

Environmental Monitoring Report Phase - 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 with oversight by Thilawa SEZ Management Committee.

The monitoring record from October 2016 to December 2016 according to the Environment Monitoring Plan is submitted in conformity with the provision of Chapter 9.1, Table 9.1-2 and 9.2, Table 9.2-2 Content of the ELA Report of Thilawa SEZ Development Project (Zone A).

2. Summary of Monitoring Activities

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

We already submit EMP for Phase 2, Construction Phase Report No.1 (December 2015), Report No.2 (March 2016), Report No.3 (June 2016) and Report No.4 (September 2016) and Report No.5 (December 2016) is submitted this day attached with Construction Phase implementation schedule.

- 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:**

Oil and Grease parameter exceed than the standard in 18 October 2016 result. The situation and countermeasures for the exceeding is attached in appendix (Accident Case)

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

There was six case of minor accidents happened during monitoring period. Please refer to the attached Environmental Monitoring Form.

- 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 A Development Project construction activities is submitted enclosed with monthly progress reports from contractor in Appendix A to D.

- A. Monthly Progress Report for September, 2016
- B. Monthly Progress Report for October, 2016
- C. Monthly Progress Report for November, 2016
- D. Monthly Progress Report for December, 2016

4. Monitoring Result

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

Monitoring Plan (Construction Phase)

Category	Item	Location	Frequency	Remark
Air Quality	NO _x , SO _x , CO, TSP, PM ₁₀	Construction site (1 point)	Once/ 3month	October 2016, Monitoring Report
Water Quality	Water temperature, pH, SS, DO, BOD, COD, coliform count, oil and grease, chromium	Construction site (6 points) Well in the Monastery (1 point)	Once/2 month	September 2016 and October 2016 Monitoring Reports
Waste	Amount of solid waste Management of solid waste of construction	Construction site	Once/3month	Monthly Progress Reports (September, October, November and December) 2016
Noise and Vibration	Noise and vibration level of construction	Preservation area such as residence around the proposed construction site. (2 points)	Once/3month (peak period)	Noise and Vibration Monitoring Report October 2016
		Preservation site such as residence along the route for on-site vehicles (2 points)	Once (peak period)	
Ground Subsidence	Ground elevation Consumption of ground water amount	Representative (1 point)	Every week	Monthly Progress Reports (September, October, November, December) 2016
Hydrology				
Risk for infectious disease such as AIDS/HIV	Status of measures of infectious disease	Construction site	Once/month	Monthly Progress Reports (September, October, November, December) 2016
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 A)
Development Project –Phase 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 (Zone A). Should there be any changes to the original plan, such change shall be reviewed and evaluated by environmental expert.

(1) General

1) Phase of the Project

- Please mark the current phase.

☐ Pre-Construction Phase

☒ Construction Phase

☐ Operation Phase

2) Obtainment of Environmental Permits (Not Applicable)

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

3) Response/Actions to Comments and Guidance from Government Authorities and the Public (Not Applicable)

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





(2) Monitoring Results

1) Ambient/ Air Quality - October 2016

NO_x, SO₂, CO, TSP, PM₁₀

Location	Item	Unit	Measured Value (Mean)	Measured Value (Min~Max.)	Country's Standard	Target value to be applied	*Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
Construction Area Near Thilawa Dam	NO _x	ppm	0.028	0.023-0.033	N/A	N/A	< 0.06	Once in three months	HAZSCANNER, EPAS	
	SO ₂	ppm	0.003	0.001-0.005	N/A	N/A	< 0.04		HAZSCANNER, EPAS	
	CO	ppm	0.054	0.030-0.075	N/A	N/A	< 10		HAZSCANNER, EPAS	
	TSP	ppm	0.086	0.041-0.175	N/A	N/A	< 0.35		HAZSCANNER, EPAS	
	PM ₁₀	ppm	0.032	0.015-0.064	N/A	N/A	< 0.12		HAZSCANNER, EPAS	

*Remark: Referred to the Japan and Thailand Standard (EIA Report, Table 6.4-1)

Complains from Residents

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

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

Contents of Complains from Residents	Countermeasures

2) (a) Water Quality – September 2016

Measurement Point: Effluent of Wastewater (Thilawa SEZ's discharging point which need to be monitored according to EIA are SW-1, SW-5 and SW-6. SW-2, SW-3 and SW-4 are attach as reference points only. They are natural creek water which are combine all the wastewater from the Local industrial water and domestic water from existing living environment. GW-1 is also as reference point for monitoring of existing tube well located in the Monastery compound.

- 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 ²	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1)Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
SW-1	pH	mg/l	6.92	None (Available Guideline Value determined by MOE)	5.0-9.0	>=4	Once in two month	pH meter, HI7609829-1 pH Sensor	
	SS ¹	mg/l	88.8		Max.30			Gravimetric method	
	DO	mg/l	5.46		-			HI7609829-2, (D.O) sensor	
	COD _{Cr}	mg/l	<3.7		Max. 70 ³			Dichromate method	
	BOD	mg/l	5.19		Max. 20			Direct inoculation method	
	Oil and Grease	mg/l	3.17		Max. 5			APHA-AWWA-WEF Method	
	Cr	mg/l	0.066		Max. 0.5			APHA-AWWA-WEF Method	
	Total coliforms ⁵	MPN/100ml	90000		Max 400			AOAC Petrifilm Method	
SW-2 (Reference Point)	pH	mg/l	6.46	None (Available Guideline Value determined by MOE)	5.0-9.0	>=4	Once in two month	pH meter, HI7609829-1 pH Sensor	
	SS ¹	mg/l	34.0		Max.30			Gravimetric method	
	DO	mg/l	4.61		-			HI7609829-2, (D.O) sensor	
	COD _{Cr}	mg/l	7.1		Max. 70 ³			Dichromate method	
	BOD	mg/l	4.30		Max. 20			Direct inoculation method	
	Oil and Grease	mg/l	-		Max. 5			APHA-AWWA-WEF Method	



Location ²	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1 Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	Cr	mg/l	-		Max. 0.5			APHA-AWWA-WEF Method	
	Total coliforms ³	MPN/100ml	160000		Max 400			AOAC Petrifilm Method	
SW-3 (Reference Point)	pH	mg/l	6.71	None (Available Guideline Value determined by MOI)	5.0-9.0	>=4	Once in two month	pH meter, HI7609829-1 pH Sensor	
	SS ⁴	mg/l	42.0		Max.30			Gravimetric method	
	DO	mg/l	3.85		-			HI7609829-2,(D.O) sensor	
	COD _{Cr}	mg/l	6.60		Max. 70 ⁵			Dichromate method	
	BOD	mg/l	7.60		Max. 20			Direct inoculation method	
	Oil and Grease	mg/l	-		Max. 5			APHA-AWWA-WEF Method	
	Cr	mg/l	-		Max. 0.5			APHA-AWWA-WEF Method	
	Total coliforms ³	MPN/100ml	24000		Max 400			AOAC Petrifilm Method	
SW-4 (Reference Point)	pH	mg/l	6.82	None (Available Guideline Value determined by MOI)	5.0-9.0	>=4	Once in two month	pH meter, HI7609829-1 pH Sensor	
	SS ⁴	mg/l	176.0		Max.30			Gravimetric method	
	DO	mg/l	3.72		-			HI7609829-2,(D.O) sensor	
	COD	mg/l	3.30		Max. 70 ⁵			Dichromate method	
	BOD	mg/l	5.04		Max. 20			Direct inoculation method	
	Oil and Grease	mg/l	-		Max. 5			APHA-AWWA-WEF Method	
	Cr	mg/l	-		Max. 0.5			APHA-AWWA-WEF Method	
	Total coliforms ³	MPN/100ml	90000		Max 400			AOAC Petrifilm Method	
SW-5	pH	mg/l	8.47	None (Available Guideline	5.0-9.0	>=4	Once in two month	pH meter, HI7609829-1 pH Sensor	
	SS ⁴	mg/l	46		Max.30			Gravimetric method	

Location ²	Item	Unit	Measured Value	Country's Standard	Target value to be applied	^{*)} Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	DO	mg/l	6.06	Value determined by MCO	-			HI7609829-2,(D.O)sensor	
	COD _{Cr}	mg/l	3.80		Max. 70 ³			Dichromate method	
	BOD	mg/l	5.89		Max. 20			Direct inoculation method	
	Oil and Grease	mg/l	-		Max. 5			APHA-AWWA-WEF Method	
	Cr	mg/l	-		Max. 0.5			APHA-AWWA-WEF Method	
	Total coliforms ²	MPN/100ml	50000		Max 400			AOAC Petrifilm Method	
SW-6	pH	mg/l	7.09	None (Available Guideline Value determined by MCO)	5.0-9.0	≥4	Once in two month	pH meter,HI7609829-1 pH Sensor	
	SS	mg/l	8.00		Max.30			Gravimetric method	
	DO	mg/l	5.30		-			HI7609829-2,(D.O)sensor	
	COD	mg/l	<0.7		Max. 70 ³			Dichromate method	
	BOD	mg/l	5.43		Max. 20			Direct inoculation method	
	Oil and Grease	mg/l	<3.1		Max. 5			APHA-AWWA-WEF Method	
	Cr	mg/l	0.04		Max. 0.5			APHA-AWWA-WEF Method	
	Total coliforms	MPN/100ml	<1		Max 400			AOAC Petrifilm Method	
GW-1 (Reference Point)	pH	mg/l	7.84	N/A	None (Available Guideline Value determined by MCO)	5.5-9.0	Once in two month	pH meter,HI7609829-1 pH Sensor	
	SS	mg/l	23			50		Gravimetric method	
	DO	mg/l	5.19			≥4		HI7609829-2,(D.O)sensor	
	COD _{Cr}	mg/l	<0.7			60		Dichromate method	
	BOD	mg/l	2.74			15		Direct inoculation method	
	Oil and Grease	mg/l	-			0.1		APHA-AWWA-WEF Method	





Location ^{*2}	Item	Unit	Measured Value	Country's Standard	Target value to be applied	^{*1} Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	Ce	mg/l	-			0.04		APHA-AWWA-WEF Method	
	Total coliforms ^{*6}	MPN/100ml	1400			2.5×10^6		AOAC Petrifilm Method	

^{*1}Remark: Referred to the Vietnam Standard (EIA Report). Reference to the Water Quality Monitoring Report, September 2016.

^{*2}Remark: Same locations with Phase (I) Operation Phase Water Quality monitoring because Thilawa SEZ Zone A has only two main discharging points: SW-1, SW-5 and SW-6 is wastewater discharge points from STP. SW-2, SW-3, SW-4 and GW-1 are reference for monitoring the situation of the outside of the Thilawa SEZ Zone A.

^{*3}Remark: In SW-1 and SW-5, suspended solids are higher than the standard due to the expected reason- surface water run-off from bare earth surfaces (erodible surfaces) of construction sites and vacant land in the industrial area in Zone A. The result at the outlet or effluent of centralized wastewater treatment plant (SW-6) is complied with the standard and effluent from each locator were treated well by the centralized wastewater treatment plant.

^{*4}Remark: For reference monitoring points (SW-2, SW-3 and SW-4), the result of suspended solids is higher than the standard due to two expected reason: i) delivered from upstream area such as natural origin and wastewater from the other industrial area outside of Thilawa SEZ and ii) delivered from downstream area by tidal effect.

^{*5}Remark: In SW-1 and SW-5, Total coliform are higher than the standard due to the expected reason- during raining season the high level of total coliform may be deposit left after the water receded of high tide during the sample were taken low tide at the discharge points.

^{*6}Remark: For reference monitoring points (SW-2, SW-3 and SW-4), the result of total coliforms is higher than the standard due to two expected reason: i) runoff of animal waste from the undeveloped area and delivered from industrial area and illegal dumping site from outside of Thilawa SEZ in the upstream area and ii) delivered from downstream area by tidal effect.

^{*7}Remark: For reference monitoring point (GW-1), the result of total coliform is higher than the standard due to expected reason for exceeding is infiltration of wastewater from toilet wastewater and / or animal waste.

2) (b) Water Quality - October 2016

Measurement Point: Effluent of Wastewater (Thilawa SEZ's discharging point which need to be monitored according to EIA are SW-1, SW-5 and SW-6. SW-2, SW-3 and SW-4 are attach as reference points only. They are natural creek water which are combine all the wastewater from the Local industrial water and domestic water from existing living environment. GW-1 is also as reference point for monitoring of existing tube well located in the Monastery compound.

- 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 Referred International Standard.

Location ²	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
SW-1	pH	mg/l	7	None (Available Guideline Value determined by MOI)	5.0-9.0	>=4	Once in two month	pH meter, HI7609829-1 pH Sensor	
	SS ³	mg/l	982.0		Max.30			Gravimetric method	
	DO	mg/l	4.76		-			HI7609829-2,(D.O) sensor	
	CCDA ₅ ³	mg/l	2380		Max. 70 ³			Dichromate method	
	BOD	mg/l	9.35		Max. 20			Direct inoculation method	
	Oil and Grease ³	mg/l	320.25		Max. 5			APHA-AWWA-WEF Method	
	Cr	mg/l	20.002		Max. 0.5			APHA-AWWA-WEF Method	
	Total coliforms ³	MPN/100ml	90000		Max 400			AQAC Petrifilm Method	
SW-2 (Reference Point)	pH	mg/l	6	None (Available Guideline Value determined by MOI)	5.0-9.0	>=4	Once in two month	pH meter, HI7609829-1 pH Sensor	
	SS ³	mg/l	36		Max.30			Gravimetric method	
	DO	mg/l	4.62		-			HI7609829-2,(D.O) sensor	
	CCDA ₅	mg/l	14.5		Max. 70 ³			Dichromate method	
	BOD	mg/l	3.56		Max. 20			Direct inoculation method	



