lowest point has an elevation of about 179 meters at the corner of north-western side (refer to attached file No.3).

1.5.5. Geology

Boring survey was conducted at 4 points in the construction area for waste transfer facility building and at a point in the construction area for entrance ramp in Sep. 2013 to gain an understanding of the properties of the ground and to consider the basic design of the facilities. The layer contains surface soil (thickness=1.0 m), laterite (thickness= from 1.0 m to 2.0 m), sandy silt mixed gravel (thickness= from 2.0 m to 3.0 m), silty clay (thickness= from 2.0 m to 3.0 m), silty and fine sand and so on. N-value was from 10 to 50 approximately and groundwater level was from -2.0m to -3.0m from the ground level

1.6. Environmental and Social Considerations

1.6.1. Components of the Project which have a Negative Environmental Impact

As mentioned above, an environmental and social examination is a necessary step before the construction of the solid waste transfer station and the access road in Nahai Village can progress. Details of these proposed works are outlined below.

Table 5: Outline of the Solid Waste Transfer Station

1. Solid waste transfer station					
Section	Floor	Room or space name	Floor space (m ²)	Details and notes	
Reloading	1 st	Storing and loading area	336.00	Space for 2 systems of rotary drum and loading conveyer	
	2 nd	Turning area for compactor truck	252.00	Sufficient space is needed for 5m ³ skip loader and 6m ³ compactor truck to turn in.	
	2 nd	Platform	189.00	The platform is needed so that the 5m ³ skip loaders and 6m ³ compactor trucks can discharge collected waste into hopper.	
	2 nd	Control room	26.25	Space for watchmen who control the rotary drum.	
	Subtotal		803.25		
Controlling	1 st	Office room	84.00	Total required office space is 174m ² Director's room is 16.5m ² Therefore, 78.75m ² (= (174 m ² -16.5 m ²) /2) is needed on each floor	
	2 nd		84.00		
	2 nd	Director's room	15.75		It is also used for meeting with visitors.
	Subtotal		183.75		
The others	1 st	Entrance hall, Stairs and toilet	42.00	Toilets are installed for administrative staff on 1 st floor.	
	2 nd	Hall, Stairs and toilet	42.00	Toilets are installed for administrative staff on 2 nd floor.	
	1 st	Store room	24.00	For spare parts and so on.	
	1 st	Electric room	18.00	Space for main power board and so on.	
	Subtotal		126.00		
Total			1,113.00		
2. Weighbridge Control House			16.00	To weigh the amount of collected waste by compactor truck and skip loader to collect basic data for operating the solid waste transfer station in good condition.	
3. Toilet House			40.00	For drivers of vehicles, workers and watchmen of the weighbridge control house.	
4. Ramp way			426.80	It is the approach path to discharge collected waste by compactor trucks and skip loaders. It is installed with 10% road grade.	
5. Car Washing House			104.00	To maintain the collection vehicles and to use them for long term in proper condition.	
Number of trips:	Compactor truck (cap:6m ³) (From centre of VTE to the solid waste transfer station)			Approx. 9 times	
	Skip loader (cap:5m ³) (From centre of VTE to the solid waste transfer station)			Approx. 25 times	
	Compactor truck (cap:20m ³) (From the solid waste transfer station to the final disposal site)			Approx. 9 times	

Table 6: Outline of the Access Road

Item	Outline
Length (from main road in Nahai Village)	Approx. 0.7km
Line	2 lines
Condition of the access road	Concrete pavement
Facility for drainage	Earth drain approx.0.7km

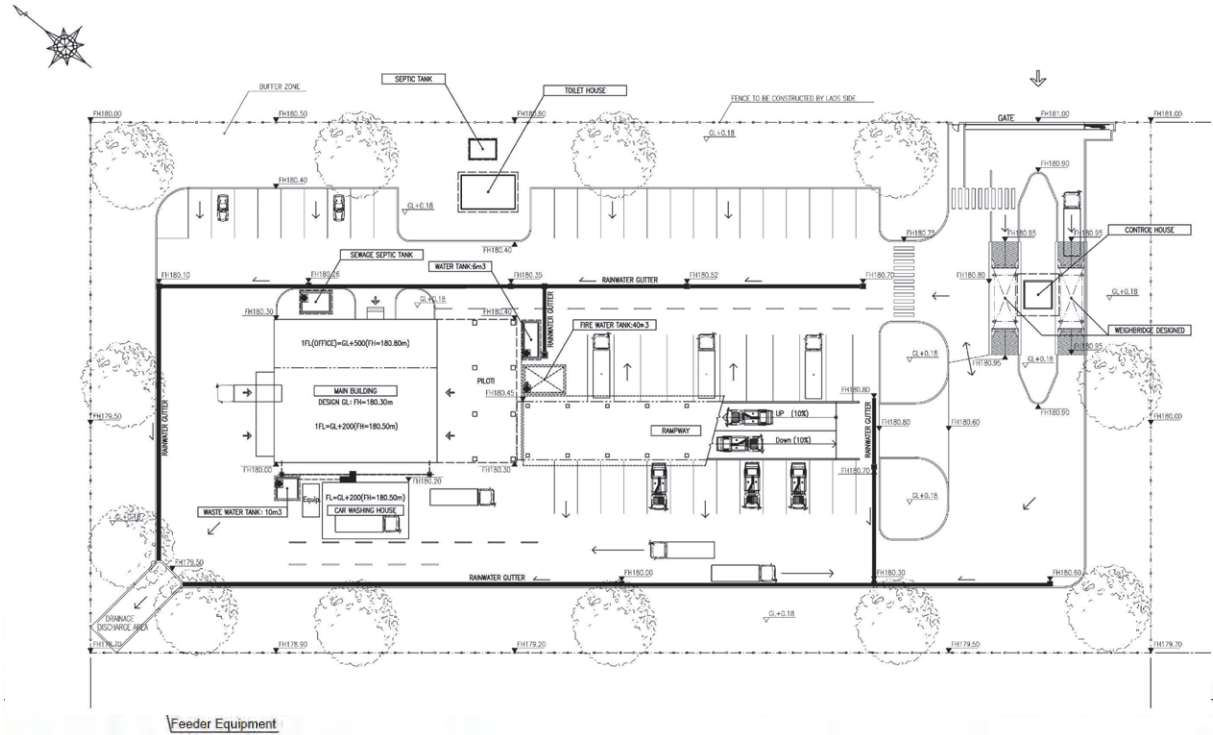


Figure 1 Elevated Plan of the Solid Waste Transfer Station

The project site is located about 1km east from the 450th anniversary road and about 1km northwest from the centre of Nahai Village. The area is not yet cultivated and the access road to the site will be expanded and paved from the main road in Nahai Village.



Figure 2: Location of the Project Site and Access Road

1.6.2. The Environmental and social Condition Around the Project Site

1.6.2.1. Land Use

As mentioned above, the project site and its surrounding area have neither been cultivated nor utilized as cropland or cattle land as yet. And it has been assigned as a public preservation area (NE) in the land-use planning and conception in 2030 of the “Project for Urban Development Master Plan Study in Vientiane Capital” (JICA 2011). However, according to our counterpart, the project site will be allocated as an industrial zone. Therefore, they have recommended this location to us as a proposed site.

1.6.2.2. Natural Environment

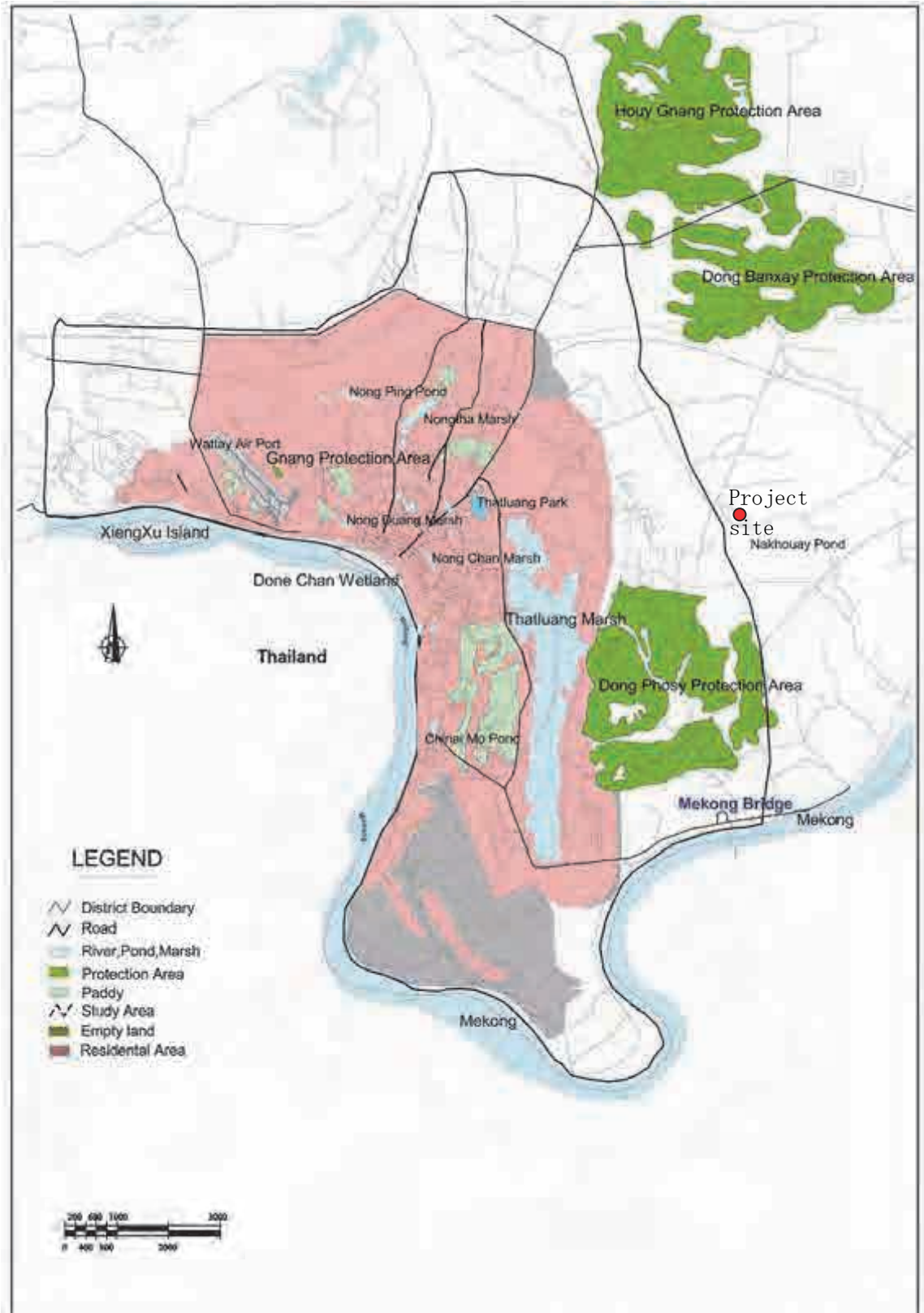
While there are 2 national protection areas and 4 municipal protection areas in VTE, there are no

protection areas around the project site. In addition, there are numerous historical heritages and temples in VTE, however, there are none around the project site.

Table 7: The Protection Areas Around the Project Site

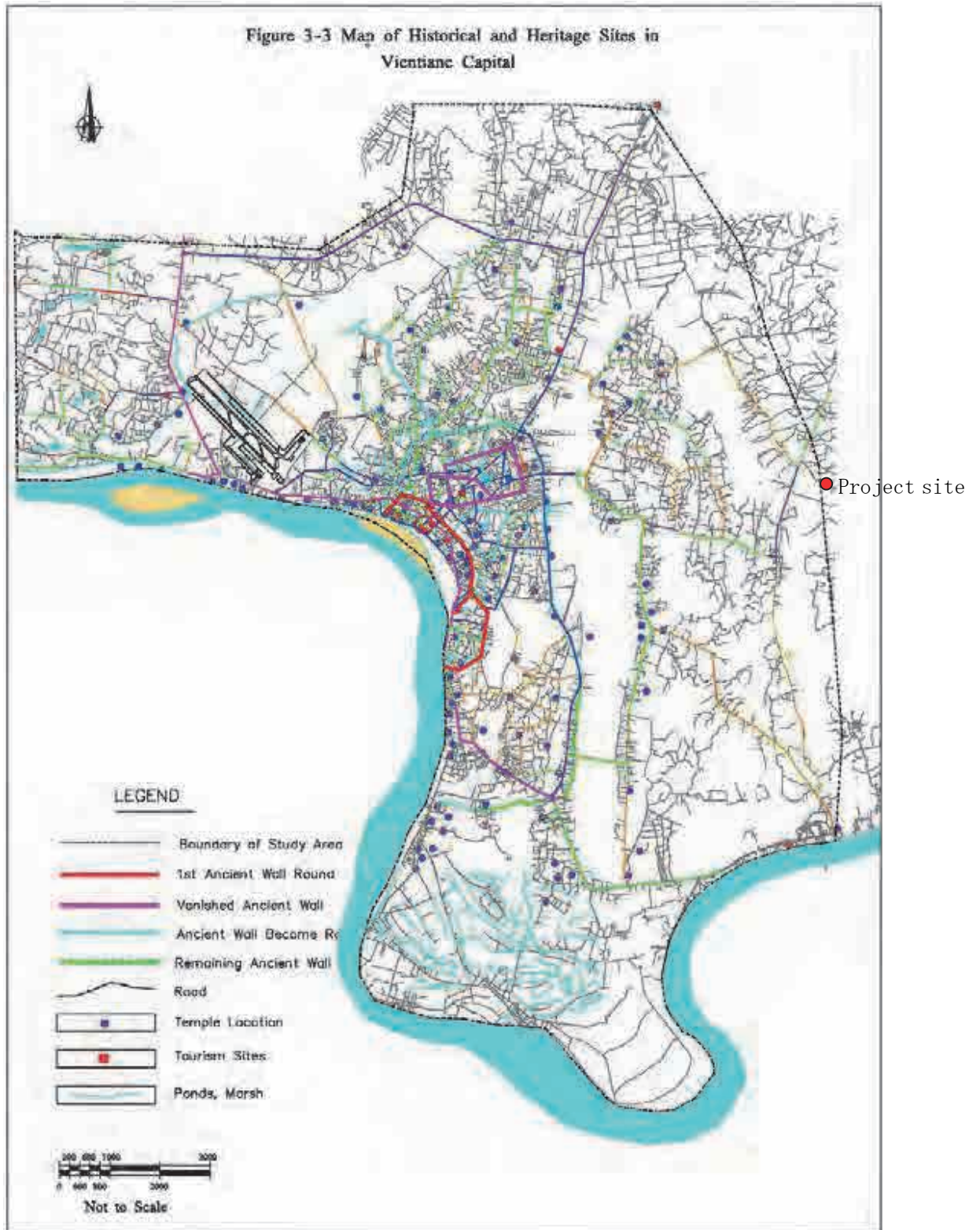
No.	Name	Area(ha)	Location
1	Dong Phosy	1,793.95	Xaysetha district: B. Xiengda, B. Nakhuay Hadxaifong district: B. Nong Hieo, B. Dong Phosy, B. Dong Khamsang.
2	Dong Houay Gngang	808	Xaythany district
3	Dong Banxay	788.75	Xaythany district: B. Dong Sanghin, B. Phokham, B. Xaysomsouk, B. Khok Sa At, B. Phonthong and B.Nakhok

Reference: The Study on the Improvement of Water Environment in Vientiane Capital



Reference: The Study of Master Plan on Comprehensive Urban Transport in Vientiane Capital

Figure 3: Map of Protection Areas Around the Project Site



Reference: General city planning investigation in VTE (2007)

Figure 4: Map of Historical Heritages and Temples in VTE

1.6.2.3. Social Economy

Although most of the habitants in Nahai Village are engaged in agriculture such as cultivating rice and vegetables (cucumbers, green beans, etc.) to make a living, there are also villagers who go to the centre of VTE and Thailand as migrant workers. Nevertheless, while the construction of food markets in recent years has provided them with expanded opportunities to sell their crops; the majority of them are still living in poor conditions.



New food market



Outside of kitchen

Figure 5: Social Economy Surrounding Area of Project Site

1.6.3. The System and Organization of Social environmental Consideration in Lao P.D.R

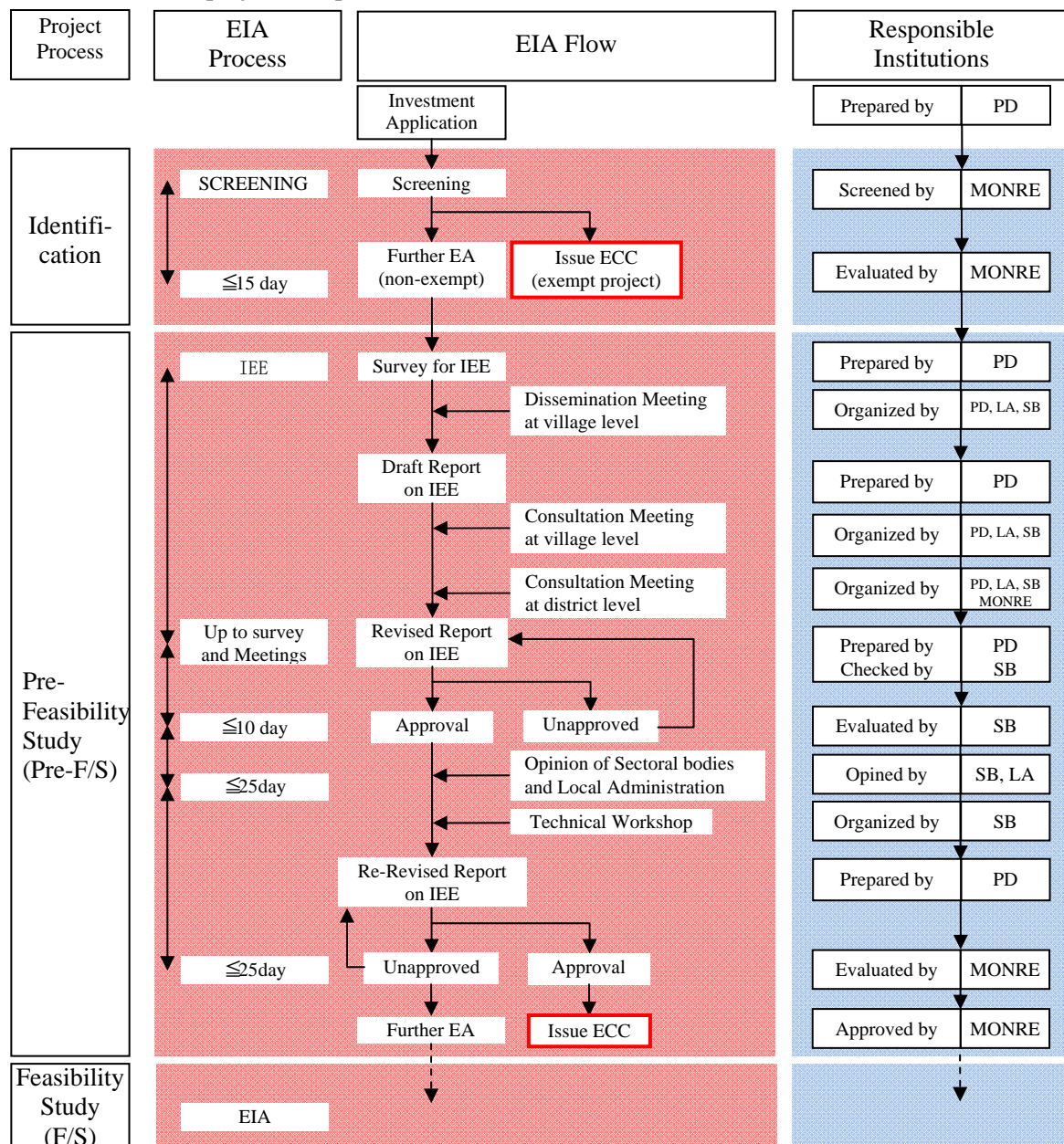
Under the current law for environmental impact evaluation in Lao P.D.R (Decree on Environmental Impact Assessment (EIA)), all project developers in Lao P.D.R have an obligation to carry out an EIA. All of the projects are classified as Category 1 or Category 2 by the list of project type (Agreement on List of Investment Project to IEE and EIA). In case the project does not exist on the list, the project is categorized by MONRE. This project corresponded to “Non-Hazardous Waste Storage” in the list. Therefore, the project developer ought to implement an IEE because “Non-Hazardous Waste Storage” is classified in category 1 regardless of facility scale.

Prior to the procedure for EIA, VUDAA submitted the Investment Application of this project to MONRE and MONRE responded to VUDAA that it was classified Category 1 on September 20th. Accordingly we describe only about IEE flow in this chapter and omit to explain EIA flow.

- 1) All project developers make an Investment Application prior to the procedure of EIA and submit it to MONRE.
- 2) MONRE ought to screen it and respond to them within 15 working days which category it has been classified as.
- 3) If, based on the results of this screening, MONRE does not request any environmental examination to the project developers, the procedure of EIA will be finished. MONRE will then issue an ECC (Environmental Compliance Certification) for the project to the developers.
- 4) If however, based on the results of the screening, MONRE requests an IEE (Initial Environmental Examination) of the project developers, they ought to investigate about the project physically, biologically, socially and environmentally, and to evaluate the negative impacts to the surrounding area that may arise due to the project.
- 5) After holding meeting(s) at the village level, the project developer needs to make an IEE report

that represents the opinions of local people. And based on the report, the project developer ought to hold a village conference with sectoral bodies and a district conference with the local administration, to make a revised report according to the results of the two conferences and to submit it to the sectoral bodies.

- 6) The sectoral bodies have to inform the project developer within 10 working days whether or not the report is appropriate. If they agree with contents of the report, they summarize the ideas of local administration and concerned agencies, hold a technical workshop and submit the minutes of discussion and the IEE report to MONRE.
- 7) In the case the IEE report is accepted by MONRE, they will issue an ECC within 25 working days and the procedure of EIA will be finished. However if the project has been complicated or had severe impacts on the environment and society, MONRE will indicate the project developer to continue to assess the project's impact on the environment.



Note : EIA: Environmental Impact Assessment
 ECC: Environmental Compliance Certification
 SB: Sectoral Bodies (DONRE)

EA: Environmental Assessment
 PD: Project Developer
 LA: Local Administration

Figure 6: IEE flow in Lao P.D.R

1.6.4. Comparative Examination of Alternative Plans

At first, the VUDAA had two candidate sites for construction of the solid waste transfer station and we evaluated them in terms of 15 items as below. Although the project site as option 1 area is inferior to option 2 in terms of transportation and infrastructure development, it is superior to the second option with regards to social environmental aspect because there are no residents or public facilities nearby and it has not been assigned as a natural protection area.

Table 8: Evaluation Table of the Solid Waste Transfer Station Candidate Sites

Name of candidate sites		Option 1		Option 2	
		The 450th anniversary Road		KM16	
Basic information		-Location: Xaysethha district Nahai Village -Approx. 25 km from KM32 landfill, if construction of the new road is completed. -Surrounding environment: There is a plan to be designated as industrial zone.		-Location: Saythani District, Phonkham village -Located in the opposite side of the original candidate site along Route 13. 16 km from KM 32 landfill -Site area: unclear -Surrounding environment: This site was originally planned for a Vietnamese developer's project, but it was suspended.	
Evaluation Items		Remarks	Score	Remarks	Score
1	Current status (Existing structure: Yes:0, No:1)	Undeveloped	1	Undeveloped	1
2	Distance from the VTE city center (>15km:0, <15km:1)	Approx. 12 km, if construction of the new road is completed (expected to be completed within two years)	1	Approx. 16 km	0
3	Site area (<2ha:0, >2ha:1)	Approx. 8ha	1	More than 2ha	1
4	Land owner (Not VTE:0, VTE:1)	DONRE	1	DONRE	1
5	Topographic condition (flat level:1, slope:0)	Flat level	1	Flat level	1
6	Distance from neighboring residential area (<1km:0, >1km:1)	Approx. 0.7km	0	Approx. 0.5km	0
7	Distance from public facilities (<1km:0, >1km:1)	No public facilities in the neighboring area	1	Main entrance of National Stadium is located 0.5 km away from this site.	0
8	Distance from main road (>1km:0, <1km:1)	Approx. 0.7km from 450 years anniversary road	1	Approx. 0.2 km from Route 13	1
9	Some possibility of traffic congestion to be caused by collection vehicles (Yes:0, No:1)	Not a possibility, as it is located off main road.	1	High possibility, as it is facing toward main road.	0
10	Conditions of the access road connecting the site with the nearest main road (unpaved (likely to be flooded in rainy season:0, paved (not likely to be flooded in rainy season):1)	Unpaved	0	Unpaved	0
11	Established infrastructures (No:0, electricity or piped water:1, electricity and piped water: 2)	Electricity (three-phase distribution line)	1	Both electricity and piped water	2
12	Surrounding facility (Yes:0, No:1)	Undeveloped (There is a plan to be designated as industrial zone.)	1	National Stadium, golf course	0
13	Building foundation to be adopted (Not spread foundation: 0) (Spread foundation: 1)	It is on a plateau. Bearing power of soil is expected to be relatively high enough to build transfer loading station. Spread foundation may be adopted.	1	It is on a former paddy area. The land may be soft up to the level of GL-5m. Pile foundation may be adopted. If this work cannot be adopted, soil stabilization work has to be done.	0
14	Located in natural reserve or not (Yes: 0) (No: 1)	The site as well as its neighbouring area is not within natural reserve.	1	The site as well as its neighboring area is within "Dong Houay Gngang" and "Dong Banxay", both of which are designated as natural reserves by VTE according to the JICA's M/P report ("The Study of Master Plan on Comprehensive Urban Transport in Vientiane Capital"(2007))	0
15	Involuntary resettlement (Yes:0,No:1)	It won't generate involuntary resettlement because there is no residence around the project site and its surroundings.	1	There is a possibility that involuntary resettlement may arise because of expanded access road.	0
Total (the higher the score, the more positive impression it represents)			12		7

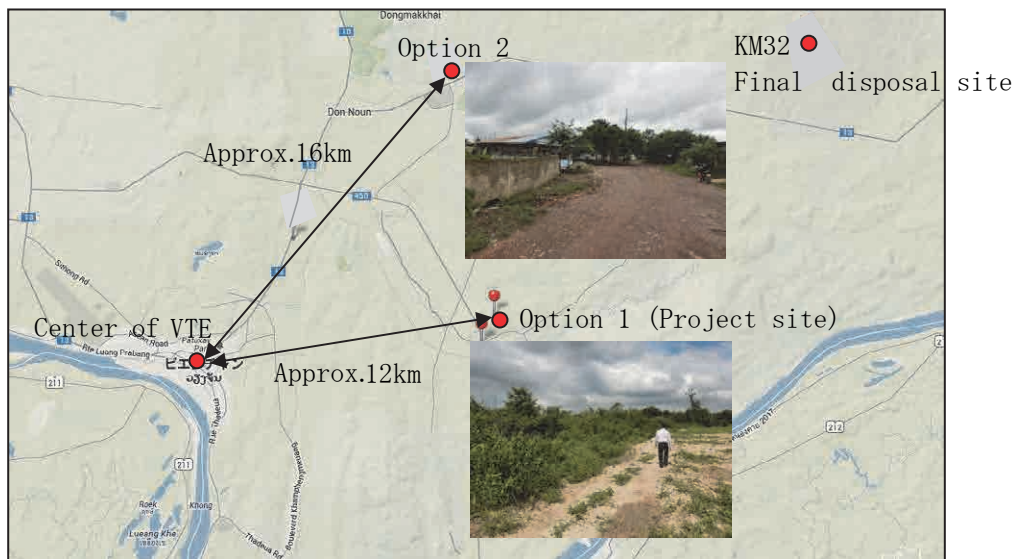


Figure 7: Location map of the transfer station candidate sites

1.6.5. Scoping

Table 9: Checklist for Scoping

No.	Impact item	Evaluation		Reasons
		During Construction	Operation	
Social environment				
1	Involuntary resettlement	D	D	There won't be any involuntary resettlement because the land owner of the project site and access road is DONRE.
2	Local economy such as employment and livelihood, etc.	C+	C+	It is possible that new jobs will be created with construction and operation of the solid waste transfer station and access road. And it is predicted that some restaurants and stand shops are opened for workers in the solid waste transfer station.
3	Land use and utilization of local resources	D	D	The project site is assigned as unused ground in land use category because currently the land is uncultivated fields. In addition, as most of the surrounding land is also unused, there is no envisaged impact.
4	Social institutions such as social infrastructure and local decision-making institutions	D	D	There is no possibility of dividing local administrative organizations, local associations, assembly and local business by the project.
5	Existing social infrastructure and services	B+	B+	Under construction: Although it can be predicted that traffic volume will increase by carrying vehicles, the access road and main village road will be paved in the project. This is an added convenience for the neighbourhood. Operation phase: Although it can be predicted that traffic volume will increase by collection vehicles, paving the access road and main road will improve accessibility. In addition, the current waste collection system is expected to be improved with the construction of the solid waste transfer station.
6	Poor classes	D	B+	Before construction: Involuntary resettlement in poor classes will not occur. Operation phase: the access road and main village road will be paved before beginning the construction. It is convenient for poor classes.
7	The indigenous and ethnic people	D	D	There are not any indigenous and ethnic people around the project site and its surroundings.
8	Maldistribution of benefit and damage	D	D	The construction of solid waste transfer station won't bring about maldistribution of benefit and damage in surrounding areas because the waste collection plan in this project includes such areas.
9	Local conflict of interest	D	D	There are no local conflicts of interest in local area because waste pickers are prohibited from working in the solid waste transfer station.
10	Water Usage	C-	C-	Under construction: If there are some wells for water drinking around the project site, the construction will have an impact by causing water turbidity. Operation phase: If there are some wells for water drinking

1. Basic Concept of the Project

				around the project site, wastewater from the solid waste transfer station is expected to cause the water to become turbid.
11	Gender	D	D	There is no negative impact in this project in terms of gender.
12	Children's rights	D	D	There is no negative impact in this project in terms of children's rights.
13	Cultural heritage	D	D	There are no precious cultural heritage sites at the project site and its surroundings.
13	Infectious diseases such as HIV/AIDS	C-	C-	There is a slight possibility that infectious diseases may be spread to local people by construction and operation workers.
14	Labor environment	D	B+	Construction works which have negative impact to the labor are not scheduled in the construction and operation phases. In particular, in the operation phase, the labor environment will be improved because current replacement work of collected waste in KM7 has switched from manual control to automatic control.
Natural environment				
15	Topography and Geology	D	D	There will be no negative impacts because excavation and landfill works do not require flatland.
16	Bottom sediment	D	D	Construction works which have negative impact to bottom sediment are not scheduled in this project.
17	Biota and ecosystem	D	D	There is no negative impact in terms of biota and ecosystem because the project site is not assigned as a natural protection area.
18	Hydro-Geological Situation	D	D	There can be no negative impact on the hydro-geological situation because there are no rivers and lakes around the project site.
19	Landscape	D	C-	New building structure appears as the solid waste transfer station.
20	Protection Area	D	D	The project site and its surrounding are not assigned as the national park and natural protection area.
21	Global warming	D	D	There are hardly any impacts in regards to global warming in this project.
Pollution Abatement				
22	Air pollution	D	D	Under construction: Although negative impact of air pollution is concerned with operating heavy machines and driving dump trucks, this will not be an issue in this case because there are no residences within 1km of the project site. Operation phase: There will be some impacts of air pollution with driving of collection vehicles. However, the impact is minimized because the existing road will be paved.
23	Water pollution	C-	C-	Under construction: There is some possibility of water pollution by discharged waste water from the construction site, heavy machines and dump trucks. Operation phase: There is some possibility of water pollution by discharged waste water from kitchen, toilet and collected garbage.
24	Soil contamination	C-	B-	Under construction: Minor impact of soil contamination will be generated by oil leaks of heavy machines and dump trucks. Operation phase: There is some possibility of soil contamination by hazardous substances which are included in garbage water and washing water.
25	Waste	C-	C-	Under construction: There is a possibility that there will be waste construction materials and waste dumps. Operation phase: There is a possibility of inadequately disposed waste being left in the project site.
26	Noise and vibration	B-	B-	Under construction: Some negative impacts of noise and vibration are concerned with operating heavy machines and driving dump trucks. Operation phase: Some negative impacts of noise and vibration are concerned with driving collection vehicles.
27	Land subsidence	D	D	Construction works which have negative impact in terms of land subsidence are not scheduled in this project.
28	Offensive odor	D	B-	Offensive odor from collected waste can be generated during the operation phase.
29	Accidents	B-	B-	Under construction: There is a possibility of some impacts by heavy machines and dump trucks. Operation phase: There is a possibility of some impacts by collection vehicles.

Rating:

A : Serious impact is expected.

B : Slight impact is expected.

C : Extent of impact is unknown (Examination is needed. Impacts may become clear as study progress.)

D : No impact is expected. IEE/EIA is not necessary.

1.6.6. TOR with regards to Environmental and Social Considerations

Table 10: TOR with regards to Environmental and Social Considerations

No.	Environmental Item	Survey Item	Survey method
Social Environment			
1	Water usage	Current condition of well usage around the project site	Interview to local people
2	Infectious diseases such as HIV/AIDS	Impact to local people during the construction and operation phases.	
Natural Environment			
3	Landscape	Current view from surrounding	Field survey
Pollution Abatement			
4	Water pollution	(1) The Environmental Standard in Lao P.D.R and in Japan. (2) Current condition of well usage around the project site (3) Some impacts during the construction and operation phases.	(1) Investigation of existing documents (2) Field survey and interview to local people (3) Confirmation of construction type, period and drainage.
5	Soil contamination	(1) Oil leaks under construction. (2) Waste water	(1) Confirmation of construction type, period and so on. (2) Confirmation of drainage
6	Waste	(1) Construction waste materials (2) Unprocessed collected waste	(1) Confirmation of waste treatment method (2) Confirmation of waste storage method
7	Noise and vibration	(1) The Environmental Standard in Lao P.D.R and in Japan. (2) Distance from the project site to residences, schools, hospitals and so on. (3) Some impacts during the construction and operation phases.	(1) Investigation of existing documents (2) Field survey and interview to local people (3) Confirmation of construction type, period and drainage.
8	Offensive odor	(1) Some impacts during the operation phase. (2) Distance from the project site to residences, school, hospital and so on.	(1) Confirmation waste disposal, waste treatment, waste storage method. (2) Field survey and interview to local people
9	Accidents	Some impacts during the construction and operation phases.	Planning the prevention policy against accidents.

1.6.7. The results of Environmental and Social Considerations Examination

1.6.7.1. Water Usage

Local people in Nahai Village utilize well water for drinking and draw water from deep wells or shallow wells. But they make drain water infiltrate into small holes in their garden because of insufficient infrastructure. Rain water is flowed to paddy field and wetland through simple side ditch of main village road.



Working well



Finished well

Figure 7: Water Usage Surrounding Area of Project site

1.6.7.2. Infectious Diseases such as HIV/AIDS

Based on the results of interviews with local people, there have been no serious problems under current conditions. On the other hand, we intend to educate and lecture workers of the solid waste transfer station completely.

1.6.7.3. Landscape

The project site and its surroundings are an uncultivated field as of December 2013 and are located about 1km from the nearest residential area. Therefore, construction of the solid waste transfer station is not expected to affect the area around the project site. Although there are future housing lots which are located on the southwest side, the project site and housing lots are divided by dense forest which has a lot of tall trees. So the solid waste transfer station cannot be viewed from the southwest side.



Field surrounding the project site



The view from the southwest side

Figure 8: Landscape Surrounding Area of Project Site

1.6.7.4. Water Pollution

(1) Environmental Standards

Two items were selected as environmental standards of water quality in Lao P.D.R to grasp the condition of groundwater quality and groundwater recharge and to monitor them easily and continuously by our counterparts.

Table 11: Environmental Standards in Lao P.D.R

Parameters	Unit	Concentration
Potential of Hydrogen	pH	6.5-9.5
Electric conductivity	µs/cm	<1,000

Resource: "Agreement on the National Environmental Standards" (Vientiane Capital 2010)

(2) Current condition of well usage around the project site

As mentioned above.

(3) Some impacts during the construction and operation phases

We couldn't discover any groundwater at the time of 10 m underground boring survey in September (the rainy season in Laos) 2013. As the septic tank will be excavated to a maximum depth of 5 m, it is considered construction of the solid waste transfer station will have a minor impact on groundwater. It is also considered the impact on its surroundings will be minor because all waste water can be discharged with appropriate methods during the operation phase.

Table 12: Types and Disposal Methods of Waste Water Generated
in the Area of Solid Waste Transfer Station

Types of waste water	Disposal methods
Rain water	Is discharged to outside through outer ditch.
Washing water	Is stored in sewage tank and is transported to final disposal site by vacuum car.
Waste water from kitchen and toilet	Is stored in septic tank and is treated anaerobically. Polluted sludge is transported to final disposal site by vacuum car.
Waste water from collected garbage	Is transported to final disposal site by 20m ³ compactor truck.

1.6.7.5. Soil Contamination

(1) Prevention of oil Leaks During Construction

The number of construction machines used in this project and its estimated period are as follows. It is necessary to give care to trouble and maintenance of construction machines because they will be used for 2 or 3 months.

Table 13: List of Construction Machines which will be used in This Project

Machine name	Purpose	Period	Number
Excavator (Cap: 0.8m ³)	Preliminary, Earth work, Foundation	2 months	1
Dump truck (10t)	work	2 months	4
Truck crane (25t)	Framework, steel work, Roofing work	3.5months	1

(2) Waste Water

The treatments of waste water and drainage system at the operation phase are as mentioned above.

1.6.7.6. Waste

(1) Construction Waste Materials

It will be transported to final disposal site according to the construction plan.

(2) Untreated Collected Waste

Maximum acceptable storage of collected waste (=170m³) in the solid waste transfer station is sufficient because the planned quantity of collected waste per day is less than this figure. The waste which cannot be disposed of in a rotary drum such as tree branches, household electronics, and bricks will be transported to the final disposal site directly.

1.6.7.7. Noise and Vibration

(1) Environmental Standard

The regulation standard of construction noise and environmental noise in Lao P.D.R. and in Japan are as shown below.

Table 14: Noise Regulation Standard in Lao P.D.R. and in Japan

Construction Phase			
Activity	Regulation	Target	Japan
Land Clearing Period	Noise Pollution will not exceed	84 dB (A)	
Land Adjustment Period	Noise Pollution will not exceed	89 dB (A)	
Building Foundation Construction Period	Noise Pollution will not exceed	77 dB (A)	85 dB (A)
Building Construction Period	Noise Pollution will not exceed	84 dB (A)	
Interior Design Period	Noise Pollution will not exceed	89 dB (A)	
Operation Phase			
Equivalent Sound Level (L _{Aeq}) from Steady Noise	L _{Aeq} 24 hour not exceeding	70 dB (A _{eq})	70 dB (A _{eq})

Reference : "Agreement on the National Environmental Standards"(Vientiane Capital 2010)

A= A-weighting

Leq : equivalent sound level

(2) The distance from the project site to nearest residential area, school, hospital and so on

The project site is located about 0.7km from nearest residential area and is also located about 1.0km from the centre of Nahai Village.

(3) Negative impact in the construction and operation phases

Although the negative impacts will be generated by operating heavy machines and driving dump trucks which carry construction generated soil at the construction phase, these are very slight because the number of vehicles is quite few. During the operation phase, about 35 vehicles are expected to drive the access road and main village road. But it is also minor impact because both roads will be

already paved at that time.

1.6.7.8. Offensive Odor

(1) Negative Impact During the Operation Phase

Collected waste will not be exposed to outside during the process from being thrown to receiver hopper device to being discharged to compactor truck because the closed-type rotary drum method will be used as loading system in the solid waste transfer station. Therefore there is only a slight impact to around the project site as offensive odors can be controlled to a minimum.

(2) The distance from the project site to nearest residential area, school, hospital and so on

It has already been mentioned above.

1.6.7.9. Accidents

Although dump trucks can run at a high speeds during the construction phase because of paved road, there is a slight possibility of accidents occurring as the number of vehicles is quite few. But during the operation phase, the possibility will increase more than current condition since about 35 vehicles will run on the access road and main village road.

1.6.8. Impact Assessment and Mitigation Measures

Impact assessment and mitigation measures based on the results of the IEE are as shown below.

Table 15: Impact assessment based on results of the IEE

No.	Affected item	Impact assessment at the scoping		Impact assessment based on results of the IEE		The reasons for change of evaluation
		Before and under construction	Operation phase	Before and under construction	Operation phase	
Social environment						
1	Water usage	C-	C-	B-	B-	Under construction: As there are some wells for water drinking around the project site, the construction will have an impact by causing water turbidity. Operation phase: As there are some wells for water drinking around the project site, wastewater from the solid waste transfer station is expected to cause the water to become turbid.
2	Infectious diseases such as HIV/AIDS	C-	C-	D	D	No serious problems have so far occurred under current conditions. On the other hand, we intend to educate and lecture to workers of the solid waste transfer station completely.
Natural environment						
3	Landscape	D	C-	D	D	As the results of the field survey, there is no negative impact visually because the solid waste transfer station is located far from the residential area.
Pollution abatement						
4	Water pollution	C-	C-	D	D	Under construction: There is no

						negative impact for groundwater by evacuation works. Operation phase: There is no negative impact around the solid waste transfer station because waste water generated on the inside is not intended to be discharged to the outside.
5	Soil contamination	C-	B-	B-	D	Under construction: Minor impact of soil contamination will be generated by oil leaks of heavy machines and dump trucks. Operation phase: There is no negative impact on the soil because waste water generated on the inside is not intended to be discharged to the outside.
6	Waste	C-	C-	D	D	Under construction: There is no negative impact from waste because construction waste materials will be transported to final disposal site according to the construction plan. Operation phase: Although acceptable capacity for collected waste is sufficient, we need to grasp the collected waste volume every day.
7	Noise and vibration	B-	B-	B-	B-	Under construction: Although some negative impacts of noise and vibration are concerned with operating heavy machines and driving dump trucks, it is slight impact because the number of vehicles is quite few. Operation phase: Although some negative impacts of noise and vibration are concerned with driving collection vehicles, it is minor impact because of paved road.
8	Offensive odor	D	B-	D	B-	Although some negative impacts derived from collected waste are expected at the operation phase, these will be slight because the closed-type rotary drum method will be used.
9	Accidents	B-	B-	B-	B-	Under construction: Although dump trucks can run at a high speed because of paved road, the impact will be slight as the number of vehicles is not many. Operation phase: Collection vehicles can run at a high speed because of paved road and it is expected that the traffic volume around the solid waste transfer station will also increase as a result of paving.

