Republic of the Union of Myanmar
Ministry of Transport and Communications

No: PaSa-5/ AhPaYa(JICA)/ 2017( )
Date: 20th March, 2017

Mr. Nobuo IWAI
Acting Chief Representative
JICA Myanmar Office

Subject: **Confirmation for Location of Mandalay Port Development Project**

Dear Mr. Nobuo IWAI,

First of all, on behalf of Ministry of Transport and Communications and on my own behalf, we would like to extend our appreciation for all your continuous supports and considerations to be sustainable development of our country, particularly in the areas of transport and communications.

In connection with the transport sector development, MOTC and JICA Team conducted the meeting on 21st - 22nd, February 2017 in Nay Pyi Taw to decide the location and continue the follow-up actions for the establishment of the Mandalay Port. So, we are very pleased to inform you that our MOTC and Mandalay Region Government (MRG) have selected the location (1) as the most suitable place to establish Mandalay Port.

Thank you once again and please accept the assurance of our highest consideration.

Sincerely Yours,

Win Khant
Permanent Secretary
Ministry of Transport and Communications
Nay Pyi Taw

Oriental Consultants Global Co., Ltd. Pacific Consultants Co., Ltd. Fukken Co., Ltd.

June 19, 2017
Ref. No. 635R6710/DOD/006

Attn. Director General
Directorate of Water Resources and Improvement of River System (DWIR)

Sub: Request for Updated Information of AIRBN Project and AUDP
Re: The Preparatory Survey on the Project for Development of Mandalay Port Technical Coordination Meeting held on June 12, 2017

Dear Sir,

Thank you very much for your kind cooperation for our survey on the above captioned Project.

Also, we would express appreciation on your invitation for the Technical Coordination Meeting held on June 12, 2017 at your office.

This is for our further clarifications on the explanation in the Technical Coordination Meeting.

1. AIRBN Project (Ayeyarwady Integrated River Basin Management Project)

On the AIRBN Project, we understand that DWIR will make a decision for river improvement method taking into account the outputs of the study made by RHDHV and hearing relevant authorities' opinion.

The presentation made by RHDHV showed 4 options (Scenario 1 ~ 4). On the other hand, DWIR introduced an option of "Subproject 1" in your presentation, which includes installation of a guide-bund at upstream and series of groynes at downstream of Mandalay waterways.

As we requested in the meeting, we would like to request DWIR to provide us your decision scenario as soon as you made it. We would like to consider influence of AIRBN to JICA project for our obligation of the study.

2. AUDP (Amarapura Urban Development Project)

This was a new information to us. We found the news article regarding AUDP as attached herewith, which says the AUDP project includes jetty development at the same area of JICA port development project.

DWIR stated in the meeting that JICA project shall have the priority to the AUDP for the port development, and AUDP has not received official approval by the government. However, we think this issue relates to the essential objective on the provision of Japan's Grant Aids.

Therefore, we would request DWIR to provide our Study Team more detailed information of the project very soon. As the issue might be very critical for us to proceed our study, please send us

the following information on AUDP by 28th of June 2017.

- Facility plot plan for Phase 1 development (20 acres area at the same place of JICA project area)
- Purpose of Jetty for AUDP (cargo or tourism passenger?)
- Drawings of jetty/port facilities
- Assumed implementation schedule

We would be very much appreciated if you could understand our sincere concern to your project coordination.

Yours Faithfully,

Masahiko Koshimizu
Chief Consultant
Joint Venture of
Oriental Consultants Global Co., Ltd.
Pacific Consultants Co., Ltd.
Fukken Co., Ltd.
on behalf of JICA Study Team

Attachment: News article

CC 1: Ministry of Transport and Communication, MOTC
2: Inland Water Transport, IWT
3: JICA headquarters
4: JICA Myanmar Office
5: OCG Yangon Office
6: File

The Republic of the Union of Myanmar

Ministry of Transport and Communications

Directorate of Water Resources and Improvement of River Systems

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Fax: +95 1 290230 URL : www.dwir.gov.mm

Letter No: 146 /AhKhaNa/AhKha-13(1)/2017

Date: 27th June, 2017

To:

Mr. Masahiko Koshimizu

Chief Consultant

Joint Venture of Oriental Consultants Global Co., Ltd

Re: **Updated information of AIRBM Project and AUDP Project**

Dear Mr. Masahiko Koshimizu,

As discussed with your JICA study team headed by Mr. Kotaro NISHIGATA, Senior Representative and member, Ms. Mayumi SHOJI, Project Formulation Advisor and U Win Ko Ko, Program Officer, on 10:00am, 27th June 2017 at DWIR office, I would like to reflect information of AIRBMP and AUDP project, concerning with your questionaries letter dated June 19, 2017, Ref No. 635R6710/DOD/006.

We already explained in the meeting about the Inland Port Development Plan, which DWIR would like to create the development of port construction with updated facilities to enhance river cargo transportation and containerization of transport facilities.

1. Ayeyarwady Integrated River Basin Management Project- dealing with World Bank credit US$ 100 million loan for 5 years, 2015-2020 and that Project Management Unit (PMU) hired RHDHV to provide " design and supervision" for Mandalay waterway improvement works by identifying of Hydraulic Mathematical Modeling Analysis. The meeting on 12 June, aim to include major stakeholders, to be consider their development plans which will be effected to the water systems of the Mandalay waterway. The decision making is not finalizing yet at the current status and we will include every infrastructure development project, which influences on the river flow regime of the water systems at this Sub-Project-1 area.

   For more details, please see World Banks website, DWIR page and http://www.myanmarinsider.com/category/insider/insider-review/page/2/ currently established in the Myanmar Insider News about the AIRBM project.

2. Amarapura Urban Development Project (AUDP)- This project has been formulated by the Mandalay Region Government since previous government period. AUDP will develop extension of urban area near river bank of southern part, has been permitted 20 acres from Region Government recently, and any of port development plan has permitted by Region Government and DWIR up to now, according to "The Conservation of Water Resources and Rivers Law 2006 and Regulation 2013". We reply this letter based on Minutes of discussion done by Region Government and our department in Mandalay.

Regarding with the Mandalay Inland Port Development Project assistant by Japanese Government through JICA, we DWIR would like to recommend as followed;

1. Mandalay Inland Port Development is G to G project, which will be treated 1st priority of our Department as National Project. Hence; Grant aids.
2. AUDP is urban development project and cannot be measured the conflict of interest to the Port Development plan with Container Facility by JICA. MDY Region government has permitted 20 acres for the project unit on the island.

However, DWIR is committed to develop Inland Port development along the Ayeyarwady and Chindwin River and Mandalay Inland Port Development is our 1st Priority Project with the assistant of Japanese Government.

Yours Sincerely,

Htun Lwin Oo
Director General
Directorate of Water Resources and Improvement of River Systems
Ministry of Transport and Communications
Republic of the Union of Myanmar

July 5, 2017

Ref. No. 635R6710/DOD/007

Attn. Director General
Directorate of Water Resources and Improvement of River System (DWIR)

Sub: Acknowledgement of your Updated Information of AIRBN Project and AUDP
Re: The Preparatory Survey on the Project for Development of Mandalay Port Technical Coordination Meeting held on June 12, 2017

Dear Sir,

Thank you very much for your kind cooperation for our survey on the above captioned Project.

We acknowledged your letter for "Updated information of AIRBM Project and AUDP Project" on June 27, 2017 (Your Ref. No. 146/AhKhaNa/AhKha-13(1)/2017), and we would like to express our appreciation of your clarification about AIRBN and AUDP Projects.

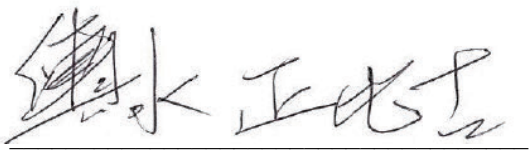
Based on your commitment on the river port development plan, we, the Consultant Team would continue to conduct the study of Mandalay Port Project.

However, we are considering that we have to pay attention to and to know the latest conditions of both Projects under conducting of the preparatory survey works of the Project.

For this purpose, we have plan to dispatch our Project Coordinator (Myanmar staff), from time to time according to the needs, to Mandalay and/or Nay Phi Taw to survey the latest situations and other necessary information about the Projects.

We would highly appreciate, if you could support for our survey, which may conduct by our Project coordinator for the above-mentioned purpose.

Yours Faithfully,



Masahiko Koshimizu
Chief Consultant
Joint Venture of
Oriental Consultants Global Co., Ltd.
Pacific Consultants Co., Ltd.
Fukken Co., Ltd.
on behalf of JICA Study Team

CC 1: Ministry of Transport and Communication, MOTC
2: Inland Water Transport, IWT
3: JICA headquarters
4: JICA Myanmar Office
5: OCG Yangon Office
6: File

The Republic of the Union of Myanmar
Ministry of Transport and Communications
Directorate of Water Resources and Improvement of River Systems

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Letter No. 222(a) /Ah Kha Na/Ah Kha-13(1)/2017
Date : 7th June , 2017

To

Mr. Katsuichi Yabunaka
Executive Technical Advisor to the Director General
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

Subject : **"Tool Port" for Management and Operation of Mandalay Port**

Dear Mr. Katsuichi Yabunaka,

We had discussion between our Myanmar Team and your Japan International Cooperation Agency Team on Second Preparatory Survey for the second outline design of the Project for Development of Mandalay Port in May, 2017 and sign Minute of Meetings.

Regarding with the Management and Operation of Mandalay Port, Myanmar Team mentioned its preference to "Tool Port" and stated that Myanmar side will finalize the port management and operation option and inform JICA in writing by the end of August, 2017.

So we'd like to inform officially about Myanmar's preference to "Tool Port" for port management and operation. However, we'd like to welcome advice from JICA to update during the time of implementation phase.

Sincerely,

Htun Lwin Oo
Director General
Directorate of Water Resources and Improvement of River Systems

DWIR
The Republic of the Union of Myanmar
Ministry of Transport and Communications
Directorate of Water Resources and Improvement of River Systems

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Letter No. 222(b) /Ah Kha Na/Ah Kha-13(1)/2017
Date : 20th September , 2017

To

Mr. Katsuichi Yabunaka
Executive Technical Advisor to the Director General
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

Subject : **Management and Operation of Mandalay Port**

Dear Mr. Katsuichi Yabunaka,

We have send the letter which stated Myanmar's preference to "Tool Port" for port management and operation and thank you for your reply.

Regarding with the meeting in May 25, 2017 related to the Port Operation and Management, I'd like to confirm about our updated information of preference on the following four (4) points;

1. **Counterpart**
   DWIR (implementation phase) and IWT (operation phase)
2. **Management Committee**
   The committee will be organized later and member will be from DWIR, IWT, DMA and part time member from Mandalay Regional Government.
3. **Role of DWIR for Mandalay port operation and management**
   DWIR is the owner of the port.
4. **Role of IWT for Mandalay port operation and management**
   IWT is the port operator for port operation and management.

We hope this will be useful for your consideration on the Port Operation and Management.

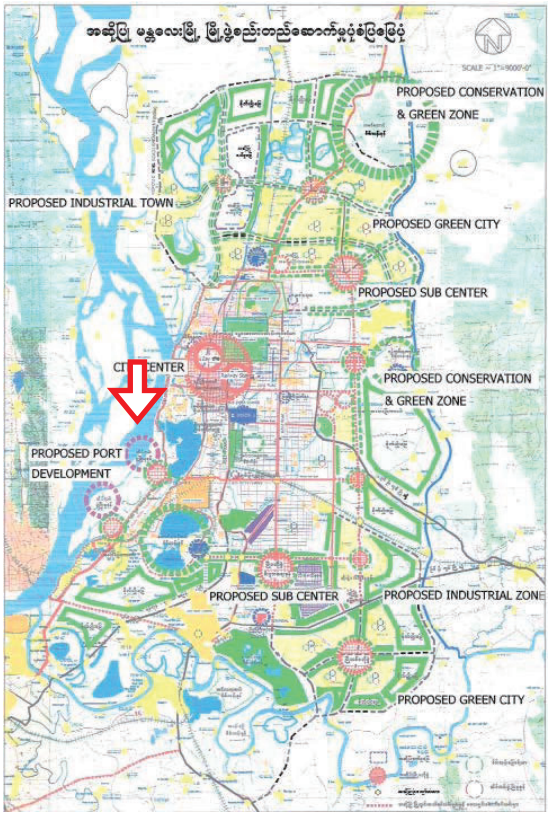
Sincerely,

Htun Lwin Oo
Director General
Directorate of Water Resources and Improvement of River Systems

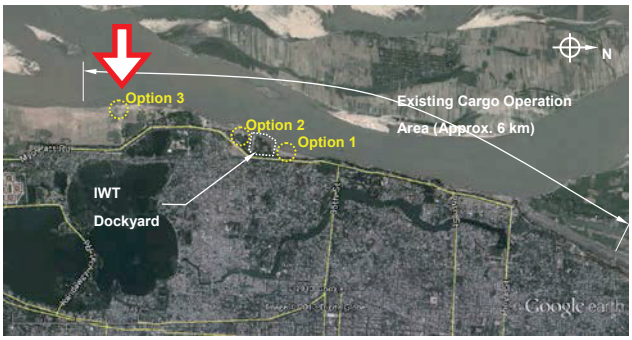
Appendix 6: Documents for Project Site Selection

6-1 Urban Development Plans and Candidate Port Locations

1. Urban Development Plans and Discussed Port Locations

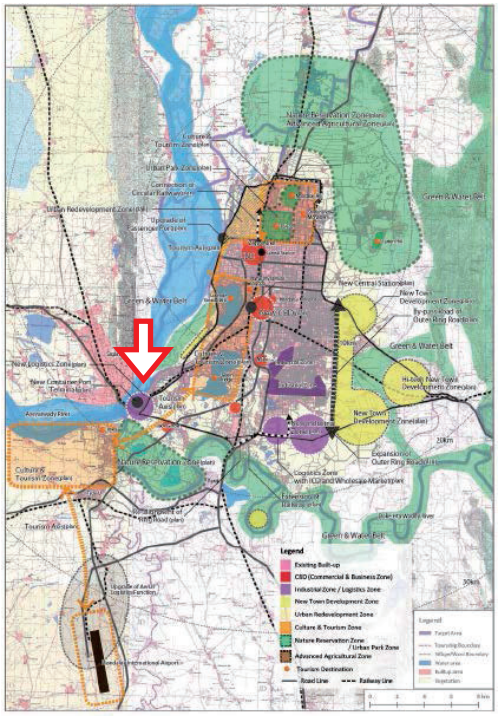


Mandalay Urban Development Conceptual Plan
MOC Myanmar, 2013

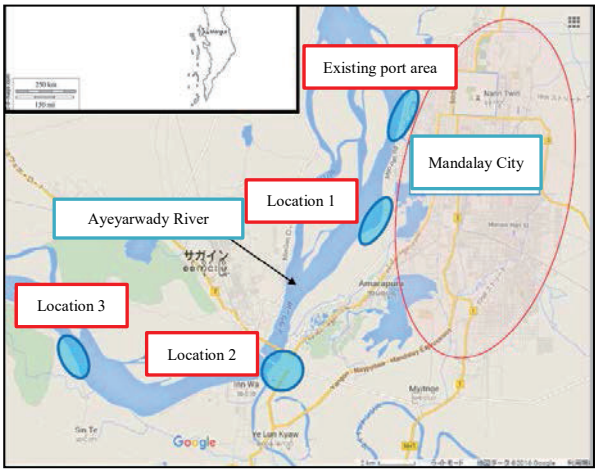


Feasibility Study on Inland Water Transport Facilities Improvement and Development Project
JICA 2014

Note: Option 3 (At Proposed Port Development location of Mandalay Urban Development Conceptual Plan) was selected during Feasibility Study



Proposed Spatial Plan of Mandalay
JICA, 2016



Development Project Accountability Committee
MOF Japan, 2016

Note: Location 1 ~ 3 will be compared in this survey and one location will be selected.

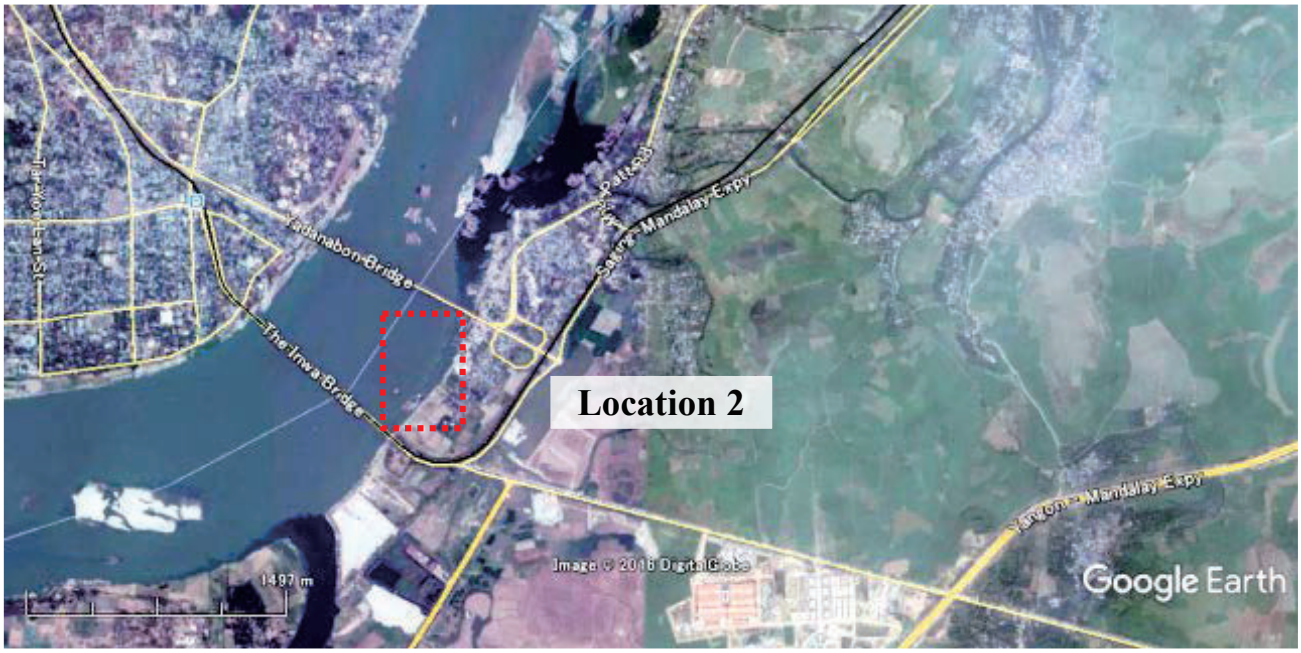
2. Descriptions of Candidate Port Locations

Location 1

Description

- **General:** This location was proposed in the Feasibility Study (JICA 2014).
- **Water Depth:** Jetty was proposed at the location -2.0m below lowest water level
- **Ground Condition:** Soil borings at 3 points were conducted. Soil condition is generally good.
- **Sedimentation Risk:** Relatively low.
- **Consistency to City Plan:** Consistent to the Mandalay Urban Development Conceptual Plan MOC Myanmar, 2013.
- **Future Expansion Area:** Wide space on dry river bed is available.
- **Influence to City Traffic:** Generally low. (access to Myo Patt Rd. proposed outer ring rd. by Conceptual City Plan 2016)
- **Social Environment:** There are a few seasonal farmers cultivating dry river bed during low-water season.
- **Land ownership:** Owned by government and under DWIR's administration. There is cultivated land for only dry season.
- **Construction Cost:** Feasibility Study estimated 3 ~ 4 Billion. JPY (30 ~ 40 Million USD)
- **Others:** EIA report had already been submitted to MONREC (to be confirmed).

Location 2



Description

- **General:** This location was proposed in the Urban Development Plan for Mandalay 2040 (JICA 2016). The port area is proposed to be between Yadanabon Bridge and Inwa Bridge.
- **Water Depth:** To be confirmed. It seems generally deep.
- **Ground Condition:** Availability of soil investigation to be confirmed.
- **Sedimentation Risk:** Low.
- **Consistency to City Plan:** Consistent to the Urban Development Plan for Mandalay 2040 (JICA 2016).
- **Future Expansion Area:** Limited between Yadanabon Bridge and Inwa Bridge. (350m x 700m; 24ha)
- **Influence to City Traffic:** Generally low. (access to proposed outer ring rd. by Conceptual City Plan 2016)
- **Social Environment:** There are many houses and cultivated land. Re-settlement will be required.
- **Land ownership:** Outside the land under DWIR's administration. There are houses and cultivated land for all seasons.
- **Construction Cost:** Lower than Location 1 (to be confirmed)
- **Others:** New bridge law should be confirmed. (the limitation of facility installation near to bridge foundation)

Location 3

Description

- **General:** This location is located approximate 30 ~ 40 km distant from Mandalay City Center.
- **Water Depth:** To be confirmed. It seems generally deep.
- **Ground Condition:** Availability of soil investigation to be confirmed.
- **Sedimentation Risk:** Low.
- **Consistency to City Plan:** Location is out of Mandalay City. Not mentioned in the City Plan.
- **Future Expansion Area:** Wide space in cultivated land is available.
- **Influence to City Traffic:** Generally low.
- **Social Environment:** Land area is the permanent cultivated land. Re-settlement will be required.
- **Land ownership:** Outside the land under DWIR's administration. There is cultivated land for all seasons.
- **Construction Cost:** Higher than Location 1 (to be confirmed). The cost for access road will be higher. (approximately 20 km of road improvement will be required)
- **Others:**

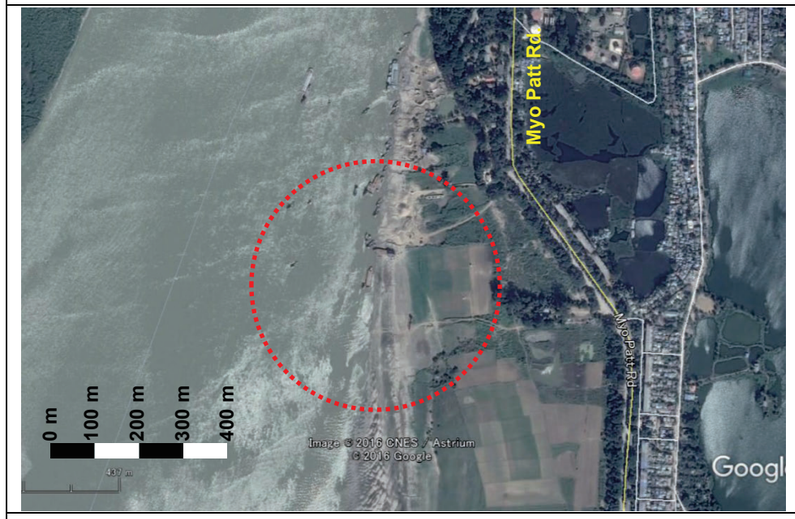
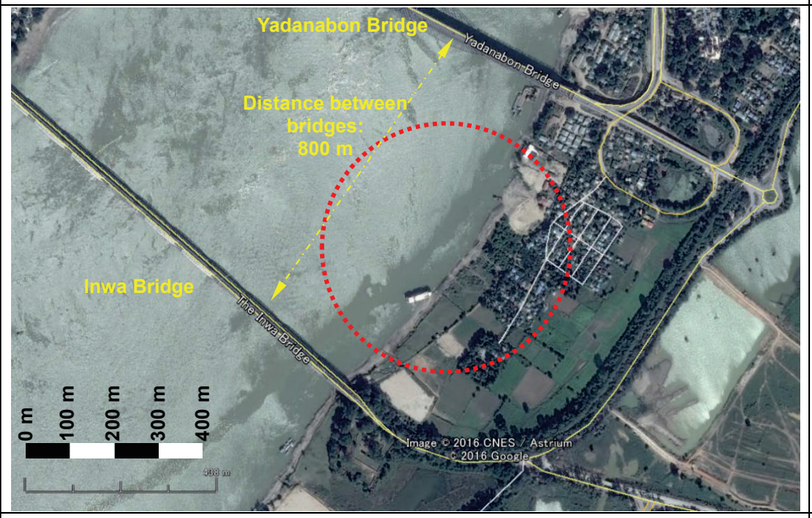
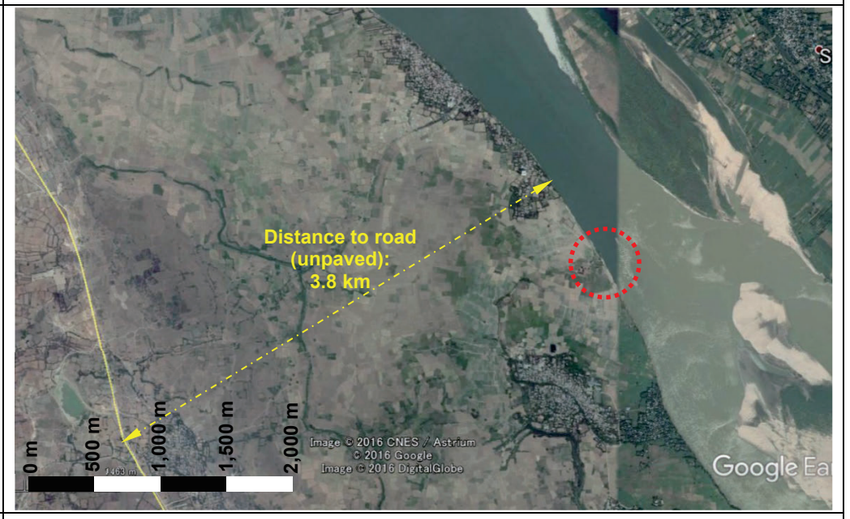
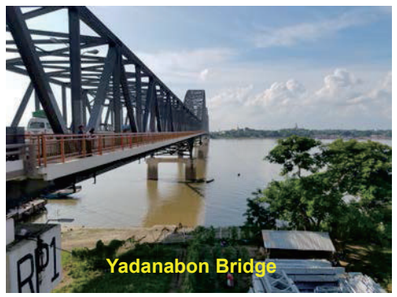
3. What are important criteria for decision making?

Following criteria and ratings will be discussed with DWIR/IWT and decision will be made by counterpart authorities.

(Example)

	Criteria		Sub-criteria	Location 1	Location 2	Location 3
1	Natural Condition	1-1	Water Depth	(rating)	(rating)	(rating)
		1-2	Sedimentation Risk	(rating)	(rating)	(rating)
2	Consistency to City Plan	2-1	Access to Industrial/Commercial Area	(rating)	(rating)	(rating)
		2-2	Influence to Traffic Congestion	(rating)	(rating)	(rating)
3	Future Expansion Area	3-1	Open Space Around the Location	(rating)	(rating)	(rating)
4	Construction Cost	4-1	Additional Cost Bared By Myanmar Side	(rating)	(rating)	(rating)
5	Environmental Impact	5-1	Resettlement	(rating)	(rating)	(rating)
6	Others	6-1	Legal Restriction, etc.	(rating)	(rating)	(rating)
Judgment				(A/B/C)	(A/B/C)	(A/B/C)

Outline of Candidate Locations

Location 1	Location 2	Location 3
		
		
		

Description		Description		Description	
General	F/S 2014 JICA	General	Urban Development Plan for Mandalay 2040 (JICA 2016)	General	-
Water Depth	-2.0m (rather shallow)	Water Depth	Shallow (less than -1.0m, advised by DWIR)	Water Depth	It may be deep enough (subject to survey)
Sedimentation Risk	Some risk but acceptable	Sedimentation Risk	There is some risk (advised by DWIR)	Sedimentation Risk	It may be less risk (subject to survey)
City Plan	Consistent to masterplan 2013 (MOC, MCDC)	City Plan	Consistent to Urban Development Plan (JICA 2016)	City Plan	Outside Mandalay City
Future Expansion	Wide dry riverbed exists behind port	Future Expansion	Rather small	Future Expansion	Wide farm field exists behind port
City Traffic	Connect to Myo Patt Rd. (Outer Ring of Mandalay)	City Traffic	Connect to Southern Outer Ring of Mandalay	City Traffic	Less influence
Resettlement	A few seasonal farmers	Resettlement	There are houses and farm field	Resettlement	There is permanent farm field at the port area
Land Owner	Government (DWIR)	Land Owner	Private owned (to be surveyed)	Land Owner	Private owned (to be surveyed)
Const. Cost	30 – 40 Million US$ (F/S 2014)	Const. Cost	Less than Location 1 (less access bridge/access road)	Const. Cost	High (long access road shall be constructed: 20km approx..)
Others	EIA report had already been submitted to MONREC (to be confirmed)	Others	The limitation of facility installation near to bridge foundation should be confirmed	Others	

6-3 Preliminary Assessment of Port Location

Preliminary Assessment of Port Location

1. Rating Table

The JICA Study Team has conducted the preliminary assessment based on the request by DWIR/IWT discussed in the meeting held on 16th February 2017 between JICA Study Team and DWIR/IWT officers. This assessment was prepared for the purpose to enhance further discussions in the Counterpart authorities lead by MOTC and for final decision of the port location.

