

Environmental Monitoring Report Phase-1 & 2 (Construction Phase)



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1. Executive Summary

The environmental inspection and compliance monitoring program will be implemented under the direction of Ministry of Natural Resources and Environmental Conservation (MONREC) with oversight by Thilawa SEZ Management Committee.

The monitoring record from September 2018 to November 2018 according to the Environment Monitoring Plan is submitted in conformity with the provision of Chapter 10, 10.1 Table 10.1-2 and 10.2, Table 10.2-2 Content of the EIA Report of Thilawa SEZ Development Project (Zone B).

2. Summary of Monitoring Activities

- a) Progress made to date on the implementation of the EMP against the submitted implementation schedule;

We submitted EMP for TSEZ Zone-B as following table.

Report No.	Description	Phase	Submission
1	Environmental Monitoring Report	Phase-1 Pre-construction Phase	March, 2017
2	Environmental Monitoring Report	Phase-1 Construction Phase	June, 2017
3	Environmental Monitoring Report	Phase-1 Construction Phase	September, 2017
4	Environmental Monitoring Report	Phase-1 Construction Phase	December, 2017
5	Environmental Monitoring Report	Phase-1&2 Construction Phase	March, 2018
6	Environmental Monitoring Report	Phase-1&2 Construction Phase	June, 2018
7	Environmental Monitoring Report	Phase-1&2 Construction Phase	September, 2018
8	Environmental Monitoring Report	Phase-1&2 Construction Phase	December, 2018

Report (No.8) is submitted this day attached with Construction Phase implementation schedule. Subsequent Construction Phase reports will be submitted on Quarterly.

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

None

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

- Depend on the exceeding parameters and situation

- d) Accidents or incidents relating to the occupational and community health and safety, and the environment;

Neither accidents nor incidents happen during this monitoring period.

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

Please refer to the attached Environmental Monitoring Form.



3. Construction Progress

Thilawa SEZ Zone B Development Project construction activities is submitted enclosed with monthly progress reports from contractor in Appendix F to H.

F. Monthly Progress Report for September, 2018

G. Monthly Progress Report for October, 2018

H. Monthly Progress Report for November, 2018

4. Monitoring Result

Environmental Monitoring Plan report for construction phase implemented according to the following table, reference on Table 10.2-2, Chapter 10, EIA for Industrial Area of Zone-B.

Monitoring Plan (Construction Phase)

Category	Item	Location	Frequency	Remark
Air Quality	NO _x , SO _x , CO, PM ₁₀ , PM _{2.5}	Construction site (1 point)	Once/ month	September 2018, Air Quality Monitoring Report
Water Quality	Water temperature, pH, SS, DO, BOD ₅ , COD, coliforms, oil and grease, chromium	- Over flow of construction site to the creek (at least 3 sampling points/ mixing point: a) discharge water, b) upstream water and c) downstream water - Well near the construction site (1 point)	Once/ 2 month	August 2018, October 2018 Water and Wastewater Quality Monitoring Report
Waste	Amount and kind of solid waste	Construction site	Once/ 3 month	Monthly Progress Reports (September, October, November 2018)
Noise and Vibration	- Noise and vibration level - Traffic Count	- Preservation area such as residence around the proposed construction site (at least 1 point) - Preservation site such as residence along the route for on-site vehicles (1 point for noise and vibration and 2 points for traffic count)	Once/ 3 month (peak period)	- Noise and Vibration Monitoring Report September 2018 - Traffic Count Monitoring Report September 2018
Ground Subsidence	- Ground water level - Ground elevation level - Consumption of ground water amount	Representative (1 point)	Every week	Monthly Progress Reports (September, October, November 2018)
Risk for infectious disease such as AIDS/HIV	Status of measures of infectious disease	Construction site	Once/month	Monthly Progress Reports (September, October, November 2018)
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 (Zone B)
Development Project –Phase 1 & 2
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 (Industrial Area of Zone B). 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.)
Approved letter for Environmental Impact Assessment (EIA) Report of Industrial Area, Thilawa Special Economic Zone (Zone-B)		29 th December 2016	Thilawa SEZ Management Committee	
Notification of the comments of Ministry of Natural Resources and Environmental Conservation regarding with the Standard Change of Wastewater Quality of Industrial Zone, Internal Regulations of Thilawa SEZ Zone-A and Zone-B	5 th January 2018	10 th January 2018	Thilawa SEZ Management Committee	



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			Upon receipt of comments/
Number and contents of responses from Government agencies			complaints

(2) Monitoring Results

1) Ambient Air Quality (September 2018)

NO_2 , SO_2 , CO , $\text{PM}_{2.5}$, PM_{10}

Location	Item	Unit	Measured Value (Mean)	Measured Value (Max)	Country's Standard	Target value to be applied ^{*1}	Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
AQ-1	NO_2	mg/m^3	0.078	0.087	0.2 mg/m^3 (1 Hour)	0.1 mg/m^3 (24 Hours)	-	One time / 3 months	Haz-Scanner EPAS	Refer to air quality report
	SO_2	mg/m^3	0.057	0.062	0.02 mg/m^3 (24 Hours)	0.02 mg/m^3 (24 Hours)	-			
	CO	mg/m^3	0.055	0.083	-	10.26 mg/m^3 (24 Hours)	-			
	$\text{PM}_{2.5}$	mg/m^3	0.012	0.016	0.025 mg/m^3 (24 Hours)	0.025 mg/m^3 (24 Hours)	-			
	PM_{10}	mg/m^3	0.006	0.007	0.05 mg/m^3 (24 Hours)	0.05 mg/m^3 (24 Hours)	-			

^{*1}Remarks: Referred to the tentative target value of ambient air quality (EIA Report for industrial area, Table 2.4-1). Reference to the air quality monitoring report (September

2018)



*Remark: The result of SO₂ in AQ1 is excess than target value due to four expected reasons i) operation activities of Myanmar International Terminal Thilawa Port ii) operation activities of local industrial zone iii) the combustion of fuel for vehicle from nearby roads iv) construction activities of Zone-B. Total exceeding hour is 57 hours during construction period, 12 hours are come from Zone-B and 45 exceeded hours are come from outside of Zone-B. And then according to summary of wind direction at AQ-1, 90.4% are come from outside of Zone-B and 9.6% are come from inside of Zone-B.

Complaints from Residents

- Are there any complaints from residents regarding air quality in this monitoring period?

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

☐ Yes ☒ No

Contents of Complaints from Residents	Countermeasures

2) (a) Water Quality - August 2018

Measurement Point: Effluent of Wastewater (SW-2, SW-3 and SW-4 are attach as reference point only and they are natural creek water which are combine all the wastewater from the Local industrial water and domestic water from existing living environment. SW-7 is the main discharging point and SW-8 is mixing point of discharge water but in this monitoring time SW-7 and SW-8 location are almost same location. SW-9 is the downstream points after mixing point. GW-2 is also as reference point for monitoring of existing tube well located in the Monastery Compound near Zone-B area)

- 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 Referenced International Standard



Location	Item	Unit	Measured Value (Max)	Country's Standard ²	Target value to be applied ¹	Frequency	Method	Note (Reason of excess of the standard)
SW-2 (reference point)	Temperature	°C	29	< 3 (increase)	40		Instrument Analysis Method	
	pH	-	6.9	6-9	6.0 - 9.0		Instrument Analysis Method	
	SS	mg/L	30	50	30		APHA 2540D (Dry at 103-105°C Method)	
	DO	mg/L	6.15	-	-		Instrument Analysis Method	
	BOD ₅	mg/L	3.32	50	20	Once per	APHA 5210 B (5days BOD Test)	
	COD _{Cr}	mg/L	10.6	250	70	2 months	APHA 5220 D (Close Reflux Colorimetric Method)	
	Total Coliform ³	MPN/100ml	92,000	400	400		APHA 9221 B (Standard Total Coliform Fermentation Technique)	
	Oil and Grease	mg/L	<3.1	10	10		APHA 5520 B (partition Gravimetric Method)	
	Chromium	mg/L	0.002	0.5	0.5		APHA (Inductively Coupled Plasma (ICP) Method)	
SW-3 (reference point)	Temperature	°C	29	< 3 (increase)	40		Instrument Analysis Method	
	pH	-	6.7	6-9	6.0 - 9.0		Instrument Analysis Method	
	SS	mg/L	50	50	30		APHA 2540D (Dry at 103-105°C Method)	
	DO	mg/L	7.46	-	-		Instrument Analysis Method	
	BOD ₅	mg/L	3.33	50	20	Once per	APHA 5210 B (5days BOD Test)	
	COD _{Cr}	mg/L	9.8	250	70	2 months	APHA 5220 D (Close Reflux Colorimetric Method)	
	Total Coliform ³	MPN/100ml	92,000	400	400		APHA 9221 B (Standard Total Coliform Fermentation Technique)	
	Oil and Grease	mg/L	<3.1	10	10		APHA 5520 B (partition Gravimetric Method)	
	Chromium	mg/L	0.006	0.5	0.5		APHA (Inductively Coupled Plasma (ICP) Method)	



Location	Item	Unit	Measured Value (Max)	Country's Standard ²⁾	Target value to be applied ¹⁾	Frequency	Method	Note (Reason of excess of the standard)
SW-4 (reference point)	Temperature ³⁾	°C	30	< 3 (increase)	40		Instrument Analysis Method	
	pH	-	6.6	6-9	6.0 - 9.0		Instrument Analysis Method	
	SS ³⁾	mg/L	98	50	30		APHA 2540D (Dry at 103-105°C Method)	
	DO	mg/L	9.17	-	-		Instrument Analysis Method	
	BOD ₅	mg/L	3.01	50	20	Once per	APHA 5210 B (5days BOD Test)	
	COD _{Cr}	mg/L	8.7	250	70	2 months	APHA 5220 D (Close Reflux Colorimetric Method)	
	Total Coliform ⁴⁾	MPN/100ml	35,000	400	400		APHA 9221 B (Standard Total Coliform Fermentation Technique)	
	Oil and Grease ⁵⁾	mg/L	<3.1	10	10		APHA 5520 B (partition Gravimetric Method)	
	Chromium	mg/L	0.012	0.5	0.5		APHA (Inductively Coupled Plasma (ICP) Method)	
SW-7	Temperature	°C	30	< 3 (increase)	40		Instrument Analysis Method	
	pH	-	7.1	6-9	6.0 - 9.0		Instrument Analysis Method	
	SS ³⁾	mg/L	260	50	30		APHA 2540D (Dry at 103-105°C Method)	
	DO	mg/L	9.17	-	-		Instrument Analysis Method	
	BOD ₅	mg/L	2.13	50	20	Once per	APHA 5210 B (5days BOD Test)	
	COD _{Cr}	mg/L	<0.7	250	70	2 months	APHA 5220 D (Close Reflux Colorimetric Method)	
	Total Coliform ⁴⁾	MPN/100ml	>160,000	400	400		APHA 9221 B (Standard Total Coliform Fermentation Technique)	
	Oil and Grease ⁵⁾	mg/L	6	10	10		APHA 5520 B (partition Gravimetric Method)	
	Chromium	mg/L	0.042	0.5	0.5		APHA (Inductively Coupled Plasma (ICP) Method)	



Location	Item	Unit	Measured Value (Max)	Country's Standard ^{1,2}	Target value to be applied ^{1,1}	Frequency	Method	Note (Reason of excess of the standard)
SW-8	Temperature	°C	26	< 3 (increase)	40		Instrument Analysis Method	
	pH	-	6.8	6-9	6.0 - 9.0		Instrument Analysis Method	
	SS ¹	mg/L	278	50	30		APHA 2540D (Dry at 103-105°C Method)	
	DO	mg/L	8.99	-	-		Instrument Analysis Method	
	BOD ₅	mg/L	4.17	50	20	Once per 2 months	APHA 5210 B (5days BOD Test)	
	COD _{Cr}	mg/L	4.5	250	70		APHA 5220 D (Close Reflux Colorimetric Method)	
	Total Coliform ^{1,4}	MPN/100ml	92,000	400	400		APHA 9221 B (Standard Total Coliform Fermentation Technique)	
	Oil and Grease	mg/L	< 3.1	10	10		APHA 5520 B (partition Gravimetric Method)	
	Chromium	mg/L	0.038	0.5	0.5		APHA (Inductively Coupled Plasma (ICP) Method)	
	Temperature	°C	30	< 3 (increase)	40		Instrument Analysis Method	
	pH	-	7.2	6-9	6.0 - 9.0		Instrument Analysis Method	
SW-9	SS	mg/L	44	50	30		APHA 2540D (Dry at 103-105°C Method)	
	DO	mg/L	5.36	-	-		Instrument Analysis Method	
	BOD ₅	mg/L	3.5	50	20	Once per 2 months	APHA 5210 B (5days BOD Test)	
	COD _{Cr}	mg/L	8.2	250	70		APHA 5220 D (Close Reflux Colorimetric Method)	
	Total Coliform ^{1,4}	MPN/100ml	> 160,000	400	400		APHA 9221 B (Standard Total Coliform Fermentation Technique)	
	Oil and Grease	mg/L	4	10	10		APHA 5520 B (partition Gravimetric Method)	
	Chromium	mg/L	0.008	0.5	0.5		APHA (Inductively Coupled Plasma (ICP) Method)	

Location	Item	Unit	Measured Value (Max)	Country's Standard ²	Target value to be applied ¹	Frequency	Method	Note (Reason of excess of the standard)
GW-2 (reference point)	Temperature	°C	31	< 3 (increase)	40		Instrument Analysis Method	
	pH	-	7.1	6-9	6.0 - 9.0		Instrument Analysis Method	
	SS	mg/L	4	50	30		APHA 2540D (Dry at 103-105°C Method)	
	DO	mg/L	8.99	-	-		Instrument Analysis Method	
	BOD ₅	mg/L	1.74	50	20	Once per 2 months	APHA 5210 B (5days BOD Test)	
	COD _{Cr}	mg/L	<0.7	250	70		APHA 5220 D (Close Reflux Colorimetric Method)	
	Total Coliform ³	MPN/100ml	33	400	400		APHA 9221 B (Standard Total Coliform Fermentation Technique)	
	Oil and Grease	mg/L	<3.1	10	10		APHA 5520 B (partition Gravimetric Method)	
	Chromium	mg/L	≤ 0.002	0.5	0.5		APHA (Inductively Coupled Plasma (ICP) Method)	

¹Remark: Reference to the Water and Wastewater Quality Monitoring Report (August 2018).

²Remark: Referred to the National Emission Quality Guideline (NEQG) 29th December 2015.

³Remark: For the monitoring point of SW-4, SW-7 and SW-8, the result of SS exceeded than the target value due to three expected reasons of i) surface water run-off from bare land in Zone B, ii) delivered from upstream area such as natural origin and wastewater from local industrial zone outside of Thilawa SEZ, and iii) influence by water from the downstream of monitoring points due to flow back by tidal fluctuation.

⁴Remark: For the monitoring point of SW-2, SW-3, SW-4, SW-7, SW-8 and SW-9, the result of total coliform exceeded than the target value due to three expected reasons i) natural bacteria existed in discharged creek because there are various kinds of vegetation of creature such as birds, and small animals in and along the discharged creek and ii) wastewater from the local industrial zone outside of Thilawa SEZ and iii) delivered from surrounding area by tidal effect. Total coliforms do not affect human health directly, and SW-12 monitoring was carried out to identify health impact by coliform bacteria. As for the result of E-Coli SW-2 was 14, SW-3 was 26, SW-4 was 21, SW-7 was 34, SW-8 was 24 and SW-12 was 12. It is considered that there is no significant impact to human health.

2) (b) Water Quality - October 2018

Measurement Point: Effluent of Wastewater (SW-2, SW-3 and SW-4 are attach as reference point only and they are natural creek water which are combine all the wastewater from the Local industrial water and domestic water from existing living environment. SW-7 is the main discharging point and SW-8 is mixing point of discharge water but in this monitoring time SW-7 and SW-8 location are almost same location. SW-9 is the downstream points after mixing point. GW-2 is also as reference point for monitoring of existing tube well located in the Monastery Compound near Zone-B area)

- 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 (Max)	Country's Standard ²	Target value to be applied ¹	Frequ-ency	Method	Note (Reason of excess of the standard)
SW-2 (reference point)	Temperature	°C	31	< 3 (increase)	40		Instrument Analysis Method	
	pH	-	7.3	6-9	6.0 - 9.0		Instrument Analysis Method	
	SS ³	mg/L	92	50	30		APHA 2540D (Dry at 103-105°C Method)	
	DO	mg/L	9.18	-	-	Once per 2 months	Instrument Analysis Method	
	BOD ₅	mg/L	2.07	50	20		APHA 5210 B (5days BOD Test)	
	COD _{Cr}	mg/L	13.9	250	70		APHA 5220 D (Close Reflux Colorimetric Method)	
	Total Coliform ⁴	MPN/100ml	>160,000	400	400		APHA 9221 B (Standard Total Coliform Fermentation Technique)	
	Oil and Grease	mg/L	<3.1	10	10		APHA 5520 B (partition Gravimetric Method)	
	Chromium	mg/L	0.012	0.5	0.5		APHA (Inductively Coupled Plasma (ICP) Method)	
SW-3 (reference point)	Temperature	°C	29	< 3 (increase)	40		Instrument Analysis Method	
	pH	-	7.1	6-9	6.0 - 9.0	Once per 2 months	Instrument Analysis Method	
	SS ³	mg/L	206	50	30		APHA 2540D (Dry at 103-105°C Method)	
	DO	mg/L	5.24	-	-		Instrument Analysis Method	



Location	Item	Unit	Measured Value (Max)	Country's Standard ²	Target value to be applied ¹	Frequency	Method	Note (Reason of excess of the standard)
SW-4 (reference point)	BOD ₅	mg/L	2.55	50	20	Once per 2 months	APHA 5210 B (5days BOD Test)	
	COD _{Cr}	mg/L	14.5	250	70		APHA 5220 D (Close Reflux Colorimetric Method)	
	Total Coliform ⁴	MPN/100ml	>160,000	400	400		APHA 9221 B (Standard Total Coliform Fermentation Technique)	
	Oil and Grease	mg/L	<3.1	10	10		APHA 5520 B (partition Gravimetric Method)	
	Chromium	mg/L	0.022	0.5	0.5		APHA (Inductively Coupled Plasma (ICP) Method)	
	Temperature	°C	30	< 3 (increase)	40		Instrument Analysis Method	
SW-7	pH	-	7.1	6-9	6.0 - 9.0	Once per 2 months	Instrument Analysis Method	
	SS ³	mg/L	212	50	30		APHA 2540D (Dry at 103-105°C Method)	
	DO	mg/L	8.23	-	-		Instrument Analysis Method	
	BOD ₅	mg/L	2.62	50	20		APHA 5210 B (5days BOD Test)	
	COD _{Cr}	mg/L	9.4	250	70		APHA 5220 D (Close Reflux Colorimetric Method)	
	Total Coliform ⁴	MPN/100ml	92,000	400	400		APHA 9221 B (Standard Total Coliform Fermentation Technique)	
	Oil and Grease	mg/L	<3.1	10	10		APHA 5520 B (partition Gravimetric Method)	
	Chromium	mg/L	0.022	0.5	0.5		APHA (Inductively Coupled Plasma (ICP) Method)	
	Temperature	°C	32	< 3 (increase)	40		Instrument Analysis Method	
	pH	-	7.1	6-9	6.0 - 9.0		Instrument Analysis Method	
SW-7	SS	mg/L	32	50	30	Once per 2 months	APHA 2540D (Dry at 103-105°C Method)	
	DO	mg/L	7.28	-	-		Instrument Analysis Method	
	BOD ₅	mg/L	1.99	50	20		APHA 5210 B (5days BOD Test)	
	COD _{Cr}	mg/L	2.6	250	70		APHA 5220 D (Close Reflux Colorimetric Method)	



