MJTD

Thilawa Special Economic Zone (ZONE A) Development

Environmental Monitoring Report (Construction Phase)

Modification of Environmental Monitoring Form

Myanmar Japan Thilawa Development Limited.

September 2014

CONTENTS

Appendix

1. Executive Summary

The environmental inspection and compliance monitoring program is implemented under the direction of Ministry of Environmental Conservation and Forestry with oversight by Thilawa SEZ Management Committee.

The monitoring record according to the Environment Monitoring Plan is submitted in conformity with the provision of Chapter 9.1, Table 9.1-2 and 9.2, Table 9.2-2 Content of the EIA Report of Thilawa SEZ Development Project (Zone A).

2. Summary of Monitoring Activities

a) **Documentation of compliance with all Conditions;**

Attached herewith is confirmation of Environmental Impact Assessment in Thilawa Special Economic Zone from Thilawa SEZ Management Committee.

b) **Progress made to date on the implementation of the EMP against the submitted implementation schedule;**

EMP for Pre-construction Phase was submitted on March 2014. The First implementation report during Construction Period was submitted on June 2014. The second report for Construction Period is submitted this day. Subsequent reports will be submitted on a quarterly base on at December 2014 and March 2015.

c) **Difficulties encountered in implementing of the EMP and recommendations for remedying those difficulties and steps proposed to prevent or avoid similar future difficulties;**

None

d) **Number and type of non-compliance with the EMP and proposed remedial measures and timelines for completion of remediation;**

None

e) **Accidents or incidents relating to the occupational and community health and safety, and the environment:**

Neither accidents nor incidents happen during this monitoring period from July 2014 to September 2014.

f) **Monitoring data on environmental parameters and conditions as committed in the EMP or otherwise required.**

Please refer to the attached Environmental Monitoring Form

g) Reporting data of Waste Disposal status

No.	Date	Description	No. of Loads	Remarks
1	30-June-14	Waste Disposal	1	YCDC
2	10-July-14	Waste Disposal	1	YCDC
3	11-Aug-14	Waste Disposal	1	YCDC
4	12.Aug-14	Waste Disposal	1	YCDC

*Reference on Monthly Progress Report August 2014, 2.8, table 4

3. Construction Progress

Thilawa SEZ Class A Development Project, Phase 1 construction activities is submitted enclosed with monthly progress reports from contractor in Appendix A to C.

- Monthly Progress Report for June, 2014
- Monthly Progress Report for July, 2014
- Monthly Progress Report for August, 2014

4. Monitoring Result

Environmental Monitoring plan report for Construction Phase implemented according to the following table, reference on Table 4.2-2, Chapter 4, EIA report.

Monitoring Plan (Construction Phase)

Category	Item	Location	Frequency	Remark
Air Quality	No2, So2, Co, TSP, PM10	Construction site (1point)	Once/ 3month	Air, Water & Waste water Monitoring Report (September)
Water Quality	Water temperature, PH, SS, DO, BOD, COD, coliform count, oil and grease, chromium	Construction site (1point) Well in the Monastery (1 point)	Once/2 month	Air, Water & Waste water Monitoring Report (July, September)
Waste	Amount of solid waste Management of solid waste of construction	Construction site	Once/3month	
Noise and Vibration	Noise and vibration level of construction	Preservation area such as residence around the proposed construction site (2 points)	Once/3moth (peak period)	Noise and Vibration monitoring report (August)
		Preservation site such as residence along the route for on-site vehicles (2points)	Once(peak period)	
Ground Subsidence	Ground elevation Consumption of ground water amount	Representative (1 point)	Every week	Monthly progress report (June,July, August)
Hydrology				
Risk for infectious disease such as AIDS/HIV	Status of measures of infectious disease	Construction site	Once/month	Monthly progress report (June,July, August)
Working conditions (including occupational safety)	Prehension of condition of occupational safety and health Prehension of infectious disease	Construction site	Once/ month	
Accident	Existence of accident	Construction site	As occasion arise	

Thilawa Special Economic Zone CLASS A
Development Project –Phase 1

Environment Monitoring Form

Environment Monitoring Form

The latest results of the below monitoring items shall be submitted to Authorities on once at Pre-construction phase and on quarterly basis at Construction Phase, and on bi-annually base at Operation Phase. The items, standards to be applied, measurement points, and frequency for each monitoring parameter are established based on the EIA Report for Thilawa Special Economic Zone Development Project (Class A). Should there be any changes to the original plan, such change shall be reviewed and evaluated by environmental expert.

(1) General

1) Phase of the Project

- Please mark the current phase.

□ Pre-Construction Phase ☑ Construction Phase □ Operation Phase

2) Obtainment of Environmental Permits

Name of permits	Expected issuance date	Actual issuance date	Concerned authority	Remarks (Conditions, etc.)
Attached approval letter:				

3) Response/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period	Duration of Report Period	Frequency
Number and contents of formal comments made by the public		Same timing of submission of Monitoring Report	Upon receipt of comments/complaints
Number and contents of responses from Government agencies			

MJTD MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED

(2) Monitoring Results

1) Ambient Air Quality - August

NO_2, SO_2, CO, TSP, PM10

Location	Item	Unit	Measured Value (Mean)	Measured Value (Min~Max)	Country's Standard	Target value to be applied	Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
Construction Area Near Gate 2	NO_2	ppm	0.0563	0.01~0.02	N/A	N/A	0.04	Once in three months	HAZSCANNER, EPAS	
	SO_2	ppm	<0.01	0.00~0.00	N/A	N/A	0.12	Ditto	HAZSCANNER, EPAS	
	CO	ppm	0.0294	0.02~0.04	N/A	N/A	10	Ditto	HAZSCANNER, EPAS	
	TSP	ppm	0.0514	0.02~0.12	N/A	N/A	0.33	Ditto	HAZSCANNER, EPAS	
	PM10	ppm	0.0229	0.02~0.03	N/A	N/A	0.12	Ditto	HAZSCANNER, EPAS	

*Remark: Referred to the Japan and Thailand Standard (EIA Report, Table 6.4-3)

Complains from Residents

- Are there any complains from residents regarding air quality in this monitoring period? □ Yes, ☑ No

If yes, please describe the contents of complains and its countermeasures to fill in below the table.

Contents of Complains from Residents	Countermeasures

2) (a) Water Quality - July

Measurement Point: Effluent of Wastewater

- Are there any effluents to water body in this monitoring period? □ Yes, ☑ No

If yes, please attach "Analysis Record" and fill in the items not to comply with Refereed International Standard.

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)*
SW-2	pH	mg/l	8.80	None (Available Guideline Value determined by MCB)	5.0-9.0		Once in two month	pH meter,HI7609829-1 pH Sensor	-
	SS	mg/l	317		Max.50			Gravimetric method	
	DO	mg/l	8.47		-	>=4		HI7609829-2,(D.O)sensor	
	COD	mg/l	14.7		Max. 60			Dichromate method	
	BOD	mg/l	4		Max. 30-60			Direct inoculation method	
	Oil and Grease	mg/l	1.6		Max.5			APHA-AWWA-WEF Method	
	Cr	mg/l	0.006		Max.0.5			APHA-AWWA-WEF Method	
	Total coliforms	cfu/100ml	7x10³		-	7.5×10³		AOAC Petrifilm Method	
SW-3	pH	mg/l	8.17	Data	Data	Data	Once in two month	pH meter,HI7609829-1 pH Sensor	-
	SS	mg/l	302					Gravimetric method	
	DO	mg/l	8.49					HI7609829-2,(D.O)sensor	
	COD	mg/l	23.5					Dichromate method	
	BOD	mg/l	10					Direct inoculation method	
	Oil and Grease	mg/l	1.9					APHA-AWWA-WEF Method	
	Cr	mg/l	0.026498					APHA-AWWA-WEF Method	
	Total coliforms	cfu/100ml	2.5×10³					AOAC Petrifilm Method	
SW-4	pH	mg/l	8.81	Data	Data	Data	Once in two month	pH meter,HI7609829-1 pH Sensor	*
	SS	mg/l	3605.5					Gravimetric method	
	DO	mg/l	6.45					HI7609829-2,(D.O)sensor	
	COD	mg/l	21.5					Dichromate method	
	BOD	mg/l	5					Direct inoculation method	

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)*
	Oil and Grease	mg/l	9.2					APHA-AWWA-WEF Method	*
	Cr	mg/l	0.013503					APHA-AWWA-WEF Method	
	Total coliforms	cfu/100ml	1.9×10³					AOAC Petrifilm Method	
GW-1	pH	mg/l	7.49	N/A	N/A	5.5-9.0	Once in two month	pH meter,HI7609829-1 pH Sensor	
	SS	mg/l	370.5			50		Gravimetric method	
	DO	mg/l	5.59			>=4		HI7609829-2,(D.O)sensor	
	COD	mg/l	15.8			50		Dichromate method	
	BOD	mg/l	6			15		Direct inoculation method	
	Oil and Grease	mg/l	ND			0.1		APHA-AWWA-WEF Method	
	Cr	mg/l	0.023498			0.04		APHA-AWWA-WEF Method	
	Total coliforms	cfu/100ml	0			7.5×10³		AOAC Petrifilm Method	

*Remark: Referred to the Vietnam Standard (EIA Report) ,Reference to the Monitoring Report, July 2014.

*Remark: Total suspended solid has been exceeding the reference standard since before construction phase as reported in the result of EIA Monitoring report (Sep 2013).

(b) Water Quality - September

Measurement Point: Effluent of Wastewater

- Are there any effluents to water body in this monitoring period? ☐ Yes, ☑ No

If yes, please attach "Analysis Record" and fill in the items not to comply with Refereed International Standard

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	Referred International Standard	Frequency	Method	Note (Reason of excess of the standard) *
	pH	mg/l	6.70	None	5.0-9.0		Once in two	pH meter,HI7609829-1 pH Sensor	

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	Referred International Standard	Frequency	Method	Note (Reason of excess of the standard) *
SW-2	SS	mg/l	148	(Available Guideline Value determined by MOI)	Max.30		month	Gravimetric method	
	DO	mg/l	8.9		-	>=4		HI7609829-2,(D.Oxymax	
	COD	mg/l	15		Max. 80			Dichromate method	
	BOD	mg/l	5.2		Max. 20-60			Direct inoculation method	
	Oil and Grease	mg/l	ND		Max. 5			APHA-AWWA-WEF Method	
	Cr	mg/l	ND		Max. 0.5			APHA-AWWA-WEF Method	
	Total coliforms	cfu/100ml	49		-	7.5×10³		AOAC Petrifilm Method	
SW-3	pH	mg/l	6.69	Data	Data	Data	Once in two month	pH meter,HI7609829-1 pH Sensor	
	SS	mg/l	143					Gravimetric method	
	DO	mg/l	8.3					HI7609829-2,(D.Oxymax	
	COD	mg/l	10					Dichromate method	
	BOD	mg/l	4					Direct inoculation method	
	Oil and Grease	mg/l	ND					APHA-AWWA-WEF Method	
	Cr	mg/l	ND					APHA-AWWA-WEF Method	
	Total coliforms	cfu/100ml	110					AOAC Petrifilm Method	
SW-4	pH	mg/l	7.04	Data	Data	Data	Once in two month	pH meter,HI7609829-1 pH Sensor	
	SS	mg/l	316					Gravimetric method	
	DO	mg/l	8.5					HI7609829-2,(D.Oxymax	
	COD	mg/l	14.5					Dichromate method	
	BOD	mg/l	5.8					Direct inoculation method	
	Oil and Grease	mg/l	7.4					APHA-AWWA-WEF Method	

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	Referred International Standard	Frequency	Method	Note (Reason of excess of the standard) *
	Cr	mg/l	ND					APHA-AWWA-WEF Method	
	Total coliforms	cfu/100ml	330					AOAC Petrifilm Method	
SW-6	pH	mg/l	7.65	Data	Data	Data	Once in two month	pH meter,HI7609829-1 pH Sensor	*
	SS	mg/l	177					Gravimetric method	
	DO	mg/l	8.7					HI7609829-2,(D.Oxymax	
	COD	mg/l	30.3					Dichromate method	
	BOD	mg/l	4.2					Direct inoculation method	
	Oil and Grease	mg/l	8					APHA-AWWA-WEF Method	
	Cr	mg/l	0					APHA-AWWA-WEF Method	
	Total coliforms	cfu/100ml	330					AOAC Petrifilm Method	
GW-1	pH	mg/l	7.89	N/A	N/A	5.5~9.0	Once in two month	pH meter,HI7609829-1 pH Sensor	
	SS	mg/l	28			50		Gravimetric method	
	DO	mg/l	9.2			>=4		HI7609829-2,(D.Oxymax	
	COD	mg/l	9			30		Dichromate method	
	BOD	mg/l	3.6			15		Direct inoculation method	
	Oil and Grease	mg/l	ND			0.1		APHA-AWWA-WEF Method	
	Cr	mg/l	ND			0.04		APHA-AWWA-WEF Method	
	Total coliforms	cfu/100ml	1.1			7.5×10³		AOAC Petrifilm Method	

*Remark: Referred to the Vietnam Standard (EIA Report) ,Reference to the Monitoring Report, Sep 2014.

*Remark: Total suspended solid has been exceeding the reference standard since before construction phase as reported in the result of EIA Monitoring report (Sep 2013).

*Remark: Oil& Grease has exceeded target standard in SW 4. It may be because of diesel or petrol oil from some vehicles nearby the channel outside of Thilawa SEZ.

3) Soil Contamination (only operation phase)

Situations environmental report from tenants

- Are there any serious issues regarding soil contamination in this monitoring period? □ Yes, ☑ No

If yes, please describe the contents of complains and its countermeasures to fill in below the table.

