

Ministry of Public Works  
The Republic of Liberia

**THE PREPARATORY SURVEY**  
**ON**  
**THE PROJECT FOR RECONSTRUCTION OF SOMALIA**  
**DRIVE IN MONLOVIA**  
**IN**  
**THE REPUBLIC OF LIBERIA**

January 2013

**JAPAN INTERNATIONAL COOPERATION AGENCY**

**KATAHIRA & ENGINEERS INTERNATIONAL**

**YACHIYO ENGINEERING CO.,LTD**

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## **PREFACE**

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to consist of Katahira & Engineers International and Yachiyo Engineering CO.,LTD.

The survey team held a series of discussions with the officials concerned of the Government of the republic of Liberia, 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 the Republic of Liberia for their close cooperation extended to the survey team.

January, 2013

Kazunori Miura  
Director General,  
Economic Infrastructure Department  
Japan International Cooperation Agency

## Summary

### 1. Outline of the Country

The Republic of Liberia is located in south-west of Western Africa and the in the north latitude 5° . The territory is facing the Atlantic Ocean.

Liberia has a population of 3.6 million (based on the Population Census in 2009) and 111,000 square kilometers in area. The GNI in 2011 was 1,359 million US dollars, or 330 US dollars per person (according to the World Bank data). The main industries in Re are agriculture, forestry and mining, especially natural rubber production is well-known. The export amount of natural rubbers accounted for 67% of total export amounts in 2011. In addition, diamonds and timber are pulling Liberia's economy along as main export goods.

Another important source of foreign income is a ship registration fee. As Liberia gives special tax treatment to ships, many foreign flag ships are registered in Liberia for the sake of convenience. The ship registration is an important measure to acquire foreign currency

### 2. Background of the Project

The 14 years civil war in the Republic of Liberia left seriously damaged and deteriorated major trunk roads in Monrovia, the capital city, and the other regions. However, the maintenance of the infrastructures has not been undertaken sufficiently by the Government. After the civil war, the population of Liberia reached 3,500,000 as of the year 2008, and most of them are refugees and internal displaced persons who flew in the metropolitan area and resettled. The population of Monrovia is estimated around 1,200,000, double of the population before the civil war and it causes the deterioration of living environment. Thus it is pointed out that rapid development of basic infrastructure is needed. The rehabilitation of roads within the city has been progressed little by little, however, the increase of traffic volume is causing traffic congestion in many parts of the city.

The Poverty Reduction Strategy Papers (PRSP) of Liberia is the basis for the Work Plan for 2008-2011, which puts importance on the basic strategy and sustainable development of Liberia. The PRSP describes the basic policy of road sector in metropolitan area of Monrovia. The government of Japan conducted Master Plan Study on Urban Facilities Restoration and Improvement in Monrovia in November 2008, and the project for reconstruction of Somalia drive in Monrovia has been proposed as a high priority project.

The 13.2 km long Somalia drive is one of the major trunk roads of Monrovia metropolitan area. Along the road, markets and kiosks are located and also used as parking space. Among the 4 lanes, 2 lanes are paved through the assistance of the World Bank, the other 2 lanes are not paved and causing traffic congestion. Even the existing lanes have serious damages on the road.

The Somalia drive is connected with the feeder roads except local distribution roads and is directly connected with some community roads. These roads constitutes a road network via Somalia drive. As a consequence, in the project site traffic congestion becomes continuously. The improvement of the roads to facilitate the traffic flow is highly required.

This Project falls under the Category A of the JICA guidelines for environmental and social considerations in the light of the 1) sector (roads), 2) characteristics (massive involuntary resettlement), and 3) area (located near the Mesurado wetland which is registered under the Ramsar Convention)

In the above mentioned Master Plan study, EIA has been carried out involving the local stakeholders, and the draft scoping plan and draft final report which were reviewed and obtained response from the Committee of the environmental and social consideration.

Based on the above mentioned results, this study will scrutinize the necessity and appropriateness of the requested project and propose the implementation plan including estimate the project cost.

### **3. Outline design of the study and contents of the project**

JICA dispatched the preparatory study team to Liberia between 21 January to 28 March 2012 for 1<sup>st</sup> stage of site investigation and 1st April to 1st June 2012 for 2<sup>nd</sup> stage of site investigation and 7 to 26 October for 3<sup>rd</sup> stage of site investigation for the execution of outline design study for Somalia Drive, about 13.2 km in total length, and the team conducted the discussions with concerned Liberia officials and investigations of the project site.

After coming back Japan, the team carried out outline design for the appropriate contents of the Project based on the result of the field survey and prepared the draft report of the study for the result of outline design.

JICA dispatched the team to Liberia from 25 November to 7<sup>th</sup> December 2012 for the explanation of draft report and the team made discussions, confirmation and agreement regarding the contents of the draft report.

The contents of the Project finally agreed are shown below.

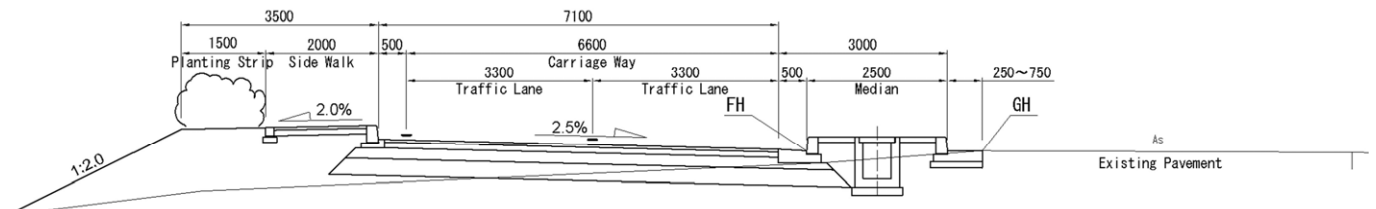
Road design requirements are as follows.

- ✓ Widening of the existing Somalia Drive road from 2-lane to 4-lane road (Total distance: 13.2km from Free Port Jct. to Red Light Jct.)

**Table-1: Overview of Facilities (Repaired Components)**

Section	Repaired Components	Repaired Item
Somalia Drive 13.2km	Widening of existing road	Widening road width 4-lane from 2-lane.
	Junction Improvement	Cross type junction 17 places.
	Gravity Retaining Wall	Construction of 34.8m length.
	Drainage Facilities	Construction of center U- drainage facilities. Construction of RC pipe (φ 400-700mm) facilities.
	Structure	Stockton Bridge (W=10.15m, L=85.0m) 1place Construction Stockton Bridge (W=10.15m, L=73.6m) 1place Construction Double Bridge 2place Rehabilitation
	Road Facilities	U-turn lane
	Curb Stones	Construction of curb stones, Installation of curb stone.
	Center Separator	Separating existing and new road by separator
	Side walk Pavement	Construction of sidewalk. Surface is Asphalt Pavement.
	Safety Facilities	Construction of Road/ Regulate sign, Cross walk.

Typical cross sections of subject road are as below.



**Figure-1: Typical Cross Section**

Contents of the facilities under outline design scheme are as below.

**Table-2 Contents of the Facilities under Outline Design Scheme**

Facilities	Specifications	Unit
Road Length	Free Port Junction to Red Light Junction, : 13.2 km	km
Carriage way Pavement	Asphalt pavement (Hot Asphalt Concrete) (t=150mm)	sq.m
	Upper Sub-base Course (Mechanical Stabilized Aggregate) (t=200mm)	sq.m
	Lower Sub-base Course (Crusher Run) (t=300mm)	sq.m
Junction Improvement	Cross type junction with left turn lane : 9 places Cross type junction : 8 places T type junction : 149 places	place
Sidewalk Pavement	Asphalt pavement (t=50mm)	sq.m
	Sub-base Course (Mechanical Stabilized Aggregate) (t=100mm)	sq.m
Drainage	U-Shape Concrete Drain (Bottom Width = 500mm)	l.m
	RC pipe Culvert (Pre-cast, Inner Diameter = 400mm-700mm)	l.m
Bridge	Stockton Bridge (W=10.15m, L=85.0m) 1place Construction Stockton Bridge (W=10.15m, L=73.6m) 1place Construction Double Bridge 2 place Rehabilitation	set
Curb Stone	Curb Stone	l.m
	Verge Block	l.m
Separator	Center Separator	
Traffic Sign	Warning & Regulatory Signs	set
Road Marking	Center Line (w=150mm), Shoulder Line (w=150mm), Pedestrian Crossing (w=450mm), Stop Line (w=450mm), etc.	l.m

#### 4. Implementation Schedule and Project Cost

In case the Project is implemented by Japan's Grant Aid, the period for the detailed design is 6.0 months and the implementation period is 23.0 months in total. The cost borne by Liberia side to implement the Project is estimated at 1,545,000 US\$.

#### 5. Project Evaluation

##### (1) Relevance

- ① A number of people receive benefit from the Project; Direct beneficiary of the Project includes the road user and the resident whose population is 300 thousand people and indirect beneficiary of the Project includes 1.2 million people who live in Monrovia.

- ② Liberia can operate and maintain the project facilities by themselves using its funds, labor and technology as excessively special techniques are not required.
- ③ This Project will reconstruct basic infrastructure, which is one of the important subjects among National Plan “the Poverty Reduction Strategy Papers (PRSP) of Liberia.” As Monrovia’s population is growing rapidly, this Project is urgent to solve the traffic congestion.
- ④ As for the countermeasures against traffic accidents after effects of road improvement on environment and society are observed, measures such as the establishment of traffic safety facilities, improvement of junction and construction of sidewalk are fully taken.
- ⑤ It is expected that this project will be implemented without difficulties by the Japanese Grant Aid scheme.

**(2) Effectiveness**

**1) Quantitative Effect**

Expected effect	Before Implementation (Present)	After Implementation (Future)
Reduction in traffic time at peak hour (L=13.2km)	60 minutes	20 minutes
Decrease of Private bus’s additional fare (round trip fare between the Red light Junction and the center of Monrovia)	20-30 Liberia \$	0

**2) Qualitative Effect**

- ✓ Safety securement  
The safety for the pedestrian will be secured by separating sidewalk and carriage way by the construction of sidewalk and curb stone.
- ✓ Decrease in the frequency of maintenance by improvement of drainage facilities  
The damage to the base course from rain water will be prevented by the improvement of drainage facilities, resulting in decrease in the frequency of maintenance.
- ✓ Smooth traffic by bus bay  
The safety of passenger on the bus as well as smooth traffic will be secured by the construction of bus bay at the place which a large number of people get on and off.

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Location Map



**Perspective (RoadSection)**



**Perspective (Stockton Bridge section)**

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## Abbreviation

CO	: Carbon Monoxide
CO <sub>2</sub>	: Carbon Dioxide
dB	: Decibel
DO	: Dissolved Oxygen
EIA	: Environmental Impact Assessment
EPA	: Environmental Protection Agency
GIZ	: Gesellschaft für Internationale Zusammenarbeit
GOL	: Government of Liberia
IFC	: International Financial Corporation
IIU	: Infrastructure Implementation Unit
JICA	: Japan International Cooperation Agency
L.C	: Liberian Constitution
LRPRC	: Liberia Refugee Repatriation and Resettlement Commission
MCC	: Monrovia City Corporation
MHSW	: Ministry of Health and Social Welfare
MIA	: Ministry of Internal Affairs
M.M.L	: Minerals and Mining Law
MLMI	: Ministry of Lands, Mines and Energy
MOF	: Ministry of Finance
MPW	: Ministry of Public Works
NO <sub>2</sub>	: Nitrogen Dioxide
OP	: Operational Policy
PAPs	: Project Affected Persons
PAHs	: Project Affected Households
PCC	: Paynesville City Corporation
RAP	: Resettlement Action Plan
RIS	: Information Sheet on Ramsar Wetlands
ROW	: Right of Way
RPM	: Respirable Particulate Matter
SO <sub>2</sub>	: Sulfur Dioxide
SPM	: Suspended Particulate Matter
SS	: Suspended Solids
TOR	: Terms of Reference
USD	: United State Dollars
WB	: World Bank



## **CHAPTER 1 BASIC CONCEPT OF THE PROJECT**

### **1-1 Project Background**

The 14 years civil war in the Republic of Liberia left seriously damaged and deteriorated major trunk roads in Monrovia, the capital city, and the other regions. However, the maintenance of the infrastructures has not been undertaken sufficiently by the Government. After the civil war, the population of Liberia reached 3,500,000 as of the year 2008, and most of them are refugees and internal displaced persons who fled in the metropolitan area and resettled. The population of Monrovia is estimated around 1,200,000, double of the population before the civil war and it causes the deterioration of living environment. Thus it is pointed out that rapid development of basic infrastructure is needed. The rehabilitation of roads within the city has been progressed little by little, however, the increase of traffic volume is causing traffic congestion in many parts of the city.

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The Somalia drive is connected with the feeder roads except local distribution roads and is directly connected with some community roads. These roads constitutes a road network via Somalia drive. As a consequence, in the project site traffic congestion becomes continuously. The improvement of the roads to facilitate the traffic flow is highly required.

This Project falls under the Category A of the JICA guidelines for environmental and social considerations in the light of the 1) sector (roads), 2) characteristics (massive involuntary resettlement), and 3) area (located near the Mesurado wetland which is registered under the Ramsar Convention)

In the above mentioned Master Plan study, EIA has been carried out involving the local stakeholders, and the draft scoping plan and draft final report which were reviewed and obtained response from the Committee of the environmental and social consideration.

Based on the above mentioned results, this study will scrutinize the necessity and appropriateness of the requested project and propose the implementation plan including estimate the project cost.

## **1-2 Natural Conditions**

The republic of Liberia is located at south-west of West Africa and the in the north latitude 5° . Territory is 111 thousands sq.km and bordered on the Ivory Coast in east, Guinea in north, Sierra Leone in west, the Atlantic Ocean in south. Regarding topography, High mountain of 4,500m in altitude is located in north-west area, the altitude become lower abruptly to the seaside, the tropical jungle is located in the seaside.

The project area of Greater Monrovia is located the seaside in the center of Liberia, there are the Mesurad wetland which is registered under the Ramsar Convention for protection of water fowl in the south side of Somalia Drive.

The climate in Monrovia city is characterizes by monsoon (wet) season and dry season. The monsoon season extends from May to October and the dry season is from November to April. Annual precipitation reaches as much as 6,900mm.

Terrestrial formation is composed of the Edina Sandstone, Payneville Sandstone and Fluvial & Deltac Deposits.

### **1-3 Environmental and Social Considerations**

#### **1-3-1 Environmental Impact Assessment**

##### **1-3-1-1 Outline of the Project Component Affecting Environment and Society**

According to the JICA Guidelines for Environmental and Social Considerations, 2004 (JICA Guidelines), the Project is classified into Category “A” based on the reasons that large-scaled involuntary resettlement is required and sensitive area, the Mesurado Wetland designated as the Ramsar Convention, exists near the Project area.

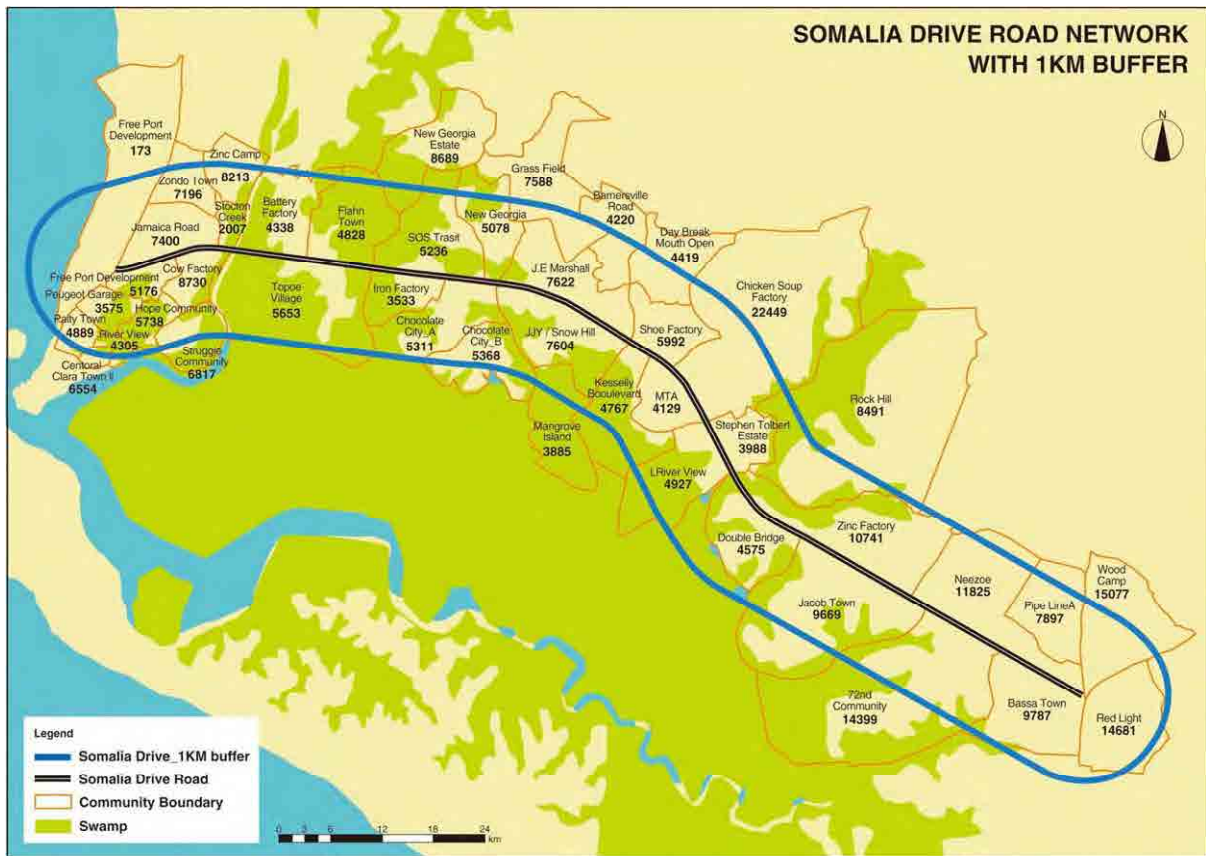
The outline of the Project components affecting the environment and society around the Project site is as follows.

- Widening of the existing Somalia Drive road from 2-lane to 4-lane road (Total distance: 13.2km from Free Port Jct. to Red Light Jct.)
- Reconstruction of the Stockton Bridge
- Renovation of the Double bridge
- Improvement of drainage facility
- Development of parking space and bus stops
- Installation of sign boards, road markings and pedestrian crossings

##### **1-3-1-2 Environment and Society**

###### **1) Population**

Based on the Census Survey carried out by Government of Liberia (GOL) in 2008, the population along the Project road within 1 km wide each side counted out 307,537, which accounts for about 32% of the total population in Greater Monrovia. The population density along the Project road is about 10,000 per km<sup>2</sup>. The highest population community is Chicken Soup Factory which is located almost center of the Project road.

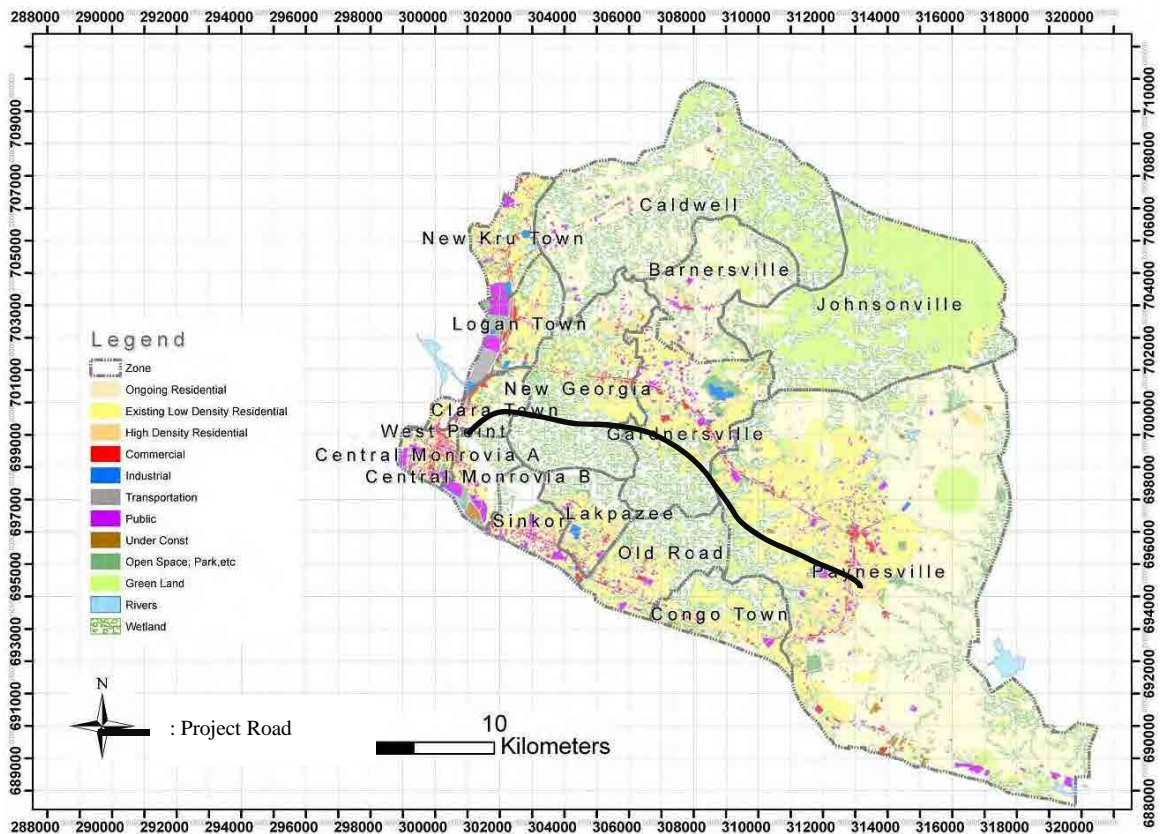


Source: JICA Survey Team

Figure 1.3-1 Population Distribution along the Project Road

## 2) Land Use

The land along the Project road is mainly used for commercial facilities such as small-scaled shop, market, petro station, business center etc. and factory such as paint, brick, furniture etc. Also, there are public facilities such as school, church and hospital.



Source: The Master Plan Study on Urban Facilities Restoration and Improvement in Monrovia in the Republic of Liberia, JICA, 2009

Figure 1.3-2 Land Use

### 3) Natural Environment

#### Topography and Geography

The Project road is located in north side of the Mesurado Wetland and almost flat area. Terrestrial formation is composed of the Edina Sandstone, Paynseville Sandstone and Fluvial & Deltac Deposits.

#### Climate

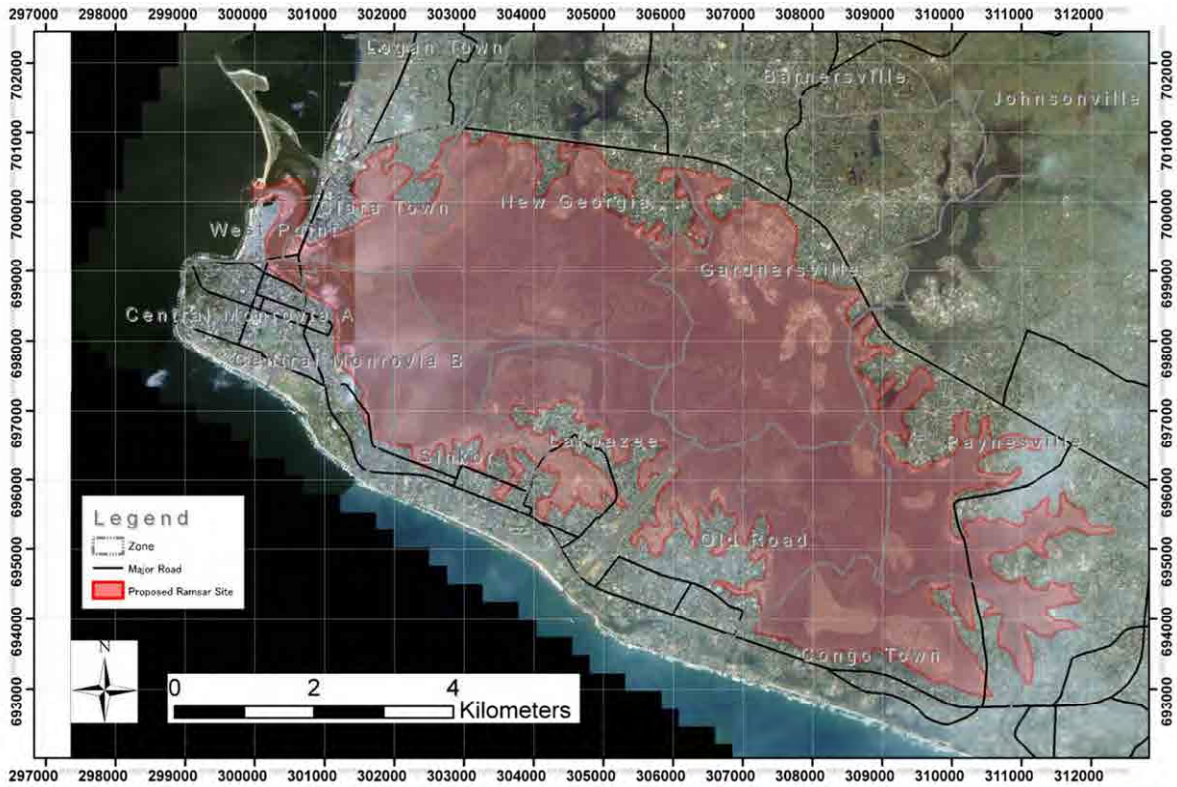
The climate in Monrovia city is characterizes by monsoon (wet) season and dry season. The monsoon season extends from May to October and the dry season is from November to April. Annual precipitation reaches as much as 6,900mm.

#### Natural Reserve Area

No natural reserve area does exist around the Project road.

#### Wetlands designated as the Ramsar Convention

The Project road is close to the Mesurad Wetland designated as the Ramsar Convention. According to “Information Sheet on Ramsar Wetland (RIS), the area of the Mesurado Wetland is about 6,760 ha, however the exact boundary of the Medurado Wetland has not been determined.



Source: The Master Plan Study on Urban Facilities Restoration and Improvement in Monrovia in the Republic of Liberia, JICA, 2009

Figure 1.3-3 Tentative Boundary of the Mesurado Wetland

#### Precious Spices and their Habitat

There are mangrove trees ranging in the Mesurado Wetland. However, these mangrove trees have been used for construction materials and fire woods by local residents and thus there are growing concerns about the decrease of mangrove forests. No research and/or survey on the mangrove forest in the Mesurado Wetland has not been carried out by Environmental Protection Agency (EPA), donors, NGOs and institutions.

#### River/Lake/Coast

Water flows into the Mesurado Wetland through mainly two creeks, Stockton Creek and Waner Creek, and flows out to the sea through Mesurado Wetland.

#### **4) Socio-economic Condition**

##### Involuntary Resettlement

As a result of the socio-economic survey carried out from March to May 2012 for the preparation of Resettlement Action Plan (RAP), 456 Project Affected Households (PAHs), 918 Project Affected Persons (PAPs) and 449 Projected Affected Structures were confirmed in the Project area, ROW 75 feet from the centerline of the Project road.

##### Land Acquisition

ROW of the Project road used to be 150 feet which was fixed by MPW. However, ROW was narrowed to 75 feet for the purpose to minimize the number of PAPs.

### Public Facility

There are 17 schools, 1 vocational school, 9 clinics/hospitals, 24 churches and 2 multi-purpose play fields along the Project road.

### Local Economy and Industry

There are a lot of kiosks/vendors, temporary structures and factories such as paint, furniture and car repair shops in operation along the Project road. Also, there used to be a lot of large-scale factories such as battery production, zinc production and food processing by the civil war in 1980' however, those factories were closed down and no plan to be restarted at this moment.

### Cultural Heritage

No historically and culturally important heritage does exist along the Project road.

## **1-3-1-3 System and Organization of Environmental and Social Consideration in Liberia**

### **1) Environmental Impact Assessment Procedural Guidelines**

#### **Outline**

Environmental Impact Assessment Procedural Guidelines, 2006 obliges a project opponent to carry out Environmental Impact Assessment (EIA) and submit the EIA report to EPA. Projects/Activities which EIA is required are classified into 26 categories shown in Table 1.3-1 and the Project corresponds with "13. Building and Civil Engineering Industry".

Table 1.3-1 Project/Activity which EIA is required

No.	Project/Activity
1.	Agriculture
2.	Livestock and Range Management
3.	Forestry Activity
4.	Fisheries Activity
5.	Wildlife
6.	Tourism and Recreational Development
7.	Energy Industry
8.	Petroleum Industry
9.	Food and Beverage Industry
10.	Textile Industry
11.	Leather Industry
12.	Wood, Pulp and Paper Industry
<b>13.</b>	<b><i>Building and Civil Engineering Industry</i></b>
14.	Chemical Industry
15.	Extractive Industry
16.	Non-metallic Industry (Products)
17.	Metal and Engineering Industry
18.	Waste Treatment and Disposal
19.	Water Supply
20.	Health Projects

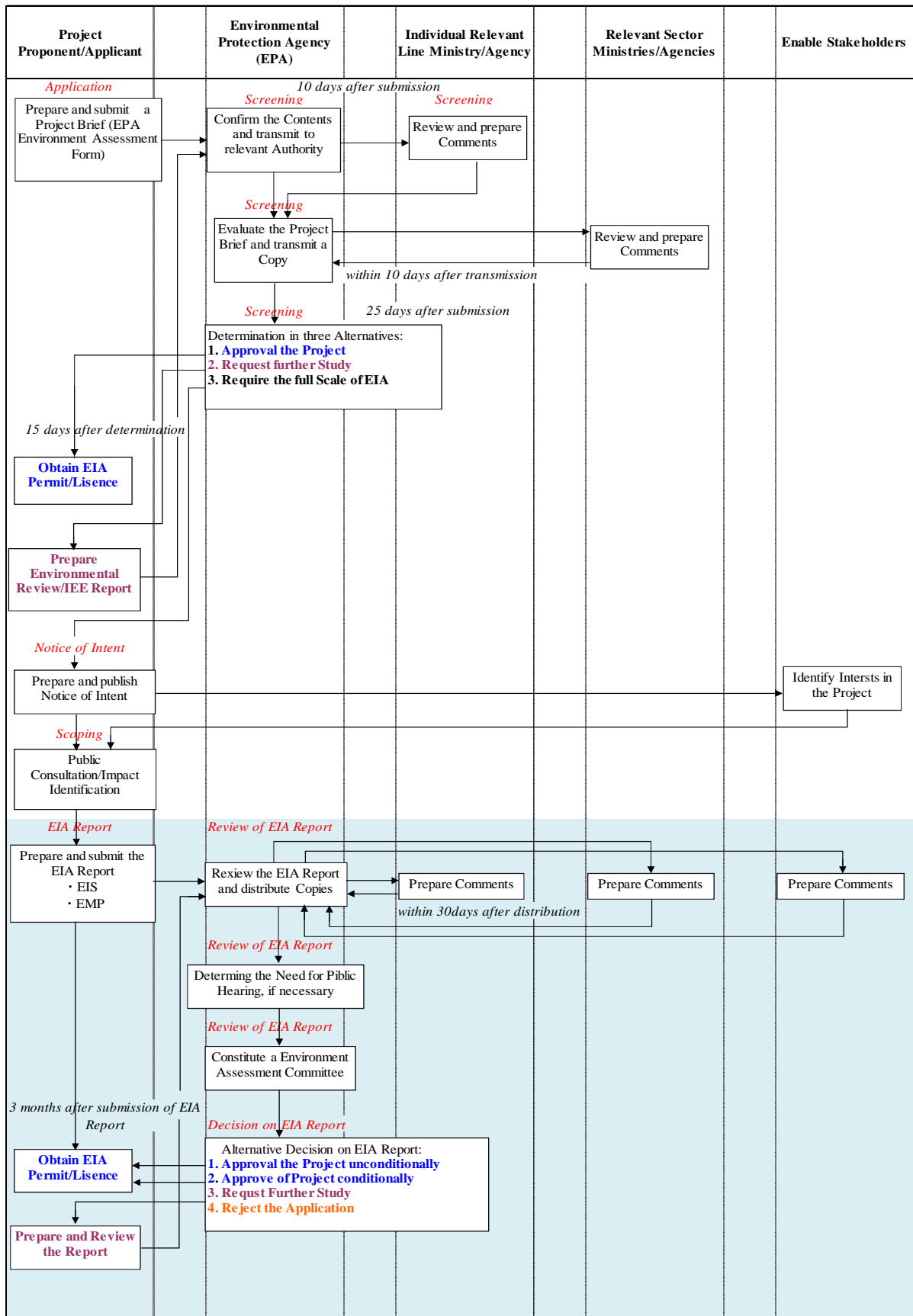
No.	Project/Activity
21.	Land Reclamation and Land Development
22.	Multi-Sectorial Project
23.	Trade: Importation and Exportation
24.	Urban and Rural Development
25.	Policy and Program
26.	General

Source: Environmental Impact Assessment Procedural Guidelines, EPA, 2006

### **Procedure of Environmental Impact Assessment**

The detail procedure of EIA is shown in Figure 1.3-4. Since the Project is to reconstruct and expand the existing Somalia Drive Road into 4-lane road from 2-lane road, EIA must be carried out and EIA report for the Project report shall be prepared based on the detailed site survey and road design, and submitted to EPA. In addition, the EIA includes RAP because large-scale involuntary resettlement is required.





Resource: The Master Plan Study on Urban Facilities Restoration and Improvement in Monrovia in the Republic of Liberia, JICA, 2009

Figure 1.3-4 Procedure to obtain EIA License

## 2) **Environmental Law and Regulation**

### **National Environment Policy (2003)**

This policy aims at improving the physical environment, quality of life and coordination between economic development, growth and sustainable management of natural resources. Key objectives of the policy includes;

- The systematic and logical framework with which to address environmental issues;
- Benchmarks for addressing environmental problems in the medium to long-term;
- Context for financial/donor support to particular sectors and non-sector;
- The means for generating information and awareness on environmental problems; and
- To demonstrate Liberia's commitment to sustainable management of the environment.