Location	Item	Unit	Measured Value (Max)	Country's Standard ²	Target value to be applied ¹	Frequency	Method	Note (Reason of excess of the standard)
SW-8	Total Coliform ⁴	MPN/100ml	830	400	400		APHA 9221 B (Standard Total Coliform Fermentation Technique)	
	Oil and Grease	mg/L	<3.1	10	10		APHA 5520 B (partition Gravimetric Method)	
	Chromium	mg/L	0.014	0.5	0.5		APHA (Inductively Coupled Plasma (ICP) Method)	
	Temperature	°C		< 3 (increase)	40		Instrument Analysis Method	
	pH	-		6-9	6.0 - 9.0		Instrument Analysis Method	
	SS ³	mg/L		50	30		APHA 2540D (Dry at 103-105°C Method)	
	DO	mg/L		-	-	Once per 2 months	Instrument Analysis Method	
	BOD ₅	mg/L		50	20		APHA 5210 B (5days BOD Test)	
	COD _{Cr}	mg/L		250	70		APHA 5220 D (Close Reflux Colorimetric Method)	
	Total Coliform ⁴	MPN/100ml		400	400		APHA 9221 B (Standard Total Coliform Fermentation Technique)	
SW-9	Oil and Grease	mg/L		10	10		APHA 5520 B (partition Gravimetric Method)	
	Chromium	mg/L		0.5	0.5		APHA (Inductively Coupled Plasma (ICP) Method)	
	Temperature	°C	30	< 3 (increase)	40		Instrument Analysis Method	
	pH	-	6.9	6-9	6.0 - 9.0		Instrument Analysis Method	
	SS ³	mg/L	152	50	30		APHA 2540D (Dry at 103-105°C Method)	
	DO	mg/L	9.4	-	-	Once per 2 months	Instrument Analysis Method	
	BOD ₅	mg/L	1.95	50	20		APHA 5210 B (5days BOD Test)	
	COD _{Cr}	mg/L	9.5	250	70		APHA 5220 D (Close Reflux Colorimetric Method)	
	Total Coliform ⁴	MPN/100ml	>160,000	400	400		APHA 9221 B (Standard Total Coliform Fermentation Technique)	
	Oil and Grease	mg/L	<3.1	10	10		APHA 5520 B (partition Gravimetric Method)	

Location	Item	Unit	Measured Value (Max)	Country's Standard ²	Target value to be applied ¹	Frequency	Method	Note (Reason of excess of the standard)
GW-2 (reference point)	Chromium ¹	mg/L	0.018	0.5	0.5		APHA (Inductively Coupled Plasma (ICP) Method)	
	Temperature	°C	29	<3 (increase)	40		Instrument Analysis Method	
	pH	-	6.8	6-9	6.0 - 9.0		Instrument Analysis Method	
	SS	mg/L	8	50	30		APHA 2540D (Dry at 103-105°C Method)	
	DO	mg/L	9.5	-	-	Once per 2 months	Instrument Analysis Method	
	BOD ₅	mg/L	0.92	50	20		APHA 5210 B (5days BOD Test)	
	COD _{Cr}	mg/L	<0.7	250	70		APHA 5220 D (Close Reflux Colorimetric Method)	
	Total Coliform ³	MPN/100ml	54,000	400	400		APHA 9221 B (Standard Total Coliform Fermentation Technique)	
	Oil and Grease	mg/L	<3.1	10	10		APHA 5520 B (partition Gravimetric Method)	
	Chromium	mg/L	≤ 0.002	0.5	0.5		APHA (Inductively Coupled Plasma (ICP) Method)	

¹Remark: Reference to the Water and Wastewater Quality Monitoring Report (October 2018)

²Remark: Referred to the National Emission Quality Guideline (NEQG) 29th December 2015

³Remark: For the monitoring points of SW-2, SW-3, SW-4 and SW-9 exceeded in SS due to three expected reasons i) surface water run-off from bare land in Zone B, ii) delivered from upstream area such as natural origin and wastewater from local industrial zone outside of Thilawa SEZ, and iii) influence by water from the downstream of monitoring points due to flow back by tidal fluctuation.

⁴Remark: For the monitoring points of (SW-2, SW-3, SW-4, SW-7, and SW-9) total coliform exceeded the target value due to three expected reasons; i) natural bacteria existed in discharged creek because there are various kinds of vegetation and creature such as birds, and small animals in and along the discharged creek and ii) wastewater from the local industrial zone outside of Thilawa SEZ and iii) delivered from surrounding area by tidal effect. Total coliforms do not affect human health directly, self-monitoring was carried out to identify health impact by coliform bacteria. As for the result of E-Coli SW-2 was 2, SW-3 was 79, SW-4 was 63, SW-7 was 11 and SW-9 was 140. It is considered that there is no significant impact to human health.

Remark: For the monitoring point of GW-2, total coliform exceeded the target value due to two expected reasons i) the poor maintenance of well which can increase the risk of bacteria and other harmful organisms ii) the well was not operated regularly and didn't use for long time. Total coliforms do not affect human health directly, self-monitoring was carried out to identify health impact by coliform bacteria. As for the result of E-Coli GW-2 <1.8. It is considered that there is no significant impact to human health.

3) Soil Contamination (only operation phase)

Situations environmental report from tenants

- Are there any serious issues regarding soil contamination in this monitoring period?
If yes please describe the contents of complains and its countermeasures to fill in below the table.

☐ Yes, ☒ No

Contents of Issues on Soil Contamination	Countermeasures

4) Noise Level (September 2018)

Location	Item	Unit	Measured Value (Mean)	Measured Value (Max)	Country's Standard	Target value to be applied*	Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
Residential Area NV-2	Leq (day)	dB(A)	51	55	Refer to NEQG Article 1.3	75	Refer the section 2.4 in EIA main report	One time / 3 months		
	Leq (evening)	dB(A)	50	52		60				
	Leq(night)	dB(A)	51	55		55				
Along the road (NV-1)	Leq (day)	dB(A)	60	63		75				
	Leq(night)	dB(A)	54	59		70				

*Remarks: Referred to the tentative target value of ambient air quality (EIA Report for industrial area, Table 2.4-8), Reference to the noise and vibration monitoring report (March 2018)



Complaints from Residents

- Are there any complaints from residents regarding noise in this monitoring period?
If yes, please describe the contents of complains and its countermeasures to fill in below the table.

☐ Yes, ☒ No

Contents of Complaints from Residents	Countermeasures

5) Solid Waste

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

Are there any wastes if 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	Date	Generated from	Unit	Value	Solid Waste Management Activities
Waste of Sludge	19-Nov-2018	Construction Waste	Loads	2	Waste disposing to authorized waste collector (VCDG)

6) (a) Ground Subsidence Hydrology

Duration (Week)	Water Consumption		Ground Level		Note
	Quantity	Unit	Quantity	Unit	
6-Sep-2018	140	m ³ / week	+ 6,299	m	
13-Sep-2018	123	m ³ / week	+ 6,298	m	
20-Sep-2018	130	m ³ / week	+ 6,297	m	
27-Sep-2018	134	m ³ / week	+ 6,298	m	

Remarks: Reference to Monthly Progress Report (September-2018)

6) (b) Ground Subsidence Hydrology



Duration (Week)	Water Consumption		Ground Level		Note
	Quantity	Unit	Quantity	Unit	
4-Oct-2018	135	m ³ / week	+ 6,298	m	
11-Oct-2018	142	m ³ / week	+ 6,298	m	
18-Oct-2018	149	m ³ / week	+ 6,299	m	
25-Oct-2018	140	m ³ / week	+ 6,299	m	

Remarks: Reference to Monthly Progress Report (October-2018)

6) (c) Ground Subsidence Hydrology

Duration (Week)	Water Consumption		Ground Level		Note
	Quantity	Unit	Quantity	Unit	
1-Nov-2018	113	m ³ / week	+ 6,299	m	
8-Nov-2018	94	m ³ / week	+ 6,299	m	
15-Nov-2018	180	m ³ / week	+ 6,299	m	
22-Nov-2018	112	m ³ / week	+ 6,300	m	
29-Nov-2018	68	m ³ / week	+ 6,300	m	

Remarks: Reference to Monthly Progress Report (November-2018)

7) Offensive Odor (only operation phase)

Complaints from Residents

- Are there any complaints from residents regarding offensive odor in this monitoring period?

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

☐ Yes, ☒ No

Contents of Complaints from Residents	Countermeasures

Situations environmental report from tenants

- Are there any serious issues regarding offensive odor in this monitoring period?

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

☐ Yes, ☒ No

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.

9) Resettlement Works for Project Affected Persons (PAPs) and Common Assets

Information from TSMC

- Please describe the progress and remarkable issues (if any) to fill in below the table.

Resettlement Works		Progress in Narrative	Remarkable Issues
Projected Affected Persons	Land Acquisition and Relocation	- Land compensation to 5 landowner PAHs in Zone B (Area 2_1 Ex_I) and 1 landowner PAH in Zone B (Area 2_1) - No Relocation	

Common Assets	Income Restoration Program	
	Relocation	

- Are there any grievances submitted, solved and pending regarding resettlement works?
If yes, please describe the contents of grievances to fill in below the table.

☒ Yes, ☐ No

Contents of Grievance	Response/ Countermeasures
There were 5 grievances received during September to November 2018. The Number of Complaints under the "Compensation" category is 1, "Labour (e.g. recruitment, salary, working hour/condition, etc)" category is 3 and "Infrastructure related" category is 1.	Among 5 grievances, 3 complaints had been resolved and 1 is conditionally resolved and the left one is under investigation concern.

10) CSR activities such as Community Support Program
- Are there any CSR activities implemented in this monitoring period?

☒ Yes, ☐ No

If yes, please describe the outline of CSR activities implemented to fill in below the table.

Date	Activities	Description (Location, Participant etc)
September 2018	Scholarship (Yearly Program)	11 high school students in Kyaut Tan Township
	Grass Planting Activity	In front of Moe Gyo Swan Monestry
	After lunch tooth brushing program	Myaing Tar Yar School
October 2018	Scholarship (Yearly Program)	11 high school students in Kyaut Tan Township



	Drug Abuse Awareness Workshop	Alwan Sout Village
November 2018	Scholarship for University Students (2018-19) Academic Year	
	After lunch tooth brushing program	Aye Mya Thida Village and Adut Taw Village
	Kahtein Robe Donation	Aye Mya Thida Village (Eastern Monestary)
	Scholarship (Yearly Program)	11 high school students in Kyaut Tan Township

End of Document



**Thilawa Special Economic Zone (Zone B)
Development Project –Phase 1 & 2**

Appendix

Water and Waste Water Monitoring Report

August 2018

**WATER QUALITY MONITORING REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
IN THILAWA SEZ ZONE B
(PHASE 1 & 2 CONSTRUCTION STAGE)**

(Bi-Monthly Monitoring)

**August 2018
Myanmar Koei International Ltd.**



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CHAPTER 1: INTRODUCTION

1.1 General

Thilawa Special Economic Zone (SEZ) is located in southern district of Yangon region and about 23 km southeast of Yangon city. As the developer of Thilawa SEZ, Myanmar Japan Thilawa Development Ltd. (MJTD) has a responsibility to carry out regular monitoring in the industrial area of Zone B in accordance with the approved Environmental Impact Assessment (EIA) report and Environmental Management Plan (EMP). MJTD has implemented monitoring various environmental items with the specified time frame to know the environmental conditions in and around the area. As for the monitoring of the water quality, total seven sampling points are set for water quality survey, named SW-2, SW-3, SW-4, SW-7, SW-8, SW-9 and GW-2 have been monitored in Thilawa SEZ and its surrounding area in timely manner. Among the seven locations, SW-7 is main discharging point of Zone B during the construction stage. Moreover, GW-2 is monitored as a reference of existing tube well which located in the monastery compound of Phalan village. Location of sampling points for water quality monitoring is shown in Figure 1.1-1.



Figure 1.1-1 Location of Sampling Points of Water Quality Monitoring



CHAPTER 2: WATER QUALITY MONITORING

2.1 Monitoring Items

Sampling points and parameters for water quality monitoring are determined to cover the environmental monitoring plan of the EIA report.

Water quality sampling was carried out at seven locations. Among the seven locations, water flow measurement was carried out at two location (SW-2 and SW-4) where can be measured by current meter. Monitoring items and sampling points are summarized in Table 2.1-1.

Table 2.1-1 Monitoring Items for Water Quality

No.	Parameters	SW-2	SW-3	SW-4	SW-7	SW-8	SW-9	GW-2	Remarks
1	pH	○	○	○	○	○	○	○	On-site measurement
2	Water temperature	○	○	○	○	○	○	○	On-site measurement
3	DO	○	○	○	○	○	○	○	On-site measurement
4	BOD (5)	○	○	○	○	○	○	○	Laboratory analysis
5	COD (Cr)	○	○	○	○	○	○	○	Laboratory analysis
6	Suspended solids	○	○	○	○	○	○	○	Laboratory analysis
7	Total coliform	○	○	○	○	○	○	○	Laboratory analysis
8	Oil and grease	○	○	○	○	○	○	○	Laboratory analysis
9	Chromium	○	○	○	○	○	○	○	Laboratory analysis
10	Escherichia Coli (Self-monitoring)	○	○	○	-	-	○	○	Laboratory analysis
11	Flow Rate	○	-	○	-	-	-	-	On-site measurement

Source: Myanmar Koei International Ltd.

2.2 Description of Sampling Points

The outline of sampling points is mentioned in Table 2.2-1. The photos of conducting field survey at each sampling points are mentioned in Appendix-1.

Table 2.2-1 Outline of Sampling Points

No.	Station	Detailed Information
1	SW-2	Coordinate - N 16° 40' 20.69", E 96° 17' 18.04"
		Location - Upstream of Shwe Pyauk Creek
		Survey Item - Surface water sampling and water flowrate measurement
2	SW-3	Coordinate - N - 16° 40' 5.50", E 96° 16' 41.60"
		Location - Upstream of Shwe Pyauk Creek, after mixing point of Thilawa SEZ Zone A and Zone B.
		Survey Item - Surface water sampling
3	SW-4	Coordinate - N 16° 39' 42.84", E 96° 16' 27.42"
		Location - Downstream of Shwe Pyauk Creek
		Survey Item - Surface water sampling and water flowrate measurement
4	SW-7	Coordinate - N 16° 40' 13.25", E 96° 17' 5.66"
		Location - Outlet of retention pond of Zone B construction site before connect to Shwe Pyauk Creek
		Survey Item - Discharge water sampling
5	SW-8	Coordinate - N 16° 40' 12.04", E 96° 17' 2.81"
		Location - Upstream of Shwe Pyauk Creek, mixing point of SW-2 and discharge water from construction site of Zone B.
		Survey Item - Surface water sampling
6	SW-9	Coordinate - N 16° 40' 6.21", E 96° 16' 43.44"
		Location - Upstream of Shwe Pyauk Creek
		Survey Item - Surface water sampling
7	GW-2	Coordinate - N 16° 39' 25.30", E 96° 17' 15.60"
		Location - In the monastery compound of Phalan village
		Survey Item - Ground water sampling

Source: Myanmar Koei International Ltd.

SW-2 (Reference Point)

SW-2 was collected at the upstream of Shwe Pyauk creek. This sampling point is located at the northeast of Zone B area and at the south of Dagon-Thilawa road. The surrounding area are Zone A in the northwest and local industrial zone in the east respectively.

SW-3 (Reference Point)

SW-3 was collected at the Shwe Pyauk creek, after mixing point of Zone A and Zone B, which is flowing from east to west and then entering into the Yangon River. The distance is about 45 m downstream of SW-9. This sampling point is located at south of Zone A area and Dagon-Thilawa road. The surrounding area are Zone B in the south and local industrial zone in the east respectively.

SW-4 (Reference Point)

SW-4 was collected at the downstream of Shwe Pyauk creek, after mixing of discharge water from local industrial zone, construction site of Zone B and Zone A, which is flowing from east to west and then entering into the Yangon River. The distance is about 800 m downstream of SW-3. This sampling point is located at southwest of Zone A area and at the south of Dagon-Thilawa road. The surrounding area are Zone B in the east, local industrial zone in the east and paddy field in the south and west respectively.

SW-7 (Discharging Point)

SW-7 is main discharging point of Zone B during construction stage. This sampling point is located at outlet of retention pond of Zone B construction site, at the north of Zone B area and at the south of Dagon-Thilawa road. The surrounding area are Zone A in the north and local industrial zone in the east respectively.

SW-8 (Reference Point)

SW-8 is mixing point of discharge water from Zone B construction site and local industrial zone, upstream of Shwe Pyauk creek. This sampling point is located at north of Zone B area and at the south of Dagon-Thilawa road. The surrounding area are Zone A in the north and local industrial zone in the east respectively.

SW-9 (Reference Point)

SW-9 was collected at the upstream of Shwe Pyauk creek which is flowing from east to west and then entering into the Yangon River. The distance is about 600 m downstream of SW-8. This sampling point is located at south of Zone A area and Dagon-Thilawa road. The surrounding area are Zone B in the south, local industrial zone in the east and paddy field in the south and west respectively.

GW-2 (Reference of Existing Tube Well)

GW-2 was collected from tube well as ground water sample. It is located in the monastery compound of Phalan village. The surrounding area are Thilawa SEZ Zone A in north, Phalan village in the south and fields in west and local industrial zone in northeast, and construction of Thilawa SEZ Zone B in east and northeast respectively.



2.3 Monitoring Method

All water samples were collected with cleaned sampling bottle and analyzed by the following standard method as shown in Table 2.3-1. All samples were kept in iced boxes keeping at 2-4 °C and were transported to the laboratory. Among the parameters; water temperature, pH and DO were measured by the on-site instrument "Horiba, U-52" and water flow rate was also conducted by using the on-site instrument "Tamaya Digital Current Meter".

Table 2.3-1 Analytic Method for Water Quality

No.	Parameter	Method
1	Temperature	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
2	pH	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
3	Dissolved oxygen (DO)	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
4	BOD (5)	APHA 5210 B (5 days BOD Test)
5	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)
6	Suspended solids (SS)	APHA 2540D (Dry at 103-105°C Method)
7	Total coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)
8	Oil and grease	APHA 5520B (Partition-Gravimetric Method)
9	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
10	Escherichia Coli	APHA 9221 F (Escherichia Coli Procedure Using Fluorogenic Substrate)
11	Flow Rate	Detection of Electromagnetic Elements (Real-time measurement by UC-200V Digital Current Meters)

Source: Myanmar Koei International Ltd.

2.4 Monitoring Period

Water quality and water flow rate monitoring were conducted on 21st August 2018 and sampling time is shown in Table 2.4-1 to avoid tidal effect. The tide record for Yangon River, Myanmar on 21st August 2018 is shown in Table 2.4-2.

Table 2.4-1 Sampling Time of Each Station

No.	Station	Sampling Time
1	SW-2	21/08/2018 09:13
2	SW-3	21/08/2018 16:26
3	SW-4	21/08/2018 09:53
4	SW-7	21/08/2018 11:11
5	SW-8	21/08/2018 11:26
6	SW-9	21/08/2018 16:54
7	GW-2	21/08/2018 10:21

Source: Myanmar Koei International Ltd.