No	Criteria	Location 1	Location 2	Location 3
1.	Natural Condition			
	1.1 Water Depth	B	C	A
	1.2 Sedimentation Risk/Maintenance Dredging	B	C	A
2.	Consistency to City Plan			
	2.1 Access to Industrial/Commercial Areas	A	A	C
	2.2 Influence to Traffic City Congestion	B	A	A
3.	Social Environment (Resettlement) & Implementation Schedule	B	B (-) ?	B (-) ?
4.	Future Expansion Area	A	B	A
5.	Construction Cost	B	A	C
6.	Safety of Ship Maneuvering	A	B	A
7.	Competitiveness against Rail/Road Transport	A	A	C
8	Legal Restriction	○	×	○
	Assessment (Preliminary)	A	C	B

Remark: A: suitable
B: fairly suitable
C: poorly suitable

2. Descriptions of Each Rating

1	1.1	(Water Depth) Location 1. : Rather shallow (-2.0m) ⇒ "B" Location 2. : Water depth become shallower in recent years based on the survey results. Location 3. : It is estimated the depth would be deep enough from river configuration (more than 2.0m) ⇒ "A"
	1.2	(Sedimentation Risk) Location 1.: There is a slight risk of sedimentation from the result of river-bed deformation analysis ⇒ "B" Location 2. : There are rather high risk for sediment. Location 3. : It is estimated the risk of sedimentation would be less than Location 1. from river configuration (river flow speed would be higher than location 1) ⇒ "A"
2	2.1	(Access to Industrial / Commercial Areas)

		Location 1.: The port is located southern center of city, where city commercial area is closed. It has access to southern industrial/logistic area by Myo Patt Rd. (assumed outer ring load of the city) ⇒ "A" Location 2.: The port is located closed to the future industrial/logistic area. The location is the proposed port area in the updated city development plan. ⇒ "A" Location 3.: The port is far from the city center (40km by roadway to commercial center, 17km to Tada-U junction of expressway) ⇒ "C"
	2.2	(Influence to Traffic City Congestion) Location 1.: The port is located along Myo Patt Rd. (assumed outer ring load of the city). The traffic of this road will be increased. ⇒ "B" Location2.: The port is located outside of high density traffic routes. Influence to the city traffic is rather small. ⇒ "A" Location 3.: The port is located far from the congested city roads. ⇒ "A"
3		**(Social Environment (Resettlement)) (Critical Factor; See Item 3)** **Location 1.: There are seasonal farmers in the port area. Though the area is state-owned, there are illegal private groups involving farmers by exchanging land with money, where total solution seems not easy at present. ⇒ "B"** **Location 2.: Part of the land is owned by the government authorities (MOC and MOTC), but the rest of the area is owned by local people. The requirement of 'resettlement' exists as Location 1. ⇒ "B"** **Location 3.: The port area is private-owned farmland, where land acquisition from farmers for port and access roads is necessary. ⇒ "B"**
4.		(Future Expansion Area) Location1.: Wide expansion area is available at dry riverbed behind the port. ⇒ "A" Location 2: Rather smaller expansion land space. Berth expansion will be limited as two bridges exist. ⇒ "B" Location 3.: Wide expansion area is available behind the port. ⇒ "A"
5.		(Construction Cost) Location 1.: The former F/S estimated 30 - 40 million US$ for construction, in which the cost for access road and jetty access bridges was required. ⇒ "B" Location 2.: From land configuration and water depth of the water front, the construction cost is expected to be less than Location 1. ⇒ "A" Location 3.: Port construction cost is estimated to be the similar level to Location 2. But the cost of access road will be big burden to the project. (approx. 4km new road construction, approx. 8km widening and road pavement, etc. will be required) ⇒ "C"
6.		(Safety of Ship Maneuvering) Location 1.: Easy ship berthing & de-berthing in the wide front water area. ⇒ "A" Location 2.: The possible risk for maneuvering and accidental damage to bridge pier should be carefully considered. It seems the maneuvering water area would be sufficient. ⇒ "B" Location 3.: Easy ship berthing & de-berthing in the wide front water area. ⇒ "A"

3. Preliminary Assessment by JICA Study Team

The counterpart authorities (DWIR and IWT) particularly emphasized the following points with respect to the port location.

1) Early implementation of the project is one of the highest required factors for the project. The target time frame is to be commencing operation of the port in the middle of 2020.
2) In order to minimize the negative impact to the local communities, the risks of social environmental impacts should be reduced as much as possible. It also enables to reduce the implementation cost burden to the Myanmar government side (land acquisition and compensation to the households, etc.) and to accomplish early

implementation of the project.

In this context, all the candidate locations seem to have similar challenges to be solved.
JICA Study Team assesses that Myanmar government should carefully survey the land ownership of the project site to clarify the requirement of the land acquisition and resettlement. If the involuntary resettlement and/or land ownership transfer will be necessary, A/RAP (agreement for resettlement of the local inhabitants) and land transfer shall be completed by the date of draft outline design scheduled on middle of November, 2017 and/or agreed deadline to be stated on the minutes of discussions.
The land shall be ready to use for the Project on or before the Tender Notice of the Project if the project is approved to implement by the Grant by the Japanese Government. The JICA Study Team would like to confirm the critical issues for decision making for port location during this initial site survey period as follows,

1) Time limit:
   Port location shall be decided by the end of March 2017, considering the time frame.
2) The most critical criteria:
   The most critical criterion to make decision is deemed to be the "Social Environment", which requires the budget and time for land acquisition and for resettlement.
3) Decision maker for port location:
   Decision maker is assumed to be DWIR (or MOTC as its governing authority), i.e., implementation authority for the project.
4) Decision making procedure:
   Decision maker is required to coordinate opinions of the relevant parties/authorities (such as MCDC, MRG and MOC) and to formulate the final decision of the port location.
5) Budget issue:
   If the land acquisition or compensation for resettlement of households will be necessary, the implementation authority is required to make a budget for such purpose.

JICA Study Team would like to discuss and confirm the concrete time-frame, task and responsibility to reach the final decision for the port location by Myanmar side by February 23, 2017, during the JICA Study Team stay in Nay Pyi Taw, based on the above confirmations.

Support by the JICA Team after the decision making

The decision making of the port location shall be made by the Government of Myanmar. The JICA Study Team will assist the counterpart authority for implementation of the social environmental solution by making a draft of A/RAP and a draft of IEE/EIA report to achieve the project be completed according to the timeframe.

4. Division of role with Development of Si Mee Khon Port (SMP) at Myo Tha Industrial Park City (MIPC)

Si Mee Khon Port (SMP) is being developed by Myo Tha Industrial Park City (MIPC) project and currently starting operation. This port will be open to public use. The port has the capacity to handle container/general cargo and transport route to Mandalay city is under development. The distance between SMP and Tada U expressway junction is approximately 70km.

The JICA Study Team has the opinion that the Mandalay Port should be required to contribute the future development of the city. The following points were obtained through the site visit survey and hearing opinions of the port users.

1) SMP is located far distant from Mandalay City (approximately 70km), where the road transportation cost will be burdened onto the inland water transportation cost. The price of transportation will not be competitive against the rail/road transportation. (opinion raised by Freight Forwarders Association)
2) The existing access road toward Mandalay City is not good condition. Access to the City or express way should need more investment for improvement. (from site visit survey)
3) SMP was mainly developed for MIPC, while it is open to public in order to raise the income from port operation. Mandalay Port will be solely developed as a public port for the Mandalay citizens to handle consumer related cargos to contribute the growth of regional economic growth. Two ports will have the different aims but the division of roles will be suitable for achieving total regional development. (from discussions with Mandalay Myotha Industrial Development Public Co., Ltd. (MMID))
4) The existing SMP facility is a floating jetty, which is still under improvement from engineering viewpoint regarding solution against river sedimentation. (from site visit survey)

Appendix 7: Explanatory Note for Selection of Structure Type of Jetty

Explanatory Note
for
Selection of Structure Type of Jetty
on
the Preparatory Survey
for
the Project for Development of Mandalay Port

1. Introduction

This explanatory note was prepared by the JICA Study Team to obtain understanding of counterpart authorities of Myanmar on the issue of selection of structure type of jetty for Mandalay Port. JICA study team would like to receive the final consent of the counterpart authorities on the type of jetty structure during the 2nd Field Survey scheduled in the end of April 2017.

2. Brief Explanation of the Past Study (FS 2014)

In the feasibility study on the project for development of Mandalay Port completed in 2014, two types of jetty structures (Floating type and Fixed type) were discussed.

The report described the advantage of floating jetty considering initial river port development which aims to introduce equipment cargo handling operation. The main advantage of the floating type is that the manual cargo handling is very easy because the height of ship's deck and surface of jetty top could be adjusted to the same elevation for all seasons. This discussion was derived from the existing circumstance that main type of the ships running inland waterway were "passenger-cum cargo ships" which has rooftop and were not suitable for equipment operation by using lifting crane. The Study Team of the feasibility study assumed that numbers of existing type of ships will not disappear very soon, and the large sized floating jetty was designed (L 90 m x W 25 m) so that lifting crane (100 tons capacity) should be workable with less sway and movement of floating jetty, while conventional worker's manual cargo handling should also be very easy.

However, the feasibility study pointed out the serious risk of the floating type jetty that river siltation might cause damage on the floating body. If the water depth under the large floating jetty would become shallower than the draft of the floating jetty, the jetty bottom will touch to the riverbed, which causes uneven bending moment in the floating body and may cause damage. It is not easy to repair the large floating body if this risk occurs.

The feasibility study conducted a numerical analysis (preliminary level) of riverbed movement around the planned jetty location for flood season in order to estimate the risk of siltation. The result of the analysis implied some risk of siltation though the risk was not crucial.

Feasibility study had not reached a conclusion, recommending further accurate analysis and continuous observation of riverbed movement at the jetty location to finalize the type of jetty structure.

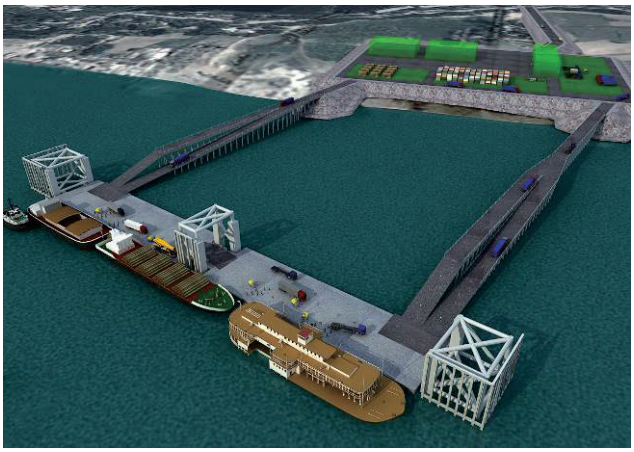


Fig.1 Floating Type Jetty

Fig.2 Fixed Type Jetty

3. Updated Recommendation by JICA Study Team

JICA Study Team of this Preparatory Survey reviewed the updated data and information for the assessment on the selection for the type of jetty structure. They would recommend that the jetty for Mandalay Port should be designed as the fixed type, considering the following points are the most critical factor.

1) Future demand of container handling should be considered. Fixed type jetty will achieve better handling efficiency than floating type jetty.
2) The risk of damage for floating jetty due to siltation of the riverbed is crucial, observing yearly change of riverbed during flood seasons.
3) Because the Mandalay Port is a pilot project for further application to the other river ports, the structure should be designed with less maintenance and repairing. In this viewpoint, fixed type jetty is thought to be more suitable for Mandalay Port.

4. Comparison Table and Evaluation Criteria

(1) Comparison Table

Followings are the evaluated comparison table of floating type and fixed type structures.

Table 1. Comparison Table

Criteria		Floating Structure	Fixed Structure
Applicability to Cargo Type	Container	B	A
	General Cargo	A	A
	Passenger	A	B
Applicability for River Bed Deformation		C	B
Ease of Maintenance & Repairing		B	A
Duplicability to Other River Port		A	A
Construction Cost		(under re-estimate)	A

Remark: A: suitable
B: fairly suitable
C: poorly suitable
Items with high priority

(2) Explanation of Criteria

Outlines of the evaluation criteria in Table 1 are as explained in below. Reasons and viewpoints to determine the Suitability (A, B or C) are explained in Item 5 below in detail.

1) Applicability to Cargo Type

a) Container **(high priority)**

From current trend of cargo transportation as well as recent rapid economic growth of Myanmar, the demand for container cargo transportation will be raised very soon[1]. Therefore, it is considered the priority of container handling facility in Mandalay Port should be high.

b) General Cargo **(high priority)**

Existing major cargoes are bagged cargo (rice, beans or cement). These cargoes shall be handled by new jetty.

c) Passenger

It is pointed that the jetty is designed primarily for cargo handling. It is noted that passenger will face a danger of accident if both operations (passenger and cargo) are carried out at the same time. In addition, passenger operation has less revenue benefit for the port operator's side.

2) Applicability for River Bed Deformation **(high priority)**

Floating structure will have the serious risk of damage if the body of jetty touches on the riverbed ground during dry season.

Fig. 3. Image of Damage to the Floating Jetty due to Siltation

Fig. 4. shows the image of damage to the jetty structure. When riverbed touches to the floating jetty, strong bending moment will act to the body which causes damage. When it is damaged, repairing will should be made in the dry docks. The dredging of the riverbed shall be made after the floating jetty moved from the place.

[1] The following facts were confirmed during 1st Field Survey.

- Myanmar Industrial Development Visions (MIDV: METI Japan) proposes to develop inland waterway network to strengthen the function of national transportation which will support the growth of industries. In practice, it will be important to develop waterways, inland ports and inland logistic bases (such as ICD; Inland Container Depot), etc.
- One of the on-going projects "Rehabilitation and Modernization of Yangon - Mandalay Railway" (JICA project) will make the rail carry containers from Yangon to Mandalay, which will be completed in the middle of 2020's. The project is to fulfil the future demand of container transportation between Yangon and Mandalay. Inland waterway will also be able to lead such demand of transportation.
- SA Marine Co. started container transport service by river barge from Thilawa MMIT to the Industrial estate located north Yangon, cooperated with IWT. SA Marine Co. expresses its intention to work for container barge transportation between Yangon and Mandalay when Mandalay Port was constructed.

3) Ease of Maintenance & Repairing **(high priority)**

The maintenance of the structure is important for both types of jetty structure. However, the easy-maintenance structure will be suitable for this project from the following points of view.

- IWT and DWIR are not used to manage maintenance & repairing of jetty structures
- If it is assumed that the similar type of structure would be applied to the future smaller inland ports, the structure should be designed for maintenance-free as much as possible.

4) Duplicability to Other River Port

Mandalay Port Project has the aim of a pilot project for inland waterways in Myanmar. The similar type of structure will be referred to other river ports in future. Therefore, the structure type should be easily applied to the other ports under the similar design conditions.

5) Construction Cost

Under the assumption that the floating deck was to be fabricated outside Myanmar, estimated the construction cost of floating type jetty higher than fixed type jetty[2]. However, the facility of manufacturing in Myanmar has been much developed recently, domestic fabrication will be possible at present.

It is assumed both fixed type and floating type will be constructed in similar cost burden within the project budget.

5. Detailed Explanation on Comparison Table

1) Applicability to Cargo Type

a) Container

✓ Suitability:

Floating (C): If the lifting equipment was designed for 40 ft container handling, 200 ton class capacity will be required. The Fig. 3 shows the image of 200 ton class crane is equipped on the floating jetty. From theoretical stability calculation of floating body, crane boom mounted on the floating jetty will sway approx. 50 cm when it lifts a 30.4 tons 40 ft container, which will cause the reduction of cargo handling efficiency.

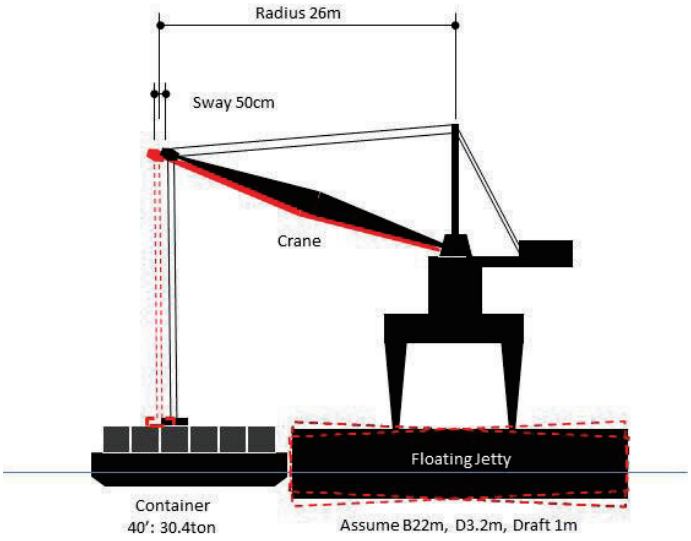


Fig. 4 Image of Sway for Floating Type Jetty

It is roughly estimated that 15~30% of cycle time will be extended due to the time required for

[2] In the FS study 2013, the floating deck was assumed to be fabricated outside Myanmar, which was the reason of high cost estimate.

stabilization of the jetty for handling next container.

Fixed (A): Fixed structure supports the lifting crane without swaying, the cargo handling efficiency will be higher than floating type jetty.

b) General Cargo

✓ Suitability:

Floating (A): Manual cargo handling is very easy and cargo handling.

Floating jetty is easy for cargo handling of currently operating "passenger-cum cargo ships" which has rooftop type.

Fixed (A): There are no risks for handling general cargo for both types of jetty.

c) Passenger

✓ Suitability:

Floating (A): Floating jetty can accommodate passengers easily.

Fixed (B): Passengers will have to climb up staircase to about 10 m higher deck level from passenger ship during dry season.

2) Applicability for River Bed Deformation

✓ Suitability:

Floating (C): Observing the annual movement of riverbed configuration from survey data (by DWIR), the riverbed is continuously moving, where high spots are moving downstream to some hundreds meters during every rainy season. For the candidate area (Location 1) as an example, approximately 2 m change in the depth was observed referred to the bathymetric data from 2012 to 2016 (minimum -2.0 m, maximum -4.0 m) . There is the risk of damage to floating jetty in the candidate area.

Fixed (A): Fixed jetty will have less risk of damage due to riverbed movement. Deck structure is supported by piles, where no unexpected force will act to the jetty.

3) Ease of Maintenance & Repairing

✓ Suitability:

Floating (B): Floating-type jetty contains movable joints between access-bridge and floating jetty. Berthing force of cargo barge will cause a risk of damages to these movable joints. Frequent inspections, maintenances and repairing works will be required.

Fixed (A): Fixed jetty will have less risk of damage because it has no movable joint.

4) Duplicability to Other River Port

✓ Suitability:

Floating (A): Floating jetty is suitable for applying to the other ports, where the port has a small to medium scale of cargo handling volume. Medium size of lifting equipment (approximately 100 ton

capacity crane or less) could be applied for equipment cargo handlings.

Fixed (A): Fixed jetty is suitable for applying to the other ports, where cargo volume is large. In such ports, heavy equipment with high efficiency will be required. Considering container handlings, more than 200 t capacity crane will be required.

5) Construction Cost

- ✓ Suitability: Floating (A), Fixed (A): Both types are assumed to be constructed within the budget. (A)

6. Study from Past Projects

1) General

Here, several projects were described to be referred to the decision of structural type of the jetty for Mandalay Port. Typical river ports are selected with the similar natural conditions. Two domestic ports were also described in along Ayeyarwady River.

2) Projects in Overseas

2)-1 Phnom Penh Port Cambodia - Fixed Type Jetty

Fig. 5 Old Port (Phnom Penh Port)

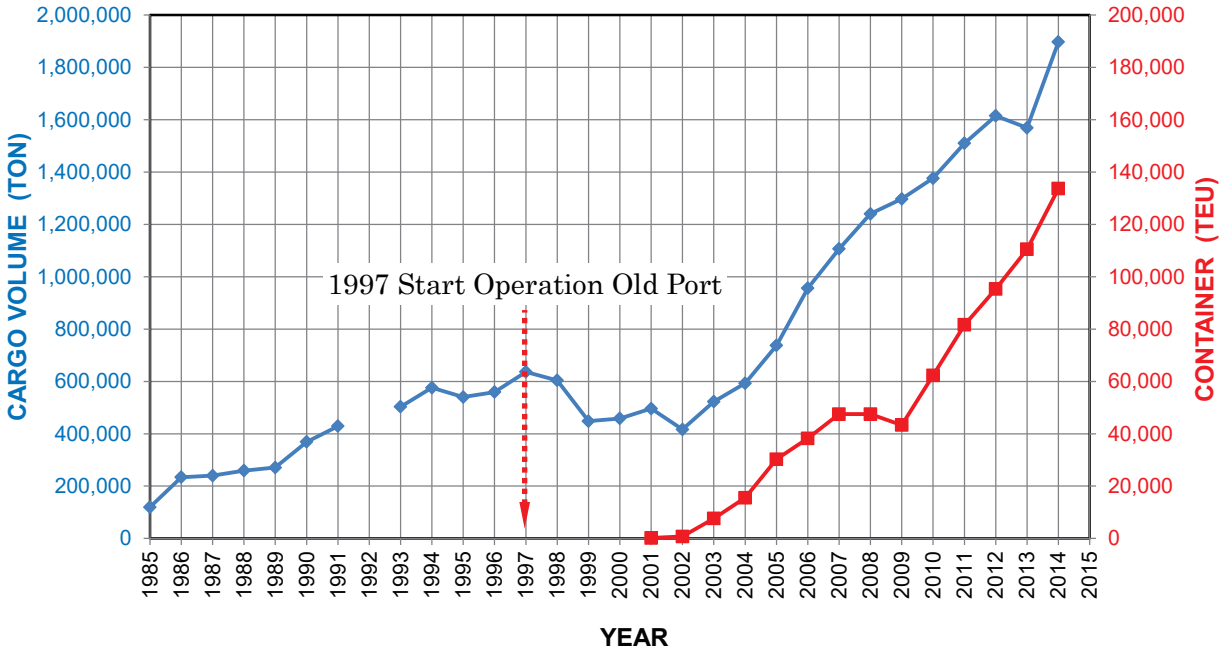
Fig. 6 New Port (Phnom Penh Port)

The Port of Phnom Penh was built in 1990's by Japan's Grant-Aid project. Considering the scale of the city (Phnom Penh has approx. 2 million population) and the fact that the port was designed for the initial introduction of equipment cargo handling to the existing manual operations before building port, the project of Mandalay Port is similar to the Phnom Penh Port in terms of its scale and purpose of the project.

In the case of Phnom Penh Port, the total cargo volume during the opening of the port (Old Port, end of 1996 start operation) was approximately 600,000 tons/year. Before opening this port, all cargoes were handled by labors without equipment, which is similar to the condition of the present Mandalay Port.

After installation of crane equipment, the cargo volume has been rapidly increased, particularly the port became to handle containers. The containerization has been rapidly spread taking the event of this project, as shown in the Fig.7 below, the latest handling volume is approximately 130,000TEU/year (2014).

Taking into account the rapid increase of the cargo volume, Port Authority has built a new port facilities at 30km downstream of Mekong River in 2013 (New Port). New Port is equipped with the rail-mounted quay gantry cranes which can handle both container and general cargoes.



2)-2 Jambi Port, Indonesia - Floating Type Jetty

Fig 7. Jambi Port

Jetty of Jambi Port was designed as floating type in initial phase to accommodate 1,000 DWT barge (approx. L 40 m B 16 m D 2.5 m). Since initial opening of the port, there have been frequent damage and repairing at movable joints between bridge and floating jetty. In order to deal with the increasing cargo volume, the port constructed fixed type jetty to accommodate large vessels, while the initial floating type jetty is currently used for smaller vessels (up to 200 DWT).

3) Projects in Myanmar

3)-1 Semeikhon Port, Myanmar - Floating Type Jetty

Fig 8. Semeikhon Port

Fig 9. Semeikhon Port (Movable Bridge)

The floating jetty was installed at the port in 2016. During flood season in 2016, the surrounding area of jetty was suffered from river siltation. A remedial measure against future siltation is under construction at present. It is needed to see the effect of remedial measure until full operation will be achieved.

3)-2 Takaung Port, Myanmar - Fixed Type Jetty)

Fig. 9 Takaung Port

Takaung jetty was built for private nickel factory. The jetty is used for loading container cargoes enclosing nickel mine products. (Takaun jetty will be surveyed during the 2nd Field Survey scheduled in the end of April)

4) Summary and Recommendation from the past projects

Looking through the aforesaid typical river port projects, the following points are raised.

- In order to achieve convenience in cargo handling under the conditions of large change in water levels of river port, floating type jetties were installed such as Jambi Port and Semeikhon Port. However, Jambi was required to carry out frequent repairing, while Semeikhon is still conducting remedial measures against siltation of the river. Both floating type jetty projects needed much effort for practical operation.
- Phnom Penh Port is one of the similar projects of Mandalay Port, where fixed type jetty was installed during transition period between primitive manual cargo handling and utilization of heavy equipment.

Fixed type jetty is useful for heavy equipment because the jetty is not moving or swaying caused by wave, current or operation of equipment on the top of jetty, in which higher rate of operation could be achieved. It is thought to be a successful project where fixed type jetty was installed in the initial development stage of river port development.

- In Ayeyarwady River, both floating and fixed type jetties are in operation. Floating jetty in Semeikhon faces troubles by unforeseen river siltation affects and is still under construction of remedial measure at present. Takaung jetty seems in normal operation by using gantry cranes for container handling (to be confirmed in 2nd Field Survey).

From these observations, JICA Study Team would like to recommend to adopt the fixed type jetty for Mandalay Port, considering the scale of existing cargo volume, size of the city and natural river conditions regarding siltation of Ayeyarwady river.

Appendix 8: Basic Descriptions of Port Management and Operation

8-1 Discussion Paper on Management and Operation of Mandalay Port

Discussion Paper
on
Management and Operation of Mandalay Port

1. Basic Description on Port Management and Port Operation

(1) Port Management

Port management means to undertake public functions on the port activities, usually undertaken by Port Authority, such as;

1) own infrastructure including major equipment
2) allow vessels to berth and collect port charge for berthing
3) undertake maintenance and repairing (M&R) for the infrastructure
4) future port planning, port statistics monitoring
5) authorize port rule/regulation and port tariff
6) manage/control private operators under the contract.

Activities of port management, except for 2) and 6), do not create any income, and thus are usually undertaken by public sector.

(2) Port Operation

Port operation refers to the actual cargo handling operation employing port workers and investing required equipment.

Port operation can be done either by the public sector or by the private sector as it creates cash flow.

2. Options of Port Management Model for IWT

2.1 Port Management Models

(1) Basic Port Management Models

Style of port management is classified into four categories as shown in Table 1.

Table 1. Basic Port Management Model

Type of Management	Infrastructure	Equipment	Port Labor	Example
Public Service Port	Public	Public	Public	Colombo, JN, Dar es Salam
Tool Port	Public	Public	Private	Chittagong
Landload Port	Public	Private	Private	Rotterdam, Antwerp, New York, Singapore (MITT Yangon)
Private Service Port	Private	Private	Private	Ports in UK, New Zealand (Semeikhon)

(2) Public Service Ports

Service ports have a predominantly public character. The port authority offers the complete range of services required for the functioning of the port system. The port owns, maintains, and operates every available assets (fixed and mobile) and cargo handling activities are executed by labor employed directly by the port authority. Service port are usually controlled by (or even part of) the ministry of transport (or communications) and the chairman (or director general) is a civil servant appointed by or directly reporting to, the minister concerned.

(3) Tool Ports

In the tool port model, the port authority owns, develops, and maintains the port infrastructure as well as the superstructure, including cargo handling equipment such as quay cranes and forklift trucks. Port authority staff usually operates all equipment owned by the port authority. Other cargo handling on board vessels as well as on the apron and on the quay is usually carried out by private cargo handling firms contracted by the shipping agents or other principals.

(4) Landlord Ports

The landlord port is characterized by its mixed public-private orientation. Under this model, the port authority acts as regulatory body and as landlord, while port operations (especially cargo handling) are carried out by private companies.