Contents of Issues on Soil Contamination	Countermeasures

4) Noise -August

Noise Level (Along the Road)

Location	Item	Unit	Measured Value (Mean)	Measured Value (Min-Max)	Country's Standard	Target value to be applied	Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
TNV-1	Leq (day)	dB(A)	59	52-64	N/A	N/A	75	Once /peak period	Sound Level Meter	
	Leq(eve)	dB(A)	55	57-60			70			

*Remark: Referred to the Japan Standard (EIA Report). Reference to the Noise and Vibration Report (August).

Noise Level (Living Environment)

Location	Item	Unit	Measured Value (Mean)	Measured Value (Min-Max)	Country's Standard	Target value to be applied	Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
TNV-2	Leq (day)	dB(A)	49	37-62	N/A	75	Singapore	Once in 3 months	Sound Level Meter	
	Leq(eve)	dB(A)	52	31-53		60				

	Leq(night)	dB(A)	46	34-53		55				
TNV-3	Leq(day)	dB(A)	52	33-62	N/A	75	Singapore	Once in 3 months	Sound level Meter	
	Leq(eve)	dB(A)	49	47-52		60				
	Leq(night)	dB(A)	45	31-53		55				

*Remark: Referred to the Singapore Target Noise Standard (EIA Report). Reference to the Noise and Vibration Report (August).

Complains from Residents

- Are there any complains from residents regarding noise in this monitoring period? □ Yes, ☑ No

If yes, please describe the contents of complains and its countermeasures to fill in below the table.

Contents of Complains from Residents	Countermeasures

5) Solid Waste

Measurement Point: Construction Site (Construction Phase), Storage for Sludge (Operation Phase)

- Are there any wastes of sludge in this monitoring period? □ Yes, ☑ No

If yes, please report the amount of sludge and fill in the results of solid waste management Activities.

Item	Generated from	Unit	Value	Solid Waste Management Activities
Amount of Sludge				

6) Ground Subsidence and Hydrology-June

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
03-June-2014	35.0	m3/week	+7.000	m	Once a week	
12-June-2014	60.0	m3/week	+7.000	m		
19-June-2014	53.0	m3/week	+7.000	m		
26-June-2014	51.0	m3/week	+7.000	m		

*Reference to the Monthly Progress Report July 2014

Ground Subsidence and Hydrology-July

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
01-July-2014	87.0	m3/week	+6.999	m	Once a week	
10-July-2014	46.0	m3/week	+6.999	m		
17-July-2014	83.0	m3/week	+7.000	m		
24-July-2014	93.0	m3/week	+7.000	m		
31-July-2014	131.0	m3/week	+7.000	m		

*Reference to the Monthly Progress Report July 2014.

Ground Subsidence and Hydrology-August

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
07-Aug-2014	120.0	m3/week	+7.000	m	Once a week	
14-Aug-2014	153.0	m3/week	+7.000	m		
21-Aug-2014	175.0	m3/week	+7.000	m		
28-Aug-2014	182.0	m3/week	+7.000	m		

*Reference to the Monthly Progress Report August 2014.

7) Offensive Odor (only operation phase) Not Applicable at Construction Phase Report

Complains from Residents

- Are there any complains from residents regarding offensive odor in this monitoring period? □ Yes, □ No

If yes, please describe the contents of complains and its countermeasures to fill in below the table.

Contents of Complains from Residents	Countermeasures

Situations environmental report from tenants Not Applicable at Construction Phase Report

- Are there any serious issues regarding offensive odor in this monitoring period? □ Yes, □ No

If yes, please describe the contents of complains and its countermeasures to fill in below the table.

Contents of Issues on Soil Contamination	Countermeasures

8) Infectious disease, Working Environment, Accident

Information from contractor (construction phase) or tenants (operation phase)

- Are there any incidents regarding Infectious disease, Working Environment, Accident in this monitoring period? □ Yes, ☑ No

If yes, please describe the contents of complains and its countermeasures to fill in below the table.

Contents of Incidents	Countermeasures

Note: If emergency incidents are occurred, the information shall be reported to the relevant organizations and authorities immediately.

End of Document

Thilawa Special Economic Zone CLASS A Development Project –Phase 1

Appendix

Air, Water and Waste Water Monitoring Report

September, 2014

MJTD MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED

MONITORING REPORT
FOR
CLASS A THILAWA SPECIAL ECONOMIC ZONE

(September 2014)

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RESULT OF AIR AND WATER QUALITY MONITORING

1. Introduction

This is the third report for Air and water quality monitoring at Thilawa Special Economic Zone (TSEZ). This report sets out the environmental monitoring required throughout the construction of the Thilawa Special Economic Zone. The terms of reference for monitoring are shown in Table 1. The location of air and water monitoring points are shown in Figure 1 and Table 1.

Terms of Reference for Monitoring

Table 1 Terms of reference for air and water quality monitoring at TSEZ.

Description	Items	Frequency	Location
Air Quality	TSP / PM10	1 time / 3months	At construction site (1point)
Waste water quality	pH, SS, DO, BOD, COD, Coliform count, oil and grease, chromium	1time / 2months	At the creek upstream and downstream which is crossed the car road (4points)
Underground water	pH, SS, DO, BOD, COD, Coliform count, oil and grease, chromium	1time /2months	Tube well inside of Moegyoswan Monastery (1 point)

Monitoring Instrument for Air and water

No.	Instrument	Brand & Model	Measurement/ Parameter	
1.	Environmental Perimeter Air Monitoring System	HAZ-SCANNER EPAS	CO, NO_2, NO, SO_2, PM (2.5), PM (10), VOCS, Relative Humidity, Temperature, Wind Speed, Wind Direction	
3	Alpha Bottle (Water Sampler)	Wildlife Supply Company® Indonesia		

So far, there is no environmental standard for ambient air quality in Republic of Myanmar, the survey result was evaluated by comparing with the standards in neighbouring country like Thailand, Vietnam, Japan and IFC (Table 2). The consultant will apply the air quality standard in Thailand, Vietnam, Japan and IFC as shown in Table 1.As for TSP and PM10, the standards in Thailand were applied and the others were compared with the standards in Japan.

Table 2 Survey Parameters for Air Quality

Item	Averaging period	Japan	Thailand	Vietnam	IFC
SO_2	10 min	-	-	-	0.5mg/m^3
	1hour	0.1ppm	0.3ppm	0.35mg/m^3	0.125mg/m^3(InterimTarget-1) 0.05mg/m^3(InterimTarget-2) 0.02mg/m^3(Guideline)
	24hours	0.04ppm	0.12ppm	0.125 mg/m^3	-
	1 year	-		0.05mg/m^3	-
NO_2	1hour	-	0.17ppm	-	0.2mg/m^3
	24hours	0.04-0.06ppm	-	-	-
	1 year	-	0.03ppm	-	0.04mg/m^3
NOx	1hour	-	-	0.2mg/m^3	
	24hours	-	-	0.04mg/m^3	
CO	1hour	--	30ppm	30mg/m^3	-
	8hours	20ppm	-	10mg/m^3	-
	24hours	10ppm	9ppm	-	-
TSP	1hour	-	-	0.3mg/m^3	-
	24hours	-	0.33mg/m^3	0.2mg/m^3	-
	1 year		0.10mg/m^3	0.14mg/m^3	-
PM_{10}	24hours	-	0.12mg/m^3	0.15mg/m^3	0.15mg/m^3(InterimTarget-1) 0.10mg/m^3(InterimTarget-2) 0.07mg/m^3(InterimTarget-3)
	1 year	-	0.05mg/m^3	0.05mg/m^3	0.07mg/m^3(InterimTarget-1) 0.05mg/m^3(InterimTarget-2) 0.03mg/m^3(InterimTarget-3)
SPM	1hour	0.2mg/m^3	-	-	-
	24hours	0.1mg/m^3	-	-	-
$PM_{2.5}$	24hours	0.035mg/m^3	0.05mg/m^3	-	0.075mg/m^3(InterimTarget-1) 0.05mg/m^3(InterimTarget-2) 0.0375mg/m^3(InterimTarget-3)
	1 year	0.015mg/m^3	0.025mg/m^3	-	0.035mg/m^3(InterimTarget-1) 0.025mg/m^3(InterimTarget-2) 0.015mg/m^3(InterimTarget-3)
Ozone	1hour	-	0.10ppm	0.3mg/m^3	-
	8hourdaily maximum	-	0.07ppm	0.2mg/m^3	0.16mg/m^3(InterimTarget-1) 0.1mg/m^3(Guideline)
	1 year	-	0.04ppm	0.14mg/m^3	-
Ox	1hour	0.06ppm	-	-	-
Pb	24hours	-	-	0.0015mg/m^3	
	1 month	-	0.0015mg/m^3	-	
	1 year	-	-	0.0005mg/m^3	

Source: National Air Quality Standard in Japan (CircularNo.25,1973, originally),Ministry of Environment, Japan
NotificationsofNationalEnvironmentalBoardNo.10, 24,28,33, and 36, Ministry of Natural Resources and Environment, Thailand
National Ambient Air Quality Standard (TCVN5973:2005), Ministry of Science and Technology in Vietnam
Environmental, Health, and Safety Guidelines, General EHS Guidelines, IFC, 2007

Figure 1 **Location of air and water monitoring points**

2. Description of the air quality monitoring station

Survey Period

Air quality survey was conducted once per 3 months as per specification provided by the client. The monitoring period was about 7 consecutive days. The sampling duration for each day is as shown in Table 3. Air quality monitoring location is shown in Figure 2.

Table 3.Sampling Duration for Air Quality Survey

Day	Third Survey (August 25th – September 1st)
Day 1	Aug. 25th - 26th
Day 2	Aug. 26th - 27th
Day 3	Aug. 27th - 28th
Day 4	Aug. 28th - 29th
Day 5	Aug. 29th –30th
Day 6	Aug. 30th – 31st
Day 7	Aug. 31st – 1st September

Source: Source: Resource &Environment Myanmar Co., Ltd.

Survey Method

Sampling and analysis of ambient air pollutants was conducted by referring to the recommendation of United States Environmental Protection Agency (U.S. EPA). The Haz-Scanner Environmental Perimeter Air Station (EPAS) was used to collect Ambient Air Monitoring data. The characteristics of the instrument are:

- Portable direct reading
- Configure up to 14 simultaneous air measurements including U.S. EPA criteria air pollutants

The basic specification of the instrument are as follow.

Instrument	Brand	Model	Measurement/ Parameter
Environmental Perimeter Air Monitoring System	HAZ-SCANNER	EPAS	CO, NO_2, NO, SO_2, PM (2.5), PM (10), VOCS, Relative Humidity, Temperature, Wind Speed, Wind Direction

Figure 2 Location and site condition of air quality monitoring station.

Table 4. Sampling and Analysis Method for Air Quality

No.	Parameter	Analysis Method
1	Sulfur dioxide (SO_2)	On site reading
2	Carbon monoxide (CO)	On site reading
3	Nitrogen dioxides (NO_2)	On site reading
4	Total suspended particle (TSP)	On site reading
5	Particle matter 10 (PM10)	On site reading

Source: Resource &Environment Myanmar Co., Ltd.

Target Ambient Air Quality Level

Parameters	Averaging Period	Value
SO_2	24 hours	0.12 ppm[1]
CO	24 hours	9 ppm[1]
NO_2	24 hours	0.04 – 0.06 ppm[2]
TSP	24 hours	0.33 mg/m3[1]
PM10	24 hours	0.12g/m3[1]

1 Thailand Standard
2 Japan Standard

Survey Result

One day average concentration of CO, NO_2, TSP, PM 10 and SO_2 are shown in Table 5. Hourly average data are presented in Appendix -1.

Table 5 one day average concentration of CO, NO_2, TSP, PM10 and SO2

	Date	Time	CO	NO2	TSP	PM10	SO2
	D.M.Y	hours	ppm	ppm	mg/m3	mg/m3	ppm
1	25th-26th Aug, 2014	24	0.03	0.02	0.03	0.02	< 0.01
2	26th-27th Aug, 2014	24	0.02	0.02	0.03	0.02	< 0.01
3	27th-28th Aug, 2014	24	0.02	0.02	0.03	0.02	< 0.01
4	28th-29th Aug, 2014	24	0.04	0.02	0.09	0.02	< 0.01
5	29th-30th Aug, 2014	24	0.04	0.02	0.12	0.02	< 0.01
6	30th-31st Aug, 2014	24	0.02	0.01	0.02	0.02	< 0.01
7	31st Aug-1st Sep, 2014	24	0.04	0.01	0.04	0.03	< 0.01
Maximum		24	0.04	0.02	0.12	0.03	0.00
Average		24	0.0294	0.0163	0.0514	0.0229	<0.01
Minimum		24	0.02	0.01	0.02	0.02	0.00
Target Value		24	10	< 0.06	< 0.33	< 0.12	< 0.04
			Japan	Japan	Thailand	Thailand	Japan

Source: Resource & Environment Myanmar Co., Ltd

Concentration level of all parameters are within the standard in this month.

3. Water Quality Monitoring

Methodology

Sampling and preservation method

Water samples were taken by Alpha horizontal water sampler and collected in sterilized sample containers. All sampling was in strict accordance with recognized standard procedures. The parameters pH, temperature, dissolved oxygen (DO), electrical conductivity (EC), were measured at each site concurrently with sample collection. All samples were kept in iced boxes and were transported to the laboratory and stored at 2-4 °C refrigerators.