Rating:

A : Serious impact is expected.

B : Some impact is expected.

D : No impact is expected. IEE/EIA is not necessary.

Table 16: Mitigation Measures

No.	Affected item	Mitigation measures
Social environment		
1	Water usage	Under construction: With regards to waste water generated in the project site, it is not disposed of outside but discharged through the side gutter which is installed with the access road. We intend to educate it and lecture it to workers of the solid waste transfer station completely. Operation phase: We intend to educate the methods of waste water treatment which are shown in the table and lecture it to workers of the solid waste transfer station completely.
Pollution abatement		
2	Soil contamination	To perform inspection and maintenance for heavy machines and dump trucks periodically. In case of defects or troubles being found, they are to be fixed and necessary parts exchanged without delay.
3	Noise and vibration	Drivers of vehicles are to be educated and lectured on prohibition of unnecessary racing and needless idling.
4	Offensive odor	With regards to the receiver hopper, to educate and lecture for workers to close it regularly without time for waste to be discharged.
5	Accidents	The workers during the construction and the operation phases will be educated and lectured on safe driving.

1.6.8.1. Monitoring Plan

The monitoring plan is as below based on the results of environmental impact assessment and mitigation measure.

Table 17: Monitoring Plan

Environmental item	Item	Frequency	Regulation standards	Monitoring point
Under construction				
Ground water quality	Potential of Hydrogen	Four times per year	6.5-9.5	Monitoring well
	Electric conductivity		<1,000 $\mu\text{s}/\text{m}^3$	
Waste	Transported volume	Once per month	—	Inside of the project site
	Noise and vibration	Noise level	Once per month	
Accidents	Confirmation of the construction method with low noise type	Once per year	—	Inside of the project site and its surroundings
	Accident records	Once per month	—	
Operation phase				
Ground water quality	Potential of Hydrogen	Four times per year	6.5-9.5	Monitoring well
	Electric conductivity		<1,000	
Waste	Transported volume	Once per month	—	Inside of the project site
	Noise and vibration	Noise level	Four times per year	
Offensive odor	Generated offensive odor records	Twice per year	—	Inside of the project site and its surroundings
	Accidents	Accident records	Once per month	

1.6.8.2. Consultant Meeting with Stakeholder

We held the meeting at village level in Oct. 2013 and the meeting at district level in Nov. 2013. There were various opinions and comments against this project from the villagers because they were interested in it so much. However there was no noticeable opposition and it was approved without problems finally.

Table 18.: The Content of Consultant Meeting at Village Level

Date	17 th Oct 2013	Venue	Nahai Village	Number of participants	70
<u>The related organizations</u>					
VUDAA, Saysetha DONRE office, village's chief members, many organization members and villagers					
<u>Contents of the meeting</u>					
Local consultant staff explained the outline of the project and the results of the Initial Environmental Examination (IEE). This was followed by both VUDAA and project staff giving explanations of technical issues of the facility.					
Based on this, the questions and requests by the participants are as below.					
<ol style="list-style-type: none"> 1. The solid waste transfer station was considered as a first for Laos and they'd never seen one before. Therefore they could not imagine what kind of problem could occur. In case of any problems occurring, the project owner and related organizations should take some appropriate actions. 2. Some people proposed that it's better to operate waste transportation at night time in order to reduce traffic jam at the village and offensive odor to the population nearby. 3. Some people are still concerned about smell even after completion of the project, as well as for other environmental impacts such as dust problems, traffic jams, and many flies. 					
Before the meeting was closed, the project staff and VUDAA explained again some details about the technical method adopted in the solid waste transfer station.					
The meeting was closed successfully and all participants seemed to have gained a clear understanding by the end of the session.					

Table 19: The Content of Consultant Meeting at District Level

Date	26 th Nov 2013	Venue	Saysetha district meeting room	Number of participants	50
<u>The related organizations</u> Vice governor of Saysetha district, VUDAA, Land Use Authority, Chief of 4 villages, The representatives of 7 village groups, the Lao Women's Union in the village, Youth, elderly and surrounding departments and many villagers					
Local consultant staff explained the draft IEE report of the project. Objectives of the meeting are as below.					
<u>Objectives of the meeting</u>					
1. To discuss the prospects of environmental impacts and measures that will be undertaken to mitigate these impacts.					
2. To discuss the Environmental Management and Monitoring Plan.					
3. To gain the input and opinions of members of the public regarding the solid waste transfer station.					
<u>The result of discussion</u>					
1. Basically all participants were agreed on the construction of solid waste transfer station which had the aim of improving the Municipal solid Waste Collection system in general.					
2. They also requested more emphasis on waste water treatment facility and compliance of the international standard in order to avoid negative impacts.					
3. They proposed to the project owner to improve some parts of the report according to the comment from participants.					
<u>Summary of comments and recommendations</u>					
1. The project developer should follow Environmental Management Plan accordingly.					
2. After the construction is completed, the responsible unit for environmental monitoring should be clear about offensive odors, waste water discharge and so on.					
3. If possible, the operation of solid waste transfer station should be done at night time.					
The meeting was closed successfully according to the prepared objectives.					

1.6.8.3. Land Acquisition and Involuntary Resettlement

These problems will not occur in this project because the land owner of the project site and access road is a government organization, DONRE.

1.6.8.4. Others

Based on the results of consulting meetings, VUDAA submitted the IEE report to DONRE in Dec. 2013. And finally DONRE issue

2. Contents of the Project

2.1. Basic Concept of the Project

2.1.1. Project Objectives and Overall Goal

In the LPP-E, a Technical Cooperation Project of JICA, “Promotion of Environmentally Sustainable Cities (hereinafter ESC)” has been set as the overall goal of the Project, and Output 1, “Formulation and promotion of ESC Guideline,” has been set to achieve this goal. Furthermore, the Survey has the same target pilot cities, VTE, LPB and XYB, as well as targeting waste management as a pilot sector; and sets out its goals in Output 2 “Enhancement for Waste Management Capacity of the C/P Agencies” and Output 3 “Promotion of Participatory Environmental Management”.

Output 2 "Waste Management Capacity of the C/P Agencies", involves both human and physical resources. In the case of waste collection for example, it is vital to have both human resources such as the capacity to maintain vehicles, collect waste fees and establish collection rules, and of course physical resources, namely vehicles. LPP-E, as a technical cooperation project, is, by nature of the scheme focused on strengthening the capacity of human resources, and provides minimal assistance with respect to physical resources. The grant aid project is intended to make up for this lack of provision of physical resources in LPP-E.

Moreover, it is also possible to find points of relevance with Output 3 “Promotion of Participatory Environmental Management”. The most basic form of public participation in waste management is in the appropriate discharge of waste. Of vital importance here is trust in waste collection companies/organizations, namely trust that appropriately discharged waste will always be appropriately collected. Without physical resources a reliable and constant service is impossible, which is what the Survey has set out to address.

The aim was to implement the two projects; LPP-E and the project, in tandem to be mutually beneficial after identifying complementary aspects of the project activities and scope of each..

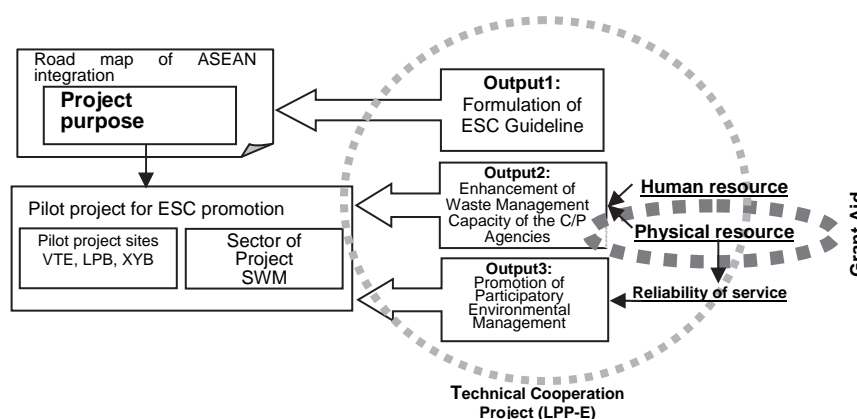


Figure 9: Complementary Relationship Between the Project and LPP-E

The objectives of the project are as shown in following Table.

Table 20: Objectives of the Project

Item	Outline																								
(1) Overall goal	To improve sanitary conditions related to solid waste management in VTE, LPB and XYB to make them environmentally sustainable cities that are clean, green and beautiful.																								
(2) Project purpose	To improve waste collection and transportation conditions in VTE, LPB and XYB, which are positioned as environmentally sustainable cities in Laos, by constructing facilities and procuring equipment related to solid waste management.																								
(3) Expected outputs	1) Capacity for waste collection in VTE, LPB and XYB is improved. 2) Capacity for waste treatment in VTE, LPB and XYB is improved. 3) Capacity to increase the efficiency of collection and transportation of waste is improved through the construction of a solid waste transfer station in VTE.																								
(4) Performance indicators of the Project	<p>Quantifiable indicators:</p> <table border="1"> <thead> <tr> <th>Indicator</th> <th>Project site</th> <th>Base line data (2013) ton/day</th> <th>Target (2020) ton/day</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Amount of waste collection</td> <td>VTE</td> <td>69.3</td> <td>259.7</td> </tr> <tr> <td>LPB</td> <td>20.6</td> <td>54.4</td> </tr> <tr> <td>XYB</td> <td>19.2</td> <td>39.1</td> </tr> <tr> <td rowspan="3">Population covered waste collection service</td> <td>VTE</td> <td>70,495</td> <td>199,596</td> </tr> <tr> <td>LPB</td> <td>33,362</td> <td>48,319</td> </tr> <tr> <td>XYB</td> <td>31,099</td> <td>47,594</td> </tr> </tbody> </table> <p>Other indicators: Sanitary conditions at the project sites will be improved by increasing the waste collection rate.</p>	Indicator	Project site	Base line data (2013) ton/day	Target (2020) ton/day	Amount of waste collection	VTE	69.3	259.7	LPB	20.6	54.4	XYB	19.2	39.1	Population covered waste collection service	VTE	70,495	199,596	LPB	33,362	48,319	XYB	31,099	47,594
Indicator	Project site	Base line data (2013) ton/day	Target (2020) ton/day																						
Amount of waste collection	VTE	69.3	259.7																						
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	XYB	19.2	39.1																						
Population covered waste collection service	VTE	70,495	199,596																						
	LPB	33,362	48,319																						
	XYB	31,099	47,594																						
(5) Target areas (pilot sites)	VTE, LPB and XYB																								
(6) Beneficiaries	Direct beneficiaries: those involved in waste collection and treatment in VTE, LPB and XYB Indirect beneficiaries: the populations of VTE, LPB and XYB, approximately 875,000 people.																								
(7) Counterpart agencies/ departments	<u>Implementing agencies:</u> National policy development level: Department of Housing and Urban Planning (DHUP), MPWT City level: Vientiane Urban Development & Administration Authority (VUDAA) LPB · XYB: Urban Development & Administration Authority (UDAA)																								

2.1.2. Outline of the Project

The project aims to improve the waste treatment capacity and enhance the efficiency of waste collection and transport by constructing solid waste transfer station in VTE and procuring heavy machineries for the final disposal sites and waste collection and transportation vehicles for each target area. Furthermore, technical guidance (soft component) is carried out in order to achieve sustainability in the operation and maintenance of the solid waste transfer station.

2.2. Outline Design of Japanese Assistance

2.2.1. Design policy

2.2.1.1. Basic Plan

The project consists of construction of the solid waste transfer station, which area is approximately 1.3 hectares, including the solid waste transfer building, control house for weigh bridge, toilet house, car wash building, and exterior in VTE; moreover it consists of procurement of waste collection vehicles, heavy machinery for landfill sites in VTE, LPB and XYB, and other necessary equipment. Furthermore, it contains the soft component such as 1) Assistance to appropriately manage the deployment of the procured collection vehicles related to the solid waste transfer station 2) Assistance to smoothly reload waste at the solid waste transfer station and 3) Assistance for adequate disposal of the reloaded waste at the final disposal site, and strengthening appropriate facilities operation and maintenance.

(1) Contents of Improvement Plan

To improve the solid waste management at project sites, the procurement of new vehicles for capacity upgrading of waste collection and the establishment of the solid waste transfer station for enhancement of work efficiency are implemented in accordance with the increasing of population and economic growth. The preconditions of the improvement plan are as follows;

- ✓ The target year of the grant aid Project is set as 2020 so as to aid in cooperation with the technical cooperation project (LPP-E) that is being conducted simultaneously.
- ✓ Reference material such as on population and waste volume estimates will use newly considered data based on the surveys already implemented in LLP-E.
- ✓ The procurement of collection vehicles is planned in accordance with the increased waste collection amount by VUDDA and UDAA of LPB and XYB between 2013 and 2020.
- ✓ The target of collection vehicles at the solid waste transfer station is only skip loaders (5m³) and compactor trucks (6m³) belonging to VUDAA. The maximum amount of waste transferred there in 2020 is approximately 50 tons per day.

(2) Plan of Buildings

Japanese standards and codes for the design of buildings are applied for the plan since there are no relevant standards or codes in Laos.

(3) Procurement of Equipment

The top priority of waste collection vehicles and heavy machinery in terms of emergency and necessity is considered according to the SWM at pilot project site.

(4) The requested Equipment or Facilities not Covered by the Project

The requested large scale incinerator for health care waste in VTE is not covered in the project since

the proper collection system and rule of health care waste has not yet been established in VTE in spite of pilot project of LPP-E, which included the installation of a small-scale incinerator in 2012.

The requested vehicle for collection of health care waste in LPB is not covered in the project because one was already procured by JICA in September 2013.

(5) Soft Component

The project will be the first such solid waste transfer station to be built in Laos, therefore, it will be the counterparts' first experience in planning, designing, constructing and operating such a facility. In particular, the Soft Component will have to give technical assistance in operational capacity in 1) establishing a waste collection vehicle (provided by the Project) deployment plan regarding vehicles transporting waste into the new solid waste transfer station as part of the expanded collection area, 2) appropriate organizational management of the solid waste transfer station, and 3) securing an access route into the final disposal sites by large compactor trucks transporting waste from the solid waste transfer station.

2.2.1.2. Policy for the Natural Environment

Laos has a tropical monsoon climate and has two seasons, a rainy season and a dry season. The rainy season starts in late May and ends in late October, with most of the rainfall occurring in the last two months, September and October. The dry season is from early November to mid-May, which brings almost no rain and the temperature is above 37 °C from March to April.

- Temperature: 15°C~35°C
- Elevation: 160~180 m above sea level
- Rainfall: approx. 1,500mm/year
- Rainy season: from May to October

On planning the construction of the solid waste transfer station, it is necessary to consider the habitability of the management office and working environment of waste transfer area, under the climatic conditions mentioned above. The reloading area of the solid waste transfer station, as it has a high ceiling of approximately 10 m and has ample space, is planned to use natural ventilation, the opening of which is to have a simple shutter so it can be open and shut to stop rain or sunlight coming in and to allow for ease of maintenance. An air conditioner will be installed to regulate air flow and temperature in the solid waste transfer station control room where staff will perform clerical work regularly. Moreover, while there is no record of earthquakes in Laos the construction plan will take into account the durability and safety of the building. In addition, the construction will be based on the design criteria of Japan; because Laos does not have design criteria, design codes and so on of general buildings. Anti-rust and -corrosion of the chassis and body panels should be taken into account when selecting waste collection vehicles because the Project sites have a high temperature and high humidity climate throughout the year, with particularly high humidity in the rainy season, and also because the drainage condition of the road surfaces is poor. Furthermore, because there is often water mixed in the fuel; installation of water

separators to separate the mixed water should also be considered.

2.2.1.3. Policy for the socio-Economic Conditions

According to national socio-economic development plan 2009-2010 of Laos (Ministry of Planning and Investment), the Lao GDP in 2008/2009 grew by 5,633 million U.S. dollars, an increase of 7.1 %. This equates to a GDP per capita of 924 U.S. dollars. The economic growth rate in recent years has been more than 7% and it is expected to continue growing.

In general, to predict the amount of generated waste in the future, it is necessary to take into account the increase in waste per capita emissions due to economic growth and an the increase in waste emissions from population growth. In the case of Laos, both factors must be given careful consideration.

Houses in Laos have a unique architecture, and are generally built raised off the ground on poles and with a pitched roof. It can be said that this style is well suited to the natural conditions as it takes into account ventilation and prevents water leaks. Moreover, the traditional architecture of temples of Laos also has a unique architectural style with steeply-pitched roofs which overlap in several layers. Furthermore, old temples architecture is a combination of bricks and wood, and the relatively new temples architecture is mainly reinforced concrete with complex roofs that are made of lightweight steel frames. In this project, the construction methods will be those used locally and the structural framework of the solid waste transfer station will be reinforced concrete structure, steel frames for the roofs and concrete blocks for the outer walls with sprayed on mortar paint. Also the weight bridge administrative buildings and management offices will adopt the locally common method of reinforced concrete structure.

2.2.1.4. Policy for the Construction/Procurement Status

(1) Construction Technology

In Laos, including VTE, there are very few large-scale construction projects. Therefore, there is also a shortage of engineers and skilled workers for construction work. Consequently, projects that require a certain level of quality need to recruit human resources from neighbouring countries such as Thailand and Vietnam. This Project will not use complex and special technologies and will employ simple construction plans that can be conducted by Japanese engineers and local human resources.

(2) Labour

In the rainy season (October to May) of Laos, the migrant workers of VTE return home to rural areas for rice planting work, therefore is difficult to ensure sufficient construction workers. Therefore, it is important to take into consideration that labour unit price in the rainy season becomes slightly higher.

(3) Construction Materials

Regarding major construction materials, construction materials from neighbouring Thailand and local products are available on the local market and a principle of local procurement has been established because they are readily available. Also there are seasonal fluctuations in construction materials as well as labor, for example river sand is difficult to come by in the rainy season, so it is important to take into

consideration that the prices of materials may also rise at this time. Furthermore, this project is planning to build parking lots as exterior facilities; and because the raw materials used in concrete pavement is cheaper than that for asphalt pavement in Laos, concrete pavement has been adopted. A reason for this is because asphalt pavement could not be maintained in Laos, meaning concrete pavement that does not require maintenance tended to be adopted, thereby further reducing the demand for asphalt and leading to the withdrawal of many asphalt plants. On the other hand, many cement plants have been built in order to meet the increased concrete demand and as a result concrete pavement became the mainstream and low cost material in Laos.

(4) Commercial Practices

The currency used in the construction materials market is the Thai Baht.

2.2.1.5. Policy of Using Local Companies

(1) Use of Local Construction Companies

There are about 180 local construction companies in Laos, and also several Japanese construction companies have opened offices in VTE. Leading local construction companies also have experience in Japanese grant aid projects, however the ability of local construction companies to manage quality, yield, processes and safety is not very high. The construction of facilities in this project will include the installation of some special equipment, however, all of the remaining construction work is planned to be undertaken making use of local construction companies and local workers under the supervision and guidance of Japanese construction companies.

(2) Use of Local Suppliers Related to Equipment Procurement

This project is planning to procure waste collection vehicles and heavy disposal site equipment materials; however trucks, passenger cars and heavy machineries made in Japan are being used in Laos, therefore genuine spare parts of most Japanese manufacturers are readily available from Japan and Thailand through local distributors. When formulating the equipment procurement plan, equipment specifications should be selected taking into consideration whether the manufacturer has a local distributor and whether there is a spare parts supply chain in Laos.

2.2.1.6. Policy of the Project Operation and Maintenance

(1) Policy for the Operation/Maintenance of Solid Waste Transfer Stations

When planning the reloading facility in the solid waste transfer station, it is necessary to consider facilities that can be easily operated and maintained in Laos without expert knowledge or high costs. In concrete terms, it should be considered a simple structure that anyone can operate, adopt a simple repairable mechanical drive instead of hydraulic drive and equipment that has a low cost and short maintenance period.

Regarding waste transfer operation, its soft component is as follows 1) Assistance to appropriately manage the deployment of the procured collection vehicles related to the solid waste transfer station 2)

Assistance to smoothly reload waste at the solid waste transfer station and 3) Assistance for adequate disposal of the reloaded waste at the final disposal site, and strengthening appropriate facilities operation and maintenance.

(2) Equipment Policy

VUDAA owns a repair department which has the maintenance capacity to continue to use even vehicles that have been used for more than 15 years since their manufacture by giving them complete overhauls and repair services, therefore, in case collection vehicles are procured in this Project, it has sufficient ability to maintain them. LPB and XYB also have a sufficient maintenance system with repair workshops. Furthermore, regarding the equipment initial operation and operational guidance, it is decided that manufacturer's engineers who are familiar with the procurement collection vehicles will be dispatched for about two weeks to provide technical guidance such as engine maintenance.

2.2.1.7. Policy in Accordance with the Setting of Grades of Facilities, and Equipment

(1) Facility Construction

In order to ensure the continuity and sustainability of the facility, easy maintenance of the solid waste transfer station will be given priority. Regarding each facility related to VUDAA, the facility grade should be equivalent to these facilities since its maintenance has been performed relatively well.

(2) Procurement Items

The equipment that is being used in VTE, LPB and XYB, was manufactured more than 10 years ago and most of them are outmoded, however the skills of operating personnel at each site, skills of repair personnel in operating existing equipment and proficiency of repair skills is high. Therefore, the procurement equipment should be simple to use, so that present operating personnel, repair personnel and others will be able to perform the maintenance of the equipment. Therefore, it has been decided to keep to a minimum the adoption of equipment with specifications that use many electronic devices.

2.2.1.8. Policy in Accordance with the Construction, Method of Construction /Method of Procurement

(1) Facility Construction

The climate in Laos is clearly divided into a dry season and a rainy season, and if the construction work is carried out during the rainy season, there is a high likelihood that the construction will be delayed or the content of the construction will have to be limited, therefore, especially in the case of foundation work, and in order to ensure the construction quality, the construction period should be set to avoid the rainy season. The critical paths of the entire project process are the design, manufacture and installation of the reloading facility, therefore the process of facility construction must take this into account. Especially regarding the facility installation, sufficient adjustment with the construction work should be considered because it requires about a month to install it.

(2) Procurement Items

The procurement plan is to basically be of equipment from Japan because waste collection vehicles, heavy machinery and waste transfer equipment that are scheduled to be procured under the project cannot be produced in Laos. The equipment installation of the solid waste transfer station and the construction of the solid waste transfer station are closely related; therefore the transport period of the equipment of the solid waste transfer station should be considered with the entire construction plan. The procured waste collection vehicles (about 50 vehicles) for VTE will be parked in the solid waste transfer station which will be constructed in this project. In case of the transportation of these vehicles is carried out before the construction of the solid waste transfer station there will be no place to keep these vehicles, therefore, the transportation of these should be performed in accordance with the completion of construction.

2.2.2. Basic Plan (Construction Plan/Equipment Plan)

2.2.2.1. Building Site/ Facility Location Plan

The solid waste transfer station that will be constructed under this project is to be built on land owned by the Laos government located in Nahai Village, VTE. The facility access is through a connecting road of about 800 m to the north of the main road of Nahai Village. The site area is 160 m × 80 m, or 1.28 ha and consists of;

- ✓ a weight bridge administrative building,
- ✓ a solid waste transfer station building, entrance ramp,
- ✓ a toilet block,
- ✓ a vehicles washing area and
- ✓ others exterior facilities.

In the case of the small waste collection vehicles which will collect waste in VTE, first the collection vehicles are weighed on the weight bridge of the facility, and then they will come up the entrance ramp and discharge their waste into the feed hopper in the waste receiving area. The wastes that were dumped into the feed hopper will be sent to the storage drum of storage/discharge equipment by a screw conveyor, moreover the wastes will be transferred to large transport vehicles by the storage drum. Furthermore, these large vehicles are planned to transport the transferred waste to KM 32 final disposal site which is approximately 25 km away from the solid waste transfer station.

2.2.2.2. Construction Plan

(1) Floor Plan

1) Floor Plan of Solid Waste Transfer Station Building

The main objective of the solid waste transfer station building is to transfer properly the wastes by driving the machinery and equipment which receives, supplies, stores, discharges and deodorizes the waste and consists of the three following sections 1) Reloading Section, 2) Management Section, 3) Other Sections. And the objectives of these three sections are: Reloading Section is to house the machinery and

equipment, the Management Section is to operate and manage the machinery and equipment and to manage the personnel and vehicle drivers who are involved with the transfer of waste. In addition, the Other Sections contains the entrance and toilets, stairs, warehouse and so on.

i) Calculation of the Required Area of the Reloading Section

The Reloading Section consists of “Storage and discharge equipment room”, “Collection vehicle turning space”, “Platform” and “Monitoring room”.

a. Storage and Discharge Equipment Room

Housing space for equipment of two systems: a Storage drum (Rotating drum method) and discharge conveyor (belt conveyor type).

b. Collection Vehicle Turning Space:

This area is to have sufficient space for the small and medium-sized collection vehicles (skip loader vehicles (5 m³) or compactor vehicles (6 m³)) that come up the entrance ramp from the ground level to turn around in.

c. Platform

This area is to have sufficient space for the collection vehicles to discharge the collected waste into the feed hopper.

d. Monitoring Room

This is a permanent control space for operation and monitoring personnel of the storage drum.

ii) Calculation of the required area of Management Section

The Management Section consist of a director room of VUDAA personnel who are in charge of managing the work schedules of the personnel and vehicle drivers who are involved with the transfer of waste of the solid waste transfer station. KM7 Office and Workshop of Waste Control & Service Bureau of VUDAA is responsible for the management of waste collection vehicle drivers and the personnel responsible for transferring the waste. The management section consists of a Bureau Director (1 person) and Deputy Directors (2 persons), and under their supervision are three departments: General Affairs Division (6 persons), Financial Affairs Division (16 persons) and Waste Collection and Transportation Department (3 persons); with a total of 28 persons. The solid waste transfer station to be established is expected to transfer from those existing KM7 Office and Waste Control & Service Bureau including the 28 persons, therefore the formulation of a floor plan should be considered under the assumption that the personnel will perform their duties in the facility. The official duty of the personnel of the organization of Waste Control & Service Bureau is the management of waste collection vehicle drivers and waste collection personnel and their work grade is management class except the Financial Affairs Division. When considering the required area for the management zone, it was calculated using the Japanese government’s standard for calculating office area in government buildings (the New General Government Building Area Calculation Standard established by the Ministry of Land, Infrastructure and Transport of Japan).

Table 21: Basis for Calculation of Management Zone of Waste Transfer Facility Building

VUDAA Waste Control & Service Bureau Department Names	Required area (m ²)	Number of persons	Room area per person calculation basis (3.3 m ² /person (Reference value)×Coefficient (Grade))(Note 1)	Remarks
Bureau Director	16.5 m ²	1	3.3×5	Coefficient5=Manager grade
Deputy Director	16.5 m ²	2	3.3×2.5	Coefficient2.5= Assistant grade
General Affairs Division	35.64	6	3.3×1.8	Coefficient1.8= Assistant manager grade
Financial Affairs Division	60.72	16	3 persons×3.3×1.8	Coefficient1.8= Assistant manager grade
Waste Collection and Transportation Department	17.82	3	+13 persons×3.3×1 3.3×1.8	Coefficient1.0= General grade Coefficient1.8= Assistant manager grade
Subtotal	147.18			
Correction value	14.72			10% of Subtotal (Note 2)
Office space subtotal	161.9			Subtotal+Correction value
Other Spaces				
Kitchen	12		Maximum 6 m ² /place × space of 2 places, is intended to be secured in the office space.	
Total	173.9			

Note 1) According to "New General Government Building Area Calculation Standard" (Ministry of Land, Infrastructure and Transport), general government buildings and government offices required area is calculated by "3.3 m²/ person × work grade coefficient (1~30)". In this project, work grade coefficient has been set in a range of 1 (General grade) to 5 (Manager class).

2) In accordance with the "New General Government Building Area Calculation Standard", with the addition of 10% as a correction value.

From the results above, waste transfer facility building which includes the offices of the Bureau Director and Deputy Directors were calculated in total 174 m² as the area requirements of Management Section.

iii) List of Planned Areas of Waste Transfer Facility Building

The area planning that was formulated on the basis of the needed area calculation of Management Section and Reloading Section mentioned above, is shown in the following table.

Table 22: Area Planning List of Waste Transfer Facility Building

Sections	Floor	Rooms	Floor space (m ²)	Details/Remarks
Transfer Section	1	Storage and Discharge Equipment Room	336.00	Space to house equipment of 2 systems: Storage drum (rotating drum method) and discharge conveyor (belt conveyor type).
	2	Collection Vehicle Turning Space	252.00	Required space to turn around small and medium-sized collection vehicles (skip loader vehicles (5m ³) or compactor vehicles (6 m ³)) which have come up the slope (entrance ramp).
	2	Platform	189.00	Required space for the collection vehicles to discharge the collected waste into the feed hopper.
	2	Monitoring Room	25.50	Room of operation and monitoring personnel of storage drum
			Subtotal	802.5
Management Section	1	1 Floor Office	84.00	Total area of required office space (174 m ²)-- Director-General office area (16.5 m ²) = 157.5 m ² To install 157.5 m ² /2=78.75 m ² per floor.
	2	Director Office	16.5	Director General office space of 16.5 m ² which will also be used as a visitor's room.
	2	2 Floor Office	84.00	Total area of required office space (174 m ²)-- Director-General office area (16.5 m ²) = 157.5 m ² To install 157.5 m ² /2=78.75 m ² per floor.
			Subtotal	184.50
Others Sections	1	Entrance Hall/ Stairs / Toilets	42.00	Toilets will be installed by gender for managerial personnel who work on the first floor.
	2	Hall/Stairs Toilet	42.00	Toilets will be installed by gender for managerial personnel who work on the second floor.
	1	Warehouse	24.00	Storage warehouse for spare parts, etc.
	1	Electrical Room	18.00	Space to house power switchboard, etc.
		Subtotal	126.00	
Total			1,113.00	

iv) Floor plan of Waste Transfer Facility Building

The area of management and reloading sections of the Floor plan for each section room was taken into account when formulating the solid waste transfer station Floor plan shown in the following table and figure.

a. Storage and Discharge Equipment Room

The objective is to have enough space to house equipment of two systems: Storage drum (Rotating drum method) and discharge conveyor (belt conveyor type).

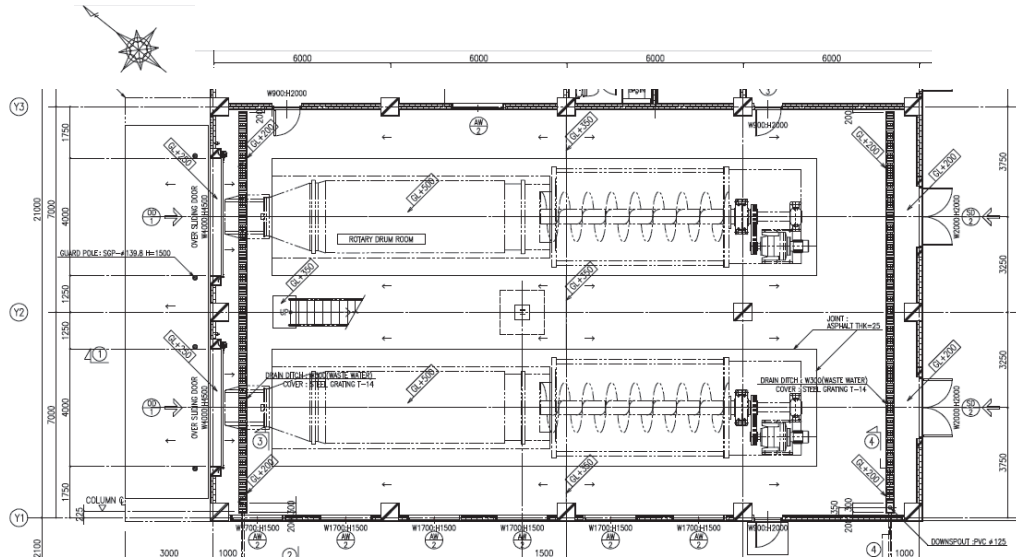


Figure 10: Plan of Storage and Discharge Equipment Room

b. Collection Vehicles Turning Space

The objective is to have enough space for small and medium-sized collection vehicles (skip loader vehicles (5m³) or compactor vehicles (6m³)) that come up the slope (entrance ramp) to turn around in.

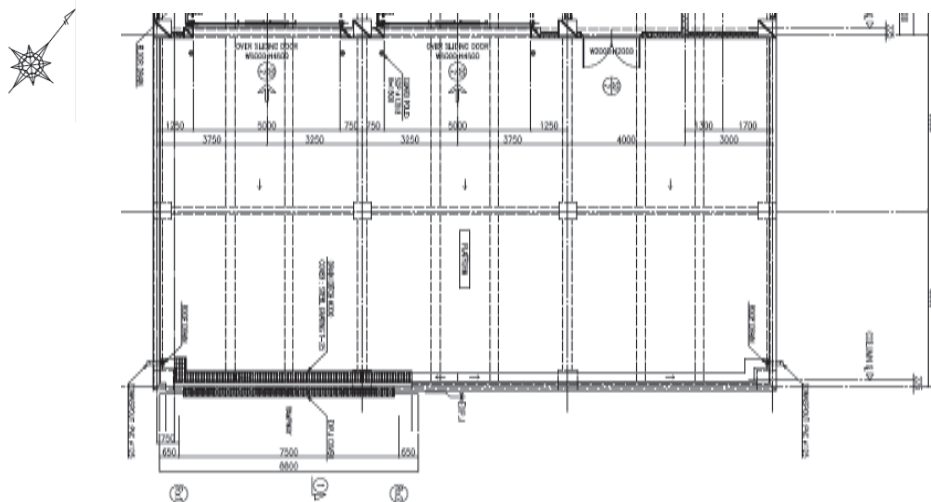


Figure 11: Plan of Collection Vehicles Turning Space

c. Platform

The objective is to have enough space for the collection vehicles to discharge the collected waste into the feed hopper properly.

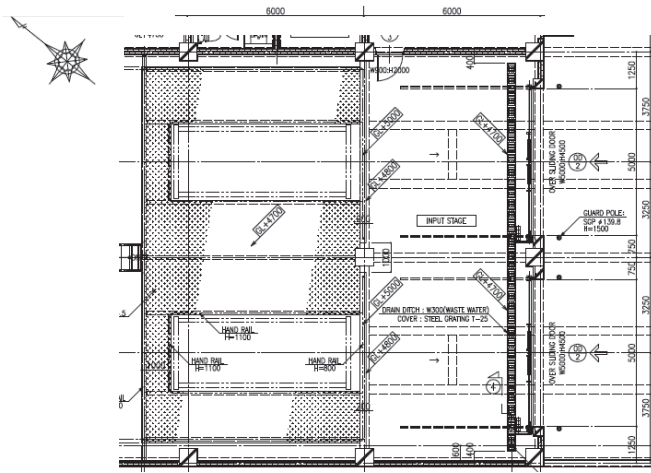


Figure 12: Plan of Platform

d. Monitoring Room

The objective of this room is to house permanent operation and monitoring personnel of the storage drum.

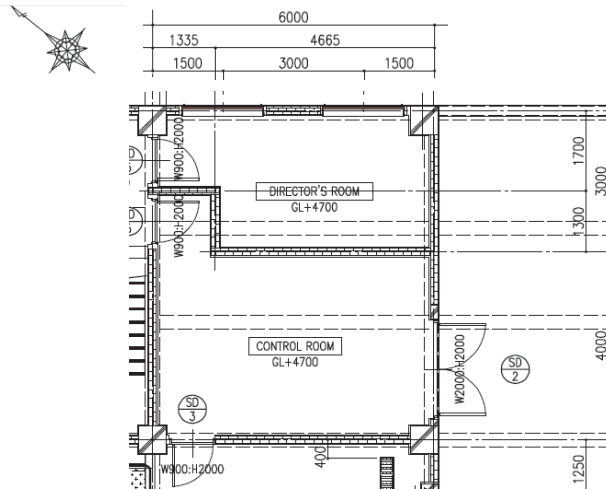


Figure 13: Plan of Monitoring Room

e. First and Second Floor Offices

The objective of these offices is to house the VUDAA personnel who are in charge of managing the personnel and vehicle drivers who are involved with the reloading of waste at the solid waste transfer station.

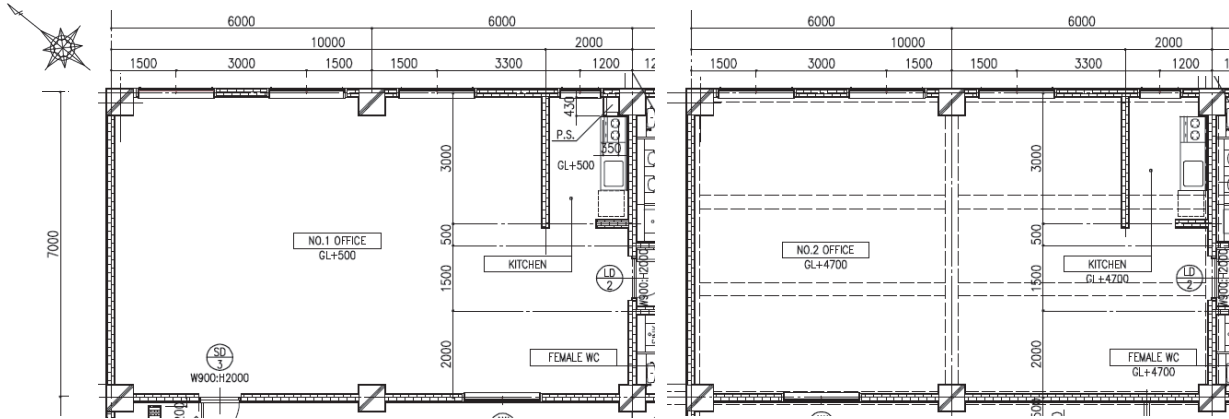


Figure 14: Plan of First (left side) and Second (right side) Floor Offices

f. Director's Office

The objective of this office is so that the director can perform the overall management of the solid waste transfer station and of solid waste transfer station personnel and vehicle drivers.

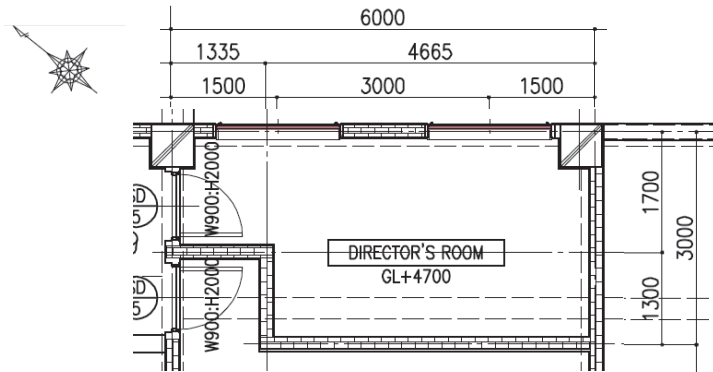


Figure 15: Plan of director's office

2) Floor plan of Weigh Bridge Administration Building

The weight bridge administration building will be installed near the main gate of the facility. And its objective is to weigh the waste hauled to the solid waste transfer station by the collection vehicles, and to collect the basic data of solid waste transfer station operations. Furthermore, this building will be built for the personnel who are in charge of collecting the data. Moreover, its structure should be a one-story reinforced concrete and masonry construction.

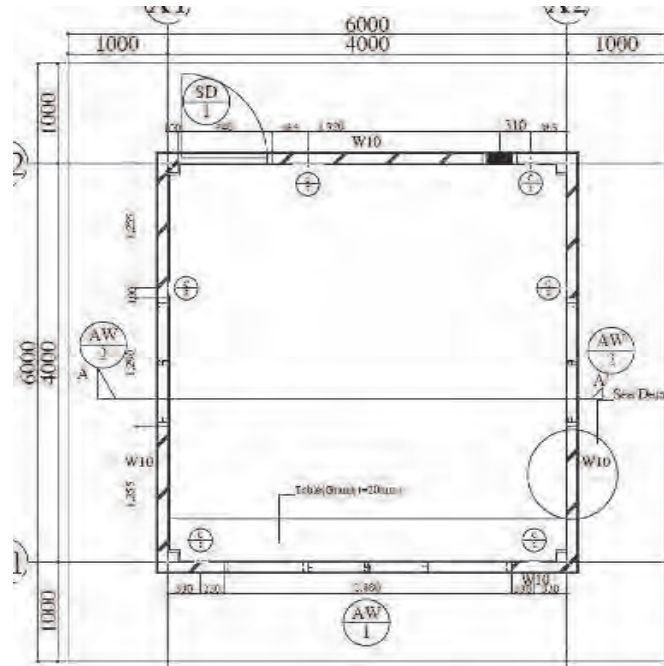


Figure 16: Plan of Weigh Bridge Administration Building

3) Floor plan of Toilet Building

The toilets are for the weight bridge monitoring personnel, waste collection personnel and drivers only. And it has a maximum user capacity of 70 persons. A total of four toilets will be installed. Moreover, its structure should be a one-story reinforced concrete and masonry construction.