Table 2.4-2 Tide Record for Yangon River, Myanmar

Date	Time	Height	Tide Conditions
21/08/2018	00:22	4.65	High Tide
	07:12	2.46	Low Tide
	12:54	4.95	High Tide
	20:23	1.97	Low Tide

Source: Myanmar Port Authority, Tide Table for the Yangon River and Elephant Point, 2018



2.5 Monitoring Results

Results of water quality monitoring at discharge point and discharged creek is summarized in Table 2.5-1. Analytical results of the laboratory are described in Appendix-2. The results were compared with the target value of effluent water quality discharging to water body stipulated in the EIA report.

2.5.1 Results of Discharging points and Discharged Creek

As the comparison with the target value, the results of SS and total coliform were exceeded than the target value. As for the result of SS, results at the surface water monitoring points (SW-4, SW-7, and SW-8) exceeded the target value due to three expected reasons; i) surface water run-off from bare land in Zone B, ii) delivered from upstream area such as natural origin and wastewater from local industrial zone outside of Thilawa SEZ, and iii) influence by water from the downstream of monitoring points due to flow back by tidal fluctuation.

As for the result of total coliform of surface water, results at surface water monitoring points (SW-2, SW-3, SW-4, SW-7, SW-8 and SW-9) exceeded the target value due to three expected reasons; i) natural bacteria existed in discharged creek because there are various kinds of vegetation and creature such as birds, and small animals in and along the discharged creek and ii) wastewater from the local industrial zone outside of Thilawa SEZ and iii) delivered from surrounding area by tidal effect. In addition, the result of E. Coli of surface water, all of results were under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point of SW-2, SW-3, SW-4, SW-7, SW-8 and SW-9, but it is considered that there is no significant impact on human health.

Table 2.5-1 Results of Water Quality Monitoring at Discharge point and Discharged Creek

No.	Parameters	Unit	SW-2	SW-3	SW-4	SW-7	SW-8	SW-9	Target Value (Reference Value for Self- Monitoring)
1	Temperature	°C	29	29	30	30	26	30	≤ 35
2	pH	-	6.9	6.7	6.6	7.1	6.8	7.2	6.0-9.0
3	Suspended solid (SS)	mg/L	30.00	50.00	98.00	260.00	278.00	44.00	50
4	Dissolved oxygen (DO)	mg/L	6.15	7.46	9.17	9.17	8.99	5.36	-
5	BOD (5)	mg/L	3.32	3.33	3.01	2.13	4.17	3.50	30
6	COD (Cr)	mg/L	10.6	9.8	8.7	< 0.7	4.5	8.2	125
7	Total coliform	MPN/100ml	92,000	93,000	15,000	> 160,000	92,000	> 160,000	400
8	Oil and grease	mg/L	< 3.1	< 3.1	< 3.1	6.0	< 3.1	4.0	10
9	Chromium	mg/L	0.002	0.006	0.012	0.042	0.038	0.008	0.500
10	Escherichia Coli	MPN/100ml	14.0	26.0	21.0	24.0	24.0	12.0	(1000)* (CFU/100ml)
11	Flow rate	m³/s	1.67	-	2.95	-	-	-	-

Note: Red color means exceeded value than target value.

*Note: Based on the water utilization at discharged creek, the quality standard for water baths in Japan. (Ministry of Environment, 1997) is set as a reference value for self-monitoring of E. coli for surface water monitoring. However, due to limitation of capacity for analytical laboratory in Myanmar, the method to analyze the "Colony Forming Unit (CFU)" is not available in Myanmar. Therefore, the results of "Most Probable Number (MPN)" are assumed similar to CFU values and compared with reference values. Once the method to analyze the CFU will be available in Myanmar, the analytical method will be changed.

Source: Myanmar Kone International Ltd.

2.5.2 Result of Reference Tube Well

Result of water quality monitoring at reference monitoring point is shown in Table 2.5-2. All parameters of result are below the target value.

Table 2.5-2 Results of Water Quality Monitoring at Reference Tube Well

No.	Parameters	Unit	GW-2	Target Value (Reference Value for Self-Monitoring)
1	Temperature	°C	31	≤ 35
2	pH	-	7.1	6.0-9.0
3	Suspended solid (SS)	mg/L	4.00	50
4	Dissolved oxygen (DO)	mg/L	8.99	-
5	BOD (5)	mg/L	1.74	30
6	COD (Cr)	mg/L	< 0.7	125
7	Total coliform	MPN/ 100ml	33	400
8	Oil and grease	mg/L	< 3.1	10
9	Chromium	mg/L	< 0.002	0.500
10	Escherichia Coli	MPN/ 100 ml	< 1.8	(100)** (MPN/100ml)
11	Flow Rate	m ³ /s	-	-

**Note: Based on the water utilization at monitoring point for ground water, B1(Irrigation water) of National Technical Regulation on Surface Water Quality in Vietnam (No. QCVN 08: 2008/BTNMT) is set as a reference value of self-monitoring for ground water monitoring.
Source: Myanmar Koei International Ltd.

CHAPTER 3: CONCLUSION AND RECOMMENDATIONS

As described in Chapter 2 (Section 2.5), parameter of SS (SW-4, SW-7, and SW-8) and total coliform (SW-2, SW-3, SW-4, SW-7, SW-8 and SW-9) in surface water were exceeded the target value in this monitoring period for construction stage of Thilawa SEZ Zone B.

There are some possible reasons for exceeding the target values of SS (SW-4, SW-7, and SW-8) and total coliform (SW-2, SW-3, SW-4, SW-7, SW-8 and SW-9) are by i) natural origin such as natural bacteria existed in discharged creek because there are various kinds of vegetation and creature such as birds, and small animals in and along the discharged creek and ii) wastewater from the local industrial zone outside of Thilawa SEZ and surface water run-off from bare land in Zone B and iii) delivered from surrounding area by tidal effect. As mentioned in Section 2.5-1, the result of self-monitoring of E-Coli at SW-2, SW-3, SW-4, SW-7, SW-8 and SW-9 were under the reference value. Therefore, although the target value of total coliform was exceeded at main discharging point and reference monitoring point, but it is considered that there is no significant impact on human health. However, it cannot reach to the conclusion of what is the reason to be exceeded the target values, thus the continuous monitoring and yearly trend analysis will be necessary to carry out based on the rainy and dry season data.

As for future subject for main discharging points of Thilawa SEZ Zone B, the following action may be taken to carry out the appropriate water quality monitoring:

- To continue monitoring *Escherichia coli* (E. coli) level to identify health impact by coliform bacteria; and
- To monitor the possibility of the overflow water from construction sites.

End of the Document

APPENDIX-1 FIELD SURVEY PHOTOS



FOR DISCHARGING POINT OF THILAWA SEZ ZONE B



Surface water sampling and onsite measurement at SW-7

**FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH
DISCHARGING POINTS AND BASELINE OF DISCHARGED CREEK**



Surface water sampling and onsite measurement at SW-2



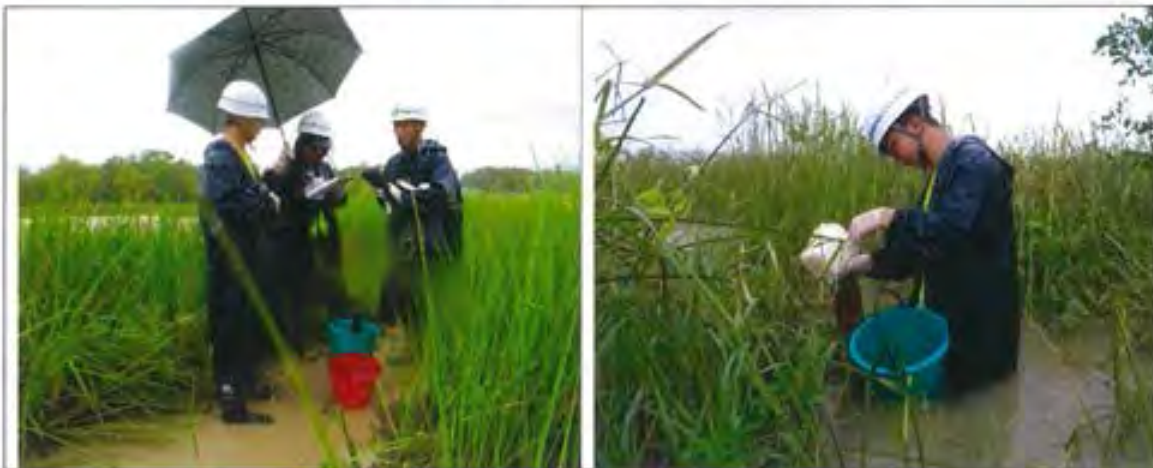
Surface water sampling and onsite measurement at SW-3



Surface water sampling and onsite measurement at SW-4



Surface water sampling and onsite measurement at SW-8



Surface water sampling and onsite measurement at SW-9



Ground water sampling and onsite measurement at GW-2

APPENDIX-2 LABORATORY RESULTS



FOR DISCHARGING POINT

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No. 11, ThilawaSEZ Zone B, Yangon Region, the Union of Myanmar
Tel: (+95) 953119311 / 953119319

Report No. : GEM-LAB-201809059
Revision No. : 1
Report Date : 5 September, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No. 1A /2B, Mya Thidar Housing, Ward 11, South Okkalapa,
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW/7-0821
Sample No. : W-1808211
Water Profile No. :
Sampling Date : 21 August, 2018
Sampling By : Customer
Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	260.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	2.13	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	< 0.7	0.7
4	Total Coliform	APHA 5221B (Standard Total Coliform Enumeration Technique)	MPN/100ml	> 160000	1.8
5	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	6.0	2.1
6	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.042	0.002

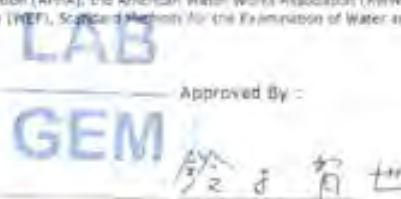
Remark : LOQ = Limit of Quantitation
APHA = American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :



Ni Ni Aye Lwin
Assistant Supervisor

Approved By :



Tomoya Suzuki
Director



**FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH
DISCHARGING POINTS AND BASELINE OF DISCHARGED CREEK**

DOWA

GOLDEN DOWA J.E.(S)SYSTEM MYANMAR CO.,LTD.
Lot No.12, Thilawa SEZ Zone B, Thilawa Region, the Union of Myanmar
(Tel:09-2309511 to 2309514)

Report No. : GEM-LAB-201809056
Revision No. : 1
Report Date : 5 September, 2018
Application No. : 0049-CD01

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.18/28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-2-0821
Sample No. : W-1808208
Waste Profile No. :
Sampling Date : 21 August, 2018
Sampling By : Customer
Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	30.00	
2	BOD (5)	APHA 5210 B (5-Days BOD Test)	mg/l	3.32	0.00
3	COD (Cr)	APHA 5220D (Dilute Reflux Colorimetric Method)	mg/l	10.6	0.7
4	Total Nitrogen	AWCH Method 10072 (TNT Persulfate Digestion Method)	mg/l	1.1	0.0
5	Total Phosphorus	APHA 4500-P-E (Ascorbic Acid Method)	mg/l	0.13	0.00
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	92000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	5.03	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1	0
9	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
10	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.002	0.002

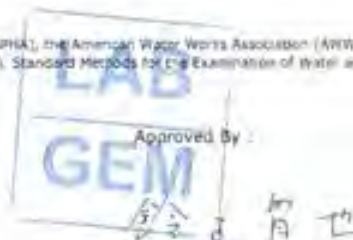
Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :



Ni Ni Aye Lwin
Assistant supervisor

Approved By :



Tomoya Suzuki
Director





GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Unit No. 11, ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
TEL: 020999511 / 09 79692149

Report No. : GEM-LAB-201809057

Revision No. : 1

Report Date : 5 September, 2018

Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /2B, Mya Thidar Housing, Ward 11, South Okkalapa,
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-3-0821
Sample No. : W-1808209
Waste Profile No. : -
Sampling Date : 21 August, 2018
Sampling By : Customer
Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	50.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.33	0.00
3	COD (Cr)	APHA 5220D (Closed Reflux Colorimetric Method)	mg/l	9.8	0.7
4	Total Nitrogen	HA/DA Method 1/072 (TNT Persulfate Digestion Method)	mg/l	2.5	0.0
5	Total Phosphorous	APHA 4503-P E (Ascorbic Acid Method)	mg/l	0.13	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	92000	1.5
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	3.02	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1.4	0.0
9	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
10	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.006	0.002

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition.

Analysed By :

Ni Ni Aye Lwin
Assistant supervisor

Approved By :

Tomoya Suzuki
Director



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY August-2018)

DOWA

(JOINT DOWA ECU-SYSTEM MYANMAR CO., LTD)
1st Flr. (1), Thilawa SEZ Zone A, Yangon Region, The Union of Myanmar
Tel: 01-2359453 / 09-784933448

Report No. : GEM-LAB-201809058

Revision No. : 1

Report Date : 5 September, 2018

Application No. : 0049-C001

Analysis Report

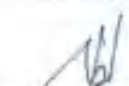
Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-4-C001
Sample No. : W-1808210
Waste Profile No. : -
Sampling Date : 21 August, 2018
Sampling By : Customer
Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	98.00	—
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.01	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	8.7	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	0.0	0.0
5	Total Phosphorus	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.15	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Enumeration Technique)	MPN/100ml	35000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	PCU	2.42	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1.0	0.0
9	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
10	Chromium	APHA 3130 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.012	0.002

Remark : LOQ - Limit of Quantitation

APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :



Ni Ni Aye Lwin
Assistant supervisor

**LAB
GEM**

Approved By :



Tomoya Suzuki
Director



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY August-2018)

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Unit No. 11, Thakemai, Zone A, Thilawa Region, the Union of Myanmar
Tel: 01-2399311, 09-76695349

Report No. : GEM-LAB-201809060
Revision No. : 1
Report Date : 5 September, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koni International LTD (MKI)
Address : No. 1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-B-0821
Sampling Date : 21 August, 2018
Sample No. : W-1808212
Sampling By : Customer
Waste Profile No. :
Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1.	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	278.00	-
2.	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	4.17	0.08
3.	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	4.5	0.7
4.	Total Coliform	APHA 9221B (Standard, Total Coliform Fermentation Technique)	MPN/100ml	92000	1.8
5.	Oil and Grease	APHA 5530B (Rampson-Gravimetric Method)	mg/l	< 3.1	3.1
6.	Chromium	APHA 8420 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.038	0.002

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition.

Analysed By :



Ni Ni Aye Lwin
Assistant supervisor

GEM

Approved By :



Tomoya Suzuki
Director



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY August-2018)

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No. 11, Thilawa SEZ Zone B, Yangon Region, Union of Myanmar
Tel 09-239651109 DOWA JAR

Report No. : GEM-LAB-201809063

Revision No. : 1

Report Date : 5 September, 2018

Application No. : 0049-C001

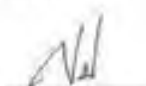
Analysis Report

Client Name : Myanmar Kaei International LTD (MKI)
Address : No. 1A /2B, Mya Thidar Housing, Ward 11, South Okkalapa
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-9-0821
Sample No. : W-1808215
Waste Profile No. :
Sampling Date : 21 August, 2018
Sampling By : Customer
Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	44.00	—
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.50	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	8.2	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	mpn/100ml	> 160000	1.8
5	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	4.0	3.1
6	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.008	0.002

Remark : LOQ : Limit of Quantitation
APHA : American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

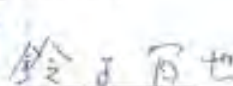
Analysed By :



Ni Ni Aye Lwin
Assistant supervisor

**LAB
GEM**

Approved By :



Tomoya Suzuki
Director



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY August-2018)

DOWA

OPEN ENVIRONMENTAL CO. SYSTEM MYANMAR CO., LTD.

(in Ave 8), Thilawa(II) Zone A, Yangon Region, the Union of Myanmar
Tel: 09-79402149

Report No. : GEM-LAB-201809061

Revision No. : 1

Report Date : 5 September, 2018

Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa
Project Name : MJTD
Sample Description :
Sample Name : MKI-GW-2-082
Sample No. : W-1808213
Waste Profile No. : -

Sampling date : 21 August, 2018

Sampling By : Customer

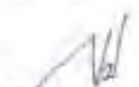
Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	4.00	
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	1.74	0.00
3	COD (Cr)	APHA 5220B (Closed Reflux Colorimetric Method)	mg/l	< 0.7	0.7
4	Total Coliform	APHA 9215 (Standard Total Coliform Enumeration Technique)	MPN/100ml	33	1.8
5	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
6	Chromium	APHA 9120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002

Remark : LOQ : Limit of Quantitation

APHA : American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF) Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :



Ni Ni Aye Lwin
Assistant supervisor



Approved By :



Tomoya Suzuki
Director



**APPENDIX-3 LABORATORY RESULT OF ESCHERICHIA COLI
(SELF-MONITORING)**



FOR DISCHARGING POINT

DOWA

NO. 01/19 DOWA ECO-SYSTEM SPANBARECO, LTD.
Lab No. 01, NisawaMF Zone B, Thilawa Special Economic Zone
Thilawa (2018/07-2018/12/19)

Report No. : GEM-LAB-201808011
Revision No. : 1
Report Date : 30 August, 2018
Application No. : 0049-C003

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No. 1A / 2B, Mya Thadar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description :
Sample Name : MKI/SW-7-0821
Sample No. : WJ808200
Water Profile No. :
Sampling Date : 21 August, 2018
Sampling By : Customer
Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Filtered Coli Filtration Using Membrane Substrate	MPN/100ml	24/0	1.0

REMARKS : LOQ : Limit of Quantitation
APHA : American Public Health Association (APHA), the American Water Works Association (AWWA), and the British Institution of Sanitary Engineers (BISSE), "Standard Methods for the Examination of Water and Wastewater", 22nd edition

Analysed By :



Ni Ni Aye Linn
Assistant supervisor

Approved By :

**LAB
GEM**



Tomoya Suzuki
Director



**FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH
DISCHARGING POINTS AND BASELINE OF DISCHARGED CREEK**

DOWA

DOEJEN DOWA ECOSYSTEM MANAGEMENT CO., LTD.
No. 11, Thilawa SEZ Zone B, Yangon Region, Republic of Myanmar
Tel: 09-2298483 / 09-2298558

Report No. : GEM-LAB-201808248
Revision No. : 1
Report Date : 30 August, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koen International LTD (MKI)
Address : No.1A /25, Mya Thida Housing, Ward 11, South Okkalapa
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-2-0831
Sample No. : W-1808192
Water Profile No. : -

Sampling Date : 21 August, 2018
Sampling By : Customer
Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9223 + Escherichia Coli Presumptive Using Presumptive Bacterial	MPN/100ml	14.0	1.8

Notes : LOQ (Limit of Quantitation)

APHA : American Public Health Association (APHA), the American Water Works Association (AWWA), and the American Society of Civil Engineers (ASCE). Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :



Aye Lin
Assistant supervisor

LAB

Approved By :

GEM



Tomoya Suzuki
Director



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY August-2018)

DOWA

(KUALAH DOWA) ECOSYSTEM MYANMAR CO., LTD.
(1st Fl., D., Thilawa SEZ Zone B, Yangon Region, the Union of Myanmar)
Tel: 09-5566611, 09-5566111, 09-5566111

Report No. : GEM-LAB-201808249
Revision No. : 1
Report Date : 30 August, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Kogi International LTD (MKI)
Address : No. 1A / 26, Mya Thidar Housing, Ward 11, South Daka Township
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-1-0821
Sample No. : W-1808198
Waste Profile No. :
Sampling Date : 21 August, 2018
Sampling By : Customer
Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 Escherichia Coli Procedure using Fluorimetric Substrate	MPN/100ml	26.0	1.8

Notes : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF). Standard Methods for the Examination of Water and Wastewater, 18th edition.