(5) Private Ports

Fully privatized ports (which often take the form of a private service port) are few in number, and can be found mainly in the United Kingdom (U.K.) and New Zealand. Semeikhon port is categorized private port. Full privatization is considered by many as an extreme form of port reform. It suggests that the state no longer has any meaningful involvement or involvement or public policy interest in the port sector. In fully privatized ports, port land is privately owned, unlike the situation in other port management models. This requires the transfer of ownership of such land from the public to the private section. In addition, along with the sale of port land to private interests, some governments may simultaneously transfer the regulatory functions to private successor companies. In the absence of a port regulator in the U.K., for example, privatized ports are essentially self-regulating.

2.2 Option Models for IWT

2.2.1 Focus

Under this Project, port facilities and cargo handling equipment are planned to be implemented and procured by the Japanese Grant Aid, and IWT is the responsible organization of the operation and maintenance of the port facilities and cargo handling equipment after completion of the Project.

In this stand point, “Public Service Port” or “Tool Port” management models are suitable and recommendable for port operation by IWT.

If the port operation is made by “Land Load Port”, equipment operation (equipment procurement itself in some case) and terminal operation are conducted by private sector. In such a case, port service tariffs are generally expensive because the costs for operation and maintenance, initial investment (equipment procurement cost as an example) will be add on the service tariffs such as cargo handling service charges, cargo storage service charges and so on.

Mandalay port is a domestic port and domestic port services generally stands on the policy of more accessibility to the public and less profitability, since conservation of domestic industries, public service fees are commonly set in the very cheap range compere with those of international ports.

Additionally, waterway transportation will face hard competition against road transportation services. If river port service set high tariff rates, the cargo demand will go to road transport.

Because of these conditions, to provide inexpensive service tariffs is important role of Mandalay port. Therefore, “Public Service Port” or “Tool Port” are suitable models to operate under the less profitability policy.

2.2.2 Options

(1) Option-1 Public Service Port

Model Description: IWT owns infrastructure, cargo handling equipment and cargo handling operation is done by IWT staffs or IWT employed port workers.

Merits: ・All management and operation activities are the responsibility of the same organization (IWT's unity of command).

Demerits: ・There is a risk of lacking of internal competition, leading to inefficiency
・Operations are not user or market oriented
・Operation and maintenance works may conduct less innovation

(2) Option-2 Tool Port

Model Description: IWT owns infrastructure, cargo handling equipment, and makes contract with private company to supply port workers.

Merits: ・All investments of port infrastructure and equipment are decided by the public sector (IWT), thus avoiding duplication of facilities.

Demerits: ・The port administration and private company jointly share the cargo handling services. This operation (split operation) may lead to conflict situations.
・Private operators do not own major equipment, and thus are unconcerned about future expansion of services.
・There are similar risks as Option-1, operations not being market oriented and lack of innovation.

2.2.3 Necessary Preparations and Actions by IWT Prior to the Port Operation

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.
In this regard, Myanmar side is requested to ensure and to commit for the operation and to take proper actions and preparations for the operation and maintenance.

To start the port operation and management, IWT shall be prepared the following items.

- ✓ To establish organizations for port operation and management,
- ✓ To reserve and train human resources, and if the port will be managed by tool port, it is necessary to hire of operators/labors for cargo handling works from private firm(s),
- ✓ To manage finances such as budget allocations and executions, to collect service fees etc.,
- ✓ To confirm and/or establish applicable laws and/or regulations

- ✓ To establish operation, maintenance manuals, equipment manuals and other necessary manuals and/or guidelines,
- ✓ To conduct port, equipment and other necessary operations such as cargo handling, port and terminal operations,
- ✓ To conduct periodical inspections and maintenance of port infrastructures, equipment and other assets in the port, and
- ✓ To conduct other necessary port administrative works such as personnel affairs, general affairs, port statistical affairs and so on.

Whichever the port operation will be conducted by "Public Service Port" or "Tool Port", above mentioned matters shall be ready to perform prior to the port operation which is expected middle of August, 2020.

3. Points to be Discussed

(1) What is the important role of IWT for Mandalay Port management ?

With respect to discuss the type of management organization, it is quite important to consider the following role of the management body of Mandalay port.

1) Primary role of Mandalay Port project is to introduce modern cargo handling system and equipment to the existing primitive way of labor force cargo handling.
2) The second role of the project is to be a pilot project of the river port management system for other river ports to be developed in future.

These roles are purely public (governmental) considerations, thus port management and operation should be led by the public sector (such as IWT) with limited private sector involvement.

(2) Is initial operation of Mandalay Port profitable ?

In the beginning term of port operation, it will not be easy to obtain enough profit from operating revenue. The following reasons are pointed out.

1) Service fees will be less than those of international ports

   From the point of conservation of domestic industries, public service fees are commonly set in the very cheap range compared to those of international port terminals in other countries. In the feasibility study in 2014, the berthing fee and port charges were assumed to be set at 50% of international ports. Therefore domestic port services stands on the policy of more accessibility to the public and less profit ability.

   Whilst international port terminal can obtain revenue in foreign currency (usually in US$), domestic port service can obtain only local currency (MMK) for revenue.

   These factors might decrease the interest on port operation business for private sectors.
2) Competition against other transport mode

   The major benefit of waterway transport is the cheap unit cost by enabling large volume of cargo transport

using barges. However, it has the weakness of longer transportation time and lack of door-to-door services like truck transportation (road transport). Waterway transportation will face hard competition against road transportation services. If river port service set high tariff rates, the cargo demand will go to road transport. In order to keep the sustainable growth of the waterway business in accordance with the government policy, port service fee should be set in the low range, i.e., port operation could face less profit.

The port operation business of domestic river port may not always be attractive for the private sector, particularly for major foreign operators.

It is necessary for governmental authority to control river port management setting lower port fees under the circumstance with less competition of domestic market, which is different from the international port always facing to competition with other international ports.

(3) What kind of organization is needed ?

In the practice of the port management and operation, the management body should have the public functions, while the operation body should concentrate on cargo handling efficiency and earning revenue/saving expenditure. For example, the organization should have the following scale of employment. For the case of Option 1 (Public Service Port), IWT directly employs all staffs & workers. For the case of Option 2 (Tool Port), equipment operators and workers should be outsourced by employing through an employment agency. For the case of Option 2' (Tool Port operated by JV including IWT), the operation body will be undertaken by Joint Venture between IWT and private operator.

Example of Organization

●Management Body

Function	Staffs
- Management organization	2
- Legal/contract	1
- Tariff/port regulation	1
- Finance/accounting	3
- Port planning	3
- Port statistics	3
- Maintenance facilities	3
- Safety management	2
- Environmental protection	2
(Total)	20

●Operation Body

Function	Staffs
- Management organization	2
- Administration/cargo document	5
- Accounting	5
- Operation control (office)	10
- Equipment operators	15
- Foremen & workers	100
- Warehouse control	5
- Warehouse workers	20
- Workshop workers	10
(Total)	172

4. Next Step

(1) Selections of Port Management Option

Considering the public role of Mandalay Port development project and that the scale of the initial development is not large enough for privatization, Option 1 (Public Service Port) or Option 2 (Tool Port) seem to be the most suitable options. However, the final decision could be made by IWT.

(2) Preparation for Port Operations

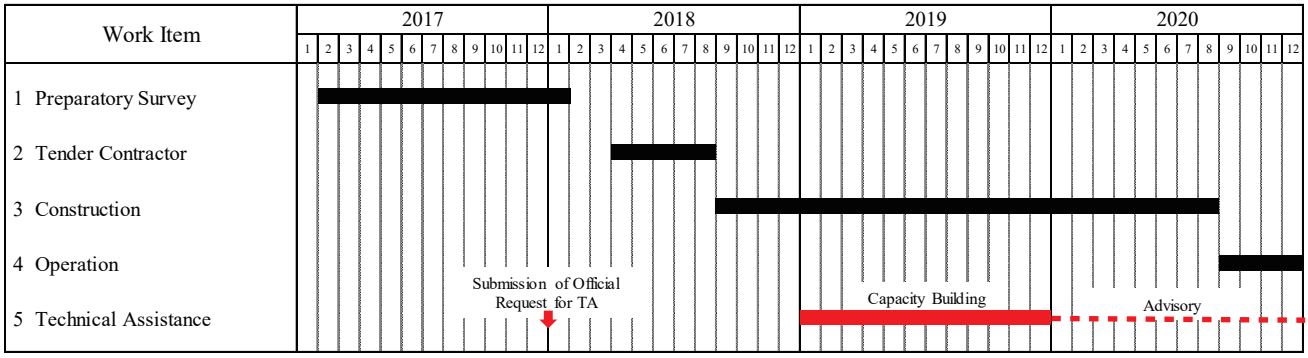
After the decision of the port management option, it is necessary to establish the port management system including i) to establish organization, ii) to reserve human resources and budget allocations, iii) to establish the rules and regulations, guidelines and manuals for operation and maintenance (including ship allocations, cargo handling, passenger traffic management, asset management, port administration, port statistical recordings, etc.) and others accordingly. Based on these preparations, the port operation and maintenance works shall be ready before opening the Mandalay port which is expected middle of August in 2020.

(3) Capacity Building by JICA Technical Assistance

Taking into account the present capability of IWT for port management and operation, where IWT has no experience in such activities, therefore, it is very tough to develop the port management system by IWT by themselves. Therefore the consultant team pointed out that to receive technical assistance by JICA is one of the option to start with the capacity development of the port management by IWT.

To receive the technical assistance by JICA, official request from the government of Myanmar is necessary and the request shall be adopted by the Japanese side. The proposed schedule of the technical assistance is shown below.

Proposed Schedule of Technical Assistance (Preliminary Idea)



5. Items to be Confirmed during Second Field Survey Mission

(1) Financial Records of IWT

For the purpose of investigating the financial capability of the executing organization, JICA Study Team requests IWT to provide financial records for 10 years. An example format of the financial record is attached to this document.

(2) Laws and Regulations to implement the Port Management and Operation

JICA Study Team needs to confirm whether each type of management structure is consistent with Myanmar's national law. If any insufficient laws/regulations for the port management and operation were found, it would be necessary to prepare them before commencing the port operation.

Table 2. Check List for Legal Consistency

Type of Management Structure	Common Item	For Each Structure
Option 1. Public Service Port	✓ Legal document for the establishment of IWT ✓ Legal restrictions for IWT to be port management body ✓ Legal restrictions for IWT to become owner of port facility and equipment ✓ Legal restrictions for establishing port regulation (if any conflict against DWIR regulation)	✓ Legal restrictions for IWT to be the port operator by direct employment of staffs/workers
Option 2. Tool Port		✓ Legal restrictions for tendering labor supplier or port operator

Attachment

1. Copy of “Port Reform Toolkit” Module 3
2. A sample form of financial records of IWT

Attachment 2: A sample form of financial records of IWT

Revenue	2013	2014	2015	2016	2017
Deferred revenue/Authorized income					
Rental income					
Interest income					
Income from operation					
Tag boat					
Cargo transport					
Passenger					
Sand income					
Equipment hired					
Slipway					
Floating restaurant					
Other income					
Gain/Loss on sales of fixed assets					
Total Revenue					

Expenditure	2013	2014	2015	2016	2017
Operational expenditure					
Audit fees					
Board expenditure					
Salaries and wedges					
Employees benefit					
Staff bonus					
Finance costs					
Other professional fees					
Loss on disposal of fixed assets					
Loss on foreign exchange					
Total operational Expenses					

Note: above items are example purpose only.

October 24, 2017
Ref. No. 635R6710/DOD/013

Attn. Director General
Directorate of Water Resources and Improvement of River System (DWIR)
Attn. Managing Director
Inland Water Transport (IWT)

Sub: Recommendation on the Port Management and Operation
Re: The Preparatory Survey on the Project for Development of Mandalay Port

Thank you for your continued and unwavering support for the Preparatory Survey on the Project for Development of Mandalay Port.

In reply to your letter subjected "Tool Port for Management and Operation of Mandalay Port" on June 7, 2017 (Your Letter No. 222(a)/Ah Kha Na/Ah Kha-13(1)/2017) and "Management and Operation of Mandalay Port" on September 20, 2017 (Your Letter No. 222(b) / Ah Kha Na/Ah Kha-13(1)/2017), we would like to recommend you to prepare your staff and budget allocations as our paper "Proposed Initial Organization and Budget Estimate for Operation of Mandalay Port" as attached in this letter.

In our proposal, it is expected that the port operation will start from August/September in 2020. In the first year's operation, it will be necessary 100% financial support by the Myanmar government, but from the second year, operational revenue will be obtained by proving port services, accordingly, such financial support will be able to reduce, where it is estimated 50% support for second year, and 25% in third year. The final goal is to establish the self-supporting management system of the port.

In parallel with the construction works which is expected to start from December 2018, we would propose you to start your preparation works from July/August 2018, including Technical Assistance that you are currently requesting to JICA. To make sure the preparation works, we would like to point out the following important points for your considerations;

1. Staff allocations

   Referring to the Employment Plan in the Proposed Initial Organization and Budget Estimate for Operation of Mandalay Port as attached in this letter, please assign core staff members who are preferably going to work in the new department "River Port Operational Department" and to involve for preparation of the organizations for management and operation of Mandalay port, so that we can make discussions with your core staff members how to develop the port management and operation of Mandalay Port.

2. Budget allocations

   As we were notified that your draft budget making should be by the end of October, please make sure to add your budget (2018-19) for the activities of preparation of opening Mandalay Port. As indicated on our paper, the estimated budget required for 2018-19 is US$ 28,500 (MMK 39,000,000, US$ 1.00 = MMK 1,371).

For further breakdown details of the estimated budget, please refer to our paper as attached herewith.

Joint Venture of Oriental Consultants Global Co., Ltd., Pacific Consultants Co., Ltd., and Fukken Co., Ltd.
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We would like to make further discussions in our next visit to Myanmar in coming November, 2017, or earlier to the visit through by e-mails and/or phone calls, or other appropriate method.

Thank you very much in advance for your kind attention.
Please do not hesitate to contact us if you have any queries on this matter.

Yours Faithfully,

Masahiko Koshimizu
Chief Consultant
Oriental Consultants Global Co., Ltd.
on Behalf of the Preparatory Survey Team

Attachment 1: Proposed Initial Organization and Budget Estimate for Operation of Mandalay Port
2: Your Letter on June 7, 2017, "Tool Port for Management and Operation of Mandalay Port" (Your Letter No. 222(a)/Ah Kha Na/Ah Kha-13(1)/2017)
3: Your Letter on September 20, 2017, "Management and Operation of Mandalay Port" (Your Letter No. 222(b) / Ah Kha Na/Ah Kha-13(1)/2017)

CC: 1: Minister of Transport and Communications
2: Permanent Secretary, Ministry of Transport and Communications
3: JICA Myanmar Office
4: JICA headquarters
5: OCG, Myanmar Office
6: File

Proposed Initial Organization and Budget Estimate

for

Operation of Mandalay Port

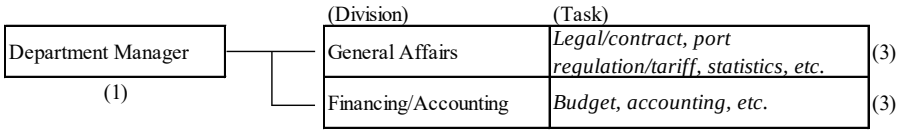
1. Organization

The following chart shows the proposed organization for initial operation of Mandalay Port assuming IWT will be the port operator under the management style of "Tool Port".

- ✓ IWT H.Q. will make a new department "River Port Operational Department" which covers regional river ports including Mandalay port and future developed river ports. Number of staffs required for the new department is estimated at 7.
- ✓ IWT will place "Mandalay Port Office" at Mandalay port. Number of staffs required for the port office is estimated at 32.
- ✓ Equipment operators, foremen, workers, workshop technicians and their management staffs are recommended to outsource such as Worker's Association or local labor-supply company. It is recommended to employ workers form existing riverbank workers in order to reduce the risk of labor dispute due to new port opening.

IWT H.Q. Yangon Total staffs = (7)

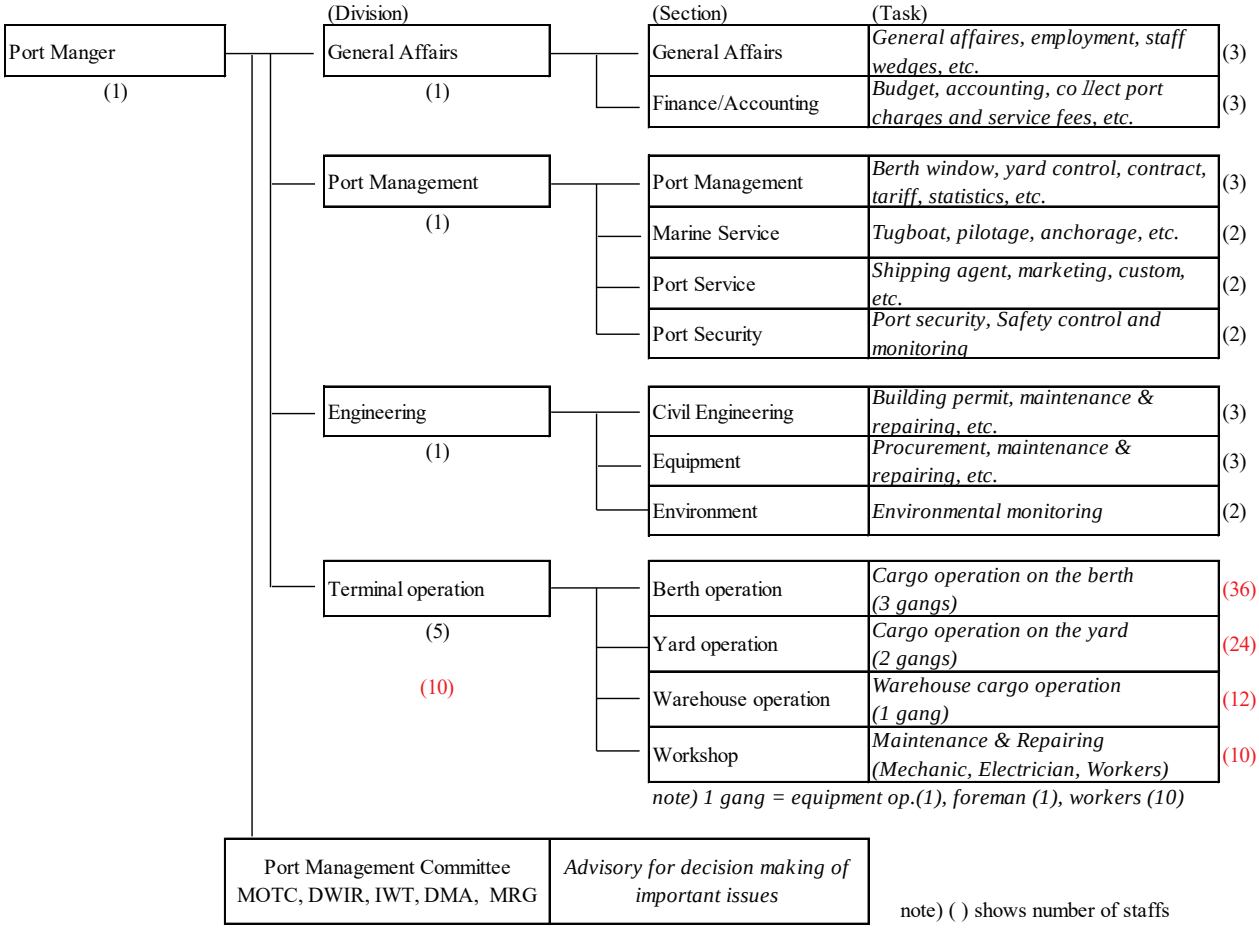
River Port Operational Management Department



IWT Mandalay Port Office

Total staffs (direct employment) = (32)

(contract terminal operation)= (92)



note) 1 gang = equipment op.(1), foreman (1), workers (10)

Port Management Committee MOTC, DWIR, IWT, DMA, MRG	*Advisory for decision making of important issues*

note) ( ) shows number of staffs

2. Budget Estimate

The following tables show the estimated initial government budget required for starting Mandalay Port operation. Basic assumptions are as follows.

- ✓ Exchange rate of MMK is assumed at 1 USD = 1,371 MMK.
- ✓ The government will support for preparation stage mainly staff employment, initial procurement and operational expenses for the first year of operation. In the following years (2022-), Mandalay Port Office will run the operation covering the expenses by earning revenues while government budget will be reduced.
- ✓ For FY2018~2020, government will employ core staffs and train for opening Mandalay Port. The numbers of staffs will be started with 7 members (see attached employment plan), and it will be increased to 39 members until the middle of 2021.
- ✓ Cargo volume is assumed to be started with approximately 100,000 tons/year in the first operation year, then it is assumed to be increased by 50,000 tons for the following years. Initial phase will be started with only daytime operation. The night works will be started when the cargo volume will exceed approximately 200,000 tons per year..
- ✓ Initial Procurement budget covers required office furniture, small equipment for workshop, a 2t-truck for maintenance works, and 2,300 pieces of pallet for warehouse.
- ✓ As an option, if the government intends to stimulate containerization for inland waterway, it is recommended to procure container boxes in the initial phase of operation. Initial required numbers of container and its budgetary cost are estimated;

  Numbers of 20' container = 150 containers (Full loaded on 2,000T barge) x 2 units = 300 containers.

  Estimated cost of procurement containers = 300 x 1,500USD = 450,000 USD (612,000,000 MMK)

Budget Estimate (USD)

F Year	Staff Employment	Initial Procurement	Cargo Operation	Total	Gov. Share	Mandalay Port Share	Government Budget
	USD	USD	USD	USD	%	%	USD
2018-19	28,411			28,411	100%	0%	28,500
2019-20	75,761			75,761	100%	0%	75,800
2020-21	137,994	147,324	168,648	453,966	100%	0%	454,000
2021-22	186,698		404,755	591,453	50%	50%	295,800
2022-23	211,050		539,674	750,723	25%	75%	187,700

Budget Estimate (MMK)

F Year	Staff Employment	Initial Procurement	Cargo Operation	Total	Gov. Share	Mandalay Port Share	Government Budget
	MMK	MMK	MMK	MMK	%	%	MMK
2018-19	38,953,133			38,953,133	100%	0%	39,000,000
2019-20	103,875,021			103,875,021	100%	0%	103,900,000
2020-21	189,200,930	201,993,462	231,230,174	622,424,567	100%	0%	622,500,000
2021-22	255,977,729		554,952,419	810,930,148	50%	50%	405,500,000
2022-23	289,366,129		739,936,558	1,029,302,687	25%	75%	257,400,000

REFERENCE: breakdown of budget estimate

1) Time Schedule and Budget

Schedule and Budget Estimate for Mandalay Port Opening

Event\Time	2018				2019				2020				2021				2022			
	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3
Construction																				
Operation																				
Training																				
Direct employment (Staff no.)		7	7	7	14	14	14	14	21	21	30	30	30	30	39	39	39	39	39	39
Direct employment (%)		18%	18%	18%	36%	36%	36%	36%	54%	54%	77%	77%	77%	77%	100%	100%	100%	100%	100%	100%
Operation contract (%)											50%	50%	50%	50%	70%	70%	70%	70%	90%	90%
Cargo volume (ton)											25,000	25,000	25,000	25,000	37,500	37,500	37,500	37,500	50,000	50,000
Cargo volume (ton/year)									50,000				125,000				175,000			
Initial gov. budget (%)		100%				100%				100%				50%				25%		
Cost direct employment (USD)		9,470	9,470	9,470	18,940	18,940	18,940	18,940	28,411	28,411	40,586	40,586	40,586	40,586	52,762	52,762	52,762	52,762	52,762	52,762
Total (USD)		28,411				75,761				137,994				186,698				211,050		
Cost operation (USD)											84,324	84,324	84,324	84,324	118,054	118,054	118,054	118,054	151,783	151,783
Total (USD)		0				0				168,648				404,755				539,674		
Total operation (USD)		28,411				75,761				306,642				591,453				750,723		
Initial Cost (USD)										147,324										
Total government budget (USD)		28,411				75,761				453,966				295,726				187,681		
Total government budget (Kyat)		38,953,133				103,875,021				622,424,567				405,465,074				257,325,672		

2) Employment Plan

No	Staff	Wedge		2018				2019				2020				2021				2022			
		USD	MMK	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3
1	Department Manager	357	490,000		1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071
2	General Affairs 1	322	441,000		966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966
3	General Affairs 2	268	367,500					804	804	804	804	804	804	804	804	804	804	804	804	804	804	804	804
4	General Affairs 3	268	367,500															804	804	804	804	804	804
5	Financing/Accounting 1	322	441,000		966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966
6	Financing/Accounting 2	268	367,500											804	804	804	804	804	804	804	804	804	804
7	Financing/Accounting 3	268	367,500															804	804	804	804	804	804
8	Port Manger	357	490,000		1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071
9	General Affairs Manager	322	441,000					966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966
10	General Affairs 1	268	367,500											804	804	804	804	804	804	804	804	804	804
11	General Affairs 2	268	367,500											804	804	804	804	804	804	804	804	804	804
12	General Affairs 3	268	367,500															804	804	804	804	804	804
13	Finance/Accounting 1	268	367,500									804	804	804	804	804	804	804	804	804	804	804	804
14	Finance/Accounting 2	268	367,500											804	804	804	804	804	804	804	804	804	804
15	Finance/Accounting 3	268	367,500											804	804	804	804	804	804	804	804	804	804
16	Port Management Manager	322	441,000		966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966
17	Port Management 1	268	367,500					804	804	804	804	804	804	804	804	804	804	804	804	804	804	804	804
18	Port Management 2	268	367,500									804	804	804	804	804	804	804	804	804	804	804	804
19	Port Management 3	268	367,500									804	804	804	804	804	804	804	804	804	804	804	804
20	Marine Service 1	268	367,500											804	804	804	804	804	804	804	804	804	804
21	Marine Service 2	268	367,500															804	804	804	804	804	804
22	Port Service 1	268	367,500									804	804	804	804	804	804	804	804	804	804	804	804
23	Port Service 2	268	367,500															804	804	804	804	804	804
24	Port Security 1	268	367,500									804	804	804	804	804	804	804	804	804	804	804	804
25	Port Security 2	268	367,500															804	804	804	804	804	804
26	Engineering Manager	322	441,000		966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966
27	Civil Engineering 1	268	367,500					804	804	804	804	804	804	804	804	804	804	804	804	804	804	804	804
28	Civil Engineering 2	268	367,500					804	804	804	804	804	804	804	804	804	804	804	804	804	804	804	804
29	Civil Engineering 3	268	367,500															804	804	804	804	804	804
30	Equipment 1	268	367,500					804	804	804	804	804	804	804	804	804	804	804	804	804	804	804	804
31	Equipment 2	268	367,500									804	804	804	804	804	804	804	804	804	804	804	804
32	Equipment 3	268	367,500											804	804	804	804	804	804	804	804	804	804
33	Environment 1	268	367,500					804	804	804	804	804	804	804	804	804	804	804	804	804	804	804	804
34	Environment 2	268	367,500															804	804	804	804	804	804
35	Terminal operation Manager	322	441,000		966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966
36	Terminal operation 1	268	367,500									804	804	804	804	804	804	804	804	804	804	804	804
37	Terminal operation 2	268	367,500											804	804	804	804	804	804	804	804	804	804
38	Terminal operation 3	268	367,500											804	804	804	804	804	804	804	804	804	804
39	Terminal operation 4	268	367,500															804	804	804	804	804	804
No. of staffs		Nos			7	7	7	14	14	14	14	21	21	30	30	30	30	39	39	39	39	39	39
		%			18%	18%	18%	36%	36%	36%	36%	54%	54%	77%	77%	77%	77%	100%	100%	100%	100%	100%	100%
Wedge Total		Wedge			6,972	6,972	6,972	12,762	12,762	12,762	12,762	18,390	18,390	25,626	25,626	25,626	25,626	32,862	32,862	32,862	32,862	32,862	32,862
		%			21%	21%	21%	39%	39%	39%	39%	56%	56%	78%	78%	78%	78%	100%	100%	100%	100%	100%	100%
Total (USD)					20,916				51,048				88,032				116,976				131,448		

3) Budget for Operational Cost Estimate

Operation Cost Estimate

Per Month (base: 245,520Ton/Year)

