**MINISTRY OF INFRASTRUCTURE DEVELOPMENT**
**THE SOLOMON ISLANDS**

# PREPARATORY SURVEY
# FOR
# KUKUM HIGHWAY UPGRADE PROJECT
# IN
# THE SOLOMON ISLANDS

**NOVEMBER 2014**

**JAPAN INTERNATIONAL COOPERATION AGENCY**
**KATAHIRA & ENGINEERS INTERNATIONAL**

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# PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to Katahira and Engineering International.

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

November, 2014

Akira Nakamura
Director General,
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

# Summary

## 1. Background of the Project

The Kukum Highway connects the center of the capital city Honiala with the international airport, which is the part of the main road along the northern coast of Guadalcanal Island. Increase in traffic volume is causing serious traffic congestions at the central area of the city along the Kukum Highway and hampering the smooth traffic flow. The causes of the traffic congestion are the bottlenecks at New Mataniko Bridge, where the highway width narrows from 4-lane to 2-lane, the City Council Roundabout, where many traffic directions intersect, and the front of the Central Market, where road crossing facilities are inadequate. Other causes are the seriously deteriorated road pavement, caused by frequent floods along the highway, where the roads are lower than the roadside lands and drainage facilities do not work well. The traffic flow is concentrating on the Kukum Highway since no detour exists. In rainy seasons, many citizens complain about the floods on the highway and the deteriorations of road pavement and the local media criticizes the delay of countermeasures. Such condition of the Kukum Highway becomes a social problem, requiring urgent countermeasures to be taken.

Under such circumstance, the Government of the Solomon Islands gave the highest priority on the project for upgrading the Kukum Highway and widening the New Mataniko Bridge (hereinafter as "the project") in National Infrastructure Investment Plan, then requested to the Government of Japan for the grant aid to implement the project. As a response to the request, this preparatory survey (hereinafter as "the survey") was conducted to examine the necessity and appropriateness of the project to be implemented under the Japanese grant aid, to formulate optimum components, outline design of the project facilities and propose the implementation plan.

## 2. Outline of the Contents of the Project

Against the above road conditions, this project aims to provide smooth and safe driving along the Kukum Highway by rehabilitating deteriorated pavement, repairing drainage facilities and mitigating the traffic congestions in the city center section by improving road facilities and widening the bridges. As the result of the field survey and discussions with the concerned parties, the following project components were proposed and designed with the described design policies:

### (1) Component of the Project

Originally, the upgrading of the Kukum Highway section from City Council Roundabout to the International Airport (Approx. 12km) was requested. However only the section from City Council to Ministry of Fishery (Section-1: approx. 3km) was selected as a target area of the project since the pavement and drainage condition of Section-1 is not good and need urgent repair while the other section condition is not urgent. Countermeasure against traffic congestion around the Central Market was not included in the original request, however it was proposed to include as the project component since the countermeasures against traffic congestion around the

Central Market is necessary to undertake together with the improvement of City Council Roundabout. Widening of New Mataniko Bridge and replacement of Old Mataniko Bridge is also necessary in order to effectively mitigate the traffic congestion in the city center section.

The design policies of each project component are as follows:

**(2) Upgrading of the Kukum Highway**

To minimize the land acquisition, the horizontal alignment and the cross sectional components of the road are planned to follow the existing road basically. The road shoulders are to be narrower than existing ones where roadside ditches are placed. The road pavement of the section between City Council Roundabout and Ministry of Fishery are to be repaved totally since it is seriously deteriorated. Drainage ditches are to be installed at the both sides of the roads. The road sections having inundation because the roads are lower than the surrounding ground are to be embanked to rise the level up. Installation of traffic signal at the major intersections are desirable, however it is not installed due to unsureness of power supply and availability of maintenance. Instead, Vura Junction and Central Hospital Junction are to be improved since it is requested strongly and its necessity is confirmed due to the large traffic volume causing traffic congestions at the junctions. Bus bays along the highway are to be provided outside of the carriageway.

**(3) Countermeasure against Traffic Congestion around the Central Market**

Since the major cause of the traffic congestion around the Central Market are buses occupying on the traffic lanes and chaotic frequent highway crossing of pedestrians, the countermeasures against traffic congestion around the Central Market are the provision of bus bays with adequate size and the provision of road crossing facilities that are to be a crosswalk and a underpass. Median fence is to be installed to prevent free road crossing. The existing underpass will be reopened after renovation. The crosswalk is to be controlled by traffic personnel instead of traffic auto signal due to aforementioned reason. To promote pedestrians to use the underpass, the existing underpass is to be renovated by repainting, lighting and installing corner mirrors and colorless entrance/exit roofing. Traffic personnel are necessary to do traffic control at the crosswalk from early morning until late evening every day and a security guard is necessary to clean and lock/unlock the underpass every day. As a soft component of the project, this project supports and monitors the establishment of the traffic control of the crosswalk and security management of the underpass. The pavement of the Central Market section is not to be renewed since its condition is still good.

**(4) Improvement of City Council Roundabout**

Traffic signalization or grade separation is the effective method to solve the traffic congestion at the roundabout. However it was not adopted due to the cost and maintenance reasons. To improve traffic capacity of the roundabout, ring road diameter is to be enlarged and number of

lanes is to be increase and number of connecting roads is to be reduced. To minimize the land acquisition necessary to enlarge the roundabout, the storage yards owned by MID is to be used.

**(5) Widening of New Mataniko Bridge**

To widen the bridge, new 2-lane bridge is to be additionally constructed, because the existing 2-lane bridge is structurally sound. The bridge structure was proposed based on the comparison of alternative schemes. Durable type riverbank protection is proposed for the eastern side abutment, because the eastern side riverbank protection of the existing bridge has been washed out by the flood occurred in April 2014. Since the flood has reached near to the existing bridge girder, new bridge elevation was designed to secure the required freeboard above the high water level. Since the existing bridge cannot be raised up to maintain the structural stability, the soil deposit under the bridge and obstacles in the river are to be removed in order to improve the capacity of flood discharge.

**(6) Replacement of Old Mataniko Bridge**

The flood occurred in April 2014 washed out the former bailey bridge and the existing bailey bridge has been installed. The existing bailey bridge was proposed to be replaced by a 2-lane permanent bridge since the former bridge is a single-lane and it is causing traffic congestions up to the Kukum Highway. The bridge length, span layout and bridge elevation were designed based on the hydrology analysis reflecting the flood occurred in April 2014.

Major components of the project are as follows:

**Major Components of the Project**

| | Components | |
|---|---|---|
| Upgrading of the Kukum Highway | Highway length: | 3.0km |
| | Cross sectional component: | Carriageway (3.5m x 4-lane), Sidewalk (2.0m x 2), Median(3.0m) |
| | Pavement: | Surface course (AC; 10cm), Base course (Mechanically stabilized granular material; 5cm), Subbase course (Crusher run; 25cm) |
| | Drainage: | Roadside ditches (6.0km), Drain pipes (0.4km), Catch basins (499 nos), New box culvert (2 nos, 68.5m) |
| | Improvement of Intersection: | Vura Intersection and Central Hospital Intersection |
| | Bus bay: | 16 locations |
| | Other road facilities: | Street light repair (9 units), Street light new installation (5 units) Guardrail and fence (1,108m), Road markings, Grassing and planting |
| Countermeasure against Traffic Congestion around the Central Market | Bus bay: | 3 locations (8-berth x 2 locations, 5-berth x 1 location) |
| | Crosswalk: | 1 location |
| | Median fence: | 340m |
| | Renovation of Underpass: | Installation of lights, corner mirror and entrance roofs and repainting |
| Improvement of City Council Roundabout | Length of ring road: | 270m, Diameter of ring road: 12m (minimum) |
| | Width of ring road: | 11.0m |
| | Pavement of ring road: | Concrete pavement (2,000m$^2$) |
| Widening of New Mataniko Bridge | Bridge length: | 66m (22m x 3 span) |
| | Bridge width: | Carriageway 8m, Sidewalk 2m x 1 |
| | Superstructure type: | 3-span continuous plate girder (Integral type) |
| | Substructure type: | Cast-in-place concrete pile-bent (with diaphragms) |
| | Abutment protection type: | Steel sheet piles (right riverbank), Concrete wall (left riverbank) |
| Replacement of Old Mataniko Bridge | Bridge length: | 60m (30m x 2 span) |
| | Bridge width: | Carriageway 7m, Sidewalk 2m x 2 |
| | Superstructure type: | Plate girder (simple supported) |
| | Substructure type: | Cast-in-place concrete pile-bent (with diaphragms) |
| | Abutment protection type: | Steel sheet piles (right riverbank), Concrete wall (left riverbank) |
| | Approach roads: | Right side 73.8m, Left side 72.3m |

## 3. Project Duration and Estimated Cost

If this project should be implemented, project design period will be 6 months, and the construction period will be 30 months. The project will be implemented in accordance with the Japan's Grant Aid scheme and the cost will be determined before concluding the Exchange of Note (E/N) for the project.

## 4. Project Evaluation

This project is appropriate to be implemented under the Japanese grant aid due to the following reasons:

- Ø This project has been given the highest priority in the development plan of the Solomon Islands since its urgency is very high.
- Ø The project beneficiaries are all Honiara citizens who are the users of public buses and the Central Market.
- Ø The major effects of the project are the improvement of living environment such as mitigation of the traffic congestions and improvement of the traffic safety.
- Ø This project provides infrastructure, which supports the socioeconomic development of the Solomon Islands.

Quantitative Effects

**Quantitative Effects**

| Quantitative Effect Indicator | Base Year (2013) | Evaluation Year (2021) (Three years after the project completion) |
|---|---|---|
| Reduce traffic congestion length (queue) from City Council Roundabout toward to the east at 9am | 670m | 300m |
| Improvement of average travel speed from Vura Junction to Hot Bread Roundabout at 9am | 20km/hr | 30km/hr |

Qualitative effects

- Ø Driving comfort and safety will be increased due to improvement of road and drainage conditions.
- Ø Comfort and safety of pedestrians and urban environment will be improved due to development of road facilities around the Central Market.
- Ø Road maintenance cost will be reduced due to renewing the road.
- Ø Socioeconomic activities will be efficient due to mitigation of traffic congestions.
- Ø The awareness of necessity of proper use and management of road facilities will be increased by experience of the soft component of the project.

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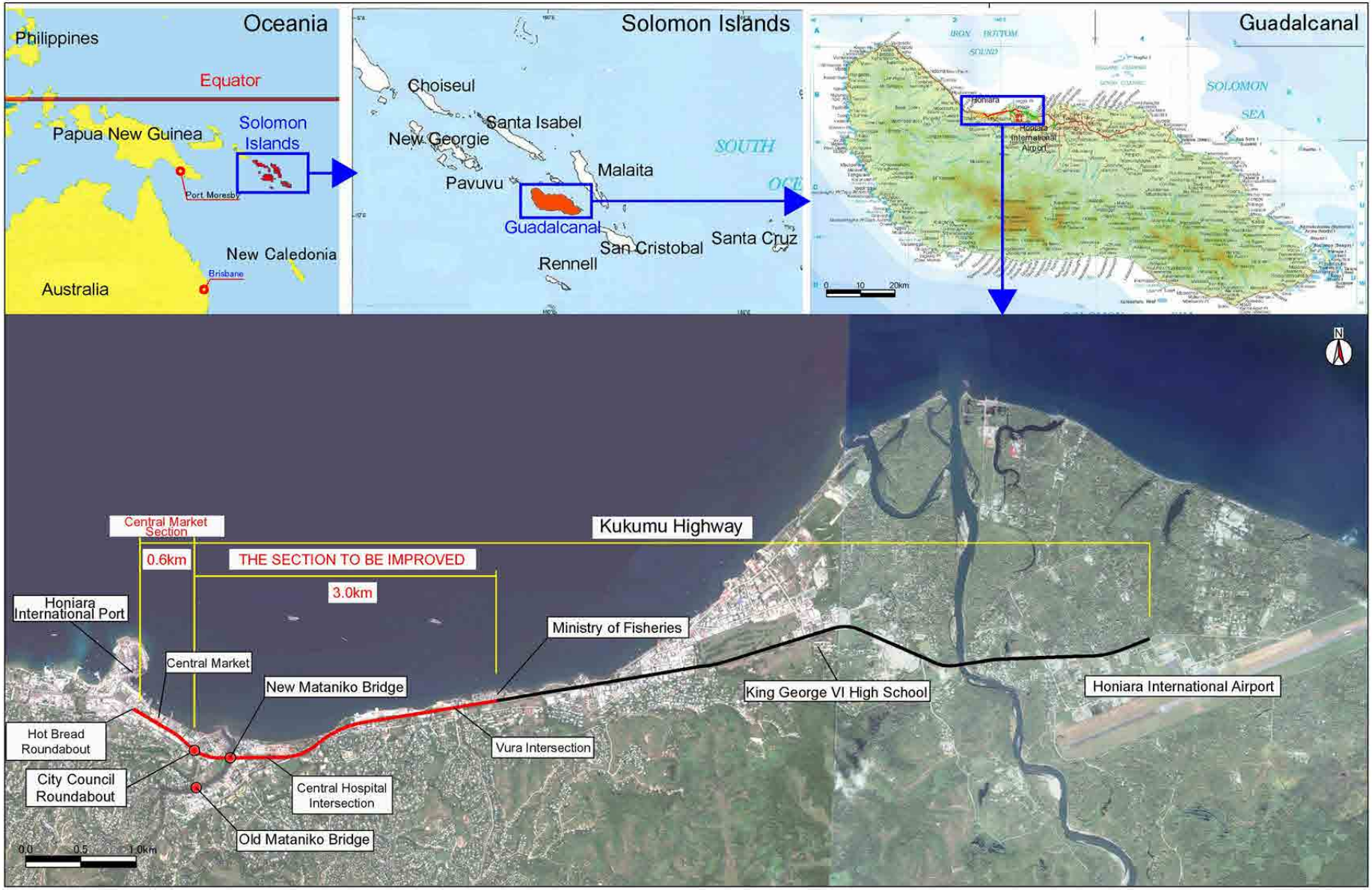


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| | |
|---|---|
| AC | : Asphalt Concrete |
| ADB | : Asian Development Bank |
| ARAP | : Abbreviated Resettlement Action Plan |
| CPIU | : Central Project Implementation Unit |
| DBST | : Double Bituminous Surface Treatment |
| EAC | : Environmental Advisory Committee |
| ECD | : Environment & Conservation Division |
| EIS | : Environmental Impact Statement |
| GDP | : Gross Domestic Product |
| IRI | : International Roughness Index |
| LAO | : Land Acquisition Officer |
| MDPAC | : Ministry of Development Planning and Aid Coordination |
| MECDM | : Ministry of Environment, Climate Change, Disaster Management and Meteorology |
| MID | : Ministry of Infrastructure Development |
| MLHS | : Ministry of Land, Housing and Survey |
| NIIP | : National Infrastructure Investment Plan |
| NTP | : National Transport Plan |
| OD | : Origin Destination (Survey) |
| PER | : Public Environment Report |
| PRIF | : Pacific Region Infrastructure Facility |
| PVC | : Polyvinyl Chloride |
| RAP | : Resettlement Action Plan |
| RC | : Reinforced Concrete |
| ROW | : Right of Way |
| SI | : Solomon Islands |
| SINIIP | : Solomon Islands National Infrastructure Investment Plan |
| TOR | : Terms of Reference |
| TSDP | : Transport Sector Development Program |

# Chapter 1 Background of the Project

## 1-1 Background of the Project

The Solomon Islands consists of more than 100 islands and the present population is approximately 552,000. The total road network in the Solomon Islands is approximately 1,875km, of which only 6% of the roads are paved. About 66% of the roads and 98% of the vehicles of the country locate in Guadalcanal and Malaita.

The Kukum Highway connects the center of the capital city Honiala with the international airport, which is the part of the main road along the northern coast of Guadalcanal Island. Increase in traffic volume is causing serious traffic congestions at the central area of the city along the Kukum Highway and hampering the smooth traffic flow.

The causes of the traffic congestion are the bottlenecks at New Mataniko Bridge where the highway width narrows from 4-lane to 2-lane, City Council Roundabout where many directions of traffic intersect and Traffic congestions in front of the Central Market where road crossing facilities are inadequate. Other causes are the seriously deteriorated pavement caused by frequent floods along the highway where the roads are lower than the roadside lands and drainage facilities do not work well and the traffic flow is concentrating on the Kukum Highway since no detour exists.

In rainy seasons, many citizens complain about the floods on the highway and the deteriorations of pavement and the local media criticizes the delay of countermeasures. Such condition of the Kukum Highway becomes a social problem, requiring urgent countermeasures to be taken.

The Solomon Islands economy is expected to grow since the export of palm oil and mineral resources are in good condition, which is stimulating the economic activities in Honiala. Therefore, improvement of the road condition in Honiala is urgently necessary.

Under such circumstance, the Government of the Solomon Islands gave the highest priority on the project for upgrading of the Kukum Highway and widening of New Mataniko Bridge (hereinafter as “the project”) in National Infrastructure Investment Plan, then requested to the Government of Japan for the grant aid of the project.

In response to the request, this preparatory survey (hereinafter as “the survey”) was conducted to examine the necessity and appropriateness of the project to be implemented by Japanese grant aid, to formulate optimum components, outline design of the project facilities and propose the implementation plan.

## 1-2 Project Site Conditions

### 1-2-1 Traffic Volume and Traffic Congestion Condition

#### 1-2-1-1 Traffic Survey

**(1) Contents of the Traffic Survey**

Traffic survey was carried out along the Kukum Highway. The objectives of the survey are to understand the traffic condition of the highway, to obtain the data to forecast the future traffic demand and the data to evaluate the effectiveness for the project. Table 1-2-1 shows items of the traffic survey.

**Table 1-2-1 Items of the Traffic Survey**

| Content | | Number of Station | Day | Remarks |
|---|---|---|---|---|
| i) Queue length Survey | | 1 | 2 days | - |
| ii) Travel Speed Survey | | 11km of the Kukum Highway | 2 days | - |
| iii) Traffic Count Survey | Daytime 12 hours | 5 | 2 days | - |
| | Nighttime 12 hours | 1 | 2 days | - |
| iv) Simple OD Interview Survey | | 1 | 1 day | At Old Mataniko Bridge |

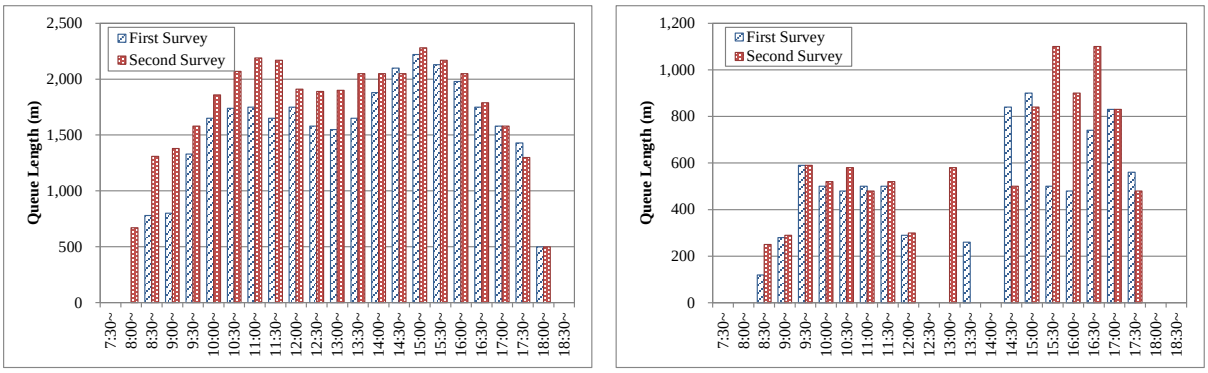
**(2) Queue Length Survey**

The queue length from City Council Roundabout toward the east side and the west side along the Kukum Highway were measured every 30 minutes from 7:30am to 7:00pm for 2 days (Nov. 28 (Thu) and Dec. 3 (Tue) in 2013). The result of the queue length survey is shown in Table 1-2-2 and Figure 1-2-1. The queue occurred between 8:00am and 6:00pm. The maximum length of the queue are 2.3km to the east and 1.1km to the west from the City Council Roundabout.

**Table 1-2-2 Result of Queue Length Survey**

| Time | East Side (m) | | West Side (m) | |
|---|---|---|---|---|
| | First Survey | Second Survey | First Survey | Second Survey |
| 7:30-8:00 | 0 | 0 | 0 | 0 |
| 8:00-9:00 | 780 | 1,310 | 120 | 250 |
| 9:00-10:00 | 1,330 | 1,580 | 590 | 590 |
| 10:00-11:00 | 1,740 | 2,070 | 500 | 580 |
| 11:00-12:00 | 1,750 | 2,190 | 500 | 520 |
| 12:00-13:00 | 1,750 | 1,910 | 290 | 300 |
| 13:00-14:00 | 1,650 | 2,050 | 260 | 580 |
| 14:00-15:00 | 2,100 | 2,050 | 840 | 500 |
| 15:00-16:00 | 2,220 | 2,280 | 900 | 1,100 |
| 16:00-17:00 | 1,980 | 2,050 | 740 | 1,100 |
| 17:00-18:00 | 1,580 | 1,580 | 830 | 830 |
| 18:00-19:00 | 500 | 500 | 0 | 0 |

Note: The first survey was conducted on Nov. 28, 2013 (Thu) and the second survey was conducted on Dec. 3, 2013 (Tue)




a) East Side from City Council (Airport Side) b) West Side from City Council (Port Side)

Note: The first survey was conducted on Nov. 28, 2013 (Thu) and the second survey was conducted on Dec. 3, 2013 (Tue)

**Figure 1-2-1 Result of Queue Length Survey**

### (3) Travel Speed Survey

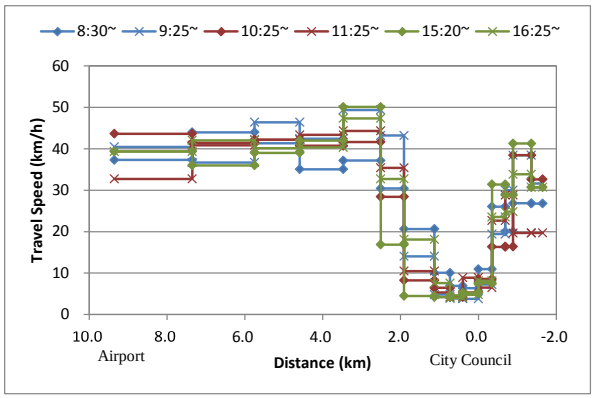
The travel speed survey was conducted along the Kukum Highway between Townground Roundabout and Honiara International Airport for 6 times from 8:00am to noon and from 3:00pm to 5:00pm for 2 days (Nov. 26 (Tue) and Nov. 27 (Wed) in 2013). The travel speed was surveyed using a sedan car traveling at the average speed of the traffic flow by measuring the elapsed time at the checkpoints along the highway. The location of the checkpoints is shown in Table 1-2-3 and Figure 1-2-2.

**Table 1-2-3 Location of Checkpoints for Travel Speed Survey**

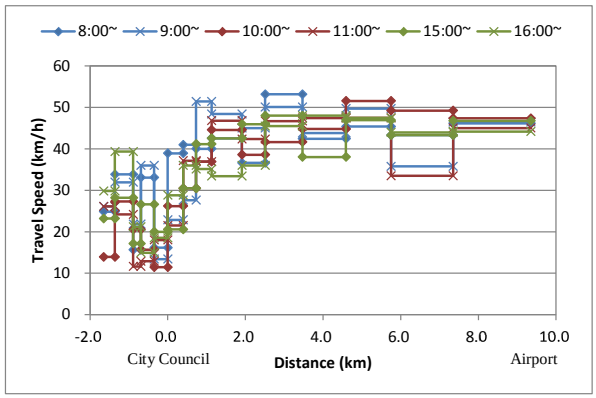
| No. | Location | Distance (km) |
|---|---|---|
| 1 | Townground Roundabout | -1.6 |
| 2 | Central Bank Roundabout | -1.4 |
| 3 | Commonwealth Street Intersection | -0.9 |
| 4 | Hotbread Roundabout (Chaka Street) | -0.7 |
| 5 | Central Market Intersection | -0.4 |
| 6 | City Council Roundabout | 0.0 |
| 7 | East Side of New Mataniko Bridge | 0.4 |
| 8 | Lawsontama Intersection (the Old Kukum Highway) | 0.7 |
| 9 | Kolaa Ridge Road Intersection (St. Barnabas Provincial Cathedral) | 1.1 |
| 10 | Kukum Police Station Intersection | 1.9 |
| 11 | Vura Road Intersection (Fishing Village Market) | 2.5 |
| 12 | Panatina Plaza Intersection | 3.5 |
| 13 | Ranadi Roundabout | 4.6 |
| 14 | King Gorge VI High School Intersection | 5.8 |
| 15 | East Side of Lungga Bridge | 7.4 |
| 16 | Honiara International Airport | 9.4 |


**Figure 1-2-2 Location of Checkpoints for Travel Speed Survey**

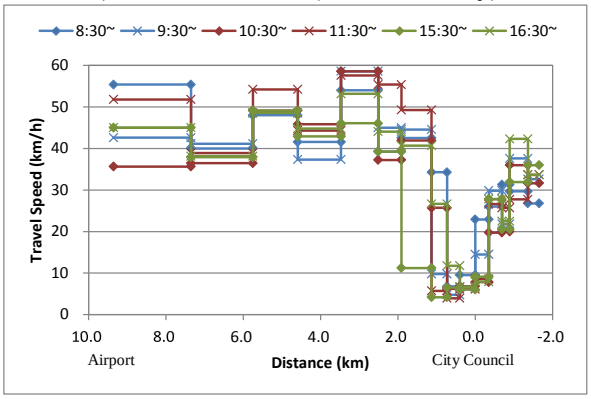
The result of the travel speed survey is shown in Figure 1-2-3. Travel speed of west direction at 9am and east direction at 4pm are shown in Table 1-2-4. Travel speed of west direction at distance between -0.5km and 2.0km is less than 10km/h which means that the head of the traffic congestion is at the Central Market. While travel speed of east direction at distance between -1.0km and 0.0km is about 10km/h which means that the head of the traffic congestion is at the City Council Roundabout.



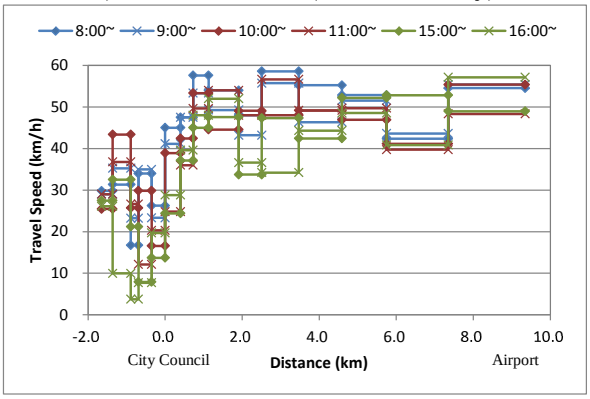

a) Direction to West (the First Survey)




b) Direction to East (the First Survey)




c) Direction to West (the Second Survey)




d) Direction to East (the Second Survey)

Note: The first survey was conducted on Nov. 26, 2013 (Tue) and the second survey was conducted on Nov. 27, 2013 (Wed)

**Figure 1-2-3 Result of Travel Speed Survey**

**Table 1-2-4 Result of Travel Speed Survey**

| Direction | Section | Distance (km) | East to West (km/h) | | West to East (km/h) | |
|---|---|---|---|---|---|---|
| | | | First Survey | Second Survey | First Survey | Second Survey |
| West | Hotbread RA - Central Market | 0.35 | 20.0 | 30.7 | 15.4 | 7.9 |
| ↑ | Central Market - City Council RA | 0.70 | 7.2 | 14.5 | 18.5 | 19.7 |
| ↑ | City Council RA - New Mataniko Bridge | 1.10 | 3.8 | 6.7 | 28.8 | 28.8 |
| ↑ | New Mataniko Bridge - Lawsontama Junction | 1.43 | 3.9 | 4.8 | 36.0 | 39.6 |
| ↑ | Lawsontama Junction - St. B Provincial Cathedral | 1.83 | 4.8 | 9.8 | 35.1 | 48.0 |
| ↑ | St. B Provincial Cathedral - Kukum Police Station | 2.61 | 14.0 | 44.6 | 33.4 | 52.0 |
| East | Kukum Police Station - Vura Junction | 3.20 | 42.5 | 44.3 | 35.4 | 36.0 |

Note: The first survey was conducted on Nov. 26, 2013 (Tue) and the second survey was conducted on Nov. 27, 2013 (Wed)

### (4) Traffic Count Survey

The traffic count survey as shown in Table 1-2-5 was conducted at 5 stations as shown in Figure 1-2-4.

**Table 1-2-5 Implementation of Traffic Count Survey**

| No. | Location | Period | Date |
|---|---|---|---|
| 1 | West Side from Mataniko Bridge | 7:00am-7:00pm | Dec. 3 (Tue) & 4 (Wed), 2013 |
| 2 | East Side from Junction with the Old Kukum Highway | 7:00am-7:00pm<br>7:00pm-7:00am | Nov. 27 (Wed) & 28 (Thu), 2013<br>Dec. 11 (Wed) & 12 (Thu), 2013 |
| 3 | West side of Ranadi Roundabout | 7:00am-7:00pm | Nov. 29 (Fri) & Dec. 2 (Mon), 2013 |
| 4 | The Starting Point of 2 Lane | 7:00am-7:00pm | Nov. 25 (Mon) & 26 (Tue), 2013 |
| 5 | West Side from Old Mataniko Bridge | 7:00am-7:00pm | Dec. 9 (Mon) & 10 (Tue), 2013 |


**Figure 1-2-4 Location Map of Traffic Count Station**

24-hour traffic volume was estimated as 12-hour traffic volume multiplied by the 24-hour/12-hour ratio (1.33 as average of all vehicles) which was surveyed at the traffic count station No.2. Estimated 24-hour traffic volume is shown in Table 1-2-6 and Figure 1-2-5.

**Table 1-2-6 24-hour Traffic Volume**

| Station | Motor cycle | Sedan/ Van/jeep | Pick-up | Mini Bus | Short & Long Body Bus | Light Truck | Heavy Truck | Trailer Truck | Bicycle | Walker | Total (Vehicle) | Total (PCU) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 18 | 17,846 | 4,023 | 5,608 | 266 | 1,924 | 124 | 120 | 52 | 3,306 | 29,929 | 35,336 |
| 2 | 28 | 23,653 | 5,073 | 6,132 | 281 | 2,614 | 171 | 120 | 72 | 2,182 | 38,072 | 44,510 |
| 3 | 35 | 15,535 | 4,359 | 3,668 | 155 | 2,481 | 191 | 99 | 42 | 1,421 | 26,523 | 31,453 |
| 4 | 32 | 9,755 | 3,100 | 3,141 | 121 | 1,654 | 191 | 51 | 67 | 1,191 | 18,045 | 21,757 |
| 5 | 4 | 8,435 | 1,645 | 741 | 39 | 790 | 0 | 0 | 45 | 8,817 | 11,654 | 12,850 |

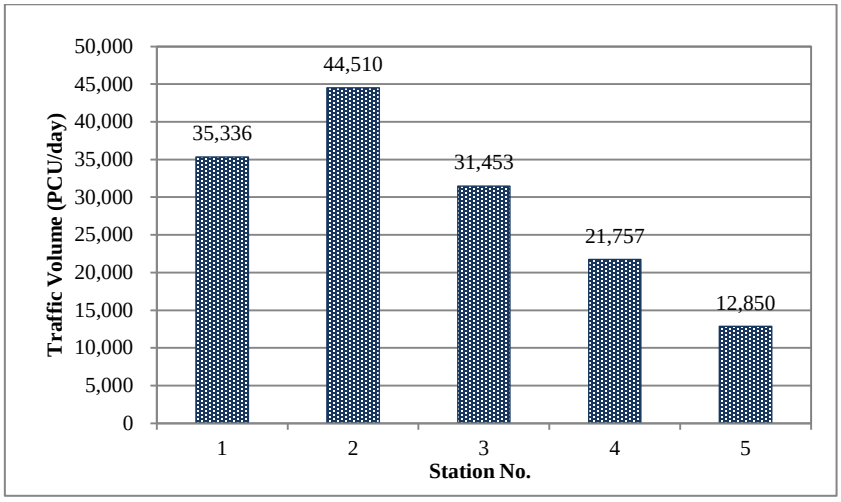



**Figure 1-2-5 24-hour Traffic Volume**

### (5) Simple OD Interview Survey

Simple OD interview survey on the vehicle traffic at Old Mataniko Bridge (Station No.5) was carried out to know how many percent of vehicles are detouring to avoid the traffic congestion at New Mataniko Bridge along the Kukum Highway and how many percent of vehicles will remain to use Old Mataniko Bridge after upgrading of the highway. This survey was carried out from 8:00am to 6:00pm on Dec. 9, 2013.

Sample number was 364 vehicles for the both directions and sampling rate was 4.3%. The result of the interview survey is shown in Table 1-2-7. The result indicates that 58.6% of City Council direction vehicles and 17.4% of China Town direction vehicles passing Old Mataniko Bridge are detouring to avoid traffic congestion at New Mataniko Bridge along the Kukum Highway and the remaining vehicles are deemed to use Old Mataniko Bridge even after upgrading the highway.

**Table 1-2-7 OD Share**

| | | Destination | | |
|---|---|---|---|---|
| | | A | B | C |
| Origin | A | - | - | - |
| | B | 41.4% | - | - |
| | C | 58.6% | 0.0% | - |

a) Direction to City Council

| | | Destination | | |
|---|---|---|---|---|
| | | A | B | C |
| Origin | A | - | 82.6% | 17.4% |
| | B | - | - | 0.0% |
| | C | - | - | - |

b) Direction to China Town

A: Area west side of Mataniko River
B: China Town area
C: Area east of Mataniko River except China Town area

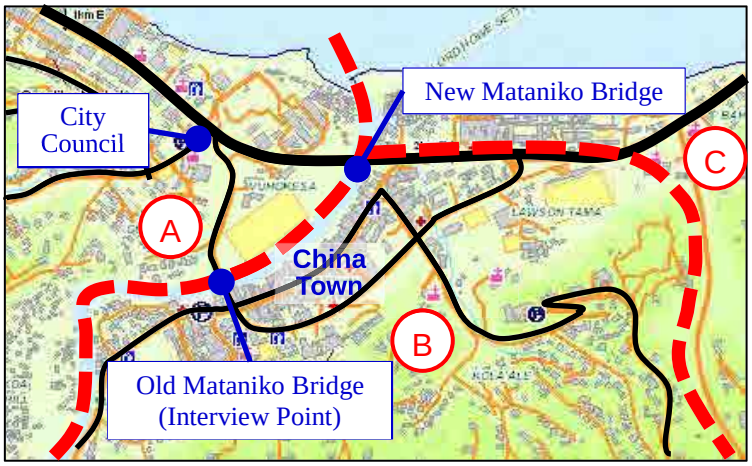



**Figure 1-2-6 Area Division of OD Interview Survey**

### (6) City Council Roundabout Traffic Survey

Objective of this survey is to understand existing traffic flow and to obtain data for the planning of the roundabout improvement. City Council Roundabout is located in traffic congestion area. The traffic congestion occurs from 8:30am to 6:00pm on weekdays. Therefore, directional traffic count survey was carried out from 7:00am to 8:00am. This hour is before traffic congestion hour. 12-hours traffic count for incoming traffic was carried out from 7:00am to 7:00pm. This survey was conducted on Dec. 3 (Tue) and Dec. 4 (Wed) in 2013. Peak hour directional traffic volume was estimated based on directional traffic volume from 7:00am to 8:00am and 12-hours traffic volume. Estimated peak hour directional traffic volume is shown in Figure 1-2-7.

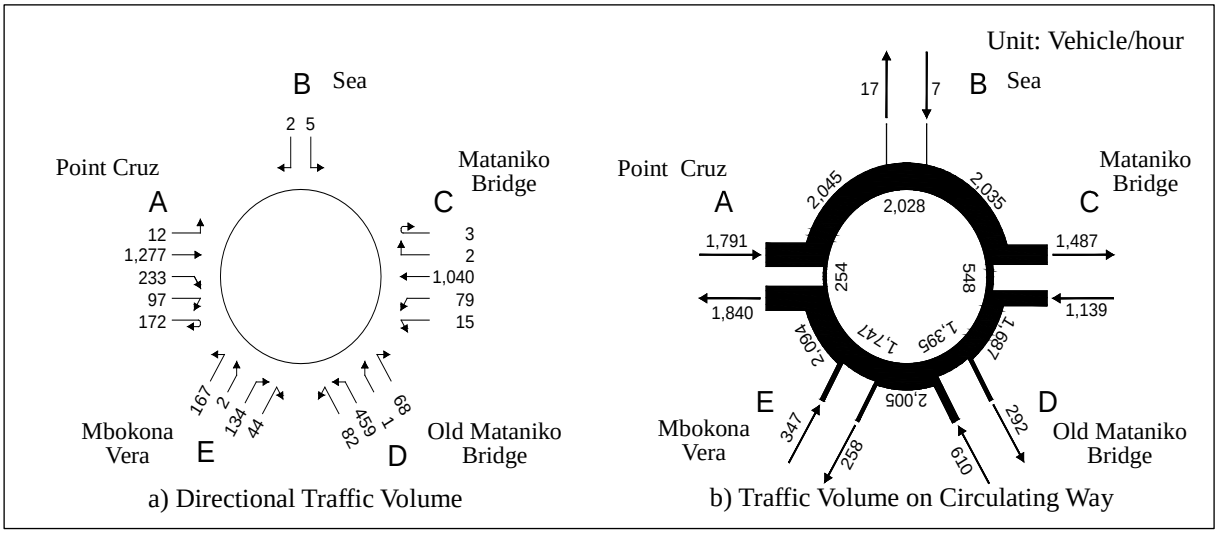



**Figure 1-2-7 Peak Hour Directional Traffic Volume**

## 1-2-1-2 Future Traffic Volume Forecast

### (1) Economic Frameworks

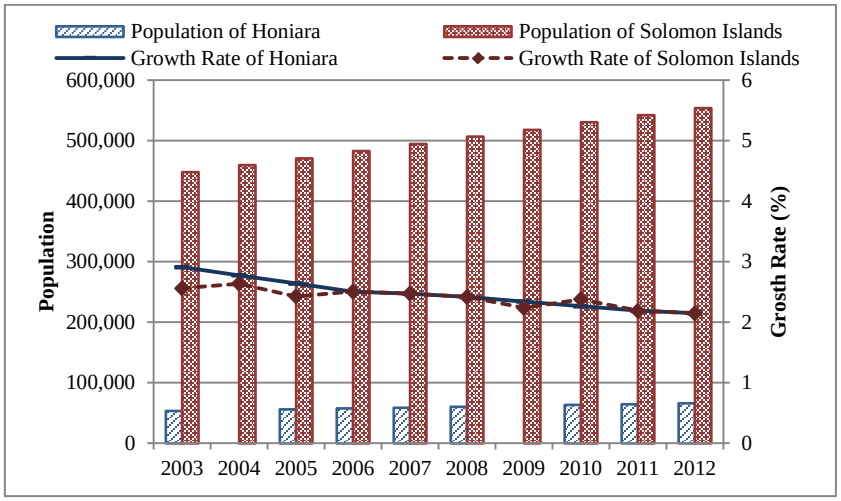
Since transportation supports social and economic activities, traffic demand is governed by socioeconomic factors. This subsection describes the present conditions and future forecast of

socioeconomic factors that is used in estimation of the future traffic volume forecast.

(a) Population

Figure 1-2-8 shows population and population growth rate of the Solomon Islands and Honiara City from 2003 to 2012. The data shows that the population of the Solomon Islands and Honiara City was increased from year 2003 to 2012. While population growth rate was decreased from middle of 2% to nearly 2%. Trend of population growth rate of Honiara City is similar to the Solomon Islands.

The long term population by 2030 of the Solomon Islands was predicted by United States Department of Agriculture and the short term population was predicted by International Monetary Fund and Statistics Office of the Solomon Islands as shown in Table 1-2-8. According to this prediction, the short term population growth rate is nearly 2% and long term population growth rate is middle of 1%.




Source: Statics Office of the Solomon Islands

**Figure 1-2-8 Population and Population Growth Rate (2003–2012)**

**Table 1-2-8 Population Projection**

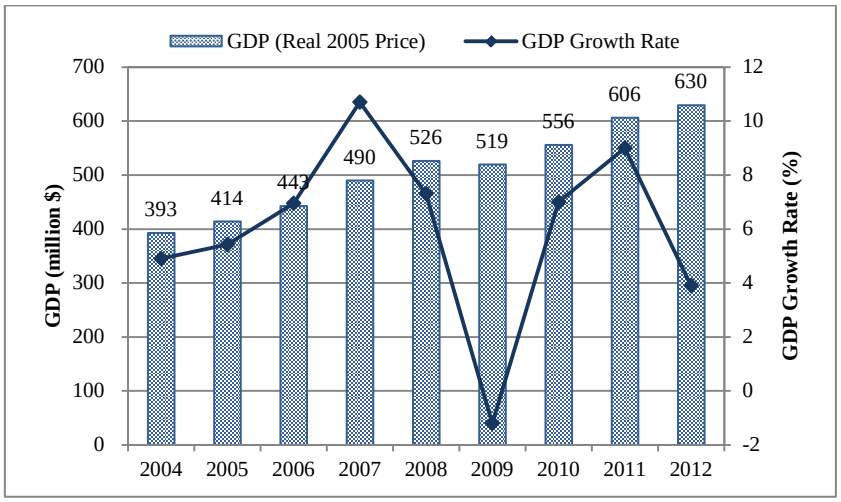
| | | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | ~2023 | ~2030 |
|---|---|---|---|---|---|---|---|---|---|
| Statistic Office | Population | 565,756 | 577,179 | | | | | | |
| | Growth Rate (%) | 2.13 | 2.02 | | | | | | |
| IMF | Population | 578,000 | 592,000 | 605,000 | 618,000 | 631,000 | 645,000 | | |
| | Growth Rate (%) | 2.30 | 2.42 | 2.20 | 2.15 | 2.10 | 2.22 | | |
| USDA | Population | 597,248 | 609,883 | 622,469 | 635,027 | 647,581 | 660,121 | 722,359 | 807,618 |
| | Growth Rate (%) | 2.17 | 2.12 | 2.06 | 2.02 | 1.98 | 1.94 | 1.82 | 1.61 |

Source: Statistics Office of the Solomon Islands (Statistics Office)
World Economic Outlook, International Monetary Fund (IMF)
Economic Research Service, United States Department of Agriculture (USDA)

(b) GDP

Figure 1-2-9 shows the historical trend of GDP of the Solomon Islands from 2004 to 2012 at constant 2005 prices. The data shows that Solomon's economy continuously grew from year 2004 to 2012 with an average annual growth rate of 6.1%. Considerable decrease in growth rate was experienced in year 2008 to 2009 due to the influence of the economic trend of the world (so-called "Lehman Shock").

Table 1-2-9 shows prediction of the GDP growth rate of the Solomon Island. The long term GDP by 2030 of the Solomon Islands has been predicted by United States Department of Agriculture and the short term population was predicted by International Monetary Fund. According to this prediction, the short term GDP growth rate is nearly 4% and long term growth rate is middle of 3%.




Source: World Bank

**Figure 1-2-9 Historical Trend of GDP and GDP Growth Rate (Constant 2005 Prices)**

**Table 1-2-9 Annual Growth Rate of GDP**

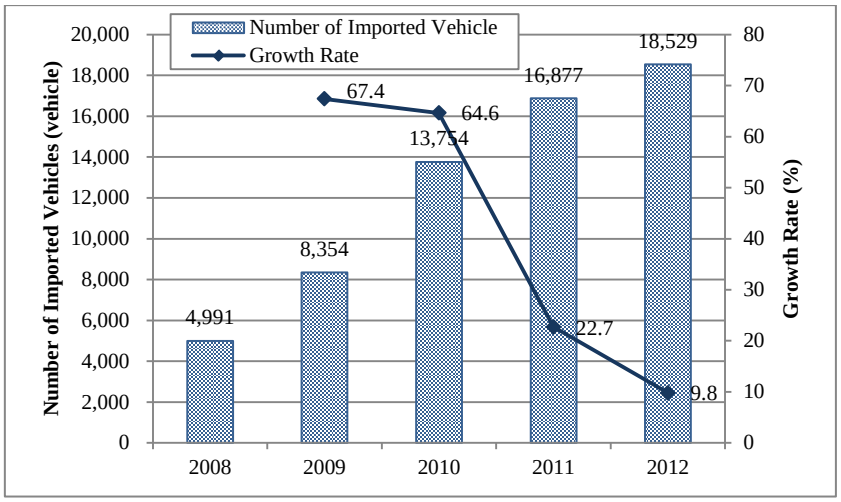
(Unit: %)

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | ~2023 | ~2030 |
|---|---|---|---|---|---|---|---|---|
| IMF | 4.05 | 3.79 | 3.71 | 3.55 | 3.57 | 3.39 | - | - |
| USDA | 3.90 | 3.84 | 4.20 | 3.70 | 3.66 | 3.61 | 3.48 | 3.24 |

Source: World Economic Outlook, International Monetary Fund (IMF)
Economic Research Service, United States Department of Agriculture (USDA)

(c) Number of Imported Vehicles

Figure 1-2-10 shows number of imported vehicles from 2008 to 2012. The data shows that the number of imported vehicles was increased from year 2008 to 2012 but the growth rate was decreased.

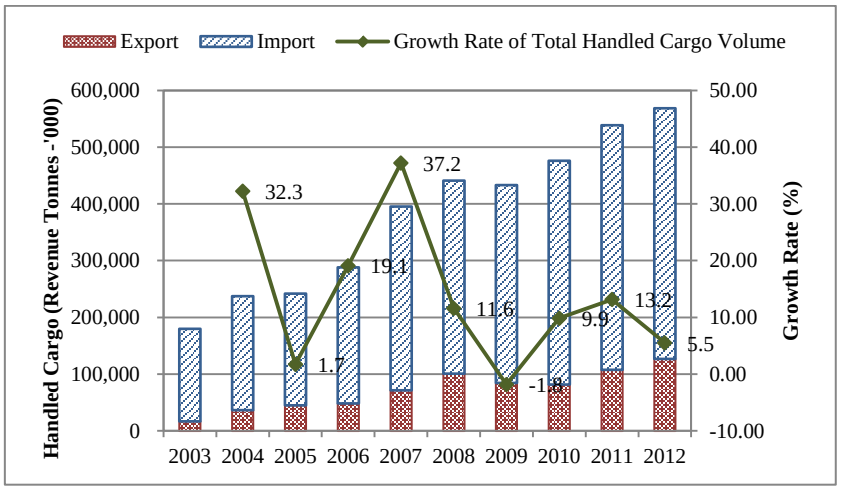



Source: Ministry of Finance & Treasury, the Solomon Islands

**Figure 1-2-10 Number of Imported Vehicles (2008–2012)**

(d) Handled Cargo Volume in Honiara Port

Figure 1-2-11 shows handled cargo volume in Honiara Port from 2003 to 2012. The data shows that handled cargo volume was increased from year 2003 to 2012. Figure 1-2-12 shows correlation between GDP and handled cargo volume in Honiara Port. The figure indicates close correlation between GDP and handled cargo volume in Honiara Port.




Source: Solomon Islands Port Authority

**Figure 1-2-11 Handled Cargo Volume in Honiara Port**

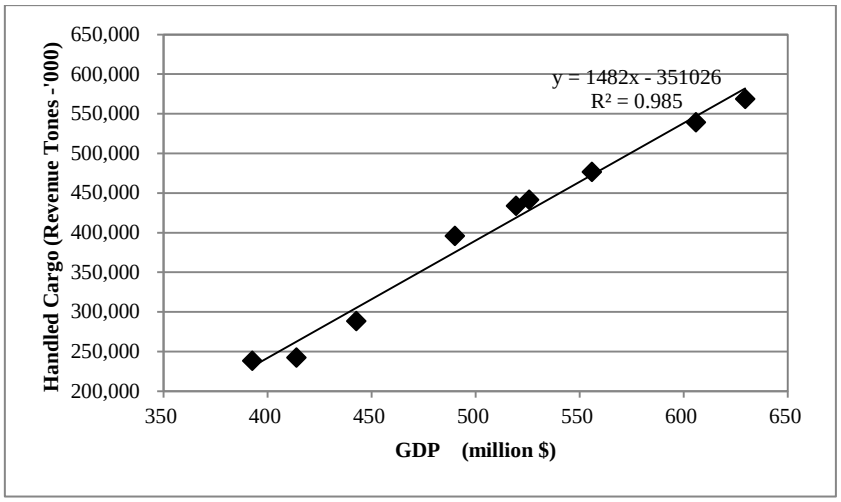



**Figure 1-2-12 Correlation between GDP and Handled Cargo Volume**

### (2) Future Traffic Demand Forecast

(a) Future Traffic Volume on the Kukum Highway

In this survey, future traffic volume of car and public transport are estimated based on population trend, while future traffic volume of trucks are estimated based on GDP trend. Traffic volume of trailer truck is affected by handling cargo volume in Honiara Port. As Figure 1-2-12 indicates, there is close correlation between GDP and handled cargo volume in Honiara Port. Therefore traffic volume of trailer truck is estimated based on future GDP.

In the estimation of future traffic demand, target years are set at 2018, 2023, 2028 and 2033. Year 2018 is assumed completion year of the project and year 2023, 2028 and 2033 are every 5 years from the survey. Table 1-2-10 and Figure 1-2-13 show estimated future traffic volume.

**Table 1-2-10 Future Traffic Volume (2013–2033)**

(Unit: PCU/day)

| Station No. | 2013 | 2018 | 2023 | 2028 | 2033 |
|---|---|---|---|---|---|
| 1 | 35,336 | 45,996 | 51,329 | 56,824 | 62,432 |
| 2 | 44,510 | 50,148 | 55,990 | 62,015 | 68,171 |
| 3 | 31,453 | 35,639 | 40,002 | 44,545 | 49,233 |
| 4 | 21,757 | 24,655 | 27,679 | 30,829 | 34,081 |
| 5 | 12,851 | 8,266 | 9,222 | 10,206 | 11,210 |

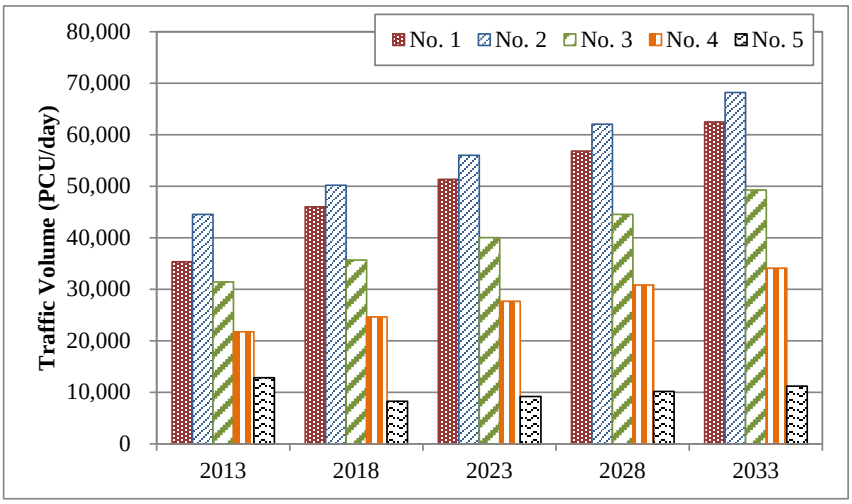
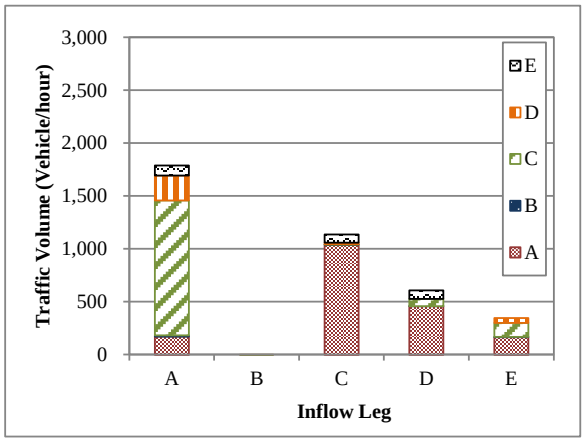


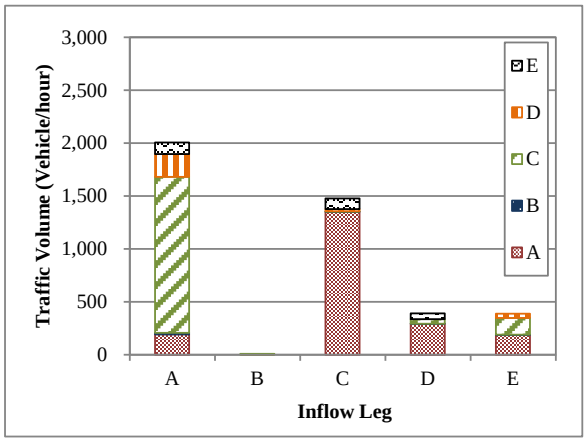

**Figure 1-2-13 Future Traffic Volume (2013–2033)**

(b) Future Directional Traffic Volume of City Council Roundabout

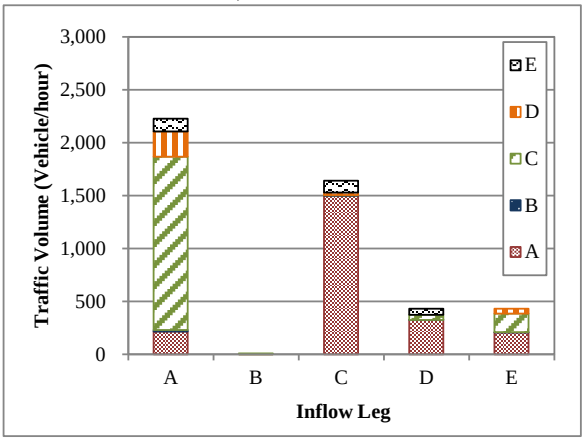
Peak hour directional traffic volume of City Council Roundabout is shown in Figure 1-2-14.



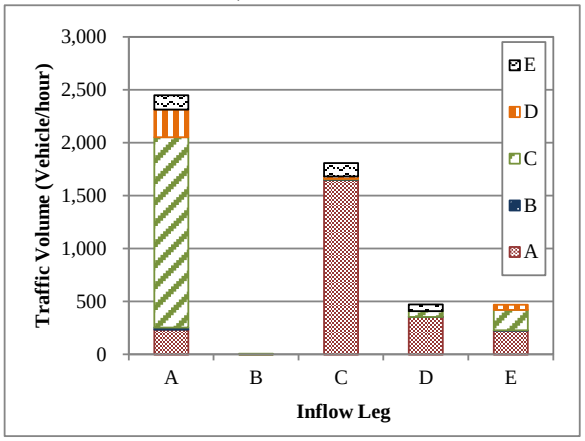

a) Year 2013



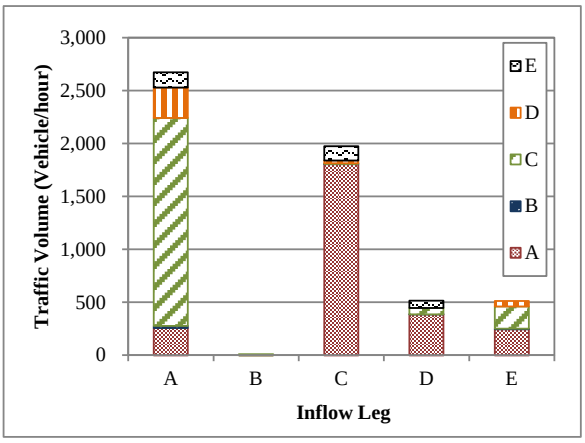

b) Year 2018




c) Year 2023




d) Year 2028




e) Year 2033

**Figure 1-2-14 Peak Hour Directional Traffic Volume of City Council Roundabout**

## 1-2-2 Road Condition

### 1-2-2-1 The Results of Road Inventory Survey

#### (1) Road Width

The section from the City Center (Sta. 0-600) to Sta. 6+000 is 4-lane road with 3m wide median and 2m wide sidewalks. The section from Sta. 6+000 to Sta. 9+000 (intersection at Honiara International Airport) is 2-lane road with gravel surface shoulder.

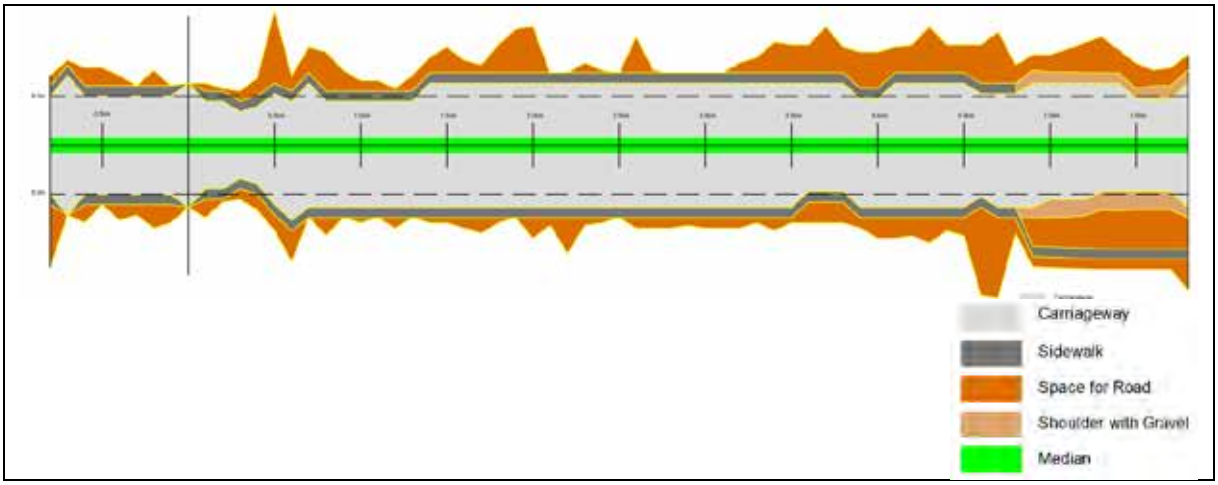



**Figure 1-2-15 Road Width Composition of the Section from Sta. 0-600 to Sta. 6+000**

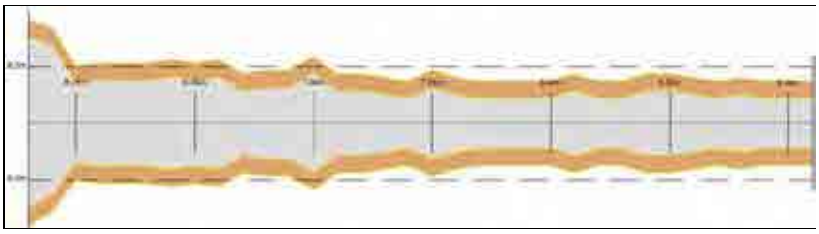


**Figure 1-2-16 Road Width Composition of the Section from Sta. 6+000 to Sta. 9+000**

### (2) Pavement Condition

The road is paved with asphalt concrete (AC) at 4-lane section and double bituminous surface treatment (DBST) at 2-lane section. Damaged sections of AC were repaired with patching and sealing with DBST. Maintenance of pavement has been done well as a whole. Pavement sections having mesh cracks are indicated with mesh mark in Table 1-2-11.

**Table 1-2-11 Present Condition of Pavement**

| IRI>8 | Mesh Crack | | IRI>8 |
|---|---|---|---|
| To East | Sta. | | To West |
| | 0+100 | | |
| | 0+200 | | ✓ |
| | 0+300 | | |
| | 0+400 | | |
| ✓ | 0+500 | | ✓ |
| | 0+600 | | |
| | 0+700 | | ✓ |
| | 0+800 | | ✓ |
| ✓ | 0+900 | | ✓ |
| ✓ | 1+000 | | ✓ |
| ✓ | 1+100 | | ✓ |
| | 1+200 | | ✓ |
| | 1+300 | | ✓ |
| | 1+400 | | ✓ |
| | 1+500 | | ✓ |
| | 1+600 | | ✓ |
| | 1+700 | | |
| | 1+800 | | |
| | 1+900 | | |
| | 2+000 | | |

| IRI>8 | Mesh Crack | | IRI>8 |
|---|---|---|---|
| To East | Sta. | | To West |
| | 2+100 | | ✓ |
| | 2+200 | | |
| ✓ | 2+300 | | ✓ |
| ✓ | 2+400 | | ✓ |
| ✓ | 2+500 | | ✓ |
| ✓ | 2+600 | | ✓ |
| ✓ | 2+700 | | |
| | 2+800 | | |
| | 2+900 | | |
| | 3+000 | | |
| ✓ | 3+100 | | |
| | 3+200 | | |
| ✓ | 3+300 | | ✓ |
| | 3+400 | | ✓ |
| | 3+500 | | ✓ |
| | 3+600 | | ✓ |
| | 3+700 | | ✓ |
| | 3+800 | | ✓ |
| | 3+900 | | ✓ |
| | 4+000 | | ✓ |

| IRI>8 | Mesh Crack | | IRI>8 |
|---|---|---|---|
| To East | Sta. | | To West |
| | 4+100 | | ✓ |
| ✓ | 4+200 | | ✓ |
| ✓ | 4+300 | | ✓ |
| ✓ | 4+400 | | ✓ |
| | 4+500 | | ✓ |
| ✓ | 4+600 | | ✓ |
| ✓ | 4+700 | | ✓ |
| ✓ | 4+800 | | |
| | 4+900 | | |
| | 5+000 | | ✓ |
| | 5+100 | | ✓ |
| | 5+200 | | ✓ |
| | 5+300 | | |
| | 5+400 | | |
| | 5+500 | | |
| | 5+600 | | |
| | 5+700 | | |
| ✓ | 5+800 | | |
| ✓ | 5+900 | | |
| | 6+000 | | |

| IRI>8 | Mesh Crack | | IRI>8 |
|---|---|---|---|
| To East | Sta. | | To West |
| | -0+100 | | |
| | -0+200 | | |
| | -0+300 | | |
| | -0+400 | | |
| | -0+500 | | |
| | -0+600 | | |
| | -0+700 | | |
| | -0+800 | | |

| Mesh Crack | IRI>8 |
|---|---|
| Sta. | Both Sides |
| 6+100 | ✓ |
| 6+200 | ✓ |
| 6+300 | ✓ |
| 6+400 | ✓ |
| 6+500 | ✓ |
| 6+600 | ✓ |
| 6+700 | ✓ |
| 6+800 | |
| 6+900 | |
| 7+000 | |
| 7+100 | ✓ |
| 7+200 | |
| 7+300 | ✓ |
| 7+400 | |
| 7+500 | ✓ |
| 7+600 | ✓ |
| 7+700 | |
| 7+800 | |
| 7+900 | |
| 8+000 | |

| Mesh Crack | IRI>8 |
|---|---|
| Sta. | Both Sides |
| 8+100 | ✓ |
| 8+200 | ✓ |
| 8+300 | ✓ |
| 8+400 | ✓ |
| 8+500 | |
| 8+600 | |
| 8+700 | |
| 8+800 | |
| 8+900 | |
| 9+000 | |
| 9+100 | |

(a) Damage and Deterioration of Pavement

Mesh cracks were observed in the survey road. In general, mesh cracks appear as a terminal symptom of deteriorated pavement. Reconstruction method is appropriate as a counter measure for deteriorated pavement with mesh cracks. In this inventory survey, mesh cracks are observed

from the city center to Sta. 4+700 on the east direction lane and from the city center to Sta. 5+100 on the west direction lane. The mesh cracks are deep and damaged base course at the section between Sta. 0+800 and Sta. 2+700. The cracks at the section between Sta. 3+000 and Sta. 5+100 are comparatively shallow and did not reach the base course.

(b) Roughness of Pavement

International Roughness Index (IRI) is referred for the roughness survey. Since the speed limit of the Kukum Highway is 50km/h and running speed of vehicles is not fast as "Normal Use" speed in Figure 1-2-17, roughness was measured by bounding of running vehicles. In the survey, IRI = 8, was set for the limit of goodness, which is the border of appearance of deep depressions. The bad sections, where IRI are larger than 8, are shown with mark "✓" in abovementioned Table 1-2-11.

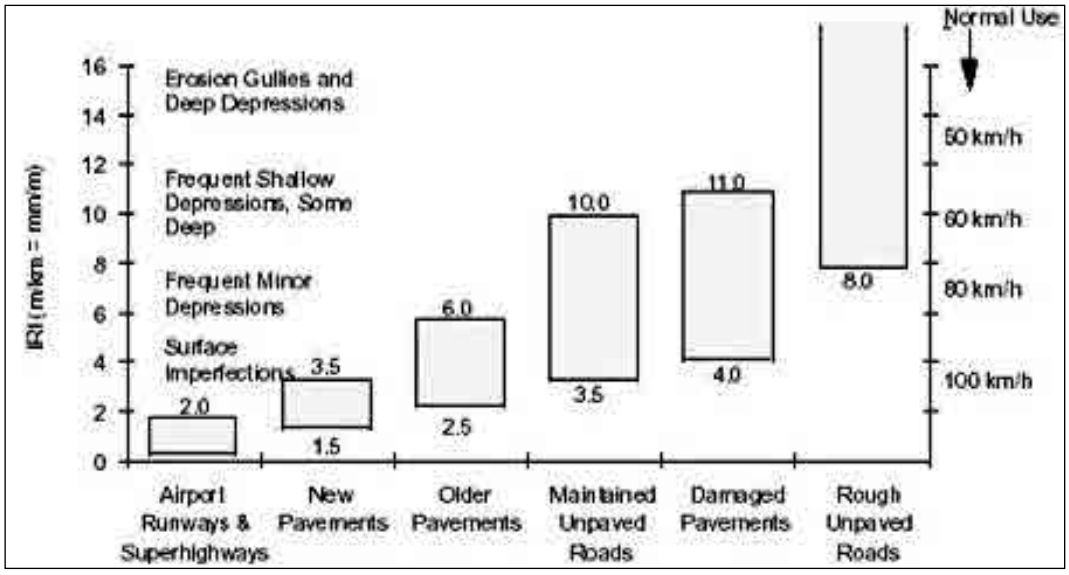



**Figure 1-2-17 Relation between IRI and Pavement Condition and Running Speed**

The sections of bad roughness correlated with the section of bad pavement condition are continued on the lane of west direction. In particular, the lane of west direction, mountain side, between Sta. 0+800 and Sta. 2+700 is very bad due to the repeated patching repair of the pavement. On the lane of east direction, sea side, bad roughness is not appeared.

### (3) Drainage Condition

Since the locations of final outlet are not matching with the flow direction of surface water, rainwater inundates at sag sections of the highway between Sta. 1+000 and Sta. 3+000. Improvement of the profile and installation of additional drainage facilities are necessary. The final outlets such as sea and creeks are far from the road section between Sta. 4+000 and Sta. 6+000. A concrete box culvert with the size of 1.2 x 1.2m is installed along the shoulder of east direction lane between Sta. 3+918 and Sta. 4+700, and the surface water is drained to this culvert.

No drainage facility is provided for the section between Sta. 5+000 and Sta. 5+900. Therefore, rainwater on the east direction lane drains into roadside golf course while rainwater on the west direction lane is pooling on the road shoulder and it evaporates or penetrates into the ground naturally.

No inundation is occurring in the city center section and 2-lane section (Sta. 6+000 – Sta. 9+000).

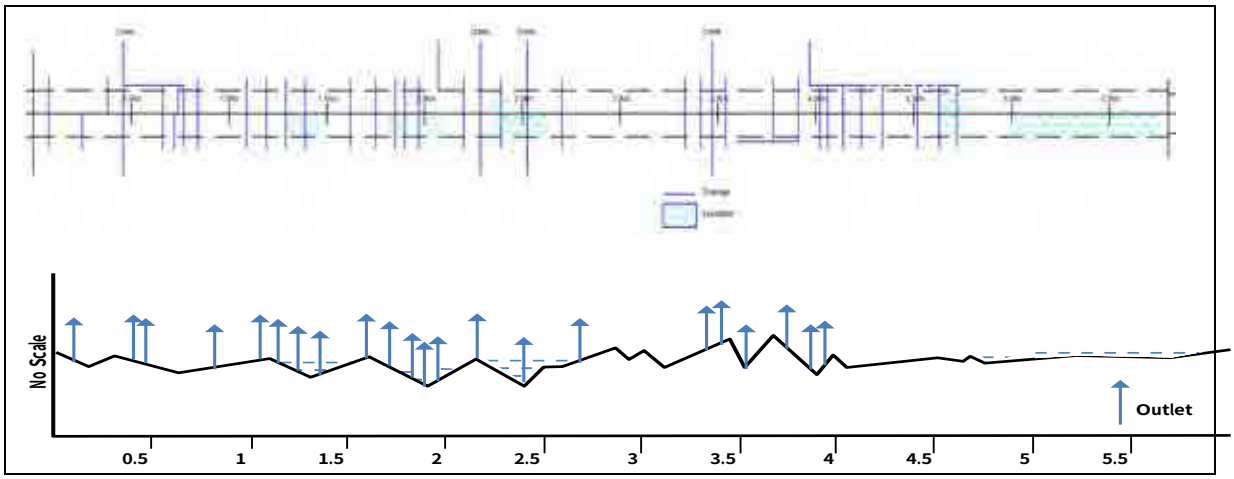



**Figure 1-2-18 Present Drainage Network / Road Profile / Location of Inundation**

### (4) Bus Stops

The buses in Honiara are wagons and mini buses which are operated by private. The buses are stopping at the bus stops between the city center and King George XI school. The east end of Lungga Bridge and the Central Market are the origin/destination of many buses where buses stop long time for waiting passengers.