## 3) **National Wetland Policy in Liberia (Draft)**

This draft policy which aims at preservation of five wetlands designated as Ramsar Convention in Liberia including the Mesurado Wetland. However the policy is still under reviewing process. Key policies include;

- The recognition that there is direct link between wetlands and wetland functions to their surroundings, particularly aquatic ecosystems, and so to ensure wetland conservation for sustainable development there is a need for an integrated ecosystem approach;
- Continuous scientific researches and the development of expertise on wetlands in Liberia is the basis for achieving wetland conservation;
- The health and health needs of Liberians depend greatly on wetlands and their functions;
- Wetland conservation is greatly achieved through a coordinated, cooperative approach involving all relevant stakeholders, including local people and the private sector;
- The need to integrate wetland issues in all sectors to ensure conservation outcomes;
- Recognition of the Liberian Government's role in advocating for the conservation of wetlands, while respecting the rights of the local people to land ownership and the decision making process;
- The need for basic change in the attitude and perceptions of Liberians regarding wetlands through communication and education programs at national and local levels; and
- Wetland development is on the basis of environmental impact assessment.

## 4) **Environmental Regulation**

### **Ambient Air Quality Standard (Draft)**

The draft standard for ambient air quality is prepared at this moment however, it is not in force yet. EPA recommends using this draft standard for the ambient air quality assessment. The draft standard and the standard of World Health Organization (WHO) for the purpose of reference are shown in Table 1.3-2.

Table 1.3-2 Draft Standard of Ambient Air Quality in Liberia and the Standard of WHO

Pollutants	Time-weighted Average	Concentration in Ambient Air			
		Industrial Areas	Residential, Rural & Other Areas	Sensitive Areas	WHO* <sup>1)</sup>
Sulphur Dioxide (SO <sub>2</sub> )	Annual Average*	80 µg/m <sup>3</sup>	60 µg/m <sup>3</sup>	15 µg/m <sup>3</sup>	-
	24 hours**	120 µg/m <sup>3</sup>	80 µg/m <sup>3</sup>	30 µg/m <sup>3</sup>	20 µg/m <sup>3</sup>
Oxides of Nitrogen (NO <sub>2</sub> )	Annual Average*	80 µg/m <sup>3</sup>	60 µg/m <sup>3</sup>	15 µg/m <sup>3</sup>	40µg/m <sup>3</sup>
	24 hours**	120 µg/m <sup>3</sup>	80 µg/m <sup>3</sup>	30 µg/m <sup>3</sup>	200µg/m <sup>3</sup>
Suspended Particulate Matter (SPM)	Annual Average*	360 µg/m <sup>3</sup>	140 µg/m <sup>3</sup>	70 µg/m <sup>3</sup>	-
	24 hours**	500 µg/m <sup>3</sup>	200 µg/m <sup>3</sup>	100 µg/m <sup>3</sup>	-
Respirable Particulate Matter (RPM) (size less than 10 microns)	Annual Average*	120 µg/m <sup>3</sup>	60 µg/m <sup>3</sup>	50 µg/m <sup>3</sup>	20µg/m <sup>3</sup>
	24 hours**	150 µg/m <sup>3</sup>	100 µg/m <sup>3</sup>	75 µg/m <sup>3</sup>	50µg/m <sup>3</sup>
Lead (Pb)	Annual Average*	1.0 µg/m <sup>3</sup>	0.75 µg/m <sup>3</sup>	0.50 µg/m <sup>3</sup>	0.50 – 1.0 µg/m <sup>3</sup>
	24 hours**	1.5 µg/m <sup>3</sup>	1.00 µg/m <sup>3</sup>	0.75 µg/m <sup>3</sup>	-
Ammonia	Annual Average*	0.1 mg/ m <sup>3</sup>	0.1 mg/ m <sup>3</sup>	0.1 mg/m <sup>3</sup>	-
	24 hours**	0.4 mg/ m <sup>3</sup>	0.4 mg/m <sup>3</sup>	0.4 mg/m <sup>3</sup>	-
Carbon Monoxide (CO)	8 hours**	5.0 mg/m <sup>3</sup>	2.0 mg/m <sup>3</sup>	1.0 mg/ m <sup>3</sup>	1.0 µg/m <sup>3</sup>
	1 hour	10.0 mg/m <sup>3</sup>	4.0 mg/m <sup>3</sup>	2.0 mg/m <sup>3</sup>	3.0 µg/m <sup>3</sup>
*	Annual Arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.				
**	24 hourly/8 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed but not on two consecutive days.				

Remarks: \*1):WHO Ambient Air Quality Standard

Source: EPA

### **Water Quality Standard (Draft)**

The draft standard for water quality is prepared at this moment however, it is not in force yet. EPA recommends using this draft standard for water quality assessment. The draft standard classifies water quality into five categories depending on land use and then establishes each standard by the categories. The Mesurado Wetland is ecologically sensitive area therefore Category SW-I is applied for water quality assessment of the Project. The draft standard in Liberia and the standard of WHO for the purpose of reference are shown in Table 1.3-3.

- ✓ SW-I : Salt Pans, Shell Fishing, Mari-culture and Ecologically Sensitive Zone
- ✓ SW-II : Bathing, Contact Water Sports and Commercial Fishing
- ✓ SW-III : Industrial Cooling, Recreating and Aesthetics
- ✓ SW-IV : Harbor
- ✓ SW-V : Navigation and Controlled Waste Disposal

Table 1.3-3 Draft Standard of Water Quality Standard of SW-1 in Liberia and the Standard of WHO

Type of Water			SW-I (Ecologically Sensitive Zone)	WHO* <sup>1)</sup>
Parameter	pH		6.5 - 8.5	6.5 – 8.5
	Dissolved Oxygen	(mg/l)	5.0	5.0
		(%)	60	-
	Color and Odor		No noticeable color or offensive odor	-
	Floating Matters		Nothing obnoxious or detrimental for use purpose	-
	Suspended Solids		None from sewage or industrial waste origin	-
	Oil and Grease		(mg/l) 0.10	0.1
	Heavy Metals	Mercury (Hg)	(mg/l) 0.01	0.006
		Lead (Pb)	(mg/l) 0.01	0.01
Cadmium (Cd)		(mg/l) 0.01	0.003	

Remarks: \*1): WHO Guidelines for Drinking-water Quality, 4th Edition

Source: EPA

### **Noise Standard (Draft) and Vibration**

Based on hearing survey to EPA, the draft standard for noise is prepared at this moment however, that for vibration is not prepared. EPA recommends using the draft standard for noise and Ghana standard for vibration for noise and vibration assessment of the Project. The draft noise standard in Liberia and the standard of International Financial Corporation (IFC) for the purpose of reference are shown in Table 1.3-4. Table 1.3-5 shows the Ghana standard for vibration.

Table 1.3-4 Draft Standard of Noise in Liberia and the Standard of IFC

Facility		Noise limits B (A) (Leg)	
		DAY 06:00 – 22:00	NIGHT 22:00 – 06:00
A	Any building used as hospital, convalescence home, home for the aged, sanatorium and institutes of higher learning, conference rooms, public library, environmental and recreational site	45	35
B	Residential buildings	50	35
C	Mixed residential (with some commercial and entertainment)	50	35
D	Residential + industry or small-scale production + commerce	60	50
E	Industry	70	60
IFC Guidelines* <sup>1)</sup>	Residential	55	45
	Industrial	70	70

Remarks: General Environmental Guideline, 2007

Source: EPA

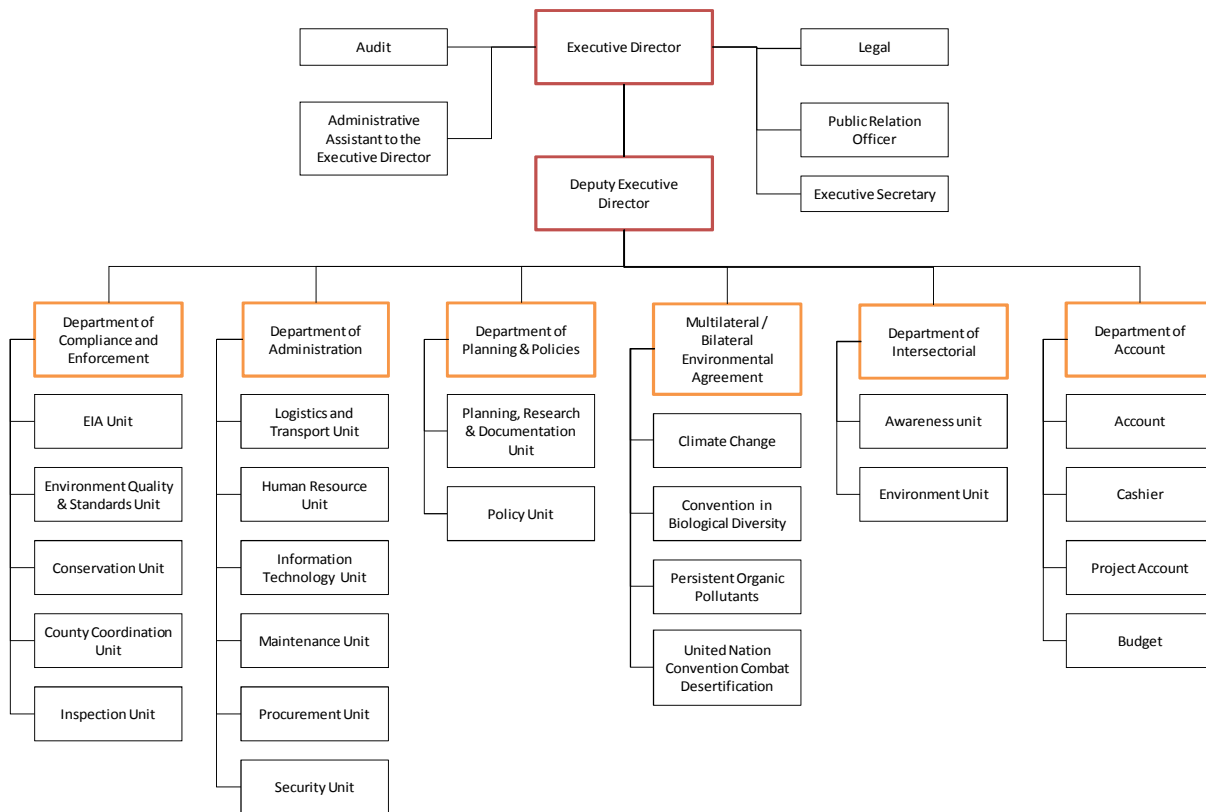
Table 1.3-5 Vibration Standard of Noise in Ghana

Zone	Description of Areas of Noise Reception	Permissible Noise Level in DB(A)	
		DAY 06:00 – 22:00	NIGHT 22:00 – 06:00
A	Residential areas with low or infrequent transportation	55	48
B1	Educational (school) and health (hospital, clinic) facilities	55	50
B2	Areas with some commercial or light industry	60	55
C1	Areas with some light industry, places of entertainment or public assembly, and places of worship located in this zone.	65	60
C2	Predominantly commercial areas	75	65
D	Light industrial, commercial areas	70	60
E	Predominantly heavy industrial areas	70	70

Remarks: Ministry of Environment, Science and Technology

**5) Environmental Protection Agency (EPA)**

EPA was established in 2004 and is in charge of environmental administration in Liberia. EPA is under presidential direct control, and only authority to coordinate, instruct and supervise all projects related to environment in Liberia. The organization chart of EPA is shown in Figure 1.3-5.



Source: EPA

Figure 1.3-5 Organization Chart of EPA

### 1-3-1-4 Comparison of Alternatives

This section describes the alternatives analysis by which the preferred alternative was identified.

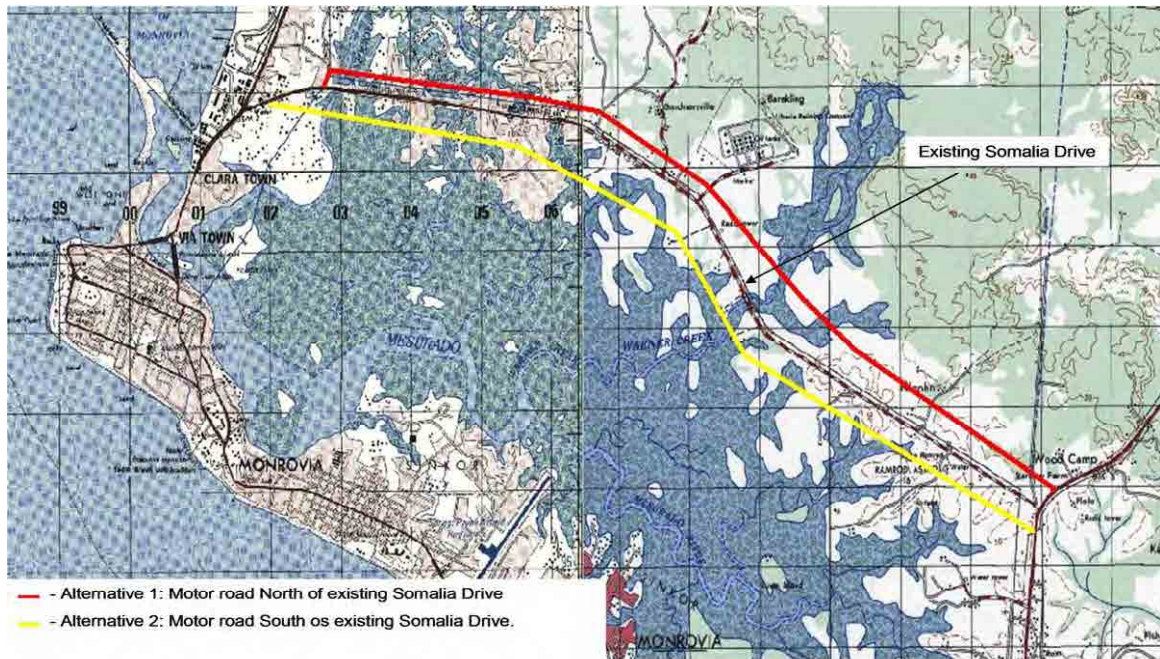


Figure 1.3-6 The Existing Somalia Drive and Proposed Alternatives

#### 1) Alternatives

##### Proposed Project Plan

This proposed project plan consists of the expansion of the entire existing Project road, 13.0km, 1 new bridge construction and 1 bridge renovation by using ROW, 75 feet. This project has a large impact on kiosks/vendors and tentative structures in operation in ROW, 75 feet, however the impact on involuntary resettlement of permanent structures is small because most of the ROW has already been acquired by GOL. The project cost is relatively small due to only one bridge construction and then the construction period is short.

##### Alternative-1

This alternative consists of 11.95km of 2-lane road construction, 1.25km of existing road renovation and 4 new bridge constructions. This alternative has a small impact on kiosks/vendors in operation along the Project road, however large-scale involuntary resettlement of permanent structures is required since this alternative goes through residential areas in the northern side of the Project road. On the other hand, the alternative goes through the furthest from the Mesurado Wetland and thus the impact on the wetland is likely to be small. In addition, the project cost is relatively large due to 4 bridge constructions and then the construction period is long.

### **Alternative-2**

This alternative comprises of 13.0km of 2-lane road construction, 0.2km of the existing road renovation and 9 new bridge constructions. This alternative has small impact on kiosks/vendors in operation along the Project road, however middle-scale involuntary resettlement on permanent structures is required since this alternative goes through residential areas in the southern side of the Project road. In addition, this alternative has the longest new road construction, accordingly the land acquisition is largest in the alternatives. On the other hand, the alternative goes through nearest from the Mesurado Wetland and thus the impact on the wetland is likely to be large. In addition, the project cost is the largest due to 9 bridge construction and then the construction period is longest.

### **Alternative-3**

This alternative composes of the same components of the propose project plan, however ROW is 150 feet. The alternative has the largest impact on kiosks/vendors in operation in ROW, 150 feet. In addition, the number of involuntary resettlement is larger than that of the proposed project plan since some lands in ROW, 150 feet, have not been acquired by MPW. The project cost is relatively small due to only 1 bridge construction and then the construction period is short.

### **No-Action Alternative**

Under the No-Action Alternative, the short-term environmental impacts such as air pollution would not occur. Conversely, the objectives of the Project would not be met, and easing the traffic problem between the Freeport and Red Light Jct. is not solved. While an alternative scenario may be considered over subsequent years, increase in population along the Project road and increase in the number of cars of the Project road is likely to increase over the years. This is going to result in serious transport problems for the communities and road users and result the serious social and environmental adverse impacts as well as serious economic damage.

## **2) Comparison of Alternatives**

Table 1-4-6 shows the comparison of this proposed Project Plan, Altenative-1.-2,-3 and No-Action.

Table 1.3-6 The Comparison between The Propose Project Plan, Alternative-1,-2,-3 and No-Action

Item	Proposed Project	Rating	Alternative-1	Rating	Alternative-2	Rating	Alternative-3	Rating	No Action	Rating
Component	- Expansion of 13.2km existing road - 1 new bridge construction - 1 existing bridge renovation - Utilization of 75 feet ROW	—	- New construction of 11.95km road - Expansion of 1.25km existing road - 4 new bridges construction	—	- New construction of 13.0 km road - Expansion of 0.20 km existing road - 9 new bridges construction	—	- Expansion of 13.0km existing road - 1 new bridge construction - 1 existing bridge renovation - Utilization of 150 feet ROW	—	- No improvement	—
Construction Cost* <sup>1)</sup>	USD57.6M	-1	USD70.3M	-2	USD90.4M	-3	USD60.6M	-1	Nil	0
Technical and/or Maintenance Aspect	- Easy because expansion of existing road - Easy because only minor renovation of existing bridge and one new bridge construction is necessary.	+2	- 4 new bridges construction may require special construction methods.	-2	- Since some bridges require structures over the Mesurado Wetland, special technics are necessary.	-2	- Easy because expansion of existing road - Easy because only minor renovation of existing bridge and one new bridge construction is necessary.	+2	- Easy maintenance - Continuous large-scale repair work is necessary because of poor drainage facility.	+2
Improvement of Traffic Capacity	- Possible to deal with traffic capacity in 2025.	+3	- Possible to deal with traffic capacity in 2025.	+3	- Possible to deal with traffic capacity in 2025.	+3	- Possible to deal with traffic capacity in 2025.	+3	- Impossible to deal with increased traffic demand	-2
Regional Development	- Promoted well	+3	- Promoted well	+3	- Promoted but limited due to the Mesurado Wetland	+3	- Promoted well	+3	- Due to heavy traffic jam, regional development is limited.	-2
Obligation of Recipient Country	- Relocation of water pipes and removal of oil pipelines are necessary. - Cost for RAP implementation is mediocre.	-1	- Detail survey is necessary to identify utility. - Cost for RAP implementation is extremely large.	-3	- Detail survey is necessary to identify utility. - Cost for RAP implementation is large.	-3	- Relocation of water pipes and removal of oil pipelines are necessary. - Cost for RAP implementation is larger than the Proposed Project.	-2	- No work	0
Social Consideration	- Involuntary resettlement for resident is relatively a little. - Impact against tentative venders is large. - It is possible to mitigate impact by implementing RAP properly.	-1	- Involuntary resettlement for resident is 5 times as large as the proposed project. - Impact against tentative venders is small. - 48 ha of land acquisition is necessary.	-3	- Involuntary resettlement for resident is 2 times as large as the proposed project. - Impact against tentative venders is small. - 53 ha of land acquisition is necessary.	-3	- Involuntary resettlement for resident and tentative vendor is large. - Impact against tentative venders is large. - It is possible to mitigate impact by implementing RAP properly.	-3	- Serious impact will expected due to deterioration of existing bridge and road.	0
Environmental Consideration	- Impact against water quality, noise & vibration and ecosystem is limited by implementing mitigation measures properly. - Ambient air quality will be almost same level as No action.	-1	- Impact against water quality, noise & vibration and ecosystem is limited by implementing mitigation measures properly. - Ambient air quality will be almost same level as No action.	-1	- Since the alternative is very close to the Mesurado Wetland, large negative impact is expected. - Ambient air quality will be almost same level as No action.	-3	- Impact against water quality, noise & vibration and ecosystem is limited by implementing mitigation measures properly. - Ambient air quality will be almost same level as No action.	-1	- Ambient air quality will deteriorate due to heavy traffic jam.	-1
Evaluation	Very Good	+4	Bad	-2	Very Bad	-8	Good	+1	Bad	-3

Rating: Significant Positive / Negative Impact : +/-3, Positive /Negative impact : +/-2, Slight Positive / Negative Impact : +/-1, Same Impact : 0

Remarks: USD1.00 = JPY80.52



### 1-3-1-5 Scoping

The scoping of the Project is shown in Table 1.3-7.

Table1.3-7 Scoping for the Project

Category	#	Environmental and Social Item	Assessment		Reason of Assessment
			Planning & Construction Stage	Operation Stage	
Pollution Measures	1	Air Quality	B-	B±	<p><u>Construction Stage</u> : Tentatively air quality is expected to deteriorate because of dust arising from the removal of existing structures and the construction of new roads as well as emission gas arising from construction vehicles.</p> <p><u>Operation Stage</u> : Due to the increase of traffic volume, emission gas arising from vesicles is expected to affect air quality. Dust arising from traffic is expected to be improved due to the pavement of unpaved roads.</p>
	2	Water Quality	B-	B±	<p><u>Construction Stage</u> : Water quality is expected to deteriorate due to muddy water during earth work and construction of the bridges Also, discharged water from construction machinery is expected to contaminate water quality. Moreover residual materials in the abandoned oil pipeline along the Project road are expected to leak when demolishing.</p> <p><u>Operation Stage</u> : When raining, dust and oil spilled on the road is expected to flow into the rivers. However, erosion by rainwater can be avoided since the rainwater is collected and discharged into the rivers though drainage facilities.</p>
	3	Wastes	B-	B-	<p><u>Construction Stage</u> : Abandoned soil and wastes arising from construction works are expected to generate.</p> <p><u>Operation Stage</u> : Due to the increase of the population along the Project road, it is expected that the amount of wastes will increase and then some of the wastes will be left around the road.</p>
	4	Soil Contamination	B-	D	<p><u>Construction Stage</u> : Oil spill from the construction machinery and vehicles is expected</p> <p><u>Operation Stage</u> : No factor affecting the soil around the Project area is expected.</p>
	5	Noise & Vibration	B-	B-	<p><u>Construction Stage</u> : Noise and vibration arising from the operation of construction machinery and vehicles is expected.</p> <p><u>Operation Stage</u> : There are easily-influenced facilities such as school, clinic and house along the Project road. Therefore due to the increase of traffic volume and the travel speed of vehicles, noise level is expected to deteriorate.</p>

Category	#	Environmental and Social Item	Assessment		Reason of Assessment
			Planning & Construction Stage	Operation Stage	
	6	Subsidence	D	D	No work triggering subsidence is expected.
	7	Offensive Odor	B-	B-	<u>Construction Stage</u> : Offensive odor by emission arising from construction machinery and vehicles is expected to deteriorate. <u>Operation Stage</u> : Emission arising from vehicles is expected to increase.
	8	Sediment	B-	D	<u>Construction Stage</u> : Muddy water is expected to settle down on the river bed during the construction of the bridges. <u>Operation Stage</u> : No factor affecting sediment is expected.
Natural Environment	9	Protected Areas	B-	C-	<u>Planning Stage</u> : Since the Project road is close to the Medsurad Wetland designated as Ramsar Convention, the construction of roads and bridges are expected to affect the Mesurado Wetland. In addition, there is possibility that other protected areas exist along the Project road. <u>Construction Stage</u> : It is expected that construction materials are ill-maintained then it is flown into the Mesurado Wetland and rivers by rainwater. <u>Operation Stage</u> : Due to the increase of convenience and population around the Project road, indirect impact such as estate development etc. is expected to increase.
	10	Ecosystem	B-	C-	<u>Planning Stage</u> : Endangered species are expected to exist around the Project road. <u>Construction Stage</u> : Trees within ROW are expected to be cut. Also, habitat loss around the Project road is expected.
	11	Hydrology	B-	D	<u>Construction Stage</u> : Since the piers of the bridges are installed in the rivers, hydrology is expected to be disturbed.
	12	Topography & Geology	B-	D	<u>Construction Stage</u> : Inappropriate earth cut and earth fill are expected to be implemented. Also, disorganized cutout from the quarries is expected.
Social	13	Resettlement	A-	B-	<u>Planning Stage</u> : Measures to minimize involuntary resettlement are not expected to be taken. Also, if involuntary resettlement is unavoidable, Resettlement Action Plan (RAP) must be prepared. However, RAP is not expected to be in accordance with JICA Guidelines and WB Guideline (OP 4.12). Moreover the resettlement is not expected to be implemented in line with the RAP approved by EPA.

Category	#	Environmental and Social Item	Assessment		Reason of Assessment
			Planning & Construction Stage	Operation Stage	
					<u>Construction &amp; Operation Stage</u> : Appropriate monitoring works are not expected to be implemented.
	14	The Poor	B±	B+	<u>Construction Stage</u> : PAPs are expected to include the poor. However, the poor is expected to benefit from the creation of new jobs arising from the construction works. <u>Operation Stage</u> : Positive impacts such as the improvement of access to social service such as school and clinic are expected because of the development of the Project road.
	15	Ethnic Minority & Indigenous Minority	D	D	No ethnic minority and indigenous minority suffering loss around the Project site do exist.
	16	Local Economy such as Employment and Livelihood etc.	B±	B+	<u>Planning Stage</u> : Due to the involuntary resettlement, employers and/or employees working at vendors and shops in ROW are expected to lose their jobs. <u>Construction Stage</u> : The number of tentative employees engaging in the construction works is expected to increase. <u>Operation Stage</u> : The construction of commercial facilities and factories are expected to increase along the Project road because the traffic congestion will be mitigated. Eventually, employment opportunity is expected to increase.
	17	Land Use and Utilization of Local Resources	B-	B+	<u>Planning Stage</u> : Appropriate land acquisition in line with RAP is not expected to be implemented. Also, local resources are expected to exist. <u>Operation Stage</u> : The land price along the Project road is expected to go up due to the mitigation of traffic congestions.
	18	Water Usage	B-	D	<u>Construction Stage</u> : In case the river water is used, the water usage is expected to be limited due to the inflow of muddy water during construction. Also, water quality of the rivers and well-waters is expected to deteriorate.
	19	Existing Social Infrastructures and Services	B±	B+	<u>Planning Stage</u> : By introducing safety measures, positive impact on existing social infrastructures and services is expected. <u>Construction Stage</u> : Traffic congestion is expected to be heavier near the Project road. <u>Operation Stage</u> : Due to the mitigation of traffic congestion of the Project road, the convenience of surrounding roads is expected to increase.

Category	#	Environmental and Social Item	Assessment		Reason of Assessment
			Planning & Construction Stage	Operation Stage	
	20	Social Institutions such as Social Infrastructure and Local Decision-making Institutions	D	D	No factor affecting social institutions and local decision-making institutions is expected due to just the expansion of the existing road.
	21	Misdistribution of Benefit and Damage	D	D	No factor affecting misdistribution of benefit and damage is expected due to the expansion of the existing road.
	22	Local Conflict of Interests	D	D	No factor affecting local conflict of interests is expected due to the expansion of the existing road.
	23	Cultural Heritage	D	D	No cultural heritage does exist around the Project road.
	24	Landscape	D	B+	<u>Operation Stage</u> : Landscape is expected to be better due to planting trees along the Project road.
	25	Gender	D	D	No factor affecting gender issue is expected due to the expansion of the existing road.
	26	Right of Children	D	D	No factor affecting right of children is expected due to the expansion of the existing road.
	27	Infectious Diseases such as HIV/AIDS	B-	D	<u>Construction Stage</u> : Infectious diseases such as HIV/AIDS are expected to spread due to the inflow of construction workers into the Project site during construction stage.
	28	Working Condition including Occupational Safety	B-	D	<u>Construction Stage</u> : Working condition including occupational safety for construction workers is expected to deteriorate.
Others	29	Accident	B±	B-	<u>Planning Stage</u> : By introducing safety measures, prevention measures on accident is expected to be promoted. <u>Construction Stage</u> : Accidents during construction works and accidents involving a third person are expected to happen. <u>Operation Stage</u> : The number of accidents is expected to increase due to the increase of traffic volume and the improvement of travel speed.
	30	Global Warming	B-	B+	<u>Construction Stage</u> : CO <sub>2</sub> emission from construction machinery is expected to increase, however the impact is expected to be limited. <u>Operation Stage</u> : CO <sub>2</sub> emission is expected to be reduced since CO <sub>2</sub> emission per vehicle goes down. In the long run, the volume of CO <sub>2</sub> emission is expected to decrease.

- Assessment Level) A+/- : Significant positive/negative impact is expected.  
 B+/- : Some positive/negative impact is expected.  
 C+/- : Extent of impact is unknown.  
 D : No impact is expected.

### 1-3-1-6 TOR of Environmental and Social Considerations

The Terms of Reference (TOR) for the environmental and social consideration of the Project is shown in Table 1.3-8 based on the scoping of the Project (Table 1.3-7).

Table 1.3-8 TOR of Environmental and Social Survey

Survey Item	Investigation Item	Investigation Method
Alternatives	① Consideration of alternatives	① 5 alternatives including Zero-action are compared in the light of Construction Cost, Technical and/or Maintenance Aspect, Improvement of Traffic Capacity, Regional Development, Obligation of Recipient Country, Social Consideration and Environmental Consideration.
Air Quality	① Confirmation of air quality standard in Liberia and WHO ② Understanding of current air quality ③ Understanding of the volume of future air pollutants such as NOx and SPM based on future traffic demand ④ Confirmation of the location of school and clinic which are affected easily by air pollution ⑤ Impact during construction ⑥ Monitoring survey results carried out by MPW ⑦ Vehicle inspection system and emission control regulation in Japan	① Investigation into existing documents. ② Implementation of baseline survey along the Project road ③ Forecast of the volume of air pollutants in 2019 ④ Site investigation and investigation into existing documents ⑤ Investigation into construction details such as method, duration, location, construction machinery, the number of vehicle etc. ⑥ Investigation into monitoring survey capacity of MPW by checking existing reports and hearing survey ⑦ Investigation into existing documents
Water Quality	① Understanding of current water quality of rivers and water-wells ② Confirmation of the water usage of rivers and water-wells ③ Construction method and sanitation management ④ Confirmation of the abandoned oil pipe line and residual in the pipeline ⑤ Confirmation of drainage facilities ⑥ Monitoring survey results carried out by MPW	① Implementation of baseline survey at the rivers and water-well. ② Site investigation and hearing survey. ③ Investigation into construction methods in light of environmentally friendly method. ④ Hearing survey to Liberia Refinery Company to understand the exact location of the oil pipe line and its residual ⑤ Investigation of the Project design drawings ⑥ Investigation into monitoring survey capacity of MPW by checking existing reports and hearing survey
Wastes	① Disposal method of construction wastes ② Possibility of recycle and/or reuse ③ Status of waste collection around the Project road	① Hearing survey to related organizations and investigation into similar projects ② Investigation into wastes whether the wastes meet standards required for construction materials

Survey Item	Investigation Item	Investigation Method
		③ Hearing survey to waste collection organization such as MCC
Soil Contamination	① Provision for oil spill during construction	① Investigation into the construction details such a as method, duration, construction machineries, the number of vehicles, working area etc.
Noise & Vibration	① Confirmation of noise and vibration standard in Liberia, Ghana and IFO ② Understanding of current noise and vibration level ③ Distance from the source origins of noise and vibration to residential area, clinic and school ④ Impact during construction ⑤ Provision for noise and vibration in operation stage ⑥ Understanding of the future noise level based on future traffic demand ⑦ Monitoring survey results carried out by MPW	① Investigation into existing documents. ② Implementation of baseline survey along the Project road ③ Site investigation ④ Investigation into construction details such a as method, duration, construction machineries, the number of vehicles, working area etc. ⑤ Soundproofing measures such as soundproof barrier and planting trees ⑥ Forecast of future noise level in 2019 ⑦ Investigation into monitoring survey capacity of MPW by checking existing reports and hearing survey
Offensive Odor	① Emission control standard ② Impact during construction ③ Understanding of the volume of future air pollutants such as NOx and SPM based on future traffic demand	① Investigation into existing documents and hearing survey ② Investigation into construction details such as method, duration, construction machineries, the number of vehicles, working area etc. ③ Forecast of air pollutants in 2019
Sediment	① Impact during construction	① Investigation into construction details such as method, duration, construction machineries, the number of vehicles, working area etc.
Protected Areas	① Confirmation of the protected and important area around the Project road ② Conservation program for the Mesurado Wetland ③ Understanding of the current situation of the Mesurado Wetland. ④ Construction material management method ⑤ Utilization of dinner's resources to prepare conservation plans ⑥ Impact of population growth	① Investigation into existing documents and hearing survey to local residents ② Investigation into existing documents and hearing survey to EPA ③ Site investigation, hearing survey ④ Investigation into construction plans and the location of material stock yard ⑤ Hearing survey to donors and investigation into existing documents ⑥ Investigation into the forecast of future population and development plans etc.
Ecosystem	① Endangered species in Liberia ② Impact on fauna and flora	① Hearing survey to EPA and local residents ② Site investigation
Hydrology	① Impact during pier construction	① Investigation into construction details such as method, duration, construction machineries etc.
Topography & Geology	① Confirmation of construction detail ② Confirmation of quarries and sand pits	① Discussion with MPW and investigation into the Project design drawings ② Hearing survey and site investigation

Survey Item	Investigation Item	Investigation Method
Resettlement	<ul style="list-style-type: none"> <li>① Consideration of minimizing involuntary resettlement alternatives</li> <li>② Confirmation of the magnitude of land acquisition and resettlement</li> <li>③ Assistance for RAP preparation</li> <li>④ Confirmation of WB project in terms of RAP</li> <li>⑤ Monitoring survey results carried out by MPW</li> </ul>	<ul style="list-style-type: none"> <li>① Investigation into plans that the number of involuntary resettlement is minimized and the Project benefit is maximized</li> <li>② Investigation into laws/regulations and related to resettlement</li> <li>③ Site survey to investigate the number and kind of project affected structures</li> <li>④ Investigation into laws/regulations in Liberia concerning resettlement, JICA Guidelines and WP OP4.12</li> <li>⑤ Investigation into monitoring survey capacity of MPW by checking existing reports and hearing survey</li> </ul>
The Poor	<ul style="list-style-type: none"> <li>① Understanding of the distribution of the poor</li> <li>② Employment involving the construction works</li> <li>③ Access status to public facilities such as school and hospital</li> </ul>	<ul style="list-style-type: none"> <li>① Investigation into the distribution of the poor based on senses survey carried out by GOL in 2008</li> <li>② Investigation into construction details such as method, duration, construction machineries, the number of vehicles, working area etc.</li> <li>③ Investigation into the location of public facilities and the time &amp; cost necessary to reach the facilities</li> </ul>
Local Economy such as Employment and Livelihood etc.	<ul style="list-style-type: none"> <li>① Confirmation of the number of kiosks/vendors in operation in ROW</li> <li>② Confirmation of work which local residents are able to be involved</li> </ul>	<ul style="list-style-type: none"> <li>① Implementation of the socio-economic survey</li> <li>② Investigation into construction details such as method, duration, construction machineries, the number of vehicles, working area etc.</li> </ul>
Land Use and Utilization of Local Resources	<ul style="list-style-type: none"> <li>① Understanding of the status of land use and the usage of local resources</li> </ul>	<ul style="list-style-type: none"> <li>① Investigation into existing documents, hearing survey and site investigation</li> </ul>
Water Usage	<ul style="list-style-type: none"> <li>① Understanding of the status of water usage</li> </ul>	<ul style="list-style-type: none"> <li>① Hearing survey and site investigation</li> </ul>
Existing Social Infrastructures and Services	<ul style="list-style-type: none"> <li>① Understanding of existing infrastructure and social services</li> </ul>	<ul style="list-style-type: none"> <li>① Hearing survey and site investigation, investigation into existing documents</li> </ul>
Infectious Diseases such as HIV/AIDS	<ul style="list-style-type: none"> <li>① Understanding of the current status of HIV/AIDS</li> </ul>	<ul style="list-style-type: none"> <li>① Investigation into existing documents and hearing survey</li> </ul>
Working Condition including Occupational Safety	<ul style="list-style-type: none"> <li>① Confirmation of working condition and laws/guidelines</li> <li>② Understanding of the current status of working conditions in Monrovia</li> </ul>	<ul style="list-style-type: none"> <li>① Investigation into existing documents</li> <li>② Hearing survey</li> </ul>
Accident	<ul style="list-style-type: none"> <li>① Understanding of the number of accidents</li> <li>② Location where accidents are likely to happen</li> <li>③ Confirmation of construction plan</li> </ul>	<ul style="list-style-type: none"> <li>① Hearing survey and Investigation into existing documents</li> <li>② Investigation into the Project design drawings</li> </ul>

Survey Item	Investigation Item	Investigation Method
		③ Investigation into construction details such as method, duration, construction machineries, the number of vehicles, working area etc.
Global Warming and Climate Change	① Confirmation of construction plan ② Understanding of the volume of future CO <sub>2</sub> emission based on future traffic demand	① Investigation into construction details such as method, duration, construction machineries, the number of vehicles, working area etc. ② Forecast of the volume of CO <sub>2</sub> emission in 2019

### 1-3-1-7 Result of Environmental and Social Survey

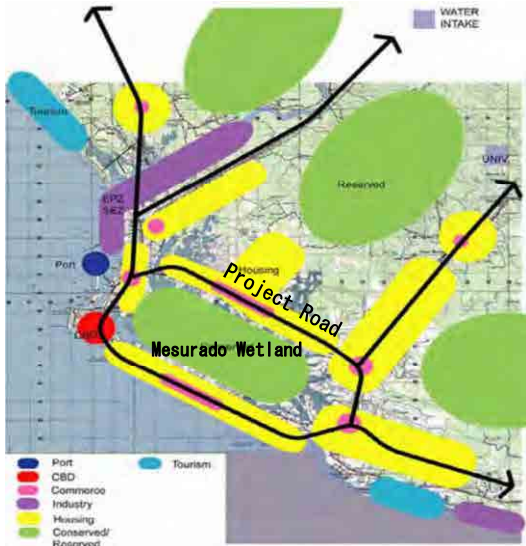
The result of the environmental and social survey is shown in Table 1.3-9 based on the TOR of environmental and social survey shown in Table 1.3-8.