Item			Unit	Qty	MMK		USD	
					U.C.	Amount	U.C.	Amount
1	Wedges	Department Manager	no	1	490,000	490,000	357	357
		Port Manager	no	1	490,000	490,000	357	357
		Department Staff	no	6	367,500	2,205,000	268	1,608
		Division Manager	no	6	490,000	2,940,000	357	2,144
		Section Staffs	no	25	367,500	9,187,500	268	6,701
	Social Security (7%)		ls	1		1,071,875		782
2	Transportation of Staffs		trip	16	411,324	6,581,191	300	4,800
3	Miscellaneous expence (5%)		%	5		1,148,278		837
Subtotal						24,113,844		17,587
4	Operation Contract		mon	1	51,686,450	51,686,450	37,697	37,698
5	Fuel Cost (Assume 200,000ton/year)		mon	1	3,427,704	3,427,704	2,500	2,500
6	Equipment Maintenance		mon	1	16,098,521	16,098,521	11,741	11,741
7	Water & Electricity		mon	1	2,193,730	2,193,730	1,600	1,600
8	Miscellaneous expence (5%)		%	5		3,670,320		2,677
Subtotal						77,076,725		56,216
Cost per ton						3,767		2.7

4) Budget for Operation Contract

Breakdown of operation contract

Item	Unit	Qty	MMK		USD		Remark
			U.P.	Amount	U.P.	Amount	
(Fixed: Per Month)							
Manager	no	2	441,000	882,000	322	643	
Staff	no	8	367,500	2,940,000	268	2,144	
Workshop	no	10	367,500	3,675,000	268	2,680	
Eq. Operator	no	6	342,770	2,056,622	250	1,500	6 gangs
Foreman	no	6	342,770	2,056,622	250	1,500	6 gangs
Social Security (7%)	ls			812,717		593	
Subtotal				12,422,961	0	9,060	
O.H. 20%	ls	1		2,484,592	0	1,812	
Total				14,907,554	0	10,872	
(At Cost per Month) assume 200,000ton/year							
Worker	ton	20,460	700	14,322,000	0.511	10,446	Jetty
Worker	ton	20,460	700	14,322,000	0.511	10,446	Yard/warehouse
Social Security (7%)	ls			2,005,080		1,462	
Subtotal				30,649,080	0	22,354	
O.H. 20%	ls	1		6,129,816	0	4,471	
Total				36,778,896	0	26,825	
Grand Total				51,686,450		37,697	
Cost per ton				2,526		1.84	

5) Breakdown of Budget for Initial Procurement

Initial Procurement Cost for Operation

Office

	Item	Unit	Qty	MMK		USD	
				U.C.	Amount	U.C.	Amount
1	PC (incl. software)	no	27	2,056,622	55,528,797	1,500	40,500
2	Printer	no	2	6,855,407	13,710,814	5,000	10,000
3	Telephones	no	20	68,554	1,371,081	50	1,000
4	Desk & Chair	ls	40	180,000	7,200,000	131	5,251
5	Meeting Table & Chair	set	2	460,000	920,000	336	671
6	Bookshelf	set	15	140,000	2,100,000	102	1,532
7	Guest room furniture	set	1	450,000	450,000	328	328
8	Frige	set	2	335,000	670,000	244	489
9	TV/DVD	set	1	350,000	350,000	255	255
10	Stationary	ls	1	4,113,244	4,113,244	3,000	3,000
11	Miscellaneous expence (5%)	ls	1		4,320,697		3,151
	Total				90,734,634		66,177

Workshop

	Item	Unit	Qty	MMK		USD	
				U.C.	Amount	U.C.	Amount
1	Truck 2t	no	1	47,987,849	47,987,849	35,000	35,000
2	Welding machine	no	3	2,742,163	8,226,488	2,000	6,000
3	Gas cutting tool	no	5	137,108	685,541	100	500
4	Ceiling mini crane	no	1	6,855,407	6,855,407	5,000	5,000
5	Chain block	no	3	1,096,865	3,290,595	800	2,400
6	Desk & Chair	ls	5	180,000	900,000	131	656
7	Bookshelf	set	3	140,000	420,000	102	306
8	Other apparatus and materials (10%)	ls					4,956
	Total				68,365,881		54,818

Warehouse

	Item	Unit	Qty	MMK		USD	
				U.C.	Amount	U.C.	Amount
1	Pallet	no	2300	13,711	31,534,872	10	23,000
2	Desk & Chair	ls	5	180,000	900,000	131	656
3	Bookshelf	set	3	140,000	420,000	102	306
4	Other apparatus and materials (10%)	ls					2,366
	Total				32,854,872		26,328

The Republic of the Union of Myanmar
Ministry of Transport and Communications
Directorate of Water Resources and Improvement of River Systems

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Letter No. 222(a) /Ah Kha Na/Ah Kha-13(1)/2017
Date : 7th June , 2017

To

Mr. Katsuichi Yabunaka
Executive Technical Advisor to the Director General
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

Subject : **"Tool Port" for Management and Operation of Mandalay Port**

Dear Mr. Katsuichi Yabunaka,

We had discussion between our Myanmar Team and your Japan International Cooperation Agency Team on Second Preparatory Survey for the second outline design of the Project for Development of Mandalay Port in May, 2017 and sign Minute of Meetings.

Regarding with the Management and Operation of Mandalay Port, Myanmar Team mentioned its preference to "Tool Port" and stated that Myanmar side will finalize the port management and operation option and inform JICA in writing by the end of August, 2017.

So we'd like to inform officially about Myanmar's preference to "Tool Port" for port management and operation. However, we'd like to welcome advice from JICA to update during the time of implementation phase.

Sincerely,

Htun Lwin Oo
Director General
Directorate of Water Resources and Improvement of River Systems

DWIR
The Republic of the Union of Myanmar
Ministry of Transport and Communications
Directorate of Water Resources and Improvement of River Systems

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email:dwiradmin1@dwir.gov.mm
dwir1.seman@gmail.com

Letter No. 222(b) /Ah Kha Na/Ah Kha-13(1)/2017
Date : 20th September , 2017

To

Mr. Katsuichi Yabunaka
Executive Technical Advisor to the Director General
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

Subject : **Management and Operation of Mandalay Port**

Dear Mr. Katsuichi Yabunaka,

We have send the letter which stated Myanmar's preference to "Tool Port" for port management and operation and thank you for your reply.

Regarding with the meeting in May 25, 2017 related to the Port Operation and Management, I'd like to confirm about our updated information of preference on the following four (4) points;

1. **Counterpart**
   DWIR (implementation phase) and IWT (operation phase)
2. **Management Committee**
   The committee will be organized later and member will be from DWIR, IWT, DMA and part time member from Mandalay Regional Government.
3. **Role of DWIR for Mandalay port operation and management**
   DWIR is the owner of the port.
4. **Role of IWT for Mandalay port operation and management**
   IWT is the port operator for port operation and management.

We hope this will be useful for your consideration on the Port Operation and Management.

Sincerely,

Htun Lwin Oo
Director General
Directorate of Water Resources and Improvement of River Systems

8-3 Inspection Items of Jib Crane (Reference)

Examples of insection items of jib crane are as presented in this Appendix for reference purpose. Items presenting in this appendix is general descriptions only. Inspection details are depended on the product. Therefore, it shall be follow the crane maker recommendations.

(1) Daily inspection

Daily Inspection

Timing	Category	Ref. No.	Item	Method
Before Operation		1	The condition of the repaired parts which had problems the day before.	Visual Inspection
	Driving components	1	There is no obstacles on the driving route for the long horizontal traveling and in the work area of the crane.	Visual Inspection
		2	There is no oil leakage from the reduction gear or the hydraulic power units.	Visual Inspection
	Machine room	1	The wire roap on the each drum is in good condition.	Visual Inspection
		2	There is no oil leakage from the reduction gear or the hydraulic power units.	Visual Inspection
	Girder, etc.	1	The wire roap is in good condition.	Visual Inspection
		2	There is no obstacles on the driving rail for the cross traveling and in the driving area of the crane.	Visual Inspection
	Operator Cabin	1	The condition of the power supply cable for the spreader.	Visual Inspection
		2	Does each master controller work normally?	Visual Inspection
		3	Does the equipment on the operation board work normally?	Operational Inspection
		4	Does each brake and rail clamps work normally?	Operational Inspection
		5	Does the hoisting and the upper limit switch work normally?	Operational Inspection
		6	Does the other limit switches work normally?	Operational Inspection
		7	Does the alert equipment work normally?	Operational Inspection
		8	Does following items work normally? - Stretch of the spreader - Twist lock - Flipper	Visual Inspection
		9	Does the stretch of the spreader and light of the twist lock sign work normally?	Operational Inspection

(2) Periodical inspection

List of Inspection of the Container Crane (Monthly Inspection/ Annual Inspection)
I. Machine and Equipment
1.1 Basic Items

Category		No	Item	Monthly	Annual	Method	Instrument	Criterion	Measured Value	Evaluation	Action/ Note
Rail for the long horizontal traveling	Foundation	1	Cracks	○	○	Visual Inspection		There is no cracks or damages.			
	Concrete	2	Subsidence of the foundation	○	○	Visual Inspection		There is no obstacles to the long horizontal traveling of the crane.			
	Rail and Splice Plate	1	Height discrepancy between left side and right side of the rail		○	Visual Inspection/ Measuring Inspection	Transit/ Steel rule	(Span) × 1/ within 1000			
		2	Vertical curve of the rail		○	Visual Inspection/ Measuring Inspection	Transit/ Steel rule	Within 5mm per 10m			
		3	Horizontal curve of the rail		○	Visual Inspection/ Measuring Inspection	Transit/ Steel rule	Within 5mm per 10m			
		4	Gradient of the surface of the rail		○	Visual Inspection/ Measuring Inspection	Transit/ Steel rule	Within 1/2500			
		5	Joint error at the joint of the rail		○	Visual Inspection/ Measuring Inspection	Steel rule	Within 1mm			
		6	Gap at the joint of the rail		○	Visual Inspection/ Measuring Inspection	Steel rule	Within 5mm (No touch will cause even in summer.)			
		7	Metal fatigue at the head of the rail		○	Visual Inspection/ Measuring Inspection	Vernier caliper	Within 10% of the original width. Original width is 100m.			
		8	Rail span		○	Visual Inspection/ Measuring Inspection	Measuring tape	(Span) Under 25m：±10mm 25～40m：±15mm			
		9	Loose or lost of the metal parts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
		10	Damages and corrosion of the metal parts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no damages or corrosion.			
		11	Loose or lost of the bolts and nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
Fixing Equipment	End Stopper and Metal items for anchor	1	Cracks, Damages, and Deformation of the components	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no cracks, damages or deformation.			
		2	Corrosion	○	○	Visual Inspection		Thereis no remarkable rust stain or corrosion.			
		3	Delamination of the paint	○	○	Visual Inspection		There is no remarkable delamination.			
		4	Loose or lost of the bolts and nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no damages or deformation.			

1.2 Structural Items

Category		No	Item	Monthly	Annual	Method	Instrument	Criterion	Measured Value	Evaluation	Action/ Note
Main Structure	Ocean side pier, Land side pier, Connecting beam, Diagonal braces, Sill beam, Tie beam, Upper frame, Garder, Boom	1	Cracks, Damages, and Deformation of the components	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no cracks, damages or deformation.			
		2	Rust stain and corrosion of the components		○	Visual Inspection/ Hammering Inspection	Testing Hammer	Not exceed the defaut value.			
		3	Delamination of the paint		○	Visual Inspection		Not exceed the defaut value.			
		4	Abrasion of the boom pin socket		○	Visual Inspection		There is no grease dirt. There is no metalic dust.			
		5	Lubrication to the boom pin	○	○	Visual Inspection		There is no oil shortage.			
		6	Loose or lost of the bolts and nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
	Rail for the cross traveling	1	Abrasion of the rail head	○	○	Visual Inspection/ Measuring Inspection	Vernier caliper	Within 10% of the original size.			
		2	Rail span		○	Visual Inspection/ Measuring Inspection	Measuring tape	Within ±5mm.			
		3	Vertical curve of the rail		○	Visual Inspection/ Measuring Inspection	Transit/ Steel rule	Within (Span) × 1/500			
		4	Horizontal curve of the rail		○	Visual Inspection/ Measuring Inspection	Transit/ Steel rule	Within 5mm of the standard.			
		5	Gradient of the surface of the rail		○	Visual Inspection/ Measuring Inspection	Transit/ Steel rule	Within 1/500			
		6	Joint error at the joint of the rail	○	○	Visual Inspection/ Measuring Inspection	Steel rule	There is no remarkable gap. (Within 1mm)			
		7	Gap at the joint of the rail	○	○	Visual Inspection/ Measuring Inspection	Steel rule	Within 5mm (No touch will cause even in summer.)			
		8	Welding condition of the rail	○	○	Visual Inspection		There is no cracks.			
		9	Loose or lost of the metal parts	○	○	Visual Inspection	Visual Inspection	Visual Inspection			
		10	Damages and corrosion of the metal parts	○	○	Visual Inspection		There is no damages or corrosion.			
		11	Loose or lost of the bolts and nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
	Tension bar, Back stay	1	Cracks at the welded part	○	○	Visual Inspection		There is no cracks.			
		2	Deformation of the components	○	○	Visual Inspection		There is no deformation.			
		3	Rust stain and corrosion of the components		○	Visual Inspection		Not exceed the defaut value.			
		4	Delamination of the paint		○	Visual Inspection		Not exceed the defaut value.			
		5	Abrasion of the pin		○	Visual Inspection/ Operational Inspection		There is no grease dirt. There is no metalic dust.			
		6	Lubrication to the pin	○	○	Visual Inspection		There is no oil shortage.			
		7	Loose or lost of the bolts and nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
Incidental Facilities	Pedestrian road, Steps, Landing, Handrail, Ladder, Stopper for the trolley	1	Shining, Sorting, and Setting-in-Order	○	○	Visual Inspection		They are sorted and set in order.			
		2	Cracks at the welded part		○	Visual Inspection		There is no cracks.			
		3	Deformation of the components	○	○	Visual Inspection		There is no deformation.			
		4	Rust stain and corrosion of the components	○	○	Visual Inspection		There is no remarkable rust stain or corrosion.			
		5	Delamination of the paint		○	Visual Inspection		There is no remarkable delamination.			
		6	Loose or lost of the bolts and nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
Machine room	Main body, Door, Window frame, Window glass	1	Damages, corrosion, or delamination of the outer wall	○	○	Visual Inspection		There is no damages, remarkable corrosion or delamination of the paint.			
		2	Rain leakage at the roof	○	○	Visual Inspection		There is no sign of the rain leakage.			
		3	Door	○	○	Visual Inspection/ Operational Inspection		It works smoothly.			
		4	Window frame, glass	○	○	Visual Inspection		There is no damages.			
		5	Crane rail for repair		○	Visual Inspection		There is no abnormal conditions.			
		6	Crane stopper for repair		○	Visual Inspection		There is no abnormal conditions.			
		7	Loose or lost of the bolts and nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
Operator Cabin	Main body, Door, Window frame, Window glass, Chair, Operation board	1	Damages, corrosion, or delamination of the outer wall	○	○	Visual Inspection		There is no damages, remarkable corrosion, or delamination of the paint.			
		2	Rain leakage at the roof	○	○	Visual Inspection		There is no sign of the rain leakage.			
		3	Door	○	○	Visual Inspection/ Operational Inspection		It works smoothly.			
		4	Window frame, glass	○	○	Visual Inspection/ Operational Inspection		It works smoothly.			
		5	Chair	○	○	Visual Inspection/ Operational Inspection		There is no abnormal conditions.			
		6	Loose or lost of the bolts and nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
		7	Vibration of the equipment	○	○	Visual Inspection/ Operational Inspection		There is no abnormal vibration.			
		8	Operatability, Operation status	○	○	Visual Inspection/ Operational Inspection		There is no abnormal conditions.			

List of Inspection of the Container Crane (Monthly Inspection/ Annual Inspection)
I. Machine and Equipment
1.3 Hoisting device, Derricking device, Driving device, and Hanging Beam

Category	No	Item	Monthly	Annual	Method	Instrument	Criterion	Measured Value	Evaluation	Action/ Note
Wire Rope	1	Breaking of the wire	○	○	Visual Inspection/ Measuring Inspection		Breaking of the wire causes within 10% (of single blade)			
	2	Abrasion/ Damages	○	○	Visual Inspection/ Measuring Inspection	Vernier caliper	Decrease of the diameter of the wire rope is within 7% of the original diameter.			
	3	Kink	○	○	Visual Inspection		There is no kinks.			
	4	Deformation/ Detwist	○	○	Visual Inspection		There is no deformation or detwist.			
	5	Condition of the applied oil	○	○	Visual Inspection		There is no oil shortage.			
	6	Rust stain/ Corrosion	○	○	Visual Inspection		There is no remarkable rust stain or corrosion.			
	7	Fixing condition of the rope end	○	○	Visual Inspection		They are in the normal condition.			
Reduction gear	1	Abnormal noise/ Abnormal heat/ Abnormal vibration		○	Listening Inspection/ Hand Touch Inspection/ Sensory Inspection		There is no abnormal noise, heat, or vibration.			
	2	Abrasion or backlash of the gear		○	Visual Inspection		There is no abnormal noise or vibration.			
	3	Condition of the cogging gear		○	Visual Inspection		They are in the normal condition. (There is no breakage, scuffing, pitching or discoloration of the gear. Abrasion limit is under the standard.)			
	4	Gear/ The grease oil for the bearing/ Condition of the application oil	○	○	Visual Inspection		There is no oil shortage.			
	5	Oil volume in the casing/ Oil leakage		○	Visual Inspection	Oil Level Gauge	The oil volume is under the default line of the level gauge; and there is no oil leakage. There is no abrasion at the seal of the penetration part of the axis. There is no damages to the air duct. There is no filter cogging.			
	6	Dirt or deterioration of the oil		○	Visual Inspection		There is no dirt or deterioration of the oil. The timing of the oil change follows the rules.			
	7	Cracks at the axis or the casing		○	Visual Inspection		There is no cracks.			
	8	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
Common base	1	Cracks at the main body		○	Visual Inspection		There is no cracks.			
	2	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
Sheave	1	Condition of turn/ Operational condition	○	○	Visual Inspection		Sheave turns normally. In case there is usage of the rope grip or shackle, they should be fixed appropriately without loose or abrasion damages.			
	2	Cracks or damages of the main body.	○	○	Visual Inspection		There is no cracks.			
	3	Abrasion at the gap of the rope.	○	○	Visual Inspection/ Measuring Inspection	Groove gauge/ Vernier caliper	Abrasion should be within 25% of the diameter of the wire rope.			
	4	Damages at the stopper of the rope	○	○	Visual Inspection		There is no damages.			
	5	Abnormal noise/ Abnormal heat/ Abnormal vibration	○	○	Listening Inspection/ Hand Touch Inspection/ Sensory Inspection		There is no abnormal noise, heat, or vibration.			
	6	Condition of the grease oil and the application oil for the bearing	○	○	Visual Inspection		There is no oil shortage.			
	7	Abnormal noise, heat or vibration of the bearing	○	○	Listening Inspection/ Hand Touch Inspection/ Sensory Inspection		There is no abnormal noise, heat, or vibration.			
	7	Fixing condition of the pins.	○	○	Visual Inspection		They are in the normal condition.			

Joint of the axis	1	Abnormal noise/ Abnormal vibration	○	○	Visual Inspection		There is no abnormal noise or vibration.			
	2	Abrasion/ Cracks/ Damages		○	Visual Inspection		There is no abrasion, cracks or damages.			
	3	Smoothness of the axis		○	Visual Inspection/ Listening Inspection		There is no abnormal noise or vibration.			
	4	Backlash		○	Visual Inspection/ Listening Inspection		There is no abnormal noise or vibration.			
	5	Condition of the grease oil and the application oil	○	○	Visual Inspection		There is no oil shortage.			
	6	Oil volume	○	○	Visual Inspection		There is no shortage of the grease oil.			
	7	Oil leakage	○	○	Visual Inspection		There is no oil leakage.			
	8	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
Wheel	1	Spinning condition and operational condition of the wheels	○	○	Visual Inspection/ Operational Inspection		It works normally.			
	2	Abrasion or angle error of the wheel flange		○	Visual Inspection/ Measuring Inspection	Vernier caliper	Abrasion: Within 50% of the original size Angle error: Within 20% from the vertical position			
	3	Abrasion at the wheel tread		○	Visual Inspection/ Measuring Inspection	Vernier caliper	Abrasion: Within 3% of the original size Discrepancy of the diameter (driven wheel): Within 0.2% of the diameter Discrepancy of the diameter (non-driven wheel): Within 0.5% of the diameter			
	4	Cracks or damages of the wheel	○	○	Visual Inspection		There is no cracks or damages.			
	5	Abnormal noise at the wheel parts	○	○	Listening Inspection		There is no abnormal noise.			
	6	Fixing condition of the axis	○	○	Visual Inspection		It is fixed properly.			
	7	Abnormal noise, heat or vibration of the bearing	○	○	Listening Inspection/ Sensory Inspection		There is no abnormal noise, heat, or vibration.			
	8	Condition of the grease oil for the bearing	○	○	Visual Inspection		There is no oil shortage.			
Drum, Gear, Coupling	1	Loose, lost and fixing condition of the joint bolts for the rope stopper	○	○	Visual Inspection/ Hammering Inspection		There is no loose or lost.			
	2	Cracks at the welded parts	○	○	Visual Inspection	Groove gauge/ Vernier caliper	There is no cracks.			
	3	Abrasion at the gap of the rope		○	Visual Inspection/ Measuring Inspection		Within 25% of the radius of the wire rope			
	4	Abnormal noise/ Abnormal vibration	○	○	Listening Inspection/ Sensory Inspection		There is no abnormal noise or vibration.			
	5	Condition of the grease oil and the application oil		○	Visual Inspection		There is no oil shortage.			
	6	Smoothness of the axis		○	Visual Inspection/ Listening Inspection		There is no abnormal noise or vibration.			
	7	Cracks, damages or abrasion at the pitch of the gear	○	○	Visual Inspection		There is no abnormal abrasion or metallic dust. (Acceptable abrasion is within the punch mark.)			
Socket for the dram axis	1	Cracks at the casing		○	Visual Inspection		There is no cracks.			
	2	Condition of the grease oil and the application oil at the bearing	○	○	Visual Inspection		There is no oil shortage.			
	3	Abnormal noise/ Abnormal heat/ Abnormal vibration	○	○	Listening Inspection/ Hand Touch Inspection/ Sensory Inspection		There is no abnormal noise, heat, or vibration.			
	4	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			

Emergency brake	1	Operational condition of the movable part	○	○	Visual Inspection		It works normally.			
	2	Abrasion of the lining	○	○	Visual Inspection/ Measuring Inspection	Abrasion limit determination gauge	Abrasion limit is 3mm (one side).			
	3	Gap between the disk and the lining	○	○	Visual Inspection/ Measuring Inspection	Feeler gauge	Acceptable air gap is within 1.5mm (one side).			
	4	Abrasion of the disk	○	○	Visual Inspection/ Measuring Inspection	Vernier caliper	Damages at the surface should be repaired immediately. Acceptable abrasion is within 5mm shortage to the original size of the disk.			
	5	Roughness, discoloration or abnormal heat of the disk	○	○	Visual Inspection/ Hand Touch Inspection		There is no roughness, discoloration or abnormal heat.			
	6	Cracks at the boss	○	○	Visual Inspection		There is no cracks.			
	7	Deformation of the key/ Gap of the key		○	Visual Inspection/ Operational Inspection		There is no deformation.			
	8	Loose or lost of the key		○	Visual Inspection/ Operational Inspection		There is no loose or lost.			
	9	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
	10	Spinning condition	○	○	Visual Inspection		It spins normally.			
Pins	1	Condition of the grease oil and the application oil	○	○	Visual Inspection		There is no oil shortage.			
	2	Fixing condition	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	The axis is fixed appropriately.			
	3	Abnormal noise	○	○	Listening Inspection/ Sensory Inspection		There is no abnormal noise.			
	4	Operational condition	○	○	Visual Inspection/ Operational Inspection		They are in normal condition.			
Brake disk	1	Abrasion or breakage of the disk	○	○	Visual Inspection/ Measuring Inspection	Vernier caliper	Damages on the surface of the disk should be repaired immediately. Acceptable abrasion is within 5mm shortage to the original size of the disk.	Left mm Right mm		
	2	Roughness, discoloration or abnormal heat of the disk	○	○	Visual Inspection/ Hand Touch Inspection		There is no roughness, discoloration or abnormal heat.			
	3	Cracks at the boss of the brake disk	○	○	Visual Inspection		There is no cracks.			
	4	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
	5	Spinning condition	○	○	Listening Inspection/ Sensory Inspection		It spins normally.			
Frame	1	Cracks/ Damages	○	○	Visual Inspection		There is no cracks or damages.			
	2	Rust stain or corrosion of the frame		○	Visual Inspection		There is no remarkable rust stain or corrosion.			
	3	Delamination of the paint	○	○	Visual Inspection		There is no remarkable delamination.			
	4	Operational condition	○	○	Visual Inspection/ Operational Inspection		It works normally.			
	5	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			

Bogie, Locker, Beam		1	Cracks/ Damages	○	○	Visual Inspection		There is no cracks or damages.			
		2	Rust stain or Corrosion of the parts		○	Visual Inspection		Not exceed the default value.			
		3	Delamination of the paint		○	Visual Inspection		Not exceed the default value.			
		4	Abnormal noise	○	○	Visual Inspection		There is no abnormal noise.			
		5	Condition of the grease oil applied to the axis	○	○	Visual Inspection/ Listening Inspection		There is no oil shortage.			
Bolts and nuts		1	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			Driving device, Fixing device
Link		1	Condition of the grease oil and the application oil	○	○	Visual Inspection		There is no oil shortage.			Rail Clamp, Fixing device (the safety device against the wind)
		2	Operational condition	○	○	Visual Inspection/ Operational Inspection		It works normally.			
		3	Deformation	○	○	Visual Inspection		There is no deformation.			
Fixing device (the safety device against the wind)	Joint Pin	1	Damages	○	○	Visual Inspection		There is no damages.			
		2	Deformation (Bend error)	○	○	Visual Inspection		There is no deformation.			
	Weight	1	Fixing condition	○	○	Visual Inspection		They are fixed properly.			
	Limit Switch Striker	1	Operational Position	○	○	Visual Inspection		It is in the normal position.			
		2	Deformation/ Corrosion	○	○	Visual Inspection		There is no remarkable deformation or corrosion.			
	Strip shaped metallic item	1	Damages	○	○	Visual Inspection		There is no damages.			
		2	Rust stain/ Corrosion	○	○	Visual Inspection		There is no remarkable rust stain or corrosion.			
		3	Operational condition	○	○	Visual Inspection/ Operational Inspection		It works normally.			
Rail brake	Brake pad	1	Thickness of the pad	○	○	Measuring Inspection	Steel rule/ Vernier caliper	Not exceed the default value.			
		2	Span of the lining and the rail	○	○	Measuring Inspection	Steel rule/ Vernier caliper	Not exceed the default value.			
		3	Condition of the lining		○	Visual Inspection		There is no discoloration.			
		4	Loose or lost of the joint bolts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
	Main body of the brake	1	Operational condition of the brake	○	○	Visual Inspection/ Operational Inspection		It works normally.			
		2	Condition of the cylinder rod	○	○	Visual Inspection		There is no dirt or rust stain.			
		3	Operational condition of the access switch	○	○	Visual Inspection		Distance to the detector plate is within the standard.			
		4	Condition of the parts	○	○	Visual Inspection		There is no lack of the parts.			
		5	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
	Hydraulic system	1	Oil leakage	○	○	Visual Inspection		There is no oil leakage.			
		2	Loose or damages of the hose	○	○	Visual Inspection		There is no loose or damages.			
		3	Oil volume in the tank		○	Visual Inspection		The oil volume is appropriate.			