Table 7 Field Equipment for Water Quality Survey

No.	Equipment	Manufacturer	Originate Country	Model
1	pH meter	HANNA	USA	HI7609829-1 pH Sensor
2	DO meter	HANNA	USA	HI7609829-2
3	Digital Water Velocity Meter	Global Water Flow Probe	USA	FP 211
4	Alpha Bottle (Water Sampler)	Wildlife Supply Company®	Indonesia	-

Table 8 Container and Preservation Method for Water Samples

No	Parameter	Container	Preservation
1	Oil and Grease	1000 ml glass bottle	Sulfuric acid, Refrigerate
2	COD	500 ml plastic bottle	Sulfuric acid, Refrigerate
3	BOD_5	1,800 ml plastic bottle	Refrigerate
4	Heavy metals	500 ml plastic bottle	HNO_3 Refrigerate
5	Bacteria	200 ml glass bottle (Sterilize)	Refrigerate
6	Others	1,800 ml polyethylene bottle	Refrigerate

Test method

The following table provides the test method for water quality.

No	Item	Analysis method
1	pH	HI7609829-1 pH Sensor
2	Suspended Solids	Gravimetric method
3	Dissolved Oxygen (DO)	HI7609829-2 Galvanic dissolved oxygen (D.O) sensor
4	Chemical oxygen demand(COD)	Dichromate method
5	Biochemical oxygen demand(BOD_5)	Direct inoculation method
6	Oil & Grease	APHA-AWWA-WEF Method
7	Chromium (Cr) (mg/l)	APHA-AWWA-WEF Method
8	E. coliform, Fecal coliforms, total coliforms	AOAC Petrifilm Method

Monitoring Result (August)

No	Item	GW-1	SW-2	SW-3	SW-4	SW-6	Standard*	Unit
1	pH	7.89	6.74	6.85	7.04	7.65	5-9	
2	Suspended Solids	28	146	143	316	177	Max. 30	mg/l
3	Dissolved Oxygen (DO)	9.2	8.9	8.3	8.5	8.7	-	mg/l
4	Chemical oxygen demand(COD)	9	13	10	14.5	10.5	Max. 60	mg/l
5	Biochemical oxygen demand(BOD_5)	3.6	5.2	4	5.8	4.2	Max. 20-60	mg/l
6	Oil & Grease	ND	ND	ND	7.4	ND	Max. 5	mg/l
7	Chromium (Cr) (mg/l)	ND	ND	ND	ND	ND	Max. 0.5	mg/l
8	E. coliform	<1.1	12	>23	12	16	-	MPN/100ml
	Fecal coliforms	<1.1	49	79	330	130	-	MPN/100ml
	Total coliforms	1.1	49	110	330	130	-	MPN/100ml

* Waste water quality standard, Ministry of Industry.

Shaded area shows higher than Standard.

Result of the Water Quality Monitoring (August)

The result of August water quality monitoring was shown in above table. The monitoring results in GW1 (Tube well in Monastery) are under the limit (lower than the standard) of MOI standard. The suspended solids were high in all locations except GW 1 (Tube well in Monastery) compared to the MOI standard and the rest parameters were lower than the standard. Oil and grease content is detected in SW4 station only and it is higher than the MOI standard. The location of SW4 is the downstream channel and no trace of oil and grease content in all upstream stations (SW-2, SW-3 and SW-6). The possible reason for oil and grease content higher than the standard is release of diesel or petrol oil from some vehicles nearby the channel.

Detailed of laboratory result and hourly air quality data are provided in appendix.

Appendix 1

Hourly Air Quality Result

Resource & environment Myanmar Co., Ltd.

Client : Myanmar Japan Thilawa Development Ltd.

Issued Date : 25-8-2014

Analysis Report

Project Name : Thilawa Special Economic Zone (TSEZ)
Sample Designated as : Ambient Air Quality Analysis
Sampling Location : AQM 1 (August _TSEZ)

Date	Time	CO	NO2	TSP	PM10	SO2
D.M.Y	H.M.S	ppb	ppb	μg/m3	μg/m3	ppb
25.8.2014	12:00-13:00	0.00	67.50	1.00	2.20	0.00
25.8.2014	13:00-14:00	3.92	76.43	3.98	3.43	0.00
25.8.2014	14:00-15:00	10.53	21.57	11.45	15.78	0.00
25.8.2014	15:00-16:00	56.32	18.15	1.30	2.10	0.00
25.8.2014	16:00-17:00	91.13	26.68	4.30	5.28	11.35
25.8.2014	17:00-18:00	56.03	22.83	13.47	9.78	0.00
25.8.2014	18:00-19:00	59.90	19.03	66.87	44.30	0.00
25.8.2014	19:00-20:00	80.23	13.85	50.72	22.40	2.00
25.8.2014	20:00-21:00	80.42	13.42	47.18	34.27	0.00
25.8.2014	21:00-22:00	17.83	12.79	35.92	22.15	0.00
25.8.2014	22:00-23:00	12.34	5.24	31.56	24.24	0.00
25.8.2014	23:00-00:00	0.00	2.00	27.91	25.00	0.00
26.8.2014	00:00-01:00	2.02	11.28	15.63	12.75	0.00
26.8.2014	01:00-02:00	2.68	19.22	30.08	20.10	0.00
26.8.2014	02:00-03:00	4.33	15.17	11.72	11.95	10.00
26.8.2014	03:00-04:00	0.00	14.13	8.65	12.95	0.00
26.8.2014	04:00-05:00	9.06	12.94	21.47	29.24	0.00
26.8.2014	05:00-06:00	8.98	11.18	54.38	30.57	0.00
26.8.2014	06:00-07:00	45.43	12.23	45.83	32.28	0.00
26.8.2014	07:00-08:00	173.78	28.08	21.52	9.47	0.00
26.8.2014	08:00-09:00	55.12	35.52	19.38	10.93	0.00
26.8.2014	09:00-10:00	0.47	41.60	28.88	12.60	0.00
26.8.2014	10:00-11:00	0.00	31.62	48.47	28.98	0.00
26.8.2014	11:00-12:00	0.00	31.93	54.90	49.60	0.00
MAX	24hours	173.7833	76.4333	66.8667	49.6000	11.3500
MIN	24hours	0.0000	2.0000	1.0000	2.1000	0.0000
Average	24hours	32.1052	23.5168	27.3575	19.6818	0.9729

		ppm	ppm	mg/m3	mg/m3	ppm
MAX	24hours	0.1738	0.0764	0.0669	0.0496	0.0114
MIN	24hours	0.0000	0.0020	0.0010	0.0021	0.0000
Average	24hours	0.0321	0.0235	0.0274	0.0197	0.0010

Resource & environment Myanmar Co., Ltd.

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Issued Date : 25-8-2014

Analysis Report

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Sampling Location : AQM 1 (August _TSEZ)

Date	Time	CO	NO2	TSP	PM10	SO2
D.M.Y	H.M.S	ppb	ppb	μg/m3	μg/m3	ppb
26.8.2014	12:00-13:00	0.00	16.35	29.07	22.75	0.00
26.8.2014	13:00-14:00	0.00	17.75	34.02	31.75	12.50
26.8.2014	14:00-15:00	1.15	15.60	49.40	40.87	0.00
26.8.2014	15:00-16:00	0.33	13.10	27.52	20.12	0.00
26.8.2014	16:00-17:00	26.77	23.32	37.68	23.82	5.00
26.8.2014	17:00-18:00	2.72	16.17	75.85	67.03	6.45
26.8.2014	18:00-19:00	5.70	5.43	56.73	41.85	0.00
26.8.2014	19:00-20:00	14.52	5.68	57.03	46.30	0.00
26.8.2014	20:00-21:00	5.35	10.05	27.23	20.20	0.00
26.8.2014	21:00-22:00	0.21	15.77	37.23	29.40	0.00
26.8.2014	22:00-23:00	0.08	6.20	38.24	20.16	0.00
26.8.2014	23:00-00:00	4.18	13.92	18.03	18.00	0.00
27.8.2014	00:00-01:00	1.10	14.03	7.26	7.23	0.00
27.8.2014	01:00-02:00	0.90	8.28	7.02	11.53	0.00
27.8.2014	02:00-03:00	6.70	14.42	13.82	11.38	0.15
27.8.2014	03:00-04:00	0.83	14.35	13.50	12.42	0.00
27.8.2014	04:00-05:00	0.00	12.33	5.42	6.42	0.00
27.8.2014	05:00-06:00	0.00	11.77	1.31	2.00	0.00
27.8.2014	06:00-07:00	0.00	2.05	8.05	6.35	0.00
27.8.2014	07:00-08:00	59.63	8.27	59.30	25.07	0.00
27.8.2014	08:00-09:00	146.82	20.55	88.62	45.25	0.00
27.8.2014	09:00-10:00	79.83	23.25	53.98	24.92	21.00
27.8.2014	10:00-11:00	18.95	44.92	13.08	10.38	0.00
27.8.2014	11:00-12:00	0.00	38.32	45.27	31.70	0.00
MAX	24hours	146.8167	44.9167	88.6167	67.0333	21.0000
MIN	24hours	0.0000	2.0500	1.3077	2.0000	0.0000
Average	24hours	15.6574	15.4945	33.5270	24.0373	1.8792

		ppm	ppm	mg/m3	mg/m3	ppm
MAX	24hours	0.1468	0.0449	0.0886	0.0670	0.0210
MIN	24hours	0.0000	0.0021	0.0013	0.0020	0.0000
Average	24hours	0.0157	0.0155	0.0335	0.0240	0.0019

Resource & environment Myanmar Co., Ltd.

Client : Myanmar Japan Thilawa Development Ltd.

Issued Date : 25-8-2014

Analysis Report

Project Name : Thilawa Special Economic Zone (TSEZ)
Sample Designated as : Ambient Air Quality Analysis
Sampling Location : AQM 1 (August _TSEZ)

Date	Time	CO	NO2	TSP	PM10	SO2
D.M.Y	H.M.S	ppb	ppb	μ g/m3	μ g/m3	ppb
27.8.2014	12:00-13:00	0.00	21.35	22.55	23.55	0.25
27.8.2014	13:00-14:00	10.07	12.42	19.28	13.93	0.10
27.8.2014	14:00-15:00	0.00	14.87	17.48	19.58	0.00
27.8.2014	15:00-16:00	0.00	17.22	50.85	40.45	0.00
27.8.2014	16:00-17:00	0.00	8.47	177.33	104.72	0.00
27.8.2014	17:00-18:00	6.32	3.18	85.07	51.13	0.00
27.8.2014	18:00-19:00	0.45	6.88	30.52	29.53	11.56
27.8.2014	19:00-20:00	28.10	10.58	72.92	41.15	0.00
27.8.2014	20:00-21:00	8.32	16.77	17.32	13.00	0.00
27.8.2014	21:00-22:00	2.95	17.43	9.20	11.42	0.00
27.8.2014	22:00-23:00	2.75	19.62	19.45	15.85	0.00
27.8.2014	23:00-00:00	1.30	17.18	14.72	13.47	2.00
28.8.2014	00:00-01:00	7.05	16.48	15.82	20.00	1.00
28.8.2014	01:00-02:00	0.00	14.17	17.60	23.05	0.15
28.8.2014	02:00-03:00	0.00	14.17	14.98	15.07	0.00
28.8.2014	03:00-04:00	0.00	18.72	31.34	24.10	0.00
28.8.2014	04:00-05:00	0.00	15.50	1.80	13.70	0.00
28.8.2014	05:00-06:00	0.00	6.88	4.18	5.75	0.00
28.8.2014	06:00-07:00	60.87	12.02	32.88	23.80	0.00
28.8.2014	07:00-08:00	100.60	19.03	18.70	17.95	0.00
28.8.2014	08:00-09:00	128.70	17.05	6.22	4.57	25.45
28.8.2014	09:00-10:00	15.33	29.10	30.57	29.87	0.00
28.8.2014	10:00-11:00	16.57	16.28	3.53	3.12	0.00
28.8.2014	11:00-12:00	0.00	26.22	31.97	23.77	0.00
MAX	24hours	128.7000	29.1000	177.3333	104.7167	25.4500
MIN	24hours	0.0000	3.1833	1.8000	3.1167	0.0000
Average	24hours	16.2236	15.4830	31.0949	24.2717	1.6879

		ppm	ppm	mg/m3	mg/m3	ppm
MAX	24hours	0.1287	0.0291	0.1773	0.1047	0.0255
MIN	24hours	0.0000	0.0032	0.0018	0.0031	0.0000
Average	24hours	0.0162	0.0155	0.0311	0.0243	0.0017

Resource & environment Myanmar Co., Ltd.