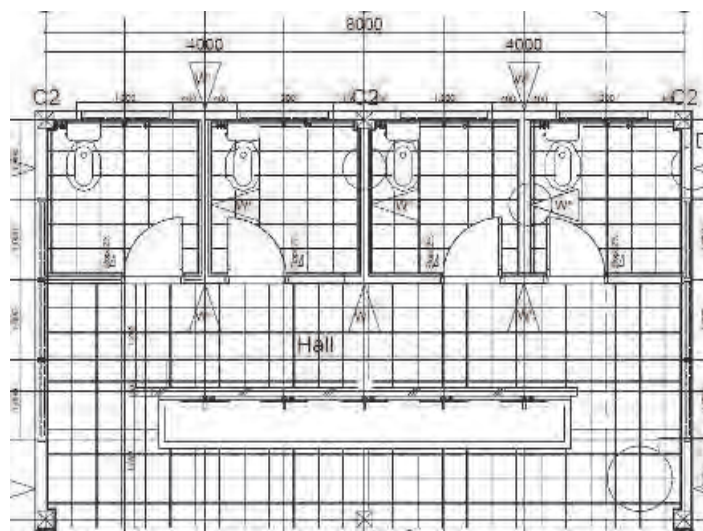


Figure 17: Plan of Weigh Bridge Administration Building

4) Floor plan of Entrance Ramp

A ramp for collection vehicles (skip loader or compactor vehicles) in order to go up to the platform

on the second floor of the waste transfer facility building will be installed at a gradient of 10%.

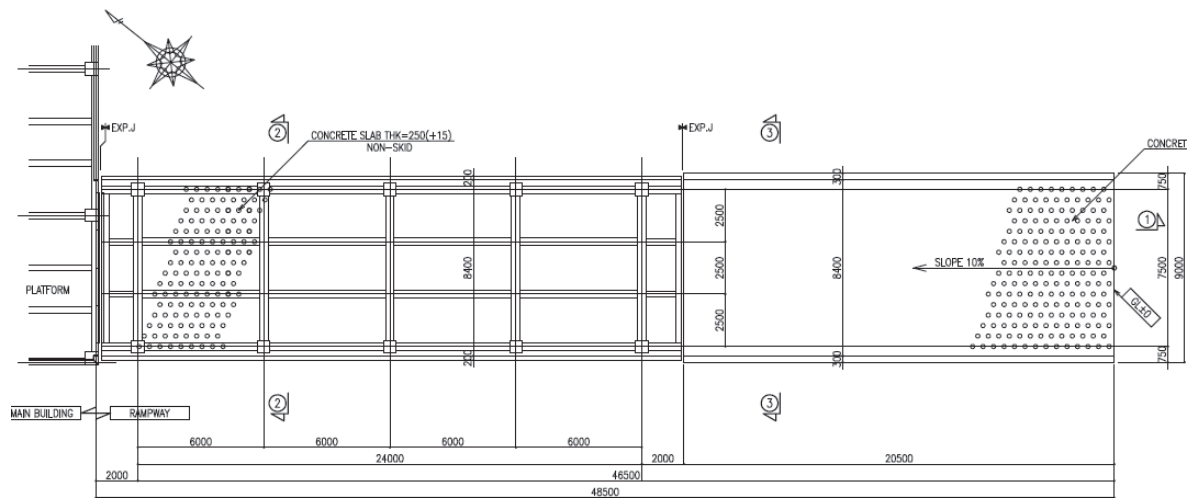


Figure 18: Plan of Entrance Ramp

5) Vehicle Washing Area

A vehicle washing area will be provided, since the vehicles can be maintained for a long period of time by regular cleaning.

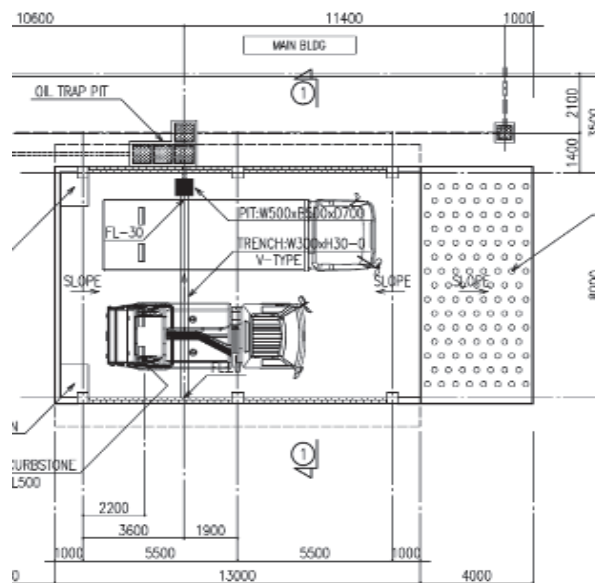


Figure 19: Plan of Vehicle Washing Area

6) Exterior

i) Parking Lot

As a storage location and to secure a minimum parking space for the vehicles, which are 9 small vehicles (5 skip loader and 4 compactor vehicles (6 m³)) that come to the solid waste transfer station to

transfer the waste collected in the city and 3 large compactor vehicles (20 m³) that will transport the waste from the solid waste transfer station to the final disposal site.

ii) Gate

A gate will be installed near the entrance to the disposal site at the expense of the Laos side. The purpose of installing the gate is to prevent unlawful entry during the night and to manage the entry and exit of collection vehicles. Furthermore, it will be an iron gate and will be opened and closed manually.

iii) Fence

A fence will be installed at the boundary of the waste transfer facility at the expense of the Laos side.

iv) Road within Solid Waste Transfer Station

A concrete road for general and collection vehicles will be constructed to link the gate and the solid waste transfer station. In addition, the shoulder of the road will be a U-shaped groove to drain rainwater.

(2) Cross-Sectional Plan

The cross-sectional plan should be as follows:

- ✓ There is a difference in height of about 1.5 m in the road level of the planned construction site on the east side, elevation +181.0 m, and the level of the west side of the site plan, elevation +179.5 m. Design ground level (GL) should be set along the slope gradient of the existing ground surface to reduce the burden of construction and to respect the current ground level.
- ✓ To prevent flooding from intensive rainfall, standard floor level of the first floor is to be raised 20cm from GL.
- ✓ The roof truss of the reloading area is to be a “truss” type roof (pin point frame)
- ✓ The management and other sections are to be concrete slab asphalt waterproof roofs.
- ✓ Ceilings will be insulated.
- ✓ Platform of the reloading section, should be 4,500mm from the ground floor level to the second floor platform floor beam.
- ✓ The ceiling joist of the discharge and storage equipment room of the reloading section should be 10,700 mm from the floor level.
- ✓ The ceiling heights of the rooms of the management and shutter sections are determined to be 2,800 mm on the ground floor and 2,850mm on the 1st floor.

(3) Structural Plan

1) Structural Planning Conditions

- ✓ Earthquakes are not recorded in VTE.

- ✓ Strong winds such as typhoons have not occurred in VTE. However, considering monsoon winds, design reference wind speed of 50 meters per second will be adopted and its criteria should be within short-term allowable stress.
- ✓ From the Project's geological survey data of construction site, the ground is stratified into: silty fine sand, topsoil (about 1.0 m thick), laterite (about 1.0 ~ 2.0 m thick), gravel mingled with sandy silt (about 2.0 ~ 3.0 m thick) and silty clay (about 2.0 ~ 3.0 m thick). N value is about 10 to 50, and the groundwater level is 2.0 ~3.0 m below ground level.

2) Structure plan

- ✓ Reloading Section: storage and discharge equipment rooms and platforms will have a 14 m-wide column-free space and the roof will be constructed with truss steel, because long-span beams will be used. The main structure of the platform should use locally sourced concrete and reinforcing steel to reinforce the concrete.
- ✓ The main structures of the Management Section and Other Sections should use locally sourced concrete and reinforcing steel to reinforce the concrete. And some parts of the walls should use locally sourced bricks.
- ✓ The platforms, ramps and the main structure of the management section should use locally sourced concrete and reinforcing steel to reinforce the concrete.

3) Foundation plan

- ✓ The reloading section, where heavy machinery such as waste collection vehicles are constantly coming in and out, has both large dead loads and large live loads, and in the management and other sections the load is large because both sections are two-story buildings and have reinforced concrete structures. On the other hand, the basis of the entire building will be footing foundation without piles because bearing ground exists at a depth of about 1 m from the ground surface.

4) Design load

- ✓ Seismic load: There is no record of earthquakes in the past, therefore seismic load is not considered, however it will be investigated, based on its past performance, whether to use the Japanese standard which sets the seismic load as 25%.
- ✓ Wind load: There is no record of typhoons in Laos, however a design reference wind speed of 50 meters per second, the average in Japan, will be adopted.
- ✓ Live load: Will be as follows based on the Japanese building code, Building Standards Law of Japan, and ordinances for its enforcement:

Table 23: Representative Live Load

Room	Live Load(N/m ²)			Remarks
	For Floor	For Framing	For Earthquake	
Reloading Section	16,000	8,000	4,000	
Management Section/ Other Section	2,900	1,800	800	

Source: Building Standards Law of Japan

5) Materials to be used

- ✓ Concrete: Cement made in Laos will be used. The design standard strength of concrete should be F_c 21N/mm² for building structure, 18N/mm² for levelling concrete and 28N/mm² for foundation of weigh bridge .
- ✓ Steel bars: Deformed bars SD295 (DB16 or less) and SD390 (DB20 and DB25) made in Laos will be used.
- ✓ Steel bar joints: Lap joints will be used because pressure welding of bars is not possible on the site.
- ✓ Steel frame: Steel materials made in Thailand that are equivalent to JIS G 3101 SS400 of Japan will be used.

(4) Facility Planning

1) Air Conditioning Facilities

Air conditioning facilities will be planned in accordance with how the rooms are to be used and the use of natural ventilation will also be incorporated. The Reloading Section will not have air conditioners installed in it because the entrance and exit remain continually open for the passage of the waste collection vehicles. Furthermore, the Other Sections will not have air conditioners installed because they are the main public spaces. The air conditioners to be adopted will be types that are commonly used in Laos (separate type air conditioners).

2) Ventilation Facilities

Ventilation will basically be by natural ventilation. However, ventilation facilities will be provided for in rooms with odor or moisture, rooms with heat generation, and air-conditioned rooms.

3) Water Supply Drainage Equipment

The city water of VTE is supplied from the elevated cisterns of the Water Supply State Enterprise located in the city. Since the Project facility site is not connected to existing water supply pipes, it is scheduled to be constructed before the start of the Project at the expense of the counterparts.

i) Water Receiving Facilities

Clean water will be taken from the water mains (ϕ 150 pipe diameter) beneath the road to the north of the project site and led to the reservoir in the eastern part of the site. The works from the branch of the water mains to the position of the meter will be conducted by the Water Supply State Enterprise, and the works beyond the meter will be conducted in this Project.

ii) Water Supply Equipment

A reservoir will be installed, from which water will be distributed to various locations via a pressure water supply pump. The reservoir will be a two-tank reservoir and will be installed on the rooftop of

the Management Section, from which the water will be distributed.

a. Transfer facility building

- Staff 30 persons x 30 litres per capita (toilet etc.) = 900 Litres
- Washing collection vehicle 49 cars x 15 litres per minute x 4 min. per car =2,940Litres
- Washing storage drum 2 units x 15 litres per min. x 10 min. per unit = 300 Litres

b. Toilet building: drivers 43 persons + collection workers 86 persons = 129 persons

- 127 persons x 5 litres per capita (toilet) = 635 litres
- 64 persons x 25 litres per capita (shower) =1,600 litres

Total 6,375 litres

iii) Sanitation Appliances and Facilities

Types of sanitation appliances and facilities are as shown below.

Table 24: Types of Sanitation Appliances and Facilities

Sanitation Appliances and Facilities	Type	Remarks
Urinal	Flush valve	
Toilet bowl, western style	Both the low-tank type and toilet bowl booth will be equipped with a small hand shower that is customary in Laos and a toilet paper roll holder.	
Asian type toilet bowl	Single faucet will be installed.	
Washstand	Counter type, single faucet	

iv) Drainage Facilities

Wastewater and rainwater will be drained separately in the project site.

Sewage drainage generated from the solid waste transfer station Management Section and the personnel or drivers toilet building, will be treated in an aerated septic tank that can be maintained easily, and the treated water will then soak into the ground. The wastewater generated from washing the vehicles is to be stored in a holding tank after passing through an oil trap. Also in the same manner, wash water generated during the cleaning of the reloading facilities as part of maintenance will be stored in the sewage tank that will be emptied once a day by a vacuum truck and transported to KM32 final disposal site to be disposed of. Capacity calculation basis of the sewage tank and septic tank are as follows.

Table 25: Estimation of Capacity of Waste Water Facility

Facility	Capacity	Calculation basis
Solid waste transfer station septic tank	2 m ³	• Staff 30 persons x 30 litres per capita (toilet etc.) = 900 Litres 900 litre x 1.2 (safety coefficient) =1.08m ³ <2m ³
Toilet building septic tank	3 m ³	• 127 persons x5 litres per capita (toilet) = 635 litres • <u>64 persons x25 litres per capita (shower) =1,600 litres</u> Total 2,235 litres
Sewage storage tank	10 m ³	• 2,235 litres x 1.2 (coefficient) =2.68m ³ <3m ³ • Washing collection vehicles 49 cars x15 litres per min. x 4min. per car =2,940 Litres • Washing storage drum 2 units x15 litres per min. x 10 min. per unit = 300 Litres Total 3,240 litres 3,240 litres× 3 days=9.72m ³

Rainwater drainage facilities planning will be 130 mm / hour rainfall intensity and will be planned to a rainfall probability of five years, and the collected rainwater will be discharged into the wilderness of adjacent land from outlet works which will be installed in the northwest corner of the planned construction site. The connection of the drainage ditch will be included in the works of this Project.

4) Fire Extinguishing Facilities

Fire laws have not been established in Laos. Although a law similar to that in Japan is planned to be enacted in the near future, there is none at present. Therefore, fire extinguishing facilities according to the standard in Japan will be installed in this Project.

Table 26: Fire Extinguishing Facilities

Items	Detail
Fire Extinguishing Facilities	Installation site
Fire extinguishers	Install one within 20 m walking distance

5) Electric Facilities

i) Power Receiving Facilities

There are no high voltage overhead lines near the planned construction site, therefore a high voltage overhead line (22Kv, 50Hz) is planned to be laid from the main road of Nahai Village to the front surface road of the planned construction site which it is expected to be laid under the responsibility of the counterpart before the construction of the facility starts. In this project, it is assumed to draw power of overhead (100Kv, 50Hz) from the high-pressure overhead line. Also a transformer will be installed on top of the first column retracted in the construction site, and by stepping down to low pressure (380/220V), it is pulled into the building electrical room. The Lao side will be responsible for the works upstream of the connection to the switch on the transformer primary side. An integrating wattmeter (provided by the electric power company) and a switchboard will be installed on the transformer secondary side, from which power is drawn to the electric room in the building. Power generators will not be installed, because power failures occur only as a result of lightening damage during the rainy season (about 2 or 3 times a year), the supply of electric power at ordinary times is stable, and the purposes of this facility will not include use in an emergency. Power is then distributed from the electric room to respective switchboards via under-floor wiring (rated for exposed outdoor use). The wiring for air conditioners will be equipped with switchboxes for maintenance. Storage drum (rotating drum method), discharge conveyor equipment (belt conveyor type), abnormalities of the pump and abnormal water level in the tank will be displayed on respective power switchboards and the signals will be collectively transmitted to the power switchboard in the machine room, and alarms will be displayed on the alarm board in the administrative office.

ii) Lighting Fixtures

Lighting of ordinary rooms and the Reloading Section will be planned basically using fluorescent lamps, which are commonly used and easily available in Laos and have high illumination efficiency.

The intensity of illumination will be planned based on JIS standards. The intensity of illumination and lighting fixtures in the main rooms will be as shown in the Table below.

Table 27: Lighting Fixtures and Intensity of Illumination

Sections	Floor	Room	Lighting Fixtures	Illumination
Reloading Section	1	Storage and Discharge Equipment Room	External*	300Lx
	2	Collection Vehicles Turning Space	External	300Lx
	2	Platform	External	300Lx
	2	Monitoring Room	External	300Lx
Management Section	1	1st Floor Office	Inset	300Lx
	2	Director Office	Inset	300Lx
	2	2nd Floor Office	Inset	300Lx
Other Sections	1	Entrance hall/Stairs/Toilets	External	75Lx
	2	Hall and Stairwell Toilets	External	75Lx
	1	Warehouse	External	75Lx
External	1	Electrical Room	External	75Lx
		Security Light	Wall-set (waterproof type)	75Lx
		Parking lot and Green areas	Pole type (waterproof type)	75Lx

* External lighting fixtures means fluorescent lights fixed to the ceiling but not inset into the ceiling.

iii) Power Outlets

Power outlets will be provided in quantities according to the needs in each room. The reloading section will be provided an outlet for lighting during the maintenance. The outlets in places involving water and moisture will be grounded (earthed) and power will be supplied to the air conditioners, pumps and so on.

iv) Telephone Facilities

The telephone equipment will not be provided because mobile phones are now commonly used.

v) Public Address Facilities

Public address facilities will be provided as a transmission for necessary information in the solid waste transfer station and outside of the work site. After the broadcasting amplifier has been installed in the second floor office, speakers will be installed in the Reloading Section and the parking lot of the station.

Table 28: Public Address Facilities

Specifications for equipment
Table top broadcasting amplifier, CD player and microphones

vi) Lightning Protection Equipment

Lightning protection equipment using the conductor rod will be installed on the building. Because there are no standards for lightning protection equipment in Laos, this equipment is planned according to JIS A 4201:1992 in Japan.

(5) Construction Material Planning

Most of the construction materials commonly available in Laos are imports from Thailand. The materials used in this Project should be those that are commonly used in Laos and are suitable for future maintenance to be performed by the Lao side.

The following shows major elements of exterior finish and interior finish.

Table 29: Exterior Finish

Building	Area	Part	Finish
Transfer facility building	Transfer area	Roof	Colored galvanized steel sheet /Asphalt roofing /Cement board/insulating material
		Exterior walls	Stretcher bond brickwork with mortar layer/ Emulsion paint
	Administration area/Others	Windows/Doors	Aluminium ash/ steel door/ UE paint/ over slide door
		Roof	RC slab roof/ Asphalt water proof
Weigh bridge administration building		Exterior walls	Stretcher bond brickwork with mortar layer/ Emulsion paint
		Windows/Doors	Aluminium ash/ Steel door/ UE paint/
		Roof	Colored galvanized steel sheet /Asphalt roofing /Cement board/insulating material
		Exterior walls	Stretcher bond brickwork with mortar layer
Toilet building		Roof	Colored galvanized steel sheet /Asphalt roofing /Cement board/insulating material
		Exterior walls	Stretcher bond brickwork with mortar layer/ Emulsion paint
		Windows/Doors	Aluminium ash/ wooden door/ UE paint/ over slide door

Table 30: Interior Finish

Building	Area	Floor	Room	Finish			
				Floor	Base	Wall	Ceiling
Transfer Facility Building	Transfer Area	1	Storage and Discharge Equipment Room	Concrete	Mortar Metal trowel Emulsion paint	Mortar Metal trowel Emulsion paint	-
				Concrete	Mortar Metal trowel Emulsion paint	Mortar Metal trowel Emulsion paint	-
				Ceramic tile	Vinyl	Mortar Metal trowel Emulsion paint	Decorated gypsum boards
	Administration	1	Office	Ceramic tile	Vinyl	Mortar Metal trowel Emulsion paint	Decorated gypsum boards
				Ceramic tile	Vinyl	Mortar Metal trowel Emulsion paint	Decorated gypsum boards
				Ceramic tile	Vinyl	Mortar Metal trowel Emulsion paint	Decorated gypsum boards
	Others	1	Warehouse	Mortar Metal trowel	Mortar Metal trowel Emulsion paint	Mortar Metal trowel Emulsion paint	Decorated gypsum boards
				Mortar Metal trowel	Mortar Metal trowel Emulsion paint	Mortar Metal trowel Emulsion paint	Decorated gypsum boards
				Ceramic tile	Vinyl	Mortar Metal trowel Emulsion paint	Decorated gypsum boards
	Weigh bridge administration building			Ceramic tile	Vinyl	Mortar Metal trowel Emulsion paint	Decorated gypsum boards
						Mortar Metal trowel Emulsion paint	Decorated gypsum boards
	Toilet building			Washroom	Ceramic tile	Mortar Metal trowel Emulsion paint	Mortar Metal trowel Emulsion paint
Toilet				Concrete	Mortar Metal trowel Emulsion paint	Mortar Metal trowel Emulsion paint	Decorated gypsum boards

2.2.2.3. Design of Equipment

(1) Overall plan

The necessary equipment is selected in accordance with the following procedure;

- i) The collection service area and rate in 2013 is surveyed by VUDAA and UDAA in LPB and XYB. The results of survey are shown in the GIS maps to easily recognize the current condition by counterparts.
- ii) The GIS map clearly shows the collection area of not only VUDAA and UDAA's but also private companies in 2013.
- iii) The collection service area and rate are planned by VUDAA and UDAA's, and it is shown on the GIS map as "target collection service area in 2020".
- iv) The "target collection service area in 2012" shows the demarcation of duty between VUDAA, UDAA's and private companies.
- v) The number and specification of waste collection vehicles is estimated based on the difference in the amount of waste estimated to be collected by VUDAA and UDAA's in the year 2020 and the current amount in 2013.
- vi) The skip loaders (5m³) and compactor trucks (6m³) only is planned to engage for the operation of solid waste transfer station. The planned amount of transferred waste in 2020 is approximately 50 tonnes per day.

The waste collection service areas in 2013 and 2020 as target year in three project sites are shown as follows;

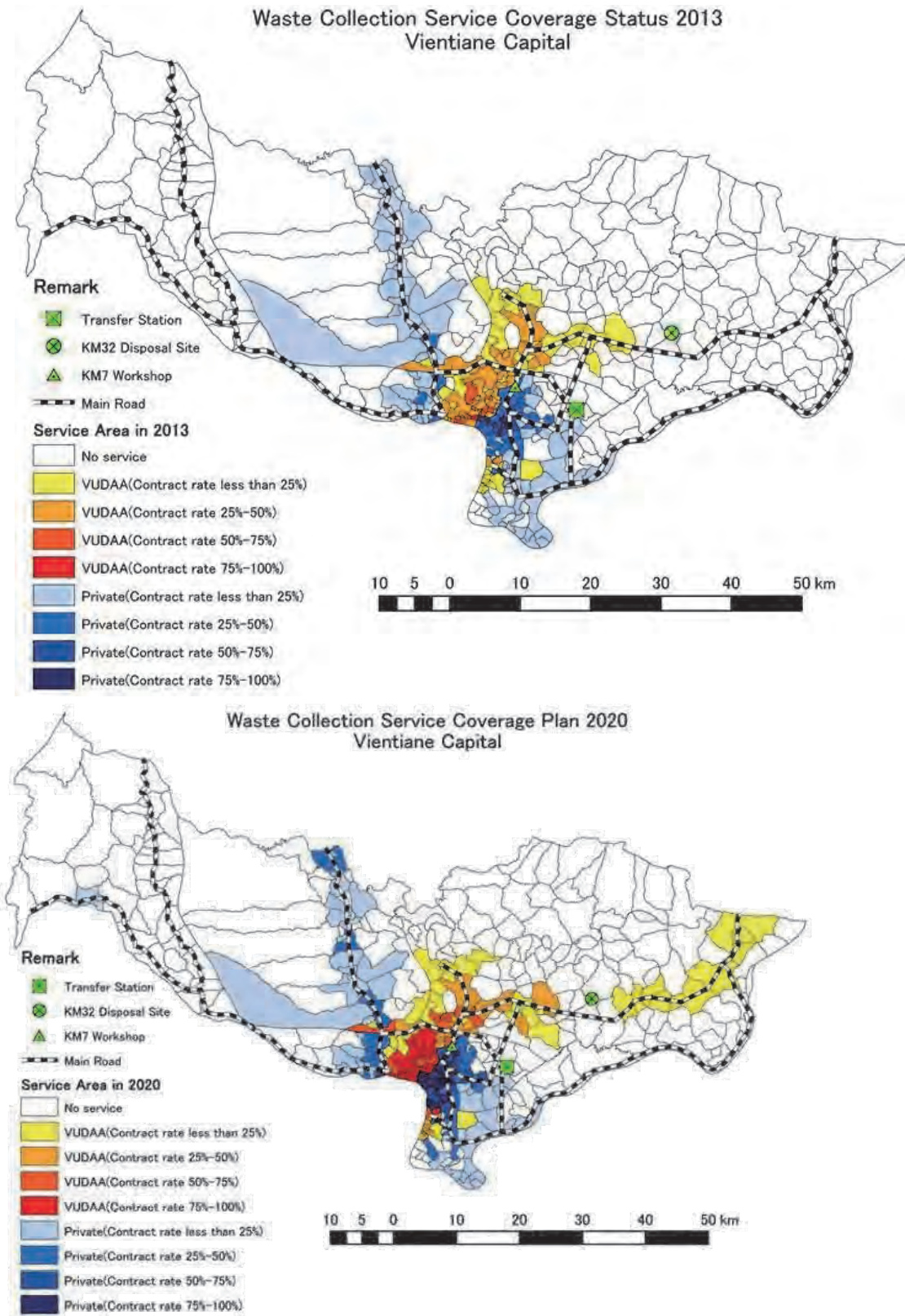
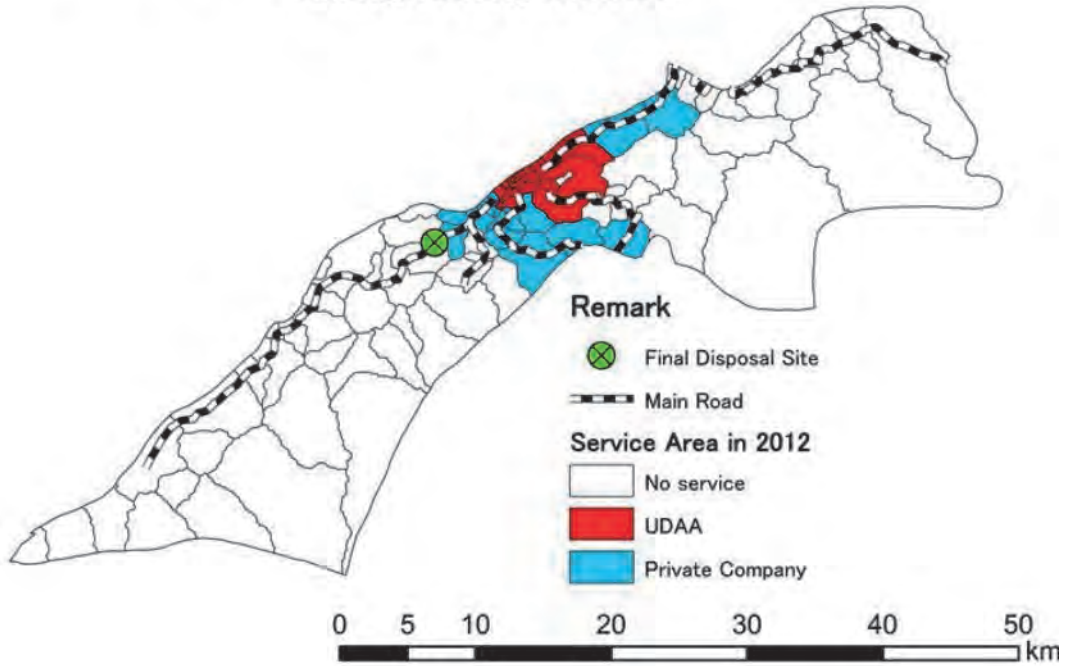


Figure 20: Service Area of Waste Collection in 2013 and in Target Area in 2020 in VTE

Waste Collection Service Coverage Status 2012 Luangprabang District



Waste Collection Service Coverage Plan 2020 Luangprabang District

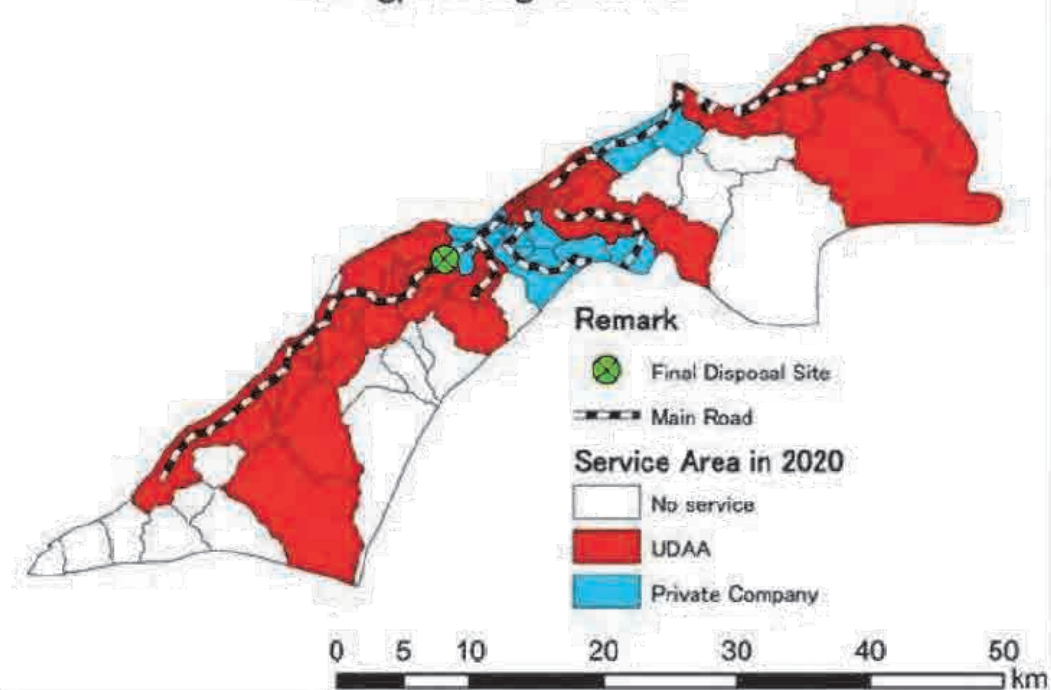
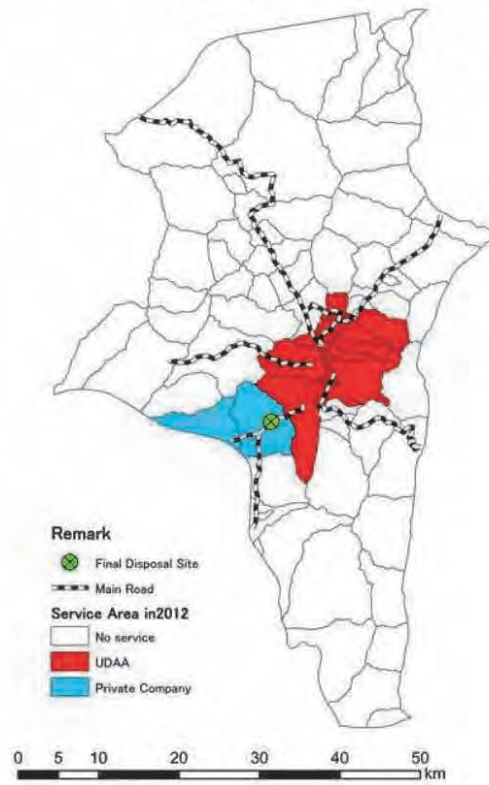


Figure 21: Service Area of Waste Collection in 2013 and in Target area in 2020 in LPB

Waste Collection Service Coverage Status 2012
Xayaboury District



Waste Collection Service Coverage Plan 2020
Xayaboury District

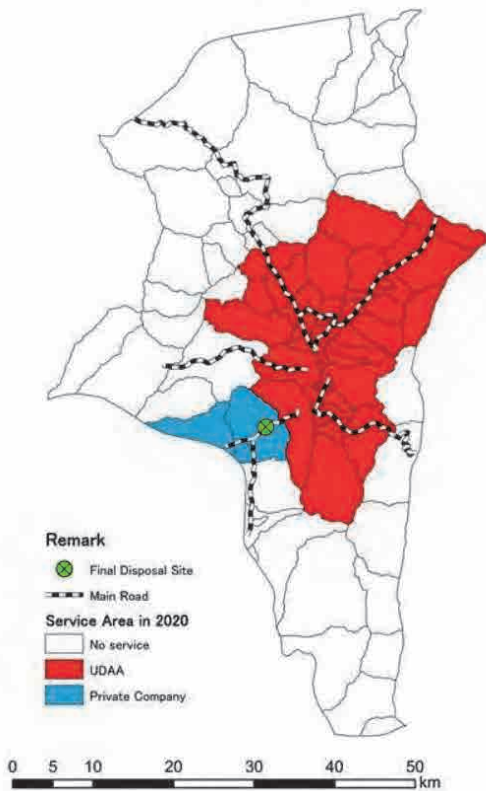


Figure 22: Service Area of Waste Collection in 2013 and in Target area in 2020 in XYB

Table 31: Waste Collection Amount and Rate in 2013 and in 2020 in Project Sites

Project site	Execution Body	Population	2013 Waste collection Amount ton/day	Waste collection rate% (population)	Population	2020 Waste collection Amount ton /day	Waste collection rate% (population)	Increased waste collection amount ton/day
VTE	VUDAA	70,495	69.3	8.6%	199,596	259.7	18.6%	190.4
	Private	97,434	97.4	11.9%	234,281	304.8	21.8%	207.4
	Sub-total	167,929	166.7	20.5%	433,877	564.1	40.4%	397.4
	Non collection	652,826	-	79.5%	641,123		59.6%	
	Total	820,755	-	100.0%	1,075,000		100.0%	
LPB	UDAA	33,362	20.6	38.4%	48,319	54.4	49.1%	33.8
	Private	26,010	16	30.0%	29,470	21.2	30.0%	5.2
	Sub-total	59,372	36.6	68.4%	77,789	75.6	79.1%	39
	Non collection	27,413		31.6%	20,541		20.9%	
	Total	86,785		100.0%	98,330		100.0%	
XYB	UDAA	31,099	19.2	43.5%	47,594	39.1	59.3%	19.9
	Private	5,629	3.5	7.9%	6,319	5.2	7.9%	1.7
	Sub-total	36,728	22.7	51.4%	53,913	44.3	67.2%	21.6
	Non collection	34,721		48.6%	26,287		32.8%	
	Total	71,449		100.0%	80,200		100.0%	

(2) Selected equipment

1) Outline of selected equipment

The outline of selected equipment is shown in the table below.

Table 32: Outline of selected equipment

Category	Item	VTE	LPB	XYB	Total
Collection of waste	Compactor truck (20m ³)	3	-	-	3
	Compactor truck (10m ³)	16	-	2	18
	Compactor truck (6m ³)	17	4	-	21
	Compactor truck (6m ³ 4 WD)	4	-	-	4
	Dump truck (10m ³)	2	3	1	6
	Skip loader (5m ³)	4	1	1	6
	Vehicle for Health care waste collection	1	-	-	1
Heavy machinery	Bulldozer (21t)	1	-	-	1
	Bulldozer(10t)	-	1	-	1
	Excavator(0.6m ³)	-	-	1	1
Equipment for solid waste transfer station		2	-	-	2
Others	Water tanker	1	1	1	3
	Water tanker for waste water (6m ³)	1	-	-	1
	Car washing machine	2	1	1	4

2) VTE

The outline of selected equipment in VTE is shown as in the table below.

Table 33: The outline of selected equipment in VTE

Items	Request	Select	Detail
Compactor truck (6m ³)	✓	✓	<ul style="list-style-type: none"> • Compactor trucks (6 m³) are planned to collect the waste in the town and transport it to the solid waste transfer station. • Compactor trucks (10 m³ and 6 m³) are planned to collect the waste in the town and transport it to KM32 disposal site without going via the solid waste transfer station. The same number of 6 m³ and 10 m³ compactor trucks is planned.
Compactor truck (10m ³)	✓	✓	
Compactor truck (20m ³)	—	✓	<ul style="list-style-type: none"> • Compactor trucks (20 m³) are planned to transport the large amount of waste from the solid waste transfer station to KM32 disposal site.
Dump truck (10m ³)	—	✓	<ul style="list-style-type: none"> • Dump trucks are planned to collect mainly the garden waste which cannot be collected by compactor truck.
Skip loader (5m ³)	✓	✓	<ul style="list-style-type: none"> • Skip loaders are planned to collect waste in the town and transport to the solid waste transfer station. Four or five old skip loaders are to be replaced by new ones.
Bulldozer	✓	✓	<ul style="list-style-type: none"> • Bulldozer is planned to spread and compact disposed waste at the disposal site.
Trailer	✓	—	<ul style="list-style-type: none"> • Instead of trailer, compactor trucks (20 m³) are planned to transport the large amount of waste from the solid waste transfer station to KM32 disposal site.
Excavator	✓	—	<ul style="list-style-type: none"> • Excavators are planned to excavate and load the covering soil.
Water tanker	✓	✓	<ul style="list-style-type: none"> • Water tanker is planned to prevent dust and waste scattering on the access road and extinguish the fire in the disposal site.
Water tanker for waste water	—	✓	<ul style="list-style-type: none"> • Water tanker for waste water is planned to collect and transport the waste water coming from car wash house and drum type storage and transfer equipment to KM32 disposal site.
HCW incinerator	✓	—	<ul style="list-style-type: none"> • Health care waste (HCW) incinerators are not planned since it was already installed by LPP-E in 2012.
Vehicle for HCW	✓	—	<ul style="list-style-type: none"> • Vehicles for HCW are not planned since it was already procured in 1997 and is still used.
Car washing machine	—	✓	<ul style="list-style-type: none"> • Car washing machines are planned to maintain the collection vehicle properly.
Drum type storage and transfer equipment	✓	✓	<ul style="list-style-type: none"> • Drum type storage and transfer equipment is planned to easily transfer the collected waste without environmental issues

i) Plan of system of solid waste transfer station for collected waste

The objective of solid waste transfer station is to improve the efficiency of collection and transportation of waste. The collection of waste in the town by small capacity vehicles is called “primary collection”, while the transportation of waste from solid waste transfer station to disposal site by large capacity vehicles is called “secondary collection”.

The system of the solid waste transfer station is carefully planned because introducing a solid waste

transfer station does not always improve efficiency; it is highly dependent on the distance between collection point and the disposal site, the road conditions and the capacity of collection vehicles and so on. Some transportation systems are recommended that the collected waste should be transported to the disposal site directly without solid waste transfer station in case that the capacity of waste collection vehicle is quite large and it can go to the disposal site directly.

Based on the above mentioned preconditions, the system of solid waste transfer station for collected waste is planned.

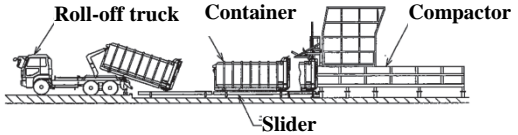
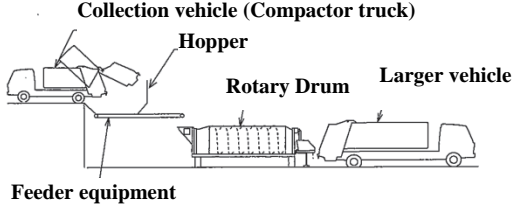
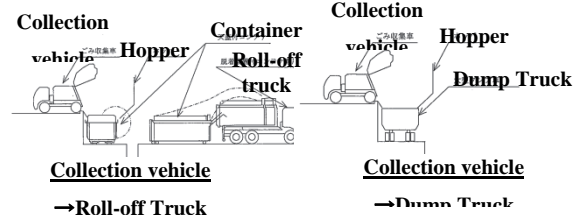
ii) Estimation of transferred waste

Five skip loaders procured by Grant Aid project in 1997 are still functioning in VTE and the waste collected by those skip loaders is transferred at KM7 central workshop with the simple structure facility causing dangerous and adverse environmental conditions. The amount of waste transferred at the solid waste transfer station is estimated to be approximately 52 ton per day based on the total amount of 34 ton per day waste collected by the current five skip loaders and 18 ton per day waste by the newly procured compactor trucks (6 m³) in this project. The specification of solid waste transfer station is designed to transfer approximately 52 ton of waste per day in terms of cost performance and efficiency.

iii) Selection of specification of solid waste transfer station equipment

Generally, there are three types of solid waste transfer station equipment, the first is “compactor container equipment”, the second is “drum type storage and transfer equipment” and the final is “hopper type equipment”. The drum type storage and transfer equipment is selected as the solid waste transfer station in this project due to less adverse impacts on the environment, less operation and maintenance cost and less need for highly technical skills.