Hanging Beam	Hanging Beam	1	Cracks, damages or deformation of the main body	○	○	Visual Inspection		There is no cracks, damages or deformation.			
		2	Delamination of the paint		○	Visual Inspection		There is no remarkable delamination.			
		3	Rust stain or corrosion of the frame		○	Visual Inspection		There is no remarkable rust stain or corrosion.			
		4	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
	Hook	1	Cracks at the hook		○	Visual Inspection		There is no cracks.			
		2	Size of the gap		○	Measuring Inspection	Vernier caliper	Not exceed the default value.			
		3	Partial abrasion		○	Measuring Inspection	Vernier caliper	Not exceed the default value.			
		4	Deformation of the hook	○	○	Visual Inspection		There is no deformation.			
		5	Condition of the grease oil applied to the bearing	○	○	Visual Inspection		There is no oil shortage.			
		6	Damages at the nonslip device of the rope	○	○	Visual Inspection		There is no damages.			
		7	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
Hoisting device	Rope Guide	1	Condition of the turn	○	○	Visual Inspection		It turns normally.			
		2	Damages of the guide rollers	○	○	Visual Inspection		There is no damages.			
		3	Abrasion of the guide rollers	○	○	Visual Inspection/ Measuring Inspection	Vernier caliper	Not exceed the default value.			
		4	Abnormal noise, heat, or vibration of the bearing	○	○	Listening Inspection/ Hand Touch Inspection/ Sensory Inspection		There is no abnormal noise, heat, or vibration.			
		5	Fixing condition of the pins	○	○	Visual Inspection		They are in the normal condition.			
Driving device	Buffer	1	Damages/ Deformation	○	○	Visual Inspection		There is no damages.			
		2	Fixing condition	○	○	Visual Inspection		They are in the normal condition.			
		3	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
Rail clamp	Metallic item for the clamp	1	Abrasion/ Damages/ Deformation	○	○	Visual Inspection	Indicator	There is no abrasion, damages or deformation.			
		2	Operational condition	○	○	Visual Inspection/ Operational Inspection		It works normally.			
Derricking device	Brake	1	Operational condition of the movable part	○	○	Visual Inspection		It works normally.			
		2	Oil leakage of the hydraulic push-up device	○	○	Visual Inspection		There is no oil leakage.			
		3	Condition of the hydraulic push-up device (Oiil volume/ Deterioration og the oil)	○	○	Visual Inspection		The volume of the oil is appropriate. There is no deterioration of the oil.			

Rail clamp	Hydraulic cylinder	1	Damages/ Deformation	○	○	Visual Inspection		There is no damages or deformation.			
		2	Oil leakage	○	○	Visual Inspection		There is no oil leakage.			
		3	Rust stain/ Corrosion	○	○	Visual Inspection		here is no rust stain or corrosion.			
		4	Operational condition	○	○	Visual Inspection/ Operational Inspection		It works normally.			
	Hydraulic pipes	1	Damages	○	○	Visual Inspection		There is no damages.			
		2	Oil leakage	○	○	Visual Inspection		There is no oil leakage.			
		3	Fixing condition	○	○	Listening Inspection/ Hand Touch Inspection		They are fixed properly.			
	Hydraulic Power Units	1	Oil volume	○	○	Visual Inspection	Oil Level Gauge	Oil volume is within the default level.			
		2	Temperature of the oil	○	○	Visual Inspection		The temperature of the oil is normal.			
		3	Dirt and deterioration of the oil	○	○	Visual Inspection		There is no dirt or deterioration of the oil. The timing of the oil change follows the rules.			
		4	Oil leakage	○	○	Visual Inspection		There is no oil leakage.			
		5	Rust stain/ Corrosion	○	○	Visual Inspection		There is no rust stain or corrosion.			
		6	Operational condition	○	○	Visual Inspection/ Operational Inspection		It works normally.			
		7	Oily dirt of the parts	○	○	Visual Inspection		There is no oil leakage.			
		8	Condition of the pump and the actuator	○	○	Listening Inspection/ Hand Touch Inspection		There is no abnormal noise or temperature.			
		9	Operational condition of the hydraulic power units	○	○	Visual Inspection/ Operational Inspection		It works normally.			
		10	Drainage of the reservoir	○	○	Visual Inspection		Drainage is conducted periodically. (Every month)			
		11	Abnormal noise or vibration of the hydraulic pump	○	○	Visual Inspection/ Listening Inspection/ Hand Touch Inspection		There is no abnormal noise or vibration.			
		12	Dirt and clog of the suction filter		○	Visual Inspection		There is no dirt or clogging.			
		13	Solenoid control valve		○	Visual Inspection/ Listening Inspection/ Hand Touch Inspection		There is no abnormal noise or vibration.			
		14	Dirt and deterioration of the application oil		○	Visual Inspection		There is no dirt, muddiness or discoloration.			
		15	Pressure switch		○	Visual Inspection/ Operational Inspection		It works normally.			
		16	Oil level switch		○	Visual Inspection/ Operational Inspection		It works normally.			

Spreader	Corner flippers	1	Operational condition	○	○	Visual Inspection/ Operational Inspection		It works normally.			
		2	Cracks, damages or deformation of the pin guide	○	○	Visual Inspection		There is no cracks, damages or deformation.			
		3	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
	Fixing frame	1	Crack, damages, or deformation of the frame	○	○	Visual Inspection		There is no cracks, damages or deformation.			
		2	Rust stain or corrosion of the frame		○	Visual Inspection		There is no remarkable rust stain or corrosion.			
		3	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
	Stretching device	1	Operational condition	○	○	Visual Inspection/ Operational Inspection		It works normally.			
		2	Abrasion of the guide roller		○	Measuring Inspection	Vernier caliper	Not exceed the default value.			
		3	Abrasion damages or deformation of the guide roller	○	○	Visual Inspection		There is no damages or deformation.			
		4	Damages or deformation of the guide roller pins	○	○	Visual Inspection		There is no damages or deformation.			
		5	Fixing condition of the guide roller pins	○	○	Visual Inspection		They are fixed properly.			
		6	Condition of the grease oil and the application oil for the guide roller pins	○	○	Visual Inspection		There is no oil shortage.			
		7	Abrasion of the sliding plate		○	Measuring Inspection	Vernier caliper	Not exceed the default value.			
		8	Condition of the grease oil and the application oil for the sliding plate	○	○	Visual Inspection		There is no oil shortage.			
		9	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
	Elastic frame	1	Cracks, damages or deformation of the frame	○	○	Visual Inspection		There is no cracks, damages or deformation.			
		2	Rust stain or corrosion of the frame	○	○	Visual Inspection		There is no remarkable rust stain or corrosion.			
	Twist lock device	1	Operational condition	○	○	Visual Inspection/ Operational Inspection		It works normally.			
		2	Abrasion of the twist lock pins		○	Measuring Inspection	Vernier caliper	Not exceed the default value.			
		3	Cracks at the twist lock pins		○	Visual Inspection		There is no cracks.			
		4	Damages or deformation of the twist lock pins	○	○	Visual Inspection		There is no damages or deformation.			
		5	Damages or deformation of the link, the link pins, or the lever	○	○	Visual Inspection		There is no damages or deformation.			
		6	Condition of the grease oil for the twist lock pins and link pins	○	○	Visual Inspection		There is no oil shortage.			
		7	Abrasion of the pin guide		○	Measuring Inspection	Vernier caliper	Not exceed the default value.			
		8	Cracks, damages or deformation of the pin guide	○	○	Visual Inspection		There is no cracks, damages or deformation.			
		9	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
	Hydraulic motor	1	Operational condition	○	○	Visual Inspection/ Operational Inspection	Pressure meter	It works normally.			
		2	Oil leakage	○	○	Visual Inspection		There is no oil leakage.			
		3	Rust stain or corrosion of the rods	○	○	Visual Inspection		There is no rust stain or corrosion.			
		4	Abnormal noise/ Abnormal heat	○	○	Listening Inspection/ Hand Touch Inspection		There is no abnormal noise or temperature.			

Equipment for the boom hook	Driving device	1	Condition of the motor and the hydraulic cylinder	○	○	Visual Inspection		There is no abnormal noise or vibration.			
		2	Operational condition of the movable part	○	○	Visual Inspection		It works normally.			
		3	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
	Main body	1	Deformation, bend error or rust stain of the frame, the buffer or the hook.	○	○	Visual Inspection		There is no deformation, bend error or rust stain.			
		2	Abrasion and fixing condition of the axis and the pins	○	○	Visual Inspection		There is no remarkable abrasion.			
		3	Operational condition of the movable parts	○	○	Visual Inspection		It works normally.			
		4	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			
Trolley	Rope Clamp (Wire Clip)	1	Fixing condition of the joint part of the wire rope	○	○	Hammering Inspection	Testing Hammer	It is in the normal condition.			
		2	Loose or lost of the bolts and the nuts	○	○	Visual Inspection/ Hammering Inspection	Testing Hammer	There is no loose or lost.			

List of Inspection of the Container Crane (Monthly Inspection/ Annual Inspection)
II. Electric Equipment

Category	No	Item	Monthly	Annual	Method	Instrument	Criterion	Measured Value	Evaluation	Action/ Note
Electric motor	1	Abnormal noise/ Abnormal heat/ Abnormal odd/ Abnormal vibration	○	○	Listening Inspection/ Hand Touch Inspection/ Sensory Inspection		There is no abnormal conditions.			Hoisting device, Cross traveling device, Derricking device, Driving device
	2	Loose or rust stain of the joint bolts for the main body	○	○	Visual Inspection/ Hammering Inspection	Testing hammer	There is no loose or stain.			
	3	Oil condition of the axis socket	○	○	Visual Inspection		There is no oil shortage.			
	4	Insulation resistance		○	Measuring Inspection	Megger	Resistivity should be above the default level.			
	5	Continuity check of the space heater		○	Measuring Inspection	Tester	There is no disconnection.			
	6	Continuity check of the thermostat circuit		○	Measuring Inspection	Tester	There is no disconnection.			
Disk brake	1	Abrasion and abnormal discoloration of the lining	○	○	Visual Inspection/ Measuring Inspection	Steel ruler/ Vernier caliper	There is no discoloration. Abrasion limit is 5mm.			Hoisting device, Cross traveling device, Derricking device, Driving device (Built-in brake)
	2	Gap between the lining and the disk	○	○	Visual Inspection/ Measuring Inspection	Steel ruler/ Feeler gauge	Gap size should be equal.			
	3	Abrasion and roughness of the disk	○	○	Visual Inspection/ Measuring Inspection	Steel ruler/ Vernier caliper	Repair damages immediately in case there are damages on the surface of the disk. Acceptable abrasion is within 5mm from the original size.			
	4	Cracks and oily dirt of the disk	○	○	Visual Inspection		There is no cracks or oily dirt.			
	5	Oil condition of the pins of each lever	○	○	Visual Inspection		There is no oil shortage.			
	6	Control torque (Size of the spring)	○	○	Visual Inspection/ Measuring Inspection	Steel ruler	Parameter of the graduation of the scale should be same as the rating plate.	Check the graduation of the scale		
	7	Loose and damages of the main lever, the rods, the joint bolts for the lining, the pins and the screws	○	○	Visual Inspection/ Hammering Inspection	Testing hammer	There is no loose or damages.			
	8	Abnormal noise/ Abnormal heat/ Abnormal odd/ Abnormal vibration	○	○	Listening Inspection/ Hand Touch Inspection/ Sensory Inspection		There is no abnormal conditions.			
	9	Excessive heat and discoloration of the brake lining	○	○	Visual Inspection		There is no discoloration.			
	10	Dust accumulation	○	○	Visual Inspection		There is no dust accumulation.			
	11	Oil leakage at the hydraulic lifter	○	○	Visual Inspection		There is no oil leakage.			
	12	Oil volume and oil condition (deterioration) of the hydraulic lifter	○	○	Visual Inspection		Oil volume is properly. There is no deterioration of the oil.			
Speed sensor (in case the electric motor is external type)	1	Condition of the joint	○	○	Visual Inspection		It is in the normal condition.			Hoisting device, Cross traveling device, Derricking device
	2	Loose of the joint bolts	○	○	Hammering Inspection	Testing hammer	There is no loose.			
	3	Condition of the grease oil applied to the joint		○	Visual Inspection		There is no oil shortage.			
	4	Insulation resistance		○	Measuring Inspection	Tester	Resistivity should be above the default level.			
Common items to the board	1	Condition of the outer surface and surroundings of the board	○	○	Visual Inspection		There is no dirt.			Transformer board, Main control board
	2	Condition of the inner items of the board	○	○	Visual Inspection		There is no dust dirt. There is no condensation.			
	3	Condition of the instruments and parts	○	○	Visual Inspection		There is no damages.			
	4	Condition of the connection of the instruments	○	○	Visual Inspection		There is no damages or abrasion.			
	5	Condition of the cables	○	○	Visual Inspection		There is no dirt or damages.			
	6	Condition of the connector		○	Visual Inspection		There is no loose.			
	7	Condition of the insulating material		○	Visual Inspection		There is no dirt, damages or lost.			
	8	Fastening condition for the structure		○	Visual Inspection/ Hand Touch Inspection		There is no loose.			
	9	Fastening condition of each part of the cables		○	Visual Inspection/ Hand Touch Inspection		There is no loose.			
	10	Sign of the damages by the excessive heat		○	Visual Inspection		There is no sign of damages.			
MCCB Earth leakage circuit breaker	1	Rated capacity	○	○	Visual Inspection		The rated capacity is as same as the parameter.			Main control board, Main circuit breaker, Auxiliaries, Control device
	2	Cracks or damages of the insulation material	○	○	Visual Inspection		There is no cracks or damages.			
	3	Condition of the open and close	○	○	Operational Inspection		It works normally.			
	4	Damages of the mold	○	○	Operational Inspection		There is no damages.			
	5	Loose of the joint bolts	○	○	Hand Touch Inspection		There is no loose.			

Wire on the board		1	Loose of the joint parts such as joint of the box	○	○	Hand Touch Inspection		There is no loose.			Main circuit breaker, Auxiliaries,
		2	Loose of the terminal	○	○	Hand Touch Inspection		There is no loose.			
		3	Damages on the surface of the cables		○	Visual Inspection		There is no damages on the cable cover.			
		4	Wire breakage		○	Visual Inspection/ Hand Touch Inspection		There is no wire breakage.			
		5	Damages on the barrier of the terminal		○	Visual Inspection		There is no damages.			
		6	Cracks at the crimped terminal		○	Visual Inspection		There is no cracks.			
		7	Lost, damages or dirt of the wire mark		○	Visual Inspection		There is no lost, damages, or dirt.			
		8	Rain water leakage into the exterior junction boxes	○	○	Visual Inspection		There is no rain water leakage.			
		9	Insulation resistance of each circuit		○	Measuring Inspection	Megger	Resistivity should be above the default level.			
		10	Dust accumulation on the cables		○	Visual Inspection		There is no dust accumulation.			
		11	Loose of the fastening of the cables		○	Hand Touch Inspection		There is no loose.			
Electromagnetic contactor, Relay		1	Condition of the connection of the contactor (disconnect)	○	○	Visual Inspection		They are in normal condition.			Main control board, Main circuit breaker, Auxiliaries
		2	Howling of the electromagnetic coil	○	○	Listening Inspection		They are in normal condition.			
		3	Condition of the attraction surface of the movable core and the surface of the coil	○	○	Visual Inspection		They are in normal condition.			
		4	Operational status	○	○	Operational Inspection		It works normally.			
		5	Loose of the joint bolts	○	○	Hand Touch Inspection		There is no loose.			
		6	Wire breakage of the lead cable		○	Visual Inspection		There is no wire breakage.			
		7	Fastening condition of the connecting parts		○	Visual Inspection		There is no loose.			
		8	Insulation resistance of the resister for the electromagnetic coil		○	Visual Inspection		They are in normal condition.			
		9	Dust accumulation on the structural parts and the electromagnetic coil		○	Visual Inspection		There is no dust.			
		10	abnormal conditions of the stopper for the movable core		○	Visual Inspection		They are in normal condition.			
		11	Setting condition of the overcurrent relay		○	Visual Inspection		They are in normal condition.			
Transformer	Coil	1	Dust accumulation	○	○	Visual Inspection		There is no dust accumulation.			
		2	Excessive heat and discoloration	○	○	Visual Inspection		There is no abnormal discoloration.			
		3	Damages	○	○	Visual Inspection		There is no damages.			
		4	Fastening condition of the connecting parts		○	Visual Inspection/ Hand Touch Inspection		There is no backlash or loose.			
		5	Insulation resistance		○	Measuring Inspection	Megger	Resistivity should be above the default level.			
	Tap changer	1	Dust	○	○	Visual Inspection		There is no damages.			
		2	Damages	○	○	Visual Inspection		There is no damages.			
	Copper belt	1	Excessive heat and discoloration	○	○	Visual Inspection		There is no abnormal discoloration.			
		2	Fastening condition		○	Visual Inspection/ Hand Touch Inspection		There is no backlash or loose.			
	Supporting items	1	Damages	○	○	Visual Inspection/ Hand Touch Inspection		There is no damages.			
		2	Vibration	○	○	Visual Inspection/ Hand Touch Inspection		There is no excessive vibration.			
	Dial thermometer	1	Thermometer signal	○	○	Visual Inspection		It works normally.			
		2	Glass fog/ Condensation	○	○	Visual Inspection		There is no glass fog or condensation.			
		3	Condition of the joint of the cables		○	Visual Inspection		It is in normal condition.			
		4	Condition of the joint (anti-vibration rubber, etc.)		○	Visual Inspection		It is in normal condition.			
		5	Operational status of the warning alarm		○	Operational Inspection		It works normally.			
		6	Insulation resistance		○	Measuring Inspection	Megger	Resistivity should be above the default level.			

Inverter board, Converter board	Control unit	1	Dust on the printed board	○	○	Visual Inspection		There is no excessive dust.			
		2	Input and output of the parameter		○	Measuring Inspection	Tester/ Oscilloscope (Syncroscope)	It works as same as the parameter.			
		3	Check the setting parameter		○	Measuring Inspection	Tester/ Programing tool	Same as the parameter.			
		4	Control voltage		○	Measuring Inspection	Tester	AC440V±10%			
		5	Back-up battery		○	Visual Inspection	Programing tool	It does not exceed its service life.			
	Cooling fan	1	Vibration	○	○	Hand Touch Inspection		There is no excessive vibration.			
		2	Spin	○	○	Visual Inspection		It spins to proper direction.			
		3	Damages to the fan	○	○	Visual Inspection		There is no deformation or damages.			
	Air duct	4	Filter clogging		○	Visual Inspection		There is no filter clogging.			
Control device, Operation disk	Controller	1	Center and vertical position of the control handle	○	○	Visual Inspection		It is in normal condition.			
		2	Smooth operation	○	○	Operational Inspection		It works normally. (Particularly, there is no play with the gear, the pins or the axis socket which is caused by the abrasion.)			
		3	Grease oil applied to the axis socket	○	○	Visual Inspection		There is no oil shortage.			
		4	Condition of the connection of the connector	○	○	Check the circuit		They are in normal condition.			
		5	Loose of the joint bolts	○	○	Hand Touch Inspection		There is no loose.			
		6	Condition of the zero notch	○	○	Operational Inspection		It works normally. (Particularly, there is no play caused by the abrasion.)			
	Switch, Button	1	Condition of the connection of the connector	○	○	Visual Inspection/ Operational Inspection		It works smoothly.			
		2	Loose of the joint bolts	○	○	Hand Touch Inspection		There is no loose.			
	Signal, Sign	1	Burn-out of the light	○	○	Visual Inspection		There is no loose.			
		2	Loose of the joint bolts	○	○	Hand Touch Inspection		There is no loose.			
Control device, Instrument board	Instruments	1	Display of the instruments	○	○	Visual Inspection		They are in normal condition.			
		2	Heat discoloration and cracks of the instrument transformers	○	○	Visual Inspection		There is no discoloration or cracks.			
		3	Dew drops on the board	○	○	Visual Inspection		There is no dew drops.			
		4	Loose of the joint bolts	○	○	Hand Touch Inspection		There is no loose.			
		5	Difference among the instruments		○	Visual Inspection		Difference should be within the parameter.			
		6	Corrosion and dirt on the board		○	Visual Inspection		There is no corrosion or dirt.			
Electronic anti-sway system	Camera (camera sensor)	1	Condition of the joint (loose and rust stain of the joint bolts)	○	○	Visual Inspection/ Hand Touch Inspection		There is no loose of the bolt. There is no rust stain.			
		2	Inner condition (Water leakage/ Dirt)	○	○	Visual Inspection		There is no leaking water. There is no dirt.			
		3	Condition of the connection of the cable connectors (Loose/ Damages)	○	○	Visual Inspection/ Hand Touch Inspection		There is no loose or damages.			
		4	Appearance of the CCD and Lens/ Condition of the connection of the CCD and Lens		○	Visual Inspection/ Hand Touch Inspection		They are in normal condition. There is no loose.			
		5	Optical axis	○	○	Visual Inspection	Monitor TV	Check the sign.			
	Camera case	1	Condition of the joint (loose and rust stain of the joint bolts)	○	○	Visual Inspection		There is no loose or the bolts. There is no rust stain.			
		2	Dirt on the surface of the glass of the camera case	○	○	Visual Inspection		There is no dirt.			
		3	Inner condition (Water leakage/ Dirt)	○	○	Visual Inspection		There is no leaking water. There is no dirt.			
		4	Continuity of the space heater	○	○	Visual Inspection		It works normally.			
	Beacon, targeting mark	1	Surface of the beacon	○	○	Visual Inspection		There is no dirt.			
		2	Condition of the connection of the beacon connector	○	○	Visual Inspection		There is no loose.			
		3	Condition of the connection of the cable connectors (Loose/ Damages)	○	○	Visual Inspection/ Hand Touch Inspection		There is no loose or damages.			
		4	Power supply voltage	○	○	Measuring Inspection	Voltmeter	Electric voltage should be ± 10% of the default voltage.			

Measuring instrument (Encoder, Synchro)	Transmitter	1	Condition of the joint	○	○	Visual Inspection/ Hand Touch Inspection		They are in normal condition.			
		2	Condition of the connection of the coupling	○	○	Visual Inspection/ Hand Touch Inspection		They are in normal condition.			
		3	Condition of the connection of the cable connectors (Loose/ Damages)	○	○	Visual Inspection/ Hand Touch Inspection		There is no loose or damages.			
		4	Cable disconnection/ Short circuit		○	Measuring Inspection	Tester	There is no cable disconnection or short circuit.			
		5	Condition of the pairing	○	○	Visual Inspection		It is in normal condition. There is no oil shortage.			
		6	Condition of the gear	○	○	Visual Inspection		It is in normal condition. There is no oil shortage.			
	Receiver (Converter)	1	Condition of the joint	○	○	Visual Inspection/ Hand Touch Inspection		It is in normal condition.			
		2	Condition of the connection of the cable connectors (Loose/ Damages)	○	○	Visual Inspection/ Hand Touch Inspection		There is no loose or damages.			
		3	Operational status of the lumps and switches	○	○	Visual Inspection/ Operational Inspection		It works normally.			
	Display	1	Condition of the joint	○	○	Visual Inspection/ Hand Touch Inspection		It is in normal condition.			
		2	Condition of the connection of the cable connectors (Loose/ Damages)	○	○	Visual Inspection/ Hand Touch Inspection		There is no loose or damages.			
		3	Operational status of the lumps and switches	○	○	Visual Inspection/ Operational Inspection		It works normally.			
Measuring instrument (Load cell)	Sensor	1	Condition of the joint	○	○	Visual Inspection/ Hand Touch Inspection		It is in normal condition.			
		2	Condition of the connection of the cable connectors (Loose/ Damages)	○	○	Visual Inspection/ Hand Touch Inspection		There is no loose or damages.			
	Converter	1	Condition of the joint	○	○	Visual Inspection/ Hand Touch Inspection		It is in normal condition.			
		2	Condition of the connection of the cable connectors (Loose/ Damages)	○	○	Visual Inspection/ Hand Touch Inspection		There is no loose or damages.			
		3	Operational status of the lumps and switches	○	○	Visual Inspection/ Operational Inspection		It works normally.			
	Sign board	1	Condition of the joint	○	○	Visual Inspection/ Hand Touch Inspection		It is in normal condition.			
		2	Condition of the connection of the cable connectors (Loose/ Damages)	○	○	Visual Inspection/ Hand Touch Inspection		There is no loose or damages.			
		3	Operational status of the lumps and switches	○	○	Visual Inspection/ Operational Inspection		It works normally.			
Wind direction, Anemometer	Transmitter	1	Appearance/ Setting condition/ Direction	○	○	Visual Inspection/ Hand Touch Inspection		It is in normal condition. There is no loose.			
		2	Condition of the connection of the cable connectors (Loose/ Damages)	○	○	Visual Inspection/ Hand Touch Inspection		There is no loose or damages.			
		3	Cable disconnection/ Short circuit		○	Measuring Inspection	Tester	There is no cable disconnection or short circuit.			
		4	Spin and operation status of the cups	○	○	Visual Inspection/ Hand Touch Inspection		It works normally.			
		5	Operational status	○	○	Visual Inspection/ Operational Inspection		It works normally.			
	Receiver	1	Condition of the joint of the main body	○	○	Visual Inspection/ Hand Touch Inspection		It is in normal condition.			
		2	Condition of the connection of the cable connectors (Loose/ Damages)	○	○	Visual Inspection/ Hand Touch Inspection		There is no loose or damages.			
		3	Check the voltage		○	Measuring Inspection	Tester	Voltage is on or under the parameter.			
		4	Operational status of the lumps and switches	○	○	Visual Inspection/ Operational Inspection		It works normally.			
		5	Check the parameter	○	○	Visual Inspection		Same as the parameter.			
		6	Operational status	○	○	Visual Inspection/ Operational Inspection		It works normally.			

Safety device	Emergency Stop Device	1	Operational status	○	○	Operational Inspection		It is in normal condition.			
		2	Condition of the joint bolts	○	○	Hand Touch Inspection		There is no loose.			
	Limit switch	1	Operational status	○	○	Operational Inspection		It works normally.			
		2	Condition of the joint bolts	○	○	Hand Touch Inspection		There is no loose.			
	Collision Avoidance System	1	Operational status	○	○	Operational Inspection		It works normally.			
		2	Condition of the joint bolts	○	○	Hand Touch Inspection		There is no loose.			
	Speed limiting switch	1	Conditions of the screwed parts	○	○	Visual Inspection		There is no loose.			
		2	Condition of the joint parts of the axis	○	○	Visual Inspection		There is no dust.			

Appendix 9 Environmental and Social Considerations

9-1 Attachments of Environmental and Social Considerations Survey Works

(1) Results of Water Quality Analysis

Results of Water Quality Analysis (Point-1) (dry season)

ISO TECH LABORATORY

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TRACE CERTIFIED

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 1 of 1

M0517 014

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	E-Guard
Nature of Water	River Water (1)
Location	Mandalay Township
Date and Time of collection	17.5.2017 (12:30 PM)
Date and Time of arrival at Laboratory	18.5.2017
Date and Time of commencing examination	18.5.2017
Date and Time of completing	19.5.2017

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	18	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	8	CFU/100ml	Not detected
pH	7.3		6.5 - 8.5
Turbidity	92	NTU	5 NTU
Colour (True)	60	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.
: This certificate is issued only for the receipt of the test sample.
: < - Less than

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-73242162, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ANALYSIS REPORT

ORIGINAL

Job Ref: 3691/2017
Date : 12 May, 2017

Sample Described as	:	**ENVIRONMENTAL WATER**
Client Name	:	**E GUARD ENVIRONMENTAL SERVICES CO., LTD.**
		No. 11, Air Port Street, Insein Township, Yangon, Myanmar
Sample Brought By	:	Client
Sample Marks	:	1
Location	:	MDY
Sample Received Date	:	08.05.2017
Analysed Date	:	09.05.2017
Lab Code No.	:	107/17

No.	Test Parameter	Unit	Result	Method	LOQ
1.	Oil & Grease	mg/l	<5	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012;5520B	5

End Of Report

SGS (Myanmar) Limited
(Nu Nu Yi)
Manager

SGS (Myanmar) Limited | Agriculture, Food and Life (AFL) 79/80, Bahosi Housing Complex, Wardan Street, Lanmadaw Tsp, Yangon, Myanmar
t +95(1)211562, 211537, 211538, 211547 f +95(1)211549, 2317049 e sgs.myanmar@sgs.com
Member of SGS Group (SGS SA)

SUPREME GROUP OF COMPANIES
SUPREME WATER DOCTOR GROUP
No.19-C, Nawaday Garden, Yangon-Pathein Road,
Hlaing Tharyar Township, Yangon, Republic of the Union of Myanmar
Tel : 01-689376, 689377, 689378, 689718, 689719. Fax : 01-685237

WATER ANALYSIS RESULT

Result Form No.	0341/ R&D / SWDG / 17
Client	Eguard
Location	မန္တလေး။ ဧရာဝတီမြစ်ရေ ။
Nature of Water	မြစ်ရေ - Point(1)
Date of Sample Received	8.5.2017
Tested on	8.5.2017

	UNIT	ANALYSIS RESULT	WHO GUIDELINE
Total Nitrogen	mg/L	0.9	-
Total Phosphorus	mg/L	0.4	-

Remark :

Approved By

Tin Moh Moh Hlaing
M.Sc (Chem:), M.S (Biotech:)
Head of R&D Dept;
Supreme Water Doctor Group
Supreme Group of Companies

MANDALAY CITY DEVELOPMENT COMMITTEE
WATER AND SANITATION DEPARTMENT
WATER LAB ORATORY

Your reference Development of Mandalay Port Project (ဧရာဝတီမြစ်ရေ) .....