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Location ²	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	Oil and Grease ^a	mg/l	16.56		Max. 5			APHA-AWWA-WEF Method	
	Cr	mg/l	≤ 0.002		Max. 0.5			APHA-AWWA-WEF Method	
	Total coliforms ^a	MPN/100ml	30000		Max 400			AOAC Petrifilm Method	
SW-3 (Reference Point)	pH	mg/l	6		5.0-9.0			pH meter, HI7609829-1 pH Sensor	
	SS ^a	mg/l	88		Max.30			Gravimetric method	
	DO	mg/l	3.71	None (Available Guideline Value determined by MCI)	-	>=4	Once in two month	HI7609829-2,(D.O) sensor	
	COD _{Cr}	mg/l	10.5		Max. 70 ^b			Dichromate method	
	BOD	mg/l	3.67		Max. 20			Direct inoculation method	
	Oil and Grease ^a	mg/l	11.38		Max. 5			APHA-AWWA-WEF Method	
	Cr	mg/l	≤ 0.002		Max. 0.5			APHA-AWWA-WEF Method	
	Total coliforms ^a	MPN/100ml	28000		Max 400			AOAC Petrifilm Method	
SW-4 (Reference Point)	pH	mg/l	6		5.0-9.0			pH meter, HI7609829-1 pH Sensor	
	SS ^a	mg/l	82		Max.30			Gravimetric method	
	DO	mg/l	4.2	None (Available Guideline Value determined by MCI)	-	>=4	Once in two month	HI7609829-2,(D.O) sensor	
	COD	mg/l	11		Max. 70 ^b			Dichromate method	
	BOD	mg/l	3.67		Max. 20			Direct inoculation method	
	Oil and Grease	mg/l	<1.1		Max. 5			APHA-AWWA-WEF Method	
	Cr	mg/l	≤ 0.002		Max. 0.5			APHA-AWWA-WEF Method	
	Total coliforms ^a	MPN/100ml	160000		Max 400			AOAC Petrifilm Method	
SW-5	pH	mg/l	7.5	None (Available	5.0-9.0		Once in two month	pH meter, HI7609829-1 pH Sensor	

Location ²	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	SS ³	mg/l	120	Guideline Value determined by MOI)	Max.30	>=4		Gravimetric method	
	DO	mg/l	6.71		-			HI7609829-2,(D.O)sensor	
	CCD ₅	mg/l	4.6		Max. 70%			Dichromate method	
	BOD	mg/l	4.46		Max. 20			Direct inoculation method	
	Oil and Grease	mg/l	< 3.1		Max. 5			APHA-AWWA-WEF Method	
	Cr	mg/l	≤ 0.002		Max. 0.5			APHA-AWWA-WEF Method	
	Total coliforms ³	MPN/100ml	160000		Max.400			AOAC Petrifilm Method	
SW-6	pH	mg/l	7.5	None (Available Guideline Value determined by MOI)	5.0-9.0	>=4	Once in two month	pH meter,HI7609829-1 pH Sensor	
	SS	mg/l	2		Max.30			Gravimetric method	
	DO	mg/l	3.32		-			HI7609829-2,(D.O)sensor	
	CCD	mg/l	10.2		Max. 70%			Dichromate method	
	BOD	mg/l	3.32		Max. 20			Direct inoculation method	
	Oil and Grease	mg/l	< 3.1		Max. 5			APHA-AWWA-WEF Method	
	Cr	mg/l	≤ 0.002		Max. 0.5			APHA-AWWA-WEF Method	
	Total coliforms	MPN/100ml	< 2		Max.400			AOAC Petrifilm Method	
GW-1 (Reference Point)	pH	mg/l	8	N/A	None (Available Guideline Value determined by MOI)	5.5-9.0	Once in two months	pH meter,HI7609829-1 pH Sensor	
	SS	mg/l	12			50		Gravimetric method	
	DO	mg/l	5.56			>=4		HI7609829-2,(D.O)sensor	
	CCD ₅	mg/l	5			60		Dichromate method	
	BOD	mg/l	3.34			15		Direct inoculation method	

Location ^{*2}	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	Oil and Grease	mg/l	< 3.1			0.1		APHA-AWWA-WEF Method	
	Cr	mg/l	≤ 0.002			0.04		APHA-AWWA-WEF Method	
	Total coliforms	MPN/100ml	< 2			7.5 × 10 ⁴		AOAC Petrifilm Method	

*1Remark: Referred to the Vietnam Standard (EIA Report), Reference to the Water Quality Monitoring Report, October 2016.

*2Remark: Same locations with Phase (I) Operation Phase Water Quality monitoring because Thilawa SEZ Zone A has only two main discharging points: SW-1, SW-5 and SW-6 is wastewater discharge points from STP. SW-2, SW-3, SW-4 and GW-1 are reference for monitoring the situation of the outside of the Thilawa SEZ Zone A.

*3Remark: In SW-1 and SW-5, suspended solids are higher than the standard due to the expected reason- surface water run-off from bare earth surfaces (erodible surfaces) of construction sites and vacant land in the industrial area in Zone A. The result at the outlet or effluent of centralized wastewater treatment plant (SW-6) is complied with the standard and effluent from each locator were treated well by the centralized wastewater treatment plant.

*4Remark: For reference monitoring points (SW-2, SW-3 and SW-4), the result of suspended solids are higher than the standard due to two expected reason: i) delivered from upstream area such as natural origin and wastewater from the other industrial area outside of Thilawa SEZ and ii) delivered from downstream area by tidal effect.

*5Remark: In SW-1 and SW-5, Total coliform are higher than the standard due to the expected reason- overflow of domestic wastewater from some construction sites into retention canals in the industrial area.

*6Remark: For reference monitoring points (SW-2, SW-3 and SW-4), the result of total coliform are higher than the standard due to two expected reason: i) runoff of animal waste from the undeveloped area and delivered from industrial from industrial area and delivered from industrial area and illegal dumping site from outside of Thilawa SEZ in the upstream area and ii) delivered from downstream area by tidal effect.

*7Remark: In SW-1, COD(Cr) is higher than the standard due to the expected reason- accidental spillage of oil and grease to retention pond (SW-1). If the water sample containing oil and grease, the analysis of COD (Cr) might be effected as positive interference and this analysis methods commonly used in Myanmar where there is limitation of laboratory instruments are unable to get correct results.

*8Remark: In SW-1, Oil and grease is higher than the standard due to the expected reason- the construction activities are anticipated to require the onsite use, storage and handling of diesel for the generator sets and lubricant oil to maintain the equipment used onsite. If not properly cleaned up, spillage of oil and grease during use, storage and

handling onsite may be washed into the drains and adversely impact the water quality of receiving water bodies. The accident spillage of oil and grease to retention pond (SW-1) is attached in the appendix of accident case in detail report.

*Remark: For reference monitoring points (SW-2 and SW-3), the result of oil and grease is higher than the standard due to expected reason- accident spillage of oil and grease to retention pond (SW-1) and these spillages may be flowing out to (SW-2 and SW-3) upstream of Shwe Pyauk Creek during high tide condition. The detail information is attached in water quality monitoring report, October 2016.

3) Soil Contamination (only operation phase)

Situations environmental report from tenants

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

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

Contents of Issues on Soil Contamination	Countermeasures

4) Noise -October 2016

Noise Level (Inside of the Thilawa Zone A expansion Area)

Location	Item	Unit	Measured Value (Mean)	Measured Value (Min~Max)	Country's Standard	Target value to be applied	*Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
NV-1	Leq(day)	dB(A)	50	47.60-51.75	N/A	N/A	75	Once (peak period)	Sound Level Meter	
	Leq(eve)	dB(A)	33	30.07-36.05			65			
	Leq(night)	dB(A)	48	46.23-50.41			65			

*Remark: Referred to the Noise Regulation Law- Japan (EIA Report), Reference to the Noise and Vibration Report October 2016.





Noise Level (In front of Administrative Building, Thilawa SEZ Zone A)

Location	Item	Unit	Measured Value (Mean)	Measured Value (Min~Max)	Country's Standard	Target value to be applied	*Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
NV-2	Leq (day)	dB(A)	60	57.05~63.03	N/A	N/A	75	Once (peak period)	Sound Level Meter	
	Leq (night)	dB(A)	57	53.72~58.70			70			

*Remark: Referred to the Noise Regulation Law- Japan (EIA Report), Reference to the Noise and Vibration Report October 2016.

Complains from Residents

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

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

Contents of Complains from Residents	Countermeasures

5) Solid Wastes

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

- Are there any wastes of sludge in this monitoring period? ☒ Yes, ☐ No

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

No.	Date	Description	No. of Loads	Remarks
1	3-Nov-16	Waste Disposal	6	YCDC

Remark: Referred to Monthly Progress Report (September 2016, October 2016, November 2016 and December 2016)

6) (a) Ground Subsidence and Hydrology- September 2016

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
1-Sep-2016	131	m3/week	+ 6.992	m	Once a week	
8-Sep-2016	154	m3/week	+ 6.993	m		
15-Sep-2016	142	m3/week	+ 6.994	m		
22-Sep-2016	139	m3/week	+ 6.994	m		
29-Sep-2016	156	m3/week	+ 6.995	m		

***Reference to the Monthly Progress Report September 2016.**

(b) Ground Subsidence and Hydrology- October 2016

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
6-Oct-2016	123	m3/week	+ 6.996	m	Once a week	
13-Oct-2016	144	m3/week	+ 6.995	m		
20-Oct-2016	130	m3/week	+ 6.993	m		
27-Oct-2016	136	m3/week	+ 6.994	m		

***Reference to the Monthly Progress Report October 2016.**

(c) Ground Subsidence and Hydrology- November 2016

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
3-Nov-2016	126	m3/week	+ 6.994	m	Once a week	
10-Nov-2016	132	m3/week	+ 6.995	m		
17-Nov-2016	117	m3/week	+ 6.996	m		
24-Nov-2016	109	m3/week	+ 6.996	m		

***Reference to the Monthly Progress Report November 2016.**



(d) Ground Subsidence and Hydrology- December 2016

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
1-Dec-2016	110	m ³ /week	+ 6,996	m	Once a week	
8-Dec-2016	131	m ³ /week	+ 6,994	m		
15-Dec-2016	127	m ³ /week	+ 6,994	m		
22-Dec-2016	123	m ³ /week	+ 6,995	m		
29-Dec-2016	114	m ³ /week	-1	m		

*Reference to the Monthly Progress Report December 2016.

†Remarks: Ground level was not measuring in 29-Dec-2016 because of no working in public holiday (Karen New Year)

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

Complains from Residents

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

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

Contents of Complains from Residents	Countermeasures

Situations environmental report from tenants Not Applicable at Construction Phase Report

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

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

Contents of Issues on Soil Contamination	Countermeasures

8) Infectious disease, Working Environment, Accident
Information from contractor (construction phase) or tenants (operation phase)

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

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

Contents of Incidents	Countermeasures
An Accident was occurred on 11 th October 2016 at Junction area, road from Gate-1 and Gate-2. Motorcycle and 4wheels vehicle were hit at the junction point road area. The motorcyclist got fracture of the right arm.	MJTD take the action as per following: - Negotiate between two parties - Remind and explained the traffic rules to reduce speed in future to site manager - The victims checked X-rays and had necessary consultation by doctor. Both parties deal by compensate for medical fees.
An Accident was occurred on 19 th October 2016 at near plot B3 and B10. The two vehicles were hit at near plot B3 and B10. Nobody got injured and only the two vehicle were damaged.	MJTD take the action as per following: - Negotiate between two parties - Remind to reduce speed and explained the traffic rules - The driver who hit the cycle took full responsibility for the damages.
An Accident was occurred on 28 th November 2016 near main gate. The two motor bikes hit near main gate. Nobody got injured and one motor bike front cover was broken.	MJTD take the action as per following: - Remind to drive carefully in future and explained the traffic rules - Both parties negotiated successfully without police involvement.
An Accident was occurred on 15 th December 2016 near B-3 plot. The tricycle was small firing cause of wiring shock near main gate. Nobody got injured and tricycle was broken.	MJTD take the action as per following: - Helped and killed the fire - Remind for regular maintenance for vehicle - The fire was extinguished by security guards.
An Accident was occurred on 26 th December 2016 near main gate. Two vehicles were hit near main gate. Nobody got injured and no damage.	MJTD take the action as per following: - Remind to reduce speed and explained the traffic rules - Both parties negotiated successfully without police involvement.



An Accident was occurred on 29th December 2016 near Plot C-5 and C-6. Motor bike hit the people near Plot C-5 and C-6. The girls who got injured her back waist and both hands and send to the clinic.

MJTD take the action as per following:

- Send the injured person to clinic by emergency car
- Arranged the required facilities to injured person by bike driver.
- Bike driver took full responsibility of victim and bear all the medical cost and one month salary.

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

The above accidents has been reported to One Stop Service Center (OSSC) and Thilawa SEZ Management Committee (TSMC).

End of Document

**Thilawa Special Economic Zone (Zone A)
Development Project –Phase 2**

Appendix

Air Quality Monitoring Report

October, 2016

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

(QUARTERLY MONITORING)**

**October 2016
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 A 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 A, Air quality had been monitored from 24th October 2016 – 31st October 2016 as follows;

Table 1.2- 1 Outlines of Air Quality Monitoring Plan

Monitoring Date	Monitoring Item	Parameters	Number of Points	Duration	Monitoring Methodology
From 24 th October – 31 st October, 2016	Air Quality	CO, NO ₂ , TSP, PM ₁₀ , and SO ₂	1 site	7 Days	On site measurement by Hiq-Scanner Environmental Perimeter Air Station (EPAS)



CHAPTER 2: AIR QUALITY MONITORING

2.1 Monitoring Item

The parameters for air quality monitoring were CO, NO₂, TSP, PM₁₀ and SO₂.

2.2 Monitoring Location

The air quality measurement equipment, "Haz-Scanner Environmental Perimeter Air Station (EPAS)" was set up at the north corner of the Thilawa SEZ Zone A, N:16°41'13.4", E:96°15'51.9", surrounded by the residential houses of Alwan sok village and fields in north, garment factory in west, Thilawa dam in southeast, and construction of factories in Zone A respectively. The air quality monitoring is carried out above location where is near to the residential houses of Alwan sok village. Possible emission sources are dust emissions from construction activities and exhaust emissions from construction fuel-burning equipment and daily human activities in Alwan sok 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 24th October – 31st October, 2016.



2.4 Monitoring Method

Monitoring of CO, NO₂, TSP, PM₁₀, and SO₂ were conducted by referring to the recommendation of the United States Environmental Protection Agency (U.S. EPA). The Haz-Scanner Environmental Perimeter Air Station (EPAS) was used to collect ambient air pollutants. The EPAS measures automatically every one minute and directly read and recorded onsite for CO, NO₂, PM₁₀, and SO₂. Due to limitation of the analytical equipment in Myanmar, TSP results was calculated as predicted value which is based on the results of PM₁₀. Therefore, the result of TSP was evaluated using the estimated TSP concentration values. 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, TSP, PM₁₀, and SO₂ are described in Table 2.5-1. Comparing with the target value of CO, NO₂, TSP, PM₁₀, and SO₂ prescribed in EIA report for Thilawa SEZ development project Zone A, all of the result are under target value.