Table 1.3-9 Result of each Environmental and Social Survey

Survey Item	Result of Survey
Alternatives	<ul style="list-style-type: none"> <li>5 alternatives including Zero-action were weighted in the light of Construction Cost, Technical and/or Maintenance Aspect, Improvement of Traffic Capacity, Regional Development, Obligation of Recipient Country, Social Consideration and Environmental Consideration, and the optimum option was selected.</li> </ul>
Air Quality	<ul style="list-style-type: none"> <li>The draft standard for ambient air quality is established however, it has not been in force yet.</li> <li>Baseline survey at 3 points was conducted. (The survey result is shown in 1-3-1-12 Baseline Survey.)</li> <li>Due to the alleviation of traffic congestion in operation stage, the travel speed of vehicles is expected to be normalized. Hence the volume of emissions (CO<sub>2</sub>, NO<sub>x</sub>, SPM) of the Project road predicted in 2019 will be the almost same as that for the Zero-action in 2019 in spite of the increase of future traffic volume.</li> <li>There are 17 schools, 9 hospitals/clinics, and 24 churches confirmed along the Project road.</li> <li>Construction plans and methods minimizing the impact of ambient air quality are taken into account.</li> <li>Emission-controlled construction machinery is utilized without unnecessary idling.</li> <li>As a result of environmental reports prepared by MPW and discussions with persons in charge of EIA in MPW, it was confirmed that MPW was able to implement the monitoring survey for ambient air quality (excluding lead and zinc).</li> <li>Some of the vehicle inspection system and emission control regulations introduced in Japan are thought to be effective in Liberia.</li> </ul>
Water Quality	<ul style="list-style-type: none"> <li>The draft standard for water quality is established however, it has not been in force yet.</li> <li>According to the hearing surveys to local residents around the Project area, water in the rivers and water-wells along the Project road is not used for drinking.</li> <li>Construction plans and methods affecting water quality as less as possible are introduced.</li> <li>Baseline survey at 2 points at the rivers and 1 location at the water-well was conducted. (The survey result is shown in 1-3-1-12 Baseline Survey.)</li> <li>There are tentative toilets under the existing Stockton Bridge and Double Bridge, and the waste material of the toilets is discharged into the rivers directly.</li> <li>No residual is left in the oil pipeline abounded.</li> </ul>



Survey Item	Result of Survey
	<ul style="list-style-type: none"> <li>• There is a slaughtering facility upstream of the Stockton Creek, and the waste water from the facility is discharged into the river directly.</li> <li>• Rain water on the Project road is collected and discharged into the rivers through designed drainage facilities.</li> <li>• As results of environmental reports prepared by MPW and discussions with persons in charge of EIA in MPW, it was confirmed that MPW was able to implement the monitoring survey for water quality.</li> </ul>
Waste	<ul style="list-style-type: none"> <li>• Wastes arising from the construction works of Project road such as waste soil and rubble are reused and/or recycled as much as possible. Wastes not being reused and/or recycled such as used oil are disposed properly by facilities authorized by EPA.</li> <li>• MCC and PCC install containers for wastes collection around the Project road and wastes arising from markets houses etc. around the area are brought. Basically, the containers are collected by companies contracted with MCC and PCC once a day and conveyed to a final disposable site. However, wastes out of containers storage are left on the roads. In addition, illegal dumping wastes around the project road are also left, and then those wastes are one of the reasons causing drainage clogs.</li> </ul>
Soil Contamination	<ul style="list-style-type: none"> <li>• The impact on soil contamination by oil leaked from construction machinery is little because the construction machinery is maintained well.</li> </ul>
Noise and Vibration	<ul style="list-style-type: none"> <li>• The draft standard for noise level is established however, it has not been in force yet. In addition, no standard for vibration is not established even draft version.</li> <li>• Baseline survey at 4 areas around the Project road was conducted. (The survey result is shown in 1-3-1-12 Baseline Survey.)</li> <li>• Appropriate construction methods and low-noise construction machinery are introduced therefore the impact of noise and vibration affecting the surrounding environment is little.</li> <li>• There are 17 schools, 9 hospitals/clinics, and 24 churches confirmed along the Project road.</li> <li>• As a result of the future forecast in 2019 of noise level. The noise level of 2 points out of 4 baseline survey points will increase in comparison with Zero-action. The one of other 2 points will decrease.</li> <li>• 1.5m width of green belt along the entire road length, and trees are planted in it.</li> </ul>
Odor	<ul style="list-style-type: none"> <li>• There is no emission control standard in Liberia.</li> <li>• Emission-controlled construction machinery is utilized without unnecessary idling.</li> <li>• Due to the alleviation of traffic congestion in operation stage, the travel speed of vehicles is expected to be normalized. Hence the volume of emissions (CO<sub>2</sub>, NO<sub>x</sub>, SPM) of the Project road predicted in 2019 will be the almost same as that for the Zero-action in 2019 in spite of the increase of future traffic volume.</li> </ul>
Sediment	<ul style="list-style-type: none"> <li>• Less impact method on sediment (Pressing Method) is selected and waste water arising from construction works is not discharged into the rivers directly.</li> <li>• There is possibility that concrete rubble will fall into the rivers when demolishing the existing bridges and constructing new bridge.</li> </ul>
Protected Areas	<ul style="list-style-type: none"> <li>• There is no protected area except for the Mesurado Wetland around the Project road.</li> <li>• Direct impact on the Mesurado Wetland is limited because the road expansion area is opposite site (southern side) of the wetland and most of ROW area is already possessed by MPW and leveled flat in advance.</li> <li>• National Wetland Policy in Liberia (Draft) is established however, it has not been in force yet.</li> <li>• There is no law/regulation in terms of the conservation of the Mesurado Wetland except for the policy above.</li> <li>• EPA conducts regular inspections around the Mesurado Wetland in order to watch illegal dumping and construction.</li> </ul>

Survey Item	Result of Survey
	<ul style="list-style-type: none"> <li>• EPA places sign boards to appeal local residents to understand the conservation of the Mesurado Wetland.</li> <li>• Based on hearing survey to EPA and site survey, the negative impacts on the Mesurado Wetland are likely to be ① the increase of traffic volume, ② water contamination, ③ the increase of construction wastes, ④ the promotion of mangrove cutting, ⑤ the promotion of estate development and housing land development in and/or near the Mesurado Wetland and ⑥ the activation of business activity.</li> <li>• In order to avoid running off construction materials from stock yards, measures such as ① to stock them in the fenced yard, ② to stock them in the yard away from the Mesurado Wetland and rivers, and ③ to cover them over anti-scattering sheet against wind and rainfall.</li> <li>• EPA prepared “Report on the Impacts of the Liberia Civil Crisis on Wetlands” with support from Ramsar Small Grant Fund (SGF) and Swiss Grant for Africa (SGA).</li> <li>• According to the Master Plan Study on urban Facilities Restoration and Improvement in Monrovia in the Republic of Liberia, JICA, 2009 (JICA Master Plan), the population in 2019 in Greater Monrovia is estimated to 1,470,000 from 1,010,575 in 2008. In addition, since most area around the Project road is proposed to be residential area, impact on the Mesurado Wetland by housing land development in apprehended in a mid- and long-term basis.</li> </ul> <div style="text-align: center;">  </div> <p style="text-align: right;">Resource: The Master Plan Study on Urban Facilities Restoration and Improvement in Monrovia in the Republic of Liberia, JICA, 2009</p> <p style="text-align: right;">Figure 1.3-7 Proposed Future Urban Plan in Greater Monrovia</p>
Ecosystem	<ul style="list-style-type: none"> <li>• As a result of hearing survey to EPA and local residents, no protected species is confirmed around the Project road.</li> <li>• There is possibility that aquatic fauna is affected by water contamination during the bridge construction.</li> <li>• There are about 50 trees in ROW.</li> </ul>
Hydrology	<ul style="list-style-type: none"> <li>• Less impact method for bridge construction on hydrology and river bed (Steel Pile Pressing Method) is selected.</li> </ul>
Topography & Geology	<ul style="list-style-type: none"> <li>• No earth filling and cutting work requiring special skill is planned.</li> <li>• Existing borrow pits and quarries which are expected to be utilized for the Project are well-maintained.</li> </ul>
Resettlement	<ul style="list-style-type: none"> <li>• 5 alternatives including Zero-action were weighted in the light of Construction Cost, Technical and/or Maintenance Aspect, Improvement of Traffic Capacity, Regional Development, Obligation of Recipient Country, Social Consideration and Environmental Consideration, and the optimum option was selected.</li> <li>• Liberian laws/regulations and RAP for projects in greater Monrovia prepared by WB were investigated in order to prepare the RAP for the Project.</li> <li>• 456 PAHs (449 Project Affected Structures) were confirmed in ROW, 75 feet, by the socio-economic surveys.</li> </ul>

Survey Item	Result of Survey
	<ul style="list-style-type: none"> <li>• About 94% of PAPs are involved in commercial business (kiosks/vendors). Their relocation site is selected under the authorization of MPW to the area in or outside of ROW where newly constructed road structures are not disturbed.</li> <li>• Draft RAP in accordance with JICA Guidelines and WB OP4.12 was prepared.</li> <li>• MPW had a lot of experience in carrying out monitoring surveys for WB projects.</li> </ul>
The Poor	<ul style="list-style-type: none"> <li>• About 50% of population living in urban area in Liberia is classified into the poor<sup>1</sup>. Therefore the population of the poor living around the Project road is estimated to about 150 thousand because the total population around the Project road (1.0km wide each side) is about 307 thousand.</li> <li>• The poor benefit from employment opportunities because the construction of the Project road creates many works without special skills.</li> <li>• The access time and cost to Monrovia city center is reduced by the implementation of the Project.</li> </ul>
Local Economy such as Employment and Livelihood etc.	<ul style="list-style-type: none"> <li>• 424 out of 449 projected affected structures involving commercial business (kiosks/vendors) are affected by the Project.</li> <li>• USD 100 per household of compensation for business is paid in terms of the resettlement of commercial business (kiosks/vendors).</li> <li>• During construction stage, the employment opportunity for construction works goes up.</li> </ul>
Land Use and Utilization of Local Resources	<ul style="list-style-type: none"> <li>• Some part of ROW is occupied by house or commercial businesses (kiosks/vendors) illegally. Only 1% of PAPs are allowed to occupy their structure not their land with official squatter right.</li> <li>• There is no local resource around the Project road. However, the alleviation of traffic congestion is promoted by the implementation of the Project.</li> <li>• Land developments and the attraction of enterprises are promoted around the Project road because of the alleviation of traffic congestion.</li> </ul>
Water Usage	<ul style="list-style-type: none"> <li>• Water in the rivers and water-wells around the Project road are utilized for the purpose of only washing cars and clothes.</li> <li>• Local residents can utilize the water in the rivers and water-wells during construction and in operation stage.</li> </ul>
Existing Social Infrastructures and Services	<ul style="list-style-type: none"> <li>• Some of existing bus stops are located in ROW therefore they are affected by the Project. However new bus stops are constructed by the Project. Temporal bus stops during construction stage are required.</li> <li>• Traffic congestion is likely to become worse during construction stage however, it is minimized by appropriate mobilization of traffic controllers.</li> <li>• Existing social infrastructures and services are affected positively by the implementing of road widening, safety measures and congestion alleviation measures.</li> </ul>
Infectious Diseases such as HIV/AIDS	<ul style="list-style-type: none"> <li>• The infection rate of HIV/AIDS among adult in Liberia is relatively low, 1.5%. Ministry of Health &amp; Social Welfare establishes National AIDS Strategic Framework 2010-2014, and are trying hard to prevent HIV/AIDS prevalence.</li> </ul>
Working Condition including Occupational Safety	<ul style="list-style-type: none"> <li>• Labor law in Liberia has been established.</li> </ul>
Accident	<ul style="list-style-type: none"> <li>• There is a no place expecting traffic accidents on the Project drawings.</li> <li>• Sidewalk, sign board and road marking are introduced as safety measures.</li> <li>• The safety for bus users in getting in and out is improved by the renovation of existing bus stops.</li> </ul>

<sup>1</sup> Income is less than USD1.4 per day.

Survey Item	Result of Survey
	<ul style="list-style-type: none"> <li>There is possibility that third persons are involved in the accidents during construction stage.</li> <li>There are many construction sites where construction workers do not put on protective equipment such as helmet and safety shoes in Monrovia.</li> </ul>
Global Warming and Climate Change	<ul style="list-style-type: none"> <li>Environmentally friendly construction machinery is utilized however it is unavoidable to increase the emission of CO<sub>2</sub> from the machinery on a temporary basis.</li> <li>The volume of emission of CO<sub>2</sub> for the Project road predicted in 2019 will be the almost same as that for the Zero-action in 2019 in spite of the increase of future traffic volume.</li> </ul>

### 1-3-1-8 Impact Assessment

Based on the result of survey in Table 1.3-9, the impact assessment is shown in Table 1.3-10.

Table 1.3-10 Impact Assessment based on the Result of Survey

Category	#	Environmental and Social Item	Assessment at the Scoping		Assessment base on the Result of Survey		Reason of Assessment
			Planning, Construction Stage	Operation Stage	Planning, Construction Stage	Operation Stage	
Pollution Measure	1	Air Quality	B-	B-	B-	B±	<p><b>Planning Stage</b> : As a result of the baseline survey, the value of NO<sub>2</sub> exceeds the draft standard in Liberia at all survey points. (The survey result is shown in 1-3-1-12 Baseline Survey.)</p> <p><b>Construction Stage</b> : Due to the operation of construction machinery, ambient air quality is deteriorate tentatively but the impact is limited.</p> <p><b>Operation Stage</b> : Due to the alleviation of traffic congestion in operation stage, the travel speed of vehicles is expected to be normalized. Hence the volume of emissions (CO<sub>2</sub>, NO<sub>x</sub>, SPM) of the Project road predicted in 2019 will be the almost same as that for the Zero-action in 2019 in spite of the increase of future traffic volume. In addition, the impact of dust is alleviated by paving unpaved road.</p>
	2	Water Quality	B-	B-	B-	B±	<p><b>Planning Stage</b> : As a result of the baseline survey, the color and odor etc. exceed the draft standard in Liberia at all survey points. (The survey result is shown in 1-3-1-12 Baseline Survey.)</p> <p><b>Construction Stage</b> : Waste water from construction site and construction machinery is likely to affect water quality tentatively. No residual is confirmed in the oil pipeline abandoned.</p>

Category	#	Environmental and Social Item	Assessment at the Scoping		Assessment base on the Result of Survey		Reason of Assessment
			Planning, Construction Stage	Operation Stage	Planning, Construction Stage	Operation Stage	
							<p><b>Operation Stage</b> : There is possibility that oil and dust on the Project road flow into the rivers. However the runoff of sand from existing earthen roads decreases. In addition, the erosion by rainfall is mitigated by the development of drainage facilities. On the other hand, the amount of waste water is likely to increase because the estate development and housing land development are promoted.</p>
	3	Wastes	B-	B-	B-	B-	<p><b>Construction Stage</b> : Most of wastes arising from the construction works are recycled and/or reused therefore, the amount of wastes to be disposed is a little. In addition, the disposal wastes are treated properly by facilities authorized by EPA.</p> <p><b>Operation Stage</b> : Due to the increase of the population along the Project road, it is expected that the amount of wastes and illegal dumping will increase. However, when the amount exceeds the limit of collection capacity by MCC and PCC, the some of the waste may be left on the road. These wastes are one of the reasons causing drainage clogs.</p>
	4	Soil Contamination	B-	D	B-	D	<p><b>Construction Stage</b> : There is possibility that oil leaking from construction machinery however, the impact is limited by implementing regular maintenance for the machinery and educations to workers.</p> <p><b>Operation Stage</b> : No soil contamination affecting surrounding environment happens because the Project is to reconstruct and expand the existing road.</p>
	5	Noise & Vibration	B-	B-	B-	B±	<p><b>Planning Stage</b> : As a result of the baseline survey, 3 out of 4 survey points in terms of noise level and 2 out of 4 survey points in terms of vibration level exceed the standards recommended by EPA. (The survey result is shown in 1-3-1-12 Baseline Survey.)</p> <p><b>Construction Stage</b> : Construction methods with low impact of noise and vibration are introduced. In addition, construction works generating large noise and vibration are done only daytime.</p> <p><b>Operation Stage</b> : Alleviation effect against noise is expected because 1.5 m width of green belt is constructed along the entire length of the Project road. In addition, noise and vibration generated by vehicles are alleviated by leveling the road surface. However, due to the increase of traffic volume, the noise and vibration level in some areas deteriorate.</p>

Category	#	Environmental and Social Item	Assessment at the Scoping		Assessment base on the Result of Survey		Reason of Assessment
			Planning, Construction Stage	Operation Stage	Planning, Construction Stage	Operation Stage	
	6	Subsidence	D	D	D	D	No work triggering subsidence is expected.
	7	Offensive Odor	B-	B-	B-	B-	<u>Construction Stage</u> : The volume of emission arising from construction machinery increases however, the impact is limited. <u>Operation Stage</u> : The future volume of emissions predicted in 2019 in Project road is almost same as that of Zero-action in spite of the increase of future traffic volume .
	8	Sediment	B-	D	B-	D	<u>Construction Stage</u> : Since appropriate construction methods are planned, the impact on sediment is minimized.
Natural Environment	9	Protected Areas	B-	C-	B-	B-	<u>Construction Stage</u> : Though the Project road goes near the Mesurado Wetland, direct impacts on the wetland are limited due to the distance. In addition, construction materials are maintained well in the stock yards away from the wetland therefore, no direct impact on the Mesurado Wetland and the rivers happens. <u>Operation Stage</u> : Due to the improvement of traffic capacity and convenience of the Project road, ① the increase of traffic volume, ② water pollution, ③ the increase of construction waste dumping, ④ the promotion of mangrove cutting, ⑤ the promotion of the estate development and housing land development in and/or outside or the wetland and ⑥ the activation of commercial business are expected. Especially, the impact on the estate development and housing land development in and near the Mesurado Wetland by population growth around the Project road.
	10	Ecosystem	B-	C-	B-	C-	<u>Planning Stage</u> : No protected and endangered species is confirmed around the Project road. <u>Construction Stage</u> : The Project area has been developed and leveled in advance therefore, large-scale earth works are not required. However, direct and/or indirect impact on ecosystem is expected during the bridge construction. <u>Operation Stage</u> : Direct and/or indirect impact on ecosystem is unknown at this moment. Therefore, monitoring surveys shall be carried out to clarify the impact.
	11	Hydrology	B-	D	D	D	<u>Construction Stage</u> : Less impact method on hydrology and river bed (Steel Pile Pressing Method) is selected for the bridge pier constructions.
	12	Topography & Geology	B-	D	D	D	<u>Planning Stage</u> : Earth works requesting special skills are not planned.

Category	#	Environmental and Social Item	Assessment at the Scoping		Assessment base on the Result of Survey		Reason of Assessment
			Planning, Construction Stage	Operation Stage	Planning, Construction Stage	Operation Stage	
							<u>Construction Stage</u> : Appropriate construction management is done. In addition, borrow pits and quarries for the Project are maintained well.
Social Environment	13	Resettlement	A-	B-	A-	B-	<u>Planning Stage</u> : 456 PAHs (449 Projected Affected Structures) were confirmed even though 5 alternatives were weighted in order to avoid and minimize involuntary resettlement. However RAP for the Project was prepared in accordance with JICA Guidelines and WB OP4.12. <u>Construction/Operation Stage</u> : MPW has enough capacity to carry out the monitoring works for the RAP implementation.
	14	The Poor	B±	B+	B±	B+	<u>Construction Stage</u> : Since PAPs include the poor, involuntary resettlement is required. However, they benefit from employment opportunity arising from the construction works for the Project. <u>Operation Stage</u> : The access time and cost to Monrovia city center is reduced by the implementation of the Project.
	15	Ethnic Minority & Indigenous Minority	D	D	D	D	No ethnic minority and indigenous minority does not exist around the Project road.
	16	Local Economy such as Employment and Livelihood etc.	B±	C+	B±	C+	<u>Planning Stage</u> : Employment of employers and employees involving in commercial business (kiosks/vendors) are affected tentatively due to involuntary resettlement. <u>Construction Stage</u> : Due to the construction works for the Project, workers involving in the project increase during construction stage. <u>Operation Stage</u> : Employment opportunities along the Project road increase due to the promotion of business facilities and factories, and estate development.
	17	Land Use and Utilization of Local Resources	B-	B+	B-	C+	<u>Planning Stage</u> : Though all ROW areas are possessed by MPW, 449 Project Affected Structures exist. Therefore, appropriate RAP implementation is necessary in order to resettle them to alternative land. <u>Operation Stage</u> : The land price around the Project road is likely to goes up due to the alleviation of traffic congestion and the increase of convenience of the Project road.
	18	Water Usage	B-	D	D	D	<u>Planning Stage</u> : The construction of the Project road does not affect water usage during construction stage. <u>Construction Stage</u> : Since water quality does not deteriorate, water in the rivers and water wells can be used as well.

Category	#	Environmental and Social Item	Assessment at the Scoping		Assessment base on the Result of Survey		Reason of Assessment
			Planning, Construction Stage	Operation Stage	Planning, Construction Stage	Operation Stage	
	19	Existing Social Infrastructures and Services	B±	B+	B±	B+	<p><b>Planning Stage</b> : Due to the road expansion, safety measures and the alleviation of traffic congestion, the convenience of existing social infrastructures and services is improved.</p> <p><b>Construction Stage</b>: Traffic congestion is likely to become worse during construction stage however, it is minimized by appropriate mobilization of traffic controllers.</p> <p><b>Planning Stage</b> : Due to the road expansion, the access of existing social infrastructures and services is improved.</p>
	20	Social Institutions such as Social Infrastructure and Local Decision-making Institutions	D	D	D	D	Little impact on social institutions such as social infrastructure and local decision-making institutions was confirmed.
	21	Misdistribution of Benefit and Damage	D	D	D	D	There is no factor affecting misdistribution of benefit and damage.
	22	Local Conflict of Interests	D	D	D	D	There is no factor affecting local conflict of interests.
	23	Cultural Heritage	D	D	D	D	No cultural heritage does exist around the Project road.
	24	Landscape	D	B+	D	B+	<b>Operation Stage</b> : Since about 10 thousand trees are planted in the green belt along the Project road, landscape is improved.
	25	Gender	D	D	D	D	There is no factor affecting gender issue.
	26	Right of Children	D	D	D	D	There is no factor affecting right of children.
	27	Infectious Diseases such as HIV/AIDS	B-	D	B-	D	<b>Construction Stage</b> : Due to the inflow of construction workers, there is possibility that infectious diseases such as HIV/AIDS is spread but the impact is limited.
	28	Working Condition including Occupational Safety	B-	D	B-	D	<b>Constitution Stage</b> : Construction plans in accordance with labor laws in Liberia are established. However there is possibility that the plans are not implemented properly.
Others	29	Accident	B±	B-	B-	B-	<p><b>Planning Stage</b> : Safety measures in terms of hardware side are planned to avoid accidents.</p> <p><b>Construction Stage</b> : Construction plans prioritizing safety management are established. However, there is possibility that accidents involving third persons happen. Furthermore, workers are likely to have accidents without wearing safety equipment such as helmet.</p> <p><b>Operation Stage</b> : Since drivers are not used to the Project road just after the opening of the Project road, they are likely to make an accident.</p>



Category	#	Environmental and Social Item	Assessment at the Scoping		Assessment base on the Result of Survey		Reason of Assessment
			Planning, Construction Stage	Operation Stage	Planning, Construction Stage	Operation Stage	
	30	Global Warming	B-	B+	B-	B-	<p><u>Construction Stage</u> : CO<sub>2</sub> is generated from construction machinery.</p> <p><u>Operation Stage</u> : The volume of emissions of CO<sub>2</sub> predicted in 2019 will be the almost same as that for the Zero-action in 2019 in spite of the increase of future traffic volume .</p>

Assessment Level) A+/- : Significant positive/negative impact is expected.

B+/- : Some positive/negative impact is expected.

C+/- : Extent of impact is unknown.

D : No impact is expected.

#### 1-3-1-9 Cost for Mitigation Measures and Implementation of Mitigation Measures

The expected mitigation measures and their cost necessary for the implementation of the mitigation measures based on the environmental and social items assessed at A- and B- in Table 1.3-10 on Assessment of the Result of Survey are shown in Table 1.3-11. The cost of the Construction Stage in the Table is total cost necessary for construction period, 3 years, and the one of Operation Stage is total cost necessary for 2 years after the opening the Project road to the public.

Table 1.3-11 Expected Mitigation Measures and their Cost Necessary for Implementation

#	Impact Item	Expected Mitigation Measures	Implementation Organization	Responsible Organization	Cost (USD)
<b>Planning Stage / Construction Stage</b>					
1	Air Quality	<ul style="list-style-type: none"> <li>• Appropriate construction machinery is used and maintained regularly. In addition, unnecessary idling is avoided.</li> <li>• Water spraying is done regularly to avoid raising sand dust during dry seasons.</li> <li>• In case backfilling materials and construction materials are stocked temporarily in the stock yards or the construction site, these materials are covered by sheets to avoid scattering.</li> <li>• Left-turn lanes are introduced at major intersections and then traffic congestion around the intersections is alleviated, eventually the volume of air pollutants from vehicles decrease.</li> <li>• The alleviation of traffic congestion and decrease of on-street parking are promoted by developing parking space and area for sorting out merchandize.</li> <li>• Regular monitoring surveys are carried out around the Project road. In addition, in case the values get worse extremely compared to baseline survey's values, MPW finds out the reason and implement measures necessary.</li> <li>• JICA provides EPA and MPW with information on vehicle inspection system and emission control regulation in Japan.</li> <li>• JICA recommend for line ministries and organizations to strengthen restrictions on ill-serviced vehicles<sup>**1</sup>.</li> </ul>	Contractor / MPW	MPW	4,800
2	Water Quality	<ul style="list-style-type: none"> <li>• Appropriate construction machinery is used and maintained regularly.</li> <li>• Waste water arising from construction works is not discharged into the rivers directly.</li> <li>• Oil fence and anti-water pollution net are utilized during bridge construction.</li> <li>• Construction machinery is not washed in the rivers.</li> <li>• Temporal toilets under the Stockton Bridge and Double Bridge are removed.</li> <li>• Regular monitoring surveys are carried out around the Project road. In addition, in case the values get worse extremely compared to baseline survey's values, MPW finds out the reason and implement measures necessary.</li> </ul>	Contractor	MPW	6,000

#	Impact Item	Expected Mitigation Measures	Implementation Organization	Responsible Organization	Cost (USD)
		<ul style="list-style-type: none"> <li>• JICA recommend for line ministries and organizations to strengthen restrictions on ill-serviced vehicles<sup>**1</sup>.</li> </ul>			
3	Waste	<ul style="list-style-type: none"> <li>• Wastes are recycled and reused as much as possible.</li> <li>• Wastes unable to be recycled and reused are disposed by facilities authorized by EPA.</li> </ul>	Contractor	MPW	-
4	Soil Contamination	<ul style="list-style-type: none"> <li>• In order to avoid oil leaking from construction machinery, regular maintenance works are done.</li> </ul>	Contractor	MPW	-
5	Noise and Vibration	<ul style="list-style-type: none"> <li>• Appropriate construction machinery is used and maintained regularly.</li> <li>• Low-noise construction machinery is utilized.</li> <li>• Construction works are done during only daytime around school and clinic/hospital.</li> <li>• In case of night work, the permission of Monrovia police is obtained and the notice of the work is notified to local residents in advance.</li> <li>• Regular monitoring surveys are carried out around the Project road. In addition, in case the values get worse extremely compared to baseline survey's values, MPW finds out the reason and implement measures necessary.</li> <li>• JICA recommend for line ministries and organizations to strengthen restrictions on ill-serviced vehicles<sup>**1</sup>.</li> <li>• Surface joints on road are reduced as many as possible in order to keep flatness of the Project roads.</li> <li>• Dumpy earthen roads are paved.</li> <li>• 1.5 m width of green belt is installed along the entire road length and trees are planted in it.</li> </ul>	Contractor / MPW	MPW	6,000
7	Odor	<ul style="list-style-type: none"> <li>• Appropriate construction machinery is used and maintained regularly. In addition, unnecessary idling is avoided.</li> <li>• Left-turn lanes are introduced at major intersections and then traffic congestion around the intersections is alleviated, eventually the volume of air pollutants decrease.</li> <li>• The alleviation of traffic congestion and decrease of on-street parking are promoted by developing parking space and area for sorting out merchandize.</li> <li>• JICA recommend for line ministries and organizations to strengthen restrictions on ill-serviced vehicles<sup>**1</sup>.</li> </ul>	Contractor	MPW	-

#	Impact Item	Expected Mitigation Measures	Implementation Organization	Responsible Organization	Cost (USD)
8	Sediment	<ul style="list-style-type: none"> <li>• Nets are installed during bridge demolition and construction in order to avoid rubble falling in the rivers.</li> <li>• Waste water with mud arising from construction works is not discharged into the rivers directly.</li> <li>• Steep pile compressing method which minimizes the disturbance of river bed is introduced in bridge pier constructions.</li> </ul>	Contractor	MPW	-
9	Protected Area	<ul style="list-style-type: none"> <li>• Construction material stock yards are placed away from the Mesurado Wetland and rivers.</li> <li>• The stock yards are fenced in order to prevent construction materials from running off.</li> <li>• Construction materials are covered by anti-scattering sheet.</li> </ul>	Contractor / MPW	MPW	-
10	Ecosystem	<ul style="list-style-type: none"> <li>• Trees in ROW not affecting newly constructed road structures are not cut.</li> <li>• 1.5 m width of green belt is installed along the entire road length and trees are planted in it.</li> <li>• Monitoring surveys for aquatic species in bridge construction sites, Stockton Creek and Warner Creek, are carried out.</li> </ul>	Contractor / MPW	MPW	37,200
13	Resettlement	<ul style="list-style-type: none"> <li>• RAP in accordance with JICA Guidelines and WB OP4.12 is prepared.</li> <li>• Resettlement is carried out according to the RAP.</li> <li>• Monitoring works for resettlement is carried out according to the RAP.</li> </ul>	MPW	MPW / EPA	-
14	The Poor	<ul style="list-style-type: none"> <li>• The poor and PAPs are given priority to be employed by the construction works for the Project.</li> <li>• PAPs especially commercial business (kiosks/vendors) are allowed to be resettle the area in or outside of ROW where newly constructed road structures are not disturbed.</li> </ul>	Contractor / MPW	MPW	-
16	Local Economy such as Employment and Livelihood etc.	<ul style="list-style-type: none"> <li>• Local residents are employed as many as possible by the construction works without special skills.</li> <li>• PAPs especially commercial business (kiosks/vendors) are allowed to be resettle the area in or outside of ROW where newly constructed road structures are not disturbed.</li> </ul>	MPW / Contractor	MPW	-