Table 34: Selection of the Loading System at Transfer Loading Station in VTE

Loading System	Compactor/container	Rotary Drum	Hopper
Illustration			
Outline	<p>This system consists of compactor, by which carried-in waste is compressed and loaded into container and mechanical equipment for driving compactor. The wastewater squeezed in the process of compaction can be stored in the container. The compressed waste is hauled by roll-off truck.</p>	<p>The rotary drum enables to continuously house carried-in waste and chip it. In most cases, hopper and feeder are equipped in order to effectively house the waste carried in by collection vehicle.</p>	<p>This system is the simplest way. The carried-in waste by collection vehicle is transferred to container. The transferred waste is hauled by roll-off truck or dump truck.</p>
Processing capacity per system	<p>40~60 m³/hour or 300 m³/day (5 hours)</p>	<ul style="list-style-type: none"> ✓ Depends on capacity of the larger vehicle. Processing speed by rotary drum is 1 m³/minute. ✓ Capacity of rotary drum ranges 6 to 40 m³. 	<p>Depends on container or dump truck</p>
Maintenance and management	<ul style="list-style-type: none"> ✓ Special knowledge is not needed. ✓ Two workers are involved in operation. ✓ Needs electricity for operating ✓ Needs water for operating ✓ Packing device for container needs being changed once a year ✓ Dust collector filter as well as activated carbon (1 ton) needs being changed every six months. ✓ Cylinder needs being overhauled once a year. 	<ul style="list-style-type: none"> ✓ Special knowledge is not needed. ✓ Two workers are involved in operation. ✓ Needs electricity for operating ✓ Needs water for cleaning the equipment system ✓ Periodic maintenance work for rotary drum equipment is required. ✓ Maintenance work for hopper is sometimes required. 	<ul style="list-style-type: none"> ✓ Special knowledge is not needed. ✓ Two workers are involved in operation. ✓ Does not need electricity for operating ✓ Needs water for cleaning the equipment system ✓ Maintenance work for hopper is sometimes required.
Installation cost	<ul style="list-style-type: none"> ✓ Of the three candidate systems, this system needs the largest floor and site areas. Therefore, its installation cost becomes highest. ✓ Simultaneously, the installation cost for other special equipment necessary for introducing this system is the highest of the three systems. 	<ul style="list-style-type: none"> ✓ The floor and site areas can be reduced unlike “compactor/container” type. ✓ The floor area necessary for installing this system is the same as one for “hopper” type. ✓ The installation cost for other special equipment necessary for introducing this system is the second highest of the three systems. 	<ul style="list-style-type: none"> ✓ The floor and site areas can be reduced unlike “compactor/container” type. ✓ The floor area necessary for installing this system is the same as one for “hopper” type. ✓ The installation cost for other special equipment necessary for introducing this system is the lowest of the three systems.
Maintenance cost	<p>Highest of the three system</p>	<p>Second highest</p>	<p>Lowest</p>
Effect on surrounding environment	<ul style="list-style-type: none"> ✓ It needs some equipment for dust control and deodorizing, but their scales are not large. 	<ul style="list-style-type: none"> ✓ It sometimes needs some equipment for dust control and deodorizing. 	<ul style="list-style-type: none"> ✓ It needs some equipment for dust control and deodorizing, and their scales are the largest of the three systems.
Wastewater	<ul style="list-style-type: none"> ✓ The amount of wastewater squeezed in the process of operation is the second largest. 	<ul style="list-style-type: none"> ✓ The amount of wastewater squeezed in the process of operation is the largest. 	<ul style="list-style-type: none"> ✓ The amount of wastewater squeezed in the process of operation is the lowest.

3) LPB

The outline of selected equipment in LPB is shown in the table below.

Table 35: The Outline of Selected Equipment in LPB

Items	Request	Select	Detail
Compactor truck (6 m ³)	✓	✓	• Compactor trucks (6 m ³) are planned to collect the waste to prevent waste scattering and environmental issues and to enable access to narrow roads in the town center
Dump truck	✓	✓	• Dump trucks are planned to collect waste from outlying areas
Skip loader (5 m ³)	✓	✓	• Current old skip loader is replaced by a new one
Bulldozer	✓	✓	• Bulldozer is planned to spread and compact disposed waste at the disposal sites.
Water tanker	✓	✓	• Water tanker is planned to prevent dust and waste scattering on the access road and extinguish the fire in the disposal site.
Car washing machine	—	✓	• Car washing machine is planned to maintain the collection vehicles properly.
Vehicle for HCW	✓	—	• LPB obtained from JICA Laos office

4) XYB

The outline of selected equipment in XYB is shown in the table below.

Table 36: The Outline of Selected Equipment in XYB

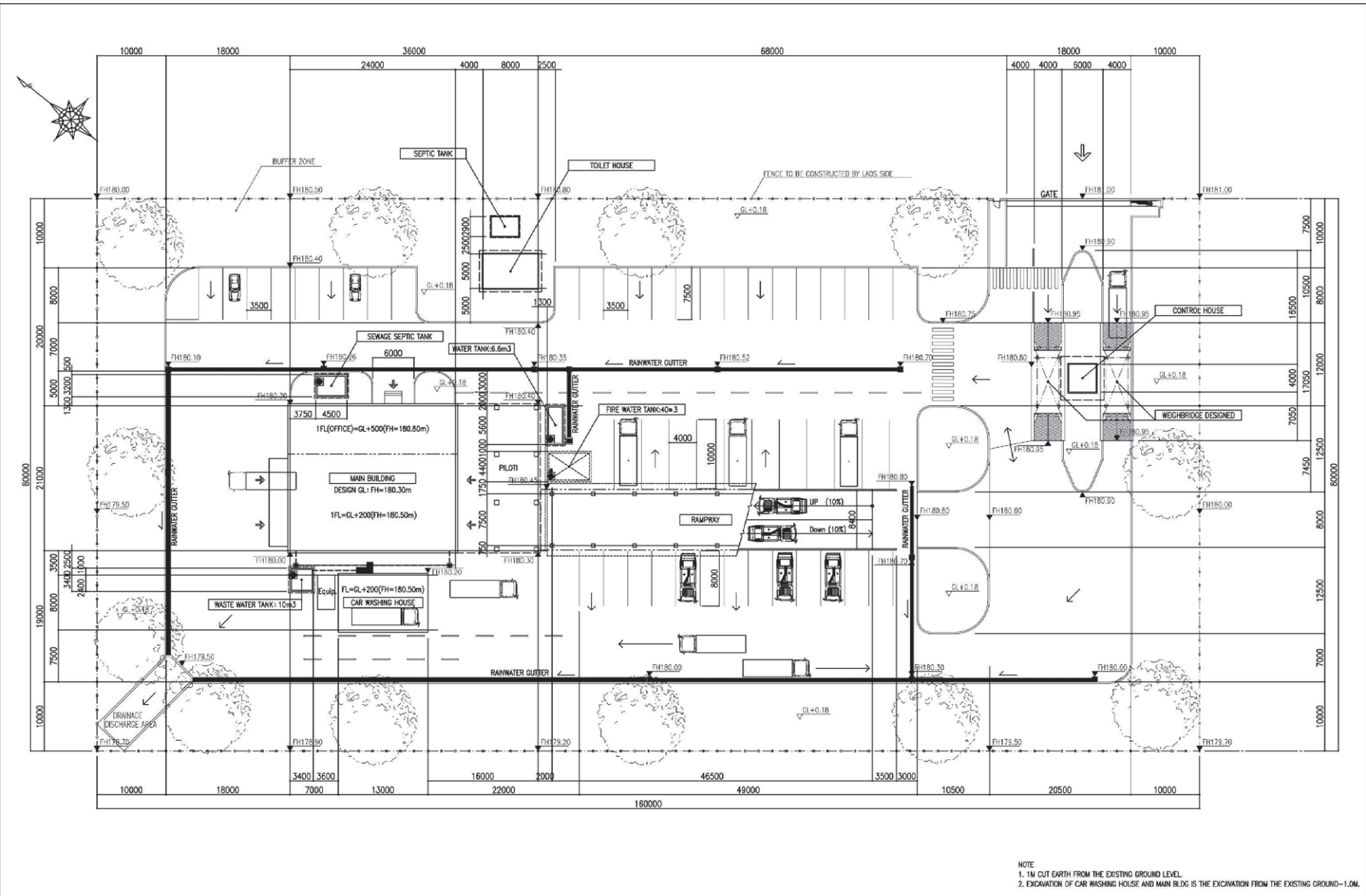
Items	Request	Select	Detail
Compactor truck (10 m ³)	—	✓	• Compactor trucks (6 m ³) are planned to collect the waste to prevent waste scattering and environmental issues and to enable access to narrow roads in the town center
Dump truck	✓	✓	• Dump trucks are planned to collect waste from outlying areas
Skip loader (5 m ³)	✓	✓	• Current old skip loader is replaced by a new one
Excavator	—	✓	• Excavator is planned to excavate and load the covering soil.
Water tanker	✓	✓	• Water tanker is planned to prevent dust and waste scattering on the access road and extinguish the fire in the disposal site.
Car washing machine	—	✓	• Car washing machine is planned to maintain the collection vehicles properly.

2.2.3. Outline Design Drawing

The list of outline drawings is shown in the table below.

Table 37: The List of Outline Drawings

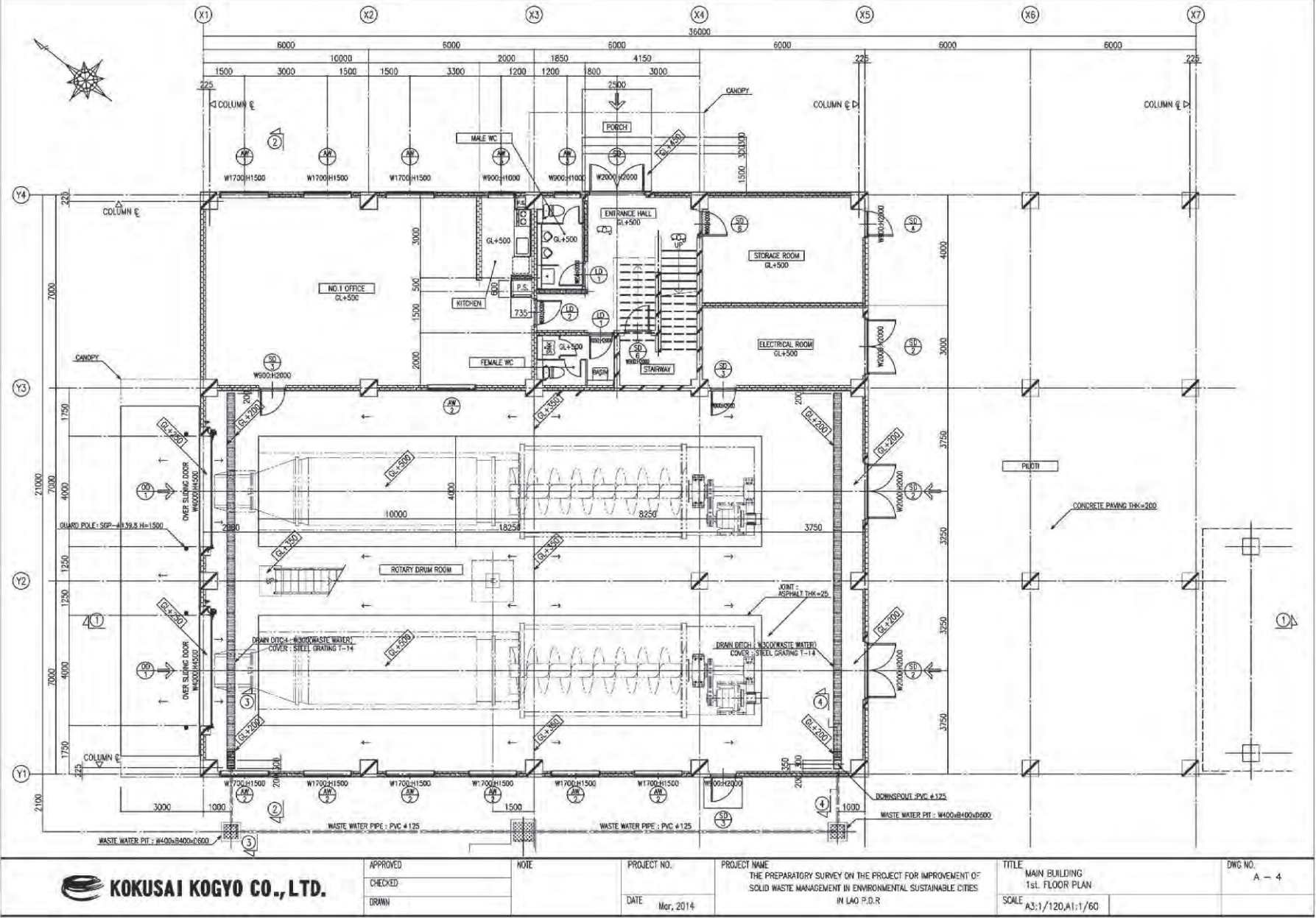
Drawings
Layout of solid waste transfer station
Plan of the 1 st floor of solid waste transfer station building
Plan of the 2 nd floor of solid waste transfer station building
Elevation of solid waste transfer station (1)
Elevation of solid waste transfer station (1)
Cross section of solid waste transfer station (1)
Cross section of solid waste transfer station (2)
Plan of weigh bridge building
Elevation of weigh bridge building
Cross section of weigh bridge building
Structure of entrance ramp
Plan of car wash building
Elevation of car wash building
Cross section of car wash building
Plan of toilet building
Elevation of toilet building
Cross section of toilet building (1)
Cross section of toilet building (2)



NOTE
 1. 1M CUT EARTH FROM THE EXISTING GROUND LEVEL.
 2. EXCAVATION OF CAR WASHING HOUSE AND MAIN BLDG IS THE EXCAVATION FROM THE EXISTING GROUND-1.0M.

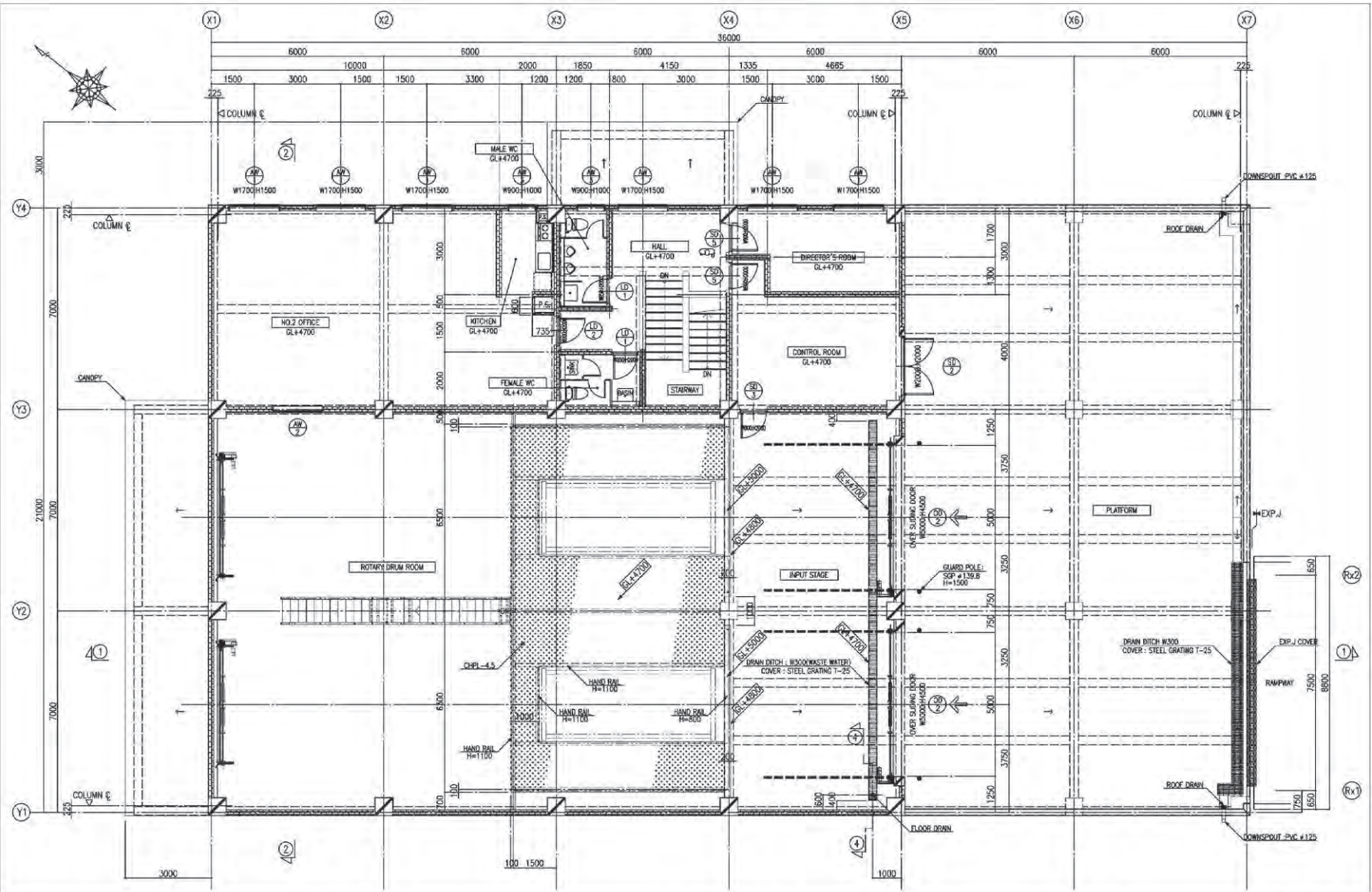
Figure 23: Layout of Solid Waste Transfer Station

	APPROVED	NOTE	PROJECT NO.	PROJECT NAME THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN ENVIRONMENTAL SUSTAINABLE CITIES IN LAO P.D.R	TITLE	DWG NO. A - 2
	CHECKED		DATE		GENERAL LAYOUT PLAN	
	DRAWN		Mar, 2014		SCALE A3:1/500, A1:1/250	



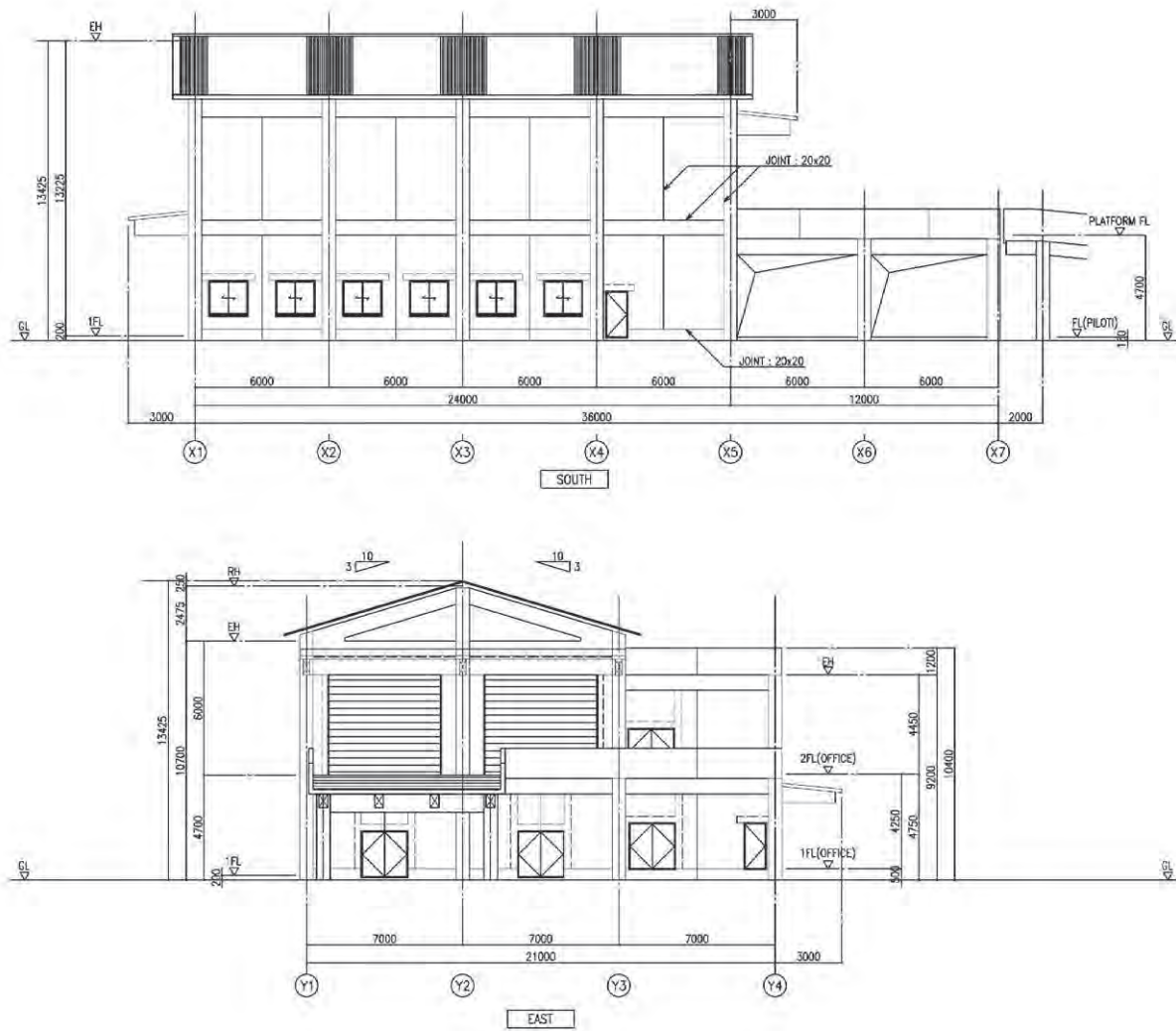
KOKUSAI KOGYO CO., LTD.	APPROVED	NOTE	PROJECT NO.	PROJECT NAME	TITLE	DWG NO.
	CHECKED			THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN ENVIRONMENTAL SUSTAINABLE CITIES IN LAO P.D.R	MAIN BUILDING 1st. FLOOR PLAN	A - 4
	DRAWN		DATE	Mar, 2014	SCALE	A3:1/120,A1:1/60

Figure 24: Plan of the 1st floor of solid waste transfer station building



	APPROVED	NOTE	PROJECT NO.	PROJECT NAME	TITLE	DWG. NO.
	CHECKED		DATE	THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN ENVIRONMENTAL SUSTAINABLE CITIES IN LAO P.D.R	MAIN BUILDING 2nd. FLOOR PLAN	A - 5
	DRAWN		Mar, 2014		SCALE A3:1/12D,A1:1/60	

Figure 25 Plan of the 2nd Floor of Solid Waste Transfer Station Building



KOKUSAI KOGYO CO., LTD.	APPROVED	NOTE	PROJECT NO.	PROJECT NAME	TITLE	DWG NO.
	CHECKED		DATE	THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN ENVIRONMENTAL SUSTAINABLE CITIES IN LAO P.D.R	MAIN BUILDING ELEVATION 1	A - 7
	DRAWN		Mar.2014		SCALE	A3:1/200,A1:1/100

Figure 26: Elevation of Solid Waste Transfer Station (1)

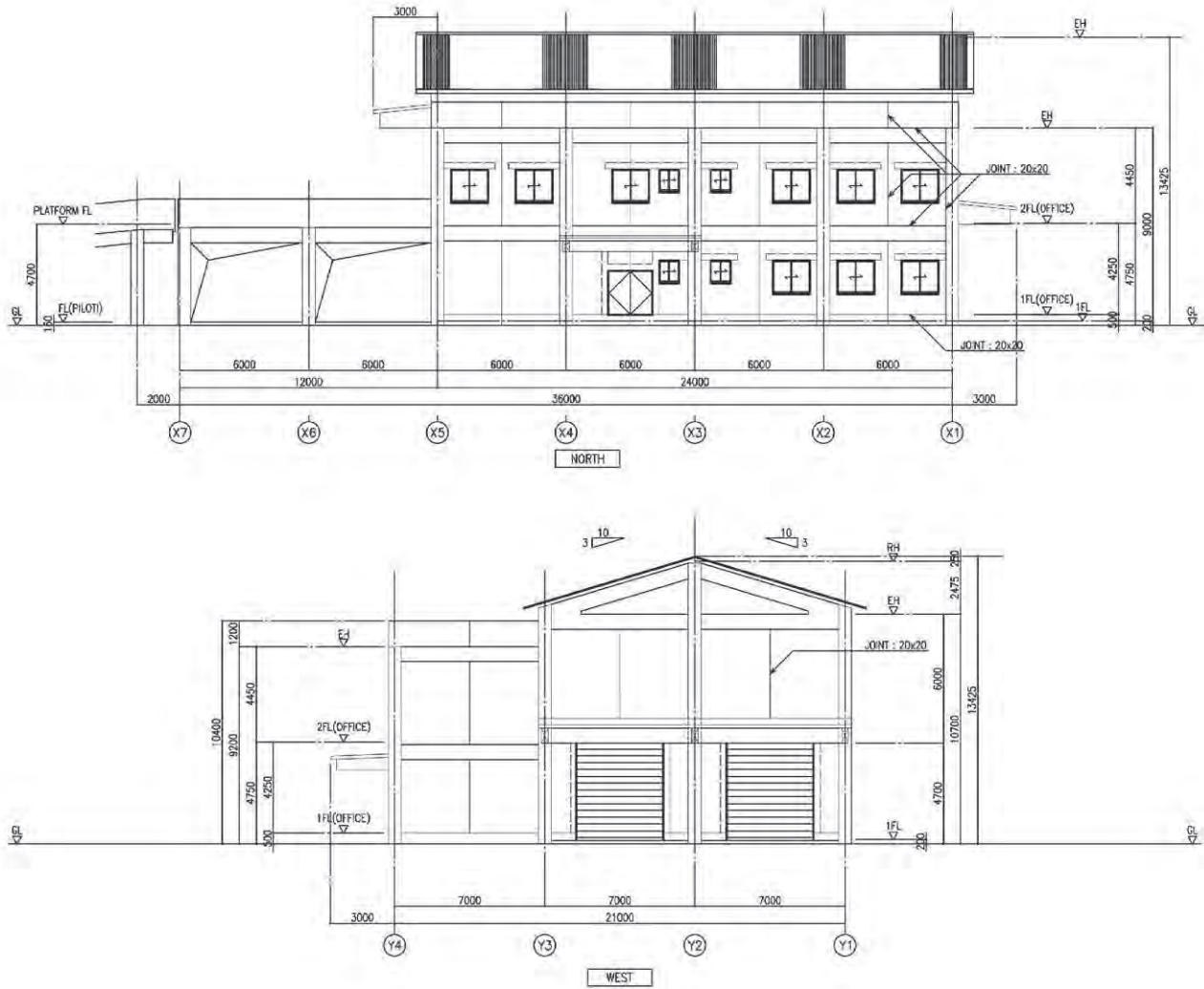
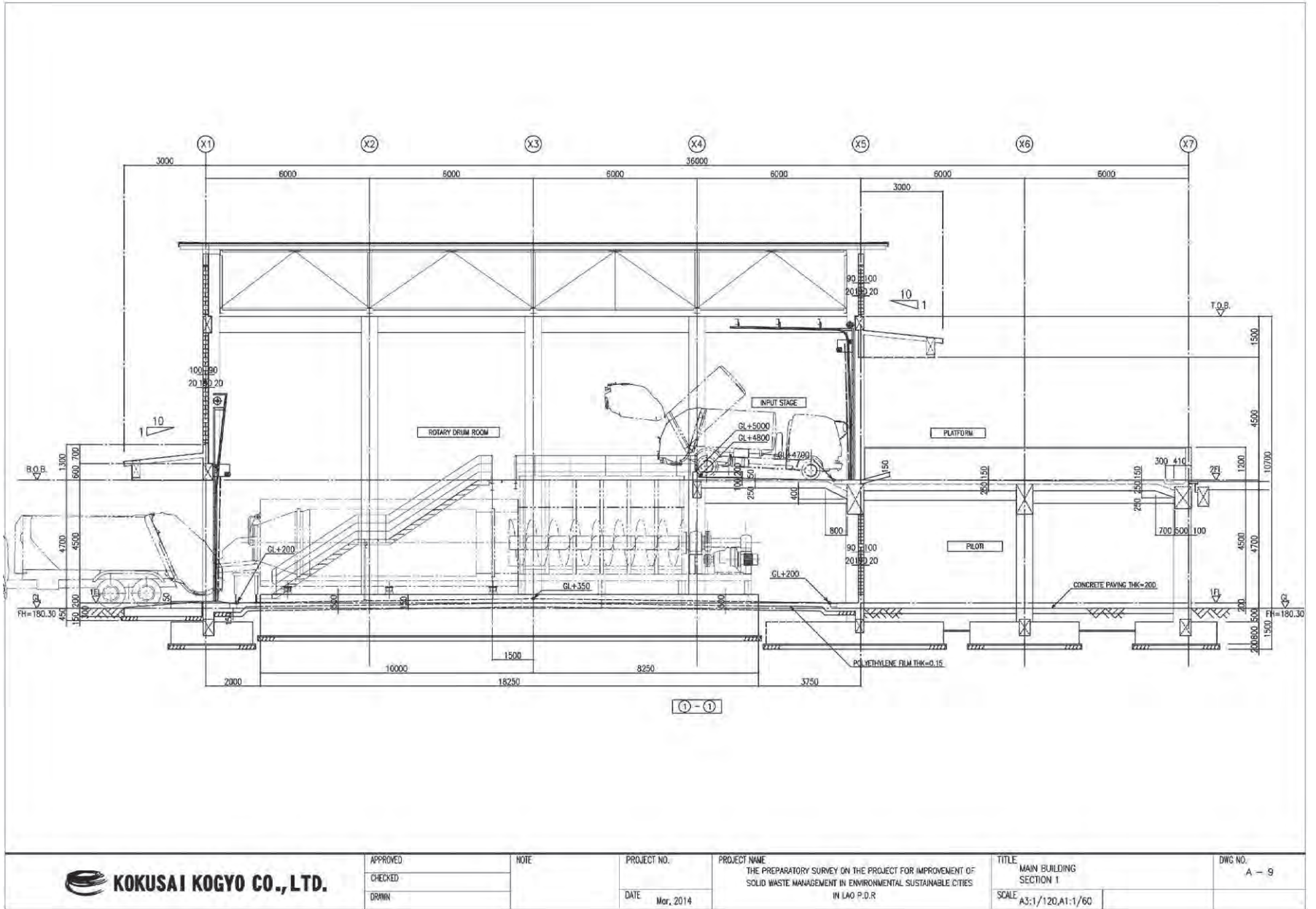


Figure 27: Elevation of Solid Waste Transfer Station (2)

Figure 28: Cross Section of Solid Waste Transfer Station (1)



	APPROVED	NOTE	PROJECT NO.	PROJECT NAME THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN ENVIRONMENTAL SUSTAINABLE CITIES IN LAO P.D.R	TITLE	DWG NO. A - 9
	CHECKED		DATE		MAIN BUILDING SECTION 1	
	DRAWN		Mar, 2014		SCALE A3:1/120,A1:1/60	

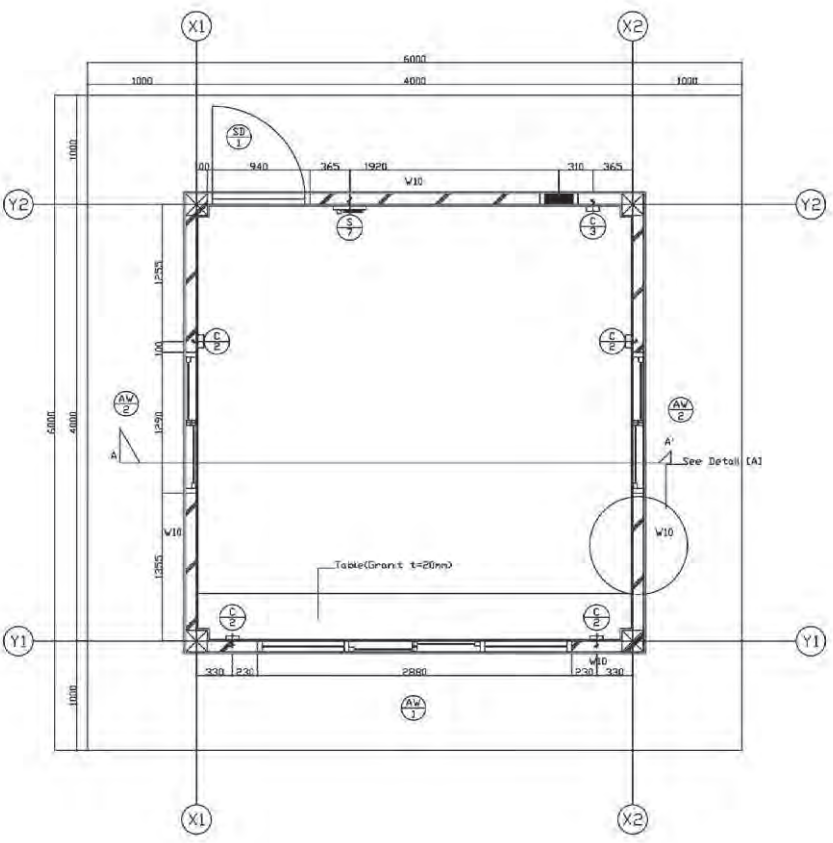
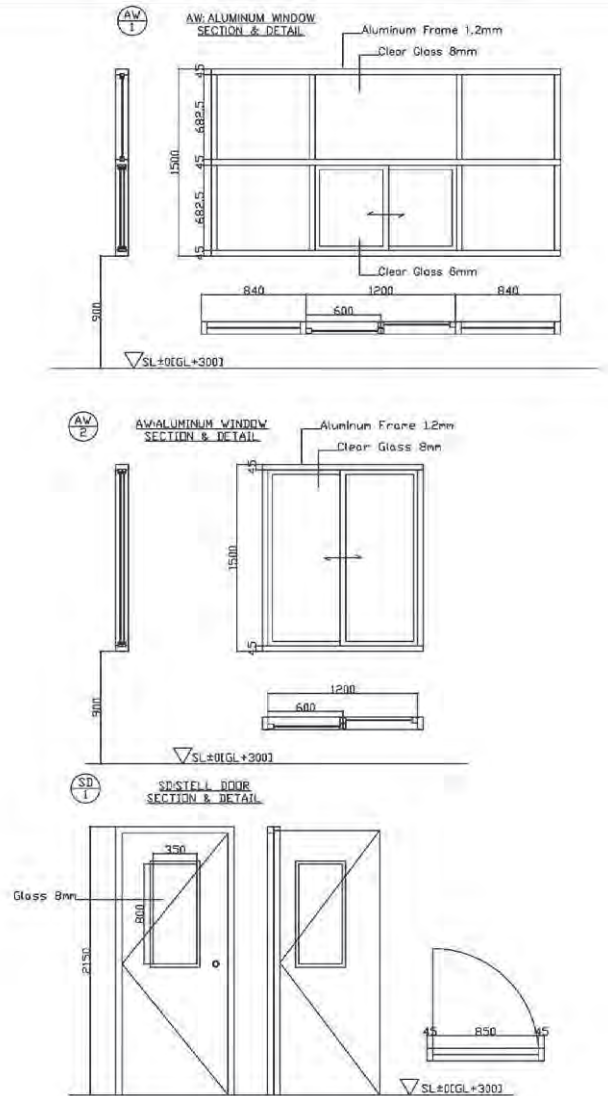


Figure 30: Plan of Weigh Bridge Building

	APPROVED	NOTE	PROJECT NO.	PROJECT NAME	TITLE	DWG NO.
	CHECKED		DATE	THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN ENVIRONMENTAL SUSTAINABLE CITIES IN LAO P.D.R	Weighbridge Control House 1st Floor Level Plan	W - 1
	DRAWN		Mar, 2014		SCALE	

Figure 31 : Elevation of Weigh Bridge Building

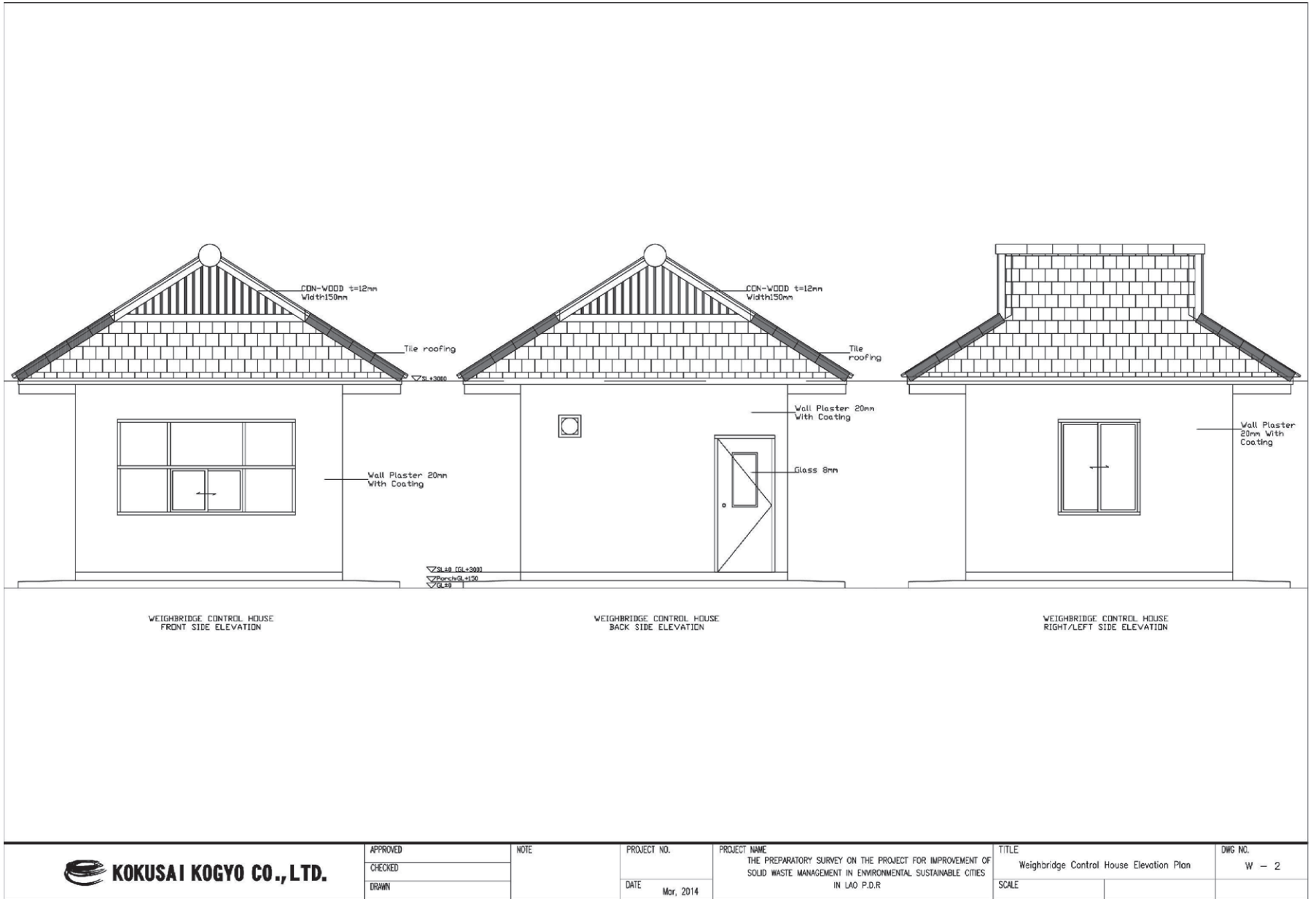
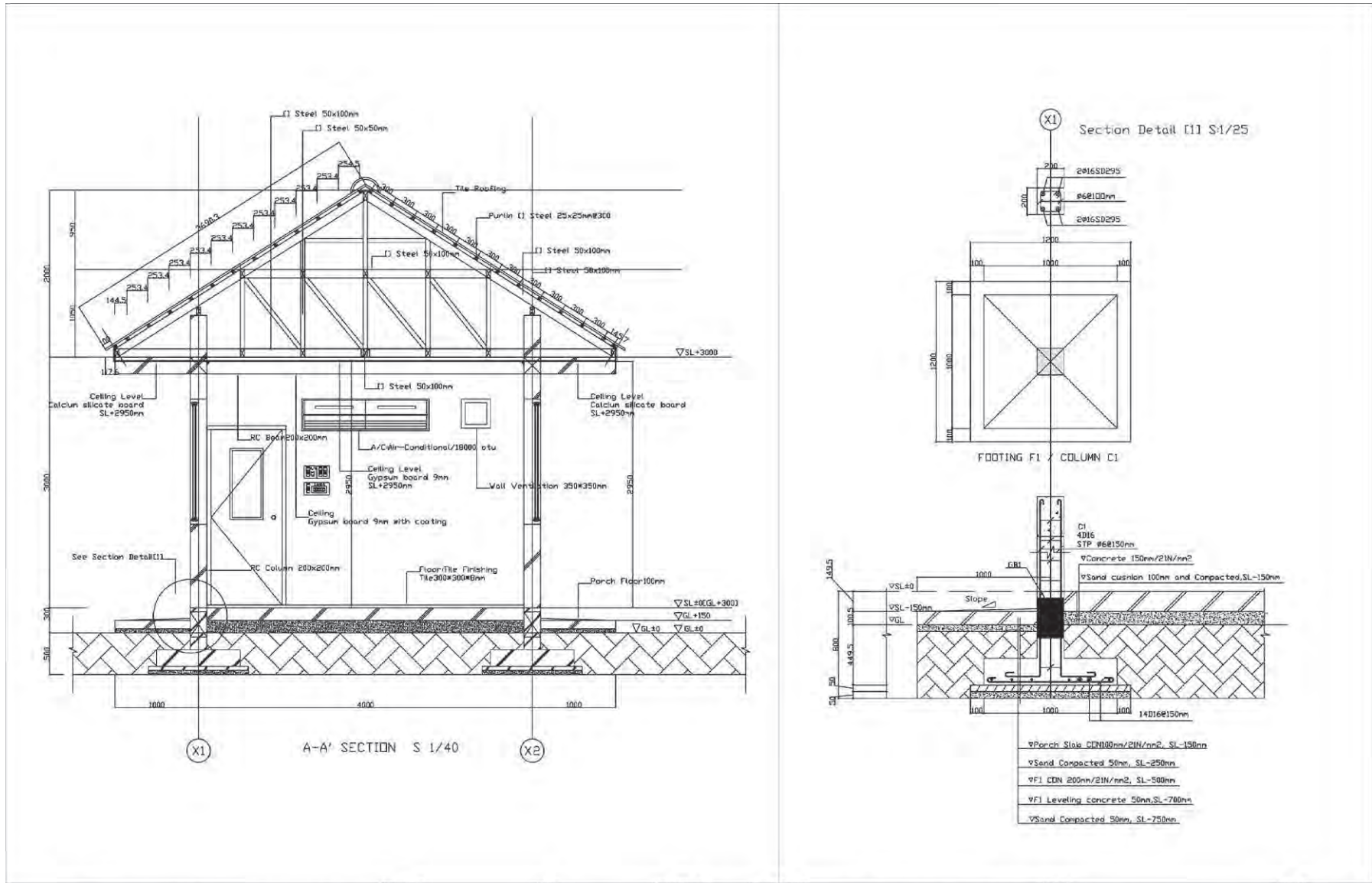
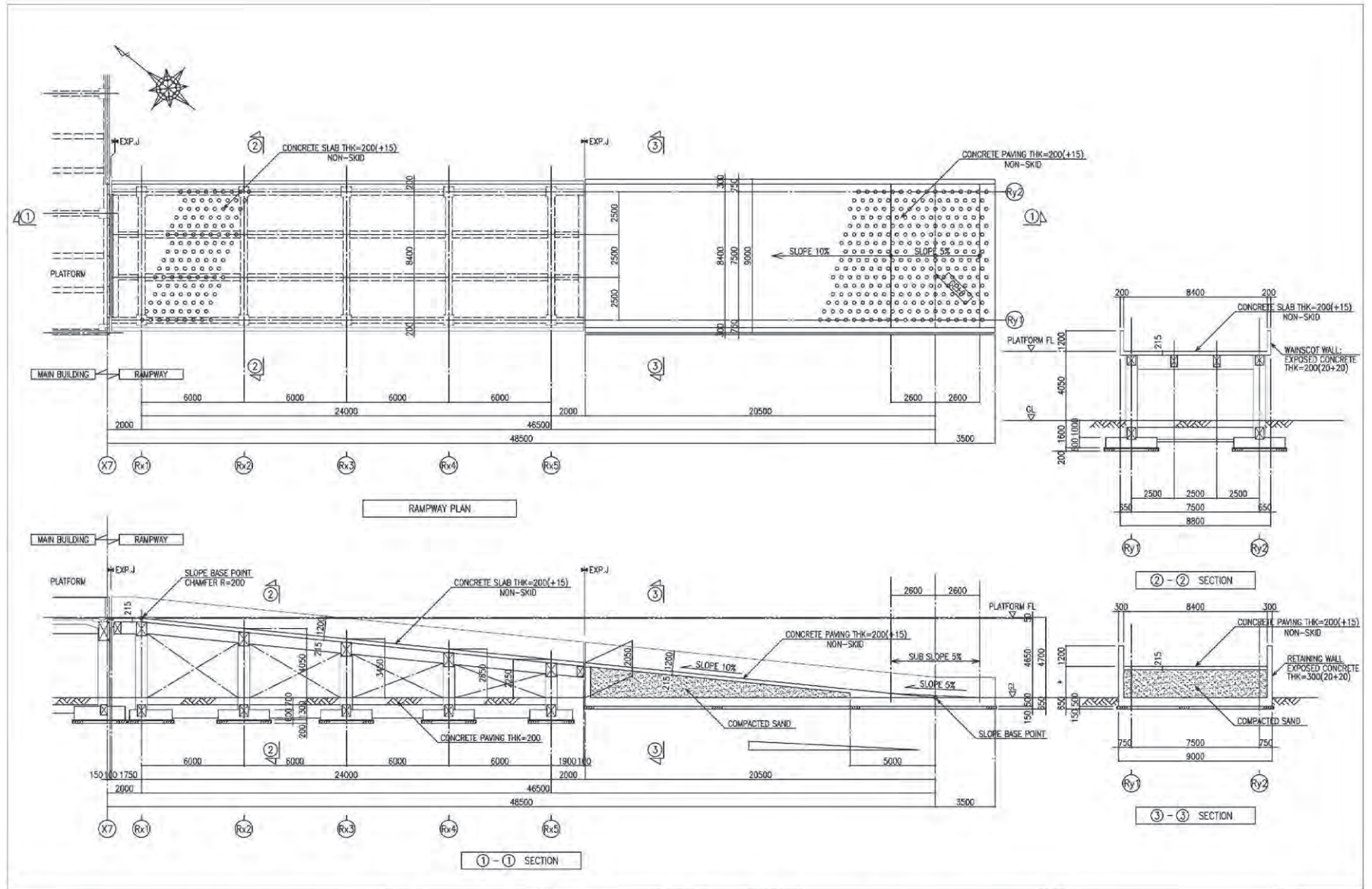