Regarding the calculation of predicted TSP concentration, the correlation value between PM₁₀ and TSP of ambient air quality guideline value in Thailand as below;

$$330 \mu\text{g}/\text{m}^3 \text{ (TSP standard value in Thailand)} / 120 \mu\text{g}/\text{m}^3 \text{ (PM}_{10} \text{ standard value in Thailand)} = 2.75 \text{ (Correlation value)}$$

Table 2.5- 1 Air Quality Monitoring Result (Daily Average)

Date	CO	NO ₂	TSP	PM ₁₀	SO ₂
	ppm	ppm	mg/m ³	mg/m ³	ppm
24-25 Oct, 2016	0.030	0.035	0.112	0.041	0.001
25-26 Oct, 2016	0.050	0.028	0.176	0.064	0.001
26-27 Oct, 2016	0.069	0.025	0.104	0.038	0.005
27-28 Oct, 2016	0.044	0.028	0.044	0.016	0.005
28-29 Oct, 2016	0.075	0.028	0.076	0.028	0.003
29-30 Oct, 2016	0.034	0.028	0.052	0.019	0.004
30-31 Oct, 2016	0.056	0.023	0.041	0.015	0.004
7 Days Average Value	0.054	0.028	0.086	0.032	0.003
Target Value	10	< 0.06	< 0.33	< 0.12	< 0.04



CHAPTER 3: CONCLUSION AND ISSUES TO BE SOLVED

The result of air quality for CO, NO₂, TSP, PM₁₀, and SO₂ in each day were lower than the target value for one day. (Referred to Table 2.5-1)

In conclusion of this environmental monitoring, there are no specific air quality impacts to the surrounding area of industrial area of Thilawa SEZ Zone A during the monitoring period.



APPENDIX - HOURLY AIR RESULTS



Date	Time	CO	NO _x	TSP	PM ₁₀	SO ₂
		ppm	ppm	mg/m ³	mg/m ³	ppm
		Hourly	Hourly	Hourly	Hourly	Hourly
24-Oct-16	11:16-12:16	0.001	0.096	0.184	0.067	0.000
24-Oct-16	12:16-13:16	0.002	0.036	0.017	0.006	0.000
24-Oct-16	13:16-14:16	0.003	0.032	0.047	0.017	0.001
24-Oct-16	14:16-15:16	0.003	0.032	0.066	0.024	0.002
24-Oct-16	15:16-16:16	0.017	0.038	0.063	0.023	0.000
24-Oct-16	16:16-17:16	0.037	0.04	0.069	0.025	0.001
24-Oct-16	17:16-18:16	0.049	0.036	0.055	0.02	0.001
24-Oct-16	18:16-19:16	0.051	0.032	0.072	0.026	0.000
24-Oct-16	19:16-20:16	0.06	0.036	0.102	0.037	0.000
24-Oct-16	20:16-21:16	0.073	0.032	0.055	0.02	0.000
24-Oct-16	21:16-22:16	0.046	0.035	0.129	0.047	0.002
24-Oct-16	22:16-23:16	0.012	0.037	0.140	0.051	0.001
25-Oct-16	23:16-00:16	0.023	0.036	0.138	0.05	0.001
25-Oct-16	00:16-01:16	0.032	0.031	0.129	0.047	0.000
25-Oct-16	01:16-02:16	0.036	0.029	0.160	0.058	0.003
25-Oct-16	02:16-03:16	0.024	0.031	0.220	0.08	0.002
25-Oct-16	03:16-04:16	0.015	0.036	0.182	0.066	0.000
25-Oct-16	04:16-05:16	0.038	0.033	0.154	0.056	0.000
25-Oct-16	05:16-06:16	0.062	0.025	0.176	0.064	0.000
25-Oct-16	06:16-07:16	0.078	0.029	0.162	0.059	0.001
25-Oct-16	07:16-08:16	0.013	0.016	0.121	0.044	0.000
25-Oct-16	07:16-09:16	0.001	0.028	0.083	0.03	0.000
25-Oct-16	09:16-10:16	0.007	0.031	0.096	0.035	0.000
25-Oct-16	10:16-11:16	0.026	0.028	0.069	0.025	0.000

Max	0.078	0.096	0.220	0.080	0.003
Avg	0.030	0.035	0.112	0.041	0.001
Min	0.001	0.016	0.017	0.006	0.000



Date	Time	CO	NO _x	TSP	PM ₁₀	SO ₂
		ppm	ppm	mg/m ³	mg/m ³	ppm
		Hourly	Hourly	Hourly	Hourly	Hourly
25-Oct-16	11:16-12:16	0.037	0.038	0.041	0.015	0.000
25-Oct-16	12:16-13:16	0.039	0.032	0.094	0.034	0.000
25-Oct-16	13:16-14:16	0.038	0.028	0.107	0.039	0.000
25-Oct-16	14:16-15:16	0.064	0.035	0.091	0.033	0.000
25-Oct-16	15:16-16:16	0.074	0.019	0.088	0.032	0.004
25-Oct-16	16:16-17:16	0.053	0.028	0.127	0.046	0.001
25-Oct-16	17:16-18:16	0.107	0.034	0.140	0.051	0.000
25-Oct-16	18:16-19:16	0.116	0.04	0.182	0.066	0.003
25-Oct-16	19:16-20:16	0.124	0.031	0.226	0.082	0.000
25-Oct-16	20:16-21:16	0.079	0.031	0.253	0.092	0.002
25-Oct-16	21:16-22:16	0.026	0.029	0.226	0.082	0.001
25-Oct-16	22:16-23:16	0.027	0.028	0.223	0.081	0.001
26-Oct-16	23:16-00:16	0.029	0.031	0.230	0.08	0.001
26-Oct-16	00:16-01:16	0.027	0.032	0.272	0.099	0.000
26-Oct-16	01:16-02:16	0.031	0.029	0.259	0.094	0.000
26-Oct-16	02:16-03:16	0.040	0.03	0.270	0.098	0.001
26-Oct-16	03:16-04:16	0.039	0.027	0.256	0.093	0.002
26-Oct-16	04:16-05:16	0.045	0.028	0.231	0.084	0.000
26-Oct-16	05:16-06:16	0.058	0.029	0.223	0.081	0.005
26-Oct-16	06:16-07:16	0.037	0.028	0.206	0.075	0.002
26-Oct-16	07:16-08:16	0.062	0.021	0.184	0.067	0.000
26-Oct-16	07:16-09:16	0.010	0.017	0.121	0.044	0.000
26-Oct-16	09:16-10:16	0.018	0.023	0.085	0.031	0.001
26-Oct-16	10:16-11:16	0.009	0.017	0.107	0.039	0.000

Max	0.124	0.04	0.272	0.099	0.005
Avg	0.050	0.028	0.176	0.064	0.001
Min	0.009	0.017	0.041	0.015	0.000



Date	Time	CO	NO _x	TSP	PM ₁₀	SO _x
		ppm	ppm	µg/m ³	µg/m ³	ppm
		Hourly	Hourly	Hourly	Hourly	Hourly
26-Oct-16	11:16-12:16	0.008	0.021	0.080	0.029	0.000
26-Oct-16	12:16-13:16	0.030	0.03	0.146	0.053	0.000
26-Oct-16	13:16-14:16	0.038	0.026	0.129	0.047	0.000
26-Oct-16	14:16-15:16	0.047	0.021	0.080	0.029	0.000
26-Oct-16	15:16-16:16	0.108	0.021	0.124	0.045	0.010
26-Oct-16	16:16-17:16	0.086	0.033	0.135	0.049	0.000
26-Oct-16	17:16-18:16	0.208	0.042	0.193	0.07	0.000
26-Oct-16	18:16-19:16	0.214	0.029	0.228	0.083	0.014
26-Oct-16	19:16-20:16	0.158	0.031	0.250	0.091	0.009
26-Oct-16	20:16-21:16	0.125	0.030	0.286	0.104	0.012
26-Oct-16	21:16-22:16	0.086	0.043	0.165	0.06	0.002
26-Oct-16	22:16-23:16	0.042	0.038	0.011	0.004	0.001
27-Oct-16	23:16-00:16	0.053	0.036	0.036	0.013	0.007
27-Oct-16	00:16-01:16	0.048	0.015	0.074	0.027	0.01
27-Oct-16	01:16-02:16	0.037	0.017	0.085	0.031	0.005
27-Oct-16	02:16-03:16	0.029	0.021	0.066	0.024	0.002
27-Oct-16	03:16-04:16	0.051	0.007	0.058	0.021	0.002
27-Oct-16	04:16-05:16	0.037	0.026	0.096	0.035	0.004
27-Oct-16	05:16-06:16	0.041	0.025	0.050	0.018	0.011
27-Oct-16	06:16-07:16	0.142	0.018	0.063	0.023	0.016
27-Oct-16	07:16-08:16	0.04	0.021	0.069	0.025	0.007
27-Oct-16	07:16-09:16	0.016	0.016	0.017	0.006	0.000
27-Oct-16	09:16-10:16	0.013	0.019	0.033	0.012	0
27-Oct-16	10:16-11:16	0.006	0.023	0.033	0.012	0

Max	0.214	0.043	0.286	0.104	0.016
Avg	0.069	0.025	0.104	0.038	0.005
Min	0.006	0.007	0.011	0.004	0.000



Date	Time	CO	NO ₂	TSP	PM ₁₀	SO ₂
		ppm	ppm	µg/m ³	µg/m ³	ppm
		Hourly	Hourly	Hourly	Hourly	Hourly
27-Oct-16	11:16-12:16	0.004	0.018	0.030	0.011	0.000
27-Oct-16	12:16-13:16	0.005	0.020	0.039	0.014	0.002
27-Oct-16	13:16-14:16	0.001	0.023	0.055	0.02	0.001
27-Oct-16	14:16-15:16	0.003	0.018	0.011	0.004	0.000
27-Oct-16	15:16-16:16	0.017	0.024	0.030	0.011	0.000
27-Oct-16	16:16-17:16	0.049	0.025	0.036	0.013	0.000
27-Oct-16	17:16-18:16	0.107	0.029	0.050	0.018	0.001
27-Oct-16	18:16-19:16	0.136	0.028	0.041	0.015	0.005
27-Oct-16	19:16-20:16	0.067	0.025	0.063	0.023	0.005
27-Oct-16	20:16-21:16	0.013	0.025	0.052	0.019	0.003
27-Oct-16	21:16-22:16	0.207	0.025	0.083	0.03	0.013
27-Oct-16	22:16-23:16	0.009	0.024	0.058	0.021	0.001
28-Oct-16	23:16-00:16	0.053	0.030	0.047	0.017	0.013
28-Oct-16	00:16-01:16	0.014	0.027	0.055	0.020	0.018
28-Oct-16	01:16-02:16	0.007	0.026	0.072	0.026	0.011
28-Oct-16	02:16-03:16	0.031	0.031	0.039	0.014	0.003
28-Oct-16	03:16-04:16	0.033	0.031	0.019	0.007	0.009
28-Oct-16	04:16-05:16	0.029	0.027	0.039	0.014	0.005
28-Oct-16	05:16-06:16	0.051	0.023	0.058	0.021	0.002
28-Oct-16	06:16-07:16	0.043	0.040	0.055	0.020	0.003
28-Oct-16	07:16-08:16	0.036	0.039	0.019	0.007	0.005
28-Oct-16	07:16-09:16	0.120	0.036	0.099	0.036	0.012
28-Oct-16	09:16-10:16	0.002	0.041	0.003	0.001	0.000
28-Oct-16	10:16-11:16	0.012	0.034	0.008	0.003	0.003

Max	0.207	0.041	0.099	0.036	0.018
Avg	0.044	0.028	0.044	0.016	0.005
Min	0.001	0.018	0.00275	0.001	0.000



Date	Time	CO	NO _x	TSR	PM ₁₀	SO ₂
		ppm	ppm	mg/m ³	mg/m ³	ppm
		Hourly	Hourly	Hourly	Hourly	Hourly
28-Oct-16	11:16-12:16	0.035	0.034	0.014	0.005	0.001
28-Oct-16	12:16-13:16	0.024	0.031	0.030	0.011	0.000
28-Oct-16	13:16-14:16	0.038	0.028	0.017	0.006	0.004
28-Oct-16	14:16-15:16	0.070	0.022	0.008	0.003	0.008
28-Oct-16	15:16-16:16	0.019	0.023	0.025	0.009	0.001
28-Oct-16	16:16-17:16	0.122	0.032	0.036	0.013	0.000
28-Oct-16	17:16-18:16	0.291	0.026	0.047	0.017	0.011
28-Oct-16	18:16-19:16	0.099	0.027	0.066	0.024	0.002
28-Oct-16	19:16-20:16	0.056	0.027	0.116	0.042	0.001
28-Oct-16	20:16-21:16	0.617	0.031	0.264	0.096	0.019
28-Oct-16	21:16-22:16	0.034	0.03	0.242	0.088	0.001
28-Oct-16	22:16-23:16	0.007	0.032	0.176	0.064	0.000
29-Oct-16	23:16-00:16	0.041	0.021	0.173	0.063	0.002
29-Oct-16	00:16-01:16	0.058	0.027	0.171	0.062	0.005
29-Oct-16	01:16-02:16	0.016	0.028	0.127	0.046	0.002
29-Oct-16	02:16-03:16	0.009	0.025	0.077	0.028	0.001
29-Oct-16	03:16-04:16	0.026	0.026	0.014	0.005	0.002
29-Oct-16	04:16-05:16	0.033	0.028	0.039	0.014	0.001
29-Oct-16	05:16-06:16	0.037	0.028	0.058	0.021	0.001
29-Oct-16	06:16-07:16	0.045	0.026	0.017	0.006	0.000
29-Oct-16	07:16-08:16	0.034	0.030	0.030	0.011	0.000
29-Oct-16	07:16-09:16	0.012	0.025	0.028	0.01	0.000
29-Oct-16	09:16-10:16	0.037	0.031	0.017	0.006	0.000
29-Oct-16	10:16-11:16	0.029	0.024	0.030	0.011	0.001

Max	0.617	0.034	0.264	0.096	0.019
Avg	0.075	0.028	0.076	0.028	0.003
Min	0.007	0.021	0.008	0.003	0.000