### (5) Erosion of Shore

The Kukum Highway is near to the shore at Sta. 1+400, Sta. 3+250 and Sta. 3+900. These shores are eroded by high waves during the natural disaster such as cyclones and storm surge, but the erosion is not progressing since the usual tide level variation is about 1m only. MID executed the repair work at heavily eroded portions and the shores are protected by concrete masonry with large coral blocks.

### (6) Summary of Road Condition

In the request of the project, the road section was divided into 2 sections at King George XI School due to the difference of cross section composition. As the result of the site survey, it

was found that the pavement and drainage conditions were quite different on the section until Sta. 3+000 and the remaining. Thus, the concerned road section is divided into 3 sections. The features of the road conditions by sections are summarized as shown in Table 1-2-12.

**Table 1-2-12 Road Condition by Section of the Kukum Highway**

| | Section-1 | Section-2 | Section-3 |
|---|---|---|---|
| Section | From City Council Roundabout to Sta. 3+000 (about 3km) | from Sta. 3+000 to the King George VI H. School (about 3km) | from King George VI H. School to Honiara International Airport (about 3km) |
| Road Width | 4-lane | 4-lane | 2-lane |
| Pavement Condition | - Existing pavement is AC.<br>- Deep mesh cracks exist at most of the section.<br>- Roughness is bad since it repaired repeatedly.<br>- Base course is damaged at parts of the section.<br>- Frequent repair is needed.<br>- Trafficability is not good.<br>- Needs of reconstruction is high. | - Existing pavement is AC.<br>- Shallow mesh cracks exist at some parts of the section<br>- Roughness is better than Section-1.<br>- Base course is not damaged at most of the section.<br>- Frequent repair is not necessary.<br>- Trafficability is not bad.<br>- Needs of reconstruction is not high. | - Existing pavement is DBST.<br>- Crack is not serious.<br>- Needs of repair is not urgent. |
| Drainage Condition | - Inundating sections are 4 in total about 600m.<br>- Embankment to improve the profile and additional installation of outlets are necessary.<br>- Many existing malfunctioning drainage facilities are necessary to be repaired.<br>- When inundating, driving and walking is difficult and dangerous.<br>- Large scale work is necessary to improve the drainage condition. | - Inundating section is about 100m.<br>- Repair of several existing facilities and additional installation of facilities are necessary.<br>- Level of disturbance of driving and walking is no serious.<br>- Necessary work to improve drainage condition is not large scale. | - Drainage improvement work has been done recently, therefore, no additional work is necessary. |
| Roadside Condition | Roadside is urbanized with public facilities, shops and residents. | Section from Sta. 3+000 to Sta. 4+700 is same as Section-1. The remaining section is not urbanized. | Roadside is mostly farms and grass land. |
| Present ADT | 27,000-38,000 | 18,000-27,000 | Approx. 18,000 (at King George VI H. School) |

### 1-2-3 Bridge Condition

#### 1-2-3-1 New Mataniko Bridge

**(1) Existing Bridge Condition**

New Mataniko Bridge was constructed in 1984 with assistance of the government of Australia. For around 30 years the bridge has been used without major maintenance. Due to the increase of the traffic volume and the 2-lane bridge is located in 4-lane highway, the bridge is bottlenecking the traffic and causing traffic congestion. Therefore, widening of the bridge to 4-lane is necessary. To widen the bridge, construction of additional 2-lane bridge is proposed. To clarify whether the existing bridge can be used continuously or not, the soundness of the bridge was examined by structural analysis and visual inspection.

(a) Structural Soundness Analysis

The structural dimensions of the existing bridge were measured as shown in Figure 1-2-19. The bridge is 3 of 21.6m spans.

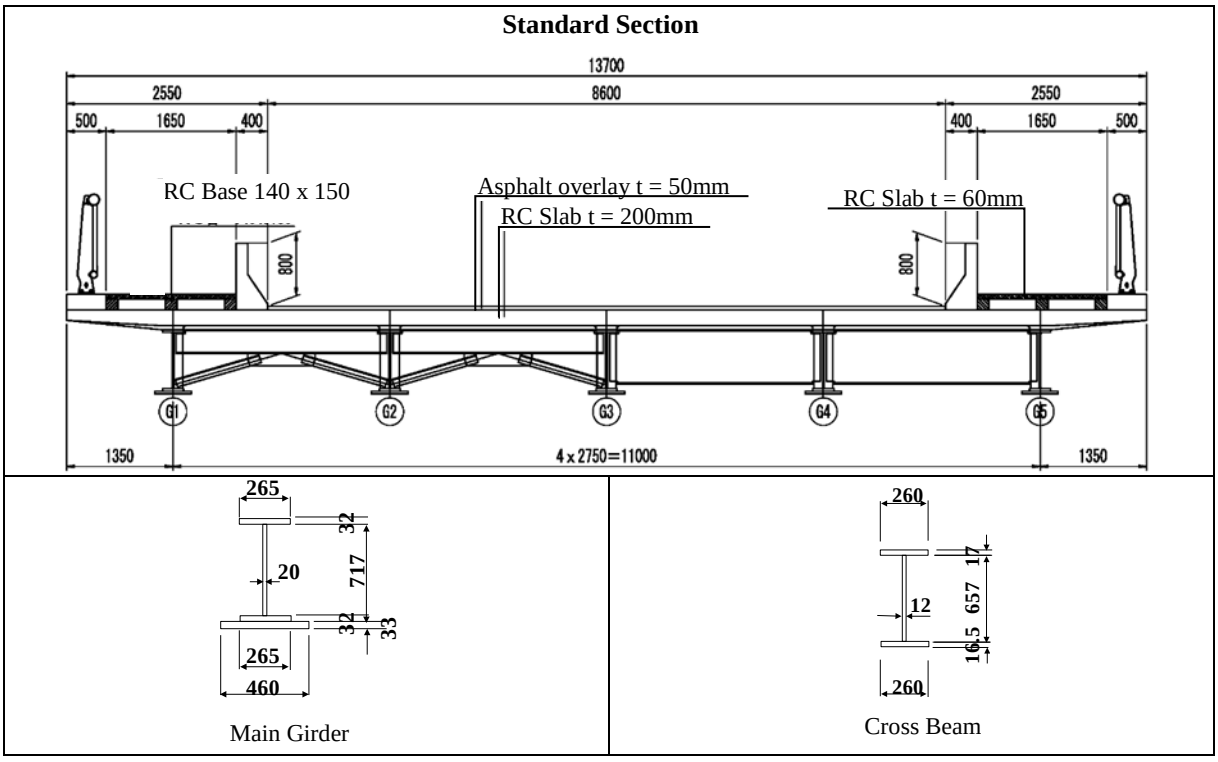



**Figure 1-2-19 Measurement of Existing New Mataniko Bridge**

The stress of the steel girder of the bridge was analyzed under the loading of "B-live load" of Japanese bridge design specification. Since no design and construction data of the bridge is available, the steel girder material is assumed to be SS400 which is the lowest strength steel despite higher strength steel is deemed to be used. In case the steel material is SS400, the maximum stress of the girder exceeds 17% of the allowable stress under the loading of B-live load of Japanese specification as shown in Table 1-2-13. Therefore, the existing bridge can be used continuously.

**Table 1-2-13 Result of Structural Analysis (Stress of G1-girder at the span center)**

| Loading Combination | Stress of Steel Girder | | Excess of Allowable Stress | |
|---|---|---|---|---|
| | At Top | At Bottom | | |
| 1. Before composite | -146.6 | 82.1 | During construction | |
| 2. After composite | -9.1 | 63.9 | | |
| 3. Creep | -7.4 | 1.7 | | |
| 4. Shrinkage | -24.6 | 5.2 | | |
| 5. Temperature | -17.7 | 3.5 | | |
| 6. 1+2 [N/mm$^2$] | -155.6 | 146.1 | | |
| Allowable stress | (-140.0) | (140.0) | +11% | +4% |
| 7. 1+2+3+4 [N/mm$^2$] | -187.6 | 153.0 | +17% | +9% |
| Allowable stress | (-161.0) | (140.0) | | |
| 8. 1+2+3+4+5 [N/mm$^2$] | -205.3 | 156.5 | +13% | |
| Allowable stress | (-182.0) | (161.0) | | |
| 9. Check of yield stress [N/mm$^2$] | -256.8 | 234.3 | +9% | |
| Allowable stress | (235.0) | (235.0) | | |
| Concrete stress [N/mm$^{2]}$ | -4.50 < -8.57 | | | |

Note: In 1993, the Japanese bridge design specification introduced “B-live load” to reflect the increase of trailer truck passage. 80% of bridges in Japan were designed with former live load (L-20 live load). B-live load is 25% larger than L-20 live load. But loading limit control is not applied for the bridges in Japan.

(b) Visual Inspection of Bridge Soundness

Table 1-2-14 shows the visual inspection result.

**Table 1-2-14 Visual Inspection Result of New Mataniko Bridge**

| Bridge Component | Defect/Damage | Cause | Countermeasure |
|---|---|---|---|
| Deck Slab | Crocodile cracks appear under carriageway.<br>Part of concrete was spalled. | Deck slab span is big (2.75m) and thickness (20cm) is small.<br>Heavy track loading increased. | To replace deck slab. |
| Main Girder | Paint condition is still sound except pinhole corrosion. | No repainting for long time. | To repaint parts or whole of the girder. |
| Bearing | About 10 anchor nuts dislocated. Paint peeled off and corroded. | Someone removed the nuts.<br>No repainting for long time. | To procure and install nuts. |
| Expansion Joint | Rubber joint at A1, P1, A2 deteriorated. A part of rubber-steel combined type joint at P2 dislocated. | Rubber joints were covered by asphalt overlay.<br>Lack of maintenance. | To replace all expansion joints. |
| Drainage Pipe | Steel pipe corroded. | Lack of maintenance. | To replace corroded pipes with PVC pipe. |
| Abutment | No defect.<br>Dust deposited on abutments. | - | To clean the dust. |
| Pier | No defect.<br>Dust deposited on abutments. | | To remove deposited dust. |
| Slope Protection | A2 abutment slope protection was washed out. | Scoured by flood. | To repair slope protection. |

It is desirable to implement all of the abovementioned countermeasures in this project. However, replacement of expansion joints and drainage pipes and repair of the slope protection are to be included in this project due to their urgency. Regarding with the deck slab, the cracks will develop and the slab is possibly broken down after 10 to 15 years, however replacement of the deck slab was not included in the project since it is not urgently necessary and it considerably increases the project cost and duration.

### 1-2-3-2 Old Mataniko Bridge

#### (1) Existing Bridge Condition

Old Mataniko Bridge was 54.9m long bailey bridge with single lane carriageway and sidewalks at the both sides. The bridge was washed out by the flood occurred in April 2014. Two month after, the bridge was urgently restored with similar bailey bridge by the Government of New Zealand. The photograph of the existing Old Mataniko Bridge is shown in Figure 1-2-20.

Side View

Deck View

**Figure 1-2-20 Existing Old Mataniko Bridge**

### 1-2-4 Traffic Condition around the Central Market

#### (1) Existing Condition

(a) Inadequate Capacity of Bus Bays

The section around the Central Market is the most congested along the Kukum Highway. Bus bays around the Central Market are too small to accommodate arriving buses, therefore buses are waiting on the through traffic lanes to enter the bus bays. The waiting buses on the through lanes are causing traffic congestion.

(b) Pedestrian Road Crossings

The underpass near the Central Market has been closed and there is no road crossing facility for pedestrians around the Central Market. Therefore chaotic frequent road crossing of pedestrians are causing traffic congestion around the Central Market.

A Bus Bay

Pedestrians Road Crossings

**Figure 1-2-21 Bus Bay and Pedestrian Road Crossing around the Central Market**

### (2) Congestion Condition Survey at the Central Market

(a) Bus Stop Duration Survey

Bus stop duration survey was conducted at the 4 bus bays around the Central Market to calculate necessary number of bus berth. Bus arrival time and departure time were recorded at each bus stop from 8:00am to 6:00pm for 2 days (Feb. 26 (Wed) and Feb. 27 (Thu) in 2014). The list and the location of bus bays around the Central Market are shown in Table 1-2-15 and Figure 1-2-22.

**Table 1-2-15 List of Bus Bays around the Central Market**

| No. | Destination | Direction |
|---|---|---|
| 1 | White River, Rove | West bound |
| 2 | KG VI, Lungga, Kolaridge, Naha | East bound |
| 3 | Henderson | |
| 4 | Gppol 1, 2, 3 | |

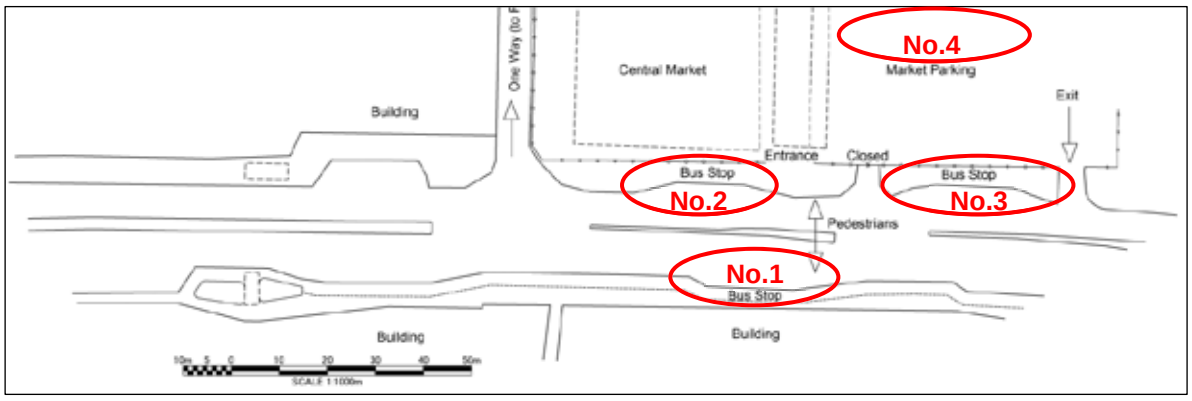



**Figure 1-2-22 Location of Bus Bays around the Central Market**

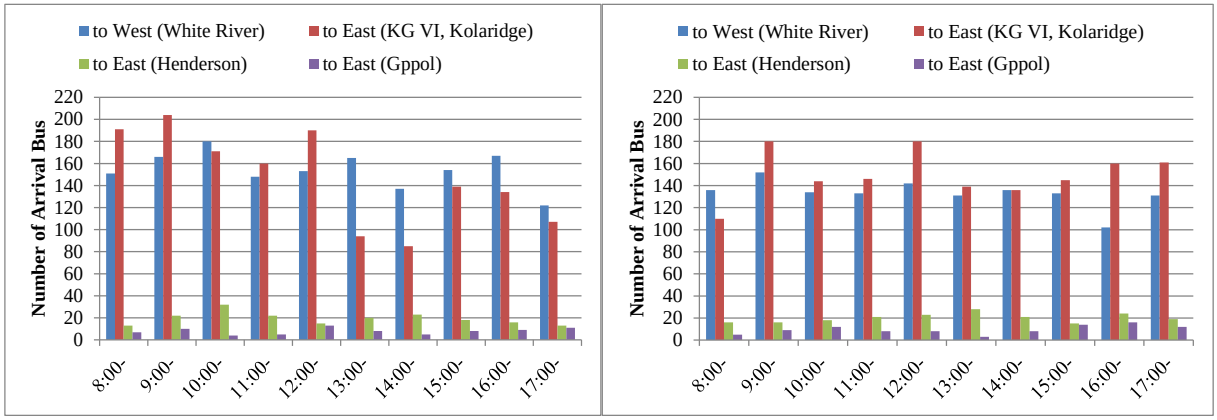
The result of the bus stop duration survey is shown in Table 1-2-16 and Figure 1-2-23. The number of arrival buses in peak hours at bus bay No.1 and No.2 was around 200 buses and the peak hour is in the morning. The maximum number of buses waiting simultaneously were 8 at

bus stop No.1 and No.2, 7 at bus stop No.3 and 12 at bus stop No.4. Average waiting time was 7 minutes at bus stop No.1 and No.2, 6 minutes at bus stop No.3 and 40 minutes at bus stop No.4.

**Table 1-2-16 Number of Arrival Buses and Number of Buses Waiting**

| Bus Stop No. | | Total No. of Arrival Bus (vehicle/10 hour) | No. of Arrival Buses in Peak Hour (vehicles/hour) | Maximum No. of Simultaneous Waiting Bus (vehicle) | Average Waiting Time |
|---|---|---|---|---|---|
| 1 | First Survey | 1,330 | 152 | 7 | Less than 1 min |
| | Second Survey | 1,543 | **180** | **8** | Less than 1 min |
| 2 | First Survey | 1,501 | 180 | **8** | Less than 1 min |
| | Second Survey | 1,475 | **204** | 7 | Less than 1 min |
| 3 | First Survey | 201 | 28 | 6 | 6 min |
| | Second Survey | 194 | **32** | **7** | 6 min |
| 4 | First Survey | 95 | **16** | **12** | 40 min |
| | Second Survey | 80 | 13 | 9 | 32 min |

Note: The First Survey: 26 Feb, 2014 (Wed), The Second Survey: 27 Feb, 2014 (Thu)




a) The First Survey b) The Second Survey

Note: The first survey was conducted on Feb. 26 (Wed) and the second survey was conducted on Feb 27 (Thu) in 2014

**Figure 1-2-23 Hourly Number of Arrival Buses**

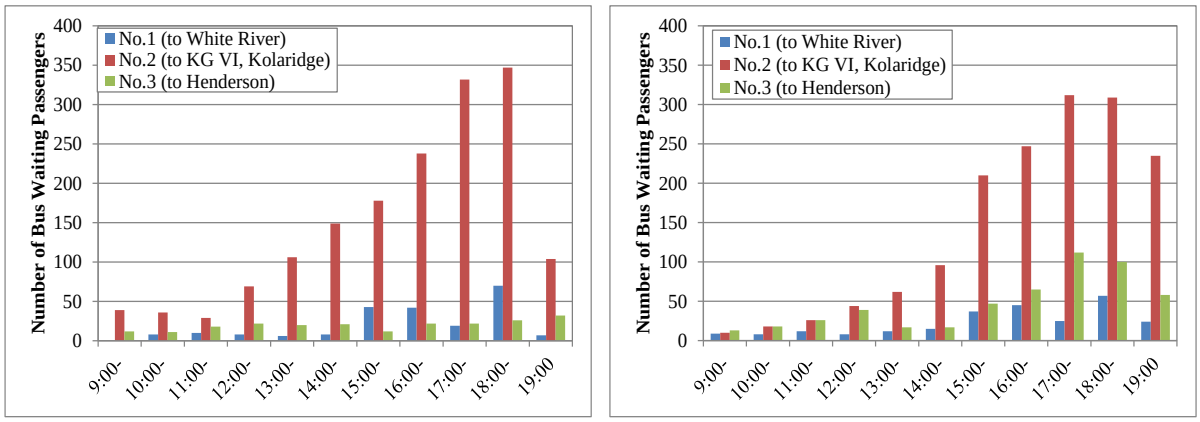
(b) Number of Passengers Waiting for Buses

Counting number of passengers waiting for buses was conducted at 3 bus bays (No.1, No.2 and No.3) in order to determine the necessary space for passengers to wait for buses. The number of passengers waiting for buses was recorded every 15 minutes from 9:00am to 7:00pm for 2 days (Mar. 6 (Thu) and Mar. 7 (Fri) in 2014). The result of counting of passengers waiting for buses is shown in Table 1-2-17 and Figure 1-2-24. The number of passengers waiting for buses in the peak hour at bus bay No.1 was 70, at bus bay No.2 it was 347 and at bus bay No.3 it was 112. The peak hour is around 6:00pm.

**Table 1-2-17 Number of Passengers Waiting for Buses in Peak Hour**

| Bus Bay No. | | No. of Passengers who Waiting for Buses in Peak Hour (passenger) | Peak Hour |
|---|---|---|---|
| 1 | First Survey | 70 | 6:00pm |
| | Second Survey | 57 | 6:30pm |
| 2 | First Survey | 347 | 6:00pm |
| | Second Survey | 312 | 5:45pm |
| 3 | First Survey | 32 | 7:00pm |
| | Second Survey | 112 | 5:45pm |

Note: The first survey was conducted on Mar. 6 (Thu), 2014 and the second survey was conducted on Mar. 7 (Fri), 2014.




a) The First Survey b) The Second Survey

Note: The first survey was conducted on Mar. 6 (Thu), 2014 and the second survey was conducted on Mar. 7 (Fri), 2014.

**Figure 1-2-24 Maximum Number of Passengers Waiting for Buses by Hour**

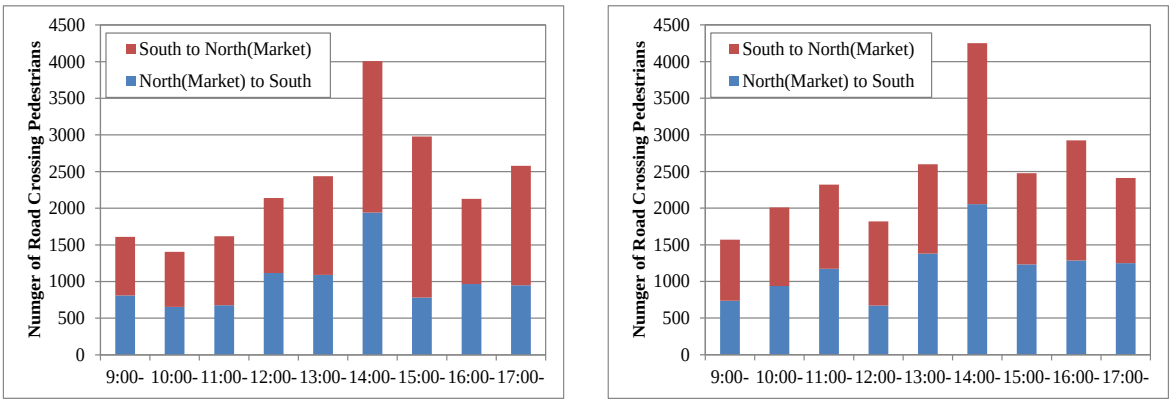
(c) Number of Pedestrians Crossing the Road

Counting of pedestrians crossing the road was conducted between Hyundai Mall and the east side of the Central Market in order to determine the necessary width of the road crossing facility. The number of pedestrians crossing the road was counted from 8:00am to 6:00pm for 2 days (Mar. 4 (Mon) and Mar. 5 (Tue) in 2014). The result of the counting of the number of pedestrian crossing the road is shown in Table 1-2-18 and Figure 1-2-25. The number of pedestrians crossing the road in the peak hour was 4,388 between 2:15pm and 3:15pm.

**Table 1-2-18 Number of Pedestrians Crossing the Road in Peak Hour**

| Direction | Survey Date | No. of Pedestrians Crossing the Road in Peak Hour | Peak Hour |
|---|---|---|---|
| North to South | First Survey | 1,941 | 2:00pm–3:00pm |
| | Second Survey | **2,054** | 2:00pm–3:00pm |
| South to North | First Survey | **2,844** | 2:30pm–3:30pm |
| | Second Survey | 2,199 | 2:00pm–3:00pm |
| Both Direction | First Survey | **4,388** | 2:15pm–3:15pm |
| | Second Survey | 4,253 | 2:00pm–3:00pm |

Note: The first survey was conducted on Mar. 4 (Mon) and the second survey was conducted on Mar. 5 (Tue) in 2014.



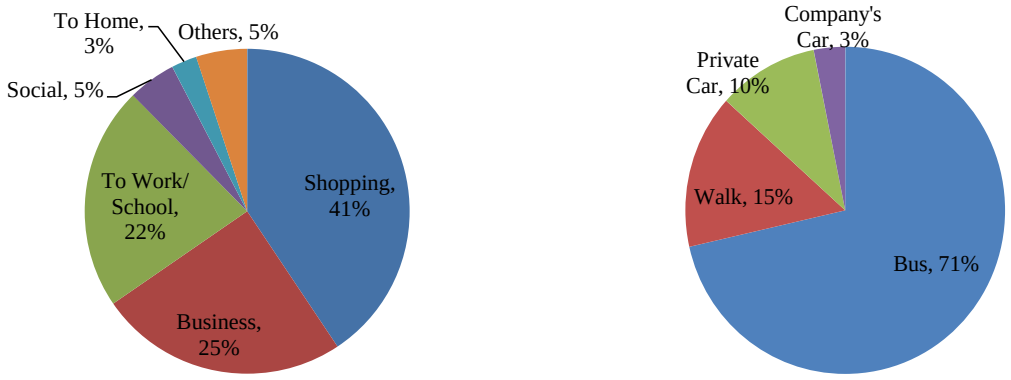

a) The First Survey　　b) The Second Survey

Note: The first survey was conducted on Mar. 4 (Mon) and the second survey was conducted on Mar. 5 (Tue) in 2014.

**Figure 1-2-25　Number of Pedestrians Crossing the Road by Hour**

(d)　Pedestrian's Moving Path Survey

Pedestrian's moving path survey was conducted around the Central Market. The Surveyors asked pedestrians about their moving path around the Central Market. Sample number was 315 pedestrians. Figure 1-2-26 shows trip purpose and transportation mode of respondents. Main trip purpose was shopping and main transportation mode was bus. Figure 1-2-27 shows moving pass of pedestrians. Main departure point and destination were the Central Market and the bus bays around the Central Market.




a) Trip Purpose　　b) Transportation Mode

**Figure 1-2-26　Pedestrian's Trip Purpose and Transportation**

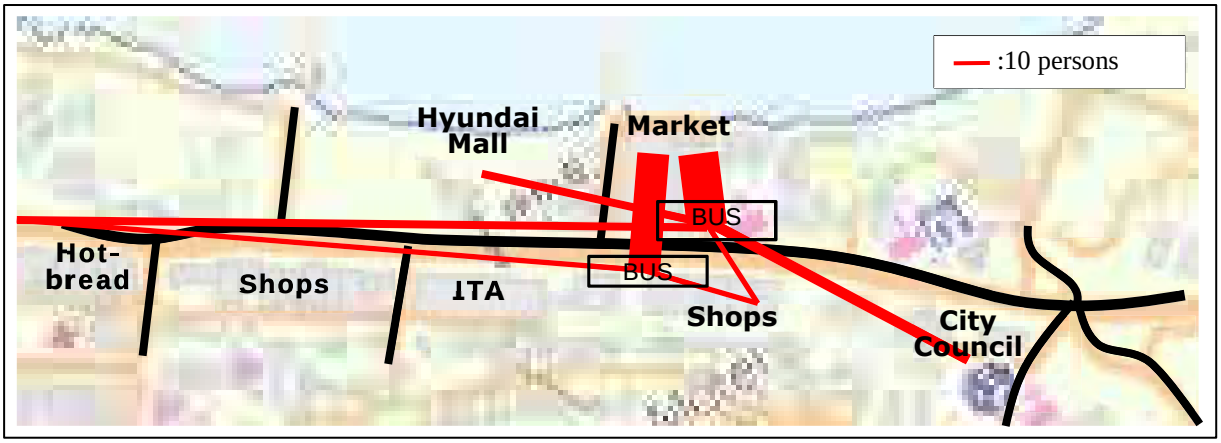



**Figure 1-2-27　Pedestrian's Moving Path**

(e) Preference Interview Survey

(i) Outline of the Interview

To mitigate the traffic congestion around the Central Market, it is necessary to control the frequent chaotic road crossing. Before the proposal of the measures, it should be surveyed whether the measures are to be accepted by the majority of the pedestrian or not. To survey it, an interview survey was conducted around the Central Market in March 2014. The outline of the interview survey result is shown in the following:

Road Crossing Facility

Ø Necessity of improvement: Necessary (89%)

Ø Facility type: Controlled crosswalk (83%)

Ø Location: In front of the Central Market (53%), In front of Hyundai Mall (26%)

Underpass

Ø Improvement measure: Provide policeman (63%), Installation of light (18%)

Ø Possibility of using the underpass: Possible to use the underpass (91%)

Installation of Barrier Fence

Ø Necessity of barrier fence: Necessary for safety (93%)

(ii) Sample Number

Sample number was 308 pedestrians and 153 drivers. Figure 1-2-28 and Figure 1-2-29 shows attribute of respondents. 81% of respondents of pedestrians and 94% of respondents of drivers were male. 70% of respondents were between 20 and 39 years old.

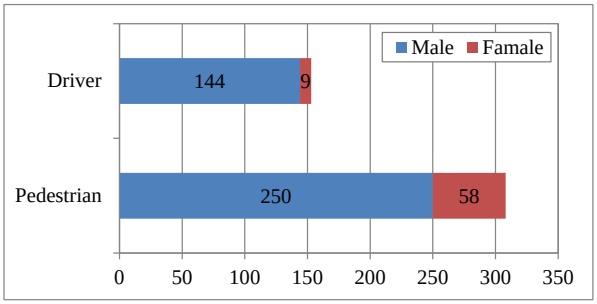



**Figure 1-2-28 Sex of Respondents**

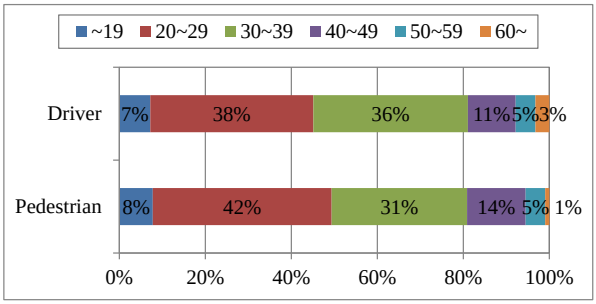
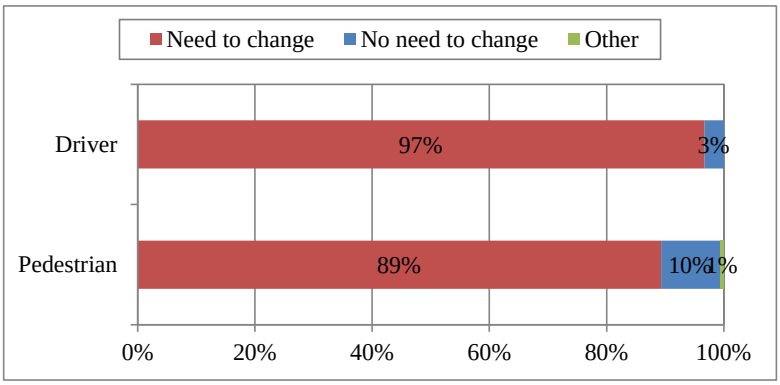



**Figure 1-2-29 Age of Respondents**

(iii) Road Crossing Facility for Pedestrians

In regards to the question on necessity of improvement of road crossing facility, 89% of pedestrians and 97% of drivers selected the choice of “some road crossing facility should be provided”.

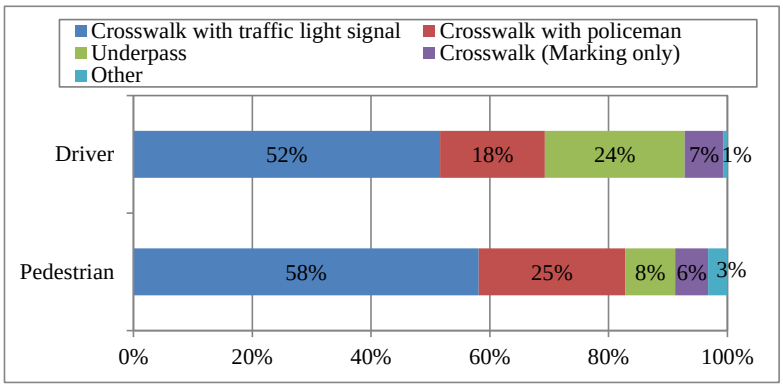



Q: How do you feel existing road crossing facility for pedestrians around the Central Market?

**Figure 1-2-30 Necessity of Road Crossing Facility for Pedestrians**

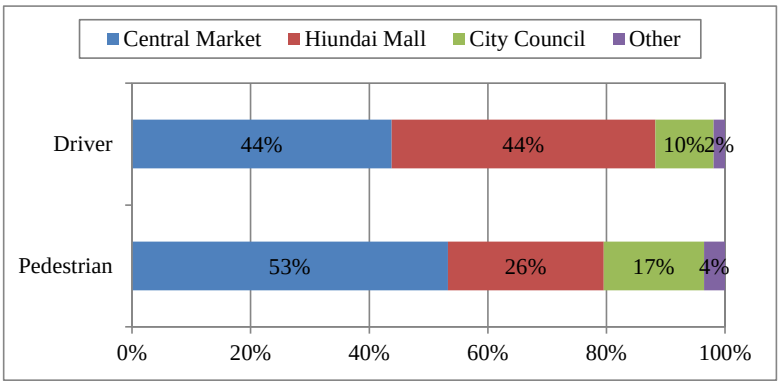
(iv) Road Crossing Facility for Pedestrians

The questions about desired type and location of road crossing facility were posed. More than 70% of respondents selected the choice of "crosswalk with traffic signal or policeman" as desired facility. 50% of respondents selected the choice of "around the Central Market" as desired location for the facility. On the other hand 61% of respondents of pedestrians and 46% of respondents of drivers selected the choice of "Crosswalk (Marking only)" as not acceptable facility.



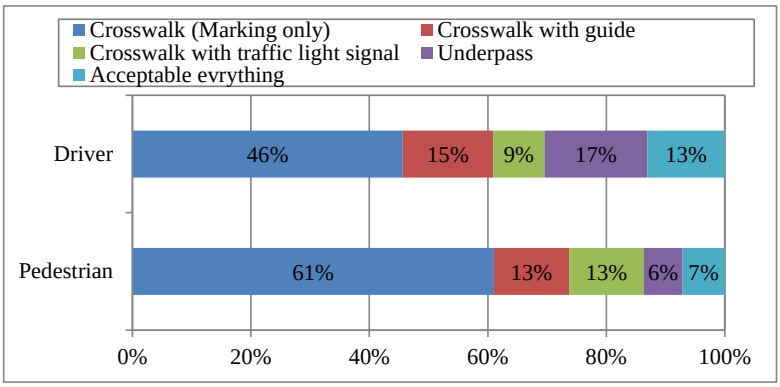

Q: Which type of road crossing facility is desired around the Central Market?

**Figure 1-2-31 Desired Road Crossing Facility**




Q: Where is desired location to construct road crossing facility which is selected above?

**Figure 1-2-32 Desired Location for the Facility**

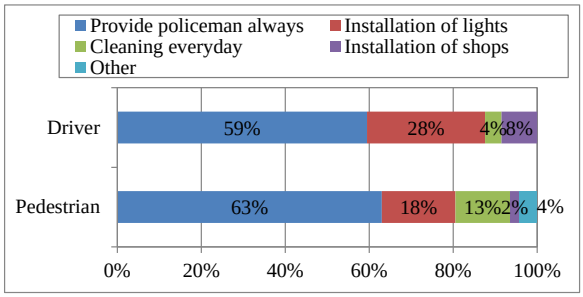



Q: Which type of road crossing facility is not acceptable around the Central Market?

**Figure 1-2-33 Not Acceptable Facility**

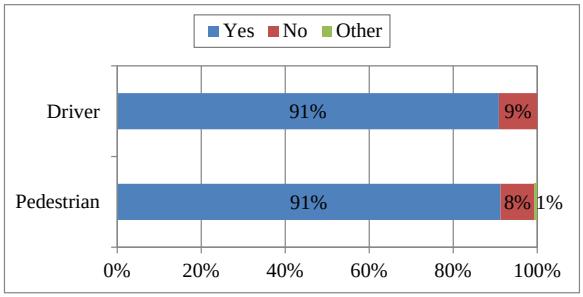
(v) Re-open of Underpass

To understand the possibility of using the underpass, surveyors asked 2 questions to respondents. The first question was "What is desired improvement of the underpass to be used by pedestrians?". 60% of respondents selected the choice of "provide policeman always". The second question was "If the underpass is improved, do you use the underpass?" More than 90% of respondents selected choice of "Yes".




Q: What is desired improvement of the underpass to use the underpass?

**Figure 1-2-34 Desired Improvement**

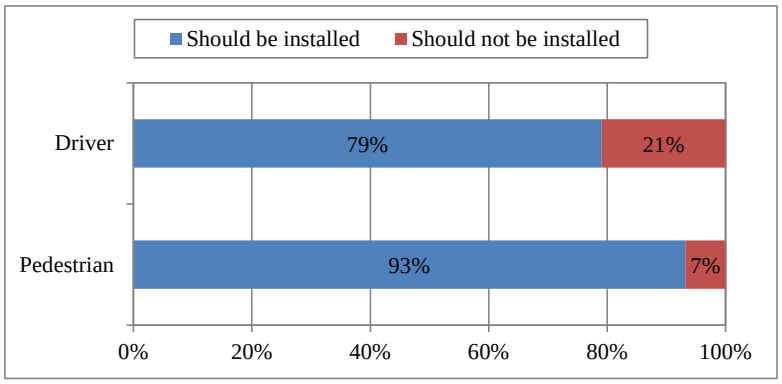



Q: If barrier fence is installed all along median, do you use the underpass with improvement of the underpass?

**Figure 1-2-35 Possibility of Using the Underpass**

(vi) Installation of Fence

Installation of barrier fence is needed along median to keep safety and smooth traffic flow. However if barrier fence is installed, pedestrians have to access to road crossing facility to across the highway. It causes inconvenience for pedestrians. It is needed to understand the preference of pedestrian's acceptability of the barrier fence. 93% of respondents of pedestrians and 79% of respondents of drivers selected the choice of "the fence should be installed". And the main reason was "for safety".

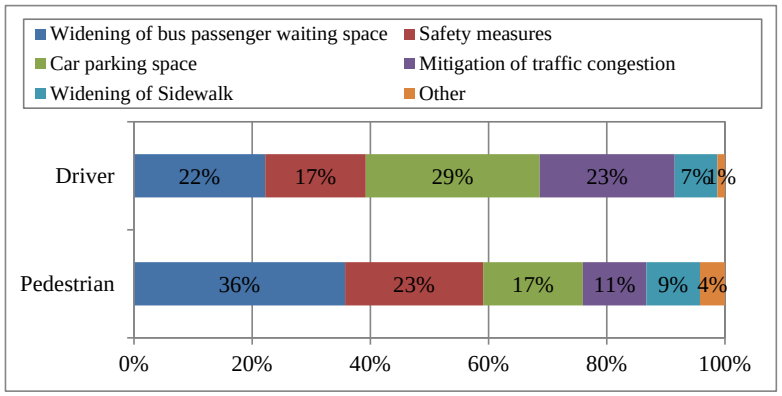



Q: What do you think about installation of barrier fence along median with installation of road crossing facility?

**Figure 1-2-36 Necessity of Installation of Fence**

(vii) Desired Improvement around the Central Market

Respondents were asked about desired improvement around the Central Market. 36% of pedestrians selected the choice of "Widening of bus waiting space" and 23% of them selected "Safety measures". 29% of drivers selected "Car parking space" and 23% of them selected "Mitigation of traffic congestion".




Q: What improvement do you want around the Central Market?

**Figure 1-2-37 Desired Improvement around the Central Market**

## (3) Necessary Capacity of Facilities

(a) Bus Berth

Necessary number of bus berth was calculated based on the result of bus stop duration survey. Basically, planned number of bus berth was set based on peak hour necessary number of bus berth in year 2033 or present maximum number of buses waiting simultaneously. Bus waiting duration at bus bay No.1 and No.2 were assumed as 1.5 minutes to calculate necessary number of bus berth. Maximum number of buses waiting simultaneously at bus bay No.3 (Destine to Henderson) was 7 while 5 berths was planned for bus bay No. 3 because bus service to Henderson is not so frequent and waiting duration is long. These waiting buses need to be controlled by bus association or City Council or traffic police. Bus stop No.4 is located in the parking of the Central Market, so this bus stop is excluded from this project.

**Table 1-2-19 Planned Number of Bus Berth**

| No. | Destination | Bus Waiting Duration | No. of Arrival Bus in Peak Hour | | Peak Hour Necessary No. of Bus Berth | | Maximum No. of Bus Waiting Simultaneously | Planned No. of Bus Berth |
|---|---|---|---|---|---|---|---|---|
| | | | Year 2014 | Year 2033 | Year 2014 | Year 2033 | | |
| 1 | White River | 1.5 min | 180 | 270 | 5 | 7 | 8 | 8 |
| 2 | KG VI | 1.5 min | 204 | 310 | 5 | 8 | 8 | 8 |
| 3 | Henderson | 6 min | 32 | 50 | 3 | 5 | 7 | 5 |
| 4 | Gppol | 40 min | 16 | 25 | 11 | 16 | 12 | - |

(b) Bus Passenger Waiting Space

Bus waiting passengers are standing tightly along the bus bays as shown in Figure 1-2-38. Existing bus waiting passenger's density is about 4 persons per $1m^2$. Passengers are standing close together even though there is a space behind them. Bus passenger's waiting space is planned as 3.3 persons per $1m^2$ in this survey. This space is correspond with service level D (Passengers are able to stand without touching other passengers but it is difficult to pass through among passengers) in Pedestrian Planning and Design, John J. Fruin, December 1974".

**Figure 1-2-38 Bus Waiting Passenger in front of the Central Market**

**Table 1-2-20 Planned Waiting Space for Bus Passenger**

| No | Destination | No of Bus Waiting Passengers (persons) | | Planned Waiting Space ($m^2$) |
|---|---|---|---|---|
| | | Year 2014 | Year 2033 | |
| 1 | White River | 70 | 100 | 30 |
| 2 | KG VI | 347 | 500 | 150 |
| 3 | Henderson | 112 | 160 | 48 |

(c) Width of Road Crossing Facility

Capacity of road crossing facility was calculated based on service level D of "Pedestrian Planning and Design, John J. Fruin, December 1974". Number of road crossing pedestrians in peak hour and capacity of road crossing facilities are shown in Table 1-2-21. The crosswalk and underpass are able to accommodate the forecasted peak hour traffic volume as of 2033.

**Table 1-2-21 Capacity of Road Crossing Facility**

| Direction | No. Road Crossing Pedestrians in Peak Hour (Persons) | | | Capacity (Persons) | | |
|---|---|---|---|---|---|---|
| | Year 2014 | Year 2033 | Peak Hour | Crosswalk (Width: 10m, opening duration: 1 minute in every 5 minute) | Underpass (Width: 3m) | Total |
| North to South | 2,054 | 2,900 | 2pm-3pm | 5,040 | 7,200 | 12,240 |
| South to North | 2,844 | 4,100 | 2:30pm-3:30pm | | | |
| Both Direction | 4,388 | 6,300 | 2:15pm-3:15pm | | | |

(d) Waiting Space for Road Crossing Pedestrians

In order to install crosswalk, waiting space for pedestrians is necessary to be provided. Density for pedestrian waiting space is planned as 3.3 persons per $1m^2$. It is the same density as bus passenger waiting space. Calculated pedestrian's waiting space is shown in Table 1-2-22.

**Table 1-2-22 Pedestrian Waiting Space**

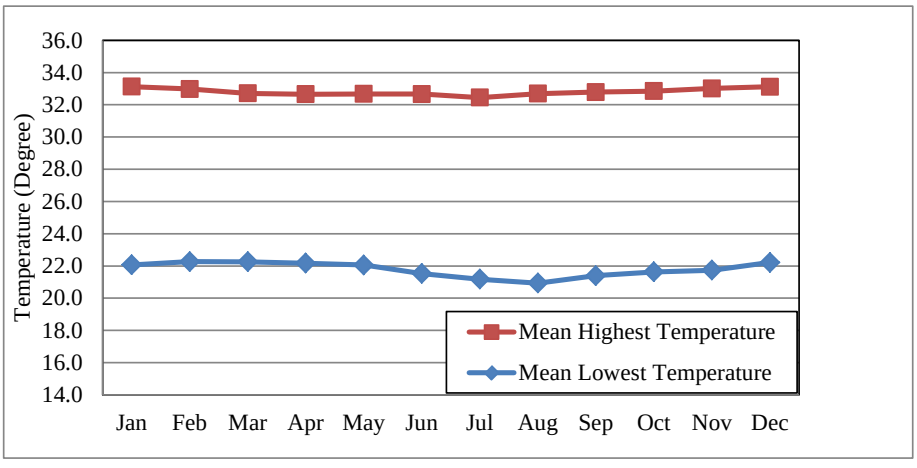
| Side | No. Road Crossing Pedestrians in Peak Hour | | Necessary Waiting Space ($m^2$) |
|---|---|---|---|
| | Year 2014 | Year 2033 | |
| North Side (North to South) | 170 person/cycle<br>2,054 person/hour | 240 person/cycle<br>2,900 person/hour | 80 |
| South Side (South to North) | 240 person/cycle<br>2,844 person/hour | 340 person/cycle<br>4,100 person/hour | 110 |

Note: to calculate necessary waiting space, it is estimated that crosswalk open 1 minute in every 5 minutes.

## 1-2-5 Meteorology and Hydrology

### (1) Temperature

The monthly mean high temperature and low temperature recorded at Honiara Meteorology Office is shown in Figure 1-2-39. The highest monthly mean temperature is 35 degree and the lowest monthly mean temperature is 17.6 degree.

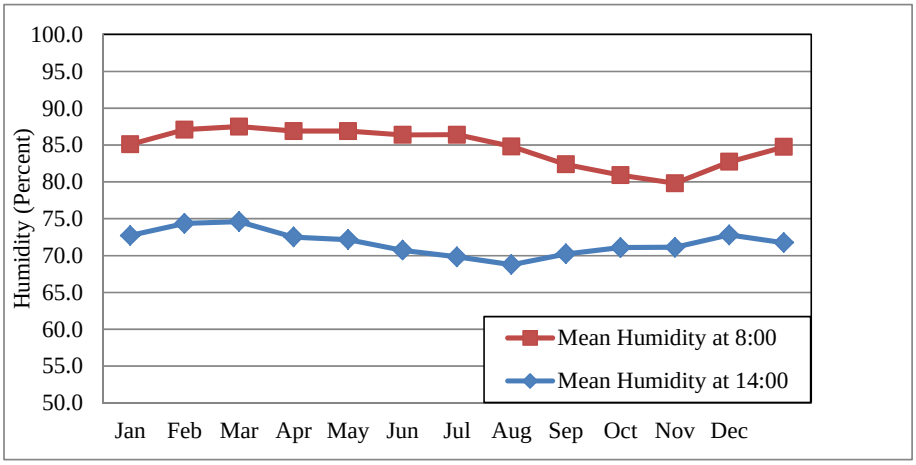



Source: The Survey Team

**Figure 1-2-39 Monthly Mean Temperature**

### (2) Humidity

The monthly mean humidity at 8:00 and 14:00 recorded at Honiara Meteorology Office is shown in Figure 1-2-40.



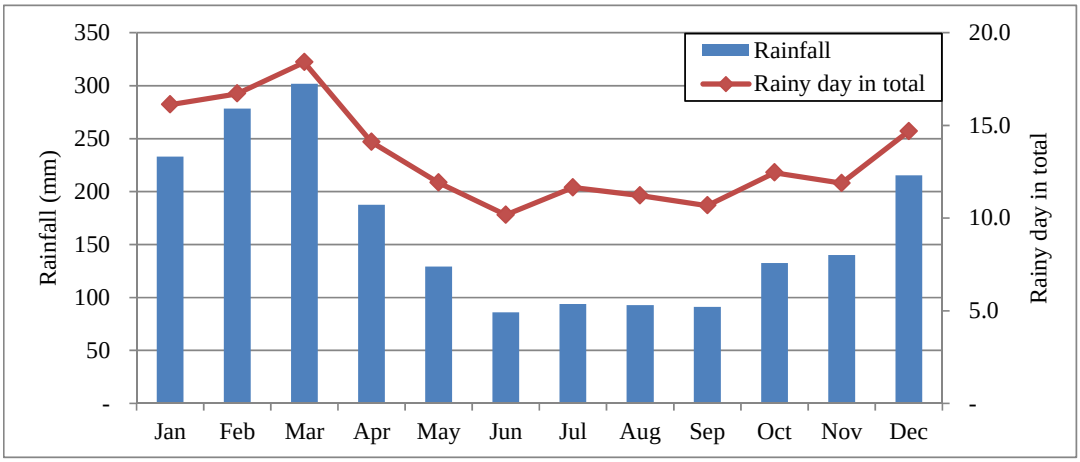

Source: The Survey Team

**Figure 1-2-40 Monthly Mean Humidity (8:00 and 14:00)**

### (3) Rainfall

The monthly mean rainfall and number of rainy days at Honiara Meteorology Office are shown in Figure 1-2-41. The annual mean rainfall is about 1987mm.

The max rainfall per day was recorded as 251.8mm before the flood occurred in April 2014. The maximum rainfall in a day was 318mm recorded on April 3, 2014 when Tropical Cyclone Ita hit Honiara.

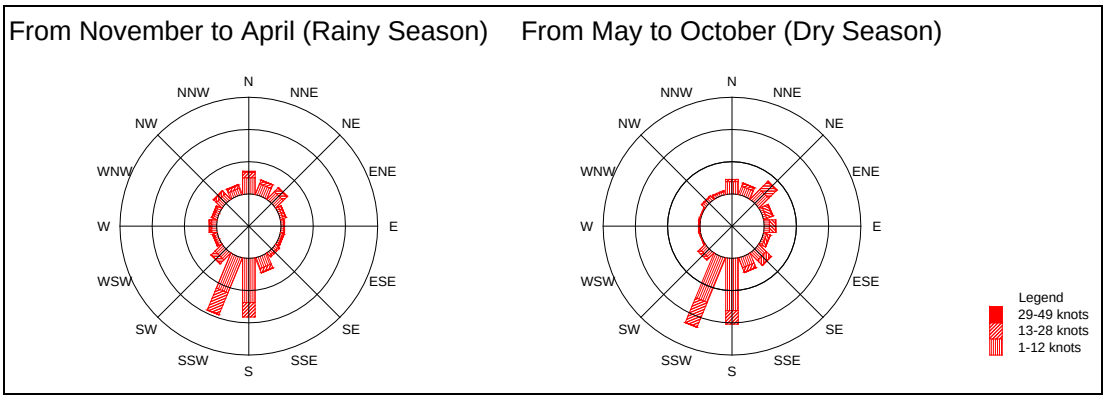



Source: The Survey Team

**Figure 1-2-41 Monthly Mean Rainfall**

### (4) Wind

The direction and velocity of wind at the offshore of the north side of at Honiara Meteorology Office are shown in Figure 1-2-42.

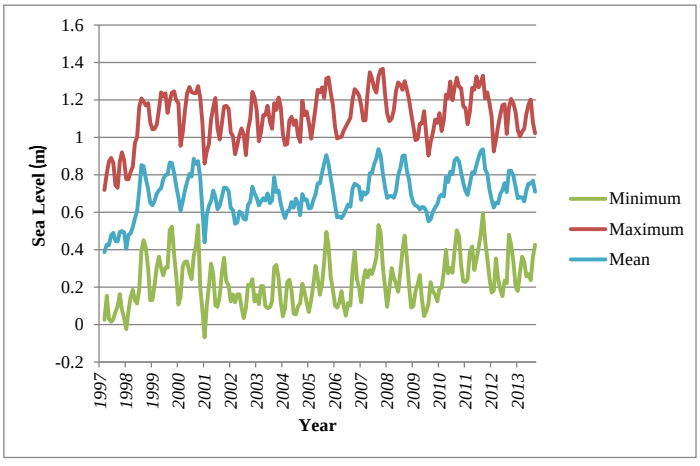



Source: The Survey Team

**Figure 1-2-42 Wind Data in the Offshore of North Side of Guadalcanal**

### (5) Tide

The tide data recorded around the Honiara Port by Australia's National Meteorological Service is shown in Figure 1-2-43.




Source: The Survey Team

**Figure 1-2-43 Tide Condition at Honiara Port**

### (6) Disaster

The main disasters in Honiara are tropical cyclone and other disasters are earthquakes, Tsunami and etc. The tropical cyclones usually attack Honiara in rainy seasons from November to April. The tropical cyclones which caused costly damages are shown in Table 1-2-23.

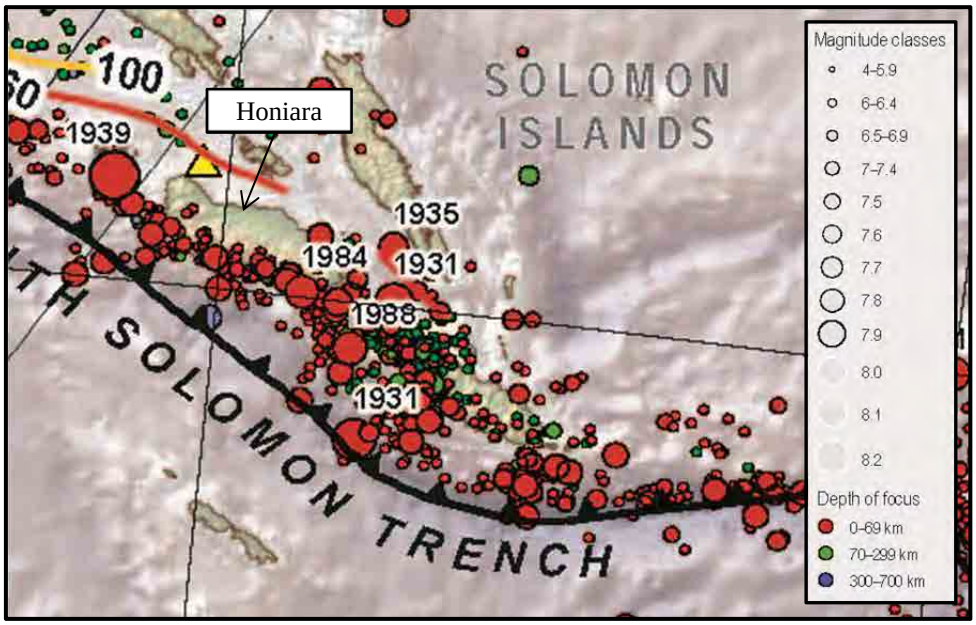
**Table 1-2-23 Record of Tropical Cyclone**

| # | Name | Year | Period | Rainfall (mm) | Loss / Damage |
|---|---|---|---|---|---|
| 1 | Angela | 1966 | 13 Nov. to 19 Nov. | 317.2 | Food crops were extensively damaged. |
| 2 | Glenda | 1967 | 26 Mar. to 8 Apr. | 376.4 | Houses were flooded; food crops and seafront were seriously damaged. |
| 3 | Ursula | 1971 | 2 Dec. to 16 Dec. | 159.4 | - |
| 4 | Carlotta | 1972 | 5 Jan. to 21 Jan. | 905.2 | The coast along the Kukum Highway was damaged and other seafront was damaged by flooding and heavy seas. |
| 5 | Wendy | 1972 | 30 Jan. to 9 Feb. | 186.6 | Blackout<br>West side part of Metapona river was flooded. |
| 6 | Emily | 1972 | 27 Mar. to 2 Apr. | 198.7 | No recorded |
| 7 | Ida | 1972 | 30 May to 3 Jun. | 185.1 | Flood of houses and food crops was damaged. |
| 8 | Bernie | 1982 | 1 Apr. to 7 Apr. | 291.2 | Flood was occurred in the some part of Guadalcanal and more than one thousand people were evacuated. |
| 9 | Hina | 1985 | 11 Mar. to 17 Mar | 372.4 | In the islands of Vanikoro, Utupia, and Tikopia, houses were damaged. |
| 10 | Namu | 1986 | 15 May to 22 May | 335.2 | Heavy flooding was occurred by heavy rains and caused serious damage to more than one thousand houses and had left 95 people dead. Infrastructure and plantations were severely damaged. |
| 11 | Anne | 1988 | 9 Jan. to 14 Jan. | 120.8 | There was no serious damage in the Guadalcanal Island. |
| 12 | Nina | 1992 | 30 Dec. to 2 Jan. | - | Velocity was recorded 75-100 knot.<br>More than 30 thousand people were affected. |
| 13 | Katarina | 1998 | 6 Jan. to 8 Jan. | 106.2 | There was no serious damage in the Guadalcanal Island. |
| 14 | Ita | 2014 | 1 Apr. to 7 Apr. | 730.0 | Mataniko River was flooded and houses were washed away and infrastructure damaged, with an estimated 12,000 people affected. There were around 10 thousand people displaced. |

Source: The Survey Team

### (7) Earthquake

The Solomon Trench lays in the southern side of the Solomon Islands. For this reason, the earthquakes occur frequently in the Solomon Islands. The epicenters of the earthquakes occurred from 1900 to 2010 are shown in Figure 1-2-44.




Source: U.S. Geological Survey

**Figure 1-2-44 Earthquake Epicenters**

### (8) Hydrology

#### 1) Condition of Mataniko River

The condition of Mataniko River is as follows.

- River width is approximately 50m at Old Mataniko Bridge and New Mataniko Bridge.
- Catchment area is about 55sq. km.
- River length is about 19.5km.
- Riverbed slope is 1/25 to 1/600.

#### 2) Probable Rainfall

The probable rainfall was calculated by using the daily rainfall data recorded from 1951 to April 2014 (missing from 1975 to 1986) including the maximum daily rainfall of 318mm recorded on April 3 2014. The probable rainfall is shown in Table 1-2-24.

**Table 1-2-24 Probable Rainfall**

| Return Period | Probable Rainfall (mm/day) | |
|---|---|---|
| | Lognormal Distribution | Gumbel |
| 10 | 191 | 201 |
| 20 | 223 | 232 |
| 30 | 243 | 251 |
| 40 | 257 | 264 |
| 50 | 268 | 274 |
| 100 | 305 | 305 |
| 200 | 341 | 323 |

Source: The Survey Team

According to Table 1-2-24, the rainfall of 318mm per day recorded on April 3, 2014 is about 150 years return period. The probable rainfall of 274mm per day was adopted for the calculation of design flood discharge as the 50 years return period.

**3) Period of Concentration**

The period of concentration was calculated based on the river length and the river rise of the catchment area of Mataniko River. As a comparison of calculation results using several formulas, 150 minutes was adopted as shown in Table 1-2-25.

**Table 1-2-25 Period of Concentration**

| Method | Kraven | Uniform Flow Velocity | Doken | Kadoya | Kinematic Wave |
|---|---|---|---|---|---|
| Period of Concentration (min) | 90 | 150 | 330 | 130 | 190 |

Source: The Survey Team

**4) Average Rainfall Intensity against Time of Concentration**

The result of average rainfall intensity against time of concentration is shown in Table 1-2-26.

**Table 1-2-26 Average Rainfall Intensity against Time of Concentration**

| | Ito Method | Mononobe Method |
|---|---|---|
| Average Rainfall Intensity against Time of Concentration (mm/h) | 40.1 | 50.5 |

Source: The Survey Team

**5) Catchments Area**

Catchments area 55sq.km was obtained by using the topographic map.

**6) Run-off Factors**

The run-off factor 0.80 was assumed based on Manual for River Works in Japan.

**7) Design Peak Discharge**

The design peak discharge is calculated with the following rational formula:

$Qp = 1/3.6*fp*r*A = 630m^3/s$

Qp: Design peak discharge in $m^3/s$

r : Average rainfall intensity

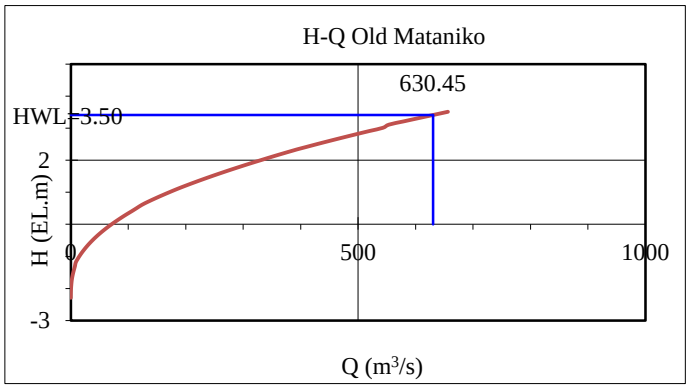
fp: Runoff coefficient

A: Catchment area

As a result, the design peak discharge of Mataniko River was computed as $630m^3/s$.

### 8) Analyzed Flood Water Level at Old Mataniko Bridge

The discharge vs. water level curve at Old Mataniko Bridge was obtained using manning formula as shown in Figure 1-2-45. The analyzed flood water level 3.5m was obtained from the figure when the discharge is 630m$^3$/sec.

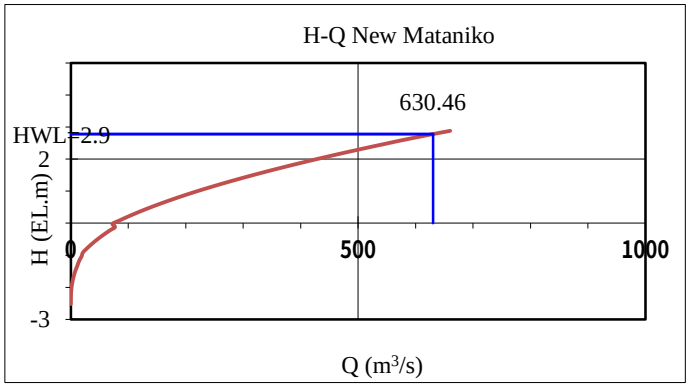



Source: The Survey Team

**Figure 1-2-45 Discharge vs. Water Level Curve at Old Mataniko Bridge**

### 9) Design Flood Water Level at New Mataniko Bridge

The discharge vs. water level curve at New Mataniko Bridge was obtained using manning formula as shown in Figure 1-2-46. The analyzed flood water level 2.9m was obtained from the figure when the discharge is 630m$^3$/sec.




Source: The Survey Team

**Figure 1-2-46 Discharge vs. Water Level Curve at New Mataniko Bridge**

The daily rainfall of April 3, 2014 was 318mm per day which is more than 50 year return period rainfall 274mm per day. However the observed flood water level at New Mataniko Bridge was almost the same as the analyzed flood level. The reasons why the flood level was lower than the analyzed were because that the river cross section at the New Mataniko Bridge became large due to scoring by the flood and the flood water was absorbed by the lowland area located just upstream side of the New Mataniko Bridge.

**10) Design High Water Level (HWL) to be applied for Bridge Design**

As the result of the above, the design flood level to be applied for the bridge design is shown in Table 1-2-27.

**Table 1-2-27 Analyzed and Observed Flood Water Level and High Water Level**

| | At New Mataniko Bridge | At Old Mataniko Bridge |
|---|---|---|
| Design Peak Discharge (return period of 50 years) | 630m$^3$/sec | 630m$^3$/sec |
| Analyzed Flood Water Level | 2.9m | 3.5m |
| Observed Flood Water Level (April 3, 2014) | 2.9m | 3.9m |
| High Water Level for the bridge design | 2.9m | 3.5m |

Source: The Survey Team

The high water level (HWL) at Old Mataniko Bridge is 0.4m lower than the observed flood water level occurred on April 3, 2014 which was dammed by the former bailey bridge. The project bridge girder bottom elevation (4.5m) is about 0.6 higher than the dammed water level (3.9m).

## 1-2-6 Geology and Roadbed Soil Property

### (1) Natural Condition Survey

Topographic Survey

The topographic survey was conducted approximately 3.6km along the Kukum Highway from Sta.0-600 to Sta. 3+000 and at New Mataniko Bridge and Old Mataniko Bridge. The outline of the topographic survey is shown in Table 1-2-28.

**Table 1-2-28 Outline of Topographic Survey**

| Contents | The Kukum Highway | New Mataniko Bridge and Old Mataniko Bridge |
|---|---|---|
| Method | Three Dimensional Survey using Total Station | |
| Item | Centerline, Profile, Cross Section, Topographic and Drainage Channel | Topographic, Profile, Cross Section and Centerline of approach road |
| Amount | Centerline and Profile Survey 3.6km, Cross Section Survey @ 20m, Topographic Survey about 3.4km$^2$ | Topographic Survey at New Mataniko Bridge about 0.6km$^2$<br>Topographic Survey at Old Mataniko Bridge about 2.0km$^2$<br>Centerline and Profile Survey 2.0km,<br>Cross Section Survey 8 sections |
| Result | Plan, Profile and Cross Sections | |

Geotechnical Investigation

**1) Roadbed Soil Investigation**

The roadbed soil investigation (CBR test and Dynamic Cone Penetration Test) was conducted at eight spots of every around 500m interval on the project road in order to obtain the soil data necessary for the design of the pavement structure. The CBR test and Dynamic Cone Penetration Test were conducted at the same spots. Outline of the roadbed soil investigation is shown in Table 1-2-29.

**Table 1-2-29 Outline of CBR and Dynamic Cone Penetration Test**

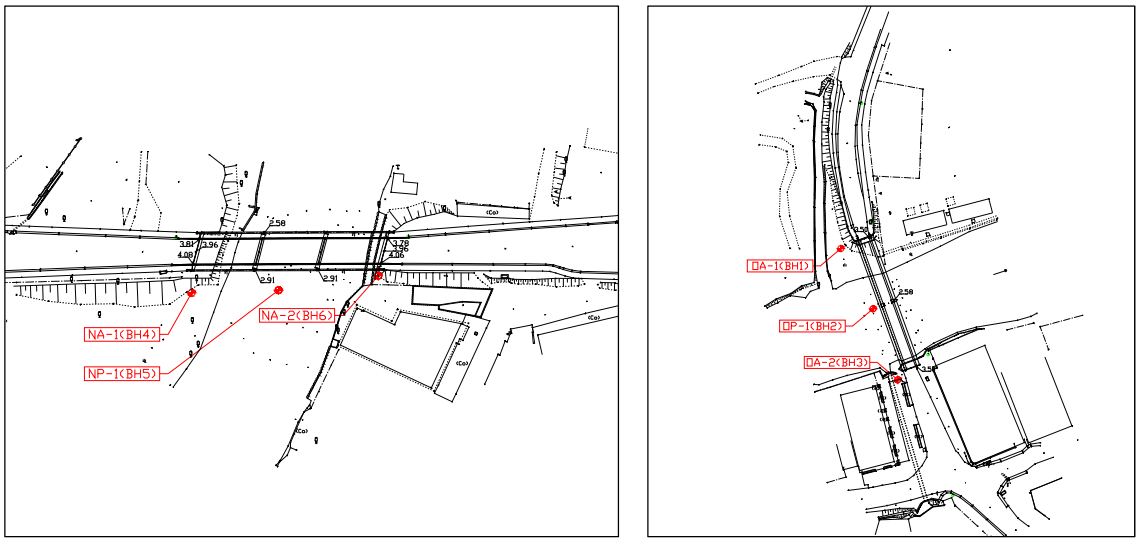
| Contents | CBR Test | Dynamic Cone Penetration Test |
|---|---|---|
| Method | Pitting, Laboratory Test | Penetration test using dynamic cone |
| Item | CBR tests, Moisture-density relation, Atterberg Limits, Specific Gravity, Moisture Content, Sieve Analysis, Soil Classification | Hitting number to penetration of soil |
| Amount | 8 spots | 8 spots |
| Result | Result of Laboratory Test | DCP graph |

### 2) Boring Survey

The boring survey was conducted at three spots of each bridge in order to obtain the soil data necessary for the design of foundation of New Mataniko Bridge and Old Mataniko Bridge. The drilling was conducted to confirm the location of the hard strata. The outline of boring survey is shown in Table 1-2-30 and the location of boring survey is shown in Figure 1-2-47. The geological log is shown in Appendix 12-3.

**Table 1-2-30 Outline of Boring Survey**

| Contents | Descriptions |
|---|---|
| Method | Wash Boring |
| Item | Standard Penetration Test (Each 1m), Sampling and Specific Gravity |
| Amount | 3 spots at New Mataniko Bridge (2 spots at near the each abutment and 1 spot at center of the river)<br>3 spots at Old Mataniko Bridge (2 spots at near the each abutment and 1 spot at center of the river) |
| Result | Geological log, Photos of Sampling, Result of laboratory test and Report |




At New Mataniko Bridge　　At Old Mataniko Bridge

**Figure 1-2-47 Location of Boring Survey**

## 1-3 Environmental and Social Consideration

### 1-3-1 Environmental Impact Assessment (EIA)

#### 1-3-1-1 Introduction

This project is an improvement of existing road facilities. On the other hand, the implementation of the project will also improve the current environmental situation. The project needs land acquisition (City Council Roundabout, New Mataniko Bridge, Old Mataniko Bridge and Vura intersection: approximately 0.3ha), however, it does not cause involuntary resettlement. Considering these points, the project is categorized as category B under the JICA Guidelines for Environmental and Social Considerations (2010) (hereinafter refer to as "the JICA Guidelines").

In accordance with the EIA procedure of the Solomon Islands, the project is required to submit a Public Environmental Report (PER), that is equivalent to an Initial Environmental Examination (IEE). The survey team assisted MID to conduct EIA study and prepare the PER.

#### 1-3-1-2 Project Components Which Affect Environmental and Social Conditions

The project components which affect environmental and social conditions due to the project are shown in Table 1-3-1.