Our reference .....

Report on ..... One (Number) ..... Sample of Water

Brought by ..... ဦးပြည်ဖြိုးကျော် ..... at ..... (Time) ..... on ..... 5-5-2017 (Date)

Tested on ..... 5-5-2017 (Date) ..... at ..... (Time)

Sampling Points		Point 1	W.H.O Standard	
Sampling Time and Date			Desirable	Imperative
Physical Examination	**Unit**			
- P^H Value	Scale	6.8	7-8.5	6.5-9.2
- Colour	Units	>50	5	50
- Turbidity	N.T.U	91.2	5	25
- Conductivity	(micromhos/cm)	73.2		
- Total Dissolved Solids	mg/l	38.4		
- Total Suspended Solids	mg/l	69		
Chemical Analysis				
- Calcium as Ca	mg/l	8	75	200
- Hardness, Total as $CaCo_3$	mg/l	28	100	500
- Magnesium as Mg	mg/l	1	30	150
- Chloride as CL	mg/l	5	200	600
- Total Alkalinity as $CaCo_3$	mg/l	40	200	500
- Iron, Total as Fe	mg/l	>0.2	0.1	1.0
- Manganese as Mn	mg/l	0.03	0.05	0.5
- Sulphate as So_4	mg/l	<200	200	400
- Nitrogen Nitrate ($N\text{-}NO_3$)	mg/l	8.8		45

Remark ..... Chemically Potable .....

Tested by .....

Approved by .....

MANDALAY CITY DEVELOPMENT COMMITTEE
WATR AND SANITATION DEPARTMENT
WATER LABORATORY

Your reference - Development of Mandalay Port Project (ရေဝတီမြစ်ရေ Point-1)

Brought by - ဦးပြည့်ဖြိုးကျော် at ..... (Time) on 5-5-2017 (Date)

Test on - 5-5-2017 (Date) at ..... (Time)

D.O (mg/l)	-	6.86
B.O.D (mg/l)	-	3.90
C.O.D (mg/l)	-	9.75
P^{H} vlue	-	6.8
Salinity	-	0.1
T.S.S (mg/l)	-	69

Tested by .....

Approved by .....

WQ Baseline Sampling/Survey Field Notes

Project: MOY Port	Date: 5.5.2017 (1)
Client:	Surveyor: Pyae Phyo Kyaw/Khin Zaw Min
Location: MOY	Time: 11:00 Am
Lat: 21° 57' 9.72" N	Long: 96° 02' 46.17" E
Evaluation:	Barometer Pressure:
Weather:	Sample/Location ID: GPS Waypoint no: Temperature: 27.6°C Time: 11:10 Am
Turbidity by Sechi Depth (cm):	
NTU converted from chart:	

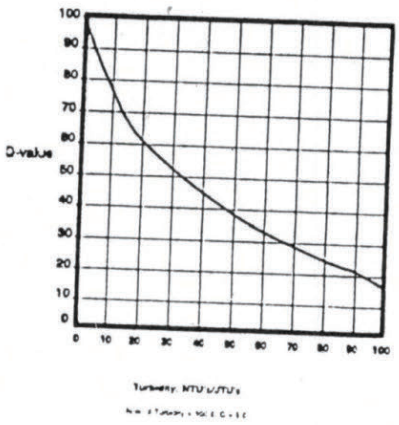
Surface/Ground/Effluent Water

Sr. No.	pH	Electrical Conductivity			DO (ppm)	Flow Rate (m/sec)	Depth (m)	Remark
		EC (µS/cm)	TDS (ppm)	Salinity (ppt)				
P1.	8.110	53.2	53mg/L	0.0	7.72			

Length to Turbidity Conversion Chart

cm	NTU
< 6	> 240
6 to 7	240
7 to 8	185
8 to 9	150
9 to 10	120
10 to 12	100
12 to 14	84
14 to 16	60
16 to 19	48
19 to 21	40
21 to 24	35
24 to 26	30
26 to 29	27
29 to 31	24

cm	NTU
31 to 34	21
34 to 36	19
36 to 39	17
39 to 41	15
41 to 44	14
44 to 46	13
46 to 49	12
49 to 51	11
51 to 54	10
54 to 57	9
57 to 60	8
60 to 70	7
70 to 85	6
> 85	< 5



Kyaw
Pyae Phyo Kyaw
EQ Team Leader

Results of Water Quality Analysis (Point-1) (rainy season)

ISO TECH LABORATORY

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 1 of 1

M0717 016

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	E-Guard
Nature of Water	River Water
Location	Mandalay Township (Point - 1)
Date and Time of collection	22.7.2017
Date and Time of arrival at Laboratory	24.7.2017
Date and Time of commencing examination	24.7.2017
Date and Time of completing	25.7.2017

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	30	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	12	CFU/100ml	Not detected
pH	7.1		6.5 - 8.5
Turbidity	110	NTU	5 NTU
Colour (True)	70	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.
: This certificate is issued only for the receipt of the test sample.
: < - Less than

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thir
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18. Lanthit Road. Nanthargone Quarter. Insein Township. Yangon. Myanmar.
Ph: 01-640955, 09-73225175, 09-73242162, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ANALYSIS REPORT

ORIGINAL

Job Ref: 5817/2017
Date : 31 July 2017

Sample Described as	:	**ENVIRONMENTAL WATER**
Client Name	:	**E GUARD ENVIRONMENTAL SERVICES CO., LTD.**
		No. 11, Air Port Street, Insein Township, Yangon, Myanmar
Project Name	:	-
Sample Brought By	:	Client
Sample Marks	:	1
Location	:	MANDALAY PORT
Sample Received Date	:	24.07.2017
Analysed Date	:	25.07.2017
Lab Code No.	:	154/2017

No.	Test Parameter	Unit	Result	Method	LOQ
1.	Total Nitrogen(organic)	mg/l	<1	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012; 4500-N_{org} B.Macro Kjeldahl Method	1
2.	Total Phosphorus	mg/l	0.020	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012;4500-P E.Ascorbic Acid Method	0.01
3.	Oil & Grease	mg/l	<5	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012;5520B	5

End Of Report

SGS (Myanmar) Limited

(Nu Nu Yi)
Manager

SGS (Myanmar) Limited | Agriculture, Food and Life (AFL) No.79/D, Bo Chein Street, 6½ Mile, Hlaing Tsp., Yangon, Myanmar.
t : +95 (1) 654795, 654796 **e :** sgs.myanmar@sgs.com

MANDALAY CITY DEVELOPMENT COMMITTEE
WATR AND SANITATION DEPARTMENT
WATER LABORATORY

Your reference - Development of Mandalay Port Project (ဧရာဝတီမြစ်ရေ Point-1)

Brought by - ဦးပြည့်ဖြိုးကျော် at ..... (Time) on 20-7-2017 (Date)

Test on - 20-7-2017 (Date) at ..... (Time)

D.O (mg/l)	-	5.67
B.O.D (mg/l)	-	3.60
C.O.D (mg/l)	-	9.00
P^{H} vlue	-	6.8
Salinity	-	0.1
T.S.S (mg/l)	-	49

Tested by .....

Approved by .....
ဌာနဆိုင်ရာ
ရေဖြန့်ဖြူးရေးဌာနခွဲ

MANDALAY CITY DEVELOPMENT COMMITTEE
WATER AND SANITATION DEPARTMENT
WATER LAB ORATORY

Your reference Development of Mandalay Port Project (ဧရာဝတီမြစ်ရေ) .....

Our reference .....

Report on ..... One ..... Sample of Water
(Number)

Brought by ..... ဦးပြည့်ဖြိုးကျော် ..... at ..... (Time) on ..... 20-7-2017 ..... (Date)

Tested on ..... 20-7-2017 ..... (Date) at ..... (Time)

Sampling Points		Point 1	W.H.O Standard	
Sampling Time and Date			Desirable	Imperative
Physical Examination	**Unit**			
- P^H Value	Scale	6.8	7-8.5	6.5-9.2
- Colour	Units	>50	5	50
- Turbidity	N.T.U	53.8	5	25
- Conductivity	(micromhos/cm)	72.8		
- Total Dissolved Solids	mg/l	38.5		
- Total Suspended Solids	mg/l	49		
Chemical Analysis				
- Calcium as Ca	mg/l	11	75	200
- Hardness, Total as $CaCo_3$	mg/l	40	100	500
- Magnesium as Mg	mg/l	3	30	150
- Chloride as CL	mg/l	5	200	600
- Total Alkalinity as $CaCo_3$	mg/l	40	200	500
- Iron, Total as Fe	mg/l	>0.2	0.1	1.0
- Manganese as Mn	mg/l	0.03	0.05	0.5
- Sulphate as So_4	mg/l	<200	200	400
- Nitrogen Nitrate ($N\text{-}NO_3$)	mg/l	8.8		45

Chemically Potable

Remark .....

Tested by .....

Approved by .....

ဌာနဆိုင်ရာ
ရေဖြန်းဖြိုးရေးဌာနခွဲ

Project: Mandalay Port	Date: 20.7.2017
Client:	Surveyor: Pyae Phyo Kyaw
Location: Mandalay	Time: 10:30 AM
Lat: 21° 57' 9.72" N	Long: 96° 02' 46.17" E
Evaluation:	Barometer Pressure:
Weather:	Sample/Location ID: GPS Waypoint no: Temperature: 26°C Time: 10:40 AM
Turbidity by Sechi Depth (cm):	
NTU converted from chart:	

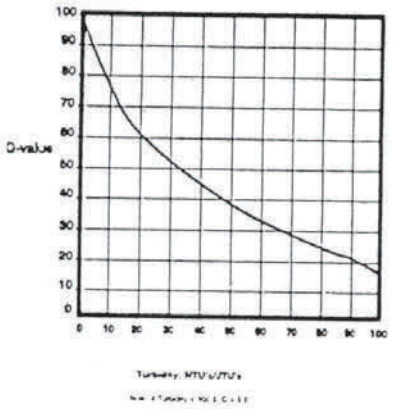
Surface/Ground/Effluent Water

Sr. No.	pH	Electrical Conductivity EC (µS/cm)	TDS (ppm)	Salinity (ppt)	DO (ppm)	Flow Rate (m/sec)	Depth (m)	Remark
P.1	7.5	52	43mg/L	0	5.2			

Length to Turbidity Conversion Chart

cm	NTU
< 6	> 240
6 to 7	240
7 to 8	185
8 to 9	150
9 to 10	120
10 to 12	100
12 to 14	84
14 to 16	60
16 to 19	48
19 to 21	40
21 to 24	35
24 to 26	30
26 to 29	27
29 to 31	24

cm	NTU
31 to 34	21
34 to 36	19
36 to 39	17
39 to 41	15
41 to 44	14
44 to 46	13
46 to 49	12
49 to 51	11
51 to 54	10
54 to 57	9
57 to 60	8
60 to 70	7
70 to 85	6
> 85	< 5



Pyae Phyo Kyaw

Results of Water Quality Analysis (Point-2) (dry season)

ISO TECH LABORATORY

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 1 of 1

M0517 015

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	E-Guard
Nature of Water	River Water (2)
Location	Mandalay Township
Date and Time of collection	17.5.2017 (12:30 PM)
Date and Time of arrival at Laboratory	18.5.2017
Date and Time of commencing examination	18.5.2017
Date and Time of completing	19.5.2017

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	22	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	10	CFU/100ml	Not detected
pH	7.1		6.5 - 8.5
Turbidity	110	NTU	5 NTU
Colour (True)	70	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.
: This certificate is issued only for the receipt of the test sample.
: < - Less than

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-73242162, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ANALYSIS REPORT

ORIGINAL

Job Ref: 3691/2017
Date : 12 May, 2017

Sample Described as	:	**ENVIRONMENTAL WATER**
Client Name	:	**E GUARD ENVIRONMENTAL SERVICES CO., LTD.**
		No. 11, Air Port Street, Insein Township, Yangon, Myanmar
Sample Brought By	:	Client
Sample Marks	:	2
Location	:	MDY
Sample Received Date	:	08.05.2017
Analysed Date	:	09.05.2017
Lab Code No.	:	108/17

No.	Test Parameter	Unit	Result	Method	LOQ
1.	Oil & Grease	mg/l	<5	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012;5520B	5

End Of Report

SGS (Myanmar) Limited
(Nu Nu Yi)
Manager

SGS (Myanmar) Limited | Agriculture, Food and Life (AFL) 79/80, Bahosi Housing Complex, Wardan Street, Lanmadaw Tsp, Yangon, Myanmar
t +95(1)211562, 211537, 211538, 211547 f +95(1)211549, 2317049 e sgs.myanmar@sgs.com
Member of SGS Group (SGS SA)

SUPREME GROUP OF COMPANIES
SUPREME WATER DOCTOR GROUP
No.19-C, Nawaday Garden, Yangon-Pathein Road,
Hlaing Tharyar Township, Yangon, Republic of the Union of Myanmar
Tel : 01-689376, 689377, 689378, 689718, 689719. Fax : 01-685237

WATER ANALYSIS RESULT

Result Form No.	0342/ R&D / SWDG / 17
Client	Eguard
Location	မန္တလေး ဧရာဝတီမြစ်ရေ ။
Nature of Water	မြစ်ရေ - Point(2)
Date of Sample Received	8.5.2017
Tested on	8.5.2017

	UNIT	ANALYSIS RESULT	WHO GUIDELINE
Total Nitrogen	mg/L	1.4	-
Total Phosphorus	mg/L	0.6	-

Remark :

Approved By

Tin Moh Moh Hlaing
M.Sc (Chem:), M.S (Biotech:)
Head of R&D Dept;
Supreme Water Doctor Group
Supreme Group of Companies

MANDALAY CITY DEVELOPMENT COMMITTEE
WATER AND SANITATION DEPARTMENT
WATER LAB ORATORY

Your reference ..... Development of Mandalay Port Project (ဧရာဝတီမြစ်ရေ)

Our reference .....

Report on ..... One (Number) ..... Sample of Water

Brought by ..... ဦးပြည့်ဖြိုးကျော် ..... at ..... (Time) ..... on ..... 5-5-2017 (Date)

Tested on ..... 5-5-2017 (Date) ..... at ..... (Time)

Sampling Points		Point 2	W.H.O Standard	
Sampling Time and Date			Desirable	Imperative
Physical Examination	**Unit**			
- P^H Value	Scale	6.8	7-8.5	6.5-9.2
- Colour	Units	>50	5	50
- Turbidity	N.T.U	97.4	5	25
- Conductivity	(micromhos/cm)	73.8		
- Total Dissolved Solids	mg/l	38.6		
- Total Suspended Solids	mg/l	72		
Chemical Analysis				
- Calcium as Ca	mg/l	8	75	200
- Hardness, Total as $CaCo_3$	mg/l	28	100	500
- Magnesium as Mg	mg/l	1	30	150
- Chloride as CL	mg/l	5	200	600
- Total Alkalinity as $CaCo_3$	mg/l	40	200	500
- Iron, Total as Fe	mg/l	>0.2	0.1	1.0
- Manganese as Mn	mg/l	0.03	0.05	0.5
- Sulphate as So_4	mg/l	<200	200	400
- Nitrogen Nitrate ($N\text{-}NO_3$)	mg/l	8.8		45

Remark ----------

Tested by .....

Approved by .....

MANDALAY CITY DEVELOPMENT COMMITTEE
WATR AND SANITATION DEPARTMENT
WATER LABORATORY

Your reference - Development of Mandalay Port Project (ဧရာဝတီမြစ်ရေ Point-2)

Brought by - ဦးမြည့်ဖြိုးကျော် at ..... (Time) on 5-5-2017 (Date)

Test on - 5-5-2017 (Date) at ..... (Time)

D.O (mg/l)	-	6.64
B.O.D (mg/l)	-	3.80
C.O.D (mg/l)	-	9.50
P^{H} vlue	-	6.8
Salinity	-	0.1
T.S.S (mg/l)	-	72

Tested by .....

Approved by .....

Project: MOY Port	Date: 5.5.2017 (2)
Client:	Surveyor: Pyae Phyo Kyaw/Khin Zaw Min
Location: MOY	Time: 11:15 Am
Lat: 21° 56′ 50.00″ N	Long: 96° 02′ 39.07″ E
Evaluation:	Barometer Pressure:
Weather:	Sample/Location ID: GPS Waypoint no: Temperature: 27°C Time: 11:30 Am
Turbidity by Sechi Depth (cm):	
NTU converted from chart:	

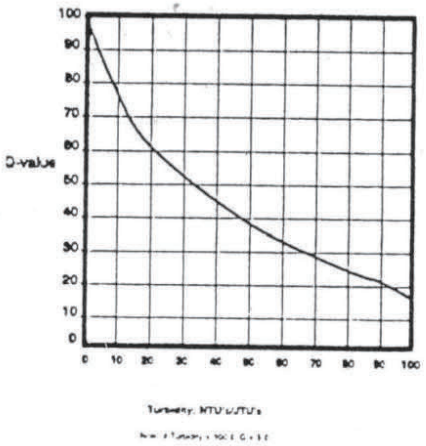
Surface/Ground/Effluent Water

Sr. No.	pH	Electrical Conductivity			DO (ppm)	Flow Rate (m/sec)	Depth (m)	Remark
		EC (µS/cm)	TDS (ppm)	Salinity (ppt)				
	8.09	50.8	51 mg/L	0.0	7.79		4m	

Length to Turbidity Conversion Chart

cm	NTU
< 6	> 240
6 to 7	240
7 to 8	185
8 to 9	150
9 to 10	120
10 to 12	100
12 to 14	84
14 to 16	60
16 to 19	48
19 to 21	40
21 to 24	35
24 to 26	30
26 to 29	27
29 to 31	24

cm	NTU
31 to 34	21
34 to 36	19
36 to 39	17
39 to 41	15
41 to 44	14
44 to 46	13
46 to 49	12
49 to 51	11
51 to 54	10
54 to 57	9
57 to 60	8
60 to 70	7
70 to 85	6
> 85	< 5



Kyaw
Pyae Phyo Kyaw
EA Team Leader

Results of Water Quality Analysis (Point-2) (rainy season)

ISO TECH LABORATORY

TRACE CERTIFIED

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 1 of 1

M0717 017

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	E-Guard
Nature of Water	River Water
Location	Mandalay Township (Point - 2)
Date and Time of collection	22.7.2017
Date and Time of arrival at Laboratory	24.7.2017
Date and Time of commencing examination	24.7.2017
Date and Time of completing	25.7.2017

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	42	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	20	CFU/100ml	Not detected
pH	6.9		6.5 - 8.5
Turbidity	158	NTU	5 NTU
Colour (True)	80	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.
: This certificate is issued only for the receipt of the test sample.
: < - Less than

Tested by

Signature:

Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:

Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-73242102, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ANALYSIS REPORT

ORIGINAL

Job Ref: 5817/2017
Date : 31 July 2017

Sample Described as	:	**ENVIRONMENTAL WATER**
Client Name	:	**E GUARD ENVIRONMENTAL SERVICES CO., LTD.**
		No. 11, Air Port Street, Insein Township, Yangon, Myanmar
Project Name	:	-
Sample Brought By	:	Client
Sample Marks	:	2
Location	:	MANDALAY PORT
Sample Received Date	:	24.07.2017
Analysed Date	:	25.07.2017
Lab Code No.	:	155/2017

No.	Test Parameter	Unit	Result	Method	LOQ
1.	Total Nitrogen(organic)	mg/l	<1	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012; 4500-N_{org} B.Macro Kjeldahl Method	1
2.	Total Phosphorus	mg/l	0.026	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012;4500-P E.Ascorbic Acid Method	0.01
3.	Oil & Grease	mg/l	<5	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012;5520B	5

End Of Report

SGS (Myanmar) Limited

(Nu Nu Yi)
Manager

SGS (Myanmar) Limited | Agriculture, Food and Life (AFL) No.79/D, Bo Chein Street, 6½ Mile, Hlaing Tsp., Yangon, Myanmar.
t : +95 (1) 654795, 654796 e : sgs.myanmar@sgs.com

MANDALAY CITY DEVELOPMENT COMMITTEE
WATER AND SANITATION DEPARTMENT
WATER LAB ORATORY

Your reference Development of Mandalay Port Project (ဧရာဝတီမြစ်ရေ) .....

Our reference .....

Report on ..... One ..... Sample of Water
(Number)

Brought by ..... ဦးပြည့်ဖြိုးကျော် ..... at ..... (Time) on ..... 20-7-2017 ..... (Date)

Tested on ..... 20-7-2017 ..... (Date) at ..... (Time)

Sampling Points		Point 2	W.H.O Standard	
Sampling Time and Date			Desirable	Imperative
Physical Examination	**Unit**			
- P^H Value	Scale	6.8	7-8.5	6.5-9.2
- Colour	Units	>50	5	50
- Turbidity	N.T.U	51.2	5	25
- Conductivity	(micromhos/cm)	72.2		
- Total Dissolved Solids	mg/l	37.7		
- Total Suspended Solids	mg/l	44		
Chemical Analysis				
- Calcium as Ca	mg/l	10	75	200
- Hardness, Total as $CaCo_3$	mg/l	40	100	500
- Magnesium as Mg	mg/l	4	30	150
- Chloride as CL	mg/l	5	200	600
- Total Alkalinity as $CaCo_3$	mg/l	40	200	500
- Iron, Total as Fe	mg/l	>0.2	0.1	1.0
- Manganese as Mn	mg/l	0.03	0.05	0.5
- Sulphate as So_4	mg/l	<200	200	400
- Nitrogen Nitrate ($N\text{-}NO_3$)	mg/l	8.8		45

Remark ---------- Chemically Potable ----------

Tested by .....

Approved by .....

MANDALAY CITY DEVELOPMENT COMMITTEE
WATR AND SANITATION DEPARTMENT
WATER LABORATORY

Your reference - Development of Mandalay Port Project (ဧရာဝတီမြစ်ရေ Point-2)

Brought by - ဦးပြည့်ဖြိုးကျော် at ..... (Time) on 20-7-2017 (Date)

Test on - 20-7-2017 (Date) at ..... (Time)

D.O (mg/l)	-	5.07
B.O.D (mg/l)	-	3.50
C.O.D (mg/l)	-	9.00
P^{H} vlue	-	6.8
Salinity	-	0.1
T.S.S (mg/l)	-	44

Tested by .....

Approved by .....

Project: Mandalay Port	Date: 20.7.2017
Client:	Surveyor: Pyae Phyo Kyaw
Location: Mandalay	Time: 11:00 AM
Lat: 21° 56' 50.00" N	Long: 96° 02' 39.07" E
Evaluation:	Barometer Pressure:
Weather:	Sample/Location ID: GPS Waypoint no: Temperature: 25.6°C Time: 11:10 AM
Turbidity by Sechi Depth (cm):	
NTU converted from chart:	

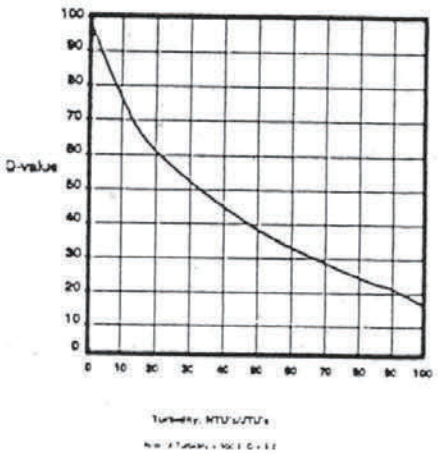
Surface/Ground/Effluent Water

Sr. No.	pH	Electrical Conductivity			DO (ppm)	Flow Rate (m/sec)	Depth (m)	Remark
		EC (µS/cm)	TDS (ppm)	Salinity (ppt)				
P2	7.9	51.2	45 mg/L	0	6.2			

Length to Turbidity Conversion Chart

cm	NTU
< 6	> 240
6 to 7	240
7 to 8	185
8 to 9	150
9 to 10	120
10 to 12	100
12 to 14	84
14 to 16	60
16 to 19	48
19 to 21	40
21 to 24	35
24 to 26	30
26 to 29	27
29 to 31	24

cm	NTU
31 to 34	21
34 to 36	19
36 to 39	17
39 to 41	15
41 to 44	14
44 to 46	13
46 to 49	12
49 to 51	11
51 to 54	10
54 to 57	9
57 to 60	8
60 to 70	7
70 to 85	6
> 85	< 5



Kyaw

(Pyae Phyo Kyaw)

(2) List of Aquatic Species in Ayeyarwady River

Sr.	Family	Scientific Name	English Name	Myanmar Name	IUCN Red List Category
1	Anabantidae	Anabas testudineus	Climbing perch	ငါးချေပမ	DD
2	Anguillidae	Anguilla bengalensis	Indian long finned eel	ငါးလင်ပန်းဆူးတောင်ရှည်	LC
3	Ariidae	Nemapteryx caelata		ငါးရောင်	Not assessed
4	Bagridae	Mystus leucophasis	Topsy Turvy fish	ငါးနောက်သစ်ပြ	LC
		Mystus cavasius	Small river cat fish	ငါးဇင်ရိုးကဖဲပြ	LC
		Sperata seenghala	River cat fish	ငါးယေကောင်း/ကော်ငုံး	LC
		Mystus gulio	Large river cat fish	ငါးရေပြ	LC
		Hemibagrus menoda	River cat fish	ငါးအိုက်	LC
		Mystus microphthalmus	River cat fish	ငါးအိုက်/ငါးငိုက်	LC
		Mystus tengara		ငါးဇင်ရိုး (ဖောကကြွခေး)	LC
		Rita sacerdotum	Giant river cat fish	ငါးထေပြ	LC
		Leiocassis siamensis	Bumble bee catfish		LC
5	Belonidae	Xenentodon cancila	Freshwater garfish	ငါးဖောင်ရိုး	LC
		Trichogaster trichopterus	gourami	ဂ်ပန်	LC
6	Channidae	Channa striata	Striped snake head fish	ငါးရံ့အောက်	LC
		Channa marulius	Giant snake head fish	ငါးရံ့ဒိုင်း	LC
		Channa punctata	Spotted snake head fish	ငါးပနော	LC
		Channa har (Channa harcourtbutleri)	Burmese snakehead	ငါးရံ့ဒိုင်း	NT
		Channa gachua	Dwarf snakehead	ငါးရံ့ခေါင်းတို	LC
7	Cichlidae	Oreochromis niloticus	Nile tilapia	ိုင်းတီလားပီးယား	Not assessed
8	Clupeidae	Ilisha megaloptera	Big eye ilisha	ငါးဇင်းဟား	Not assessed
		Tenualosa ilisha	Hilsa shad	ငါးသလောက်	Not assessed
		Gudusia variegate	Burmese river shad	ငါးလပိ	LC
		Coilia	Gold	ငါးစမီးတံသပြ်	Not assessed

Sr.	Family	Scientific Name	English Name	Myanmar Name	IUCN Red List Category
		dussumieri	spotted grenadier anchovy		
9	Cobitidae	Syncrossus beauforti	Chameleon Loach	ငါးသလဲထိုး	NT
		Syncrossus helodes	Banded Tiger Loach	ငါးသလဲထိုး	LC
		Botia histrionica	Burmese loach	ရေးစာရေး	LC
		Syncrossus berdmorei	Tiger botia	ငါးသလဲထိုး	NT
		Acanthopsoides hapalias		ငါးသလဲထိုး	LC
10	Cyprinidae	Amblypharyngodon atkinsonii	Small carp	ငါးဘဲဖ	LC
		Cirrhinus mrigala	Mrigala carp	ငါးၾကင်းျဖ	LC
		Labeo rohita	Rohu carp	ငါးျမစ္စခ်င္း	LC
		Catla catla	Catla carp	ငါးသိုင်းခေါင်းပြ	Not assessed
		Labeo calbasu	Black carp	ငါးနကျဟ	LC
		Labeo nandina	Nandina carp	ငါးအုံတုံ	NT
		Salmophasia sardinella	flying barb	ရင်ဘောင်ဇာ	LC
		Salmophasia sladoni	flying barb		LC
		Salmophasia bacaila	flying barb		LC
		Laubuca laubuca	flying barb		LC
		Raiamas bola	Barb	ငါးခုံးမ	LC
		Puntius amphibius	Barb	ငါးခုံးမ	DD
11	Gobiidae	Glossogobius callidus	River goby	ကပ်သပိုး	LC
		Brachygobius nunus	Bumblebee goby	ကပ်သပိုး	Not assessed
12	Mastacembelidae	Macrognathus aral	Peacock eel	ငါးစေမထြီးချေဟင်ခော	LC
		Macrognathus zebrinus	Zebrinus spiny eel	ငါးစေမထြီးခကံဆစ်	LC
		Mastacembelus armatus	Zig-zag-spiny eel	ငါးစေမထြီးကား/စေမန်ဂါး	LC
		Mastacembelus dayi	Spotted spiny eel	ငါးစေမထြီးဇာချေဟက်	LC
13	Macruridae	Coelorinchus parallelus	Spiny-rat-tail	ငါးစမီးသယ်	Not assessed
14	Notopteridae	Notopterus notopterus	Bronz feather back	ငါးဖယ်	LC
15	Sciaenidae	Johnius coitor	coitar croaker	ငါးပုတ်သင်	LC

Sr.	Family	Scientific Name	English Name	Myanmar Name	IUCN Red List Category
		Boesemania microlepis	Smallscale croaker	ငါးဗ်က္	NT
16	Schilbeidae	Eutropiichthys vacha	Batchwa cat fish	ငါးျမင္းအုပ္ဖား	LC
		Neotropius acutirostris	Dwarf catfish	ငါးသံခ်ိတ္	LC
		Pseudotropius acutirostris	Dwarf catfish	ငါးသံခ်ိတ္	
		Silonia silondia	Giant butter cat fish	ငါးျမင္း	LC
17	Siluridae	Ompok bimaculatus	Butter cat fish	ငါးႏြားနွဴး	NT
		Ompok hypophthalmus		ငါးႏြားနွဴး	Not assessed
		Wallago attu	Fresh water shark	ငါးဘတ္	NT
18	Sisoridae	Gagata cenia	Indian gagata	ငါးတင္ဂုတ္	LC
		Bagarius yarrelli	Giant yellow cat fish	ငါးေမာင္းမ	NT
		Bagarius bagarius	Yellow cat fish	ငါးေမာင္းမ	NT
19	Tetraodontidae	Chelonodon biocellatus	Trey kam pot	ငါးဆီပူ	LC

*DD = Data Deficient; LC = Least Concerned; NT = Near Threatened

Source: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>. Downloaded on 23

(3) Record of the Stakehokder Meeting

E Guard Environmental Services Co., Ltd. Meeting Minutes	
Subject: Stakeholder Meeting for Initial Environmental Examination of Mandalay Port Development Plan	**Date:** 27th June 2017
Venue: Yanmyolone Pawtawmuu Pagoda, Dammha Hall,	**Time:** 10:00 AM to 12:00 AM
Attendees: Total: 74 (Government Department: 24 Local People: 17 Media: 17 Parliament members : 4 NGO & : 5 Private Company : 7)	

Agenda:

1) Opening Ceremony.