Date	Time	CO	NO _x	TSP	PM ₁₀	SO ₂
		ppm	ppm	mg/m ³	mg/m ³	ppm
		Hourly	Hourly	Hourly	Hourly	Hourly
29-Oct-16	11:16-12:16	0.001	0.019	0.014	0.005	0.000
29-Oct-16	12:16-13:16	0.000	0.025	0.006	0.002	0.000
29-Oct-16	13:16-14:16	0.002	0.022	0.008	0.003	0.001
29-Oct-16	14:16-15:16	0.003	0.028	0.063	0.023	0.000
29-Oct-16	15:16-16:16	0.006	0.015	0.008	0.003	0.001
29-Oct-16	16:16-17:16	0.078	0.028	0.044	0.016	0.001
29-Oct-16	17:16-18:16	0.085	0.020	0.022	0.008	0.003
29-Oct-16	18:16-19:16	0.149	0.022	0.044	0.016	0.005
29-Oct-16	19:16-20:16	0.134	0.027	0.085	0.031	0.004
29-Oct-16	20:16-21:16	0.15	0.027	0.096	0.035	0.006
29-Oct-16	21:16-22:16	0.023	0.025	0.066	0.024	0.003
29-Oct-16	22:16-23:16	0.051	0.024	0.085	0.031	0.005
30-Oct-16	23:16-00:16	0.088	0.029	0.085	0.031	0.002
30-Oct-16	00:16-01:16	0.085	0.031	0.080	0.029	0.001
30-Oct-16	01:16-02:16	0.009	0.027	0.066	0.024	0.001
30-Oct-16	02:16-03:16	0.108	0.025	0.077	0.028	0.003
30-Oct-16	03:16-04:16	0.014	0.024	0.077	0.028	0.002
30-Oct-16	04:16-05:16	0.002	0.083	0.074	0.027	0.001
30-Oct-16	05:16-06:16	0.021	0.043	0.039	0.014	0.000
30-Oct-16	06:16-07:16	0.080	0.041	0.069	0.025	0.003
30-Oct-16	07:16-08:16	0.051	0.034	0.061	0.022	0.030
30-Oct-16	07:16-09:16	0.072	0.030	0.058	0.021	0.004
30-Oct-16	09:16-10:16	0.05	0.019	0.011	0.004	0.009
30-Oct-16	10:16-11:16	0.022	0.011	0.017	0.006	0.001

Max	0.150	0.083	0.096	0.035	0.030
Avg	0.054	0.028	0.052	0.019	0.004
Min	0.000	0.011	0.006	0.002	0.000



Date	Time	CO	NO ₂	TSP	PM ₁₀	SO ₂
		ppm	ppm	mg/m ³	mg/m ³	ppm
		Hourly	Hourly	Hourly	Hourly	Hourly
30-Oct-16	11:16-12:16	0.000	0.015	0.008	0.003	0.001
30-Oct-16	12:16-13:16	0.000	0.014	0.019	0.007	0.000
30-Oct-16	13:16-14:16	0.000	0.018	0.019	0.007	0.000
30-Oct-16	14:16-15:16	0.007	0.02	0.047	0.017	0.000
30-Oct-16	15:16-16:16	0.031	0.024	0.041	0.015	0.000
30-Oct-16	16:16-17:16	0.041	0.029	0.055	0.020	0.000
30-Oct-16	17:16-18:16	0.084	0.031	0.022	0.008	0.004
30-Oct-16	18:16-19:16	0.091	0.024	0.050	0.018	0.004
30-Oct-16	19:16-20:16	0.202	0.031	0.066	0.024	0.006
30-Oct-16	20:16-21:16	0.316	0.036	0.080	0.029	0.007
30-Oct-16	21:16-22:16	0.207	0.031	0.088	0.032	0.005
30-Oct-16	22:16-23:16	0.007	0.029	0.096	0.035	0.000
31-Oct-16	23:16-00:16	0.002	0.024	0.077	0.028	0.002
31-Oct-16	00:16-01:16	0.008	0.022	0.036	0.013	0.006
31-Oct-16	01:16-02:16	0.024	0.024	0.025	0.009	0.011
31-Oct-16	02:16-03:16	0.031	0.026	0.036	0.013	0.005
31-Oct-16	03:16-04:16	0.055	0.025	0.033	0.012	0.002
31-Oct-16	04:16-05:16	0.013	0.025	0.039	0.014	0.007
31-Oct-16	05:16-06:16	0.095	0.024	0.052	0.019	0.002
31-Oct-16	06:16-07:16	0.068	0.020	0.061	0.023	0.005
31-Oct-16	07:16-08:16	0.039	0.014	0.022	0.008	0.001
31-Oct-16	07:16-09:16	0.013	0.015	0.011	0.004	0.003
31-Oct-16	09:16-10:16	0.003	0.009	0.006	0.002	0.012
31-Oct-16	10:16-11:16	0.014	0.013	0.003	0.001	0.016

Max	0.316	0.036	0.096	0.035	0.016
Avg	0.056	0.023	0.041	0.015	0.004
Min	0.000	0.009	0.003	0.001	0.000



**Thilawa Special Economic Zone (Zone A)
Development Project –Phase 2**

Appendix

Water and Waste Water Quality Monitoring Report

September, 2016

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

(Bi-Monthly Monitoring)

September 2016

Myanmar Koei International Ltd.



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CHAPTER 1: INTRODUCTION

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 monitoring in the industrial area of Zone A 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-1, SW-2, SW-3, SW-4, SW-5, SW-6, and GW-1 have been monitored in Thilawa SEZ Zone A and its surrounding area in timely manner. Among the 7 locations, SW-1, SW-5 are main discharging gates and SW-6 is discharging from centralized Sewage Treatment Plant (STP) which is required to monitor by Environmental Monitoring Plan (EMoP) in EIA report of Thilawa SEZ Zone A. The remaining points SW-2, SW-3 and SW-4 are sampled as a reference monitoring for comparison with discharging points and baseline of discharged creek. Moreover, GW-1 is monitored as a reference of existing tube well which located in the monastery compound. Location of sampling points for water quality monitoring is shown in Figure 1.1-1.

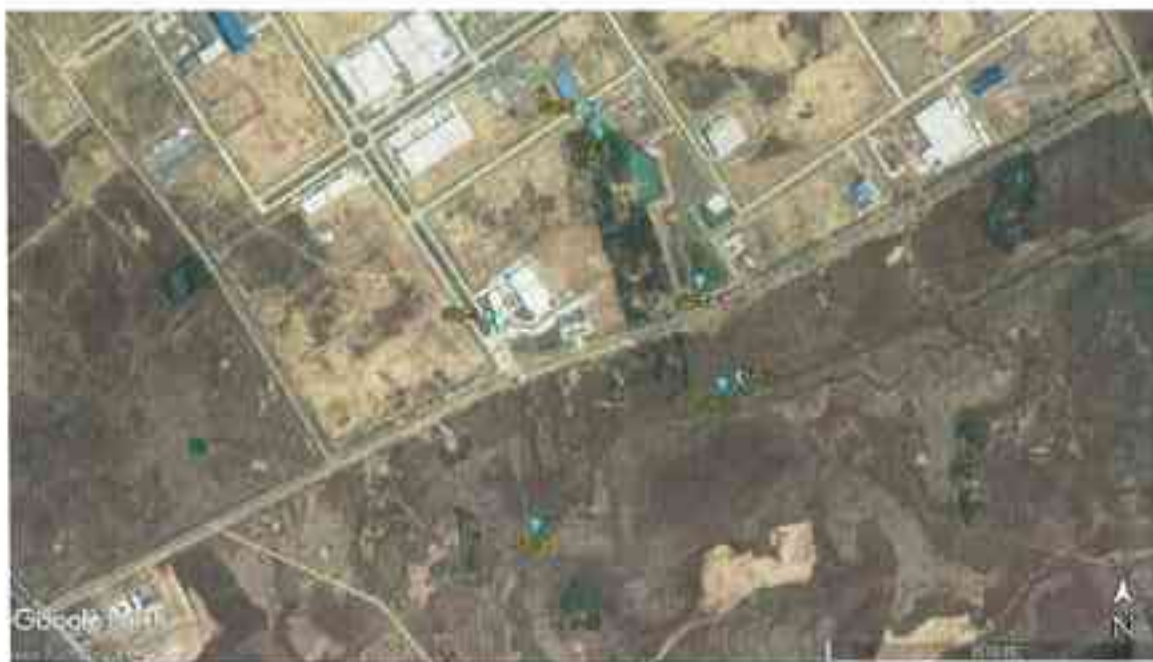


Figure 1.1- 1 Location of Sampling Points of Water Quality Monitoring



CHAPTER 2: WATER QUALITY MONITORING

2.1 Monitoring Items

Sampling points and parameters for water quality monitoring are determined so as to cover the environmental monitoring plan of the EIA report and the instruction from MJTD.

Water quality sampling was carried out at 7 locations. Among the 7 locations, water flow measurement was carried out at 3 locations (SW-1, SW-5, and SW-6) where can be measured by flow rate instrument. Monitoring items and sampling points are summarized in Table 2.1-1.

Table 2.1-1 Monitoring Items for Water Quality

No.	Parameters	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	GW-1	Remarks
1	pH	○	○	○	○	○	○	○	On-site analysis
2	Water Temperature	○	○	○	○	○	○	○	On-site analysis
3	DO	○	○	○	○	○	○	○	On-site analysis
4	BOD	○	○	○	○	○	○	○	Laboratory analysis
5	COD	○	○	○	○	○	○	○	Laboratory analysis
6	Total nitrogen	○	○	○	○	○	○	○	Laboratory analysis
7	Suspended solids	○	○	○	○	○	○	○	Laboratory analysis
8	Total coliform	○	○	○	○	○	○	○	Laboratory analysis
9	Total phosphorus	○	○	○	○	○	○	○	Laboratory analysis
10	Color	○	○	○	○	○	○	○	Laboratory analysis
11	Odor	○	○	○	○	○	○	○	Laboratory analysis
12	Flow Rate	○	-	-	-	○	○	-	On-site analysis

2.2 Description of Sampling Points

The description 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-1	Coordinate: N-16° 40' 13.5", E- 96° 16' 39.8"
		Location - Outlet of Retention Pond
		Survey Item - Surface water sampling and water flow rate measurement.
2	SW-2	Coordinate: N-16° 40' 06.0", E- 96° 16' 43.1"
		Location - Upstream of Shwe Pyauk Creek
		Survey Item - Surface water sampling.
3	SW-3	Coordinate: N-16° 40' 05.5", E- 96° 16' 41.6"
		Location - Upstream of Shwe Pyauk Creek, after combining with the disposal discharge from MJTD.
		Survey Item - Surface water sampling.
4	SW-4	Coordinate: N-16° 39' 54.6", E- 96° 16' 26.4"
		Location - Downstream of Shwe Pyauk Creek
		Survey Item - Surface water sampling.
5	SW-5	Coordinate: N-16° 40' 10.7", E- 96° 16' 22.6"
		Location - Outlet of Retention Canal
		Survey Item - Surface water sampling and water flow rate measurement.
6	SW-6	Coordinate: N-16° 40' 26.8", E- 96° 16' 30.7"
		Location - Outfall from STP to Retention Pond
		Survey Item - Surface water sampling and water flow rate measurement.
7	GW-1	Coordinate: N-16° 40' 25.1", E- 96° 16' 31.7"
		Location - In Moogyoe Swan Monastery
		Survey Item - Ground Water Sampling

Source: Myanmar Koei International Ltd.



SW-1

SW-1 was collected at the discharge point of retention pond which is located in the east of Moegyo Swan monastery. This drainage is flowing from north to south and then connected to the Shwe Byauk creek through earth drain. The surrounding area is most of occupied by the buildings.

SW-2 (Reference Point)

SW-2 was collected at the upstream of Shwe Byauk creek which is flowing from east to west and then entering into the Yangon river. This sampling point is located at south of Zone A area and Dagon-Thilawa road. The surrounding area are Zone A in the north, industrial compound in the east and paddy field in the south and west respectively.

SW-3 (Reference Point)

SW-3 was collected at the upstream of Shwe Byauk creek which is flowing from east to west and then entering into the Yangon river. It is distance about 60 m downstream of SW-2. This sampling point is located at south of Zone A area and Dagon-Thilawa road. The surrounding area are Zone A in the north, industrial compound in the east and paddy field in the south and west respectively.

SW-4 (Reference Point)

SW-4 was collected at the downstream of Shwe Byauk creek which is flowing from east to west and then entering into the Yangon river. It is distance about 500 m downstream of SW-3. This sampling point is located at south of Zone A area and Dagon-Thilawa road. The surrounding area are Zone A in the north, industrial compound in the east and paddy field in the south and west respectively.

SW-5

SW-5 was collected at retention canal in front of main gate of Thilawa SEZ. Most of the water collected in this drain is rain water and waste water from surrounding. This drain is also connected to the Shwe Byauk creek. The surrounding area is most of occupied by the buildings.

SW-6

SW-6 was collected after treatment of centralized sewage treatment plant (STP) which is located in the north of Moegyo Swan monastery compound and retention pond (SW-1). Then the treated water is flowing to the retention pond.

GW-1 (Reference of Existing Tube Well)

GW-1 was collected from tube well as ground water sample. It is located in the compound of Moegyo Swan monastery. The surrounding area are Zone A in the west, retention pond in the east and Dagon-Thilawa road in the south respectively.

2.3 Monitoring Method

All water samples were collected with sterilized 1L 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 3 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	Suspended solid (SS)	APHA 2540 D (Dry at 103-105°C Method)
4	Dissolved oxygen (DO)	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
5	BOD ₅	APHA 5210 B (5 days BOD Test)
6	COD (Cr)	APHA 5220 D (Closed Reflux Colorimetric Method)
7	Total coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)
8	Total nitrogen (T-N)	HACH Method 10072 (TNT Persulfate Digestion Method)
9	Total phosphorous (T-P)	APHA 4500-P E (Ascorbic Acid Method)
10	Color	APHA 2120 C (Spectrophotometric Method)
11	Odor	APHA 2150 B (Threshold Odor Test)
12	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 22nd September 2016 and sampling time is shown in Table 2.4-1 to avoid tidal effect.

Table 2.4-1 Sampling Time of Each Station

No.	Station	Sampling Time
1	SW-1	22/09/2016 12:43
2	SW-2	22/09/2016 11:13
3	SW-3	22/09/2016 10:52
4	SW-4	22/09/2016 10:01
5	SW-5	22/09/2016 12:16
6	SW-6	22/09/2016 16:33
7	GW-1	22/09/2016 12:00

Source: Myanmar Koei International Ltd.

2.5 Monitoring Results

Results of water quality survey are summarized in Table 2.5-1 and Table 2.5-2. 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 and the Industrial Zone, Internal Regulations of Thilawa SEZ Zone A.



2.5.1 Results of Discharging points and After Sewage Treatment Plant of Thilawa SEZ

As the comparison with the target value, the results of suspended solid (SS), total coliform were exceeded the value. As for the result of SS, the result at the outlet of the centralized sewage treatment plant (SW-6) complied with the target value. It implied that effluents from each locator were treated well by the sewage treatment plant. On the other hand, results at the other surface water monitoring points (SW-1 and SW-5) exceeded the target value due to the expected reasons; surface water run-off from bare earth surfaces (erodible surfaces) of construction sites and surface water run-off from bare earth surfaces (erodible surfaces) of vacant land in the industrial area in Zone A. However, the levels of SS are less than background level before development of Zone A (91 to 272 mg/L in June to August 2013). Therefore, it is expected that there are not serious impacts on SS to the surrounding environment. In order to reduce SS levels, the following actions can be taken: bare lands should be minimized after completion of the construction activities and the roads and retention canal should be cleaned up in the industrial area. Although MJTD has applied recommended control measures, continuous monitoring is required to achieve the target level.