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Issued Date : 25-8-2014

Analysis Report

Project Name : Thilawa Special Economic Zone (TSEZ)
Sample Designated as : Ambient Air Quality Analysis
Sampling Location : AQM 1 (August _TSEZ)

Date	Time	CO	NO2	TSP	PM10	SO2
D.M.Y	H.M.S	ppb	ppb	μ g/m3	μ g/m3	ppb
28.8.2014	12:00-13:00	22.52	15.15	12.43	5.98	0.00
28.8.2014	13:00-14:00	13.47	18.13	28.43	18.10	0.00
28.8.2014	14:00-15:00	0.00	27.05	45.25	32.82	0.00
28.8.2014	15:00-16:00	0.00	15.47	35.33	21.10	26.00
28.8.2014	16:00-17:00	0.00	27.42	59.42	39.55	0.00
28.8.2014	17:00-18:00	0.00	17.85	24.58	14.40	2.55
28.8.2014	18:00-19:00	0.00	23.60	63.22	41.80	0.00
28.8.2014	19:00-20:00	0.00	4.55	37.12	25.72	0.00
28.8.2014	20:00-21:00	6.22	12.30	47.50	39.02	1.50
28.8.2014	21:00-22:00	678.57	14.80	48.58	45.12	0.00
28.8.2014	22:00-23:00	76.18	13.87	899.62	47.20	0.00
28.8.2014	23:00-00:00	8.83	16.30	711.35	18.93	11.55
29.8.2014	00:00-01:00	1.88	17.97	1.00	31.42	0.00
29.8.2014	01:00-02:00	0.00	17.02	1.00	24.78	0.00
29.8.2014	02:00-03:00	1.17	18.13	1.00	17.58	0.00
29.8.2014	03:00-04:00	0.00	18.67	1.00	18.98	2.00
29.8.2014	04:00-05:00	0.00	17.35	1.00	16.57	0.00
29.8.2014	05:00-06:00	0.00	14.54	1.00	13.92	0.00
29.8.2014	06:00-07:00	0.00	3.80	1.00	3.00	0.00
29.8.2014	07:00-08:00	0.28	4.45	4.18	2.18	2.15
29.8.2014	08:00-09:00	5.32	22.03	13.17	2.52	0.00
29.8.2014	09:00-10:00	18.73	21.18	1.00	4.43	0.00
29.8.2014	10:00-11:00	7.89	25.39	1.00	9.79	0.00
29.8.2014	11:00-12:00	1.12	15.95	59.56	16.73	0.11
MAX	24hours	678.5667	27.4167	899.6167	47.2000	26.0000
MIN	24hours	0.0000	3.8000	1.0000	2.1833	0.0000
Average	24hours	35.0910	16.7900	87.4477	21.3185	1.9108

		ppm	ppm	mg/m3	mg/m3	ppm
MAX	24hours	0.6786	0.0274	0.8996	0.0472	0.0260
MIN	24hours	0.0000	0.0038	0.0010	0.0022	0.0000
Average	24hours	0.0351	0.0168	0.0874	0.0213	0.0019

Resource & environment Myanmar Co., Ltd.

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Analysis Report

Project Name : Thilawa Special Economic Zone (TSEZ)
Sample Designated as : Ambient Air Quality Analysis
Sampling Location : AQM 1 (August _TSEZ)

Date	Time	CO	NO2	TSP	PM10	SO2
D.M.Y	H.M.S	ppb	ppb	μg/m3	μg/m3	ppb
29.8.2014	12:00-13:00	0.00	13.92	1.00	8.85	2.40
29.8.2014	13:00-14:00	0.00	18.02	3.43	9.78	0.14
29.8.2014	14:00-15:00	0.00	20.55	110.78	18.48	0.00
29.8.2014	15:00-16:00	0.00	18.42	111.30	15.87	2.00
29.8.2014	16:00-17:00	0.00	17.20	125.63	31.83	0.00
29.8.2014	17:00-18:00	0.00	18.33	167.87	22.83	0.00
29.8.2014	18:00-19:00	21.32	16.12	71.00	44.70	0.00
29.8.2014	19:00-20:00	2.92	14.37	1.00	44.12	0.00
29.8.2014	20:00-21:00	0.00	12.28	1.00	40.22	0.00
29.8.2014	21:00-22:00	0.28	12.20	1.00	29.08	0.00
29.8.2014	22:00-23:00	0.00	14.33	1.00	23.08	0.00
29.8.2014	23:00-00:00	0.00	17.42	1.00	40.65	18.25
30.8.2014	00:00-01:00	17.83	5.77	35.00	20.05	0.00
30.8.2014	01:00-02:00	87.75	10.77	7.12	18.72	0.00
30.8.2014	02:00-03:00	175.32	14.03	1.00	15.92	0.00
30.8.2014	03:00-04:00	222.56	12.32	1.00	15.32	0.00
30.8.2014	04:00-05:00	201.13	14.00	22.20	15.40	0.00
30.8.2014	05:00-06:00	189.34	18.00	42.34	11.23	11.85
30.8.2014	06:00-07:00	50.00	23.00	64.00	30.60	0.00
30.8.2014	07:00-08:00	0.00	38.68	182.84	2.36	0.00
30.8.2014	08:00-09:00	0.37	30.82	98.38	3.88	0.00
30.8.2014	09:00-10:00	0.00	16.45	692.85	7.00	3.00
30.8.2014	10:00-11:00	22.53	14.18	1105.13	13.50	0.00
30.8.2014	11:00-12:00	31.20	14.40	39.08	9.90	0.00
MAX	24hours	222.5588	38.6800	1105.1333	44.7000	18.2500
MIN	24hours	0.0000	5.7667	1.0000	2.3600	0.0000
Average	24hours	42.6061	16.8988	120.2901	20.5575	1.5683

		ppm	ppm	mg/m3	mg/m3	ppm
MAX	24hours	0.2226	0.0387	1.1051	0.0447	0.0183
MIN	24hours	0.0000	0.0058	0.0010	0.0024	0.0000
Average	24hours	0.0426	0.0169	0.1203	0.0206	0.0016

Appendix 2

Laboratory Result

Ministry of Agriculture and Irrigation

Irrigation Department

Survey and Investigation Branch

Soil Survey Section

Soil and Water Analytical Laboratory

ANALYTICAL DATA FOR WATER SAMPLE

PROJECT NAME; Water Quality Monitoring in Thilawa SEZ

SAMPLE DESIGNATED AS; Water Quality

SAMPLING LOCATION; Near Thanlyin & Thilawa

SAMPLING DATE; 14.8.2014
ISSUED DATE ; 22.8.2014
SAMPLING BY ; Client

Sr No	Station	Results (mg/l)			
		BOD_5	COD	Chromium	Remark
1	GW-1	3.6	9.0	0.000000	
2	SW-2	5.2	13.0	0.000000	
3	SW-3	4	10	0.000000	
4	SW-4	5.8	14.5	0.000000	
5	SW-6	4.2	10.5	0.000000	
Drinking Water Standard (WHO)	Highest desirable level	6 mg/l	10 mg/l	–	
	Maximum permissible level	Concentration at maximum permissible pollution		0.01 mg/l	

Remark: Analytical mentions are ppb unit by AAS. But this unit is changed as mg/L according to the standard of WHO unit for Cr.

(May Aye Lwin)
Staff Officer (Laboratory)
Soil and Water Laboratory
Survey and Investigation Branch
Irrigation Department

RESULT OF AIR AND WATER QUALITY MONITORING

1. Introduction

This is the third report for Air and water quality monitoring at Thilawa Special Economic Zone (TSEZ). This report sets out the environmental monitoring required throughout the construction of the Thilawa Special Economic Zone. The terms of reference for monitoring are shown in Table 1. The location of air and water monitoring points are shown in Figure 1 and Table 1.

Terms of Reference for Monitoring

Table 1 Terms of reference for air and water quality monitoring at TSEZ.

Description	items	Frequency	Location
Air Quality	TSP / PM10	1 time / 3months	At construction site (1point)
Waste water quality	pH, SS, DO, BOD, COD, Coliform count, oil and grease, chromium	1time / 2months	At the creek upstream and downstream which is crossed the car road (4points)
Underground water	pH, SS, DO, BOD, COD, Coliform count, oil and grease, chromium	1time /2months	Tube well inside of Moegyoswan Monastery (1 point)

Monitoring Instrument for Air and water

No.	Instrument	Brand & Model	Measurement/ Parameter	
1.	Environmental Perimeter Air Monitoring System	HAZ-SCANNER EPAS	CO, NO_2, NO, SO_2, PM (2.5), PM (10), VOCS, Relative Humidity, Temperature, Wind Speed, Wind Direction	
3	Alpha Bottle (Water Sampler)	Wildlife Supply Company® Indonesia		

So far, there is no environmental standard for ambient air quality in Republic of Myanmar, the survey result was evaluated by comparing with the standards in neighbouring country like Thailand, Vietnam, Japan and IFC (Table 2). The consultant will apply the air quality standard in Thailand, Vietnam, Japan and IFC as shown in Table 1.As for TSP and PM10, the standards in Thailand were applied and the others were compared with the standards in Japan.

Table 2 Survey Parameters for Air Quality

Item	Averaging period	Japan	Thailand	Vietnam	IFC
SO_2	10 min	-	-	-	0.5mg/m^3
	1hour	0.1ppm	0.3ppm	0.35mg/m^3	0.125mg/m^3(InterimTarget-1) 0.05mg/m^3(InterimTarget-2) 0.02mg/m^3(Guideline)
	24hours	0.04ppm	0.12ppm	0.125 mg/m^3	-
	1 year	-		0.05mg/m^3	-
NO_2	1hour	-	0.17ppm	-	0.2mg/m^3
	24hours	0.04-0.06ppm	-	-	-
	1 year	-	0.03ppm	-	0.04mg/m^3
NOx	1hour	-	-	0.2mg/m^3	
	24hours	-	-	0.04mg/m^3	
CO	1hour	--	30ppm	30mg/m^3	-
	8hours	20ppm	-	10mg/m^3	-
	24hours	10ppm	9ppm	-	-
TSP	1hour	-	-	0.3mg/m^3	-
	24hours	-	0.33mg/m^3	0.2mg/m^3	-
	1 year		0.10mg/m^3	0.14mg/m^3	-
PM_{10}	24hours	-	0.12mg/m^3	0.15mg/m^3	0.15mg/m^3(InterimTarget-1) 0.10mg/m^3(InterimTarget-2) 0.07mg/m^3(InterimTarget-3)
	1 year	-	0.05mg/m^3	0.05mg/m^3	0.07mg/m^3(InterimTarget-1) 0.05mg/m^3(InterimTarget-2) 0.03mg/m^3(InterimTarget-3)
SPM	1hour	0.2mg/m^3	-	-	-
	24hours	0.1mg/m^3	-	-	-
$PM_{2.5}$	24hours	0.035mg/m^3	0.05mg/m^3	-	0.075mg/m^3(InterimTarget-1) 0.05mg/m^3(InterimTarget-2) 0.0375mg/m^3(InterimTarget-3)
	1 year	0.015mg/m^3	0.025mg/m^3	-	0.035mg/m^3(InterimTarget-1) 0.025mg/m^3(InterimTarget-2) 0.015mg/m^3(InterimTarget-3)
Ozone	1hour	-	0.10ppm	0.3mg/m^3	-
	8hourdaily maximum	-	0.07ppm	0.2mg/m^3	0.16mg/m^3(InterimTarget-1) 0.1mg/m^3(Guideline)
	1 year	-	0.04ppm	0.14mg/m^3	-
Ox	1hour	0.06ppm	-	-	-
Pb	24hours	-	-	0.0015mg/m^3	
	1 month	-	0.0015mg/m^3	-	
	1 year	-	-	0.0005mg/m^3	

Source: National Air Quality Standard in Japan (CircularNo.25,1973, originally),Ministry of Environment, Japan
NotificationsofNationalEnvironmentalBoardNo.10, 24,28,33, and 36, Ministry of Natural Resources and Environment, Thailand
National Ambient Air Quality Standard (TCVN5973:2005), Ministry of Science and Technology in Vietnam
Environmental, Health, and Safety Guidelines, General EHS Guidelines, IFC, 2007

Resource & environment Myanmar Co., Ltd.

Client : Myanmar Japan Thilawa Development Ltd.

Issued Date : 25-8-2014

Analysis Report

Project Name : Thilawa Special Economic Zone (TSEZ)
Sample Designated as : Ambient Air Quality Analysis
Sampling Location : AQM 1 (August _TSEZ)

Date	Time	CO	NO2	TSP	PM10	SO2
D.M.Y	H.M.S	ppb	ppb	μg/m3	μg/m3	ppb
30.8.2014	12:00-13:00	90.50	14.60	7.48	17.30	0.00
30.8.2014	13:00-14:00	119.27	13.28	1.00	31.95	24.00
30.8.2014	14:00-15:00	0.00	13.15	12.67	48.17	0.00
30.8.2014	15:00-16:00	0.00	15.93	105.73	69.15	0.90
30.8.2014	16:00-17:00	0.00	18.55	55.07	48.80	0.00
30.8.2014	17:00-18:00	0.00	13.58	32.83	19.42	0.00
30.8.2014	18:00-19:00	0.00	13.05	29.98	18.48	31.60
30.8.2014	19:00-20:00	0.00	14.88	16.02	17.20	0.00
30.8.2014	20:00-21:00	0.00	5.90	3.75	3.70	0.00
30.8.2014	21:00-22:00	0.00	17.43	22.73	27.88	0.00
30.8.2014	22:00-23:00	0.00	12.79	9.29	14.98	0.00
30.8.2014	23:00-00:00	0.00	9.23	24.10	10.05	0.00
31.8.2014	00:00-01:00	0.00	7.18	5.37	4.25	0.00
31.8.2014	01:00-02:00	1.72	8.78	2.10	6.53	2.00
31.8.2014	02:00-03:00	0.00	9.82	16.58	12.68	0.00
31.8.2014	03:00-04:00	0.00	9.62	14.07	10.93	0.00
31.8.2014	04:00-05:00	0.00	10.68	11.08	12.10	0.00
31.8.2014	05:00-06:00	0.00	8.82	9.56	11.27	4.00
31.8.2014	06:00-07:00	0.00	8.59	7.07	7.78	0.00
31.8.2014	07:00-08:00	8.22	7.03	14.95	15.53	0.00
31.8.2014	08:00-09:00	168.32	26.25	61.50	46.45	0.00
31.8.2014	09:00-10:00	168.32	26.25	61.50	46.45	6.00
31.8.2014	10:00-11:00	0.00	17.75	26.12	28.43	0.00
31.8.2014	11:00-12:00	18.82	11.25	19.13	15.98	0.30
MAX	24hours	168.3167	26.2500	105.7333	69.1500	31.6000
MIN	24hours	0.0000	5.9000	1.0000	3.7000	0.0000
Average	24hours	23.9646	13.1005	23.7371	22.7282	2.8667

		ppm	ppm	mg/m3	mg/m3	ppm
MAX	24hours	0.1683	0.0263	0.1057	0.0692	0.0316
MIN	24hours	0.0000	0.0059	0.0010	0.0037	0.0000
Average	24hours	0.0240	0.0131	0.0237	0.0227	0.0029

Resource & environment Myanmar Co., Ltd.

