

Environmental Monitoring Report Phase-2 & 3 (Construction Phase)



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1. Executive Summary

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

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

2. Summary of Monitoring Activities

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

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

| Report No. | Description | Phase | Submission |
|------------|---------------------------------|--------------------------------|-----------------|
| 1 | Environmental Monitoring Report | Phase-1 Pre-construction Phase | March, 2017 |
| 2 | Environmental Monitoring Report | Phase-1 Construction Phase | June, 2017 |
| 3 | Environmental Monitoring Report | Phase-1 Construction Phase | September, 2017 |
| 4 | Environmental Monitoring Report | Phase-1 Construction Phase | December, 2017 |
| 5 | Environmental Monitoring Report | Phase-2 Pre-construction Phase | December, 2017 |
| 6 | Environmental Monitoring Report | Phase-1&2 Construction Phase | March, 2018 |
| 7 | Environmental Monitoring Report | Phase-1&2 Construction Phase | June, 2018 |
| 8 | Environmental Monitoring Report | Phase-1&2 Construction Phase | September, 2018 |
| 9 | Environmental Monitoring Report | Phase-3 Pre-construction Phase | December, 2018 |
| 10 | Environmental Monitoring Report | Phase-2&3 Construction Phase | March, 2019 |
| 11 | Environmental Monitoring Report | Phase-2&3 Construction Phase | June, 2019 |
| 12 | Environmental Monitoring Report | Phase-2&3 Construction Phase | September, 2019 |

Report (No.12 is submitted this day attached with Construction Phase implementation schedule. Subsequent Construction Phase reports will be submitted on Quarterly.

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

None

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

- Depend on the exceeding parameters and situation



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

Neither accidents nor incidents happen during this monitoring period.

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

Please refer to the attached Environmental Monitoring Form.

3. Construction Progress

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

E. Monthly Progress Report for June, 2019

F. Monthly Progress Report for July, 2019

G. Monthly Progress Report for August, 2019

4. Monitoring Result

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

Monitoring Plan (Construction Phase)

| Category | Item | Location | Frequency | Remark |
|---------------------|--|---|-----------------------------|--|
| Air Quality | NO ₂ , SO ₂ , CO, PM _{2.5} , PM ₁₀ | Construction site (1 point) | Once/ 3month | June 2019, Air Quality Monitoring Report |
| Water Quality | Water temperature, pH, SS, DO, BOD ₅ , COD, coliforms, oil and grease, chromium | <ul style="list-style-type: none"> Over flow of construction site to the creek (at least 3 sampling points/ mixing point: i) discharge water, ii) upstream water and iii) downstream water Well near the construction site (1 point) | Once/ 2 month | June, August 2019 Water and Wastewater Quality Monitoring Report |
| Waste | Amount and kind of solid waste | Construction site | Once/ 3 month | Monthly Progress Reports (June, July, August 2019) |
| Noise and Vibration | <ul style="list-style-type: none"> Noise and vibration level Traffic Count | <ul style="list-style-type: none"> Preservation area such as residence around the proposed construction site (at least 1 point) Preservation site such as residence along the route for on-site vehicles (1 point for noise and vibration and 2 points for traffic count) | Once/ 3 month (peak period) | Noise and Vibration Monitoring Report June 2019 Traffic Count Monitoring Report June 2019 |
| Ground Subsidence | <ul style="list-style-type: none"> Ground water level Ground elevation level | Representative (1 point) | Every week | Monthly Progress Reports (June, July, August 2019) |
| Hydrology | <ul style="list-style-type: none"> Consumption of ground water amount | | | |



| Category | Item | Location | Frequency | Remark |
|--|---|-------------------|-------------------|---|
| Risk for infectious disease such as AIDS/HIV | Status of measures of infectious disease | Construction site | Once/month | Monthly Progress Reports (June, July, August 2019) |
| Working conditions (including occupational safety) | Prehension of condition of occupational safety and health Prehension of infectious disease | Construction site | Once/ month | |
| Accident | Existence of accident | Construction site | As occasion arise | |



Thilawa Special Economic Zone (Zone B)
Development Project –Phase 2 & 3

Environment Monitoring Form

Environment Monitoring Form

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

(1) General

1) Phase of the Project

- Please mark the current phase.