#	Impact Item	Expected Mitigation Measures	Implementation Organization	Responsible Organization	Cost (USD)
17	Land Use and Utilization of Local Resources	<ul style="list-style-type: none"> <li>• RAP is implemented properly.</li> </ul>	MPW	MPW/ EPA	-
19	Existing Social Infrastructures and Services	<ul style="list-style-type: none"> <li>• Traffic controllers are mobilized properly.</li> <li>• Temporal bus stops are installed.</li> </ul>	Contractor / MPW	MPW	-
27	Infectious Disease such as HIV/AIDS	<ul style="list-style-type: none"> <li>• Education for HIV/AIDS is provided for workers. In addition, the contract of the Project implementation with the contractor stipulates the article of the education above.</li> </ul>	Contractor / MPW	Ministry of Health & Social Welfare	-
28	Working Condition including Occupational Safety	<ul style="list-style-type: none"> <li>• The contract of the Project implementation with the contractor stipulates that labor laws in Liberia must be complied.</li> </ul>	Contractor / MPW	Ministry of Labor	-
29	Accident	<ul style="list-style-type: none"> <li>• Safety educations are provided construction workers with. The contract with the contractor stipulates the implementation of the safety educations.</li> <li>• Construction workers put on safety equipment such as helmet and safety shoes.</li> <li>• 17 pedestrian crossings are installed around facilities such as school and church.</li> <li>• Sidewalks separated from carriage ways are installed.</li> <li>• Medians serving as safety zone are installed.</li> <li>• Left-turn lanes are installed at the major intersections including the existing road in order to avoid rear-end accidents.</li> <li>• Sign boards and road markings with a high regard for safety are placed.</li> <li>• The safety for bus users in getting in and out are secured by introducing new bus stops.</li> <li>• In terms of the operation route of construction vehicles, MPW and the contractor discuss it with Monrovia Police and Monrovia City Corporation as well as local residents in advance.</li> <li>• Information such as construction plans is disclosed to the public though newspapers and radios.</li> </ul>	Contractor / MPW	MPW	-
30	Global Warming	<ul style="list-style-type: none"> <li>• Appropriate construction machinery is used and maintained regularly. In addition, unnecessary idling is avoided.</li> </ul>	Contractor / MPW	MPW	-
Sub-total					54,000

#	Impact Item	Expected Mitigation Measures	Implementation Organization	Responsible Organization	Cost (USD)
<b>Operation Stage</b>					
1	Air Quality	<ul style="list-style-type: none"> <li>Regular monitoring surveys are carried out around the Project road. In addition, in case the values get worse extremely compared to baseline survey's values, MPW finds out the reason and implement measures necessary.</li> <li>JICA recommend for line ministries and organizations to strengthen restrictions on ill-serviced vehicles<sup>*1</sup>.</li> </ul>	MPW	MPW / Monrovia Police	2,700
2	Water Quality	<ul style="list-style-type: none"> <li>JICA recommend for line ministries and organizations to strengthen restrictions on ill-serviced vehicles<sup>*1</sup>.</li> <li>Regular monitoring surveys are carried out around the Project road. In addition, in case the values get worse extremely compared to baseline survey's values, MPW finds out the reason and implement measures necessary.</li> </ul>	MPW / EPA	Monrovia Police	3,600
3	Wastes	<ul style="list-style-type: none"> <li>Drainage facilities which connect the Project road to the Mesurado wetland will be rehabilitated by MPW by the commencement of the Project construction.</li> <li>Campaigns to prevent littering implemented by EPA, MCC and PCC are promoted continuously.</li> <li>Drainage facilities are maintained every 2 weeks.</li> <li>Status of illegal dumping around the Project road is monitored every month in collaboration with MCC and PCC.</li> </ul>	MPW	MPW (EPA / MCC / PCC)	-
5	Noise and Vibration	<ul style="list-style-type: none"> <li>Regular monitoring surveys are carried out around the Project road. In addition, in case the values get worse extremely compared to baseline survey's values, MPW finds out the reason and implement measures necessary.</li> <li>JICA recommend for line ministries and organizations to strengthen restrictions on unleaded gasoline use<sup>*1</sup>.</li> <li>JICA recommend for line ministries and organizations to strengthen restrictions on ill-serviced vehicles<sup>*1</sup>.</li> <li>In case pot holes and damages on the Project road are found, they are repaired immediately.</li> <li>Trees planted in the green belt are maintained well.</li> </ul>	MPW	MPW	3,600

#	Impact Item	Expected Mitigation Measures	Implementation Organization	Responsible Organization	Cost (USD)
7	Odor	<ul style="list-style-type: none"> <li>JICA recommend for line ministries and organizations to strengthen restrictions on ill-serviced vehicles<sup>※1</sup>.</li> </ul>	MPW	Monrovia Police	-
9	Protected Area	<ul style="list-style-type: none"> <li>JICA recommend for EPA to put the National Wetland Policy in Liberia (Draft) in force to be enforceable.</li> <li>MPW share all information acquired through the baseline and monitoring surveys for the Project with EPA.</li> <li>It is difficult for Liberia by itself to take effective measures to conserve the Mesuraso Wetland. Therefore, JICA recommends that EPA should request assistance and aid fund from donors such as WB and United States Agency for International Development.</li> </ul>	EPA/MPW	EPA	-
10	Ecosystem	<ul style="list-style-type: none"> <li>Monitoring surveys for aquatic species in bridge construction sites, Stockton Creek and Warner Creek, are carried out.</li> </ul>	MPW/EPA	MPW/EPA	49,600
13	Resettlement	<ul style="list-style-type: none"> <li>Monitoring works for resettlement is carried out according to the RAP.</li> </ul>	MPW	MPW/EPA	-
29	Accident	<ul style="list-style-type: none"> <li>Traffic flow is controlled just after the opening of the Project road in cooperation with Monrovia Police.</li> </ul>	Monrovia Police	Monrovia Police	-
Sub-total					59,500
<b>Grand Total</b>					<b>113,500</b>

Remarks: ※1) It is difficult at this moment in light of the condition of Liberia and the capacity and human resources of EPA and line ministries. However, it is possible to promote them together with GIZ (Gesellschaft für Internationale Zusammenarbeit) because GIZ has been supporting traffic sectors for years in Ministry of Transport.

### 1-3-1-10 Monitoring Plan

The monitoring plan of the Project in construction stage and operation stage for first two years is shown in Table 1.3-12. However, the monitoring plan will be modified in the Detailed Design (D/D), if necessary. The monitoring surveys in construction state shall be carried out by the Contractor, and compiled and submitted to EPA and JICA by MPW. Those in operation stage shall be carried out by MPW, and compiled and submitted to EPA and JICA by MPW as well.

Table 1.3-12 Monitoring Plan

Kind of Survey	Parameter	Survey Point (same as each baseline survey* <sup>1</sup> )	Frequency Upper: Construction Stage Lower: Operation Stage	Responsible Organization
<b>【Construction Stage】 【Operation Stage】</b>				
Ambient Air Quality	PM <sub>2.5</sub> , PM <sub>10</sub> , CO, NO <sub>x</sub> , SO <sub>x</sub> , Wind Direction/Velocity	Starting Point (Urban), Middle Point (Suburb), End Point (Urban)	Every Four Months Every Six months	Contractor /MPW
Noise & Vibration	Noise & Vibration Level ( $L_{Aeq}$ • $L_{Amax}$ • $L_{Amin}$ )	Residential Area, School Area, Light Industrial Area, Commercial Area	Every 4 Months Every Six Months	Contractor /MPW
Water Quality	pH, SS, EC, COD, DO, Oil, Conductivity, Turbidity, Odor, Color	Stockton Creek, Warner Creek, Water-well	Every Four Months Every Six months	Contractor /MPW
Biological	Fauna	Stockton Creek, Warner Creek	Every Six Months Every Six Months	Contractor /MPW

### 1-3-1-11 Stakeholder Meeting

In terms of the environmental and social considerations for the Project, 9 in total stakeholder meetings were taken place. 1 stakeholder meeting was held on the purpose of discussion with line ministries, organizations, institutions and unions, and 8 stakeholder meetings were held on the purpose of public participation with local communities, local residents and PAPs. The outline of the former meeting is shown in Table 1.3-13 and that of latter meetings is shown 1-3-2-10 Public Participation.

Table 1.3-13 The Outline of the Stakeholder Meeting with Line Ministries, Organizations, Institutions and Unions

Date	21 <sup>st</sup> February 2012
Place	Meeting Room at MPW
Participants	MPW, EPA, Ministry of Foreign Affairs, Ministry of Internal Affairs, Ministry of Transport, Minister of Lands, Mines, and Energy, Minister of Health and Social Welfare, Minister of Finance and Economic Planning, Minister of Justice, Monrovia City Corporation, Representative of Township, LWSC, NTA, Land Commission, Monrovia Market Association, Driver's Union, Liberia Telecom, Earthcons., JICA Preparatory Survey Team (Total 29 persons)
Major Comment and Question	<ul style="list-style-type: none"> <li>• Since Project road is a trunk road, the expansion into 4-lane is necessary to meet future traffic demand.</li> <li>• The compensation standards for PAPs of the Project should meet that of WB project which intends to improve the Red Light Jct. in order to avoid confusion among PAPs.</li> <li>• ROW was reduced to 75 feet from 150 feet. In addition, the 75 feet ROW shall be examined to be reduced more for the purpose to minimize PAPs.</li> <li>• It is necessary to declare Cut-off Date before the commencement of the socio-economic and senses surveys.</li> </ul>



- Sufficient stakeholder meetings shall be held and exchange opinions with local residents.
- Only consultants registered and approved by EPA are allow preparing EIA/RAP report. (In case of the Project, JICA will assist a local consultant, Earthcons, to prepare the reports in accordance with JICA Guidelines.)
- MPW requests line ministries and departments to cooperate with JICA Preparatory Survey Team.

### 1-3-1-12 Baseline Survey

Ambient air quality Survey, water quality survey and noise & vibration survey were conducted as baseline surveys. Figure 1.3-8 shows the location of each survey points.

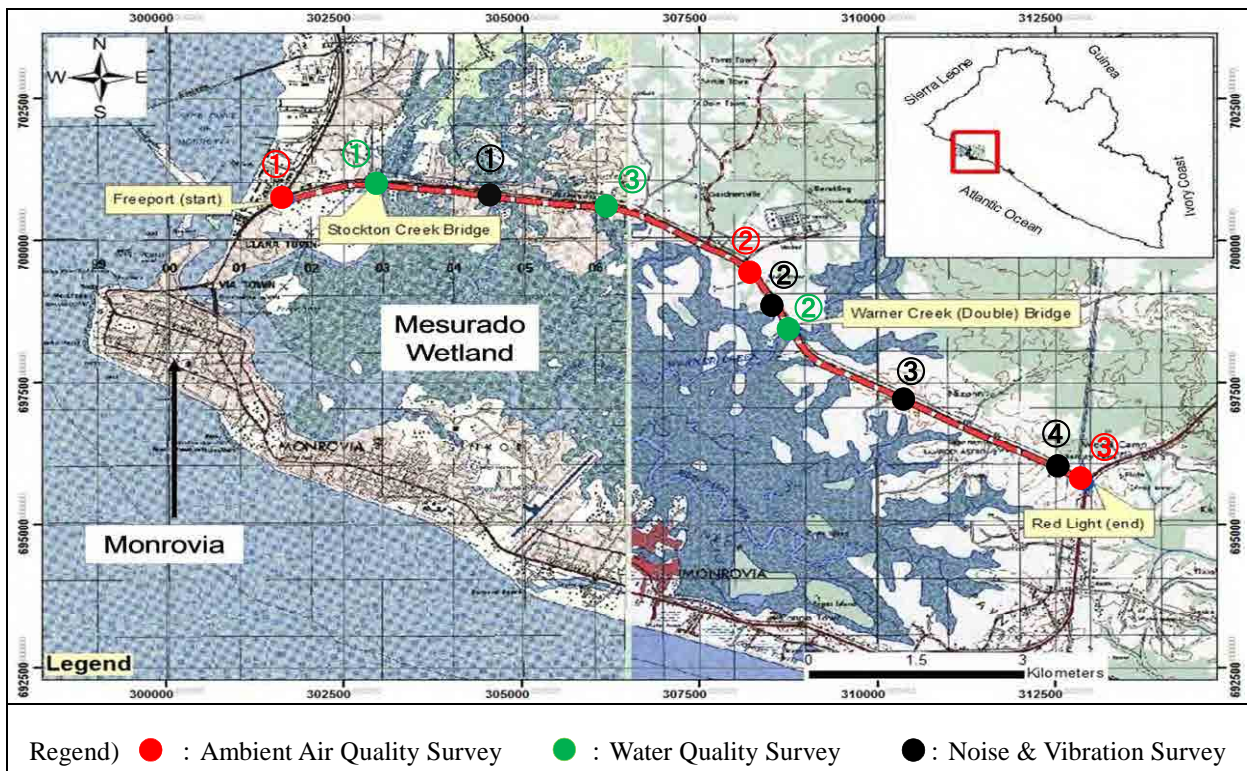


Figure 1-4-8 Location of Each Survey

#### 1) Ambient Air Quality Survey

Ambient air quality survey was carried out at 3 points at the edge of ROW, 75 feet. Table 1.3-14 shows the detail of the survey and Table 1.3-15 shows the result of the survey.

Table 1.3-14 Detail of the Ambient Air Quality Survey

Parameter	Particulate Matter (PM <sub>2.5</sub> , PM <sub>10</sub> ), Nitrogen Dioxide (NO <sub>2</sub> ), Sulfur Dioxide (SO <sub>x</sub> ), Carbon Monoxide (CO), Ammonia, Wind Direction, Wind Velocity		
Survey Point	3 Points (refer to Figure 1.3-8 : Edge of ROW, 75 feet) along the Project road (Starting Point, Middle Point, End Point)		
	① Starting Point	② Middle Point	③ End Point
	N 6°20'15.61"	N 6°19'36.61"	N 6°17'33.10"
	W 10°47'33.54"	W 10°44'02.20"	W 10°41'27.29"
Survey Method	24 hours continuous survey with air sampler		
Survey Period	From 16 <sup>th</sup> to 19 <sup>th</sup> , April 2012		

Table 1.3-15 Result of the Ambient Air Quality Survey

Parameter	Unit	Survey Point			Liberia <sup>1)</sup> (Draft)	WHO	Time Weighted Average
		① Starting Point	② Middle Point	③ End Point			
PM <sub>2.5</sub>	µg/m <sup>3</sup>	43	17	16	— —	—	—
PM <sub>10</sub>	µg/m <sup>3</sup>	44	46	57	100 60	50 20	24 hours 1 year
NO <sub>2</sub>	µg/m <sup>3</sup>	<b>188</b>	<b>180</b>	<b>188</b>	80 60	20 —	24 hours 1 year
SO <sub>2</sub>	µg/m <sup>3</sup>	26	52	52	80 60	— 40 (NO <sub>2</sub> )	24 hours 1 year
CO	mg/m <sup>3</sup>	478	1,055	1,539	4,000 2,000	3,000 1,000	1 hour 8 hours
Ammonia	mg/m <sup>3</sup>	0.2	0.3	0.4	0.4 0.1	—	24 hours 1 year
Wind Velocity	m/s	1.02	0.67	0.31	— —	— —	— —
Wind Direction	—	SSW	ESE	ESE	— —	— —	— —

Remarks: 1) Residential, Rural & Other Area standard is applied

The value of NO<sub>2</sub> in all survey points exceeds the Draft standard in Liberia. The expected main reason is vehicles with low speed due to heavy traffic congestions..

## 2) Water Quality Survey

Water quality survey was carried out at 2 rivers and 1 water-well. Table 1.3-16 shows the detail of the survey and Table 1.3-17 shows the result of the survey.

Table 1.3-16 Detail of Water Quality Survey

Parameter	Temperature, pH, Conductivity, Turbidity, Color, Odor, Total Dissolved Solid (TDS), Suspended Solid (SS), Chemical Oxygen Demand (COD), Dissolved Oxygen (DO), Escherichia Coli (E coli), Oil		
Survey Point	3 Points (Stockton Creek, Warner Creek, Water Well, refer to Figure 1.3-8)		
	① Stockton Creek	② Warner Creek	③ Water-well
	N 6°18'57.07"	N 6°20'23.73"	N 6°20'18.83"
	W 10°43'41.07"	W 10°46'49.52"	W 10°46'45.99"
Survey Method	Water samples are collected and analysed in laboratory authorized by EPA.		
Survey Period	Dry Season: 5 <sup>th</sup> June 2012, Rainy Season: 19 <sup>th</sup> September 2012		

Table 1.3-17 Result of Water Quality Survey

	①Stockton Creek	②Warner Creek	③Water-well	Liberia (Draft)	WHO
Temperature (°C)	29.1	31.0	26.1	-	-
	26.1	26.4	25.4		
pH	7.3	7.3	7.2	6.5-8.5	6.5-8.5
	7.7	8.0	7.2		
Conductivity (µS/cm)	13.9	21.4	5.0	-	-
	11.4	7.4	4.1		
Turbidity (NTU)	11.2	13.1	10.0	-	5
	11.2	13.1	10.0		
Color (Co-Pt)	<b>58</b>	<b>49</b>	<b>53</b>	No Color	15
	<b>92</b>	<b>71</b>	<b>156</b>		
Odor	No Odor	No Odor	No Odor	No Odor	-
	<b>Muddy</b>	<b>Muddy</b>	No Odor		
TDS (mg/l)	5.6	13.9	<b>32.5</b>	-	30
	7.4	4.8	26.7		
SS (mg/l)	22	24	1	-	30
	6	8	11		
COD(mg/l)	21	<b>31</b>	26	-	30-50
	15	24	17		
DO (mg/l)	<b>3.2</b>	5.3	<b>0.6</b>	5.0	5.0
	<b>0.1</b>	<b>1.1</b>	<b>0.5</b>		
E coli. (MPN/100ml)	16	16	2.2	-	-
	9.2	5.1	2.2		
Oil (mg/l) <sup>*1)</sup>	<b>Less than 2</b>	<b>Between 2 and 5</b>	<b>Less than 2</b>	0.1	0.1
	<b>Between 2 and 5</b>	<b>Less than 2</b>	<b>Less than 5</b>		

Remarks: Upper: Dry Season, Lower: Rainy Season

\*1): It is impossible to analyze oil precisely in Liberia at this moment.

All samples have muddy color and high turbidity value. In term of the rivers (①Stockton Creek、② Warner Creek), this is because of muddy water coming from up streams and trash abandoned along the river sides. In terms of the water-well, this is because of the inflow of rain water with mud around the water-well.

### 3) Noise & Vibration Survey

Noise & Vibration survey was carried out at 3 points at the edge of ROW, 75 feet. Table 1.3-18 shows the detail of the surveys and Table 1.3-19 and Table 1.3-20 show the result of the survey.

Table 1.3-18 Detail of Noise & Vibration Survey

Parameter	Noise/Vibration Level: $L_{Aeq} \cdot L_{Amax} \cdot L_{Amin}$			
Survey Point	4 points (refer to Figure 1.3-8): Inside of buildings at the edge of ROW 75 feet (Residential Area, School Area, Light Industrial Area, Commercial Area)			
	① Residential Area	② School Area	③ Light Industrial Area	④ Commercial Area
	N 6°18'33.90"	N 6°19'06.11"	N 6°20'21.85"	N 6°17'44.72"
	W 10°43'28.35"	W 10°43'42.61"	W 10°47'15.87"	W 10°41'07.52"
Survey Method	Noise & Vibration meters are installed inside of the buildings at the edge of ROW and the value of noise & vibration in a 24-hour period			
Survey Period	24 hours continuous survey × each 1day Residential Area: 21 <sup>st</sup> July 2012, School Area: 20 <sup>th</sup> July 2012, Light Industrial Area: 23 <sup>rd</sup> July 2012, Commercial Area: 24 <sup>th</sup> July 2012			

Table 1.3-19 Result of Noise Survey

Facility		Survey Result dB (A) (Leg)		Draft Liberian Standard dB (A) (Leg)	
		Day 06:01-22:00 (Min.-Max.)	Night 22:01-06:00 (Min.-Max.)	Day 06:01-22:00	Night 22:01-06:00
①	Any building used as hospital, convalescence home, home for the aged, sanatorium and institutes of higher learning, conference rooms, public library, environmental and recreational site	42 (32-50)	43 (31-50)	45	35
②	Residential buildings	<b>70</b> (54-79)	<b>55</b> (40-74)	50	35
③	Mixed residential (with some commercial and entertainment)	<b>83</b> (70-93)	<b>66</b> (40-79)	50	35
④	Residential + industry or small-scale production + commerce	<b>76</b> (54-91)	<b>56</b> (40-79)	60	50
—	Industry	-	-	70	60
IFC Guidelines	Residential	-	-	55	45
	Industrial	-	-	70	70

3 out of 4 survey points exceed the draft standard in Liberia. The expected reasons are that

- Large-sized vehicles travel with low speed during traffic congestion,
- Large-sized vehicles park in ROW and sort out merchandise or maintain vehicles while idling,
- Ill-serviced vehicles make noise,
- A lot of vehicles pass through ROW in order to avoid traffic congestion and
- Since the surface of ROW is uneven and earthen road, noise is made by passing vehicle.

Table 1.3-20 Result of Vibration

Facility		Survey Result dB (Leg)		Ghana Standard dB (Leg)	
		Day 06:01-22:00 (Min.-Max.)	Night 22:01-06:00 (Min.-Max.)	Day 06:01-22:00	Night 22:01-06:00
①	Any building used as hospital, convalescence home, home for the aged, sanatorium and institutes of higher learning, conference rooms, public library, environmental and recreational site	<b>59</b> (53-60)	<b>55</b> (54-55)	55	50
②	Residential buildings	<b>58</b> (54-61)	<b>52</b> (50-56)	55	48
③	Mixed residential (with some commercial and entertainment)	60 (55-62)	53 (52-58)	60	55
④	Residential + industry or small-scale production + commerce	59 (56-62)	53 (50-60)	65	60
—	Industry	-	-	70	70

2 out of 4 survey points exceed the Ghana standard. The expected reasons are that

- There are pot holes on the existing road, therefore vibration is made in passing through the road,
- A lot of vehicles pass through ROW in order to avoid traffic congestion,
- Since the surface of ROW is uneven, noise is made by passing vehicle and
- There are a lot of over-loaded vehicles.

### 1-3-2 Land Acquisition and Resettlement

#### 1-3-2-1 Necessity of Land Acquisition and Resettlement

The Project is to reconstruct and widen the existing Somalia Drive Road and the Project area has already secured by MPW. However, according to socio-economic surveys (Population Census Survey, Asset and Land Survey, Livelihood Survey) carried out from March to May 2012, 449 project affected structures (456 PAHs) were confirmed in the Project area (ROW, 75 feet, from the centerline of the road). Therefore it is necessary to resettle those PAHs properly in order to implement the Project.

In JICA Master Plan, ROW of the Project used to be 150 feet, though ROW was narrowed up to 75 feet in order to reduce the number of involuntary resettlement. Also, 5 alternatives including Zero-action were weighted in order to minimize PAHs/PAPs and the most suitable plan was adopted for the Project. (The detail is shown in 1-3-1-4 Comparison of Alternatives) However, there are project affected structures mainly temporary commercial structures such as kiosk and vendor along the Project road and thus land acquisition and resettlement in accordance with Liberian Laws as well as JICA Guidelines is required.

## **1-3-2-2 Framework of Land Acquisition and Resettlement**

### **1) Framework of Land Acquisition and Resettlement**

#### Liberian Constitution 1986

Article 22 (a) and (b) of the Constitution gives right to all individuals to own property, either on individual basis or in conjunction with other individuals, as long as they are Liberian citizens. The right to ownership of property, however, does not extend to mineral resources on or beneath the land. Article 24 provides for the expropriation of private property for public use; and set the conditions upon which compensation can be made for said properties.

#### County Act 1969

This Act instituted official distribution and demarcation of land boundaries in Liberia into political subdivisions known as counties. At the time of independence, there were only three counties in Liberia - Montserrado, Grand Bassa and Sinoe. Later, other counties along the coast were annexed and the regions in the hinterland were declared as provinces. However, by this Act, all of the provinces were declared counties.

#### Land Acquisition Act 1929

The Act outlines procedure for obtaining rights to any piece of land in Liberia through purchase. It distinguishes land in Liberia into two categories: the hinterland and the county area. The procedure for obtaining land located in the hinterlands is as follows:

- Obtain consent of Tribal Authority to have a parcel of land deeded to the individual by the Government;
- Pay a sum of money as a token of one's intention to live peacefully with the tribesmen;
- Paramount or clan chief signs a certificate which purchaser forwards to the office of the District Commissioner (who also acts as the Land Commissioner for the area);
- The District Commissioner, after ascertaining that the land is not encumbered in anyway, approves that the land be deeded to the applicant and he issues a certificate to the applicant.

The procedure for obtaining land located in the county is as follows:

- Application to the Land Commissioner in the county in which the land is located.
- The applicant obtains a certificate from the Land Commissioner, if he is satisfied that the land is unencumbered.

#### Revised Law and Administrative Regulations for Governing the Hinterland (RLARGH), 2001

Article 66 of the RLARGH states that, "title to the territory of the Republic of Liberia is vested in the sovereign state". The right and title of the respective tribes to land of an adequate area for farming and other enterprises essential to the necessities of the tribe main interest in the land to be utilized by them for their purposes; and whether or not they have procured deeds from Government, delimiting by notes and bounds such reserves, their rights and interests in and to such areas, are a perfect reserve and give them title to the land against any person or persons whomsoever. The article further states that

when the tribe should advance, they should petition the Government for the division of the land into family holdings and the Government should grant deeds to each family in fee simple.

Article 67 of the RLARGH states, among other things, that individuals not member of a tribe may enter a tribal land for the purpose of using said land. However, said person should obtain permission from the Tribal Authority prior to commencing his activities and agree to pay some token in the nature of rent.

The Independent National Commission on Human Rights Act of 2005

This Act establishes the framework upon which complaint of the violation of the human rights of persons can be received and investigated. The Commission is authorized to review existing national legislation and recommend provisions to ensure that they are harmonized with international human rights standards and instruments. The Commission is also authorized to draw to national attention, the violation of the human rights of persons in any part of the country.

Mineral and Mining Law

This Law provides for mineral ownership, administration, eligibility for rights regarding exploration, mine and quarry operation, environmental protection, common licensing provisions, protected zones, occupant and owner rights, public use of infrastructure, environmental considerations, trade, inspections, fiscal and other provisions.

**2) JICA’s Policy on Involuntary Resettlement**

JICA’s policy on involuntary resettlement is shown below;

The key principle of JICA policies on involuntary resettlement is summarized below.		
I.	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.	
II.	When, population displacement is unavoidable, effective measures to minimize the impact and to compensate for losses should be taken.	
III.	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.	
IV.	Compensation must be based on the full replacement cost <sup>2</sup> as much as possible.	

<sup>2</sup> Description of “replacement cost” is as follows.

Land	Agricultural Land	The pre-project or pre-displacement, whichever is higher, market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes.
	Land in Urban Areas	The pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land, plus the cost of any registration and transfer taxes.
Structure	Houses and other Structures	The market cost of the materials to build a replacement structure with an area and quality similar or better than those of the affected structure, or to repair a partially affected structure, plus the cost of transporting building materials to the construction site, plus the cost of any labor and contractors’ fees, plus the cost of any registration and transfer taxes.

- V. Compensation and other kinds of assistance must be provided prior to displacement.
- VI. For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. It is desirable that the resettlement action plan includes elements laid out in the World Bank Safeguard Policy, OP4.12, Annex A.
- VII. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner and language that are understandable to the affected people.
- VIII. Appropriate participation of affected people must be promoted in planning, implementation and monitoring of resettlement action plan.
- IX. Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

Above principals are compensated by World Bank OP4.12, since it is stated in JICA Guideline that “JICA confirms that projects do not deviate significantly form the World Bank’s Safeguard Policies”. Additional key principle based on World Bank OP4.12 is as follows.

- X. Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves an eligibility cut-off date, asset inventory, and socio-economic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits.
- XI. Eligibility of benefits include, the PAHs/PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAHs/PAPs who don’t have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying.
- XII. Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.
- XIII. Provide support for the transition period (between displacement and livelihood restoration).
- XIV. Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, land led, elderly, woman and children, ethnic minorities etc.
- XV. For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared.

In addition to the above core principles on the JICA policy, it also laid emphasis on a detailed resettlement policy inclusive of all the above points; project specific resettlement plan; institutional framework for implementation; monitoring and evaluation mechanism; time schedule for implementation; and , detail Financial Plan etc.



### 3) Comparison between Liberian Registrations and JICA Guideline

Table 1.3-21 shows the comparison between the Liberian registrations and JICA Guidelines.

Table 1.3-21 Comparison between Liberian Legislations and JICA Guidelines for Environmental and Social Considerations, 2004

No.	JICA Guidelines, 2004	Laws and Regulations of Liberia	Gap between JICA Guidelines and Laws and Regulations of Liberia	Policy for the Project to Bridge the Gap
1.	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	L. C.* - Art. 11 (a) provides that all persons are born equally free and independent and have certain natural, inherent and in alien-able rights, among which are the right of enjoying and defending life and liberty, of pursuing and maintaining the security of the person and of acquiring, possessing and protecting property.	Current Constitutional provisions and EIA/SIA guidelines do not make explicit reference to the need for avoidance or limiting of physical or economic displacement.	In order to avoid and/or minimize Involuntary resettlement and loss of means of livelihood, feasible alternatives shall be examined.
2.	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	M.M.L.* - S 11.3 provides that "landowner or occupants of land shall be entitled to just, prompt and adequate compensation for any diminution in the value of land caused by disturbance, disfigurement or other factor.	There is no big difference between JICA Guidelines and Laws and Regulations of Liberia.	The best design to minimize impact shall be selected. Also the same compensation standard for PAHs/PAPs as WB shall be applied.
3.	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	Same as above.	There is no laws and regulations that describe improvement or restoration of PAHs/'PAPs' standard of living, income opportunities and production levels	The same compensation standard for PAPs as WB shall be applied. Also measures to improve or restore PAHs/'PAPs' standard of living, income opportunities and production levels shall be taken into consideration.
4.	Compensation must be based on the full replacement cost as much as possible. (JICA GL)	Same as above.	There is no law and regulation that describe full replacement cost.	Compensation shall be based on the full replacement cost.

No.	JICA Guidelines, 2004	Laws and Regulations of Liberia	Gap between JICA Guidelines and Laws and Regulations of Liberia	Policy for the Project to Bridge the Gap
5.	Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL)	—	There is no laws and regulations which describe exact schedule of payment of compensation.	Compensation and other kinds of assistance shall be provided prior to displacement.
6.	For projects that entail large-scale involuntary resettlement, RAP must be prepared and made available to the public. (JICA GL)	—	There is no laws and regulations which describe RAP.	RAP shall be prepared in accordance with JICA and WB guidelines.
7.	In preparing a RAP, consultations must be held with the PAPs and their communities based on sufficient information made available to them in advance. (JICA GL)	EIA Procedure Guidance describe that an important part of the Environmental Impact Assessment process is the public consultation that is carried out by the proponent.	There is no big gap between laws and regulations of Liberia and JICA Guidelines.	Sufficient stakeholder meetings shall be held by MPW. Also MPW shall provide adequate information to PAPs in advance of the meetings.
8.	When consultations are held, explanations must be given in a form, manner and language that are understandable to the PAPs. (JICA GL)	—	There is no laws and regulations which describe manner and language that are understandable to the PAPs.	When consultations are held, explanations shall be given in a form, manner and language that are understandable to the PAPs.
9.	Appropriate participation of PAPs must be promoted in planning, implementation and monitoring of resettlement action plans. (JICA GL)	—	There is no laws and regulations which describe public participation in planning, implementation and monitoring.	Adequate stakeholder meetings shall be held from planning, implementation and monitoring stage to obtain consensus from PAPs.
10.	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	L. C.* - Art. 26 provides where any person or any association alleges that any of the rights granted under this Constitution or any legislation or directives are constitutionally contravened, that person or association may invoke the privilege and benefit of court direction.	Liberian Law does not require the proponent to establish their own grievance mechanism for this purpose.	MPW shall establish a third party grievance process to manage grievances including those relating to the resettlement process.

No.	JICA Guidelines, 2004	Laws and Regulations of Liberia	Gap between JICA Guidelines and Laws and Regulations of Liberia	Policy for the Project to Bridge the Gap
11.	PAPs are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory and socio-economic survey), preferably at the Project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. (WB OP4.12 Para.6)	M.M.L. - S 11.3 provides that “landowner or occupants of land shall be entitled to just, prompt and adequate compensation for any diminution in the value of land caused by disturbance, disfigurement or other factors.	Laws and regulations of Liberia do not explain the relation-ship between a ‘land-owner identification study’ and a census. There is also no specify cut-off dates for eligibility of land-owners to receive compensation or assistance from the proponent.	The Project shall ensure the conduct of people and asset censuses. This will be conducted for each resettlement affected area. Commencement of this census will mark the “cut-off date” after which time any new houses, gardens, or other fixed assets will no longer be eligible for resettlement assistance package options and/or compensation. Public disclosure and engagement shall be undertaken to appraise land-owners of the cut-off date and information on resettlement.
12.	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don’t have formal legal rights to land at the time of census but have a clam to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para.15)	Laws and regulations of Liberia recognize a broad distinction between the holders of: - Freehold titles over land (L.C.) - Customary land Rights (RLARGH – Art. 66)	Laws and regulations of Liberia do not prescribe compensation for anyone without recognizable legal title to land.	The Project shall provide for compensation and assistance to households affected by the Project resettlement regardless of any prevailing or prospective status.
13.	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6)	—	There is no laws and regulations which describe provision of support for the transition period.	Support for the transition period shall be taken into considerations.

No.	JICA Guidelines, 2004	Laws and Regulations of Liberia	Gap between JICA Guidelines and Laws and Regulations of Liberia	Policy for the Project to Bridge the Gap
14.	Particular attention must be paid to the needs of vulnerable group among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.12)	—	There is no laws and regulations which describe particular attention to vulnerable groups.	Vulnerable groups shall be paid damage and deprivation compensation, as well as an assistance of livelihood restoration.