Client : Myanmar Japan Thilawa Development Ltd.

Issued Date : 25-8-2014

Analysis Report

Project Name : Thilawa Special Economic Zone (TSEZ)
Sample Designated as : Ambient Air Quality Analysis
Sampling Location : AQM 1 (August _TSEZ)

Date	Time	CO	NO2	TSP	PM10	SO2
D.M.Y	H.M.S	ppb	ppb	μg/m3	μg/m3	ppb
31.8.2014	12:00-13:00	152.77	14.90	66.37	32.75	2.00
31.8.2014	13:00-14:00	82.50	22.35	42.58	33.42	0.00
31.8.2014	14:00-15:00	0.00	13.65	50.85	31.17	0.00
31.8.2014	15:00-16:00	0.00	17.75	60.37	49.92	0.00
31.8.2014	16:00-17:00	0.00	16.87	55.70	35.87	0.00
31.8.2014	17:00-18:00	0.00	13.38	23.87	20.80	0.00
31.8.2014	18:00-19:00	2.17	5.87	2.45	4.13	29.45
31.8.2014	19:00-20:00	28.63	14.08	17.18	11.27	0.00
31.8.2014	20:00-21:00	20.28	9.10	39.95	25.90	0.00
31.8.2014	21:00-22:00	12.93	10.70	38.53	23.00	0.00
31.8.2014	22:00-23:00	0.00	10.28	43.77	28.75	31.50
31.8.2014	23:00-00:00	0.00	9.75	73.90	50.88	0.00
1.9.2014	00:00-01:00	0.00	8.18	36.72	21.97	0.00
1.9.2014	01:00-02:00	0.00	11.48	10.13	17.75	0.00
1.9.2014	02:00-03:00	0.00	16.17	17.03	31.55	0.00
1.9.2014	03:00-04:00	0.00	10.08	5.52	12.55	14.00
1.9.2014	04:00-05:00	0.00	8.68	8.67	9.75	3.70
1.9.2014	05:00-06:00	0.35	12.90	29.58	32.12	0.00
1.9.2014	06:00-07:00	0.00	11.90	77.67	88.17	5.00
1.9.2014	07:00-08:00	26.78	6.88	25.00	19.00	0.00
1.9.2014	08:00-09:00	130.45	13.30	15.22	11.13	0.00
1.9.2014	09:00-10:00	206.55	14.28	46.92	31.67	0.65
1.9.2014	10:00-11:00	148.10	13.87	51.23	27.25	0.00
1.9.2014	11:00-12:00	148.00	14.28	38.03	20.73	0.00
MAX	24hours	206.5500	22.3500	77.6667	88.1667	31.5000
MIN	24hours	0.0000	5.8667	2.4500	4.1333	0.0000
Average	24hours	39.9799	12.5292	36.5514	27.9785	3.5958

		ppm	ppm	mg/m3	mg/m3	ppm
MAX	24hours	0.2066	0.0224	0.0777	0.0882	0.0315
MIN	24hours	0.0000	0.0059	0.0025	0.0041	0.0000
Average	24hours	0.0400	0.0125	0.0366	0.0280	0.0036

Report No. : 2014-00939 / 001-1 (Page 1 of 1) **Issued date :** September 4, 2014

CLIENT : **RESOURCE AND ENVIRONMENT MYANMAR CO., LTD.**
CONTACT : Ms. Pwint Pwint
ADDRESS : B702 Delta Plaza, Shwegondaing Rd., Bahan, Yangon, Myanmar
Tel. +959-73013448 Fax. +951-552901
E-mail : pwint@enviromyanmar.net

Analysis Report

PROJECT NAME : Water Quality Monitoring in Thilawa SEZ
SAMPLE DESIGNATED AS : Water Quality **SAMPLING DATE** : August 14 , 2014
SAMPLING LOCATION : Thilawa, Myanmar **SAMPLING BY** : Client

Parameters	Units	LOQ*	Results				
			GW-1	SW-2	SW-3	SW-4	SW-6
Total Coliform Bacteria	MPN/100mL	-	1.1	49	110	330	130
Fecal Coliform Bacteria	MPN/100mL	-	< 1.1	49	79	330	130
E.Coli	MPN/100mL	-	< 1.1	12	> 23	12	16

Remark :
- Analysis Methods followed *to the Standard Methods for the Examination of Water and Wastewater* endorsed by American Public Health Association (APHA), American Water Works Association (AWWA)and Water Environment Federation (WEF).
- LOQ = Limit of Quantitation

(Siriporn Imwilaiwan)
License ID : ว-010-ก-1793

(Thepson Yommana)
License ID : ว-010-ก-333

SGS (THAILAND) LIMITED

TY/Client/VV/Ws

SGS

ANALYSIS REPORT

ORIGINAL

Job Ref: 5873/2014
Date : 22.08.2014

Client Name	:	**RESOURCE AND ENVIRONMENT CO., LTD** B-702 Delta Plaza, Shwegondaing Rd, Bahan Township, Yangon, Myanmar
Project Name	:	Water Quality Monitoring in Thilawa SEZ (Near Thanlyin & Thilawa)
Sample Brought By	:	Client
Sample Received Date	:	18.08.2014
Analysed Date	:	21.08.2014

Stations	Commodity Name	Lab Code	Results (mg/l)	
			Total Suspended Solid	Oil & Grease
Method	-	-	APHA 2540 D	APHA 5520 B
GW -1	Ground Water	151/14	28	ND
SW-2	Surface Water	152/14	146	ND
SW-3	Surface Water	153/14	143	ND
SW-4	Surface Water	154/14	316	7.4
SW-6	Surface Water	155/14	177	ND
Detection Limit			2	0.2

End Of Report

SGS (Myanmar) Limited

(Nu Nu Yi)
Manager

Thilawa Special Economic Zone CLASS A Development Project –Phase 1

Appendix

Water and Waste Water Monitoring Report

July, 2014

MJTD MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED

MONITORING REPORT
FOR
CLASS A THILAWA SPECIAL ECONOMIC ZONE

(JULY 2014)

Resource & Environment Myanmar Ltd.
8-702/401 Delta Plaza Building, Shwegondaing Rd., Bahan, Yangon. MYANMAR
Tel: (959) 7301 3448; Fax: (951) 552901

www.enviromyanmar.net

RESULT OF WATER QUALITY MONITORING

1. Introduction

Water sample were collected on 9th June 2012 for water quality monitoring at Thilawa Special Economic Zone (TSEZ). This report sets out the environmental monitoring required throughout the construction of the Thilawa Special Economic Zone. The terms of reference for monitoring are shown in Table 1. The location of air and water monitoring points are shown in Figure 1 and Table 1.

Terms of Reference for Monitoring

Table 1 Terms of reference for air and water quality monitoring at TSEZ.

Description	Items	Frequency	Location
Air Quality	TSP / PM10	1 time / 3months	At construction site (1point)
Waste water quality	pH, SS, DO, BOD, COD, Coliform count, oil and grease, chromium	1time / 2months	At the creek upstream and downstream which is crossed the car road (3points)
Underground water	pH, SS, DO, BOD, COD, Coliform count, oil and grease, chromium	1time /2months	Tube well, at inside of Moegyoswan Monastery (1 point)

Monitoring Instrument for Air and water

No.	Instrument	Brand & Model	Measurement/ Parameter	
1.	Environmental Perimeter Air Monitoring System	HAZ-SCANNER EPAS	CO, NO_2, NO, SO_2, PM (2.5), PM (10), VOCS, Relative Humidity, Temperature, Wind Speed, Wind Direction	
3	Alpha Bottle (Water Sampler)	Wildlife Supply Company® Indonesia		

So far, there is no environmental standard for ambient air quality in Republic of Myanmar, the survey result was evaluated by comparing with the standards in neighbouring country like Thailand, Vietnam, Japan and IFC (Table 2). The consultant will apply the air quality standard in Thailand, Vietnam, Japan and IFC as shown in Table 1.As for TSP and PM10, the standards in Thailand were applied and the others were compared with the standards in Japan.

Table 2 Survey Parameters for Air Quality

Item	Averaging period	Japan	Thailand	Vietnam	IFC
SO_2	10 min	-	-	-	0.5mg/m^3
	1hour	0.1ppm	0.3ppm	0.35mg/m^3	0.125mg/m^3(InterimTarget-1) 0.05mg/m^3(InterimTarget-2) 0.02mg/m^3(Guideline)
	24hours	0.04ppm	0.12ppm	0.125 mg/m^3	-
	1 year	-		0.05mg/m^3	-
NO_2	1hour	-	0.17ppm	-	0.2mg/m^3
	24hours	0.04-0.06ppm	-	-	-
	1 year	-	0.03ppm	-	0.04mg/m^3
NOx	1hour	-	-	0.2mg/m^3	
	24hours	-	-	0.04mg/m^3	
CO	1hour	--	30ppm	30mg/m^3	-
	8hours	20ppm	-	10mg/m^3	-
	24hours	10ppm	9ppm	-	-
TSP	1hour	-	-	0.3mg/m^3	-
	24hours	-	0.33mg/m^3	0.2mg/m^3	-
	1 year		0.10mg/m^3	0.14mg/m^3	-
PM_{10}	24hours	-	0.12mg/m^3	0.15mg/m^3	0.15mg/m^3(InterimTarget-1) 0.10mg/m^3(InterimTarget-2) 0.07mg/m^3(InterimTarget-3)
	1 year	-	0.05mg/m^3	0.05mg/m^3	0.07mg/m^3(InterimTarget-1) 0.05mg/m^3(InterimTarget-2) 0.03mg/m^3(InterimTarget-3)
SPM	1hour	0.2mg/m^3	-	-	-
	24hours	0.1mg/m^3	-	-	-
$PM_{2.5}$	24hours	0.035mg/m^3	0.05mg/m^3	-	0.075mg/m^3(InterimTarget-1) 0.05mg/m^3(InterimTarget-2) 0.0375mg/m^3(InterimTarget-3)
	1 year	0.015mg/m^3	0.025mg/m^3	-	0.035mg/m^3(InterimTarget-1) 0.025mg/m^3(InterimTarget-2) 0.015mg/m^3(InterimTarget-3)
Ozone	1hour	-	0.10ppm	0.3mg/m^3	-
	8hourdaily maximum	-	0.07ppm	0.2mg/m^3	0.16mg/m^3(InterimTarget-1) 0.1mg/m^3(Guideline)
	1 year	-	0.04ppm	0.14mg/m^3	-
Ox	1hour	0.06ppm	-	-	-
Pb	24hours	-	-	0.0015mg/m^3	
	1 month	-	0.0015mg/m^3	-	
	1 year	-	-	0.0005mg/m^3	

Source: National Air Quality Standard in Japan (CircularNo.25,1973, originally),Ministry of Environment, Japan
NotificationsofNationalEnvironmentalBoardNo.10, 24,28,33, and 36, Ministry of Natural Resources and Environment, Thailand
National Ambient Air Quality Standard (TCVN5973:2005), Ministry of Science and Technology in Vietnam
Environmental, Health, and Safety Guidelines, General EHS Guidelines, IFC, 2007