**Table 1-3-1 Project Components**

| Project Components | Contents of Components |
|---|---|
| (1) Upgrading of the Kukum Highway (section from City Council Roundabout to Ministry of Fishery) | Re-pavement, strengthening of intersection and installation of bus bays |
| (2) Countermeasure against Traffic Congestion around the Central Market | Traffic facility improvements including bus bay and crosswalk |
| (3) Widening of New Mataniko Bridge | Construction of an additional bridge |
| (4) Improvement of City Council Roundabout | Improvements including expansion of circle, lanes and connecting roads |
| (5) Replacement of Old Mataniko Bridge | Rebuilding of the existing bridge for two lanes |

Source: The Survey Team

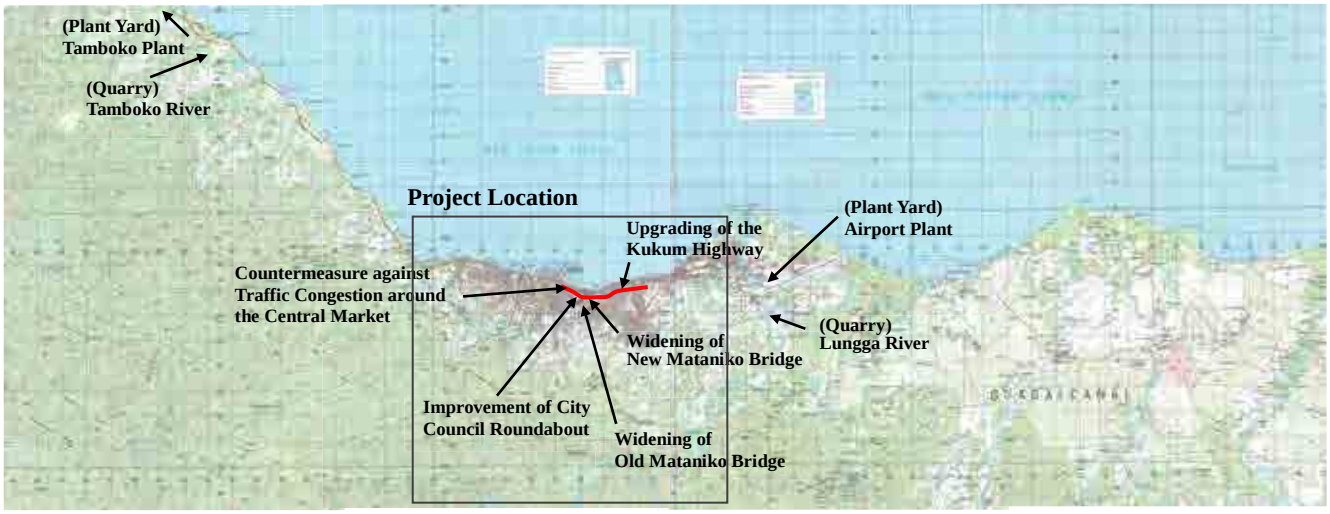
**Quarry and Plant Yard**

The project needs a quarry and a plant yard which provides gravel and central maceprocesses aggregate around the project area. Two candidate quarry sites are shown in Table 1-3-2 and Figures 1-3-1, 2, and 3. The quarry will be selected from these two sites by MID. The plant yard should be determined near the quarry to improve transport efficiency and reduce negative impacts.

**Table 1-3-2 Candidate Sites for Quarrying**

| Candidate Sites for Quarrying | Location (from the project area) | Plant Yards |
|---|---|---|
| Lungga River | Approximately 10km to the east | Airport Plant |
| Tamboko River | Approximately 30km to the west | Tamboko Plant |

Note: Both plant yards are existing facilities.
Source: The Survey Team




Source: The Survey Team

**Figure 1-3-1 Location of Quarry and Plant Yard**

**Figure 1-3-2 Tamboko River**

**Figure 1-3-3 Lungga River**

**Borrow Pit of Embankment Soil**

A borrow pit located at 5km west of the project site will be used (Figure 1-3-4). However, behind the borrow pit, there is a school facility of Tanlan school. During the excavation work, mitigation measures should be considered to avoid the impacts on the school.

Surplus soil will be generated through the construction activities, but should be reused as much as possible to reduce unnecessary soil gathering and avoid environmental impacts at borrow pit.

**Figure 1-3-4 Borrow Pit (Tanlan School)**

### 1-3-1-3 Environmental and Social Baseline

#### (1) Location

The Solomon Islands is located at south latitude 5 to 12 degrees, and east longitude 154 to 172

degrees, approximately 1,900km to northeast of Australia. It is an islands country that consists of approximately 100 islands. The whole area of the country is 28,896km$^2$. Guadalcanal, where the project site is located, is the largest island with area of 5,320km$^2$. Most of the island is mountainous, and plains are limited on the north coastal area including the project site.

**Social Environment**

**(2) Demography**

The population of the Solomon Islands is 515,870 (2009). The populations of Guadalcanal province and Honiara City are 93,613 and 64,609. Urban population of the Solomon Islands is 102,030, which is 19.8% of the whole population. The growth rate of the whole country and urban population is 2.3% and 4.7%. Gender ratio is approximately same.[1]

The official language is English. However, only 1 to 2% of the whole population speaks English. It is spoken in Honiara City only. Although Melanesian Pidgin is a lingua franca, 120 indigenous languages are spoken across the whole country.[2]

Ethnic group consists of Melanesian 95.3%, Polynesian 3.1%, Micronesian 1.2%, and other 0.3%.[3]

**(3) Land Use**

The lands of the Solomon Islands consist of *customary land* and *public land*. The public land is owned by the "Commissioner of Lands" (COL) on behalf of the Government. Any person (Solomon Islander) can lease a public land with a time limited term from COL. The ownership of the lands is registered and recorded by the Ministry of Land, Housing and Surveys (MLHS).

The COL holds the interests of almost all of the lands in Honiara and in the eight provincial capitals across the country. Most of the commercial and agricultural lands in the Solomon Islands are also owned by the government. Consequently, the Government of the Solomon Islands is currently the largest owner of the perpetual estates.[4]

In the north of Guadalcanal Island, the project area is located. There are business, government and municipal offices, residences, educational institutions, industrial zone and port facilities in Honiara City (see Figure 1-3-5). In the east of Honiara City, particularly the east of Honiara international airport, the palm plantations are being developed in a large scale (see Figure 1-3-6). In the west of Honiara City, there is an undeveloped area with a large virgin forest which reaches the coast. In the south of Honiara City, there is a long stretch of hills and undeveloped mountainous areas (see Figure 1-3-7).[5]

The Kukum Highway, one of the project components, is the only main road that connects the

1 Solomon Islands National Statistics Office, 2009
2 The World Factbook, 2009
3 The World Factbook, 2009
4 World Bank, 2011
5 The Survey Team

center of Honiara City and the airport. Stores, offices, government offices and religious facilities are located from the Central Market to Mataniko River. A medical institution (Central Hospital, see Figure 1-2-8), the University of the South Pacific, stores, residences and industrial zone are scattered along the Highway from Mataniko River to the King George National High School[6].

**Figure 1-3-5 The Kukum Highway around the New Mataniko Bridge**

**Figure 1-3-6 Palm Plantation Located to the East of the Project Site**

**Figure 1-3-7 Long Stretch of Hills in the South of the Project Site**

**Figure 1-3-8 Central Hospital located along the Kukum Highway**

**(4) Infrastructure/ Public Facilities**

A tribal conflict, which occurred from 1998 to 2003, drove the nation into near-collapse. Basic social services were hampered by this incident, and the economy of the Solomon Islands was lethally impacted. Nowadays the social system is in the process of rebuilding. However, the development of the fundamental infrastructure such as road and power supply has been still left behind. Moreover, social services provided by the Government are remained low level.[7]

One of the major constraints for the private sector development in the Solomon Islands is unreliability, poor coverage, and high cost of power supply. Over 80% of the rural population are without access to electricity. The high cost of imported fuel has led to a dramatic increase

[6] The Survey Team
[7] The Survey Team

in electricity cost. Blackouts are quite often. While many businesses and government offices rely on standby generators, many small and medium-sized enterprises and most microenterprises are unable to afford this option.[8]

The length of the road network in the country is approximately 1,661km. The length of paved road is only 139km (6%). The maintenance level of both paved and unpaved roads are very poor. Therefore, the Government insists on the maintenance of existing roads.[9]

The road network of Honiara City is concentrating along the Kukum Highway. The highway is significantly congested since it is the only road connecting the business area, the airport and major points.[10]

With regard to urban transport, public buses are the principle means of transport and are being operated along the Kukum Highway. However, operations are few in other areas.[11]

The facilities for pedestrians are insufficient. In the business area along the Kukum Highway, it is hard for pedestrians to cross the Kukum Highway. This causes congestion and accidents.[12]

Water supply and sewage are operated by the Solomon Islands Water Authority. The water service rate in Honiara City was only 72% in 2011. Moreover, the degraded pumps make it difficult to provide stable water supply. Approximately two third of users are supplied only for a few hours in a day.[13]

### (5) Economy, Industry

Gross National Income (GNI) per capita of the Solomon Islands is US$1,110 in 2011, and categorized as the Least Developed Countries. Economic growth rate in 2011 is 9.0%.

Most of the people engage in agriculture, fishery and forestry. Most of the manufactured and petroleum products depend on imports.

Gross Domestic Product (GDP) consists of primary industry (agriculture, fishery and forestry) 51.8%, secondary industry 9.2%, and tertiary industry (services) 39%.

The main agricultural products are cocoa, coconuts, palm kernels, rice, potatoes, vegetables, fruit, cattle and pigs.[14]

The mining products are gold, bauxite and nickel. Gold is mined at the Gold Ridge in the suburbs of Honiara City. Petroleum has not been extracted although it is said that there exist petroleum reserves in the coastal areas.

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8 ADB, Australian Government, AusAID, 2010
9 Ministry of Infrastructure and Development, Solomon Islands Government, 2013
10 National Transport Plan 2011-2030, 2010
11 National Transport Plan 2011-2030, 2010
12 National Transport Plan 2011-2030, 2010
13 The Survey Team
14 The World Factbook, 2009

### (6) Health and Hygiene

The Solomon Islands has the high incidence of malaria. The infection rate of Plasmodium falciparum, which usually gets patients become severe, accounts for 64% of the total[15].

Malaria has a higher mortality than other diseases in the Solomon Islands. Approximately eight percent of the cause of death is due to malaria[16]. The tribal conflict which occurred at the end of 1998 obstructed malaria control, and this escalated the incidence of malaria.

## Natural Environment

### (7) Geometry and Geology

Geometry and geology is referred on

### (8) Climate and Hydrology

Climate and hydrology is referred on

### (9) Protection Area

There are no national park, world heritage and marine conservation area around the project site. In regard to other areas, the Solomon Islands is supporting the following preservation areas:

1) East Rennell Lale Ferano (world heritage)

2) Arnavons Conservation Area (marine conservation areas in Santa Isabel and Choiseul)

3) Tetepare Islands (marine and land conservation area)

Besides the above areas there are approximately 130 areas, Locally Managed Marine Area (LMMA) which are small-scale conservation areas supported by the locals. There is no LMMA around Honiara City.

### (10) Fauna, Flora and Habitat

In regard to the forest vegetation, approximately 4,500 species including indigenous palm, orchid and climbing pandanus were found. Sixteen species among them are designated as "threatened" on IUCN Red Data criteria.[17]

Coastal areas have the ecosystem of various mangroves including 13 families, 15 genera and 26 species. These occupy 43% of all the mangrove species. Approximately 62,200ha area of Santa Isabel, Runnel, Shortland, Malaita and New Georgia is a mangrove swamp.[18]

In regard to birds, various species inhabit. Ninety nine species of "restricted-range species" (RR) have been found in the country. Three species among them have been found in

[15] WHO, 2013
[16] World Health Rankings
[17] Ministry of Environment Conservation and Meteorology, 2008
[18] Ministry of Environment Conservation and Meteorology, 2008

Guadalcanal. In regard to mammal, fifty three species are known. Most are bats, mice and opossums. Twenty species among them are indigenous. In regard to reptile, approximately eighty species are known. One third among them is indigenous, besides five species are threatened.[19]

**Pollution**

The Solomon Islands does not have the environment standards including air quality, noise, vibration and water quality. Monitoring for the environment has not been conducted. And existing data of environment are not found.

### (11) Air Quality, Noise and Vibration

The vehicle traffic in Honiara City is extending linearly along the Kukum Highway not two dimensions, and the impacts of air pollution, noise and vibration also extend linearly. Most of vehicles which run in Honiara City are aging vehicles made in Japan. Poorly-maintenance vehicles which discharge black smoke are often seen. (see Figure 1-3-9) In the future, increase of traffic volume may affect road sides.

### (12) Water Quality

Mataniko River, which runs across the Kukum Highway, is being polluted by waste dumping and drainage. (see Figure 1-3-10) The current speed of Mataniko River is significant low at the vicinity of the estuary where New Mataniko Bridge and Old Mataniko Bridge are located. This is causing considerable pollution with the offensive odor.

Waste is also considerably being dumped on road sides of the Kukum Highway. This is deteriorating the capacity of drainage facilities. (see Figure 1-3-11)

**Figure 1-3-9 Vehicles emitting black smoke are often observed.**

**Figure 1-3-10 Mataniko River polluted by waste dumping**

[19] Ministry of Environment Conservation and Meteorology, 2008

**Figure 1-3-11 Waste Blocks Drainage along the Kukum Highway**

**(13) Environmental Issues in the Solomon Islands**

"Solomon Islands State of Environment Report 2008" indicates that the main environmental issues in the Solomon Islands are:

Ø Depletion of forest resources because of over logging

Ø Encroachment of forest and runoff of topsoil

Ø Biodiversity loss

Ø Degradation of coast, sea waters and coral reef

Ø Change of ecosystem due to climate change

### 1-3-1-4 Legal Framework and Organizations of the Environmental and Social Considerations in the Solomon Islands

**(1) Environmental Policies and National Plans**

**National Transport Plan 2011-2030 (NTP 2011-2030)**

The National Transport Plan was formulated in October 2011 as the supreme plan of transport development from 2011 to 2030. The main objectives of the plan are the followings:

Ø Developing transport sector services;

Ø Developing and maintaining transport sector physical infrastructure; and,

Ø Improving the competency and capacity of government agencies, and developing the transport private sector.

The plan sets the implementation programs: the priority of development, the goal of each sector, responsibilities, environmental and social considerations, finances and action plans.

When implementing the transport plan, it requires to mitigate or to minimize environmental and social impacts in accordance with the Environmental Act 1998 and Regulation 2008. (Chapter 10, Environmental and Social Safeguards)

**National Development Strategy 2011 to 2020**

The National Development Strategy 2011 to 2020 is a development strategy which was formulated by the Ministry of Development Planning and Aid Coordination (MDPAC), targeting from 2011 to 2020 (as of 2014, draft final).

The strategy declares that the most important issue is to tackle with climate change because the Solomon Islands is an island country and are vulnerable to sea level rise and natural disaster. Waste pollution, depletion of marine resources, biodiversity, water resources and land resources are the second most important issues.

The strategy stipulates the implementing organizations to tackle with these issues. (7 Creating and Maintaining the Enabling Environment)

## (2) Relevant Laws on the Environment

**The Environment Act 1998, No.8 of 1998**

The Environment Act 1998 is the supreme law on the environment and put into effect in 1998. The act includes the contents of Table 1-3-3.

**Table 1-3-3 Contents of the Environment Act 1998**

| Items | Contents |
|---|---|
| Part 1 : Preliminary | ž Definition<br>ž Objects of the Act |
| Part 2 : Administration | ž Establishment of environmental and conservation division<br>ž Establishment, functions and powers of the environmental advisory committee<br>ž Functions and powers of the division<br>ž Matters on the environmental report |
| Part 3 : Development Control, Environmental Impact Assessment, Review and Monitoring | ž EIA for prescribed development<br>ž Procedure of EIA, implementation and responsibility of developer and MECDM |
| Part 4 : Control of pollution | ž Responsibility for pollution control and penalty |
| Part 5 : Miscellaneous | ž Protection of officers, the general penalty<br>ž Introduction of regulation |
| Schedules | ž Prescribed development that needs environmental consideration |

Part 3 of the Act stipulates the Environmental Impact Assessment (EIA). The schedule attached to the Act determines the “prescribed developments” that need to follow the EIA procedure. The prescribed developments include mining, the agriculture industry, logging, food industry, tourism, public works sector. The projects included in the public works sector are shown below:

**Prescribed Developments (Public Works Sector)**

| | |
|---|---|
| (a) landfills | (g) airport developments |
| (b) infrastructure developments | (h) waste management, drainage and disposal systems |
| (c) major waste disposal plants | (i) dredging |
| (d) soil erosion and siltation control | (j) watershed management |
| (e) hydropower schemes | (k) ports and harbours |
| (f) reservoir development | |

Source: Second Schedule, The Environment Act 1998, No.8 of 1998

The Act stipulates the category of the prescribed developments but not the scale of the project. All the prescribed developments on the schedule need to follow the EIA procedure irrespective of the scale of projects. The project, that is upgrade and improvement of roads and bridges, corresponds to "infrastructure developments", and needs to follow the EIA procedure of the Environment Act 1998.

**The Environment Regulations 2008**

The Environment Regulations 2008 was proclaimed as a supplementary law of the Environment Act 1998. The regulation stipulates mainly the details of EIA. The contents of the regulation are shown in Table 1-3-4.

**Table 1-3-4 Contents of the Environment Regulations 2008**

| Items | Contents |
|---|---|
| Part 1 : Preliminary | ž Objects of the Regulation<br>ž Definition |
| Part 2 : PER (Public Environmental Report) and implementation of EIA | ž Guidelines to assist in the evaluation of PER or EIS<br>ž Persons authorized to undertake PER or EIS<br>ž Additional matters to EIS |
| Part 3 : Applications for Prescribed Development | ž Proposal application, timelines for processing applications<br>ž Implementing matters on PER and EIS |
| Part 4 : Appeal Procedures | ž Grounds of appeal on EIA procedure |
| Part 5 : Control of Pollution | ž Details on the part 4 of the Environment Act 1998 |
| Schedules | ž Prescribed premises<br>ž Prescribed fees<br>ž Prescribed forms |

**Other Relevant Legislation**

Other relevant legislations on environmental and social considerations are shown in Table 1-3-5.

**Table 1-3-5 Other Relevant Legislation**

| Act | Date | Main Objectives |
|---|---|---|
| Wild Life Protection and Management | 1998 | Regulates the international trade in the country's wildlife resources |
| The Town and Country Planning | 1979 | Ensures that land is developed and used in accordance with proper polices and a high consideration to the peoples welfare |
| Provincial Government | 1979 | Devolution of power for making ordinances over wildlife and marine resources with the provinces |
| River Waters | 1973 | Control of the river waters for equitable and beneficial use |
| National Parks | 1978 | Establishes national parks and prohibits fishing and hunting without permit |
| Wild Birds Protection | 1978 | Lists scheduled birds for protection from being killed, wounded, taken or sold; establishes several bird sanctuaries |
| Agriculture and Livestock | 1982 | Provides for protection and advancement of agriculture and livestock industries |
| Lands and Titles | 1988 | Covers the management of land, defines "customary " land, and sets out procedures for land acquisition |
| Forest Resource and Timber Utilization | 1991 | Governs licensing of felling of trees and sawmills, and timber agreements on customary land |
| Mines and Minerals | 1996 | Establishes a system for mining applications and licensing, regulates and controls mining activities |
| Wildlife Management and Protection | 1998 | Provides for the protection, conservation and management of wildlife by regulating the export and import of certain animals and plants |
| Fisheries | 1998 | Framework for fisheries management and development |

Source: The Survey Team

### (3) EIA Procedure

The EIA in the Solomon Islands is implemented according to the Environment Act 1998 and the Environment Regulations 2008.

Based on the scoping which is conducted at the early stage, an implementing division under MECDM, Environment & Conservation Division (ECD), evaluates environmental impacts and categorizes the project as PER or Environmental Impact Statement (EIS). Note that PER is recognized as the Initial Environmental Examination (IEE), and EIS is equivalent to the full EIA.

In 2010, MECDM compiled a guideline of EIA implementation, "Environmental Impact Assessment Guidelines". The Guidelines explains plainly a flow chart and the responsibilities of a project proponent on EIA.

The procedure of PER is the same as that of EIS as shown in Figure 1-3-12.

(a) Proposal of Application

A project proponent prepares an Application that describes a project outline, and submits it to ECD.

(b) Screening

ECD examines the Application to judge the necessity of EIA. When ECD judges it "necessary", ECD continuously conducts the scoping. When ECD judges it "unnecessary", implementation of the project is approved, and a "Development Consent" is issued to the project proponent.

The Environment Act 1998 defines the prescribed developments that need the EIA procedure, however does not define a project scale. Small scale projects which impacts are expected to be insignificant may be judged as "unnecessary" during the screening.

(c) Scoping

If EIA procedure is "necessary", ECD directs the proponent to conduct the EIA. Based on the result of the scoping, ECD determine a category of the project, PER or EIS. Screening and scoping by ECD takes 15 days.

(d) EIA study

The proponent implements EIA and prepares PER or EIS.

(e) Submission of Development Application and PER/EIS

The proponent submits the PER/EIS and a Development Application to ECD.

(f) PER/EIS review (first)

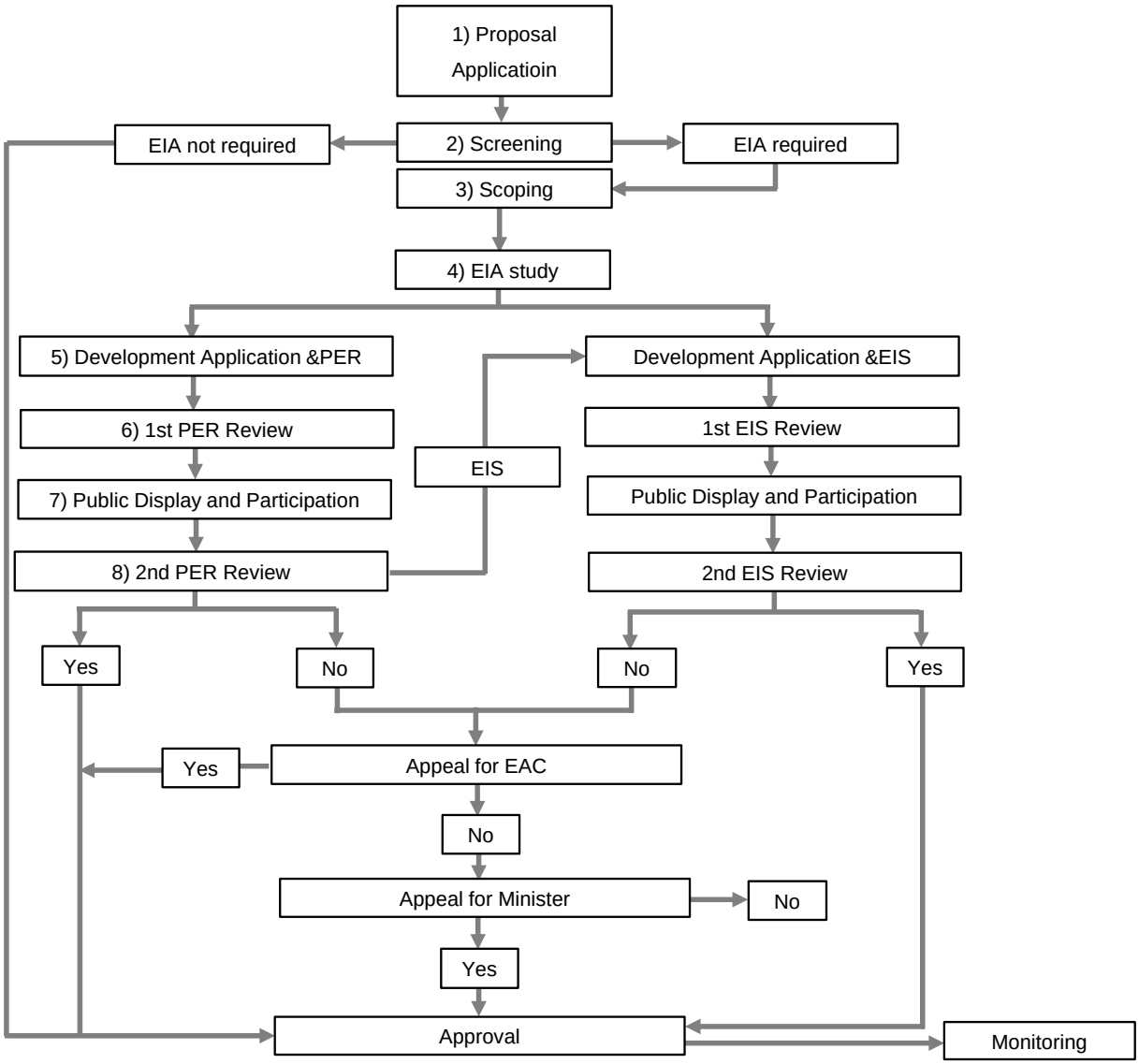
ECD reviews the Development Application and PER/EIS. In the case of "dissatisfaction" ECD requests the proponent to make corrections.

(g) Information disclosure and public participation

ECD opens the PER/EIS (30 days) to the public and holds a stakeholder meeting.

(h) PER/EIS review (second)

Considering the opinions from the public comments and the stakeholder meeting, ECD reviews the PER/EIS again. As a result of the review, ECD judges whether it can be "approval" or "reject" or rather "re-implemented with EIS. If approved, the EIA procedure is concluded with the issue of the Development Consent. In the case of "reject", the proponent can complain formally to MECDM.




Source: Environmental Impact Assessment Guidelines (MECDM)

**Figure 1-3-12 Flow Chart of EIA Procedure in the Solomon Islands**

### (4) Treaties and Agreements with Neighboring Countries

Treaties and agreements that the Solomon Islands has ratified are shown in Table 1-3-6.

**Table 1-3-6 Treaties and Agreements with Neighboring Countries**

| Convention/Instruments | Status | Purpose/Aim | Agency Responsible & related Projects |
|---|---|---|---|
| **Regional MEAs** | | | |
| Wigani Convention | Ratified 7/10/1998 | Ban the importation of hazardous and radioactive wastes and to control the trans boundary movement and management of hazardous waste within the South Pacific region. | ECD |
| Pollution Protocol for Dumping | Ratified 10/9/1989 | Prevention of pollution of the South Pacific region by dumping | Marine Div/ECD |
| Pollution Protocol for Emergencies | Ratified 10/9/1989 | Cooperation in combating pollution emergencies in the South Pacific region | Marine Div/ECD Project: National |

| Convention/Instruments | Status | Purpose/Aim | Agency Responsible & related Projects |
|---|---|---|---|
| | | | Pollution Prevention Plan |
| National Resources and Environment of South Pacific(SPREP Convention) | Ratified 10/9/1989 | Protection of natural resources and environment of the South Pacific Region in terms of management and development of the marine and coastal environment in the South Pacific region | ECD |
| **Chemicals, Wastes and Marine Pollution** | | | |
| Liability for Oil Pollution Damage | Ratified | Strict liability of a ship owner for pollution damage to a coastal state within a certain amount | Marine Div |
| Marine Pollution Convention (London) | Ratified | Prevention of marine pollution by dumping of wastes and other matter | ECD/Foreign Affairs |
| POPs Convention (Stockholm) | Acceded 28/7/2004 | Protection of human health and environment from persistent organic pollutants | ECD/Environmental Health Div<br>Project: National Implementation Plan (NIP) |
| **Biodiversity** | | | |
| Desertification (UNCCD) | Acceded 16/4/1999 | Agreement to combat desertification and mitigate the effects of drought in countries experiencing drought or desertification | Agriculture Div/ECD |
| Cartagena Protocol on Biosafety | Acceded 26/10/2004 | Protection of human health and the environment from possible adverse effects of the products of modern biotechnology, especially the living modified organisms (LMO) while maximizing its benefit | ECD<br>Project: National Biosafety Framework |
| Convention on Biological Diversity (UNCBD) | Ratified 3/10/1995 | Conserve biological diversity through the sustainable use of its components and the fair and equitable sharing of the benefits arising out of utilizing genetic resources | ECD |
| CITES | Instrument of ratification being prepared | Regulation and restriction of trade in specimens of wild animals and plants through a certification system for imports and exports | ECD |
| World Heritage Convention | Acceded 10/6/1992 | The protection of sites of Outstanding Universal Value. The Solomon Islands currently has East Rennelle as World Heritage site. | Museum/ECD |
| **Climate** | | | |
| Kyoto Protocol | Ratified 13/3/2003 | Reduce greenhouse gases especially carbon dioxide for the 39 industrial/developed by an average of 5.2% by 2012 | Meteorology Div |
| Climate Change (UNFCCC) | Ratified 28/12/1994 | Sets and the overall framework for intergovernmental efforts to tackle the challenge posed by climate change | Meteorology Div/ECD |
| Montreal Protocol | Acceded 17/6/1993 | Allows phase out of substances that deplete the ozone layer according a fixed schedule | ECD/Energy Div |
| Ozone Layer Convention (Vienna) | Acceded 17/6/1993 | Protection of the ozone layer through intergovernmental cooperation on research, systematic observation of the ozone layer and monitoring of chlorofluorocarbons (CFC) production | ECD/Energy |

Source: Ministry of Environment Conservation and Meteorology, 2008

### 1-3-1-5 Comparison of JICA Guidelines and EIA of the Solomon Islands

Table 1-3-7 shows the comparison of policies of JICA Guidelines and EIA system of the Solomon Islands, gaps and policies of gap filling.

**Table 1-3-7 Comparison of JICA Guidelines and the Solomon Islands' EIA**

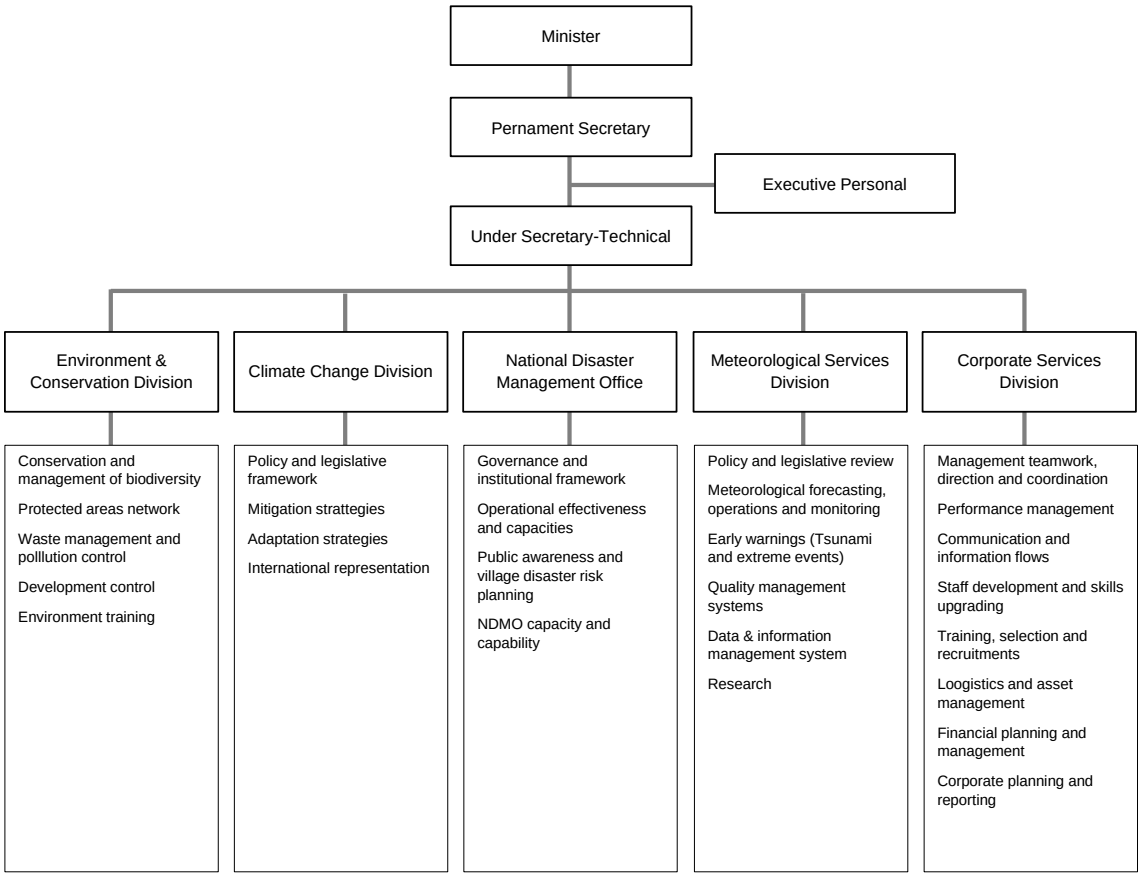
| Policies of JICA Guidelines | EIA System of the Solomon Islands | Gaps and Policies of Gap Filling |
|---|---|---|
| The types of impacts addressed by JICA cover a wide range of environmental and social issues. | ECD implements a scoping for each project. Expected environmental impacts are evaluated on EIA procedure. | No gap. Moreover, it is recommended that the expected impacts are described on the Application. |
| JICA applies a Strategic Environmental Assessment (SEA) when conducting Master Plan Studies etc, and encourages project proponents etc. to ensure environmental and social considerations from an early stage to a monitoring stage. | No provision on the SEA | The project is not a master plan project. EIA will be applied on the project. |
| JICA ensures accountability and transparency when implementing cooperation projects. | Submitted PER (or EIS) is displayed on the public. And stakeholder meeting is held. In respect of the opinions on public, PER (or EIS) is reviewed. | No gap |
| JICA incorporates stakeholder opinions into decision-making processes regarding environmental and social considerations by ensuring the meaningful participation of stakeholders in order to have consideration for environmental and social factors and to reach a consensus accordingly. JICA replies to stakeholders' questions. Stakeholders who participate in meetings are responsible for what they say. | | No gap |
| JICA itself discloses information on environmental and social considerations in collaboration with project proponents etc., in order to ensure accountability and to promote the participation of various stakeholders. | | No gap |
| JICA makes efforts to enhance the comprehensive capacity of organizations and operations in order for project proponents etc., to have consideration for environmental and social factors, appropriately and effectively, at all times. | The implementation agency has a safeguard section that handles the environmental and social considerations. | No gap |
| JICA address request of acceleration for the prompt implementation of projects while undertaking environmental and social considerations. | Procedure term is approximately 2.5 months. All the EIA procedure will take 6 to 8 months including PER preparation. | The survey team should encourage MID to proceed the procedure quickly. |
| Projects are categorized as four grades in terms of outline, scale, location and so on. | The screening is implemented for the prescribed developments. The Kukum Highway project, as the EIA procedure of the Solomon Islands, will need PER (equivalent to IEE) submission. | The project is categorized as category B. Therefore, no gap exists. |

Source: The Survey Team

### 1-3-1-6 Environmental Relevant Agencies

**Ministry of Environment, Climate Change, Disaster Management and Meteorology: MECDM**

The current official name is the Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM). It was called as the Ministry of Environment Conservation and Meteorology before 2010, and had been called as Ministry of Forestry, Environment and Conservation before 2007. The Ministry handles mainly the environmental, meteorological and disaster matters. The Minister makes the final decision on relevant projects of EIA. The Environment and Conservation Division (ECD) in the Ministry is responsible for other processes except for the final decisions. The organization chart of MECDM is shown in Figure 1-3-13.




Source: MECDM

**Figure 1-3-13 Organization and Responsibility of MECDM**

**Environment and Conservation Division: ECD**

ECD is one of the divisions of MECDM. A developer submits “Application” to ECD. ECD: screens the Application submitted, implements a scoping, advices for EIA survey and the review for report.

**Environmental Advisory Committee: EAC**

EAC is a third party organization which is stipulated in the Environment Act 1998. The principal work of EAC is to advise on the EIA procedure in the Solomon Islands. EAC is a temporary committee which is summoned by ECD. People who have complaints about the first decision of ECD can appeal to ECD. Based on the appeal, EAC makes the second decision.

### 1-3-1-7 Comparison of Alternatives

The survey team compared sub projects in multiple terms including the environmental and social considerations. Based on the comparison, the priority of the sub projects was examined. Moreover, regarding two projects (1) Widening of New Mataniko Bridge and (2) Improvement in City Council Roundabout, alternatives were examined from environmental and social viewpoints, particularly with consideration to extent of the land acquisitions.

#### (1) Widening of New Mataniko Bridge

Four draft alternatives of the project were planned. Four draft alternatives have merits and demerits on the below view points: engineering, project cost, environmental and social considerations, and feasibility of land acquisition. Each element on the alternatives was evaluated, and compiled on Table 1-3-8.

**Table 1-3-8 Draft Alternative Widening of New Mataniko Bridge**

| Scheme | Evaluation | | | | Comprehensive evaluation |
|---|---|---|---|---|---|
| | Engineering | Project cost | Environmental and social considerations | Feasibility of land acquisition | |
| A-1<br><br>Additional bridge with 2 lanes is constructed on the north side (downstream of the river) of the existing bridge. | - Change of alignment is easy because the approach length is short.<br>- Construction period is short.<br>- Construction is easy. | Low | Because construction period is short, environmental impacts including air pollution, noise and vibration are lowest. | Lands on the south side (approximately 1,300$m^2$) are needed. However, the land is unused. Therefore it is expected that negative impacts are less significant than A-2, B and C that require the land acquisition of north side. | Land acquisition is required. However, considering other factors,A-1 is most superior on whole evaluations |
| A-2<br><br>Additional bridge with 2 lanes is constructed on the south side (upstream of the river) of the existing bridge. | - Because the approach length is long, construction is rather difficult. | Low | Environmental impacts including air pollution, noise and vibration are moderately low. However, because construction area is larger than A-1, negative environmental impacts are more than A-1. | The land acquisition of north side (approximately 1,600$m^2$) is required. The land includes an educational facility (school). | There is an impact on the educational facility. |
| B<br><br>Additional bridge | Change of alignment is minimum | High | Construction area is smallest. However, construction period is | The land acquisition of both sides (approximately | Impacts under construction |

| Scheme | Evaluation | | | | Comprehensive evaluation |
|---|---|---|---|---|---|
| | Engineering | Project cost | Environmental and social considerations | Feasibility of land acquisition | |
| with 1 lane is constructed on both sides of the existing bridge. | - Construction period is long.<br>- Construction is difficult. | | longer. Therefore negative impacts including air pollution, noise and vibration continue longer. | 1,000m$^2$) is required. However, the area is small. The structure of land owner is affected. | periods are most and project cost is expensive. |
| C<br><br>New bridge with 4 lanes is constructed after demolishing the existing bridge. | - Change of alignment is least.<br>- Construction period is long and construction is difficult.<br>- The existing bridge is demolished. Therefore, detour is needed. | High | Because construction period is long and detour is required, negative impacts including air pollution, noise and vibration are expected. Demolish of the existing bridge and building of new bridge may cause negative impacts for the water quality of Mataniko River. | The land acquisition of both sides (approximately 1,000m$^2$) is required. However, the area is small. The structure of land owner is affected. | Impacts under construction periods are most and project cost is expensive |
| No project | - | - | No construction impact. However, road congestion impacts including air pollution, noise and vibration are not mitigated. | No land acquisition (A) | With increase of future traffic volume, environment along the road will worsen. |

B and C require the high cost and long period of construction. In particular, C which needs a detour may cause negative impacts around the detour. Compering B and C, A-2 will have a significant negative impact on a neighboring educational facility despite moderately low impacts. A-1 need land acquisition. However, the negative impacts on the education facility on the north side are less, and the land acquisition is expected easy. Considering these factors, A-1 was selected.

### (2) Improvement of City Council Roundabout

Three draft alternatives of the sub project were planned. (see Figure 2-2-12) Advantages and disadvantages of the alternatives including no implementation were evaluated and summarized in Table 1-3-9.

**Table 1-3-9 Draft Alternative Improvement of City Council Roundabout**

| Alternative | Evaluation | | | | Comprehensive evaluation |
|---|---|---|---|---|---|
| | Project effectiveness and engineering | Project cost | Environmental and social considerations | Feasibility of land acquisition | |
| 1 | - Project effectiveness is smallest.<br>- Construction scale is smallest, however includes excavation of a slope of the | Low | Negative Impacts under construction including air pollution, noise and vibration will be moderately less than other alternatives. However, negative impacts | This alternative does not need large site (approximately 500m$^2$). However needs a parcel of south side (church). | Although negative impacts on the environment are minimum, project effects is minimum. |

| Alternative | Evaluation | | | | Comprehensive evaluation |
|---|---|---|---|---|---|
| | Project effectiveness and engineering | Project cost | Environmental and social considerations | Feasibility of land acquisition | |
| | south side. | | of slope excavation are also expected. | | |
| 2 | - It is effective to increase capacity of the intersection.<br>- Construction scale is large. | High | Large site area of construction causes negative Impacts under construction including air pollution, noise and vibration. | This alternative needs large site (approximately 700m$^2$). However, almost of needed site is MID's site. Therefore, new land acquisition will be kept to minimum. | Construction scale and project effects are medium in three alternatives. Land acquisition is little. |
| 3 | - It is most effective to increase capacity of the intersection.<br>- Construction scale is large. | High | Large site area of construction causes negative Impacts under construction including air pollution, noise and vibration. Moreover negative impacts of slope excavation are also expected. | This alternative needs large site including the parcel of the church (approximately 900m$^2$). | Construction scale is large. The required land area is wider than Alternative 2. Project effects are maximum. |
| No implementation | - | - | - | - | Increasing traffic will worsen road congestion, and negative impacts such as air pollution will become worsen. |

Source: The Survey Team

Three alternatives have a trade-off relationship between project effects and negative impacts such as the scale of construction and land acquisition. Considering the project effect and the smallness of land acquisition, Alternative 2 was selected.

### 1-3-1-8 Scoping and TOR

The survey team conducted a scoping on each project component. For the scoping, "Screen Format" (JICA guidelines Appendix 4) and "Check List (road, bridge)" were referred. Moreover "climate change" which is one of the most concerned items in the Solomon Islands was added. The results of the scoping are shown in Tables 1-3-10, 11, 12.

**Table 1-3-10 Results of Scoping**
**(Widening of New Mataniko Bridge and Relocation of Old Mataniko Bridge)**

| Categories | | Environmental Items | Evaluation | | Reasons of Evaluation |
|---|---|---|---|---|---|
| | | | Before/ Under Construction | Operation | |
| Anti-pollution | 1 | Air pollution | B- | B-/B+ | **Construction:** The operation of machinery may affect the atmosphere temporally.<br>**Operation:** The increase of traffic may cause the increase of emission gasses. On the other hand, the increase of vehicle speed may decrease the emission gasses. |

| Categories | | Environmental Items | Evaluation | | Reasons of Evaluation |
|---|---|---|---|---|---|
| | | | Before/ Under Construction | Operation | |
| | 2 | Water pollution | B- | B- | **Construction:** Construction site, machinery and drainage of accommodation may cause water pollution.<br>**Operation:** Road dust and oil may be poured by rain. |
| | 3 | Waste | B- | D | **Construction:** It may cause surplus soil and waste.<br>**Operation:** No waste. |
| | 4 | Soil pollution | B- | B- | **Construction:** Oil discharge from the machinery may cause soil pollution.<br>**Operation:** Vehicles may discharge oil. |
| | 5 | Noise and vibration | B- | B- | **Construction:** The operation of the machinery and vehicles may affect noise and vibration.<br>**Operation:** The increase of traffic and vehicle speed may affect noise and vibration. |
| | 6 | Ground subsidence | D | D | **Construction:** Any construction work of the project may not cause ground subsidence. |
| | 7 | Offensive odors | D | D | **Construction:** Any construction work of the project may not cause offensive odors. |
| | 8 | Bottom sediment | B- | D | **Construction:** The construction of a pier may affect bottom sediment of rivers. |
| Natural Environment | 9 | Conservative area | D | D | No conservative area and national park in and around the project site |
| | 10 | Biota and ecosystem | D | D | The project is the enlargement of the existing bridges. Urbanization increases around the project site. Therefore, the project may not affect biota and ecosystem. |
| | 11 | Water system | B- | B- | **Construction:** The construction of a pier may affect the stream<br>**Operation:** New piers may change the stream of rivers. |
| | 12 | Geography and geology | D | D | The project is enlargement of the existing bridge and does not include a large scale excavation and embankment. Therefore, it may not affect geography and geology of the area. |
| Social Environment | 13 | Involuntary resettlement | B- | D | **Construction:** The widening of approach may cause partial demolition of existing structures and trees. |
| | 14 | Poor | D | B+ | **Construction:** The affected people may not include poor.<br>**Operation:** The project will contribute positive effects such as improvements of the access to the urban area and social services. |
| | 15 | Indigenous or ethnic people | D | D | No indigenous or ethnic people in and around the project site |
| | 16 | Local economies, such as employment, livelihood, etc. | B+ | B+ | **Construction:** Construction work will create new jobs.<br>**Operation:** The improvement of access for urban will improve employment of local area. |
| | 17 | Land use and utilization of local resources | D | D | The project is enlargement of the existing bridge. Therefore, it does not affect the land use and utilization of the local resources. |
| | 18 | Water utilization | D | D | The project is enlargement of the existing bridge. Therefore, it does not affect the water utilization. |
| | 19 | Existing social infrastructures and services | B- | C- | **Construction:** The construction work may cause traffic congestion.<br>**Operation:** The increase of traffic and vehicle speed may increase traffic accidents. |
| | 20 | Social institutions such as social infrastructure | D | D | The project is enlargement of the existing bridge. Therefore, it does not affect social institutions such |

| Categories | | Environmental Items | Evaluation | | Reasons of Evaluation |
|---|---|---|---|---|---|
| | | | Before/ Under Construction | Operation | |
| | | and local decision-making institutions | | | as social infrastructure and local decision-making institutions. |
| | 21 | Misdistribution of benefits and damages | D | D | The project is enlargement of the existing bridge. Therefore, it does not cause misdistribution of benefits and damages around the project area. |
| | 22 | Local conflicts of interest | D | D | The project is enlargement of the existing bridge. Therefore, it does not almost affect local conflicts of interest around the project area. |
| | 23 | Cultural heritage | D | D | No cultural heritage in and around the project site |
| | 24 | Landscape | D | D | The project is enlargement of the existing bridge. Therefore, it does not affect landscape around the project area. |
| | 25 | Gender | D | D | The project will not affect gender. |
| | 26 | Children's rights | D | D | The project will not affect children's rights. |
| | 27 | Infectious diseases such as HIV/AIDS | B- | D | **Construction:** The influx of workers may spread infectious diseases. |
| | 28 | Work environment | B- | D | **Construction:** the work environment of workers should be considered.<br>**Operation:** it does not include the work that affects negative impacts to the workers. |
| Others | 29 | Accidents | B- | B- | **Construction:** the accidents on the construction should be considered.<br>**Operation:** the increase of traffic and vehicle speed may increase traffic accidents. |
| | 30 | Climate change | B- | B-/B+ | **Construction:** the operation of machinery may increase greenhouse gasses.<br>**Operation:** the increase of traffic will increase the emission of greenhouse gasses. On the other hand, the increase of vehicle speed will decrease the emission of greenhouse gasses. |

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses.)
D: No impact is expected.

**Table 1-3-11 Results of Scoping (Improvement of City Council Roundabout)**

| Categories | | Environmental Items | Evaluation | | Reasons of Evaluation<br>Before/ Under Construction |
|---|---|---|---|---|---|
| | | | Before/ Under Construction | Operation | |
| Anti-pollution | 1 | Air pollution | B- | B-/B+ | **Construction:** The operation of machinery may affect the atmosphere temporally.<br>**Operation:** The increase of traffic may cause the increase of emission gasses. On the other hand, the increase of vehicle speed may decrease the emission gasses. |
| | 2 | Water pollution | B- | B- | **Construction:** Construction site, machinery and drainage of accommodation may cause water pollution.<br>**Operation:** Road dust and oil may be poured by rain. |
| | 3 | Waste | B- | D | **Construction:** It may cause surplus soil and waste.<br>**Operation:** No waste. |
| | 4 | Soil pollution | B- | B- | **Construction:** Oil discharge from the machinery may cause soil pollution. |

| Categories | | Environmental Items | Evaluation | | Reasons of Evaluation Before/ Under Construction |
|---|---|---|---|---|---|
| | | | Before/ Under Construction | Operation | |
| | | | | | **Operation:** Vehicles may discharge oil. |
| | 5 | Noise and vibration | B- | B- | **Construction:** The operation of the machinery and vehicles may affect noise and vibration.<br>**Operation:** The increase of traffic and vehicle speed may affect noise and vibration. |
| | 6 | Ground subsidence | D | D | **Construction:** Any construction work of the project may not cause ground subsidence. |
| | 7 | Offensive odors | D | D | **Construction:** Any construction work of the project may not cause offensive odors. |
| | 8 | Bottom sediment | D | D | **Construction:** the project is an improvement of the existing intersection. Therefore, it does not affect bottom sediment. |
| Natural Environment | 9 | Conservative area | D | D | No conservative area and national park in and around the project site |
| | 10 | Biota and ecosystem | D | D | The project is the improvement of the existing intersection. Urbanization increases around the project site. Therefore, the project may not affect biota and ecosystem. |
| | 11 | Water system | D | D | The project is the improvement of the existing intersection. Therefore, it does not affect water system. |
| | 12 | Geography and geology | D | D | The project is the improvement of the existing intersection and does not include a large scale excavation and embankment. Therefore, it may not affect geography and geology. |
| Social Environment | 13 | Involuntary resettlement | B- | D | **Construction:** The widening of the intersection may cause partly demolition of existing structures and trees. |
| | 14 | Poor | D | B+ | **Construction:** Affected people may not almost include poor.<br>**Operation:** The project will cause positive effects such as improvements of the access to the urban area and social services. |
| | 15 | Indigenous or ethnic people | D | D | No indigenous or ethnic people in and around the project site |
| | 16 | Local economies, such as employment, livelihood, etc. | B+ | B+ | **Construction:** Construction work will create new jobs.<br>**Operation:** The improvement of urban access will improve employment of local area. |
| | 17 | Land use and utilization of local resources | D | D | The project is the improvement of the existing intersection. Therefore, it does not affect land use and utilization of local resources. |
| | 18 | Water utilization | D | D | The project is the improvement of the existing intersection. Therefore, it does not affect water utilization. |
| | 19 | Existing social infrastructures and services | B- | C- | **Construction:** The construction work may cause traffic congestion.<br>**Operation:** The increase of traffic and vehicle speed may cause traffic accidents. |
| | 20 | Social institutions such as social infrastructure and local decision-making institutions | D | D | The project is the improvement of the existing intersection. Therefore, it does not affect social institutions such as social infrastructure and local decision-making institutions. |
| | 21 | Misdistribution of benefits and damages | D | D | The project is the improvement of the existing intersection. Therefore it does not affect misdistribution of benefits and damages around the project area. |

| Categories | | Environmental Items | Evaluation | | Reasons of Evaluation Before/ Under Construction |
|---|---|---|---|---|---|
| | | | Before/ Under Construction | Operation | |
| | 22 | Local conflicts of interest | D | D | The project is the improvement of the existing intersection. Therefore it does not affect local conflicts of interest around the project area. |
| | 23 | Cultural heritage | D | D | No cultural heritage in and around the project site |
| | 24 | Landscape | D | D | The project is the improvement of the existing intersection. Therefore, it does not affect landscape around the project area. |
| | 25 | Gender | D | D | The project will not affect gender. |
| | 26 | Children's rights | D | D | The project will not affect children's rights. |
| | 27 | Infectious diseases such as HIV/AIDS | B- | D | **Construction:** The influx of workers may spread infectious diseases. |
| | 28 | Work environment | B- | D | **Construction:** the work environment of workers should be considered.<br>**Operation:** it does not include the work that affects negative effects to the workers. |
| Others | 29 | Accidents | B- | B- | **Construction:** the accidents on the construction should be considered.<br>**Operation:** the increase of traffic and vehicle speed may increase traffic accidents. |
| | 30 | Climate change | B- | B-/B+ | **Construction:** the operation of machinery may increase greenhouse gasses.<br>**Operation:** the increase of traffic will increase the emission of greenhouse gasses. On the other hand, the increase of vehicle speed will decrease the emission of greenhouse gasses. |

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses.)
D: No impact is expected.

**Table 1-3-12 Results of Scoping (Upgrading of the Kukum Highway)**

| Categories | | Environmental Items | Evaluation | | Reasons of Evaluation Before/ Under Construction |
|---|---|---|---|---|---|
| | | | Before/ Under Construction | Operation | |
| Anti-pollution | 1 | Air pollution | B- | B-/B+ | **Construction:** The operation of machinery may affect temporally the atmosphere.<br>**Operation:** The increase of traffic may cause the increase of emission gasses. On the other hand, the increase of vehicle speed may cause the decrease of the emission gasses. |
| | 2 | Water pollution | B- | D | **Construction:** Construction site, machinery and drainage of accommodation may cause water pollution.<br>**Operation:** the project will not change the area of pavement. Therefore current condition will not change. |
| | 3 | Waste | B- | D | **Construction:** the construction work of the project may cause waste.<br>**Operation:** No waste. |
| | 4 | Soil pollution | B- | B- | **Construction:** Oil discharge from the machinery may cause soil pollution.<br>**Operation:** Vehicles may discharge oil. |
| | 5 | Noise and vibration | B- | B-/B+ | **Construction:** The operation of the machinery and vehicles may affect noise and vibration.<br>**Operation:** The increase of traffic and vehicle |

| Categories | | Environmental Items | Evaluation | | Reasons of Evaluation Before/ Under Construction |
|---|---|---|---|---|---|
| | | | Before/ Under Construction | Operation | |
| | | | | | speed may affect noise and vibration. On the other hand, the flatness of the road may suppress vibration. |
| | 6 | Ground subsidence | D | D | **Construction:** Any construction work of the project may not cause ground subsidence. |
| | 7 | Offensive odors | D | D | **Construction:** Any construction work of the project may not cause offensive odors. |
| | 8 | Bottom sediment | D | D | **Construction:** the project is an improvement of the existing road. Therefore it does not affect bottom sediment. |
| Natural Environment | 9 | Conservative area | D | D | No conservative area and national park in and around the project site |
| | 10 | Biota and ecosystem | D | D | The project is the improvement of the existing road. Urbanization increases around the project site. Therefore the project may not affect biota and ecosystem. |
| | 11 | Water system | D | D | The project is the improvement of the existing road. Therefore it does not affect water system. |
| | 12 | Geography and geology | D | D | The project is the improvement of the existing road and does not include a large scale excavation and embankment. Therefore it may not affect geography and geology. |
| Social Environment | 13 | Involuntary resettlement | B- | D | **Construction:** The new drainage may cause partly demolition of existing structures and trees. |
| | 14 | Poor | D | B+ | **Construction:** Affected people may not almost include poor.<br>**Operation:** The project will cause positive effects such as improvements of the access to the urban area and social services. |
| | 15 | Indigenous or ethnic people | D | D | No indigenous or ethnic people in and around the project site |
| | 16 | Local economies, such as employment, livelihood, etc. | B+ | B+ | **Construction:** Construction work will create new jobs.<br>**Operation:** The improvement of urban access will improve employment of local area. |
| | 17 | Land use and utilization of local resources | D | D | The project is the improvement of the existing road. Therefore it does not affect land use and utilization of local resources. |
| | 18 | Water utilization | D | D | The project is the improvement of the existing road. Therefore it does not affect water utilization. |
| | 19 | Existing social infrastructures and services | B- | C- | **Construction:** The construction work may cause traffic congestion.<br>**Operation:** The increase of traffic and vehicle speed may cause traffic accidents. |
| | 20 | Social institutions such as social infrastructure and local decision-making institutions | D | D | The project is the improvement of the existing road. Therefore it does not affect social institutions such as social infrastructure and local decision-making institutions. |
| | 21 | Misdistribution of benefits and damages | D | D | The project is the improvement of the existing road. Therefore it does not affect misdistribution of benefits and damages around the project area. |
| | 22 | Local conflicts of interest | D | D | The project is the improvement of the existing road. Therefore it does not affect local conflicts of interest around the project area. |
| | 23 | Cultural heritage | D | D | No cultural heritage in and around the project site |
| | 24 | Landscape | D | D | The project is the improvement of the existing road. Therefore it does not affect landscape around the project area. |

| Categories | | Environmental Items | Evaluation | | Reasons of Evaluation Before/ Under Construction |
|---|---|---|---|---|---|
| | | | Before/ Under Construction | Operation | |
| | 25 | Gender | D | D | The project will not affect gender. |
| | 26 | Children's rights | D | D | The project will not affect children's rights. |
| | 27 | Infectious diseases such as HIV/AIDS | B- | D | **Construction:** The influx of workers may spread infectious diseases. |
| | 28 | Work environment | B- | D | **Construction:** the work environment of workers should be considered.<br>**Operation:** it does not include the work that affects negative effects to the workers. |
| Others | 29 | Accidents | B- | B- | **Construction:** the accidents on the construction should be considered.<br>**Operation:** the increase of traffic and vehicle speed may increase traffic accidents. |
| | 30 | Climate change | B- | B-/B+ | **Construction:** the operation of machinery may increase greenhouse gasses.<br>**Operation:** the increase of traffic will increase the emission of greenhouse gasses. On the other hand, the increase of vehicle speed will decrease the emission of greenhouse gasses. |

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses.)
D: No impact is expected.

TOR was examined as Table 1-3-13.

**Table 1-3-13 TOR of Environmental and Social Survey**

| Environmental Items | Survey Items | Survey Measures |
|---|---|---|
| Alternatives | 1) Alignment, scope of expansion<br>2) Methods of construction | 1) Minimizing land acquisition and its impact on social benefits<br>2) Selection of construction method on the reduction of environmental impacts and road congestion on the construction |
| Air Pollution | 1) Standards<br>2) Current conditions of air quality<br>3) Increase of traffic volume based on traffic demand forecast<br>4) Dwellings, school and hospital around the project site<br>5) Construction impacts | 1) Collection of existing materials<br>2) Collection of existing materials<br>3) Forecast of impact based on traffic demand forecast<br>4) Field survey<br>5) Contents, construction methods, period, area, machinery, access routes on the construction |
| Water Pollution | 1) Water quality<br>2) Utilization of river water | 1) Collection of existing materials<br>2) Field survey |
| Waste | 1) Waste management on construction | 1) Hearing on existing projects |
| Soil Pollution | 1) Protection of oil leakage on construction | 1) Contents, construction method, machinery, operating condition |
| Noise and Vibration | 1) Environmental legislation and standards<br>2) Distance between sources and considered areas (dwelling, school and hospital)<br>3) Construction impacts | 1) Existing materials<br>2) Field survey<br>3) Contents, construction methods, period, area, machinery, access routes on the construction |

| Environmental Items | Survey Items | Survey Measures |
|---|---|---|
| Bottom Sediment | 1) Construction method | 1) Contents, construction methods, period, area, machinery on the construction |
| Water System | On Mataniko River<br>1) Pier of bridge<br>2) Construction impacts | <br>1) Planning of the bridge projects<br>2) Contents, construction methods, period machinery on the construction |
| Involuntary Resettlement | 1) Contents and scope of land acquisition and resettlement<br>2) Preparation of RAP | 1) Planning of the projects (bridges and roundabout), field survey<br>2) Preparation of RAP based on JICA Guidelines, World Bank Operational Policy 4.12 and the precedents of the Solomon Islands. |
| Poor | 1) Social benefit by the project | 1) Planning of the project |
| Local Economies, such as Employment, Livelihood, etc. | 1) Forecast on social impacts with the project | 1) Planning of the projects and construction plan |
| Existing Social Infrastructures and Services | 1) Dwelling, school and hospital around the project site<br>2) Increase of traffic volume based on traffic demand forecast | 1) Field survey<br>2) Forecast of impact based on traffic demand forecast |
| Infectious Diseases such as HIV/AIDS | 1) HIV/AIDS and malaria incidence around the project site | 1) Existing materials |
| Work Environment | 1) Measures of occupational safety | 1) Precedents of a similar project |
| Accidents | 1) Expected increase of traffic accidents | 1) Existing materials, field survey |
| Climate Change | 1) Change of GHG by the implementation of the project | 1) GHG emission forecast based on traffic demand forecast |

### 1-3-1-9 Survey Results

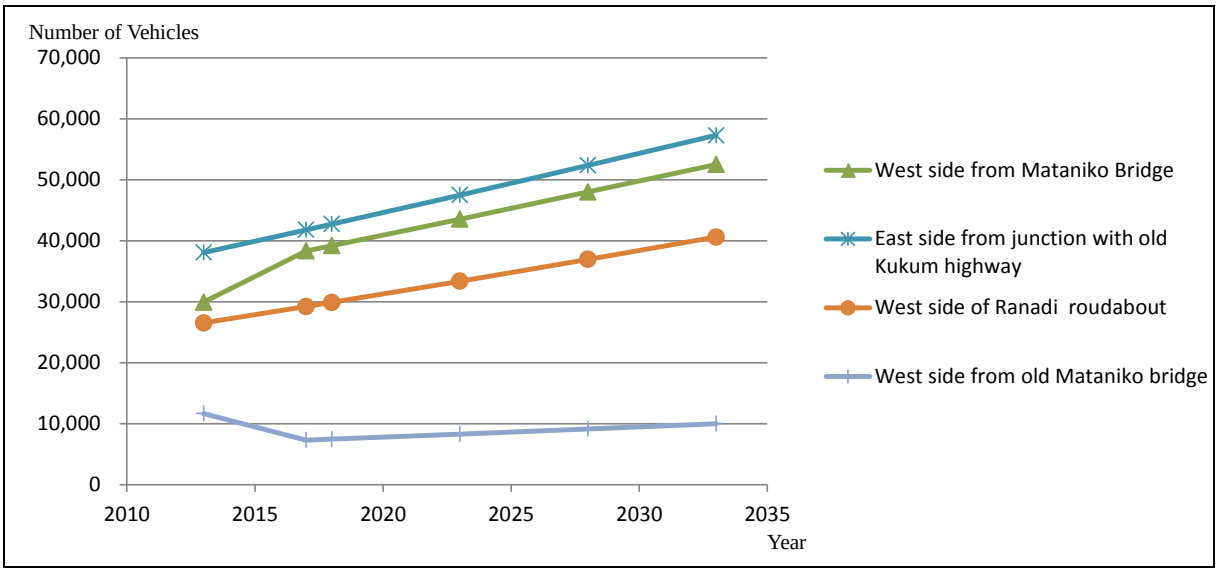
#### (1) Air Pollution

**Before/Under Construction**

The construction activities of the project require the operation of machinery including vehicles and heavy machinery. The gas emission and dust generation by the machinery may cause some adverse impacts on air quality around the project site. However, the construction activities are conducted in limited periods. Moreover, the location of construction sites moves continuously. Therefore, it is expected that the impacts on air quality are temporary and minor. To reduce the impacts of the construction activities more, MID implements some mitigation measures as shown in *1-3-1-11 Mitigation Measures and Implementation Costs*.

**Operation**

Surveyed traffic volume and future estimations of major spots on the Kukum Highway are shown in Figure 1-3-14.

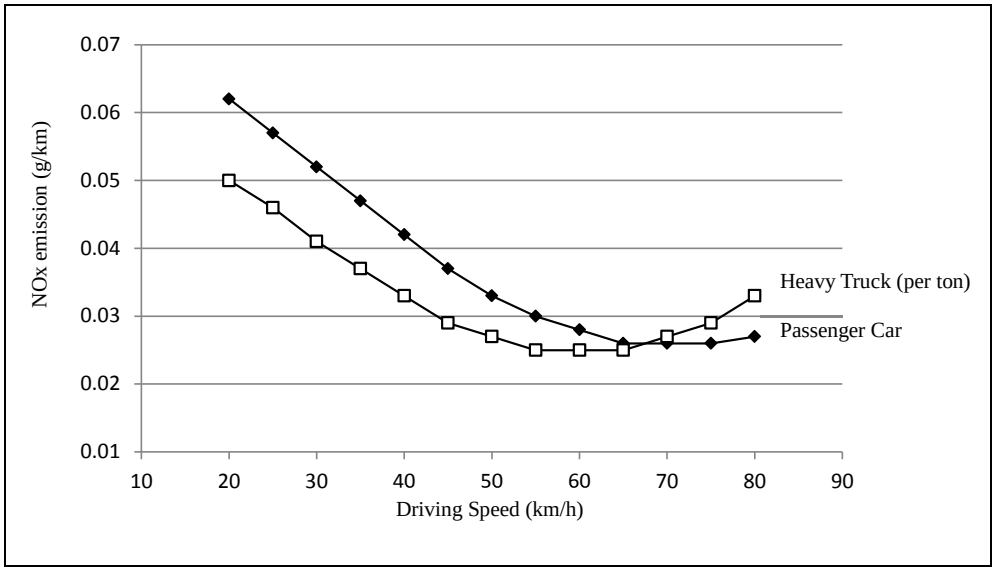



(2013: surveyed, 2017-2033: forecast, by The Survey Team)

**Figure 1-3-14 Change of Traffic Volume of the Kukum Highway**

Traffic volume of the Kukum Highway is increasing in accordance with economic growth of the country. The increase is due to only economic growth and not because of the improvements of the existing road facilities. On the other hand, the improvement of the existing road facilities reduces road congestion and increases vehicle speed. And the improvement of vehicle speed will reduce the emissions of air pollutants such as NOx and SPM. NOx emission factors of vehicles are shown in Figure 1-3-15.

The above table shows that the increase of travel speed reduces NOx emission. Travel speed around City Council Roundabout is approximately 10-20km/h on the current condition. The increase of travel speed significantly reduces air pollution on the road side.




Source: Technical note of National Institute for Land and Infrastructure Management No. 671 (Japan)

**Figure 1-3-15 Example of NOx Emission Factors (2009 registered vehicle in Japan)**

**(2) Water Pollution (Bottom Sediment)**

**Before/Under Construction**

The existence of the construction site, machinery and the drainage from accommodation may cause water pollution. In particular, the piling work for the bridges may disturb the bottom of Mataniko River.

The water pollution and the impacts on the bottom sediment originate from mainly following construction activities.

Ø Bottom disturbance and material leakage with the piling work in Mataniko River

Ø Soil discharge from exposed ground surface

Ø Oil leakage from machinery

Ø Drainage from accommodation

**Piling Work**

As piling work for New and Old Mataniko bridges, cast-in-place concrete piles which are 1.2m/1.5m in diameter are used. The cast-in-place pile is superior to a percussion pile on the mitigation of noise and vibration impacts. New Mataniko Bridge has 16 piles and Old Mataniko Bridge has 12 piles. On the pilling work, the bottom and water of Mataniko River may be disturbed, or the piling materials may flow out into the river. To avoid such incidents, a reverse circulation drill which has a reputation on aquatic piling work should be adopted. On the drilling work, casing cylinder which is installed in the river prevents bottom and water turbulence and leakage of material. This will minimize the impact on the bottom and the water of Mataniko River.

**Prevention of Soil Outflow**

Exposed soil from the construction activities may be washed away, and may pollute water. However, it is expected that the soil exposure is temporary on each construction activity. Therefore it will cause few negative impacts. On the other hand, the storage yard of soil may be exposed for comparatively long period. In case of that, the storage yards of soil needs the measures for mitigation of washing out of the soil. Contractors will conduct the mitigation measures such as covering to prevent the soil outflow.

**Operation**

Road dust and leakage oil may pollute streams and the soil. Since the project is an improvement of the existing road facilities and does not include new road construction, road dust and oil leakage will not increase. Moreover, upgrading of the Kukum Highway includes installation and repair of ditches and cross drainage. These procedures will prevent water pollution derived from the dispersion of road dust and oil leakage.

### (3) Waste

**Before/Under Construction**

The construction activities produce wastes. The wastes of the project are mainly due to the removal of the existing facilities. Estimated wastes are the followings.

- Asphalt concrete removed from existing road pavement
- Soil excavated from the existing road bed and slope
- Soil excavated from the piling work of the bridge construction

**Figure 1-3-16 Ranadi Dumpsite**

The wastes are being disposed of Ranadi dumpsite in the east of Honiara City (see Figure 1-3-16). Since Ranadi dumpsite is located near the project site, it is expected that the impacts derived from transport activities are less.

On the other hand, sub-projects such as the upgrading of the Kukum Highway and improvement of City Council need extra soil for embankment. The extra soil must be acquired from other borrow pit site. On the project, waste surplus soil should be reused for the embankment. This procedure will reduce the waste derived from the construction activities and reduce the impacts on the dumpsite.

### (4) Soil Pollution

**Before/Under Construction**

On the operation of the machinery, oil discharge with the machinery is a concern. For the prevention of the oil discharge, the machinery must be kept in better condition. Mitigation measures which are shown in (2) Water pollution should be implemented.

**Operation**

Road dust and leakage may pollute streams and soil. Since the project is an improvement of the existing road facilities and does not include new road construction, road dust and oil leakage will not increase. Upgrading of the Kukum Highway includes installation and repair of ditches and cross drainage. These procedures will prevent water pollution derived from the dispersion of road dust and oil leakage.

### (5) Noise and Vibration

**Before/Under Construction**

**Vehicle Noise and Vibration**

The project depends on a certain amount of dump trucks for the transportation of materials and wastes. Driving of dump trucks brings road noise and vibration. The total volume of major

materials (gravel, asphalt, concrete and soil) is approximately 56,000cu.m. The upgrading of the Kukum Highway needs approximately 28,000cu.m gravel during one year of the construction period. It is expected that on average 20-30 dump trucks pass through per day. (supposed 280 working days per year and 4cu.m as maximum load) Compared with the traffic volume of the Kukum Highway approximately 10,000-30,000 vehicles, the number of driving dump trucks are below 1%. Therefore impacts of vehicle noise and vibration will be very small. However, to reduce the impacts of the construction activities more, MID will direct the contractor to follow the mitigation measures as shown in *1-3-1-11 Mitigation Measures and Implementation Costs*.

**Machinery Noise and Vibration**

Construction activities, especially operation of heavy machinery, cause noise and vibration around the construction site. Generally the environmental impacts of construction noise and vibration are limited to small areas. (When a source moves away from one meter to 100 meter, noise decreases by 40dB.) And construction work is also temporary matters. However since there are some sensitive facilities such as hospital, school around the project site, appropriate mitigation measures should be implemented to reduce the negative impacts.