Figure 32: Cross Section of Weigh Bridge Building



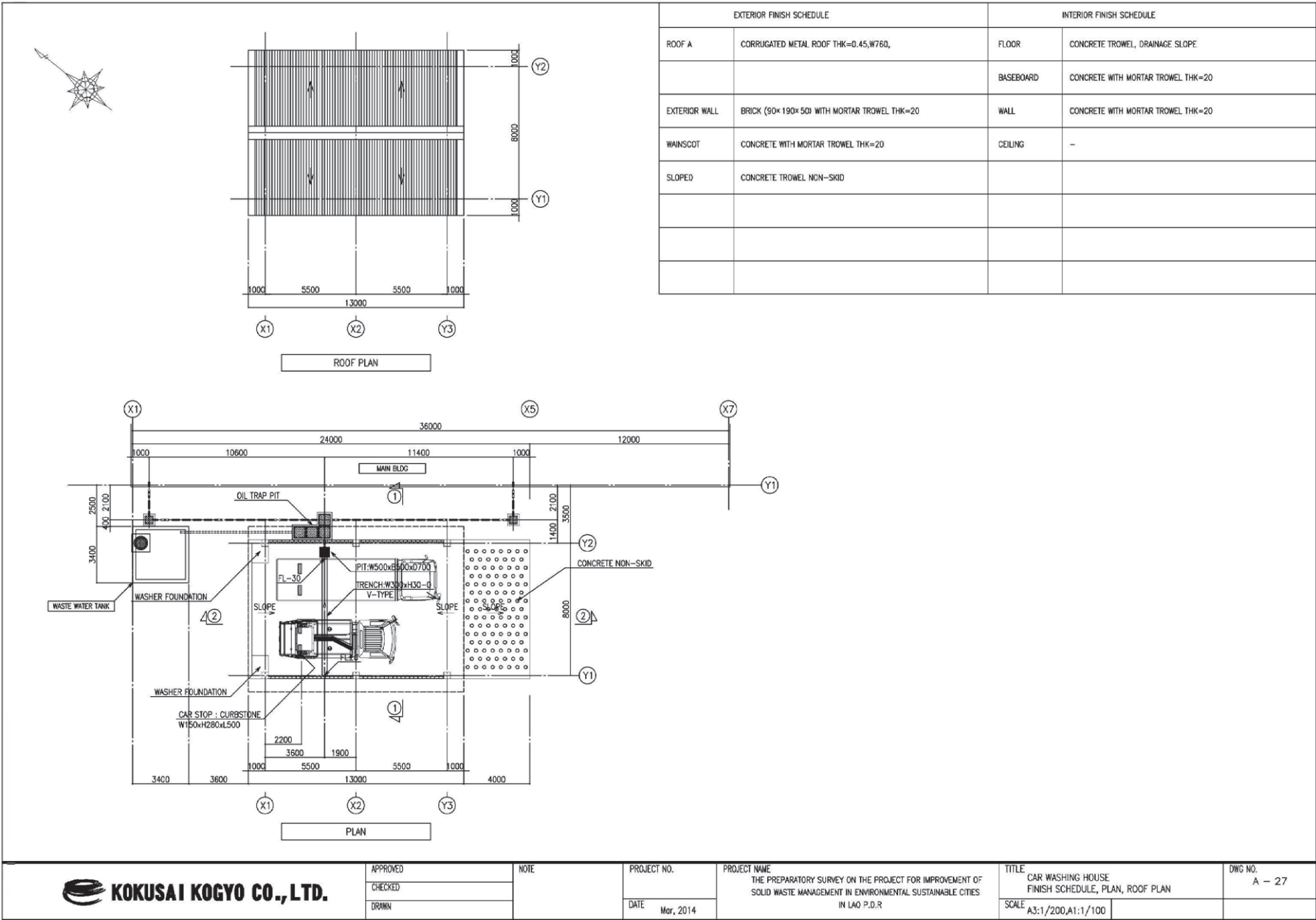
	APPROVED	NOTE	PROJECT NO.	PROJECT NAME	TITLE	DWG NO.
	CHECKED		DATE	THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN ENVIRONMENTAL SUSTAINABLE CITIES IN LAO P.D.R	Weighbridge Control House Elevation Plan	W - 5
	DRAWN		Mar, 2014		SCALE	

Figure 33: Structure of Entrance Ramp



	APPROVED	NOTE	PROJECT NO.	PROJECT NAME THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN ENVIRONMENTAL SUSTAINABLE CITIES IN LAO P.D.R	TITLE	DWG NO. A - 25
	CHECKED		DATE		RAMPWAY PLAN,SECTION	
	DRAWN		Mar. 2014		SCALE A3:1/200,A1:1/100	

Figure 34: Plan of Car Wash Building



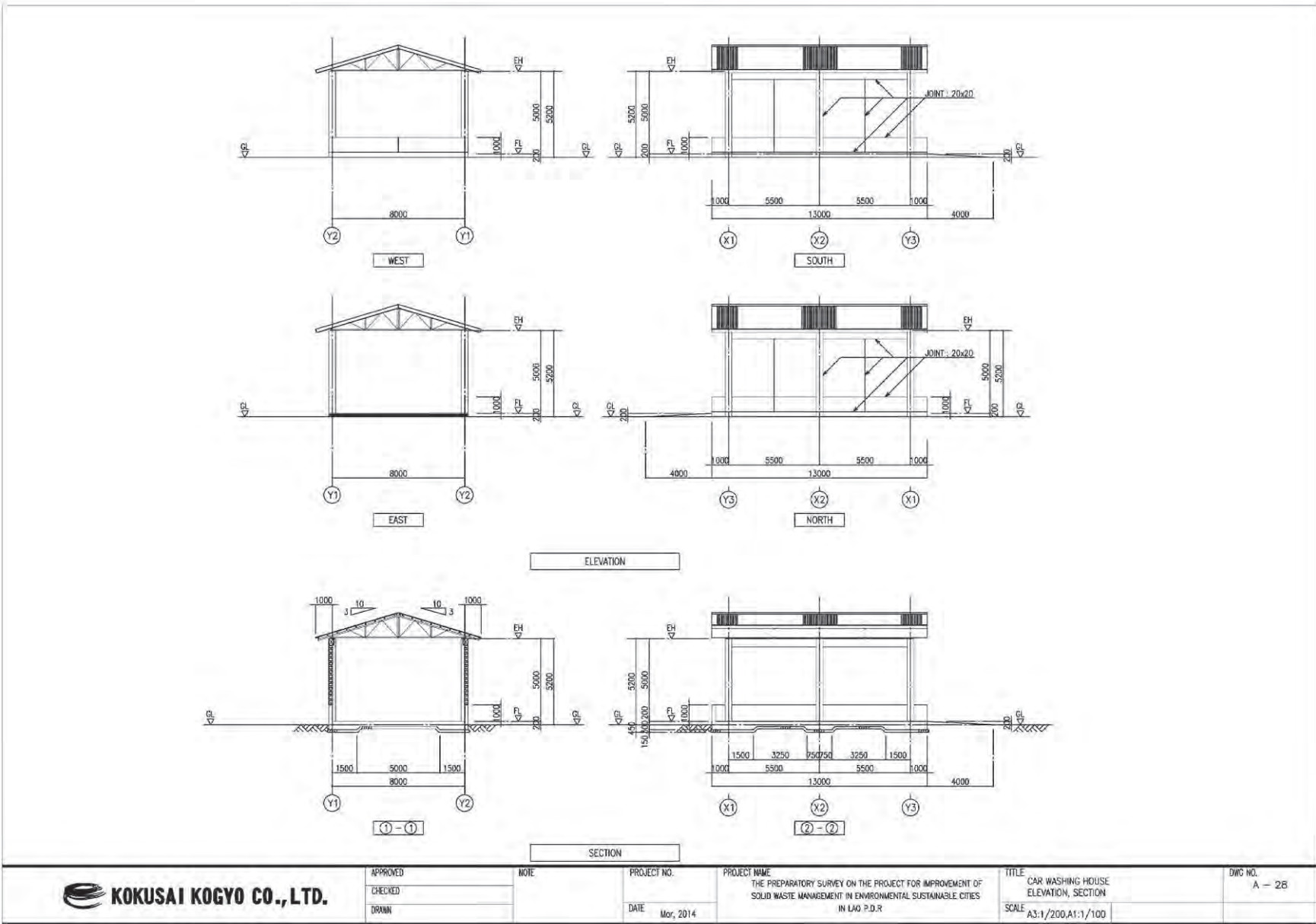
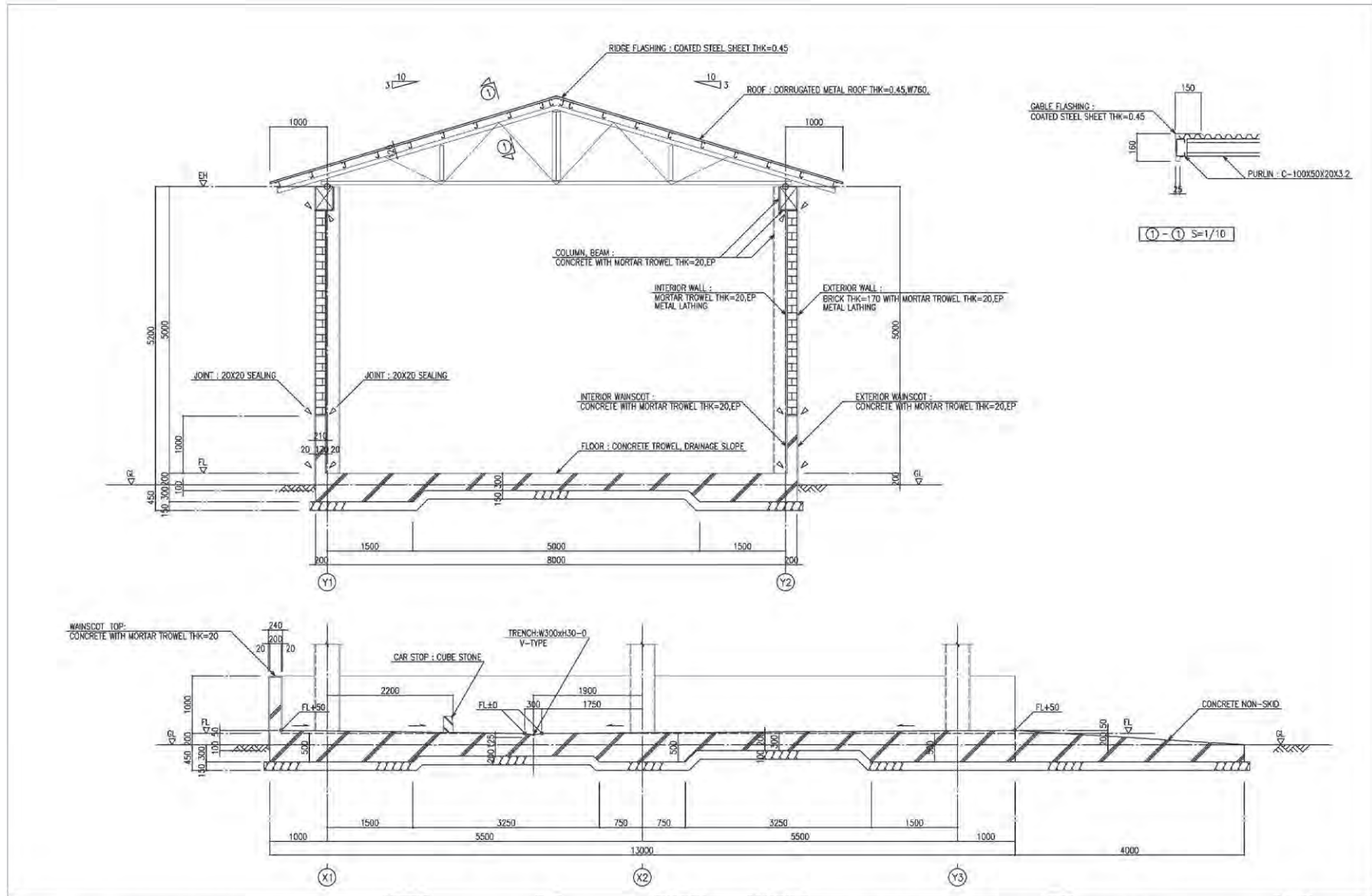


Figure 35: Elevation of Car Wash Building

Figure 36: Cross Section of Car Wash Building



	APPROVED	NOTE	PROJECT NO.	PROJECT NAME	TITLE	DWG NO.
	CHECKED		DATE	THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN ENVIRONMENTAL SUSTAINABLE CITIES IN LAO P.D.R	CAR WASHING HOUSE SECTIONAL DETAIL	A - 29
	DRAWN		Mar, 2014		SCALE: A3:1/60, A1:1/30	

Figure 37: Plan of Toilet Building

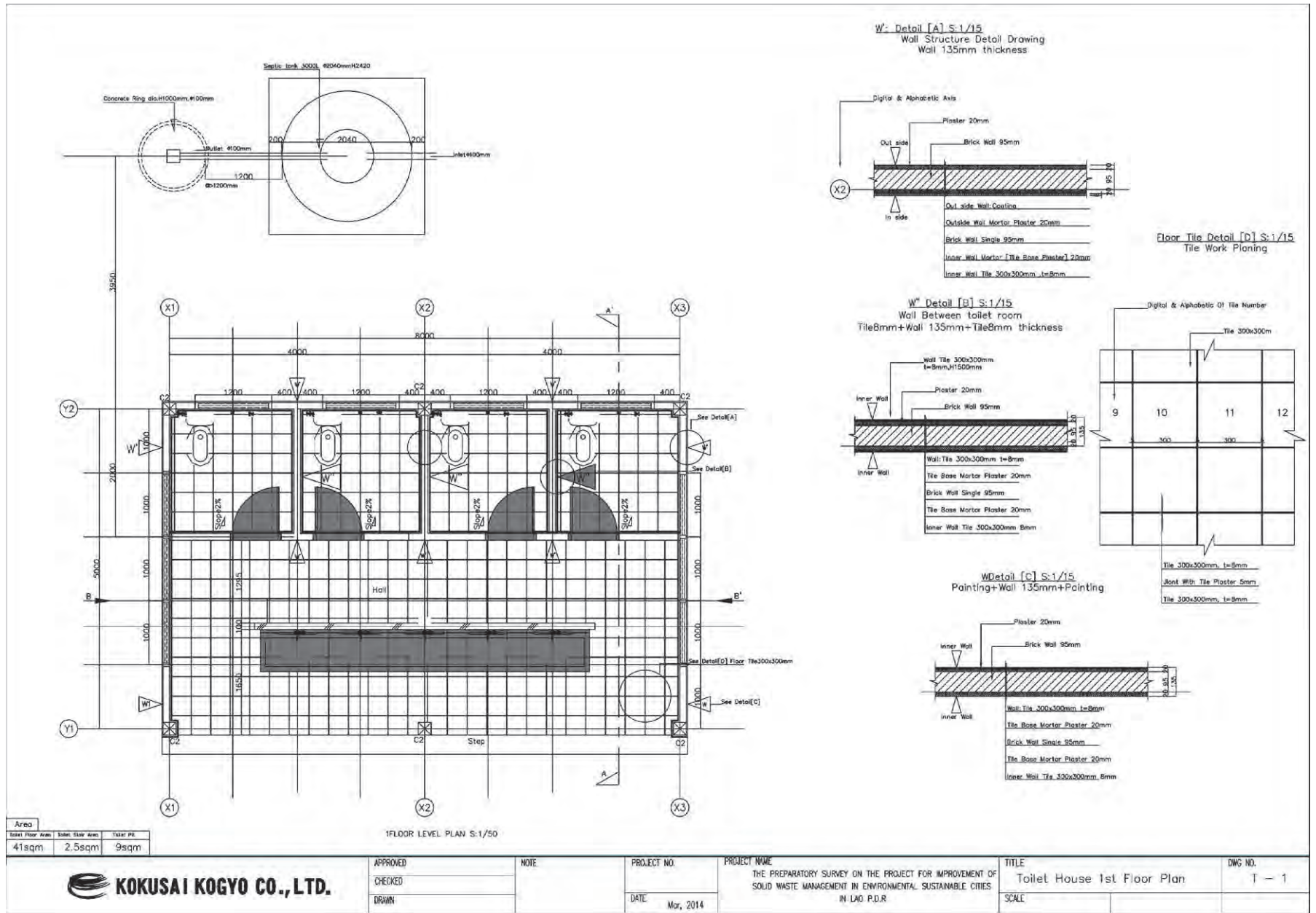


Figure 38: Elevation of Toilet Building

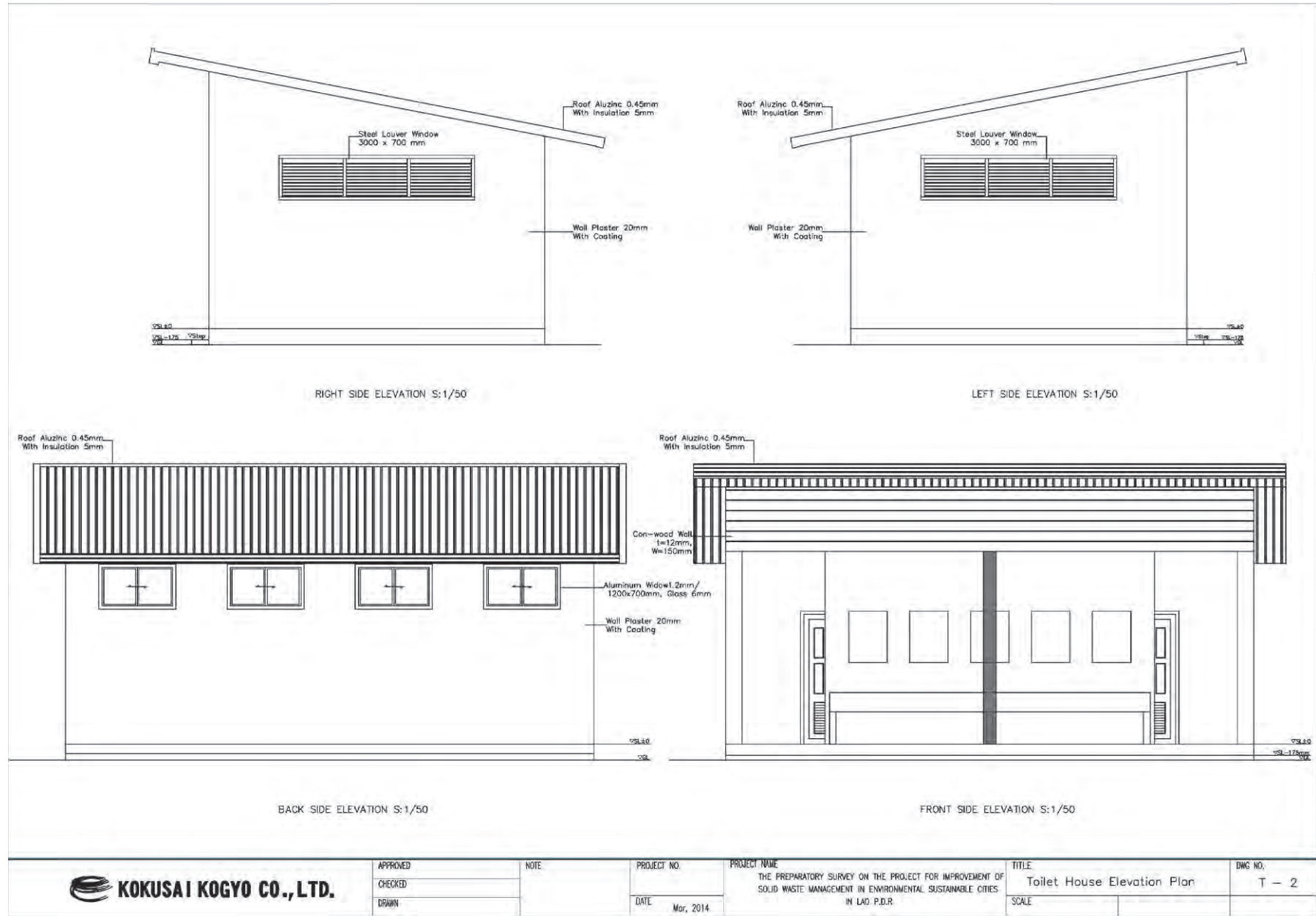
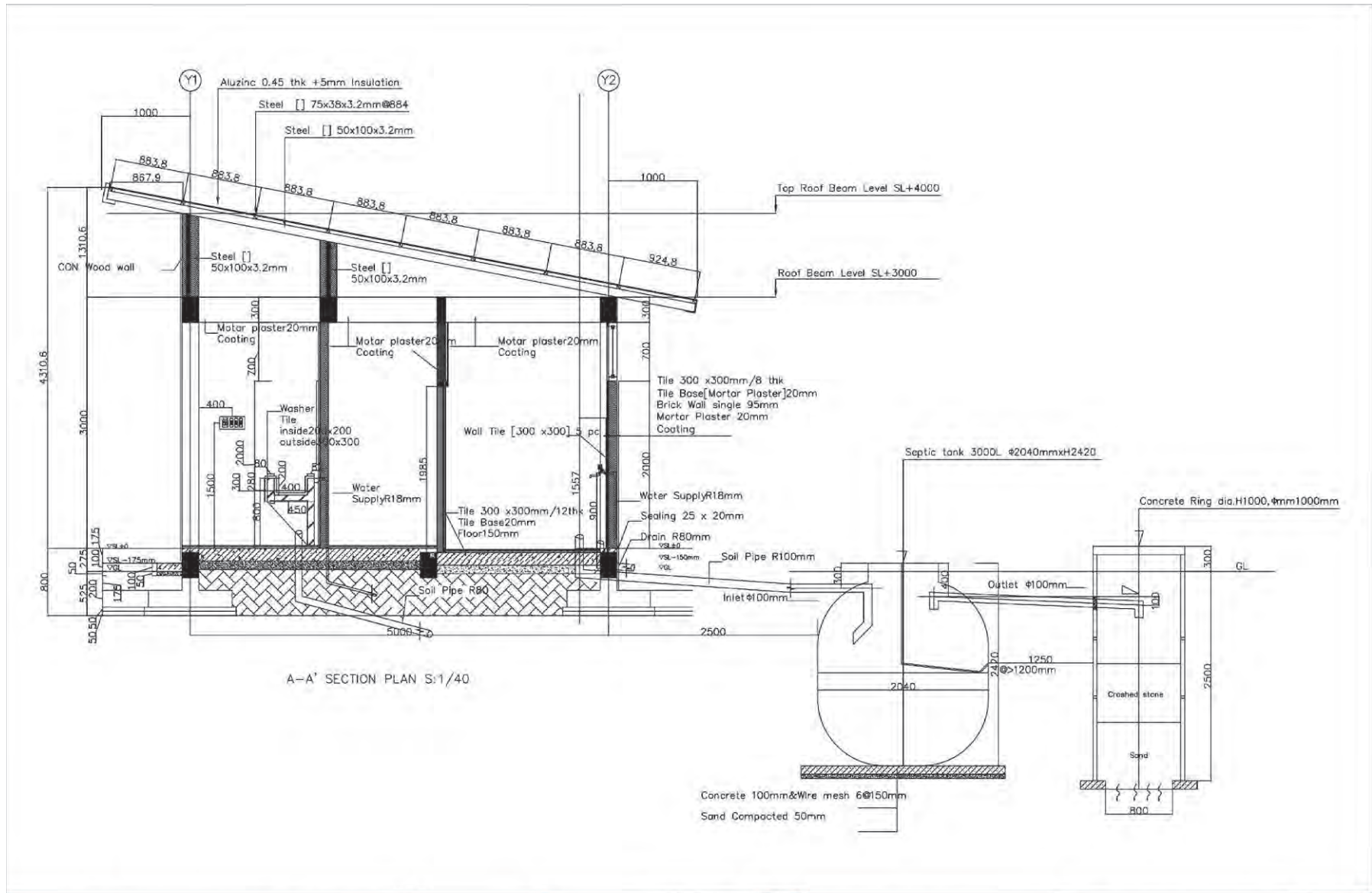
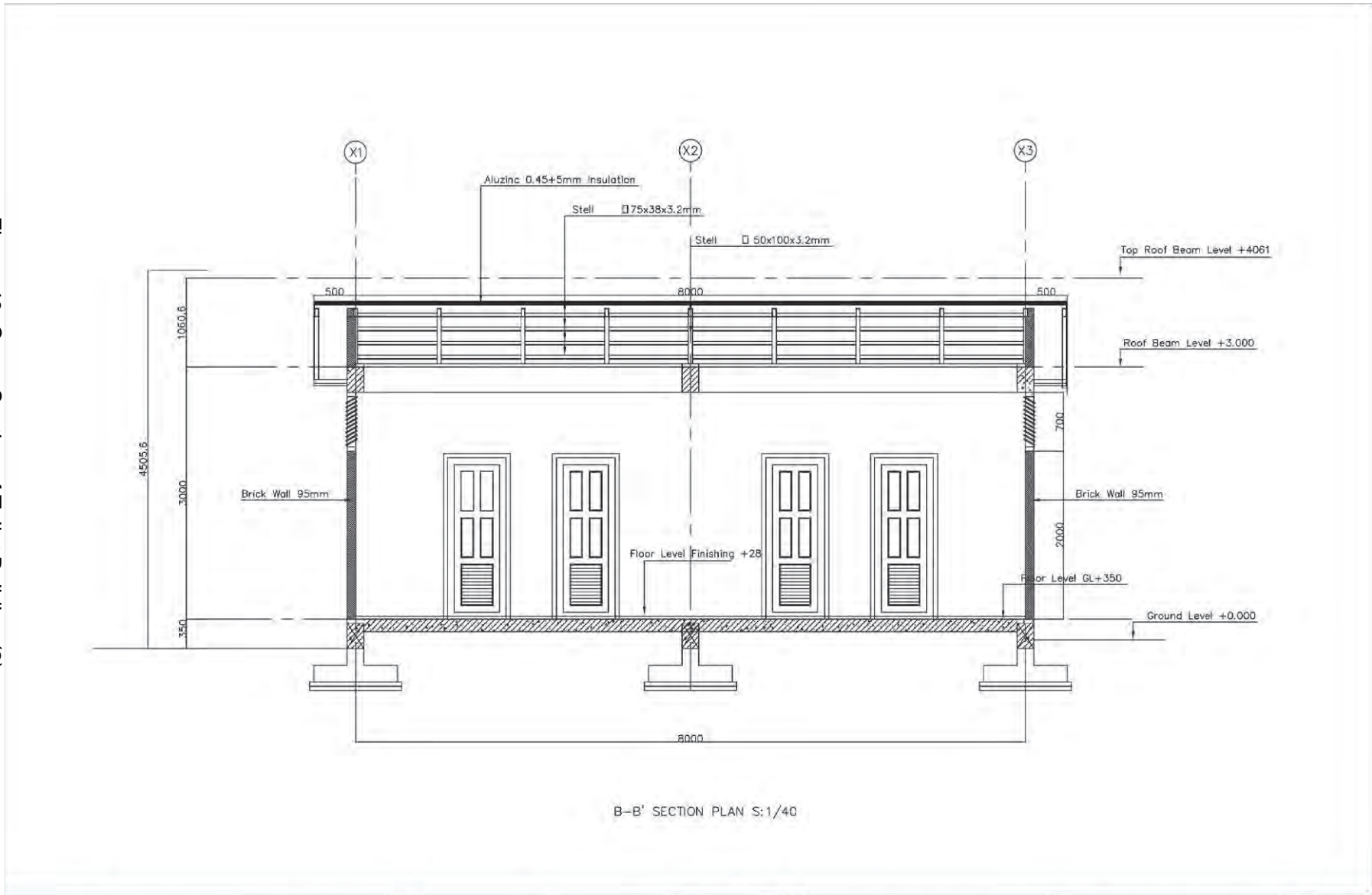


Figure 39: Cross Section of toilet Building (1)



	APPROVED	NOTE	PROJECT NO.	PROJECT NAME	TITLE	DWG NO.
	CHECKED			THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN ENVIRONMENTAL SUSTAINABLE CITIES IN LAO P.D.R.	Toilet House A-A' Section Plan	T - 3
	DRAWN		DATE	Mar, 2014	SCALE	

Figure 40: Cross Section of Toilet Building (2)



KOKUSAI KOGYO CO., LTD.

APPROVED	NOTE	PROJECT NO.	PROJECT NAME	TITLE	DWG. NO.
CHECKED		DATE	THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN ENVIRONMENTAL SUSTAINABLE CITIES IN LAO P.D.R.	Toilet House B-B' Section Plan	T - 4
DRAWN		Mar, 2014		SCALE	

2.2.4. Implementation Plan

2.2.4.1. Implementation Policy

(1) Basic Policy

The Project shall be implemented in accordance with the scheme of the Japanese Grant Aid. The Grant Aid shall be used for the procurement of the products and services for the Project which is agreed upon in the Exchange of Notes (hereinafter referred to as the “E/N”) between the Government of Japan and the Lao P.D.R.. Following the E/N, the Grant Agreement (hereinafter referred to as the “G/A”) of the Project shall be concluded between the Lao P.D.R. and JICA. The application of Grant Aid to a particular project funded by the Grant will be stipulated in the G/A. The rights and obligations of the Lao P.D.R. and the providers of the products and services for the Project are governed by the tender documents, and by the contracts signed by the Lao P.D.R. with the providers of the products and services. The roles of the concerned parties, including the Government of Japan, JICA, consultants and contractors in relation to the implementation of the Project under the Grant Aid are understood as follows.

- 1) the Government of Japan decides the Grant shall be extended to the Lao P.D.R. in accordance with the relevant laws and regulations of Japan.
- 2) JICA extends the Grant to the Lao P.D.R. in accordance with the relevant laws and regulations of Japan and within the scope of the E/N and pays serious attention to ensure the accountability and that the Grant is used properly and effectively for the Project.
- 3) the Lao P.D.R. is the recipient of the Grant, and is responsible for the execution of the Project. As the client or the buyer, the Lao P.D.R. conducts the procurement of the products and services necessary for the Project implementation using the Grant provided by JICA.
- 4) the Consultant is the firm who renders services to the Lao P.D.R. with regard to designing, cost estimating, tendering and supervising the procurement and the construction works for the Project in accordance with the contract with the Lao P.D.R.; and
- 5) the Contractor is the firm who provides the products and services necessary for the Project in accordance with the contract with the Lao P.D.R.

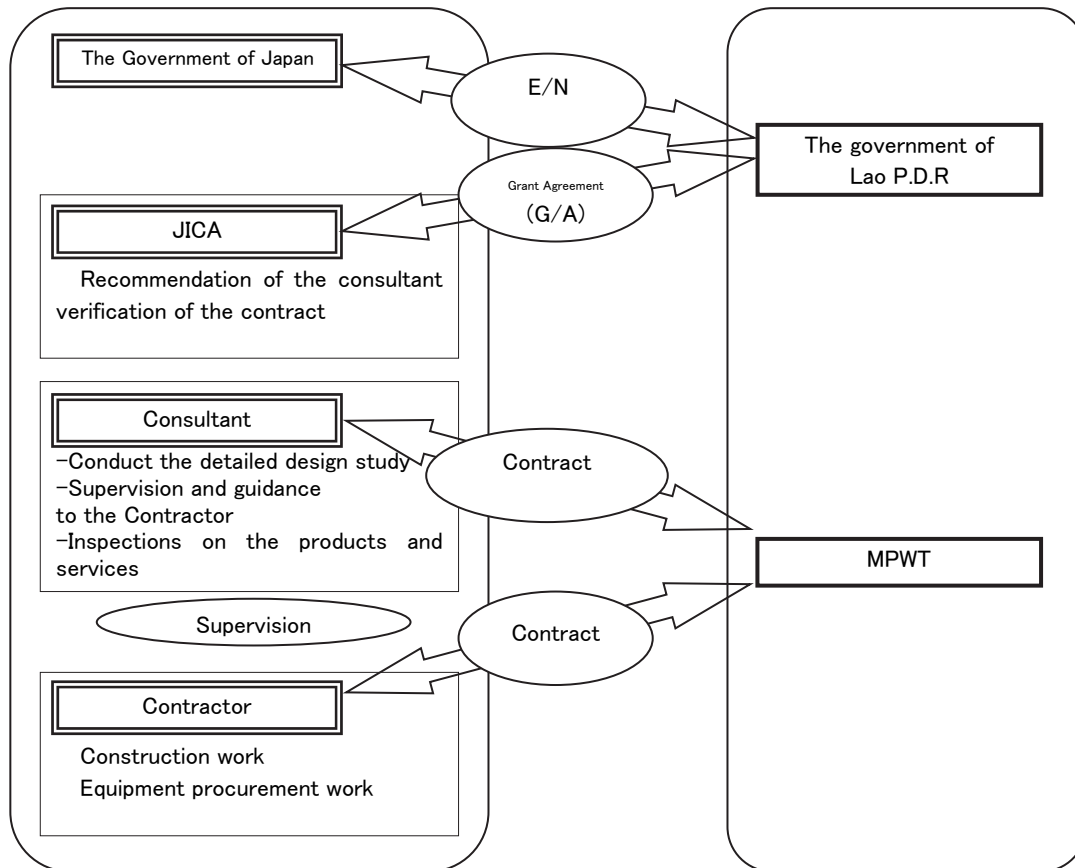


Figure 41: The Roles of the Concerned Parties

(2) Implementing Organization of Lao P.D.R. Side

The executing agency of the Lao side for the Project is MPWT and implementing agency is the director general of DHUP, MPWT. For the smooth progress of the Project, it shall be necessary to contact and consult closely among the Consultant, the Contractors and concerned agencies/organizations of the Lao side. Accordingly, the Lao side shall need to assign responsible persons in charge of the Project. Responsible persons shall understand the roles and duties of the Project and to implement Lao side's obligations including the construction of infrastructure without any delay.

(3) Consultant

The Consultant of the Project shall conclude a contract regarding services for detail design study, tendering and construction/procurement supervising works with MPWT and the Government of Lao P.D.R. In accordance with Japan's Grant Aid scheme, the consultant shall form a project team in order to design and supervise the correct progress of the construction works, following the prescriptions made at the point of outline design. The service contents of each step shall be as follows.

1) Services before the tender

The Consultant shall review the survey results produced by the Preparatory Survey of the Project,

and the Consultant shall indemnify against the consistency in the services.

2) Services in the tender stage

The Consultant shall execute the following services in the tender stage of the Project;

- ✓ Compiling of the tender documents
- ✓ Supporting the tender
- ✓ Supporting preparation of answers to the questions from tender participants and amendment drafts regarding the tender
- ✓ Supporting production of technical evaluations and evaluation tables / evaluation reports
- ✓ Evaluation of tender prices, production of evaluation tables / evaluation reports and determination of the winner of the tender to enter the first round of contract negotiations
- ✓ Supporting the contact negotiations of the Project

3) Services in the stages of construction / procurement supervising works

The Project shall need to dispatch Japanese technicians to Laos to ensure a certain level of quality is maintained in the construction of the Project. Besides, the Project shall be an integrated assistance including equipment procurement and soft component. Therefore, the Project shall place a full-time stationed consultant in Laos for coordinating works among concerned persons of the Laos side and the contractor's side, and also for supervising works of the implementation stage of the Project.

The consultant shall supervise the contractors in order to execute contracts concerning the Project adequately and smoothly. The consultant supervision for the Project shall aim to supervise whether or not the construction and the procurement are being implemented correctly, while ensuring a level of quality prescribed in documents such as specifications and design drawings in the contracts of the Project. It shall also confirm whether or not qualities, standards and the actual dimensions of the facilities meet those prescribed in the contracts of the Project. In addition, it shall also supervise whether or not the contractors are controlling and storing documents concerning their working records such as quality control data, photos and equipment procurement adequately. Besides, the consultant shall visit each manufacturing place at the time of assembly if necessary, in order to prevent finding discrepancies after the delivery of the materials and equipment.

(4) Contractors

According to the Japan's Grant Aid scheme, Japanese contractors who are selected through a bidding procedure will implement the construction works and equipment procurement works for the Project.

Even after the building and the equipment are handed over, it is still necessary to contact the contractors regarding after-sale services, repair and maintenance. Thus, the contractors shall make arrangements for the above services.

1) Necessity of Engineer Dispatch

The construction works in the Project includes material and equipment procurement, transportation and construction, which requires coordination between the parties concerned. Also, it is necessary to dispatch a chief engineer from Japan to manage and supervise construction, including the schedule, quality, and safety. This person will also arrange and manage the schedule of local construction workers, in order to make the most effective use of them under the Project.

2) Policy Concerning the Construction Works

Effective use of local materials and methods shall be considered a high priority in the Project for the smooth implementation and cost reduction.