Remark: \*) L.C : Liberian Constitution 1986  
M.M.L : Minerals and Mining Law

#### 4) Land Acquisition and Resettlement Policy of the Project

<p>I. The Government of Liberia will use the Project Resettlement Policy (the Project Policy) for “the Preparatory Survey on the Project for Reconstruction of Somalia Drive in Monrovia in the Republic of Liberia” specifically because existing national laws and regulations have not been designed to address involuntary resettlement according to international practice, including JICA’s policy. The Project Policy is aimed at filling-in any gaps in what local laws and regulations cannot provide in order to help ensure that PAHs/PAPs are able to rehabilitate themselves to at least their pre-projection condition. This section discusses the principles of the Project Policy and the entitlements of the PAHs/PAPs based on the type and degree of their losses. Where there are gaps between the Liberian legal framework for resettlement and JICA’s Policy on Involuntary Resettlement, practicable mutually agreeable approaches will be designed consistent with Government practices and JICA’s Policy</p> <p>II. Land acquisition and involuntary resettlement will be avoided where feasible, or minimized by identifying possible alternative project designs that have the least adverse impact on the communities in the project area.</p> <p>III. Where displacement of households is unavoidable, all PAHs/PAPs (including communities) losing assets, livelihood or resources will be fully compensated and assisted so that they can improve, or at least restore, their former economic and social conditions.</p> <p>IV. Compensation and rehabilitation support will be provided to any PAHs/PAPs, that is, any person or household or business which on account of project implementation would have his, her or their:</p> <ul style="list-style-type: none"> <li>• Standard of living adversely affected;</li> <li>• Right, title or interest in any house, interest in, or right to use, any land (including premises, agricultural and grazing land, commercial tenancy, or right in annual or perennial crops and trees or any other fixed or movable assets, acquired or possessed, temporarily or permanently;</li> <li>• Income earning opportunities, business, occupations, work or place of residence or habitat adversely affected temporarily or permanently; or</li> <li>• Social and cultural activities and relationships affected or any other losses that may be identified during the process of resettlement planning.</li> </ul>
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- V. All affected people will be eligible for compensation and rehabilitation assistance, irrespective of tenure status, social or economic standing and any such factors that may discriminate against achievement of the objectives outlined above. Lack of legal rights to the assets lost adversely affected tenure status and social or economic status will not bar the PAPs from entitlements to such compensation and rehabilitation measures or resettlement objectives. All PAHs/PAPs residing, working, doing business and/or cultivating land within the project impacted areas as of the date of the latest census and inventory of lost assets (IOL), are entitled to compensation for their lost assets (land and/or non-land assets), at replacement cost, if available and restoration of incomes and businesses and will be provided with rehabilitation measures sufficient to assist them to improve or at least maintain their pre-project standards, income-earning capacity and production levels.
- VI. PAHs/PAPs that lose only part of their physical assets will not be left with a portion that will be inadequate to sustain their current standard of living. The minimum size of remaining land and structures will be agreed during the resettlement planning process.
- VII. People temporarily affected to be considered PAHs/PAPs and resettlement plans address the issue of temporary acquisition.
- VIII. Where a host community is affected by the development of a resettlement site in that community, the host community shall be involved in any resettlement planning and decision-making. All attempts shall be made to minimize the adverse impacts of resettlement upon host communities.
- IX. The resettlement plans will be designed in accordance with Liberia law and JICA's Policy on Involuntary Resettlement.
- X. The Resettlement Plan will be translated into local languages and disclosed for the reference of PAHs/PAPs as well as other interested groups.
- XI. Payment for land and/or non-land assets will be based on the principal of replacement cost.
- XII. Compensation for PAHs/PAPs dependent on agricultural activities will be land-based wherever possible. Land-based strategies may include provision of replacement land, ensuring greater security of tenure, and upgrading livelihoods of people without legal land titles. If replacement land is not viable, other strategies may be built around opportunities for re-training, skill development, wage employment, or self-employment, including access to credit. Solely cash compensations will be avoided as an option if possible, as this may not address losses that are not easily quantified, such as access to services and traditional rights, and may eventually lead to those populations being worse off than without the Project.
- XIII. Replacement lands, if the preferred option of PAHs/PAPs should be within the immediate vicinity of the affected lands wherever possible and be of comparable productive capacity and potential<sup>3</sup>. As a second option, sites should be identified that minimize the social disruption of those affected; such lands should also have access to services and facilities similar to those available in the lands affected.

Resettlement assistance will be provided not only for immediate loss, but also for a transition period needed to restore livelihood and standards of living of PAHs/PAPs. Such support could take the form of short-term jobs, subsistence support, salary maintenance, or similar arrangements.

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<sup>3</sup> Agricultural land for of equal productive capacity means that the land provided as compensation should be able to produce the same or better yield the AP was producing on his/her land prior to the project. The production should be in the planting season immediately following the land acquisition. It can be for a future period if transitional allowance equal to the household's previous yield is provided to the AP household while waiting for the land to get back to the same productivity as the previous land.

- XV. The resettlement plan must consider the needs of those most vulnerable to the adverse impacts of resettlement (including the poor, those without legal title to land, ethnic minorities, women, children, elderly and disable) and ensure they are considered in resettlement planning and mitigation measures identified. Assistance should be provided to help them improve their socio-economic status.
- XVI. PAHs/PAPs will be involved in the process of developing and implementing resettlement plans.
- XVII. PAHs/PAPs and their communities will be consulted about the project, the rights and options available to them, and proposed mitigation measures for adverse effects, and to the extent possible be involved in the decisions that are made concerning their resettlement.
- XVIII. Adequate budgetary support will be fully committed and made available to cover the costs of land acquisition (including compensation and income restoration measures) within the agreed implementation period. The funds for all resettlement activities will come from the Government.
- XIX. Displacement does not occur before provision of compensation and of other assistance required for relocation. Sufficient civic infrastructure must be provided in resettlement site prior to relocation. Acquisition of assets, payment of compensation, and the resettlement and start of the livelihood rehabilitation activities of PAHs/PAPs, will be completed prior to any construction activities, except when a court of law orders so in expropriation cases. (Livelihood restoration measures must also be in place but not necessarily completed prior to construction activities, as these may be ongoing activities.)
- XX. Organization and administrative arrangements for the effective preparation and implementation of the resettlement plan will be identified and in place prior to the commencement of the process; this will include the provision of adequate human resources for supervision, consultation, and monitoring of land acquisition and rehabilitation activities.
- XXI. Appropriate reporting (including auditing and redress functions), monitoring and evaluation mechanisms, will be identified and set in place as part of the resettlement management system. An external monitoring group will be hired by the project and will evaluate the resettlement process and final outcome. Such groups may include qualified NGOs, research institutions or universities.

#### Cut-off Date of Eligibility

The Cut-off Date of eligibility refers to the date prior to which the occupation or use of the project area makes residents/users of the same eligible to be categorized as PAHs/PAPs and be eligible to Project entitlements. In the Project, Cut-off dates for titleholders will be the date of notification under the Land Acquisition Act and for non-titled holders will be the beginning date of the population census; 12 March, 2012). This date has been disclosed to each affected communities by MPW. The establishment of the eligibility Cut-off Date is intended to prevent the influx of ineligible non-residents who might take advantage of Project entitlements

#### Principle of Resettlement Cost

All compensation for land and non-land assets owned by households/shop owners who meet the Cut-off Date will be based on the principle of replacement cost. Replacement cost is the amount calculated before displacement which is needed to replace an affected asset without depreciation and without deduction for taxes and/or costs of transaction as follows:

- a. Sale/Market Comparison Method: This method is based on data provided from recent sales of properties that are highly comparable to the subject property in the vicinity.
- b. Contingent Valuation Method: This method is based on the willingness to accept (WTA) and willingness to pay (WTP) between the affected person and project proponent. This method is mainly used for land price estimation.
- c. Income Approach: This method considers the value of a property relative to the property ability to produce cash flow. This method is mainly used for estimating the prices of crops and trees on agricultural land.
- d. Replacement Cost Approach: This method was useful for structure cost estimation. The value of the structure is based on the current cost for building/constructing the affected structure and labor cost<sup>\*1</sup>. For the purpose of this RAP, the value of structures and labor cost was based on market value without depreciation.

Remarks: \*1) Regulation of the Real Estate Division of the Ministry of Finance

### 1-3-2-3 Magnitude and Scope of Land Acquisition and Resettlement

The Cut-off Date was declared by utilizing mass media such as newspapers, Daily Inquire, and radio stations, Truth FM, Sky FM, LBS FM. In addition, the notice of the Cut-off Date was posted along the Project road in order for local residents around the Project area and Liberians to obtain necessary information. Moreover in order to prevent the inflow of new residents and/or workers in the Project area after the Cut-off Date, following measures were taken.

- ✓ Awareness campaign through the local communities
- ✓ Request for the cooperation of the local residents
- ✓ Posting the notice in public facilities along the Project site

In case the land acquisition and resettlement are implemented within 2 years after the socio-economic survey, the data shall be renewed.

#### 1) Population Censuses Survey

Population censuses survey was carried out targeting all persons occupying the Project area in order to obtain the information of PAHs/PAPs. As a result of the survey, it was confirmed that 456 households (449 structures) were affected in the Project area, ROW 75 feet. However, about 19.5 % of total households (the owner of structure), or 89 households were un-surveyed due to absence, and therefore the number of households surveyed was 367. The number of PAPs was 918 in total and the average number of persons per household was turned out to be 2.50. Table 1.3-22 shows the details of PAHs and PAPs.

Table 1.3-22 Number of PAHs and PAPs

No.	Type of Loss	PAHs			PAPs		
		Legal <sup>*1)</sup>	Illegal	Total	Legal <sup>*1)</sup>	Illegal	Total
Loss with Resettlement							
1	Residential Structure (Owner)	—	10	10	—	41	41
2	Residential Structure (Tenant)	—	1	1	—	1	1
3	Commercial Structure (Owner)	2	274	276	10	635	645
4	Commercial Structure (Tenant)	—	80	80	—	231	231
Loss without Resettlement							
5	Wage-worker	—	221	221	—	555	555

Remarks: Possession of structure is authorized by Squatter Right.

In addition, MPW continues to confirm the whereabouts of the 89 households un-surveyed by utilizing stakeholder meetings and mass media such as radios.

## 2) Asset and Land Survey

Asset and land survey was carried out in order to obtain the information of assets and land which PAHs own in the Project area. Since all Project site, ROW 75 feet, belongs to MPW, new land acquisition is not required. However, there are 449 structures occupied in the Project area, which are mainly used for commercial business (kiosks/vendors). Table 1.3-23 shows the nature of structure and Table 1.3-24 shows the structure type of occupied structure.

Table 1.3-23 Nature of the Structures

Intended Use of Structure	Household	Ratio
Commercial Structure	424	94.4 %
Residential Structure	11	2.5 %
Others	14	3.1 %
Total	449	100.0%

Remarks: 89 un-surveyed structures were estimated to commercial structures by appearance.

Table 1.3-24 Structure Type of Occupied Structures

Building Structure	Number	Ratio
Concrete Flat + Zinc Roof	107	23.8 %
Concrete Elevated Floor + Zinc Roof	3	0.7 %
Fence-barb wire	8	1.8 %
Fence-concrete + Barb Wire	7	1.6 %
Fuel Station	50	11.1 %
Mud Bricks + Zinc Roof	12	2.7 %
Round Poles + Zinc Roof	20	4.5 %
Zinc Roof + Plywood Round	45	10.0 %
Zinc Roof + Mat Round	10	2.2 %
Kiosk	47	10.5 %
Container	130	29.0 %
Others	10	2.2 %
Total	449	100.0 %



### 3) Livelihood Survey

Livelihood survey was carried out with 367 out of the 456 household in order to obtain the information of the livelihood of PAHs. About 97 % of PAHs gain an income from commercial activities such as kiosk and vendor, and about 3 % of them do from public servant. Table 1.3-25 shows the detail of Livelihood of PAHs.

Table 1.3-25 Livelihood of PAHs

Livelihood of PAHs	Household	Ratio
Commercial	355	96.7 %
Public Servant	9	2.5 %
Others	3	0.8 %
Total	367	100.0 %

Although hearing surveys to PAHs were conducted in order to obtain the information of PAHs' average income, all PAHs rejected to disclose their incomes, no matter how many times MPW persuaded PHHs. This is because suspicions such as tax imposition by authorizes exist. Generally it is difficult to acquire the PAHs' incomes in Liberia.

### 4) Vulnerable Persons/groups

The population censuses survey revealed that 92 out of the 367 households were vulnerable persons/groups which special assistances are necessary in the Project area. Apart from them, no elderly person, children, indigenious groups, ethnic minorities etc. was confirmed.

## 1-3-2-4 Measures of Compensation and Assistance

### 1) Compensation of Loss

Out of the 367 PAHs surveyed, 311 or 85 % of PAHs prefer cash compensation as their preferred mode of resettlement. On the other hand, 56 or 15 % of PAHs preferred alternative land or alternative land and cash compensation as their preferred mode of resettlement. GOL has been developing an alternative land for the PAHs/PAPs, though the completion of the alternative land is still unknown due to lack of budget for the development. Moreover even though the alternative land is ready for receiving the PAHs/PAPs, it was revealed that all PAHs/PAPs don't prefer the resettlement to the alternative land. Thereupon we obtained consensus from all PAHs/PAPs that compensation on resettlement would be done by cash after 8 stakeholder meetings with them. However, MPW considers that PAHs/PAPs would be given priority to resettle to the alternative land once the land is completed and ready for receiving the PAHs/PAPs.

### 2) Income Restoration Measures

One of the purposes for preparing RAP is for PAHs/PAPs to restore their standard of living, income opportunities and production levels to at least pre-project levels as soon as possible. In order to achieve the purpose, following measures are taken in the Project.

- a. Compensation shall be paid prior to acquisition or displacement.
- b. Compensation for structures shall include the full cost of materials and labor required for reconstructing a building of similar and preferably better quality and standing. In other words, the affected person must be able to have their structure rebuilt in a different location using the compensation paid for the old building. Depreciation will not be taken into account while calculating the cost of affected structures. The Compensation package will also include cost of moving, such as transport costs as well as any associated land titling or transfer fees.
- c. In case of movable and tentative kiosks/vendors, their operations in the area in or outside of ROW where newly constructed road structures are not disturbed are allowed.
- d. PAHs/PAPs will be given priority to be employed for construction works.
- e. To consult stakeholders, including communities and ensure their participation in the compensation policy for loss.
- f. MPW together with other related organizations shall consider carrying out software measures such as vocational trainings for PAHs/PAPs especially the vulnerable persons/groups.

### **3) Entitlement Matrix**

Table 1.3-26 shows the entitlement matrix for the Project.

Table 1.3-26 Entitlement Matrix for the Project

#	Type of Loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Implementation Issues/Guidelines	Responsible Organization
1	Loss of Land	Legal Owners of Land	Replacement Cost	<ul style="list-style-type: none"> <li>✓ Assessment of quantity and quality of land.</li> <li>✓ Assessment of Market Value</li> <li>✓ Assessment of Cash Compensation</li> <li>✓ Updating of titles of the affected persons.</li> <li>✓ Payment of Cash Compensation</li> <li>✓ Affected Persons will be fully informed of the entitlements and the procedures regarding payments.</li> <li>✓ Advance notice to vacate</li> </ul>	GOL/MPW /IIU
		Illegal Occupants of Land	No Compensation for Land	<ul style="list-style-type: none"> <li>✓ Cash compensation for assets such as structures and standing trees.</li> <li>✓ Advance notice to vacate.</li> </ul>	GOL/MPW /IIU
2	Loss of Structures	Owners of Structure	Replacement Cost	<ul style="list-style-type: none"> <li>✓ Assessment of quality of structures.</li> <li>✓ Assessment of Market Value</li> <li>✓ Assessment of Cash Compensation</li> <li>✓ Payment of Cash Compensation</li> <li>✓ In addition, US\$ 250 for relocation assistance and US\$ 100 for transportation assistance will be provided per PAH for Residential Structure</li> <li>✓ Affected Persons will be fully informed of the entitlements and the procedures regarding payments.</li> <li>✓ Permission to continue business within ROW which does not destruct road facilities.</li> <li>✓ Advance notice to vacate.</li> </ul>	GOL/MPW /IIU
		Owner of Container	US\$ 250 per PAH	<ul style="list-style-type: none"> <li>✓ Payment of Cash Compensation (US\$ 250 per PAH which is sufficient to rent a forklift to relocate container from original position to another)</li> <li>✓ No compensation for container itself, because containers will not be demolished.</li> <li>✓ Additional assistances such as relocation.</li> <li>✓ Permission to continue business within ROW which does not destruct road facilities.</li> <li>✓ Advance notice to vacate.</li> </ul>	GOL/MPW /IIU

#	Type of Loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Implementation Issues/Guidelines	Responsible Organization
3	Loss of Income	Owners of Businesses	US\$ 100 per PAH	<ul style="list-style-type: none"> <li>✓ Payment of Assistance (US\$ 100 per PAH for loss of business income during the period of relocation or demolition of the structures. All PAHs operating businesses in Project area wish to continue operating within ROW out of the proposed road facilities such as carriageways, greenbelt, and sidewalk. Therefore US\$ 100 per PAH is sufficient to compensate loss of business income during the period of relocation or demolition of the structures. The period between the relocation and restart of the business is anticipated as 7 days.</li> <li>✓ Affected Persons will be fully informed of the entitlements and the procedures regarding payments.</li> <li>✓ Advance notice to vacate.</li> </ul>	GOL/MPW /IIU
		Wage Earners	Assistance for Loss of Wage	<ul style="list-style-type: none"> <li>✓ Assessment of income loss</li> <li>✓ 3 month cash hand-out worth of wages paid, if employment is lost by the Project.</li> </ul>	GOL/MPW /IIU
4	Loss of Accommodation	Vulnerable Persons	US\$ 50 per PAHs, Special Measures and Assistance	<ul style="list-style-type: none"> <li>✓ Assessment of Loss</li> <li>✓ Assessment of Assistance</li> <li>✓ Payment of Cash Assistance</li> <li>✓ Affected Persons will be fully informed of the entitlements and the procedures regarding payments.</li> <li>✓ Provision of materials to help them build a higher standard replacement unit, assistance to acquire vocational training or income generating scheme. (done on a case-by-case basis)</li> <li>✓ Additional assistances such as transportation, etc.</li> <li>✓ Advance notice to vacate.</li> </ul>	GOL/MPW /IIU
		Tenants	Special Assistance	<ul style="list-style-type: none"> <li>✓ Re-imbursement of remaining worth of lease or tenancy deposit</li> <li>✓ Moving assistance such as house replacement, assistance of rent for 3-month period and moving cost</li> <li>✓ Advance notice to vacate.</li> </ul>	GOL/MPW /IIU

### 1-3-2-5 Grievance Redress Mechanism

To ensure that grievances that may result over compensation are dealt with in timely and transparent way, MPW is going to set-up a grievance redress committee around the 1st quarter of 2013, to address complaints arising from the implementation of the RAP. Functions of the grievance redress committee includes

- a. Provision of support to affected persons on problems arising from loss of residence and business area, and loss of income
- b. Recording grievance of PAHs/PAPs, categorizing and prioritizing the grievance that need to be resolved by the committee; and
- c. Reporting to the aggrieved parties about the developments regarding their grievances and the decision of the Project authorities.

Grievance related to any aspect of the Project is handled through negotiation, which aims at achieving an amicable and consensus settlement.

Table 1.3-27 Grievance Redress Mechanism in Liberia

Stage	Organization	Description
First Stage	Grievance Redress Committee	Aggrieved person(s) may file compliant with the Grievance Redress Committee which will act on it within 7 working days on receipt. In order to address the compliant, a meeting in attendance with the aggravated person(s) and Grievance Committee members will be held.
Second Stage	Minister of MPW	If there is no resolution to the problem or the affected person does not receive a response from the MPW within a timely manner, the affected person may appeal to the Minister of MPW, which should act on the complaint/grievance within 5 working days as of the day of filing the complaint.
Third Stage	RAP External Committee	If the case is not resolved to the satisfaction of the complainant or the affected person does not receive a response from the Minister of Public Works, he/she may advance the matter to the RAP External Monitoring body for redress.
Last Stage	Court	If, at this level, the case remains unresolved, the aggrieved party may resort to legal actions in the Court of Law.

Grievance redress mechanism in Liberia has works smoothly without big problems in projects sponsored by donors such as WB and UAID and thus the Project introduces the same grievance redress mechanism as well. The grievance redress committee which plays key role of the mechanism is set directly under the Assistant Minister for Technical Services of MPW. The grievance redress committee will be established directly under the assistant minister of MPW and organized by members of the representative of MPW, EPA, MLME, MoE, MHSW, LPPRC, MIA and PAPs. The detail of the grievance redress committee member (Draft) is shown in Table 1.3-28.

Table 1.3-28 Member of Grievance Redress Committee (Draft)

No.	Name	Institution	Function in Institution	Role in the Committee
1	Ersel Smith	MPW	Assistant Minister	Chairman of the Committee
2	Henry Mah	MPW	Valuator	Valuator
3	Rupert Taylor	MLME	Surveyor	Land Dispute Officer
4	Edward Neblett	EPA	Environmentalist	Environmentalist
5	Varney Conneh	EPA	Assistant Manager	Environmentalist/Socialist
6	David Carter	MPW	Zoning Officer	Zoning Expert
7	Mohammed A. Nasser	MPW	Internal Auditor	Auditor/Observer
8	Alex Fallah	CDRI	Resettlement Expert	Resettlement Expert
9	David L. Wiles	MPW/IIU	Environmentalist	Environmentalist/Socialist
10	—	MoF	—	—
11	—	MHSW	—	—
12	—	LRPRC	—	—
13	—	MIA	—	—
14	Representative of PAPs <sup>*1)</sup>	PAPs	—	Member
15	Representative of PAPs <sup>*1)</sup>	PAPs	—	Member
16	Representative of PAPs <sup>*1)</sup>	PAPs	—	Member
17	Representative of PAPs <sup>*1)</sup>	PAPs	—	Member

Remarks: \*1) The representatives of PAPs will be selected after the approval of RAP.

### 1-3-2-6 Implementation Structure

Implementation of the RAP involves relevant institutions with mandates on Resettlement, land acquisition, infrastructure, environment and implementation of the Project. These institutions include MPW, MLME, EPA, JICA, RAP Implementation Committee and an external monitoring agency. However, the Infrastructure Implementation Unit (IIU) of MPW takes initiatives in the overall conduct of this exercise. Table 1.3-29 shows their functions during the implementation process, while Figure 1.3-9 shows a matrix of the key implementing agencies of the RAP.

Table 1.3-29 Key Implementing Agencies and their Functions

Agency	Responsibilities
Ministry of Public Works/IIU	Coordination (planning & implementation process); Budget allocation for project; Monitoring & Evaluation
Ministry of Lands, Mines & Energy	Authenticate title of land owners
Environmental Protection Agency	Ensure that the social and environmental policies and guidelines are followed
JICA	Ensure compliance of the JICA and World Bank Policies.
RAP Implementation Committee	Implementation of RAP
CDRI	Monitor the RAP implementation externally

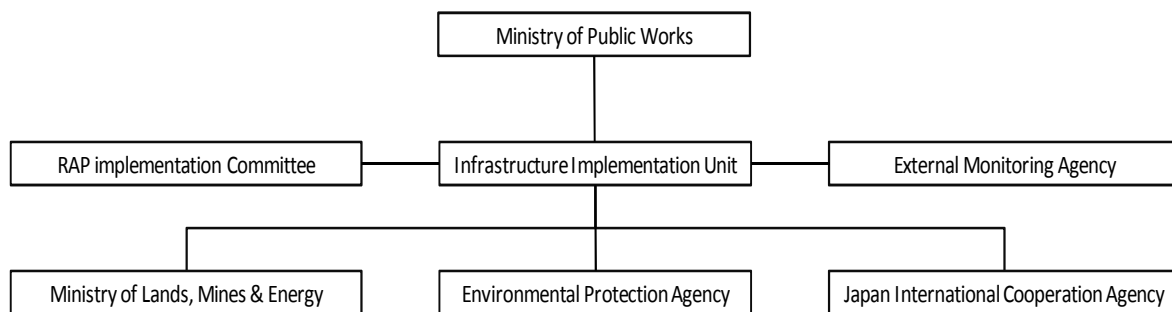


Figure 1.3-9 Organizational Chart for the Implementation of the Resettlement Action Plan

The respective roles of the institutions involved in implementation of the RAP are as follows.

Infrastructure Implementation Unit (IIU) / Ministry of Public Works (MPW)

The IIU within the MPW together with RAP Implementation Committee implements the RAP and coordinates and supervises all activities for the Project. For effective implementation of this RAP, IIU should recruit environmental health and social safeguard specialists to coordinate implementation of the RAP at least before 3 months. The environmental health and social specialists will:

- Ensure that the IIU complies with all applicable national, JICA, and World Bank policies;
- Liaise with other government agencies and prepare periodic monitoring reports; and
- Monitor RAP implementation.

Ministry of Lands, Mines and Energy (MLME)

The ministry has the responsibility for authenticating ownership of land, issuing Certificates of Occupancy, and regulation of land allocation and acquisition process; along with its major function of overseeing the mineral resources of the country.

Environmental Protection Agency (EPA)

EPA is responsible to assess the environmental suitability of proposed actions including choice of resettlement areas and benefits to affected persons.

Japan International Cooperation Agency (JICA)

JICA is the entity financing the Project. JICA has the responsibility of ensuring that all of its and the WB Guidelines are in compliance during the implementation of the Project.

RAP Implementation Committee

The role and responsibility for the committee includes

- Check on the compliance of the procurement procedures in relation with Liberian Law
- Coordination of stakeholder meeting and public hearing
- Management and monitoring of RAP implementation

- Internal monitoring and evaluation of the RAP process together with IIU
- Coordination with the field team
- Preparation of internal monthly environmental and social audit reports

RAP Implementation Committee will be established directly under the assistant minister of MPW and organized by members of the representative of MPW, EPA, MLME, MoE, MHSW, LPPRC, MIA and PAPs. The representatives of PAPs will be selected after the approval of RAP.

#### External Monitoring Agency

The agency will be employed by MPW. The role and responsibility is to monitor and evaluate the RAP implementation.

### **1-3-2-7 Implementation Schedule**

The RAP implementation schedule is suggested in Table 1.3-30 as an initial one which should be revised and updated as program items have been implemented. Updating of the implementation plan is the responsibility of the RAP Implementation Committee. This plan is to be implemented over a period of 15 months, which is the expected duration for the payment of all compensation packages and resettlement of the PAHs/PAPs. The plan also takes into account important variables such as resolution of conflicts and grievances; cash flow from GOL to the consultant monitoring of the resettlement process.

Table 1.3-30 Proposed Implementation Schedule

Action	2012		2013			
	3Q	4Q	1Q	2Q	3Q	4Q
Preparation of Draft RAP						
Approval from EPA of Draft RAP						
Stakeholder Meeting						
Establishment of RAP Implementation Committee						
Confirmation of Assets						
Payment of Compensation						
Handing Grievance						
Relocation of PAPs						
Dimension of Affected Structures						
Post-evaluation						

### **1-3-2-8 Budget and Source**

The expected cost for the implementation of the RAP is US\$859,335.79. Table 1.3-31 shows the breakdown of the cost for RAP implementation.



Table 1.3-31 Budget for the Implementation of Resettlement Action Plan

No.	Item	Unit	Q'ty	Estimated Cost	Source of Funding
<b>Compensation for Affected Structure</b>					
1	Concrete Flat/Zinc Roof	HH	107	462,557.20	GOL/MPW
2	Concrete Elevated Floor/Zinc Roof	HH	3	15,120.40	GOL/MPW
3	Container (with some development)	HH	130	8,043.80	GOL/MPW
4	Fence-barb wire	HH	8	10,541.20	GOL/MPW
5	Fence-concrete/barb wire	HH	7	13,820.80	GOL/MPW
6	Fuel Stations	HH	50	66,339.30	GOL/MPW
7	Kiosk	HH	47	8,920.92	GOL/MPW
8	Mud Bricks/Zinc Roof	HH	12	28,862.90	GOL/MPW
9	Round Poles/Zinc Roof	HH	20	5,787.60	GOL/MPW
10	Zinc/Mat Round	HH	10	4,139.80	GOL/MPW
11	Zinc/Plywood Round	HH	45	12,592.36	GOL/MPW
12	Other (Well, Bus Stop etc.)	HH	10	6,310.80	GOL/MPW
<b>Sub-Total (= A)</b>				643,037.08	—
<b>Compensation and Other Assistance</b>					
13	Compensation for Loss of Income (US\$ 100 per HH)	HH	431	43,100.00	GOL/MPW
14	Relocation Assistance (US\$ 250 per Container x 130, US\$ 250 per Structure (residential) x 11)	HH	141	35,250.00	GOL/MPW
15	Transportation Assistance (US\$ 100 per Residential Structure x 11, Other x 14)	HH	25	2,500.00	GOL/MPW
16	Assistance to Vulnerable People (US\$ 50 per HH)	HH	92	4,600.00	GOL/MPW
<b>Sub-Total (= B)</b>				85,450.00	—
<b>Total (C = A + B)</b>				728,487.08	—
<b>Administration, Implementation, Monitoring and Evaluation</b>					
17	RAP Implementation Logistics and Administration	L.S.	1	15,000.00	GOL/MPW
18	Cost for RAP Implementation Committee	L.S.	1	8,000.00	GOL/MPW
19	Consultancy Service (Implementation & Internal Monitoring)	L.S.	1	15,000.00	GOL/MPW
20	External Monitoring	L.S.	1	20,000.00	GOL/MPW
<b>Sub-Total (= D)</b>				58,000.00	—
21	Contingency (E = 10% of C)* <sup>1</sup>	L.S.	1	72,848.71	—
<b>Grand Total (F = C + D + E)</b>				<b>859,335.79</b>	—

Remarks: \*1: Contingency includes inflation rate and other unpredictable cost.

### 1-3-2-9 Monitoring Structure of the Proponent

Monitoring and evaluation of RAP implementation is highly important and is needed to be properly designed and implemented. Monitoring involves the collection and analysis of data on project activities, ensuring project implementation and management towards target project objectives. Monitoring also allows PAPs to review project activities, to determine whether project objectives are being achieved and to suggest revision where necessary. There are both internal and external monitoring for the implementation of the RAP.

## 1) Internal Monitoring

The MPW/IIU shall constitute an internal monitoring team for the RAP implementation. The monitoring team shall prepare a Project Implementation Manual, which will detail the monitoring frequency and content of monitoring reports. The result of monitoring shall be reported to JICA and EPA on quarterly basis, during the implementation of the RAP and project. Table 1.3-32 shows the criteria and indicators for the internal monitoring.

Table 1.3-32 Criteria and Indicators for Internal Monitoring

Criteria	Indicator for Monitoring
Budget and Time Frame	1. Have all resettlement staff been appointed and mobilized for the field and office work on schedule?
	2. Have capacity building and training activities been completed on schedule?
	3. Are resettlement implementation activities being achieved against agreed implementation plan?
	4. Are funds for resettlement being allocated on time?
	5. Have resettlement offices received the scheduled funds?
	6. Have funds been disbursed according to RAP?
Delivery of PAPs Entitlements	7. Have all PAPs received entitlements according to numbers and categories of loss set out in the Entitlement Matrix?
	8. Are assistance measures being implemented as planned?
	9. Have affected businesses received entitlements including transfer and payments for income losses resulting from lost business?
Consultations, Grievance and Special Issues	10. Have consultations taken place as scheduled including meetings and community activities?
	11. Have disclosure meetings taken place?
	12. How many PAPs know their entitlements? How many PAPs know if they have been received?
	13. Has Grievance Redress Committee been set up?
	14. Have any PAPs used the grievance redress procedures? What were the outcomes?
Benefit Monitoring	15. Have conflicts been resolved?
	16. What changes have occurred in patterns of occupation and production compared to the pre-project situation?
	17. What changes have taken place in key social parameters relating to living standards?
	18. What changes have occurred for vulnerable groups?

## 2) External Monitoring

External monitoring shall be carried out by a third agency employed by MPW 3 times after the completion of RAP implementation. The agency shall prepare and submit reports including PAPs information, livelihood restoration, satisfaction, immediate result of resettlement etc. to MPW and EPA. Table 1.3-33 shows the criteria and indicators for the external monitoring.

Table 1.3-33 Criteria and Indicators for External Monitoring

Criteria	Indicators for Monitoring
Basic Information on PAPs Households	1. Location
	2. Composition and structure, ages, income, type of livelihoods and gender of household head
	3. Land and other resource owning
	4. Participation in neighborhood or community groups
	5. Value of all assets forming entitlements and resettlement entitlements
Livelihood Restoration	6. Were structure compensation payments made free of depreciation, fees or transfer costs to the PAP?
	7. Were other compensation payments free of deductions for depreciation, fees or transfer costs to the AP?
	8. Were compensation payments sufficient to replace lost assets?
	9. Did income substitution allow for re-establishment of enterprises?
	10. Have vulnerable groups been provided income earning opportunities? Are these effective and sustainable?
Levels of Satisfaction	11. How much do PAPs know about resettlement procedures and entitlements? Do PAPs know their entitlements?
	12. Do they know if these have been met?
	13. How do PAPs assess the extent to which their own living standards and livelihoods have been restored?
	14. How much do PAPs know about grievance procedures and conflict resolution procedures?
Effectiveness of Resettlement Planning	15. Were the PAPs and their assets correctly enumerated?
	16. Was the time frame and budget sufficient to meet objectives?
	17. How did resettlement implementers deal with unforeseen problems?
	18. Were there unintended environmental impacts?

#### 1-4-2-10 Public Participation

In order to exchange opinions among stakeholders and share information in terms of the preparation of RAP and environmental & social considerations, 8 in total stakeholder meetings were taken place. Table 1.3-34 shows the outline of the stakeholder meetings.

Table 1.3-34 Outline of the Stakeholder Meetings

Stakeholder Meeting	The First Stage			
	First	Second	Third	Fourth
Date	28 <sup>th</sup> April 2012		5 <sup>th</sup> May 2012	
Venue	Faith & Victory School	Jimmy Jolocon School	Monrovia Vocational School	Paynesville Community School
Method	Public Assembly			
Participant	28	48	36	36
Stakeholder Meeting	The Second Stage			
	Fifth	Sixth	Seventh	Eighth
Date	16 <sup>th</sup> June 2012		23 <sup>rd</sup> June 2012	
Venue	Faith & Victory School	Jimmy Jolocon School	Monrovia Vocational School	Paynesville Community School
Method	Public Assembly			
Participant	18	27	16	21

The opinions raised from stakeholders at the meetings were reflected to the Project design and RAP as many as possible. Major comments/opinions and their answer from MPW are shown below.