As for the result of total coliform of surface water, the result at the outlet of the centralized sewage treatment plant (SW-6) also complied with the target value. It implied that effluents from each locator were treated well by the sewage treatment plant. On the other hand, results at the other surface water monitoring points (SW-1 and SW-5) exceeded the target value due to the expected reason; during the rainy season the high level of total coliform may be due to the deposit left after the water receded of high tide when the sample were taken low tide at the discharge points.

2.5.2 Results of Reference Monitoring for Comparison with Discharging Points and Baseline of Discharged Creek

As the comparison with the target value, the results of SS, total coliform, and Total nitrogen were exceeded the value. As for the result of SS, results at the surface water monitoring points (SW-2, SW-3, SW-4) exceeded the target value due to two expected reasons; i) delivered from upstream area such as natural origin and wastewater from the other industrial area outside of Thilawa SEZ, and ii) delivered from downstream area by tidal effect. However, the levels of SS are more or less than background level before development of Zone A (91 to 272 mg/L in June to August 2013). Therefore, it is expected that there are not serious impacts on SS to the surrounding environment.

As for the result of total coliform of surface water, results at the other surface water monitoring points (SW-2, SW-3, SW-4) exceeded the target value due to two expected reasons; i) runoff of animal waste from the undeveloped area and delivered from industrial area and illegal dumping site from outside of Thilawa SEZ in the upstream area, and ii) delivered from downstream area by tidal effect. Therefore, it is difficult to identify major pollution sources to cause exceeding the target value.

As for the result of total coliform in ground water, result at GW-1 (groundwater in Moegyoswan monastery) exceeded the target value. The expected reason for exceeding the target value is infiltration of wastewater from toilet wastewater and /or animal waste.

As for the result of total nitrogen (T-N), the result at GW-1 (groundwater in Moegyoswan monastery) exceeded the target value. The expected reason for exceeding the target value is infiltration of wastewater from toilet wastewater and /or animal waste. It has a possibility to high level of nitrite-nitrogen (N-NO₂) to be affected babies causing hemoglobinemia. If a baby who lives in the monastery and drink water from the groundwater, it is recommended to check whether nitrite-nitrogen (N-NO₂) exceeds the guideline value stipulated in World Health Organization (WHO) and to advice the monastery not good for baby to drink water from groundwater.



However, the above observations cannot reach to the conclusion of what is the reason to be exceeded the target values, the continuous monitoring will be necessary.

Table 2.5-1 Results of Water Quality Monitoring at Main Discharging Gates and Discharged from Centralized STP

No.	Parameters	Unit	SW-1	SW-5	SW-6	Target Value
1	Temperature	°C	31.43	33.04	29.39	
2	pH	-	6.92	8.47	7.09	5-9
3	Suspended solid (SS)	mg/L	88.0	46.00	8.00	30
4	Dissolved oxygen (DO)	mg/L	5.46	6.06	5.30	-
5	BOD (5)	mg/L	5.19	5.89	5.43	20
6	COD (Cr)	mg/L	<0.7	2.8	<0.7	70
7	Total coliform	MPN/100ml	90,000	90,000	<2	400
8	Total nitrogen (T-N)	mg/L	1.8	0.9	14.3	80
9	Total phosphorus (T-P)	mg/L	0.232	0.134	0.098	-
10	Color	TCU (True Color Unit)	5.91	4.22	0.96	(Reference value as 15°)
11	Odor	TON (Threshold Odor Number)	1	2	4	(Reference value as 3°)
12	Oil and grease ⁽¹⁾	mg/L	3.17	-	<3.1	5
13	Chromium ⁽¹⁾	mg/L	0.066	-	0.04	0.5
14	Flow Rate	m/s	0.131	0.200	1.250	-

Note *1: 15 TCU is standard value of National Secondary Drinking Water Regulations (NSDWRs) which has established for non-mandatory water quality standards by United States Environmental Protection Agency (USEPA).

Note *2: 3 TON is standard value of NSDWRs which has established by USEPA.

Note *3: In the MJTD's self-monitoring results on 7th September 2016 were not exceeded the target levels of Oil and grease and Chromium. Therefore, the monitoring of Oil and grease and Chromium were not carried out on 22nd September 2016.

Source: Myanmar Koei International Ltd.

Table 2.5-2 Result of Water Quality Survey for Reference Monitoring Points for Comparison with Discharging Points and Baseline of Discharged Creek

No.	Parameters	Unit	SW-2	SW-3	SW-4	GW-1	Target Value
1	Temperature	°C	30.53	30.00	29.29	33.63	
2	pH	-	6.46	6.71	6.82	7.84	5-9
3	Suspended solid (SS)	mg/L	34.0	42.00	176.0	24	30
4	Dissolved oxygen (DO)	mg/L	4.61	3.85	3.72	5.19	-
5	BOD (5)	mg/L	4.30	7.60	5.04	2.74	20
6	COD (Cr)	mg/L	7.1	6.6	3.3	<0.7	70
7	Total coliform	MPN/100ml	160,000	24,000	90,000	1,400	400
8	Total nitrogen (T-N)	mg/L	1.7	2.0	3.4	110	80
9	Total phosphorus (T-P)	mg/L	0.293	0.158	0.298	0.237	-
10	Color	TCU (True Color Unit)	12.64	14.31	17.32	1.19	(Reference value as 15°)
11	Odor	TON (Threshold Odor Number)	1	2	1	1	(Reference value as 3°)
12	Flow Rate	m/s	-	-	-	-	-

Note *1: 15 TCU is standard value of National Secondary Drinking Water Regulations (NSDWRs) which has established for non-mandatory water quality standards by United States Environmental Protection Agency (USEPA).

Note *2: 3 TON is standard value of NSDWRs which has established by USEPA.

Source: Myanmar Koei International Ltd.



CHAPTER 3: CONCLUSION AND RECOMMENDATIONS

As described in Chapter 2, parameters of SS, total coliform in some points were exceeded the target values in this period for discharging points of Thilawa SEZ Zone A. As for parameters of SS, total coliform, and total nitrogen in some points were exceeded the target values for reference monitoring point as baseline of discharged creek and tube well in monastery. There are some expected reasons for exceeding the target values. However, it cannot reach to the conclusion of what is the reason to be exceeded the target values, thus the continuous monitoring and seasonal data and yearly trend analysis will be necessary.

As for recommendation for discharging points of Thilawa SEZ Zone A, the following actions can be taken to achieve the target levels:

- Minimizing bare lands after completion of the construction activities to reduce SS level.
- Cleaning up roads and retention canal in the industrial area to reduce SS level.

As for recommendation for reference monitoring point as baseline of discharged creek and tube well in monastery, to give advice to monastery to control on the exceeding the target value is as follow;

- Monitoring for Total coliform and nitrite-nitrogen ($N-NO_2$) at groundwater in the monastery (GW-1) to identify impacts from infiltration of toilet wastewater and animal waste in the monastery.

End of the Document



APPENDIX-1 FIELD SURVEY PHOTOS



FOR DISCHARGING POINTS OF THILAWA SEZ ZONE A



Surface water sampling and onsite measurement at SW-1



Surface water sampling and onsite measurement at SW-5



Surface water sampling and onsite measurement at SW-6



**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





Ground water sampling and onsite measurement at GW-1



APPENDIX-2 LABORATORY RESULTS





GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD
Lot No. 12, ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel: 01-2708511 or 70633140

Report No. : GEM-LAB/2016ID025
Revision No. : 1
Report Date : 5 October, 2016
Application No. : 0049-C001

Analysis Report

Client Name:	Myanmar Kwei International LTD (MKI)		
Address:	No.1A/28, Mya Thider Housing, Ward 11, South Okkalapa		
Project Name:	-		
Sample Description:			
Sample Name:	HKI-SW-5-2216	Sampling Date:	
Sample No.:	W-1609073	Sampling By:	
Waste Profile No.:	-	Sample Received Date:	

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	46.00	0
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.81	0
3	COD (Cr)	APHA 5220D (Closed Reflux Colorimetric Method)	mg/l	3.8	0.2
4	Total Nitrogen	HACH Method 18013 (NIT Persulfate Digestion Method)	mg/l	0.9	0
5	Total Phosphorus	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.134	0.05
6	Color	APHA 2120C (Spectrophotometric Method)	TCU	4.22	0
7	Odor	APHA 2150 B (Threshold Odor Test)	TDN	2	-
8	Total Coliform	APHA 9222B (Standard Total Coliform Fermentation Technique)	MPN/100ml	50000	2

Footnote: $LOQ = \text{Limit of Quantitation}$

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, 21st edition.

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Approved By:

Tamara Bush
Director



DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
1st Fl. Thilawa SEZ Zone A, Yangon Region, the Union of Myanmar
Tel: 09-23845111 or 79855149

Report No. : GEM-LAB-201610029
Revision No. : 1
Report Date : 5 October, 2016
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Kool International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : -
Sample Description :
Sample Name : MKI-SW-3-2216
Sample No. : W-1609077
Waste Profile No. : -

Sampling Date : 22 September, 2016
Sampling By : Customer
Sample Received Date : 22 September, 2016

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry wt 103-105°C Method)	mg/l	42.00	0
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	7.05	0
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	6.6	0.7
4	Total Nitrogen	HCN Method 10472 (CNF Persulfate Digestion Method)	mg/l	2.0	0
5	Total Phosphorus	APHA 4500-P C (Ascorbic Acid Method)	mg/l	0.150	0.05
6	Color	APHA 2120C (Spectrophotometric Method)	TCU	14.31	0
7	Odor	APHA 2150 B (Threshold Odor Test)	TOM	2	-
8	Total Coliform	APHA 9222B (Standard Test Coliform Fermentation Technique)	MPN/100ml	24000	1

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, 21st edition

Analysed By :

Ni Ni Aye Linn
Assistant supervisor



Approved By :

Tomoya Suzuki
Director





GOLDEN CHRYSLER LTD-SYSTEM MYANMAR CO., LTD

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Report No.: GEM-LAB-2016:0027

Revision No. 1

Report Date: 5 October, 2016

Application No. = 0049-C001

Analysis Report

Client Name	Myanmar Kael International LTD (MKI)		
Address	No. 1A/2B, Mya Thidar Housing, Ward 11, South Okkalapa.		
Project Name	-		
Sample Description			
Sample Name	RK-SW-6(s)-221B	Sampling Date	
Sample No.	W-1609675	Sampling By	
Waste Profile No.		Sample Received Date	

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	176.06	0
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	5.04	0
3	COD (Cr)	APHA 5210D (Dich. Reflux Colorimetric Method)	mg/l	3.3	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	3.4	0
5	Total Phosphorus	APHA 4500 P E (Ascorbic Acid Method)	mg/l	0.298	0.03
6	Color	APHA 2120C (Spectrophotometric Method)	TCU	17.72	0
7	Odor	APHA 2150 B (Threshold Odor Test)	TOM	1	-
8	Total Coliform	APHA 2021B (Membrane Total Coliform Enumeration Technique)	MPN/100ml	90000	2

Remark : LQ = unit of Quantities

AAPHA - 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*, 21st edition.

Analyzed By:

Sgt. M. Ayo Lewis
Assistant supervisor

Approved By

Tomoya Suzuki
Director



**Thilawa Special Economic Zone (Zone A)
Development Project –Phase 2**

Appendix

Water and Waste Water Quality Monitoring Report

October, 2016

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

(Bi-Monthly Monitoring)

October 2016

Myanmar Koei International Ltd.,



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CHAPTER 1: INTRODUCTION

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 monitoring in the industrial area of Zone A 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-1, SW-2, SW-3, SW-4, SW-5, SW-6, and GW-1 have been monitored in Thilawa SEZ Zone A and its surrounding area in timely manner. Among the 7 locations, SW-1, SW-5 are main discharging gates and SW-6 is discharging from centralized sewage treatment plant (STP) which is required to monitor by Environmental Monitoring Plan (EMoP) in EIA report of Thilawa SEZ Zone A. The remaining points SW-2, SW-3 and SW-4 are sampled as a reference monitoring for comparison with discharging points and baseline of discharged creek. Moreover, GW-1 is monitored as a reference of existing tube well which located in the monastery compound. 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 so as to cover the environmental monitoring plan of the EIA report and the instruction from MJTD.

Water quality sampling was carried out at 7 locations. Among the 7 locations, water flow measurement was carried out at 3 locations (SW-1, SW-5, and SW-6) where can be measured by flow rate instrument. Monitoring items and sampling points are summarized in Table 2.1-1.

Table 2.1-1 Monitoring Items for Water Quality

No.	Parameters	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	GW-1	Remarks
1	pH	○	○	○	○	○	○	○	On-site measurement
2	Water Temperature	○	○	○	○	○	○	○	On-site measurement
3	DO	○	○	○	○	○	○	○	On-site measurement
4	BOD	○	○	○	○	○	○	○	Laboratory analysis
5	COD	○	○	○	○	○	○	○	Laboratory analysis
6	Total Nitrogen	○	○	○	○	○	○	○	Laboratory analysis
7	Suspended Solids	○	○	○	○	○	○	○	Laboratory analysis
8	Total Coliform	○	○	○	○	○	○	○	Laboratory analysis
9	Total Phosphorous	○	○	○	○	○	○	○	Laboratory analysis
10	Color	○	○	○	○	○	○	○	Laboratory analysis
11	Oil and grease	○	○	○	○	○	○	○	Laboratory analysis
12	Chromium	○	○	○	○	○	○	○	Laboratory analysis
13	Odor	○	○	○	○	○	○	○	Laboratory analysis
14	Flow Rate	○	-	-	-	○	○	-	On-site measurement

Source: Myanmar Koei International Ltd.



2.2 Description of Sampling Points

The description 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-1	Coordinate- N-16° 40' 13.5", E- 96° 16' 39.8" Location - Outlet of Retention Pond Survey Item - Surface water sampling and water flow rate measurement.
2	SW-2	Coordinate- N-16° 40' 06.0", E- 96° 16' 43.1" Location - Upstream of Shwe Pyauk Creek Survey Item - Surface water sampling.
3	SW-3	Coordinate- N-16° 40' 05.5", E- 96° 16' 41.6" Location - Upstream of Shwe Pyauk Creek, after combining with the disposal discharge from MJTD. Survey Item - Surface water sampling.
4	SW-4	Coordinate- N-16° 39' 54.6", E- 96° 16' 26.4" Location - Downstream of Shwe Pyauk Creek Survey Item - Surface water sampling.
5	SW-5	Coordinate- N-16° 40' 10.7", E- 96° 16' 22.6" Location - Outlet of Retention Canal Survey Item - Surface water sampling and water flow rate measurement.
6	SW-6	Coordinate- N-16° 40' 26.8", E- 96° 16' 30.7" Location - Outlet from STP to Retention Pond Survey Item - Surface water sampling and water flow rate measurement.
7	GW-1	Coordinate- N-16° 40' 25.1", E- 96° 16' 31.7" Location - In Moegyo Swan Monastery. Survey Item - Ground Water Sampling.