As mitigation measures on construction noise and vibration, MID will direct the contractor to follow the mitigation measures as shown in *1-3-1-11 Mitigation Measures and Implementation Costs*.

**Operation**

**Road Noise**

As mentioned above, the traffic volume of the Kukum Highway is increasing due to economic growth. However, travel speed will increase with implementation of the project. The increase of traffic volume and travel speed will increase the noise level.

The traffic volumes on major points of the Kukum Highway are expected to increase approximately to 1.2-1.5 times by 2033. These will cause increase of noise level to 1-2dB approximately.

Regarding travel speed, Leq (equivalent sound level, which is most major index of noise level) does not depend on driving speed under low and medium speed (see below). Therefore increase of travel speed has no impact on noise.

**Estimation of Road Noise**

Power level of vehicle noise (dB): $L_{WA}=a+10\log_{10}V+C$

(unsteady driving mode: 10km/h<=V<=60km/h)

a: constant by vehicle category

V: driving speed (km/h)

C: correction value

(ASJ RTN-Model 2013)

When travel speed (V) is doubled, LWA increases 3dB. On the other hand, doubled speed reduces exposure time by half. This means reducing noise 3dB. As a result, Leq is independent of speed change under low or middle speed.

**Road Vibration**

Road vibration mainly depends on traffic volume, the weight and the driving speed of vehicle, the roughness of road surface and road bed strength. As same as road noise, the increase of traffic volume increases vibration to 1-2dB. Moreover the increase of vehicle speed increases vibration.

One of the most powerful causes is the roughness of road surface. The upgrading of the Kukum Highway improves road bed and pavement and keeps flatness of pavement. This procedure will improve the road vibration.

### (6) Bottom Sediment

Refer to *Water system*.

### (7) Water system

**Before/Under Construction, Operation**

On the widening of New Mataniko Bridge and the replacement of Old Mataniko Bridge, new piers will be constructed. New Mataniko Bridge has two piers and Old Mataniko Bridge has one pier in the river. These piers may affect the water flow of Mataniko River. New Mataniko Bridge has originally two piers. The new piers will be installed in the same row of the existing pier. Old Mataniko Bridge has originally one pier. The existing pier was demolished, and new one pier will be installed near the existing pier. Since the number of pier is same as the existing one, the installation of new piers will have little impact on the water flow of Mataniko River.

By the catastrophic storm which hit Guadalcanal Island in April 2014, Mataniko River overflowed, and Old Mataniko Bridge was washed away. Based on this incident, bridge design was revised, and riverbank repair work was added. This arrangement will keep the flow capacity of Mataniko River and contribute to the prevention of the flood disaster.

### (8) Involuntary Resettlement

Since the project is the improvement of existing facilities, the implementation of the project has no involuntary resettlement of residents. However land acquisition is required.

Except two parcels, the required area is below ten percent of each parcel. A half of the lands is unused. The losses of properties include wall and fence. Those losses are not likely to affect owner’s or user’s livelihood. And there are no informal settlers in the lands to be acquired.

Land acquisition is implemented based on the relevant legislations. The Ministry of Lands, Housing and Surveying (MLHS) consults with the land owners to reach agreement on the land sales. On the other hand, the Solomon Islands has no policy on involuntary resettlement under legislations.

Socio-economic surveys for affected persons were conducted by MID, and a draft Resettlement Action Plan (RAP) was prepared in accordance with the JICA Guidelines.

### (9) Existing Social Infrastructures and Services

**Before/Under Construction**

The project includes the replacement of the bridges and the improvement of the main road in Honiara City. These construction activities need regulating traffic, and may cause traffic congestion even though it is temporary. For the purpose of reduction of traffic congestion to be caused by the construction activities, mitigation measures were examined on the construction plan. (see *1-3-1-11 Mitigation Measures and Implementation Costs*.)

**Operation**

The project improves the traffic flow of the Kukum Highway, and will increase the travel speed. The increase of traffic and vehicle speed may cause traffic accidents. In particular, around the Central Market there are a lot of pedestrians. The chaotic crossing of pedestrian is also frequent.

As the pedestrian safety measures on the Central Market, the project is planning the re-open of the underpass and traffic control. A guard fence will be installed on the median strip for the purpose of prevention of chaotic crossing. At the same time, the underpass which had been closed will be re-opened after improvement. Moreover, crosswalk traffic control will be carried out by police officers. These measures will enforce the safety for pedestrians (see Figure 2-2-5, 7, 8).

### (10) Infectious Diseases such as HIV/AIDS

**Before/Under Construction**

Generally construction activities gather a lot of workers at construction sites. Some infectious diseases may spread under high density work circumstance.

**Malaria**

In the Solomon Islands, malaria which is mosquito-borne infectious disease continues to be a leading cause of mortality and morbidity. Approximately eight percent of the cause of death is due to malaria. Malaria is widely prevalent in the Solomon Islands, and the project implementation does not have positive relation to disease transmission and infection. However contractors who engage in the construction activities should instruct methods of self-defense such as:

Ø Using mosquito nets and insect repellents

Ø Mosquito-control measures such as spraying insecticides and draining standing water.

**HIV/AIDS**

The Solomon Islands has no data of HIV/AIDS prevalence. Contractors should conduct the sufficient measures for the prevalence of HIV/AIDS through the education for workers.

### (11) Work Environment

**Before/Under Construction**

Contractors must keep safety on their construction activities. The contractor should secure safety on the work. The contractor shall implement the following measures on the construction activities. MID will direct the contractor to follow the mitigation measures as shown in *1-3-1-11 Mitigation Measures and Implementation Costs*.

### (12) Accidents

**Before/Under Construction**

The construction activities may cause accidents. Not only the construction workers but also pedestrians may suffer from accidents. The contractor shall implement the measures, which are shown in *1-3-1-11 Mitigation Measures and Implementation Costs*, to avoid accidents on the construction activities. MID will direct the contractor to follow it.

**Operation**

Refer to *Existing Social Infrastructures and Services*.

### (13) Climate Change

**Before/Under Construction**

On the construction activities, machinery operation emits $CO_2$. The fuel consumption of the project is estimated approximately 1,200kL. $CO_2$ which is emitted with this fuel combustion is estimated approximately 3,100 to 3,300 ton (see Table 1-3-14).

$CO_2$ emission derived from the construction activities is mitigated by the mitigation measures shown in *1-3-1-11 Mitigation Measures and Implementation Costs*. The contractor should enlighten the workers and implement mitigation measure appropriately.

**Table 1-3-14 Fuel Quantities Consumed with the Project and $CO_2$ Emission**

| Category of Fuel | Quantity (kL) | Default Net Calorific Values (TJ/Gg) Lower/Upper | Default $CO_2$ Emission Factors (kg/TJ) Lower/Upper | Density ($kg/m^3$) | $CO_2$ Emission ($CO_2$ ton) |
|---|---|---|---|---|---|
| Diesel | 1,071 | 41.4<br>43.3 | 72,600<br>74,800 | 843.9 | 2,717<br>2,927 |
| Heavy Gas Oil | 149 | 41.4<br>43.3 | 72,600<br>74,800 | 843.9 | 378<br>407 |
| Gasoline | 5.1 | 42.5<br>44.8 | 67,500<br>73,000 | 740.7 | 11<br>12 |
| Total $CO_2$ Emission | | | | | 3,106<br>3,346 |

Source of parameters: 2006 IPCC Guidelines for GHG Inventory No.2 Energy

**Operation**

The Solomon Islands is an island country which has steep topography, sea level plain and sensitive ecology system. Therefore climate change which brings serious impacts on them is one of the most concern. Because of its economic scale, the GHG emission of the Solomon Islands is negligible volume comparing other countries, and its impacts are insignificant (see Table 1-3-15).

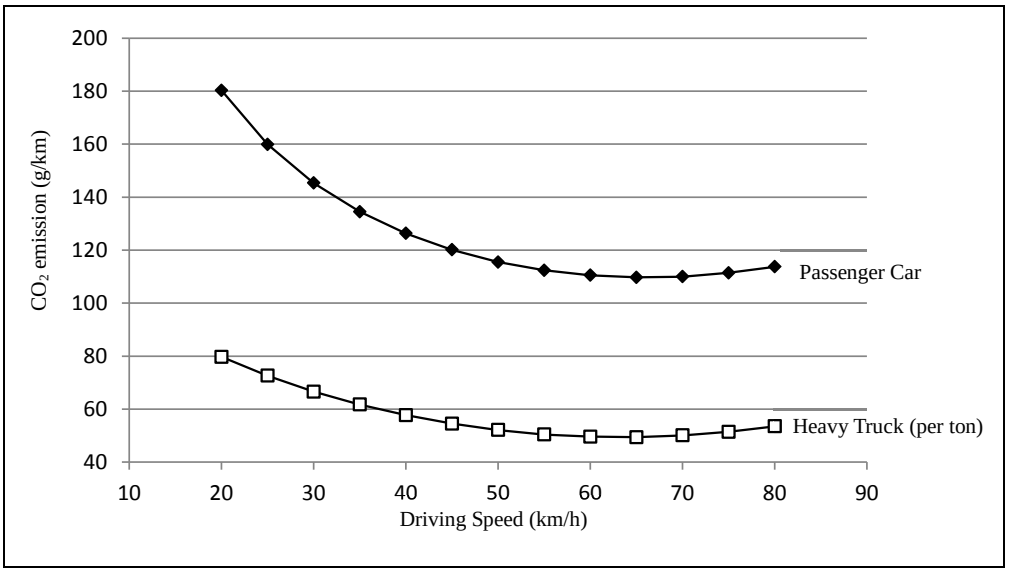
**Table 1-3-15 $CO_2$ Emission of Major Emission Countries and the Solomon Islands (2011)**

| Country | $CO_2$ Emission (million $CO_2$ ton) |
|---|---|
| China | 8715.307 |
| USA | 5490.631 |
| Russian Federation | 1788.136 |
| India | 1725.762 |
| Japan | 1180.615 |
| The Solomon Islands | 0.20324 |

Source: U.S. Energy Information Administration

However, as vulnerable country for climate change, the emission reduction or control should be considered. The traffic volume of the Kukum Highway is expected to increase in future, approximately 1.2-1.4 times. This is due to only expected economic growth and not because of the operation of the project. On the other hand, the improvement in the existing road facilities reduces road congestion and increases vehicle speed. And the improvement in vehicle speed reduces the emissions of $CO_2$ which is greenhouse gas. $CO_2$ emission factors of vehicles are shown in Figure 1-3-17.

The table indicates that the increase of travel speed from 20km/h to 30km/h reduces $CO_2$ emission to approximately eight tenths. The increase from 20km/h to 40km/h will reduce to approximately seven tenths. There for $CO_2$ increase with traffic volume will be canceled by the decrease of $CO_2$ with the increase of vehicle speed.




Source: Technical note of National Institute for Land and Infrastructure Management No. 671 (Japan)

**Figure 1-3-17 Example of $CO_2$ Emission Factors (2005-2009 registered vehicle in Japan)**

### 1-3-1-10 Impacts Assessment

Based on the survey, environment items are evaluated on Table 1-3-16.

**Table 1-3-16 Results of Evaluation Based on the Survey**

| Categories | | Environmental Items | Evaluation on the Scoping | | Evaluation by the Survey | | Reasons of Evaluation |
|---|---|---|---|---|---|---|---|
| | | | Before/ Under Construction | Operation | Before/ Under Construction | Operation | |
| Anti-pollution | 1 | Air pollution | B- | B-/B+ | **B-** | **B+** | **(Before/Under Construction)**<br>Because construction periods are limited and construction sites continuously move, impacts are temporary. Therefore it is expected that the impacts are temporary and minor.<br>MID will implement some mitigation measures to reduce the impacts more.<br>At the quarry and the borrow pit, MID implement above mitigation measures, and waste surplus soil should be reused for embankment.<br>**(Operation)**<br>The emissions get bigger by the traffic increase under economic growth. However the project itself does not increase the emissions. On the other hand, the project will raise vehicle travel speed, and decrease the emissions. |
| | 2 | Water pollution | B- | B- | **B-** | **D** | The construction activities including piling work have impacts on water quality, and appropriate mitigation measures are needed to regulate the impacts.<br>Quarry of aggregate should be conducted apart from a stream. |
| | 3 | Waste | B- | | **B-** | | The construction activities produce a certain amount of wastes. Mitigation measures such as reuse of waste soil are needed. |
| | 4 | Soil pollution | B- | B- | **B-** | **D** | Oil discharge of the machinery is expected. |

| Categories | | Environmental Items | Evaluation on the Scoping | | Evaluation by the Survey | | Reasons of Evaluation |
|---|---|---|---|---|---|---|---|
| | | | Before/ Under Construction | Operation | Before/ Under Construction | Operation | |
| | | | | | | | However, the appropriate maintenance for the machinery will prevent the impacts. The project does not extend the road, and has no impacts of soil pollution. |
| | 5 | Noise and vibration | B- | B- | **B-** | **D** | **(Before/Under Construction)**<br>Because construction periods are limited and noise and vibration impacts are local, impacts are less. MID will implement some mitigation measures to reduce the impacts more.<br>**(Operation)**<br>The emissions get bigger by the traffic increase under economic growth. However the project itself does not increase the traffic, and the project has no impacts of noise and vibration. Moreover the improvements on road pavement reduce the vibration.<br>On the quarry work, living environment and holiday should be considered.<br>The borrow pit work should be conducted away from neighboring school. |
| | 8 | Bottom sediment | B- | | **B-** | | Bridge construction may affect the bottom sediment of Mataniko River. Appropriate mitigation measures are needed. |
| Natural Environment | 11 | Water system | B- | B- | **B-** | D | (Under construction)<br>The installation of new piers may affect water system of Mataniko River. Appropriate mitigation measures are needed.<br>(Operation)<br>The additional New Mataniko Bridge and the relocated Old Mataniko Bridge have same number and the location of piers as the existing bridges, and will give no impacts on the water system of Mataniko River. |
| Social Environment | 13 | Involuntary resettlement | B- | | **B-** | | The implementation of the project needs land acquisition, and needs the demolitions of trees and some structures such as fence and brick wall. However it does not cause involuntary resettlement. |
| | 14 | Poor | | B+ | | **B+** | The project will smooth the traffic, and activate the local economies. This will contribute to the improvement on poor. |
| | 16 | Local economies, such as employment, livelihood, etc. | B+ | B+ | **B+** | **B+** | The increase of traffic volume is causing serious traffic congestions at the central area of the city, and preventing socio-economic activities. The project will smooth the traffic, and activate the local economies. |
| | 19 | Existing social infrastructures and services | B- | C- | **B-** | **B-** | **(Under construction)**<br>The construction activities need justly regulating traffic, and may cause traffic congestion even though it is temporary. For the purpose of reduction of traffic congestion, mitigation measures are examined on the construction plan.<br>**(Operation)** |

| Categories | | Environmental Items | Evaluation on the Scoping | | Evaluation by the Survey | | Reasons of Evaluation |
|---|---|---|---|---|---|---|---|
| | | | Before/ Under Construction | Operation | Before/ Under Construction | Operation | |
| | | | | | | | The project reduces the road congestion, and raises the driving speed on the Kukum Highway. This may increase traffic accident. Preventing the traffic accident, the road facilities around the Central Market are improved. |
| | 27 | Infectious diseases such as HIV/AIDS | B- | | **D** | | The construction activities are mainly implemented by heavy machinery, and will not directly related to the prevalence of disease such as HIV/AIDS. |
| | 28 | Work environment | B- | | **D** | | The project does not necessarily have negative work environment compared with other projects. |
| Others | 29 | Accidents | B- | B- | **B-** | **B-** | **(Under construction)**<br>The construction activities may cause accidents. MID will carry out mitigation measures to prevent the accidents.<br>At the borrow pit, safeguards should be conducted for neighboring school.<br>**(Operation)**<br>Refer to *Existing social infrastructures and services*. |
| | 30 | Climate change | B- | B-/B+ | **B-** | **B+** | **(Under construction)**<br>The operation of machinery and vehicles emits a certain amount of $CO_2$. Mitigation measures on the construction activities are needed.<br>**(Operation)**<br>The project will raise the travel speed on the Kukum Highway. The improvements of the travel speed will reduce vehicle emissions of $CO_2$. |

### 1-3-1-11 Mitigation Measures and Implementation Costs

#### (1) Air Pollution

**Before/Under Construction**

It is expected that the impacts on air quality are temporary and minor. To reduce the impacts on the construction activities more, MID implements some mitigation measures. As mitigation measures on construction activities, MID will direct the contractor to follow the mitigation measures shown below.

Ø To formulate an appropriate transport plan of construction materials

Ø To follow the construction plan on construction activities

Ø To avoid wasting fuel, to avoid gunning the engine

Ø To make effort to reduce a fuel consumption of heavy machinery and vehicles

Ø To maintain good condition of heavy machinery and vehicles by appropriate maintenance

Ø To instruct operators to carry out certainly above items

**(2) Water Pollution (Bottom Sediment)**

**Before/Under Construction**

**Piling Work**

On the pilling work, the bottom and water of Mataniko River may be disturbed, or the piling materials may flow out into the river. To avoid such occurrences, a reverse circulation drill which has a reputation on aquatic piling work is adopted. On the drilling work, casing cylinder which will be installed in the river prevents bottom and water turbulence and leakage of material. This will minimize the impact on the bottom and water of Mataniko River.

**Prevention of Soil Outflow**

Preventing the soil outflow from the storage yards, the storage yards of soil needs the mitigation measures for washing out of soil. MID will conduct the following mitigation measure.

Ø To sheet the soil of the storage yards

Ø Or to grass over the soil of the storage yards

**(3) Waste**

**Before/Under Construction**

To reduce the excavation, waste surplus soil should be reused for making the embankment.

**(4) Soil Pollution**

**Before/Under Construction**

For the prevention of the oil discharge the machinery must be maintained well. Mitigation measures which are shown in (1) Air Pollution will be implemented.

**(5) Noise and Vibration**

**Before/Under Construction**

To reduce the impacts of the construction activities more, MID will direct the contractor to follow the mitigation measures shown in the followings.

Ø To formulate an appropriate transport plan of construction materials

Ø To follow the construction plan on the construction activities

Ø To avoid gunning the engine of the operation of machinery or vehicles

Ø To observe the speed limit on the driving on public road

Ø In case of being complained, to consult sincerely and agree with them

Ø To instruct operators to carry out certainly above items

Ø To maintain the good condition of heavy machinery and vehicles by appropriate maintenance

**(6) Bottom Sediment**

Refer to *Water system*.

**(7) Involuntary Resettlement**

Involuntary Resettlement is referred on *1-3-2 Land Acquisition and Resettlement Action Plan*.

**(8) Existing Social Infrastructures and Services**

**Before/Under Construction**

For the purpose of reduction of traffic congestion caused by the construction activities, the followings are being examined on the construction plan.

- Ø The construction of the New Mataniko Bridge precedes. After completion of the New Mataniko Bridge, the relocation of the Old Mataniko Bridge will be conducted. Therefore, the current lanes and more are secured during construction.
- Ø During the Upgrading of the Kukum Highway, construction activity will be regulated continuously on one lane (and median split, pedestrian road), and three lanes will be opened. Therefore the congestion by the construction activity will be avoided.
- Ø During the improvement of City Council Roundabout, a detour will be installed as necessary.
- Ø The construction activities around the Central Market will be conducted basically at night because the traffic is very much on day time. The construction activities of major intersections also will be conducted at night as necessary.

**(9) Work Environment, Accidents**

**Before/Under Construction**

The workers on the construction activities must engage in their work in safety. The contractor should care about the securement of safety on the work. The contractor shall implement the following measures on the construction activities. MID will direct the contractor to follow it.

- Ø To make a construction plan which considers safety enough, and to follow it
- Ø Appropriate maintenance and control for machinery condition and operation
- Ø To keep persons away from heavy machinery to set up a barricade
- Ø Implementation of safety education and training for workers
- Ø Lending of a hard hat and a safety belt for a worker as necessary
- Ø To observe the traffic regulation and speed limit on the driving on public road
- Ø To instruct operators to carry out certainly above items

**(10) Climate Change**

**Before/Under Construction**

$CO_2$ emission derived from the construction activities will be mitigated by the following measures. The contractor should enlighten the worker and implement mitigation measure appropriately.

Ø Rational operation of heavy machinery in accordance with the construction plan

Ø Appropriate maintenance for heavy machinery

Ø Avoidance of engine gunning and idling

Ø Observance of regulatory speed on public road

**(11) Cost**

The mitigation measures will be implemented in the appropriate routines of construction management. Therefore the cost as mitigation measures is not needed.

### 1-3-1-12 Monitoring Plan

Monitoring will be implemented to confirm the degree of impacts and the implementation of mitigation measures. Monitoring plan is shown in Table 1-3-17. Most of the environmental items which need to be monitored are under construction periods.

**Table 1-3-17 Monitoring Plan**

| Environmental Items | Location | Means of Monitoring | Criteria | Frequency |
|---|---|---|---|---|
| Air Pollution | Construction site | Confirmation of the construction plan and the observance of it | The construction plan considers air pollution. | Before the construction activities |
| | | Control of fuel consumption of heavy machinery and vehicles | The fuel consumptions are according to the construction plan. | Every month |
| | | Visual inspection for the mechanical conditions of heavy machinery and vehicles | No trouble on the heavy machinery and vehicles | Every month |
| Water Pollution Water System | Construction site | Confirmation of the construction plan | The construction plan considers water pollution.<br>The construction plan considers the flow of Mataniko River | Before the construction activities |
| | | Visual inspection for the piling work | Water pollution of Mataniko River is prevented with appropriate measures. | Every two week during the piling work |
| | | Visual inspection for the mitigation measures against soil outflow | Measures against oil outflow are implemented. | Every month |
| Waste | Construction site | Reuse of waste surplus soil | Waste surplus soil is reused suitably. | Before the construction activities |
| Soil Pollution | Construction site | Visual inspection for the mechanical conditions of heavy machinery and vehicles | No trouble on the heavy machinery and vehicles | Every month |
| Noise and | Construction | Confirmation of the construction | The construction plan considers | Before the |

| Environmental Items | Location | Means of Monitoring | Criteria | Frequency |
|---|---|---|---|---|
| Vibration | site | plan and the observance of it | noise and vibration. | construction activities |
| | | Visual inspection for the mechanical conditions of heavy machinery and vehicles | No trouble on the heavy machinery and vehicles | Every month |
| Involuntary Resettlement | Construction site | Visual inspection and interview for land owners | Resettlement and compensation procedure is appropriate. | Before construction |
| Existing Social Infrastructures and Services | Construction site | Confirmation of the construction plan | The construction plan has mitigation measures against road congestion during the construction periods, such as the securement of detour. | Before construction |
| Accidents | Construction site | Confirmation of the construction plan | The construction plan considers safety enough. | Before construction |
| | | Visual inspection for machinery condition and operation | The machinery keeps good condition.<br>The machinery operation is appropriate. | Every month |
| | | Visual inspection for safety measures | Safety measures are definitely implemented. | Every month |
| Climate Change | Construction site | Confirmation of the fuel consumption of heavy machinery and vehicles | The fuel consumptions are according to the construction plan. | Every month |

Source: The Survey Team

Table 1-3-18 shows the parts of monitoring. Most of the impacts are derived from the construction activities, and the agency relating construction activities including construction contractor and supervision consultant will be in charge of monitoring implementation. MID will supervise the monitoring work of the implementation agency.

**Table 1-3-18 Parts of Monitoring**

| Items | Implementation Agency | Supervision Agency |
|---|---|---|
| Air Pollution | Construction contractor and supervision consultant | MID |
| Water Pollution/Water System | Construction contractor and supervision consultant | MID |
| Waste | Construction contractor and supervision consultant | MID |
| Soil Pollution | Construction contractor and supervision consultant | MID |
| Noise and Vibration | Construction contractor and supervision consultant | MID |
| Involuntary Resettlement | Consultant whom MID commissions | |
| Existing Social Infrastructures and Services | Construction contractor and supervision consultant | MID |
| Work Environment | Construction contractor and supervision consultant | MID |
| Accidents | Construction contractor and supervision consultant | MID |
| Climate Change | Construction contractor and supervision consultant | MID |

### 1-3-1-13 Stakeholder Consultation Meeting

To disseminate the information on the project and obtain the beneficial opinions and suggestions, two stakeholder consultation meetings were held as follows:

**First Stakeholder Consultation Meeting**

- Date and time: 9:30-12:00, 20th March 2014
- Venue: Heritage Park Hotel (in Honiara City)
- Agenda: the explanation on the project outlines, and questions and answers
- Attendance: 42 people including governments, local governments, leading enterprises, donors and media

**Figure 1-3-18 Stakeholder Consultation Meeting**

**Second Stakeholder Consultation Meeting**

- Date and time: 9:30-12:00, 27th August 2014
- Venue: Kitano Mendana Hotel (in Honiara City)
- Agenda: the explanation on the draft of the project, environmental and social considerations (the environmental aspects of the project and procedure of EIA and RAP) and questions and answers
- Attendance: 36 people including governments, local governments, leading enterprises, donors and media. And local residents were invited too.

**Figure 1-3-19 Stakeholder Consultation Meeting**

**Tackling with the Opinions**

On the first stakeholder meeting, the requests about traffic facilities around the Central Market and the access for the china town were raised. The draft plan of the project which incorporated these requests was explained on the second stakeholder meeting, and the improvement effects of the project gained high evaluation and expectation.

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

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

Some components of the project require land acquisition due to expansion of the existing ROW. On the other hand, the required lands are small-scale. Although, some structures are affected, no displacement of dwellers is foreseen. The lands to be acquired are unused or unproductive. Hence the land acquisition do not threaten owner's livelihood (See Table 1-3-19). All the lands to be acquired are well managed by land owners, so there are no informal settlers and ambulant venders in these lands.

Thus the Resettlement Action Plan (RAP) is prepared to focus on appropriate compensation for the loss of land and asset.

**Table 1-3-19 Project Components and Necessity of Land Acquisition and Resettlement**

| Project Components | Necessity of Land Acquisition and Resettlement |
|---|---|
| (1) Upgrading of the Kukum Highway | The installation of drainage needs only land acquisition. There is no resettlement. |
| (2) Countermeasures against Traffic Congestion around the Central Market | The component needs only land acquisition. Therefore resettlement is not needed. |
| (3) Widening of New Mataniko Bridge | The land acquisition is needed for approaches and some structures are affected. However resettlement is not needed. |
| (4) Improvement of City Council Roundabout | The additional ROW is needed for expansion of the roundabout. In some alternatives a few structures are affected, however resettlement is not needed. |
| (5) Relocation of Old Mataniko Bridge | The component needs land acquisition for approaches. However, resettlement is not needed. |

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

#### (1) Outlines of Laws and Regulation

Laws and regulations related to land acquisition and resettlement are as follows:

**The Constitution of the Solomon Islands**

The Constitution basically stipulates the protection from deprivation of private property, but also admits land acquisitions for public and welfare purposes.

**Land and Titles Act (CAP. 133)**

Land and Titles Act was established in 1968 and the latest amendment was enacted in 1988. The responsible authority of this act is Ministry of Lands, Housing and Survey (MLHS). The division 2 of the Act mainly describes the followings: land acquired for public purposes, appeal against expropriation, claim for compensation, temporary occupancy of land, assessment of compensation and just compensation.

**Roads Act (CAP. 129)**

The Ministry of Infrastructure Development is responsible for the Roads Act. The law describes the issues of public road construction: temporary utilization of lands (construction of building, waste stock, temporary road) around project sites, removal of obstruction (trees), and compensation for damage to property.

**Relevant Legislation**

Other relevant regulations on land acquisition and resettlement are shown in Table 1-3-20.

**Table 1-3-20 Other Relevant Regulations on Land Acquisitions and Resettlement**

| Legislation | Date | Main Objectives |
|---|---|---|
| Customary Lands Records Act 1994 (No.3 of 1994) | 1994 | Matters on customary land records: Land Record Office, functions of National Recorder, boundary disputes, customary land maps. |
| Customs Recognition Act 2000 (No. 7 of 2000) | 2000 | Matters on civil cases on customary land ownership. |
| Infrastructure Management Bill | 2012 | Powers relating to road development works; Identifying lands required for roads and infrastructure; Restrictions on using areas required for roads, etc. |
| Tribal Land Dispute Resolution Bill | 2012 | Providing for the establishment and operation of Tribal Land Dispute Panels. |

### (2) Land Acquisition Process in the Solomon Islands

Regarding land acquisition for public infrastructures, the MLHS pursues land acquisition in response to the request of the proper authorities. The Valuation Department of MLHS assesses the required lands according to factors including land area, land use and damage. Land Acquisition Officer commissioned by MLHS negotiates with the land owners. In case of no agreement with land owners during negotiation within three months, the process moves to the legal procedure.

### (3) Gaps between Regulations of the Solomon Islands and JICA Guidelines on Land Acquisition and Involuntary Resettlement

The Solomon Islands' legislation makes the land acquisition for public purposes and compensation possible. However they have no rule of involuntary resettlement for the vulnerable people.

A comparison of the JICA Guidelines and the legal framework of the Solomon Islands on land acquisition and involuntary resettlement were undertaken. Some gaps are observed as shown in Table 1-3-21. Appropriate project polices to fill in the gaps are also proposed in Table 1-3-21.

**Table 1-3-21 Comparison and Gaps between the JICA Guidelines and Laws and Regulations of the Solomon Islands, Project Policies to fill in the Gaps**

| No. | JICA Guidelines | Laws and Regulations of the Solomon Islands | Gap between JICA Guidelines and Relevant Laws of the Solomon Islands | Project Policies to fill in the Gaps |
|---|---|---|---|---|
| 1 | Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL) | No property shall be compulsorily taken except town/country planning and development that promote public benefit. The Constitution of the Solomon Islands, Land and Titles Act. Div.2 | In principle, expropriation of land is possible without exploring any viable alternatives. | Involuntary resettlement and losses of livelihood should be avoided when feasible by exploring all viable alternatives. |
| 2 | When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL) | In the case of admission of Commissioner of Land, a claimant who is entitled to the land may be compensated from the Commissioner of | Minimization of the impacts is not considered. Compensation is based on the claim of affected | Effective measures to minimize impact and to compensate for losses should be taken. |

| No. | JICA Guidelines | Laws and Regulations of the Solomon Islands | Gap between JICA Guidelines and Relevant Laws of the Solomon Islands | Project Policies to fill in the Gaps |
|---|---|---|---|---|
| | | Land.<br>Land and Titles Act. Sec79, 81 | people. | |
| 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) | No provision | No livelihood rehabilitation measures are provided. | Compensation and livelihood assistance should be provided to improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. |
| 4 | Compensation must be based on the full replacement cost as much as possible. (JICA GL) | Compensation is to be determined reasonably and properly based on the assessment of Commissioner of Land.<br>Land and Titles Act. Sec85 | Standards of compensation are not clear. | Compensation should be based on the full replacement cost. |
| 5 | Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL) | No provision | Compensation is provided after displacement. | Compensation should be provided prior to displacement. |
| 6 | For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL) | No provision | Preparation and publication of the RAP is not required. | Abbreviate resettlement plan should be prepared for the project. |
| 7 | 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. (JICA GL) | No provision | Consultations with affected people are not provided. | Consultation with the affected people should be held. |
| 8 | When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL) | No provision | Consultations with affected people are not provided. | When consultations are held, explanation should be given in a form, manner, and language that are understandable to the affected people. |
| 9 | Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL) | No provision | Monitoring is not required. | Appropriate participation of affected people should be prompted in planning, implementation, and monitoring of resettlement action plans. |
| 10 | Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL) | No provision | No grievance redress mechanisms are provided. | Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. |
| 11 | 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 as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of | No provision | No initial baseline survey is implemented. | On the early stage, the initial baseline socio-economic survey should be implemented. |

| No. | JICA Guidelines | Laws and Regulations of the Solomon Islands | Gap between JICA Guidelines and Relevant Laws of the Solomon Islands | Project Policies to fill in the Gaps |
|---|---|---|---|---|
| | such benefits. (WB OP4.12 Para.6) | | | |
| 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 claim 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) | A claimant whose livelihood depends on the land may claim compensation from Commissioner of Land. Land and Titles Act. Sec79 | People who don't have formal legal rights to land do not have the eligibility of benefits. | The PAPs who do not have formal legal rights to land should also have the eligibility of benefits. |
| 13 | Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11) | No provision | Land-based resettlement strategies are not provided. | The land-based resettlement strategies should have priority. |
| 14 | Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6) | No provision | The support for the transition period is not provided. | The support for the transition period should be provided. |
| 15 | Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.8) | No provision | Attention for vulnerable groups is not made. | Particular attention should be paid for vulnerable groups. |
| 16 | For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared. (WB OP4.12 Para.25) | No provision | Preparation of abbreviated resettlement plan is not needed. | Abbreviated resettlement plan should be prepared for the project. |

Source: The Survey Team

### (4) Cut-off-date of Eligibility

The first stakeholder meeting for PAPs was held on 4th September, 2014. On the meeting, it was declared that the starting date of a socio-economic survey (8th September, 2014) was cut-off date and the compensation policies of the project were explained.

### (5) Principle of Replacement 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) Productive Land (agriculture, aquaculture, garden and forest) based on actual current market prices that reflect recent land sales in the area, and in the absence of such recent sales, based on recent sales in comparable locations with comparable attributes, fees and taxes or in the absence of such sales, based on productive value;

(b) Residential land based on actual current market prices according to a real estate agent;

(c) Existing local government regulations for compensation calculations for building, crops and

trees will be used where ever available;

(d) Houses and other related structures based on actual current market prices according to a consultant or a contractor;

(e) For perennial crops, cash compensation at replacement cost that should be in line with local government regulations, if available, is equivalent to current market value given the type and age at the time of compensation;

(f) For timber trees, cash compensation at replacement cost that should be in line with local government regulations, if available, will be equivalent to current market value for each type, age and relevant productive value at the time of compensation based on the diameter at breast height of each tree.

### 1-3-2-3 Affected Lands and Assets

#### (1) Land Acquisition and Loss of Assets

Estimates of affected lands and structures are summarized in Table 1-3-22. The present land use of the affected lands is classified into unused, office, commercial and church.

The whole area of parcel L-1 is acquired, but unused. Also L-5 needs the whole parcel, so far, this site is a part of public road. In other parcels, the area to be acquired is below 10% of each parcel.

**Table 1-3-22 Estimate of Affected Lands and Structures**

| No. | Estimated Area of Land Acquired / Total Area of the Parcel (sq.m) | Estimate of affected structures | Location | Parcel Number | Note |
|---|---|---|---|---|---|
| L-1 | 230/230 | S-1 Block Wall H2.0m L=110m | New Mataniko Bridge | 025-118 | |
| L-2 | 860/30,000 | S-2 Steel Fence H2.0m L=120m | | 023-119 | |
| L-3 | 160//3,200 | | | 023-141 | |
| L-4 | 20/1,500 | | City Council Roundabout | 023-050 | Possessed by Honiara City |
| L-5 | 440/440 | | | 023-154/155 | |
| L-6 | 210/4,300 | | | 023-137 | Possessed by Solomon Islands Water Authority (SIWA) |
| L-7 | 30/36,000 | | | 024-090 | |
| L-8 | 60/30,000 | S-3 Steel Fence H2.0m L=25m | Old Mataniko Bridge | 023-119 | |
| L-9 | 15/30,000 | | | 023-119 | |
| L-10 | 60/1,800 | | Kukum | 041-259 | |
| L-11 | 70/6,000 | S-4 Steel Fence H2.0m L=20m | Vura Intersection | 037-015 | |
| L-12 | 100/3,600 | S-5 Steel Fence H2.0m L=27m | | 038-033 | |
| L-13 | 270/5,200 | | Central Market | 023-071 | Possessed by Honiara City |

Source: The Survey Team

### (2) Census survey

A socio-economic survey including a census survey was started on 8th September, 2014. On the first stakeholder meeting which was held on 4th September, 2014, it was declared that the starting date of a socio-economic survey (8th September, 2014) was cut-off date. The results of the survey are summarized below on each affected area. Table 1-3-23 shows the number of PAUs and APs.

**Table 1-3-23 Number of Project Affected Units (PAUs) and Affected Persons (APs)**

| Type of Loss | Number of PAUs | | | Number of APs | | |
|---|---|---|---|---|---|---|
| | Legal | Illegal | Total | Legal | Illegal | Total |
| Required for Displacement | | | | | | |
| 1 HH (Structure Owner on Gov. Land) | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 HH (Structure on Private Land) | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 HH (Tenants) | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 CBEs (Structure Owner on Gov. Land) | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 CBEs (Structure Owner on Private Land) | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 CBEs (Tenants) | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 Community Owned Structures Including Physical Cultural Resources | 0 | 0 | 0 | 0 | 0 | 0 |
| Not required for Displacement | | | | | | |
| 8 Land Owners | 10 | 0 | 10 | 10 | 0 | 10 |
| 9 Wage Earners | 0 | 0 | 0 | 0 | 0 | 0 |
| Grand Total (1-9) | 10 | 0 | 10 | 10 | 0 | 10 |

HH: House Hold, CBEs: Commercial and Business Enterprises

### (3) Land and Asset Survey

The affected lands and properties are shown in Table 1-3-24, 25.

**Table 1-3-24 Area of Land Acquisition**

| No. | Location (Village/Sub District) | Land Use | Affected Area ($m^2$) |
|---|---|---|---|
| The New Mataniko Bridge | | | |
| L-1 | Kukum | Unused | 230 |
| L-2 | Vavaea Ridge | Unused | 860 |
| L-3 | Vavaea Ridge | Unused | 160 |
| Sub Total | | | 1,250 |
| Improvement on City Council Roundabout | | | |
| L-4 | Vavaea Ridge | Honiara City Council | 20 |
| L-5 | Vavaea Ridge | Public road | 440 |
| L-6 | Vavaea Ridge | Office | 210 |
| L-7 | Vavaea Ridge | Church | 30 |
| Sub Total | | | 700 |
| The Old Mataniko Bridge | | | |
| L-8 | Vavaea Ridge | Unused | 60 |
| L-9 | Vavaea Ridge | Unused | 15 |

| No. | Location (Village/Sub District) | Land Use | Affected Area ($m^2$) |
|---|---|---|---|
| Sub Total | | | 75 |
| The Kukum Highway/Vura Intersection | | | |
| L-10 | Kukum | Commercial | 60 |
| L-11 | Vura Intersection | Commercial | 70 |
| L-12 | Vura Intersection | Church | 100 |
| Sub Total | | | 230 |
| Central Market | | | |
| L-13 | Central Market | Commercial | 270 |
| Sub Total | | | 270 |
| Total | | | 2,525 |

**Table 1-3-25 Affected Building and Structure**

| No. | Location (Village/Sub District) | Type of Building | Total |
|---|---|---|---|
| Residential Building | | | |
| - | - | - | - |
| Sub Total | | | |
| Shops | | | |
| - | - | - | - |
| Sub Total | | | |
| Public Institution | | | |
| - | - | - | - |
| Sub Total | | | |
| Miscellaneous Structure | | | |
| S-1 | Kukum | Block Wall<br>H=2.0m L=110m | 1 |
| S-2 | Vavaea Ridge | Steel Fence<br>H=2.0m L=120m | 1 |
| S-3 | Vavaea Ridge | Steel Fence<br>H=2.0m L=25m | 1 |
| S-4 | Vura Intersection | Steel Fence<br>H=2.0m L=20m | 1 |
| S-5 | Vura Intersection | Block Wall<br>H=2.0m L=27m | 1 |
| Sub Total | | | |
| Total | | | |

### 1-3-2-4 Eligibility and Compensation Measures

#### (1) Compensation

Besides the compensation for land and structure which the Solomon laws and stipulates, compensations for land and structure are estimated with market rates because the compensation based on the Solomon laws and standards do not satisfy replacement cost. Compensations are estimated based on the cost survey around the project area. Table 1-3-26, 27 show the estimated compensations.

**Table 1-3-26 Compensation for Land Acquisitions**

| Location | Land Areas ($m^2$) | Unit Cost (SBD/$m^2$) | Amounts (SBD) |
|---|---|---|---|
| The New Mataniko Bridge | 1,250 | 1,800 | 2,250,000 |
| The Old Mataniko Bridge | 75 | 1,800 | 135,000 |
| Improvement in City Council Roundabout | 700 | 1,800 | 1,260,000 |
| The Kukum Highway | 230 | 1,200 | 276,000 |
| Central Market | 270 | 2,400 | 648,000 |
| Total | 2,525 | | 4,569,000 |

Unit cost: Current market values by real estate agencies in Honiara City

**Table 1-3-27 Compensation for Losses of Properties**

| No. | Description | Quantity (m) | Unit Cost (SBD) | Amounts (SBD) |
|---|---|---|---|---|
| S-1 | Block wall H=2.0m | 110 | 2,000 | 220,000 |
| S-2 | Fence H=2.0m | 120 | 3,500 | 420,000 |
| S-3 | Fence H=2.0m | 25 | 3,500 | 87,500 |
| S-4 | Fence H=2.0m | 20 | 3,500 | 70,000 |
| S-5 | Block wall H=2.0m | 27 | 2,000 | 54,000 |
| Total | | | | 851,500 |

Unit cost: Current market values by a contractor in Honiara City

### (2) Livelihood Rehabilitation

As mentioned above, there will be no involuntary resettlement and loss of assets that affects owner's livelihood. Therefore no measures for livelihood rehabilitation are demanded for this project.

### (3) Entitlement Matrix

The entitlements and compensation for PAPs are shown in Table 1-3-28.

**Table 1-3-28 Entitlement Matrix**

| Type of Losses | Application | Entitled Person | Compensation | Implementation Unit |
|---|---|---|---|---|
| 1. LAND<br>Classified as Agricultural, Residential, Commercial, Industrial | All or a part of the land is lost. | Persons who have ownership on Estate Register | Cash compensation for loss of land at full replacement cost (free from taxes and transaction cost) | MLHS/MID |
| 2. STRUCTURES | Severely affected<br>Marginally affected | | Cash compensation for entire structure at full replacement cost (without depreciation or deductions for salvaged building materials). | MLHS/MID |

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

On the project implementation, the following procedures of Grievance Redress Mechanism will be taken to address any complaints from the affected land owners in a transparent and efficient manner.

MID informs the PAPs about the installation of grievance redress section in CPIU of MID, the role of the section, and the method of contact. MID shows the PAPs it in writing on the agreement with the PAPs.

Since the project sites are located in urban areas, it is desired that the PAPs discuss their complaints with the project office of MID, and complaints are resolved then and there. All such issues are recorded and informed to the MID by the subproject staff.

If the PAP is not satisfied with the outcome, the complainant directly brings his/her complaint to MID. MID should consultant with the complainant sincerely.

### 1-3-2-6 Implementing Organization

MLHS is responsible for land acquisitions. After completion of land acquisitions, MID is responsible for implementation of the RAP. Consultation and negotiation on land acquisition and compensation for loss of assets will follow the procedures outlined in the RAP.

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

Implementation schedule of the RAP is shown in Table 1-3-29. MID prepares RAP in September of 2014 and submits it to JICA. And JICA confirms the contents of RAP. Based on the RAP, the land acquisition and compensation are implemented.

**Table 1-3-29 Resettlement Schedule**

| Item | 2014 | | | | 2015 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr-Jun | Jul-Sep | After Oct |
| RAP Survey | ━ | | | | | | | | | |
| Agreement with PAPs | | ━ | | | | | | | | |
| Payment of Compensation | | | | | | | ━ | | | |
| Monitoring | | | ┅ | ┅ | ┅ | ┅ | ┅ | ┅ | ┅ | |
| Project Implementation | | | | | | | | | | ━ |

### 1-3-2-8 Cost and Budget

The costs of the land acquisition and the compensations are estimated on Table 1-3-30.

**Table 1-3-30 Costs of Land Acquisition and Compensations**

| Item | Cost（SBD） | Note |
|---|---|---|
| 1. Land Acquisition | 4,569,000 | |
| 2. Compensation for property losses | 851,500 | Fence, Block Wall |
| Total | 5,420,500 | |

Source: The Survey Team

The above cost is a burden of the Government of the Solomon Islands. Therefore MID budgets for it and implements. On the budget of 2015, the project costs including the payment of the compensation have been budgeted.

### 1-3-2-9 Monitoring and Evaluation

Regarding the land acquisition and resettlement of the project, a consultant commissioned by MID conducts a monitoring for MID and PAPs, and reports it to MID. MID submits the results of the monitoring to JICA. Monitoring items are shown in Table 1-3-31. And a monitoring form is shown in Appendix8.

**Table 1-3-31 Monitoring Items**

| Item | Criteria | Measure | Time/Frequency |
|---|---|---|---|
| Payment of Compensation | - Paid before the implementation of the project<br>- Paid with replacement cost | - Interview to PAPs and MID<br>- Confirmation of evidence of payments | March and August, 2015 (before the implementation of the project) |
| Grievance Redress Process | - Grievance redress section appropriately installed<br>- The contents of complaints recorded<br>- MID responds to PAPs appropriately, agrees with PAPs | - Interview to PAPs and MID<br>- Confirmation of records of grievance redress processes | November, 2014 -September, 2015 Every two month |

Source: The Survey Team

# Chapter 2 Contents of the Project

## 2-1 Basic Concept of the Project

### 2-1-1 Objectives of the Project

The Kukum Highway connects the center of the capital city Honiara with the international airport, and is the part of the main road along the northern coast of Guadalcanal Island. Increase of traffic volume is causing serious traffic congestions at the central area of the city along the Kukum Highway and the smooth traffic flow is being hampered. The causes of the traffic congestion are: (a) the bottlenecks at the Central Market where buses stop in the carriageways and pedestrians are crossing the highway, (b) New Mataniko Bridge where the highway width narrows from four-lane to two-lane, (c) City Council Roundabout where many directions of traffic intersect and (d) Old Mataniko Bridge where the bridge width is only one-lane. An another cause is the seriously deteriorated pavement by frequent floods along the highway where the roads are lower than the roadside lands.

Under the above road conditions, this project aims to provide smooth and safe driving along the Kukum Highway by rehabilitating deteriorated pavement and repairing drainage facilities and to mitigate the traffic congestions in the city center section by improving road facilities and widening the bridges.

### 2-1-2 Component of the Project

The components of the project are as follows:

(1) Upgrading of the Kukum Highway (section from City Council Roundabout to Ministry of Fishery, approx. 3km)

(2) Countermeasure against traffic congestion around the Central Market

(3) Improvement of City Council Roundabout

(4) Widening of New Mataniko Bridge (from 2-lane to 4-lane)

(5) Replacement of Old Mataniko Bridge (1-lane to 2-lane)

(6) Soft component

Originally the Kukum Highway section from City Council Roundabout to the International Airport (Approx. 12km) was requested to be upgraded, however only the section from City Council to Ministry of Fishery (Section-1: approx. 3km) was selected as a target area of the project since the pavement and drainage condition of Section-1 is not good and need urgent repair while the other section condition is not urgent.

Countermeasure against traffic congestion around the Central Market was not included in the original request, however it was proposed to be included as the project component since the countermeasures against traffic congestion around the Central Market is necessary to be undertaken together with the improvement of City Council Roundabout. Widening of New Mataniko Bridge and replacement of Old Mataniko Bridge is also necessary in order to

effectively mitigate the traffic congestion in the city center section.


**Figure 2-1-1 Location of Problem Area along the Kukum Highway**

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

### 2-2-1 Design Policy

#### 2-2-1-1 Design Concept of Project Component

Based on the field surveys and discussions with the concerned parties, the project components is designed with the following concepts:

**(1) Upgrading of the Kukum Highway**

- Ø To minimize the land acquisition, the horizontal alignment and the cross sectional components of the road are planned to follow the existing road basically. The road shoulders are to be narrower than existing ones where roadside ditches are placed.
- Ø The pavement of the section between City Council Roundabout and Ministry of Fishery are to be repaved totally since it is seriously deteriorated.
- Ø Drainage ditches are to be installed at the both sides of the roads. The road sections having inundation because the roads are lower than the surrounding ground, are embanked to rise up.
- Ø Installation of traffic signal at the major intersections are desirable, however it is not installed due to unsureness of power supply and availability of maintenance. Instead, Vura Junction and Central Hospital Junction are to be improved since it is requested strongly and its necessity is confirmed due to the large traffic volume causing traffic congestions at the junctions.
- Ø Bus bays along the highway are to be provided outside of the carriageway.

**(2) Countermeasure against Traffic Congestion around the Central Market**

- Ø Since the major cause of the traffic congestion around the Central Market are bus stoppings occupying the traffic lanes and chaotic frequent highway crossing of pedestrians, the countermeasures against traffic congestion around the Central Market are provision of bus bays with adequate size and provision of road crossing facilities that are to be a crosswalk and a underpass. Median fence is to be installed to prevent free road crossing. The existing underpass will be reopened after renovation.
- Ø The crosswalk is controlled by traffic personnel instead of traffic auto signal due to the abovementioned reason.
- Ø To promote pedestrians to use the underpass, the existing underpass is to be renovated by repainting, lighting and installing corner mirrors and colorless entrance/exit roofing.
- Ø Traffic personnel are necessary to do traffic control at the crosswalk from early morning until late evening every day and a security guard is necessary to clean and lock/unlock the underpass every day.
- Ø As a soft component of the project, this project supports and monitors the establishment of the traffic control of the crosswalk and security management of the underpass.
- Ø The pavement of the Central Market section is not to be repaved since its condition is still good.

**(3) Improvement of City Council Roundabout**

- Ø Traffic signalization or grade separation is the effective method to solve the traffic congestion at the roundabout, however it was not adopted due to cost and maintenance reasons.
- Ø To improve traffic capacity of the roundabout, ring road diameter is to be enlarged and number of lane is to be increase and number of connecting road is reduced.
- Ø To minimize the land acquisition necessary to enlarge the roundabout, the storage yards owned by MID is to be used.

**(4) Widening of New Mataniko Bridge**

- Ø To widen the bridge, new 2-lene bridge is to be additionally constructed because the existing 2-lene bridge is structurally sound. The location of the additional bridge is to be chosen either downstream side or upstream side based on the comparison.
- Ø The bridge structure is proposed based on the comparison of alternative schemes.
- Ø The existing bridge is to be repaired. The cracking on the concrete deck slab possibly need replacement by MID after 10 to 15 years.
- Ø Durable type riverbank protection is proposed for the eastern side abutment because the eastern side riverbank protection of the existing bridge has been washed out by flood

occurred in April 2014. Since the flood has reached near to the existing bridge girder, new bridge elevation is designed to secure the required freeboard above the high water level. Since the existing bridge cannot be raised up to maintain the structural stability, the soil deposit under the bridge and obstacles in the river are removed in order to improve the capacity of flood discharge.

**(5) Replacement of Old Mataniko Bridge**

- Ø The flood occurred in April 2014 washed out the former bailey bridge and the existing bailey bridge has been installed. The existing bailey bridge is proposed to be replaced by a 2-lane permanent bridge since the former is a single-lane and it is causing traffic congestions up to the Kukum Highway.
- Ø The bridge length, span layout and bridge elevation are designed based on the hydrology analysis reflecting the flood occurred in April 2014.

### 2-2-1-2 Design Policy

**(1) Design Standards and Criteria**

- Ø The design standards and criteria established by the government of the Solomon Islands are applied in the design of the project roads and bridges basically and the Japanese specifications are applied supplementally, however their appropriateness is clarified with the international specifications such as AASHTO.

**(2) Policy against Natural Conditions**

- Ø The natural conditions such as rainfall, temperature change, earthquake and others are reflected in the designs.
- Ø The drainage structure sizes are determined based on the hydrology analysis.
- Ø The bridge elevations are determined based on both the river hydrology analysis and the hearing survey of the flood history.
- Ø Countermeasures against salt water are considered in the design of bridges crossing Mataniko River.
- Ø The bridge foundation is designed based on the boring survey data. Liquefaction effect is considered in the foundation design since the site is within earthquake prone area.
- Ø The thickness of the pavement is determined based on the analysis employing the traffic loads and the strength property of the pavement materials.

**(3) Policy on Environmental and Social Considerations**

- Ø It minimizes land acquisition, resettlement and removal of existing properties in designing.

- Ø It minimizes negative effect on traffic convenience in construction planning. Night work is proposed in case the negative effect on the traffic is unacceptable to the daytime traffic.
- Ø Detours are provided where existing roads are closed for the construction.
- Ø Construction methods with minimum vibration, noise, dust and other pollutions are adopted in construction planning.
- Ø The connection areas between the highway and the roadside private areas are planned so as to be acceptable for the roadside area owners.

**(4) Policy on Procurement Planning**

- Ø It maximizes utilization of local products and materials.
- Ø Materials with acceptable quality, price and supply capacity are used.
- Ø Specifications and sizes of materials and equipment are transportable size and weighs.

**(5) Policy on Operation and Maintenance**

- Ø To secure the proper operation and management of crosswalk and underpass in front of the Central Market, this project supports to establish the operational organization and method as a soft component of the project.
- Ø Road facilities and bridges are designed to be maintenance free or easy for maintenance. Open ditches are to be used instead of drain pipes. Concrete pavement is used instead of asphalt pavement for roundabout. Bridges are designed with minimal expansion joints which require frequent repair.

### 2-2-2 Basic Plan

#### 2-2-2-1 The Kukum Highway Upgrading Plan

**(1) Design Criteria**

The design criteria was discussed with MID based on the design standards of Solomon Islands and pavement design manual of Japan. It was established as follows.

- Ø Design speed: 50km/h
- Ø Normal cross slope: 2%
- Ø Max. superelevation: 4%
- Ø Pavement type: Asphalt pavement, partly cement concrete pavement
- Ø Design Period: 10 years, both of asphalt and cement concrete pavement

**(2) Geometrics**

This project aims to upgrade the existing highway, however improvement of the horizontal

alignment and widening of the road is not proposed because the lands at the both sides of the highway is already in use and such upgrading needs a lot of land acquisitions and involuntary resettlements which is not so easy. Geometric requirements at design speed 50km/h and super-elevation 4% are as follows

Ø Min. Curve Radius: 86m

Ø Curve Radius without Superelevation: More than 1,300m

Ø Min. Curve Length: 80m

Ø Runoff of Superelevation: 1/115

Ø Max. Grade: 8%

Ø Min. Vertical Curve: K=7 for crest and K=13 for sag

Basically the project road alignment follows the existing road which satisfies the geometric requirements. There are two sections where super-elevations are not given to the curved sections. The S-curb section between City Council Roundabout and New Mataniko Bridge is not provided with super-elevation because the distance between the curves is too short to provide super-elevations and their runoffs. This geometric dissatisfaction comes from the widening of the highway to connect the widened New Mataniko Bridge and to avoid demolition of SIWA building. The other one is City Council Roundabout ring road and its approaches where driving is slow.

The sagged sections having inundation (Sta.0+700 – Sta.2+600) are raised up by embankment to improve.

The approach road of Old Mataniko Bridge is design to follow the existing road alignment since the new bridge is designed to locate at the existing bridge. The bridge approach road is designed with the design speed of 30km/h. The geometric requirements for design speed 30km/h are as follows. Super-elevation is not provided to the curbed sections because the curbs are short and close to the intersections.

Ø Min curve radius: 30m

Ø Min. curve length: 50m

Ø Max. grade: 10%

Ø Min. vertical curve: K=2 for crest, K=6 for sag

### (3) Cross Section Composition

In the Solomon Islands, the land ownership is complicated and the land acquisition is not easy in some cases. Therefore, the cross section composition is designed to be accommodated within the existing highway width. The proposed cross section composition is as follows:

Ø Median: 3.0m

Ø Driving lane: 3.5m

Ø Right turn lane: 3.0m

Ø Shoulder: Inner 0.5m, Outer 0.5m~1.7m

Ø Sidewalk: 2.0m

The existing road is 4-lane with the center median. The width of road is not uniform and one side road width varies from 7 to 11m. While proposed minimum road width is 8m in case lane width is 3.5m and minimum shoulder width is 0.5m. The outer shoulder is proposed to be 0.5m or wider to maintain the existing road width as much as possible. The typical cross section is shown in Figure 2-2-1.

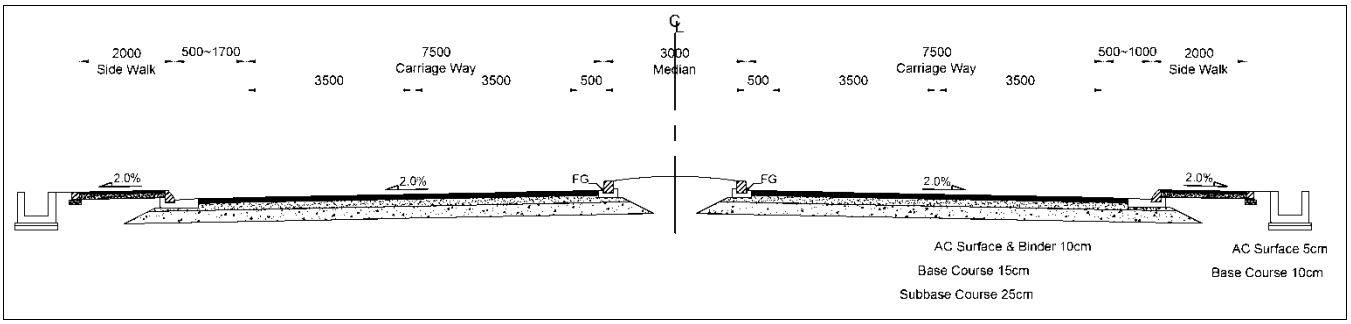



**Figure 2-2-1 Typical Cross Section**

**(4) Pavement Design**

The pavement design manual of Japan which requires design data of heavy vehicle traffic volume is adopted for this project because AASHTO pavement design guide requires axle weigh data which is not available in the Solomon Islands. The heavy vehicle traffic data was obtained by the traffic survey and the future demand forecast at New Mataniko Bridge where the traffic volume is the maximum along the Kukum Highway. The heavy vehicle traffic volume for pavement design is shown in Table 2-2-1. As shown in the table, cargo truck vehicles were classified by number of axles in this traffic survey. Since heavy vehicles such as loading capacity 8 ton class 2-axle trucks were counted under light truck, 10% of traffic of light trucks are considered as heavy vehicles.

**Table 2-2-1 Heavy Vehicle Traffic Volume for Pavement Design**

(Vehicle/day)

| | Cargo Truck Vehicles | | | Total | Heavy Vehicle Total |
|---|---|---|---|---|---|
| | Light Truck (2-Axle, Double rear tire) | Heavy Track (More than 3 axle) | Semi & Full Trailer Truck | | |
| 2,013 | 2,614 | 171 | 120 | 2,905 | 552 |
| 2,017 | 3,040 | 199 | 140 | 3,379 | 642 |
| 2,018 | 3,150 | 206 | 145 | 3,501 | 666 |
| 2,023 | 3,738 | 245 | 172 | 4,155 | 790 |
| 2,028 | 4,393 | 287 | 202 | 4,882 | 928 |

The average heavy vehicle traffic volume for one direction during the design year from 2018 to 2028 is 397 vehicle/day. This heavy vehicle traffic volume is classified as load class "N5", upward of 250 and under 1,000 unit/day direction, in the pavement design manual of Japan. CBR values of subgrade of the concerned section varies widely from 8 to 80. The extreme vales of the CBRs were not taken and the design CBR 8 was obtained. The pavement structure was designed for the design period 10 years and reliability 90%. The pavement structure is shown in Table 2-2-2.

**Table 2-2-2 Pavement Structure for the Kukum Highway**

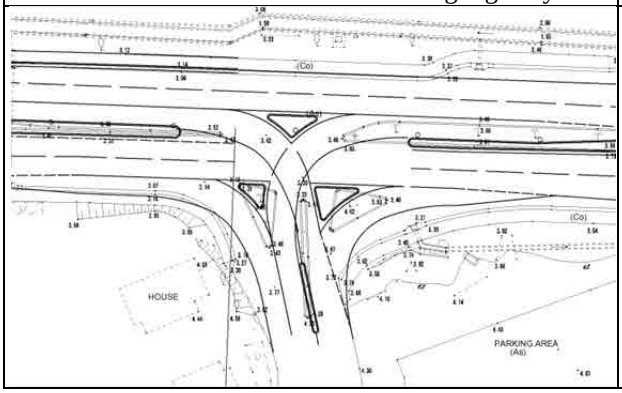
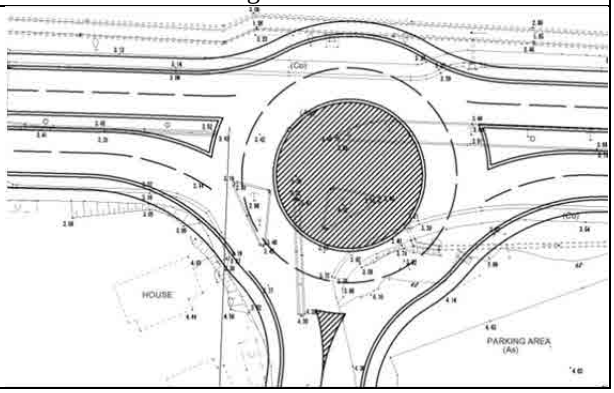
| Layer | Material | Structure Coefficient | Thickness |
|---|---|---|---|
| Surface Course | Hot mixed Asphalt Concrete | 1.00 | 5cm |
| Binder Course | | 1.00 | 5cm |
| Base Course | Mechanically Stabilized Granular Material | 0.35 | 15cm |
| Subbase Course | Crusher run | 0.20 | 25cm |
| | | $T_A$= | 20.25 |

"Traffic Monitoring Guide" published in 2001 by The Federal Highway Administration (FHWA) of USA classified the vehicles into 13 classes and suggested the typical ESALs by vehicle class. Using this typical ESAL values and AASHTO pavement design method results same pavement structure as Table 2-2-2.

### (5) Intersection in Front of Central Hospital

In the public consultation meeting during the field survey, improvement of Central Hospital Intersection (Sta. 0+700) was requested and the necessity of the improvement was confirmed since the traffic volume is large and traffic congestion is occurring. Alternative schemes of improvement of Central Hospital Intersection are shown in Table 2-2-3. Maintaining T-shape intersection was proposed as the comparison result. A traffic island with right turn lane is provided for the right turn traffic from Chinatown.

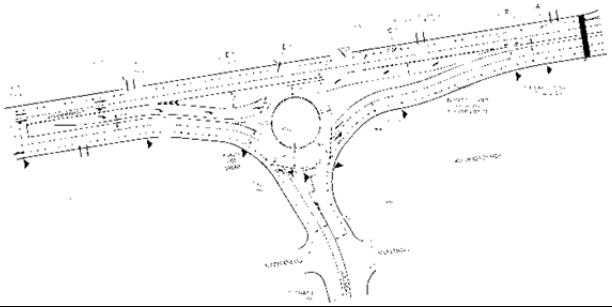
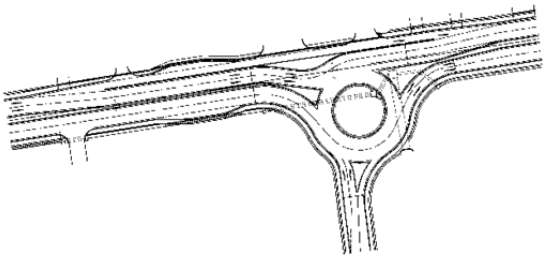
**Table 2-2-3 Alternative Scheme of Improvement of Central Hospital Intersection**

| T-shape with Traffic Island | Roundabout |
|---|---|
| -No land acquisition<br>-Right turn traffic from Chinatown need to wait for gap of highway traffic<br>-Suitable to maintain smooth traffic along highway | -Need land acquisition<br>-Need all vehicles to stop entering the roundabout<br>-Cause traffic congestion of the highway<br>-Convenient for turning vehicles |
|  |  |

**(6) Vura Intersection**

MID has prepared the preliminary design of Vura Intersection (Sta. 2+500) and requested to include in this project. Since the intersection traffic volume is large and the necessity of the improvement of the Vura Intersection was confirmed, the Vura Intersection was included in the project. However the land acquisition area of the preliminary design was large, the design was reviewed. The comparison between the preliminary design and revised design are shown in Table 2-2-4. Use of ridged pavement (concrete pavement) was proposed only for inside the roundabout.

**Table 2-2-4 Preliminary Design and Revised Design of Vura Intersection Improvement**

| Preliminary Design | Revised Design |
|---|---|
| -Land acquisition area: approx. 1,200 sq.m<br>-Demolish building: bread shop and church<br>-Construction cost: More than revised design<br>-Traffic capacity: Same as revised design | -Land acquisition: approx. 300 sq.m<br>-Demolish building: None<br>-Construction cost: Less than preliminary design<br>-Traffic capacity: Same as preliminary design |
|  |  |

**(7) Bus Bays**

Bus bays are provided outside of the carriageway not to obstruct the through traffic. Since the most buses are wagon, 3m wide bus bay was designed. The locations of bus bays are shown in Table 2-2-5.

**Table 2-2-5 Location of Bus Bay**

| Sta. of Left Bus Bay | Location | Sta. of Right Bus Bay |
|---|---|---|
| 0+540 | China Town | 0+540 |
| 0+730 | Central Hospital | 0+800 |
| 1+060 | Down Kolaridge | 1+130 |
| 1+420 | Bahai | 1+480 |
| 1+610 | Hotel Casino | 1+640 |
| 2+090 | Kukum | 2+150 |
| 2+430 | Vula Jct. | 2+440 |
| 2+640 | Fish Market | 2+680 |

### (8) Drainage Plan

The design criteria of road drainage are as follows:

Ø Return Period: 2 years

Ø Precipitation Intensity for 10 min: 120mm/h

Existing catch basins located on the shoulder are broken and very dangerous for driving. Therefore, catch basins are located inside the sidewalk. Since the interval of the catch basis are too big, rainwater flows on the carriageway and inundate on the road when rain is heavy. The catch basins are located at 10m interval along the sidewalk. Side ditch is to be located outside the sidewalk to drain the water from the catch basins. The cross pipes under the road are to be cleaned and reused.

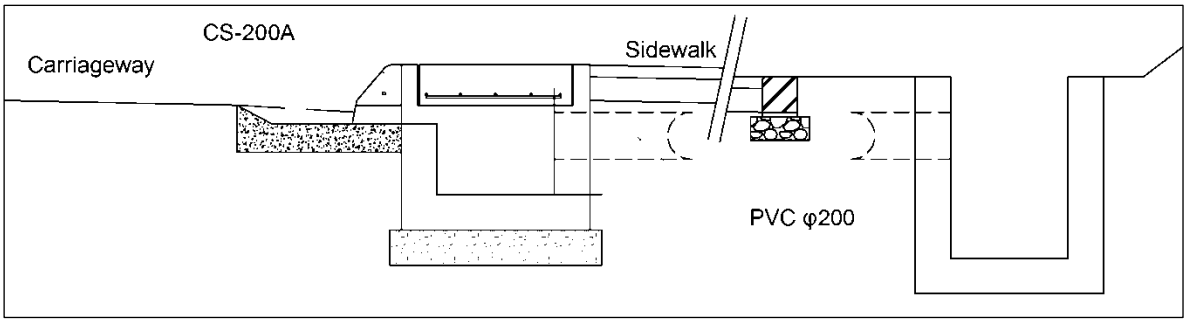



**Figure 2-2-2 Drainage System with L-shape Gutter**

The size of side ditches is designed to accommodate discharges from the southern mountain areas which are estimated based on the hydraulic analysis of each watersheds of the area. Based on the analysis of discharge at outlet point, two culvers are to be replaced and three culverts are to be newly constructed.

**(9) Sidewalk**

Basically, mount up type sidewalk are used to drain the road surface water to the catch basis. Flat type side walk as shown in Figure 2-2-3 are used where the roadside is lower that the road (sea side of Sta.1+300~1+600 and Sta.2+800~3+000).

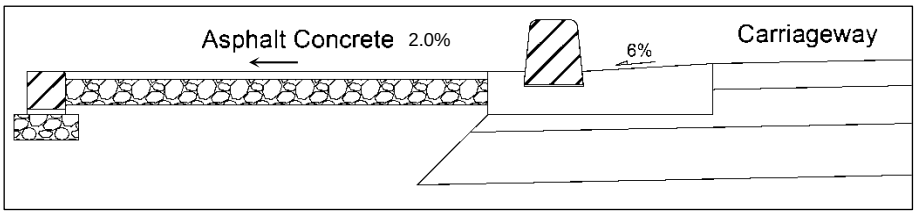



**Figure 2-2-3 Flat Type Sidewalk**

The asphalt pavement is designed for the sidewalk because it is easy for digging and repairing. The pavement structure for the sidewalk is adopted 5cm surface course and 10cm base curse which is recommended as the sample of popular structure for sidewalk by the pavement design manual of Japan.

**(10) Other Road Facilities**

(a) Street Light

The existing street lights are used continuously. Where the median is moved, street light poles are relocated to the center of median. New street lights are installed at City Council Roundabout and Vura Intersection.

- New installation：2 of 2-branch type and 3 of 1-branch type
- Relocation：5 of 2-branch type
- Repair：7 of 2-branch type and 2 of 1-branch type

(b) Road Marking

The road marking is not provided in Solomon Is. thus there is not centerline even on the undivided 2-lane road. In this project, the road marking such as lane lines, edge striping, arrows and clear zone are provided based on Japanese standard to upgrade the safety of the road.

(c) Guardrail

The guardrails are installed at the place box culverts. The existing guardrails are used continuously.

(d) Pedestrian Fence

Pedestrian fences are installed along the big roadside ditch (1000 x 1000 and 800 x 800) to prevent pedestrians from falling down.