<b>Concern / Question</b>	<b>Answer</b>
I have heard that people with legitimate deed for land are going to be compensated. What about those who are squatters but also paid taxes for their properties?	<b>MPW</b> answers that every PAPs will receive some form of compensation. However, it will be done on a case-by-case basis.
My container is on land that is allegedly owned by Government. Even though someone is claiming title to said land, will the government provide me compensation to relocate my container?	<b>MPW</b> answers every structure owner will receive some compensation. In case of containers, relocation assistance will be given to containers owners.
I am not affected now by the 75feet, but my structure is within the 150feet owned by the Government, what happens to me after the completion of this JICA project?	<b>MPW</b> answers that the ROW for the project is 75 feet which was agreed by both Liberian side and Japanese side. So far MPW has no concrete development plan beyond 75 feet.
What mechanism has been put in place by Government to ensure that affected persons resettle peacefully and quickly?	<b>MPW</b> answers that the government will provide some form of assistance/compensation to every affected person in accordance with world standard such as World Bank.
What kind of road do we expect to see, will it be a boulevard or something different?	<b>MPW</b> answers that it will be a 4-lane good quality road in total. 2 additional lanes will be designed. However, the final design is yet to be presented by JICA Survey Team.
Will this road project take into account issues surrounding pollution, most especially cow factory near Jamaica road?	<b>MPW</b> answers that the issue concerning the cow factory has nothing to do with the Project. Only issues concerning the Project will be addressed. However the issue shall be addressed by EPA.
We have heard two different scenarios concerning 75feet and 150feet, what specific message should we take back to our respective communities?	<b>MPW</b> answers that the present project is considering 75 feet. ROW used to be 150 feet but revised to 75 feet in order to minimize social impacts.
Is there any grace period for PAPs to be resettled before demolition begins?	<b>MPW</b> answers that when some form of compensation has been provided each PAPs, they will be granted enough time to vacate from the Project area. The resettlement schedule will be shown in the RAP which is under preparation.
During the 150feet survey in 2009, the contrary Hon. Mary Broh came and broke our structures without any prior notice, what's the difference between the Project and the first.	<b>MPW</b> answers that our process is different from MCC. We will resettle PAPs in accordance with international standard with sufficient compensation.
The commissioner should be invited to the next meet too.	<b>MPW</b> answers commissioners will be invited from next meetings.
What methodology is going to be used during the compensation process?	<b>MPW</b> answers that this will be considered in the RAP, at the end of the process.
What kind of compensation will be given to people who owned more than one structures and when are they going to receive said compensation?	<b>MPW</b> answers that compensation for each structure will be paid. The clear timing of distribution of compensation is unknown at this moment. After budget for it is allocated, MPW will take necessary procedure to disburse.

Concern / Question	Answer
I have a container on the road that falls within the 75 feet, will I be permitted to push my container behind 75 feet?	<b>MPW</b> answers that the Project is considering 75 feet. <b>MPW</b> intend to push structures including containers away from 75 feet.
What kind of assistance will be given to PAPs who are renting lands from people claiming title to the front view of the road?	<b>MPW</b> answers that anyone claiming ownership will be required to provide their documentation in order to ensure right compensation is given for the property or structure.
I rented a land but and constructed a structure on that land, will the land owner and I share the compensation for said compensation?	<b>MPW</b> answers that the land owner will be compensated for the land, while the structure owner will be compensated for the structure.
I am a widow with children in a structure that is affected. Can you tell me when we have to move?	<b>MPW</b> answers that no time was set for this yet, but PAPs will be notified after receiving some compensation. Also all PAPs will be given adequate time to relocate after receiving compensation.
Will the government find a land for business people to be relocated?	<b>MPW</b> answers that as documented in the socio-economic survey, alternative resettlement site and option of PAPs will be considered.
What does Earthcons. intend to achieve after this exercise?	<b>MPW</b> answers that RAP will be submitted to the Government and JICA.
What happens to the remaining portion of a structure that is half affected?	<b>MPW</b> answers that the entire structure will be considered if remain part is not useless.
Is it prudent for me to move ahead of time and still stand a chance of receiving my compensation?	<b>MPW</b> answers that it will be no problem that PAPs are on the property and available for meeting and inspection.
One of the two bridges on the Somalia Drive route is dilapidated. Will JICA build a new bridge during the road construction exercise?	<b>MPW</b> answers the bridge is already constructed at the Warner Creek (Double Bridge) which will be renovated. According to JICA's plan, JICA will construct a new bridge at the Stockton Creek.
Will vehicles be allowed to ply the streets during the road construction period?	<b>MPW</b> answers basically existing 2-lane road will be open for traffic during construction period. However detour may be made because of safety reasons some time.
What method will be used to compensate PAPs, will it be cash payment or cheques?	<b>MPW</b> answers there is a substantial likelihood that PAPs will receive their compensation through the issuance of cheques.
Will the government provide a forklift to relocate my container if I don't want cash compensation?	<b>MPW</b> answered that PAPs with containers will be given reasonable compensation to hire the services of a forklift of their choice.
As you are aware or not, townships have been surviving and running on taxes paid by us. Why shouldn't squatters' right permit be given to PAPs within the 75feet of the road?	<b>MPW</b> answers that the township commissioners had issued squatters right permit to PAPs before the Cut-off-date. That was recorded and confirmed by socio-economic study.
What method was used to determine the compensation for affected structures?	<b>MPW</b> answers that there were property valuers and resettlement experts who conducted an objective evaluation of affected structure based on the current market value consistent with the Laws of Liberia and International best practice. All PAPs would be shown the value and their package at the close of the meeting. Also if you have objections to the compensation, grievance redress mechanism will be set up.

Concern / Question	Answer
Who is to receive compensation, is it the person that resides in the structure or the structure's owner?	<b>MPW</b> answers that it depends on the specific case involved. The person who resides in the structure will receive furniture transportation allowance, relocation assistance and/or loss of income for occupying the structure while the structure owner receives the assessed value of compensation for structure.
Will the government find a suitable place for business owners to relocate their businesses?	<b>MPW</b> answers that the Government is currently working on plans to build a multi-purpose market duplex around the former Omega Tower community. This project is intended to relocate the Red Light Market and other businesses. We hope that business owners will take advantage of this venture in the future. And that land will be replaced with suitable land for all those who show legitimate title to the land to be used for the project. However in case of the Project, most of PAPs hesitate to relocate to the new relocation site because the new site is far and still under construction. MPW allows PAPs to keep business tentatively within ROW where road facilities and construction works are not disturbed.
Is it advisable for us to undertake further development or renovation on our structures since we are in the rainy season?	<b>MPW</b> answers that as you are aware, there was a Cut-off-date before the conduct of the Socio-Environmental survey and property evaluation assessment. Therefore, any new improvement or development on your structure will not be considered for compensation.
Who receives compensation for a structure in an instant case where the structure's owner wasn't present during the survey but his tenant misled the survey team as being the legitimate owner of the structure?	<b>MPW</b> answers to the effect that this is why we have set up a grievance redress committee comprising members of your community to investigate issues of such nature and report to us their findings based on the truth. Also after the draft RAP approved, the Government re-assess properties so mistakes/misleads will be modified.
Is it prudent for me to relocate my container/structure in advance before cash compensation is given?	<b>MPW</b> answers that before compensation is paid, verification will be conducted to validate the accuracy of data captured on the field which forms an integral part of the RAP's official report. Therefore, relocating your container or structure before said period will be at your disadvantage.

At the time the RAP is approved by EPA and the cost for resettlement for PAHs/PAPs respectively is confirmed, other stakeholder meetings will be taken place by MPW.

## **CHAPTER 2 CONTENTS OF THE PROJECT**

### **2-1 Basic Concept of the Project**

#### **2-1-1 Upper Objective and Project Objective**

The Poverty Reduction Strategy Papers (PRSP) of Liberia is the basis for the Work Plan for 2008-2011, which puts importance on the basic strategy and sustainable development of Liberia. The PRSP describes the basic policy of road sector in metropolitan area of Monrovia. The government of Japan conducted Master Plan Study on Urban Facilities Restoration and Improvement in Monrovia in November 2008, and the project for reconstruction of Somalia drive in Monrovia has been proposed as a high priority project

Overall goal: To activate the social economic activities in the metropolitan area of Monrovia

Objectives of the Project: To mitigate the traffic congestion and secure traffic safety through widening of the Somalia drive

Outcomes:

- 1) 4-lane road including the two existing lanes are constructed
- 2) 4-lane bridge is constructed at the point of crossing Stockton River
- 3) Rehabilitation of Double bridge

#### **2-1-2 Scope of the Requested Japanese Assistance**

For the completion of 4-lane road, new 2-lane road should be designed parallel with existing 2-lane road on the 13.2 km stretch from Free Port Junction to Red Light Junction.

The width of Right of Way (ROW) on the left side of the existing road is 150 feet (45m). However, the road space for this planning was agreed at 75 feet (22.5m) width by the M/D of Preparatory Survey on August 2011, because roadside has been developed and a lot of buildings, houses and other structures have been located within the ROW.

The concerned section for Japanese assistance was agreed to be from Free Port Junction to Station 13+200 through the discussion with MPW.

## **2-2 Outline Design of the Japanese Assistance**

### **2-2-1 Design Policy (Construction Plan)**

#### **(1) Design Standard**

Liberia does not have own design standard of the road and bridge. In general, American standard such as AASHTO and ASTM are commonly used. AASHTO guidelines provide unspecified design standard in some points. Therefore, the Team also refers Japanese standard sometime. The unit of length is converted from feet/inch to metric unit.

#### **(2) Geometric Structure**

The horizontal alignment is designed based on the centerline survey of existing road to adjust and follow the existing alignment. The vertical alignment is designed with minor improvement to provide vertical curves to the existing road. The changes of the alignment are very limited in order to maintain the existing road drainage system.

#### **(3) Natural Condition**

The design should reflect adapted to the natural condition based on the results of investigation on meteorology, topography, geology, hydrology and so on. In particular, the drainage facilities are designed to be proper size based on the hydrological analysis.

#### **(4) User of Public Transport**

The roadside has been developed and a lot of vendors, shops and markets are doing business within the ROW. There are many people waiting buses and taxies, and parking bike taxies at around intersections, and the activities are mixed up and disorder situation. This situation should be improved for the convenience of road users. The facilities of the public transport such as bus stops, waiting zones of the taxies and bikes should be provided and properly used. The sidewalk should be provided.

#### **(5) Landuse of Roadside**

Access ways from the project road to the roadside shops, facilities and communities should be provided properly.

Road drainage facilities should be provided properly in order to drain rain water from the existing road and the new road to the proper outlets.



## 2-2-2 Basic Plan

### 2-2-2-1 Design Criteria

#### (1) Road

MPW and the Team made several discussions on the engineering matters based on the result of site survey. The both parties agreed the design criteria of this project as follows.

##### General Matter

Design Speed : 60 km/hr

Cross Slope : 2.5%

Maximum Superelevation : 4%

Pavement Type : Flexible Pavement (Improved Asphalt Concrete)

Performance Period : 10years

Standard Axle Load : 11.5 ton (ECOWASStandard)

##### Cross Section Element

Width of Median : 2.5m

Lane Width : 3.30m

Pavement Width : 7.60m

Width of Sidewalk : Raised Sidewalk : 2.00m

Width of Greenbelt : 1.50m

##### Road Space

75 feet (22.5m) on both sides from centerline of median

#### (2) Bridge

Major design conditions are shown below.

Table 2.2-1 Bridge Design Condition

Road Class		Urban Primary Road
Design Speed		V=60km/hr
Design Load	Vehicle load	HS-20-44 (AASHTO)
	Others	Tank Load is considered (Request to MPW)
	Pedestrian load	$q = 3.5\text{kN/m}^2$
Horizontal seismic coefficient <sup>*)</sup>		Kh=0.1
Reference strength	PC concrete	$\sigma_{ck} = 35\text{ N/mm}^2$
	RC concrete	$\sigma_{ck} = 24\text{ N/mm}^2$
	Reinforcing bar	$\sigma_{sy} = 295\text{ N/mm}^2$
Referred Standard		AASHTO LRFD Bridge Design Specifications AASHTO 2002, 17 <sup>th</sup> Edition AASHTO LRFD Bridge Construction Specifications 2004, 2 <sup>nd</sup> Edition

\*) There is no experience of earthquake in Liberia. Regarding horizontal seismic coefficient, minimum value “0.1” in Japan was recommended by the team and it was agreed on Technical Note by both sides.

### **2-2-2-2 Geometric Design**

New construction part of the Project road is designed to be combined with the existing part of the Project road. The improvement of horizontal and vertical alignment is not considered and new part is designed to adjust to the existing road. However present geometric values are reviewed whether those satisfy the design criteria, and it confirms that the alignment is appropriate.

Values agreed the geometric design criteria agreed with MPW are as follows:

- Minimum radius :  $R=135\text{m}$
- Sharpest curve without superelevation :  $R>1,310\text{m}$
- Minimum length of curve :  $66\text{m}$
- Superelevation runoff :  $1/167$
- Maximum grade :  $i=7\%$
- Minimum vertical curve : Crest  $K=11$ , Sag  $K=18$

The horizontal alignment is not improved at any alignment elements basically since the new part construction is contiguous with the existing pavement. But beginning part at around Free Port Junction is constructed with 4 lane road, because existing road has transition part from 4 lane to 2 lane. The horizontal alignment is adjusted to standard cross section of 4-lane road from beginning up to Station 0+435 for the transition part. Only this part adopts design speed 30 km/hr as exception for junction.

Regarding vertical alignment, the existing alignment is adopted for new construction part. But the vertical curve is provided on the change points of grade to provide for the smooth alignment.

The road surface elevation near Station 0+025 at around Free Port Junction is lower than roadside land level. During rainfall, surface water on UN Drive flow toward Somalia Drive and the lower portion on Somalia Drive is inundated for a long time. Therefore the road surface elevation between Station 0+012.5 and 0+290 is raised by 40 cm at maximum to prevent the water flow from UN Drive, and to let the surface water of Somalia Drive flows down to existing concrete ditch.

### **2-2-2-3 Cross Section Component**

There are houses, shops and public facilities located on the roadside of the Project road. In view of environmental and social consideration, MPW and the Team are agreed that this project facilities should be planed within 75 feet width on both sides, although the regulated ROW is 150 feet from

the existing road edge. It is considered to minimize the number of relocation.

The Somalia Drive is planned to be divided 4-lane road and the median is provided at the edge of the existing pavement. The width of medium is planned to be 3.5 m to secure the space for left turn lanes, road drainage facilities and safety zone of crossing pedestrian. The pavement edge is not straight due to the damages. It is planned to provide inside road shoulder with a width of average 50 cm between the pavement edge and the raised median separator for the adjustment of indented edge line.

3.3 m lane width is adopted to referring to the recommended value of urban arterial in AASHTO. Left turn lane is 3.0 m wide. Median separator can not be provided at the left turn lanes due to the lack of space, instead the centerlines are painted by double yellow lines to separate the opposing direction lanes..

Sidewalk is provided for the safety of pedestrian and it is 2 m wide width for securing the space for wheelbarrows to pass each other. It installs curbs and the level of the sidewalk is raised 25 cm to clear the border of carriageway and walkway.

Green belt is provided at the outside of the road and planed shrubs as a hedge. It makes clear the border of road space and prevents the occupation of road space by stalls and vendors.

These cross section composition are shown in Figure 2.2-1 as the typical cross section

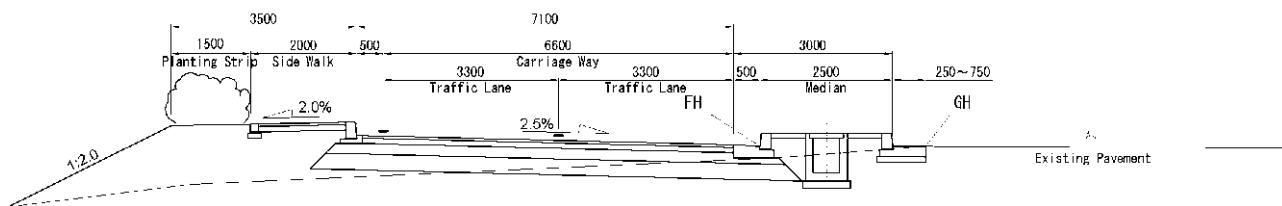


Figure 2.2-1 Typical Cross Section

#### 2-2-2-4 Pavement Design

Pavement design is carried out in accordance with AASHTO Guide for Design of Pavement Structures 1993. AASHTO says that pavement, new or rehabilitated, are usually designed for the period ranging 10 to 20 years. The minimum performance period is desirable at least 10 years before some major rehabilitation operation. The maximum performance period is 20 years from their experience. However they say that the selection of longer time periods that can be achieved in the field will result in unrealistic designs.

In this project, it is difficult to obtain high accuracy for the future traffic trend and forecast due to the rapid restoration and development in Monrovia. So future traffic forecast may low accuracy for the periods longer than 10 years and it may bring the excessive or insufficient design. Therefore the performance period of initial pavement is set up at 10 years in this project.

The result of traffic survey and traffic forecast are shown below.

Table 2.2-2 Result of Traffic Survey in 2012

	1	2	3	4	5	6	7	8	9	10	
	Sedan / Wagon / Pick-up	Taxi	Mini Bus	Large Bus	Light Truck (2-Axle)	Heavy Truck (> 2-Axle)	Tractor (Articulated Truck)	Motorbike	Bicycle	Pedestrian	
PCU	1.0	1.0	1.5	2.5	2.0	2.0	2.0	0.2			
Stokton Bridge											
Average	4656	9354	4308	1072	1123	989	348	12761	94	7227	Both direction
PCU	4656	9354	6462	2680	2246	1978	696	2552.2	0	0	30624.2
per lane	2474	4472	2346	425	559	443	88	6576	40	3844	East to West
Double Bridge											
Average	3746	8986	2480	409	682	797	207	7457	67	4593	Both direction
PCU	3746	8986	3720	1022.5	1364	1594	414	1491.4	0	0	22337.9
per lane	1906	4144	1136	225	317	365	85	4229	33	2652	East to West
Bardnesvill Junction											
Average	4281	8715	2763	440	670	885	154	13065	33	5144	Both direction
PCU	4281	8715	4144.5	1100	1340	1770	308	2613	0	0	24271.5
per lane	2366	3761	1371	200	379	470	75	6286	-	2195	East to West

Table 2.2-3 Traffic Forecast by PCU Unit

	2012	2014	2019	2025
Stokton Bridge	30624	35587	48757	65339
Double Bridge	22338	26248	38211	51206
Bardnesvill Junctio	24272	28415	40227	53908

For the pavement design, the section is divided by traffic volume. The elements used in the design are shown below.

- Section : Section 1-Station 0+012 ~ 5+000, Section 2-Station 5+000~13+200
- Traffic Load (w18) : Section 1- $40.19 \times 10^6$ , Section 2- $25.93 \times 10^6$
- Bearing capacity of roadbed : Section 1- CBR=12%, Section 2-CBR=10%
- Reliability (R) : 90%
- Terminal Serviceability Index : Initial P<sub>0</sub>=4.2, Lowest allowable P<sub>t</sub>=2.5
- Modifying the layer coefficient for drain : Base course – 1.0, Subbase course – 1.0

The structure numbers (N) were calculated in accordance with equation of flexible pavement by AASHTO and the pavement structures were studied respectively. The pavement structures were designed as shown in the Table 2.2-4.

Table 2.2-4 Result of Pavement Structure Design

	Material	Specification	Section 1	Section 2
Surface	AC	350,000psi	5cm	5cm
Binder	AC	350,000psi	10cm	10cm
Base	Mechanical stabilized gravel	CBR $\geq$ 80	20cm	20cm
Subbase	Crusher run	CBR $\geq$ 30	30cm	30cm

Pavement structure for the sidewalk was referred to Japanese standard and planned with surface 5 cm of AC and base 10cm of gravel.

### 2-2-2-5 Junction Plan

Major junctions were studied separately. MPW requested to include Free Port Junction at beginning point of this project for the improvement. The Team carried out the traffic survey of Free Port Junction in the peak hour. The traffic volume was counted on the two days on weekday between 6:30a.m. ~ 9:30a.m. and 16:30p.m. ~ 19:30p.m. and calculated by every 15 minutes. The classification of traffic and conversion factor for PCU were used the same value with sectional traffic survey, and the traffic volume by direction on peak hour was calculated. Figure 2.2-2 shows the peak hour traffic volume by direction in the morning and the evening.

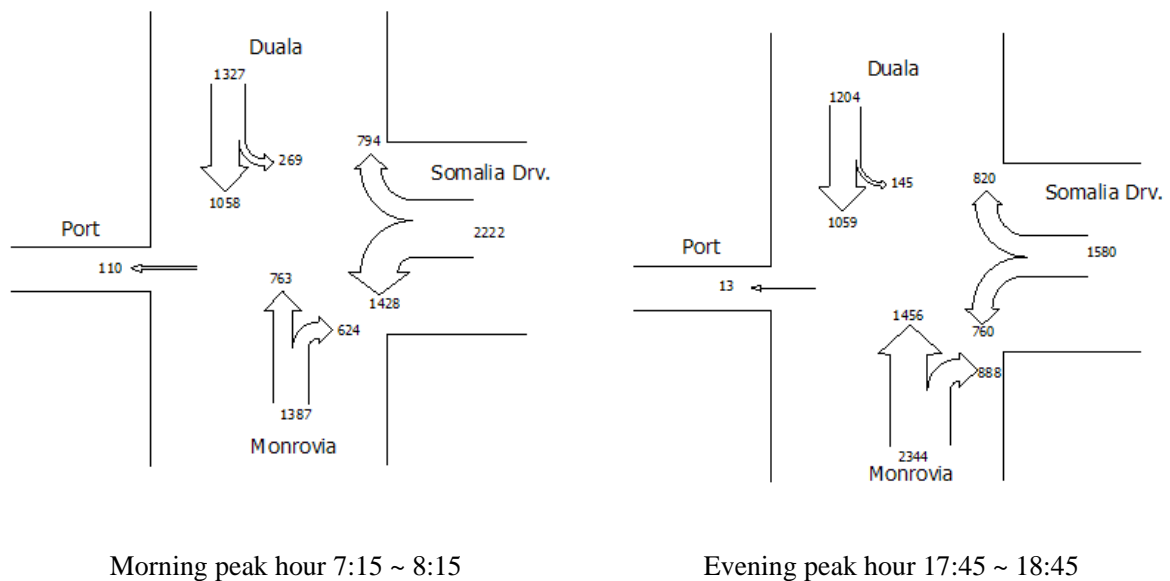


Figure 2.2-2 Traffic Volume of Free Port Junction

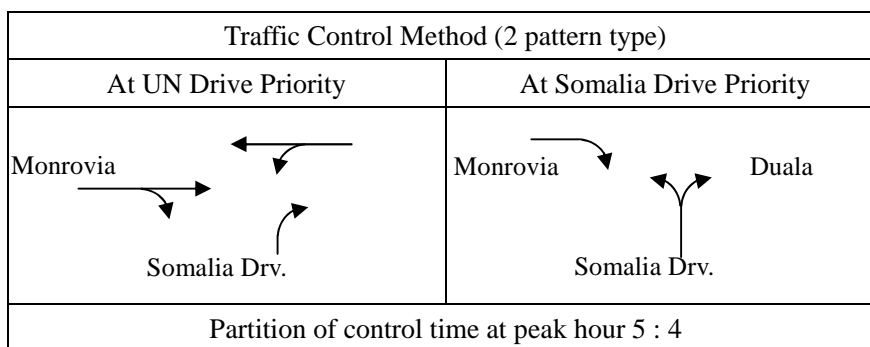
From this figure, it can understand the following matters.

- The traffic volume toward Somalia Drive in the morning and the evening are less than 1,000 PCU/hr, and Somalia Drive has 2 lanes for entering traffic. The capacity of 2 lanes is approximately 4,000 PCU/hr, thus the present situation is enough for future traffic also.
- The traffic volume from Somalia Drive toward Duala on UN Drive is less than 1,000 PCU/hr in the morning and the evening. Present channelized island is effective to reduce the traffic on the main carriageway.
- The biggest traffic is UN Drive toward central Monrovia in the morning peak hour and it becomes about 2,500 PCU/hr from Duala and Somalia Drive. There are 3 lanes on UN Drive at this point, so it is not problem on the capacity of the road.

The result of intersection analysis by computer software, JICA STRADA, is shown in Table 2.2-5.

Table 2.2-5 The Result of Analysis of Freeport Junction

Inflow Direction	Duala	Duala	Somalia	Somalia	Monrovia	Monrovia
Outflow Direction	Through and Left-turn	Through	Left-turn	Right-turn	Through	Through and Right-turn
Number of Lanes	1	2	2	1	2	1
Ideal Saturation Flow Rate(One Lane)	2000	2000	1800	1800	2000	2000
Lane Width(m)	3	3	3	3	3	3
Left Turns Ratio(%)	60.86	0	100		0	0
Traffic Volume of Opposing Lane Direction(veh/h)	762		0			
Probability of Left Turns	0.47		1			
Pass Flow during Yellow Phase(veh/cycle)	2		2			
Left Turn Equivalence	2.24					
Adjustment Factor for Left Turn and Through	0.57					
Saturation Flow(veh/h)	1139	4000	3600	1800	4000	1500
Design Hourly Volume(veh/h)		1326	1428	794		1386
Normalized Traffic Rate		0.258	0.352	0.441		0.252
Capacity(veh/h)		2856	1680	1800		3057
Degree of Saturation of Intersection	0.610					



As the result, saturation of intersection is still low at 0.61. It is evaluated that the improvement of Freeport Junction is not necessary with proper traffic control, even the traffic volume increases in near future.

One the other side, Red Light Junction at the end point, Station 13+243, is going to be improved in the project of WB. In this project, construction limit shall be Station 13+200 and Red Light junction is not included.

The other major junction along Somalia Drive were investigated their congesting situation, landuse of roadside and surrounding communities of connecting roads. The 3 junctions, where the junction are disorder due to the existence of parking taxis and bikes waiting passengers, were evaluated to design orderly. These junctions are designed in detail and provided the parking space of taxis and bikes not to disturb the through traffic in the junctions. Left turn lanes are provided to all major junctions to secure the smooth drive of main carriage way. The major junctions left turn lane are provided be shown in Table 2.2-6.

Table 2.2-6 Junctions with Left Turn Lane

Station	Connecting Road	Remarks
Sta.1+248	Jamaica Road	
Sta.4+375	New Georgia Road	Detail drawing
Sta.6+260	Barnesville Road	Detail drawing
Sta.6+852	Old LPRC Road	
Sta.7+414	Chicken Soup Factory Road	Detail drawing
Sta.8+051	Stephen Tolbert Estate Road	
Sta.10+657	Rehab Road	
Sta.11+312	Neezoe Community Road	
Sta.13+191	Pipe Line Old Road	

### 2-2-2-6 Bridge / River crossing Structure

#### (1) Project Bridges

Existing Stockton Bridge will be replaced by 2-lane new bridge and additional 2-lane new Stockton Bridge at northern side will be constructed.

Existing bridge will be utilized as detour during the construction of the new bridge.

#### (2) Bridge Location

- ✓ Existing navigation clearance should be maintained, therefore, span length should be equal or more than existing 21.3 m.
- ✓ Location of new substructures should be distant more than 4m from existing substructures because it is impossible to remove existing footings and foundations which are locating under the ground.
- ✓ Clearance between the bridges should be minimized, However, the space for the construction of bridges should be secured. (Distance between the bridge center lines =13.0m)

#### (3) Bridge Height

Clearance between the bridge and the high water Level (HWL) should be 1.0 m or more.

H.W.L. was determined based on the observation of flood mark on the existing bridge and interview survey at the site.

H.W.L. are as follows;

- ✓ Stockton Bridge : 1.80m
- ✓ Double Bridge : 1.46m

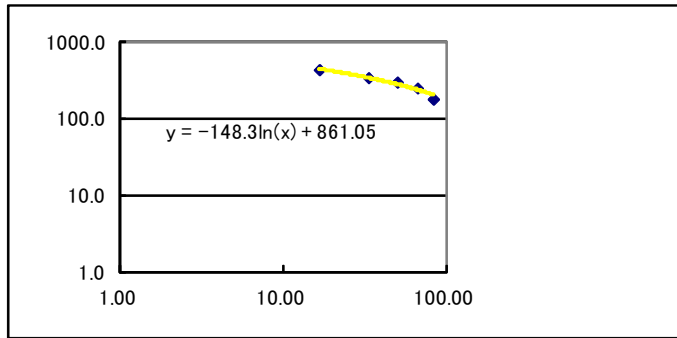
The H.W.L.s .are verified with the analyzed peak discharge of flood.

Peak discharge is calculated based on daily rainfall in 50 years return period which is estimated based on the rainfall data observed at Liberian Hydrological Service Rainfall Station.

The calculation of the peak discharge is shown in Table 2.2-7.

Dailey rainfall in Monrovia	
Year	Dailey Rainfall
2007	180.5
2008	435.3
2009	251.1
2010	342.2
2011	300.0

Liberian Hydrological Service Rainfall Station			
Rank	Year	Dailey rainfall	Occurrence Probability
1	2008	435.3	16.67
2	2010	342.2	33.33
3	2011	300.0	50.00
4	2009	251.1	66.67
5	2007	180.5	83.33



Ocurence Probability	Period	Dailey Rainfall
50%	2 years	280.90
10%	10 years	519.58
2%	50 years	758.26
1%	100 years	861.05
99%	1 year	179.59
33%	3 years	342.52

Figure 2.2-3 Daily Rainfall in 50 Years Return Period

Table 2.2-7 Calculation of Peak Discharge

Hydrological data: rainfall in 50 years return period $R_{50}$ = 758.26 mm/day										
Bridge Name	Catchment Area $A(\text{km}^2)$	Stream Length $L(\text{m})$	Elevation of Bridge $El_1(\text{m})$	Elevation of Riverhead $El_2(\text{m})$	Difference of elevation $H(\text{m})$	River Gradient $i$	Reachable time of flood $T_a(\text{Hour})$	Rainfall Intensity $r_a(\text{mm/h})$	Discharge Coefficient $C$	Peak Discharge $Q_{\text{max}}(\text{m}^3/\text{s})$
Stockton Br.	20	10,000	1.80	5.0	3.2	0.0003	17.62	38.83	0.5	108
Double Br.	10	5,000	1.46	5.0	3.5	0.0007	8.21	64.58	0.5	90

Difference of Elevation:  $H(\text{m}) = El_2 - El_1$   
 River Gradient:  $i = H/L$   
 Raechable time of food:  $T_a = 1.67 \cdot 10^{-3} \cdot (L/\sqrt{i})^{0.7}$  (Public Work Research Institute's formula )  
 Rainfall Intensity:  $r_a = R_{50}/24 \cdot (24/T_a)^{(2/3)}$  (Monobe formula)  
 Discharge Coefficient:  $C = 0.5$  (Natural River)  
 Peak Discharge:  $Q_{\text{max}} = \frac{1}{3.6} \cdot C \cdot i \cdot A$  (Rational formula)

Design high water discharge is estimated based on the river cross-section area calculated with design high water level, and Manning mean velocity formula as shown in the Table 2.2-8.



Table 2.2-8 Calculation of Design High Water Discharge

Bridge Name	Stream Length L(m)	Elevation of Bridge El <sub>1</sub> (m)	Elevation of Riverhead El <sub>2</sub> (m)	Difference of elevation H(m)	River Gradient i	River Crosssection Area A <sub>0</sub> (m <sup>2</sup> )	Hydraulic Radius R(m)	Roughness Coefficient n	Design Velocity V(m <sup>2</sup> /s)	Design Highwater Discharge Q <sub>0</sub> (m <sup>3</sup> /s)
Stockton Br.	10,000	1.80	5.0	3.2	0.0003	331	4.294	0.09	0.53	174
Double Br.	5,000	1.46	5.0	3.5	0.0007	198	3.364	0.09	0.66	131

Difference of Elevation: H(m) = El<sub>2</sub> - El<sub>1</sub>  
 River Gradient: i = H/L  
 River crosssection area: A<sub>0</sub>(m<sup>2</sup>) = A<sub>0</sub>/P (Wetted perimeter)  
 hydraulic Radius: R(m) = 0.09 (Natural river)  
 Roughness Coefficient: n =  
 Design Velocity: V =  $\frac{1}{n} * R^{2/3} * i^{1/2}$  (Manning mean velocity formula)  
 Design highwater discharge: Q<sub>0</sub>(m<sup>3</sup>/s) = A<sub>0</sub>\*V

The design high water discharges are larger than the peak discharges, therefore river cross-section areas are safe against for flood at the bridge sites.

**(4) Composition of Cross Section**

Composition of cross section is as follows;

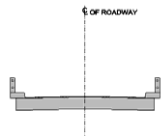
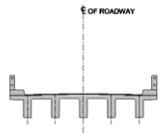
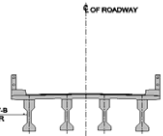
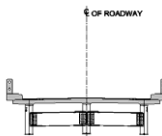
✓ (Outside footpath) + (Carriage way) + (Inside footpath) = 1.0m + 7.6m + 0.75m = 10.15m

Width of the outside footpath (1.5m excluding railway) is decided as adequate width which pedestrians can cross, in addition because of the request from local government. Width of inside footpath is decided refer from Double bridges' width on which pedestrians generally never pass. Cross slope is decided same as road design.

**(5) Type of Superstructure**

PC girder type is selected based on the comparison study as shown in the Table 2.2-9.