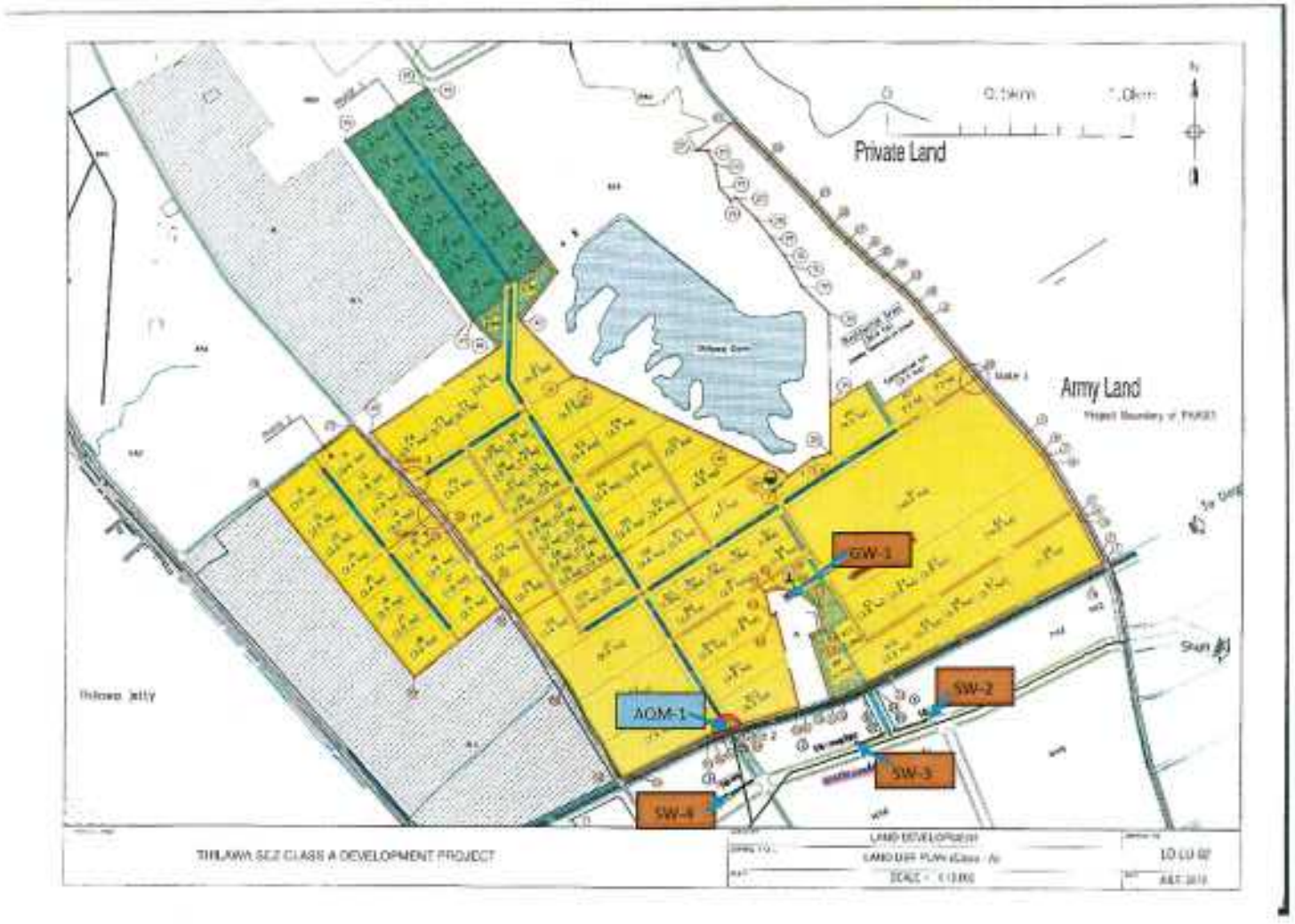

Figure 1 Location of air and water monitoring points

2. Water Quality Monitoring

Methodology

Sampling and preservation method

Water samples were taken by Alpha horizontal water sampler and collected in sterilized sample containers. All sampling was in strict accordance with recognized standard procedures. The parameters pH, temperature, dissolved oxygen (DO), electrical conductivity (EC), were measured at each site concurrently with sample collection. All samples were kept in iced boxes and were transported to the laboratory and stored at 2-4 °C refrigerators.

Table 1 Field Equipment for Water Quality Survey

No.	Equipment	Manufacturer	Originate Country	Model
1	pH meter	HANNA	USA	HI7609829-1 pH Sensor
2	DO meter	HANNA	USA	HI7609829-2
3	Digital Water Velocity Meter	Global Water Flow Probe	USA	FP 211
4	Alpha Bottle (Water Sampler)	Wildlife Supply Company®	Indonesia	-

Table 2 Container and Preservation Method for Water Samples

No	Parameter	Container	Preservation
1	Oil and Grease	1000 ml glass bottle	Sulfuric acid, Refrigerate
2	COD	500 ml plastic bottle	Sulfuric acid, Refrigerate
3	BOD_5	1,800 ml plastic bottle	Refrigerate
4	Heavy metals	500 ml plastic bottle	HNO_3 Refrigerate
5	Bacteria	200 ml glass bottle (Sterilize)	Refrigerate
6	Others	1,800 ml polyethylene bottle	Refrigerate

Test method

The following table provides the test method for water quality.

No	Item	Analysis method
1	pH	HI7609829-1 pH Sensor
2	Suspended Solids	Gravimetric method
3	Dissolved Oxygen (DO)	HI7609829-2 Galvanic dissolved oxygen (D.O) sensor
4	Chemical oxygen demand(COD)	Dichromate method
5	Biochemical oxygen demand(BOD_5)	Direct inoculation method
6	Oil & Grease	APHA-AWWA-WEF Method
7	Chromium (Cr) (mg/l)	APHA-AWWA-WEF Method
8	E. coliform, Fecal coliforms, total coliforms	AOAC Petrifilm Method

Monitoring Result (June)

Samples Collected Date – 9 June 2014

No	Item	GW-1	SW-2	SW-3	SW-4	Standard*	Unit
1	pH	7.49	8.80	8.17	8.84	5-9	
2	Suspended Solids	376.3	517	802	3601.5	Max. 30	mg/l
3	Dissolved Oxygen (DO)	3.59	5.47	6.49	6.45	-	mg/l
4	Chemical oxygen demand(COD)	13.8	14.7	23.5	21.5	Max. 60	mg/l
5	Biochemical oxygen demand(BOD_5)	6	4	10	5	Max. 20-60	mg/l
6	Oil & Grease	ND	1.6	1.9	9.2	Max. 5	mg/l
7	Chromium (Cr) (mg/l)	0.021698	0.005955	0.026498	0.013545	Max. 0.5	mg/l
8	E. coliform	0	$1x10^2$	$8x10^2$	$1x10^2$	-	cfu/100ml
	Fecal coliforms	0	$6x10^2$	$1.7x10^3$	$1.8x10^3$	-	cfu/100ml
	Total coliforms	0	$7x10^2$	$2.5x10^3$	$1.9x10^3$	-	cfu/100ml

* Waste water quality standard, Ministry of Industry.

Shaded area shows higher than Standard.

Result of the Water Quality Monitoring (August)

The result of August water quality monitoring was shown in above table. According to the laboratory analysis, suspended solids concentration of all sampling stations are higher than the standard. The possible reasons is the increasing of insoluble particulate matter during run off or discharging that can be generated from the some construction activities and direct discharge of waste water disposal from the upstream area. Oil and grease content in SW4 station is higher than the MOI standard. The location of SW4 is the downstream channel and oil and grease content in all upstream stations (SW-2 and SW-3). The possible reason for oil and grease content higher than the standard is release of diesel or petrol oil from some vehicles nearby the channel.

Compared with the previous monitoring result the following things are noted.

1. DO is decreased compared to the previous results.
2. BOD and COD are increased compared to the previous results.

Detailed of laboratory results are provided in appendix.

Laboratory Result

THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF LIVESTOCK , FISHERIES AND RURAL DEVELOPMENT
DEPARTMENT OF FISHERIES
FISH INSPECTION AND QUALITY CONTROL DIVISION
YANGON, MYANMAR
ANALYTICAL LABORATORY SECTION

Test Report for Microbiological Analysis

Name of Project : Water Quality Monitoring in Thilawa SEZ (June)

Name of Company : Resource and Environment Myanmar Co., Ltd.

Date of Received : 23.6.2014

Date of Analysis : 23.6.2014

Test Method : AOAC Petrifilm Method

No	Date of Analysis	Detail of Samples (Water)	Total Coliforms cfu/100ml	Fecal Coliforms cfu/100ml	*E.coli* cfu/100ml	Remarks
1	23.6.14	GW -1 Ground Water 9.6.14	0	0	0	
2	23.6.14	SW-2 surface Water 9.6.14	$7x10^2$	$6x10^2$	$1x10^2$	
3	23.6.14	SW-3 surface Water 9.6.14	$2.5 x10^3$	$1.7x10^3$	$8x10^2$	
4	23.6.14	SW-4 surface Water 9.6.14	$1.9 x10^3$	$1.8x10^3$	$1 x10^2$	

Reference : The International Commission on Microbiological Specification for foods (ICMSF,1986) , 98/93 EC , Guidelines for drinking water quality WHO 1997 (2nd Edition) .

Analyzed by :

Than Than Myint
Micro Lab

Evaluated by:

Dr.Su Myo Thwe
Ph.D Japan
TM, Head of Micro Lab

Approved by :

Thet Naing (QMR)
B.Sc (Chemistry)
Assistant Director
Analytical Laboratory Section
Department of Fisheries

Remarks: This result is responsible for the sample in the lab.

SGS

ANALYSIS REPORT

ORIGINAL

Job Ref: 4512/2014
Date : 13.06.2014

Client Name	:	**RESOURCE AND ENVIRONMENT CO., LTD** B-702 Delta Plaza, Shwegondaing Rd, Bahan Township, Yangon, Myanmar
Project Name	:	Water Quality Monitoring In Thilawa SEZ
Sample Brought By	:	Client
Sample Received Date	:	10.06.2014
Analysed Date	:	11.06.2014

Stations	Commodity Name	Lab Code	Results (mg/l)	
			Total Suspended Solid	Oil & Grease
Method	-	-	APHA 2540 D	APHA 5520 B
1. GW – 1	GROUND WATER	111/14	376.3	Not Detected
2. SW – 2	SURFACE WATER	112/14	517	1.6
3. SW - 3	SURFACE WATER	113/14	802	1.9
4. SW - 4	SURFACE WATER	114/14	3601.5	9.2
Detection Limit			2	0.2

End Of Report

SGS (Myanmar) Limited

(Nu Nu Yi)
Manager

The Government of the Republic of the Union of Myanmar
Ministry of Agriculture and Irrigation
Irrigation Department
Survey and Investigation Branch
Soil Survey Section
Soil and Water Analytical Laboratory

ANALYTICAL DATA FOR WATER SAMPLE

PROJECT NAME;Water Quality Monitoring in Thilawa SEZ
SAMPLE DESIGNATED AS; Water Quality
SAMPLING LOCATION; Near Thanlyin &Thilawa

SAMPLING DATE; 9.6.2014
ISSUED DATE ; 20.6.2014
SAMPLING BY ; Client

Sr No	Station	Results (mg/l)		
		BOD5	COD	Chromium(Cr)
1	GW-1	6	13.8	0.021698
2	SW-2	4	14.7	0.005955
3	SW-3	10	23.5	0.026498
4	SW-4	5	21.5	0.013545
Drinking Water Standard (WHO)	Highest desirable level	6 mg/l	10 mg/l	-
	Maximum permissible level	Concentration at maximum permissible pollution		0.01mg/l

Remark: Analytical mentions are ppb unit by AAS. But this unit is changed as mg/L according to the standard of WHO unit.

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RESULT OF WATER QUALITY MONITORING

1. Introduction

Water sample were collected on 9th June 2012 for water quality monitoring at Thilawa Special Economic Zone (TSEZ). This report sets out the environmental monitoring required throughout the construction of the Thilawa Special Economic Zone. The terms of reference for monitoring are shown in Table 1. The location of air and water monitoring points are shown in Figure 1 and Table 1.

Terms of Reference for Monitoring

Table 1 Terms of reference for air and water quality monitoring at TSEZ.

Description	Items	Frequency	Location
Air Quality	TSP / PM10	1 time / 3months	At construction site (1point)
Waste water quality	pH, SS, DO, BOD, COD, Coliform count, oil and grease, chromium	1time / 2months	At the creek upstream and downstream which is crossed the car road (3points)
Underground water	pH, SS, DO, BOD, COD, Coliform count, oil and grease, chromium	1time /2months	Tube well, at inside of Moegyoswan Monastery (1 point)

Monitoring Instrument for Air and water

No.	Instrument	Brand & Model	Measurement/ Parameter	
1.	Environmental Perimeter Air Monitoring System	HAZ-SCANNER EPAS	CO, NO_2, NO, SO_2, PM (2.5), PM (10), VOCS, Relative Humidity, Temperature, Wind Speed, Wind Direction	
3	Alpha Bottle (Water Sampler)	Wildlife Supply Company® Indonesia		

So far, there is no environmental standard for ambient air quality in Republic of Myanmar, the survey result was evaluated by comparing with the standards in neighbouring country like Thailand, Vietnam, Japan and IFC (Table 2). The consultant will apply the air quality standard in Thailand, Vietnam, Japan and IFC as shown in Table 1.As for TSP and PM10, the standards in Thailand were applied and the others were compared with the standards in Japan.

Table 2 Survey Parameters for Air Quality

Item	Averaging period	Japan	Thailand	Vietnam	IFC
SO_2	10 min	-	-	-	0.5mg/m³
	1hour	0.1ppm	0.3ppm	0.35mg/m³	0.125mg/m³(InterimTarget-1) 0.05mg/m³(InterimTarget-2) 0.02mg/m³(Guideline)
	24hours	0.04ppm	0.12ppm	0.125 mg/m³	-
	1 year	-		0.05mg/m³	-
NO_2	1hour	-	0.17ppm	-	0.2mg/m³
	24hours	0.04-0.06ppm	-	-	-
	1 year	-	0.03ppm	-	0.04mg/m³
NOx	1hour	-	-	0.2mg/m³	
	24hours	-	-	0.04mg/m³	
CO	1hour	--	30ppm	30mg/m³	-
	8hours	20ppm	-	10mg/m³	-
	24hours	10ppm	9ppm	-	-
TSP	1hour	-	-	0.3mg/m³	-
	24hours	-	0.33mg/m³	0.2mg/m³	-
	1 year		0.10mg/m³	0.14mg/m³	-
PM_{10}	24hours	-	0.12mg/m³	0.15mg/m³	0.15mg/m³(InterimTarget-1) 0.10mg/m³(InterimTarget-2) 0.07mg/m³(InterimTarget-3)
	1 year	-	0.05mg/m³	0.05mg/m³	0.07mg/m³(InterimTarget-1) 0.05mg/m³(InterimTarget-2) 0.03mg/m³(InterimTarget-3)
SPM	1hour	0.2mg/m³	-	-	-
	24hours	0.1mg/m³	-	-	-
$PM_{2.5}$	24hours	0.035mg/m³	0.05mg/m³	-	0.075mg/m³(InterimTarget-1) 0.05mg/m³(InterimTarget-2) 0.0375mg/m³(InterimTarget-3)
	1 year	0.015mg/m³	0.025mg/m³	-	0.035mg/m³(InterimTarget-1) 0.025mg/m³(InterimTarget-2) 0.015mg/m³(InterimTarget-3)
Ozone	1hour	-	0.10ppm	0.3mg/m³	-
	8hourdaily maximum	-	0.07ppm	0.2mg/m³	0.16mg/m³(InterimTarget-1) 0.1mg/m³(Guideline)
	1 year	-	0.04ppm	0.14mg/m³	-
Ox	1hour	0.06ppm	-	-	-
Pb	24hours	-	-	0.0015mg/m³	
	1 month	-	0.0015mg/m³	-	
	1 year	-	-	0.0005mg/m³	

Source: National Air Quality Standard in Japan (CircularNo.25,1973, originally),Ministry of Environment, Japan
NotificationsofNationalEnvironmentalBoardNo.10, 24,28,33, and 36, Ministry of Natural Resources and Environment, Thailand
National Ambient Air Quality Standard (TCVN5973:2005), Ministry of Science and Technology in Vietnam
Environmental, Health, and Safety Guidelines, General EHS Guidelines, IFC, 2007

Figure 1 Location of air and water monitoring points

2. Water Quality Monitoring

Methodology

Sampling and preservation method

Water samples were taken by Alpha horizontal water sampler and collected in sterilized sample containers. All sampling was in strict accordance with recognized standard procedures. The parameters pH, temperature, dissolved oxygen (DO), electrical conductivity (EC), were measured at each site concurrently with sample collection. All samples were kept in iced boxes and were transported to the laboratory and stored at 2-4 °C refrigerators.