(e) Planting Work

All medians and traffic islands are covered with grass. Additionally shrubs are planted along the perimeter of center islands of City Council Roundabout and Vura Intersection and along the median fence around the Central Market.

### 2-2-2-2 Countermeasures against Traffic Congestion around the Central Market

The area around the Central Market is the most commercial and business center of Honiara. Therefore, the countermeasures are:

Ø To mitigate traffic congestion

Ø To improve traffic safety

Ø To improve convenience of the Central Market Area

#### (1) Mitigation of Traffic Congestion

To mitigate the traffic congestion around the Central Market, the proposed countermeasures are as follows:

(a) Improvement of Bus Bays

One of major cause of the traffic congestion is disturbance to the pass through traffic by buses. When the bus bay is occupied fully by buses, arriving buses wait on the carriageway for available space to enter the bus bays. The bus bays are necessary to be provided with sufficient space against the demand of bus stoppings and bus bays are necessary to be separated from the carriageway. The necessary number of bus berth of each bus bays by destination was proposed as shown in Table 2-2-6 based on the observation survey of present bus bay operation and traffic demand forecast. Alternative schemes of improvement of bus bay are shown in Figure 2-2-4. As the result of the comparison, Scheme-2: double lane bus bay is proposed.

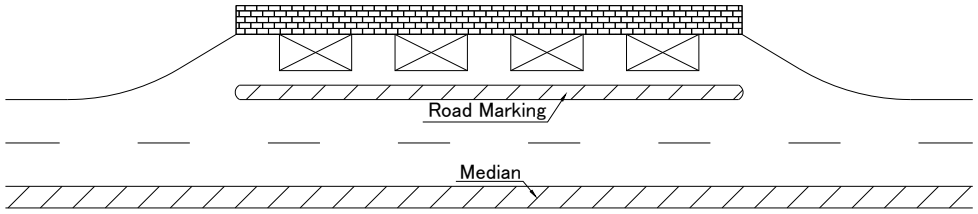
**Table 2-2-6 Number of Bus Berth**

| Destination | Stopping Duration | Peak Hour Bus Stopping (Veh/h) | | Peak Hour Bus Berth Needed (Nos) | | Observed No of Bus Stopping | Proposed No of Berth |
|---|---|---|---|---|---|---|---|
| | | 2014 | 2033 | 2014 | 2033 | | |
| White River | 1.5 Min | 180 | 270 | 5 | 7 | 8 | 8 |
| KG VI | 1.5 Min | 204 | 310 | 5 | 8 | 8 | 8 |
| Henderson | 6 Min | 32 | 50 | 3 | 5 | 7 | 5 |
| Gppol | 40 Min | 16 | 25 | 11 | 16 | 12 | - |

Note: Busses destine to Gppol are waiting inside the Central Market parking.

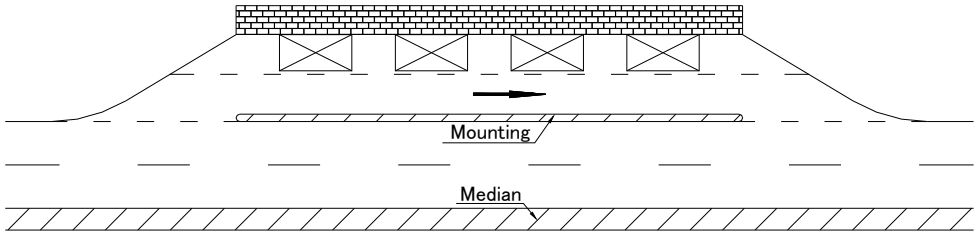
**Scheme-1: Road Marking**

Bus bay is separated from carriageway by road marking.




**Scheme-2: Double Lane Bus Bay**

Bus bay is separated from carriageway by mounting-block. Bus bay will be composed with a stop lane and a passing lane.




**Scheme-3: Relocation of Bus Bays to the Central Market Parking**

A part of the Central Market parking is used for bus stopping.

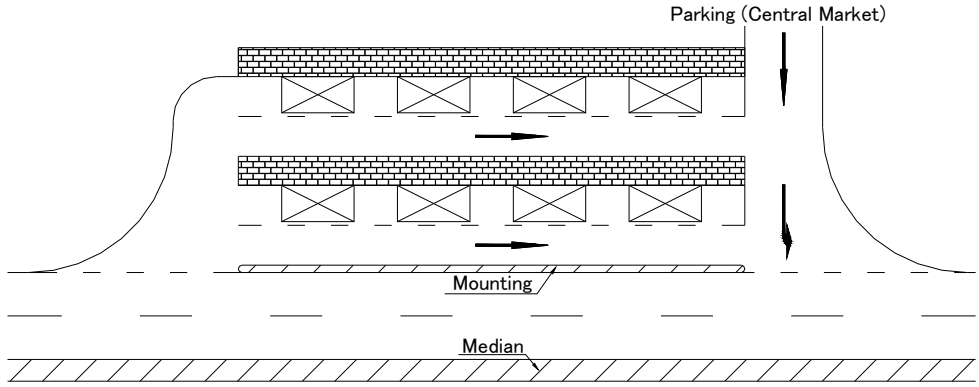



**Figure 2-2-4 Alternative Schemes of Improvement of Bus Bays**

(b) Improvement of Road Crossing Facility for Pedestrians

One of the major causes of the traffic congestion is chaotic frequent road crossing of pedestrians. There is no road crossing facility for pedestrians around the Central Market, therefore provision of road crossing facilities are necessary to control the free road crossings. In an interview survey, 83% of pedestrians and 70% of drivers desired crosswalk with traffic light signals or traffic policeman. Traffic light signal needs emergency power supply and special maintenance. Therefore, provision of crosswalk with traffic personnel is proposed. Traffic personnel are necessary to do traffic control at the crosswalk from early morning until late evening every day.

There is an underpass near the Central Market. The underpass has been closed due to security and sanitary reasons. In the interview survey, 91% of pedestrians and drivers answered they will use the underpass if it is improved. To encourage pedestrians to use the underpass, the existing underpass is necessary to be renovated and to maintain security. The underpass renovation by

installing lights, a corner mirror and colorless entrance roofs and repainting walls as shown in Figure 2-2-5 was proposed. A security guard is necessary to do cleaning and lock/unlock the underpass every day.

| | |
|---|---|
| **Crosswalk with Policeman**<br>Pedestrians cross the Highway by instruction of policemen.<br>  | **Reopen of the Underpass**<br>The underpass will be cleaned and provided security officer.<br>  <br>  |

**Figure 2-2-5 Road Crossing Facilities**

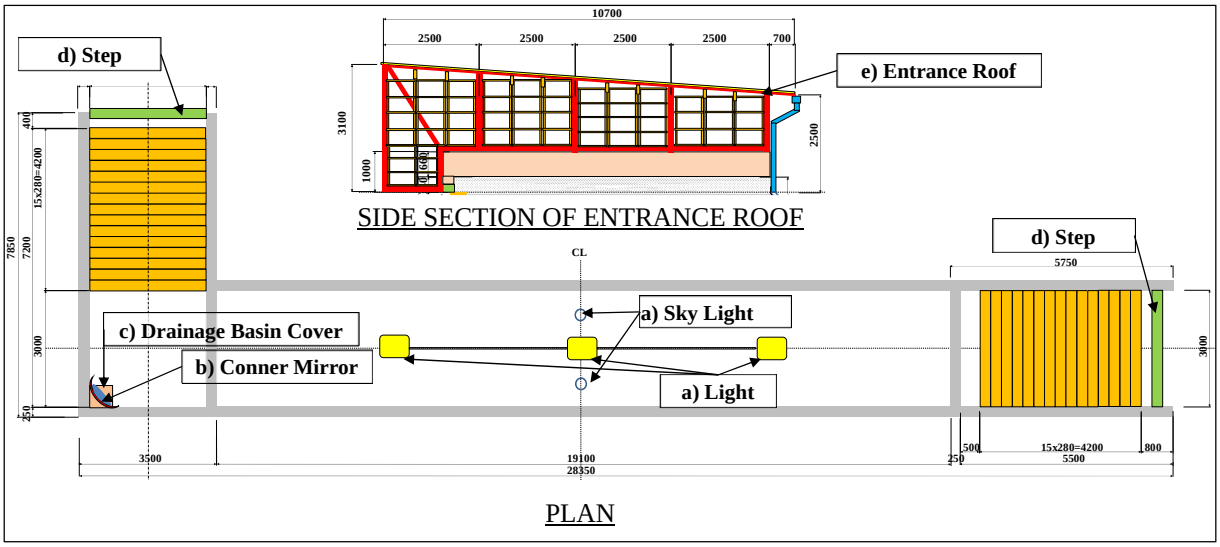



**Figure 2-2-6 Improvement Plan of Underpass**

### (2) Improvement of Traffic Safety

Chaotic frequent road crossing of pedestrian is the cause of traffic congestion and traffic accident. Installation of fence along median between City Council and Hyundai Mall was proposed to stop free road crossing of pedestrians. The location of proposed fence is shown in Figure 2-2-7. To improve the landscaping of the area, planting flowers along the fence was proposed as shown in Figure 2-2-8.


**Figure 2-2-7 Installation of Fence along Median**

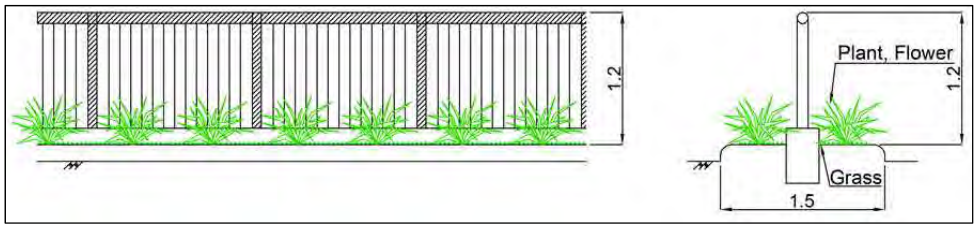



**Figure 2-2-8 Schematic Drawing of Fence**

### (3) Improvement of the Convenience of the Central Market Area

(a) Location of the Bus Bays

Existing bus bays are located at 200 to 300m interval along the highway. The west bound bus bay in front of the City Council is removed since the location is occupied by the proposed left turn lane of the City Council Roundabout. To mitigate traffic congestion, the west bound bus bay opposite side of the Central Market is better to be relocated to the west side of the existing location in order to reduce road crossings near to City Council Roundabout. However, the bus bay was proposed to be located at the east side (City Council side) of the existing location after discussion with MID and other parties. The reasons for relocation of the bus bay to the east side are as follows:

- Installation of a bus bay near City Council is necessary because the existing bus bay in front of City Council is removed.
- If the bus bay is relocated to the west side, buses might stop on the carriageway at the opposite side of the Central Market because many passengers go to the Central Market.

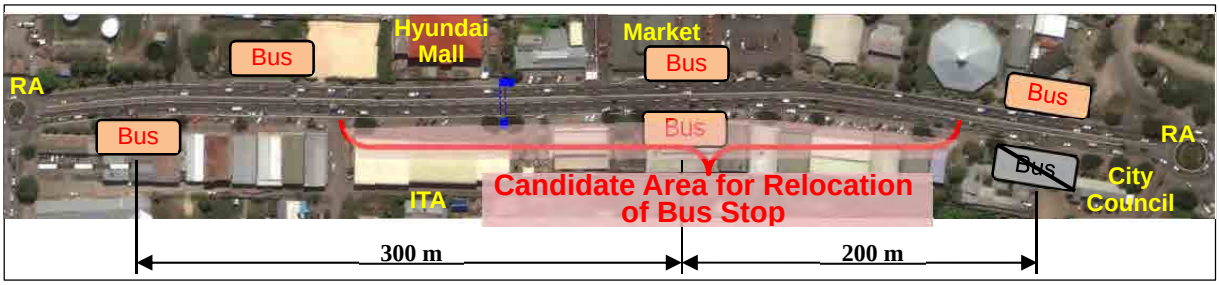



**Figure 2-2-9 Relocation of Bus Bay Located Opposite Side of the Central Market**

(b) Road Crossing Facility for Pedestrians

Many pedestrians come to the Central Market area by bus for shopping and business. The major movements of the pedestrians in the area are shown in Figure 2-2-10. As shown in the figure, the most movements is connected with the Central Market, therefore the crosswalk is proposed to be installed in front of the Central Market to align with the movement.

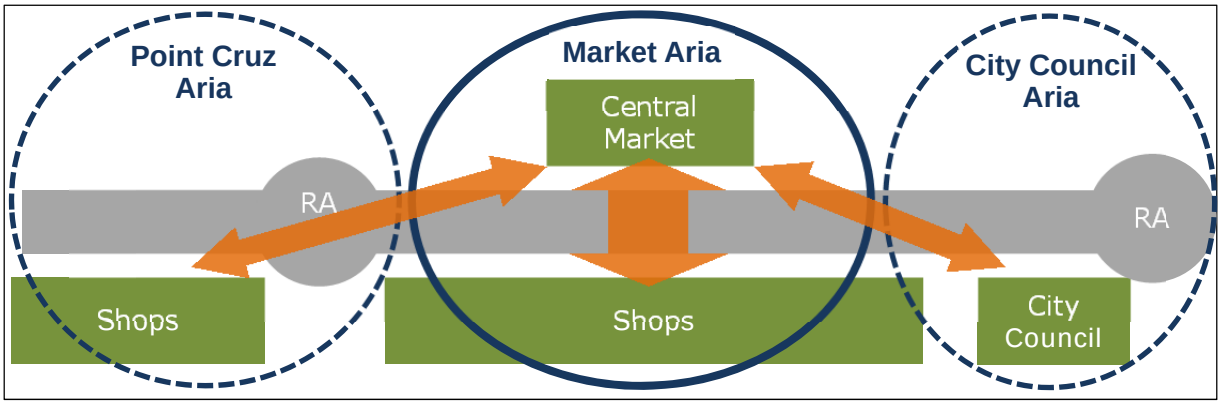


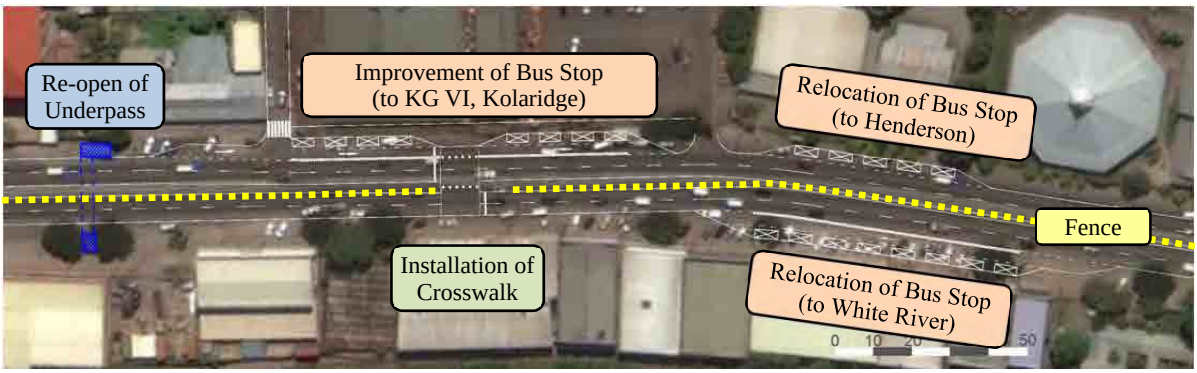

**Figure 2-2-10 Image of Pedestrian's Movement around the Central Market**

### (4) Project Facility Layout around the Central Market

Based on the above study, alternative schemes of the project facility layout around the Central Market is proposed as shown in Figure 2-2-11. As the result of comparison, Scheme-1 is proposed.

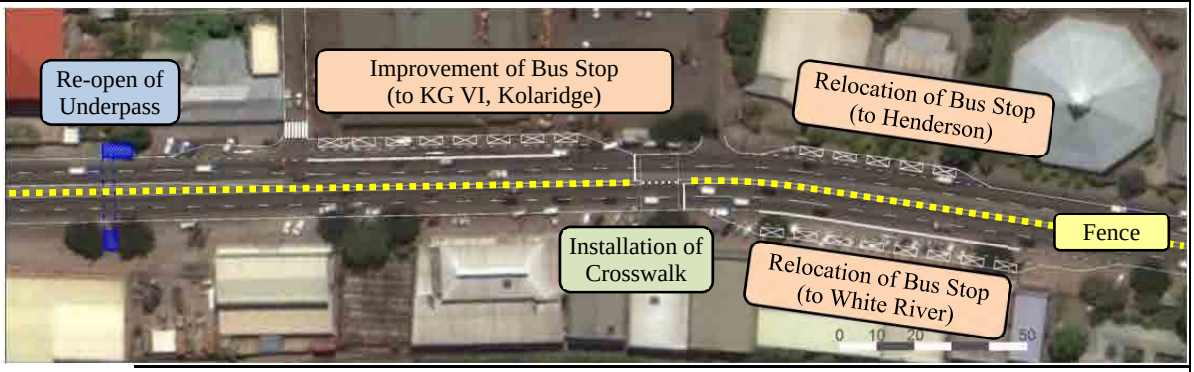
**Scheme 1**

Crosswalk and east bound bus stop are installed in front of the Central Market. West bound bus stop is relocated east side from existing location under consideration of passenger's accessibility. The crosswalk is located middle of east bound bus stop, so vehicles and pedestrians need to be controlled by police.




**Scheme 2**

Crosswalk is installed east side of the Central Market. East bound bus stop of direction to KG VI is improved to 8 berths. West bound bus stop is relocated east side from existing location. The crosswalk is located east side of the Central Market, so pedestrians have to pass through behind bus waiting passenger to access the Central Market.




**Scheme 3**

Crosswalk is installed near the underpass. West bound bus stop is relocated west side from existing location and the bus stop is separated into 4 berths and 2 berths.

There is long distance between City Council Roundabout and west bound bus stop, so this scheme is effective for mitigation of traffic congestion. But it is not convenient for bus passengers.

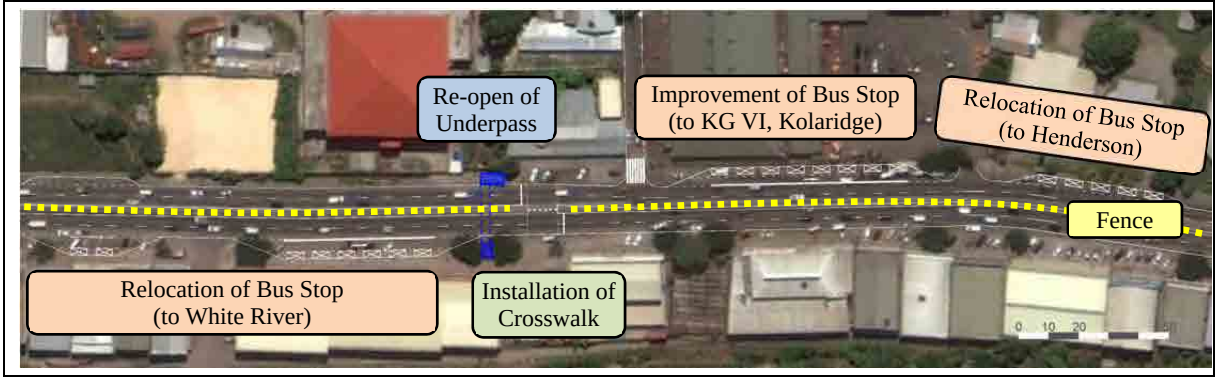



**Figure 2-2-11 Alternative Schemes of Project Facility Layout around the Central Market**

### 2-2-2-3 Improvement of City Council Roundabout

#### (1) Type of Intersection

There are three options to improve City Council Roundabout such as: 1) Enlarging existing roundabout, 2) Traffic signalizing and 3) grade separating as shown in Table 2-2-7. As compared in the table, enlarging existing roundabout is the most practical for the improvement of City Council Roundabout. Traffic signal needs emergency power supply and special maintenance and flyover is costly and unsuitable in the city center area.

**Table 2-2-7 Options to Improve City Council Roundabout**

| Option | Enlarging Roundabout | Traffic Signalizing | Grade Separating |
|---|---|---|---|
| Outline | Capacity is smaller than other options. It is not need special maintenance. | Capacity is larger than roundabout. This option does not need large area. But traffic signal needs emergency power supply and special maintenance. | Capacity is larger than other options. This option needs large site. If vehicle speed will be increased, it will be cause of traffic accident. |
| Traffic Capacity | △ | ○ | ◎ |
| Maintenance | ◎ | △ | ○ |
| Safety | ◎ | ◎ | △ |
| Land Acquisition | ○ | ◎ | △ |
| Landscape | ◎ | ◎ | △ |
| Evaluation | ◎ | ○ | △ |

Note: ◎ = Good, ○ = Fir, △ = Poor

#### (2) Alternative Scheme of City Council Roundabout

Roundabout is composed of ring road and legs. Table 2-2-8 and Table 2-2-9 show alternative schemes of improvement of ring road and legs of the roundabout.

**Table 2-2-8 Alternative Schemes of Ring Road Improvement**

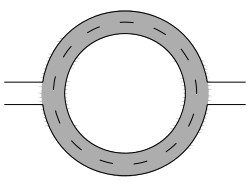
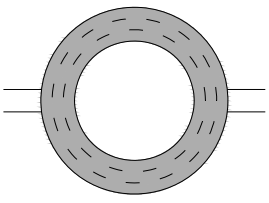
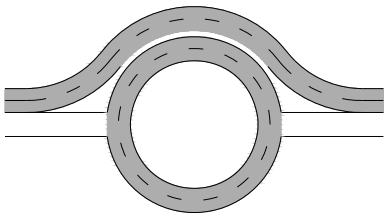
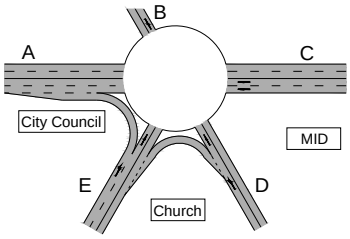
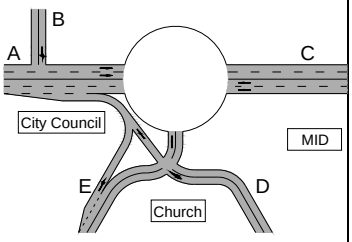
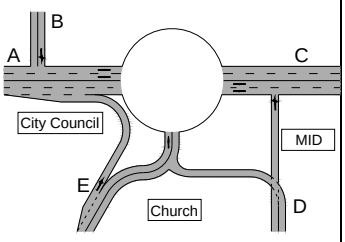
| Scheme | C-1 | C-2 | C-3 |
|---|---|---|---|
| Outline | To enlarge the diameter of the ring road. Capacity increases a little. | To increase number of lanes to be 3 lanes. Capacity increases. Accordingly, enlarging diameter is necessary for weaving. | To reduce traffic volume in the roundabout, the lane from Point Cruz to New Mataniko Bridge is separated. Ring road is 2 lanes. Capacity increases. |
| Plan |  |  |  |

**Table 2-2-9 Alternative Schemes of Roundabout Leg Improvement**

| Scheme | L-1 | L-2 | L-3 |
|---|---|---|---|
| Outline | To install left turn lanes to reduce traffic volume in the roundabout. This option does not need large area. Connection point of each leg is near, so traffic conflict occurs in ring road. | To relocate legs to reduce traffic conflict in ring road. There is at grade intersection in leg D. Roundabout capacity is bigger than other schemes. | To relocate legs to reduce traffic conflict in ring road. There is at grade intersection in leg D. Roundabout capacity is medium. |
| Plan |  |  |  |

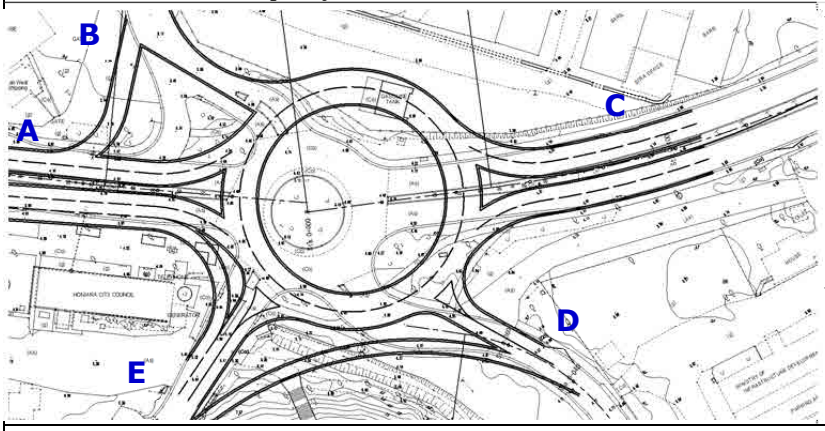
Based on the above study, alternative schemes of improvement of City Council Roundabout are developed as shown in Figure 2-2-12. From the result of comparison, Scheme-2 was selected.

**Scheme 1 (C-1+ L-1)**

2-lane ring road + 5 legs and 2 left turn lanes.

No need large area.

Increase of the traffic capacity is little.




Volume/Capacity Ratio

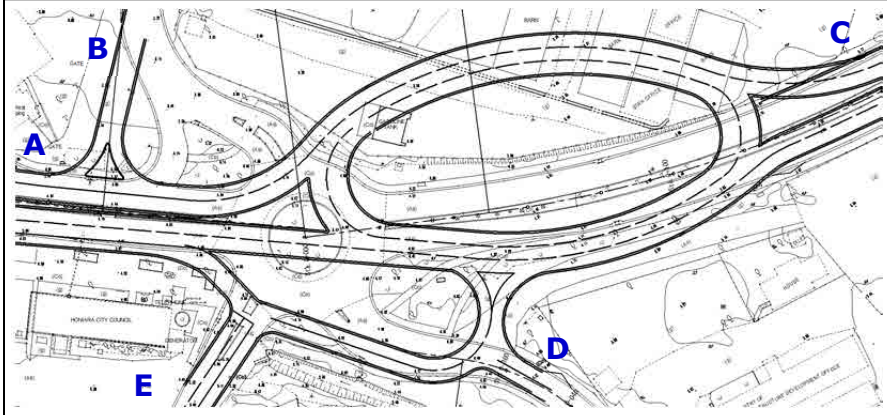
| Year | A | B | C | D | E |
|---|---|---|---|---|---|
| 2018 | 1.4 | 0.1 | 1.1 | 1.2 | 0.8 |
| 2023 | 1.6 | 0.1 | 1.3 | 1.6 | 1.0 |
| 2028 | 1.8 | 0.1 | 1.6 | 2.0 | 1.4 |
| 2033 | 2.0 | 0.1 | 1.8 | 2.6 | 1.8 |

※Volume-to-capacity ratio should be kept under 0.9.

**Scheme 2 (C-2+ L-2)**

3-lane ring road + 3 legs and 1 left turn lane.

Effective to increase capacity of the intersection. Need large area.



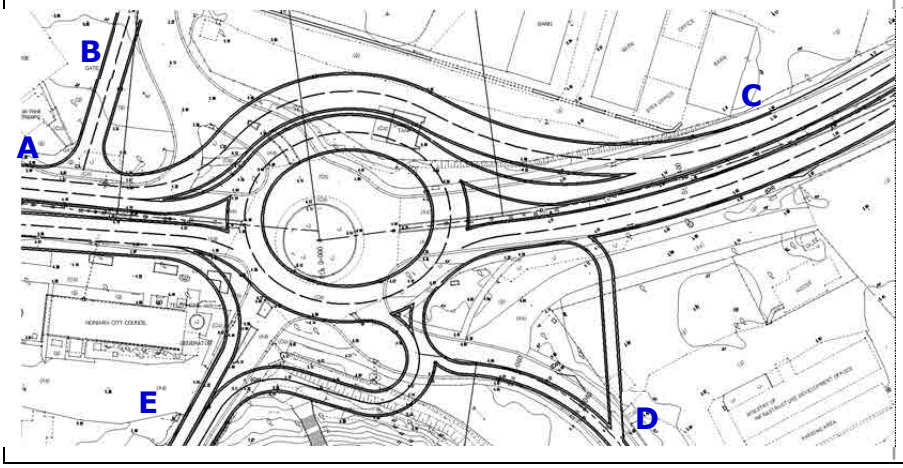

Volume/Capacity

| Year | A | C | D |
|---|---|---|---|
| 2018 | 1.1 | 0.9 | 0.5 |
| 2023 | 1.3 | 1.1 | 0.6 |
| 2028 | 1.4 | 1.2 | 0.7 |
| 2033 | 1.6 | 1.4 | 0.8 |

**Scheme 3 (C-3+ L-3)**

2-lane ring road + 3 legs and 1 left turn lane and 2 detour lanes.

Effective to improve traffic flow from leg A to leg C. Weaving length from leg E to leg A does not have enough length. Need large area.




Volume/Capacity

| Year | A | C | D |
|---|---|---|---|
| 2018 | 0.7 | 1.4 | 0.8 |
| 2023 | 0.8 | 1.7 | 1.0 |
| 2028 | 0.9 | 1.9 | 1.3 |
| 2033 | 1.0 | 2.2 | 1.7 |

**Figure 2-2-12 Alternative Schemes of Improvement of City Council Roundabout**

### 2-2-2-4 Widening of New Mataniko Bridge

Since the structural soundness of the existing New Mataniko Bridge is confirmed, it is widened to be 4-lane by construction of a new 2-lane Bridge.

#### (1) Location of the new additional bridge

The location of the new additional 2-lane bridge is compared between the upstream side and the downstream side of the existing bridge. Figure 2-2-13 shows comparison of road alignments of alternative additional bridge locations. From the viewpoint of road alignment geometry, the upstream side is better than the downstream side because the curve radius is larger. Additionally, the highway will close to a building which was used by the university in case the additional bridge is located at the downstream side. At the upstream side, an unused storage shed is 5.3 m and a store (Rainbow Shop) is 14.5 m apart from the existing bridge. Removal of the storage shed and land acquisition of the area is necessary, however the building of the store is beyond the affected area. After discussions with MID, construction of the new additional bridge at the upstream side was proposed.

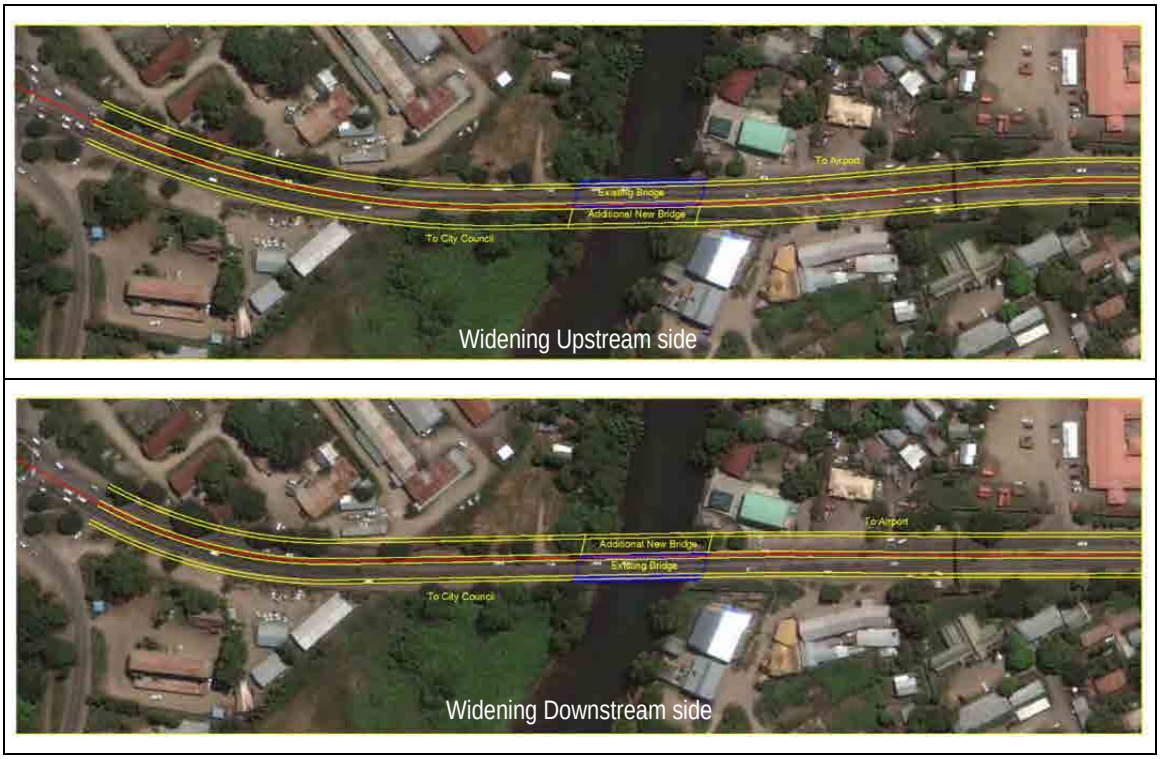



**Figure 2-2-13 Comparison of Road Alignments of Alternative Additional Bridge Locations**

#### (2) Design Standards and Criteria

The design standards and criteria of the new bridge are as follows:

- Design standard: Japanese bridge design standards
- Live load: B-Live Load which is equivalent to AUSTROAD T44-track loading

- Seismic load: Earthquake Engineering for Bridges in Papua New Guinea (Zone 2) (Importance factor = 1.2, Material factor = 1.0, Basic horizontal seismic intensity = 0.32, Design horizontal seismic intensity V = 1.2 x 1.0 x 0.32 = 0.39)
- Wind load: 49m/sec (AS/NZS 1170 part 2 of New Zealand Wind Code)
- Temperature change: Mean temperature 28℃, Temperature change ±10℃

### (3) Bridge Width Component

The bridge width component of the new bridge is same as the bridge approach road which is shown in Figure 2-2-14.

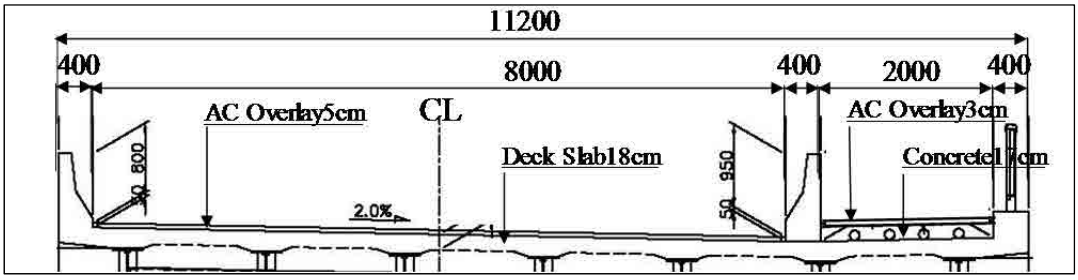



**Figure 2-2-14 New Mataniko Bridge Width Component**

### (4) Bridge Length, Span Length and Skew Angle

Eastern side river wall of Mataniko River was widely scoured during flood in April 2014 and the backfill of A2 abutment was washed out. Since the backfill of A2 has been restored as it was, the locations of abutments and piers of the new bridge are proposed to align with the existing bridge. The bridge length, span length and skew angle are as shown in Table 2-2-10.

**Table 2-2-10 Bridge Length, Span Length and Skew Angle**

| | Existing Bridge | New Bridge | Remarks |
|---|---|---|---|
| Bridge Length | 66m | 66m | As same as existing bridge |
| Span Length | 22m + 22m + 22m | 22m + 22m + 22m | As same as existing bridge |
| Skew Angle | 75° | 75° | As same as existing bridge |

### (5) Bridge Location and Elevation

The curb to curb distance between the existing bridge and the new bridge is designed to be 1m which is determined with the consideration to secure the distance to avoid settlement of existing bridge during the new bridge construction and to secure the acceptable distance between the new bridge and the upstream side store building (Rainbow Shop). According to the Japanese bridge design specification, the clear distance between the existing bridge substructure and new pile should be more than two times of new pile diameter in case the pile is cast-in-concrete pile. As the result, 2.5m distance is secured between Rainbow Shop building and the bridge approach retaining wall.

Based on the hydraulic analysis reflecting the experience of the flood in April 2014, design high water level is set at altitude 2.9m. The new bridge elevation was designed to secure the necessary freeboard clearance between the girder bottom and the design high water level. The Japanese specification suggests minimum freeboard is 1m where the design flood discharge is from 500 to 2000 cu.m/sec. The existing bridge girder bottom elevation is 3.1m which is only 0.2m above the design high water level. Raising up the bridge to secure the necessary freeboard is difficult because it might danger the substructure stability. Instead, river sectional area is increased by excavating the soil deposit under the bridge and demolishing a retaining wall constructed inside the river at downstream side of the bridge.

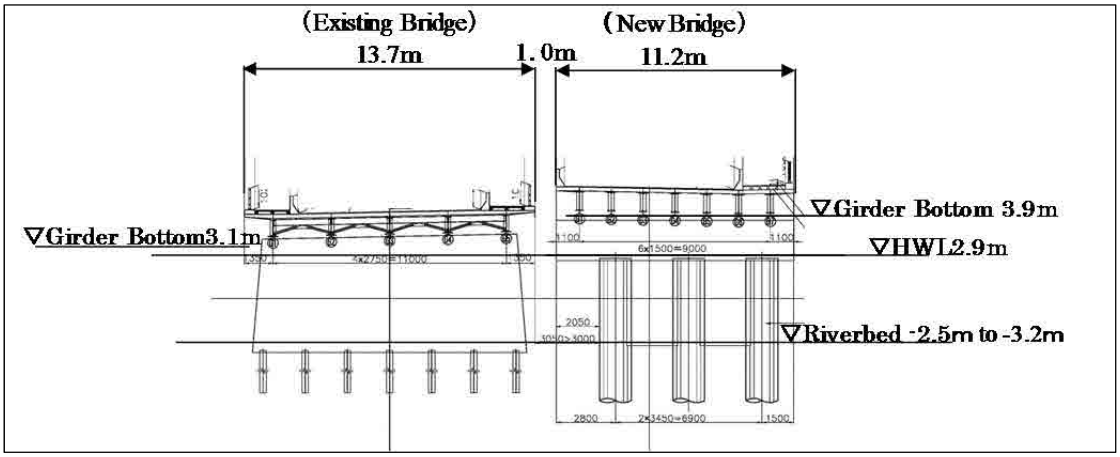



**Figure 2-2-15 Bridge Location and Elevation**

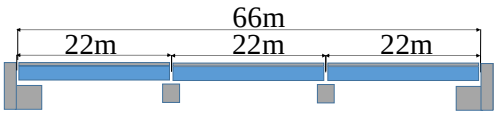
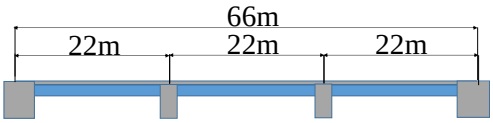
### (6) Superstructure Type

Applicable superstructure types are steel girder and PC girder for this bridge. Steel girder type is selected with the following reasons:

- Since the subsurface soil is soft (N-values are 10 to 15 from the surface up to depth 40m), substructures of steel girder type are smaller and less cost.
- Construction period of steel girder is shorter because girders are not fabricated on site.
- Construction yard of steel girder is smaller because girders are made of small pieces.
- Steel girder erection is easier and large erection equipment is not necessary because the steel girder pieces are smaller and lighter.
- Steel girder height is smaller.
- Steel girder possesses higher seismic resistance capacity.
- The cost for steel girder and PC girder are almost the same if the number of girders are not many.

Since the piles are embedded in the hard strata and no settlement is anticipated, integral structure type is applicable for the steel girder bridge. A comparison between simple supported composite plate girder type and 3-span continuous integral plate girder type is shown in Table 2-2-11. As the result of the comparison, 3-span continuous integral plate girder type is selected.

**Table 2-2-11 Comparison of Alternative Steel Girder Type**

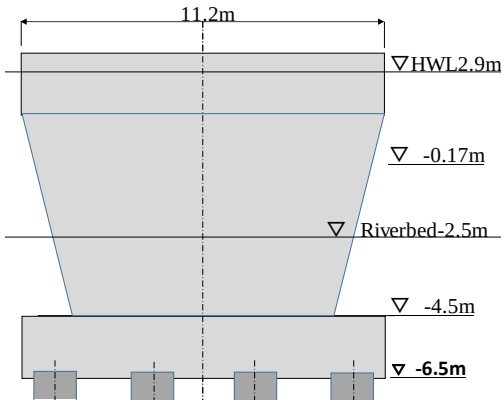
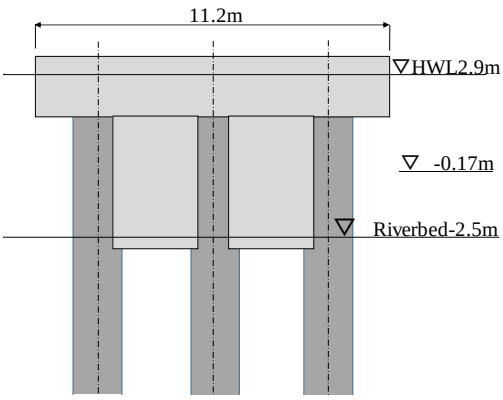
| | Simple Supported Composite Girder | 3-Span Continuous Integral Girder |
|---|---|---|
| |  |  |
| Cost | △ | ○ |
| Girder Height | △<br>0.80m | ○<br>0.65m |
| Construct-ability | ○ | △<br>Construction period is longer.<br>Construction is little complicated. |
| Maintenance | △<br>Maintenance of bearings and expansion joints are necessary. | ○<br>No bearing and no expansion joint is necessary. |
| Evaluation | △ | ○ |

Note) ○: Superior , △: Inferior

### (7) Substructure

A comparison of alternative substructure types is shown in Table 2-2-12. Pile-bent type is selected due to its superiority in constructability, economy and structural suitability for integral bridge. The diaphragms in between piles are provided to prevent scoring around the piles.

**Table 2-2-12 Comparison of Bridge Substructure Type**

| | Inverted-T Type | Pile-Bent with Diaphragm |
|---|---|---|
| |  |  |
| Cost (Concrete) | × (583 cu.m) | ○ (290 cu.m) |
| Structural Characteristic | × | ○<br>Pile-bent type is suitable for integral bridge due to its flexibility. |
| Construct-ability | ×<br>Large cofferdam and deep excavation are necessary to construct footing and wall. | ○<br>Small cofferdam is necessary to construct diaphragms. |
| Maintenance | ○ | ○ |
| Evaluation | × | ○ |

Note) ○: Superior, ×: Inferior

### (8) Bridge Structure

Since the existing bridge and new bridge are located closely, the difference of the both bridge deck elevations is desired to be small. To make the difference of the bridge deck elevations less than 0.8m, girder spacing is designed to be 1.6m. The outline of the bridge structure is shown in Figure 2-2-16.

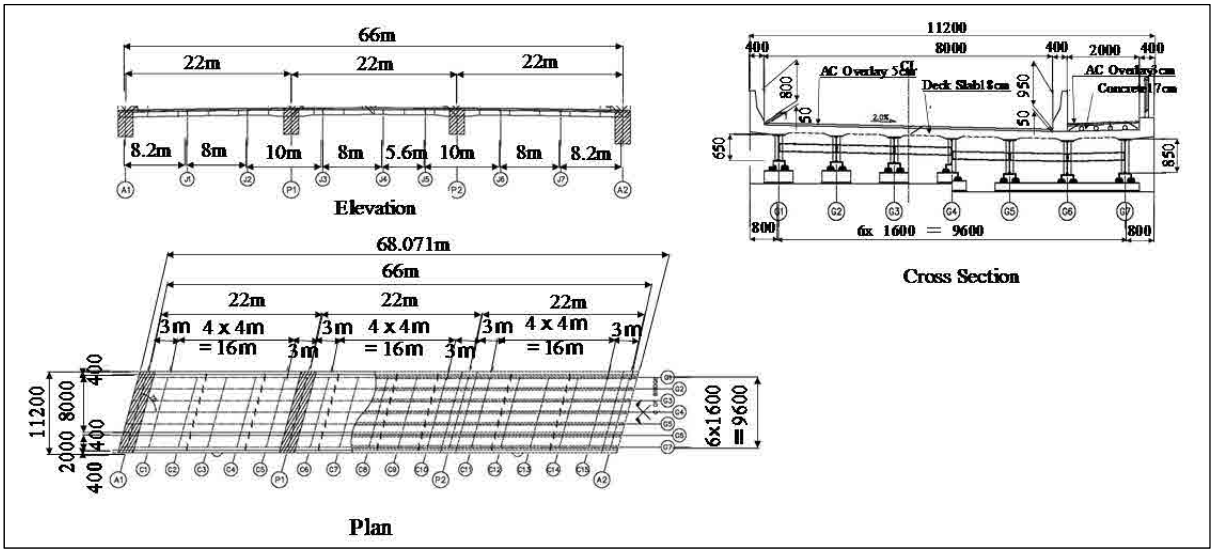



**Figure 2-2-16 Outline of New Mataniko Bridge Structure**

### (9) Construction Plan

Erection yard at upstream side of A1 abutment is proposed. A construction plan using a crawler crane for placing temporary scaffoldings, piling of RC piles and erection of steel girders was proposed as shown in Figure 2-2-17.

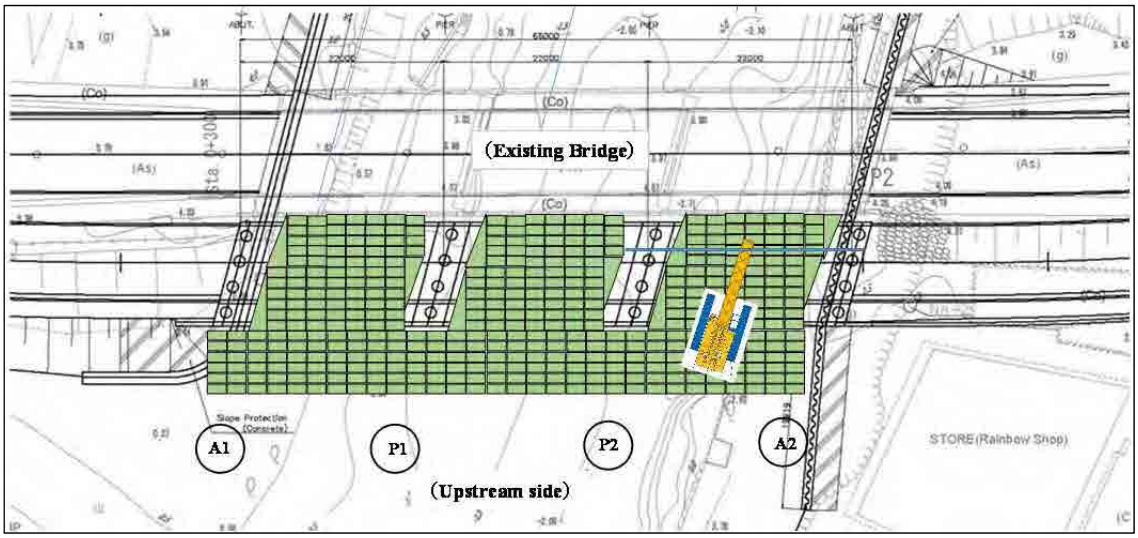



**Figure 2-2-17 Construction Plan**

**(10) Abutment Protection**

(a) A2 Abutment Protection (Eastern Abutment)

Since A2 abutment protection of the existing bridge was washed out by the flood in April 2014, so steel sheet piles are proposed as a durable type protection. The upstream side of the steel sheet piles is connected with the existing riverbank rocks at about 20m distant from A2 abutment. The downstream side of the steel sheet piles is extended about 14m from A2 abutment. The part of steel sheet piles above the riverbed is coated with corrosion free agent against salt water. Sand bags contain lean concrete are placed in front of the steel sheet piles to prevent scouring.

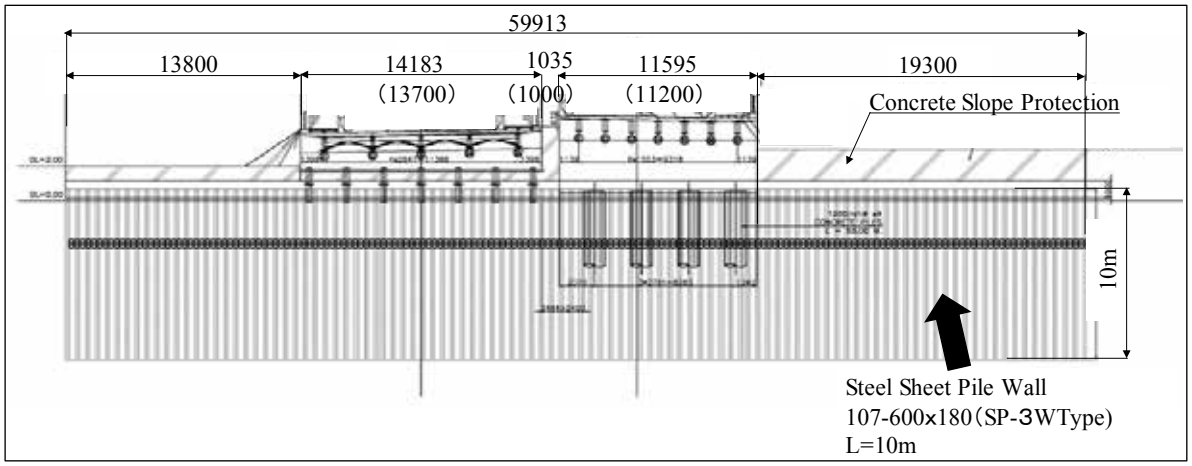



**Figure 2-2-18 A2 Abutment Protection**

(b) A1 Abutment Protection (Western Abutment)

Concrete wall is installed for A1 abutment protection. Concrete slope protection is placed on the embankment slopes above the concrete wall. The location of the concrete wall is shown in Figure 2-2-19. The soil deposited under the bridge is excavated and the existing concrete wall constructed inside of the river by the adjacent land owner is demolished as shown in Figure 2-2-19.

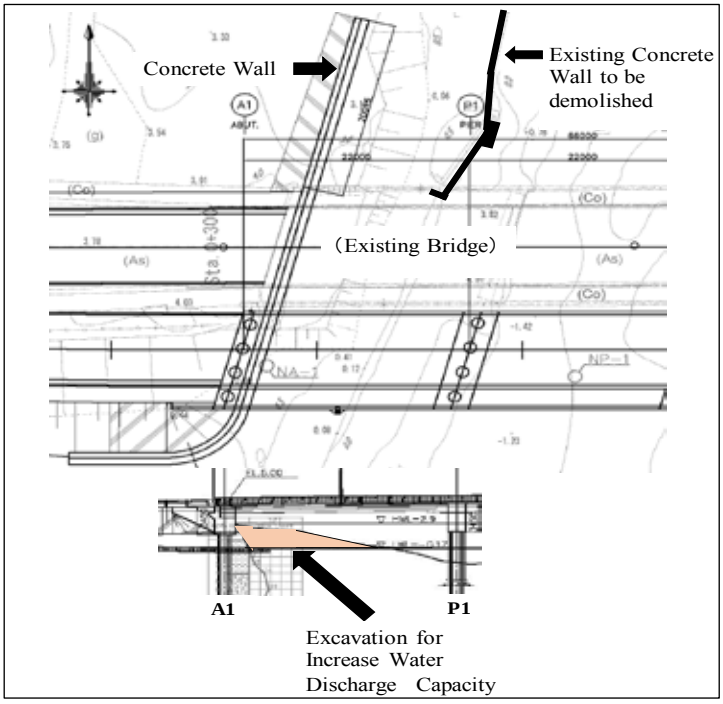



**Figure 2-2-19 A1 Abutment Protection**

### (11) Bridge Approach Road

Land acquisition is necessary for the construction of both sides of the approach road of the new bridge. Embankment with slope as shown in Figure 2-2-20 is proposed for the construction of A1 side approach road since there is no building within the construction affected area. Embankment with retaining wall is proposed for the construction of A2 side approach road since there is a store building (Rainbow Shop) adjacent to the road as shown in Figure 2-2-20. Demolition of concrete block walls of an abandoned warehouse located within the construction area of A2 side approach road is necessary.

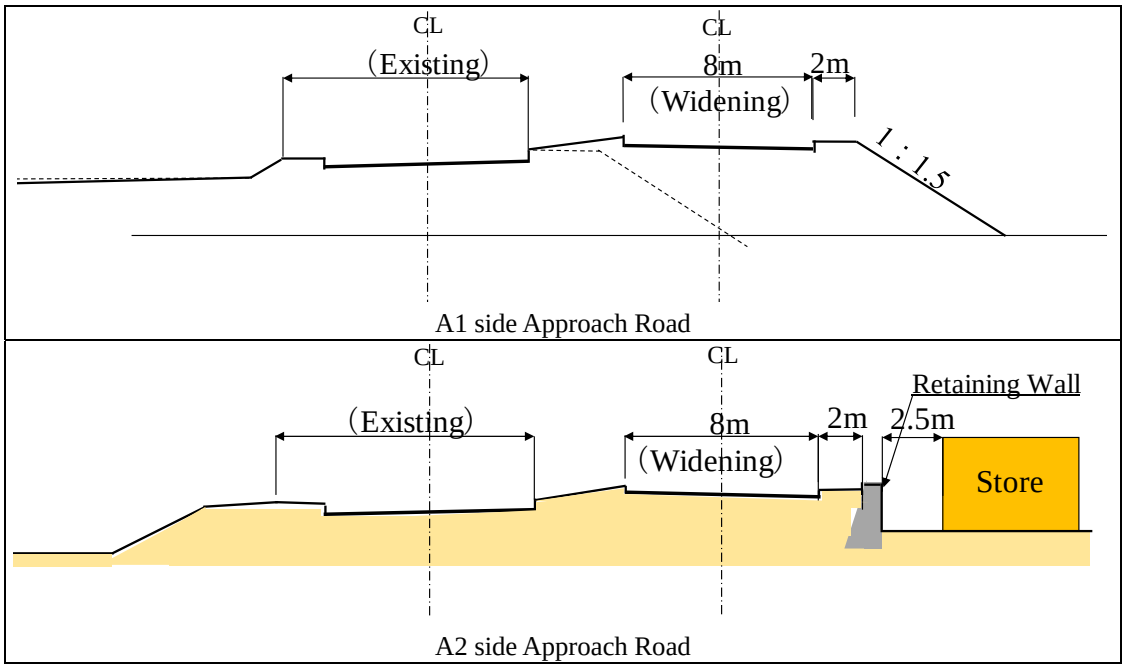



**Figure 2-2-20 Typical Cross Section of Approach Road**

**(12) Repair of Existing Bridge**

After the opening of the new bridge for the traffic, existing bridge is closed for the traffic and the following repair of the existing bridge is executed.

(i) Remove existing asphalt overlay.

(ii) Remove existing expansion joints and replace with buried type expansion joint (steel plate to bridge the gap and bitumen sheet to cover it) will be installed after leveling the surface of the deck slab with mortar and epoxy adhesive.

(iii) Coat the deck slab with waterproof material.

(iv) Overlay with 5cm thick hot-mixed asphalt concrete.

(v) Set anchor nuts on the bearing anchor bolts without nuts.

(vi) Replace corroded drainage pipes.

(vii) Repair a broken part of the handrail at upstream side near A2 abutment.

**(13) Utility Support Structure**

Four pieces of 10cm diameter PVC pipes are installed under the sidewalk in order to accommodate the utilities. Additionally, eye nuts are installed to support the water pipes as shown in Figure 2-2-21.

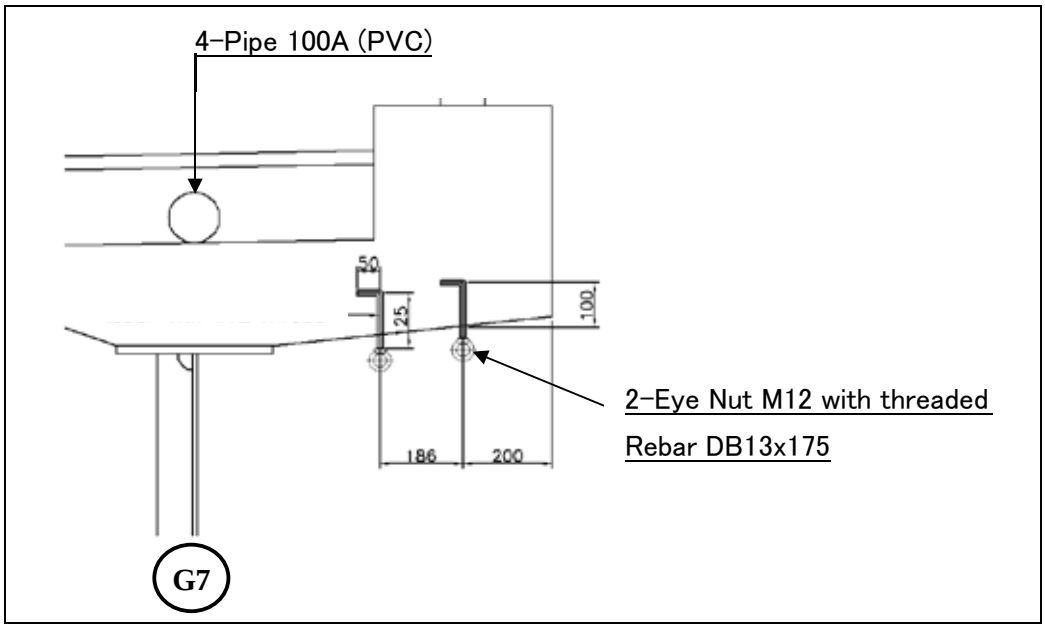



**Figure 2-2-21 Utility Support Structure**

### 2-2-2-5 Replacement of Old Mataniko Bridge

Existing 1-lane bailey bridge is replaced with a 2-lane bridge.

#### (1) Design Standards and Criteria

Design standards and criteria are same as New Mataniko Bridge.

#### (2) Bridge Width Component

Bridge width component is shown in Figure 2-2-22. Since heavy vehicles seldom pass the bridge, 7m wide carriageway is proposed. And since pedestrian traffic is large, 2m wide sidewalks for the both sides are proposed.

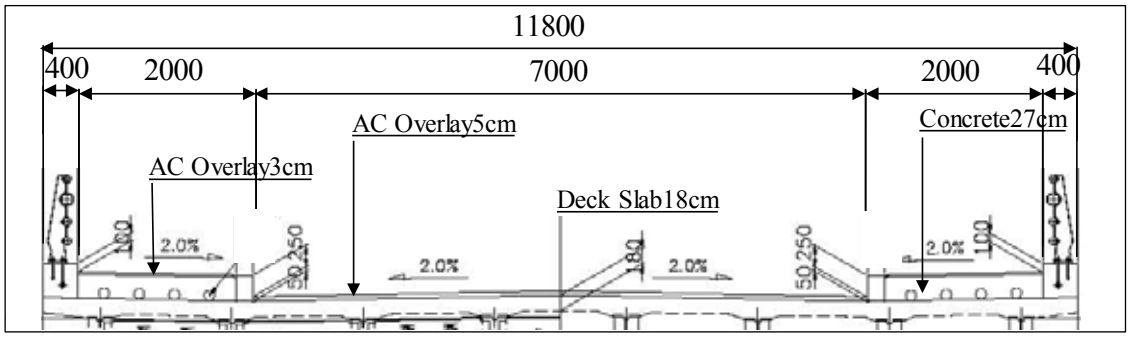



**Figure 2-2-22 Old Mataniko Bridge Width Component**

#### (3) Location of Bridge

Construction of the new bridge at the location of the existing bridge is proposed because there is not enough space to construct the new bridge at upstream or downstream side of the existing bridge. The road is closed during the construction and the detour is New Mataniko Bridge for the

vehicle traffic. Therefore, the construction of this bridge should start after the completion of widening of New Mataniko Bridge. A temporary pedestrian bridge is installed during the construction.

### (4) Bridge Length and Span Layout

A 60m bridge length is proposed with consideration of smoothness of the riverbank alignment and the required river sectional area to discharge the design flood. 3-span layout is desirable to reduce the abutment and approach road elevation, however 2-span layout was proposed since drift woods longer than 20m are seen during the flood in April 2014. The bridge length and span length are shown in Table 2-2-13.

**Table 2-2-13 Bridge Length and Span Length**

| | Existing Bridge | New Bridge |
|---|---|---|
| Bridge Length | 54m | 60m |
| Span Length | 27m + 27m | 30m + 30m |

### (5) Bridge Elevation and Vertical Alignment

Based on the hydrology analysis reflecting the experience of the flood in April 2014, the design high water level at the bridge site is determined at an altitude 3.5m. As a result, the new bridge deck elevation becomes about 2m higher than the existing bridge deck with consideration of securing 1m freeboard above the high water level and minimizing girder height. While the eastern side abutment and approach road are located in front of stores, therefore the abutment and the approach road are minimized by designing the bridge with vertical curve and the approach road with 5% slope (sidewalk is 8%).

### (6) Superstructure Type

Steel girder type was selected for the superstructure with the reason same as New Mataniko Bridge. However, simple supported composite girder type was selected instead of continuous integral girder type because the simple supported girder is not problem in case substructure settlement occurred. A boring survey at A2 abutment has conducted up to 61m deep, however no hard soil was identified in the survey. Therefore A2 pile foundation was designed to be supported by friction force of soil which might cause little settlement.

### (7) Substructure Type

Pile-bent with diaphragm type is selected for the substructure with the reason same as New Mataniko Bridge.

### (8) Bridge Structure

The steel girder height is varied to follow the vertically curved alignment as shown in Figure

2-2-23. The girder spacing 1.5m was designed to minimize the girder height.

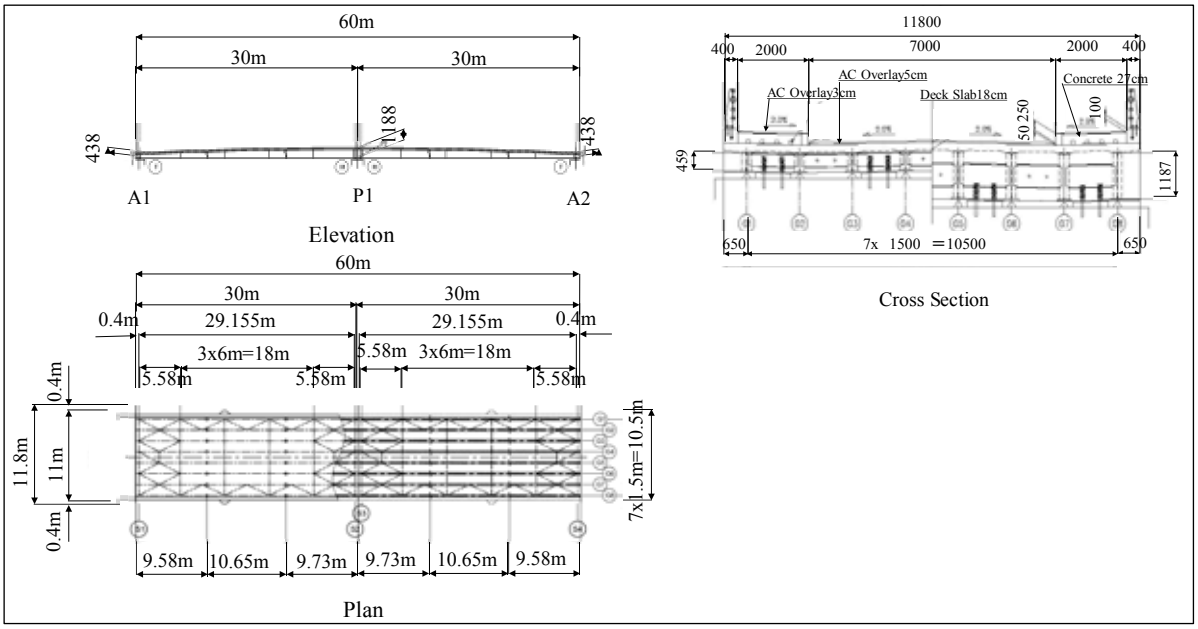



**Figure 2-2-23 Outline of Old Mataniko Bridge Structure**

### (9) Construction Plan

Erection yard at upstream side of A1 abutment is proposed. A construction plan using a crawler crane for placing temporary scaffoldings, piling of RC piles and erection of steel girders is proposed as shown in Figure 2-2-24. A temporary pedestrian bridge is provided at the upstream side of the scaffolding. The existing bailey bridge is disassembled and transported to the MID storage near MID head office. The existing pier is demolished.

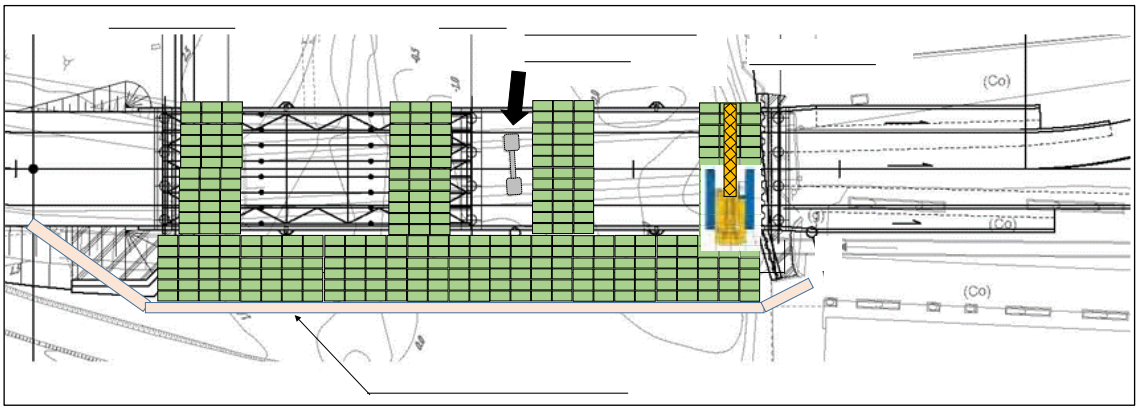



**Figure 2-2-24 Old Mataniko Bridge Construction Plan**

### (10) Abutment Protection

(a) A2 Abutment (Eastern Abutment)

Abutment protection made of steel sheet piles are proposed for A2 since the concrete river wall at downstream side has been washed out by the last flood and floods hit this area due to curvature

of the river. The downstream and upstream side of the steel sheet piles is connected with the existing concrete wall. The part of the steel sheet piles above the riverbed is coated with corrosion free agent against salt water. Sand bags contain lean concrete are place in front of the steel sheet piles to prevent scouring. Concrete slope protection is placed on the slope above the steel sheet piles.

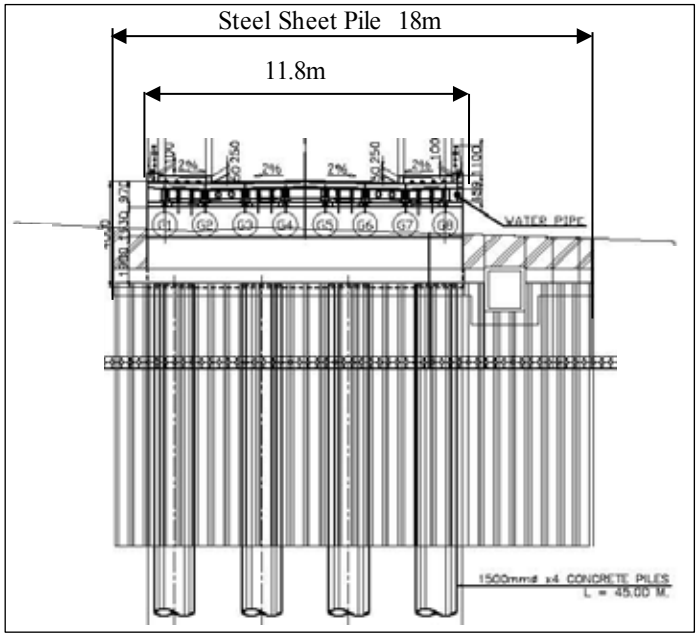



**Figure 2-2-25 A2 Abutment Protection**

(b) Left Bank A1 Abutment Side

Concrete wall is installed for A1 abutment protection. Concrete slope protection is placed on the embankment slopes above the concrete wall. The location of the concrete wall is shown in Figure 2-2-26. The soil deposited in between A1 and P1 is excavated and the existing gabion wall installed inside the river by the adjacent land owner is demolished as shown in Figure 2-2-26.

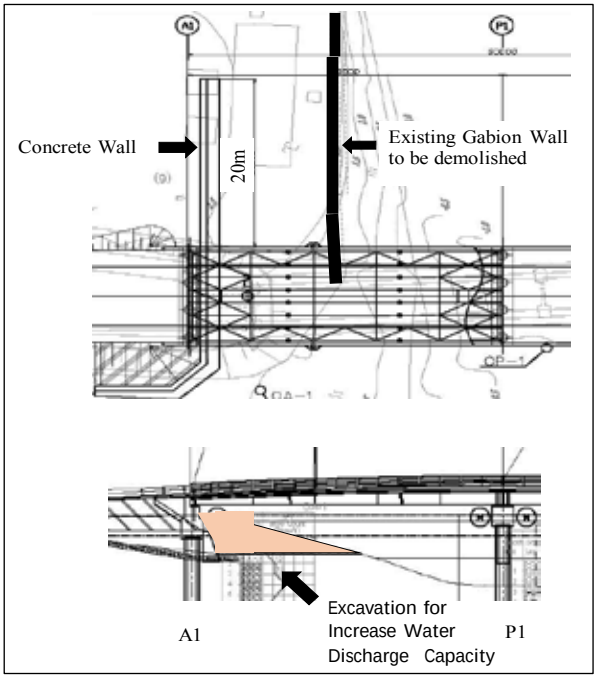



**Figure 2-2-26 A1 Abutment Protection**

### (11) Bridge Approach Road

The proposed centerline of the approach road is located almost same as existing road. The vertically curved alignment is about 2m higher than the existing road at the abutments and sloped down to the existing road by 5%. Embankment with slope is proposed for A1 side approach road. Embankment with retaining walls as shown in Figure 2-2-27 is proposed for A2 side approach road since the both sides of the road is now used by parking of the stores. The slope of the sidewalk is separated from the carriageway and sloped with 8% to minimize the affected area by the construction of the approach road.