Analysed By :



Ni Ni Aye Lwin
Assistant Supervisor

**LAB
GEM**

Approved By :



Fumio Suzuki
Director



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY August-2018)

DOWA

DOWA THILAWA DEVELOPMENT MYANMAR CO., LTD.
No. 1A / 2B, Mya Thida Housing, Ward 11, South Okkalapa,
Yangon Region, Myanmar

Report No. : GEM-LAB-201808250
Revision No. : 1
Report Date : 30 August, 2018
Application No. : 0049-C001

Analysis Report

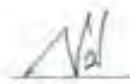
Client Name : Myanmar Kites International LTD (MKI)
Address : No. 1A / 2B, Mya Thida Housing, Ward 11, South Okkalapa
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-4-0821
Sample No. : W-1808199
Waste Profile No. :
Sampling Date : 21 August, 2018
Sampling By : Customer
Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 B: Escherichia Coli Membrane Using Fluorogenic Substrate	MPN/100ml	214	1.8

Remark : LOQ : Limit of Quantitation

APHA : American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition.

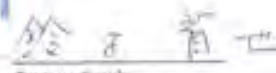
Analysed By :



Ni Ni Aye Lwin
Assistant supervisor

**LAB
GEM**

Approved By :



Tomoya Suzuki
Director



DOWA

GOLDEN DOWA ECOSYSTEM MYANMAR CO., LTD.
10th Fl. Thilawa SEZ Zone B, Thilawa Special Economic Zone, Thilawa
Tel: 09-2596000 / 09-2600044

Report No. : GEM-LAB-201806253
Revision No. : 1
Report Date : 30 August, 2018
Application No. : 0040-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No. 2A/28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description :
Sample Name : HX1-SW-B-0821
Sample No. : W-1808202
Water Profile No. :
Sampling Date : 21 August, 2018
Sampling By : Customer
Sample Received Date : 22 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 E Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	24.0	1.8

LOQ (Limit of Quantitation)
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :



Ni Ni Aye Lin
Assistant Supervisor

Approved By :

**LAB
GEM**



Tomoya Suzuki
Director

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Unit No. 11 / 11th Floor 11th Zone 4, Sample Region, The Union of Myanmar
Tel: 01-2596211-19 Fax: 01-2596214

Report No. : GEM-LAB-201808255
Revision No. : 1
Report Date : 30 August, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A / 28, Mya Thidar Housing, Ward 11, South Dikhhapa
Project Name : MJTD
Sample Description :
Sample Name : PRT-SW-9-0821
Sample No. : W-1808204
Waste Profile No. :
Sampling Date : 21 August, 2018
Sampling By : Customer
Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9223 B Escherichia Coli by confirm using Fluorogenic Substrate	MPN/100ml	12.0	1.8

Remark : LOQ = Limit of Quantitation
APHA : American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :



Ni Ni Aye Kyin
Assistant supervisor

**LAB
GEM**

Approved By :



Tomoya Suzuki
Director



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY August-2018)

DOWA

GREEN IS THILAWA ECOSYSTEM MYANMAR CO., LTD.
Unit No. 12 Thilawada Zone B, Insein Region, the Union of Myanmar
Tel: 09-76651145, 09-76651146

Report No. : GEN-LAB-201808252
Revision No. : 1
Report Date : 30 August, 2018
Application No. : 0049-0801

Analysis Report

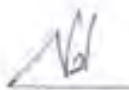
Client Name : Myanmar Kyo International (TD) (MKI)
Address : No 1A /28, Mya Thida Housing, Ward 11, South Okkalapa
Project Name : MJTD
Sample Description :
Sample Name : HQT-GW-3-0821
Sample No : W-1888231
Wayte Profile No :
Sampling Date : 11 August, 2018
Sampling By : Customer
Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1.	Extraneous Col	APHA 8237 F.B Extraneous Col. Bismore Acid Manganese substrate	MPN/100ml	< 1.8	1.8

Remark : LOQ : Limit of Quantitation

APHA : American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :



Ni In Aye Lynn
Assistant supervisor

Approved By :

**LAB
GEM**



Tomoya Suzuki
Director



**Thilawa Special Economic Zone (Zone B)
Development Project –Phase 1 & 2**

Appendix

Water and Waste Water Monitoring Report

October 2018

**WATER QUALITY MONITORING REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
IN THILAWA SEZ ZONE B
(PHASE 1 & 2 CONSTRUCTION STAGE)**

(Bi-Monthly Monitoring)

**October 2018
Myanmar Koei International Ltd.**



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CHAPTER 1: INTRODUCTION

1.1 General

Thilawa Special Economic Zone (SEZ) is located in southern district of Yangon region and about 23 km southeast of Yangon city. As the developer of Thilawa SEZ, Myanmar Japan Thilawa Development Ltd. (MJTD) has a responsibility to carry out regular monitoring in the industrial area of Zone B in accordance with the approved Environmental Impact Assessment (EIA) report and Environmental Management Plan (EMP). MJTD has implemented monitoring various environmental items with the specified time frame to know the environmental conditions in and around the area. As for the monitoring of the water quality, total seven sampling points are set for water quality survey, named SW-2, SW-3, SW-4, SW-7, SW-8, SW-9 and GW-2 have been monitored in Thilawa SEZ and its surrounding area in timely manner. Among the seven locations, SW-7 is main discharging point of Zone B during the construction stage. Moreover, GW-2 is monitored as a reference of existing tube well which located in the monastery compound of Phalan village. Location of sampling points for water quality monitoring is shown in Figure 1.1-1.



Figure 1.1-1 Location of Sampling Points of Water Quality Monitoring

CHAPTER 2: WATER QUALITY MONITORING

2.1 Monitoring Items

Sampling points and parameters for water quality monitoring are determined to cover the environmental monitoring plan of the EIA report.

Water quality sampling was carried out at six locations. SW-8 was not carried out for water sampling because of there was no water during the monitoring period. Among the six locations, water flow measurement was carried out at one location (SW-4) where can be measured by current meter and Monitoring items and sampling points are summarized in Table 2.1-1.

Table 2.1-1 Monitoring Items for Water Quality

No.	Parameters	SW-2	SW-3	SW-4	SW-7	SW-8	SW-9	GW-2	Remarks
1	pH	○	○	○	○	—	○	○	On-site measurement
2	Water temperature	○	○	○	○	—	○	○	On-site measurement
3	DO	○	○	○	○	—	○	○	On-site measurement
4	BOD (5)	○	○	○	○	—	○	○	Laboratory analysis
5	COD (Cr)	○	○	○	○	—	○	○	Laboratory analysis
6	Suspended solids	○	○	○	○	—	○	○	Laboratory analysis
7	Total coliform	○	○	○	○	—	○	○	Laboratory analysis
8	Oil and grease	○	○	○	○	—	○	○	Laboratory analysis
9	Chromium	○	○	○	○	—	○	○	Laboratory analysis
10	Escherichia Coli (Self-monitoring)	○	○	○	○	—	○	○	Laboratory analysis
11	Flow Rate	—	—	○	—	—	—	—	On-site measurement

Source: Myanmar Koei International Ltd.

2.2 Description of Sampling Points

The outline of sampling points is mentioned in Table 2.2-1. The photos of conducting field survey at each sampling points are mentioned in Appendix-1.

Table 2.2-1 Outline of Sampling Points

No.	Station	Detailed Information
1	SW-2	Coordinate- N-16° 40' 20.69", E- 96° 17' 18.04" Location - Upstream of Shwe Pyauk Creek Survey Item - Surface water sampling
2	SW-3	Coordinate - N - 16° 40' 5.50", E 96° 16' 41.60" Location - Upstream of Shwe Pyauk Creek, after mixing point of Thilawa SEZ Zone A and Zone B Survey Item - Surface water sampling
3	SW-4	Coordinate- N-16° 39' 42.84", E- 96° 16' 27.42" Location - Downstream of Shwe Pyauk Creek Survey Item - Surface water sampling and water flow rate measurement
4	SW-7	Coordinate - N 16° 40' 13.25", E 96° 17' 5.66" Location - Outlet of retention pond of Zone B construction site before connect to Shwe Pyauk Creek Survey Item - Discharge water sampling
5	SW-8	Coordinate - N 16° 40' 12.04", E 96° 17' 2.81" Location - Upstream of Shwe Pyauk Creek, mixing point of SW-2 and discharge water from construction site of Zone B Survey Item - Surface water sampling
6	SW-9	Coordinate - N 16° 40' 6.21", E 96° 16' 43.44" Location - Upstream of Shwe Pyauk Creek Survey Item - Surface water sampling
7	GW-2	Coordinate - N 16° 39' 25.30", E 96° 17' 15.60" Location - In the monastery compound of Phalan village Survey Item - Ground water sampling

Source: Myanmar Koei International Ltd.



SW-2 (Reference Point)

SW-2 was collected at the upstream of Shwe Pyauk creek. This sampling point is located at the northeast of Zone B area and at the south of Dagon-Thilawa road. The surrounding area are Zone A in the northwest and local industrial zone in the east respectively.

SW-3 (Reference Point)

SW-3 was collected at the Shwe Pyauk creek, after mixing point of Zone A and Zone B, which is flowing from east to west and then entering into the Yangon River. The distance is about 45 m downstream of SW-9. This sampling point is located at south of Zone A area and Dagon-Thilawa road. The surrounding area are Zone B in the south and local industrial zone in the east respectively.

SW-4 (Reference Point)

SW-4 was collected at the downstream of Shwe Pyauk creek, after mixing of discharge water from local industrial zone, construction site of Zone B and Zone A, which is flowing from east to west and then entering into the Yangon River. The distance is about 800 m downstream of SW-3. This sampling point is located at southwest of Zone A area and at the south of Dagon-Thilawa road. The surrounding area are Zone B in the east, local industrial zone in the east and paddy field in the south and west respectively.

SW-7 (Discharging Point)

SW-7 is main discharging point of Zone B during construction stage. This sampling point is located at outlet of retention pond of Zone B construction site, at the north of Zone B area and at the south of Dagon-Thilawa road. The surrounding area are Zone A in the north and local industrial zone in the east respectively.

SW-8 (Reference Point)

SW-8 is mixing point of discharge water from Zone B construction site and local industrial zone, upstream of Shwe Pyauk creek. This sampling point is located at north of Zone B area and at the south of Dagon-Thilawa road. The surrounding area are Zone A in the north and local industrial zone in the east respectively.

SW-9 (Reference Point)

SW-9 was collected at the upstream of Shwe Pyauk creek which is flowing from east to west and then entering into the Yangon River. The distance is about 600 m downstream of SW-8. This sampling point is located at south of Zone A area and Dagon-Thilawa road. The surrounding area are Zone B in the south, local industrial zone in the east and paddy field in the south and west respectively.

GW-2 (Reference of Existing Tube Well)

GW-2 was collected from tube well as ground water sample. It is located in the monastery compound of Phalan village. The surrounding area are Thilawa SEZ Zone A in north, Phalan village in the south and fields in west and local industrial zone in northeast, and construction of Thilawa SEZ Zone B in east and northeast respectively.

2.3 Monitoring Method

All water samples were collected with cleaned sampling bottle and analyzed by the following standard method as shown in Table 2.3-1. All samples were kept in iced boxes keeping at 2-4 °C and were transported to the laboratory. Among the parameters; water temperature, pH and DO were measured by the on-site instrument "Horiba, U-52" and water flow rate was also conducted by using the on-site instrument "Tamaya Digital Current Meter".

Table 2.3-1 Analytic Method for Water Quality

No.	Parameter	Method
1	Temperature	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
2	pH	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
3	Dissolved oxygen (DO)	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
4	BOD (5)	APHA 5210 B (5 days BOD Test)
5	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)
6	Suspended solids (SS)	APHA 2540D (Dry at 103-105°C Method)
7	Total coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)
8	Oil and grease	APHA 5520B (Partition-Gravimetric Method)
9	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
10	Escherichia Coli	APHA 9221 F (Escherichia Coli Procedure Using Fluorogenic Substrate)
11	Flow Rate	Detection of Electromagnetic Elements (Real-time measurement by UC-200V Digital Current Meters)

Source: Myanmar Koei International Ltd.

2.4 Monitoring Period

Water quality and water flow rate monitoring were conducted on 16th October 2018 and sampling time is shown in Table 2.4-1 to avoid tidal effect. The tide record for Yangon River, Myanmar on 16th October 2018 is shown in Table 2.4-2.

Table 2.4-1 Sampling Time of Each Station

No.	Station	Sampling Time
1	SW-2	16/10/2018 10:03
2	SW-3	16/10/2018 09:01
3	SW-4	16/10/2018 11:14
4	SW-7	16/10/2018 10:33
5	SW-8	-
6	SW-9	16/10/2018 09:29
7	GW-2	16/10/2018 11:43

Source: Myanmar Koei International Ltd.

Table 2.4-2 Tide Record for Yangon River, Myanmar

Date	Time	Height	Tide Conditions
16/10/2018	03:11	1.77	Low Tide
	08:33	5.02	High Tide
	15:51	1.63	Low Tide
	21:25	4.61	High Tide

Source: Myanmar Port Authority, Tide Table for the Yangon River and Elephant Point, 2018

2.5 Monitoring Results

Results of water quality monitoring at discharge point and discharged creek is summarized in Table 2.5-1. Analytical results of the laboratory are described in Appendix-2. The results were compared with the target value of effluent water quality discharging to water body stipulated in the EIA report.

2.5.1 Results of Discharging points and Discharged Creek

As the comparison with the target value, the results of SS and total coliform were exceeded than the target value. As for the result of SS, results at the surface water monitoring points (SW-2, SW-3, SW-4 and SW-9) exceeded the target value due to three expected reasons; i) surface water run-off from bare land in Zone B, ii) delivered from upstream area such as natural origin and wastewater from local industrial zone outside of Thilawa SEZ, and iii) influence by water from the downstream of monitoring points due to flow back by tidal fluctuation.

As for the result of total coliform of surface water, results at surface water monitoring points (SW-2, SW-3, SW-4, SW-7, and SW-9) exceeded the target value due to three expected reasons; i) natural bacteria existed in discharged creek because there are various kinds of vegetation and creature such as birds, and small animals in and along the discharged creek and ii) wastewater from the local industrial zone outside of Thilawa SEZ and iii) delivered from surrounding area by tidal effect. In addition, the result of E. Coli of surface water, all of results were under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point of SW-2, SW-3, SW-4, SW-7, and SW-9, but it is considered that there is no significant impact on human health.

Table 2.5-1 Results of Water Quality Monitoring at Discharge point and Discharged Creek

No.	Parameters	Unit	SW-2	SW-3	SW-4	SW-7	SW-8	SW-9	Target Value (Reference Value for Self-Monitoring)
1	Temperature	°C	31	29	30	32	-	30	≤ 35
2	pH	-	7.3	7.1	7.1	7.1	-	6.9	6.0-9.0
3	Suspended solid (SS)	mg/L	92.00	206.00	232.00	32.00	-	152.00	50
4	Dissolved oxygen (DO)	mg/L	9.18	5.24	8.23	7.28	-	9.4	-
5	BOD (5)	mg/L	2.07	2.55	2.62	1.99	-	1.95	30
6	COD (Cr)	mg/L	13.9	14.5	9.4	2.6	-	9.5	125
7	Total coliform	MPN/100ml	160,000	> 160,000	92,000	830	-	> 160,000	400
8	Oil and grease	mg/L	< 3.1	< 3.1	< 3.1	< 3.1	-	< 3.1	10
9	Chromium	mg/L	0.012	0.022	0.022	0.014	-	0.018	0.500
10	Escherichia Coli	MPN/100ml	2.0	79.0	63.0	11.0	-	140.0	(1000)* (CFU/100ml)
11	Flow rate	m³/s	-	-	0.151	-	-	-	-

Note: Red color means exceeded value than target value.

*Note: Based on the water utilization at discharged creek, the quality standard for water baths in Japan, (Ministry of Environment, 1997) is set as a reference value for self-monitoring of E. coli for surface water monitoring. However, due to limitation of capacity for analytical laboratory in Myanmar, the method to analyze the "Colony Forming Unit (CFU)" is not available in Myanmar. Therefore, the results of "Most Probable Number (MPN)" are assumed similar to CFU values and compared with reference values. Once the method to analyze the CFU will be available in Myanmar, the analytical method will be changed.

Source: Myanmar Koei International Ltd.

2.5.2 Result of Reference Tube Well

Result of water quality monitoring at reference tube well monitoring point is shown in Table 2.5-2. All parameters of result except for total coliform are below the target value.

As for the result of total coliform in ground water, results at GW-2 exceeded the target value. It may be possible due to expected reasons i) the poor maintenance of well which can increase the risk of bacteria and other harmful organisms ii) the well was not operated regularly and didn't use for long time. However, the result of E.coli of GW-2 was under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point of GW-2 but it is considered that there is no significant impact on human health.

Table 2.5-2 Results of Water Quality Monitoring at Reference Tube Well

No.	Parameters	Unit	GW-2	Target Value (Reference Value for Self-Monitoring)
1	Temperature	°C	29	≤ 35
2	pH	-	6.8	6.0-9.0
3	Suspended solid (SS)	mg/L	6.00	50
4	Dissolved oxygen (DO)	mg/L	9.5	-
5	BOD (5)	mg/L	0.92	30
6	COD (Cr)	mg/L	< 0.7	125
7	Total coliform	MPN/ 100ml	54,000	400
8	Oil and grease	mg/L	< 3.1	10
9	Chromium	mg/L	≤ 0.002	0.500
10	Escherichia Coli	MPN/ 100 ml	< 1.8	(100)** (MPN/100ml)
11	Flow Rate	m ³ /s	-	-

**Note: Based on the water utilization at monitoring point for ground water, B1(Irrigation water) of National Technical Regulation on Surface Water Quality in Vietnam (No. QCVN 08: 2008/ BTNMT) is set as a reference value of self-monitoring for ground water monitoring.

Source: Myanmar Koei International Ltd.

CHAPTER 3: CONCLUSION AND RECOMMENDATIONS

As described in Chapter 2 (Section 2.5), parameter of SS (SW-2, SW-3, SW-4 and SW-9) and total coliform (SW-2, SW-3, SW-4, SW-7 and SW-9) in surface water were exceeded the target value in this monitoring period for construction stage of Thilawa SEZ Zone B.

There are some possible reasons for exceeding the target values of SS (SW-2, SW-3, SW-4 and SW-9) and total coliform (SW-2, SW-3, SW-4, SW-7 and SW-9) are by i) natural origin such as natural bacteria existed in discharged creek because there are various kinds of vegetation and creature such as birds, and small animals in and along the discharged creek and ii) wastewater from the local industrial zone outside of Thilawa SEZ and surface water run-off from bare land in Zone B and iii) delivered from surrounding area by tidal effect. As for the parameter of total coliform in ground water GW-2 was exceeded the target value of reference tube well in monastery. As mentioned in Section 2.5-1, the result of self-monitoring of E-Coli at SW-2, SW-3, SW-4, SW-7, SW-9 and GW-2 were under the reference value. Therefore, although the target value of total coliform was exceeded at main discharging point and reference monitoring point, but it is considered that there is no significant impact on human health. As for parameter of total coliform exceeded the target value of reference tube well (GW-2), expected reasons are poor maintenance of well, not operated regularly, not used by local people. It will be recommended to test the tube well for total coliform every year. However, it cannot reach to the conclusion of what is the reason to be exceeded the target values, thus the continuous monitoring and yearly trend analysis will be necessary to carry out based on the rainy and dry season data.

As for future subject for main discharging points of Thilawa SEZ Zone B, the following action may be taken to carry out the appropriate water quality monitoring:

- To continue monitoring Escherichia coli (E. coli) level to identify health impact by coliform bacteria; and
- To monitor the possibility of the overflow water from construction sites.