Table 1 Field Equipment for Water Quality Survey

No.	Equipment	Manufacturer	Originate Country	Model
1	pH meter	HANNA	USA	HI7609829-1 pH Sensor
2	DO meter	HANNA	USA	HI7609829-2
3	Digital Water Velocity Meter	Global Water Flow Probe	USA	FP 211
4	Alpha Bottle (Water Sampler)	Wildlife Supply Company®	Indonesia	-

Table 2 Container and Preservation Method for Water Samples

No	Parameter	Container	Preservation
1	Oil and Grease	1000 ml glass bottle	Sulfuric acid, Refrigerate
2	COD	500 ml plastic bottle	Sulfuric acid, Refrigerate
3	BOD_5	1,800 ml plastic bottle	Refrigerate
4	Heavy metals	500 ml plastic bottle	HNO_3 Refrigerate
5	Bacteria	200 ml glass bottle (Sterilize)	Refrigerate
6	Others	1,800 ml polyethylene bottle	Refrigerate

Test method

The following table provides the test method for water quality.

No	Item	Analysis method
1	pH	HI7609829-1 pH Sensor
2	Suspended Solids	Gravimetric method
3	Dissolved Oxygen (DO)	HI7609829-2 Galvanic dissolved oxygen (D.O) sensor
4	Chemical oxygen demand(COD)	Dichromate method
5	Biochemical oxygen demand(BOD_5)	Direct inoculation method
6	Oil & Grease	APHA-AWWA-WEF Method
7	Chromium (Cr) (mg/l)	APHA-AWWA-WEF Method
8	E. coliform, Fecal coliforms, total coliforms	AOAC Petrifilm Method

Monitoring Result (June)

Samples Collected Date – 9 June 2014

No	Item	GW-1	SW-2	SW-3	SW-4	Standard*	Unit
1	pH	7.49	8.80	8.17	8.84	5-9	
2	Suspended Solids	376.3	517	802	3601.5	Max. 30	mg/l
3	Dissolved Oxygen (DO)	3.59	5.47	6.49	6.45	-	mg/l
4	Chemical oxygen demand(COD)	13.8	14.7	23.5	21.5	Max. 60	mg/l
5	Biochemical oxygen demand(BOD_5)	6	4	10	5	Max. 20-60	mg/l
6	Oil & Grease	ND	1.6	1.9	9.2	Max. 5	mg/l
7	Chromium (Cr) (mg/l)	0.021698	0.005955	0.026498	0.013545	Max. 0.5	mg/l
8	E. coliform	0	$1x10^2$	$8x10^2$	$1x10^2$	-	cfu/100ml
	Fecal coliforms	0	$6x10^2$	$1.7x10^3$	$1.8x10^3$	-	cfu/100ml
	Total coliforms	0	$7x10^2$	$2.5x10^3$	$1.9x10^3$	-	cfu/100ml

* Waste water quality standard, Ministry of Industry.

Shaded area shows higher than Standard.

Result of the Water Quality Monitoring (August)

The result of August water quality monitoring was shown in above table. According to the laboratory analysis, suspended solids concentration of all sampling stations are higher than the standard. The possible reasons is the increasing of insoluble particulate matter during run off or discharging that can be generated from the some construction activities and direct discharge of waste water disposal from the upstream area. Oil and grease content in SW4 station is higher than the MOI standard. The location of SW4 is the downstream channel and oil and grease content in all upstream stations (SW-2 and SW-3). The possible reason for oil and grease content higher than the standard is release of diesel or petrol oil from some vehicles nearby the channel.

Compared with the previous monitoring result the following things are noted.

1. DO is decreased compared to the previous results.
2. BOD and COD are increased compared to the previous results.

Detailed of laboratory results are provided in appendix.

Laboratory Result

SGS

ANALYSIS REPORT

ORIGINAL

Job Ref: 4512/2014
Date : 13.06.2014

Client Name	:	**RESOURCE AND ENVIRONMENT CO., LTD** B-702 Delta Plaza, Shwegondaing Rd, Bahan Township, Yangon, Myanmar
Project Name	:	Water Quality Monitoring In Thilawa SEZ
Sample Brought By	:	Client
Sample Received Date	:	10.06.2014
Analysed Date	:	11.06.2014

Stations	Commodity Name	Lab Code	Results (mg/l)	
			Total Suspended Solid	Oil & Grease
Method	-	-	APHA 2540 D	APHA 5520 B
1. GW – 1	GROUND WATER	111/14	376.3	Not Detected
2. SW – 2	SURFACE WATER	112/14	517	1.6
3. SW - 3	SURFACE WATER	113/14	802	1.9
4. SW - 4	SURFACE WATER	114/14	3601.5	9.2
Detection Limit			2	0.2

End Of Report

SGS (Myanmar) Limited

(Nu Nu Yi)
Manager

THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF LIVESTOCK , FISHERIES AND RURAL DEVELOPMENT
DEPARTMENT OF FISHERIES
FISH INSPECTION AND QUALITY CONTROL DIVISION
YANGON, MYANMAR
ANALYTICAL LABORATORY SECTION

Test Report for Microbiological Analysis

Name of Project : Water Quality Monitoring in Thilawa SEZ (June)

Name of Company : Resource and Environment Myanmar Co., Ltd.

Date of Received : 23.6.2014

Date of Analysis : 23.6.2014

Test Method : AOAC Petrifilm Method

No	Date of Analysis	Detail of Samples (Water)	Total Coliforms cfu/100ml	Fecal Coliforms cfu/100ml	*E.coli* cfu/100ml	Remarks
1	23.6.14	GW -1 Ground Water 9.6.14	0	0	0	
2	23.6.14	SW-2 surface Water 9.6.14	$7x10^2$	$6x10^2$	$1x10^2$	
3	23.6.14	SW-3 surface Water 9.6.14	$2.5 x10^3$	$1.7x10^3$	$8x10^2$	
4	23.6.14	SW-4 surface Water 9.6.14	$1.9 x10^3$	$1.8x10^3$	$1 x10^2$	

Reference : The International Commission on Microbiological Specification for foods (ICMSF,1986) , 98/93 EC , Guidelines for drinking water quality WHO 1997 (2nd Edition) .

Analyzed by :

Than Than Myint
Micro Lab

Evaluated by:

Dr Su Myo Thwe
Ph.D Japan
TM, Head of Micro Lab

Approved by :

Thet Naing (QMR)
B.Sc (Chemistry)
Assistant Director
Analytical Laboratory Section
Department of Fisheries

Remarks: This result is responsible for the sample in the lab.

The Government of the Republic of the Union of Myanmar
Ministry of Agriculture and Irrigation
Irrigation Department
Survey and Investigation Branch
Soil Survey Section
Soil and Water Analytical Laboratory

ANALYTICAL DATA FOR WATER SAMPLE

PROJECT NAME;Water Quality Monitoring in Thilawa SEZ
SAMPLE DESIGNATED AS; Water Quality
SAMPLING LOCATION; Near Thanlyin &Thilawa

SAMPLING DATE; 9.6.2014
ISSUED DATE ; 20.6.2014
SAMPLING BY ; Client

Sr No	Station	Results (mg/l)		
		BOD5	COD	Chromium(Cr)
1	GW-1	6	13.8	0.021698
2	SW-2	4	14.7	0.005955
3	SW-3	10	23.5	0.026498
4	SW-4	5	21.5	0.013545
Drinking Water Standard (WHO)	Highest desirable level	6 mg/l	10 mg/l	-
	Maximum permissible level	Concentration at maximum permissible pollution		0.01mg/l

Remark: Analytical mentions are ppb unit by AAS. But this unit is changed as mg/L according to the standard of WHO unit.

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Thilawa Special Economic Zone CLASS A Development Project –Phase 1

Appendix

Noise and Vibration Monitoring Report

August, 2014

NOISE AND VIBRTION MONITORING

IN

THILAWA SEZ CLASS A DEVELOPMENT

(August 2014)

Resource & Environment Myanmar Ltd., B-702 Delta Plaza Building, Shwegondaing Rd., Bahan, Yangon. MYANMAR Tel: (959) 7301 3448; Fax: (951) 552901 mailto: admin@enviromyanmar.net

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Noise and Vibration Monitoring Report

1. Introduction

The monitoring points are located in the Thilawa SEZ class A area. The site location is shown in Figure 1. Thilawa SEZ is located beside the Thanlyin and Kyauktan towns, about 20 km southeast side of Yangon city as shown in Figure 3.1-1. Project area with 400ha is center of Thilawa SEZ with an area of about 2,400 ha. Thilawa SEZ is surrounded by ring road and accompanied with the container ports along the Yangon River.

There are 2 ways to access to Thilawa SEZ from Yangon city, which are the route passing through Thanlyin Bridge and the route passing through Dagon Bridge.

Figure 1 Location map of the Thilawa Special Economic Zone.

2. Environmental Standard

2.1 Noise

(1) Construction Phase

There is no noise standard of construction activities to receptors in Myanmar and International Organization's standards such as WHO and Environmental, Health, and Safety (EHS) Guidelines prepared by International Fiancé Cooperation (IFC) in a group member of World Bank, therefore the target noise level at construction stage is set based on the standard in the other foreign countries.

In the south-east Asia countries, only Singapore has the noise standard of construction activities to receptors categorized area to be quiet, residential area, and the other areas. On the basis of the above information, target noise level is set as following concept.

- Residential houses and monastery located less than 150m from the construction site comply with the middle range of the Singapore standard (categorized as "Residential buildings located less than 150m"), or
- Residential houses and monastery located more than 150m from the construction site, office, commercial facilities, and factories shall comply with the moderate range of standard Singapore standard (categorized as "Other buildings") or

This target noise level is shown in Table 1 and is not so much difference comparing with noise standard at construction stage in the other countries as shown in Table 2.

Table 1 Target Noise Level in Construction Phase

Category	Day time (Leq) (7am-7pm)	Evening Time (Leq) (7pm-10pm)	Night time (Leq) (10pm-7am)
Residential houses and monastery located less than 150m	75 dB	60 dB	55 dB
Residential houses and monastery located more than 150m from the construction site, office, commercial facilities, and factories	75 dB	65 dB	65 dB

Note) Evaluation point is at boundary of building

Table 2 Noise Standard at Construction Stage in the Various Countries

Items		Day time (Leq)	Night time (Leq)
Japan	Using heavy equipments with high noise level (piling, excavating etc.)	85 dB (Maximum)	-
Singapore	Hospitals, schools, institutions of higher learning, homes for the aged sick, etc.	60 dB (7am – 7pm, 12hrs)	50 dB (7pm – 7am, 12hrs)
	Residential buildings located less than 150m from the construction site where the noise is being emitted	75 dB (7am – 7pm, 12hrs)	60 dB (7pm – 10pm, 3hr) 55 dB (10pm – 7am, 9hr)
	Other Buildings	75 dB (7am – 7pm, 12hrs)	65 dB (7pm – 7am, 12hrs)
UK	In rural, suburban and urban areas away from main road traffic and industrial noise.	70 dB (8:00-18:00)	-
	Urban areas near main roads	72 dB (8:00-18:00)	-
USA	Residential	80 dB (8hrs)	70 dB (8hrs)
	Commercial	85 dB (8hrs)	85 dB (8hrs)
	Urban Area with high ambient noise level (>65 dB)	Ambient Noise Level +10dB	

Source: Noise Regulation Act, Japan (Law No.98, 1968, Amended No.33, 2006)
Environmental Protection and Management Act in Singapore (Chap.94A, Section 77, revised in 2008)
British Standard 5228: 1997 "Noise and vibration control on open and construction sites"
Transit Noise and Vibration Impact Assessment, U.S. Department of Transportation in USA, 1995

(2) Operation Phase

There is no ambient noise standard to receptors in Myanmar. However, most of the countries in south-east Asia have the ambient noise standard to receptors categorized land use or requirement of quiet as well as in Japan. International standard is also available in the EHS Guidelines prepared by IFC. On the

basis of the above information, target noise level is set as following concept and target ambient noise level.