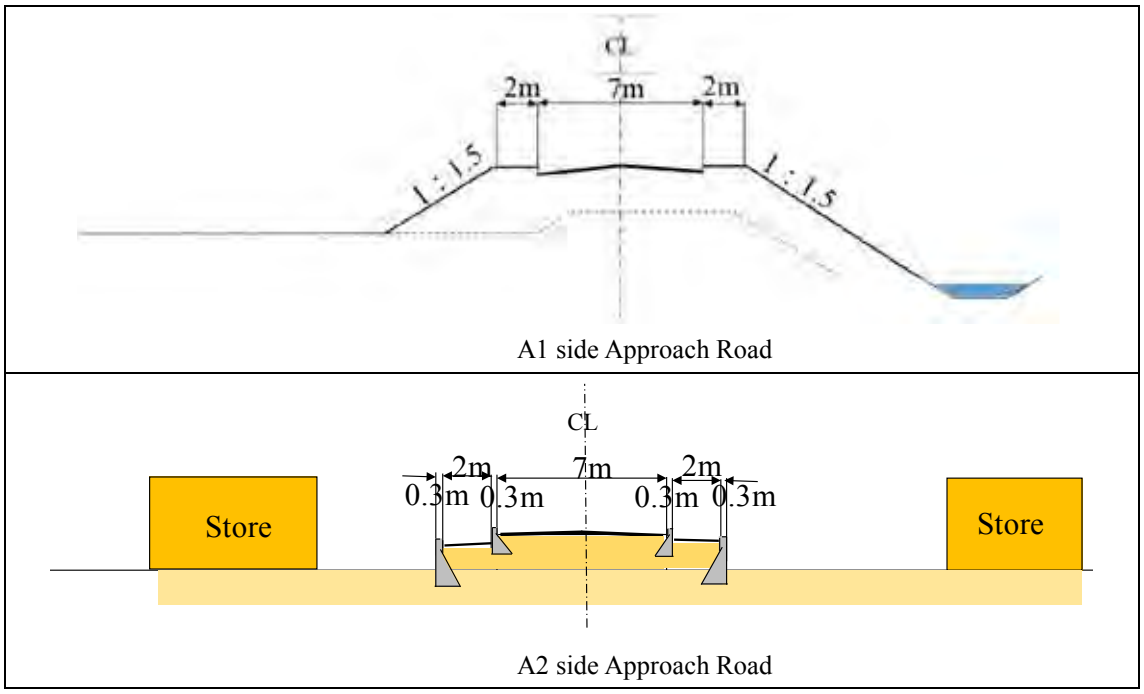



**Figure 2-2-27 Typical Cross Section of Approach Road**

### (12) Utility Support Structure

Four pieces of 10cm diameter PVC pipes are installed under the both sides of sidewalks in order to accommodate the utilities. Additionally, brackets and eye nuts are installed to support the water pipes as shown in Figure 2-2-28. The existing underground water pipes are connected with the bridge through outside of the approach road retaining wall.

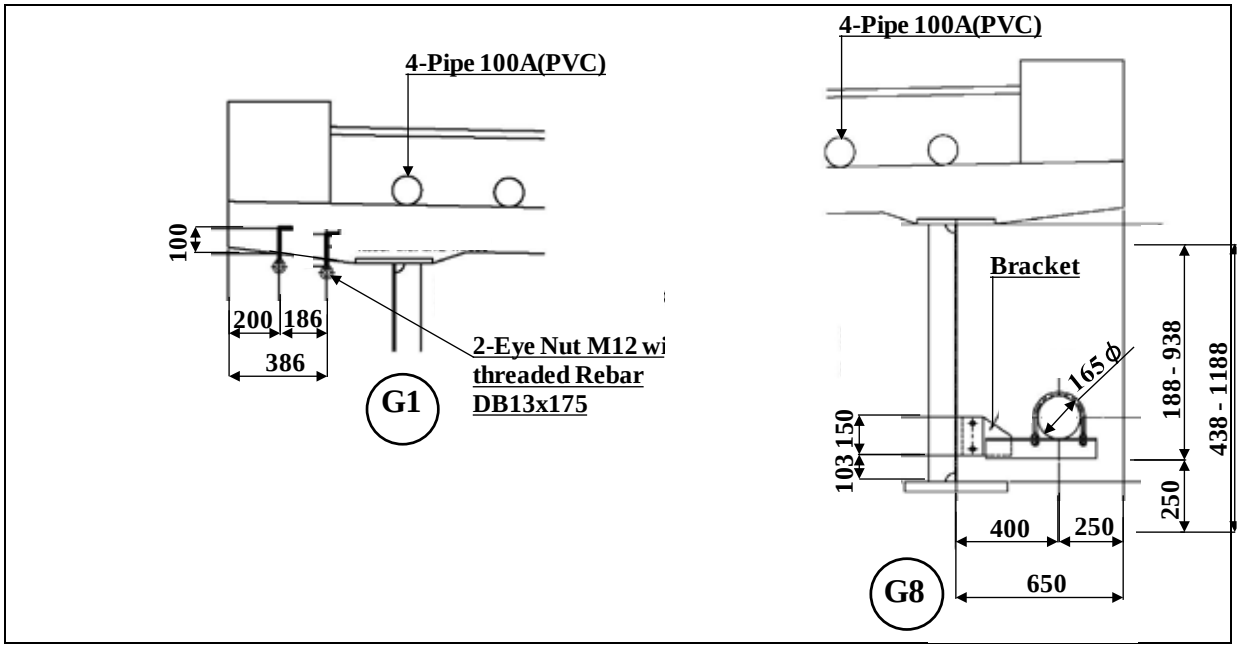



**Figure 2-2-28 Utility Support Structure**

### 2-2-3 Outline Design Drawings

The major components of the project are shown in Table 2-2-14. Conceptual plans of the components are shown in Figure 2-2-29 to 2-2-33. A set of outline design drawings of the project facilities are shown in Appendix 2.

**Table 2-2-14 Major Components of the Project**

| | Components | |
|---|---|---|
| Upgrading of the Kukum Highway | Highway length: | 3.0km |
| | Cross sectional component: | Carriageway (3.5m x 4-lane), Sidewalk (2.0m x 2), Median(3.0m) |
| | Pavement: | Surface course (AC; 10cm), Base course (Mechanically stabilized granular material; 5cm), Subbase course (Crusher run; 25cm) |
| | Drainage: | Roadside ditches (6.0km), Drain pipes (0.4km), Catch basins (499 nos), New box culvert (2 nos, 68.5m) |
| | Improvement of Intersection: | Vura Intersection and Central Hospital Intersection |
| | Bus bay: | 16 locations |
| | Other road facilities: | Street light repair (9 units), Street light new installation (5 units) Guardrail and fence (1,108m), Road markings, Grassing and planting |
| Countermeasure against Traffic Congestion around the Central Market | Bus bay: | 3 locations (8-berth x 2 locations, 5-berth x 1 location) |
| | Crosswalk: | 1 location |
| | Median fence: | 340m |
| | Renovation of Underpass: | Installation of lights, corner mirror and entrance roofs and repainting |
| Improvement of City Council Roundabout | Length of ring road: | 270m, Diameter of ring road: 12m (minimum) |
| | Width of ring road: | 11.0m |
| | Pavement of ring road: | Concrete pavement (2,000m$^2$) |
| Widening of New Mataniko Bridge | Bridge length: | 66m (22m x 3 span) |
| | Bridge width: | Carriageway 8m, Sidewalk 2m x 1 |
| | Superstructure type: | 3-span continuous plate girder (Integral type) |
| | Substructure type: | Cast-in-place concrete pile-bent (with diaphragms) |
| | Abutment protection type: | Steel sheet piles (right riverbank), Concrete wall (left riverbank) |
| Replacement of Old Mataniko Bridge | Bridge length: | 60m (30m x 2 span) |
| | Bridge width: | Carriageway 7m, Sidewalk 2m x 2 |
| | Superstructure type: | Plate girder (simple supported) |
| | Substructure type: | Cast-in-place concrete pile-bent (with diaphragms) |
| | Abutment protection type: | Steel sheet piles (right riverbank), Concrete wall (left riverbank) |
| | Approach roads: | Right side 73.8m, Left side 72.3m |

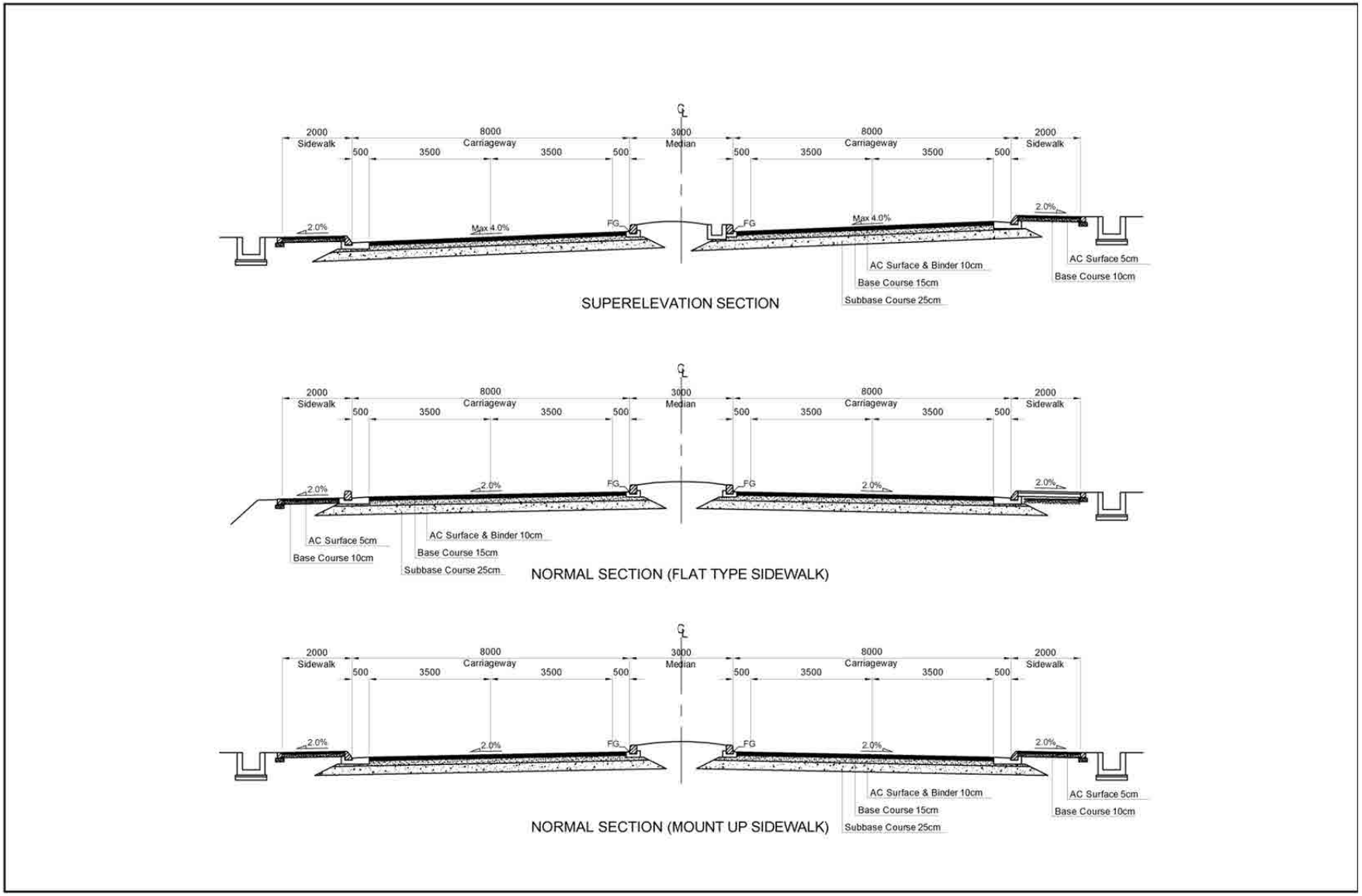



**Figure 2-2-29 Typical Cross Section of the Kukum Highway**

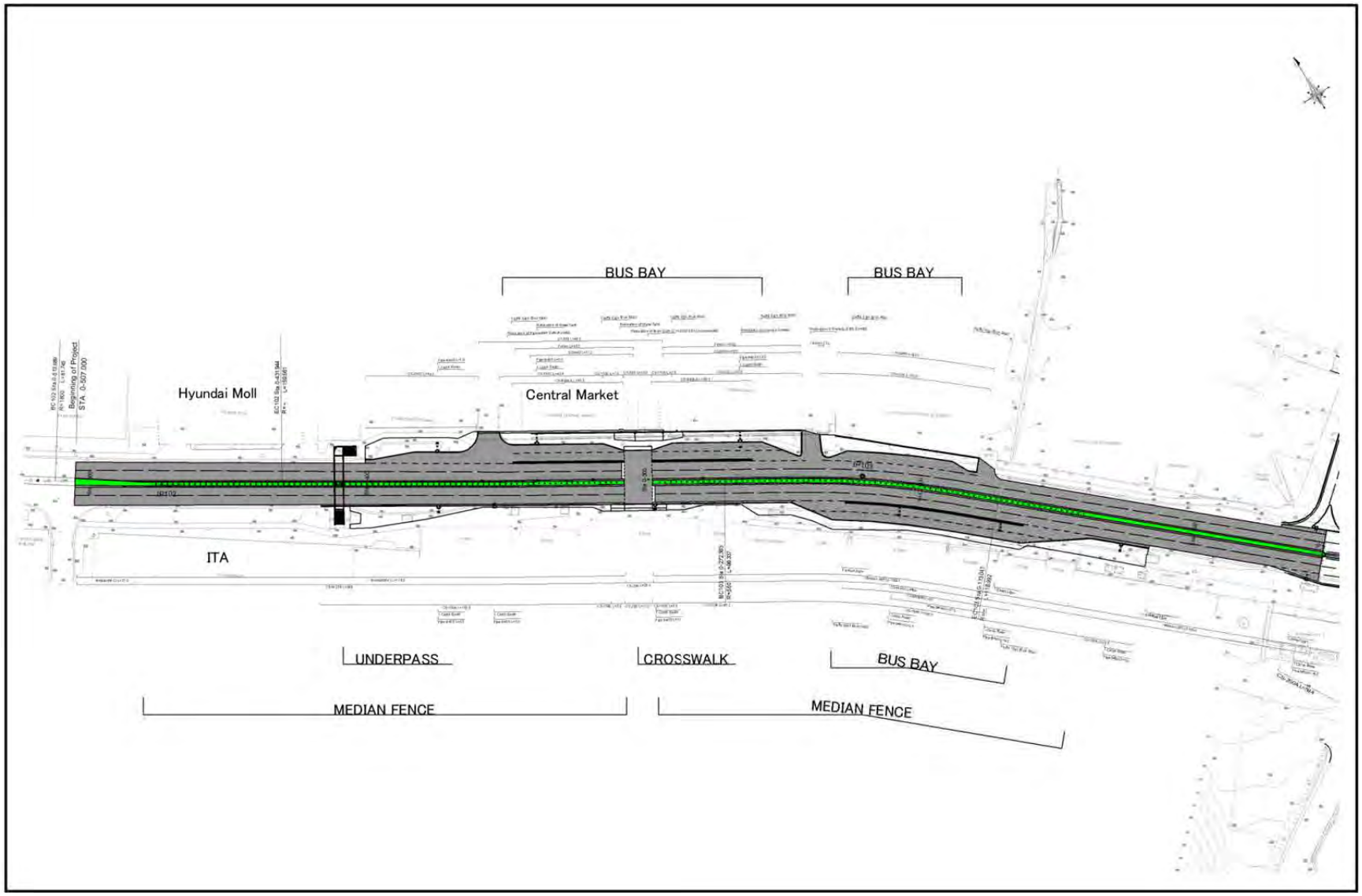



**Figure 2-2-30 Countermeasure against Traffic Congestion around the Central Market**

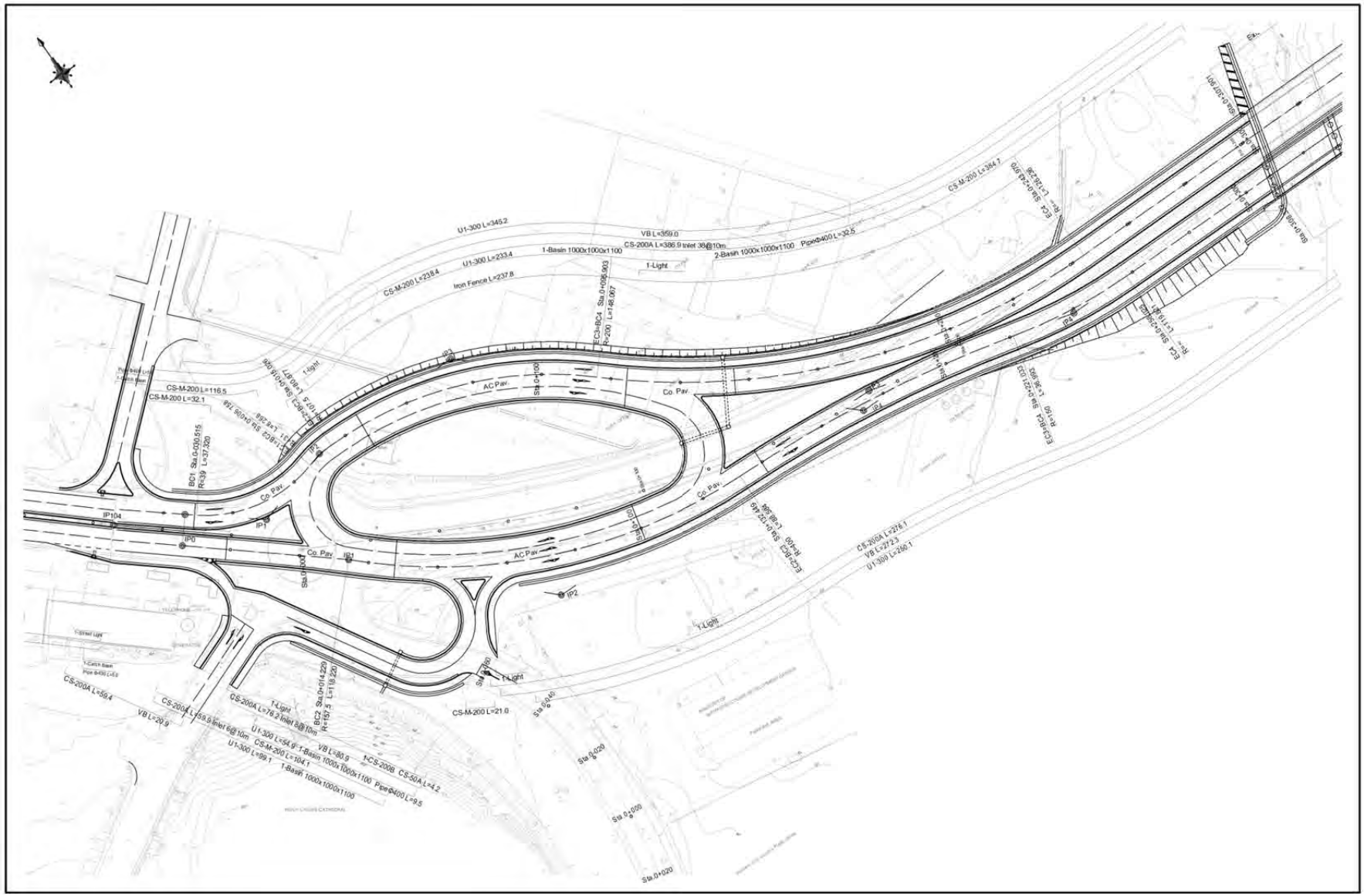



**Figure 2-2-31 Improvement of City Council Roundabout**

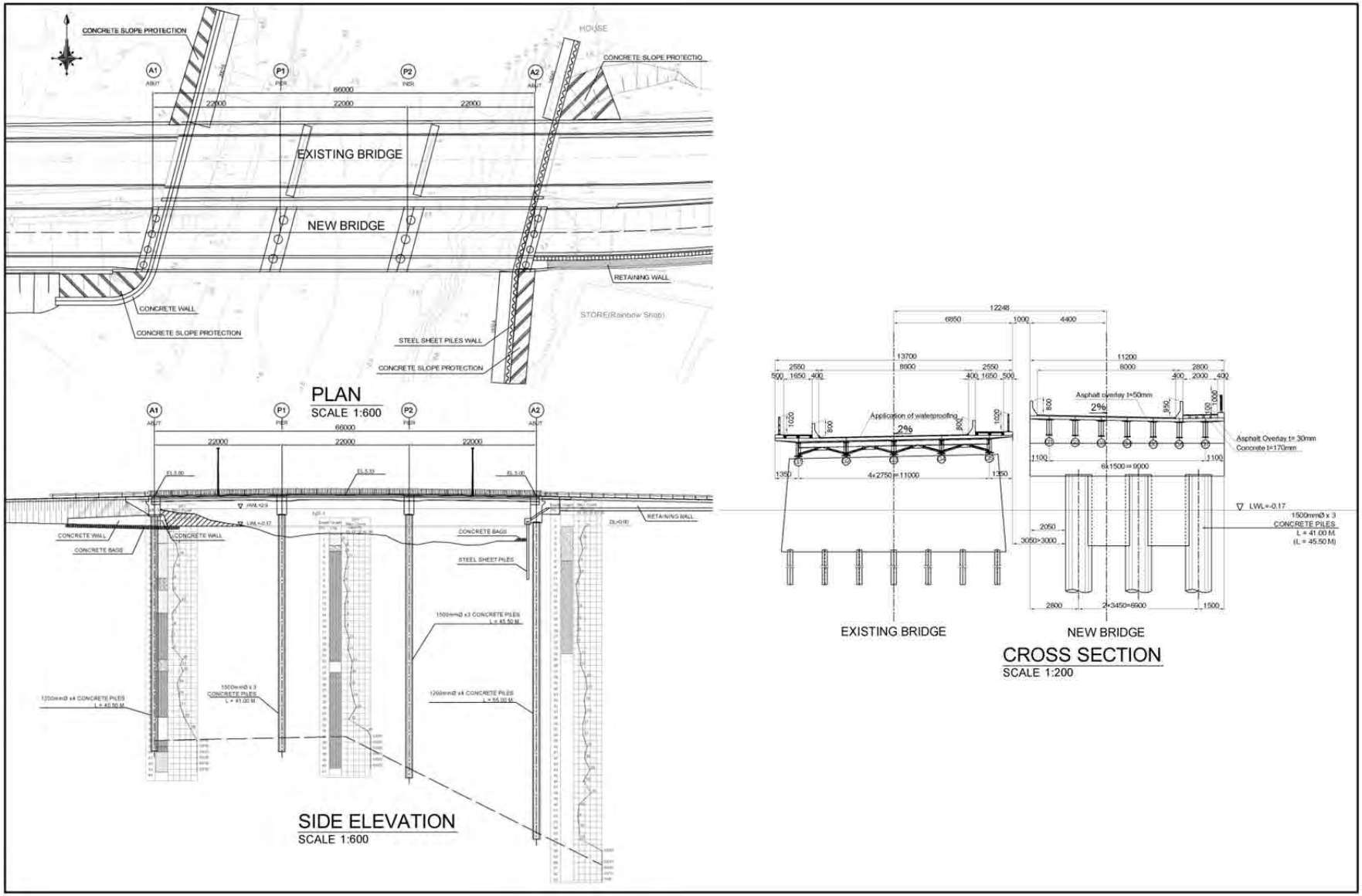



**Figure 2-2-32 Widening of New Mataniko Bridge**

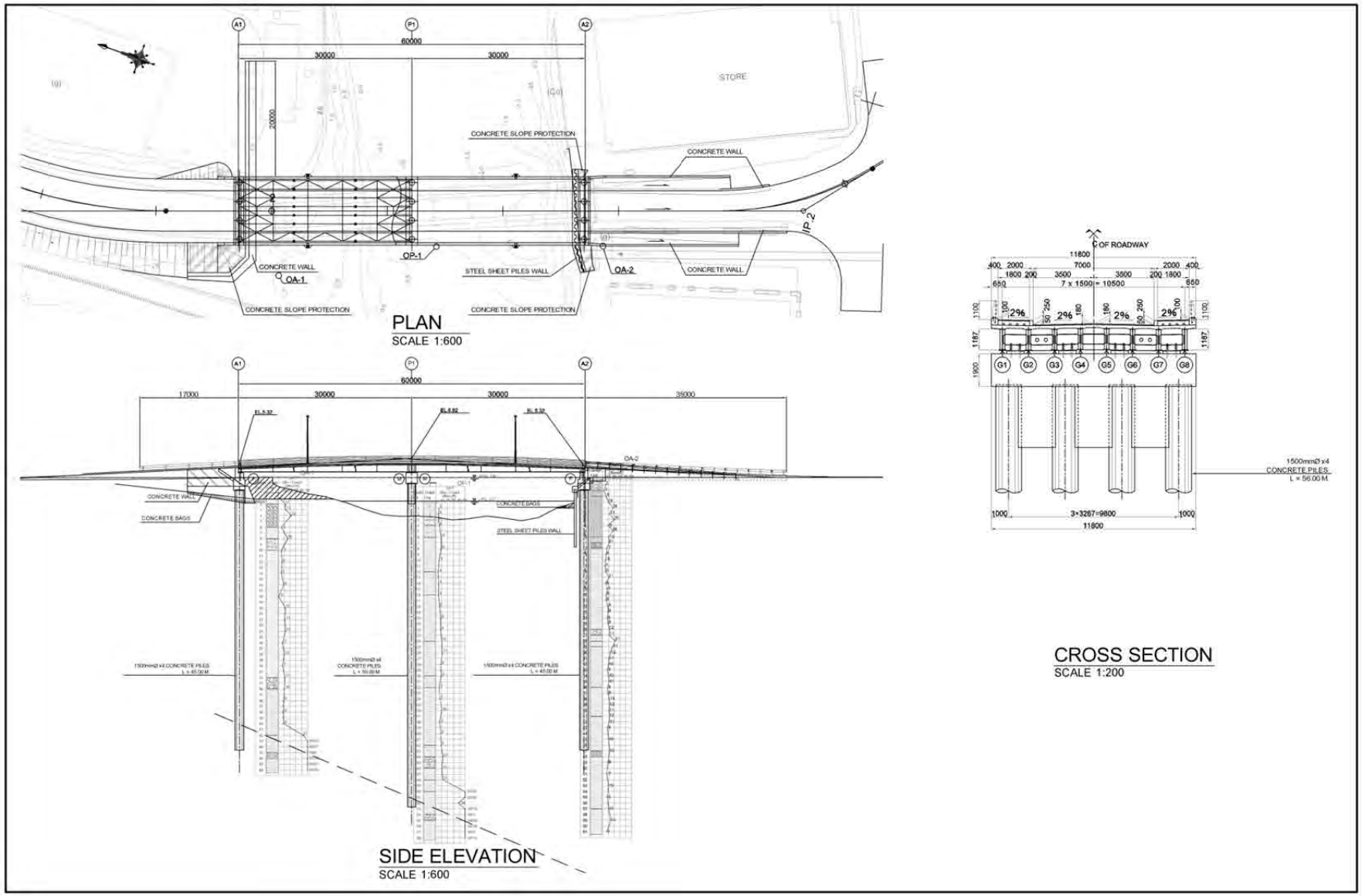



**Figure 2-2-33 Replacement of Old Mataniko Bridge**

### 2-2-4 Implementation Plan

#### 2-2-4-1 Implementation Policy

The basic concepts for implementation of the project under the Japanese grant aid system are as follows:

- Ø On reaching an agreement and signing of the Exchange of Note and Grant Agreement by both Governments of Japan and the Solomon Islands, the project will be implemented in accordance with the guideline of Japanese grant aid.
- Ø Ministry of Infrastructure Development (MID) is the lead ministry for the project implementation.
- Ø Detailed design, assistance in tendering and construction supervision will be undertaken by Japanese consulting firm in accordance with a contract between the MID and Consultant.
- Ø A Japanese pre-qualified tenderer who was awarded the contract by the MID will undertake the implementation of the project.

Main concepts for the implementation planning are as follows:

- Ø Materials and labor for the project will be procured in the Solomon Islands as much as possible. If the required qualities and capacities are not enough or available or they are less competitive, materials and labor will be procured effectively from Japan and/or third countries.
- Ø Technicians and specialists for special works such as bridge, asphalt concrete pavement and steel sheet piling, who are not available in the Solomon Islands, will be procured from Japan, and such works will be carried out by local laborers under the instruction of Japanese technicians/specialists.
- Ø Implementation method and schedule for the project will be planned on the basis of local meteorological, topographic, geological and relevant river conditions as well as any natural conditions affecting the construction works.
- Ø Appropriate standards and specifications for construction will be proposed, and site organizations of both the contractor and the consultant will be arranged to comply with the above-mentioned standards and specifications.
- Ø Protection against sound and vibration, air pollution, water pollution and soil flowing out at the work site, temporary plant yards, quarry sites and borrow pits will be done in order to preserve environment. Construction waste will be treated and/or dumped in a proper site specified by the Government of the Solomon Islands.
- Ø Safety ensuring to third persons and laborers is first priority. And the construction will be planned and managed to ease the environmental burdens to pedestrians and residents along the project site as much as possible.

#### 2-2-4-2 Implementation Conditions

The implementation conditions regarding construction and procurement of the project are as follows:

- The undertakings of the Solomon Islands to be accomplished before the commencement of the construction will be confirmed their progress before the starting of tendering. The tendering starts after the completion of the undertakings.
- To mitigate the current traffic congestion earlier, following components are first priorities in the implementation:
  (i) Countermeasure against traffic congestions around the Central Market
  (ii) Improvement of City Council Roundabout
  (iii) Widening of New Mataniko Bridge (the Kukum Highway: Sta.0+200 to 0+500 is included in New Mataniko Bridge)
- The soft component of the project is schedule to be implemented when the opening of the crosswalks and underpass around the Central Market. The construction schedule of the facilities around the Central Market should coordinate with the soft component staff.
- Replacement of Old Mataniko Bridge starts after the completion of the widening of New Mataniko Bridge.
- During the replacement of Old Mataniko Bridge, the vehicle traffic is closed, only the pedestrian traffic is to be maintained.
- The repair of existing New Mataniko Bridge starts after the completion of its widening.
- Countermeasure around the Central Market is to be basically carried out at night.
- During the Kukum Highway upgrading, one lane is to be closed for work and remaining three lanes are to be maintained for traffic.
- In case provision of detour is difficult for work at intersections along the Kukum Highway, pavement works are to be basically carried out at night.
- Since experienced local technicians such as foreman, skilled worker and painter of bridge work and foreman and operator of bored piling are not available in the Solomon Islands, so Japanese technicians are to be procured to instruct the local laborers to execute these works.
- Since local laborers are not familiar to the asphalt concrete pavement using hot mix asphalt, so Japanese technicians (such as paver operator and rakerman) are procured as instructors to train local laborers on the job.
- Driving steel sheet piles under existing New Mataniko Bridge is planned. As shown in Figure 2-2-34, special low head hydraulic steel pile driver with Japanese technicians are necessary to execute the work.
- Materials, machineries and equipment necessary for the works uncommon in the country are planned to be procured from Japan.

**Figure 2-2-34 Sample of Steel Sheet Piling under Bridge**

Safety Measures

Following safety measures are taken for the execution of the Project.

**Table 2-2-15 Safety Measures**

| Safety Measures | Specific Measures |
|---|---|
| Adopting Night Work | Works on the walkway along/around the Central Market and works in the market are executed at night for the safety of pedestrians and market users. |
| | Road works along the Central Market are executed at night for securing the daytime traffic and for preventing further traffic congestion. |
| | Road works at intersections of the Kukum Highway are executed generally at night. In case that a detour is available daytime works may be allowed. |
| Allocating Flaggers/Spotters | Flaggers/spotters are continuously and for 24 hours allocated at road construction areas during the entire working period for guiding vehicles and pedestrians and for securing the safety of them. |
| Securing Three Lanes for Traffic | Three travel lanes are secured and maintained in the execution of road construction along the Kukum Highway for the safety of travelling vehicles. |
| Installing Safety Control Devices | Safety control devices, such as construction signs, detour signs, nightime lightings, barricade, cones, etc., are installed to warn and protect travelling vehicles and pedestrians during the road construction. These devices protect not only the public but also laborers from accidents. |

### 2-2-4-3 Scope of Work

Undertakings of both governments of Japan and the Solomon Islands are listed in Table 2-2-16.

**Table 2-2-16 Undertakings of Both Governments**

| Items | Contents | Undertaken by | | Remarks |
|---|---|---|---|---|
| | | Japan | Solomon Islands | |
| Preparation Works | Land acquisition | | O | |
| | Compensation and removal of structures in the construction area | | O | Fence, etc. |
| | Underground utility relocation | | O | Power cables, telephone cables and water pipelines |
| | Aerial utility relocation | | O | Power poles |
| | UXO survey & clearance | | O | Bridge construction area |
| | Provision of construction yards | | O | Including spaces for site office, storage yard, workshop, etc. |
| | Provision of borrow pits | | O | Including land rents & royalty |
| | Provision of quarries | | O | Including land rents & royalty |
| | Provision of soil disposal areas | | O | Including land rents |
| | Provision of waste disposal area | | O | Including land rents |
| | Other preparation works | O | | |
| Main Works | Procurement & transportation | O | | |
| | Road works | O | | |
| | Bridge works | O | | |

### 2-2-4-4 Consultant Supervision

A Japanese consultant will carry out detailed design, assistance in tendering and construction supervision in accordance with the consultant agreement made between the Government of the Solomon Islands and the Consultant. The following services will be carried out by the Consultant during construction to be executed by the Contractor according to the contract and implementation plan:

Ø Inspections and approvals of topographic survey
Ø Inspections and approvals of construction plan
Ø Quality control
Ø Progress control
Ø Measurement of works
Ø Inspection of safety aspects
Ø Final inspection and handover
Ø Confirmation and expediting of progress of utility relocation

The Consultant provides one resident engineer to be stationed in the site during the construction and three assistant supervising engineers to be assigned during the particular works as shown in Table 2-2-17.

**Table 2-2-17 Assignment Schedule of Consultant Supervision**

| Personnel | Assignment in Charge |
|---|---|
| Resident Engineer | All aspects of the project |
| Assistant Supervising Engineer 1 | Widening of New Mataniko Bridge |
| Assistant Supervising Engineer 2 | Replacement of Old Mataniko Bridge |
| Assistant Supervising Engineer 3 | Quality control of hot mix asphalt pavement and inspection of night works |

### 2-2-4-5 Quality Control Plan

Major quality control items for earth work and pavement work, concrete work and plate girder fabrication work are shown in Table 2-2-18 to Table 2-2-20 respectively.

**Table 2-2-18 Major Quality Control Items for Earth Work and Pavement Work**

| Item | Test Item | Test Method (Specification) | Frequency of Tests |
|---|---|---|---|
| Embankment | Field Density Test | AASHTO T191 | Once every 500$m^3$ |
| Subgrade & Base Course | Filed Density Test | AASHTO T191 | Once every 1,000$m^3$ |
| | Field Compaction Test | AASHTO T180 | Once every 1,000$m^2$ |
| Asphalt Concrete (Surface & Binder Course) | Temperature of Asphalt Mixture | Temperatures while carrying, laying and compacting | 5 times a day |
| | Abrasion Test of Aggregate | AASHTO T96 | Once every 1,500$m^3$, and when material is changed |

**Table 2-2-19 Major Quality Control Items for Concrete Work**

| Item | Test Item | Test Method (Specification) | Frequency of Tests |
|---|---|---|---|
| Cement | Physical Property Test | AASHTO M85 | Once before each trial mix; then once in every 500m$^3$ of concrete or when material is changed |
| Fine Aggregate | Physical Property Test | AASHTO M6 | Once before each trial mix; then once in every 500m$^3$ or when material source is changed |
| | Sieve Analysis | AASHTO T27 | Once a month |
| Course Aggregate | Physical Property Test | AASHTO M80 | Once before each trial mix; then once in every 500m$^3$ or when material source is changed |
| | Sieve Analysis | AASHTO T27 | Once a month |
| Water | Quality Test | AASHTO T26 | Once before each trail mix |
| Concrete | Slump Test | AASHTO T119 | Twice a day |
| | Air Content Test | AASHTO T121 | Twice a day |
| | Compressive Strength Test | AASHTO T22 | 6 specimens in each concreting. In case of large amount in each concreting, 6 specimens in every 75m$^3$ (3 specimens for 7-day strength and 3 specimens for 28-day strength) |
| | Temperature Test | — | Twice a day |
| | Salinity Test | — | Twice a day |

**Table 2-2-20 Major Quality Control Items for Plate Girder Fabrication Work**

| Item | Test | Test Method (Specification) | Frequency of Test |
|---|---|---|---|
| Steel Plate | Mill sheet quality test | JISG3101 | Before work |
| High Tensile Bolt | Mill sheet quality test | JISB0205/Z2201 | Before work |
| Galvanizing | Weighing test | JISH0401 | Every work |
| Welding | X-ray radio graphic flaw detection, Liquid penetration test | JISG3106 | Every work |
| Shop Assembly | Japanese Road Association Specifications | JISG3101 | Every bridge |
| Fabrication Factory | ISO 9001 Certified Factory | | |

### 2-2-4-6 Procurement Plan

#### (1) Construction Material

Construction materials such as embankment soil, stones, sands, aggregates, crushed stones, ready-mixed concretes and lumbers are available from local markets in the Solomon Islands, however they are generally expensive. Some of construction materials to be produced by the contractor locally are more economical than ones purchased from the local market. Many kind of imported construction materials are available from local markets, however, they are generally expensive because they are transported from overseas countries. Therefore some materials to be procured from Japan by the contractor is more economical than ones imported. Construction materials to be procured from Japan are supposed to be transported by regular shipping services from Yokohama to Honiara. Procurement plan for major materials is shown in Table 2-2-21.

**Table 2-2-21 Construction Material Procurement Plan**

| Item | Procured from | | | Remarks |
|---|---|---|---|---|
| | Solomon Islands | Japan | Third Country | |
| Cement | O | | | |
| Admixture for Concrete | | O | | For economical reason |
| Reinforcing Steel | | O | | ditto |
| Steel Sections | | O | | ditto |
| Straight Asphalt | | O | | ditto |
| Asphalt Emulsion | | O | | ditto |
| Hot-mixed Asphalt | O | | | |
| Sub-grade & Fill Material | O | | | |
| Aggregate | O | | | |
| Crushed Stones | O | | | |
| Plywood for Formwork | | O | | ditto |
| Timber for Formwork | O | | | |
| Ready-mixed Concrete | O | | | |
| Concrete Products | O | | | |
| Gasoline, Diesel | O | | | |
| Heavy Oil | | O | | ditto |
| PVC Pipes (dia. 50, 75, 100, 150) | O | | | |
| PVC Pipe (dia. 200) | | O | | ditto |
| Trees, Turf | O | | | |
| Paints for Road Marking | | O | | ditto |
| Paints for Concrete, etc. | | O | | ditto |
| Guardrails | | O | | ditto |
| Road Signs | O | | | |
| Street Lightings (post, lamp, lamp cover, stabilizer, controller, cable joints, cable, panel board, board case) | | O | | Local procurement is not available. |
| Gratings, Covers | | O | | ditto |
| Steel Girder | | O | | ditto |
| Handrail, Bridge Guard Fence | | O | | ditto |
| Shoes, Expansion Joints | | O | | ditto |
| Waterproofer for Bridge Deck | | O | | ditto |
| Materials for Temporary Bridge, Cofferdam, Strut & Wale | | O | | ditto |
| Materials for Formwork, Scaffolding, Dead Shore | | O | | ditto |

### (2) Construction Equipment

There is no equipment renting business in the Solomon Islands. Construction machines owned by local contractors are basically used for their own projects and their rental prices are higher in general. Therefore most of the equipment to be procured from Japan are more economical than ones procured locally. Machines and equipment for asphalt pavement and bored piling are difficult to procure locally. The procurement policies of machines and equipment are as follows:

Ø Machines unavailable locally such as asphalt finisher are procured from Japan.

Ø Machines to be used frequently or long period are procured from Japan.

Ø Machines to be seldom used or low cost are procured locally.

**Table 2-2-22 Construction Equipment Procurement Plan**

| Item | Procured from | | | Remarks |
|---|---|---|---|---|
| | Solomon Islands | Japan | Third Country | |
| Bulldozer, 21ton | O | | | |
| Backhoe, 0.8m$^3$ | | O | | For economical reason |
| Backhoe, 0.28m$^3$ | O | | | |
| Backhoe, 0.45m$^3$ | O | | | |
| Wheel Loader, 1.9~2.1m$^3$ | | O | | ditto |
| Dump Truck, 10ton | | O | | ditto |
| Truck Crane, 4.9ton lifting | O | | | |
| Truck Crane, 20ton lifting | O | | | |
| Crawler Crane, 50ton lifting | | O | | ditto |
| Truck, 2ton loading | O | | | |
| Truck, 3~3.5ton loading | O | | | |
| Truck with Crane, 2.9ton lifting, 10ton loading | | O | | ditto |
| Trailer, 20ton loading | | O | | ditto |
| Trailer, 40ton loading | O | | | |
| Motor Grader, 3.1m blade | | O | | ditto |
| Macadam Roller, 10~12ton | | O | | ditto |
| Tire Roller, 8~20ton | | O | | ditto |
| Vibrating Roller, mount 3~4ton | | O | | ditto |
| Vibrating Roller, hand guide 0.5~0.6ton | | O | | ditto |
| Vibrating Roller, hand guide 0.8~1.1ton | | O | | ditto |
| Asphalt Finisher, wheel type, 2.4~6m | | O | | Local procurement is not available. |
| Distributor, self-propel, 2~3kl | | O | | For economical reason |
| Water Tanker, 5.5~6.5kl | O | | | |
| Pot Mixer, 0.08m$^3$ | O | | | |
| Tamper, 60~80kg | | O | | ditto |
| Vibrating Compactor, 40~60kg | | O | | ditto |
| Line Marker, hand guide, 15~20cm | | O | | ditto |
| Concrete Cutter, dia. 45cm blade | | O | | ditto |
| Giant-braker, hydraulic 1300kg | | O | | ditto |
| Hand-hammer, 20kg | | O | | ditto |
| Bored Piling Machine (RCD), max. dia. 3m, max. depth 200m | | O | | Local procurement is not available. |
| Hydraulic Pile Driver/Puller, engine type unit 1000/1100kN | | O | | ditto |
| Vibrating Hammer, 60kW | | O | | For economical reason |
| Pneumatic Compressor, 3.5~3.7m$^3$/min | | O | | ditto |
| Crushing Plant, 100ton/hr | | O | | ditto |
| Hot-mix Asphalt Plant, 50t/hr | | O | | Local procurement is not available. |
| Ready-mixed Concrete Plant, automatic mixing, 30m$^3$/hr | | O | | For economical reason |
| Agitator Truck, 4.4m$^3$ | | O | | ditto |

### 2-2-4-7 Soft Component Plan

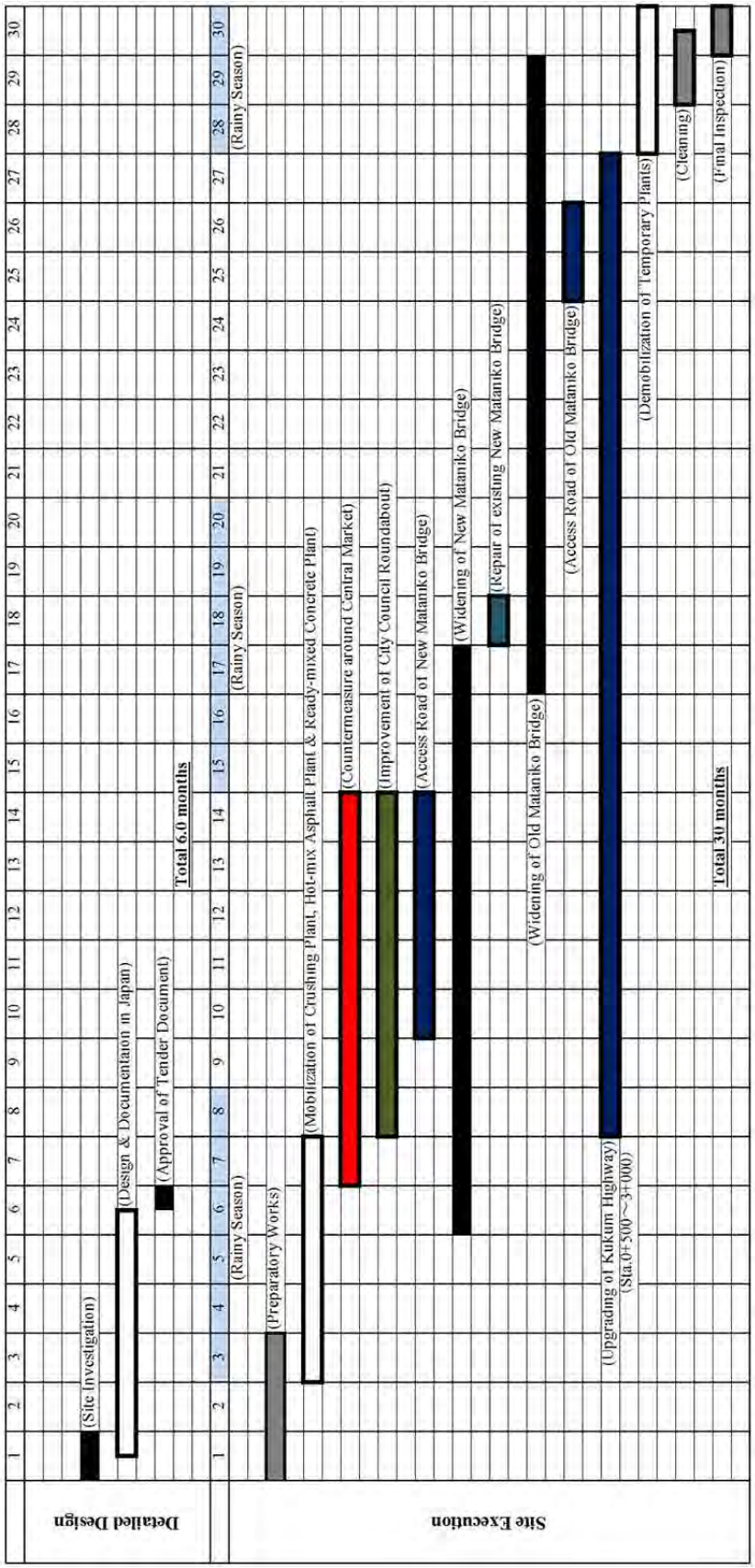
As the countermeasure against traffic congestion around the Central Market, installation of a crosswalk, median fence and renovation of underpass to reuse were proposed in this project. These countermeasures has been implemented before, however several years after the underpass has been closed due to security and sanitary reasons and the median fence has been demolished due to lack of traffic control of road crossings. To avoid repeating such unsuccessful experience and to promote pedestrians to use the underpass continuously, provision of a security guard to observe the safety and cleanliness of the underpass and lock and unlock the underpass entrances every morning and evening is necessary. Also provision of traffic officers to conduct traffic control at the crosswalk from early morning to late evening everyday is necessary to maintain the smooth traffic flow and to secure the road crossing pedestrians' safety and convenience.

To secure the proper operation and management of crosswalk and underpass, this project supports to establish the operational organization and method as a soft component of the project. The detail of the soft component is explained in Appendix 3.

### 2-2-4-8 Implementation Schedule

The implementation schedule of the detailed design and the construction is shown on Table 2-2-23. The construction period is scheduled considering the influence of rainy seasons.

**Table 2-2-23 Implementation Schedule**



## 2-3 Obligation of Recipient Country

The Government of the Solomon Islands is responsible to undertake the following items when the grant aid by the Government of Japan is extended to the Project;

### (1) Undertakings before the Project

The following undertakings are necessary to be completed before the commencement of the construction. The tendering will start after the completion of them in order to secure the smooth construction of the project.

(i) Land acquisition and compensation for structures to be demolished

The list of land acqusiton and structures to be compensated and their location map is shown in Appendix 4.

(ii) Acqusiton of Development Consent

PER is prepared by MID and submitted to ECD. The Development Consent for the project is acuired. The Development of Consent is scheduled to be acquired before January 2015.

(iii) Relocation of utilities

Power posts and cables, telephone boxes and cables and water supply pipes exist within the costruction area are necessary to be relocated to outside the area. The utility location map indicating relocation parts are shown in Appendix 5.

(iv) Provision of temporary yards

Temporary yards for constuction, material storage and site offices are provided by MID. Provision of the yards as shown in Figure 2-3-1 is confirmed.

(v) Provision of borrow pits and quarries and payment for materials

A selected soil borrow pit located within 15km from the project site and a gravel quarry are provided by MID. The necessary paymet to the land owners to quarry the materials are also payed by MID. Provision of either Tampoko Quarry or Lungga Quarry is confirmed.

(vi) Provision of Plant Yard

Either Airport Plant Yard or Tampoko Plant Yard is provided by MID. It is confirmed that in case Airport Plant Yard is provided the quarry must be Lungga Quarry or in case Tampoko Plant Yard is provided the quarry must be Tampoko Quarry.

(vii) Provision of soil and waste disposal area

Provision of Ranady Dump site for the waste disposal is confirmed.


Construction yard at New Mataniko Bridge


Construction yard at Old Mataniko Bridge


Yard for site office and storage

**Figure 2-3-1 Location of Temporary Yards**

(viii) UXO survey and clearance

UXO survey and clearance of the construction area at New Mataniko Bridge and Old Mataniko Bridge is undertaken by MID. UXO survey has been executed during the Preparatory Survey, however it is necessary to do again since a flood occurred afterward. The necessary UXO survey area is shown in Figure 2-3-2.


New Mataniko Bridge


Old Mataniko Bridge

**Figure 2-3-2 UXO Survey Area**

(ix) Payment of Bank Commission

Payment to open a bank account and banking service commissions to the bank in Japan in connection with the grant aid of the project

**(2) Undertakings during the Project**

(i) Ensure prompt tax exemption, customs clearance, and effective measures for smooth inland transportations of materials and equipment;

(ii) Exempt Japanese nationals engaged in the project from any customs duties for purchasing of products and services necessary for the Project;

(iii) Provide all necessary permission, licenses and certificates for the implementation of the project (such as construction permission, traffic control permission, detour permission, earthwork permission, etc.);

(iv) Coordinate and solve any issue related to the project that may be raised from residents and/or third parties;

(v) Bear all the expenses other than covered by the Japanese grant aid necessary for the project;

(vi) To secure safety of the construction site in terms of public order;

(vii) Environmental and social monitoring and report;

(viii) Participation in implementation of soft component and payment of the neessary cost and

(ix) Provision of data necessry in the implementation of the project.

**(3) Undertakings after the Project**

(i) Maintenance of the project road and bridges after the completion of the project and

(ii) Provision of traffic officers to operate the crosswalk in front of the Central Market and security guard to manage the underpass.

## 2-4 Project Operation and Maintenance Plan

The Department of Transport Infrastructure of MID is the responsible organization for the maintenance of the Kukum Highway. The maintenance of roads and bridges are being undertaken by contractors. Routine maintenance of the roads and bridges are executed under two-year period contract with contractors. Routine maintenance works are cleaning and inspection of pavement, drainage facilities and bridges. In case damages are identified, the repair works are executed under contract of repairing. The Department of Transport Infrastructure manages the contracts and supervises the maintenance works. The Department of Transport Infrastructure does not have road maintenance equipment, however they have laboratory which is necessary to supervise the road maintenance work. Work items and estimated cost necessary for the maintenance of the project road are shown in Table 2-5-2.

## 2-5 Project Cost Estimation

### 2-5-1 Initial Cost Estimation

#### (1) Cost Borne by the Government of the Solomon Islands

**Table 2-5-1 Breakdown of Cost Borne by the Government of the Solomon Islands**

| Cost Items | Cost (SBD) |
|---|---|
| Land Acquisition | 7,977,000 |
| Structure Compensation | 809,000 |
| Relocation of Utilities | 11,550,000 |
| Renting Lands for Contractor's Office & Construction | 240,000 |
| Royalties for Quarry and Borrow Pits | 75,000 |
| Renting Lands for Contractor's Plant Yards | 100,000 |
| UXO Survey & Clearance | 20,000 |
| Payment of Bank Commission | 112,000 |
| Employment of Traffic Officers to Operate Crosswalk and Security Guard for Underpass (cost per year) | 183,000 |
| Total | 21,065,000 |

The total cost borne by the government of the Solomon Islands for the execution of the project is estimated at SBD 21,065,000.

#### (2) Conditions in Cost Estimate

Time of Cost Estimation : April 2014
Exchange Rates : 1 US$ = 103.76 Yen
1 SBD = 14.12 Yen
Construction Period : As shown in the Implementation Schedule
Other Condition : Cost estimate is implemented in accordance with the guideline of Japan's Grant Aid

### 2-5-2 Maintenance Cost

The necessary maintenance work items and the estimated cost for the project road are shown in Table 2-5-2.

**Table 2-5-2 Maintenance Work Items and Estimated Cost**

| Maintenance Item | Frequency | Location | Work Items | Annual Cost (SBD) |
|---|---|---|---|---|
| Cleaning & Inspection | | | | |
| 1) Pavement | 2 times/year | Pavement surface | Cleaning and inspection | 30,000 |
| 2) Drainage Facility | 2 times/year | Inside of drainage | Cleaning and inspection | 100,000 |
| 3) Bridge | 2 times/year | All parts of bridge | Cleaning and inspection | 6,000 |
| Subtotal of Annual Cost of Cleaning and Inspection | | | | 136,000 |
| Repair & Rehabilitation | | | | |
| 1) Pavement | Once/2 year | Pavement | Crack seal, Pothole patching | 150,000 |
| 2) Road Marking | Once/2 year | Road surface | Repair of damaged parts | 50,000 |
| 3) Drainage Facility | Once/2 year | Drainage facility | Repair of damaged parts | 100,000 |
| 4) Other Road Facilities | Once/5 year | Street light and others | Repair of damaged parts | 7,000 |
| 5) Bridge | Once/10 year | Damaged part of bridge | Repair of damaged parts | 22,000 |
| 6) Road Crossing | Yearly | Crosswalk & Underpass | Operating crosswalk & security guard for underpass | 183,000 |
| Subtotal of Annual Cost of Repair and Rehabilitation | | | | 512,000 |
| Total | | | | 648,000 |

# Chapter 3 Project Evaluation

## 3-1 Preconditions

The preconditions to realize the project are as follows:

- Ø The undertakings of the Solomon Islands as described in Section 2-3 shall be implemented timely. Especially land acquisition, receipt of Development Consent and relocation of underground utilities are the preconditions for the start of the tendering in order to avoid suspension of the work during the construction.
- Ø Securing the necessary budget for timely payments for the above works is the most essential condition for the smooth implementation of the project.

## 3-2 Necessary Inputs by the Recipient Country

MID is obliged to assign at least one engineer to implement the project which includes the following tasks:

- Ø To support the contractor and the consultant of the project in application of tax exemption and visa/work permit.
- Ø To coordination with the police office and residents in implementation of the work.
- Ø To conduct environmental monitoring and report to the concerned parties including JICA.
- Ø To pay the fees for aggregate quarrying and renting land for temporary works.
- Ø To coordinate with related offices to conduct soft component of the project.

## 3-3 Important Assumptions

The followings are necessary external conditions to generate the expected effects of the project:

- Ø In order to mitigate the traffic congestions around the Central Market, the proposed soft component is necessary to be implemented by all related offices to clear their responsibilities, to establish the methods of operation and maintenance of the road facilities around the Central Market and to continue the operation and maintenance thereof. Otherwise the underpass would not be used by pedestrians and the median fences would be demolished as it has been happened in the past and the traffic congestion would not be mitigated.
- Ø This project provides short-term solutions against the present traffic congestions in the center of Honiara. Therefore medium-term solutions such as the construction of bypass should be provided to avoid occurrence of serious traffic congestions along the Kukum Highway in the future.
- Ø The road drainage facilities are necessary to inspect twice a year and should be cleaned and repaired if required. Other road facilities are also to be maintained as scheduled. Otherwise their performance would be hampered and the usable life of the facilities would be shorter than expected.

## 3-4 Project Evaluation

### 3-4-1 Relevance

This project is appropriate to be implemented under Japanese grant aid due to the following reasons:

- Ø This project has been given the highest priority in the development plan of the Solomon Islands since its urgency is very high.
- Ø The project beneficiaries are all Honiara citizens, who are the users of public buses and the Central Market.
- Ø The major effects of the project are the improvement of living environment, such as mitigation of the traffic congestions and improvement of the traffic safety.
- Ø This project provides infrastructure which supports the socioeconomic development of the Solomon Islands.

### 3-4-2 Effects

Quantitative effects of the project are shown in Table 3-4-1.

**Table 3-4-1 Quantitative Effects**

| Quantitative Effect Indicator | Base Year (2013) | Evaluate Year (2021) (Three years after the project completion) |
|---|---|---|
| Reduce traffic congestion length (queue) from City Council Roundabout toward to the east at 9am | 670m | 300m |
| Improvement of average travel speed from Vura Junction to Hotbread Roundabout at 9am | 20km/hr | 30km/hr |

Qualitative effects of the project are as follows:

- Ø Driving comfort and safety will be increased due to improvement of road and drainage conditions.
- Ø Comfort and safety of pedestrians and urban environment will be improved due to development of road facilities around the Central Market.
- Ø Road maintenance cost will be reduced due to renewing the road.
- Ø Socioeconomic activities will be efficient due to mitigation of traffic congestions.
- Ø Awareness of necessity of proper use and management of road facilities will be increased by experience of the soft component of the project.

## Appendix 1 Member List of the Survey Team

**First Field Survey**

| No. | Name | Job Title | Occupation |
|---|---|---|---|
| 1 | Mr. Nobuyuki TSUNEOKA | Leader | Japan International Cooperation Agency |
| 2 | Mr. Yusuke TSUMORI | Cooperation Planning | Japan International Cooperation Agency |
| 3 | Mr. Soemu OSHITA | Chief Consultant / Traffic Planning | Katahira & Engineers International |
| 4 | Mr. Keiichi MURAKAMI | Road Design / Construction Planning | Katahira & Engineers International |
| 5 | Mr. Mamoru IZAWA | Bridge Design / Construction Planning | Katahira & Engineers International |
| 6 | Mr. Hiroshi WATANABE | Procurement Planning / Cost Estimation | Katahira & Engineers International |
| 7 | Mr. Taiji TANOGUCHI | Environmental & Social Consideration | Katahira & Engineers International |
| 8 | Mr. Ken NISHINO | Traffic Survey / Traffic Demand Forecast | Katahira & Engineers International |
| 9 | Mr. Masateru TOCHINAKA | Natural Condition Survey (Hydrology / Meteorology) | Katahira & Engineers International |

**Second Field Survey**

| No. | Name | Job Title | Occupation |
|---|---|---|---|
| 1 | Mr. Nobuyuki TSUNEOKA | Leader | Japan International Cooperation Agency |
| 2 | Mr. Yuya FUKADA | Cooperation Planning | Japan International Cooperation Agency |
| 3 | Mr. Soemu OSHITA | Chief Consultant / Traffic Planning | Katahira & Engineers International |
| 4 | Mr. Keiichi MURAKAMI | Road Design / Construction Planning | Katahira & Engineers International |
| 5 | Mr. Mamoru IZAWA | Bridge Design / Construction Planning | Katahira & Engineers International |
| 6 | Mr. Hiroshi WATANABE | Procurement Planning / Cost Estimation | Katahira & Engineers International |
| 7 | Mr. Taiji TANOGUCHI | Environmental & Social Consideration | Katahira & Engineers International |
| 8 | Mr. Ken NISHIONO | Natural Condition Survey (Topography / Geology) | Katahira & Engineers International |
| 9 | Mr. Masateru TOCHINAKA | Natural Condition Survey (Hydrology / Meteorology) | Katahira & Engineers International |

**Additional Field Survey (Flood Damage Survey)**

| No. | Name | Job Title | | Occupation |
|---|---|---|---|---|
| 1 | Mr. Soemu OSHITA | Chief Consultant / Traffic Planning | | Katahira & Engineers International |
| 2 | Mr. Mamoru IZAWA | Bridge Design / Construction Planning | | Katahira & Engineers International |
| 3 | Mr. Masateru TOCHINAKA | Natural Condition Survey (Hydrology / Meteorology) | | Katahira & Engineers International |

**Explanation of the Draft Outline Report**

| No. | Name | Job Title | Occupation |
|---|---|---|---|
| 1 | Mr. Nobuyuki TSUNEOKA | Leader | Japan International Cooperation Agency |
| 2 | Mr. Takama SAKAMOTO | Deputy Leader | Japan International Cooperation Agency |
| 3 | Mr. Yuya FUKADA | Cooperation Planning | Japan International Cooperation Agency |
| 4 | Mr. Yusuke TSUMORI | Cooperation Planning | Japan International Cooperation Agency |
| 5 | Mr. Soemu OSHITA | Chief Consultant / Traffic Planning | Katahira & Engineers International |
| 6 | Mr. Keiichi MURAKAMI | Road Design / Construction Planning | Katahira & Engineers International |
| 7 | Mr. Taiji TANOGUCHI | Environmental & Social Consideration | Katahira & Engineers International |

# Appendix 2 Survey Schedule

## First Field Survey

| Name | | | Mr.Nobuyuki TSUNEOKA | Mr.Yusuke TSUMORI | Mr. Soemu OSHITA | Mr. Keiichi MURAKAMI | Mr. Mamoru IZAWA | Mr. Hiroshi WATANABE | Mr. Taiji TANOGUCHI | Mr. Ken NISHINO |
|---|---|---|---|---|---|---|---|---|---|---|
| Position | | | Team Leader (JICA) | Cooperation Planning (JICA) | Chief Consultant/ Traffic Planning (KEI) | Road Design /Construction Planning (KEI) | Bridge Design/ Construction Planning (KEI) | Procurement Planning/ Cost Estimation (KEI) | Environmental and Social Consideration (KEI) | Traffic Survey/ Traffic Demand Forecast (KEI) |
| No. | Date | Day | | | | | | | | |
| 1 | 20-Nov-13 | Wed | | | | | | | | Narita → Singapore → Brisbane |
| 2 | 21-Nov-13 | Thr | | | | | | | | Brisbane → Honiara |
| 3 | 22-Nov-13 | Fri | | | | | | | | Site Survey |
| 4 | 23-Nov-13 | Sat | | | | | | | | |
| 5 | 24-Nov-13 | Sun | | | Narita → Singapore → Brisbane | Narita → Singapore → Brisbane | | | Narita → Singapore → Brisbane | Reporting |
| 6 | 25-Nov-13 | Mon | | | Brisbane → Honiara | Brisbane → Honiara | | | Brisbane → Honiara | |
| 7 | 26-Nov-13 | Tue | | | Meeting with JICA Office, Discussion with MID | Meeting with JICA Office, Discussion with MID | | | Meeting with JICA Office, Discussion with MID | Site Survey |
| 8 | 27-Nov-13 | Wed | | | Site Survey | | | | Site Survey | |
| 9 | 28-Nov-13 | Thr | | | | | | Narita → Singapore → Brisbane | | |
| 10 | 29-Nov-13 | Fri | | | | | | Brisbane → Honiara | | |
| 11 | 30-Nov-13 | Sat | | | | | | Site Survey | | |
| 12 | 01-Dec-13 | Sun | | | Reporting | | Narita → Singapore → Brisbane | Reporting | | |
| 13 | 02-Dec-13 | Mon | | | Site Survey | | Brisbane → Honiara | Site Survey | | |
| 14 | 03-Dec-13 | Tue | | | Site Survey | | | | | |
| 15 | 04-Dec-13 | Wed | | | Discussion with MID | | | | | Site Survey |
| 16 | 05-Dec-13 | Thr | | | Site Survey | | | | | |
| 17 | 06-Dec-13 | Fri | | | | | | | | |
| 18 | 07-Dec-13 | Sat | Narita → Singapore → Port Moresby | Narita → Singapore → Port Moresby | | | | | | |
| 19 | 08-Dec-13 | Sun | Port Moresby → Honiara | Port Moresby → Honiara | Reporting | | | | | |
| 20 | 09-Dec-13 | Mon | CC to JICA, Meeting with MID, Site Survey | | | | | | | Site Survey |
| 21 | 10-Dec-13 | Tue | Discussion with MID, Meeting within Team | | | | | | | |
| 22 | 11-Dec-13 | Wed | Discussion with MID, Site Survey | | | | Site Survey | | | |
| 23 | 12-Dec-13 | Thr | Site Survey, Meeting within Team | | | | | | | |
| 24 | 13-Dec-13 | Fri | Report to EOJ, Signing on the M/M, Report to JICA Office, Meeting with DonorsJ | | | | Site Survey | | | |
| 25 | 14-Dec-13 | Sat | Honiara → Port Moresby → Singapore | Honiara → Port Moresby → Singapore | Site Survey | | | | | |
| 26 | 15-Dec-13 | Sun | Singapore → Haneda | Singapore → Haneda | Reporting | | | | | |
| 27 | 16-Dec-13 | Mon | | | Site Survey | | | Honiara → Brisbane → Singapore | Site Survey | |
| 28 | 17-Dec-13 | Tue | | | | | | Singapore → Narita | | |
| 29 | 18-Dec-13 | Wed | | | | | | | | |
| 30 | 19-Dec-13 | Thr | | | | | | | | |
| 31 | 20-Dec-13 | Fri | | | Report to JICA, Site Survey | | | | Report to JICA, Site Survey | |
| 32 | 21-Dec-13 | Sat | | | Reporting | | | | Reporting | |
| 33 | 22-Dec-13 | Sun | | | Honiara → Brisbane → Singapore | Honiara → Brisbane → Singapore | Honiara → Brisbane → Singapore | | Honiara → Brisbane → Singapore | Honiara → Brisbane → Singapore |
| 34 | 23-Dec-13 | Mon | | | Singapore → Narita | Singapore → Narita | Singapore → Narita | | Singapore → Narita | Singapore → Narita |

EOJ: Embassy of Japan

MID: Ministry of Infrastructure Development

# Second Field Survey

| No. | Date | Day | JICA | | Consultant | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mr.Nobuyuki TSUNEOKA | Mr.Yuya FUKADA | Mr. Soemu OSHITA | Mr. Keiichi MURAKAMI | Mr. Mamoru IZAWA | Mr. Hiroshi WATANABE | Mr. Taiji TANOGUCHI | Mr. Ken NISHINO | Mr. Masateru TOCHINAKA |
| | | | Team Leader | Cooperation Planning | Chief Consultant/ Traffic Planning | Road Design /Construction Planning | Bridge Design/ Construction Planning | Procurement Planning/ Cost Estimation | Environmental and Social Consideration | Natural Condition Survey (Topography, Geology) | Natural Condition Survey (Hydrology, Meteorology) |
| 1 | 23-Feb | Sun | | | Narita → Singapore → | | | | | Narita → Singapore → | |
| 2 | 24-Feb | Mon | | | Brisbane → Honiara, Site Visit | | | | | Brisbane → Honiara | |
| 3 | 25-Feb | Tue | Narita→Singapore→ | | Site Survey | | | | | Site Survey | |
| 4 | 26-Feb | Wed | Brisbane→Honiara | | | | | | | | |
| 5 | 27-Feb | Thu | Site Visit | | | Site Survey | | | | | |
| 6 | 28-Feb | Fri | Explanation and Discussion on Interim Report with MID | | | | | | | | |
| 7 | 1-Mar | Sat | Documentation | | Site Survey | | | | | | |
| 8 | 2-Mar | Sun | Internal Meeting | | Reporting | | | | | Reporting | |
| 9 | 3-Mar | Mon | Signing of M/D, Report to JICA Field Office and EOJ | | | Site Survey | | | | Site Survey | |
| 10 | 4-Mar | Tue | Honiara→Brisbane→Singapore | | Site Survey | | | | | | |
| 11 | 5-Mar | Wed | →Yangon | →Haneda | | | | | | | |
| 12 | 6-Mar | Thu | | | | | | | Narita → Singapore → | | |
| 13 | 7-Mar | Fri | | | Site Survey | | | | Brisbane → Honiara | | |
| 14 | 8-Mar | Sat | | | Site Survey | | | | | | |
| 15 | 9-Mar | Sun | | | Reporting | | | | | | |
| 16 | 10-Mar | Mon | | | Site Survey | | | | | | |
| 17 | 11-Mar | Tue | | | | | | | | | |
| 18 | 12-Mar | Wed | | | | | | | | | |
| 19 | 13-Mar | Thu | | | | | | | | | |
| 20 | 14-Mar | Fri | | | | | | | | | |
| 21 | 15-Mar | Sat | | | | | | | | | |
| 22 | 16-Mar | Sun | | | Reporting | | | | | | |
| 23 | 17-Mar | Mon | | | Site Survey | | Honiara → Brisbane → Singapore | Site Survey | | | |
| 24 | 18-Mar | Tue | | | | | Singapore → Narita | | | | |
| 25 | 19-Mar | Wed | | | | | | | | | |
| 26 | 20-Mar | Thu | | | Public Consultation Meeting | | | Public Consultation Meeting | | | |
| 27 | 21-Mar | Fri | | | Site Survey | | | Honiara → Brisbane → Singapore | Site Survey | | |
| 28 | 22-Mar | Sat | | | | | | Singapore → Narita | | | |
| 29 | 23-Mar | Sun | | | Reporting | | | | Reporting | | |
| 30 | 24-Mar | Mon | | | Site Survey | | | | Site Survey | | Honiara → Brisbane → Singapore |
| 31 | 25-Mar | Tue | | | | | | | | | Singapore → Narita |
| 32 | 26-Mar | Wed | | | Discussion with MID | | | | Discussion with MID | | |
| 33 | 27-Mar | Thu | | | Report to JICA | Honiara → Brisbane → Singapore | | | Report to JICA | | |
| 34 | 28-Mar | Fri | | | Honiara → Brisbane → Singapore | Singapore → Narita | | | Honiara → Brisbane → Singapore | Site Survey | |
| 35 | 29-Mar | Sat | | | Singapore → Narita | | | | Singapore → Narita | Site Survey | |
| 36 | 30-Mar | Sun | | | | | | | | Site Survey | |
| 37 | 31-Mar | Mon | | | | | | | | Site Survey | |
| 38 | 1-Apr | Tue | | | | | | | | Site Survey | |
| 39 | 2-Apr | Wed | | | | | | | | Site Survey | |
| 40 | 3-Apr | Thu | | | | | | | | Honiara → Brisbane → Singapore | |
| 41 | 4-Apr | Fri | | | | | | | | Singapore → Narita | |

EOJ: Embassy of Japan
MID: Ministry of Infrastructure Development

## Additional Field Survey (Flood Damage Survey)

| Name | | | Mr. Soemu OSHITA | Mr. Mamoru IZAWA | Mr. Masateru TOCHINAKA |
|---|---|---|---|---|---|
| Position | | | Chief Consultant/ Traffic Planning (KEI) | Bridge Design/ Construction Planning (KEI) | Natural Condition Survey (Hydrology, Meteorology) |
| No. | Date | Day | | | |
| 1 | 20-Apr | Sun | Narita → Singapore → | | |
| 2 | 21-Apr | Mon | Brisbane → Honiara, Site Visit | | |
| 3 | 22-Apr | Tue | Discussion with JICAField Office, Discussion with MID and Donors | | |
| 4 | 23-Apr | Wed | Site Survey | | |
| 5 | 24-Apr | Thu | Site , Discussion with MID | | |
| 6 | 25-Apr | Fri | Discussion with MID, Report to EOJ, JICA Field Office | | |
| 7 | 26-Apr | Sat | Site Survey | | |
| 8 | 27-Apr | Sun | Honiara → Brisbane → | | |
| 9 | 28-Apr | Mon | Singapore → Narita | | |

EOJ: Embassy of Japan
MID: Ministry of Infrastructure Development

## Explanation of the Draft Outline Report

| | | | JICA | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Mr.Nobuyuki TSUNEOKA | Mr.Yuya FUKADA | Mr.Yuya FUKADA | Mr. Soemu OSHITA | Mr. Keiichi MURAKAMI | Mr. Taiji TANOGUCHI |
| No. | Date | Day | Team Leader | Deputy Team Leader | Cooperation Planning | Chief Consultant/ Traffic Planning | Road Design /Construction Planning | Environmental and Social Consideration |
| 1 | 23-Aug-14 | Sat | Narita → Port Moresby | | | | | |
| 2 | 24-Aug-14 | Sun | Port Moresby → Honiara | | | | | |
| 3 | 25-Aug-14 | Mon | Meeting at JICA Office, Site Survey w/MID | | | | | |
| 4 | 26-Aug-14 | Tue | Explanation on DFR, Discussion with MID | | | | Site Survey | |
| 5 | 27-Aug-14 | Wed | Stakeholder Meeting, Discussion with MID | | | | | |
| 6 | 28-Aug-14 | Thu | Discussion with M/D, Report to EOJ | | | | Site Survey | |
| 7 | 29-Aug-14 | Fri | Signing on M/D, Meeting with MDPAD and MoFT | | | | Site Survey | |
| 8 | 30-Aug-14 | Sat | Honiara → Port Moresby → Narita | | | | | |

MID: Ministry of Infrastructure Development
MDPAD: Ministry of Development Planning and Aid Coordination
MoFT: Minitry of Finance and Treasury
EOJ: Embassy of Japan

**Appendix 3 List of Parties Concerned in Solomon Islands**

Ministry of Infrastructure Development (MID)

| | |
|---|---|
| Moses Virivolomo | Permanent Secretary |
| Jimmy Nuake | Under Secretary (Technical) |
| John Ta'aru | Project Coordinator |
| Harry Rini | Director (Transport Infrastructure) |
| Mike Qaqara | Deputy Director (Transport Policy and Planning) |
| Jabin Basitau | Deputy Director (Operation and Maintenance) |
| Lawrence Waware | Chief Civil Engineer |
| John Hughes | Team Leader, TSDP |
| Bruce Anderson | Pacific Technical Assistance Mechanism (PACTAM) |
| Winston Lapo | Environmental Office, TSDP |
| Yuji Hatakeyama | JICA Expert on Social and Environmental Safeguard |

Ministry of Development Planning and Aid Coordination (MDPAC)

| | |
|---|---|
| Ms. Rose Tungale | Acting Permanent Secretary |
| Mr. Andrew Prakash | Director, Economic & Productive Sector Division |
| Ms. Siona Koti | Chief Planning Officer, Aid Coordination Division |
| Ms. Lisa Sugumanu | Principal Planning Officer - Economic Infrastructure |
| Mr. Yasushi Hayashi | Aid Coordination Advisor (JICA Expert) |

Ministry of Fincance and Treasuruy (MoFT)

| | |
|---|---|
| Mr. Shadrach Fanega | Permanent Secretary |
| Mr. Mckinnie Dentana | Under Secretary |

Solomon Telekom Company Ltd

| | |
|---|---|
| Lawrence Samani | Manager |
| Leonard Uvikatsi | Senior Engineer |
| Simon Walegerea | Engineer |

Solomon Islands Water Authrity (SIWA)

| | |
|---|---|
| Richard Austin | General Manager |
| Ray Andresen | Operation & Technical Manager |

Solomon Islands Electoric Authority (SIEA)

| | |
|---|---|
| Rollins Suluia | Distribution Engineer |

Other Donor

| | |
|---|---|
| Daisuke Mizusawa | ADB Headquarter |

| | |
|---|---|
| Rishi Ram Adhar | ADB Sydney Office |
| Paula Baleilevuka | ADB Honiara Office |
| Scott McNamara | Australian Aid |
| Jan Willem Overbeek | Pacific Region Infrastructure Facility (PRIF) |

Embassy of Japan

| | |
|---|---|
| Satoshi Nakajima | Ambasador |
| Kenichi Kimiya | Ambasador |
| Hitomi Obata | Resercher / Advisor |

JICA Solomon Islands Office

| | |
|---|---|
| Taiji Usui | Representative |
| Naoko Laka | Project Formulation Adviser |
| Yoshihiko Nishimura | Project Formulation Adviser |
| Akiko Fukuda | Project Formulation Adviser |

## Appendix 4 Minutes of Discussions (M/D)

### First Field Survey

**MINUTES OF DISCUSSIONS**
**ON**
**THE PREPARATORY SURVEY**
**ON**
**THE PROJECT FOR UPGRADING OF THE KUKUM HIGHWAY**
**IN**
**SOLOMON ISLANDS**

In response to a request from the Government of Solomon Islands (hereinafter referred to as "Solomon"), Japan International Cooperation Agency (hereinafter referred to as "JICA") in consultation with the Government of Japan decided to conduct a Preparatory Survey (hereinafter referred to as "the Survey") on the Project for Upgrading of the Kukum Highway (hereinafter referred to as "the Project").