2) Presentation of Project Introduction by U Aung Myo Khaing, Deputy Director, Directorate of Water Resources and Improvement of River Systems

3) Presentation of Environmental and Social Considerations in Project by U Aye Thiha, Managing Director, E Guard Environmental Services Co., Ltd.

4) Presentation of Project Cut-off Date by U Aung Myo Khaing, Deputy Director, Directorate of Water Resources and Improvement of River Systems

5) Recommendations and suggestions by Attendees.

6) Closing Remark by U Toe Aung Lin, Deputy Director, Directorate of Water Resources and Improvement of River Systems

7) Closing Ceremony

Presentation of Project Introduction by U Aung Myo Khaing, Deputy Director, Directorate of Water Resources and Improvement of River Systems

U Aung Myo Khaing said that he will explain about the main situations.

According to the order of Environmental Conservation Department, we are doing Initial Environmental Examination for this project. If a new inland water port alongside Ayeyarwady River is constructed, cargo transportation and economy will improve. The purpose of this project is needing modern port for Mandalay and Mandalay port located alongside Ayeyarwady river accommodates passengers and cargoes that are transported from more or less all major cities in the country. The project proponent is Directorate of Water Resources and Improvement of River Systems. Location of this project is less than 1 km west of Kantawagyi Lake that lies next to and west of Mandalay city and west of Shwe Hlan Bo Monastery and Myo Patt Road. In this project area, there will be include container yard and ware houses. Moreover, it is planned for two berths. The area of this project is about 20 acres. The project design is now doing with support from Japan and the dead line is 2017, November. Construction period will be from 2018, November to 2020, September. In the period before project, Public Consultation will be held to solve project affected land area.

Presentation of Environmental and Social Considerations in Project by U Aye Thiha,

Managing Director, E Guard Environmental Services Co., Ltd.

U Aye Thiha said that E Guard Environmental Services Co., Ltd analysed positive and negative impacts on environmental and social at the project area.

Environmental Conservation Department ordered to report Initial Environmental Examination because this project area is less than 25 hectare. We collected social survey, data collection and interviewed with local people.

We will do this project according to the related laws and regulation. We measured environmental base line conditions such as air quality, water quality, noise, rainfall, biodiversity and we also considered waste disposal, vibration and odour around the project site. We collected the social economic profile of the local people for land acquisition. The project site area is now used for planting seasonal crops. Air pollution and water pollution results are a little out of National Environmental Quality (Emission) Guidelines. We studied gender ratio, education level, occupation of the local people. Income and outcome range is not different but no excess. Three quarter of respondents think this port project will give them advantages but 10% of respondents are not interested in this project. Three households and one company occupy this project area. There are 7 huts in this area. Butter bean and peanuts are planted by this three households. The important matter is the resettlement plan and compensation. We report mitigation plan to reduce accidents in the construction site to the DWIR. We announced this Stakeholder Meeting in the newspaper and invited relevant government departments and parliament members.

Recommendations and suggestions by Attendees.

(1) U Myo Zaw Htun

Question: I want to know about compensation. How do the land outside the project area affect or benefit?

Answer: We will pay the compensation in accordance with the laws and regulations in Myanmar. We will report the list of farmers working in the land to Department. The Department of Regional Committee will make the final decision how much should he paid. The land outside the project area will be hired temporarily for the materials used in the construction project. If the land was affected or if you want to ask any questions, please contact.

(2) U Tin Soe

Question: We have problems with the Great Wall Company. We want to know how to protect the farmers.

Answer: We have the list of lands which are owned by the farmers. Great Wall company also owns. If you own your land, we will arrange to give the compensation. We cannot decide who the owner is. We can only say we will compensate the owners.

(3) U Pyaung

Question: I have owned the land since 20 years ago. I want to know about compensation. Is the port owned by government or company?

Answer: The port is owned by the Ministry of Transport and Communications so it is public. The port is constructed by the help of JICA. Compensation will be made by DWIR/MOTC.

U Myint Swe (Parliament member, Amarapura constituency, Mandalay Division)

I am the president of agriculture and livestock committee and also a farmer. I have 50 acres land and it is national land. If our country needs this land area, I will give it. Government should compensate to the project affected persons (PAPs). It is a good project for our country. So the farmers should not disturb this project. If project proponent has any problem, we will be able to help them.

Closing Remark by U Toe Aung Lin, Deputy Director, Directorate of Water Resources and Improvement of River Systems

U Toe Aung Lin said that he will associate for this project because it is located in Mandalay.

Many local people should attend and ask many questions in this meeting. The project proponent is Directorate of Water Resources and Improvement of River Systems and the user is citizen. Taxes obtained from this port will be national funds. The case of land owner does not concern with third party.

Compensation problems will be explained by the decisions of parliament and government department. Although the Japanese Government will help for this project, our government will compensate to PAPs. The present Mandalay Port is not modernized, so new port is required. We ask local people to support for this project.

Attendance List of Stakeholder Meeting

Parliament Members

No	Name	Occupation	Organization/Department
1	U Myint Swe	Member of Parliament	Hluttaw, Mandalay Division
2	U Zaw Zaw Aung	Member of Parliament	Hluttaw, Mandalay Division
3	U Win Bo	NLD (Maharaungmyay Township)	Maharaungmyay NLD Office
4	U Sein Min	NLD (MaharAung Myay Township)	Maharaungmyay NLD Office

Government Department

No	Name	Occupation	Organization/Department
1	U Aung Myo Khaing	Deputy Director	DWIR
2	U Toe Aung Lin	Deputy Director	DWIR
3	U Tin Soe	DYCE	IWT
4	U Khin Maung Aye	Manager	IWT
5	Daw Khin Sandar Win	Deputy Staff Officer	Department of Rural Development
6	Daw Mar Mar Htwe	Upper Division Clerk	Department of Rural Development
7	Daw Thin Thin Ohn	Staff Officer	Metrology and Hydrology Department
8	U Kyaw San Lin	Deputy Director	Fisheries Dapartment
9	U Aung Tin	Staff Officer	Metrology and Hydrology Department (Mandalay)
10	U Thaw Zin		Bureau of Special Investigation
11	Daw Phyo Ma Ma	Deputy Police Officer	Amarapura Township Police Station
12	U Shwe	Assistant Staff Officer	Amarapura
13	U Than Soe Win	Deputy Staff Officer	Amarapura
14	U Aung Aung	Department Head	MCDC
15	U Aung Kyi	Surveyor	MCDC
16	U Aung Myo	Deputy Township	Mahaaungmyay Township

	Thant	Administrator	
17	Daw Pa Pa Oo	Staff Officer	Planning Department
18	U Nyi Nyi Htun	Ward Administrator	Tan layat Maw (South)
19	Daw San San Mu	Clerk	Tan layat Maw (South)
20	Daw Win Win Aye	Store Keeper	Department of Electricity
21	U Tin Swe	Ward Administrator	Shan Kalay Kyun, Amarapura Town
22	U Thein Win	Hundred Household Head	Chaw Seik (405, B)
23	U Min Gyi	Hundred Household Head	Chaw Seik (405, B)
24	U Aung Toe	Hundred Household Head	Zaw Min Ward

Non-Government Organization

No	Name	Occupation	Organization
1	U Aung Thu		NLD
2	U Hla Htun	C.S.O	Port Stevedore
3	U Wai Lwin Oo	Member	Port Stevedore
4	U Saw Lin	Chairman	Port Stevedore
5	U Kyaw Than	Vice Chairman	Chan Mya Tharzi Township, NLD

Private Company

No	Name	Occupation	Company Name
1	U Naing Naing Lin	Director	JLPC
2	U Naing Win	Director	Myanmar Infinity Power
3	U Thet Htun Oo	Director	VISS (Myanmar)
4	U Than Kyaing	Consultant	Great Wall Group
5	U Aung Than		
6	U Htet Naung Oo	Manager	JLPC
7	U Myo Thant	GM	JLPC

Media

No	Name	Occupation	Media
1	Daw Aye Thida Su Lwin	Reporter	MRTV
2	Daw Theint Tneint Thu Win	Reporter	MRTV
3	U Myo Nyunt Aung	Reporter	MRTV

4	U Wai Yan Phyo	Reporter	MRTV
5	Daw Khin Mon Thein Tan	Reporter	MRTV
6	U Kyaw Htoo	Reporter	Mandalay News
7	Daw Phyo Phyo Thet	Reporter	7 Day News
8	U Aung Thant Khaing	Reporter	Myanmar Times Daily
9	U Eain Khaing Myae	DVB Reporter	Myanmar Times Daily
10	Daw Myat Thit Khaing	DVB Reporter	Democracy Today
11	U Aung Min Oo		Mandala Daily
12	U Kyaw Ko Ko	Reporter	The Myanmar Times
13	U Ko Myo Kyaw	Reporter	Mandalay News
14	U Min Than	Reporter	MHM Media
15	Daw Khaing Thazin	Reporter	Mandalay Khit
16	U Yan Moe Naing	Reporter	The Voice Daily
17	Daw Lae Lae Aung	Reporter	Daily Eleven

Local Community

No	Name	Occupation	Address
1	U Than Htike Aung	Business Man	Amarapura
2	U Tin Htut	Farmer	Shankalay Kyun
3	U Myo Zaw Htun	Farmer	Amarapura
4	U Myint Maung	Farmer	(457), Than Layat Maw (South)
5	Daw Hla Than	Farmer	(457), Than Layat Maw (South)
6	Daw San San Htwe	Farmer	(457), Than Layat Maw (South)
7	U Tin Myaing	Farmer	(457), Than Layat Maw (South)
8	Daw Tin Tin Khaing	Farmer	(457), Than Layat Maw (South)
9	Daw Than Than Myint	Farmer	(457)
10	U Tin Hlaing	Farmer	Shan Kalay Kyun, Amarapura Township
11	U Kyaw Htet Aung	Farmer	Lae Yway
12	U Tin Soe	Farmer	Nay Puu Village
13	Daw Than Oo	Farmer	Shwe Lan Bo
14	U Saw Maung	Farmer	Nay Puu Village
15	U Myint Wai	Farmer	Shan Kalay Kyun, Amarapura Township
16	U Kyaw Swe Win	Local	Amarapura Township
17	U Win Htay Kywal	Local	Amarapura Township

(4) Detailed Calculations for Project-affected Structures

Hut-1

Size - 15 ft x 25 ft (Height – 7 ft)

No.	Particular	Size	Rate (MMK)	Quantity	Amount (MMK)
1	Column (wood)	10 ft	7,000	2	14,000
2	Bamboo for Beam	12 ft	5,000	3	15,000
3	Bamboo for roof, wall and floor	20 ft	700	7	4,900
4	Palm for roof	sq-ft	80	375	30,000
5	Zinc roof	sheet	1,500	-	-
6	Attap dwelling	sq-ft	120	-	-
7	Worker	day	5,000	1	5,000
				Total	68,900

Hut-2

Size - 7 ft x 6 ft (Height – 6 ft)

No.	Particular	Size	Rate (MMK)	Quantity	Amount (MMK)
1	Column (wood)	10 ft	7,000	-	-
2	Bamboo for Beam	12 ft	5,000	1	5,000
3	Bamboo for roof, wall and floor	20 ft	700	5	3,500
4	Palm for roof	sq-ft	80	42	3,360
5	Zinc roof	sheet	1,500	-	-
6	Attap dwelling	sq-ft	120	-	-
7	Worker	day	5,000	1	5,000
				Total	16,860

Hut-3

Size - 8 ft x 7ft (Height – 7 ft)

No.	Particular	Size	Rate (MMK)	Quantity	Amount (MMK)
1	Column (wood)	10 ft	7,000	2	14,000
2	Bamboo for Beam	12 ft	5,000	2	10,000
3	Bamboo for roof, wall and floor	20 ft	700	8	5,600
4	Palm for roof	sq-ft	80	-	
5	Zinc roof	sheet	1,500	-	
6	Attap dwelling	sq-ft	120	65	7,800
7	Worker	day	5,000	1	5,000
				Total	42,400

Hut-4

Size - 10 ft x 7 ft (Height – 6 ft)

No.	Particular	Size	Rate (MMK)	Quantity	Amount (MMK)
1	Column (wood)	10 ft	7,000	1	7,000
2	Bamboo for Beam	12 ft	5,000	2	10,000
3	Bamboo for roof, wall and floor	20 ft	700	10	7,000
4	Palm for roof	sq-ft	80	90	7,200
5	Zinc roof	sheet	1,500	-	-
6	Attap dwelling	sq-ft	120	-	-
7	Worker	day	5,000	1	5,000
				Total	36,200

Hut-5

Size - 7 ft x 7ft (Height 7 ft)

No.	Particular	Size	Rate (MMK)	Quantity	Amount (MMK)
1	Column (wood)	10 ft	7,000	-	-
2	Bamboo for Beam	12 ft	5,000	2	10,000
3	Bamboo for roof, wall and floor	20 ft	700	5	3,500
4	Palm for roof	sq-ft	80	68	5,440
5	Zinc roof	sheet	1,500	-	-
6	Attap dwelling	sq-ft	120	-	-
7	Worker	day	5,000	1	5,000
				Total	23,940

Hut-6

Size - 7 ft x 7ft (Height 7 ft)

No.	Particular	Size	Rate (MMK)	Quantity	Amount (MMK)
1	Column (wood)	10 ft	7,000	-	-
2	Bamboo for Beam	12 ft	5,000	2	10,000
3	Bamboo for roof, wall and floor	20 ft	700	5	3,500
4	Palm for roof	sq-ft	80	68	5,440
5	Zinc roof	sheet	1,500	-	-
6	Attap dwelling	sq-ft	120	-	-
7	Worker	day	5,000	1	5,000
				Total	23,940

Hut-7

Size - 10 ft x 12 ft (Height 7 ft)

No.	Particular	Size	Rate (MMK)	Quantity	Amount (MMK)
1	Column (wood)	10 ft	7,000	2	14,000
2	Bamboo for Beam	12 ft	5,000	3	15,000
3	Bamboo for roof, wall and floor	20 ft	700	9	6,300
4	Palm for roof	sq-ft	80	-	-
5	Zinc roof	sheet	1,500	28	42,000
6	Attap dwelling	sq-ft	120	-	-
7	Worker	day	5,000	2	10,000
				Total	87,300

(5) Monitoring Form for Land Acquisition (sample)

<Monitoring Form for Land Acquisition>

No.	Activity	Progress	Description of the Situation (incl. any necessary actions)	CD (plan)	CD	RD	Recorded by
1.	Formation of Farmland Management Committee	%					
		%					
		%					
		%					
2.	Formation of Grievance Committee	%					
		%					
		%					
		%					
3.	Supplementary Survey (if required)	%					
		%					
		%					
		%					
4.	Finalization of Compensation and Support	%					
		%					
		%					
		%					
5.	Agreement with PAPs	HH/ HH					
		HH/ HH					
		HH/ HH					
		HH/ HH					
6.	Provision of Compensation and Support to PAPs	HH/ HH					
		HH/ HH					
		HH/ HH					
		HH/ HH					
7.	Securement of Land (e.g. removal of structures)	acres/ acres					
		acres/ acres					
		acres/ acres					
		acres/ acres					

*CD: completion date; RD: recorded date; HH: household

<Monitoring Form for Public Consultation>

No.	Time and Date	Venue	Participants	Content including Q&A
1				
2				
3				

(6) Photographs

Lost Asset Inventory Survey

Lost Asset Inventory Survey

PAPs Survey and Interview

PAPs Survey and Interview

Project-affected Unit (crop)

Flooded Area during Rainy Season

Interview with Local People

Interview with Local People

Interview with Local People

Air Quality Survey

Water Quality Survey

Water Quality Survey




Participants' Registration at Stakeholder Meeting


Presentation by IEE Consultant

Presentation by DWIR


Question and Answers with Local People

Response by IEE Consultant

Opinion from the Floor

Closing Remarks by DWIR

Media Interviewing DWIR

Media Interviewing IEE Consulta

DWIR Explaining Compensation Policy

(7) Environmental Checklist

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) N (c) N (d) N	(a) Since the project is categorized to be an IEE Type Project in accordance with EIA Procedure (2015) in Myanmar, an initial environmental examination (IEE) report has been prepared and submitted by DWIR to the Ministry of Natural Resources and Environmental Conservation (MONREC) through MOTC by a letter dated Sep 4, 2017. (b) The Environmental Conservation Department (ECD)/MONREC is expected to complete its review on the IEE report within 60 working days in accordance with EIA Procedure (2015), which is early Dec, 2017. (c) Refer to (b) above. (d) There is no other environmental permit required for implementation of the project.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) A notification in both English and Burmese was put up at the township and ward GAD offices and related department offices as well as DWIR's webpage (http://dwir.gov.mm/index.php/news-events/advertisement) in June, 2017 upon commencement of the IEE. In addition, a stakeholder meeting was carried out and particpants views' reflected to the project through a stakeholder meeting held on June 27, 2017. The stakeholder meeting was attended by the people potentially affected by the project (i.e. project-affected persons/PAPs) in addition to relevant government organizations including ECD/MONREC and regional governments, community-based and social organizations and the media, 74 in total. Contents of the project and the potential impacts been adequately explained here and no voices against the project was heard. (b) Comments from the stakeholders, including those from the local residents, have been reflected to, inter alia, finalizing the impact evaluation, environmental mitigation measures including means of compensation, and environmental monitoring plans..
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Project alternatives were compared with each other in different stages of the project. During the F/S carried out in 2014, three different locations were compared against each other reaching a conclusion that the current location was most suitable primarily as no involuntary resettlement was expected in the area. In the basic design stage, a comparison was made in terms of the jetty structure and access road design. Similarly, a conclusion was made in consideration of the environmental and social impacts that are expected to be generated by each option.
2 Pollution Control	(1) Air Quality	(a) Do air pollutants, such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust emitted from ships, vehicles and project equipments comply with the country's emission standards? Are any mitigating measures taken?	(a) N/Y	(a) Ambient (i.e. pre-project) air quaity for PM2.5, PM10 and SO2 was in excess of the National Environmental Quality (NEQ) Guidelines of Myanmar. That for NO2 and ozone was within the guideline values. Mobilization and operation of heavy equipment, construction machinery and trucks is expected to generate exhaust gas and dust from construction activities possibly causing air pollution in the construction stage and minor level of air quality degradation is expected in the O&M stage. From a broader perspective, on the other hand, modal shift from trucks to ships in cargo transportation is expected to contribute to reduction of greenhouse gases such as carbon dioxide. Mitigation measures will be taken in both stages (e.g. spraying water on the ground, proper storage of construction materials such as covering sand and gravel, limiting maximum speed of vehicle to 20km/h within the project area, and air quality measurement/monitoring).
	(2) Water Quality	(a) Do effluents from the project facilities comply with the country's effluent and environmental standards? (b) Do effluents from the ships and other project equipments comply with the country's effluent and environmental standards? (c) Does the project prepare any measures to prevent leakages of oils and toxicants? (d) Does the project cause any alterations in coastal lines and disappearance/appearance of surface water to change water temperature or quality by decrease of water exchange or changes in flow regimes? (e) Does the project prepare any measures to prevent polluting surface, sea or underground water by the penetration from reclaimed lands?	(a) Y (b) Y (c) Y (d) N (e) Y	(a) Domestic waste and sewage from passenger and port worker as well as wastewater used after cleaning cargoes can cause water pollution. There is also a possibility of oil spill and leakage of other substances. By adopting countermeasures (e.g. proper storage and collection of used oil and lubrication using a drum, development of closed drainage canal, installation of sanitary facilities such as temporary toilets or septic tanks), the environmental standards in Myanmar are expected to be met. By the way, the level of total suspended solids was higher than the NEQ Guidline value of Myanmar. (b) Effluents from the ships and other project equipments are not expected to be significant enough to exceed the environmental standards in Myanmar. (c) Refer to (a) above. (d) Such impact is not expected. (e) In addition to measures mentioned in (a) above, rules for waste management will be developed and training will be provided to workers to follow them, construction equipment will be well-maintained and a contingency plan against risk of unexpected leakage will be prepared.
	(3) Wastes	(a) Are wastes generated from the ships and other project facilities properly treated and disposed of in accordance with the country's regulations? (b) Is offshore dumping of dredged soil properly disposed in accordance with the country's regulations? (c) Does the project prepare any measures to avoid dumping or discharge toxicants?	(a) Y (b) NA (c) Y	(a) Wastes willl be properly collected and disposed with reference to, and in consultation with, MCDC and its rules. (b) Dredging is not expected to take place under this project. Necessary sand will be purchased from a river sand collection company operating nearby. (c) The following measures are planned to be adopted to avoid dumping or discharge toxicants: preparation of a temporary waste dumping site during storage; prohibition of dumping into the river or any other place unless approved by the consultant; appropriate storage of oil residue including used lubricant; reuse of material in proper ways; and development of rules for waste management and training workers to follow them.
2 Pollution Control	(4) Noise and Vibration	(a) Do noise and vibrations from the vehicle and train traffic comply with the country's standards?	(a) Y	(a) Impact of noise and vibration is expected from construction machinery and equipment but only temporarily and at an insignificant level during construction. In the O&M stage, loading machines and moving vehicles during port operation are expected to generate some level of noise and vibration. However, the impact is expected to be limited given the size and scale of vehicles used and proximity to the sensitive receptors. The ambient noise level was within the NEQ Guideline value.
	(5) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) The project is not expected to involve extraction of a large volume of underground water that can cause ground subsidence.
	(6) Odor	(a) Are there any odor sources? Are adequate odor control measures taken?	(a) N	(a) No specific source of offensive odor is expected in the project. Waste will be properly collected and disposed.
	(7) Sediment	(a) Are adequate measures taken to prevent contamination of sediments by discharges or dumping of hazardous materials from the ships and related facilities?	(a) Y	(a) Activities that directly contaminate bottom sediment is not expected. Refer to '(2) Water Quality' for measures to prevent impact on sediment quality degradation caused via water quality degradation.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) N/A
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that the project will adversely affect aquatic organisms? Are adequate measures taken to reduce negative impacts on aquatic organisms? (e) Is there a possibility that the project will adversely affect vegetation or wildlife of coastal zones? If any negative impacts are anticipated, are adequate measures taken to reduce the impacts on vegetation and wildlife?	(a) N (b) N (c) N/A (d) Y (e) Y	(a) N/A (b) There is no protected habitats of endangered species designated by the country's laws or international treaties and conventions. According to the 'Feasibility study for the Inland Water Transport Facilities Improvement and Development Project Final Report (2014)', Ayeyarwady dolphins rarely come to the area. (c) No significant ecological impacts are anticipated. (d) (e) According to the 'Feasibility study for the Inland Water Transport Facilities Improvement and Development Project Final Report (2014)', none of the fish species in the study area are listed in the IUCN Red List category of endangered fish species for Myanmar and all species around the project site are composed of common species. Turbid water due to construction works may affect those species, however, its intensity is expected to be limited. Refer to '(2) Water Quality' for measures taken to reduce negative impacts on aquatic organisms. No plant species that require special care has been identified near the project site either. The project site is not located in or near a coastal zone.
	(3) Hydrology	(a) Do the project facilities affect adversely flow regimes, waves, tides, currents of rivers and etc if the project facilities are constructed on/by the seas?	(a) N	(a) According to the 'Feasibility study for the Inland Water Transport Facilities Improvement and Development Project Final Report (2014)', river flow and speed is expected to decrease under and near the project site yet no significant change is expected to the river flow. The project site is not located in or near the sea.
	(4) Topography and Geology	(a) Does the project require any large scale changes of topographic/geographic features or cause disappearance of the natural seashore?	(a) N	(a) N/A

Environmental Checklist: . 10.Ports and Harbors （1）

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) N (c) N (d) N	(a) Since the project is categorized to be an IEE Type Project in accordance with EIA Procedure (2015) in Myanmar, an initial environmental examination (IEE) report has been prepared and submitted by DWIR to the Ministry of Natural Resources and Environmental Conservation (MONREC) through MOTC by a letter dated Sep 4, 2017. (b) The Environmental Conservation Department (ECD)/MONREC is expected to complete its review on the IEE report within 60 working days in accordance with EIA Procedure (2015), which is early Dec, 2017. (c) Refer to (b) above. (d) There is no other environmental permit required for implementation of the project.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) A notification in both English and Burmese was put up at the township and ward GAD offices and related department offices as well as DWIR's webpage (http://dwir.gov.mm/index.php/news-events/advertisement) in June, 2017 upon commencement of the IEE. In addition, a stakeholder meeting was carried out and particpants views' reflected to the project through a stakeholder meeting held on June 27, 2017. The stakeholder meeting was attended by the people potentially affected by the project (i.e. project-affected persons/PAPs) in addition to relevant government organizations including ECD/MONREC and regional governments, community-based and social organizations and the media, 74 in total. Contents of the project and the potential impacts been adequately explained here and no voices against the project was heard. (b) Comments from the stakeholders, including those from the local residents, have been reflected to, inter alia, finalizing the impact evaluation, environmental mitigation measures including means of compensation, and environmental monitoring plans..
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Project alternatives were compared with each other in different stages of the project. During the F/S carried out in 2014, three different locations were compared against each other reaching a conclusion that the current location was most suitable primarily as no involuntary resettlement was expected in the area. In the basic design stage, a comparison was made in terms of the jetty structure and access road design. Similarly, a conclusion was made in consideration of the environmental and social impacts that are expected to be generated by each option.