- According to baseline survey in the Project, ambient noise levels in the monastery in Thilawa SEZ (Class A) are 53-60 dB in the daytime (6:00-22:00) and 44-58 dB in the nighttime (22:00-6:00).
- Ambient noise standard for sensitive areas of Japan and International Organization, relatively high in comparison with the results of baseline survey especially during nighttime.
- Thus, the target ambient noise level for sensitive and residential area is set in accordance with the noise standard in Singapore which is similar to the ambient noise level of the baseline survey.

The target noise level is shown in Table 3 and the target noise level is not so much difference comparing with ambient noise standard as shown in Table 4.

Table 3 Target Ambient Noise Level in Operation Phase

Category	Day Time (Leq) (7am-7pm)	Evening Time (Leq) (7pm-10pm)	Night Time (Leq) (10pm-7am)
Sensitive area such as Monastery	60 dB	55 dB	50 dB
Residential houses	65 dB	60 dB	55 dB
Commercial and Industrial Areas	70 dB	65 dB	60 dB

Note) Evaluation point is at boundary of building

Table 4 Ambient Noise Standard at Operation Stage in South-East Countries

Items		Day time (Leq)	Night time (Leq)
Indonesia	Noise standard for sensitive areas such as residences, hospitals, schools, places of religious worships	55 dB	
	Noise standard for office and commercial	65 dB	
	Noise standard for commercial and service	70 dB	
Malaysia	Sensitive Areas/ Low Density Residential Areas	55 dB (7am – 10pm, 15hrs)	50 dB (10pm – 7am, 9hrs)
	Sub Urban Residential	60 dB (7am – 10pm, 15hrs)	55 dB (10pm – 7am, 9hrs)
	Urban Residential	65 dB (7am – 10pm, 15hrs)	60 dB (10pm – 7am, 9hrs)
	Commercial and Business	70 dB (7am – 10pm, 15hrs)	60 dB (10pm – 7am, 9hrs)
Singapore	Sensitive Areas	60 dB (7am – 7pm, 12hrs)	55 dB (7pm – 10pm, 3hr) 50 dB (10pm – 7am, 9hr)
	Residential Areas	65 dB (7am – 7pm, 12hrs)	60 dB (7pm – 10pm, 3hr) 55 dB (10pm – 7am, 9hr)
	Commercial Areas	70 dB (7am – 7pm, 12hrs)	65 dB (7pm – 10pm, 3hr) 60 dB (10pm – 7am, 9hr)
Thailand	Noise standard	70 dB (24hrs)	
Japan	Sensitive Area (Class AA)	50 dB (6am – 10pm, 16hrs)	40 dB (10pm – 6pm, 8hrs)
	Residential Area (Class A and Class B)	55 dB (6am – 10pm, 16hrs)	45 dB (10pm – 6pm, 8hrs)
	Commercial and Industrial Area (Class C)	60 dB (6am – 10pm, 16hrs)	50 dB (10pm – 6pm, 8hrs)
IFC	Residential; institutional, educational	55 dB (7am – 10pm, 15hrs)	45 dB (10pm – 7am, 9hrs)
	Industrial; commercial	70 dB (7am – 10pm, 15hrs)	70 dB (10pm – 7am, 9hrs)

Source: Nose Standard in Indonesia (KEP-48/MENLH/11/1996)
Effect of Traffic Noise on Sleep: A Case Study in Serdang Raya, Selangor, Malaysia, Environment Asia, 2010
Environmental Protection and Management Act in Singapore (Chap.94A, Section 77, revised in 2008)
Notification of Environmental Board No. 15 B.E.2540(1997) under the Conservation and Enhancement of National Environmental Quality Act B.E.2535 (1992) dated March 12, B.E.2540 (1997) and Notification of Pollution Control Department ; Subject: Calculation of Noise Level Dated August 11, B.E. 2540 (1997) in Thailand

2.2 Vibration

(3) Construction Phase

There is no vibration standard of construction activity to receptors in Myanmar as well as south-east Asia and International Organizations such as WHO and IFC. Thus, the target vibration level at

site. There was not any other noise source around the house. The location of TNV-1 is shown in Figure 2.

Figure 2 Location of TNV-1.

TNV-2

TNV-2 was sited at Moegyoswun Monastery Compound. The location was an open area beside monk houses with about 250m from the car road. The road was paved with low traffic. Dominant sources of noise were alarm song in the compound that ring thrice a day. There was not any other noise source around the monastery compound. The location of TNV-2 is shown in Figure 3.

Figure 3 Location of TNV-2.

TNV-3

TNV-3 was sited in front of Moegyoswun Monastery. The location was an open area beside the road with about 260 m from the car road. The road was paved with low traffic. Dominant sources of noise were alarm song in the compound that ring thrice a day and vehicular traffic. The location of TNV-3 is shown in Figure 4.

Figure 4 Location of TNV-3.

Survey Period

Sampling and monitoring of surrounding sound and vibration level at TNV-1, TNV-2 and TNV-3 were conducted during 19th August to 23rd August, 2014.

Sampling Point	Survey Period
TNV-1	19th August – 20th August, 2014 (24 hours)
TNV-2	21st August – 22 nd August, 2014 (24 hours)
TNV-3	22nd August – 23rd August, 2014 (24 hours)

Survey Method

Sampling and monitoring of surrounding sound and vibration level were conducted by using following instrument for 24 hours/1 day measurement.

Instrument	Brand	Model	Measurement unit
Sound Level Meter	Lutron	SL-0423SD	dB
Vibration Meter	Lutron	VB-8206SD	mm/s, cm/s

a) Noise Survey

Frequency

- One time (24 hours monitoring in weekday)

Total Sample

- Three samples

Record Interval

- One record for 10 minute interval

b) Vibration Survey

Frequency

- One time (24 hours monitoring in weekday)

Total Sample

- Three samples

Record Interval

- One record for 5 seconds interval for 10 minutes during an hour

Survey Result

Noise levels (L_{Aeq}) of the monitoring points were presented in Table 7. One day L_{Aeq} was calculated by using the following array formula in the excel sheet. This formula is firstly used for hourly L_{Aeq} and then for the 24 hours L_{Aeq}.

10*LOG10(AVERGAE(10^((RANGE)/10)))

By means of the calculated results, all of the noise levels found lower than the environmental standard (1-day) in Thailand. Noise level (LAeq) in present monitoring period was presented in Table 7 and Table 8. Table of observed hourly noise level in three monitoring stations is shown in Appendix 1.

Table 7 Hourly LAeq value in noise monitoring stations.

Unit: dBA

	TNV-1	TNV-2	TNV-3
Date	19 – 20 August	21 – 22 August	22 – 23 August
7:00-8:00	55	38	42
8:00:9:00	54	39	33
9:00-10:00	57	40	36
10:00-11:00	53	47	61
11:00-12:00	57	47	62
12:00-13:00	52	56	60
13:00-14:00	64	54	62
14:00-15:00	61	56	54
15:00-16:00	56	62	51
16:00-17:00	66	54	52
17:00-18:00	61	37	55
18:00-19:00	57	42	58
Day L_{Aeq}	58	48	52
19:00-20:00	60	51	49
20:00-21:00	58	53	52
21:00-22:00	57	53	47
Evening L_{Aeq}	58	52	49
22:00-23:00	58	52	47
23:00-24:00	56	53	45
24:00-1:00	48	53	47
1:00-2:00	51	50	46
2:00-3:00	49	39	52
3:00-4:00	48	34	50
4:00-5:00	52	44	39
5:00-6:00	41	38	31
6:00-7:00	58	52	47
Night L_{Aeq}	50	46	45

Table 8 A-weighted Loudness Equivalent (LAeq) Level

Unit: dB(A)

Date	TNV-1 19 August -20 August 14			TNV-2 20 August – 21 August 14			TNV-3 22 August – 23 August 14		
	Day Time	Evening Time	Night Time	Day Time	Evening Time	Night Time	Day Time	Evening Time	Night Time
	58	58	50	48	52	46	52	49	45
Target Noise Level	75	65	65	75	60	55	75	60	55

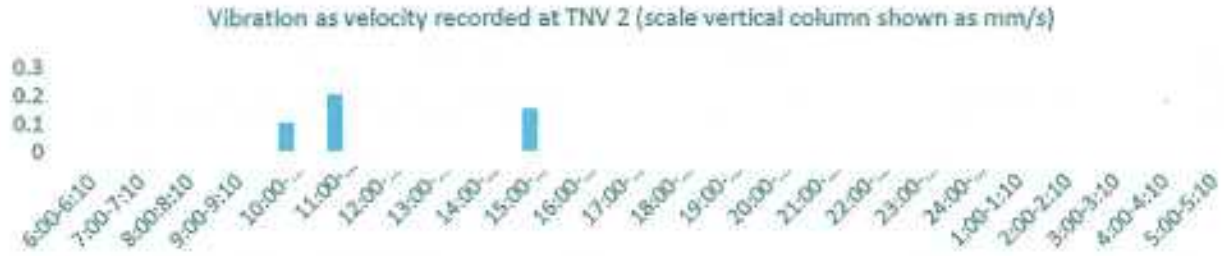

Figure 6 Vibration result of TNV 2.

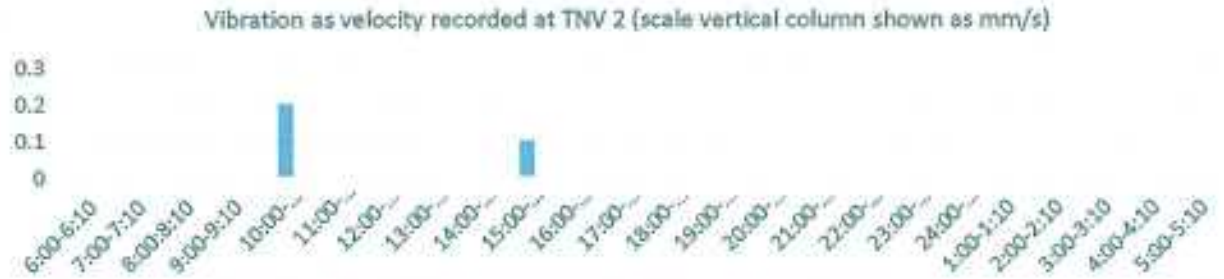

Figure 7 Vibration result of TNV 3.

4. Conclusion

The noise level monitoring results are compared with target noise level proposed in EIA report (See Table 1). Two noise receptors were designated in construction phase based on the baseline noise data.

There are :

1. Residential houses and monastery located less than 150m from the construction site comply with the middle range of the Singapore standard (categorized as "Residential buildings located less than 150m"), or
2. Residential houses and monastery located more than 150m from the construction site, office, commercial facilities, and factories shall comply with the moderate range of standard Singapore standard (categorized as "Other buildings")

The noise level monitoring at three sites in and near the project site are lower than the target noise level (See Table 8).

There is no standard relating to vibration during construction activities. Common practice in Myanmar has been to use guidance from internationally recognized standards. Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, the magnitude of vibration is expressed in terms of Peak Particle Velocity (PPV) in millimetres per second (mm/s).

In the case of nominally continuous sources of vibration such as traffic, vibration is perceptible at around 0.5mm/s and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short duration.

During the monitoring time there are no activity inside the Class A compound and only the loading and unloading raw materials by small vehicles. The main noise and vibration source are largely road traffic noise and vibration. The observed noise and vibration in all monitoring points are lower than the target level in pre – construction phase.

Appendix 1 Observed Noise level in 3 Monitoring Stations

	Date		
	19-20 August	21-22 August	22-23 August
Time	TNV-1	TNV-2	TNV-3
6:00-7:00	55	38	42
7:00-8:00	54	39	33
8:00-9:00	57	40	36
9:00-10:00	53	47	61
10:00-11:00	57	47	62
11:00-12:00	52	56	60
12:00-13:00	64	54	62
13:00-14:00	61	56	54
14:00-15:00	56	62	51
15:00-16:00	66	54	52
16:00-17:00	61	37	55
17:00-18:00	57	42	58
18:00-19:00	55	63	49
19:00-20:00	60	51	49
20:00-21:00	58	53	52
21:00-22:00	57	53	47
Day L_{eq}	58	49	51
22:00-23:00	58	52	47
23:00-24:00	56	53	45
24:00-1:00	48	53	47
1:00-2:00	51	50	46
2:00-3:00	49	39	52
3:00-4:00	48	34	50
4:00-5:00	52	44	39
5:00-6:00	41	38	31
Night L_{eq}	50	46	45

Appendix-2 Observed vibration level in 3 monitoring stations

Vibraion as Velocity (mm/s)

	TNV 1 (19 - 20 August)	TNV 2 (20-21 August)	TNV 3 (22-23 August)
Time	**mm/s**	**mm/s**	**mm/s**
6:00-6:10	0	0	0
7:00-7:10	0.15	0	0
8:00:8:10	0.1	0	0
9:00-9:10	0.1	0	0
10:00-10:10	0.2	0.1	0.2
11:00-11:10	0.1	0.2	0
12:00-12:10	0	0	0
13:00-13:10	0.25	0	0
14:00-14:10	0.1	0	0
15:00-15:10	0.15	0.15	0.1
16:00-16:10	0	0	0
17:00-17:10	0	0	0
18:00-18:10	0	0	0
19:00-19:10	0	0	0
20:00-20:10	0	0	0
21:00-21:10	0	0	0
22:00-22:10	0	0	0
23:00-23:10	0	0	0
24:00-24:10	0	0	0
1:00-1:10	0	0	0
2:00-2:10	0	0	0
3:00-3:10	0	0	0
4:00-4:10	0	0	0
5:00-5:10	0.15	0	0