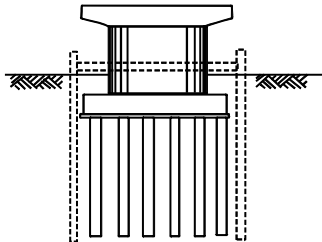
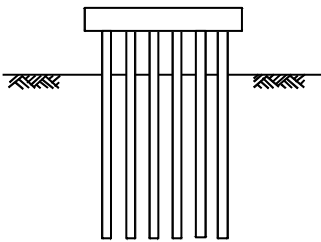
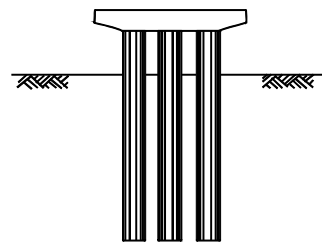
Table 2.2-9 Comparison of Superstructure Type of Stockton Bridge

	RC Slab	RC Girder	PC Girder	Steel Girder
Cross-section				
Applicable Span	12m	22m	35m	40m
Cost	* Most economical	*It's more expensive than RC Slab	* Unit cost is more expensive than RC Girder usually, but Total cost is the most economical considering shortening work period.	* Material cost of steel is expensive, therefore more expensive than PC Girder.
Workability	*Fabrication of slab is Cast-in-place, therefore Support in the river is necessary.	* Workability is more difficult than RC Slab because of the shape of Girder. *Fabrication of Girder is Cast-in-place, therefore Supports in the river are necessary.	* Fabrication of PC Girder needs special technique especially for stressing cable. * Installation of PC Girder needs big crane, but work period is short.	*Steel company fabricates the girder, and transport by sea * Installation of Girder is easier than PC girder because steel girder is light.
Construction Term	*A lot of support for slab is necessary, therefore work period is long.	*A lot of support for Girder is necessary, therefore work period is long.	*Support is not necessary for Girder fabrication, therefore Construction term is shorter than RC Slab or RC Girder.	*Support is not necessary for Girder fabrication, therefore Construction term is shorter than RC Slab or RC Girder.
Maintenance	*Easy	*Easy	*Easy	*Necessary Re-painting after 40 to 50 years in case by Melting Zink Coating
Problem	*Applicable Span is too short.	* It needs long term for Supporting in the river, therefore it's difficult for construction within Dry season.	* Leading by Japanese Engineer solves the problem for Fabrication and Installation of Girder.	* Re-painting is difficult for local government.
Judgement	* It's the most economical method, but it's not applicable because applicable span is too short.	* Because of big volume of supporting in the river, temporary work become complex and work period is long.	* Total cost is the most economical in these condition because the construction term is short.	* Construction cost is the most expensive. Maintenance is difficult for local government.
	×	△	○	△

**(6) Type of Substructure**

According to soil investigation report, bearing layer is sand located approximately 20m deep from the river bed. Therefore pile foundation is necessary. Pile bent with big diameter piles is selected based on the comparison study as shown in Table 2.2-10.

Table 2.2-10 Comparison of Substructure type of Stockton bridge

	Wall type (Footing + Pile foundation)	Driving Pile foundation	Pile Bent with big diameter.
Cross-section			
Cost	It is a little expensive because temporary cofferdam is necessary.	* This is the most economical because of no temporary cofferdam.	* Temporary cofferdam is not necessary, but it is the most expensive because big piling machine is necessary.
Workability	* There are many construction steps (Temporary Cofferdam ~ Excavation and Strutting ~ RC Piling ~ Footing ~ Wall), therefore Workability is complex.	* Temporary Cofferdam is not necessary and structure is simple, therefore workability is good. But it is impossible to keep Vertical Accuracy of piling.	* Temporary Cofferdam is not necessary and structure is simple, therefore workability is good. But this construction machine is big.
Construction Term	*Work period is long because of above mentioned reason.	* Construction term is Short.	* Construction term is Short.
Judgement	* Work period is too long and it is difficult to finish construction within dry season.	* Pile length is too long.	* Construction cost is expensive, but work period is short.
	△	×	○

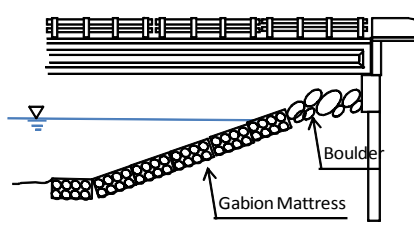
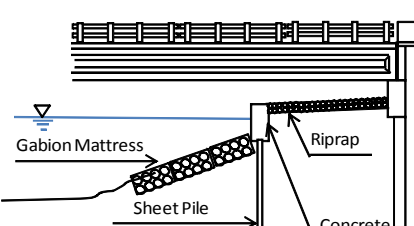
**(7) Type of River Protection**

River protection is planned at around abutments for protection of abutments from scoring, denudation, and collapse of embankment besides of the abutments.

Boulder type (gabion mattress under water) is selected as shown in Table 2.2-11.

Galvanized steel wire should be used for the gabion matters.

Table 2.2-11 Comparison of River Protection Type of Stockton Bridge

	Riprap	Sheet pile
Image		
Material	*Boulder *Gabion Mattress	*Sheet Pile *Concrete *Boulder
Slope	*1:1.5~1:2	* No limit if sheet pile can be installed
Cost	*Economical	* Expensive
Construction Term	*Short	*Short
Judgement	* The most adequate method at brackish water	*Problem of Cost
	○	△

**(8) Type of Bridge Structure**

Type of bridge structure should be selected considering local maintenance capability, change of temperature, type of foundation/ and so on. Integral type/ portal ramen type which has no expansion joint and no bearing is selected.

Integral type has demerit, but these demerit is not applicable to this site.

Table 2.2-12 Comparison of Type of Bridge Structure






No.	Item	General Type (Superstructure and substructure are separated)	Comparis	Integral/ Portal Ramen Type (Superstructure and substructure are integral )
1	Maintenance	*Expansion joint and joint shoe should be cleaned at fixed interval.	<	*Basically maintenance free
2	Structure	*Structure becomes costly, because Bending moment acts to center of span only, and no bending moment at the edge.	<	*Structure becomes economical because bending moment separates to edge and center of the span.



3	For expansion by difference in temperature	*Superstructure is movable, therefore expansion by difference in temperature never reach to substructure.	>	*There is possibility to occur crack comes from expansion by difference in temperature. (Difference in temperature in Liberia is small, therefore no problem)
4	Condition of foundation	*All foundation type is applicable.	>	*Pile foundation is only applicable, spread foundation is not applicable. (Stockton bridge has pile foundation, therefore no problem)

### (9) Repair for Double Bridge

The Survey team has judged that Double Bridge is not necessary to be reconstructed, but it is necessary to repair for some part of the bridge. It is noted that Japan's grant aid repairs Double Bridge without defect liability. The list of Double Bridges' repair is shown in Table 2.2-13.

Table 2.2-13 List of Double bridge's repair

No.	Place	Repair Method	Photo
1	Hole at Slab (At North Bridge)	*Make existing hole 1mX1m size by chipping, and expose existing re-bars. *Clean inside of Box Girder *Clean re-bars, and place new re-bars with more than 1m lapping. *After setting form, pour concrete.	
2	No AC Pavement (At North Bridge)	*Clean slab surface *Coat by tack-coat *Pave asphalt concrete	
3	Stripping AC pavement (At South Bridge)	*Shave existing AC surface. *Clean slab surface *Coat by tack-coat *Pave asphalt concrete	
4	No Approach Slab (See Figure 2.2-4)	*Excavate back of abutments *Attach corbel by Anchor bolts *Back-filling with compaction *Place approach cushion slab *Pave asphalt concrete	
5	Missing Railing	*Chipping of concrete around missing portion. *Clean re-bars, and place new re-bars with more than 1m lapping. *After setting form, pour concrete. *painting (for all railing)	

No.	Place	Repair Method	Photo
6	Hole at Abutment (At between bridges)	<ul style="list-style-type: none"> <li>*Make existing hole 1.5mX1.5m size by chipping, and expose existing re-bars.</li> <li>*Clean re-bars, and place new re-bars with more than 1.0m lapping.</li> <li>*After setting form, pour concrete.</li> <li>*back-filling with compaction.</li> </ul>	
7	Deterioration of Bearing shoe	*Place additional bearing shoes on expansive mortal between existing bearing shoes.	

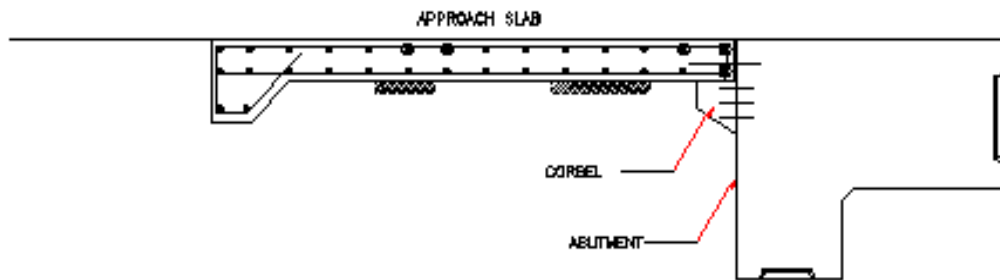
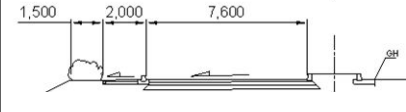
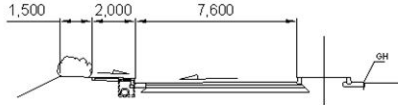
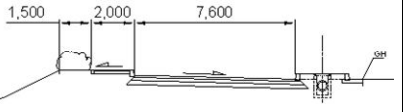
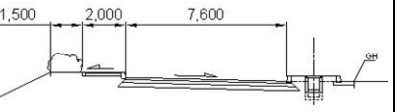


Figure 2.2-4 Approach Slab

### 2-2-2-7 Road Drainage System

Road surface drainage system is comparatively studied with 4 alternative types considering the heavy precipitation in Monrovia.

Table 2.2-14 Comparative Study for Surface Drainage System

	Case 1	Case 2	Case 3	Case 4
	Drain outside of road	Drainage Facility at road edge	Drainage Facility at median with pipe	Drainage facility at median with ditch
Cross section				
Sidewalk	Flat type with curb stone	Raised walkway with curb	Raised walkway with curb	Raised walkway with curb
Method	Open curb stone with regular interval to flow outside	Catch by basin installed at road edge	Catch by basin installed at median	Catch by basin installed at median
Outlet	Not necessary outlet	Limited wetland near roadside and existing crossing drainage structures	Limited wetland near roadside and existing crossing drainage structures	Limited wetland near roadside and existing crossing drainage structures
Drain of existing road	Open median with regular interval to flow new road and flow outside of road finally. Surface water from existing road crosses about 17 m up to outside of new road.	Open median with regular interval to flow at basin located road edge. The installed pipe under the sidewalk drain from basin to final outlet. Surface water from existing road crosses about 13 m and rain water for 4 lane accumulate at outside lane edge.	Open median with regular interval and flow down to basin located at median. Surface water flows from basin to outlet by pipes buried under the median.	Open median with regular interval and flow down to basin located at median. Surface water flows from basin to outlet by concrete ditch on the median.
Capacity of drainage facility	No need to consider the capacity due to not installed pipe nor ditch	Installation of pipe become under the sidewalk and it crossing connecting road and entrance of facility. The elevation of pipe at such location become lower and lower. Finally it is impossible to keep the drainage grade for outlet at some section.	The elevation of pipe can adjust more flexible than roadside drainage type except the location of major junctions. The capacity can adjust by pipe size and drainage grade and flexibility is high.	The depth of ditch can adjust more flexible than roadside drainage type except the location of major junctions. The drainage grade is decided by road grade and the capacity can adjust by the depth of ditch. The flexibility is lower than case 3.
Maintenance	There is no remarkable places to maintain regularly.	It is necessary the regular clean up of mud and trashes in the ditches and pipes. Choked pipe makes lost of function of drainage system and the road become inundation. So pipe cleaning is indispensable.	It is necessary the regular clean up of mud and trashes in the ditches and pipes. Choked pipe makes lost of function of drainage system and road become inundation. So pipe cleaning is indispensable.	It is necessary the regular clean up of mud and trashes in the ditches and pipes. Total length of buried pipe is very short than case 2 & 3 and the work load can much reduce.
After improved existing road	After improved existing part, surface water flow to outside of road as the same with this project and there is no effect on the project road. Open space on the median become useless.	It is necessary 2 line drainage facilities at road edge during improvement and it is costly than the others. Surface water of existing part do not flow to new part and constructed drainage facilities become excessive facilities. Also Open space on the median become useless.	After improved existing part, surface water flow down to ditches in median and it does not need new construction of drainage system.	After improved existing part, surface water flow down to ditches in median and it does not need new construction of drainage system.
Convenience for pedestrian	Surface of sidewalk is flat and smoothness is excellent. But walking quality become temporary worth during rain due to surface water drain on the walkway. The water flowing outside lane and splashes of muddy water by many vehicle makes bad condition	The cover of ditch installed interval and down the level of sidewalk at entrance of facility are lost the flatness and worse walking quality. The water flowing outside lane and splashes of muddy water by many vehicle makes bad condition for walking space.	The sidewalk become low at entrance of facilities and flatness and walking comfort become low. There is no change on the convenience during rain.	The sidewalk become low at entrance of facilities and flatness and walking comfort become low. There is no change on the convenience during rain.
Traffic safety function	It not effect for the vehicles leave the traveled way to prevent by the only interval curbs. The water flowing outside lane is much and it may cause hydroplaning phenomenon.	The curb of sidewalk is effective for the vehicles leave the traveled way. The water flowing outside lane is much and it may cause hydroplaning phenomenon.	The curb of sidewalk is effective for the vehicles leave the traveled way.	The curb of sidewalk is effective for the vehicles leave the traveled way.
Effect to roadside	There is no drainage system at present. Any effect is not expected after the project..	It improves by the reduction of water flow. But much rain water is discharged at outlet and it need attention of effect around outlet.	The surface water of road become none and they get good situation. But much rain water is discharged at outlet and it need attention of effect around outlet.	The surface water of road become none and they get good situation. But much rain water is discharged at outlet and it need attention of effect around outlet.
Evaluation	It is the most cheap option. But the condition of surface water is not improved and convenience of pedestrian and traffic safety function are worse. * Capable but some problems	Convenience of pedestrian is worse and it need much manpower for the maintenance. Finally drainage system become double and need high cost. * Problem on the maintenance	It need much manpower for the maintenance. The initial investment become expensive due to construct drainage for both of new & existing parts. * Problem on the maintenance	It is necessary the maintenance, but manpower is comparatively less. The initial investment become expensive due to construct drainage for both of new & existing parts. * The most desirable

As the result of the study, case 4; drain to U-shape ditch installed at median, is adopted. It drains surface water from the existing road also. At the location of superelevated section, the additional drainage facilities are installed under the sidewalk.

The design conditions are as follows.

- Return period : 3 years
- Time concentration : 10 minutes
- Precipitation strength : 100mm/hr
- Runoff coefficient : 0.9 (asphalt pavement)
- Roughness coefficient : 0.015 (concrete ditch)
- Effective depth : 80%

The concrete pipes are installed where the drainage facilities crossing junctions and carriageway. At these locations, the pipes are protected by concrete from traffic load.

#### **2-2-2-8 Ancillary Facility of Road**

##### **(1) U-Turn Slot**

The gas station located at the corner of UN Drive and Somalia Drive has the entrance at UN Drive and Exit at Somalia Drive. All vehicles entered in the gas station come out on Somalia Drive. But the vehicles wanted to return on UN Drive are blocked by median and enforced to go to opposite direction. So many vehicles run on the raised median and they bring disorder at junction because they are going to push into the stopping vehicles at front of the junction. This project plans that the median is raised 25 cm to prevent crossing the median. Instead of present route, the U-turn slot is provided at Station 0+334 for the vehicles return on UN Drive and the separation with waiting vehicles at junction is planned. The force by the tires of turning vehicles makes pavement pushing aside. For the resistance of side force to the pavement, the rigid pavement (concrete) is adopted.

##### **(2) Retaining Wall**

The embankment of approach of Stockton Bridge would bury the existing creek, if the embankment is made. The gravity retaining wall is constructed on this section to avoid burring the creek.

In addition, the inlet and/or outlet of cross drainage pipes will have high embankment, retaining walls are installed.

**(3) Connecting Road, Entrance for Roadside Facility**

The roads connecting with Somalia Drive are classified into four types, Type A ~ Type D, considered with the result of site investigation about importance, traffic volume and surrounding area.

Table 2.2-15 Classification of Connecting Road

	Priority	Corner cut	Median Open	Left Turn Lane	Location
Type A	Highest	Provided	Opened	Provided	9 places
Type B	High	Provided	Opened	None	8 places
Type C	Middle	Provided	Closed	None	149 places
Type D	Low	None	Closed	None	46 places

**(4) Pedestrian Crossing**

There are pedestrian crossings along the existing road. Present crossings are extended to the new 2-lane road and raised median is cut down. The median has the role of safety waiting zone for pedestrians. In addition, road marking of yield is painted to make attention of pedestrian crossing ahead.

**(5) Road Sign**

The follows; four types of road signs are be installed.

- Stop Sign : at connecting major road
- Pedestrian Crossing : at bus stop
- Yield Here to Pedestrian : at pedestrian crossing
- School Sign : at school

**2-2-3 Outline Design Drawing**

Outline design drawings are presented at the pages.



**THE PREPARATORY SURVEY  
ON  
THE PROJECT FOR RECONSTRUCTION  
OF  
SOMALIA DRIVE  
IN  
MONROVIA  
IN THE REPUBLIC OF LIBERIA**

**JANUARY 2013**

**DRAWINGS**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

## ABBREVIATION LIST

CLASSIFICATION(1)	CLASSIFICATION(2)	CLASSIFICATION(3)	CLASSIFICATION(4)	DRAWING NO.	ABBREVIATION	
CURBS	CURB STONE	FOR SIDE WALK OR MEDIAN	H250 × L600	RS-1	CS-250	
		FOR SIDE WALK	H250~50 × L600	RS-1	CS-S	
		FOR SIDEWALK OR CROSS WALK	H50 × L600	RS-1	CS-50	
		FOR CROSS WALK AT MEDIAN(ON GUTTER TYPE-L)	H50 × L600	RS-1	PB-50	
		FOR GUTTER TYPE-L	B500	RS-1	AP	
		FOR GUTTER TYPE-LS	B250~750	RS-1	AP-L	
		FOR GUTTER TYPE-L	H250 × L600	RS-1	PB	
		FOR CATCH BASIN OR CROSS WALK IN MEDIAN	H250 × L600	RS-1	CS-D	
	FOR LEFT TURN LANE SIDE & MEDIAN EDGE	H250 × L600	RS-1	CS-LT		
	VERGE BLOCK		B150 × H150 × L600	RS-1	VB	
DRAINAGE	U-DITCH	IN MEDIAN	W=500mm, H≤850mm, WITH CONCRETE COVER	DS-1	MU-A	
		IN MEDIAN	W=500mm, 850<H≤1650mm, WITH CONCRETE COVER	DS-1	MU-B	
		AT OUTLET	W=500mm, H=500mm	DS-1	U-A	
		AT OUTLET & ACCESS ROAD CROSSING	W=500mm, H=500mm, WITH CONCRETE COVER	DS-1	U-B	
		AT SIDEWALK CROSSING	W=500mm, H=350mm	DS-1	U-C	
		AT SIDEWALK CROSSING	W=500mm, H=350mm, WITH CONCRETE COVER	DS-1	U-D	
		AT OUTLET	W=500mm, H=800mm	DS-1	U-E	
		AT ACCESS ROAD CROSSING	W=500mm, H=800mm, WITH CONCRETE COVER	DS-1	U-F	
		CONCRETE COVER	FOR MU-A,MU-B,U-D	W=630mm, L=500mm, T=100mm	DS-1	CC-A
			FOR U-B,U-F	W=630mm, L=500mm, T=130mm	DS-1	CC-B
	CONCRETE PIPE CULVERT	φ 400,CROSSING TYPE	WITH 360 DEGREE CONCRETE BASE	DS-2	RC400-360	
		φ 500,CROSSING TYPE	WITH 360 DEGREE CONCRETE BASE	DS-2	RC500-360	
		φ 700,CROSSING TYPE	WITH 360 DEGREE CONCRETE BASE	DS-2	RC700-360	
		φ 400, LONGITUDINAL TYPE	WITH SAND BASE(t=200)	DS-2	RC400-SB	
		φ 500, LONGITUDINAL TYPE	WITH SAND BASE(t=200)	DS-2	RC500-SB	
	CATCH BASIN	IN MEDIAN	500 × 700 × (H≤1150),WITH CONCRETE COVER	DR-3	CB-A	
		IN MEDIAN	500 × 700 × (1150<H≤1550),WITH CONCRETE COVER	DR-3	CB-B	
		IN MEDIAN INTO EXISTING PIPE PR BOX CULVERT	500 × 700 × (H≤1150),WITH CONCRETE COVER	DR-4	CB-C	
		IN MEDIAN INTO EXISTING PIPE PR BOX CULVERT	500 × 700 × (1150<H),WITH CONCRETE COVER	DR-4	CB-D	
		AT SIDEWALK	500 × 700 × (H≤1150),WITH CONCRETE COVER	DR-5	CB-E	
		AT SIDEWALK	500 × 700 × (1150<H≤1550),WITH CONCRETE COVER	DR-5	CB-F	
	HAED WALL	FOR CONCRETE PIPE φ 500	B2500 × H1000 × T300	DO-1.2	HW-A	
		FOR CONCRETE PIPE φ 500	B1800 × H1300 × T300	DO-1.2	HW-B	
RETAINING WALL	RETAINING WALL	AT OUTLET OR INTET OF EXISTING CROSSING CULVERT	H2600 × L7300	BW-3	WC-1	
		AT OUTLET OR INTET OF EXISTING CROSSING CULVERT	H4300 × L16300	BW-4	WC-2	
		AT OUTLET OR INTET OF EXISTING CROSSING CULVERT	H2800 × L8000	BW-8	WC-3	
		AT OUTLET OR INTET OF EXISTING CROSSING CULVERT	H3000 × L8800	BW-10	WC-4	
		AT ROADSIDE	H3500 × L40000	RW-1	RW	
BUS BAY	BUS BAY		W=2700	BB-1	BB	
GREEN BELT	GREEN BELT		W=1500	PP-1~20	GB	
DRY PITCHING REVETMENT		AT ABATMENT OF STOCKTON BRIDGE	T=2000	DR-1	DR-1.2	

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JAPAN INTERNATIONAL  
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KATAHIRA & ENGINEERS INTERNATIONAL  
YACHIYO ENGINEERING CO.,LTD.

THE PREPARATORY SURVEY ON  
THE PROJECT FOR  
RECONSTRUCTION OF  
SOMALIA DRIVE IN MONROVIA

TITLE :

ABBREVIATION LIST

Drawing No.

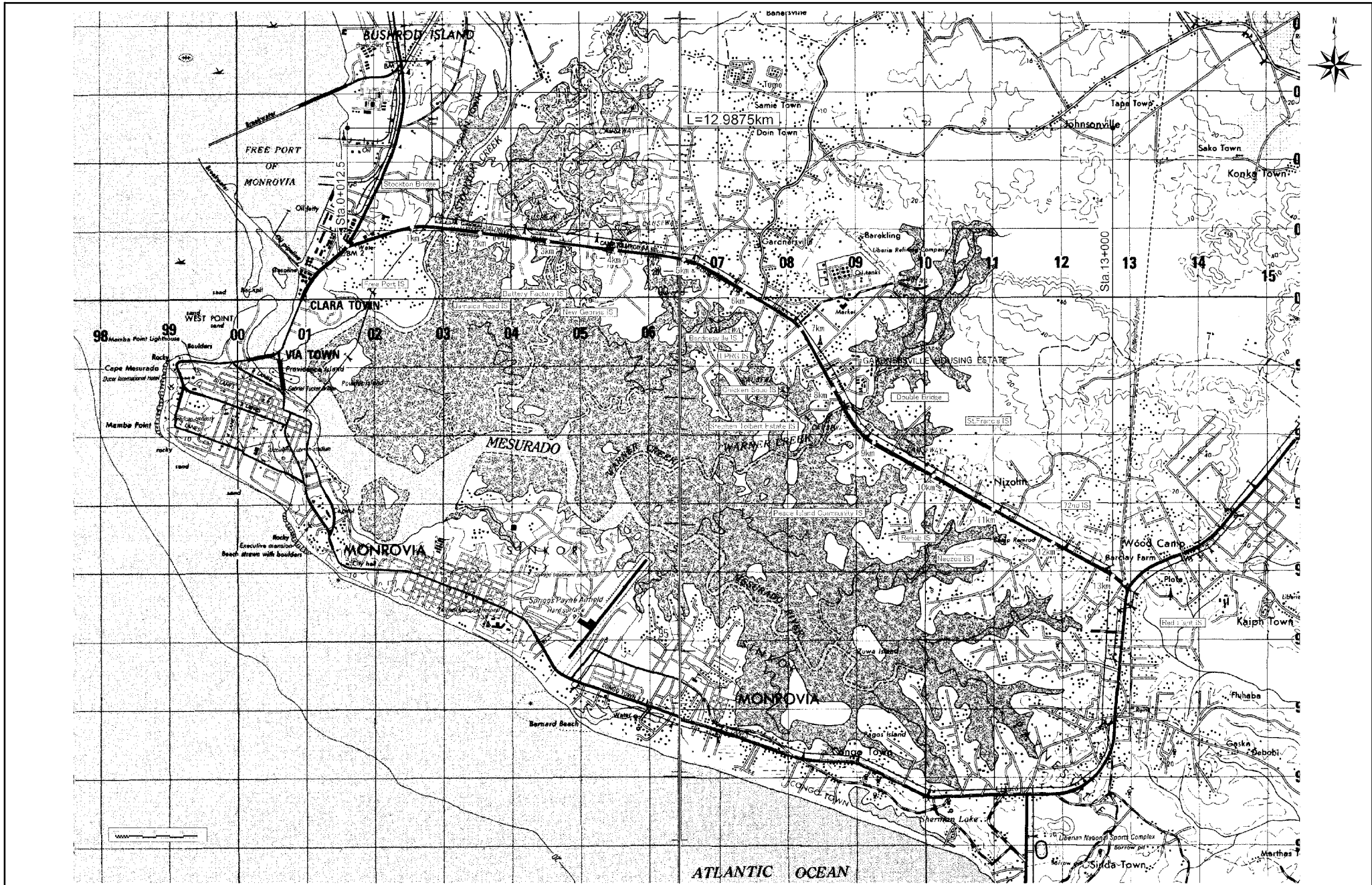
AB-1

SCALE

Non Scale

DATE

SEP. 2012



2-21

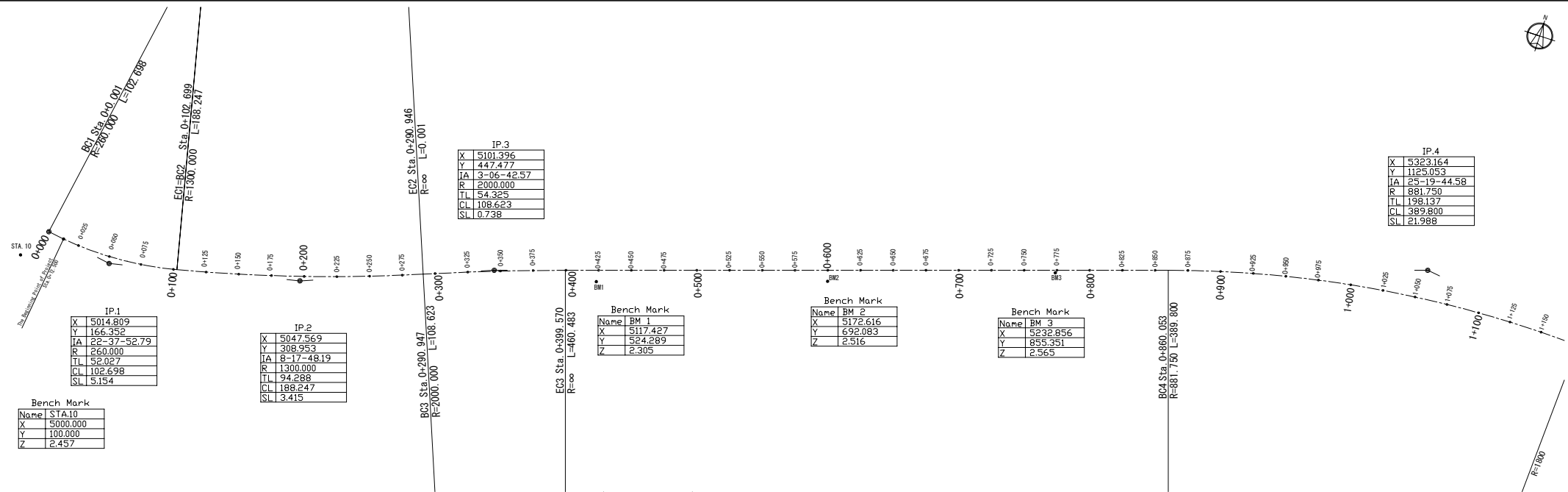
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JAPAN INTERNATIONAL  
COOPERATION AGENCY  
KATAHIRA & ENGINEERS INTERNATIONAL  
YACHIYO ENGINEERING CO.,LTD.

THE PREPARATORY SURVEY ON  
THE PROJECT FOR  
RECONSTRUCTION OF  
SOMALIA DRIVE IN MONROVIA

TITLE: LOCATION MAP  
(Sta.0+000-Sta.13+243.355)

Drawing No. LC-1  
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A3:S=1/50,000  
DATE SEP. 2012



Bench Mark	
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Y	100.000
Z	2.457

IP.1	
X	5014.809
Y	166.352
IA	22-37-52.79
RI	260.000
TL	52.027
CL	102.698
SL	5.154

IP.2	
X	5047.569
Y	308.953
IA	8-17-48.19
RI	1300.000
TL	94.288
CL	188.247
SL	3.415

IP.3	
X	5101.396
Y	447.477
IA	3-06-42.57
RI	2000.000
TL	54.325
CL	108.623
SL	0.738

Bench Mark	
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Z	2.305

Bench Mark	
Name	BM 2
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Y	692.083
Z	2.516

Bench Mark	
Name	BM 3
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Y	855.351
Z	2.565

IP.4	
X	5323.164
Y	1125.053
IA	25-13-44.58
RI	881.750
TL	198.137
CL	389.800
SL	21.988

Schedule of Left Side Center Elements

Important Point	X-coordinate	Y-coordinate	Element	Distance
BC4L-1	5309.385	1251.846	R=1800.000	
EC4L-1	5297.076	1394.768	R=1800.000	
BC4L-2	5274.820	1570.794	R=2000.000	
EC4L-2	5263.830	1646.155	R=2000.000	
BC4L-3	5263.830	1646.155	R=2000.000	
EC4L-3	5252.840	1721.515	R=2000.000	

Important Point	Station	X-coordinate	Y-coordinate	Element	Distance
BP	0+000.000	5023.569	115.067		0.001
BC1	0+000.001	5023.569	115.068	R=260.000	102.698
EC1=BC2	0+102.699	5026.458	217.058	R=1300.000	188.247
BC2	0+290.946	5081.719	396.839		0.001
EC2	0+290.947	5081.720	396.841	R=2000.000	108.623
EC3	0+399.570	5118.294	499.107		166.483
BC4	0+860.053	5261.532	936.745	R=881.750	389.800
EC4	1+249.853	5298.310	1321.625		865.809
IP.5	2+115.662	5189.706	2180.596		

Bench Mark	
Name	BM 4
X	5298.671
Y	1312.544
Z	4.356

Bench Mark	
Name	BM 5
X	5272.067
Y	1450.703
Z	4.834

Bench Mark	
Name	BM 6
X	5261.607
Y	1536.442
Z	4.508

Bench Mark	
Name	BM 5
X	5229.316
Y	1799.932
Z	3.278

Bench Mark	
Name	BM 7
X	5202.875
Y	2009.779
Z	2.763

IP.5	
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L	865.809

2-22

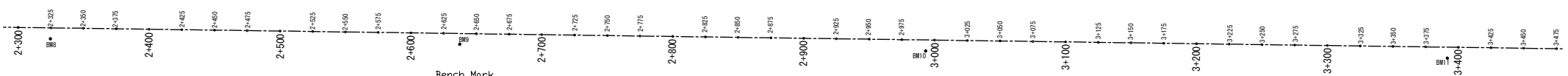
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THE PREPARATORY SURVEY ON  
THE PROJECT FOR  
RECONSTRUCTION OF  
SOMALIA DRIVE IN MONROVIA

TITLE :  
KEY PLAN  
(Sta.0+000-Sta.2+300)

Drawing No.	KP-1
SCALE	A1:S=1/1500 A3:S=1/3000
DATE	SEP. 2012



Bench Mark

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Bench Mark

Name	BM 9
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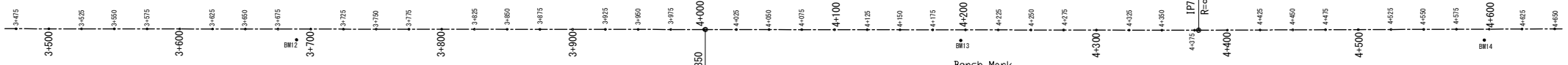
Bench Mark

Name	BM 10
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Y	3050.290
Z	3.043

Bench Mark

Name	BM 11
X	5022.151
Y	3445.612
Z	3.865

Important Point Center-line	Station	X-coordinate	Y-coordinate	Element	Distance
IP.5	2+115.662	5189.706	2180.596		1885.688
IP.6	4+001.350	4954.341	4051.538		376.690
IP.7	4+378.040	4907.165	4425.262		



Bench Mark

Name	BM 12
X	4385.155
Y	3740.770
Z	3.895

IP.6

X	4954.341
Y	4051.538
EA	0-01-27.70
L	1885.688

Bench Mark

Name	BM 13
X	4921.884
Y	4244.031
Z	4.226

IP.7

X	4907.165
Y	4425.262
EA	0-18-03.86
L	376.690

Bench Mark

Name	BM 14
X	4872.591
Y	4640.829
Z	3.673



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THE PROJECT FOR  
RECONSTRUCTION OF  
SOMALIA DRIVE IN MONROVIA

TITLE :  
KEY PLAN  
(Sta.2+300-Sta.4+650)

Drawing No.	KP-2
SCALE	A1:S=1/1500 A3:S=1/3000
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IP.8	
X	4845.247
Y	4937.416
IA	9-10-34.19
P	1881.750
TL	134.958
CL	269.339
SI	5.406

IP.9	
X	4762.694
Y	5223.998
IA	10-35-23.81
P	1761.750
TL	163.277
CL	325.623
SI	7.550

Bench Mark	
Name	BM 15
X	4691.056
Y	5348.102
Z	5.024

IP.10	
X	4652.475
Y	5443.530
IA	4-42-45.67
P	2001.750
TL	82.370
CL	164.648
SI	1.694

Bench Mark	
Name	BM 17
X	4517.417
Y	5648.409
Z	5.189



Important Point Center-line	Station	X-coordinate	Y-coordinate	Element	Distance
IP.7	4+378.040	4907.165	4425.262		
BC8	4+758.965	4861.445	4803.433		380.925
EC8=BC9	5+28.304	4807.890	5067.101	R=1681.750	269.339
EC9=BC10	5+353.927	4689.434	5369.916	R=1761.750	325.623
EC10	5+518.575	4609.593	5513.858	R=2001.750	164.648
BC11	6+703.422	3992.766	6525.485		1184.847