Environmental Checklist: . 10.Ports and Harbors （2）

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
2 Pollution Control	(1) Air Quality	(a) Do air pollutants, such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust emitted from ships, vehicles and project equipments comply with the country's emission standards? Are any mitigating measures taken?	(a) N/Y	(a) Ambient (i.e. pre-project) air quaity for PM 2.5, PM 10 and SO2 was in excess of the National Environmental Quality (NEQ) Guidelines of Myanmar. That for NO2 and ozone was within the guideline values. Mobilization and operation of heavy equipment, construction machinery and trucks is expected to generate exhaust gas and dust from construction activities possibly causing air pollution in the construction stage and minor level of air quality degradation is expected in the O&M stage. From a broader perspective, on the other hand, modal shift from trucks to ships in cargo transportation is expected to contribute to reduction of greenhouse gases such as carbon dioxide. Mitigation measures will be taken in both stages (e.g. spraying water on the ground, proper storage of construction materials such as covering sand and gravel, limiting maximum speed of vehicle to 20km/h within the project area, and air quality measurement/monitoring).
	(2) Water Quality	(a) Do effluents from the project facilities comply with the country's effluent and environmental standards? (b) Do effluents from the ships and other project equipments comply with the country's effluent and environmental standards? (c) Does the project prepare any measures to prevent leakages of oils and toxicants? (d) Does the project cause any alterations in coastal lines and disappearance/appearance of surface water to change water temperature or quality by decrease of water exchange or changes in flow regimes? (e) Does the project prepare any measures to prevent polluting surface, sea or underground water by the penetration from reclaimed lands?	(a) Y (b) Y (c) Y (d) N (e) Y	(a) Domestic waste and sewage from passenger and port worker as well as wastewater used after cleaning cargoes can cause water pollution. There is also a possibility of oil spill and leakage of other substances. By adopting countermeasures (e.g. proper storage and collection of used oil and lubrication using a drum, development of closed drainage canal, installation of sanitary facilities such as temporary toilets or septic tanks), the environmental standards in Myanmar are expected to be met. By the way, the level of total suspended solids was higher than the NEQ Guidline value of Myanmar. (b) Effluents from the ships and other project equipments are not expected to be significant enough to exceed the environmental standards in Myanmar. (c) Refer to (a) above. (d) Such impact is not expected. (e) In addition to measures mentioned in (a) above, rules for waste management will be developed and training will be provided to workers to follow them, construction equipment will be well-maintained and a contingency plan against risk of unexpected leakage will be prepared.
	(3) Wastes	(a) Are wastes generated from the ships and other project facilities properly treated and disposed of in accordance with the country's regulations? (b) Is offshore dumping of dredged soil properly disposed in accordance with the country's regulations? (c) Does the project prepare any measures to avoid dumping or discharge toxicants?	(a) Y (b) NA (c) Y	(a) Wastes willl be properly collected and disposed with reference to, and in consultation with, MCDC and its rules. (b) Dredging is not expected to take place under this project. Necessary sand will be purchased from a river sand collection company operating nearby. (c) The following measures are planned to be adopted to avoid dumping or discharge toxicants: preparation of a temporary waste dumping site during storage; prohibition of dumping into the river or any other place unless approved by the consultant; appropriate storage of oil residue including used lubricant; reuse of material in proper ways; and development of rules for waste management and training workers to follow them.

Environmental Checklist: . 10.Ports and Harbors (3)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
2 Pollution Control	(4) Noise and Vibration	(a) Do noise and vibrations from the vehicle and train traffic comply with the country's standards?	(a) Y	(a) Impact of noise and vibration is expected from construction machinery and equipment but only temporarily and at an insignificant level during construction. In the O&M stage, loading machines and moving vehicles during port operation are expected to generate some level of noise and vibration. However, the impact is expected to be limited given the size and scale of vehicles used and proximity to the sensitive receptors. The ambient noise level was within the NEQ Guideline value.
	(5) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) The project is not expected to involve extraction of a large volume of underground water that can cause ground subsidence.
	(6) Odor	(a) Are there any odor sources? Are adequate odor control measures taken?	(a) N	(a) No specific source of offensive odor is expected in the project. Waste will be properly collected and disposed.
	(7) Sediment	(a) Are adequate measures taken to prevent contamination of sediments by discharges or dumping of hazardous materials from the ships and related facilities?	(a) Y	(a) Activities that directly contaminate bottom sediment is not expected. Refer to '(2) Water Quality' for measures to prevent impact on sediment quality degradation caused via water quality degradation.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) N/A
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that the project will adversely affect aquatic organisms? Are adequate measures taken to reduce negative impacts on aquatic organisms? (e) Is there a possibility that the project will adversely affect vegetation or wildlife of coastal zones? If any negative impacts are anticipated, are adequate measures taken to reduce the impacts on vegetation and wildlife?	(a) N (b) N (c) N/A (d) Y (e) Y	(a) N/A (b) There is no protected habitats of endangered species designated by the country's laws or international treaties and conventions. According to the 'Feasibility study for the Inland Water Transport Facilities Improvement and Development Project Final Report (2014)', Ayeyarwady dolphins rarely come to the area. (c) No significant ecological impacts are anticipated. (d) (e) According to the 'Feasibility study for the Inland Water Transport Facilities Improvement and Development Project Final Report (2014)', none of the fish species in the study area are listed in the IUCN Red List category of endangered fish species for Myanmar and all species around the project site are composed of common species. Turbid water due to construction works may affect those species, however, its intensity is expected to be limited. Refer to '(2) Water Quality' for measures taken to reduce negative impacts on aquatic organisms. No plant species that require special care has been identified near the project site either. The project site is not located in or near a coastal zone.
	(3) Hydrology	(a) Do the project facilities affect adversely flow regimes, waves, tides, currents of rivers and etc if the project facilities are constructed on/by the seas?	(a) N	(a) According to the 'Feasibility study for the Inland Water Transport Facilities Improvement and Development Project Final Report (2014)', river flow and speed is expected to decrease under and near the project site yet no significant change is expected to the river flow. The project site is not located in or near the sea.
	(4) Topography and Geology	(a) Does the project require any large scale changes of topographic/geographic features or cause disappearance of the natural seashore?	(a) N	(a) N/A

Environmental Checklist: . 10.Ports and Harbors （4）

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) N (b) Y (c) Y (d) Y (e) Y (f) Y (g) N (h) Y/N (i) Y (j) Y	(a) No involuntary resettlement is expected in this project but only land acquisition. Efforts have been made to minimize the adverse socio-economic impacts. (b) No involuntary resettlement is expected in this project but only land acquisition. A stakeholder meeting has been held with the PAPs and other stakeholders in Burmese and with visual aids where compensation policy had been explained to the PAPs. (c) While no involuntary resettlement is expected, an ARAP has been prepared including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socio-economic studies. (d) Yes. (e) It has been documented in the ARAP. (f) The project pays particular attention to vulnerable groups. But no particular vulnerable groups that require special support have been identified in this project. (g) Agreements with the affected people will be obtained prior to securing of land (i.e. project site). (h) Organizational framework has been established. Necessary budget will be secured after the IEE report has been approved by ECD/MONREC. (i) Plans have been developed to monitor the impacts on land acquisition in both the implementation and O&M stages. No involuntary resettlement is expected to take place under this project but only land acquisition. (j) It has been established and depicted in the IEE report.
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that changes in water uses (including fisheries and recreational uses) in the surrounding areas due to project will adversely affect the livelihoods of inhabitants? (c) Is there a possibility that port and harbor facilities will adversely affect the existing water traffic and road traffic in the surrounding areas? (d) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are considerations given to public health, if necessary?	(a) Y (b) N (c) Y (d) Y	(a) There is no inhabitant in the project site. Adequate measures are considered to reduce the impacts on PAPs' living and livelihood. (b) Changes in water uses is not expected by the project. No fishing activity has been identified as a result of the study. (c) Water traffic and road traffic in the surrounding areas may increase to some extent as a result of the project. (d) An influx of construction/immigrant workers into the project area is expected especially during the construction phase, which can heighten the risk of transmission of infectious diseases. Education and awareness-raising will be carried out of construction workers (and local people as necessary) about prevention of infectious diseases such as HIV/AIDS.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There is only one monastery near the project site and one pagoda north of the site but no impact is expected to either of them.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) There is no special landscape within and near the project area and the extent of change to the existing landscape can be considered negligible.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a) There is no ethnic minorities and indigenous people in or near the project site. (b) N/A

Environmental Checklist: . 10.Ports and Harbors (5)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, 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? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) N (b) Y (c) Y (d) Y	(a) DWIR is not violating any laws and ordinances associated with the working conditions of the country. (b) The following measures are planned to be taken to ensure safety: development of, and compliance with, traffic regulation and rules; prevention of outsiders entering construction sites by installing fence and sign boards and arranging guards; preparation of security boats, life jackets, medical box and so on; preparation of proper personal protective equipment and provision to workers; proper record and analysis of the cases and causes of accidents; and proper lightening of construction sites. (c) In addition to '(b) above', education and awareness-raising will be carried out of construction workers (and local people as necessary) about prevention of infectious diseases. (d) Training will be provided to security guards prior to their assignment.
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)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	(a) Adequate measures are considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes). Refer to the environmental management plan in the IEE report for more details. (b) Ecoystem that may be affected by the project is considered to be primarily the aquatic ecosystem. Preventive measures will be adopted as shown in '2. (2) Water Quality' above. In addition, water quality monitoring will be carried out during consutruction and in the O&M stage and appropriate measures considered and taken based on an analysis of the results of such monitoring. Species around the project site is composed of common species. (c) Adequate measures will be considered to reduce impacts generated during construction.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) N/A (c) Y (d) Y	(a) DWIR has developed and is prepared to implement monitoring program for the environmental items that are considered to have potential impacts. (b) Refer to the environmental monitoring plan in the IEE report for details of the monitoring program. (c) DWIR will establish an adequate monitoring framework and carry out monitoring with support from other actors (e.g. consultant) (d) EIA Procedure (2015) states that 'The Project Proponent shall submit monitoring reports to the Ministry not less frequently than every six (6) months, as provided in a schedule in the EMP, or periodically as prescribed by the Ministry' (Art. 108).
6 Note	Note on Using Environmental Checklist	(a) Where necessary, impacts on groundwater hydrology (groundwater level drawdown and salinization) that may be caused by alteration of topography, such as land reclamation and canal excavation should be considered, and impacts, such as land subsidence that may be caused by groundwater uses should be considered. If significant impacts are anticipated, adequate mitigation measures should be taken. (b) 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) N/A (b) N/A	(a) Noted. (b) Noted.

1) Regarding the term “Country's Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards appropriate environmental considerations are required to be made.
In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).
2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Environmental Management Plan (draft)

No.	Impacts	Mitigation Measures	Implementation Organization	Management Organization	Cost (USD)
Planning Phase					
1.	Land Acquisition	1. Compensation for all affected land, structures and crops in accordance with the ARAP 2. Information disclosure and public consultation to understand the concerns and needs of the PAPs and to relieve their stress 3. Installation of notification board concerning the project at the project site in order to prevent any occupation or use in the project site	DWIR	DWIR	1. USD 1,700,000 *refer to EMOP for cost of consultation meetings.
Construction Phase					
1.	Air Pollution	1. Spraying water to suppress dust generated from construction work and site and vehicles carrying construction materials 2. Proper storage of construction materials such as covering sand and gravel that are easily diffused into the atmosphere at construction site and during their transportation 3. Limiting a maximum speed of vehicle to 20km/h within the project area 4. Air quality measurement/monitoring	contractor	consultant/DWIR	refer to EMOP for cost of air quality monitoring
2.	Water Pollution	1. Proper storage and collection of used oil and lubrication using a drum 2. Development of rules for waste management and training workers to follow them 3. Development of closed drainage canal to avoid wastewater spreading to river and farmland 4. Installation of sanitary facilities such as temporary toilets or septic tanks at the construction sites 5. Selection of appropriate construction methods which generates less turbidity during pile driving 6. Good maintenance of construction equipment 7. Preparation of a contingency plan against risk of unexpected leakage 8. Water quality measurement/monitoring especially during disposal of dredging material and collection of landfilling material	contractor	consultant/DWIR	to be included in construction cost *refer to EMOP for cost of water quality monitoring

No.	Impacts	Mitigation Measures	Implementation Organization	Management Organization	Cost (USD)
3.	Waste Disposal	1. Preparation of a temporary waste dumping site during storage and prohibition of waste dumping into the river or any other place unless approved by the consultant 2. Appropriate storage of oil residue including used lubricant 3. Reuse of material in proper ways 4. Proper collection and final disposal of wastes with reference to, and in consultation with, MCDC and its system 5. Development of rules for waste management and training workers to follow them	contractor	consultant/DWIR	to be included in construction cost
4.	Noise and Vibration	1. Development of working rules (e.g. avoid unnecessary use of air horns, keep the speed limit, turn off engines when not in operation) and training to drivers and construction workers to follow the rules 2. Avoidance of construction activities that generate high level of noise and vibration during night time 3. Selection of low-noise emission machines and/or installation of silencers and temporary noise barrier (when required) 4. Appropriate maintenance of construction equipment 5. Noise level measurement/monitoring	contractor	consultant/DWIR	to be included in construction cost *refer to EMOP for cost of monitoring of noise level
5.	Ecosystem	Monitoring of turbidity and water pollution in the river during disposal of dredging material and collection of landfilling material (refer to '2. Water Pollution')	contractor	consultant/DWIR	to be included in construction cost
6.	Bottom Sediment	Monitoring of sediment quality before and after filling	contractor	consultant/DWIR	refer to '2. Water Pollution'
7.	Land Acquisition	Information disclosure and public consultation to understand the socio-economic status, concerns and needs of the PAPs and to relieve their stress	DWIR/consultant/ contractor	Mandalay Region Government, MOTC and local authorities	refer to EMOP for cost of holding consultation meetings
8.	Existing Social Infrastructure and Services	1. Post traffic warning signs for road users notifying that the 'construction site is ahead' and to make people aware of the movement of heavy machines 2. Notification of contents and schedule of construction work 3. Assign flagman for assisting 'entry' to the construction site and 'exit' from the construction site to reduce traffic load	contractor	consultant/DWIR	to be included in construction cost
9.	Sanitary	1. Installation of sanitary facilities such as temporary toilets or	contractor	consultant/DWIR	to be included in

No.	Impacts	Mitigation Measures	Implementation Organization	Management Organization	Cost (USD)
	Condition	septic tanks at the construction sites and operate those appropriately 2. Consultation with MCDC for final disposal of sludge at their sewage disposal facilities			construction cost
10.	Infectious Diseases such as HIV/AIDS	Education and awareness-raising of construction workers (and local people as necessary) about prevention of infectious diseases such as HIV/AIDS	contractor	consultant/DWIR	to be included in construction cost
11.	Accidents	1. Development of, and compliance with, traffic regulation and rules 2. Prevention of outsiders entering construction sites by installing fence and sign boards and arranging guards 3. Preparation of security boats, life jackets, medical box and so on 4. Preparation of proper personal protective equipment (PPE) and provision to workers 5. Proper record and analysis of the cases and causes of accidents 6. Proper lightening of construction sites	contractor	consultant/DWIR	to be included in construction cost
Operation Phase					
1.	Air Pollution	1. Limiting a maximum speed of vehicle to 20km/h within the project site 2. Air quality measurement/monitoring	port operator	consultant/DWIR	refer to EMOP for cost of air quality monitoring
2.	Water Pollution	1. Development of closed drainage canal to avoid wastewater spreading to river 2. Development of a contained storage area for oil, chemicals, and others 3. Consultation with MCDC for final disposal of sludge at their sewage disposal facilities 4. Installation of adequate sanitation system with proper treatment facilities for toilet, canteen and so on 5. Training of workers so that they follow waste management rules (e.g. do not throw waste into the river) 6. Water quality measurement/monitoring	port operator	consultant/DWIR	to be included in operation cost *refer to EMOP for cost of water quality monitoring
3.	Waste Disposal	1. Periodic disposal of waste in cooperation with MCDC 2. Training of workers so that they follow waste management rules (e.g. do not throw waste into the river)	port operator	consultant/DWIR	to be included in operation cost

No.	Impacts	Mitigation Measures	Implementation Organization	Management Organization	Cost (USD)
4.	Ecosystem	Refer to '2. Water Pollution'.	port operator	consultant/DWIR	to be included in operation cost
5.	Hydrology	Monitoring and regular dredging to prevent sedimentation and to maintain smooth river flow	port operator	consultant/DWIR	to be included in operation cost
6.	Bottom Sediment	Refer to '2. Water Pollution' and '5. Hydrology'.	port operator	consultant/DWIR	to be included in operation cost
7.	Sanitary Condition	1. Consultation with MCDC for final disposal of sludge at their sewage disposal facilities 2. Installation of adequate sanitation system with proper treatment facilities for toilet, canteen and so on 3. Training of workers so that they follow waste management rules	port operator	consultant/DWIR	to be included in operation cost
8.	Accidents	1. Development of, and compliance with, working rules, traffic regulation and rules through education. 2. Enforcement of workers' use of PPE 3. Installation of proper signboard for safety and security 4. Preparation of security boats, life jackets, medical box and so on 5. Proper record and analysis of the cases and causes of accidents	port operator	consultant/DWIR	to be included in operation cost

Source: JICA Study Team

Environmental Monitoring Plan (draft)

No.	Category	Monitoring Item	Location	Frequency	Implementation Organization	Management Organization	Cost (USD) per year
Planning Phase							
1.	Land Acquisition	1. progress of provision/payment of compensation and social assistance 2. level of information disclosure and public involvement 3. voices and complaints from PAPs 4. state of project site	project site and surrounding area	biweekly during ARAP implementation stage	DWIR	Mandalay Region Government, MOTC and local authorities	to be included in operation cost
Construction Phase							
1.	Air Pollution	NO2, SO2, PM (PM10 and PM2.5) and Ozone, Micro climate (temperature, humidity, wind speed and direction etc. for reference)	2 points (same places as the baseline survey, in principle)	biannually	contractor	consultant/DWIR	USD 4,000 (USD 1,000*2points*2times)
2.	Water Pollution	1. BOD, COD, oil & grease, pH, Total coliform, Total nitrogen, Total phosphorus and TSS 2. turbidity during filling by visual observation	2 points (same places as the baseline survey, in principle) downstream of filling area	1. biannually 2. every day during filling	contractor	consultant/DWIR	USD 4,000 (USD 1,000*2points*2times) to be included in construction cost
3.	Waste Disposal	1. Volume, type and place of disposal of domestic and industrial waste 2. Voices and complaints from local community	project site and surrounding area	monthly and whenever complaints are heard in this regard	contractor	consultant/DWIR	to be included in construction cost
4.	Noise and Vibration	1. LAeq *Measurement is considered necessary for noise only. 2. Voices and complaints from local community	2 points (same places as the baseline survey, in principle) project site and	biannually and whenever complaints are heard in this regard	contractor	consultant/DWIR	USD 4,000 (USD 1,000*2points*2times) to be included in construction cost

No.	Category	Monitoring Item	Location	Frequency	Implementation Organization	Management Organization	Cost (USD) per year
			surrounding area				
5.	Ecosystem	Refer to '2. Water Pollution' above.					
6.	Bottom Sediment	sediment quality before and after filling	downstream of filling area	every day during filling	contractor	DWIR	to be included in construction cost
7.	Land Acquisition	1. extent of livelihood and income restoration 2. level of information disclosure and public involvement 3. level of satisfaction of the PAPs	project site and surrounding area	biannually and whenever complaints are heard in this regard	DWIR/consultant/contractor	Mandalay Region Government, MOTC and local authorities	USD 2,000 (USD 1,000*2 times) for public consultation
8.	Existing Social Infrastructure and Services	voices and complaints from local community	project site and surrounding area	biannually and whenever complaints are heard in this regard	DWIR/consultant/contractor	Mandalay Region Government, MOTC and local authorities	
9.	Sanitary Condition	1. state of sanitary facilities (e.g. toilets, septic tanks and rubbish bins) 2. voices and complaints from local community	project site and surrounding area	monthly and whenever complaints are heard in this regard	contractor	consultant/DWIR	to be included in construction cost
10.	Infectious Diseases such as HIV/AIDS	1. number of infected patients 2. voices and complaints from local community	project site and surrounding area	biannually and whenever complaints are heard in this regard	contractor	consultant/DWIR, MOTC, MOH, Mandalay Region Government and local authorities	to be included in construction cost
11.	Accidents	1. record of number and type of accidents 2. record of safety awareness training and campaigns 3. state of use of PPE 4. state of safety equipment (e.g. fence, sign board, guards, security boats, life jackets, medical box etc.)	project site and surrounding area	monthly	contractor	consultant/DWIR	to be included in construction cost

No.	Category	Monitoring Item	Location	Frequency	Implementation Organization	Management Organization	Cost (USD) per year
Operation Phase							
1.	Air Pollution	NO2, SO2, PM (PM10 and PM2.5) and Ozone, Micro climate (temperature, humidity, wind speed and direction etc. for reference)	2 points (same places as the baseline survey, in principle)	annually for the first two years	port operator	consultant/DWIR	USD 2,000 (USD 1,000*2points)
2.	Water Pollution	BOD, COD, oil & grease, pH, Total coliform, Total nitrogen, Total phosphorus and TSS	2 points (same places as the baseline survey, in principle)	biannually for the first two years	port operator	consultant/DWIR	USD 4,000 (USD 1,000*2points*2times)
3.	Waste Disposal	1. Volume, type and place of disposal of domestic and industrial waste 2. Voices and complaints from local community	project site and surrounding area	annually and whenever complaints are heard in this regard	port operator	consultant/DWIR	to be included in operation cost
4.	Ecosystem	Refer to '2. Water Pollution'.					
5.	Hydrology	dredging schedule and work	project site and surrounding area	during and before dredging	port operator	consultant/DWIR	to be included in operation cost
6.	Bottom Sediment	Refer to '2. Water Pollution' and '6. Hydrology'.					
7.	Sanitary Condition	1. state of sanitary facilities (e.g. toilets, septic tanks and rubbish bins) 2. voices and complaints from local community	project site and surrounding area	annually and whenever complaints are heard in this regard	port operator	consultant/DWIR	to be included in operation cost
8.	Accidents	1. record of number and type of accidents 2. state of use of PPE 3. state of safety equipment (e.g. fence, sign board, guards, security boats, life jackets, medical box etc.)	project site and surrounding area	biannually	port operator	consultant/DWIR	to be included in operation cost

Source: JICA Study Team

Environmental Monitoring Form (planning stage/draft)

No.	Category	Monitoring Item	Method	Location	Frequency	Results of Monitoring		
						Date	Result	Actions to be Taken
1	Land Acquisition	Refer to the form for land acquisition below.						

Environmental Monitoring Form (construction stage/draft)

1. Pollution and Nuisance

No.	Category	Monitoring Item	Method	Location	Frequency	Results of Monitoring				
						Date	Result		NEQ GL Value	Remarks/Actions
1	Air Pollution	NO2, SO2, PM (PM10 and PM2.5) and ozone, micro climate (temperature, humidity, wind speed and direction etc. for reference)	one weekday for 24 consecutive hours per location	2 points (same places as the baseline survey, in principle)	biannually		NO2	µg/m^3	200µg/m^3	
							SO2,	µg/m^3	20µg/m^3	
							PM10	µg/m^3	50µg/m^3	
							PM2.5	µg/m^3	25µg/m^3	
							ozone	µg/m^3	100µg/m^3	
							temperature		-	
							humidity		-	
							wind speed/ direction		-	
2	Water Pollution	BOD, COD, oil & grease, pH, total coliform, total nitrogen, total phosphorus and TSS	sampling and measurement using field equipment and laboratory analyses	2 points (same places as the baseline survey, in principle)	biannually (*once during dry season and once during rainy season)		BOD	mg/l	30mg/l	
							COD	mg/l	125mg/l	
							oil & grease	mg/l	10mg/l	
							pH		6-9	
							total coliform	/100ml	400/ 100ml	
							total nitrogen	mg/l	10mg/l	
							total phosphorus	mg/l	2mg/l	
							TSS	mg/l	50mg/l	
3	Noise	LAeq	one weekday for 24 consecutive hours per location	2 points (same places as the baseline survey, in principle)	biannually			dBA	70dBA	

2. Social and Natural Environment

No.	Category	Monitoring Item	Method	Location	Frequency	Results of Monitoring		
						Date	Result	Actions to be Taken
1	Waste Disposal	- volume, type and place of disposal of domestic and industrial waste - voices and complaints from local community	- confirmation of records of waste generated - confirmation of voices and complaints - visual observation	project site and surrounding area	monthly and whenever complaints are heard in this regard			
2	Ecosystem	Refer to '1.2. Water Pollution' above.						
3	Bottom Sediment	sediment quality before and after filling	visual observation	downstream of filling area	every day during filling			
4	Land Acquisition	Refer to the form for land acquisition below.						
5	Existing Social Infrastructure and Services	voices and complaints from the local community	- confirmation of voices and complaints - visual observation	project site and surrounding area	biannually and whenever complaints are heard in this regard			
6	Sanitary Condition	- state of sanitary facilities (e.g. toilets, septic tanks and rubbish bins) - voices and complaints from local community	- confirmation of voices and complaints - visual observation	project site and surrounding area	monthly and whenever complaints are heard in this regard			
7	Infectious Diseases such as HIV/AIDS	- number of infected patients - voices and complaints from the local community	- confirmation of health check list of workers (and preferably of local community)	project site and surrounding area	biannually and whenever complaints are heard in this regard			

No.	Category	Monitoring Item	Method	Location	Frequency	Results of Monitoring		
						Date	Result	Actions to be Taken
			- confirmation of voices and complaints					
8	Accidents	- record of number and type of accidents - record of safety awareness training and campaigns - state of use of PPE - state of safety equipment (e.g. fence, sign board, guards, security boats, life jackets, medical box etc.)	- confirmation of records - visual observation	project site and surrounding area	monthly			

Environmental Monitoring Form (operation stage/draft)

1. Pollution and Nuisance

No.	Category	Monitoring Item	Method	Location	Frequency	Results of Monitoring				
						Date	Result		NEQ GL Value	Remarks/Actions
1	Air Pollution	NO2, SO2, PM (PM10 and PM2.5) and ozone, micro climate (temperature, humidity, wind speed and direction etc. for reference)	same as baseline survey	2 points (same places as the baseline survey, in principle)	annually for the first two years		NO2	µg/m^3	200µg/m^3	
							SO2,	µg/m^3	20µg/m^3	
							PM10	µg/m^3	50µg/m^3	
							PM2.5	µg/m^3	25µg/m^3	
							ozone	µg/m^3	100µg/m^3	
							temperature		-	
							humidity		-	
							wind speed/ direction		-	
2	Water Pollution	BOD, COD, oil & grease, pH, total coliform, total nitrogen, total phosphorus and TSS	same as baseline survey	2 points (same places as the baseline survey, in principle)	biannually for the first two years (*once during dry season and once during rainy season)		BOD	mg/l	30mg/l	
							COD	mg/l	125mg/l	
							oil & grease	mg/l	10mg/l	
							pH		6-9	
							total coliform	per 100ml	400 per 100ml	
							total nitrogen	mg/l	10mg/l	
							total phosphorus	mg/l	2mg/l	
							TSS	mg/l	50mg/l	

2. Social and Natural Environment

No.	Category	Monitoring Item	Method	Location	Frequency	Results of Monitoring		
						Date	Result	Actions to be Taken
1	Waste Disposal	- volume, type and place of disposal of domestic and industrial waste - voices and complaints from local community	- confirmation of voices and complaints - visual observation	project site and surrounding area	annually and whenever complaints are heard in this regard			
2	Hydrology	dredging schedule and work	visual observation	project site and surrounding area	during and before dredging			
3	Bottom Sediment	Refer to '1.2. Water Pollution' and '2.2. Hydrology' above.						
4	Sanitary Condition	- state of sanitary facilities (e.g. toilets, septic tanks and rubbish bins) - voices and complaints from the local community	- confirmation of voices and complaints - visual observation	project site and surrounding area	annually and whenever complaints are heard in this regard			
5	Accidents	- record of number and type of accidents - state of use of PPE - state of safety equipment (e.g. fence, sign board, guards, security boats, life jackets, medical box etc.)	- confirmation of records - visual observation	project site and surrounding area	biannually			

Environmental Monitoring Form (land acquisition)

No.	Activity	Progress (tasks completed)	Description of the Situation (incl. any necessary actions)	CD (plan)	CD	RD	Recorded by
1.	Formation of Farmland Management Committee	%					
		%					
		%					
		%					
2.	Formation of Grievance Committee	%					
		%					
		%					
		%					
3.	Supplementary Survey (if required)	%					
		%					
		%					
		%					
4.	Finalization of Compensation and Support	%					
		%					
		%					
		%					
5.	Agreement with PAPs	HH/ HH					
		HH/ HH					
		HH/ HH					
		HH/ HH					
6.	Provision of Compensation and Support to PAPs	HH/ HH					
		HH/ HH					
		HH/ HH					
		HH/ HH					
7.	Securement of Land (e.g. removal of structures)	acres/ acres					
		acres/ acres					
		acres/ acres					
		acres/ acres					

*CD: completion date; RD: recorded date; HH: household

Environmental Monitoring Form (public consultation)

No.	Time and Date	Venue	Participants	Content including Q&A
1				
2				
3				