3) Policy for Equipment Procurement

Equipment which requires special skills for operation and maintenance would endanger the sustainability of the Project, therefore equipment must be universal and available on the market.

2.2.4.2. Implementation Conditions

Described below are those items to be noted for implementation of the project. They should be fully taken into consideration when making the implementation plan.

(1) Schedule Management

Foundation works should be planned avoiding the rainy season. Work schedule should be planned paying attention to the climate conditions and customs in Laos, such as those workers will be in short supply during the Lao New Year in April and the busy farming season.

(2) Sending of Technicians for Equipment Installation

To ensure the continued and appropriate functioning of the supplied waste collection vehicles, heavy machineries for the landfill site operation and drum type storage and transfer equipment to contribute to the proper Solid Waste Management at the three project sites after implementation of the Project, it is extremely important that appropriate operation and maintenance methods are transferred. Technicians with expertise in handling these vehicles and equipment should be selected, and instruction of handling methods (operation techniques, simple repair techniques, and inspection methods) should be given using sufficient time. The instruction should be given carefully making sure the understanding of the responsible persons on the recipient side.

(3) Procurement conditions

It is required to clean and organize spaces for storage and for installation of the equipment procured by the Project before its delivery so that the soft component can commence smoothly. In addition, considering the time it will take to produce the equipment to be procured for the Project, it is important to urge the procurement contractor of the Project to start preparations for the procurement of

equipment well in advance.

(4) Safety Measures

At construction sites, it is necessary to consider safety measures for construction workers. The construction works will involve work in high places such as roofing, so there is a possibility of falling accidents. Consequently, the Project will need to prepare concrete measures to ensure worker safety, such as the wearing of helmets and safety shoes, and prohibiting work going up-and-down.

2.2.4.3. Scope of Works

(1) Scope of Works for Construction

1) Preparation of the Project Site

At the Project site, there is no obstacle to ownership and use of the site for the construction. However, because there are wild fields, bushes and some trees at the construction site, the Laos side shall be responsible for their removal and land reclamation.

2) Access road

The Laos side shall be responsible for improving the existing access road, approximately 700 m, between the main trunk road in Nahai Village and the project site, to a wide asphalt road because it is currently a narrow gravel road and vehicles cannot pass there.

3) Infrastructure

i) Electric Power

The Laos side shall be responsible for wiring works of electric power cables with 100kV from the nearest power lines up to a transformer. The Grant Aid shall cover installation of the transformer, distribution to the facilities in the Project site and wiring inside the facilities.

ii) Water supply

The Laos side shall be responsible for supplying water to the water tank planned in the Project.

iii) Drainage

There are two types of drainage system at the project site, one of them is for sewage water, and the other is for rain water. The sewage water is infiltrating into the ground after it is treated in a septic tank. The waste water from a waste collection vehicle washing area flows to the waste water storage tank through an oil trap to remove the grease and oil of waste collection vehicles. Stored waste water is taken to the KM32 regularly and discharged there by waste water tanker.

The rain water at the project site is collected with a “U” shaped concrete drain and it is discharged out of the premises of the Project site.

iv) Furniture and Equipment

The Laos side shall be responsible for installing the furniture including desks, chairs, shelves and so on which are not included as project items.

4) Application for Permission

i) Construction Permission

The Laos side shall be responsible for submitting the application for construction permission. The Japan side shall only be responsible for preparing the drawings (construction plans).

(2) Scope of Works for Equipment Procurement and Installation

1) Delivery to the Sites

All equipment to be procured in the Project shall be delivered to the Project sites at VTE, LPB and XYB. Delivery shall be implemented by the Japan side.

2) Installation

After completion of delivery of forklifts, initial operation guidance shall be implemented by the Japan side.

3) Scope of Works for the Project

Scope of Works for the Project is as in the table below

Table 38: Major Undertakings, Scope of Works to be Borne by Japan and Lao P.D.R.

NO	Items	To be covered by the Grant	To be covered by Recipient side
1	To secure land necessary for the implementation of the Project and to clear the site		•
2	To construct the following facilities		
	1) The building	•	
	2) The gates and fences in and around the site		•
	3) The parking lot	•	
	4) The road within the site	•	
	5) The road outside the site		•
3	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities necessary for the implementation of the Project outside the site		
	1) Electricity		
	a. The distributing line to the site		•
	b. The drop wiring and internal wiring within the site	•	
	c. The main circuit breaker and transformer	•	
	2) Water Supply		
	a. The city water distribution mains to the site		•
	b. The supply system within the site (receiving and/or elevated tanks)	•	
	3) Drainage		
	a. The city drainage main (for storm, sewer and others) to the site		•
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	•	
	4) Furniture and Equipment		
	a. General furniture		•
	b. Project equipment	•	
4	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine (air) transportation of the products from Japan to the recipient country	•	
	2) Tax exemption and customs clearance of the products at the port of disembarkation		•
	3) Internal transportation from the port of disembarkation to the project site	•	
5	To ensure that 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 be exempted /be borne by the Authority without using the Grant		•
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		•
7	To ensure that [the Facilities and the products]/[the Facilities]/ [the products] be maintained and used properly and effectively for the implementation of the Project		•
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		•
9	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		•
	2) Payment commission		•
10	To give due environmental and social consideration in the implementation of the Project.		•

2.2.4.4. Consultant Supervision

(1) Consultant Supervision

Since the Project shall be an integrated assistance project including facility construction, equipment procurement and soft component, it shall be important to complete each work within the prescribed schedules in accordance with each of their operation plans in order for the observance of the whole schedule of the Project. Moreover, it shall also be important to always grasp the working progress of items to be borne by the Laos side that are vital to the smooth progress of the whole schedule. The Project shall include various types of works such as material and equipment procurement work, temporary work, foundation work, structural work, mechanical work, finishing work and so on. The consultant shall execute their supervising work in collaboration with the implementing organization of the Project.

(2) Consultant Supervision Plan for Construction Works

1) Schedule Control

The consultant shall compare the implementation progress of the construction to be planned at the time of their contracts with those to be carried out actually in order for the observance of deadlines prescribed in the contracts signed by the contractors of the Project. The consultant shall encourage the contractor to keep strictly to the schedule and request the contractor to submit proposed measures and implement these against the issues when schedule delays are predicted, in order that the construction and equipment delivery can be completed on time. The items to be compared with the schedule are as follows.

- ✓ Overall progress (progress of the material and equipment procurement, and construction work)
- ✓ Material and equipment delivery (material, equipment and accessories for construction)
- ✓ Temporary work and provision of construction machines (accordingly)
- ✓ The number of engineers, technicians, general workers, etc.

2) Quality Control and Inspection of Actual Dimensions

The consultant shall supervise whether or not the facilities to be constructed by the Project and its construction materials meet the required quality and actual dimensions as per the contract documents. If the consultant finds any issues with the quality or faults in the contractor's workmanship in the process of their confirming and inspecting work, the consultant shall require the contractors to correct, change and modify them immediately. The items to be controlled are as follows.

- ✓ Examine shop drawings and specifications of construction work
- ✓ Examine shop drawings and specifications of accessories and fixtures
- ✓ Attendance to the production place of the material and equipment or examine the inspection results

- ✓ Examine plans and methods of equipment installation
- ✓ Inspect and confirm performance and actual dimensions

3) Safety Control

By discussing and cooperating with the responsible persons of the contractors for safety control, the consultant shall supervise the contractors to prevent industrial accidents, injuries and accidents to third persons at the Project site during the implementation term. Important points for the safety control at the site shall be as follows.

- ✓ Formulation of safety control regulations and selection of responsible persons for safety controls
- ✓ Avoidance of accidents by the regular inspection of construction machines
- ✓ Formulation of the operational routes of vehicles for construction and transporting machines and adherence to safe driving practices
- ✓ Setting of facilities and equipment for safety controls and their regular checks
- ✓ Welfare measures for construction workers and encouragement to take days off

4) Dispatching of the Consultant

As regards to consultant supervision of the Project, the consultant shall assign a supervisor stationed in Laos who has experienced construction supervising works abroad. The consultant shall also dispatch the engineer properly in accordance with the capacities and contents of the construction work of the Project as described in the following table.

Table 39: Dispatching of the Consultant for Construction Works

Consultant	Working Contents	Timing (Total Term)
Project Manager	Supervision of the whole project, attendance at the commencement, final completion of the Project, etc.	When necessary
Stationed Supervisor (Resident Consultant staff)	Supervision of the whole construction work, negotiation and consultation with organizations concerned with the Project, confirmation of design / shop drawings and specifications.	During the Project implementation
Structure Engineer	Supervision of foundation and structural work.	When necessary
Mechanical and Electrical Engineer	Supervision of piping, and air conditioning works	When necessary
Mechanical and Electrical Engineer	Electric systems / wiring	When necessary

5) Construction Management by the Contractor

In order to ensure the quality of the building and that deadlines are met, it is desirable for the work to be managed by a Japanese engineer. Therefore, a well experienced Japanese engineer shall be stationed at the construction site for the whole period of construction. Mechanical and electrical engineer shall be also dispatched according to the progress. Other necessary engineers shall be hired locally. During the construction period, the Japanese engineers are expected to transfer their construction skills and technology to Lao engineers.

Considering the scale of the construction in this Project, at least the engineers listed below shall be necessary.

Table 40: Personnel Dispatching by the Contractor

Contractor	Working Contents	Timing
Director (Site Representative)	Manage the whole work, obtain approval, manage procurement of material, equipment and accessories, manage workers, and site works	During the Project implementation
Mechanical and Electrical Chief Administrator	Manage mechanical and electrical work Manage procurement of material, equipment and accessories, workers, and do the accounting	When necessary During the Project implementation

(3) Consultant Supervision Plan for Equipment Procurement Works

1) Specification, Quality and Quantity

The consultant shall supervise whether or not the equipment to be procured by the Project meets the specifications, quality and quantity required by the contract documents.

2) Installation of Equipment and Operational Training

The consultant shall supervise whether or not the equipment are possible to be delivered to the facility to be constructed. After delivery to the Project site, the consultant shall supervise operation training to be executed by the contractor.

3) Dispatching of the Consultant

The consultant shall dispatch the engineer properly as described in the following table.

Table 41: Dispatching of the Consultant for Equipment Procurement Works

Consultant	Working contents	Timing
Procurement supervisor	Procurement supervision, inspection of delivered equipment	When necessary
Stationed procurement supervisor	Confirmation of quantities, specifications, initial instructions and shipping inspection	When necessary
Inspector in Japan	Confirmation of shop drawings and specifications, factory and shipping inspection shipping inspection in Japan	When necessary
Inspector in Lao	Inspection of malfunction before expiry of warranty	When necessary

2.2.4.5. Quality Control Plan

It is feasible to procure the materials, equipment and machines for the construction domestically. However, as Lao P.D.R. has imported many goods from neighbouring countries, the quality of domestically sourced items varies. Therefore, the specifications and performance of the materials, equipment and machines used for this Project require careful examinations before they are approved. For the quality control of reinforcement bars, concrete, mortar etc., which will be processed at the construction site, the rules specified in the construction method to be specified during implementation of the Project must be followed.

When concrete temperatures are high, there is a possibility of increased risk of slump declines and cracks by rapid vaporization of surface moisture on the concrete. Accordingly, the Project shall need to reduce the temperature of the concrete by considering the method of their in-site transporting, placing and curing works.

To examine concrete quality, the Project shall carry out the compressive strength test of concrete at public institutions in Lao P.D.R. In terms of reinforcement bars, the Project shall carry out their quality controls by confirming their inspection certificates. As for the tensile strength test of reinforcing bars the Project shall carry out the test at public institutions.

To ensure the quality of the construction works, the Project shall need the following quality controls in terms of the major works of the construction.

Table 42: Items of Quality Controls and Methods of Major Works

Works	Items of Quality Control	Method of Quality Control
Temporary work	Locations of the permanent and temporary facilities, etc.	Staking out inspection, confirmation of benchmark
Earth work	Excavation	Confirmation of bearing stratum
Piling work	Cast in place concrete piles	Confirmation of position and bearing stratum
Reinforcement bar work	Material	Tensile strength test, confirmation of inspection certificate
	Arrangement	Confirmation of diameter, numbers, binding, etc.
Concrete work	Fresh concrete	Confirmation of slump, air content, temperature, etc.
	Concrete placement	Confirmation of placing situation
	Formwork	Inspection of forming
	Concrete strength	Confirmation of compressive strength test
Roofing work	Water leakage	Visual inspection, sprinkling inspection
Plastering work	Flatness, unevenness	Visual inspection of finishing
Door and window work	Installation	Visual inspection
Painting work	Surface finishing, color	Visual inspection
Electric power system work	Performance, operation	Confirmation of factory inspection result, operation test
Piping work bending,	Twist, support pitch	Visual inspection
Wiring work	Damage	Measurement of resistance value, visual inspection
Lightning work	Resistance value	Measurement of resistance value, visual inspection
Lighting work Performance	Operation	Visual inspection
Water supply work Support pitch,	Water leakage	Water pressure test, visual inspection
Air conditioning work	Performance, operation	Operation test

2.2.4.6. Procurement Plan

(1) Procurement method

1) Construction materials

Construction materials produced in Laos are sand and gravel, wood, hollow bricks, unglazed roof tiles, and concrete blocks, as well as cement and steel bars that have come to be produced recently. Import restrictions are imposed on these items. Many of other construction materials are made in Thailand and imported. Although these can be procured in Laos, procurement from Thailand should be considered regarding piles, steel frame materials, and metal roofing materials because of the problems in quality and quantities.

(2) Consumable Goods and Spare Parts for the Equipment

While the equipment to be procured under this project shall in principle be procured from Japan or in Laos, some may also be procured in third countries if deemed as more favourable for the project in consideration of the following conditions with prior approval of the Government of Japan.

- ✓ The equipment to be procured is not manufactured in Japan.
- ✓ Although the equipment is manufactured in Japan, limiting the procurement country to Japan may undermine the fairness in the tender.
- ✓ The transportation cost of equipment is extremely high; the procurement from Japan may have a negative impact on the efficacy of the project.

(3) Transport Plan

The route for the transportation of construction materials and equipment from other countries to VTE begins with landing at Bangkok Port in Thailand. Following inland transportation in Thailand, the route crosses the Friendship Bridge from Nong Khai on the Thai side. After customs clearance in Thanaleng on the Lao side, it reaches VTE. It takes about 2 weeks from Bangkok Port to VTE.

2.2.4.7. Operational Guidance Plan

The Project shall implement operation guidance for waste collection vehicles, heavy machineries and the drum type waste storage and transfer equipment at the solid waste transfer station so that these are operated safely and properly. The contractor of equipment procurement shall train those operators designated by the Lao side. Operation guidance shall include the operation and maintenance training.

2.2.4.8. Soft Component (Technical Assistance) Plan

The project will be the first such solid waste transfer station to be built in Laos, therefore, it will be the counterparts' first experience in planning, designing, constructing and operating such a facility. In particular, the Soft Component will have to give technical assistance in operational capacity in 1) establishing a waste collection vehicle (provided by the Project) deployment plan regarding vehicles transporting waste into the new solid waste transfer station as part of the expanded collection area, 2) appropriate organizational management of the solid waste transfer station, and 3) securing an access route into the final disposal sites by large compactor trucks transporting waste from the solid waste transfer station.

2.2.4.9. Implementation Schedule

The implementation schedule of the Project is shown in the table below.

Table 43: Implementation Schedule of the Project

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
Detail Design	■ (Assignment in Lao)																					
		□ (Assignment in Japan)																				
			■ (Assignment in Japan)	Total 3.0 Months																		
Construction and Procurement									■ (Preparation and temporary work)													
									■ (Foundation work)													
									■ (Structure work)													
									■ (Facilities and finishing work)													
										■ (Exterior work)												
				■ [Procurement of equipment]																		
		■ (Assembling/Procurement: Transfer station equipment)																				
																	■ (Transportation)					
																		■ (Installation/adjustment)				
		■ (Assembling/Procurement: vehicle and heavy machineries)																				
																		■ (Transportation)				
																			■ (Initial instruction of operation)			
																	Total 14.0Months					

2.3. Obligations of Recipient Country

2.3.1. General Items

In the implementation of Japan's Grant Aid Scheme, the Laos side is required to undertake certain measures as follows:

- 1) To ensure prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.
- 2) To exempt from customs duties, internal taxes and other fiscal levies that would normally be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.
- 3) To accord the agent whose services may be required in connection with the supply of the products and services under the verified contracts, such facilities that may be necessary for their entry into the recipient country and stay therein for the performance of the work.
- 4) The recipient country is required to operate and maintain the facilities constructed and equipment purchased under the Grant Aid properly and effectively.
- 5) Assign the staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.
- 6) Bear the commissions paid to the bank for banking services based upon the B/A.

2.3.2. Special Items for the Project

The following special items are required to be undertaken by the Laos side when carrying out the Project

- 1) To submit the application for construction works and others related to the Project if any, and to obtain permission for these.
- 2) To prepare the land, remove trees and other preparatory construction related to the Project.
- 3) To construct the gate at the main entrance and install the fence along the premises of the Project site
- 4) To construct the access road between main road in Nahai Village and the Project site
- 5) To bring in power lines, water supply and drainage to Project site.
- 6) To secure the parking lot for vehicles and heavy machineries.
- 7) To plant trees surrounding the project site as a buffer zone to mitigate environmental issues.

2.3.3. Operability for Obligations of Recipient Country

Lao side agreed on the obligations of recipient country in the minutes of meeting on the mission on 20th September 2013; in addition the Lao side agreed on the cost estimation for obligation of recipient country in the technical note on 2nd October 2013.

2.4. Project Operation Plan

2.4.1. Waste collection vehicles and heavy machineries for final disposal site

2.4.1.1. Administration plan

(1) Operation system and organization

The actual execution bodies at three project sites are VUDAA, and UDAA in LPB and XYB. These execution bodies have carried out the Solid Waste Management including waste collection service and operation of landfill sites since the year 1999. Moreover, these agencies are the main counterpart of LPP-E in parallel and LPP-E contributes to establishing the proper operation system and organization by the capacity development of VUDAA, and UDAA in LPB and XYB.

These execution bodies are expected to expand the organization and train the new drivers to properly operate the newly procured vehicles and heavy machineries when the project starts. Each execution body has an administration unit and already has the knowledge and experience to discipline staff well and to expand the collection service.

(2) Personnel assignment plan

The planned number of waste collection vehicles and heavy machineries procured in this project covers the target waste collection amount in 2020. The number of staff is planned to increase in accordance with the progress of expansion of service area and increasing of collection waste amount year by year. The waste collection amount in 2013, the target waste collection amount and the increased rate in 2020 are as outlined in the table below.

Table 44: Personnel Assignment Plan

Site	Items	Unit	2013	2020	Additional
VTE (VUDAA)	Waste amount	ton/day	69.3	259.3	
	Collection vehicle	Unit	25	71	
	Driver	Person	25	71	
	Worker	Person	75	213	
	Total	Person	100	284	184
	Operator of heavy machinery	Person	1	3	2
LPB (UDAA)	Waste amount	ton/day	20.6	54.4	
	Collection vehicle	Unit	3	11	
	Driver	Person	3	11	
	Worker	Person	9	33	
	Total	Person	12	44	32
	Operator of heavy machinery	Person	1	2	1
XYB (UDAA)	Waste amount	ton/day	19.2	39.1	
	Collection vehicle	Unit	4	8	
	Driver	Person	4	8	
	Worker	Person	12	24	
	Total	Person	16	32	16
	Operator of heavy machinery	Person	1	2	1

(3) Operation plan of waste collection and final disposal

1) Waste collection management

All necessary costs of waste collection in VTE, LPB and XYB are paid by the collection fee from the beneficiaries such as residents, businesses, shops, markets, and so on. When the collection service area is expanded and the collection rate is increased using the newly procured collection vehicles in accordance with the target waste collection amount, the procedure of making new contracts with new beneficiaries must be carried out properly. VUDAA and UDAA shall educate the staff who belong to the villages and the personnel who promote the new waste collection contract with residents to increase the collection rate.

2) Appropriateness of solid waste transfer station in terms of waste collection

The main objective of the solid waste transfer station is to reduce the operation cost of transportation of waste from generation source to KM32 disposal site. The cost to transport directly from the generation source by small collection vehicles to KM32 disposal site is more than the cost of transportation via solid waste transfer station, therefore, the operation of solid waste transfer station achieves its objective. Furthermore, the cost of transporting directly to KM32 disposal site from the generation source by skip-loader with 5m³ containers, and the cost of transportation via solid waste transfer station are estimated. And as a result, the cost of transportation via solid waste transfer station is less than the cost of transporting directly to KM32 disposal site. The breakdown of the cost estimation is mentioned in Annex 7-6.

**Table 45: Comparison of the Operation Cost of Transporting
between Directly KM32 Disposal Site and via Solid Waste Transfer Station**

Items	Direct transportation (LAK/ton)	Transportation via solid waste transfer station (LAK/ton)
Primary collection (from generation source to solid waste transfer station or to final disposal site)	130,088	57,914
Secondary collection (from solid waste transfer station to final disposal site)		47,558
Cost of transferring at the solid waste transfer station		11,951
Total	130,088	117,423

The details of appropriate waste collection area, distance, types of collection vehicles and schedule related to solid waste transfer station are planned during Soft Component support.

3) Operation of final disposal site

The new procured collection vehicles shall be registered to be measured the weight at the weigh bridge at VTE and LPB final disposal site and the tipping fee from those collection vehicles is collected in the same manner as the current system. Since some waste pickers are collecting the recyclable waste at the final disposal sites in the three Project sites, the working place and the working time of waste pickers and the location and timing of waste discharge by VUDAA or UDAA shall be different to avoid any kind of accident. The access route for the large compactor trucks (20m³) at

KM32 final disposal site in VTE is planned to be supported by Soft Component to discharge solid waste properly. And one or two foremen are assigned to instruct the proper discharging of waste by using the large compactor trucks (20m³) at the final disposal site.

2.4.1.2. Maintenance plan

The KM7 central workshop to maintain the collection vehicles in VTE was established in 1997 by Japan Grant Aid Project and procured some of the dump trucks and skip loaders which have been well maintained at the workshop since 1997. The new waste collection vehicles procured by this Project are expected to be maintained properly at existing KM7 central workshop as well. In LPB and XYB, there are small workshops belonging to UDAA to repair minor trouble of waste collection vehicles and some private workshops to repair major troubles of these vehicles. The new waste collection vehicles in LPB and XYB are also expected to be maintained at these workshops.

2.4.2. Solid waste transfer station

2.4.2.1. Administration plan

(1) Operation system and organization

The solid waste transfer station is established in VTE and the section of solid waste collection and discharging of VUDAA is in charge of its operation.

(2) Personnel assignment plan

The required number of staff to operate the new solid waste transfer station is 4 persons (2 persons x 2 lines) and can be employed by VUDAA. The number of staff assigned to the current solid waste transfer station at KM7 central workshop is two persons; therefore, two additional persons must be employed by VUDAA for new solid waste transfer station before it starts operation.

(3) Operation plan of solid waste transfer station

The working schedule of collection vehicles and large compactor trucks (20m³) is properly planned in accordance with the capacity of transferring at solid waste transfer station. Moreover, daily maintenance of drum type storage, cleaning of facility, parking schedule for collection vehicles are conducted properly.

The details of these operations are supported by Soft Component.

2.4.2.2. Maintenance plan

The maintenance system of the solid waste transfer station is organized by the staff working at KM7 central workshop. Although there are 10 mechanics working at KM7 central workshop, additional mechanics will be recruited for the solid waste transfer station.

The drum type storage and transfer equipment of waste is simple and consists of a rotary motor and has fewer items that require maintenance. The operation of drum type storage and transfer equipment only requires direct instruction to the staff of solid waste transfer station during the test operation. A major concern is that waste may damage the drum type storage and the transfer equipment, therefore, waste such

as concrete blocks and long objects should be avoided. The waste composition survey at generation source must be conducted and the plan of acceptable waste must be defined before starting the operation of the solid waste transfer station.

2.5. Project Cost Estimation

2.5.1. Initial Cost Estimation

Total Project Cost borne by the Lao side; approximately 665,964USD (66.1 Million Japanese Yen).

(1) Project cost borne by the Lao side

<u>Total Project Cost borne by the Lao side</u>	<u>665,964USD</u>	<u>(Approx.66.1Million JPY)</u>
1) To construction of access road to Project site	532,000USD	<u>(Approx.52.9 Million JPY)</u>
2) To bring in power lines to Project site	100,000USD	<u>(Approx.10.0 Million JPY)</u>
3) To construct water supply pipe to Project site	10,000USD	<u>(Approx.1.0 Million JPY)</u>
4) To install the fence along the premises of Project site	10,000USD	<u>(Approx.1.0 Million JPY)</u>
5) To install the fence at the entrance	2,000USD	<u>(Approx.0.1 Million JPY)</u>
6) To plant trees surrounding the Project site	5,000USD	<u>(Approx.0.5 Million JPY)</u>
7) Fee of banking arrangement	6,964USD	<u>(Approx.0.6 Million JPY)</u>

(2) Condition for cost estimation

- 1) Date of estimates: From June, 2013, to August, 2013 (Average of 3months exchange rate)
- 2) Exchange rate: 1USD=99.38JPY
- 3) Period of construction/procurement: The detail is mentioned on the implementation schedule
- 4) Others: The Project should be implemented in accordance with the procedures of Japan's Grant Aid Scheme.

2.5.2. Operation and maintenance Cost

2.5.2.1. Operation and maintenance cost of waste collection

The total operation and maintenance cost of waste collection at each project site in 2020 is estimated as 12,592,186 thousand LAK in VTE, 1,898,795,000 LAK in LPB and 1,006,688,000 LAK in XYB. The necessary operation and maintenance cost of waste collection is borne by waste collection charge from residents, 24,000LAK per contract in VTE, 20,000LAK per contract in LPB and 10,000LAK per contract in XYB. The detail of operation and maintenance cost of waste collection is shown on the table below and the operation cost per vehicles per day is given in Annex.7-7

Table 46: The Details of Operation and Maintenance Cost of Waste Collection in VTE, LPB and XYB in 2020 (private sector not included)

Site	Items	Operation and maintenance Cost	Qty. of procured vehicles	Annual operation and maintenance cost	Remark
		Thousand LAK /year/vehicle		Thousand LAK /year	
VTE	New Procured vehicles	Compactor truck(6m ³)	21	2,717,841	431,404(LAK/day)×300day/year
		Compactor truck(10m ³)	16	2,253,056	469,388(LAK/day)×300day/year
		Compactor truck(20m ³)	3	1,040,100	1,155,665(LAK/day)×300day/year
		Skip-loader (5m ³)	4	562,920	469,100(LAK/day)×300day/year
		Dump truck (10m ³)	2	270,064	450,106(LAK/day)×300day/year
		Water tanker (6m ³)	1	135,032	450,106(LAK/day)×300day/year
		Water tanker for waste water(6m ³)	1	135,032	450,106(LAK/day)×300day/year
		Collection vehicle for health care waste	1	135,032	450,106(LAK/day)×300day/year
Current vehicles (as assumed operation and maintenance cost in 2012)				5,343,109	
Total				<u>12,592,186</u>	
LPB	New Procured vehicles	Compactor truck(6m ³)	4	540,128	450,106(LAK/ day)×300day/year
		Skip-loader (5m ³)	1	140,730	469,100(LAK/ day)×300day/year
		Dump truck (10m ³)	3	405,096	450,106(LAK/ day)×300day/year
		Water tanker for waste water(6m ³)	1	135,032	450,106(LAK/ day)×300day/year
Current vehicles (as assumed operation and maintenance cost in 2012)				677,809	
Total				<u>1,898,795</u>	
XYB	New Procured vehicles	Compactor truck(10m ³)	2	281,632	469,388(LAK/ day)×300day/year
		Skip-loader (5m ³)	1	140,730	469,100(LAK/ day)×300day/year
		Dump truck (10m ³)	1	135,032	450,105(LAK/ day)×300day/year
		Water tanker for waste water(6m ³)	1	135,032	450,106(LAK/ day)×300day/year
Current vehicles (as assumed operation and maintenance cost in 2013)				314,262	
Total				<u>1,006,688</u>	

1LAK =0.013JPY

2.5.2.2. Operation and maintenance cost of final disposal site

Operation and maintenance cost of final disposal site in 2020 consists of the operation of current and new procured heavy machineries and it is estimated as 1,730,155,000 LAK per year in VTE、321,182,000 LAK per year in LPB and 133,364,000 LAK per year. The details of operation and maintenance cost of waste collection are shown as following table.

The necessary operation and maintenance cost of final disposal site is borne by waste tipping fee from execution body of waste collection. Although the current tipping fee is charged as 15,000 LAK per ton in VTE, the total operation and maintenance cost is deficit annually, hence VTE supported approx. 100,000,000 LAK per year subsidiaries to VUDAA in 2012. UDAA in LPB and XYB do not charge tipping fee for the operation and maintenance cost of final disposal site from execution body of waste collection except for the collection of health care waste and garden waste. The introduction of tipping fee charge, same as VUDAA, is expected to operate and maintain final disposal site properly in LPB and XYB.

Table 47: Operation and Maintenance Cost at Final Disposal Site in 2020

Site	Heavy machinery	Daily operation cost for discharging (LAK/day/ton)	Waste amount of discharge (ton/day)	Annual operation and maintenance cost (thousand LAK/year)	Remark
VUDAA	Bulldozer (21ton)	7,741	464.1	1,077,779	464.1 ton/day=Increased waste amount397.8ton/day×7days÷6days Operation day:300days
	Current vehicles (as assumed operation and maintenance cost in 2012)			652,376	
	Total			1,730,155	$\frac{1,730,155 \text{ thousand LAK}}{(659 \text{ ton/day} \times 300 \text{ days})} = 8,751 \text{ LAK/ton}$
LPB UDAA	Bulldozer (10ton)	8,916	88.0	235,382	88.0ton/day=total waste amount75.6ton/day×7days÷6days Operationday:300days
	Current vehicles (as assumed operation and maintenance cost in 2012)			85,800	
	Total			321,182	$\frac{321,182 \text{ thousand LAK}}{(88 \text{ ton/day} \times 300 \text{ days})} = 12,166 \text{ LAK/ton}$
XYB UDAA	Excavator (0.6m ³)	7,063	52.0	110,183	52.0ton/day=total waste amount 44.3ton/day×7days÷6days (Operation day300days)
	Current vehicles (as assumed operation and maintenance cost in 2013)			23,181	
	Total			133,364	$\frac{133,364 \text{ thousand LAK}}{(52 \text{ ton/day} \times 300 \text{ days})} = 8,549 \text{ LAK/ton}$

Note: 1LAK=0.013JPY
The breakdown of the daily operation cost for discharging (LAK/day/ton) is shown in Annex7-8.

2.5.2.3. Operation and maintenance cost of solid waste transfer station

Operation and maintenance cost of solid waste transfer station consist of salary of the staff and charge of electricity for motor of drum storage operation, and is estimated to 186,428,000 LAK per year in 2020. The detail of operation and maintenance cost of waste collection is shown as following table.

The necessary operation and maintenance cost of solid waste transfer station is borne by waste collection charge, 24,000 LAK per contract, from residents.

Table 48: Operation and Maintenance Cost at Solid Waste Transfer Station in VTE in 2020

Items	Unit	Qty.	Unit cost (LAK)	Cost (LAK)	Remark
1. Direct cost				12,946,400	
2. Indirect cost	%	20	12,946,440	2,589,280	
Total	LAK/month			15,535,680	Monthly O&M cost
	Thousand LAK/year			186,428	Annual O&M cost
	LAK/ton			11,951	O & M cost per ton

Note 1 : the waste amount of transfer:52 ton per day, 1,300 ton per month, Operation:25 days per month
2 : Operation hours for transferring of waste: 4hours per day, 25days per month, Motor power 52kW per unit×2unit
3.1LAK=0.013JPY

2.5.2.4. Budget allocation

The revenue related to the solid waste management in VTE composed of waste collection fee, tipping fee at final disposal site from execution body of waste collection, on the other hand, the expenditure includes the cost of waste collection, operation of solid waste transfer station and final disposal site. The balance between the revenue and the expenditure in VTE in 2020 is expected to have a surplus of 1,530,923,000

LAK; therefore, VUDAA can implement stable solid waste management as long as the current price of waste collection and tipping fee at final disposal site is continued to be charged.

The revenue related to solid waste management in LPB is composed only of waste collection fee from the residents, on the other hand, expenditure includes the cost of waste collection and final disposal site. The balance between revenue and expenditure in VTE in 2020 is expected to have a surplus of 99,335,000 LAK; therefore, UDAA can implement stable solid waste management.

The revenue related to the solid waste management in LPB composed of only waste collection fee from the residents; on the other hand, expenditure includes the cost of waste collection and final disposal site. The balance between revenue and expenditure in LPB in 2020 is expected to have a surplus of 99,335,000 LAK; therefore, UDAA can implement stable solid waste management.

The revenue related to the solid waste management in XYB composed of only waste collection fee from the residents; on the other hand, expenditure includes the cost of waste collection and final disposal site. The balance between revenue and expenditure in XYB in 2020 is expected to have a surplus of 2,204,000 LAK; therefore UDAA can implement stable solid waste management..

Table 49: Budget Allocation of Solid Waste Management in VTE, LPB and XYB in 2020

Site	Items	Thousand LAK/year	Remark	
VTE	Revenue	Charge of waste collection	14,370,912	199,596persons÷4 persons/household×24,000LAK/contract×12 months Incoming of waste amount from private waste collection company x unit rate of tipping fee =304.8 ton/day×365days×15,000LAK/ton
		Tipping fee at the final disposal site	1,668,780	
		Total (1)	16,039,692	
	Expenditure	Waste collection	12,592,186	
		Solid waste transfer station	186,428	
		Final disposal site	1,730,155	
Total(2)		14,508,769		
	(1)-(2)	1,530,923		
LPB	Revenue	Charge of waste collection (3)	2,319,312	48,319person ÷ 5persons/household ×20,000LAK/contract×12months
	Expenditure	Waste collection	1,898,795	
		Final disposal site	321,182	
		Total(4)	2,219,977	
	(3)-(4)	99,335		
XYB	Revenue	Charge of waste collection(5)	1,142,256	47,594persons ÷5persons/household ×10,000LAK/contract×12months
	Expenditure	Waste collection	1,006,688	
		Final disposal site	133,364	
		Total (6)	1,140,052	
	(5)-(6)	2,204		

3. Project Evaluation

3.1. Preconditions

Preconditions for the Project implementation, its schedule and the progress as of March 2014 are described in the following table.

Table 50: Preconditions for Project implementation

Precondition	The schedule and the progress as of March 2014	In charge
1 Land acquisition for the implementation of the Project	Completed in December 2013	VTE
2 Necessary procedure for the approval of IEE for solid waste transfer station in VTE	Approved in January 2014	Applied by VUDAA Approved by DONRE
3 Necessary procedure for the approval of building certificate for solid waste transfer station in VTE	Should be authorized before starting construction It takes approx. 3 weeks to authorize since the application is submitted.	Applied by VUDAA Approved by DPWT
4 Fee of banking arrangement	Making contract	MPWT
5 Custom clearance	When necessary	MPWT
6 Tax exemption	When necessary	MPWT
7 <u>Undertakings by Lao side</u>		
• Clear the project site	• Before commencement	
• To construction of access road to project site	• Before commencement	
• To bring in power lines to project site	• Before commencement	
• To construct water supply pipe to project site	• Before commencement	VUDAA
• To install the fence along the premises of project site	• Before completion	
• To install the fence at the entrance	• Before completion	
• To plant trees surrounding the project site	• Before completion	

3.2. Necessary Input from the Recipient Country

The necessary input from the recipient country to accomplish the project is shown as following table.

Table 51: Necessary Input from the Recipient Country

Site	Necessary Input
VTE	Assignment of drivers for new procured collection vehicles and collection workers Establishment of organization for solid waste transfer station
LPB	Assignment of drivers for new procured collection vehicles and collection workers
XYB	Assignment of drivers for new procured collection vehicles and collection workers

3.3. Important Assumptions

Important assumptions to secure the project effects and sustainability will be as follows.

- Serious natural disaster will not occur
- National policy related to the project will not change in Lao P.D.R.

- Deterioration of public order will not occur in the project sites
- VUDAA and UDAAAs in LPB and XYB will be continuously the execution body of solid waste management, although some private companies are taking charge of some waste collection services.

3.4. Project Evaluation

3.4.1. Relevance

The main objective of the Project is to increase the efficiency of solid waste collection and transportation, and it contributes to the improvement of solid waste management in project sites, thus the implementation of the project is significant. Moreover, synergetic effect between LPP-E is expected by the Project. The details of relevance of the Project implementation are described as follows;

(1) Improvement of urban environment and sanitary condition

The objective of the Project is to contribute the improvement of urban environment and sanitary condition by the construction of the solid waste transfer station and the procurement of waste collection vehicles at VTE, LPB and XYB which are registered as 'Environmentally Sustainable Cities' in Laos.

(2) Necessity of the project in accordance with development policy of solid waste management sector in Laos

Lao government set the priority of sustainable economic and social development with environmental considerations in the '7th five-year national economic and social development plan (enacted Oct. 2011, period 2011-2015)' and 'National Environmental Strategy (enacted 2004, period 2004-2020)' and also emphasizes the necessity of strengthening solid waste management capacity in the three cities in 'Environmental Management Action Plan (2011-2015)' enacted by MONRE. Accordingly, this Project corresponds in direction of the strategy and the plans of Lao government.

(3) Conformity to Japanese ODA policy related to the sector of solid waste management of Lao P.D.R.

The Project is categorized as "Development of economic and social infrastructure", significant policy to Japanese ODA for Lao P.D.R., which belongs to the development subject of "Realization of comfortable society harmonized with environment".

(4) Assistance and coordination of other donors or other projects

LPP-E, as a technical cooperation project, is by nature of the scheme focused on strengthening the capacity of human resources, such as the operation of final disposal site, collection of waste fees and establishment of collection rules at the project sites. However, it provides minimal assistance with respect to physical resources. In order to improve this; LPP-E contributes to upgrading the capacity of solid waste management, and the Project is intended to make up for this lack of provision of physical

resources in LPP-E.

Output 2 "Waste Management Capacity of the C/P Agencies", involves both human and physical resources in the case of waste collection for example.

(5) Facilitation of poverty reduction

The new jobs created by the construction of solid waste transfer station and new access road contribute to the facilitation of poverty reduction.

3.4.2. Effectiveness

Expected effectiveness of the Project implementation consists of quantitative effects and qualitative effects as follows.

3.4.2.1. Quantitative effect

This Project is expected to bring the following quantitative effects

Table 52: Quantitative Effect of the Project

Indicator	Project site	Base line data (2013) ton/day	Target (2020) ton/day
	VTE	69.3	259.7
Amount of waste collection	LPB	20.6	54.4
Amount of waste collection	XYB	19.2	39.1
	VTE	70,495	199,596
Population waste collection service covered	LPB	33,362	48,319
	XYB	31,099	47,594

3.4.2.2. Qualitative Effects

This Project is expected to bring about the following qualitative effects.

- The capacities of solid waste collection of VUDAA and UDAA's in LPB and XYB are improved.
- The efficiency of solid waste collection by small capacity vehicles is improved due to solid waste transfer station in VTE
- LPP-E and the Project in tandem to be mutually beneficial is expected because of above mentioned improvement of solid waste management at three project sites

Due to the reasons above, the high relevance and sufficient effects are expected by the Project.

Appendices

1. Member List of the Study Team
2. Study Schedule
3. List of Parties Concerned in the Recipient Country
4. Minutes of discussions
5. Soft Component Project
6. The list of Reference Documents
7. The other documents and information

1. MEMBER LIST OF THE STUDY TEAM

(1) The 1st Survey

From 22 August, 2013 to 4 October, 2013 (44 days)

	Name	Position	Organization
1	Mr. Noriaki MURASE	Leader	Japan International Cooperation Agency (JICA)
2	Mr. Toru TAGUCHI	Planning management	Japan International Cooperation Agency (JICA)
3	Mr. Naofumi SATO	Chief consultant/ Solid waste management planning	Kokusai Kogyo Co., Ltd.
4	Mr. Ichiro KONO	Waste collection equipment planning 1	Kokusai Kogyo Co., Ltd.
5	Mr. Keigo ANDO	Waste collection equipment planning 2/ Environmental social considerations	Kokusai Kogyo Co., Ltd.
6	Mr. Hideo SATO	Cost estimation/ Procurement planning	Kokusai Kogyo Co., Ltd.
7	Mr. Masayuki TAKAZAWA	Transfer station planning	Kokusai Kogyo Co., Ltd.

(2) The 2nd Survey

From 3 December, 2013 to 12 December, 2013 (10 days)

	Name	Position	Organization
1	Mr. Susumu YUZURIO	Leader	Laos Office, JICA
2	Ms. Akiko KISHIUE	Planning management	Laos Office, JICA
3	Mr. Naofumi SATO	Chief consultant/ Solid waste management planning	Kokusai Kogyo Co., Ltd.