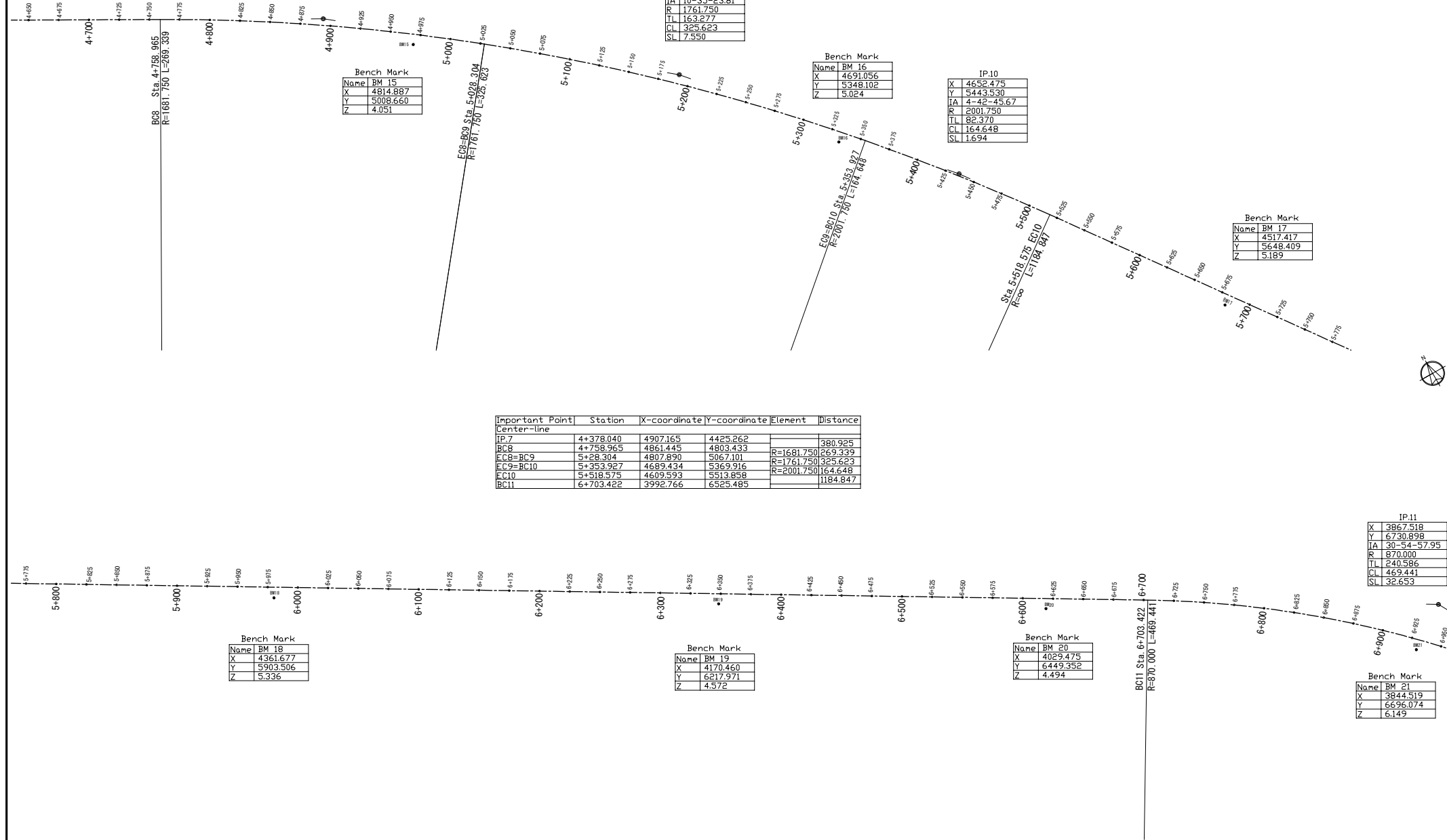
IP.11	
X	3867.518
Y	6730.898
IA	30-54-57.95
P	870.000
TL	240.586
CL	462.441
SI	32.653

Bench Mark	
Name	BM 18
X	4361.677
Y	5303.506
Z	5.336

Bench Mark	
Name	BM 19
X	4170.460
Y	6217.971
Z	4.572

Bench Mark	
Name	BM 20
X	4029.475
Y	6449.352
Z	4.494

Bench Mark	
Name	BM 21
X	3844.519
Y	6696.074
Z	6.149



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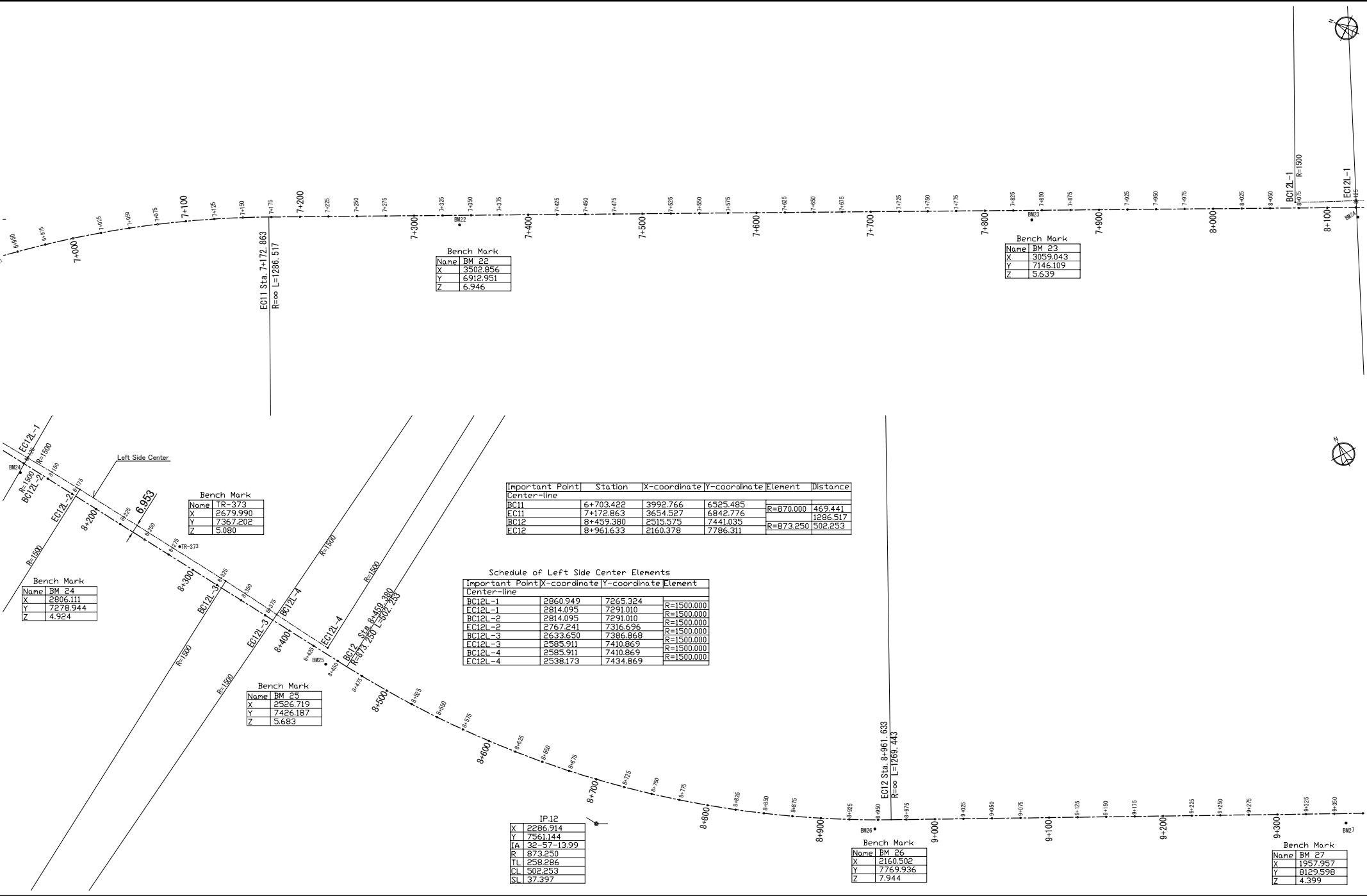
TITLE :

KEY PLAN  
(Sta.4+650-Sta.6+950)

Drawing No.	KP-3
SCALE	A1:S=1/1500 A3:S=1/3000
DATE	SEP. 2012



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Bench Mark

Name	BM 23
X	3059.043
Y	7146.109
Z	5.639

Bench Mark

Name	BM 23
X	3059.043
Y	7146.109
Z	5.639

Bench Mark

Name	TR-373
X	2679.990
Y	7367.202
Z	5.080

Important Point	Station	X-coordinate	Y-coordinate	Element	Distance
Center-line					
EC11	6+703.422	3992.766	6525.485	R=870.000	469.441
EC11	7+172.863	3654.527	6842.776		1286.517
BC12	8+459.380	2515.575	7441.035		
EC12	8+961.633	2160.378	7786.311	R=873.250	502.253

Schedule of Left Side Center Elements

Important Point	X-coordinate	Y-coordinate	Element
Center-line			
BC12L-1	2860.949	7265.324	R=1500.000
EC12L-1	2814.095	7291.010	R=1500.000
BC12L-2	2814.095	7291.010	R=1500.000
EC12L-2	2767.241	7316.696	R=1500.000
BC12L-3	2633.650	7386.868	R=1500.000
EC12L-3	2585.911	7410.869	R=1500.000
BC12L-4	2585.911	7410.869	R=1500.000
EC12L-4	2538.173	7434.869	R=1500.000

Bench Mark

Name	BM 25
X	2526.719
Y	7426.187
Z	5.683

IP12

X	2286.914
Y	7561.144
IA	32-57-13.99
R	873.250
TL	258.286
CL	502.253
SL	37.397

Bench Mark

Name	BM 26
X	2160.502
Y	7763.936
Z	7.944

Bench Mark

Name	BM 27
X	1957.957
Y	8129.598
Z	4.399

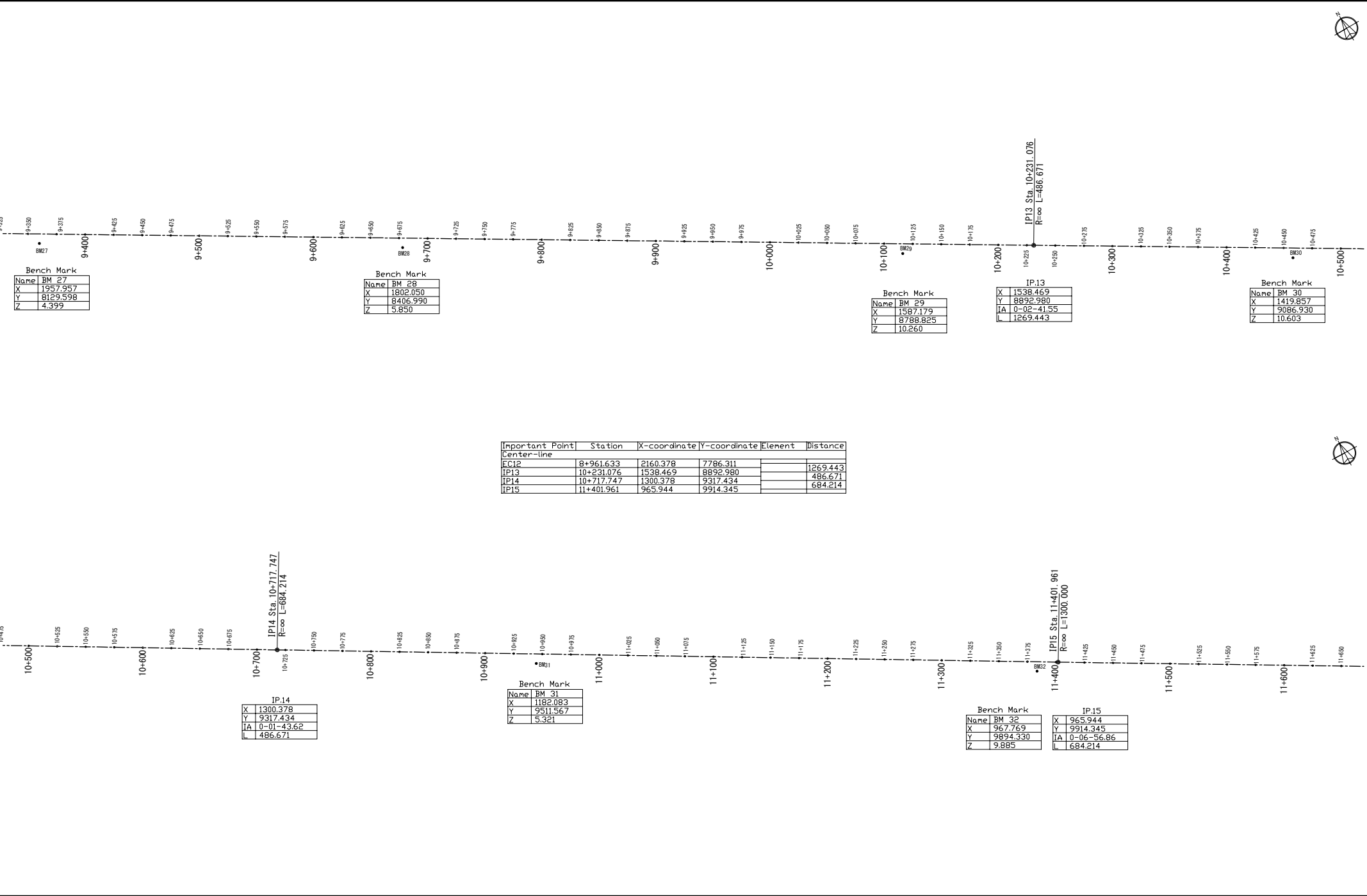
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THE PREPARATORY SURVEY ON  
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TITLE :  
KEY PLAN  
(Sta.6+950-Sta.9+350)

Drawing No.	KP-4
SCALE	A1:S=1/1500 A3:S=1/3000
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Important Point	Station	X-coordinate	Y-coordinate	Element	Distance
Center-line					
IP12	8+961.633	2160.378	7786.311		1269.443
IP13	10+231.076	1538.469	8892.980		486.671
IP14	10+717.747	1300.378	9317.434		684.214
IP15	11+401.961	965.944	9914.345		

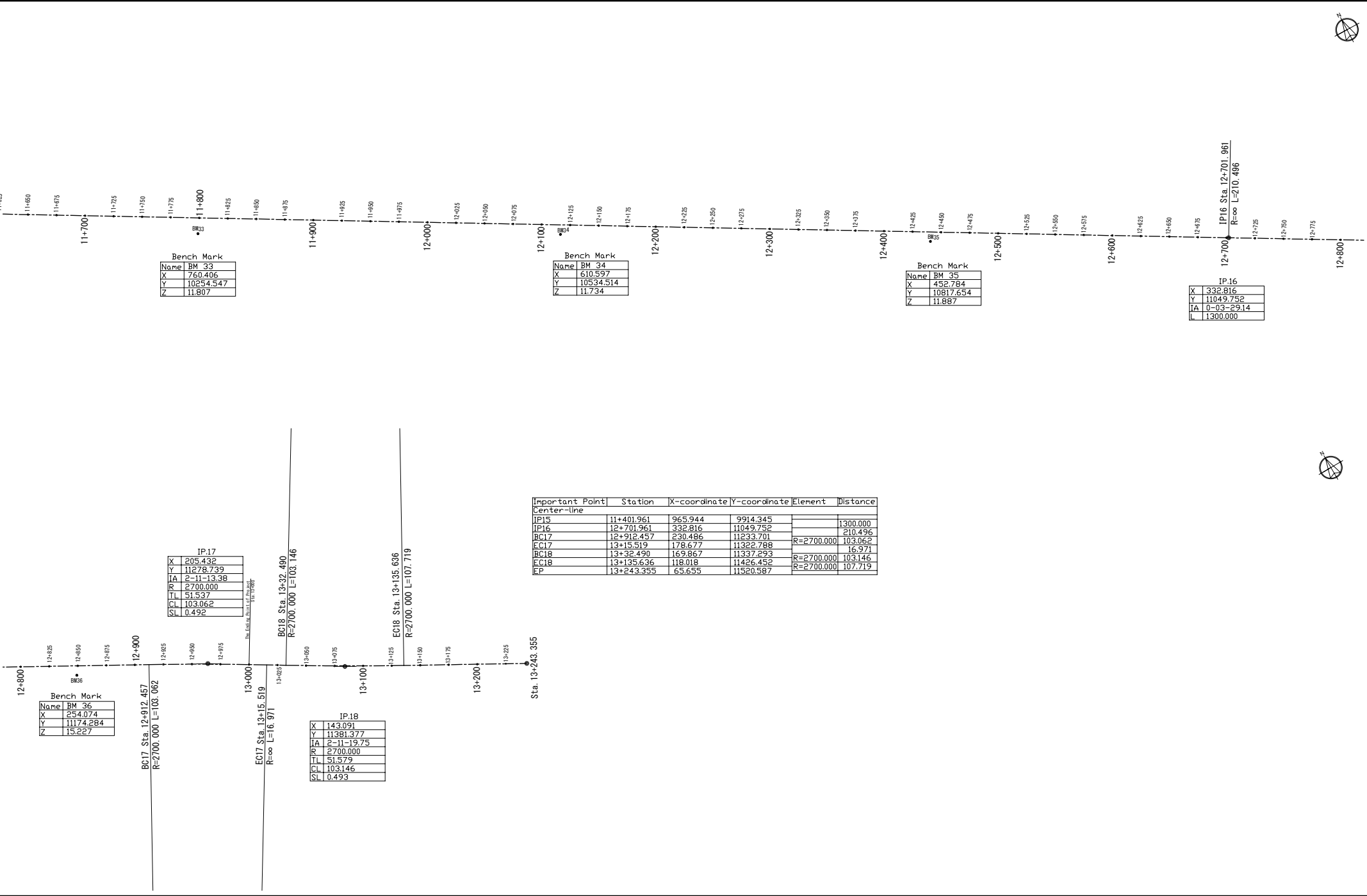
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				SCALE	A1:S=1/1500 A3:S=1/3000
				DATE	SEP. 2012





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Bench Mark	
Name	BM 33
X	760.406
Y	10254.547
Z	11.807

Bench Mark	
Name	BM 34
X	610.597
Y	10534.514
Z	11.734

Bench Mark	
Name	BM 35
X	452.784
Y	10817.654
Z	11.867

IP 16	
X	332.816
Y	11049.752
EA	0-03-29.14
L	1300.000

Important Point	Station	X-coordinate	Y-coordinate	Element	Distance
Center-line					
IP15	11+401.961	965.944	9914.345		1300.000
IP16	12+701.961	332.816	11049.752		210.496
BC17	12+912.457	230.496	11233.701	R=2700.000	103.062
EC17	13+15.519	173.677	11322.788		16.971
BC18	13+32.490	169.867	11337.293	R=2700.000	103.146
EC18	13+135.636	118.018	11426.452	R=2700.000	107.719
EP	13+243.355	65.655	11520.587		

IP 17	
X	205.432
Y	11278.739
EA	2-11-13.38
R	2700.000
TL	51.537
CL	103.062
SL	0.492

Bench Mark	
Name	BM 36
X	254.074
Y	11174.284
Z	15.227

IP 18	
X	143.091
Y	11381.377
EA	2-11-19.75
R	2700.000
TL	51.579
CL	103.146
SL	0.493

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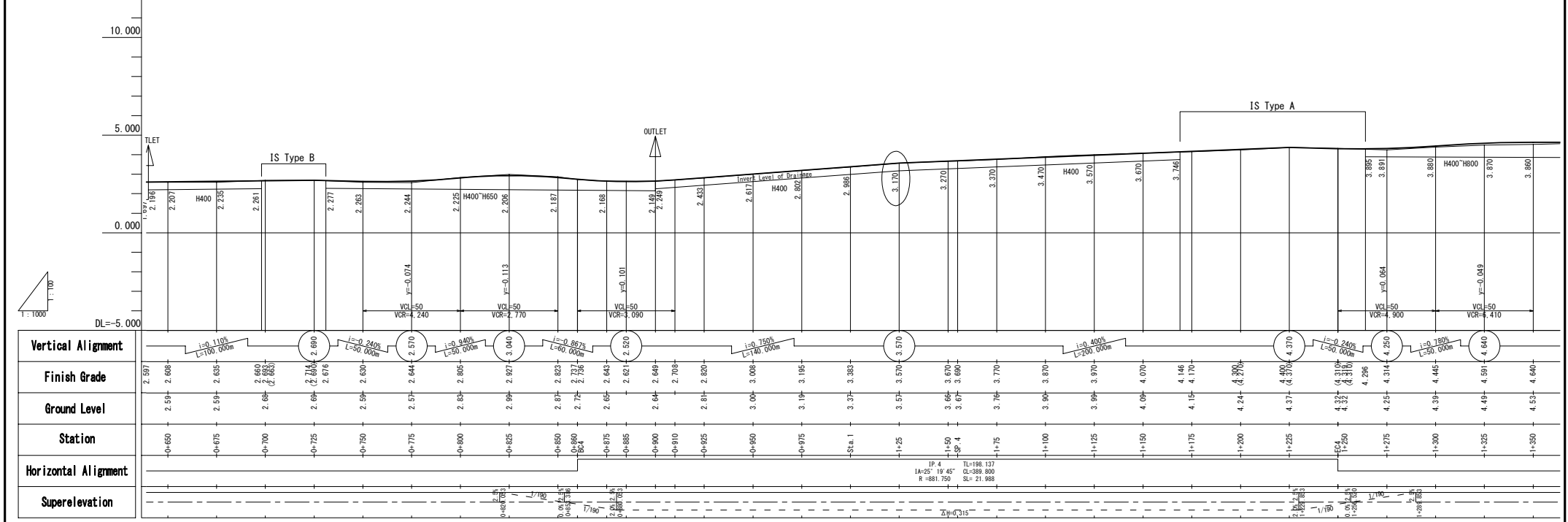
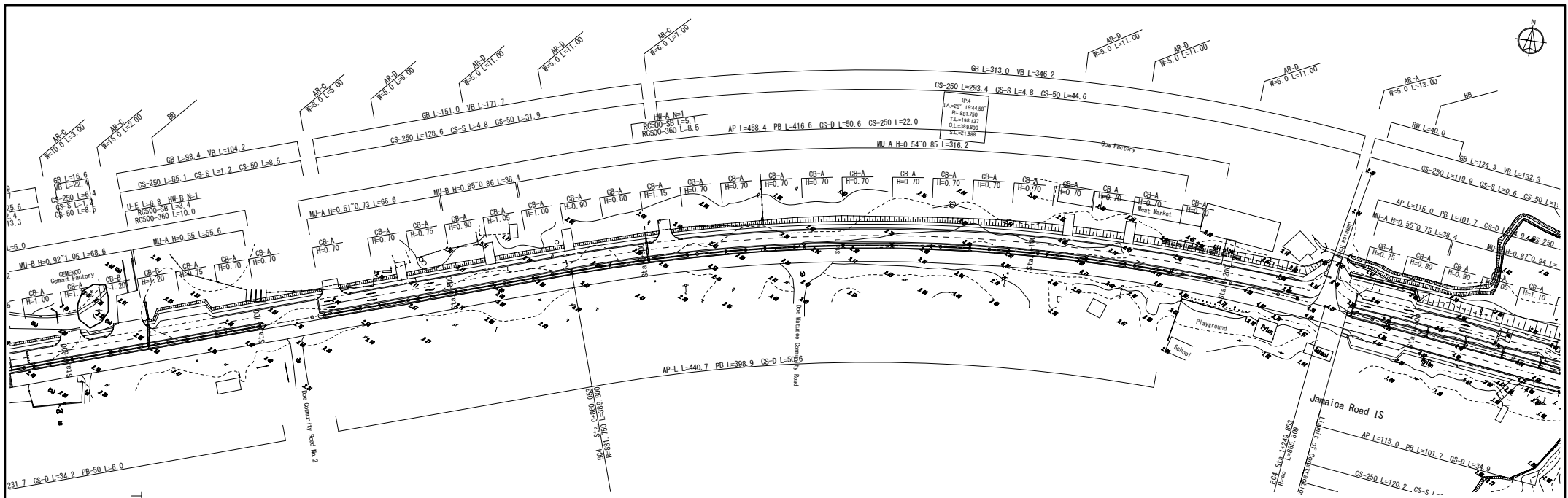
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THE PREPARATORY SURVEY ON  
THE PROJECT FOR  
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TITLE :  
KEY PLAN  
(Sta.11+650-Sta.13+243.355)

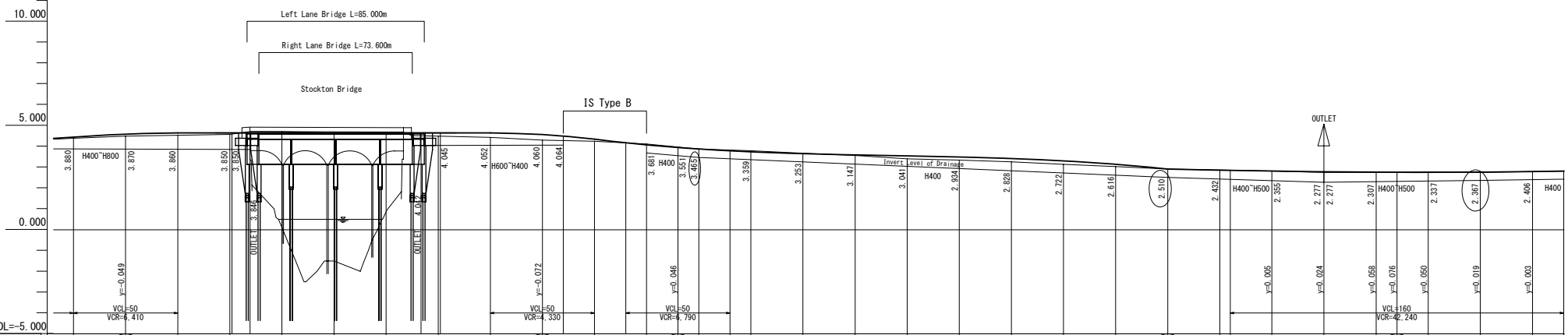
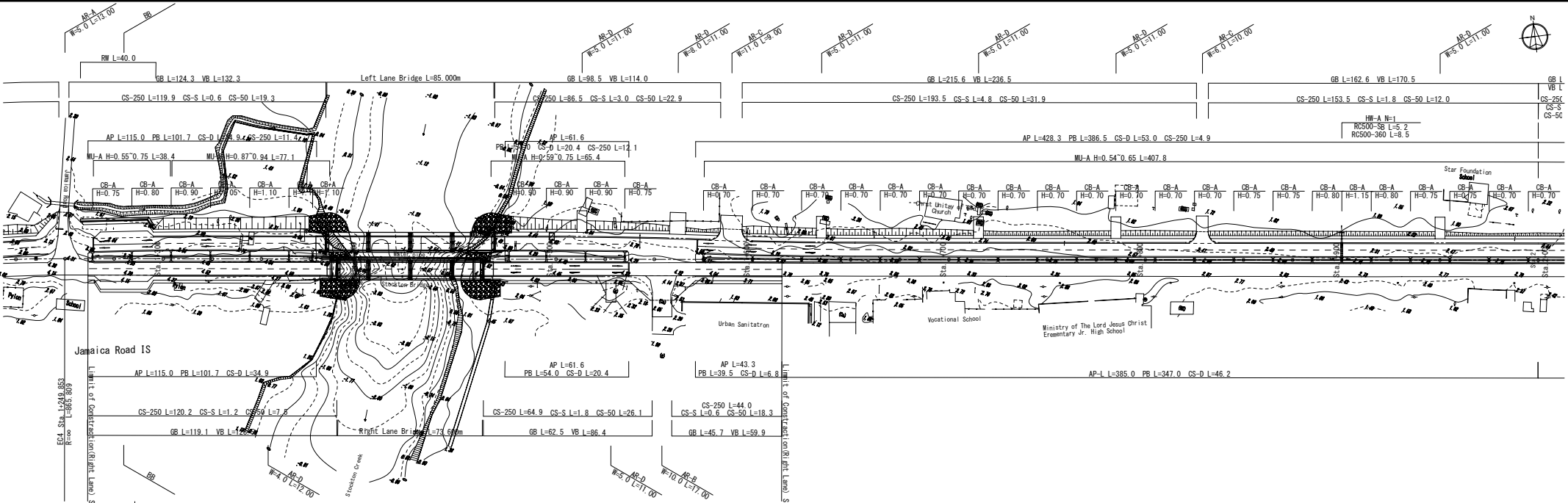
Drawing No.	KP-6
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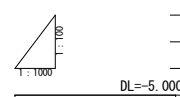
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				SCALE	PLAN S=1/1000 PROFILE V=1/100 H=1/1000
				DATE	SEP. 2012

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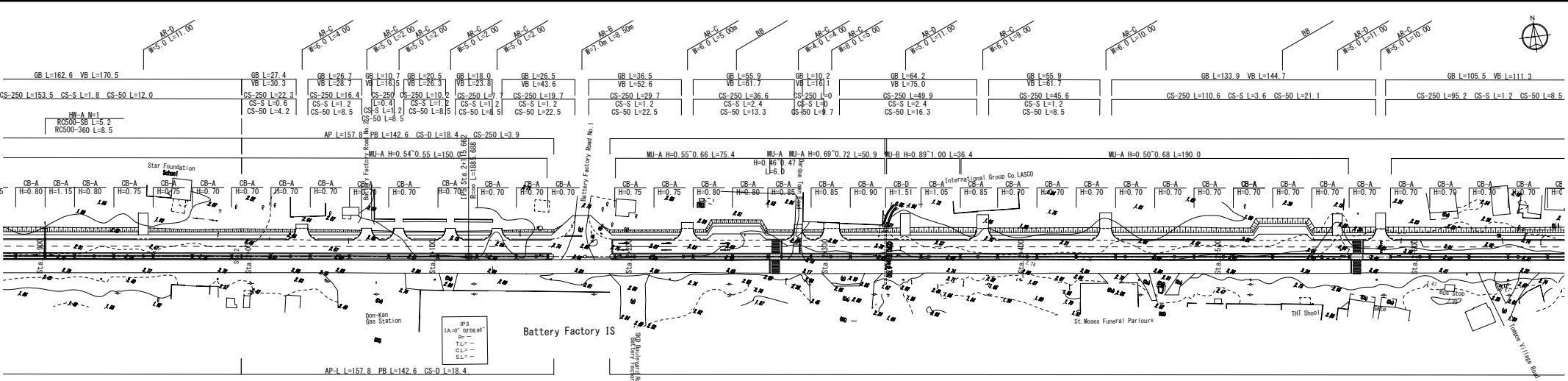
Vertical Alignment	Finish Grade	Ground Level	Station	Horizontal Alignment	Superelevation
L=0.300% L=50.000m	4.445	4.39	+1+300		
	4.591	4.49	+1+325		
	4.640	4.53	+1+350		
	4.640	4.58	+1+375		
	4.640	4.70	+1+400		
	4.640	4.64	+1+425		
	4.640	4.64	+1+450		
	4.640	4.49	+1+475		
	4.640	4.43	+1+500		
	4.640	4.30	+1+525		
	4.640	4.25	+1+550		
	4.070	4.11	+1+575		
	3.890	3.87	+1+600		
	3.786	3.79	+1+625		
	3.640	3.67	+1+650		
	3.536	3.56	+1+675		
	3.431	3.40	+1+700		
	3.327	3.34	+1+725		
	3.223	3.26	+1+750		
	3.119	3.14	+1+775		
	3.014	3.03	+1+800		
	2.910	2.91	+1+825		
	2.858	2.87	+1+850		
	2.847	2.85	+1+855		
	2.810	2.82	+1+875		
	2.777	2.75	+1+900		
	2.739	2.75	+1+925		
	2.706	2.71	+1+935		
	2.705	2.77	+1+950		
	2.707	2.75	+1+975		
	2.703	2.79	Sta. 2		

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Vertical Alignment	L=0.300% L=50.000m
Finish Grade	4.445
Ground Level	4.39
Station	+1+300
Horizontal Alignment	
Superelevation	

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			Drawing No.	PP-3
			SCALE	PLAN S=1/1000 PROFILE V=1/100 L=1/100
			DATE	SEP. 2012



Vertical Alignment	Station	Ground Level	Finish Grade	Station	Horizontal Alignment	Superelevation
	1+950	2.777	2.765	1+950		
	1+975	2.751	2.767	1+975		
	Sta. 2	2.719	2.703	Sta. 2		
	2+15	2.816	2.816	2+15		
	2+25	2.822	2.833	2+25		
	2+50	2.866	2.875	2+50		
	2+75	2.944	2.918	2+75		
	2+96	2.964	2.960	2+96		
	2+97	2.956	2.976	2+97		
	2+98	2.944	2.988	2+98		
	3+01	2.988	3.011	3+01		
	3+07	3.017	3.017	3+07		
	3+03	3.034	3.034	3+03		
	3+02	3.052	3.052	3+02		
	3+04	3.044	3.062	3+04		
	3+09	3.091	3.088	3+09		
	3+12	3.112	3.113	3+12		
	3+14	3.144	3.139	3+14		
	3+19	3.191	3.164	3+19		
	3+17	3.174	3.174	3+17		
	3+22	3.221	3.182	3+22		
	3+23	3.152	3.152	3+23		
	3+22	3.122	3.122	3+22		
	3+03	3.003	3.017	3+03		
	3+15	3.031	2.915	3+15		
	3+20	3.221	2.780	3+20		
	3+35	3.122	2.774	3+35		
	3+30	3.003	2.702	3+30		
	3+30	3.003	2.702	3+30		
	3+37	2.751	2.733	3+37		
	3+35	2.774	2.712	3+35		
	3+40	2.733	2.741	3+40		
	3+41	2.711	2.741	3+41		
	3+42	2.766	2.807	3+42		
	3+45	2.874	2.917	3+45		
	3+45	3.003	3.028	3+45		
	3+18	3.118	3.118	3+18		
	3+24	3.241	3.249	3+24		
	3+36	3.361	3.369	3+36		
	3+46	3.461	3.470	3+46		
	3+45	3.451	3.432	3+45		
	3+37	3.337	3.393	3+37		
	3+31	3.311	3.355	3+31		

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				SCALE	PLAN S=1/1000 PROFILE V=1/100 H=1/1000
				DATE	SEP. 2012