End of the Document



APPENDIX-1 FIELD SURVEY PHOTOS



FOR DISCHARGING POINT OF THILAWA SEZ ZONE B



Surface water sampling and onsite measurement at SW-7

**FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH
DISCHARGING POINTS AND BASELINE OF DISCHARGED CREEK**



Surface water sampling and onsite measurement at SW-2



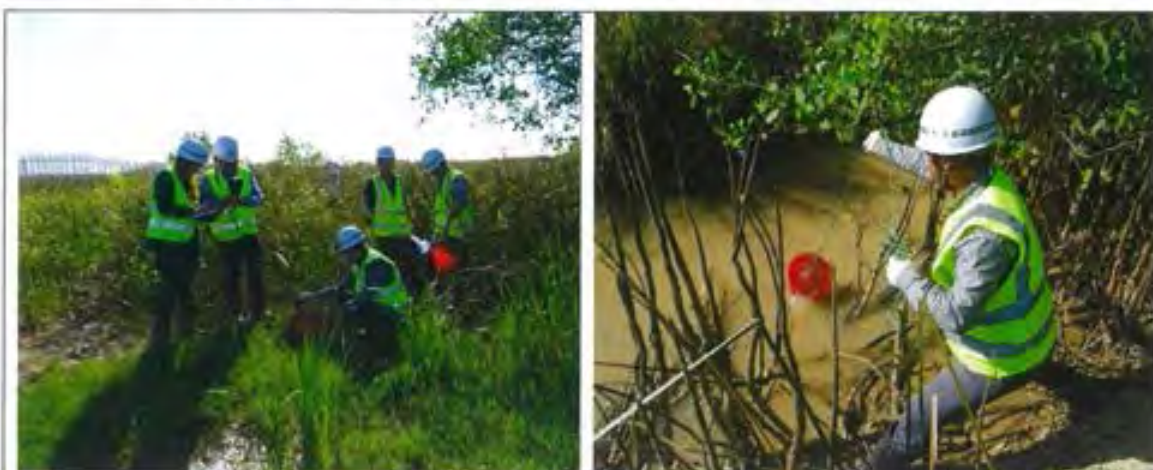
Surface water sampling and onsite measurement at SW-3



Surface water sampling and onsite measurement at SW-4



Surface water sampling at SW-8 (There is no water during monitoring period)



Surface water sampling and onsite measurement at SW-9



Ground water sampling and onsite measurement at GW-2

APPENDIX-2 LABORATORY RESULTS



FOR DISCHARGING POINT

DOWA

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Doc No: GEM-LB-00048/00
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Report No. : GEM-LAB-201811008
Revision No. : 1
Report Date : 2 November, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No. 1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-7-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810157 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	32.00	-
2	BOD (5)	APHA 5210 B (5-Days BOD Test)	mg/l	1.99	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	2.6	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	830	1.8
5	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
6	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.014	0.002

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin
Assistant supervisor



Approved By :

Tomoya Suzuki
Director

**FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH
DISCHARGING POINTS AND BASELINE OF DISCHARGED CREEK**



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Phone No. Fax No: (+95) 1 2309051



Report No. : GEM-LAB-201811005
Revision No. : 1
Report Date : 2 November, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thicar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-2-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810154 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	92.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	7.07	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	13.9	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	7.0	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.11	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	> 160000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	7.05	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	2	0
9	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
10	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.012	0.002

Remark : LOQ - Limit of Quantitation

APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin

Assistant supervisor

**LAB
GEM**

Approved By :

Tomoya Suzuki

Director





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Report No. : GEM-LAB-201811006
Revision No. : 1
Report Date : 2 November, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koel International LTD (MKI)
Address : No. 1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-3-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810155 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	206.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	2.55	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	14.5	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	4.0	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.16	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	> 150000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	4.91	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1.4	0.0
9	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
10	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.022	0.002

Remark : LOQ - Limit of Quantitation

APHA - American Public Health Association, the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin
Assistant supervisor



Approved By :

Tomoya Suzuki
Director





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Report No. : GEM-LAB-201811007
Revision No. : 1
Report Date : 2 November, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koel International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Dokaleta Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-4-1018 Sampling Date : 16 October, 2018
Sample No. : W-1810156 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	232.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	2.62	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	9.4	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	3.0	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.10	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	92000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	3.90	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1.4	0.0
9	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
10	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.022	0.002

Remark : LOQ - Limit of Quantitation

APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin
Assistant supervisor



Approved By :

Tomoya Suzuki
Director



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Report No. : GEM-LAB-201811011
Revision No. : 1
Report Date : 2 November, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A/28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-9-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810160 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	152.00	—
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	1.95	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	9.5	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	> 160000	1.8
5	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
6	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.018	0.002

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin
Assistant supervisor

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GEM**

Approved By :

Tomoya Suzuki
Director





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Report No. : GEM-LAB-201811009
Revision No. : 1
Report Date : 2 November, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-GW-2-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810158 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	6.00	—
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	0.92	0.00
3	COO (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	< 0.7	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	54000	1.8
5	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
6	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin
Assistant supervisor



Approved By :

Tomoya Suzuki
Director



**APPENDIX-3 LABORATORY RESULT OF ESCHERICHIA COLI
(SELF-MONITORING)**



FOR DISCHARGING POINT

DOWA

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Report No. : GEM-LAB-201810242
Revision No. : 1
Report Date : 30 October, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description :

Sample Name : MKI-SWF-7-1018

Sampling Date : 16 October, 2018

Sample No. : W-1810147

Sampling By : Customer

Waste Profile No. : -

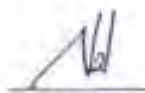
Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	11.0	1.8

Remark : LOQ - Limit of Quantitation

APHA : American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :



Ni Ni Aye Lwin
Assistant supervisor



Approved By :



Kei Nagata
Senior Manager



**FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH
DISCHARGING POINTS AND BASELINE OF DISCHARGED CREEK**



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Report No. : GEM-LAB-201810239
Revision No. : 1
Report Date : 30 October, 2018
Application No. : 0049-C001

Analysis Report

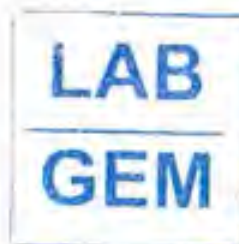
Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-2-1016
Sample No. : W-1610144
Waste Profile No. :
Sampling Date : 16 October, 2018
Sampling By : Customer
Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9223-F Escherichia Coli Membrane Using Fluorogenic Substrate	MPN/100ml	2.0	1.8

Remark : LOQ : Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

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Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY October-2018)

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Doc No: GEM-LB-0001/00
Page 5 of 10

Report No. : GEM-LAB-201810240
Revision No. : 1
Report Date : 30 October, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-3-1016 Sampling Date : 15 October, 2018
Sample No. : W-1810145 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 15 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	79.0	1.8

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :



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Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY October-2018)

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Report No. : GEM-LAB-201810241
Revision No. : I
Report Date : 30 October, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-4-1016
Sample No. : W-1810146
Waste Profile No. :
Sampling Date : 16 October, 2018
Sampling By : Customer
Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure using Fluorogenic Substrate	MPN/100ml	63.0	1.8

Remark : LOQ : Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF). Standard Methods for the Examination of Water and Wastewater, 22nd edition

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Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY October-2018)

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Doc No. GEM-LB-R004L/00
Page 10 of 10

Report No. : GEM-LAB-201810245
Revision No. : 1
Report Date : 30 October, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-9-1016
Sample No. : W-1810150
Waste Profile No. :
Sampling Date : 16 October, 2018
Sampling By : Customer
Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	140.0	1.8

Remark : LOQ : Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

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Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY October-2018)



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Report No. : GEM-LAB-201810243
Revision No. : 1
Report Date : 30 October, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description :
Sample Name : MKI-GW-2-1016
Sample No. : W-1610148
Waste Profile No. : -

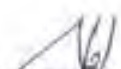
Sampling Date : 16 October, 2018
Sampling By : Customer
Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	< 1.8	1.8

Remarks : LOQ – Limit of Quantitation
APHA : American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF). Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Approved By :


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Assistant supervisor




Kei Nagata
Senior Manager



**Thilawa Special Economic Zone (Zone B)
Development Project –Phase 1 & 2**

Appendix

Air Quality Monitoring Report

September 2018

**AIR QUALITY MONITORING
REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
THILAWA SEZ ZONE B
(PHASE 1 & 2 CONSTRUCTION STAGE)

(QUARTERLY MONITORING)**

**September 2018
Myanmar Koei International Ltd.**



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CHAPTER 1: OUTLINES AND SUMMARY OF MONITORING PLAN

1.1 General

Thilawa Special Economic Zone (TSEZ) is located in southern district of Yangon region and about 23 km southeast of Yangon city. As the developer of Thilawa SEZ, Myanmar Japan Thilawa Development Ltd. (MJTD) has a responsibility to carry out regular environmental monitoring in the industrial area of Zone B in accordance with the approved Environmental Impact Assessment (EIA) report with Environmental Management Plan (EMP). MJTD has implemented monitoring various environmental items with the specified time frame to know the environmental conditions in and around the area.

1.2 Outlines of Monitoring Plan

To assess the environmental condition under the construction of industrial area in and around Thilawa SEZ Zone B, Air quality had been monitored from 4th September 2018 – 11th September 2018 as follows;

Table 1.2-1 Outlines of Air Quality Monitoring Plan

Monitoring Date	Monitoring Item	Parameters	Number of Point	Duration	Monitoring Methodology
From 4 th September – 11 th September, 2018	Air Quality	CO, NO ₂ , PM _{2.5} , PM ₁₀ and SO ₂	1	7 Days	On site measurement by Haz-Scanner Environmental Perimeter Air Station (EPAS)

CHAPTER 2: AIR QUALITY MONITORING

2.1 Monitoring Item

The parameters for air quality monitoring were CO, NO₂, PM_{2.5}, PM₁₀, and SO₂.

2.2 Monitoring Location

The air quality measurement equipment, "Haz-Scanner Environmental Perimeter Air Station (EPAS)" was set up at the south of the Thilawa SEZ Zone B, N: 16°39'24.20", E: 96°17'15.80", inside the monastery compound of Phalan village, surrounded by the residential houses of Phalan village in the south and fields in west, Thilawa SEZ Zone A in north, local Thilawa Industrial Zone in northeast, and construction of Thilawa SEZ Zone B in east and northeast respectively. The air quality monitoring is carried out above location where is near to the residential houses of Phalan village. Possible emission sources are dust emissions from construction activities and exhaust gas emissions from construction fuel-burning equipment and daily human activities in Phalan village. The location of air quality monitoring is shown in the Figure 2.2-1.



Figure 2.2-1 Location of Air Quality Monitoring Point

2.3 Monitoring Period

Air quality monitoring was conducted seven consecutive days from 4th September 2018 – 11th September, 2018.

2.4 Monitoring Method

Monitoring of CO, NO₂, PM_{2.5}, PM₁₀, and SO₂ were conducted by referring to the recommendation of the United States Environmental Protection Agency (U.S. EPA). The Haz-Scanner EPAS was used to collect ambient air pollutants. The EPAS measures automatically every one minute and directly read and recorded onsite for CO, NO₂, PM_{2.5}, PM₁₀, and SO₂. The state of air quality monitoring is shown in Figure 2.4-1.



Figure 2.4-1 Status of Air Quality Monitoring Point

2.5 Monitoring Results

The daily average value of air quality monitoring results of CO, NO₂, PM_{2.5}, PM₁₀, and SO₂ are described in Table 2.5-1. Comparing with the target value of CO, NO₂, PM_{2.5}, PM₁₀, and SO₂ prescribed in EIA report for Thilawa SEZ development project Zone B, concentration of CO, NO₂, PM_{2.5} and PM₁₀ were lower than the target value, while concentration of SO₂ measured results for seven days were exceeded than the target value.

Table 2.5-1 Air Quality Monitoring Result (Daily Average) During Construction and Non-Construction Period

Date	CO	NO ₂	PM _{2.5}	PM ₁₀	SO ₂
	Ppm	ppm	mg/m ³	mg/m ³	ppm
4 ~ 5 Sep, 2018	0.038 (0.044 mg/m ³)	0.046 (0.087 mg/m ³)	0.016	0.007	0.020 (0.053 mg/m ³)
5 ~ 6 Sep, 2018	0.034 (0.039 mg/m ³)	0.044 (0.083 mg/m ³)	0.015	0.007	0.023 (0.059 mg/m ³)
6 ~ 7 Sep, 2018	0.039 (0.044 mg/m ³)	0.041 (0.076 mg/m ³)	0.016	0.006	0.022 (0.058 mg/m ³)
7 ~ 8 Sep, 2018	0.053 (0.061 mg/m ³)	0.040 (0.076 mg/m ³)	0.012	0.007	0.022 (0.057 mg/m ³)
8 ~ 9 Sep, 2018	0.048 (0.055 mg/m ³)	0.039 (0.073 mg/m ³)	0.006	0.006	0.019 (0.049 mg/m ³)
9 ~ 10 Sep, 2018	0.072 (0.083 mg/m ³)	0.040 (0.076 mg/m ³)	0.007	0.006	0.024 (0.062 mg/m ³)
10 ~ 11 Sep, 2018	0.051 (0.059 mg/m ³)	0.041 (0.078 mg/m ³)	0.009	0.005	0.022 (0.058 mg/m ³)
7 Days Average Value	0.048 (0.055 mg/m ³)	0.042 (0.078 mg/m ³)	0.012	0.006	0.022 (0.057 mg/m ³)
Target Value	9.000 (10.26 mg/m ³) ^{*)}	0.050 (0.1 mg/m ³) ^{*)}	0.025	0.050	0.008 (0.02 mg/m ³) ^{*)}

Note: The target value of CO, NO₂ and SO₂ were converted to ppm units from mg/m³. Red color mentions the exceeded value for SO₂.

Construction activities of Thilawa SEZ Zone B are described in Table 2.5-2, SO₂ result during construction period are described in Table 2.5-3. During construction period, seven days average value for SO₂ were exceeded the target value and (Day 1 to Day 7) daily average results were also exceeded the target value.

Table 2.5-2 Construction Activities of Thilawa SEZ Zone B

Date	Time	Type	Construction Activities
4 th September 2018	8:30-17:00	Excavator, Skat, Car Crane	Road 7 and STP area Soft soil removing and preparation of drainage General use
5 th September 2018	8:00-17:00	Excavator, Skat, Car Crane	STP area Steel plate placing and access repairing work General use
6 th September 2018	8:00-17:00	Excavator, Skat, Car Crane	STP area Steel plate placing, access repairing work and soft soil removing work General use
7 th September 2018	8:00-17:00	Excavator, Skat, Car Crane	STP area Fencing work, excavation work, backfilling work and water drain preparation General use
8 th September 2018	8:00 – 17:00	Excavator, Skat, Car Crane	STP area Backfilling work General use
9 th September 2018	9:00 – 17:00	Sunday & No Machine Using	
10 th September 2018	9:00 – 17:00	Excavator, Skat, Car Crane	STP area and RBC 25 area Fence footing and column installation Water dyke and drain preparation work General use
11 th September 2018	8:30 – 17:00	Excavator, Skat, Car Crane	STP, Road-7 and Road 14 area Soil leveling, steel plate placing and access preparing General use

Table 2.5-3 SO₂ Results (During Construction Period)

Day	Construction Time for each day	SO ₂
		ppm
Day 1	8:30 – 17:00	0.020
Day 2	8:00 – 17:00	0.024
Day 3	8:00 – 17:00	0.025
Day 4	8:00 – 17:00	0.022
Day 5	8:00 – 17:00	0.021
Day 6	9:00 – 17:00	0.031
Day 7	8:30 – 17:00	0.025
7 days Average value	-	0.024
Target Value	-	0.008

Note: Red color mentions the exceeded value than target value



Wind direction and wind speed were measured at AQ-1. Hourly average values of measured wind direction and wind speed data are described in Appendix 1. Status of air quality monitoring point and wind direction are described in Figure 2.5-1. Depending on the wind direction, West-Northwest (WNW), Northwest (NW), North-Northwest (NNW), North (N), North-Northeast (NNE), Northeast (NE), East-Northeast (ENE) and East (E) directions are assumed come from the construction site of Zone B.



Figure 2.5-1 Status of Air Quality Monitoring Point and Wind Direction

Remark: **N** North **NNE** North-Northeast **NE** Northeast **ENE** East-Northeast **E** East **ESE** East-Southeast **SE** Southeast **SSE** South-Southeast **S** South **SSW** South-Southwest **SW** Southwest **WSW** West-Southwest **W** West **WNW** West-Northwest **NW** Northwest **NNW** North-Northwest

Overall summary of total exceeded hours for Day 1 to Day 7 during construction and non-construction time for SO₂ are shown in Table 2.5-4. The summary of wind direction at AQ-1 is shown in figure 2.5-5. Based on the summary table of total exceeded hours for SO₂ the total exceeded hours for seven days during construction and non-construction were 164 hours but exceeded hours for construction time was 57 hours. After detailed analyzed the SO₂ exceeded time according to the wind direction during construction period, 12 exceeded hours are come from Zone B and 45 exceeded hours are come from other sides of Zone B. And then according to the summary of wind direction at AQ-1, 90.4% are come from outside of Zone B and 9.6% are come from inside of Zone B. Possible emission sources are affected from the combustion of fuel for vehicles from nearby roads, construction activities of Zone B, operation activities of Myanmar International Terminals Thilawa Port, operation activities of local industrial zone.

Table 2.5-4 Summary of Total Exceeded Hours for Day 1 to Day 7 During Construction and Non-Construction Period for SO₂

SO ₂								
	Construction Time for each day	Total Exceeded Hours	Construction Period exceeded hours	Non-construction Period exceeded hours	Non-construction Period (wind from Zone B)	Non-construction Period (wind from other sides)	Construction Period (wind from Zone B)	Construction Period (wind from other sides)
Day-1	8:30 - 17:00	23	8	15	3	12	2	6
Day-2	8:00 - 17:00	24	9	15	0	15	0	9
Day-3	8:00 - 17:00	24	9	15	2	13	0	9
Day-4	8:00 - 17:00	23	8	15	3	12	5	3
Day-5	8:00 - 17:00	22	6	16	3	13	5	1
Day-6	9:00 - 17:00	24	8	16	2	14	0	8
Day-7	8:30 - 17:00	24	9	15	0	15	0	9
Total		164	57	107	13	94	12	45

Note: Red color is referred to the construction period exceeded hours and construction period (wind from Zone B).

Table 2.5-5 Summary of Wind Direction at AQ-1

Wind Direction	All Day	Day Time	Night Time	Inside/Outside Zone B	
N	0.8%	0.6%	1.0%	6.4%	Inside Zone B
NNE	0.3%	0.0%	0.6%		
NE	0.5%	0.0%	1.0%		
ENE	1.3%	0.0%	2.8%		
E	3.5%	2.6%	4.6%		
ESE	4.8%	4.4%	5.2%	90.4%	Outside Zone B
SE	5.7%	4.8%	6.6%		
SSE	8.7%	7.2%	10.3%		
S	6.1%	5.2%	7.2%		
SSW	5.4%	3.9%	7.0%		
SW	5.2%	3.1%	7.4%		
WSW	11.6%	13.1%	9.9%		
W	28.7%	35.9%	21.1%		
WNW	14.3%	16.3%	12.1%		
NW	2.4%	2.8%	2.0%	3.2%	Inside Zone B
NNW	0.8%	0.2%	1.4%		

CHAPTER 3: CONCLUSION AND RECOMMENDATION

The result of air quality of CO, NO₂, PM_{2.5} and PM₁₀ during seven days monitoring were not exceeded the target value, thus there are no impacts on the surrounding environments. On the other hand, concentration of SO₂ measured results for daily average results were exceeded than the target value. In addition, SO₂ level measured for seven days consecutive measurement in this monitoring period are higher than the target value.