Source: Myanmar Koei International Ltd.

SW-1

SW-1 was collected at the discharge point of retention pond which is located in the east of Moegyo Swan monastery. This drainage is flowing from north to south and then connected to the Shwe Byauk creek through earth drain. The surrounding area is most of occupied by the buildings.

SW-2 (Reference Point)

SW-2 was collected at the upstream of Shwe Byauk creek which is flowing from east to west and then entering into the Yangon river. This sampling point is located at south of Zone A area and Dagon-Thilawa road. The surrounding area are Zone A in the north, industrial compound in the east and paddy field in the south and west respectively.

SW-3 (Reference Point)

SW-3 was collected at the upstream of Shwe Byauk creek which is flowing from east to west and then entering into the Yangon river. It is distance about 60 m downstream of SW-2. This sampling point is located at south of Zone A area and Dagon-Thilawa road. The surrounding area are Zone A in the north, industrial compound in the east and paddy field in the south and west respectively.

SW-4 (Reference Point)

SW-4 was collected at the downstream of Shwe Byauk creek which is flowing from east to west and then entering into the Yangon river. It is distance about 500 m downstream of SW-3. This sampling

point is located at south of Zone A area and Dagon-Thilawa road. The surrounding area are Zone A in the north, industrial compound in the east and paddy field in the south and west respectively.

SW-5

SW-5 was collected at retention canal in front of main gate of Thilawa SEZ. Most of the water collected in this drain is rain water and waste water from surrounding. This drain is also connected to the Shwe Byauk creek. The surrounding area is most of occupied by the buildings.

SW-6

SW-6 was collected at drain outlet of centralized sewage treatment plant (STP) which is located in the north of Moegyo swan monastery compound and retention pond (SW-1). Then the treated water is flowing to the retention pond.

GW-1 (Reference of Existing Tube Well)

GW-1 was collected from tube well as ground water sample. It is located in the compound of Moegyo swan monastery. The surrounding area are Zone A in the west, retention pond in the east and Dagon-Thilawa road in the south respectively.

2.3 Monitoring Method

All water samples were collected with sterilized 1L 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	Suspended solids (SS)	APHA 2540D (Dry at 103-105°C Method)
4	Dissolved oxygen (DO)	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
5	BOD (5)	APHA 5210 B (5 days BOD Test)
6	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)
7	Total coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)
8	Total nitrogen (T-N)	HACH Method 10072 (TN Persulfate Digestion Method)
9	Total phosphorus (T-P)	APHA 4500-P E (Ascorbic Acid Method)
10	Color	APHA 2120C (Spectrophotometric Method)
11	Oil and grease	APHA 5520B (Partition-Gravimetric Method)
12	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
13	Odor	APHA 2150 B (Threshold Odor Test)
14	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 survey were conducted on 18th October 2016 and sampling time is shown in Table 2.4-1 to avoid tidal effect. The tide record for Yangon river, Myanmar on 18th October 2016 is shown in Figure 2.4-1.

Table 2.4-1 Sampling Time of Each Station

No.	Station	Sampling Time
1	SW-1	18/10/2016 13:28
2	SW-2	18/10/2016 10:54
3	SW-3	18/10/2016 11:26
4	SW-4	18/10/2016 12:00
5	SW-5	18/10/2016 12:31
6	SW-6	18/10/2016 12:53
7	GW-1	18/10/2016 13:59

Source: Myanmar Koei International Ltd.

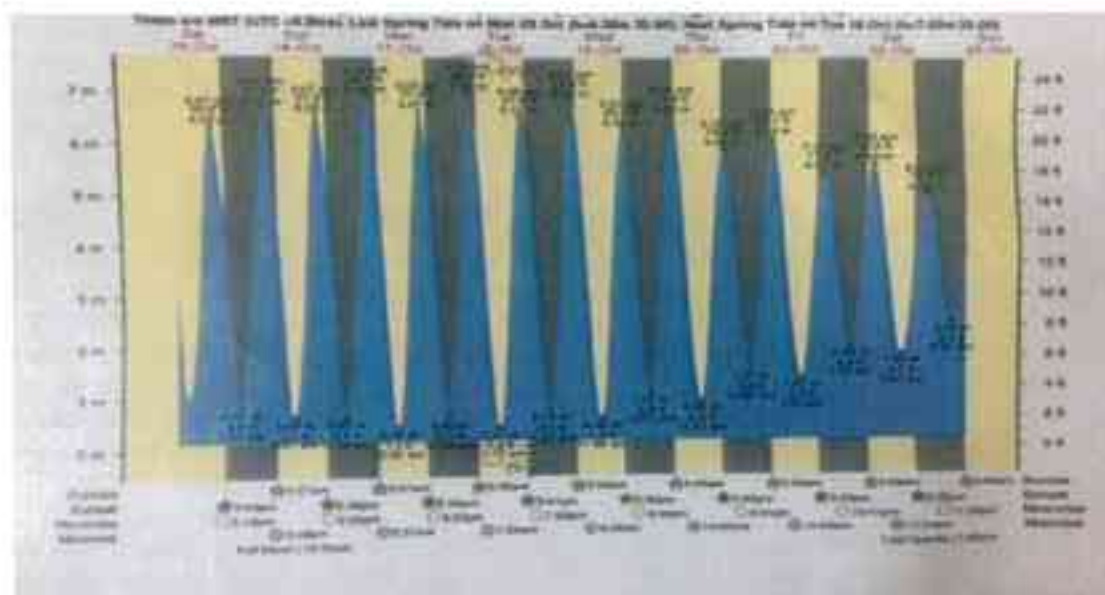


Figure 2.4-1 Tide Record for Yangon River, Myanmar

2.5 Monitoring Results

Results of water quality survey are summarized in Table 2.5-1 and Table 2.5-2. 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 and Industrial Zone, Internal Regulations of Thilawa SEZ Zone A.



2.5.1 Results of Discharging points and After Sewage Treatment Plant of Thilawa SEZ

(1) Results of Bi-Monthly Monitoring

As the comparison with the target value, the results of suspended solid (SS), COD (Cr), Total coliform, Oil and grease were exceeded than the target value. As for the result of SS, the result at the outlet of the centralized wastewater treatment plant (SW-6) complied with the target value. It implied that effluents from each locator were treated well by the wastewater treatment plant. On the other hand, results at the other surface water monitoring point (SW-1) exceeded the target value due to the expected reasons; surface water run-off from bare earth surfaces (erodible surfaces) of construction sites and surface water run-off from bare earth surfaces (erodible surfaces) of vacant land in the industrial area in Zone A. However, the result the levels of SS at outlet of retention canal (SW-5) is less than background level before development of Zone A (91 to 272 mg/L in June to August 2013). Therefore, it is expected that there are not serious impacts on SS to the surrounding environment. In order to reduce SS levels, the following actions can be taken: bare lands should be minimized after completion of the construction activities and the roads and retention canal should be cleaned up in the industrial area. Although MJTD has applied recommended control measures, continuous monitoring is required to achieve the target level.

As for the result of COD (Cr) of surface water, the result at the outlet of the centralized wastewater treatment plant (SW-6) and at the outlet of retention canal (SW-5) also complied with the target value. It implied that effluents from each locator were treated well by the wastewater treatment plant. On the other hand, results at the other surface water monitoring point (SW-1) exceeded the target value due to the expected reason; accidental spillage of Oil and grease to retention pond (SW-1). If the water sample containing Oil and grease, the analysis of COD (Cr) might be affected as positive interference. These analysis methods commonly used in Myanmar where there is limitation of laboratory instruments are unable to get correct results. One of the possibility to avoid positive interference is to analyze with the upgraded method.

As for the result of Total coliform of surface water, the result at the outlet of the centralized wastewater treatment plant (SW-6) also complied with the target value. It implied that effluents from each locator were treated well by the wastewater treatment plant. On the other hand, results at the other surface water monitoring points (SW-1 and SW-5) exceeded the target value due to the expected reasons; overflow of domestic wastewater at some construction sites into channels in the industrial area. In order to reduce Total coliform level, the following possible actions can be taken: 1) Leakage of domestic wastewater from construction sites by checking and 2) Roads and retention canal by cleaning in the industrial area. Although MJTD has applied recommended control measures, continuous monitoring is required to achieve the target level.

As for the result of Oil and grease of surface water, the result at the outlet of the centralized wastewater treatment plant (SW-6) also complied with the target value. It implied that effluents from each locator were treated well by the wastewater treatment plant. On the other hand, results at the other surface water monitoring point (SW-1) exceeded the target value due to the expected reasons; the construction activities are anticipated to require the onsite use, storage and handling of diesel for the generator sets and lubrication oil to maintain the equipment used onsite. If not properly cleaned up, spillage of Oil and grease during use, storage or handling onsite may be washed into the drains and adversely impact the water quality of receiving water bodies. In order to reduce Oil and grease level, the following possible actions can be taken: 1) leakage and spillages in the storage area of construction site by checking and 2) spillage to be collected and should be sent to waste management plant for proper disposal.

(2) Additional Monitoring by MJTD

MJTD has carried out regular water quality monitoring in accordance with EIA report. In addition to EIA report, MJTD has conducted water quality monitoring by weekly and monthly basis. During MKI conducted water quality monitoring on (18-Oct-2016), water sample has contained high level of Oil and grease at SW-1. Therefore, lab results (18-Oct-2016) is compared with lab results (2-Nov-2016). It



can be clearly seen that the result of SS, COD (Cr), Oil and grease are lower on (2-Nov-2016) lab results. In conclusion, all exceeded parameters at SW-1 are due to the possibility of positive interference by Oil and grease in sample.

2.5.2 Results of Reference Monitoring for Comparison with Discharging Points and Baseline of Discharged Creek

As the comparison with the target value, the results of SS, Total coliform, Oil and grease 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) exceeded the target value due to two expected reasons; i) delivered from upstream area such as natural origin and wastewater from the other industrial area outside of Thilawa SEZ, and ii) delivered from downstream area by tidal effect. However, the levels of SS are more or less than background level before development of Zone A (91 to 272 mg/L in June to August 2013). Therefore, it is expected that there are not serious impacts on Suspended Solid to the surrounding environment.

As for the result of Total coliform of surface water, results at the other surface water monitoring points (SW-2, SW-3, SW-4) exceeded the target value due to two expected reasons; i) runoff of animal waste from the undeveloped area and delivered from industrial area and illegal dumping site from outside of Thilawa SEZ in the upstream area, and ii) delivered from downstream area by tidal effect. Therefore, it is difficult to identify major pollution sources to cause exceeding the target value.

As for the result of Oil and grease of surface water, results at the other surface water monitoring points (SW-2, SW-3) exceeded the target value due to expected reason; accidental spillage of Oil and grease to retention pond (SW-1) and these spillages may be flowing up to SW-2 and flowing out to SW-3 during high tide, upstream of Shwe Pyauk creek. After this issue was found, retention pond discharge gate was closing from 18th October 2016 to 26th October 2016. In during those days, heavy rain and the collected rain water diluted with oil contaminated water. Then, oil and grease level has been lower than the target value. For the confirmation of current status for Oil and grease at retention pond, additional water quality monitoring was conducted. After confirmed that Oil and grease level were below the target value, retention pond discharge gate was opened. Therefore, oil contaminated water which is exceeded the target value were not discharged to the natural creek.



Table 2.5-1 Results of Water Quality Monitoring at Main Discharging Gates and Discharged from Centralized STP

No.	Parameters	Unit	Sampling Date		18-Oct-16	2-Nov-16	18-Oct-16	18-Oct-16	Target Value
			MKI ¹	MJTD ²	SW-1	SW-1	SW-5	SW-6	
1.	Temperature	°C	35	-	33	-	33	30	Max. 40
2.	pH	-	7	-	7.5	-	7.5	7.5	5.0-9.0
3.	Suspended solids (SS)	mg/L	982.00	402	120.00	-	2.00	2.00	Max. 30
4.	Dissolved oxygen (DO)	mg/L	4.76	-	6.71	-	3.32	3.32	-
5.	BOD (5)	mg/L	8.35	0.6	4.48	-	3.32	3.32	Max. 20
6.	COD (Cr)	mg/L	2380.0	< 0.7	4.6	-	10.2	10.2	Max. 70
7.	Total coliform	MPN/100ml	95,000	160,000	160,000	-	< 2	< 2	Max. 400
8.	Total nitrogen (T-N)	mg/L	3.1	5.3	1.2	-	7.4	7.4	80
9.	Total phosphorous (T-P)	mg/L	0.606	0.322	0.27	-	0.09	0.09	-
10.	Color	TCU (True Color Unit)	8.75	7.53	5.62	-	7.00	7.00	-
11.	Oil and grease	mg/L	320.25	4.73	< 3.1	-	< 3.1	< 3.1	Max. 5
12.	Chromium	mg/L	≤ 0.002	0.046	≤ 0.002	-	≤ 0.002	≤ 0.002	Max. 0.3
13.	Odor	TON (Threshold Odor Number)	200	8	1	-	1	1	-
14.	Flow Rate	m ³ /s	0.061	-	0.517	-	1.004	1.004	-

Note *1: MJTD has carried out regular water quality monitoring in accordance with EIA report. In addition to EIA report, MJTD has conducted water quality monitoring by weekly and monthly basis. During MKI conducted water quality monitoring on 18 Oct 2016, water sample has contained high level of Oil and grease at SW-1. Therefore, lab results (18-Oct-2016) is compared with lab results (2-Nov-2016). It can be clearly seen that the result of SS, COD (Cr), Oil and grease are lower on (2-Nov-2016) lab results. In conclusion, all exceeded parameters at SW-1 are due to the possibility of positive interference by Oil and grease in sample.

Source: Myanmar Koei International Ltd.