2. DETAILED SCHEDULE OF THE WORK IN LAO P.D.R

(1) The 1st Survey

	Date	JICA		Consultant				
		Team Leader	Planning management	Chief consultant / Solid Waste Management Planning	Waste collection equipment planning 1	Waste collection equipment planning 2/ Environmental Social Consideration	Cost estimation / procurement planning	Transfer station planning
	The 1 st work in Laos							
1	22Aug (Thu)			Traveling (Tokyo-Bangkok-Vientiane)				
2	23 (Fri)			AM: Courtesy call on DHUP and UDAA PM: Courtesy call and meeting with VUDAA, DONRE and DPWT				
3	24 (Sat)			Site visiting to KM32 existing landfill site and candidate sites of transfer station				
4	25 (Sun)			PM: Moving (VTE-LPB)				Compilation
5	26 (Mon)			AM: Courtesy call and meeting with LPB and UDAA PM: Site visiting to KM8 landfill site and LPB town	AM: Courtesy call and meeting with LPB and UDAA PM: Site visiting to KM8 landfill site and LPB town PM: Moving(LPB-VTE)	AM: Courtesy call and meeting with LPB and UDAA PM: Site visiting to KM8 landfill site and LPB town	Survey for regulation and design criteria/ (VTE)	
6	27 (Tue)			AM: Moving (LPB-XYB) PM: Courtesy call and meeting with LPB and UDAA	Field survey for existing waste collection vehicles (VTE)	AM: Moving (LPB-XYB) PM: Courtesy call and meeting with LPB and UDAA	Survey for regulation and design criteria/ (VTE)	
7	28 (Wed)			AM: Site visiting to KM9 landfill site and XYB town PM: Moving (XYB-LPB-VTE)	Field survey for existing waste collection vehicles (VTE)	AM: Site visiting to KM9 landfill site and XYB town PM: Moving (XYB-LPB-VTE)	Survey for regulation and design criteria/ (VTE)	
8	29 (Thu)			Courtesy call and meeting with VTE vice governor		Supporting for IEE report(VTE)	Field survey for procurement/cost estimation (VTE,LPB,XYB)	Survey for regulation and design criteria/ (VTE)
9	30 (Fri)			AM: Meeting with VUDAA, DONRE(including land authority) and DPWT Topic: evaluation for candidate sites of transfer station Field survey for candidate site of transfer station(VTE)				
10	31 (Sat)			Field survey for candidate site of transfer station(VTE) with the VTE vice governor	Traveling (Vientiane - Bangkok)	Field survey for candidate site of transfer station(VTE)		
11	1Sep (Sun)			Compilation	Traveling (Bangkok-Tokyo)	Compilation		
12	2 (Mon)			Meeting with VUDAA Topic: evaluation for candidate sites of transfer station		Survey for O&M of collection vehicles (VTE, LPB, XYB)	Meeting with VUDAA Topic: evaluation for candidate sites of transfer station	
13	3 (Tue)			Meeting with DPWT Topic: evaluation for candidate sites of transfer station		Survey for O&M of collection vehicles (VTE, LPB, XYB)	Field survey for procurement/cost estimation (VTE,LPB,XYB)	Meeting with DPWT Topic: evaluation for candidate sites of transfer station
14	4 (Wed)			a.m. Meeting with VUDAA p.m. Meeting with DHUP Topic: evaluation for candidate sites of transfer station		a.m. Supporting for IEE report(VTE) p.m. Meeting with DHUP Topic: evaluation for candidate sites of transfer station	a.m. Meeting with VUDAA p.m. Meeting with DHUP Topic: evaluation for candidate sites of transfer station	a.m. Meeting with VUDAA p.m. Meeting with DHUP Topic: evaluation for candidate sites of transfer station
15	5 (Thu)			Survey for execution body of project (VTE,LPB, XYB)		Supporting for IEE report(VTE)	Field survey for procurement/cost estimation (VTE,LPB,XYB)	Organizing topographic survey and geological survey (VTE)
16	6 (Fri)			Survey for future plan of landfill site (VTE,LPB,XYB)		Supporting for IEE report(VTE)	Field survey for procurement/cost estimation (VTE,LPB,XYB)	Planning and design of transfer station (VTE)
17	7 (Sat)			Survey for future plan of landfill site (VTE,LPB,XYB)		Supporting for IEE report(VTE)	Field survey for procurement/cost estimation (VTE,LPB,XYB)	Planning and design of transfer station (VTE)

	Date	JICA		Consultant				
		Team Leader	Planning management	Chief consultant / Solid Waste Management Planning	Waste collection equipment planning 1	Waste collection equipment planning 2/ Environmental Social Consideration	Cost estimation / procurement planning	Transfer station planning
18	8 (Sun)			Compilation		Compilation		
19	9 (Mon)			a.m. Meeting with VUDAA Topic: evaluation for candidate sites of transfer station, Field survey for candidate site of transfer station(VTE) p.m. Survey for other donors' project (VTE,LPB,XYB)		Planning of waste collection equipment (VTE,LPB,XYB)	Field survey for procurement/cost estimation (VTE,LPB,XYB)	a.m. Meeting with VUDAA Topic: evaluation for candidate sites of transfer station p.m. Planning and design of transfer station (VTE)
20	10 (Tue)			Survey for other donors' project (VTE,LPB,XYB)		Planning of waste collection equipment (VTE,LPB,XYB)	Field survey for procurement/cost estimation (VTE,LPB,XYB)	Planning and design of transfer station (VTE)
21	11 (Wed)			Planning of soft component		Planning of waste collection equipment (VTE,LPB,XYB)	Estimation of draft project cost (VTE,LPB,XYB)	Planning and design of transfer station (VTE)
22	12 (Thu)			Planning of soft component		Planning of waste collection equipment (VTE,LPB,XYB)	Estimation of draft project cost (VTE,LPB,XYB)	Planning and design of transfer station (VTE)
23	13 (Fri)			a.m. Meeting with VUDAA p.m. Planning of soft component		a.m. Meeting with VUDAA p.m. Planning of waste collection equipment (VTE,LPB,XYB)	a.m. Meeting with VUDAA p.m. Estimation of draft project cost (VTE,LPB,XYB)	Planning and design of transfer station (VTE)
24	14 (Sat)			Planning of soft component		Planning of waste collection equipment (VTE,LPB,XYB)	Estimation of draft project cost (VTE,LPB,XYB)	Planning and design of transfer station (VTE)
25	15 (Sun)			Compilation		Compilation	Compilation	Compilation
26	16 (Mon)		Traveling (Tokyo-Bangkok-Vientiane)	Making priority of requested component	Traveling (Tokyo-Bangkok-Vientiane)	Planning of waste collection equipment (VTE,LPB,XYB)	Estimation of draft project cost (VTE,LPB,XYB)	Planning and design of transfer station (VTE)
27	17 (Tue)	Traveling (Tokyo-Bangkok-Vientiane)	Meeting with consultant team	Meeting with JICA		a.m. Supervision and advise for IEE Procedure p.m. Meeting with JICA	a.m. Estimation of project cost (VTE,LPB,XYB) p.m. Meeting with JICA	Planning and design of transfer station (VTE)
28	18 (Wed)	a.m. Courtesy call on DHUP p.m. Courtesy call and meeting with VUDAA, DONRE and DPWT			a.m. Courtesy call on DHUP		Estimation of project cost (VTE,LPB,XYB)	Planning and design of transfer station (VTE)
29	19 (Thu)	a.m. Site visiting to KM7 workshop, KM32 existing landfill site and candidate sites of transfer station p.m. Reporting to Embassy of Japan			a.m. Compiling/Reporting p.m. Reporting to JICA Laos Office	a.m. Supporting for IEE report(VTE) p.m. Traveling (Vientiane-Bangkok)	a.m. Estimation of project cost (VTE,LPB,XYB) p.m. Traveling (Vientiane-Bangkok)	a.m. Planning and design of transfer station (VTE) p.m. Traveling (Vientiane-Bangkok)
30	20 (Fri)	a.m. Signing of MD p.m. Reporting to JICA Laos office Traveling (Vientiane-Bangkok)		a.m. Signing of MM p.m. Reporting to JICA Laos office	a.m. Compiling/Reporting p.m. Reporting to JICA Laos Office	Traveling (Bangkok-Tokyo)		
31	21 (Sat)	Traveling (Bangkok-Tokyo)		a.m. Compiling/Reporting p.m. Traveling (Vientiane-Bangkok)	Clarification of Planning			
32	22 (Sun)			Traveling (Bangkok-Tokyo)	Compilation			
33	23 (Mon)				Planning for Landfill Equipment			
34	24 (Tue)				Control of Subcontract work			
35	25 (Wed)				Follow up for IEE Procedure			
36	26 (Thu)				Compilation of Basic Design			
37	27 (Fri)				Discussion with CP			
38	28 (Sat)				Reporting			
39	29 (Sun)				Compilation			

	Date	JICA		Consultant				
		Team Leader	Planning management	Chief consultant / Solid Waste Management Planning	Waste collection equipment planning 1	Waste collection equipment planning 2/ Environmental Social Consideration	Cost estimation / procurement planning	Transfer station planning
40	30 (Mon)				Reporting			
41	1 Oct (Tue)				Compilation of Basic Design			
42	2 (Wed)				Discussion with CP			
43	3 (Thu)				a.m. Reporting to JICA Laos office p.m. Traveling (Vientiane-Bangkok)			
44	4 (Fri)				Traveling (Bangkok-Tokyo)			

(2) The 2nd Survey

	Date	JICA		Consultant
		Team Leader	Planning management	Chief consultant / Solid Waste Management Planning
	The 2 nd work in Laos			
1	3 Dec (Tue)			Traveling (Tokyo-Bangkok-Vientiane)
2	4 (Wed)	Meeting with consultant team		a.m. Meeting with JICA Laos office p.m. Meeting with VUDAA
3	5 (Thu)			a.m. Moving (VTE-LPB) p.m. Meeting with LPB UDAA
4	6 (Fri)			a.m. Moving (LPB-XYB) p.m. Meeting with XYB UDAA
5	7 (Sat)			a.m. Preparation of the report for meetings p.m. Moving (XYB-LPB-VTE)
6	8 (Sun)			Compilation
7	9 (Mon)	a.m. Meeting with consultant team p.m. Meeting with DPWT, MPWT, VUDAA, LPB UDAA, XYB UDAA, DONRE		a.m. Meeting with JICA p.m. Meeting with DPWT, MPWT, VUDAA, LPB UDAA, XYB UDAA, DONRE
8	10 (Tue)	Signing of MD with DPWT, MONRE, VUDAA, UDAA		a.m. Compilation p.m. Signing of MD with DPWT, MONRE, VUDAA, UDAA
9	11 (Wed)	Reporting from consultant team		a.m. Reporting to JICA Laos office p.m. Traveling (Vientiane- Bangkok)
10	12 (Thu)			Traveling (Bangkok-Tokyo)

3. LIST OF PARTIES CONCERNED ON THE RECIPIENT COUNTRY

Name	Position
【Ministry of Public Works and Transports, Department of Housing and Urban Planning】	
Mr. Khamthavy THAIPHACHANH	Director General
Mr. Bounthong KEOHANAM	Director of Division
Mr. Soulisack PHONHACHATH	Director of Planning and Building Division
Mr. Nuphonh PHOSY	
Mr. Phaikoun KEOMANIVONG	Engineer
【Vientiane Urban Development & Administration Authority】	
Mr. Somboun THAMMAVONGSA	
Mr. Khampien INTHALUECHA	
Mr. Sonethavy PHIMMASANE	
Mr. Sisouk THORATHA	
【Ministry of Natural Resources and Environment】	
Ms. Keobang AKEOLA	Director General
Mr. Vanhxay PHIEWMANYVONE	DPC
【Department of Public Works and Transports, Vientiane Capital】	
Ms. Bouavone LUANGKHOT	
Mr. Thammanoh SINGHAVISAY	
【Department of Natural Resources and Environment, Vientiane Capital】	
Ms. Lotchana PHUANGMANYVONG	
Mr. Vilasack VENGPASERT	
【Luang Prabang District】	
Mr. Vongsavanh THEPPHACHANH	Governor
Mr. Phoumy OPHETSANE	Vice Governor
Mr. Padith THAMMAVONGSAVANH	UDAA
Ms. Kaysone KOUSONSAVATH	UDAA
Mr. Chanthy PHONESY	UDAA
Mr. Soulaphone THIRAKOUN	DONRE
Mr. Sackdaphone KEOPRACHAN	DONRE
【Xayaboury District】	
Ms. Bounphak INTHAPAYA	Governor
Dr. Bounly XAYTHONGPHEH	Administration department, Xayaboury Province
Ms. Khamphiew PHANTHAVONG	DONRE
Mr. Kitsamon PHOTHILAK	DONRE
Mr. Phuangkham PHILAKET	DPWT
Mr. Somdet CHANTHAVONG	DHP
Mr. Phonpadit	Provincial Hospital
Mr. Bounkhong PHONGSAVANH	UDAA
Mr. Thonglan PHEUAPHOM	UDAA
Mr. Phongphorpat THAMMAVONG	UDAA
Mr. Phathanong SONEPHAN	UDAA
Mr. Souliyan MANKHONG	UDAA

Name	Position
Ms. Thavisouk SOMPASONG	UDAA
Mr. Saythavin KHAMPHUVONG	UDAA
Mr. Sinakhon DUANGPHACHAN	Administration office
Mr. Souvan SIMI	Environment office
Mr. Sonsavane CHANTHAVONG	Planning office
Mr. Thongphin DUANGMALA	Police office

THE MINUTES OF DISCUSSIONS
ON
THE MISSION FOR THE PREPARATORY SURVEY
ON
THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN
ENVIRONMENTAL SUSTAINABLE CITIES IN LAO PDR

In response to a request from the Government of Lao PDR, the Government of Japan decided to conduct the Preparatory Survey on the Project for Improvement of Solid Waste Management in Environmental Sustainable Cities (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA")

JICA sent Lao PDR the Preparatory Survey Team (hereinafter referred to as "the Team"), which was headed by Mr. Noriaki MURASE, Advisor, JICA and is scheduled to stay in the country August 23rd, 2013 to September 20th, 2013

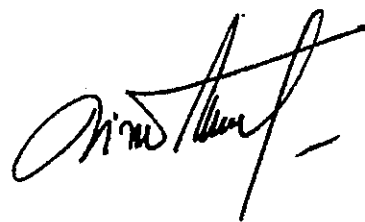
The Team held discussions with the officials concerned of the Lao side and conducted field survey.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Outline Design Survey Report

Vientiane, Lao PDR
September 20, 2013



Mr. Noriaki MURASE
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan



Mr. Khamthavy THAIPHACHANH
Director General
Department of Housing and Urban Planning
Ministry of Public Works and Transports
Lao PDR

Witnessed by



Ms. Keobang A KEOLA
Director General
Department of Pollution Control
Ministry of Natural Resources and
Environment



Mr. Khampian INTHALUXA
Vice President
Vientiane Urban Development and
Administration Authority
Vientiane Capital



Mr. Phoumy OPHETSANE
Vice President
Urban Development and Administration
Authority
LuangPrabang Province



Mr. Thonglan PHEUPHOM
Vice President
Urban Development and Administration
Authority
Xayaboury Province

ATTACHMENT

1. Objective of the Project

Both sides agreed that the objective of the Project is to improve waste collection and transportation conditions in Vientiane Capital (VTE), Luang Prabang district (LPB) and Xayabouri district (XYB), which is positioned as environmentally sustainable cities in Laos, by constructing facilities and procuring equipment related to solid waste management.

2. Inception Report

The Team explained the Inception Report to the Department of Housing and Urban Planning (hereinafter referred to as "DHUP"), Ministry of Public Works and Transport (hereinafter referred to as "MPWT"). DHUP agreed and accepted the contents of the Inception Report so that the Team did a survey according to it.

3. Project sites

Both sides agreed that project sites are VTE, LPB and XYB.

4. Implementing organizations

4-1. National level

DHUP, MPWT

4-2. City level

VTE: Urban Development & Administration Authority (VUDAA)

LPB and XYB: Urban Development & Administration Authority (UDAA)

5. Supporting organization

Pollution Control Department (PCD), Ministry of Natural Resources and Environment (MONRE)

6. Items requested by the Government of Lao PDR

The items originally requested by the Lao side are described in ANNEX 2.

The both sides confirmed that the appropriateness of the request would be examined in accordance with the further studies and analysis, and the final components of the Project would be decided by the Japanese side.

7. Japan's Grant Aid Scheme

7-1. The Lao side understood the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Lao PDR explained by the Team, as described in ANNEX 3

7-2. The Lao side assured to take necessary measures, as described in ANNEX 5, for the smooth implementation of the Project, in the case that the Project will be implemented

8. Schedule of the Survey

8-1. The consultant members of the Team will proceed to undertake further surveys in Lao PDR until early October, 2013

8-2. Based on the results of these field surveys in Lao PDR, the Team will continue the study and conduct analysis in Japan until December, 2013.

8-3. As a result of the survey, the Team will prepare the draft preparatory survey report in English and dispatch a mission in order to explain its contents to the Lao side by January, 2014.

9. Other relevant issues

9-1. Environmental and Social Considerations (To be discussed in the meeting)

The Lao side will investigate necessity of environmental and social considerations and decide an officially required procedure for construction of the transfer station among Environmental Impact Assessment (EIA), Initial Environmental Examination (IEE) and Environmental Management Plan. With decision of its procedure, the Lao side will inform the result of JICA Laos office immediately by the end of September, 2013. In case, EIA is necessary, the Government of Lao PDR will conduct it on his own expense and responsibility. Choosing IEE as the appropriate procedure, it has to be done before the next JICA's mission, which is supposed to be dispatched by the beginning of January, 2014.

9-2. Undertakings of the Lao side for the survey

The site clearance at the project site of transfer station in Ban Nahai, Xaysettha district will be done by the Lao side before starting of geological survey and topography survey.

9-3. Selection and land acquisition of the site for the Transfer Station

The both sides confirmed that the sites for the Transfer Stations in Ban Nahai, Xaysettha district, Vientiane Capital (shown in ANNEX 1) should be decided through this survey. The Lao side also confirmed that the selected site was officially allocated by the Government of Lao PDR for the Project and cannot be used for another purpose without any pre-notification to the Japanese side.

9-4. Measures to be taken by the Lao side for construction of the Transfer Station

Through this survey, the Team explained the undertakings of the Lao side, as are described in ANNEX 5. Other than undertakings described in ANNEX 5, the Lao side will take certain measures to complete these undertakings for construction of the Transfer Station.

- Site clearance,
- Construction of gates and fences around the site,
- Construction of access-road to the transfer station,
- Preparation of electricity, a water supply system and drainage,
- Parking area for the procured equipment, and
- Trees and plants in the buffer zone

9-5. Overlapping with other projects

The both sides confirmed that the on-going / proposed projects in VTE, LBP and XYB supported by other donor agencies, NGOs, and Lao official organization(s) should be carefully investigated to avoid overlapping with the Project. The Lao side agreed to provide necessary information on related projects.

9-6. Lifetime of the landfill site

The Lao side assured that the landfill site, which receives the waste generated in the Project sites, still have enough lifetime after implementing the Project so that the procured equipment could be used effectively.

9-7. Private sector

The Lao side confirmed that VUDAA and UDAA would be responsible for waste management in each city continuously and there is no plan for them to additionally commission the waste management task to private companies. The procured equipment will be also used only for waste management in the specific area covered by VUDAA and UDAA.

ANNEX 1: Location of Project Sites for Transfer Station

ANNEX 2: Items requested by the Lao side

ANNEX 3: Japan's Grant Aid Scheme

ANNEX 4: Flow Chart of Japan's Grant Aid procedure

ANNEX 5: Major Undertakings to be taken by Each Government

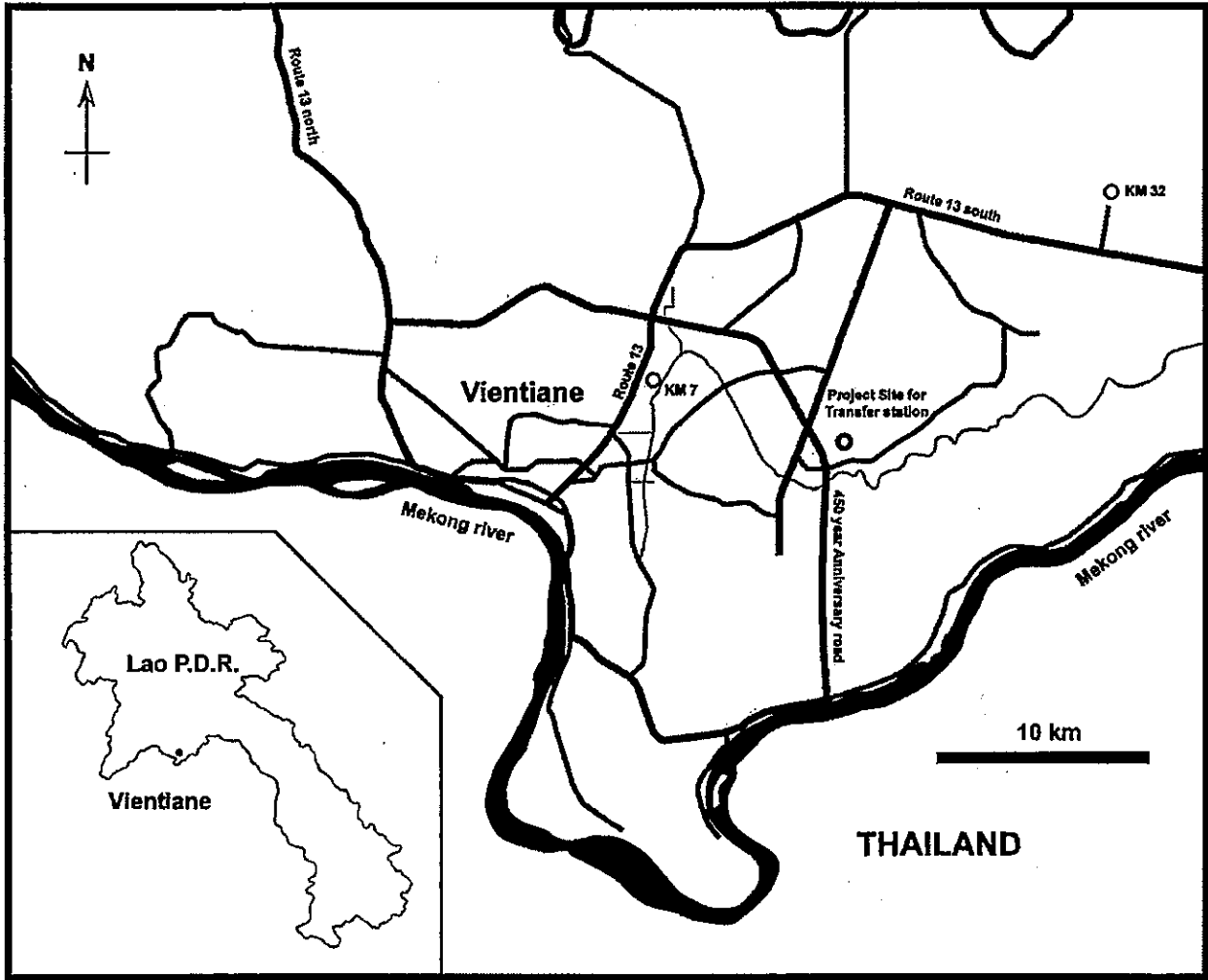


Figure1: Location of Project Site for Transfer Station

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Items requested by the Lao side

(1) Construction of facility

Transfer station in VTE

(2) Procurement of equipment

a. Vientiane Capital

Waste collection vehicle	Twenty-four (24) compactor trucks (10m3) Six (6) compactor trucks (6m3) Four (4) container trucks
Waste transfer trailer	Ten (10) trailers
Heavy equipment and vehicle for operation of final disposal site	One (1) bulldozer One (1) excavator One (1) water tanker
Health care waste treatment	One (1) incinerator for the health care waste One (1) vehicle for health care waste

b. Luang Prabang district

Waste collection vehicle	Two (2) compactor trucks (6m3) Two (2) dump trucks Three (3) container trucks
Waste transfer trailer	-
Heavy equipment and vehicle for operation of final disposal site	One (1) bulldozer One (1) water tanker One (1) dump truck for covering soil
Health care waste treatment	One (1) vehicle for health care waste

c. Xayabouri district

Waste collection vehicle	Five (5) dump trucks Two (2) container trucks
Waste transfer trailer	-
Heavy equipment and vehicle for operation of final disposal site	One (1) water tanker
Health care waste treatment	-

JAPAN'S GRANT AID SCHEME

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on the law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is conducted as follows-

- Preparatory Survey (hereinafter referred to as "the Survey")
- The Survey conducted by JICA
 - Appraisal & Approval
 - Appraisal by The GOJ and JICA, and Approval by the Japanese Cabinet
 - Determination of Implementation
 - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
 - Agreement concluded between JICA and a recipient country
- Implementation
 - Implementation of the Project on the basis of the G/A

2. Preparatory Survey**(1) Contents of the Survey**

The aim of the Survey is to provide a basic document necessary for the appraisal of the Project by JICA and the GOJ. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.

- Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- Preparation of a basic design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures are necessary to ensure 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 organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

3. Japan's Grant Aid Scheme

(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 country to make a plea for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

The consultant firm(s) used for the Survey will be recommended by JICA to the recipient country to also work on the Project's implementation after the E/N and the G/A, in order to maintain technical consistency.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
- b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

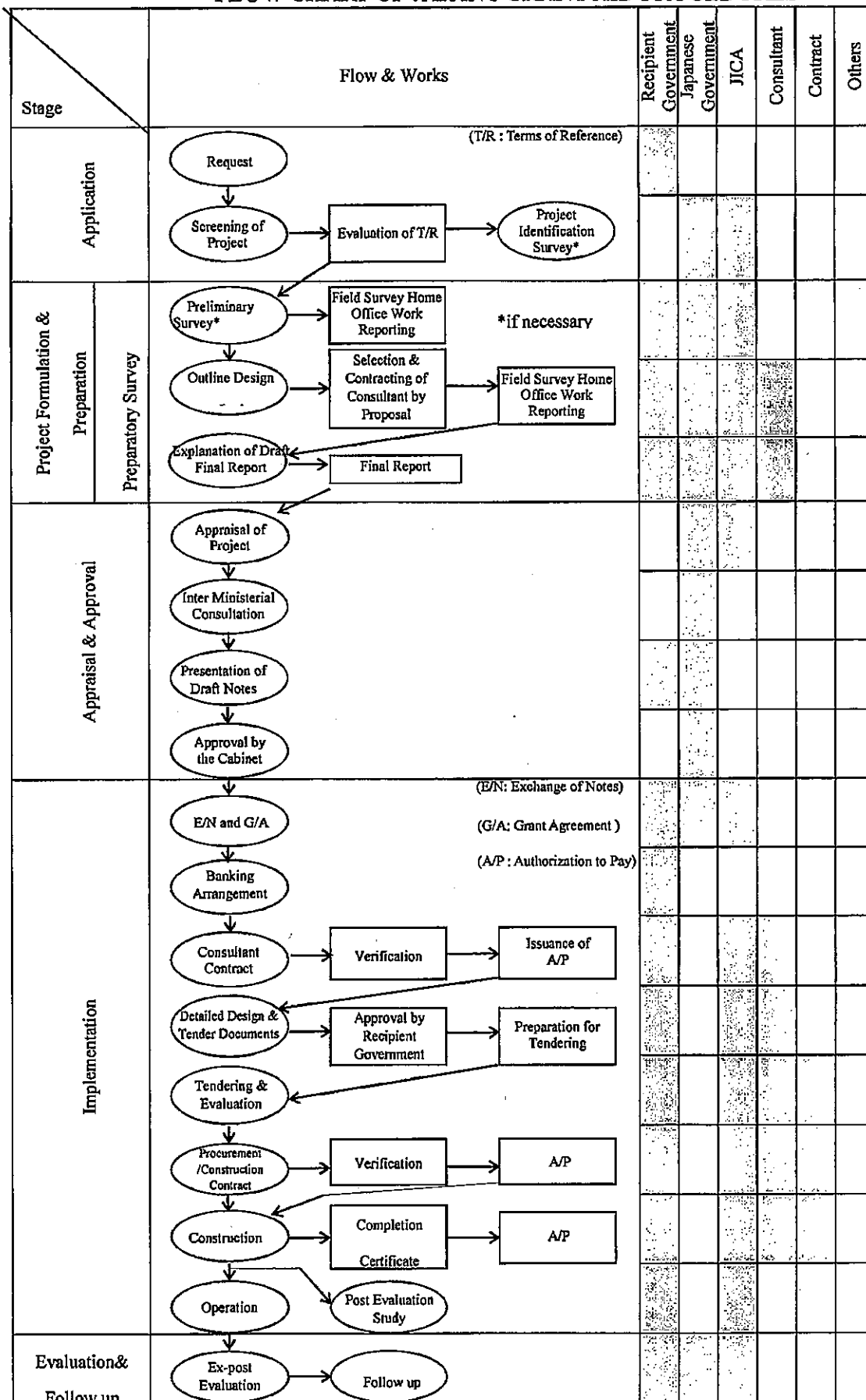
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

(10) Social and Environmental Considerations

A recipient country must ensure the social and environmental considerations for the Project and must follow the environmental regulation of the recipient country and JICA socio-environmental guideline.

(End)

FLOW CHART OF JAPAN'S GRANT AID PROCEDURES



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Major Undertakings to be taken by Each Government

ANNEX 5

NO	Items	To be covered by the Grant	To be covered by Recipient side
1	To secure a lot of land necessary for the implementation of the Project and to clear site		•
2	To construct the following facilities		
	1) The building	•	
	2) The gates and fences in and around the site		•
	3) The parking lot	•	
	4) The road within the site	•	
	5) The road outside the site		•
3	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities necessary for the implementation of the Project outside the site		
	1) Electricity		
	a. The distributing line to the site		•
	b. The drop wiring and internal wiring within the site	•	
	c. The main circuit breaker and transformer	•	
	2) Water Supply		
	a. The city water distribution main to the site		•
	b. The supply system within the site (receiving and/or elevated tanks)	•	
	3) Drainage		
	a. The city drainage main (for storm, sewer and others) to the site		•
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	•	
	4) Gas Supply		
	a. The city gas main to the site		•
	b. The gas supply system within the site	•	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame / panel (MDF) of the building		•
	b. The MDF and the extension after the frame / panel	•	
	6) Furniture and Equipment		
	a. General furniture		•
	b. Project equipment	•	
4	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine(Air) transportation of the products from Japan to the recipient country	•	

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	2) Tax exemption and customs clearance of the products at the port of disembarkation		•
	3) Internal transportation from the port of disembarkation to the project site	•	
5	To ensure that 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 be exempted /be borne by the Authority without using the Grant		•
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		•
7	To ensure that [the Facilities and the products]/[the Facilities]/[the products] be maintained and used properly and effectively for the implementation of the Project		•
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		•
9	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		•
	2) Payment commission		•
10	To give due environmental and social consideration in the implementation of the Project.		•

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

MINUTES OF DISCUSSIONS
ON
THE MISSION FOR THE PREPARATORY SURVEY
ON
THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN
ENVIRONMENTAL SUSTAINABLE CITIES IN LAO PDR
(EXPLANATION OF DRAFT REPORT)

From August to October 2013, Japan International Cooperation Agency (hereinafter referred to as “JICA”) dispatched the Preparatory Survey team on the Project for Improvement of Solid Waste Management in Environmental Sustainable Cities (hereinafter referred to as “the Project”) and to Lao PDR, and through discussions, field survey, and technical examination of the results, JICA prepared the Draft Preparatory Survey Report (hereinafter referred to as “Draft Report”).

In order to explain and to consult with the Government of Lao PDR on the components of the Draft Report, JICA sent to Lao PDR the Draft Report Explanation Team (hereinafter referred to as “the Team”), which was headed by Mr. Susumu YUZURIO, Senior Representative, JICA Laos office, from 9th to 11th December, 2013

As a result of discussions, both sides confirmed the main items described on the attached sheets.

Vientiane, Lao PDR
December 10, 2013



Mr. Susumu YUZURIO
Leader
Draft Report Explanation Team
Japan International Cooperation Agency
Japan



Mr. Khamthavy THAIPHACHANH
Director General
Department of Housing and Urban Planning
Ministry of Public Works and Transports
Lao PDR

Witnessed by



Ms. Keobang A KEOLA
Director General
Department of Pollution Control
Ministry of Natural Resources and
Environment



Mr. Khampian INTHALUXA
Vice President
Vientiane Urban Development and
Administration Authority
Vientiane Capital



Ms. Kaysone KOUSONSAVATH
Chief of Waste Management Division
Urban Development and Administration
Authority
Luang Prabang Province



Mr. Thonglan PHEUAPHOM
Vice President
Urban Development and Administration
Authority
Xayaboury Province

ATTACHMENT

1. Components of the Draft Report

The Lao side agreed and accepted in principle the components of the Draft Report explained by the Team. The components of the Project are shown in ANNEX 1.

2. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and send it to the Government of Lao PDR by March 2014.

3. Confidentiality of the Project

3-1. Detailed Specifications

Both sides confirmed that all the information related the Project including detailed specifications of the facilities, equipment and other technical information shall not be released to any other party(ies) before signing of all the contract(s) for the Project.

3-2. Project Cost Estimation

The Team explained to the Lao side the Project Cost Estimation as described in ANNEX 2 and that this cost estimation is provisional and would be further examined by the Government of Japan for the approval of the Grant. Both sides agreed that the Project Cost Estimation should be never duplicated or released to any outside parties until signing of all the contract(s) for the Project.

The Lao side understood that the Project Cost Estimation is not final and subject to modification.

4. Other Relevant Issues

The following issues were discussed and confirmed by both sides.

4-1. Undertakings of the Lao side

Both sides confirmed that the Government of Lao PDR would carry out the undertakings show in the previous minutes of discussions signed by both sides on 20th September, 2013 and the Draft Report in accordance with the implementation schedule of the Project. (ANNEX 3)

Main undertakings by the Lao side are as follows:

(1) Construction of the Transfer Station.

The Lao side confirmed to complete undertakings shown below for the construction of the Transfer Station:

Before the commencement of the construction (by the end of October 2014)

- Site clearance,
- Construction of access-road to the transfer station,
- Preparation of electricity, a water supply system and drainage,

Before the completion of the construction

- Construction of gates and fences around the site,
- Parking area for the procured equipment, and
- Trees and plants in the buffer zone

(2) Operation and Maintenance Cost in Vientiane Capital Luang Prabang District and Xayaboury District

Based on the results of the Preparatory Survey, the Team requested the Lao side to take necessary actions which were proposed in the Draft Report such as allocation of the adequate budget and qualified personnel for proper, effective and sustainable operation and maintenance of the equipment in Vientiane Capital, Luang Prabang District, and Xayaboury District. The Lao side understood its necessity and also stated that they would prepare a necessary action plan for ensuring sustainability of operation and maintenance of the equipment and submit it to JICA Laos office by the end of December 2013. Examples of actions include budget allocation, collection of tipping fee at final disposal sites, increase of contract coverage, and increase of collection fees, etc.

(3) Waste water from the Transfer Station

Both sides agreed that water used for washing vehicles such as compactor trucks and rotary drums at the transfer station would be stored in the sewage storage tank first. It should be transported to the landfill site KM32 by a water tanker for waste water to be disposed at least once a day. The water tanker for waste water will be procured by the Project.

4-2. Technical Assistance (Soft Component)

The Team explained that the contents of the technical assistance as “Soft Component” would focus on the subjects as described in ANNEX 4 and the Lao side agreed on it.

The Lao side committed to assign responsible staff and operators before the Soft Component starts as described in the Draft Report.

4-3. Environmental and Social Considerations

The Lao side confirmed that the officially required procedure of Environmental and Social Considerations for construction of the transfer station was Initial Environmental Examination (IEE) and the certificate of IEE would be issued by the end of December 2013 and be submitted to the JICA Laos office immediately. Both sides confirmed that appropriate environmental monitoring shall be planned and implemented as tentatively set in ANNEX 5, which would be valid after issue of the certificate, by the Laos side based on domestic laws and regulations and IEE report of the Project, JICA Environmental Social Considerations guidelines, and other relevant standards.

ANNEX 1: Components of the Project

ANNEX 2: Project Cost Estimation (CONFIDENTIAL)

ANNEX 3: Obligations of the Lao side (Chapter 3. Obligations of Recipient Country of Draft Report)

ANNEX 4: Technical Assistance (Soft Component)

ANNEX 5: Monitoring Form

Components of the Project

(1) Construction of facility

Transfer station in VTE

(2) Procurement of equipment

a. Vientiane Capital

Waste collection vehicle	Three (3) compactor trucks (20m ³) Sixteen (16) compactor trucks (10m ³) Seventeen (17) compactor trucks (6m ³) Four (4) compactor trucks (6m ³ , 4WD) Two (2) dump trucks (10m ³) Four (4) skip loaders (5m ³)
Heavy equipment and vehicle for operation of final disposal site	One (1) bulldozer (21t)
Equipment for transfer station	Two (2) drum type storage and transfer equipment
Health care waste treatment	One (1) vehicle for health care waste
Others	One (1) water tanker One (1) water tanker for waste water (6m ³) Two (2) car washing machines

b. Luang Prabang district

Waste collection vehicle	Four (4) compactor trucks (6m ³) Three (3) dump trucks (10m ³) One (1) skip loader (5m ³)
Heavy equipment and vehicle for operation of final disposal site	One (1) bulldozer (10t)
Others	One (1) water tanker One (1) car washing machine

c. Xayabouri district

Waste collection vehicle	Two (2) compactor trucks (10m ³) One (1) dump truck (10m ³) One (1) skip loader (5m ³)
Heavy equipment and vehicle for operation of final disposal site	One (1) excavator (0.6m ³)
Others	One (1) water tanker One (1) car washing machine

CONFIDENTIAL

Project Cost Estimation (provisional)

1. Cost Borne by the Japanese side

Items		Cost Estimate (million JPY)
Construction	Transfer station	303.6
Equipment	compactor trucks, dump trucks, skip loaders, bulldozer, excavator, water tanker, car washing machine, drum type storage and transfer equipment	987.8
Detailed design, Implementation / Procurement supervision / Soft Component		81.1
Total		1372.5

2. Cost Borne by the Lao side

Items		Cost Estimate (thousand LAK)
Access road	Paved road L =1,100m + 800m	4,157,793
Electricity supply	High Voltage 3 Phase 22KV + Transformer	781,540
Water supply	Dia 50mm PVC pipe	78,154
Fence	L = 480m	78,154
Gate	Sliding Gate	15,631
Planting for Buffer zone	Double line in 6m interval	39,077
Bank charge		Under estimation
Total		5,150,349

Obligations of the Lao side (Chapter 3. Obligations of Recipient Country of Draft Report)

Items	Obligations of the Lao side
1. General matters	<ol style="list-style-type: none"> 1) To ensure prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid. 2) To exempt from customs duties, internal taxes and other fiscal levies that would normally be imposed in the recipient country with respect to the supply of the products and services under the verified contracts. 3) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts, such facilities that may be necessary for their entry into the recipient country and stay therein for the performance of the work. 4) To operate and maintain the facilities constructed and equipment purchased under the Grant Aid properly and effectively. 5) To assign the staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid. 6) To bear the commissions paid to the bank for banking services based upon the banking arrangement.
2. Special items for the Project	<ol style="list-style-type: none"> 1) To submit the application for construction works and others related to the Project if any, and to obtain permission for these. 2) To prepare the land, remove trees and other preparatory construction related to the Project. 3) To construct the gate at the main entrance and install the fence along the premises of the Project site 4) To construct the access road between main road in Nahai Village and the Project site 5) To bring in power lines, water supply and drainage to Project site. 6) To secure the parking lot for vehicles and heavy machineries (LPB, XYB). 7) To plant trees surrounding the project site as buffer zone to mitigate environmental issues (VTE).

low

Technical Assistance (Soft Component)

Items	Activity	Details
Procurement of collection vehicles	New vehicles used to expand collection area; Support development of collection plan	Daily waste generation amount will be calculated based on the population of collection area, then by setting collection frequency, the area possible to be collected in one trip can be determined. Whereupon the collection route will be planned taking into account road conditions.
Construction of transfer station	Support development of rules for operating transfer station	Support development of items related to operation of transfer station such as regulations for the station and health and safety measures.
Transportation to disposal sites with compactor trucks (20m ³)	Technical training on securing entryways for large vehicles into disposal sites	Large vehicles will be used to transport waste to disposal sites with the new transfer station therefore technical training will be given on securing entry roads to landfill areas.

Pin

Monitoring Form (During Construction)**1. Water Quality**

Monitoring Item	Measured Value (The 1 st sampling)	Measured Value (The 2 nd sampling)	Country's Standard	Frequency
▪pH			6-9.5	Twice a year
▪EC			1,000	Twice a year

2. Waste

Monitoring Item	Frequency	Monitoring results during monitoring period
▪Transport record of construction waste materials to disposal site	Once a month	

3. Noise and Vibration

Monitoring Item	Tolerance	Frequency	Monitoring results during monitoring period
▪Noise/vibration level	According to IEE report	Once a month	
▪Usage of low-noise, low-vibration methods		Once a year	

4. Accidents

Monitoring Item	Frequency	Monitoring results during monitoring period
▪Record of accidents and injuries	Once a month	

Monitoring Form (During Use)

1. Water Quality

Monitoring Item	Measured Value (The 1 st sampling)	Measured Value (The 2 nd sampling)	Country's Standard	Frequency
▪pH			6-9.5	Twice a year
▪EC			1,000	Twice a year

2. Waste

Monitoring Item	Frequency	Monitoring results during monitoring period
▪Transport record of construction waste materials to disposal site	Once a month	

3. Noise and Vibration

Monitoring Item	Frequency	Monitoring results during monitoring period
▪Noise/vibration level	Once a year	

4. Accidents

Monitoring Item	Frequency	Monitoring results during monitoring period
▪Record of accidents and injuries	Once a month	

5. Offensive Odor

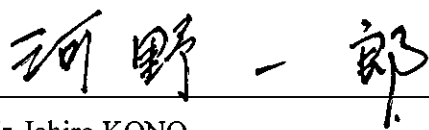
Monitoring Item	Frequency	Monitoring results during monitoring period
▪Record of offensive odor	Twice a year	

TECHNICAL NOTES
ON THE PREPARATORY SURVEY
ON THE PROJECT FOR IMPROVEMENT OF SWM
IN ENVIRONMENTAL SUSTAINABLE CITIES
IN LAO P.D.R.