During the seven days monitoring period, 164 hours results were exceeded for SO₂. According to wind direction of Zone B during the construction period, total 57 exceeded hours are during construction period, 45 exceeded hours are come from outside of Zone B and 12 exceeded hours are come from Zone B. And then according to the summary of wind direction at AQ-1, 90.4% are come from outside of Zone B and 9.6% are come from inside of Zone B. Possible emission sources are affected from operation activities of Myanmar International Terminals Thilawa Port, operation activities of local industrial zone, the combustion of fuel for vehicles from nearby roads, construction activities of Zone B.

In the public health statement SO₂ reported by ATSDR (Agency for Toxic Substances and Disease Registry) in US, 100 ppm (261.8 mg/m³) SO₂ is considered immediately dangerous to life and health (short term). Lung function changes observed when 0.4 to 3 ppm (1.05mg/m³ to 7.85 mg/m³) exposure for 20 years or more (long term). Therefore, the significant impact on SO₂ contamination was not expected.

As for future subject for air quality monitoring in Zone B, the following action may be taken to achieve the target level:

- 1) To control the speed limit of all machinery & vehicle (25 km/hr) on site to avoid excessive dust creation and to minimize air pollution by the exhaust fumes.
- 2) To conduct the proper operation (stop idling while no operation).
- 3) To implement the regular maintenance of machine used for construction activities.
- 4) To give the machinery awareness training to workers.
- 5) To check and maintain the generator regularly.

The continuous monitoring will be necessary to grasp the environmental conditions in construction stage of Thilawa SEZ Zone B. The mitigation measures for environmental management will be considered in collected periodical environmental data has been reviewed in future.



APPENDIX - HOURLY AIR RESULTS



Date	Time	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Wind Speed	Wind Direction	
		ppm	ppm	mg/m ³	mg/m ³	ppm	kph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
04 Sep. 2018	10:00 ~ 10:59	0.001	0.043	0.003	0.001	0.003	1.50	274	W
04 Sep. 2018	11:00 ~ 11:59	0.022	0.057	0.033	0.006	0.029	1.08	285	WNW
04 Sep. 2018	12:00 ~ 12:59	0.006	0.053	0.038	0.002	0.022	1.75	277	W
04 Sep. 2018	13:00 ~ 13:59	0.004	0.050	0.007	0.004	0.018	0.47	262	W
04 Sep. 2018	14:00 ~ 14:59	0.136	0.045	0.019	0.015	0.024	0.18	242	WSW
04 Sep. 2018	15:00 ~ 15:59	0.039	0.043	0.017	0.009	0.023	0.55	284	WNW
04 Sep. 2018	16:00 ~ 16:59	0.047	0.043	0.020	0.007	0.021	0.55	278	W
04 Sep. 2018	17:00 ~ 17:59	0.045	0.046	0.022	0.025	0.019	1.02	275	W
04 Sep. 2018	18:00 ~ 18:59	0.038	0.048	0.024	0.008	0.016	1.50	281	W
04 Sep. 2018	19:00 ~ 19:59	0.028	0.047	0.013	0.025	0.014	0.47	282	WNW
04 Sep. 2018	20:00 ~ 20:59	0.006	0.049	0.018	0.018	0.021	0.93	285	WSW
04 Sep. 2018	21:00 ~ 21:59	0.019	0.040	0.014	0.007	0.026	1.00	286	WNW
04 Sep. 2018	22:00 ~ 22:59	0.019	0.046	0.009	0.003	0.023	0.42	246	WSW
04 Sep. 2018	23:00 ~ 23:59	0.035	0.046	0.016	0.013	0.015	0.58	281	W
05 Sep. 2018	0:00 ~ 0:59	0.024	0.044	0.011	0.005	0.017	0.22	248	WSW
05 Sep. 2018	1:00 ~ 1:59	0.020	0.045	0.009	0.001	0.016	1.12	263	W
05 Sep. 2018	2:00 ~ 2:59	0.053	0.048	0.012	0.004	0.022	1.20	274	W
05 Sep. 2018	3:00 ~ 3:59	0.017	0.045	0.015	0.005	0.021	1.08	274	SW
05 Sep. 2018	4:00 ~ 4:59	0.022	0.046	0.013	0.005	0.017	1.22	271	W
05 Sep. 2018	5:00 ~ 5:59	0.030	0.046	0.014	0.008	0.022	2.45	279	W
05 Sep. 2018	6:00 ~ 6:59	0.037	0.046	0.005	0.002	0.011	1.50	277	W
05 Sep. 2018	7:00 ~ 7:59	0.072	0.048	0.005	0.009	0.024	0.58	270	W
05 Sep. 2018	8:00 ~ 8:59	0.073	0.048	0.023	0.006	0.018	1.15	274	W
05 Sep. 2018	9:00 ~ 9:59	0.027	0.044	0.017	0.015	0.027	1.55	275	W

Max	0.136 (0.136 mg/m ³)	0.057 (0.057 mg/m ³)	0.034	0.016	0.071 (0.071 mg/m ³)
Avg	0.038 (0.044 mg/m ³)	0.046 (0.047 mg/m ³)	0.016	0.007	0.020 (0.021 mg/m ³)
Min	0.001 (0.002 mg/m ³)	0.040 (0.034 mg/m ³)	0.003	0.001	0.003 (0.003 mg/m ³)

Date	Time	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Wind Speed	Wind Direction	
		ppm Hourly	ppm Hourly	µg/m ³ Hourly	µg/m ³ Hourly	ppm Hourly	kph Hourly	Deg Hourly	Direction Hourly
05 Sep. 2018	10:00 – 10:59	0.005	0.043	0.013	0.013	0.019	3.78	275	W
05 Sep. 2018	11:00 – 11:59	0.013	0.040	0.005	0.002	0.026	4.90	272	W
05 Sep. 2018	12:00 – 12:59	0.040	0.035	0.004	0.005	0.019	3.00	272	W
05 Sep. 2018	13:00 – 13:59	0.042	0.037	0.013	0.003	0.029	4.05	246	WSW
05 Sep. 2018	14:00 – 14:59	0.037	0.026	0.004	0.002	0.026	3.25	254	WSW
05 Sep. 2018	15:00 – 15:59	0.055	0.030	0.005	0.014	0.023	0.02	227	SW
05 Sep. 2018	16:00 – 16:59	0.037	0.021	0.003	0.004	0.023	0.67	193	SSW
05 Sep. 2018	17:00 – 17:59	0.039	0.037	0.007	0.006	0.026	0.92	183	S
05 Sep. 2018	18:00 – 18:59	0.066	0.049	0.019	0.001	0.019	0.75	211	SSW
05 Sep. 2018	19:00 – 19:59	0.072	0.046	0.013	0.003	0.014	0.70	188	S
05 Sep. 2018	20:00 – 20:59	0.017	0.046	0.015	0.013	0.020	0.53	168	SSE
05 Sep. 2018	21:00 – 21:59	0.043	0.049	0.016	0.006	0.027	0.38	157	SSE
05 Sep. 2018	22:00 – 22:59	0.035	0.048	0.017	0.010	0.025	0.33	137	S
05 Sep. 2018	23:00 – 23:59	0.028	0.055	0.014	0.004	0.025	0.40	161	S
06 Sep. 2018	0:00 – 0:59	0.015	0.048	0.014	0.003	0.024	0.48	144	SE
06 Sep. 2018	1:00 – 1:59	0.033	0.043	0.020	0.008	0.026	0.65	154	SSE
06 Sep. 2018	2:00 – 2:59	0.019	0.042	0.019	0.007	0.021	0.53	214	SSW
06 Sep. 2018	3:00 – 3:59	0.029	0.046	0.021	0.006	0.019	0.35	255	WSW
06 Sep. 2018	4:00 – 4:59	0.056	0.048	0.009	0.001	0.015	0.85	264	W
06 Sep. 2018	5:00 – 5:59	0.008	0.043	0.006	0.005	0.017	0.10	155	SSE
06 Sep. 2018	6:00 – 6:59	0.100	0.051	0.022	0.006	0.024	0.16	135	SE
06 Sep. 2018	7:00 – 7:59	0.016	0.048	0.033	0.008	0.024	0.50	153	SSE
06 Sep. 2018	8:00 – 8:59	0.040	0.051	0.027	0.010	0.029	0.61	143	SE
06 Sep. 2018	9:00 – 9:59	0.028	0.042	0.026	0.017	0.021	0.83	144	SE

Max	0.100 (0.114 mg/m ³)	0.055 (0.104 mg/m ³)	0.033	0.017	0.029 (0.077 mg/m ³)
Avg	0.034 (0.079 mg/m ³)	0.044 (0.093 mg/m ³)	0.015	0.007	0.023 (0.059 mg/m ³)
Min	0.008 (0.009 mg/m ³)	0.026 (0.060 mg/m ³)	0.004	0.001	0.014 (0.038 mg/m ³)

Date	Time	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Wind Speed	Wind Direction	
		ppm	ppm	µg/m ³	µg/m ³	ppm	kph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
06 Sep. 2018	10:00 - 10:59	0.027	0.038	0.016	0.007	0.017	0.88	119	ESE
06 Sep. 2018	11:00 - 11:59	0.029	0.037	0.013	0.013	0.020	0.73	134	SE
06 Sep. 2018	12:00 - 12:59	0.044	0.034	0.002	0.004	0.032	0.82	152	SSE
06 Sep. 2018	13:00 - 13:59	0.032	0.034	0.005	0.004	0.029	0.58	184	S
06 Sep. 2018	14:00 - 14:59	0.022	0.029	0.013	0.001	0.032	0.93	152	SSE
06 Sep. 2018	15:00 - 15:59	0.030	0.024	0.010	0.005	0.031	0.85	156	SSE
06 Sep. 2018	16:00 - 16:59	0.022	0.033	0.003	0.002	0.017	0.85	153	SSE
06 Sep. 2018	17:00 - 17:59	0.028	0.036	0.004	0.007	0.012	1.50	249	WSW
06 Sep. 2018	18:00 - 18:59	0.219	0.045	0.006	0.002	0.037	0.24	273	W
06 Sep. 2018	19:00 - 19:59	0.078	0.041	0.011	0.004	0.024	0.13	162	SSE
06 Sep. 2018	20:00 - 20:59	0.090	0.043	0.016	0.002	0.011	0.02	222	SW
06 Sep. 2018	21:00 - 21:59	0.019	0.043	0.012	0.003	0.012	0.20	179	S
06 Sep. 2018	22:00 - 22:59	0.030	0.045	0.013	0.003	0.021	0.02	246	WSW
06 Sep. 2018	23:00 - 23:59	0.086	0.043	0.009	0.002	0.027	0.00	233	WSW
07 Sep. 2018	0:00 - 0:59	0.018	0.042	0.011	0.003	0.018	0.10	169	SSE
07 Sep. 2018	1:00 - 1:59	0.017	0.042	0.018	0.008	0.017	0.02	86	E
07 Sep. 2018	2:00 - 2:59	0.004	0.042	0.018	0.002	0.019	0.02	177	S
07 Sep. 2018	3:00 - 3:59	0.003	0.048	0.022	0.018	0.020	0.00	204	SSW
07 Sep. 2018	4:00 - 4:59	0.000	0.040	0.027	0.006	0.017	0.10	243	WSW
07 Sep. 2018	5:00 - 5:59	0.028	0.047	0.029	0.007	0.026	0.80	293	WNW
07 Sep. 2018	6:00 - 6:59	0.004	0.046	0.032	0.019	0.032	0.08	284	WNW
07 Sep. 2018	7:00 - 7:59	0.036	0.043	0.040	0.009	0.021	0.73	278	W
07 Sep. 2018	8:00 - 8:59	0.012	0.041	0.024	0.012	0.024	0.88	268	W
07 Sep. 2018	9:00 - 9:59	0.033	0.037	0.020	0.005	0.024	1.23	275	W

Max	0.219 (0.251 mg/m ³)	0.048 (0.091 mg/m ³)	0.032	0.013	0.032 (0.063 mg/m ³)
Avg	0.039 (0.044 mg/m ³)	0.041 (0.070 mg/m ³)	0.016	0.006	0.022 (0.028 mg/m ³)
Min	0.000 (0.000 mg/m ³)	0.025 (0.048 mg/m ³)	0.002	0.003	0.011 (0.029 mg/m ³)



Date	Time	CO	NO ₂	PM ₁₀	PM _{2.5}	SO ₂	Wind Speed	Wind Direction	
		ppm	ppm	mg/m ³	mg/m ³	ppm	kph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
07 Sep. 2018	10:00 ~ 10:59	0.071	0.040	0.003	0.006	0.030	1.75	278	W
07 Sep. 2018	11:00 ~ 11:59	0.078	0.034	0.002	0.003	0.028	1.60	283	WSW
07 Sep. 2018	12:00 ~ 12:59	0.073	0.029	0.002	0.001	0.031	0.93	293	WNW
07 Sep. 2018	13:00 ~ 13:59	0.049	0.020	0.003	0.003	0.019	0.83	305	NW
07 Sep. 2018	14:00 ~ 14:59	0.033	0.027	0.015	0.018	0.019	0.55	263	W
07 Sep. 2018	15:00 ~ 15:59	0.036	0.033	0.002	0.008	0.016	1.40	85	E
07 Sep. 2018	16:00 ~ 16:59	0.031	0.037	0.010	0.001	0.007	0.93	99	E
07 Sep. 2018	17:00 ~ 17:59	0.086	0.039	0.000	0.002	0.032	0.30	191	S
07 Sep. 2018	18:00 ~ 18:59	0.084	0.045	0.001	0.003	0.019	0.38	264	W
07 Sep. 2018	19:00 ~ 19:59	0.024	0.039	0.009	0.005	0.015	0.16	195	SSW
07 Sep. 2018	20:00 ~ 20:59	0.019	0.045	0.010	0.001	0.017	0.08	206	SSW
07 Sep. 2018	21:00 ~ 21:59	0.051	0.045	0.017	0.004	0.013	0.35	289	WNW
07 Sep. 2018	22:00 ~ 22:59	0.015	0.047	0.003	0.007	0.020	0.70	285	WNW
07 Sep. 2018	23:00 ~ 23:59	0.002	0.043	0.006	0.018	0.020	1.07	283	WNW
08 Sep. 2018	0:00 ~ 0:59	0.017	0.045	0.011	0.012	0.020	0.87	252	WSW
08 Sep. 2018	1:00 ~ 1:59	0.036	0.046	0.014	0.006	0.022	0.12	253	WSW
08 Sep. 2018	2:00 ~ 2:59	0.150	0.045	0.026	0.010	0.020	0.09	191	S
08 Sep. 2018	3:00 ~ 3:59	0.009	0.043	0.021	0.008	0.017	0.17	241	WSW
08 Sep. 2018	4:00 ~ 4:59	0.001	0.046	0.017	0.004	0.025	0.15	262	W
08 Sep. 2018	5:00 ~ 5:59	0.299	0.047	0.031	0.004	0.030	0.48	263	W
08 Sep. 2018	6:00 ~ 6:59	0.031	0.046	0.032	0.004	0.024	1.17	274	W
08 Sep. 2018	7:00 ~ 7:59	0.047	0.043	0.025	0.010	0.026	0.80	281	W
08 Sep. 2018	8:00 ~ 8:59	0.032	0.043	0.020	0.016	0.022	0.95	278	W
08 Sep. 2018	9:00 ~ 9:59	0.047	0.039	0.009	0.011	0.027	0.72	289	WNW
Max		0.299 (0.297 mg/m ³)	0.047 (0.046 mg/m ³)	0.032	0.018	0.032 (0.083 mg/m ³)			
Avg		0.053 (0.061 mg/m ³)	0.040 (0.029 mg/m ³)	0.012	0.007	0.022 (0.057 mg/m ³)			
Min		0.000 (0.000 mg/m ³)	0.020 (0.017 mg/m ³)	0.000	0.001	0.007 (0.018 mg/m ³)			



Date	Time	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Wind Speed	Wind Direction	
		ppm	ppm	µg/m ³	µg/m ³	ppm	mph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
08 Sep. 2018	10:00 ~ 10:59	0.070	0.028	0.002	0.002	0.023	0.72	293	WNW
08 Sep. 2018	11:00 ~ 11:59	0.084	0.029	0.002	0.002	0.016	0.78	294	WNW
08 Sep. 2018	12:00 ~ 12:59	0.103	0.028	0.002	0.001	0.021	1.12	282	WNW
08 Sep. 2018	13:00 ~ 13:59	0.086	0.026	0.002	0.003	0.023	1.25	281	WNW
08 Sep. 2018	14:00 ~ 14:59	0.098	0.029	0.013	0.007	0.006	0.58	287	WSW
08 Sep. 2018	15:00 ~ 15:59	0.036	0.026	0.008	0.012	0.016	0.63	281	W
08 Sep. 2018	16:00 ~ 16:59	0.011	0.024	0.002	0.006	0.018	0.35	286	WNW
08 Sep. 2018	17:00 ~ 17:59	0.152	0.028	0.002	0.001	0.017	0.53	169	S
08 Sep. 2018	18:00 ~ 18:59	0.029	0.026	0.002	0.002	0.008	0.47	130	SE
08 Sep. 2018	19:00 ~ 19:59	0.051	0.038	0.016	0.002	0.014	0.08	181	S
08 Sep. 2018	20:00 ~ 20:59	0.086	0.044	0.016	0.004	0.019	0.32	147	SSE
08 Sep. 2018	21:00 ~ 21:59	0.020	0.030	0.004	0.001	0.019	0.17	135	SE
08 Sep. 2018	22:00 ~ 22:59	0.049	0.046	0.015	0.002	0.022	0.10	171	S
08 Sep. 2018	23:00 ~ 23:59	0.019	0.042	0.001	0.003	0.015	0.08	148	SSE
09 Sep. 2018	0:00 ~ 0:59	0.009	0.043	0.008	0.014	0.023	0.03	161	SSE
09 Sep. 2018	1:00 ~ 1:59	0.021	0.049	0.004	0.006	0.020	0.07	161	SSE
09 Sep. 2018	2:00 ~ 2:59	0.025	0.047	0.024	0.005	0.024	0.10	80	NE
09 Sep. 2018	3:00 ~ 3:59	0.024	0.047	0.005	0.007	0.021	0.43	84	E
09 Sep. 2018	4:00 ~ 4:59	0.027	0.040	0.002	0.010	0.017	0.07	228	SW
09 Sep. 2018	5:00 ~ 5:59	0.073	0.044	0.016	0.011	0.027	6.18	129	SE
09 Sep. 2018	6:00 ~ 6:59	0.087	0.045	0.007	0.013	0.022	0.10	143	SE
09 Sep. 2018	7:00 ~ 7:59	0.037	0.044	0.002	0.004	0.020	0.72	119	ESE
09 Sep. 2018	8:00 ~ 8:59	0.013	0.039	0.008	0.013	0.021	1.15	173	S
09 Sep. 2018	9:00 ~ 9:59	0.007	0.049	0.002	0.004	0.021	0.52	283	WNW

Max	0.152 (0.174 mg/m ³)	0.050 (0.094 mg/m ³)	0.024	0.014	0.027 (0.075 mg/m ³)
Avg	0.048 (0.055 mg/m ³)	0.038 (0.073 mg/m ³)	0.006	0.006	0.019 (0.049 mg/m ³)
Min	0.007 (0.008 mg/m ³)	0.028 (0.046 mg/m ³)	0.000	0.001	0.006 (0.016 mg/m ³)