Table 2.5-2 Result of Water Quality Survey for Reference Monitoring Points for Comparison with Discharging Points and Baseline of Discharged Creek

Sampling Date			18-Oct-16	18-Oct-16	18-Oct-16	18-Oct-16	-
No.	Parameters	Unit	SW-2	SW-3	SW-4	GW-1	Target Value
1.	Temperature	°C	29	30	30	34	Max. 40
2.	pH	-	6	6	6	8	5.0-9.0
3.	Suspended solids (SS)	mg/L	36.00	88.00	82.00	12.00	Max. 30
4.	Dissolved oxygen (DO)	mg/L	4.62	3.71	4.2	3.56	-
5.	BOD (5)	mg/L	3.86	3.67	3.87	3.34	Max. 20
6.	COD (Cr)	mg/L	14.5	10.5	11.0	5.0	Max. 70
7.	Total coliform	MPN/100ml	30,000	24,000	160,000	< 2	Max. 400
8.	Total nitrogen (T-N)	mg/L	0.8	7.2	7.2	0.7	80
9.	Total phosphorus (T-P)	mg/L	0.113	0.19	0.171	0.089	-
10.	Color	TCU (True Color Unit)	14.09	8.76	8.25	4.46	
11.	Oil and grease	mg/L	16.56	11.38	< 3.1	< 3.1	Max. 5
12.	Chromium	mg/L	≤ 0.002	≤ 0.002	≤ 0.002	≤ 0.002	Max. 0.5
13.	Odor	TUN (Threshold Odor Number)	2	2	1	1	
14.	Flow Rate	m³/s	-	-	-	-	-

Source: Myanmar Koei International Ltd.



CHAPTER 3: CONCLUSION AND RECOMMENDATIONS

As described in Chapter 2, parameters of SS, COD (Cr), Total coliform, Oil and grease in surface water were exceeded the target values in this period for main discharging gates of Thilawa SEZ. As for parameters of SS, Total coliform, Oil and grease in surface water were exceeded the target values for reference monitoring points. There are some expected reasons for exceeding the target values. However, it cannot reach to the conclusion of what is the reason to be exceeded the target values, thus the continuous monitoring and seasonal data and yearly trend analysis will be necessary.

As for recommendation for main discharging points of Thilawa SEZ, the following action can be taken to achieve the target levels:

- Minimizing bare lands after completion of the construction activities to reduce SS level.
- Monitoring the domestic wastewater from construction sites and make instruction to the contractors together with Thilawa SEZ Management Committee as necessary.
- Cleaning up roads and retention canal in the industrial area to reduce SS and Total coliform level.
- Conducting visual inspection of Oil and grease leakage from the construction sites along the retention canal periodically.

End of the Document



APPENDIX-1 FIELD SURVEY PHOTOS



FOR DISCHARGING POINTS OF THILAWA SEZ ZONE A



Surface water sampling and onsite measurement at SW-1



Surface water sampling and onsite measurement at SW-5



Surface water sampling and onsite measurement at SW-6



**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 at SW-3



Surface water sampling and onsite measurement at SW-4





Ground water sampling and onsite measurement at GW-1



APPENDIX-2 LABORATORY RESULTS



FOR DISCHARGING POINTS AND AFTER SEWAGE TREATMENT PLANT

DOWA

GOLDEN DOWA ECOSYSTEM MYANMAR CO., LTD.

Lot No. 11, Thilawa SEZ Zone A, Yangon Region, Myanmar

Tel: 04-2104051 / 00-96833149

Report No. : GEM-LAB-201611015

Revision No. : 1

Report Date : 7 November, 2016

Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No. 1A / 2B, Nya Thidar Housing, Ward 11, South Okkalapa
Project Name : -
Sample Description :
Sample Name : MKI-SW-1-101B Sampling Date : 18 October, 2016
Sample No. : W-1610077 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 18 October, 2016

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	982.00	8
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	9.35	9
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	2380.0	0.7
4	Total Nitrogen	HACH Method 10072 (TN Persulfate Digestion Method)	mg/l	3.1	9
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.006	0.05
6	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	320.35	3.1
7	Total Coliform	APHA 9222B (Standard Total Coliform Membrane Technique)	MPN/100ml	90000	2
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	8.75	8
9	Odor	APHA 2130 B (Threshold Odor Test)	TON	200	8
10	Cyanide	HACH 8027 (Pyridine -Pyrazolone Method)	mg/l	7.000	0.002
11	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	8.0	0.1
12	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	1.188	0.035
13	Formaldehyde	HACH 8116 (MBTH Method)	mg/l	0.490	0.033
14	Phenol	APHA 8000 (4-Aminoantipyrine, Potassium Ferricyanide, Potassium Peroxydisulfate)	mg/l	0.032	0.032

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, 21st edition



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No.	Parameter	Method	Unit	Result	LOQ
15	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.00054	0.00054
16	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.054	0.002
17	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.022	0.01
18	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
19	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.001	0.001
20	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
21	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
22	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.004	0.002
23	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.048	0.001
24	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.052	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, 21st edition

Analyzed By:



Ni Ni Aye Lwin
Assistant supervisor



Approved By :



Tomoya Suzuki
Director



DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.

Lot No. 01, Thilawa SEZ Zone A, Yangon Region, the Union of Myanmar
Tel: 09-2234656 / 09-26603149

Report No. : GEM-LAB-201611020

Revision No. : 1

Report Date : 7 November, 2016

Application No. : 0045-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /2B, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : -
Sample Description :
Sample Name : MKI-SW-S-1018
Sample No. : W-1610081
Waste Profile No. : -
Sampling Date : 19 October, 2016
Sampling By : Customer
Sample Received Date : 18 October, 2016

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	120.00	0
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	4.48	0
3	COD (Cr)	APHA 5220D (Dilute Reflux Colorimetric Method)	mg/l	4.6	0.7
4	Total Nitrogen	HACH Method 10072 (TWT Persulfate Digestion Method)	mg/l	1.2	0
5	Total Phosphorus	APHA 4500 P-E (Ascorbic Acid Method)	mg/l	0.27	0.05
6	Oil and Grease	APHA 5320B (Partition-Gravimetric Method)	mg/l	< 3.1	5.1
7	Total Coliform	APHA 9222B (Standard Plate Count: Fermentation Technique)	MPN/100ml	150000	2
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	5.62	0
9	Odor	APHA 2150 B (Threshold Odor Test)	TCU	1	0
10	Cyanide	HACH 8027 (Pyridine-Pyrazolone Method)	mg/l	0.147	0.002
11	Free Chlorine	APHA 4500 CL-G (DPD Colorimetric Method)	mg/l	2.8	0.1
12	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.508	0.005
13	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.262	0.003
14	Phenol	APHA 8210 (4-Amino Resorcinol Method)	mg/l	0.028	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, 19th ed.



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No.	Parameter	Method	Unit	Result	LOQ
15	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.00054	0.00054
16	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.042	0.002
17	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.012	0.01
18	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
19	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.001	0.001
20	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
21	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
22	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
23	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.036	0.001
24	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.028	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, 21st edition

Analyzed By:



Uti Aye Lwin
Assistant supervisor

Approved By :



Tomoya Suzuki
Director





GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No. 11, Thilawa SEZ Zone A, Fuyang Region, the Union of Myanmar
Tel 01-2386111, 85 76433143

Report No. : GEM-LAB-201611021

Revision No. : 1

Report Date : 7 November, 2016

Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Kwei International LTD (MKI)
Address : No. 1A /2B, Mya Thadar Housing, Ward 11, South Okkalapa.
Project Name : -
Sample Description :
Sample Name : MKI-SW-G-1018 Sampling Date : 18 October, 2016
Sample No. : W-1610082 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 18 October, 2016

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	2.00	0
2	BOD (5)	APHA 5210 D (5 Days BOD Test)	mg/l	3.32	0
3	COD (Cr)	APHA 5210D (Dichromate Reflux Colorimetric Method)	mg/l	10.2	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	1.4	0
5	Total Phosphorus	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.09	0.05
6	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
7	Total Coliform	APHA 9221B (Standard Test Coliform Enumeration Technique)	MPN/100ml	< 2	2
8	Color	APHA 2100C (Spectrophotometric Method)	TCU	2.00	0
9	Odor	APHA 2150 B (Threshold Odor Test)	TCB	I	II
10	Cyanide	HACH 8027 (Pyridine-Pyrazolone Method)	mg/l	0.001	0.002
11	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	9.1	0.1
12	Sulfide	HACH 8131 (LUSEM Methylene Blue Method)	mg/l	< 0.005	0.005
13	Formaldehyde	HACH 8010 (MBTH Method)	mg/l	0.004	0.003
14	Phenol	APHA 8001 (4-CPP Method) (Spectrophotometric Transmittance Method)	mg/l	0.004	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, 21st edition



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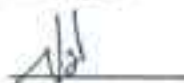
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No.	Parameter	Method	Unit	Result	LOQ
15	Mercury	APHA 3120.8 (Inductively Coupled Plasma (ICP) Method)	mg/l	± 0.00054	0.00054
16	Zinc	APHA 3120.8 (Inductively Coupled Plasma (ICP) Method)	mg/l	0.006	0.002
17	Arsenic	APHA 3120.8 (Inductively Coupled Plasma (ICP) Method)	mg/l	±0.01	0.01
18	Chromium	APHA 3120.8 (Inductively Coupled Plasma (ICP) Method)	mg/l	± 0.002	0.002
19	Cadmium	APHA 3120.8 (Inductively Coupled Plasma (ICP) Method)	mg/l	± 0.001	0.001
20	Selenium	APHA 3120.8 (Inductively Coupled Plasma (ICP) Method)	mg/l	± 0.01	0.01
21	Lead	APHA 3120.8 (Inductively Coupled Plasma (ICP) Method)	mg/l	± 0.002	0.002
22	Copper	APHA 3120.8 (Inductively Coupled Plasma (ICP) Method)	mg/l	±0.002	0.002
23	Barium	APHA 3120.8 (Inductively Coupled Plasma (ICP) Method)	mg/l	0.014	0.001
24	Nickel	APHA 3120.8 (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, 21st edition

Analyzed 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 ENVIRONMENT MYANMAR CO., LTD.
Lot No. 81, Thilawa SEZ Zone A, Yangon Region, the Union of Myanmar
Tel (01) 3306331 or 78633149

Report No. : GEM-LAB-201611017

Revision No. : 1

Report Date : 7 November, 2016

Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Kael International LTD (MKI)
Address : No.1A / 2B, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : -
Sample Description :

Sample Name : MKI-SW-2-2016

Sampling Date : 18 October, 2016

Sample No. : W-161007B

Sampling By : Customer

Waste Profile No. : -

Sample Received Date : 18 October, 2016

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	35.00	3
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.88	0
3	COD (Cr)	APHA 5220D (Dichloro Reflux Colorimetric Method)	mg/l	14.5	0.7
4	Total Nitrogen	HACH Method 10072 (TKN Persulfate Digestion Method)	mg/l	0.8	0
5	Total Phosphorus	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.113	0.05
6	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	16.54	3.1
7	Total Coliform	APHA 9221A (Membrane Filter (Surface Filtration Technique)	MPN/100ml	30000	2
8	Color	APHA 2120C (Spectrophotometric Method)	PCU	14.06	3
9	Odor	APHA 2130 B (Threshold Odor Test)	TON	2	0
10	Cyanide	HACH 8027 (Pyridine - Pyrazolone Method)	mg/l	0.031	0.002
11	Free Chlorine	APHA 4500 Cl ₂ G (DPD Colorimetric Method)	mg/l	0.7	0.1
12	Sulphide	HACH 8123 (METHIA Methylene Blue Method)	mg/l	0.102	0.005
13	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.006	0.003
14	Phenol	APHA 8210 (4-Amino-2,6-Dimethylphenol 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 Research Foundation (WERF), Standard Methods for the Examination of Water and Wastewater, 21st edition



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No.	Parameter	Method	Unit	Result	LOQ
12	Mercury	APHA 8120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	± 0.00654	0.0024
13	Zinc	APHA 8120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.012	0.002
17	Arsenic	APHA 8120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	± 0.01	0.01
18	Chromium	APHA 8120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	± 0.002	0.002
19	Cadmium	APHA 8120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	± 0.001	0.001
20	Selenium	APHA 8120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	± 0.01	0.01
21	Lead	APHA 8120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	± 0.002	0.002
22	Copper	APHA 8120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	± 0.002	0.002
23	Barium	APHA 8120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.012	0.001
24	Nickel	APHA 8120 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, 21st edition

Analyzed By :



Hi Hi Aye Lwin
Assistant supervisor



Approved By :



Tomoya Suzuki
Director





GOLDEN DOWA ECO-SYS (S) MYANMAR CO., LTD

(Lot No. 11, Thilawa SEZ Zone A, Sangan Region, the Union of Myanmar)
Tel: 01-231601 / 01-231611

Report No. : GEM-LAB-201611018

Revision No. : 1

Report Date : 7 November, 2016

Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Kwei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : -
Sample Description : -
Sample Name : MKI-SW-3-1019
Sample No. : W-1610079
Waste Profile No. : -

Sampling Date : 18 October, 2016

Sampling By : Customer

Sample Received Date : 18 October, 2016

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	88.00	0
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.67	0
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	19.5	0.7
4	Total Nitrogen	HACH Method 80672 (TNT Persulfate Digestion Method)	mg/l	7.2	0
5	Total Phosphorus	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.19	0.05
6	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	11.38	3.1
7	Total Coliform	APHA 9229B (Standard Total Coliform Fermentation Technique)	MPN/100ml	28000	2
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	8.76	0
9	Odor	APHA 2150 B (Threshold Odor Test)	TON	2	0
10	Cyanide	HACH 8077 (Pyridine -Pyrazolone Method)	mg/l	0.076	0.002
11	Free Chlorine	APHA 4500 CL-G (DPD Colorimetric Method)	mg/l	1.4	0.1
12	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.254	0.005
13	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.128	0.003
14	Phenol	APHA Method 8001 (Phenylhydrazine Spectrophotometric, Formaldehyde Extraction)	mg/l	0.001	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, 18th edition.



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No.	Parameter	Method	Unit	Result	LOQ
15	Mercury	APHA 1631 B (Inductively Coupled Plasma (ICP) Method)	mg/l	± 0.00054	0.00054
16	Zinc	APHA 1631 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.014	0.002
17	Arsenic	APHA 1631 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
18	Chromium	APHA 1631 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
19	Cadmium	APHA 1631 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.001	0.001
20	Selenium	APHA 1631 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
21	Lead	APHA 1631 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
22	Copper	APHA 1631 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
23	Barium	APHA 1631 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.08	0.001
24	Nickel	APHA 1631 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.01	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, 21st edition

Analyzed By:



Ni Ni Aye Lwin
Assistant supervisor

Approved By :



Tomoya Suzuki
Director



DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No. 22, Mahlaung 22 Zone A, Yangon Region, the Union of Myanmar
Tel: 09-76631149

Report No. : GEM-LAB-201611019

Revision No. : 1

Report Date : 7 November, 2016

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 : -
Sample Description :
Sample Name : HET-SW-4-1018 Sampling Date : 18 October, 2016
Sample No. : W-1610080 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 18 October, 2016

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	82.00	0
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	1.87	0
3	COD (Cr)	APHA 5210G (Dose Reflux Colorimetric Method)	mg/l	11.0	0.2
4	Total Nitrogen	HACH Method 18072 (TRT Persulfate Digestion Method)	mg/l	7.2	0
5	Total Phosphorus	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.171	0.05
6	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
7	Total Coliform	APHA 9211B (Standard Total Coliform Fermentation Technique)	MPN/100ml	180000	2
8	Color	APHA 2120C (Spectrophotometric Method)	PCU	8.25	0
9	Odor	APHA 2130 B (Threshold Odor Test)	TON	1	0
10	Cyanide	HACH 8027 (Pyridine -Pyrazolone Method)	mg/l	0.009	0.002
11	Free Chlorine	APHA 4500 CL G (DPO Colorimetric Method)	mg/l	1.3	0.1
12	Sulfide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.243	0.005
13	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.137	0.003
14	Phenol	USEPA Method 8210 (Threshold Sublimation Colorimetric Method)	mg/l	0.007	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.