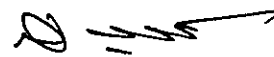
Based on the Minutes of Discussions signed on September 20, 2013, between the Preparatory Survey Team (hereinafter referred to as “the Team” of Japan International Cooperation Agency (hereinafter referred to as “JICA”) and the Department of Housing and Urban Planning (hereinafter referred as DHUP) of Ministry of Public Works and Transport (hereinafter referred to as “MPWT”) on the Project for Improvement of Solid Waste Management (hereinafter referred to as “the Project”), the consultant members of the Team had a series of discussions and conducted field surveys from September 23, 2013 to October 3, 2013.

As a result of the discussions and the surveys, both sides confirmed the technical conditions described on attached sheets.

Vientiane October 2, 2013.



Mr. Ichiro KONO
Consultant for
Preparatory Survey
Japan International Study Team(JICA)



Mr. Somboun AKNAVONGSA
Vice President
Vientiane Urban Development and
Administration Authority
Vientiane Capital

Attachment

The both parties agreed upon and confirmed the following items.

A. Undertaken by Lao Side

In order to utilize the transfer station fully and effectively, following works shall be implemented before completion of the transfer station.

Item	Specification	Cost Estimation*1 (US\$)
Access Road 1	Paved road L=1,100m	308,000
Access Road 2	Paved road L=800m	224,000
Electricity supply	High Voltage 3 Phase 22KV+Transformer	100,000
Water supply	Dia 50mm PVC pipe	10,000
Fence	L=480m	10,000
Gate	Sliding Gate	2,000
Planting for Buffer zone	Double line in 6m Interval	5,000
Total		659,000

*1: Reference only



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B. Waste water and Drainage System

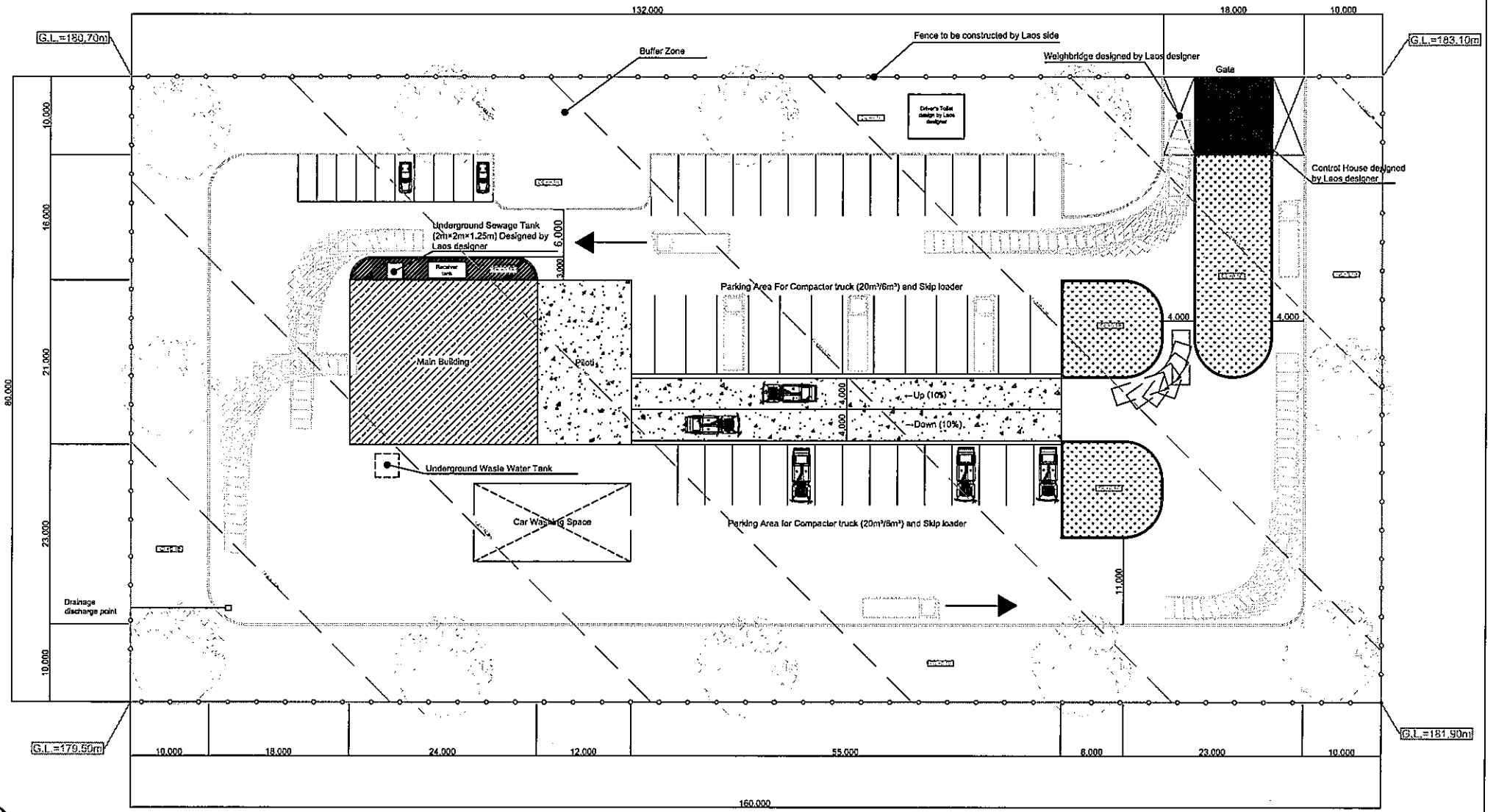
VUDAA agreed the basic plan for waste water and drainage system as follows.

Type of Waste Water	Discharge System
Waste water from Waste	Load on to Big Compactor Truck and transport to the final disposal site..
Waste water from car wash	Storage at underground waste water tank. Stored waste water will be vacuumed and transported to the final disposal site and discharge at waste water treatment pond.
Waste water from Toilet and Washing basin	Treated at septic tank installed at site.
Rain water	Drained to the lower point which is north waste corner of the site.

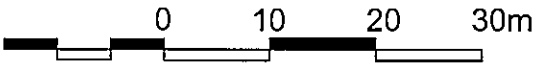
C. Layout of Transfer Station and Transfer Building

VUDAA agreed to the layout of transfer station and transfer building as attached sheets.





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KOKUSAI KOGYO CO., LTD.

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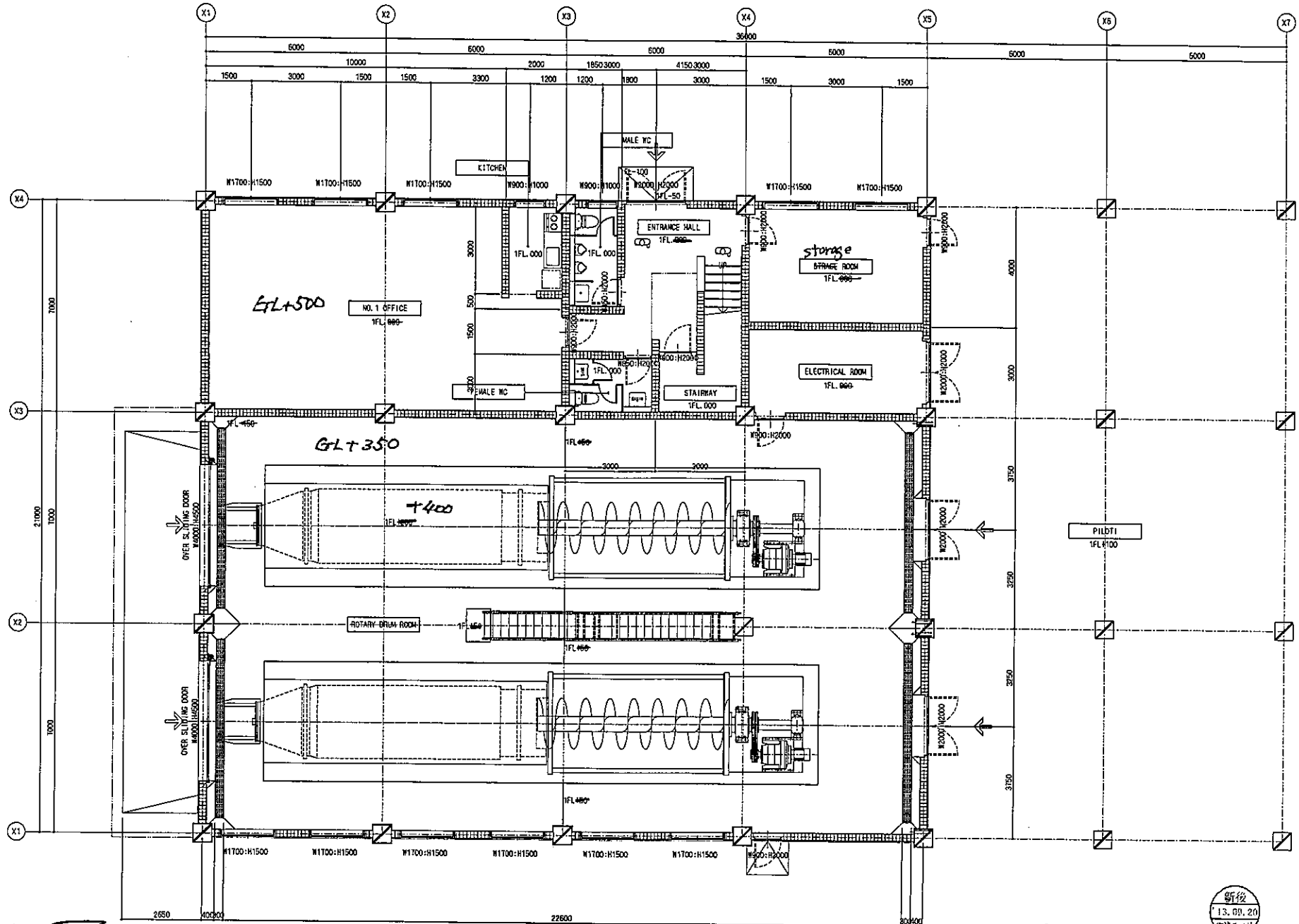
NOTE

PROJECT NO.	
DATE	Sep, 2013

PROJECT NAME
 THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF
 SOLID WASTE MANAGEMENT IN ENVIRONMENTAL SUSTAINABLE CITIES
 IN LAD P.D.R.

TITLE	General Layout Plan
SCALE	

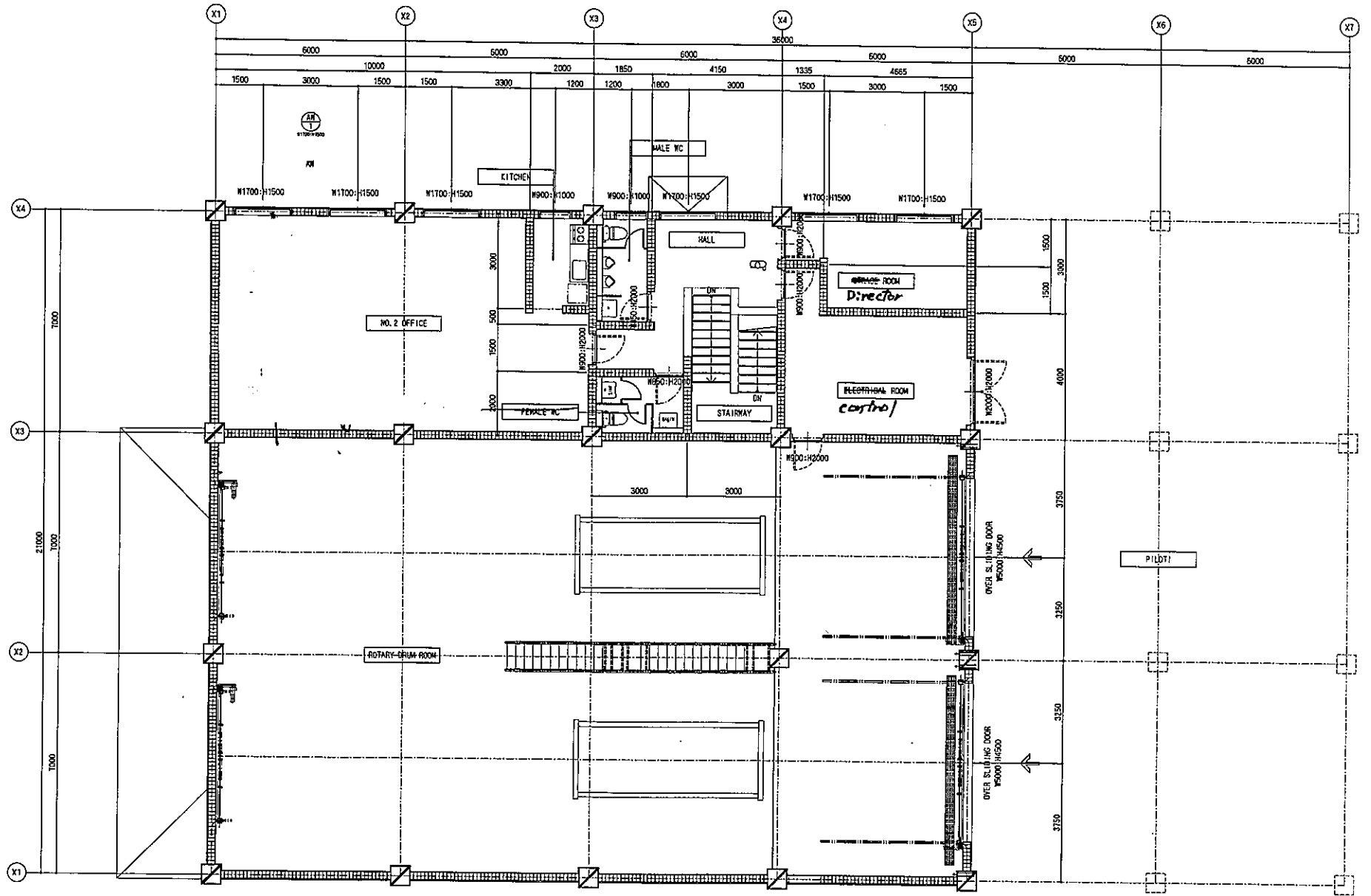
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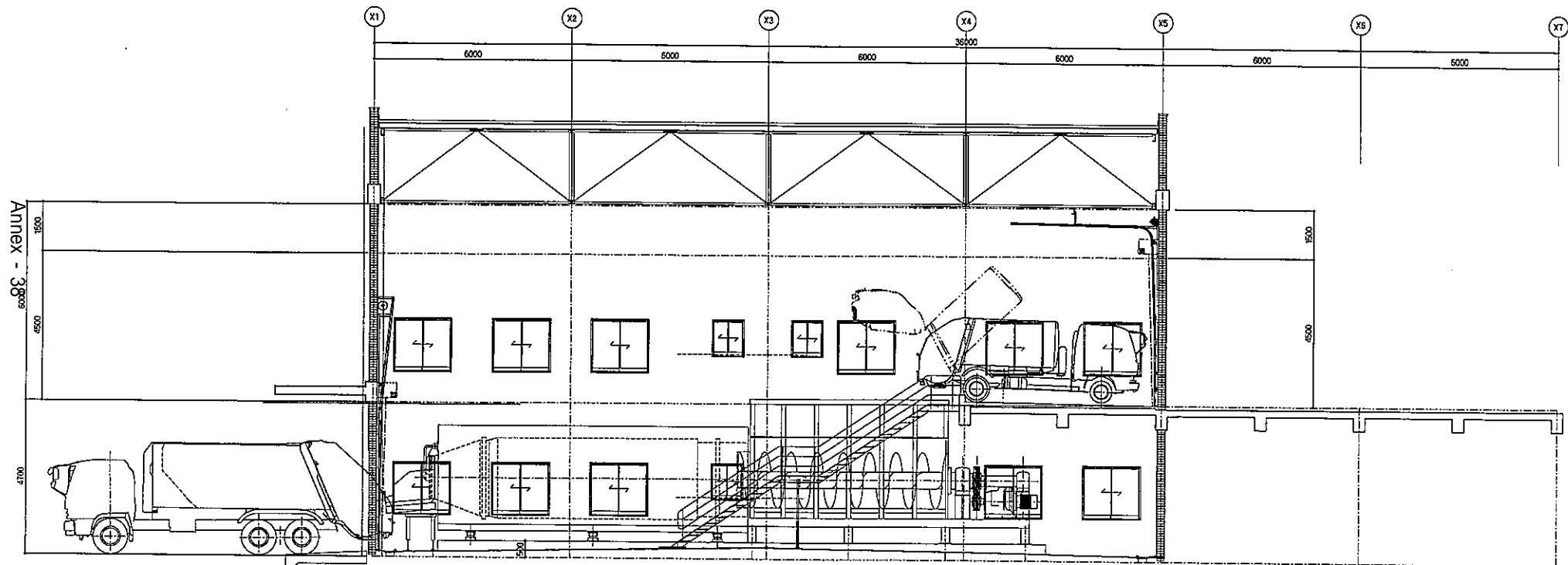
1st Floor

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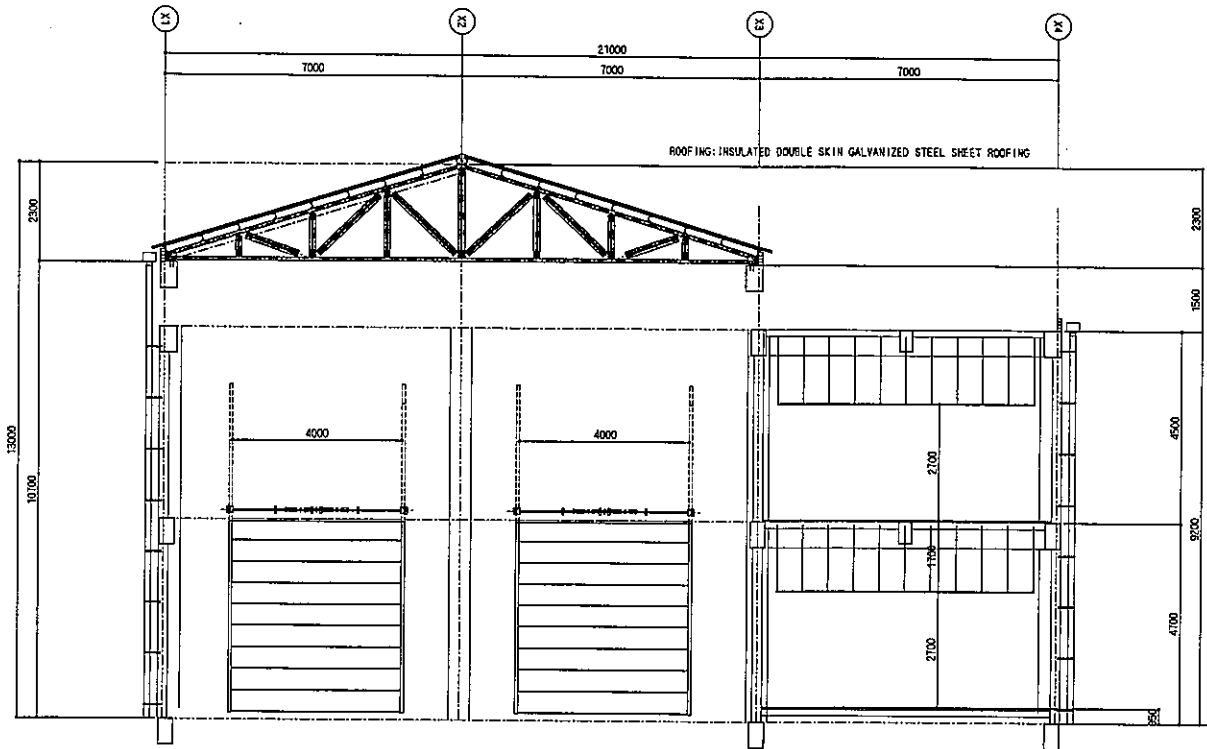


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2nd Floor

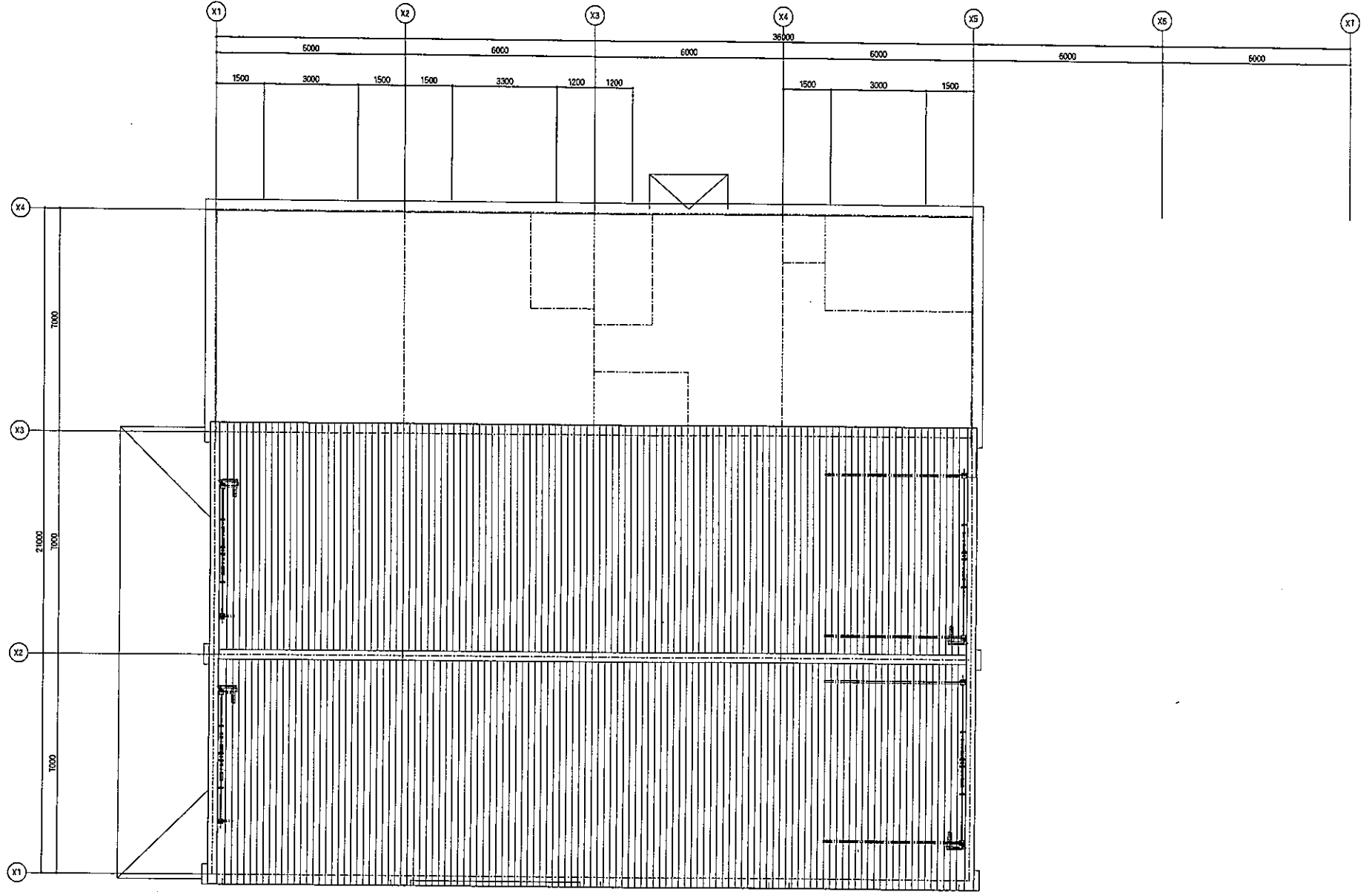


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BLOCK BRICK (1*215)-CONCRETE WITH LATERITE SOIL
MALL: PLASTER AND EMULSION PAINT ON BLOCK BRICK (1*215)
DOWNSPOUT: GALVANIZED STEEL PIPE
STANDARD: BS 1387 NOMINAL BORE: MINIMUM 100mm DIA THICKNESS: MINIMUM 3.65mm

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5. Soft Component Project

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF PUBLIC WORKS AND TRANSPORT
LAO PEOPLE'S DEMOCRATIC REPUBLIC

***THE PREPARATORY SURVEY ON
THE PROJECT FOR IMPROVEMENT OF
SOLID WASTE MANAGEMENT
IN ENVIRONMENTAL SUSTAINABLE CITIES
IN LAO PEOPLE'S DEMOCRATIC REPUBLIC***

SOFT COMPONENT PROJECT

DECEMBER 2013

KOKUSAI KOGYO CO., LTD.

CONTENTS

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3	Outputs of the Soft Component and Means of Verification.....	2
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4.3	Activity 3.1 Guidance on appropriate disposal methods for the disposal site supervisors, heavy equipment operators and 20m3 compactor truck drivers	6
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6	Implementation schedule of Soft Component.....	7
7	Estimated Project cost of Soft Component.....	8
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1 Background to Planning Soft Component

The aim of the “Preparatory Survey on Plan to Improve Solid Waste Management for Environmentally Sustainable Cities in Laos Peoples Democratic Republic” (hereinafter the Survey) is to contribute to improving the urban environments of three cities in Laos earmarked as Environmentally Sustainable Cities, Vientiane, Luang Prabang and Xayaburi, by improving the solid waste collection and transportation environment through the procurement of equipment and construction of facilities related to solid waste management.

In Vientiane, the capital of Laos where the Soft Component Project (hereinafter the Project) is to be implemented, the existing final waste disposal site is 32 km from the city center. This distance means that small waste collection vehicles can only make two trips per day, while large waste collection vehicles can only make one trip per day. Waste collected by skip loaders from about 90 waste containers (5 m³) in Vientiane is transported about 7 km from the city to a workshop where a simple scaffold structure has been erected to reload the waste. The waste reloading work at this simple scaffold facility has various issues, from perspectives of safety, efficiency, hygiene and environment. Therefore, constructing a transfer station to appropriately transfer waste is an urgent priority.

The Project’s new waste transfer station to be run by the Vientiane Urban Development Administration Authority (hereinafter VUDAA), which provides waste management services in Vientiane, is planned to be constructed on approximately 2 hectares of land located on the Laos 450 year memorial road about 12 km from the city center. This will be the first such waste transfer station to be built in Laos, therefore, it will be the counterparts’ first experience in planning, designing, constructing and operating such a facility. In particular, the Soft Component will have to give technical assistance in operational capacity in 1) establishing a waste collection vehicle (provided by the Project) deployment plan regarding vehicles transporting waste into the new transfer station as part of the expanded collection area, 2) appropriate organizational management of the transfer station, and 3) securing an access route into the final disposal sites by large compactor trucks transporting waste from the transfer station.

2 Objective of the Soft Component

In Vientiane, the target area of the Soft Component, the environmental management component of the JICA-ASEAN joint pilot project in Laos (hereinafter LPP-E), which this Project is in close collaboration with, is implementing a project to improve waste services as part of the Vientiane urban environment management plan from 2011 to September 2015. LPP-E is already giving VUDAA assistance in improving waste disposal and collection rules, and improving the waste collection fee system, and in developing waste related laws; however, this does not include any support for improving collection and transportation efficiency through the installation of a transfer station, therefore the Soft Component will support the operation and management of the transfer station by setting the following objectives.

(1) To enable the appropriate management of deployment of the provided waste collection vehicles that are used in relation to the transfer station

The Project is to provide approximately 40 new waste collection vehicles to support VUDAA’s waste collection services. Of these five skip loaders and four 6 m³ compactor trucks are to be used to collect

waste within an approximately 12 km radius of the transfer station and transport the waste from there to the final disposal site. The counterparts will be assisted so that they can appropriately manage the deployment of the newly provided waste collection vehicles by establishing a collection plan for the vehicles that will transport waste to the new transfer station under the collection area expansion.

(2) To enable the smooth reloading of collected waste for transportation at the transfer station

Waste collected in Vientiane by small collection vehicles is transported to the transfer station and after being reloaded into 20 m3 compacter trucks in the reloading facility is then transported to the existing final disposal site. The Soft Component will support appropriate organizational management of the transfer station to establish the capability for waste to be smoothly reloaded and transported out without delay.

(3) To enable the appropriate disposal at the final disposal site of waste reloaded at the transfer station

The waste that is reloaded into 20m3 compactor trucks at the transfer station will be transported to and disposed of at the existing final disposal site. The existing final disposal site however, has never had large compactor trucks disposing waste in it. The Soft Component will give technical guidance on securing an access way to enable large vehicles to enter the site and dispose their load of waste, and moreover, to give any other relevant support needed to operate the disposal site resulting from this change.

3 Outputs of the Soft Component and Means of Verification

The following outlines the detailed activities and outputs of the Soft Component.

Table 1 Activities and outputs of the Soft Component

Item	Activity	Output	Means of verification
1. Support to enable the appropriate management of deployment of the provided waste collection vehicles that are used in relation to the transfer station	1. Teaching VUDAA Waste Collection Services Department how to develop a vehicle deployment plan	A vehicle deployment plan that takes into consideration factors such as waste volumes and distances to the transfer station of each area	1 . Vehicle deployment plan
2. Support to enable the smooth reloading of collected waste for transportation at the transfer station	1. Teaching how to establish operational rules such as on safety and hygiene procedures, reloading procedures in the transfer station, and labor regulations	The transfer station is operated according to the operational rules and waste is reloaded smoothly and without delay	1. Operational rules 2. Teaching records
3. Support to enable the appropriate disposal at the final disposal site of waste reloaded at the transfer station	1. Teaching the disposal site supervisor, heavy machinery operators, 20m3 compactor truck drivers how to appropriately dispose of waste	Large waste transport vehicles appropriately dispose waste at final disposal sites	1. Sanitary Landfill Plan document which describes the access road planning of large vehicles 2. Teaching records

4 Soft component activities (input plan)

The fields for guidance in the soft component to obtain the above results are proper management of the collection equipment, operational management of the waste transfer station and operational management of the final disposal sites. As for the guidance related to the waste transfer facility and the provided transportation equipment and collection equipment; first operational guidance will be conducted for the equipment that needs initial guidance before using the equipment, with the soft component guidance planned to assist the ongoing efficient operation of this equipment.

Table 2 Classification of soft component and operational guidance

Guidance items	Equipment operation guidance	Soft Component
Collection vehicles, large transport vehicles and waste transfer facility initial guidance <ul style="list-style-type: none"> ● Operation guidance of basic equipment (usage) ● Inspection before starting work ● Troubleshooting operations 	○	
Guidance in order to achieve the objectives efficiently by using equipment: <ul style="list-style-type: none"> ● Teaching VUDAA Waste Collection Services Department how to develop a vehicle deployment plan. ● Formulation assistance of management regulations of waste transfer station waste reloading procedures, labor regulations, safety and hygiene items, etc. ● Guidance for appropriate disposal methods for the waste transfer station disposal site supervisors. ● Heavy equipment operators and 20m³ compactor truck drivers 		○

Specific activities in their respective fields are summarized in the table below.

Table 3 Activity details of Soft Component

Fields	Activities	Activity Details
1. Support to enable the appropriate management of deployment of the provided waste collection vehicles that are used in relation to the transfer station	1.1 Teaching VUDAA Waste Collection Services Department how to develop a vehicle deployment plan	<p>The area that can be collected in one trip will be determined by calculating waste generated amount by day based on the population of extended collection area and by setting the collection service frequency. After that, the collection route of the target area will be planned by taking into consideration the road conditions.</p> <ul style="list-style-type: none"> • Calculation of waste collection and verification of each area • Calculation of the transport distance • Calculation of the number of trips per day • Calculation of the required number of vehicles • Collection route planning
2. Support to enable the smooth reloading of collected waste for transportation at the transfer station	2.1 Formulation assistance of management regulations of waste transfer station waste reloading procedures, labor regulations, safety and hygiene items, etc.	<p>To give guidance to formulate management regulations by taking into consideration the following operations of waste transfer station, which has a function of receiving collection vehicles loaded with waste and reload it into large transport vehicles.</p> <ul style="list-style-type: none"> • Survey on truck scale operating procedures • Loading and unloading of waste collection vehicles • Waste reloading work • Loading of waste into transport vehicles • Treatment of sewage generated from vehicle washing area, etc. • Control management of raising trees and plants as buffer zone
3. Support to enable the appropriate disposal at the final disposal site of waste reloaded at the transfer station	3.1 Guidance for appropriate disposal methods for the waste transfer station disposal site supervisors, heavy equipment operators and 20m ³ compactor truck drivers	<p>To give guidance to transport and dispose the waste that has been loaded into the large transport vehicles from existing final disposal site to appropriate landfill area.</p> <ul style="list-style-type: none"> • Revision of the existing waste disposal site management manual • Practical guidance on access road construction to disposal site supervisors and heavy equipment operators • Practical guidance on approach method and disposal method for 20m³ compactor truck drivers

Apart from the activities above, daily implementation of specific activities will be organized as shown below.

4.1 Activity 1.1 Teaching VUDAA Waste Collection Services Department how to develop a vehicle deployment plan

Regarding the collection vehicles such as provided skip loaders and 6 m³ compactor trucks which will transport the waste to the transfer station, the project will teach VUDAA Waste Collection Services Department how to develop a vehicle deployment plan. The area that can be collected in one trip will be determined by calculating the amount of waste generated per day based on the population of collection target area and by setting the collection service frequency. After which, the collection route of the target area will be planned by taking into consideration the condition of roads.

Table 4 Teaching VUDAA Waste Collection Services Department how to develop a vehicle deployment plan

Teaching details	Timing of implementation	Japanese (in charge of vehicle deployment plan)	Local employees (support)	VUDAA	
				Transfer station manager (1 person)	Personnel in charge (2 persons)
● Calculation of waste collection and verification of each area	2015 12	7 days	7 days	1 day	7 days
● Calculation of the transport distance		3 days	3 days	1 day	3 days
● Calculation of the number of trips per day		3 days	3 days	1 day	3 days
● Calculation of the required number of vehicles		3 days	3 days	1 day	3 days
● Collection route planning		7 days	7 days	1 day	7 days
Total (operation days)		23 days	23 days	5 days	23 days

4.2 Activity 2.1 Formulation assistance of management regulations of waste transfer station waste reloading procedures, labor regulations, safety and hygiene items, etc.

The waste in loaded collection vehicles such as skip loaders and 6 m³ compactor trucks, will be reloaded into 20m³ compactor trucks at the waste transfer station. Furthermore, guidance for formulation of management regulations such as on safety and hygiene procedures, reloading procedures in the waste transfer station, and labor regulations will be performed.

Table 5 Formulation assistance of management regulations of waste transfer station waste reloading procedures, labor regulations, safety and hygiene items, etc.

Teaching details	Timing of implementation	Japanese (in charge of transfer station)	Local employees (support)	VUDAA	
				Transfer station manager (1 person)	Personnel in charge (2 persons)
● Survey on truck scale operating procedures	2015 12	3 days	3 days	1 day	3 days
● Survey on waste reloading		3 days	3 days	1 day	3 days
● Survey on impact measures on the surrounding environment		3 days	3 days	1 day	3 days
● Survey on work regulations, safety and hygiene		3 days	3 days	2 days	3 days
● Formulation assistance of management regulations		7 days	7 days	2 days	7 days
● Practical guidance related to waste transfer station management.		7 days	7 days	1 day	7 days
Total (operation days)		26 days	26 days	8 days	26 days

4.3 Activity 3.1 Guidance on appropriate disposal methods for the disposal site supervisors, heavy equipment operators and 20m³ compactor truck drivers

To give guidance on transporting the waste loaded onto the large transport vehicles (20m³ compactor trucks) so that it is disposed of in an appropriate location in the existing final disposal site.

Table 6 Guidance for appropriate disposal methods for the waste transfer station disposal site supervisors, heavy equipment operators and 20m³ compactor truck driver

Guidance details	Timing of implementation	Japanese (in charge of the disposal site)	Local employees (support)	VUDAA KM32 final disposal site unit
● Revision of the existing waste disposal site management manual	2016 01	5 days	5 days	Personnel in charge 1 person × 5 days
● Practical guidance on access road construction to disposal site supervisors and heavy equipment operators		3 days	3 days	Disposal site supervisor 1 person × 3 days Heavy Equipment One Machine × 3 days Heavy Equipment Operator 1 person × 3 days
● Practical guidance on approach method and disposal method for 20m ³ compactor truck drivers		3 days	3 days	20m ³ Compactor Truck Drivers 3 persons × 3 days
Total (operation days)		11 days	11 days	

5 Procurement methods of implementation resources of Soft Component

The Soft Component Project will be “Direct Assistance Type” by Japanese consultants.

This Soft Component is for guidance of collection and transportation of waste planning, waste transfer station operation and management and general waste plan of final disposal site operation and management. The Soft Component will basically be implemented by a Japanese consultant who is responsible for all of the work involved in the basic design formulation and facility construction materials and equipment procurement supervision, and with the support of a local assistant, it will enable the technical guidance to be undertaken effectively in a short period of time.

6 Implementation schedule of Soft Component

The implementation schedule of the Soft Component activities is as shown below.

Table 7 Table of Soft Component Implementation schedule

Month Activities	Soft component		
	0	1	2
	Completion of construction & installation ▲		
Making appropriate plan of schedule of waste collection vehicle		■	
Making operation rule of transfer station			■
Instruction of final disposal site operation			■

7 Estimated Project cost of Soft Component

Estimated Project cost is as follows.

8 Responsibilities of the counterpart implementing agency

Vientiane Urban Development & Administration Authority (hereinafter VUDAA) was established in 1995 with an objective of reducing the workload of the Department of Public Works and Transport (hereinafter DPWT) by conducting efficient provision of public services and improvement of urban infrastructure that is growing rapidly. Furthermore, VUDAA is performing public services and developing urban infrastructure works in all 9 counties of VTE; in concrete terms, it is responsible for roads, waste, waterways, sewage, environmental protection, roadside and river erosion prevention, planning of urban development work such as park maintenance, construction, management and operations. The organizational structure of VUDAA is as shown in the figure below.

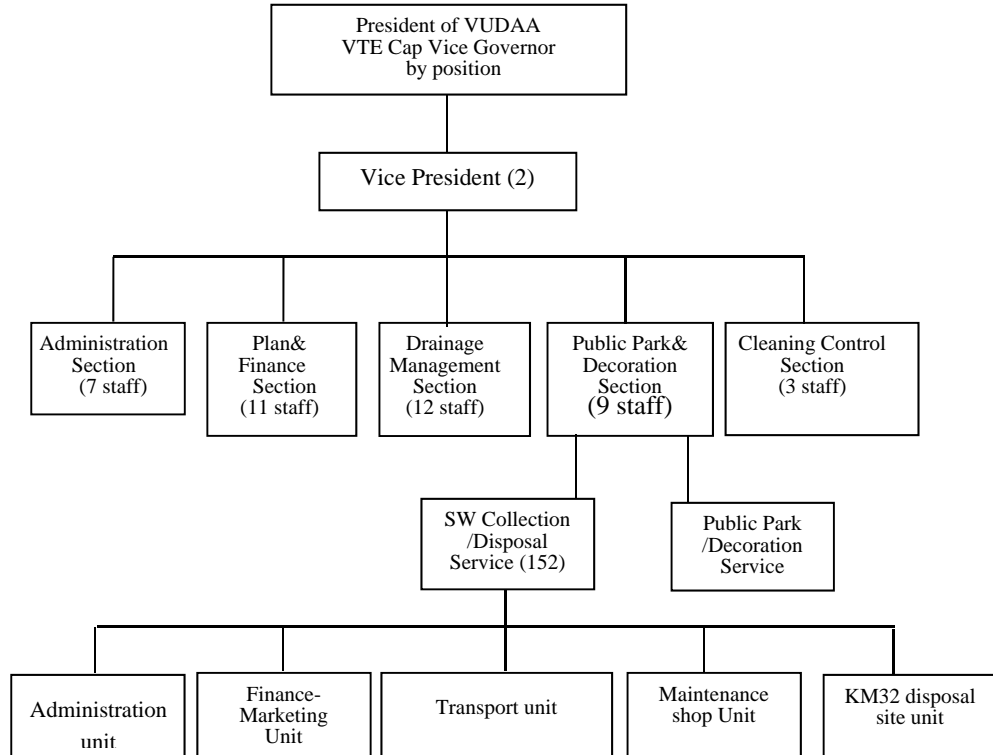


Figure 1 VUDAA organizational structure

Responsibilities of Partner country's implementing agency (Urban Development & Administration Authority,

VUDAA) related to Soft Component are as follows.

Implementing agency	Responsibilities
Administration unit	<ul style="list-style-type: none"> • Collection plan, transfer facility management, appointment of managers involved in software component to ensure the access road of the final disposal site. • Cooperate and contact with the relevant ministries (Ministry of Nature and Environment).
Transportation unit	<ul style="list-style-type: none"> • Development assistance of vehicle deployment planning. • Monitoring and proper deployment of the provided collection vehicles. • Development assistance of the managerial regulations of the transfer facility. • Practical operation of the transfer facility.
KM32 disposal site unit	<ul style="list-style-type: none"> • Assistance in revising the existing waste disposal site management manual. • Practical guidance on access road construction to disposal site supervisors and heavy equipment operators. • Practical guidance on method of entering the landfill area and disposal method for 20m³ compactor truck drivers.

6. The list of Reference Documents

Document name	Source
Agreement on the National Environmental Standards	Water Resource and Environment Administration
Statistical Yearbook 2012	Ministry of Planning and Investment