Date	Time	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Wind Speed	Wind Direction	
		ppm	ppm	mg/m ³	mg/m ³	ppm	kph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
09 Sep, 2018	10:00 – 10:59	0.104	0.049	0.004	0.006	0.017	0.23	304	SSW
09 Sep, 2018	11:00 – 11:59	0.029	0.035	0.001	0.009	0.024	0.73	250	WSW
09 Sep, 2018	12:00 – 12:59	0.045	0.025	0.002	0.001	0.053	0.68	257	WSW
09 Sep, 2018	13:00 – 13:59	0.052	0.029	0.006	0.007	0.013	0.63	258	WSW
09 Sep, 2018	14:00 – 14:59	0.076	0.023	0.012	0.004	0.025	0.85	228	SW
09 Sep, 2018	15:00 – 15:59	0.062	0.027	0.010	0.007	0.026	1.72	226	W
09 Sep, 2018	16:00 – 16:59	0.065	0.045	0.002	0.006	0.018	0.58	250	WSW
09 Sep, 2018	17:00 – 17:59	0.097	0.041	0.002	0.002	0.026	0.50	265	W
09 Sep, 2018	18:00 – 18:59	0.089	0.076	0.003	0.011	0.025	0.67	279	W
09 Sep, 2018	19:00 – 19:59	0.093	0.090	0.004	0.005	0.017	0.58	262	W
09 Sep, 2018	20:00 – 20:59	0.056	0.037	0.008	0.001	0.024	0.20	250	WSW
09 Sep, 2018	21:00 – 21:59	0.023	0.040	0.008	0.005	0.026	0.12	254	WSW
09 Sep, 2018	22:00 – 22:59	0.067	0.041	0.010	0.004	0.027	0.05	212	SSW
09 Sep, 2018	23:00 – 23:59	0.057	0.043	0.001	0.001	0.024	0.07	94	E
10 Sep, 2018	0:00 – 0:59	0.053	0.049	0.019	0.004	0.023	0.60	133	ESE
10 Sep, 2018	1:00 – 1:59	0.041	0.030	0.003	0.004	0.022	0.02	230	SW
10 Sep, 2018	2:00 – 2:59	0.030	0.048	0.026	0.002	0.022	0.00	97	E
10 Sep, 2018	3:00 – 3:59	0.027	0.045	0.006	0.004	0.024	0.00	112	ESE
10 Sep, 2018	4:00 – 4:59	0.054	0.046	0.007	0.001	0.024	0.00	142	SE
10 Sep, 2018	5:00 – 5:59	0.141	0.049	0.030	0.012	0.028	0.00	143	SE
10 Sep, 2018	6:00 – 6:59	0.143	0.044	0.009	0.005	0.021	0.00	192	SSW
10 Sep, 2018	7:00 – 7:59	0.103	0.046	0.002	0.003	0.028	0.12	132	SE
10 Sep, 2018	8:00 – 8:59	0.007	0.043	0.001	0.007	0.017	0.73	269	W
10 Sep, 2018	9:00 – 9:59	0.041	0.037	0.000	0.008	0.031	0.78	264	W

Max	0.194 (0.272 mg/m ³)	0.091 (0.097 mg/m ³)	0.030	0.015	0.033 (0.088 mg/m ³)
Avg	0.072 (0.083 mg/m ³)	0.040 (0.076 mg/m ³)	0.007	0.006	0.024 (0.062 mg/m ³)
Min	0.007 (0.008 mg/m ³)	0.023 (0.048 mg/m ³)	0.000	0.001	0.013 (0.034 mg/m ³)



Date	Time	CO	NO ₂	PM ₁₀	PM _{2.5}	SO ₂	Wind Speed	Wind Direction	
		ppm	ppm	µg/m ³	µg/m ³	ppm	kph	Dir	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
10 Sep. 2018	10:00 ~ 10:59	0.055	0.036	0.001	0.004	0.021	0.68	254	WSW
10 Sep. 2018	11:00 ~ 11:59	0.040	0.034	0.002	0.008	0.022	0.62	207	SSW
10 Sep. 2018	12:00 ~ 12:59	0.042	0.021	0.001	0.001	0.033	0.77	222	SW
10 Sep. 2018	13:00 ~ 13:59	0.120	0.029	0.006	0.008	0.031	1.50	277	W
10 Sep. 2018	14:00 ~ 14:59	0.103	0.038	0.009	0.006	0.022	0.92	272	W
10 Sep. 2018	15:00 ~ 15:59	0.069	0.034	0.010	0.004	0.027	0.65	247	WSW
10 Sep. 2018	16:00 ~ 16:59	0.063	0.042	0.002	0.009	0.023	1.80	279	W
10 Sep. 2018	17:00 ~ 17:59	0.080	0.041	0.006	0.002	0.028	1.48	277	W
10 Sep. 2018	18:00 ~ 18:59	0.036	0.043	0.005	0.002	0.026	0.48	281	W
10 Sep. 2018	19:00 ~ 19:59	0.141	0.041	0.024	0.009	0.036	0.72	276	W
10 Sep. 2018	20:00 ~ 20:59	0.006	0.046	0.020	0.002	0.020	0.80	286	SSW
10 Sep. 2018	21:00 ~ 21:59	0.048	0.042	0.021	0.003	0.021	0.05	271	W
10 Sep. 2018	22:00 ~ 22:59	0.037	0.049	0.019	0.003	0.016	0.03	214	SW
10 Sep. 2018	23:00 ~ 23:59	0.006	0.048	0.018	0.002	0.022	0.05	117	SE
11 Sep. 2018	0:00 ~ 0:59	0.010	0.043	0.017	0.006	0.019	0.07	210	SSW
11 Sep. 2018	1:00 ~ 1:59	0.026	0.047	0.016	0.005	0.018	0.03	257	WSW
11 Sep. 2018	2:00 ~ 2:59	0.030	0.047	0.008	0.006	0.014	0.07	260	W
11 Sep. 2018	3:00 ~ 3:59	0.029	0.046	0.004	0.007	0.016	0.12	243	WSW
11 Sep. 2018	4:00 ~ 4:59	0.033	0.046	0.001	0.007	0.023	0.00	134	S
11 Sep. 2018	5:00 ~ 5:59	0.076	0.050	0.009	0.008	0.026	0.03	308	SSW
11 Sep. 2018	6:00 ~ 6:59	0.127	0.048	0.004	0.002	0.028	0.02	299	SSW
11 Sep. 2018	7:00 ~ 7:59	0.016	0.043	0.003	0.002	0.009	0.70	278	W
11 Sep. 2018	8:00 ~ 8:59	0.028	0.037	0.003	0.009	0.022	1.12	278	W
11 Sep. 2018	9:00 ~ 9:59	0.043	0.031	0.001	0.004	0.026	1.22	276	W

Max	0.141 (0.162 mg/m ³)	0.050 (0.095 mg/m ³)	0.024	0.009	0.037 (0.087 mg/m ³)
Avg	0.051 (0.088 mg/m ³)	0.041 (0.075 mg/m ³)	0.009	0.005	0.022 (0.038 mg/m ³)
Min	0.006 (0.007 mg/m ³)	0.021 (0.039 mg/m ³)	0.001	0.001	0.009 (0.025 mg/m ³)



**Thilawa Special Economic Zone (Zone B)
Development Project –Phase 1 & 2**

Appendix

Noise and Vibration Monitoring Report

September 2018

**NOISE AND VIBRATION
MONITORING REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
THILAWA SEZ ZONE B
(PHASE 1 & 2 CONSTRUCTION STAGE)**

(QUARTERLY MONITORING)

**September 2018
Myanmar Koei International Ltd.**



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CHAPTER 1: OUTLINES AND SUMMARY OF MONITORING PLAN

1.1 General

Thilawa Special Economic Zone (TSEZ) is located in southern district of Yangon region and about 23 km southeast of Yangon city. As the developer of Thilawa SEZ, Myanmar Japan Thilawa Development Ltd. (MJTD) has a responsibility to carry out regular environmental monitoring in the industrial area of Zone B in accordance with the approved Environmental Impact Assessment (EIA) report with Environmental Management Plan (EMP). MJTD has implemented monitoring various environmental items with the specified time frame to know the environmental conditions in and around the area.

1.2 Outlines of Monitoring Plan

To assess the environmental condition under the construction of industrial area in and around Thilawa SEZ Zone B, noise and vibration levels had been monitored from 4th September 2018 – 6th September 2018 as follows;

Table 1.2-1 Outlines of Noise and Vibration Level Monitoring

Monitoring Date	Monitoring Item	Parameters	Number of Points	Duration	Monitoring Methodology
From 4 th September – 5 th September, 2018	Noise Level	$L_{Aeq}(dB)$	1 (NV-2)	24 hours	On-site measurement by "Rion NL-42 sound level meter"
From 5 th September – 6 th September, 2018	Noise Level	$L_{Aeq}(dB)$	1 (NV-1)	24 hours	On-site measurement by "Rion NL-42 sound level meter"
From 4 th September – 5 th September, 2018	Vibration Level	$L_{v10}(dB)$	1 (NV-2)	24 hours	On-site measurement by "Vibration Level Meter- VM-53A"
From 5 th September – 6 th September, 2018	Vibration Level	$L_{v10}(dB)$	1 (NV-1)	24 hours	On-site measurement by "Vibration Level Meter- VM-53A"



CHAPTER 2: NOISE AND VIBRATION LEVEL MONITORING

2.1 Monitoring Item

The noise and vibration level monitoring items are shown in Table 2.1-1.

Table 2.1-1 Monitoring Parameters for Noise and Vibration Level

No.	Item	Parameter
1	Noise	A-weighted loudness equivalent (L_{Aeq})
2	Vibration	Vibration level, vertical, percentile (L_{v10})

2.2 Monitoring Location

Noise and vibration levels were measured at the northeast corner of the Thilawa SEZ Zone B, monitoring point (NV-1); N: 16°40'18.22", E: 96°17'18.18" for traffic noise concerned and at the south of the Thilawa SEZ Zone B, monitoring point (NV-2); N: 16°39'24.90", E: 96°17'16.70", inside the monastery compound of Phalan village. The location of the noise and vibration monitoring points are shown in Figure 2.2-1.



Figure 2.2-1 Location of Noise and Vibration Level Monitoring Points

NV-1

NV-1 is located in front of temporary gate of construction site of Thilawa SEZ Zone B and next to Thilawa Development road. The surrounding area are Zone A in the northwest and local industrial zone in the east respectively. Possible sources of noise and vibration is generated from construction activities and road traffic.

NV-2

NV-2 is located at the south of the Thilawa SEZ Zone B, inside the monastery compound of Phalan village, surrounded by the residential houses of Phalan village in the south and fields in west, Thilawa SEZ Zone A in north, local industrial zone in northeast respectively. Possible sources of noise and vibration is generated from construction activities from Zone B and daily human activities from nearby Phalan village.

2.3 Monitoring Method

Noise level was measured by "Rion NL-42 sound level meter" and automatically recorded every 10 minutes in a memory card. The vibration level meter was, VM-53A (Rion Co. Ltd., Japan), accompanied by a 3-axis accelerometer PV-83C (Rion Co. Ltd.) was placed on solid soil ground. Vertical vibration (Z axis), L_v , was measured every 10 minutes within the adaptable range of (10-70) dB at NV-1 and (10-70) dB at NV-2 and recorded to a memory card.

The measurement period of noise and vibration was 24 hours for each monitoring point. The status of the noise and vibration level monitoring on NV-1 and NV-2 are shown in Figure 2.3-1.



Figure 2.3-1 Status of Noise and Vibration Level Monitoring at NV-1 and NV-2

2.4 Monitoring Results

Noise Monitoring Results

Noise monitoring results are separated daytime (6:00 AM to 10:00 PM), evening time (10:00 PM to 6:00 AM) time frames for NV-1 and daytime (7:00 AM to 7:00 PM), evening time (7:00 PM to 10:00 PM), and night time (10:00 PM to 7:00 AM) time frames respectively for NV-2. Noise measurement was carried out for one location on a 24-hour basis. The monitoring results are summarized in Table 2.4-1 and Table 2.4-2. Hourly noise level (L_{Aeq}) monitoring results at NV-1 and NV-2 are shown in Table 2.4-3 and Table 2.4-4. Figure 2.4-1 and 2.4-2 showed the results of noise level (L_{Aeq}) at NV-1 and NV-2. Comparing with the target value of noise level in construction stage prescribed in EIA report for Thilawa SEZ development project Zone B, all results were under the target values.

Table 2.4-1 Results of Noise Levels (L_{Aeq}) Monitoring at NV-1

Date	(Traffic Noise Level) Equivalent Noise Level (L_{Aeq} dB)	
	Day Time (6:00 AM – 10:00 PM)	Night Time (10:00 PM – 6:00 AM)
4 th September – 6 th September, 2018	60	54
Target Value	75	70

Note: Target value is applied in the noise standard along main road stipulated in the Noise Regulation Law (Japan) (Law No. 98 of 1968, Latest Amendment by Law No.91 of 2000).

Table 2.4-2 Results of Noise Levels (L_{Aeq}) Monitoring at NV-2

Date	(Residential area & monastery located less than 150m from the construction site) Equivalent Noise Level (L_{Aeq} dB)		
	Day Time (7:00 AM – 7:00 PM)	Evening Time (7:00 PM – 10:00 PM)	Night Time (10:00 PM – 7:00 AM)
4 th September – 6 th September, 2018	51	50	51
Target Value	75	60	55

Note: Target value is applied to the noise level during the construction stage in the EIA Report for Thilawa SEZ Development Project (Industrial Area of Zone B).

Table 2.4-3 Hourly Noise Level (L_{Aeq}) Monitoring Results at NV-1

Date	Time	(L_{Aeq} dB)	(L_{Aeq} dB) Each Category	(L_{Aeq} dB) Target Value	Remark	
5 th September – 6 th September 2018	6:00-7:00	57	60	75	No Construction Activity	
	7:00-8:00	61			Steel plate placing and access repairing work and general work.	
	8:00-9:00	62				
	9:00-10:00	59				
	10:00-11:00	60				
	11:00-12:00	60				
	12:00-13:00	61				
	13:00-14:00	60				
	14:00-15:00	59				
	15:00-16:00	60				
	16:00-17:00	60				
	17:00-18:00	63				No Construction Activity
	18:00-19:00	60			54	
	19:00-20:00	57				
	20:00-21:00	54				
	21:00-22:00	53				
	22:00-23:00	52				
	23:00-24:00	48				
	24:00-1:00	51				
	1:00-2:00	52				
	2:00-3:00	59				
	3:00-4:00	55				
	4:00-5:00	53				
	5:00-6:00	54				

Table 2.4-4 Hourly Noise Level (L_{Aeq}) Monitoring Results at NV-2

Date	Time	(L_{Aeq} dB)	(L_{Aeq} dB) Each Category	(L_{Aeq} dB) Target Value	Remark
4 th September – 5 th September 2018	7:00-8:00	49	51	75	No Construction Activity
	8:00-9:00	47			Soft soil removing, preparation of drainage and general work.
	9:00-10:00	46			
	10:00-11:00	52			
	11:00-12:00	55			
	12:00-13:00	51			
	13:00-14:00	48			
	14:00-15:00	49			
	15:00-16:00	48			
	16:00-17:00	54			
	17:00-18:00	49			
	18:00-19:00	44	50	60	No Construction Activity
	19:00-20:00	46			
	20:00-21:00	50			
	21:00-22:00	52			
	22:00-23:00	52	51	55	
	23:00-24:00	50			
	24:00-1:00	53			
	1:00-2:00	55			
	2:00-3:00	52			
	3:00-4:00	47			
	4:00-5:00	47			
	5:00-6:00	50			
	6:00-7:00	50			

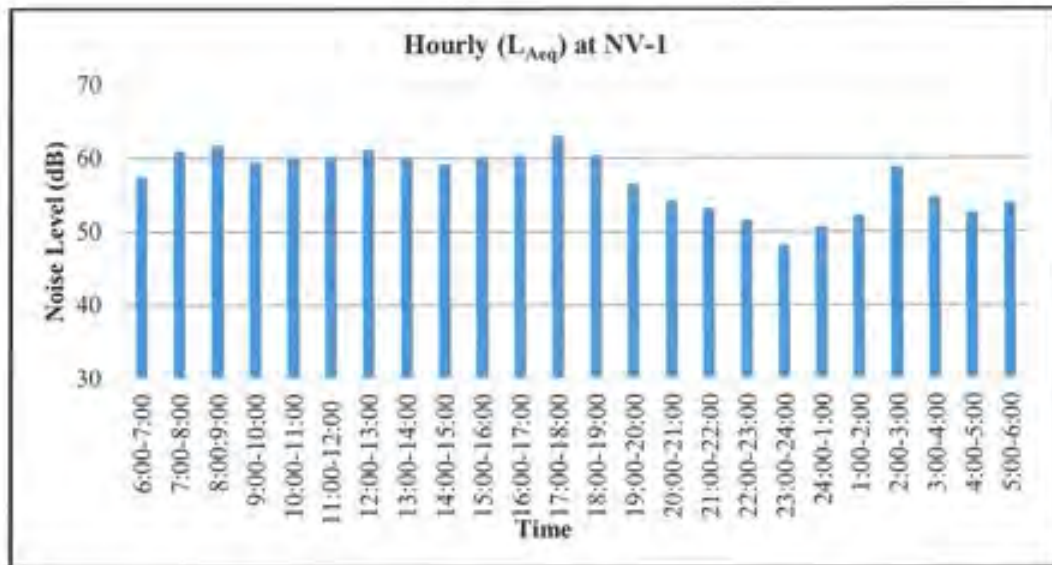


Figure 2.4-1 Results of Noise Levels (L_{Aeq}) Monitoring at NV-1

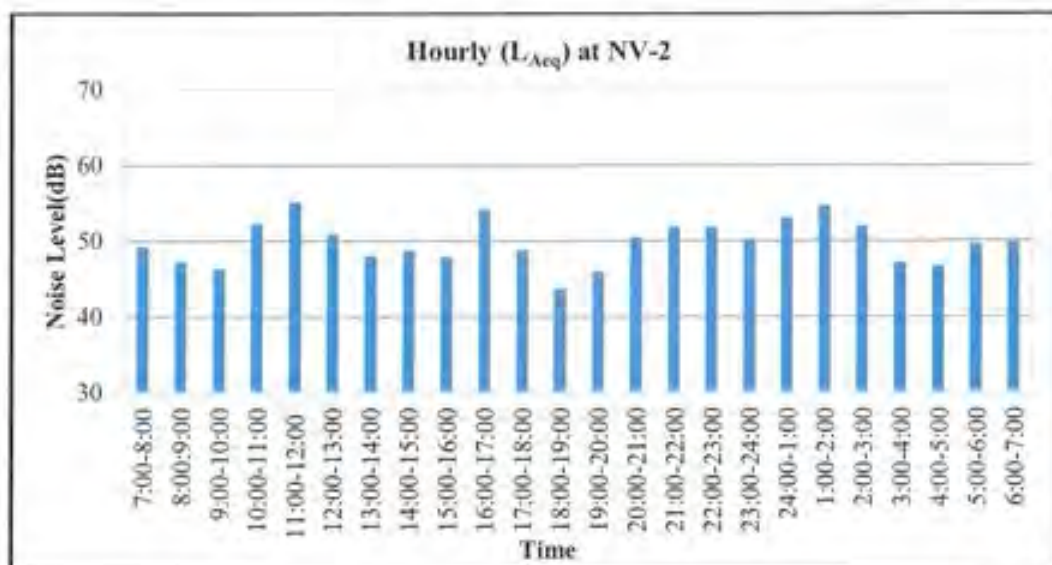


Figure 2.4-2 Results of Noise Levels (L_{Aeq}) Monitoring at NV-2

Vibration Monitoring Results

The results of vibration level (L_{v10}) monitoring at NV-1 and NV-2 are shown in Table 2.4-5 and Table 2.4-6. Hourly vibration level (L_{v10}) monitoring results at NV-1 and NV-2 are shown in Table 2.4-7 and Table 2.4-8. Figure 2.4-3 and Figure 2.4-4 showed the graph of vibration level monitoring results at NV-1 and NV-2. By comparing with the target vibration level in construction stage in EIA report for Thilawa SEZ development project Zone B, all of results were under the target values.