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No.	Parameter	Method	Unit	Result	LOQ
15	Mercury	APHA 1631 & Inductively Coupled Plasma (ICP) Method	mg/l	≤ 0.00054	0.00054
16	Zinc	APHA 1631 & Inductively Coupled Plasma (ICP) Method	mg/l	0.022	0.002
17	Arsenic	APHA 1631 & Inductively Coupled Plasma (ICP) Method	mg/l	≤ 0.01	0.01
18	Chromium	APHA 1631 & Inductively Coupled Plasma (ICP) Method	mg/l	≤ 0.002	0.002
19	Cadmium	APHA 1631 & Inductively Coupled Plasma (ICP) Method	mg/l	≤ 0.001	0.001
20	Selenium	APHA 1631 & Inductively Coupled Plasma (ICP) Method	mg/l	≤ 0.01	0.01
21	Lead	APHA 1631 & Inductively Coupled Plasma (ICP) Method	mg/l	≤ 0.002	0.002
22	Copper	APHA 1631 & Inductively Coupled Plasma (ICP) Method	mg/l	≤ 0.002	0.002
23	Barium	APHA 1631 & Inductively Coupled Plasma (ICP) Method	mg/l	0.018	0.001
24	Nickel	APHA 1631 & Inductively Coupled Plasma (ICP) Method	mg/l	0.01	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, 21st edition

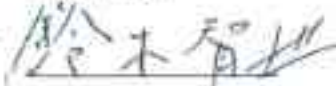
Analyzed By:



Hi Ni Aye Lwin
Assistant supervisor



Approved By :



Tomoya Suzuki
Director



DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No. 11, Thilawa SEZ Zone A, Yangon Region, the Union of Myanmar
Tel: 011-2588011 / 09-76625144

Report No. : GEM-LAB-201611015

Revision No. : 1

Report Date : 7 November, 2016

Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Kiet International LTD (MKI)
Address : No.1A / 2B, Mya Thadar Housing, Ward 11, South Okkalapa.
Project Name : -
Sample Description :
Sample Name : MKI-GW-1-1D1X Sampling Date : 18 October, 2016
Sample No. : W-1610E76 Sampling by : Customer
Water Profile No. : - Sample Received Date : 18 October, 2016

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	11.00	0
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	1.34	0
3	COD (Cr)	APHA 5220D (Open Reflux Colorimetric Method)	mg/l	5.8	0.7
4	Total Nitrogen	HACH Method 10072 (TNF Persulfate Digestion Method)	mg/l	0.7	0
5	Total Phosphorus	APHA 4500-PE (Ascorbic Acid Method)	mg/l	0.088	0.05
6	Oil and Grease	APHA 5520B (Filtration-Gravimetric Method)	mg/l	< 3.1	3.1
7	Total Coliform	APHA 5220B (Standard Plate Count, Membrane Filtration Technique)	MPN/100ml	< 2	2
8	Color	APHA 2120C (Spectrophotometric Method)	PCU	4.40	0
9	Odor	APHA 2150 B (Threshold Odor Test)	TUO	1	0
10	Cyanide	HACH 8017 (Pyridine -Pyrazolone Method)	mg/l	0.002	0.002
11	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.1	0.1
12	Sulfate	HACH 8131 (USEPA Barium Chloride Blue Method)	mg/l	< 0.005	0.005
13	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	< 0.003	0.002
14	Phenol	APHA 8210 (4-Amino-2,6-Dimethylphenol Method)	mg/l	0.015	0.002

Remark: LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the British Columbia Water Society (BCWS) Standard Methods for the Examination of Water and Wastewater, 19th Edition.



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Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone A
(Bi-Monthly Monitoring in FY-2016)

No.	Parameter	Method	Unit	Result	LOQ
15	Mercury	APHA 2128 B (Inductively Coupled Plasma (ICP) Method)	mg/l	< 0.00054	0.00054
16	Zinc	APHA 2128 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.01	0.002
17	Arsenic	APHA 2128 B (Inductively Coupled Plasma (ICP) Method)	mg/l	< 0.01	0.01
18	Chromium	APHA 2128 B (Inductively Coupled Plasma (ICP) Method)	mg/l	< 0.002	0.002
19	Cadmium	APHA 2128 B (Inductively Coupled Plasma (ICP) Method)	mg/l	< 0.001	0.001
20	Selenium	APHA 2128 B (Inductively Coupled Plasma (ICP) Method)	mg/l	< 0.01	0.01
21	Lead	APHA 2128 B (Inductively Coupled Plasma (ICP) Method)	mg/l	< 0.000	0.002
22	Copper	APHA 2128 B (Inductively Coupled Plasma (ICP) Method)	mg/l	< 0.002	0.002
23	Barium	APHA 2128 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.002	0.001
24	Nickel	APHA 2128 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, 21st edition

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**Thilawa Special Economic Zone (Zone A)
Development Project –Phase 2**

Appendix

Noise and Vibration Monitoring Report

October, 2016

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

(QUARTERLY MONITORING)

October 2016

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 A 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 A, Noise and Vibration levels had been monitored from 24th October 2016 – 26th October 2016 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 24 th October–25 th October, 2016	Noise Level	$L_{Aeq}(dB)$	1 site (NV1)	24 hours	On-site measurement by "Rion NL-22 sound level meter"
From 25 th October–26 th October, 2016	Noise Level	$L_{Aeq}(dB)$	1 site (NV2)	24 hours	On-site measurement by "Rion NL-22 sound level meter"
From 24 th October–25 th October, 2016	Vibration Level	$L_{v10}(dB)$	1 site (NV1)	24 hours	On-site measurement by "Vibration Level Meter- VM-53A"
From 25 th October–26 th October, 2016	Vibration Level	$L_{v10}(dB)$	1 site (NV2)	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 place of the inside of the Thilawa SEZ Zone A expansion compound, sampling point (NV-1); N:16° 41' 12.43", E:96° 15' 54.11" and in front of administrative building, Thilawa SEZ Zone A, sampling point (NV-2); N:16°40'10.86", E:96°16'31.36" for traffic noise concerned. 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 surrounded by the residential houses of Alwan sok village and fields in north, garment factory in west, Thilawa dam in southeast, and construction of factories in Zone A respectively. The noise and vibration monitoring are carried out at NV-1 where is near to the residential houses of Alwan sok village. Possible source of noise and vibration is generated from construction activities. Another possible source is road traffic. There is an access road situated north of NV-1 and which is paved with moderately traffic volume.

NV-2

NV-2 is located in front of Administrative building, Thilawa SEZ and next to Dagon-Thilawa road which is paved with moderate to highly traffic volume during the day and night by passing of loader vehicles and dump trucks. Possible source of noise and vibration is generated from vehicle traffic during the day time and night.

2.3 Monitoring Method

Noise level was measured by "Rion NL-22 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_{vz} , was measured every 10 minutes within the adaptable range of (10-70) dB at NV-1 and (20-80) dB at NV-2 and recorded to a memory card.

The measurement period of both noise and vibration was 24 hours for each sampling 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 are separated 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-1 and daytime (6:00 AM to 10:00 PM), evening time (10:00 PM to 6:00 AM) time frames for NV-2. Noise measurements 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. Comparing with the target value of noise level in construction stage prescribed in EIA report for Thilawa SEZ development project Zone A, all of the result are under target value.

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

Date	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)
24 th October– 29 th October, 2016	50	53	48
Target Value	75	65	65

Note: Target value is referred in the EIA Report for Development of Thilawa SEZ (Zone A)

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

Date	Equivalent Noise Level (L_{Aeq} , dB)	
	Day Time (6:00 AM – 10:00 PM)	Night Time (10:00 PM – 6:00 AM)
23 rd October– 26 th October, 2016	60	57
Target Value	75	70

Note: Target value is applied to 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 2.4-3 Hourly Noise Level (L_{Aeq}) Monitoring Results at NV-1

Date	Time	(L_{Aeq} dB)	(L_{Aeq} dB) Each Company	(L_{Aeq} dB) Ogger Value
24 th October- 25 th October, 2016	7:00-8:00	50.79	50	75
	8:00-9:00	48.37		
	9:00-10:00	48.96		
	10:00-11:00	50.69		
	11:00-12:00	47.60		
	12:00-13:00	48.27		
	13:00-14:00	49.25		
	14:00-15:00	51.75		
	15:00-16:00	50.16		
	16:00-17:00	50.86		
	17:00-18:00	51.61		
	18:00-19:00	48.69		
	19:00-20:00	56.05	53	65
	20:00-21:00	51.53		
	21:00-22:00	50.07		
	22:00-23:00	50.43	48	65
	23:00-24:00	47.36		
	24:00-1:00	49.95		
	1:00-2:00	48.00		
	2:00-3:00	48.62		
	3:00-4:00	46.78		
	4:00-5:00	46.23		
	5:00-6:00	46.99		
	6:00-7:00	47.85		



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

Date	Time	(L_{Aeq} , dB)	(L_{Aeq} , dB) Each Century	(L_{Aeq} , dB) Limit Value
23 rd October – 26 th October, 2016	6:00-7:00	57.98	60	75
	7:00-8:00	61.38		
	8:00-9:00	59.59		
	9:00-10:00	60.97		
	10:00-11:00	59.40		
	11:00-12:00	59.67		
	12:00-13:00	60.49		
	13:00-14:00	61.06		
	14:00-15:00	63.05		
	15:00-16:00	61.55		
	16:00-17:00	61.60		
	17:00-18:00	60.55		
	18:00-19:00	60.85		
	19:00-20:00	58.24		
	20:00-21:00	57.05		
	21:00-22:00	59.02		
	22:00-23:00	58.39	57	70
	23:00-24:00	57.37		
	24:00-1:00	58.70		
	1:00-2:00	57.37		
	2:00-3:00	58.63		
	3:00-4:00	57.28		
	4:00-5:00	55.00		
	5:00-6:00	53.72		

The result of vibration level is shown in Table 2.4-5. By comparing with the target vibration level in construction phase in EIA report for Thilawa SEZ development project Zone A, all of results were under the target values.

Table 2.4-5 Results of Vibration Levels (L_{v10}) Monitoring at NV-1 and NV-2

Location	Date	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	24 th – 25 th October, 2016	27	16	14
NV-2	25 th – 26 th October, 2016	42	40	39
Target Value		70	70	65

Note: Target value is referred in the EIA Report for Development of Thilawa SEZ (Zone A)



Table 2.4-6 Results of Hourly Vibration Levels (L_{v10}) Monitoring at NV-1 and NV-2

Date	24 th - 24 th Dec 2018	25 th - 26 th Dec 2018	L_{v10} (9) (NV-1) Each Category	L_{v10} (8) (NV-2) Each Category	L_{v10} (dB) Target Value
Time	L_{v10} (NV-1)	L_{v10} (NV-2)			
7:00-8:00	21.06	39.84	27	42	70
8:00-9:00	23.86	40.28			
9:00-10:00	23.20	41.65			
10:00-11:00	32.38	41.09			
11:00-12:00	30.48	41.52			
12:00-13:00	19.25	41.31			
13:00-14:00	23.46	41.49			
14:00-15:00	23.80	43.29			
15:00-16:00	25.58	43.52			
16:00-17:00	30.04	42.07			
17:00-18:00	30.50	40.23			
18:00-19:00	21.42	42.62			
19:00-20:00	17.65	38.85	16	40	70
20:00-21:00	15.02	39.61			
21:00-22:00	14.49	41.13			
22:00-23:00	14.36	39.34	14	39	65
23:00-24:00	13.32	40.02			
24:00-1:00	13.76	38.51			
1:00-2:00	13.65	39.03			
2:00-3:00	13.39	37.49			
3:00-4:00	13.69	39.30			
4:00-5:00	13.09	35.88			
5:00-6:00	14.19	34.81			
6:00-7:00	16.88	39.84			



CHAPTER 3: CONCLUSION AND ISSUES TO BE SOLVED

All of results of noise levels at NV-1 and NV-2 are lower than target levels.

By comparing with the target vibration level in construction stage in EIA report for Thilawa SEZ development project Zone A, all of results were under the target values. The result of vibration levels for NV-1 and NV-2 are approximately half of the target levels.

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 A during the monitoring period.



**Thilawa Special Economic Zone (Zone A)
Development Project –Phase 2**

Appendix

Accident Case

October 2016 to December 2016

Description - Oil and grease found in Retention Pond and Counter Measures

Situation and Action Taken

- Immediately closed the discharge gate of retention pond when found the oil and grease in Retention Pond. After closing, checking the situation with OSSC-Environmental Section.
- Oil contaminated water are not discharging to the water body (natural creek) and follow the OSSC instruction as following:
 1. Oil removal and discharging water from retention pond as long as MJTD can control flood.
 2. Additional water quality monitoring - take the sample from SW-1 (discharging point of retention pond) and analysis parameter of oil and grease and other bi-monthly monitoring parameters after removal of oil (before discharging water to the outside canal).
 3. To install simple oil fence, oil removal mat or oil catcher to take action such incident in future to prevent such kind of incident.
- Retention pond discharge gate was closing from 18 October 2016 to 26 October 2016. In during those days, heavy rain and the rain water diluted with oil contaminated water and disappear the oil. The following tables is water quality monitoring for before and after discharging of oil contaminated water.

Table: Water Quality Monitoring Result (Before and After Discharging)

No	Parameter	Standard	Unit	Storage in Retention Pond	Before Discharging	After Discharging
Date				19-Oct-16	26-Oct-16	2-Nov-16
1	Oil and Grease	5	ppm	421.4	8.8	4.73



Figure 1 Found the oil and grease in SW-1 (retention pond discharge)



Figure 2 Construction Site near around the box culvert.

Conclusion

Oil contaminated water was not discharged into the water body and water quality monitoring conduct for oil and grease periodically until within the standard. As the reference table, oil and grease level is obviously decreased and the oil and grease is within the standard during discharging.



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