JICA sent the Preparatory Survey Team (hereinafter referred to as "the Team") to Solomon, headed by Mr. Nobuyuki Tsuneoka, Senior Advisor of JICA from November 21 to December 22, 2013.

The Team held discussions with officials concerned of the Government of Solomon and conducted a field survey in the Project area.

In the course of discussions and the field survey, both sides confirmed the main items described in the attached sheets.

Honiara, December 13, 2013

Nobuyuki Tsuneoka
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Moses Soajonga Virivolomo
Permanent Secretary
Ministry of Infrastructure Development
Solomon Islands

## ATTACHMENT

1. Title of the Project

Both Japanese and Solomon sides confirmed that the title of the Project shall be "the Project for Upgrading of the Kukum Highway".

2. Objective of the Project

Both sides confirmed that the objective of the Project is to reduce traffic congestion and ensure smooth traffic and safety on the Kukum highway by widening of bridge(s) and improvement of road facilities such as drainage, pavement, intersection(s) and bus bay(s).

3. Project Site

Both sides confirmed that the site of the Project is as shown in Annex-1.

4. Objective of the Survey

Both sides confirmed the objective of the Survey as follows:

4-1. To understand the background and objective of the Project and examine its impacts and appropriateness.

4-2. To identify the components of the Project based on the data and information collected from and the results of meetings with Solomon side.

4-3. To study the issues of environmental and social considerations through the Survey.

5. Responsible and Implementing Agency

Both sides confirmed the implementing organizations as follows:

5-1. The responsible and implementing organization is Ministry of Infrastructure Development (MID).

5-2. The organization chart of MID is as shown in Annex-2.

6. Items Requested by the Government of Solomon

As a result of discussions between both sides, the items in the following table were finally requested by Solomon side with prioritization. Both sides confirmed that the components of the Project will be decided by Japanese side in consideration of necessity, technical feasibility, sustainability, cost-effectiveness and available budget. Therefore, Solomon side understood that not all the requested items will be accepted as final components of the Project.

| Priority | Component | Remarks |
|---|---|---|
| 1 | Improvement of the Kukum Highway from City Council Roundabout to around 3km point from City Council Roundabout | drainage, pavement, intersection, bus bay |
| 2 | Improvement of traffic congestions in front of Central Market and neighboring area | drainage, pavement, intersection, bus bay, pedestrian barrier, rehabilitation of existing pedestrian underpass |
| 3 | Widening of New Mataniko Bridge to a total 4 lanes | tentatively agreed on the upper stream side |
| 4 | Improvement of intersection of City Council Roundabout | |
| 5 | Reconstruction of Old Mataniko Bridge to a total 2 lanes | |
| 6 | Improvement of the Kukum Highway from around 3km point from City Council Roundabout to Ranadi East/King GeorgeVI school | drainage, pavement, intersection, bus bay |
| 7 | Improvement of the Kukum Highway from Ranadi East/King GeorgeVIschool to the International Airport | drainage, pavement, intersection, bus bay |

7. Japan's Grant Aid Scheme

Solomon side understands the Japan's Grant Aid scheme explained by the Team, as described in Annex-3 and Annex-4.

Solomon side will take the necessary measures, as described in Annex-5, to facilitate the smooth implementation of the Project, as a condition for the Japan's Grant Aid to be implemented, according to the existing agreement between the Government of Japan and the Government of Solomon.

8. Schedule of the Survey

Both sides confirmed the schedule of the Survey as follows:

8-1. The Team will continue the first field survey in Solomon until December 21, 2013.

8-2. JICA will prepare the interim report including components of the Project and send a mission team to explain its contents to Solomon side (second field survey) in the end of February 2014. And this team will continuously conduct outline design and cost estimation until the early in April 2014.

8-3. JICA will prepare the draft final report and send a mission team to explain its contents to Solomon side in early August 2014. JICA will explain details of the Project including the final components and cost estimation to Solomon side.

8-4. JICA will finalize the final report and send it to Solomon side around December 2014.

8-5. The above schedule is tentative and subject to change.

9. Environmental and Social Considerations

9-1. The Team explained the Project is categorized as "Category B" according to the JICA Guideline, since the Project is widening of the bridge, major improvement of existing roads, and its impact on the environment may be expected.

9-2. Solomon side understood the Project needs to follow the JICA guideline. Therefore the initial environmental examination (IEE) shall be done through the Survey.

9-3. Regarding the Project Affected Persons (PAPs) within the Project sites, the Solomon side agreed to secure the appropriate budget to be allocated for resettlement and compensation and secure the land before the implementation of the Project. In this regard an Abbreviated Resettlement Action Plan (Abbreviated RAP) will be prepared and approved by the responsible authorities beforehand and Solomon side will take necessary measures to PAPs according to an Abbreviated RAP in close communication with JICA.

10. Proper Use

Solomon side shall secure enough budget and personnel necessary for the operation and maintenance of the facilities constructed by the Project, including the periodical maintenance work after the completion of the Project.

11. Other Relevant Issues

11-1. Solomon side shall, at its own expense, provide the Team with the following items in cooperation with other organizations concerned:

(1) security-related information as well as measures to ensure the safety of the survey team;
(2) information as well as support in obtaining medical service;
(3) data and information necessary for the Survey;
(4) counterpart personnel;
(5) suitable office space with necessary equipment and services;
(6) credentials or identification cards if necessary;
(7) entry permits necessary for the survey team members to conduct field surveys;
(8) necessary arrangement for exemption of the taxes, duties, and any charges on equipment, machinery and other materials brought into Solomon for the implementation of the Survey; and
(9) support in obtaining other privileges and benefits if necessary.

11-2. Solomon side agreed that the following undertakings should be taken by Solomon side at the Solomon's expenses under the Project if implementation of the Project is approved by the Government of Japan:

(1) to secure the lots of land necessary for the implementation of the Project including land for site office, plant yards, material storing yard, motor pool, temporary construction yard and waste disposal site;

(2) to relocate existing utilities within the Project site;

(3) to arrange issuance of license, permission and other necessary procedures for the Project;

(4) to obtain the royalties/permission for taking raw materials such as stone/rock/filling materials from the quarry/river-bed/borrow pit and to bear the cost of raw material; and

(5) to provide security measures for all concerned working for the Project.

11-3. Solomon side shall detect discriminate and clear UXOs (Unexploded Objects) in the site of New Mataniko Bridge and Old Mataniko Bridge area before the implementation of the second field survey.

11-4 Solomon side shall provide proper measures of traffic safety for surveyors conducting geological and topographical survey on the road during the second field survey.

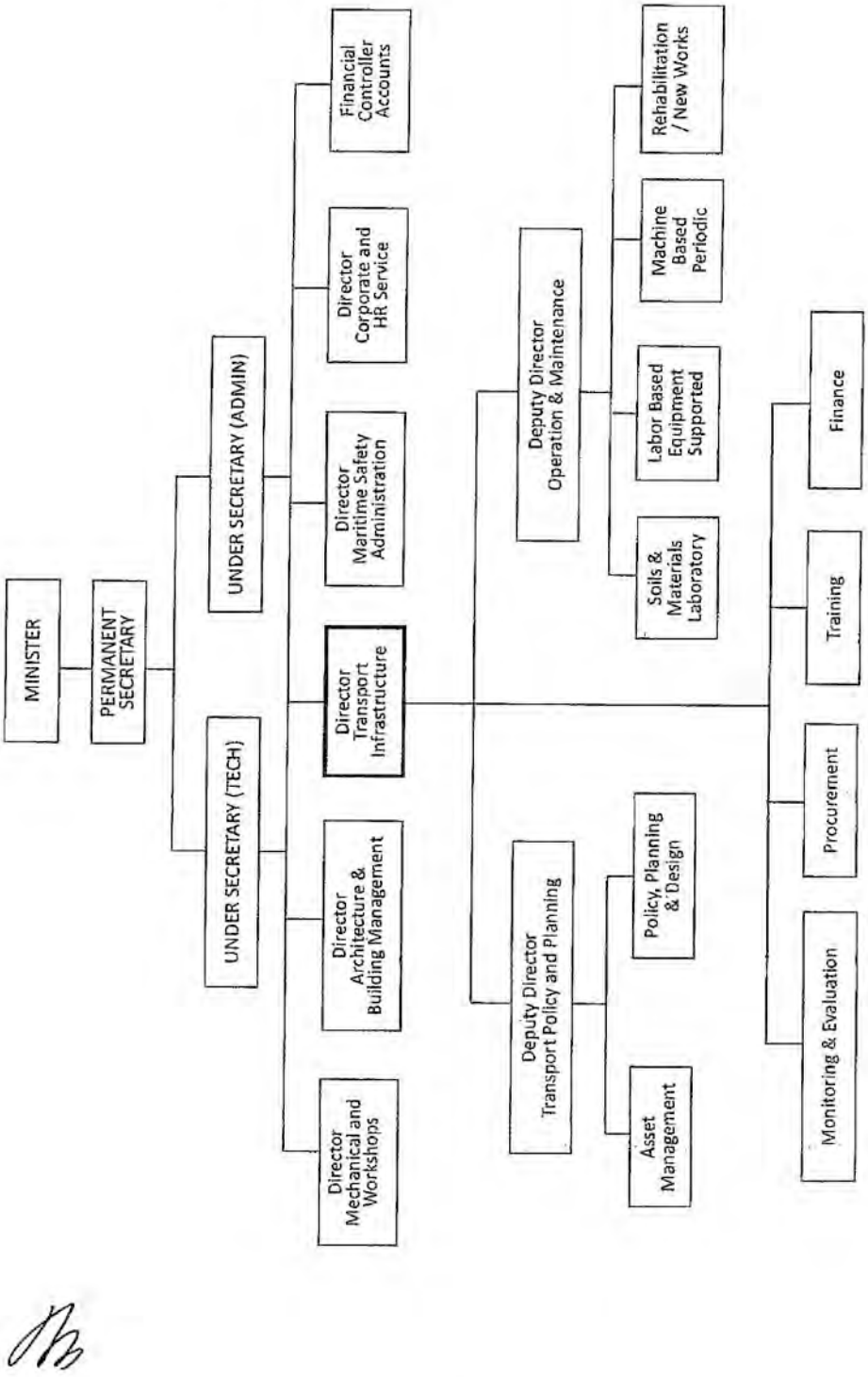
12. Disclosure of Information

Both sides confirmed that the study results excluding the Project cost will be disclosed to the public after the completion of the Survey. All the study result including the Project cost will be disclosed to the public after all the verification of contracts for the Project by JICA are concluded.

Annex-1: Project Site
Annex-2: Organization Chart of MID
Annex-3: Japan's Grant Aid Scheme
Annex 4: Flowchart of Japan's Grant Aid Procedure
Annex 5: Major Undertakings to be taken by Each Government

Annex-1: Project Site

Annex-2: Organization Chart of MID



Annex 3: Japan's Grant Aid Scheme

## JAPAN'S GRANT AID

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

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

### 1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures:

・Preparatory Survey

- The Survey conducted by JICA

・Appraisal &Approval

-Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet

・Authority for Determining Implementation

-The Notes exchanged between the GOJ and a recipient country

・Grant Agreement (hereinafter referred to as "the G/A")

-Agreement concluded between JICA and a recipient country

・Implementation

-Implementation of the Project on the basis of the G/A

### 2. Preparatory Survey

(1) Contents of the Survey

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

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.

- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of a outline design of the Project.
- Estimation of costs of the Project.

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

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

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

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

**3. Japan's Grant Aid Scheme**

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

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

(4) Necessity of "Verification"

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

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

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex5.

(6) "Proper Use"

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

(7) "Export and Re-export"

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

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

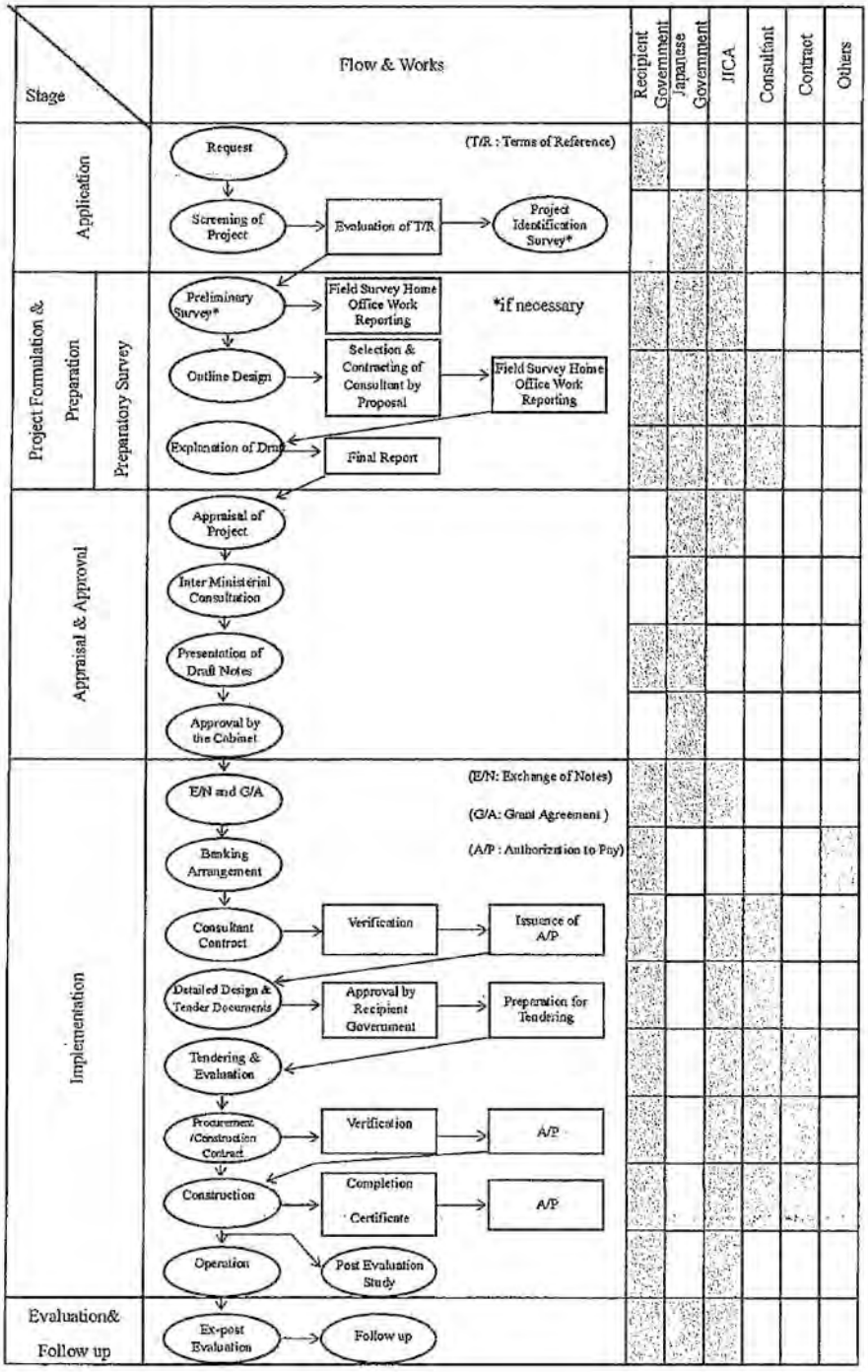
(9) Authorization to Pay (A/P)

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

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

Annex 4: Flowchart of Japan's Grant Aid Procedure



Annex-5: Major Undertakings to be taken by Each Government

| No. | Items | To be covered by Grant Aid | To be covered by Recipient Side |
|---|---|---|---|
| 1 | To secure lots of land necessary for the implementation of the Project and to clear the site | | ● |
| 2 | To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products. | | |
| | 1) Marine (Air) transportation of the products from Japan to the recipient country | ● | |
| | 2) Tax exemption and customs clearance of the products at ports of disembarkation | | ● |
| | 3) Internal transportation from the port of embarkation to the project site | (●) | (●) |
| 3 | To ensure that customs duties, internal taxes and other fiscal levies, which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted. | | ● |
| 4 | To accord Japanese physical persons and / or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the implementation of the Project. | | ● |
| 5 | To ensure that the Facilities be maintained and used properly and effectively for the implementation of the Project. | | ● |
| 6 | To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project. | | ● |
| 7 | To bear the following commissions paid to the Japanese bank for banking services based upon the B/A | | ● |
| | 1) Advising commission of A/P | | ● |
| | 2) Payment commission | | ● |
| 8 | 3) To give due environmental and social consideration in the implementation of the Project. | | ● |

(B/A: Banking Arrangement, A/P: Authorization to Pay)

**MINUTES OF DISCUSSIONS**
**ON**
**THE PREPARATORY SURVEY**
**ON**
**THE PROJECT FOR UPGRADING OF THE KUKUM HIGHWAY**
**IN**
**SOLOMON ISLANDS**

**(Second Field Survey)**

In response to a request from the Government of Solomon Islands (hereinafter referred to as "Solomon"), Japan International Cooperation Agency (hereinafter referred to as "JICA") in consultation with the Government of Japan decided to conduct a Preparatory Survey (hereinafter referred to as "the Survey") on the Project for Upgrading of the Kukum Highway (hereinafter referred to as "the Project").

JICA sent the Preparatory Survey Team (hereinafter referred to as "the Team") to Solomon, headed by Mr. Nobuyuki TSUNEOKA, Senior Advisor of JICA from February 24th to March 28th, 2014.

The Team explained and held discussions based on the Interim Report, which had been prepared by the team, with officials concerned of the Government of Solomon and conducted a field survey in the Project area.

In the course of discussions and the field survey, both sides confirmed the main items described in the attached sheets.

Honiara, March 3rd, 2014

Nobuyuki Tsuneoka
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Moses Soajonga Virivolomo
Permanent Secretary
Ministry of Infrastructure Development
Solomon Islands

## ATTACHMENT

1. First Field Survey

First Field Survey conducted from November 21st to December 22nd 2013 and Minutes of Discussion of First Field Survey (hereinafter referred to as "M/D-1") was signed on December 13th 2013.

Both sides confirmed Minutes of Discussions of Second Field Survey (hereinafter referred to as "M/D-2") is based on the M/D-1 attached as Annex-2, therefore descriptions in the M/D-2 focuses on necessary points to be added to and/or amended from the M/D-1.

2. Components of the Project

Both sides confirmed the components of the Project in the following table. However, Solomon side understood that not all the items will be accepted as final components of the Project.

| Component | Remark |
|---|---|
| 1. Upgrading of Kukum Highway (Between the City Council Roundabout and around the Fishing village market. However, actual length of the road to be covered in the Project will be determined until the explanation of Draft Final Report ) | Improvement of pavement, drainage, intersections and bus-bays |
| 2.Countermeasure against traffic congestion around Central Market | Improvement of bus-bays, road crossing facilities and others |
| 3.Widening of New Mataniko Bridge | Additional construction of 2-lane bridge |
| 4.Improvement of City Council Roundabout | Enlarging circle and lanes |
| 5.Replacement of Old Mataniko Bridge | New construction of the bridge with 2-lane bridge |

The sites of the Project listed above are as shown in Annex-1.

Solomon side agreed that, referring to M/D-1 the other components prioritized as 6 and 7 (Improvement of the Kukum Highway from around 3km point from City Council Roundabout to Ranadi East/King George VI school and Improvement of the Kukum Highway from Ranadi East/King George VI school to the International Airport) are determined not to be covered in the Project

3. Schedule of the Survey

Both sides confirmed the schedule of the Survey as follows:

3-1. The Team will continue Second Field Survey in Solomon until March 28th, 2014.

3-2. JICA will prepare the draft final report and send a mission team to explain its contents to Solomon side in early August 2014. JICA will explain details of the Project including the final components and cost estimation to Solomon side.

3-3. JICA will finalize the final report and send it to Solomon side around December 2014.

3-4. The above schedule is tentative and subject to change.

4. Environmental and Social Considerations

4-1. Regarding Initial Environmental Examination (IEE) Solomon side will prepare and make it approved by the responsible authorities by the end of September 2014.

4-2. Regarding the Abbreviated RAP, Solomon side will prepare and make it approved by the responsible authorities by the end of July 2014.

5. Other Relevant Issues

Both sides reconfirmed the following issues mentioned in M/D-1 as those of which are important to proceed with the surveys.

5-1. Solomon side agreed that the following undertakings should be taken by Solomon side at the Solomon's expenses under the Project if implementation of the Project is approved by the Government of Japan;

(1) to secure the lands necessary for the implementation of the Project including land for site office, plant yards, material storing yard, motor pool, temporary construction yard and waste disposal site;

(2) to relocate existing utilities within the Project site;

(3) to arrange issuance of license, permission and other necessary procedures for the Project;

(4) to obtain the royalties/permission for taking raw materials such as stone/rock/filling materials from the quarry/river-bed/borrow pit and to bear the cost of raw material; and

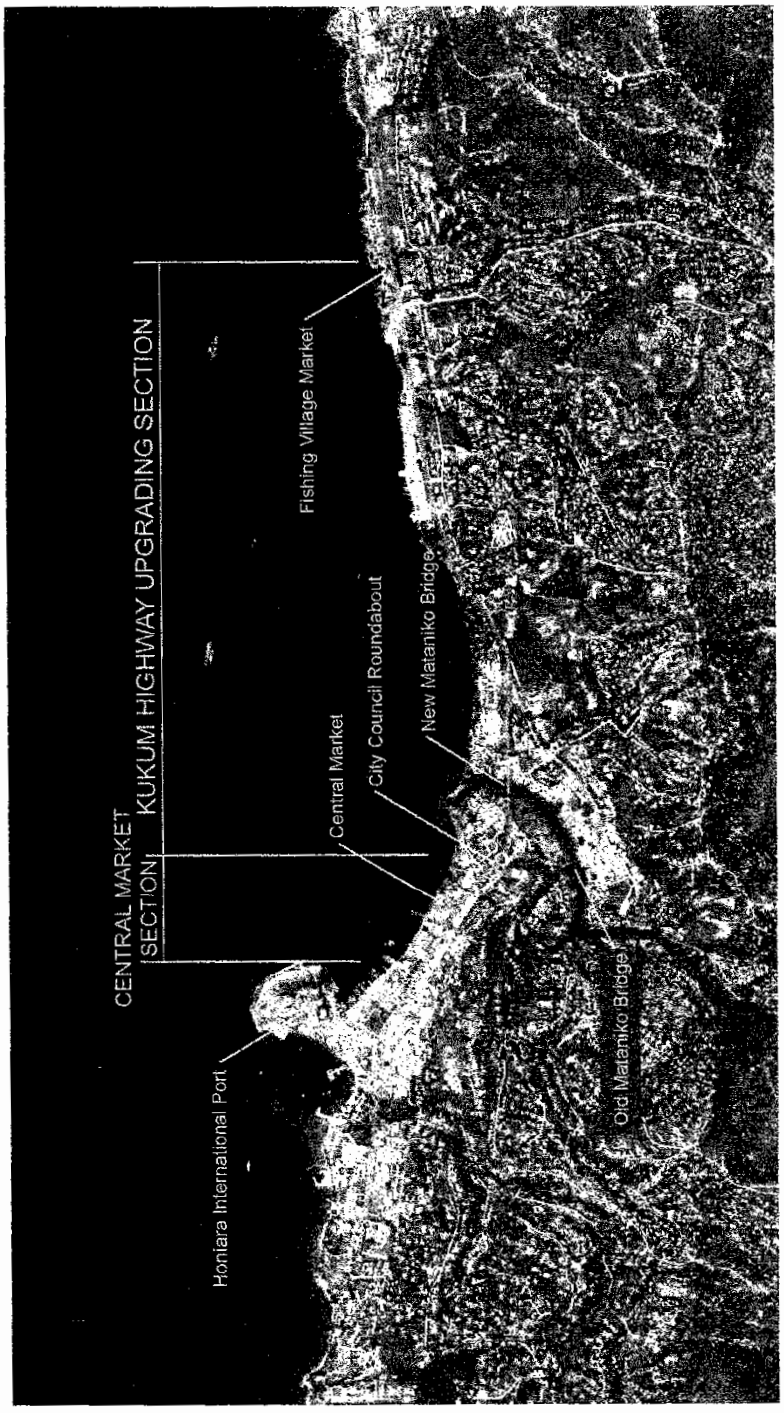
(5) to provide security measures for all concerned working for the Project.

5-2. Solomon side shall detect discriminate and clear UXOs (Unexploded Objects) in the site of New Mataniko Bridge and Old Mataniko Bridge area before the implementation of Second Field Survey.

5-3. Solomon side shall provide proper measures of traffic safety for surveyors conducting geological and topographical survey on the road during Second Field Survey.

Annex-1: Project Site
Annex-2: M/D-1

Annex-1: Project Site



Annex-2 M/D-1

**MINUTES OF DISCUSSIONS**
**ON**
**THE PREPARATORY SURVEY**
**ON**
**THE PROJECT FOR UPGRADING OF THE KUKUM HIGHWAY**
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**SOLOMON ISLANDS**

In response to a request from the Government of Solomon Islands (hereinafter referred to as "Solomon"), Japan International Cooperation Agency (hereinafter referred to as "JICA") in consultation with the Government of Japan decided to conduct a Preparatory Survey (hereinafter referred to as "the Survey") on the Project for Upgrading of the Kukum Highway (hereinafter referred to as "the Project").

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The Team held discussions with officials concerned of the Government of Solomon and conducted a field survey in the Project area.

In the course of discussions and the field survey, both sides confirmed the main items described in the attached sheets.

Honiara, December 13, 2013

Nobuyuki Tsuneoka
Leader
Preparatory Survey Team
Japan International Cooperation Agency
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Moses Soajonga Virivolomo
Permanent Secretary
Ministry of Infrastructure Development
Solomon Islands

## ATTACHMENT

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3. Project Site

Both sides confirmed that the site of the Project is as shown in Annex-1.

4. Objective of the Survey

Both sides confirmed the objective of the Survey as follows:

4-1. To understand the background and objective of the Project and examine its impacts and appropriateness.

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4-3. To study the issues of environmental and social considerations through the Survey.

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Both sides confirmed the implementing organizations as follows:

5-1. The responsible and implementing organization is Ministry of Infrastructure Development (MID).

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As a result of discussions between both sides, the items in the following table were finally requested by Solomon side with prioritization. Both sides confirmed that the components of the Project will be decided by Japanese side in consideration of necessity, technical feasibility, sustainability, cost-effectiveness and available budget. Therefore, Solomon side understood that not all the requested items will be accepted as final components of the Project.

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| 4 | Improvement of intersection of City Council Roundabout | |
| 5 | Reconstruction of Old Mataniko Bridge to a total 2 lanes | |
| 6 | Improvement of the Kukum Highway from around 3km point from City Council Roundabout to Ranadi East/King George VI school | drainage, pavement, intersection, bus bay |
| 7 | Improvement of the Kukum Highway from Ranadi East/King George VI school to the International Airport | drainage, pavement, intersection, bus bay |

7. Japan's Grant Aid Scheme

Solomon side understands the Japan's Grant Aid scheme explained by the Team, as described in Annex-3 and Annex-4.

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Both sides confirmed that the study results excluding the Project cost will be disclosed to the public after the completion of the Survey. All the study result including the Project cost will be disclosed to the public after all the verification of contracts for the Project by JICA are concluded.

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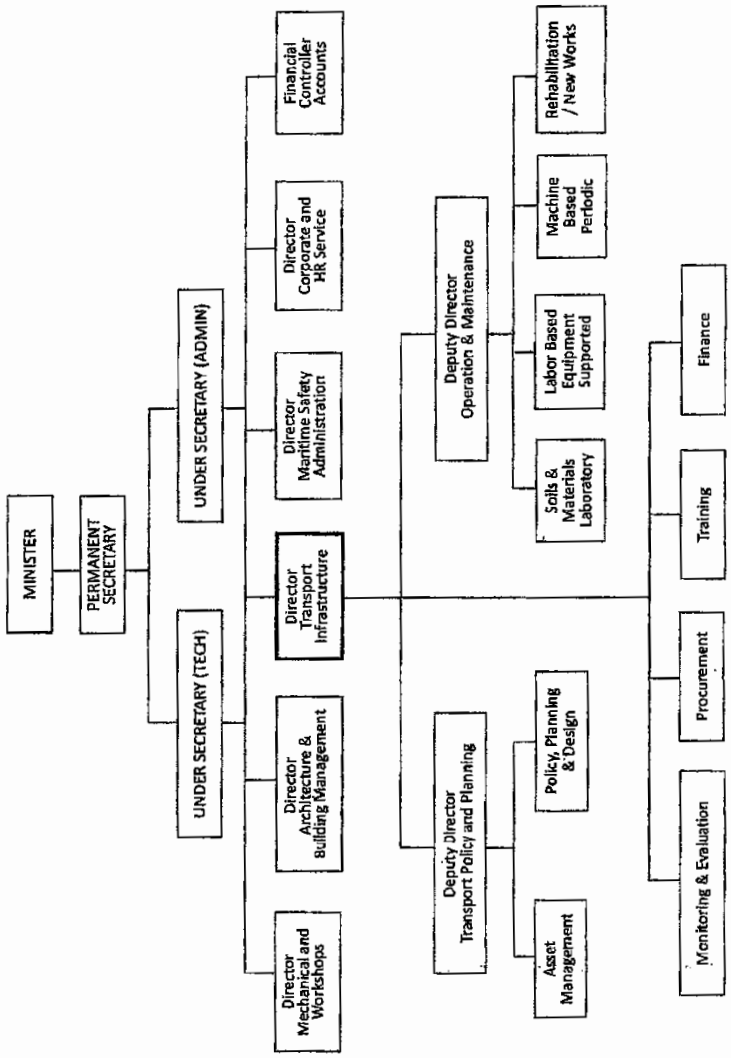
**Annex-1: Project Site**

Annex-2: Organization Chart of MID



Annex 3: Japan's Grant Aid Scheme

## JAPAN'S GRANT AID

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- The Survey conducted by JICA

・Appraisal &Approval

-Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet

・Authority for Determining Implementation

-The Notes exchanged between the GOJ and a recipient country

・Grant Agreement (hereinafter referred to as "the G/A")

-Agreement concluded between JICA and a recipient country

・Implementation

-Implementation of the Project on the basis of the G/A

### 2. Preparatory Survey

(1) Contents of the Survey

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

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.

- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of a outline design of the Project.
- Estimation of costs of the Project.

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

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

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

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

**3. Japan's Grant Aid Scheme**

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

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

(4) Necessity of "Verification"

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

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

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex5.

(6) "Proper Use"

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

(7) "Export and Re-export"

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

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

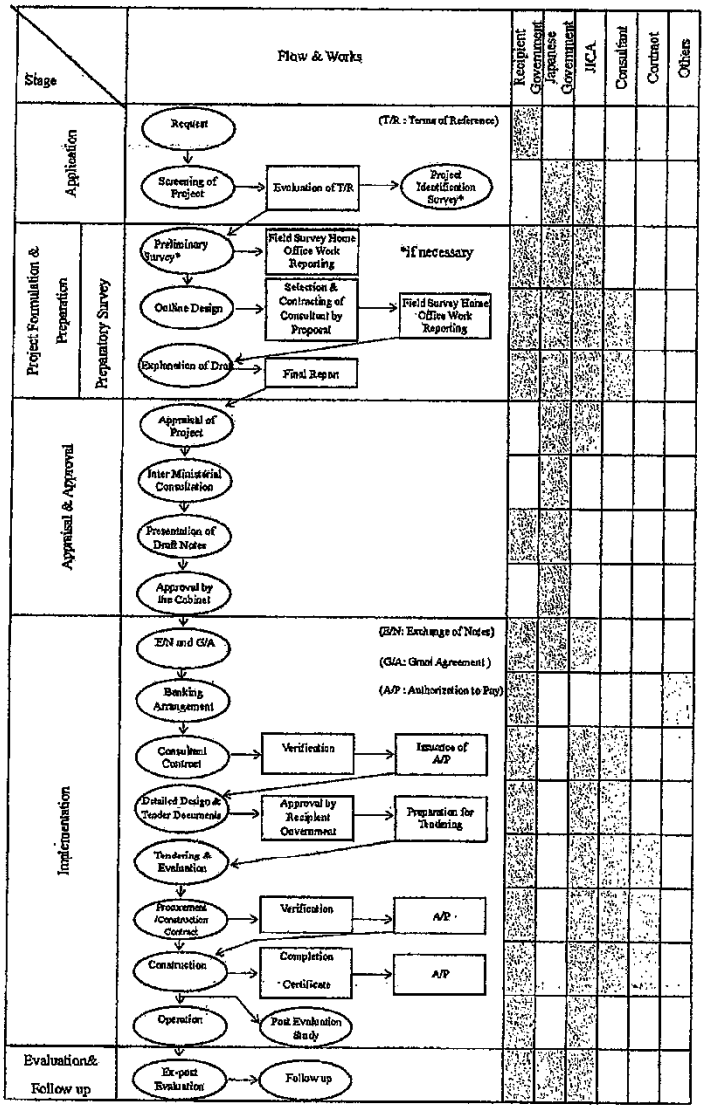
(9) Authorization to Pay (A/P)

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

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

Annex 4: Flowchart of Japan's Grant Aid Procedure



Annex-5: Major Undertakings to be taken by Each Government

| No. | Items | To be covered by Grant Aid | To be covered by Recipient Side |
|---|---|---|---|
| 1 | To secure lots of land necessary for the implementation of the Project and to clear the site | | ● |
| 2 | To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products. | | |
| | 1) Marine (Air) transportation of the products from Japan to the recipient country | ● | |
| | 2) Tax exemption and customs clearance of the products at ports of disembarkation | | ● |
| | 3) Internal transportation from the port of embarkation to the project site | (●) | (●) |
| 3 | To ensure that customs duties, internal taxes and other fiscal levies, which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted. | | ● |
| 4 | To accord Japanese physical persons and / or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the implementation of the Project. | | ● |
| 5 | To ensure that the Facilities be maintained and used properly and effectively for the implementation of the Project. | | ● |
| 6 | To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project. | | ● |
| 7 | To bear the following commissions paid to the Japanese bank for banking services based upon the B/A | | ● |
| | 1) Advising commission of A/P | | ● |
| | 2) Payment commission | | ● |
| 8 | 3) To give due environmental and social consideration in the implementation of the Project. | | ● |

(B/A: Banking Arrangement, A/P: Authorization to Pay)

**MINUTES OF DISCUSSIONS**
**ON**
**THE PREPARATORY SURVEY**
**FOR**
**THE PROJECT FOR UPGRADING OF THE KUKUM HIGHWAY**
**IN**
**SOLOMON ISLANDS**

**(Explanation of the Draft Outline Design Report)**

On the basis of the previous preparatory surveys in the Solomon Islands three times from November to December, 2013, from February to March, and in April, 2014 and following technical examination in Japan, Japan International Cooperation Agency (hereinafter referred to as "JICA") prepared a Draft Outline Design Report (hereinafter referred to as "the Report") on the Project for Upgrading of the Kukum Highway (hereinafter referred to as "the Project").

The Preparatory Survey Team visiting Solomon Islands from Aug. 24th, 2014 to Aug. 30th, 2014 (hereinafter referred to as "the Team"), headed by Dr. Nobuyuki Tsuneoka, Senior Advisor of JICA, explained to and consulted with the Ministry of Infrastructure Development (hereinafter referred to as "MID") and the concerned officials of the Government of Solomon Islands (hereinafter referred to as "the SIG") on the contents of the Report.

As a result of discussions, both sides confirmed the main items described in the attachment.

Honiara, August 29th, 2014

Nobuyuki Tsuneoka
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Moses Soajonga Virivolomo
Permanent Secretary
Ministry of Infrastructure Development
Solomon Islands

## ATTACHMENT

1. Components of the Draft Outline Design Report

1.1. The Solomon side agreed and accepted the contents of the Report explained by the Team. In particular, the components of the Project described below as a) to f), which were presented by the Team during its stay in this time, as a result of succeeding surveys and thorough technical examination, were discussed and agreed by both sides to be conducted.

a) Upgrading of the Kukum Highway (section from City Council Roundabout to Ministry of Fishery, approx. 3 km)
b) Countermeasures against traffic congestion around the Central Market
c) Improvement of City Council Roundabout
d) Widening of New Mataniko Bridge (from 2-lane to 4-lane)
e) Replacement of Old Mataniko Bridge (1-lane to 2-lane)
f) Soft Component for traffic management around the Central Market

2. Cost Estimation for the Project

2.1. The Team explained to the Solomon side the estimate of the Project Cost described in Annex-1; while the final Project Cost to be described in the Exchange of Notes (hereinafter referred to as "E/N") would be appraised by the Government of Japan (hereinafter referred to as "GOJ").

2.2. Both sides further confirmed that the Project Cost Estimation in Annex-1, and details of the construction works in the Report should never be duplicated and/or disclosed to any third parties UNTIL all the contracts for the Project are concluded.

2.3. The Team explained and the Solomon side agreed that the cost for land acquisition is also subject to change but in principle it will be compensated at full replacement cost according to the JICA Guidelines for Environmental and Social Considerations (hereinafter referred to as "JICA Guidelines").

3. Undertakings by the Solomon Side

3.1. The Solomon side promised to undertake the Major Undertakings to be Taken by SIG for the Project listed in Annex-2 at full responsibility and its own expenses based on the contents of the Report.

3.2. The Solomon side confirmed that the customs duties, internal taxes and other fiscal levies, imposed in Solomon Islands with respect to the purchase of the products and the services should be exempted in accordance with the regulations of E/N between the two governments.
For the sake of this smooth tax exemption procedures, the Team strongly recommended

MID (1) that MID would begin necessary preparations of the application of tax exemption mentioned above and consultation with Ministry of Finance and Treasury (hereinafter referred to as MoFT) and relevant organizations, if any, based on the past E/N contents, e.g. those of "Project for Improvement of Honiara Port Facilities", as soon as possible, (2) that MID would consult with MoFT to acquire "umbrella-type" comprehensive approval about the tax exemption from MoFT, based on expected all equipment to be imported, just after the completion of detailed design, and (3) that MID would consult with MoFT again to ask them to apply "automatically" tax exemption procedures for each shipment time in response to MID's request based on the "umbrella-type" comprehensive approval mentioned in above (2). MID replied to try to do so.

In case the exemption would not be processed in a timely manner, anyhow, both sides confirmed such tentative payment(s) would be owed by the Solomon side.

3.3. The Solomon side promised to execute the undertakings listed in Annex-2 in time, duly understanding the possibilities of the suspension / termination of this grant financial assistance if there will be violations on the undertakings.

3.4. The Solomon side explained that they are preparing the divided budget for their undertakings and that they had already requested SBD 10 million for a fiscal year 2015 in July 2014 (remaining SBD 4 million for 2016 is expected to be requested in 2015 appropriately). For each fiscal year, the Solomon side promised to request budgeting in advance, to make their best efforts to obtain parliament approval in time and to report its approval progress to JICA Solomon office in order to ensure the budgeting. If the budget cannot be approved in time and/or appropriately, there is a possibility that the Project might be suspended / terminated.

3.5. The Solomon side agreed that MID will report to JICA Solomon office the progress of thier undertakings by the Solomon side until all the works to be done. Reports to JICA Solomon office shall be submitted monthly with actual progress bar chart in Annex-2. Other than the monthly report, MID shall reply if requested by JICA.

4. Operation and Maintenance of the Facilities

4.1. The Solomon side agreed to secure enough staff and budgets necessary for appropriate operation and maintenance of the facilities constructed by the Project. The annual operation and maintenance costs are estimated and shown in the table below.

| Maintenance Item | Frequency | Location | Work Items | Annual Cost (SBD) |
|---|---|---|---|---|
| Cleaning and Inspection | | | | |
| 1) Pavement | 2 times/years | Pavement surface | Cleaning and inspection | 30,000 |
| 2) Drainage Facilities | 2 times/years | Inside of drainages | Cleaning and inspection | 100,000 |
| 3) Bridges | 2 times/years | All parts of bridges | Cleaning and inspection | 6,000 |
| Subtotal of annual cost of cleaning and inspection | | | | 136,000 |

| Repair and Rehabilitation | | | | |
|---|---|---|---|---|
| 1) Pavement | Once/2 years | Pavement | Crack sealing, Pothole patching etc. | 150,000 |
| 2) Road Markings | Once/2 years | Road surface | Repair of damaged parts | 50,000 |
| 3) Drainage Facilities | Once/2 years | Drainage facilities | Repair of damaged parts | 100,000 |
| 4)Other Road Facilities | Once/5 years | Street lights and others | Repair of damaged parts | 7,000 |
| 5) Bridges | Once/10 years | Damaged parts of bridges | Repair of damaged parts | 22,000 |
| Subtotal of annual cost of repair and rehabilitation | | | | 329,000 |
| Operation and management of a crosswalk and an underpass | | | | 183,000 |
| Total | | | | 648,000 |

4.2. The Solomon side will take every necessary action to maintain the drainage facilities and avoid clogging which could cause overflowing and damages to the road.

4.3. The Team explained and the Solomon side agreed that taking necessary actions to let the road users respect traffic regulations are fundamental regarding the following three issues to maintain the facilities and to ensure road safety.

4.3.1. Although the project includes some facilities to ensure traffic safety such as guardrails increasing traffic will inevitably raise the risks of accidents.

4.3.2. Overloading trucks which would exceed designed live load would cause earlier rehabilitation and shorter life.

4.3.3. Proper asset management will impact greatly to maintenance cost and lifespan.

## 5. Environment and Social Considerations

5.1. Both sides confirmed that information on environmental and social considerations including major impacts and relevant mitigation measures is summarized in the Environmental Checklist attached as Annex-3. MID confirmed that they will inform JICA of any major changes, which may affect environmental and social considerations, by revising the Checklist in a timely manner.

5.2. Both sides confirmed continuous environmental monitoring will be conducted by MID in accordance with the Environmental Checklist and Monitoring Form attached as Annex-3 and Annex-4.

5.3. MID confirmed that the results of environmental monitoring will be provided to JICA by filling in Environmental Monitoring Form attached as Annex-4 on a quarterly basis until the completion of the Project, provided that there is no outstanding issue regarding the environmental and social considerations during implementation of the Project.
In case JICA finds that there is necessity for improvement in a situation with respect to environmental and social considerations after the agreed monitoring period, JICA can request to extend the period of monitoring and reporting until JICA confirms the issues

have been properly addressed.

5.4. MID agreed JICA's disclosure of provided monitoring results in the Environmental Monitoring Form attached as Annex-4 on JICA's website.

5.5. MID confirmed they will submit the Abbreviated Resettlement Action Plan (ARAP) as well as updated ARAP to JICA if any changes are necessary, and JICA will review it.

6. Japan's Grant Aid Scheme

6.1. The Solomon side fully understood and reconfirmed the scheme of the Japan's Grant Aid and the necessary measures to be undertaken by the Solomon side, which was explained by the Team and agreed as the Minutes of Discussion signed on 21st November, 2013.

6.2. Exchange of Notes (E/N) and Grant Agreements (G/A) will be signed twice, respectively, i.e. the one as for detailed design and the other as for construction.

7. Schedule of the Study

7.1. JICA will complete the Final Report of the Preparatory Survey both in Japanese and English, in accordance with the confirmed items, and send the English version to the Solomon side around December, 2014.

7.2. The above schedule is tentative and subject to change.

8. Disclosure of Information

8.1. Both Sides confirmed that the study results excluding the Project cost estimation and details of the construction works will be disclosed to the public after completion of the Preparatory Survey. All the study results including the Project cost and details of the construction works will be disclosed to the public AFTER all the contracts for the Project are concluded.

9. Collaboration among Relevant Organizations

9.1. During the survey, both sides jointly held stakeholder meetings in order to share the information for smooth implementation of the Project.

9.2. MID promised to work closely with relevant organizations, such as the Office of the Prime Minister and Cabinet, MoFT, Ministry of Development Planning and Aid Coordination (MDPAC), Ministry of Foreign Affairs and Trade, Ministry of Environment Climate Change, Disaster Management and Meteorology (MECDM), Ministry of Land, Housing and Survey (MoLHS) and Honiara City Council, with mutual common understanding and cooperation for the Project.

9.3. MID will continuously take actions to aware the road users of the infrastructures covered by the project to ensure road safety and proper use.

Annex-1: Project Cost Estimation
Annex-2: Major Undertakings to be taken by SIG
Annex-3: Environmental Checklist
Annex-4: Environmental Monitoring Form

Annex-1: Project Cost Estimation

CONFIDENTIAL

(1) Cost Estimation Borne by the Government of Japan

Confidential

(2) Cost Estimation Borne by the Government of Solomon Islands

| Items | Cost Estimation (SBD) |
|---|---|
| Land acquisition | 4,569,000 |
| Structure compensation | 852,000 |
| Relocation of utilities | 7,766,000 |
| Renting lands for contractor's office & construction | 240,000 |
| Royalties for quarry and borrow pits | 75,000 |
| Renting lands for contractor's plant yards | 100,000 |
| UXO survey & clearance | 20,000 |
| Payment of bank commission | 112,000 |
| Employment of traffic officers to operate the crosswalk and security guards for the underpass (cost for the first year) | 183,000 |
| Total | 13,917,000 |

(3) Conditions of Cost Estimation

- Estimated timing: April 2014
- Exchange rates: USD 1.00 = JPY 103.76
  SBD 1.00 = JPY 14.12
- Others: The project is implemented in accordance with the system of Japan's Grant Aid. The above cost estimation does not assure the ceiling cost on the E/N and shall be reviewed by GOJ before the E/N between the two governments.

Annex -2: Major Undertakings to be taken by SIG

(1) Undertakings of which progress required to be shared with and to be reported to JICA in a timely manner

*The Solomon side is required to implement following items described below and report to JICA Solomon office monthly and the times when the items marked " ▼" is done, as well as at the beginning and end points of the bar charts. Furthermore, MID is also required to report to JICA on an ad hoc basis in response to JICA's inquiries.*

| Undertaking | | Month | 2014 9 | 10 | 11 | 12 | 2015 1 | 2 | 3 | 4 | 5 | 6 | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project Implementation | Exchange of Notes and Grant Agreement (P) | | | | ▼ | | | | | | | | |
| | Detailed design | | | | | | | | | | | | |
| | Tender notice | | | | | | | | | | ▼ | | |
| Securing Budget *(See Annex-1 for items and estimated cost to be secured)* | Request of budget for FY 2015 | Plan | | | | | | | | | | | (done in July 2014) |
| | | Actual | | | | | | | | | | | |
| | Request of budget for FY 2016 | Plan | | | | | | | | | ▼ | | To be prepared just after the detailed design will have finished. |
| | | Actual | | | | | | | | | | | |
| | Approval of budget for FY 2015 | Plan | ▼ | | | | | | | | | | Make best effort for parliament approval before the election in 2014 |
| | | Actual | | | | | | | | | | | |
| | Available timing for payment | Plan | | | | | ▼ | | | | | | In case of the delay, appropriation budget should be utilized. |
| | | Actual | | | | | | | | | | | |
| Tax Exemption *(See 3. in the Attachment for exception)* | Submission and authorization of tax exemption from MoFT | Plan | | | ▬ | | | | | | | | Begin preparation of application and consultation with MoFT referring to the existing E/Ns for the other projects. |
| | | Actual | | | | | | | | | | | |
| | Submission of application for each tax payments | Plan | | | | | | | | | | | Application must be submitted each shipment time when the exemption will be required |
| | | Actual | | | | | | | | | | | |
| Land Acquisition and Compensation for Structures | Issuance of an official letter to MoLHS | Plan | | | | | | | | | | | (done in August 2014) |
| | | Actual | | | | | | | | | | | |
| | Nomination of a land acquisition officer (s) | Plan | ▼ | | | | | | | | | | Recommendation has been already made in July 2014 |
| | | Actual | | | | | | | | | | | |
| | Preparation of ARAP | Plan | ▬ | | | | | | | | | | |
| | | Actual | | | | | | | | | | | |
| | Stakeholder meeting for ARAP | Plan | ▼ | | | | | | | | | | |
| | | Actual | | | | | | | | | | | |
| | Submission of ARAP to JICA | Plan | | ▼ | | | | | | | | | |
| | | Actual | | | | | | | | | | | |
| | Agreements with land owners | Plan | | ▼ | | | | | | | | | |
| | | Actual | | | | | | | | | | | |
| | Payment of compensation for lands and structures | Plan | | | | | | | ▼ | | | | |
| | | Actual | | | | | | | | | | | |
| Environmental & Social Considerations | Stakeholder meeting for Public Environmental Report (PER) | Plan | ▼ | | | | | | | | | | |
| | | Actual | | | | | | | | | | | |
| | Submission of PER to Environmental and Conservation Division (ECD) of MECDM | Plan | ▼ | | | | | | | | | | |
| | | Actual | | | | | | | | | | | |
| | Receipt of Development Consent from ECD | Plan | | | | ▼ | | | | | | | |
| | | Actual | | | | | | | | | | | |
| | Review and approval of Environmental Management Plan (EMP) | Plan | | | | | | | | | | | EMP shall be submitted by the Contractor during the preparation of construction |
| | | Actual | | | | | | | | | | | |
| | Commencement of environmental monitoring | Plan | | | | | | | ▬ | ▬ | ▬ | ▬ | Quarterly monitoring report shall be submitted to JICA during construction |
| | | Actual | | | | | | | | | | | |
| Relocation of Utilities | Discussions with utility companies to prepare contracts | Plan | ▬ | | | ▬ | | | | | | | |
| | | Actual | | | | | | | | | | | |
| | Contracts with utility companies for relocation | Plan | | | | | ▬ | | | | | | |
| | | Actual | | | | | | | | | | | |
| | Relocation to be done before tender (Type-1) | Plan | | | | | | | ▬ | ▬ | ▬ | | |
| | | Actual | | | | | | | | | | | |
| | Relocation to be done during construction (Type-2&3) | Plan | | | | | | | | | | | Relocation shall be completed within 3 weeks from request during construction. |
| | | Actual | | | | | | | | | | | |
| Provision of Temporary Work Yards | Negotiation with land owners | Plan | | ▬ | | | | | | | | | Temporary work yards shall be at New and Old Matanikau Bridge sites. |
| | | Actual | | | | | | | | | | | |
| | Contracts for land rent | Plan | | | | | ▬ | | | | | | |
| | | Actual | | | | | | | | | | | |
| Provision of yard for contractor's site office | Removal of existing structures from the yards | Plan | | | | | | | | ▬ | | | Temporary yard for contractor's site office shall be at MID storage yard. |
| | | Actual | | | | | | | | | | | |
| Provision of Borrow Pits and Quarry (ies) | Contract with borrow pits and quarry(ies) owners | Plan | | | | | ▬ | | | | | | Borrow pits shall be within 15km from the project site. Quarry(ies) shall be Tenpoko River or Lunggа River. |
| | | Actual | | | | | | | | | | | |
| Provision of plant yard | Contract with plant yard owner | Plan | | | | | | | ▬ | | | | Plant yard shall be Airport or Tenpoko whichever near to the provided quarry. |
| | | Actual | | | | | | | | | | | |
| Provision of waste disposal area | Acquisition of approval of soil and construction waste disposal from the dump site owner (Honiara City Council) | Plan | | | | | | | ▬ | | | | Dump site shall be Ranadi Dump Site. |
| | | Actual | | | | | | | | | | | |
| UXO survey and clearance | Contract with UXO survey company | Plan | | | | | | | | ▬ | | | UXO survey shall be conducted around construction area at New and Old Matanikau Bridge sites. |
| | | Actual | | | | | | | | | | | |
| | UXO survey and clearance | Plan | | | | | | | | ▬ | | | |
| | | Actual | | | | | | | | | | | |
| Payment of bank commission | Opening of bank account and arrange Authorization to Pay | Plan | | | | ▬ | | | | | | | |
| | | Actual | | | | | | | | | | | |
| | Payment commision | Plan | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | |
| | | Actual | | | | | | | | | | | |

Note: Type-1: Utilities of which necessity of relocation are clear and they are to be relocated before the tender.
Type-2: Utilities of which necessity of relocation are unclear, so the necessity of relocation will be cleared during the construction and they will be relocated, if necessary.
Type-3: Utilities existing within the construction area and to be relocated within the construction area during the construction since places to be relocated outside of the construction area are unavailable.

(2) Other Undertakings necessary for smooth implementation of the Project

| Items |
|---|
| To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products. |
| To accord Japanese physical persons and / or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the implementation of the Project. |
| To ensure that the Facilities be maintained and used properly and effectively for the implementation of the Project. |
| To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project even other than the cost shown in Annex-I if necessary. |
| To support ensuring security for the personnel assigned to the Project and ensuring security at the Project sites, e.g. security information sharing, coodination with police, etc. |
| To cooperate in solving potential troubles with the local people or any third party in connection with the execution of the Project with close consultation with JICA. |

| Category | Items | Check points | Yes: Y<br>No: N | Measures of Environmetal and Social Considerations<br>(Reasons for Yes or No, Bases, Mitigation measures) |
|---|---|---|---|---|
| 1. permits and explanation | (1)EIA and Environmental Permits | (a) Have EIA reports been officially completed?<br>(b) Have EIA reports been approved by authorities of the host country's government?<br>(c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?<br>(d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government? | (a) N<br>(b) N<br>(c) N<br>(d) N | (a) (b) (c)The host country has EIA system for development projects, and the project is the subject of the EIA system. In March 2014, the EIA procedure began with the submision a *application* to the environmental authority in the host country. The EIA procedure of the project is being implemented. (as of July 2014)<br>(d) The project does not need other environmental permits. |
| | (2)Explanation to the Public | (a) Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public?<br>(b) Are proper responses made to comments from the public and regulatory authorities? | (a) Y<br>(b) Y | (a) For the purpose of publicity of the project, MID and JICA held a consultation meeting inviting stakeholders, and explained the outlienes of the project in March 2014.<br>(b) On the consultation meeting, MID and JICA answered stakeholder's questions. For a part of opinions, reflection for plans is examined. |
| | (3)Alternatives | (a) Are the alternatives of the project examinened in terms of the environmental and social matters? | (a) Y | (a) On the planning of a bridge and a roundabout, the alternatives have been examined in terms of environmental and social considerations. |
| 2. Mitigation Measures | (1)Air Quality | (a) Is there a possibility that air pollutants emitted from various sources, such as vehicle traffic will affect ambient air quality? Does ambient air quality comply with the country' s ambient air quality standards?<br>(b) Where industrial areas already exist near the route, is there a possibility that the project will make air pollution worse? | (a) N<br>(b) N | (a) The project will improve travel speed of vehicles, and reduce emissions.<br>(b) There are industrial areas around the route. However, because the project itself does not change traffic volume, the project will not make air pollution worse. |
| | (2)Water Quality | (a) Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas?<br>(b)Is there a possibility that surface runoff from roads will contaminate water sources, such as groundwater?<br>(c)Do effluents from various facilities, such as stations and parking areas/service areas comply with the country's effluent standards and ambient water quality standards? Is there a possibility that the effluents will cause areas that do not comply with the country's ambient water quality standards? | (a) N<br>(b) N<br>(c) N | (a) The project is the improvement projet of existing road facilities and has no large scale earthmoving, and will not affect water quality significantly.<br>(b) Since the project is implemented in ROW and it is naturely the improvement of pavement, surface runoff from roads will not contaminate the water source.<br>(c) The project does not have the facilities which discharge effluent such as stations and service areas. |
| | (3)Waste | (a) Are wastes derived from road facilities legally disposed? | (a) N | (a) The project does not have the facilities which discharge wasete such as stations and service areas. |
| | (4)Noise and Vibration | (a) Do noise and vibrations from vehicle traffic comply with the country's standards? | (a) N | (a) The host country does not have noise and vibration standards. |

Annex -3: Environmental Check List (2)

| Category | Items | Check points | Yes: Y<br>No: N | Measures of Environmetal and Social Considerations<br>(Reasons for Yes or No, Bases, Mitigation measures) |
|---|---|---|---|---|
| 3. Natural Environment | (1)Protected Areas | (a) Is the project site located in protected areas designated by the country's law or international treaties and conventions? Is there a possibility that the project will affect the protected area? | (a) N | (a) The project site is located on urban areas. There are no protected areas around the project site. |
| | (2) Ecosystem | (a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats?<br>(b)Does the project site encompass the protected habitats of endangered species designated by the country's law or international treaties and conventions?<br>(c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?<br>(d) Are adequate protection measure taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock?<br>(e) Is there a possibility that installation of roads will cause impacts, such as destruction of forest, poaching, etc?<br>(f) In case where the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of nature environments? | (a)N<br>(b)N<br>(c)N<br>(d)N<br>(e)N<br>(f)N | (a) (b)(c)(d)(e)(f) The project site is located on urban areas, and there are no valuable ecosystem such as primeval forests, tropical rain forests around the site. The project is the improvement in the existing road facilities, and will not cause the losses of nature envirnment. |

| Category | Items | Check points | Yes: Y<br>No: N | Measures of Environmetal and Social Considerations<br>(Reasons for Yes or No, Bases, Mitigation measures) |
|---|---|---|---|---|
| 3. Natural Environment | (3) Hydrology | (a) Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows?<br>(b) Does structures affect the flows of surface and underground water? | (a)N<br><br>(b)N | (a) Since the project is the development of an existing road and bridges and the construction scale is small, impacts on water flow will less affect.<br>(b) The project has piers of the bridges in the Mataniko River. Because the location and number of piers is same as the existing bridge, the piers will not affect the flows of the Mataniko River. |
| | (4)Topography and Geology | (a) Is there a soft ground on the route that may cause slope failures or landslides? Are adequate measure considered to prevent slope failures or landslides, where needed?<br>(b) Is there a possibility that civil works, such as cutting and filing will cause slope failure or landslides? Are adequate measure considered to prevent slope failure or landslides?<br>(c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measure taken to prevent soil runoff? | (a) N<br>(b) N<br>(c) N | (a) (b) (c) The project is basicaly implemented in the ROW of the exisiting road, and cutting and filling work which cause slope failure or landslides will be implemented. |
| | (1) Resettlement | (a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?<br>(b) Is adequate explanation on relocation and compensation given to affected persons prior to resettlement?<br>(c) Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?<br>(d) Are compensations paid prior to the resettlement?<br>(e) Are compensation policies issued written instructions?<br>(f) Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?<br>(g) Are agreements with the affected persons obtained prior to resettlement?<br>(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?<br>(i) Are monitring on the resettlement planned?<br>(j) Is a plan developed to monitor the impacts of resettlement? | (a)N<br>(b)N<br>(c)-<br>(d)-<br>(e)-<br>(f)-<br>(g)--<br>(h)-<br>(i)-<br>(j)- | (a) (b) The project implementation does not cause involuntary resettlement<br>(c) (d) (e) (f) (g) (h) (i) (j) The project needs land acquisitions on the implementation and some losses of properties. Therefore RAP encompassing the items of JICA guidelines are being prepared. . |

| Category | Items | Check points | Yes: Y<br>No: N | Measures of Environmetal and Social Considerations<br>(Reasons for Yes or No, Bases, Mitigation measures) |
|---|---|---|---|---|
| 4. Social Environment | (2)Living and Livelihood | (a) Where roads are newly installed, is there a possibility that the project will affect the existing means of transportation and associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Is adequate measure considered for preventing these impacts?<br>(b) Is there a possibility that the project will adversely affect the living condition of inhabitants other than the affected inhabitants? Are adequate measures considered to reduce the impacts, if necessary?<br>(c) Is there a possibility that diseases, including communicable diseases, such as HIV will be introduced due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?<br>(d) Is there a possibility that roads and railways will cause impede the movement of inhabitants?<br>(e) Is there a possibility that structures associated with roads such as bridges will cause a sun shading and radio interference? | (a) N<br>(b) N<br>(c) N<br>(d) N<br>(e) N | (a) The project is the improvements of the existing road facilities, and will not affect the existing means of transportation and associated workers, land use, livelihood.<br>(b) Since the project is the improvements of the existing road facilities, the project will improve living conditions of inhabitants.<br>(c) The construction activities of the project depends on mainly heavy machinery, workers will not concentrate excessively.<br>(d) The project is the improvements of the existing road facilities, and will not impede the movement<br>(e) The project does not include an overpass structure, and does not cause a sun shading and radio interference. |
| | (3)Heritage | (a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws? | (a) N | (a) There are no archeological, historical, cultural, and religious heritage sites around the project site. Moreover, the project is basically implemented in the existing ROW. |
| | (4)Landscape | (a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken? | (a) N | (a) The project is the improvements of the existing road and bridges, and will not adversely affect the local landscape? |
| | (5)Ethnic Minorities and Indigenous Peoples | (a) Where ethnic minorities and indigenous peoples are living in the rights-of-way, are considerations given to reduce the impacts on culture and lifestyle of ethnic minorities and indigenous peoples?<br>(b) Does the project comply with the country's laws for rights of ethnic minorities and indigenous peoples? | (a) N<br>(b) - | (a) The project site is located on urban areas, and there are no ethnic minorities and indigenous peoples.<br>(b) The project is implemented based on the host country's laws. |

Annex -3: Environmental Check List (5)

| Category | Items | Check points | Yes: Y<br>No: N | Measures of Environmetal and Social Considerations<br>(Reasons for Yes or No, Bases, Mitigation measures) |
|---|---|---|---|---|
| 4. Social Environment | (6)Working conditions | (a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?<br>(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?<br>(c)Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public sanitation) for workers etc?<br>(d)Are appropriate measures being taken to ensure that security guards involved in the project do not violate safety of other individuals involved, or local residents? | (a) Y<br>(b) N<br>(c) N<br>(d) N | (a) The project is implemented based on the host country's laws.<br>(b) On the construction activities, safety considerations for workers and the public are needed.<br>(c) The establishment of safety and health program and safety training for workers should be implemented on the project implementation.<br>(d) So far, security on the project implementation is unclear. |
| 5. Others | (1)Impacts during Construction | (a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?<br>(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?<br>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? | (a) Y<br>(b) Y<br>(c) Y | (a) (b) (c) Because construction activities may cause environmental and social impacts, the environmental and social considerations were examined, and described on the PER (IEE document in the host counry). |
| | (2)Monitoring | (a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?<br>(b) Are the items, methods and frequencies included in the monitoring program judged to be appropriate?<br>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?<br>(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities? | (a) Y<br>(b) Y<br>(c) Y<br>(d) Y | (a) (b) (c) (d) The proponent is preparing the PER, and describing a monitoring items and framework. |
| 6. Note | Note on Using Environmental Checklist | (a) If necessary, the impacts to transboundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming). | (a)Y:<br>Global warming | (a) The construction work of the project uses heavy machinery. These emits CO2. On the implementation of the consrtuction work, CO2 reduction should be considered. |

Annex -4: Environmental Monitoring Form

Table1 Monitoring Plan

| Environmental Items | Location | Means of Monitoring | Criteria | Frequency |
|---|---|---|---|---|
| Air pollution | Construction site | Confirmation of the construction plan and the observance of it | The construction plan considers air pollution. | Before the construction activities |
| | | Control of fuel consumption of heavy machinery and vehicles | The fuel consumptions are according to the construction plan. | Every month |
| | | Visual inspection for the mechanical conditions of heavy machinery and vehicles | No trouble on the heavy machinery and vehicles | Every month |
| Water pollution | Construction site | Confirmation of the construction plan | The construction plan considers water pollution. | Before the construction activities |
| | | Visual inspection for the piling work | Water pollution of Mataniko River is prevented with appropriate measures. | Every two weeks during the piling work |
| | | Visual inspection for the mitigation measures against soil outflow | Measures against oil outflow are implemented. | Every month |
| Waste | Construction site | Reuse of waste surplus soil | Waste surplus soil is reused suitably. | Before the construction activities |
| Soil pollution | Construction site | Visual inspection for the mechanical conditions of heavy machinery and vehicles | No trouble on the heavy machinery and vehicles | Every month |
| Noise and vibration | Construction site | Confirmation of the construction plan and the observance of it | The construction plan considers noise and vibration. | Before the construction activities |
| | | Visual inspection for the mechanical conditions of heavy machinery and vehicles | No trouble on the heavy machinery and vehicles | Every month |
| Involuntary resettlement | Construction site | Visual inspection and interview for land owners | Resettlement and compensation procedure is appropriate. | Before construction |
| Existing social infrastructures and services | Construction site | Confirmation for the construction plan | The construction plan has mitigation measures against road congestion under construction periods, such as the securement of detour. | Before construction |
| Accidents | Construction site | Confirmation for the construction plan | The construction plan considers safety enough. | Before construction |
| | | Visual inspection for machinery condition and operation | The machinery keeps good condition.<br>The machinery operation is appropriate. | Every month |
| | | Visual inspection for safety measures | Safety measures are definitely implemented. | Every month |
| Climate change | Construction site | Confirmation of the fuel consumption of heavy machinery and vehicles | The fuel consumptions are according to the construction plan. | Every month |

Table2 Monitoring Form

| Environmental Items | Location | Criteria | Monitoring | |
|---|---|---|---|---|
| | | | Date and Time | Results |
| Air pollution | Construction site | The construction plan considers air pollution. | | |
| | | The fuel consumptions are according to the construction plan. | | |
| | | No trouble on the heavy machinery and vehicles | | |
| Water pollution | Construction site | The construction plan considers water pollution. | | |
| | | Water pollution of Mataniko River is prevented with appropriate measures. | | |
| | | Measures against oil outflow are implemented. | | |
| Waste | Construction site | Waste surplus soil is reused suitably. | | |
| Soil pollution | Construction site | No trouble on the heavy machinery and vehicles | | |
| Noise and vibration | Construction site | The construction plan considers noise and vibration. | | |
| | | No trouble on the heavy machinery and vehicles | | |
| Involuntary resettlement | Construction site | Resettlement and compensation procedure is appropriate. | | |
| Existing social infrastructures and services | Construction site | The construction plan has mitigation measures against road congestion under construction periods, such as the securement of detour. | | |
| Accidents | Construction site | The construction plan considers safety enough. | | |
| | | The machinery keeps good condition.<br>The machinery operation is appropriate. | | |
| | | Safety measures are definitely implemented. | | |
| Climate change | Construction site | The fuel consumptions are according to the construction plan. | | |

**Monitoring implementation**

MID is responsible for the environmental monitoring during the implementation of the Project with the assistance of Consultant and Contractor. MID reports the monitoring results to ECD and JICA Office every month.