Table 2.4-5 Results of Vibration Levels (L_{v10}) Monitoring at NV-1

Location	Date	(Residential and commercial and industrial areas) Equivalent Vibration Level (L_{v10} , dB)		
		Day Time (7:00 AM – 7:00 PM)	Evening Time (7:00 PM – 10:00 PM)	Night Time (10:00 PM – 7:00 AM)
NV-1	5 th – 6 th September, 2018	41	34	29
Target Value		70	70	65

Note: Target value is applied to the noise level during the construction stage in the EIA Report for Thilawa SEZ Development Project (Industrial Area of Zone B).

Table 2.4-6 Results of Vibration Levels (L_{v10}) Monitoring at NV-2

Location	Date	(Monastery and residential area) Equivalent Vibration Level (L_{v10} , dB)		
		Day Time (7:00 AM – 7:00 PM)	Evening Time (7:00 PM – 10:00 PM)	Night Time (10:00 PM – 7:00 AM)
NV-2	4 th – 5 th September, 2018	18	15	16
Target Value		65	65	60

Note: Target value is applied to the noise level during the construction stage in the EIA Report for Thilawa SEZ Development Project (Industrial Area of Zone B).

Table 2.4-7 Results of Hourly Vibration Levels (L_{A10}) Monitoring at NV-1

Date	5 th – 6 th September 2018	(L _{A10} , dB) Each Category	(L _{A10} , dB) Target Value	Remark
Time	L _{A10} (NV-1)			
7:00-8:00	40	41	70	No Construction Activity
8:00-9:00	36			
9:00-10:00	40			
10:00-11:30	40			
11:30-12:30	42			
12:30-13:30	42			
13:30-14:30	42			Steel plate placing and access repairing work
14:30-15:30	39			
15:30-16:30	40			
16:30-17:00	42			
17:00-18:00	43			
18:00-19:00	40			
19:00-20:00	34	34	70	
20:00-21:00	37			
21:30-22:00	38			
22:00-23:00	29	70	65	No Construction Activity
23:00-24:00	28			
24:00-1:00	31			
1:00-2:30	33			
2:00-3:30	25			
3:00-4:00	23			
4:00-5:00	25			
5:00-6:00	24			
6:00-7:00	25			

Table 2.4-8 Results of Hourly Vibration Levels (L_{v10}) Monitoring at NV-2

Date	4 th – 5 th September 2018	(L _{v10} , dB) Each Category	(L _{v10} , dB) Target Value	Remark		
Time	L _{v10} (NV-2)					
7:00-8:00	17	18	65	No Construction Activity		
8:00-9:00	18			Soft soil removing, preparation of drainage and general use.		
9:00-10:00	19					
10:00-11:00	20					
11:00-12:00	20					
12:00-13:00	17					
13:00-14:00	16					
14:00-15:00	18					
15:00-16:00	18					
16:00-17:00	18					
17:00-18:00	18					
18:00-19:00	17				15	65
19:00-20:00	15					
20:00-21:00	16					
21:00-22:00	15					
22:00-23:00	14	16	60			
23:00-24:00	16					
24:00-1:00	17					
1:00-2:00	20					
2:00-3:00	17					
3:00-4:00	14					
4:00-5:00	14					
5:00-6:00	14					
6:00-7:00	16					

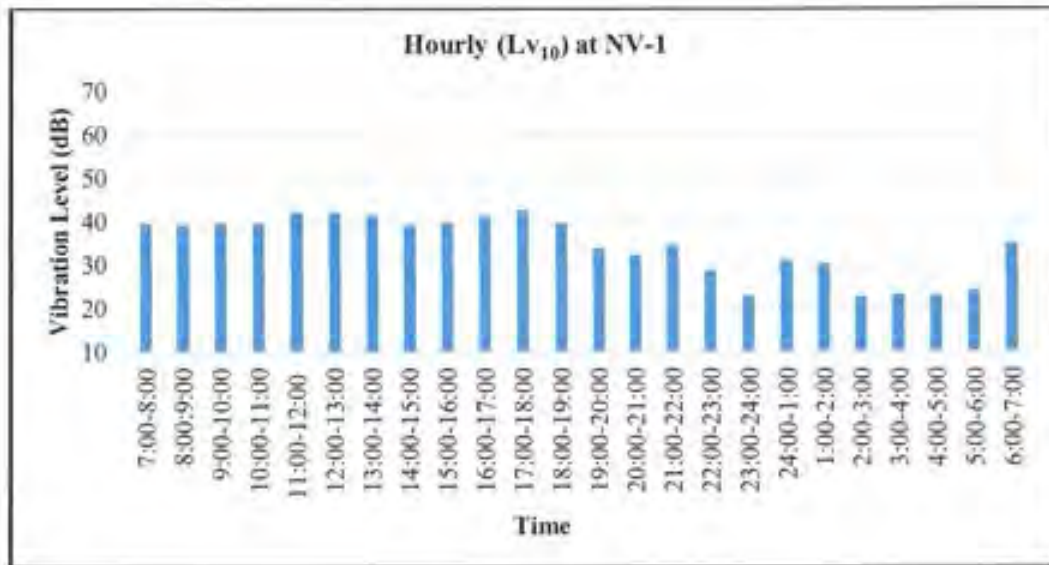


Figure 2.4-3 Results of Vibration Levels (L_{v10}) Monitoring at NV-1

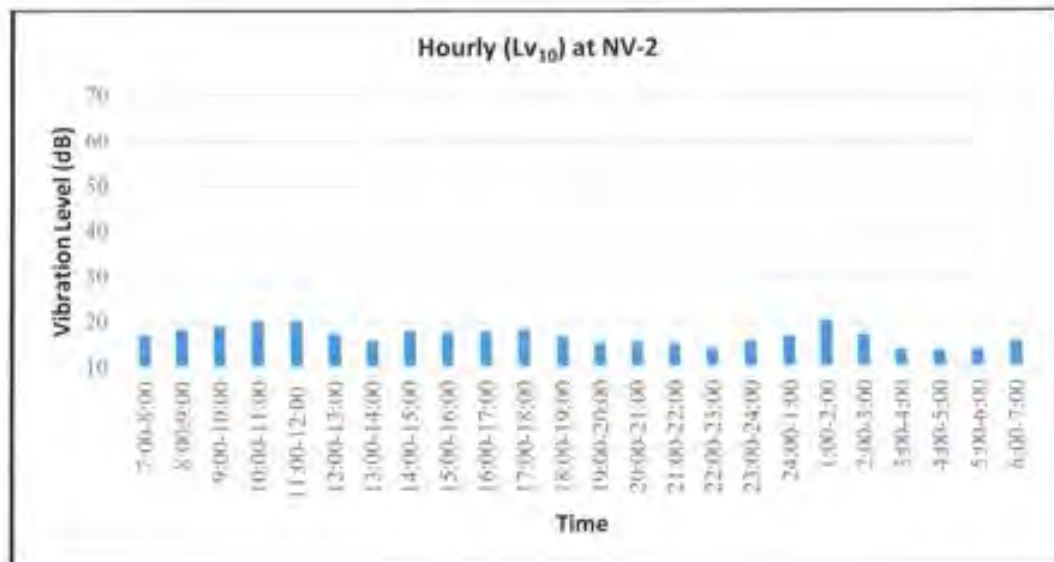


Figure 2.4-4 Results of Vibration Levels (L_{v10}) Monitoring at NV-2



CHAPTER 3: CONCLUSION AND RECOMMENDATION

By comparing with the target noise and vibration level in construction stage in EIA report for Thilawa SEZ development project Zone B, all results were under the target values at NV-1 and NV-2. As for the detailed analysis of noise level at NV-1 and NV-2 on 24 hours, all results were under the target value. The results of vibration level for NV-1 and NV-2 are also lower than the target levels. Thus, there is no negative impact on noise and vibration from construction activities of Zone B to the surrounding environment.

In conclusion of this environmental monitoring, there are no specific noise and vibration impacts to the surrounding area of industrial area of Thilawa SEZ Zone B during the monitoring period.



**Thilawa Special Economic Zone (Zone B)
Development Project –Phase 1 & 2**

Appendix

**Traffic Volume Monitoring Report
September 2018**

**TRAFFIC VOLUME MONITORING REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
THILAWA SEZ ZONE B
(PHASE 1 & 2 CONSTRUCTION STAGE)**

(QUARTERLY MONITORING)

**September 2018
Myanmar Koei International Ltd.**



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CHAPTER 1: OUTLINES AND SUMMARY OF MONITORING PLAN

1.1 General

Thilawa Special Economic Zone (TSEZ) is located in southern district of Yangon region and about 23 km southeast of Yangon city. As the developer of Thilawa SEZ, Myanmar Japan Thilawa Development Ltd. (MJTD) has a responsibility to carry out regular environmental monitoring in the industrial area of Zone B in accordance with the approved Environmental Impact Assessment (EIA) report with Environmental Management Plan (EMP). MJTD has implemented monitoring various environmental items with the specified time frame to know the environmental conditions in and around the area.

1.2 Outlines of Monitoring Plan

To assess the environmental condition under the construction of industrial area in and around Thilawa SEZ Zone B, Traffic volume had been monitored from 5th September 2018 to 6th September 2018 as follows;

Table 1.2-1 Outlines of Traffic Volume Monitoring

Monitoring Date	Monitoring Item	Parameters	Number of Points	Duration	Monitoring Methodology
5 th September 2018 -6 th September 2018	Traffic Volume	-	1 (TV-1)	24 hours	Manual Count



CHAPTER 2: TRAFFIC VOLUME MONITORING

2.1 Monitoring Item

The traffic volume monitoring item are shown in Table 2.1-1. All vehicles were classified into four types as detailed in Table 2.1-2.

Table 2.1-1 Monitoring Parameters for Traffic Volume

No.	Item	Parameter
1	Traffic volume	Number of Vehicle (4 Types)

Table 2.1-2 Classification of Vehicles Types

No.	Classification		Description
1	Two-wheel vehicle		Motorbike, Motorcycle taxi
2	Four-wheel light vehicle	  	Pick-up car, Jeep, Taxi, Saloon car, Light truck (under 2 tons)
3	Four-wheel heavy vehicle	  	Medium bus, Express, Big bus, Medium truck, Heavy truck
4	Others		Tractor

2.2 Monitoring Location

Traffic volume was measured at the northeast corner of the Thilawa SEZ Zone B, monitoring point (TV-1); N: 16°40'17.90", E: 96°17'18.20". The location of the traffic volume monitoring point is shown in Figure 2.2-1.



Figure 2.2-1 Location of Traffic Volume Monitoring Point

TV-1

TV-1 is located in front of main gate of construction site of Thilawa SEZ Zone B and next to Thilawa Development road. The surrounding area are Zone A in the northwest and local industrial zone in the east respectively.

2.3 Monitoring Method

The traffic volume monitoring was conducted for 24 hours at the same time as the traffic noise and vibration level monitoring. Traffic volume monitoring was conducted to count the numbers of vehicles moving in each direction. Manual count method is used and data are recorded using tally sheets. The status of the traffic volume monitoring on TV-1 is shown in Figure 2.3-1.



Figure 2.3-1 Status of Traffic Volume Monitoring at TV-1

2.4 Monitoring Results

The traffic volume monitoring results are summarized in Table 2.4-1. Hourly quantities of each type of vehicle were recorded. The table 2.4-1 shows that the number of 2-wheel vehicles are distinctly higher utilized in weekdays. The number of 4-wheel heavy vehicles are two times lower than the number of 4-wheel light vehicles for each direction.

Table 2.4-1 Summary of Traffic Volume Recorded at TV-1

Survey Point	Direction	Date	Weekday	2-wheel Vehicles	4-wheel Light Vehicles	4-wheel Heavy Vehicles	Others	Total
TV-1	Phalan village to Dagon-Thilawa road	5 th September 2018-6 th September 2018	Wednesday and Thursday	2146	826	242	41	3255
	Dagon-Thilawa road to Phalan village			2117	865	250	41	3273

The summary monitoring results of hourly traffic volume at TV-1 is shown in Table 2.4-2 and Table 2.4-3, respectively. Compare the result of each direction in morning peak hours as 6:00 to 9:00 and in the evening peak hours as 16:00 to 18:00, traffic volume from Phalan village to Dagon- Thilawa road is higher than another direction in the morning peak hours. In the evening peak hours, traffic volume from Dagon-Thilawa road to Phalan village is higher than another direction. It may be possible commuting vehicles are passing from Phalan village to Dagon-Thilawa road in the morning peak hours and returning from Dagon-Thilawa road to Phalan village in the evening peak hours in this monitoring period.

Table 2.4-2 Hourly Traffic Volume Results at TV-1 (From Phalan Village to Dagon-Thilawa Road)

From	To	Classification				Total
		Type of vehicles				
		Two-wheel vehicle	Four-wheel light vehicle	Four-wheel heavy vehicle	Others	
11:00	12:00	107	51	34	0	192
12:00	13:00	83	60	23	4	170
13:00	14:00	88	46	20	2	154
14:00	15:00	94	64	20	7	185
15:00	16:00	78	49	15	2	144
16:00	17:00	141	61	17	2	221
17:00	18:00	270	82	21	5	378
18:00	19:00	158	56	12	4	230
19:00	20:00	33	33	4	2	72
20:00	21:00	38	31	3	0	72
21:00	22:00	9	9	0	0	18
22:00	23:00	6	9	0	0	15
23:00	00:00	3	1	1	0	5
00:00	1:00	3	2	7	1	13
1:00	2:00	6	1	1	0	8
2:00	3:00	6	1	0	0	7
3:00	4:00	0	3	0	0	3
4:00	5:00	0	3	0	0	3
5:00	6:00	18	7	0	0	25
6:00	7:00	81	32	5	0	118
7:00	8:00	465	78	14	2	559
8:00	9:00	267	67	14	6	354
9:00	10:00	86	30	10	2	128
10:00	11:00	108	50	21	2	181
Total		3146	526	242	41	3255

Table 2.4-3 Hourly Traffic Volume Results at TV-1 (From Dagon-Thilawa Road to Phalan Village)

From	To	Classification				Total
		Type of vehicles				
		Two-wheel vehicle	Four-wheel light vehicle	Four-wheel heavy vehicle	Others	
11:00	12:00	99	72	29	1	201
12:00	13:00	90	59	19	3	171
13:00	14:00	109	64	30	2	205
14:00	15:00	105	74	13	4	196
15:00	16:00	91	58	23	3	175
16:00	17:00	225	58	25	4	312
17:00	18:00	375	74	27	3	479
18:00	19:00	115	38	18	4	175
19:00	20:00	55	27	3	2	87
20:00	21:00	49	22	3	1	75
21:00	22:00	22	7	4	1	34
22:00	23:00	22	16	2	0	40
23:00	00:00	6	4	0	0	10
00:00	1:00	6	3	1	0	10
1:00	2:00	4	0	3	0	7
2:00	3:00	2	1	3	0	6
3:00	4:00	0	0	0	0	0
4:00	5:00	2	1	1	0	4
5:00	6:00	4	3	0	0	9
6:00	7:00	46	20	1	0	67
7:00	8:00	285	82	11	8	386
8:00	9:00	225	74	11	4	314
9:00	10:00	90	43	8	0	141
10:00	11:00	90	63	15	1	169
Total		3117	865	250	41	3273

The summary of traffic volume results during quarterly monitoring at TV-1 is shown in Table 2.4-4 and Table 2.4-5, respectively. In the summary traffic volume results during quarterly monitoring surveys at TV-1, comparison of traffic volume results for one year was described. Among the traffic monitoring surveys (quarterly), traffic volume results for September 2017 is the lowest compared with other quarterly monitoring surveys. Traffic volume results are increasing start from December 2017. Traffic volume results for September 2018 is slightly lower than June 2018 monitoring surveys from Phalan village to Dagon Thilawa Road. However, traffic volume results from Dagon Thilawa Road to Phalan village for September 2018 is slightly higher than June 2018.

**Table 2.4-4 Summary of traffic volume results during quarterly monitoring surveys at TV-1
(From Phalan Village to Dagon Thilawa Road)**

Survey Point	Direction	Date	Weekday	2-wheel Vehicles	4-wheel Light Vehicles	4-wheel Heavy Vehicles	Others	Total
TV-1	Phalan village to Dagon-Thilawa road	29 th Mar-30 th Mar 2017	Wednesday & Thursday	1,712	545	216	29	2,502
		22 nd June-23 rd June 2017	Thursday & Friday	1,402	528	352	47	2,329
		19 th September-20 th September 2017	Tuesday & Wednesday	1,254	509	393	17	2,173
		7 th December-8 th December 2017	Thursday & Friday	1,800	652	339	43	2,834
		15 th March 2018 – 16 th March 2018	Thursday and Friday	2,210	830	360	52	3,452
		5 th June 2018 – 6 th June 2018	Tuesday & Wednesday	2,253	847	323	54	3,477
		5 th September 2018 – 6 th September 2018	Wednesday & Thursday	2,146	826	242	41	3,255

**Table 2.4-5 Summary of traffic volume results during quarterly monitoring surveys at TV-1
(From Dagon-Thilawa Road to Phalan Village)**

Survey Point	Direction	Date	Weekday	2-wheel Vehicles	4-wheel Light Vehicles	4-wheel Heavy Vehicles	Others	Total
TV-1	Dagon-Thilawa road to Phalan village	29 th Mar-30 th Mar 2017	Wednesday & Thursday	1,534	500	236	28	2,298
		22 nd June-23 rd June 2017	Thursday & Friday	1,291	542	357	43	2,233
		19 th September-20 th September 2017	Tuesday & Wednesday	1,195	486	372	19	2,072
		7 th December-8 th December 2017	Thursday & Friday	1,695	682	322	40	2,739
		15 th March 2018 - 16 th March 2018	Thursday and Friday	2,062	812	312	48	3,234
		5 th June 2018 - 6 th June 2018	Tuesday & Wednesday	2,048	799	322	52	3,221
		5 th September 2018 - 6 th September 2018	Wednesday & Thursday	2,117	865	250	41	3,273

CHAPTER 3: CONCLUSION AND RECOMMENDATION

The results of the traffic volume show that the number of 2-wheel vehicles are distinctly higher utilized in this monitoring period. The number of 4-wheel heavy vehicles are significantly lower than the number of 4-wheel light vehicles for each direction. It seems that commuting vehicles are much utilized during this monitoring period as compare with construction related vehicles (4-wheel heavy vehicles). By comparing the previous quarterly traffic surveys, the traffic volume is increasing start from December 2017. Traffic volume results for September 2018 is slightly lower than June 2018 monitoring surveys from Phalan village to Dagon Thilawa Road. However, traffic volume results from Dagon Thilawa Road to Phalan village for September 2018 is slightly higher than June 2018.

The continuous monitoring will be necessary to grasp the traffic volume data in construction stage of Thilawa SEZ Zone B. Once enough traffic volume data will be collected, the mitigation measures for traffic volume management will be considered in future.



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