# Appendix 5 Technical Notes

## Second Field Survey

The Preparatory Survey on the Project for Upgrading of Kukum Highway
Technical Notes (Draft)

JICA Preparatory Survey Team and Ministry of Infrastructure Development (MID) have made technical discussions and confirmed the followings. However, some points might be revised in further analysis and discussion in Japan.

**1. Upgrading of Kukum Highway**

The targeted improvement section is between City Council Roundabout and around Fishing Village Market.

1-1.Scope of Improvement Work:

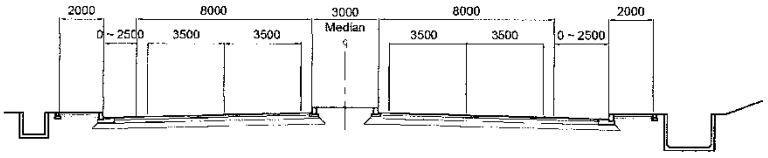
- To reconstruct pavement
- To install ditches/drain pipes and repair cross drains
- To install sidewalks, median and bus bays
- To install road markings
- To repair broken street lights
- To improve junctions: to install a seagull island for China Town Junction. To Improve Vura Junction was requested by MID. It will be discussed with JICA whether it is included in the project or not.

1-2. Geometric Standards

- Speed limit: 50 km/h
- Normal cross slope: 2 %
- Maximum super-elevation: 4 %
- Minimum curve radius: 86 m

1-3.Typical Cross Section

The typical cross section of Kukum Highway improvement is as follows:




- The ditch may be substituted by drainage pipe where necessary.
- The width of the road shoulder is depend on the available space.
- The curbstone at median is barrier type while at sidewalk is sloped type.
- The median will be covered with grass. Drainage is provided if necessary.

1-4.Pavement Design Criteria

- Design period: 10 years
- Design method: Japanese Pavement Guideline (to be clarified with Road Note 31/AASHTO)

1-5.Road Surface Drainage Design Criteria

- Time concentration: 10 min.

- Return period: 2 year
- Precipitation intensity: 120 mm/h

**2. Improvement of the Central Market Section**

The improvement section is between City Council Roundabout and the front of Hyundai Mall.

2.1 Scope of Improvement Work

- To relocate and improve bus bays: 2-lane bus bay for White River bound (8 berths) and KG & Kolaridge bound (8 berths)
- To install a wide crosswalk with traffic control officers
- To re-open underpass: to furnish lights and corner mirrors and renew the gates with colorless roofs. To provide cleaning and a security guard every day. The gate is closed nighttime.
- To install barrier fence along the median to prevent free road crossing

2.2 Concept of Improvement of Bus bay

The concept of improvement of bus bays in front of the Central Market is as follows:


Plan

2.3 Concept of Installation of Fence along Median

The concept of installation of fence along median between City Council Roundabout to Hyndai Mall is as follows:


2.4 Layout of the Facilities

The layout of the facilities to be improved is as follows:

The west bound bus stop in front of City Council was proposed to be deleted in order to improve the roundabout. To mitigate traffic congestion around the Central Market, the west bound bus stop in front of the Central Market is desired to be relocated to the west side of the existing bus stop, however relocation to the east side was proposed to secure the convenience for bus passengers (to be acceptable distance (about 200m) from the deleting bus stop in front of City Council to the new bus stop in front of the Central Market.) A 2-lane bus bay with 8 berths is provided in front of the Central Market which can accommodate the forecasted 15 year after peak hour buses. Therefore, the bus bay improvement plan mitigates the traffic congestion around the Central Market.

To invite the pedestrians to use the underpass, improvement of the underpass by furnishing lights, corner mirrors and new gates with colorless roofs was proposed. Cleaning and a security guard are provided every day by HCC. These improvements are desired by the 90% of the total interviewee who wish to use the underpass if it is improved. Therefore, the underpass probably be used by pedestrians crossing the highway at the west side of the Central Market and pedestrians who don't want to wait long time to open the crosswalk, in case the cleanliness and safety of the underpass is maintained.

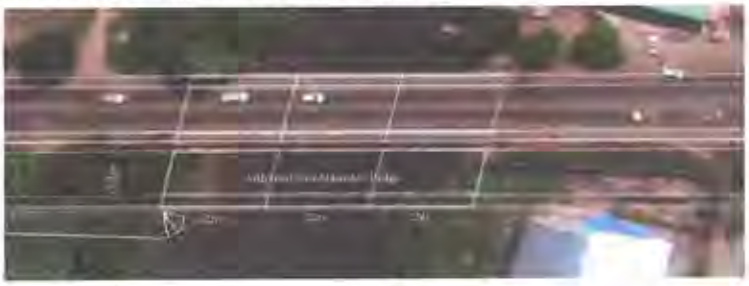
**3. Improvement of City Council Roundabout**

The scheme of the improvement of City Council Roundabout is as follows. The existing west bound bus stop in front of City Council is removed. Accordingly White River bound bus terminal is relocated to the place behind City Council.


**4. Widening of New Mataniko Bridge**

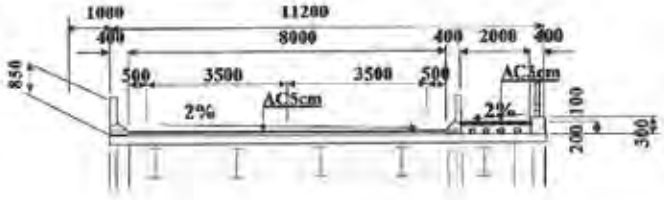
4-1. Scheme of Widening of New Mataniko Bridge

The scheme of the widening is to construct additional 2-lane bridge at the upstream side. The span layout of the additional bridge (3@22m) is same as existing bridge as shown below. The bridge height and elevation is almost same as the existing bridge.



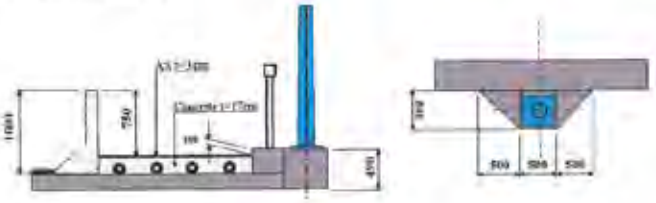
4-2. Bridge Width Component

The bridge width component is as follows:




4-3. Detail of Sidewalk and Guard Wall

The detail of the bridge sidewalk and guard wall is as follows. 4 of diameter 100mm ducts for utilities are provided under the sidewalk. The handrail height is 1000mm. 2 street lights are installed on the additional bridge.



4-4. Bridge Design Criteria

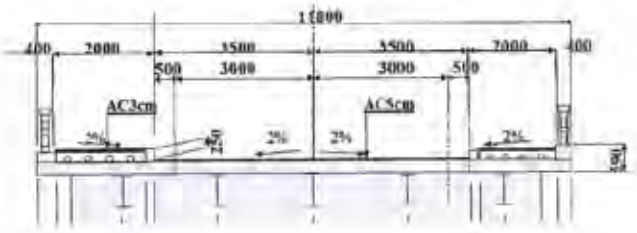
-Design method: Japanese Bridge Design Specification
-Live load: B-Live Load of Japanese specification (equivalent to AUSTROADS T44)
-Seismic load: Earthquake Engineering for Bridges in Papua New Guinea (Zone 2) is applied
-Wind load: 49 m/s (AS/NZS 1170 Part 2 of New Zealand Wind Code)
-Temperature change: ±10℃, mean temperature is 28℃

## 5. Replacement of Old Mataniko Bridge

The scheme is to demolish the existing bridge and to construct new bridge at the same location. No temporary bridge for vehicles during about one year construction period will be provided. A temporary pedestrian bridge will be provided during the construction. The existing bailey bridge materials are transported to MID storage by the contractor.

5-1. Bridge Width Component

The bridge width component is as follows:




5-2. Detail of Sidewalk

The detail of the bridge sidewalks are as shown above. 4 of diameter 100mm ducts for utilities are provided under the both side sidewalks. The handrail height is 1000mm. 3 street lights are installed on the bridge.

5-3. Bridge Design Criteria

Bridge design criteria is same as New Mataniko Bridge.

5-4. Bridge Layout

The bridge span layout is 3@20m. The bridge soffit is raised about 0.6m higher than the existing bridge to secure 1m freeboard against HWL.

**6. Improvement of Vura Junction**

The scheme of improvement of Vura Junction is as follows. As abovementioned, it is not sure whether it is included in the project or not.

**7. Undertakings of the Government of Solomon Government**

Japanese grant aid covers detailed design, construction and construction supervision of the project component works. While the Government of Solomon Islands is responsible for the followings. In case the undertakings scheduled to be undertaken before the tender would not be completed by the time, the project cannot proceed to the tender stage.

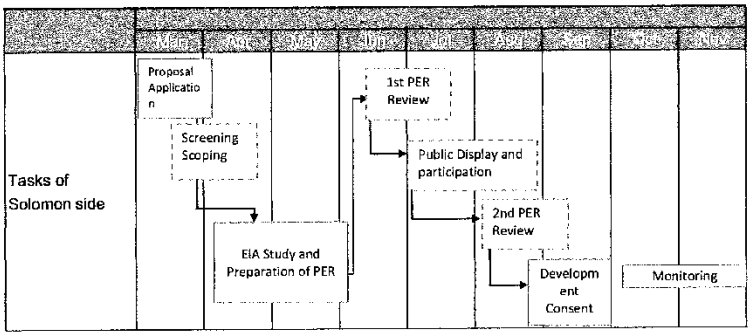
7-1. Environmental and Social Consideration

The following environmental and social considerations shall be undertaken:

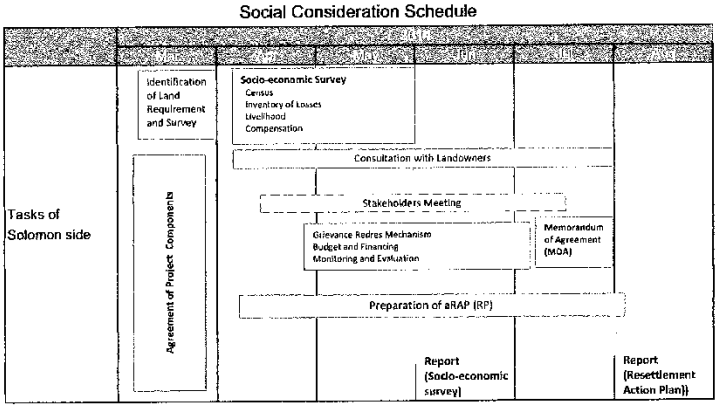
- Prepare PER and submit to ECD by the beginning of June 2014.
- Acquire "Development Consent" of the project from ECD by the end of September 2014.
- Socio-economic survey for land acquisition by the end of May 2014.
- Prepare an abbreviate Resettlement Action Plan by the end of July 2014.
- Make "memorandum of agreement" with land owners by the end of July 2014.

The survey team has submitted to MID the draft of "Technical Specification for EIA Work" and "Technical Specifications for Preparation of Work for Resettlement Action Plan" for the project as the guide of the above work. The necessary land acquisition areas and compensation items are indicated in the specifications. The detailed drawing of the land acquisition will be submitted by the survey team to MID as soon as it is prepared in around June 2014.

Environmental Consideration Schedule




Social Consideration Schedule




7-2. Utility Relocation

The utilities such as power posts, power cables, telephone cables, water pipes, sewage pipes, optic cables and etc. which exist within the construction area and conflict with the proposed project facilities shall be relocated. The items and locations of utilities to be relocated will be informed by the survey team with drawings when the draft final report is explained in August 2014. The utility relocation shall be completed before the tendering.

7-3. Provision of Temporary Construction Lands

Temporary construction lands at New Mataniko Bridge and Old Mataniko Bridge and for contractor's office and motor pool shall be secured/rent before the tendering. The necessary land area are as follows:

Temporary Construction Land at New Mataniko Bridge


Temporary Construction Land at Old Mataniko Bridge


Note: One warehouse located in the yard is to be demolished by MID before the construction.

Temporary Land for Contractor Office and Motor Pool at MID

7-4. Provision of Quarry and Plant Yard

Quarry and plant yard for crushing, concrete mixing and asphalt mixing shall be secured/rent before the tendering. It was confirmed that the location of the quarry and plant yard shall be one of the following candidates:

- Candidate 1: Tamboko Quarry and Tamboko Plant Yard
- Candidate 2: Lungga Quarry and Airport Plant Yard

It was confirmed that MID shall obtain necessary royalties/permissions for taking raw materials such as stone/rock/filling materials from quarry/riverbed/borrow pit and to bear the costs of raw materials.

7-5. Provision of Borrow Pits

Borrow pits of top soil and selected soil for subgrade shall be provided by MID. The borrow pit location shall be within 15 km from the project road. The borrow pit shall be secured before the tendering.

7-6. Provision of Construction Disposal Area

The construction waste site designated by MID is Ranady Dump Site.

7-7. Operation and Maintenance of the Road and Facilities

To attain the targeted effect of the project, the following shall be undertaken:

- Provide traffic officers to conduct traffic control at the crosswalk in front of the Central Market every daytime.
- Provide a security guard to the underpass in front of the Central Market to observe the safety and open/close the underpass gate every day. Maintain the cleanliness of the underpass.
- Conduct routine and periodic maintenance of the project road and facilities.

7-8. UXO Clearance of the Construction Area

UXO Clearance of the bridge construction area shown below shall be undertaken before the tendering and the certificate of the clearance shall be submitted to the tenderers.

New Mataniko Bridge

Old Mataniko Bridge

Noted by:

March 25, 2014

Harry Rini
Director for Transport Infrastructure
Ministry of Infrastructure Development

Soemu Oshita
Chief Consultant
JICA Preparatory Survey Team

## Additional Field Survey (Flood Damage Survey)

The Preparatory Survey on the Project for Upgrading of Kukum Highway
Additional Filed Survey on Flood Damage of New and Old Mataniko Bridge
Technical Notes

JICA Preparatory Survey Team conducted additional field survey on flood damages of New and Old Mataniko Bridge and reviewed New Mataniko Bridge widening plan and Old Mataniko Bridge replacement plan. With regards to this, the Survey Team made technical discussions with Ministry of Infrastructure Development (MID) and confirmed the followings. However, some points might be revised in further analysis and discussion in Japan.

**1. New Mataniko Bridge Widening Plan**

1-1. Undertakings of MID

- As the urgent restoration, MID repairs the eastern abutment of which backfill has been eroded and temporary bridge has been installed. It is backfilled and installed an approach slab then re-paved after removal of the temporary bridge.
- The land for installation of riverbank protection at the downstream side of the western side abutment (please refer to attached drawing) shall be added to the land acquisition area.

1-2. Scope of Japan's Grant Aid

- To construct 2-lane steel girder with RC deck bridge at the upstream side of the existing bridge. The span layout is same as existing bridge. The new bridge elevation is higher than the existing bridge to secure the necessary freeboard against flood level. The bridge foundation is 1.2m diameter bored pile. The pier type is pile-bent with walls between piles. (Please refer to attached drawing)
- To install steel sheet pile riverbank to protect the eastern abutment including the existing abutment (please refer to attached drawing).
- To install concrete/stonemasonry riverbank to protect the western abutment.
- To demolish the existing concrete retaining wall located inside the river at the downstream side of the western abutment then install the concrete/stonemason riverbank at the downstream side of the western abutment (please refer to attached drawing).
- To repair existing bridge expansion joints, drain pipes, bearing anchor nuts, part of railings and pavement after the opening of the new 2-lane bridge.

**2. Old Mataniko Bridge Replacement Plan**

2.1 Undertakings of MID

- As the urgent restoration, MID installs 1-lane bailey bridge at the same location of the previous bridge with the assistance of New Zealand Government. It is scheduled to be completed before the middle of June 2014.
- The land for installation of riverbank protection at the downstream side of the western side abutment (please refer to attached drawing) shall be added to the land acquisition area.
- Three power poles which will obstruct the bridge construction shall be relocated before the tendering.

2.2 Scope of Japan's Grant Aid

- To disassemble the bailey bridge to be constructed with the assistance of New Zealand Government and transport the bailey materials to the storage yard of MID.
- To construct 2-lane steel girder with RC deck bridge at the same location of the previous

1

bridge. The bridge span layout is 3@20m=60m. The bridge foundation is 1.2m diameter bored pile. The pier type is pile-bent with walls between piles. (Please refer to attached drawing)

- To secure the 1m freeboard above the HWL, the new bridge deck elevation is about 2m higher than the previous bridge. As the result, concrete retaining walls are installed along the eastern approach road in front of Chinese stores.
- To install steel sheet pile riverbank to protect the eastern abutment (please refer to attached drawing).
- To install concrete/stonemasonry riverbank to protect the western abutment.
- To demolish the existing gabion riverbank located inside the river at the downstream side of the western abutment then install concrete/stonemasonry riverbank at the downstream side of the western abutment (please refer to attached drawing).
- To provide temporary pedestrian bridge during the construction. The road is closed during the construction.

▷ To demolish existing pier

3. **Necessity of Control of River Structure Construction by MID**

To avoid damage on bridges and riverbank protections by future floods, it is advisable for MID to control construction of structures along the river.

- The private riverbank protections adjacent to the bridges should align with the abutment protections of the bridges to form a smooth riverbank alignment.
- The riverbank protection to be constructed by private should not occupy the river area, otherwise it raises the flood level.
- The washed out bailey bridge and large size debris in the river should be removed from the river in order to secure the smooth discharge of floods and avoid bridge damage by the debris.

4. **Project Implementation Schedule**

MID requested to implement the project with the following phase. The Survey Team conveys the request to JICA H.Q.

Phase-1:

- Widening of New Mataniko Bridge
- Improvement of City Council Roundabout
- Improvement of road facilities around the Central Market (against traffic congestion)

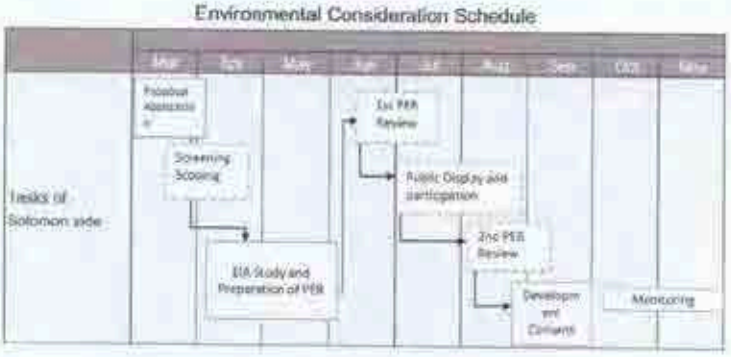
Phase-2:

- Replacement of Old Mataniko Bridge
- Improvement of Kukum Highway

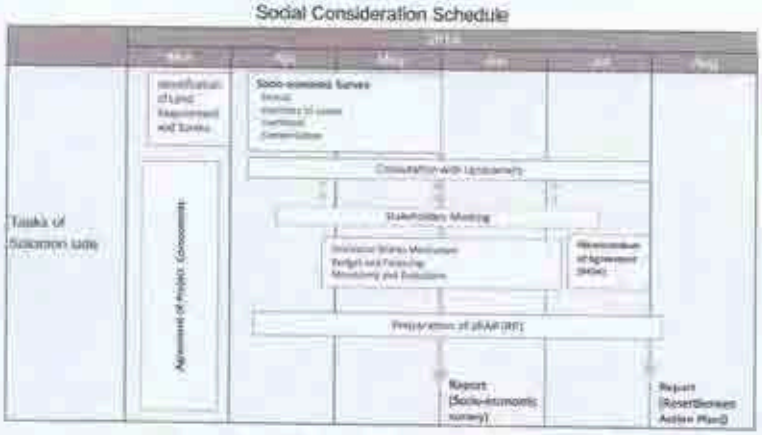
5. **Expedite Environmental and Social Considerations**

No activity of environmental and social consideration for the project has been commenced yet by MID. The Survey Team advised MID to procure local consultant soon to undertake the following scheduled environmental and social considerations.

Environmental Consideration Schedule




Social Consideration Schedule




## 6. Undertakings of MID for the Project

The items and timing of the undertakings of MID for the project were confirmed.

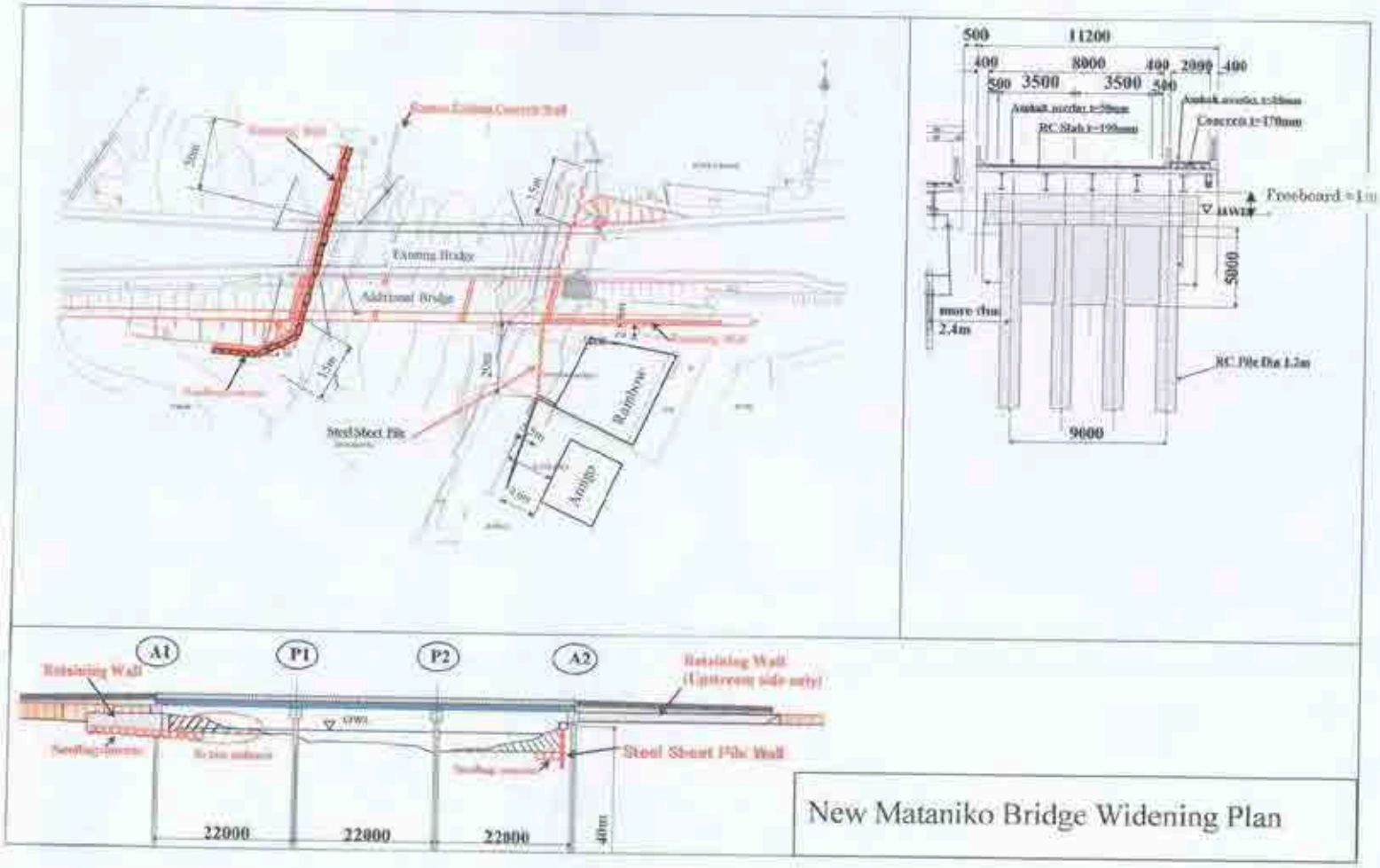
| Undertakings | | Timing |
|---|---|---|
| Environmental and Social Considerations | Preparation of abbreviated RAP | Before end of July 2014 |
| | Receipt of Development Consent | Before end of September 2014 |
| Relocation of Utilities | Items to be relocated before the project | Before Tender |
| | Items to be relocated during the project | Within 3 weeks after request |
| Provision of Temporary Yard | Lease agreement of yards for office and equipment and material storage | Before Tender |
| | Lease agreement of yard for bridge work | Before Tender |
| Provision of Quarry of Aggregate and Soil | Agreement of quarry owners | Before Tender |
| Provision of Disposal Area | Approval of disposal | Before Tender |
| UXO Survey | UXO clearance certificate | Before Tender |
| Bank Arrangement | For payment to consultant and contract | Immediately after contract |
| Tax Exemption | For consultant and contractor | Immediately after contract |
| Operation and Management of Facilities | Operation and management of crosswalk, underpass and bus bays | Immediately after completion |
| Maintenance of Facilities | Maintenance of roads and bridges | Routine and periodic maintenance |

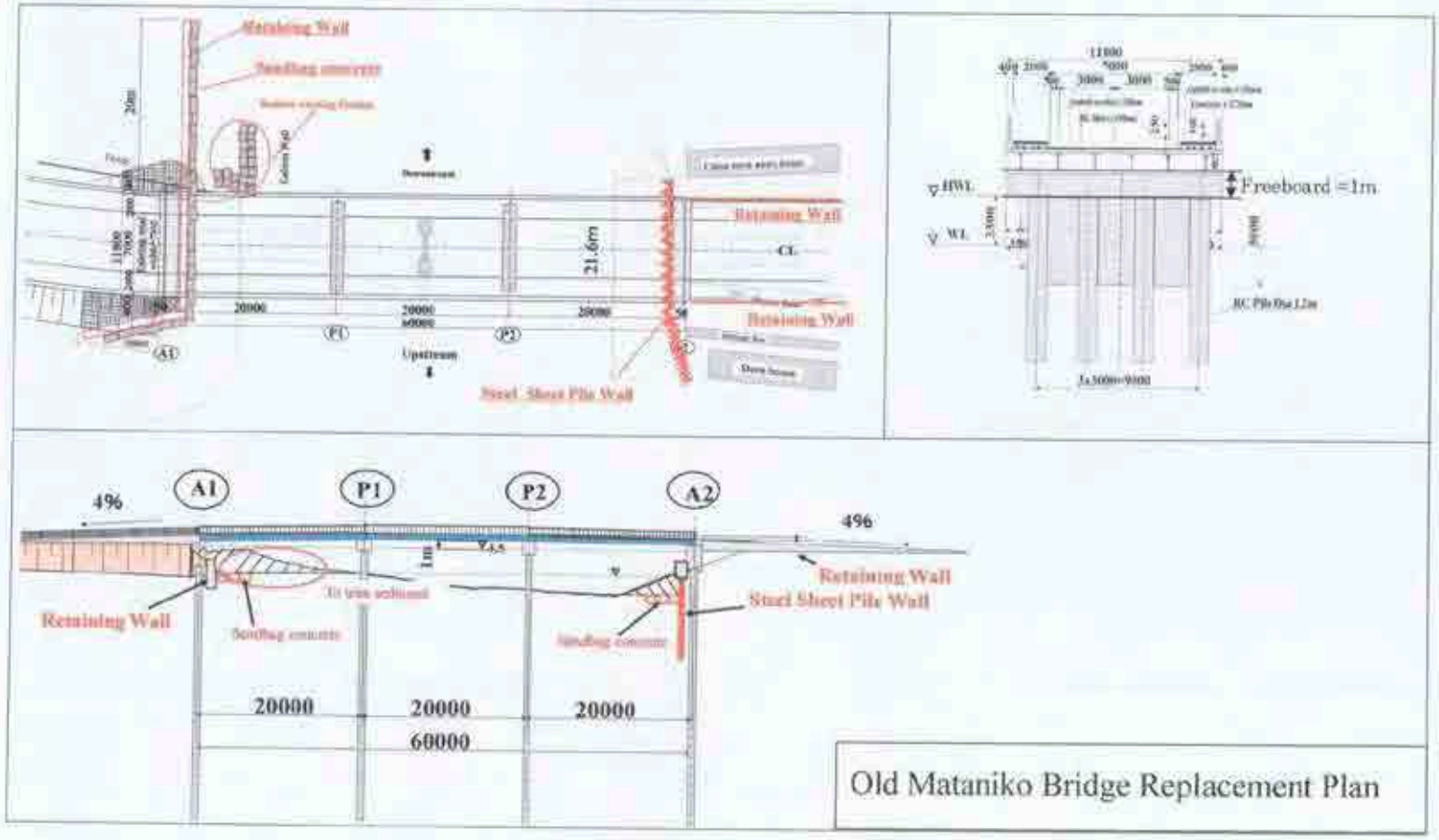
Noted by:

April 24, 2014

Jimmy Nuake
Under Secretary (Technical)
Ministry of Infrastructure Development

Soemu Oshita
Chief Consultant
JICA Preparatory Survey Team


Existing Bridge
Additional Bridge
Steel Sheet Pile
Rainbow
Apollo
500
11200
400
8000
400
2000
400
500
3500
3500
500
RC Slab t=190mm
Concrete t=170mm
Freeboard = 1.0m
5000
move this
2.4m
RC Pile Dia 1.2m
9000
A1
P1
P2
A2
Retaining Wall
Retaining Wall
(Upstream side only)
Steel Sheet Pile Wall
22000
22000
22000
40m
New Mataniko Bridge Widening Plan


Retaining Wall
Steel Sheet Pile Wall
21.6m
20000
20000
20000
60000
Upstream
CL
Freeboard =1m
HWL
L.W.L
A1
P1
P2
A2
4%
4%
Retaining Wall
Steel Sheet Pile Wall
Old Mataniko Bridge Replacement Plan

## Appendix 6 Soft Component Plan

### 1. Background of Soft Compnent Plan

This project aims to mitigate the severe traffic congestions along Kukum Highway. As the countermeasure against traffic congestion around the Central Market, installation of a crosswalk and median fences and renovation of the underpass to reuse are proposed in this project. These countermeasures had been implemented before. However after several years, the underpass was closed due to security and sanitary reasons and the median fence was demolished due to lack of traffic control of road crossings. To avoid repeating such unsuccessful experience and to promote pedestrians to use the underpass continuously, provision for a security guard to observe the safety and cleanliness of the underpass as well as lock and unlock the underpass entrances every morning and evening is to be necessary. The traffic control of the crosswalk by traffic personnel is proposed due to unsureness of power supply and special maintenance necessary for the control of traffic signal. Therefore, provision for traffic personnel to conduct traffic control at the crosswalk from early morning to late evening everyday is necessary to maintain the smooth traffic flow and to secure the road crossing pedestrians' safety and convenience.

To secure the proper operation and management of crosswalk and underpass, this project supports to establish the operational organization and method as a soft component of the project.

### 2. Objectives of the Soft Component

Through discussions and trial operations of the project facilities involving the related parties, proper operation methods is to be introduced and responsible management organization is to be established.

### 3. Result of Soft Component

The responsible organizations and methods of the operation and management of the bus bays, crosswalk and underpass are not clear now. It will be cleared and to be comfirmed through the discussions with concerned parties and trial operation of the facilities.

By implementing continuous proper operation and management of the bus bays, crosswalk and underpass, the traffic congestion around the Central Market is mitigated and traffic safety and convenience of the pedestrians are secured.

### 4. Evaluation of the Soft Component Accomplishment

At the end of the soft component, the conditions of operation and management of the facilities is to be surveyed with the following methods to evaluate the accomplishment of the soft component.

**Table A4-1 Evaluation of the Soft Component Accomplishment**

| Evaluation Item | Method | Evaluator | Timing |
|---|---|---|---|
| Is bus bay being used efficiently? | Interview survey | Bus Association<br>Consultant | After opening bus bay and after improvement of bys bay operation |
| Is proper traffic control of crosswalk being provided? | Interview survey | Traffic Police<br>Consultant | After opening crosswalk and after improvement of operation |
| Is unerpass being used by expected numbers of pedestrians? (600 in peak hour) | Traffic survey | Underpass manager<br>Consultant | End of soft component |
| Is there pedestrian crossing median fence? Is there median fence demolished/destroyed? | Occular survey | Consultant<br>Traffic Police | End of soft component |
| Has traffic congestion been mitigated? | Measurement of congestion que length and travel speed | Traffic Police<br>Consultant | End of soft component |

Note: Interview survey is conducted to around 100 pedestrians and 30 drivers.

## 5. Activity of the Soft Component

Input of Japan side

A Japanese traffic expert is to be sent to the project site for three months after basic preparation in Japan for 0.3-month. Additionally one local engineer is to be employed as an assistant for three months. The following activities are to be conducted by them in the project site.

- To coordinate with related parties (MID, City Council, Traffic Police, Bus Association and Central Market) to clear the responsibility of the operartion and management of the bus bays, crosswalk and underpass.
- To support the responsible parties in operation and manegament of facilities since the opening of the facilities and the optimum method of the operation and management is to be established after trial operations.
- To prepare posters and panphlets and delever to pedestrians to promote proper use of the facilities with coordination with the responsible parties. The contents of the posters and panphlets are request and instruction of the proper use of the facilities.
- To present recommendations to traffic policemen on traffic control to promote traffic congestion mitigation and traffic safety along Kukum Highway and around the Central Market.

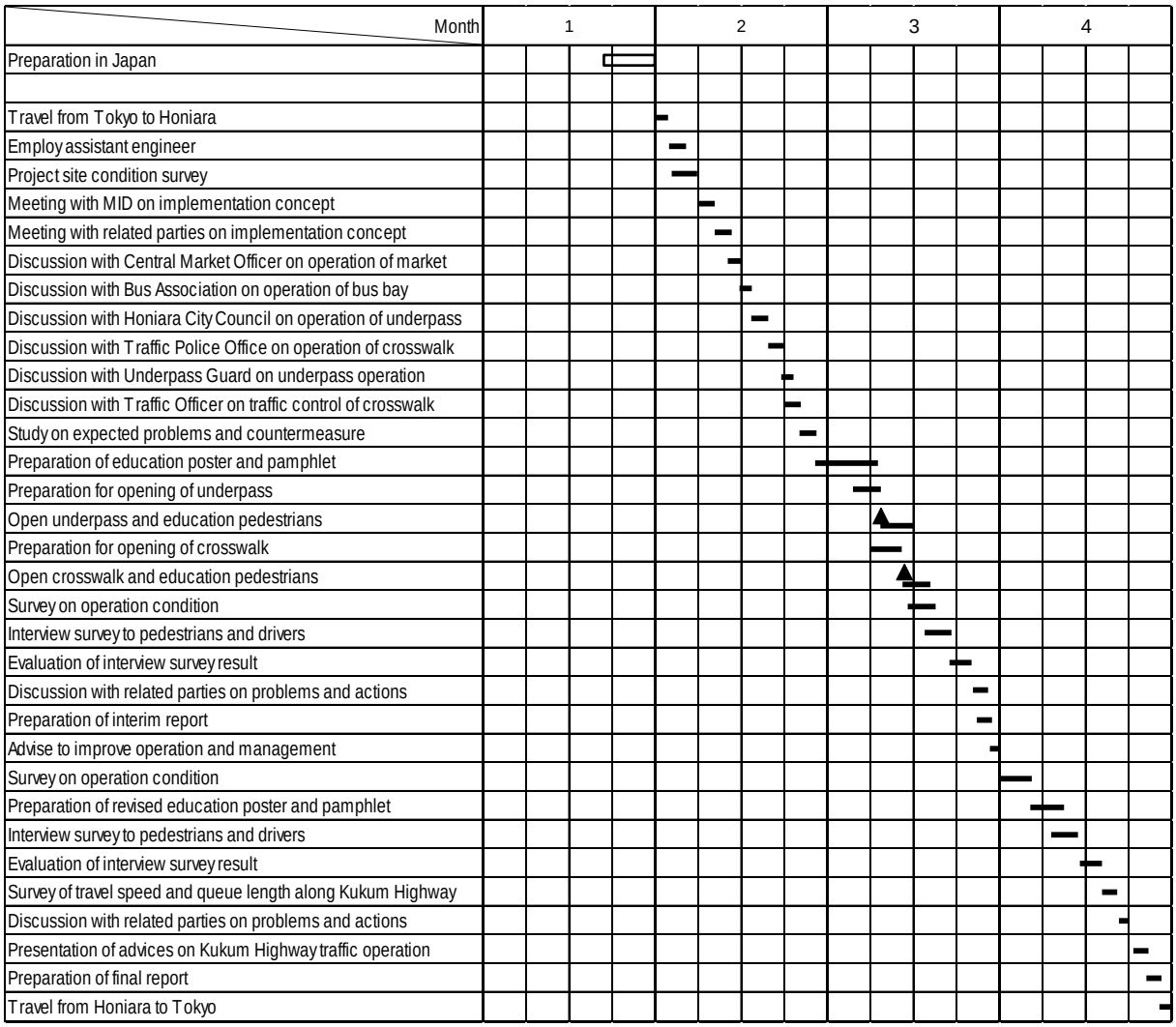
Input of Solomon Islands Side

- MID is to support the Japanese expert to conduct the above activities.
- MID is to coordinate with Traffic Police Office to provide four to six tarffic personnel to conduct traffic control at the crosswalk.
- MID is to coordinate with City Council to provide a security guard to manage the underpass.

## 6. Implementation Schedule of the Soft Component

The soft component is to be implemented when the crosswalk and underpass will be completed and the median fence will be installed. Before the start of the use of the facilities, coordination with the concerned parties is to be made to establish the operation organization and trail operation method. After the trial use of the facility, the operation and manegement condition are to be surveyed and advice is made to improve the operation and management. The implementation schedule is shown in Table A4-2.

**Table A4-2 Implementation Schedule of Soft Component**




## 7. Reports of the Soft Component

Reports to be made in the soft component are as follows:

- The facility operation and management organization and method
- Posters and panphlets to educate proper use of the facilities
- Recommendations on traffic control along Kukum Highway
- Final report (acommplishment and evaluation of activity and recommendations)

Environmental Check List (1)

| Category | Items | Check points | Yes: Y<br>No: N | Measures of Environmetal and Social Considerations<br>(Reasons for Yes or No, Bases, Mitigation measures) |
|---|---|---|---|---|
| 1. permits and explanation | (1)EIA and Environmental Permits | (a) Have EIA reports been officially completed?<br>(b) Have EIA reports been approved by authorities of the host country's government?<br>(c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?<br>(d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government? | (a) N<br>(b) N<br>(c) N<br>(d) N | (a) (b) (c)The host country has EIA system for development projects, and the project is the subject of the EIA system. In March 2014, the EIA procedure began with the submision a *application* to the environmental authority in the host country. The EIA procedure of the project is being implemented. (as of July 2014)<br>(d) The project does not need other environmental permits. |
| | (2)Explanation to the Public | (a) Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public?<br>(b) Are proper responses made to comments from the public and regulatory authorities? | (a) Y<br><br><br>(b) Y | (a) For the purpose of publicity of the project, MID and JICA held a consultation meeting inviting stakeholders, and explained the outlienes of the project in March 2014.<br>(b) On the consultation meeting, MID and JICA answered stakeholder's questions. For a part of opinions, reflection for plans is examined. |
| | (3)Alternatives | (a) Are the alternatives of the project examinened in terms of the environmental and social matters? | (a) Y | (a) On the planning of a bridge and a roundabout, the alternatives have been examined in terms of environmental and social considerations. |
| 2. Mitigation Measures | (1)Air Quality | (a) Is there a possibility that air pollutants emitted from various sources, such as vehicle traffic will affect ambient air quality? Does ambient air quality comply with the country’ s ambient air quality standards?<br>(b) Where industrial areas already exist near the route, is there a possibility that the project will make air pollution worse? | (a) N<br>(b) N | (a) The project will improve travel speed of vehicles, and reduce emissions.<br>(b) There are industrial areas around the route. However, because the project itself does not change traffic volume, the project will not make air pollution worse. |
| | (2)Water Quality | (a) Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas?<br>(b)Is there a possibility that surface runoff from roads will contaminate water sources, such as groundwater?<br>(c)Do effluents from various facilities, such as stations and parking areas/service areas comply with the country’s effluent standards and ambient water quality standards? Is there a possibility that the effluents will cause areas that do not comply with the country’s ambient water quality standards? | (a) N<br>(b) N<br>(c) N | (a) The project is the improvement projet of existing road facilities and has no large scale earthmoving, and will not affect water quality significantly.<br>(b) Since the project is implemented in ROW and it is naturely the improvement of pavement, surface runoff from roads will not contaminate the water source.<br>(c) The project does not have the facilities which discharge effluent such as stations and service areas. |
| | (3)Waste | (a) Are wastes derived from road facilities legally disposed? | (a) N | (a) The project does not have the facilities which discharge wasete such as stations and service areas. |
| | (4)Noise and Vibration | (a) Do noise and vibrations from vehicle traffic comply with the country's standards? | (a) N | (a) The host country does not have noise and vibration standards. |

Environmental Check List (2)

| Category | Items | Check points | Yes: Y<br>No: N | Measures of Environmetal and Social Considerations<br>(Reasons for Yes or No, Bases, Mitigation measures) |
|---|---|---|---|---|
| 3. Natural Environment | (1)Protected Areas | (a) Is the project site located in protected areas designated by the country's law or international treaties and conventions? Is there a possibility that the project will affect the protected area? | (a) N | (a) The project site is located on urban areas. There are no protected areas around the project site. |
| | (2) Ecosystem | (a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats?<br>(b)Does the project site encompass the protected habitats of endangered species designated by the country's law or international treaties and conventions?<br>(c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?<br>(d) Are adequate protection measure taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock?<br>(e) Is there a possibility that installation of roads will cause impacts, such as destruction of forest, poaching, etc?<br>(f) In case where the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of nature environments? | (a)N<br>(b)N<br>(c)N<br>(d)N<br>(e)N<br>(f)N | (a) (b)(c)(d)(e)(f) The project site is located on urban areas, and there are no valuable ecosystem such as primeval forests, tropical rain forests around the site. The project is the improvement in the existing road facilities, and will not cause the losses of nature envirnment. |

Environmental Check List (3)

| Category | Items | Check points | Yes: Y<br>No: N | Measures of Environmetal and Social Considerations<br>(Reasons for Yes or No, Bases, Mitigation measures) |
|---|---|---|---|---|
| 3. Natural Environment | (3) Hydrology | (a) Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows?<br>(b) Does structures affect the flows of surface and underground water? | (a)N<br><br>(b)N | (a) Since the project is the development of an existing road and bridges and the construction scale is small, impacts on water flow will less affect.<br>(b) The project has piers of the bridges in the Mataniko River. Because the location and number of piers is same as the existing bridge, the piers will not affect the flows of the Mataniko River. |
| | (4)Topography and Geology | (a) Is there a soft ground on the route that may cause slope failures or landslides? Are adequate measure considered to prevent slope failures or landslides, where needed?<br>(b) Is there a possibility that civil works, such as cutting and filing will cause slope failure or landslides? Are adequate measure considered to prevent slope failure or landslides?<br>(c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measure taken to prevent soil runoff? | (a) N<br>(b) N<br>(c) N | (a) (b) (c) The project is basicaly implemented in the ROW of the exisiting road, and cutting and filling work which cause slope failure or landslides will be implemented. |
| | (1) Resettlement | (a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?<br>(b) Is adequate explanation on relocation and compensation given to affected persons prior to resettlement?<br>(c) Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?<br>(d) Are compensations paid prior to the resettlement?<br>(e) Are compensation policies issued written instructions?<br>(f) Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?<br>(g) Are agreements with the affected persons obtained prior to resettlement?<br>(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?<br>(i) Are monitring on the resettlement planned?<br>(j) Is a plan developed to monitor the impacts of resettlement? | (a)N<br>(b)N<br>(c)-<br>(d)-<br>(e)-<br>(f)-<br>(g)--<br>(h)-<br>(i)-<br>(j)- | (a) (b) The project implementation does not cause involuntary resettlement<br>(c) (d) (e) (f) (g) (h) (i) (j) The project needs land acquisitions on the implementation and some losses of properties. Therefore RAP encompassing the items of JICA guidelines are being prepared. . |

Environmental Check List (4)

| Category | Items | Check points | Yes: Y<br>No: N | Measures of Environmetal and Social Considerations<br>(Reasons for Yes or No, Bases, Mitigation measures) |
|---|---|---|---|---|
| 4. Social Environment | (2)Living and Livelihood | (a) Where roads are newly installed, is there a possibility that the project will affect the existing means of transportation and associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Is adequate measure considered for preventing these impacts?<br>(b) Is there a possibility that the project will adversely affect the living condition of inhabitants other than the affected inhabitants? Are adequate measures considered to reduce the impacts, if necessary?<br>(c) Is there a possibility that diseases, including communicable diseases, such as HIV will be introduced due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?<br>(d) Is there a possibility that roads and railways will cause impede the movement of inhabitants?<br>(e) Is there a possibility that structures associated with roads such as bridges will cause a sun shading and radio interference? | (a) N<br>(b) N<br>(c) N<br>(d) N<br>(e) N | (a) The project is the improvements of the existing road facilities, and will not affect the existing means of transportation and associated workers, land use, livelihood.<br>(b) Since the project is the improvements of the existing road facilities, the project will improve living conditions of inhabitants.<br>(c) The construction activities of the project depends on mainly heavy machinery, workers will not concentrate excessively.<br>(d) The project is the improvements of the existing road facilities, and will not impede the movement<br>(e) The project does not include an overpass structure, and does not cause a sun shading and radio interference. |
| | (3)Heritage | (a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws? | (a) N | (a) There are no archeological, historical, cultural, and religious heritage sites around the project site. Moreover, the project is basically implemented in the existing ROW. |
| | (4)Landscape | (a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken? | (a) N | (a) The project is the improvements of the existing road and bridges, and will not adversely affect the local landscape? |
| | (5)Ethnic Minorities and Indigenous Peoples | (a) Where ethnic minorities and indigenous peoples are living in the rights-of-way, are considerations given to reduce the impacts on culture and lifestyle of ethnic minorities and indigenous peoples?<br>(b) Does the project comply with the country's laws for rights of ethnic minorities and indigenous peoples? | (a) N<br>(b) - | (a) The project site is located on urban areas, and there are no ethnic minorities and indigenous peoples.<br>(b) The project is implemented based on the host country's laws. |

Environmental Check List (5)

| Category | Items | Check points | Yes: Y<br>No: N | Measures of Environmetal and Social Considerations<br>(Reasons for Yes or No, Bases, Mitigation measures) |
|---|---|---|---|---|
| 4. Social Environment | (6)Working conditions | (a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?<br>(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?<br>(c)Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public sanitation) for workers etc?<br>(d)Are appropriate measures being taken to ensure that security guards involved in the project do not violate safety of other individuals involved, or local residents? | (a) Y<br>(b) N<br>(c) N<br>(d) N | (a) The project is implemented based on the host country's laws.<br>(b) On the construction activities, safety considerations for workers and the public are needed.<br>(c) The establishment of safety and health program and safety training for workers should be implemented on the project implementation.<br>(d) So far, security on the project implementation is unclear. |
| 5. Others | (1)Impacts during Construction | (a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?<br>(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?<br>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? | (a) Y<br>(b) Y<br>(c) Y | (a) (b) (c) Because construction activities may cause environmental and social impacts, the environmental and social considerations were examined, and described on the PER (IEE document in the host counry). |
| | (2)Monitoring | (a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?<br>(b) Are the items, methods and frequencies included in the monitoring program judged to be appropriate?<br>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?<br>(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities? | (a) Y<br>(b) Y<br>(c) Y<br>(d) Y | (a) (b) (c) (d) The proponent is preparing the PER, and describing a monitoring items and framework. |
| 6. Note | Note on Using Environmental Checklist | (a) If necessary, the impacts to transboundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming). | (a)Y: Global warming | (a) The construction work of the project uses heavy machinery. These emits CO2. On the implementation of the consrtuction work, CO2 reduction should be considered. |

## Appendix 8 Environmental Monitoring Form

**Environmental**

**Table 1 Monitoring Plan**

| Environmental Items | Location | Means of Monitoring | Criteria | Frequency |
|---|---|---|---|---|
| Air pollution | Construction site | Confirmation of the construction plan and the observance of it | The construction plan considers air pollution. | Before the construction activities |
| | | Control of fuel consumption of heavy machinery and vehicles | The fuel consumptions are according to the construction plan. | Every month |
| | | Visual inspection for the mechanical conditions of heavy machinery and vehicles | No trouble on the heavy machinery and vehicles | Every month |
| Water pollution Water system | Construction site | Confirmation of the construction plan | The construction plan considers water pollution. The construction plan considers the flow of the Mataniko River | Before the construction activities |
| | | Visual inspection for the piling work | Water pollution of Mataniko River is prevented with appropriate measures. | Every two weeks during the piling work |
| | | Visual inspection for the mitigation measures against soil outflow | Measures against oil outflow are implemented. | Every month |
| Waste | Construction site | Reuse of waste surplus soil | Waste surplus soil is reused suitably. | Before the construction activities |
| Soil pollution | Construction site | Visual inspection for the mechanical conditions of heavy machinery and vehicles | No trouble on the heavy machinery and vehicles | Every month |
| Noise and vibration | Construction site | Confirmation of the construction plan and the observance of it | The construction plan considers noise and vibration. | Before the construction activities |
| | | Visual inspection for the mechanical conditions of heavy machinery and vehicles | No trouble on the heavy machinery and vehicles | Every month |
| Involuntary resettlement | Construction site | Visual inspection and interview for land owners | Resettlement and compensation procedure is appropriate. | Before construction |
| Existing social infrastructures and services | Construction site | Confirmation for the construction plan | The construction plan has mitigation measures against road congestion under construction periods, such as the securement of detour. | Before construction |
| Accidents | Construction site | Confirmation for the construction plan | The construction plan considers safety enough. | Before construction |
| | | Visual inspection for machinery condition and operation | The machinery keeps good condition. The machinery operation is appropriate. | Every month |
| | | Visual inspection for safety measures | Safety measures are definitely implemented. | Every month |
| Climate change | Construction site | Confirmation of the fuel consumption of heavy machinery and vehicles | The fuel consumptions are according to the construction plan. | Every month |

**Table 2 Monitoring Form**

| Environmental Items | Location | Criteria | Monitoring | |
|---|---|---|---|---|
| | | | Date and Time | Results |
| Air pollution | Construction site | The construction plan considers air pollution. | | |
| | | The fuel consumptions are according to the construction plan. | | |
| | | No trouble on the heavy machinery and vehicles | | |
| Water pollution Water system | Construction site | The construction plan considers water pollution. | | |
| | | The construction plan considers the flow of the Mataniko River. | | |
| | | Water pollution of Mataniko River is prevented with appropriate measures. | | |
| | | Measures against oil outflow are implemented. | | |
| Waste | Construction site | Waste surplus soil is reused suitably. | | |
| Soil pollution | Construction site | No trouble on the heavy machinery and vehicles | | |
| Noise and vibration | Construction site | The construction plan considers noise and vibration. | | |
| | | No trouble on the heavy machinery and vehicles | | |
| Involuntary resettlement | Construction site | Resettlement and compensation procedure is appropriate. | | |
| Existing social infrastructures and services | Construction site | The construction plan has mitigation measures against road congestion under construction periods, such as the securement of detour. | | |
| Accidents | Construction site | The construction plan considers safety enough. | | |
| | | The machinery keeps good condition.<br>The machinery operation is appropriate. | | |
| | | Safety measures are definitely implemented. | | |
| Climate change | Construction site | The fuel consumptions are according to the construction plan. | | |

**Monitoring implementation**

MID is responsible for the environmental monitoring during the implementation of the Project with the assistance of Consultant and Contractor. MID reports the monitoring results to ECD and JICA Office every quarter of the year.

**Social (Land Acquisition and Compensation)**

**Table3 Monitoring Form (Progress)**

| Items | Planned Total | Progress (Accumulation) | | | | Responsible Organization |
|---|---|---|---|---|---|---|
| | | 2014 | 2015 | | | |
| | | Oct-Dec | Jan-Mar | Apr-Jun | Jul-Sep | |
| 1.Finalization of PAPs List | | | | | | MID,MLHS |
| Boundary Survey | | | | | | |
| Finalization of PAPs | | | | | | |
| 2.Agreement with Land Owners | | | | | | MID, MLHS |
| New Mataniko Bridge | | | | | | |
| City Council Roundabout | | | | | | |
| Old Mataniko Bridge | | | | | | |
| Kukum, Vura Intersection | | | | | | |
| The Central Market | | | | | | |
| 3. Implementation of Compensation | | | | | | MID |
| New Mataniko Bridge | | | | | | |
| City Council Roundabout | | | | | | |
| Old Mataniko Bridge | | | | | | |
| Kukum, Vura Intersection | | | | | | |
| The Central Market | | | | | | |

**Table 4 Monitoring Form (Check Items)**

Land No.: L-

| Item | Criteria | Measurement | Monitoring | | | |
|---|---|---|---|---|---|---|
| | | | Date | | Results | Identifier |
| | | | Plan | Actual | | |
| Payment of Compensation | Paid before the implementation of the project? | Interview to PAPs and MID | Mar, and Aug, 2015 | | | |
| | Paid with replacement cost? | Confirmation of evidence of payments | | | | |
| Grievance Redress Process | Grievance redress section appropriately installed? | Interview to PAPs and MID | Nov,2014-Sep,2015 Every two month | | | |
| | Contents of complaints recorded? | Confirmation of records of grievance redress processes | | | | |
| | MID responds to PAPs appropriately, agrees with PAPs? | Confirmation of records of grievance redress processes Interview to PAPs and MID | | | | |

**Monitoring implementation**

MID is responsible for the environmental monitoring during the implementation of the Project with the assistance of Consultant. MID reports the monitoring results to JICA Office every quarter of the year.

## Appendix 9 Minutes of Discussions of Stakehoulder Meetings

### First Stakeholder Meeting

Date and time: 20th March 2014 10:00-12:00 am
Venue: Heritage Hotel, Honiara City
Attendance: please refer to attached Attendance List

### Agenda Presentation of project, question and answer

**1. Presentation of project outlines**

JICA survey team showed the outcomes of the first field survey, priority of components and five components proposed.

**2. Major comments and answers**

(1) **The underpass will become dirty and be obstructed. Installation of comfort room is recommended around here.**

There is a public lavatory in the market. New installation is not intended. (MID)

(2) **Is the improvement of Chinatown JCT. intended?**

A traffic island will be installed. This will help smooth right turn. (Survey team)

(3) **How do you reduce the traffic congestion? How is a traffic demand forecast?**

The congestion will be reduced by the measures: the widening of Mataniko Bridge, the improvement of City Council Roundabout, moving of bas bay and improvement of cross walk in front of Central Market. The results of the traffic demand forecast is that 35,000pcu on New Mataniko bridge increase to 62,000pcu on 2033. (Survey team)

(4) **Length of the bas bay is too short. Is improvement of bas bay based on a traffic demand forecast?**

The bas bay length in front of Central Market is decided on demand forecast of bas. (Survey team)

(5) **Now population is increasing smoothly, and bas and taxi are increasing. How are you considering parking for bus and taxi?**

The purpose of the survey is reduction of congestion. The issue of the parking is out of scope of the survey.

(6) **How do you consider bas bay improvements except Central Market?**

New installation of bas bays is proposed because the number of bas bay is too short. The length is

proposed based on current conditions. (Survey team)

(7) **Regarding fence in front of Central Market, I hope to utilize the existing flower pots for Kukum Highway. Is it possible that the flower pots are put in the median?**

Substitutes for the fence such as flower pots and vegetation are examined. (Survey team)

(8) **Chinatown will extend in future. I am afraid of congestion of road connecting roundabout to Chinatown. Moreover I am also examining new bas route. Therefore I ask the shape of the intersection. (Bas Association)**

The demand forecast shows that the widening of New Mataniko bridge and the replacement of Old Mataniko bridge will reduce the congestion. (Survey team)

(9) **The bas bay improvement in front of Central Market will occupy the existing parking, and narrow pedestrian road. The bas bay should be moved to around the underpass.**

The bas bay in front of City Council is lost. And an access to Central Market should be kept. Therefore it is difficult to move more west side. (Survey team)

(10) **The portion to Hot Bread Roundabout should be improved.**

On the result of examining priority and budget, the improvement to Hot Bread Roundabout is excluded. (JICA)

(11) **How do you intend the traffic under construction?**

A contractor and a consultant prepare construction plan with the police. Construction work of Central Market and the roundabout will be implemented at night. In respect of Kukum Highway, two lanes are blocked, and remaining two lanes will be utilized. The wide of one side is 8 meter. Therefore it can keep three lanes. We are examining two lanes toward the west and one lane toward the east in the morning, and invert in the afternoon. (Survey team)

**Detour and traffic plan under construction should be prepared.**

**3. Other opinions**

(1) Concentration of people on Central Market causes congestion. Other markets should be prepared on other place aiming at dispersion of the people.

(2) Installation of a multistory parking garage should be examined in respect of future vehicle increase.

(3) Bas bay should be installed next to the underpass. This will promote underpass utilization.

## Attendance List

| NO# | Name | Organization |
|---|---|---|
| 1 | Geoffrey .F. Samuel | Honiara Bus Association |
| 2 | David Taylor | Guadalcanal Plains Palm Oil Limited |
| 3 | Philip Luiramo | Kosol Group of Company |
| 4 | Andy Hewson | Solbrew /SICCI |
| 5 | Noel Orudiana | Solomon Islands Electricity Authority |
| 6 | Carlos Romero | World Bank |
| 7 | Glyn Joshua | Solomon Islands Ports Authority |
| 8 | Richard Austin | Solomon Water |
| 9 | Ronald Ivupitu | Solomon Islands Ports Authority |
| 10 | Fred Peter | Kings Taxi Service |
| 11 | Lawerence Samani | Solomon Telekom |
| 12 | Wendy Ho | S.I Chinese Association |
| 13 | Shilling wong | S.I Chinese Association |
| 14 | ofani Eremae | Solomon Star |
| 15 | Nancy Kwatea | Solomon Islands Chamber of Commerce Industry |
| 16 | Carson Korowa | South Pacific Oil |
| 17 | Andrew Prakash | Ministry of Development Planning and Aid Coordination |
| 18 | Nick West | Solomon Islands Electricity Authority |
| 19 | Scott McNamare | Department of Foreign Affairs and Trade-AHC |
| 20 | George Mouli | Traffic |
| 21 | Keithie Sewolg | US Consular |
| 22 | B Sandra | BJS Group |
| 23 | D Metijhohn | BHC |
| 24 | Bruce Anderson | Ministry of Infrastructure Development |
| 25 | Mike Qaqara | Ministry of Infrastructure Development |
| 26 | Van Vytvancn | European Union |
| 27 | Jimmy Nuake | Ministry of Infrastructure Development |
| 28 | Paula Baluliua | Asian Development Bank |
| 29 | Mia Kima | South Pacific Commission |
| 30 | Gary Hatigeva | Island Sun |
| 31 | John Hughes | SKM-TSDP |
| 32 | Henry Zimbo | Honiara City Council |
| 33 | John Ta'aru | Ministry of Infrastructure Development |
| 34 | Luke Kiddle | New Zealand MC |
| 35 | Eric Lui | Department Foreign Affairs & Trade |

**Second Stakeholder Meeting**

Date and Time: August 27, 2014 9:30 – 12:00 am
Venue : Kitano Mendana Hotel, Honiara City
Attendees: please refer to attached Attendance List

Agenda:

1. Opening Remarks by Permanent Secretary Mr. Moses Virivolomo and JICA Office Representative Mr. Taiji Usui
2. Explanation on outline design of the project components and environmental & social considerations by Chief Consultant of Survey Team
3. Comments and answers
4. Closing Remarks by the Survey Team Leader Mr. Nobuyuki Tsuneoka

Major comments and answers are as follows:

<u>Comments on Countermeasures against traffic congestion around the Central Market</u>

(1) The priority of this project is very high because it improve the transportation condition of the city. Honiara city has cleaned the existing underpasses and re-opened it yesterday as the measure to secure traffic safety and mitigate the traffic congestion. Soft component which is to be implemented in this project is very effective for proper use of the underpass and crosswalk. (City Clerk)
(2) Participation of Traffic Police is a key point for the implementation of soft components. MID is a member of Road Transport Board and it can give pressure to mobilize Traffic Police to participate the soft component. (MID)
(3) Median fence around the Central Market are necessary to prevent free road crossing of pedestrian. (City Clerk)
(4) The west bound bus bay is better to be located nearer to the underpass, isn't it? (City Clerk) → The locations of the bus bays were designed with consideration of convenience of the bus users and bus bay intervals. It is not far from the underpass. (MID)
(5) Road crossing located between the bas bays is dangerous for pedestrians, isn't it? →It will be controlled by traffic officers so the safety of the pedestrians will be secured. (Survey Team)
(6) C6: The parking fee of the Central Market Parking is too expensive, therefore cars are parked on the road which is causing the traffic congestion around the Central Market. (China Association)→ The parking fee is reasonable. It is necessary for maintenance and management the market. (City Clerk)
(7) Taxi stands should be provided as well as bus bays. (Taxi Association) → Installation of taxi stands are low priority in this project. It is the issue of the nest step. (MID)
(8) The road at the hill side should be improved. (Chinese Association) → The improvement of the road has been started already. (MID)

<u>Comments on Upgrading of Kukum Highway</u>

(9) Honiara Taxi Association appreciates this project which will mitigate the traffic congestion along

the highway. The citizens should use public transport such as taxies and buses instead of private cars for a further measure. (Taxi Association)

(10) Vura Intersection is often flooded. How is the drainage plan on the project? → Rainwater will be drained with improved ditches and pipes to the creek. (Survey team) The project includes raising the road level. This measure will ensure the drainage. (MID)

(11) The current traffic volume is large. Traffic problem is anticipated during the construction. → One lane is to be closed for work and the remaining three lanes are to be maintained for traffic. The work at the major intersections and around the Central Market is to be executed basically at night. (Survey team)

(12) Cost, responsibility, schedule and work instruction of the utility relocation are necessary to be discussed. (SIEA) → MID will discuss about the matter with utility companies soon. (MID)

(13) How is the plan of the street lighting in the project?

(14) Five street lights are to be newly installed at the improved roundabouts. Nine of broken street lights are to be repaired. Five existing street lights are to be relocated with median which are to be shifted. (Survey team)

(15) Fish Market is impeding traffic along Kukum Highway. Fish Market is illegal, however it will be remained there. In the future, City Council will take appropriate measures against the matter. (City Clerk)

Comments on Environmental and Social Considerations

No comment on environmental and social considerations.

## Attendance List

| NO# | Name | Organization |
|---|---|---|
| **1** | Gideon Bouro | Secretariat of the South Pacific (SPC) |
| **2** | Wendy Mark-Lamani | MID |
| **3** | Philip Luiramo | Kosol Group of Company |
| **4** | Mike QaQara | MID |
| **5** | Kevin Teferomu | MID |
| **6** | Ben Bilua | Island Sun Newspaper |
| **7** | Fred Peter | Kings Cab (Taxi Association) |
| **8** | Rollins Suluia | SIEA |
| **9** | Kenneth Laeta | SIEA |
| **10** | Mathew Quan | S.I. Chinese Association |
| **11** | Wendy Ho | S.I. Chinese Association |
| **12** | Lisa Sugumanu | MDPAC |
| **13** | Jimmy Nuake | MID |
| **14** | Luke Kiddle | NZ High Commission |
| **15** | Chris Laekalia | Royal Solomon Islands Police Force |
| **16** | Carson Korowa | South Pacific Oil |
| **17** | Geoffrey Samuel | Buses Association |
| **18** | John Ta'aru | MID |
| **19** | Paula Baleilevua | ADB |
| **20** | Charles Kelly | Honiara City Council |
| **21** | Harry Rini | MID |
| **22** | Jay Bartlett | Hatanga Company/Solomon Islands Chamber of Commerce & Industry |
| **23** | H.E Victor Yu | Republic of China (Taiwan) |
| **24** | Tony Koraua | Solomon Islands Chamber of Commerce & Industry (SICCI) |
| **25** | Ofani Eremae | Solomon Star Newspaper |
| **26** | Nancy Kwalea | SICCI |
| **27** | Hon. Bodo Dettke | ITA Hardware |

## Appendix 10 References

| No. | Title | Issued by | Year |
|---|---|---|---|
| 1 | National Development Strategy 2011-2020 | Ministry of Development Planning and Aid Coordination | July 2011 |
| 2 | National Transport Plan 2011-2030 | Ministry of Infrastructure and Development | October 2010 |
| 3 | Solomon Islands National Infrastructure Investment Plan | Ministry of Development Planning and Coordination | December 2012 |
| 4 | Geology of the Honiara Area | Ministry of Natural Resources | 1979 |
| 5 | Geology and Geophysics | Ministry of Natural Resources | 1982 |
| 6 | Specification for Road Maintenance | Ministry of Infrastructure and Development | February 2013 |
| 7 | Honiara Climate Data | Solomon Islands Meteorological Service | 2013 |
| 8 | 2009 Population & Housing Census | National Statistics Office Ministry of Finance and Treasury | 2009 |
| 9 | Website of the Solomon Islands National Statistics Office | The Solomon Islands National Statistics Office | 2009 |
| 10 | The World Factbook | CIA | 2013 |
| 11 | Solomon Islands State of Environment Report 2008 | Ministry of Environment Conservation and Meteorology | July 2008 |
| 12 | Pacific Climate Change Science Program | Solomon Islands Meteorological Service/Australian Government | 2011 |
| 13 | Environmental Impact Assessment Guidelines | Ministry of Environment, Climate Change, Disaster Management and Meteorology | |
| 14 | Justice for the poor, Briefing Note Volume4 Issue3 | World Bank | April 2010 |
| 15 | Justice for the poor, Briefing Note Volume6 Issue1 | World Bank | February 2011 |
| 16 | World Malaria Report 2013 | World Health Organization | 2013 |