☐ Pre-Construction Phase

☒ Construction Phase

☐ Operation Phase

2) Obtainment of Environmental Permits

| Name of permits | Expected issuance date | Actual issuance date | Concerned authority | Remarks (Conditions, etc.) |
|---|------------------------------|--------------------------------|----------------------------------|----------------------------|
| Approved letter for Environmental Impact Assessment (EIA) Report of Industrial Area, Thilawa Special Economic Zone (Zone-B) | | 29 th December 2016 | Thilawa SEZ Management Committee | |
| Notification of the comments of Ministry of Natural Resources and Environmental Conservation regarding with the Standard Change of Wastewater Quality of Industrial Zone, Internal Regulations of Thilawa SEZ Zone-A and Zone-B | 5 th January 2018 | 10 th January 2018 | Thilawa SEZ Management Committee | |
| | | | | |

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

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

(2) Monitoring Results

1) Ambient Air Quality (June 2019)

NO₂, SO₂, CO, PM_{2.5}, PM₁₀

| Location | Item | Unit | Measured Value (Mean) | Measured Value (Max) | Country's Standard | Target value to be applied*1 | Referred International Standard | Frequency | Method | Note (Reason of excess of the standard) |
|----------|-------------------|-------------------|-----------------------|----------------------|---------------------------------------|---------------------------------------|---------------------------------|------------------------|-------------------------|---|
| AQ-1 | NO ₂ | mg/m ³ | 0.041 | 0.168 | 0.2 mg/m ³ (1 Hour) | 0.1 mg/m ³ (24 Hour) | - | One time / 3 months | Haz- Scanner EPAS | Refer to air quality report |
| | SO ₂ | mg/m ³ | 0.018 | 0.083 | 0.02 mg/m ³ (24 Hours) | 0.02 mg/m ³ (24 Hours) | - | | | |
| | CO | mg/m ³ | 0.034 | 0.201 | - | 10.26 mg/m ³ (24 Hours) | - | | | |
| | PM _{2.5} | mg/m ³ | 0.01 | 0.053 | 0.025 mg/m ³ (24 Hours) | 0.025 mg/m ³ (24 Hours) | - | | | |
| | PM ₁₀ | mg/m ³ | 0.047 | 0.483 | 0.05 mg/m ³ (24 Hours) | 0.05 mg/m ³ (24 Hours) | - | | | |

*1Remarks: Referred to the tentative target value of ambient air quality (EIA Report for industrial area, Table 2.4-1), Reference to the air quality monitoring report (June 2019)

Complaints from Residents

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

☐ Yes ☒ No

| Contents of Complaints from Residents | Countermeasures |
|---------------------------------------|-----------------|
| | |

2) (a) Water Quality - June 2019

Measurement Point: Effluent of Wastewater (SW-2 and SW-4 are attached as reference point only and they are natural creek water which are combine all the wastewater from the Local industrial water and domestic water from existing living environment. SW-7 is the main discharging point. GW-2 is also as reference point for monitoring of existing tube well located in the Monastery Compound near Zone-B area)

- Are there any effluents to water body in this monitoring period?

☐ Yes, ☒ No

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

| Location | Item | Unit | Measured Value (Max) | Country's Standard ² | Target value to be applied ¹ | Frequency | Method | Note (Reason of excess of the standard) |
|----------|------|------|----------------------|---------------------------------|---|-----------|--------|---|
| | | | | | | | | |



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| Location | Item | Unit | Measured Value (Max) | Country's Standard*2 | Target value to be applied*1 | Frequency | Method | Note (Reason of excess of the standard) |
|---------------------------|---------------------------------|------------|----------------------|----------------------|------------------------------|-------------------|--|---|
| SW-2 (reference point) | Temperature | °C | 29 | < 3 (increase) | ≤ 35 | Once per 2 months | Instrument Analysis Method | Refer to water quality report |
| | pH | - | 7.47 | 6-9 | 6.0 - 9.0 | | Instrument Analysis Method | |
| | SS | mg/L | 10 | 50 | 50 | | APHA 2540D (Dry at 103-105°C Method) | |
| | DO | mg/L | 3.03 | - | - | | Instrument Analysis Method | |
| | BOD ₅ | mg/L | 6.96 | 50 | 30 | | APHA 5210 B (5days BOD Test) | |
| | COD _{Cr} | mg/L | 65 | 250 | 125 | | APHA 5220 D (Close Reflux Colorimetric Method) | |
| | Total Coliform*4 | MPN/100 ml | 35000 | 400 | 400 | | APHA 9221 B (Standard Total Coliform Fermentation Technique) | |
| | Oil and Grease | | <3.1 | 10 | 10 | | APHA 5520 B (partition Gravimetric Method) | |
| | Chromium | mg/L | 0.004 | 0.5 | 0.5 | | APHA (Inductively Coupled Plasma (ICP) Method) | |
| | Total Dissolved solids (TDS) *7 | mg/L | 222 | - | 2000 | | APHA 2540C (Total Dissolved Solids Dried at 180.C) | |
| SW-4 (reference point) | Iron*7 | mg/L | 2.862 | 3.5 | 3.5 | Once per 2 months | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |
| | Mercury*7 | mg/L | ≤ 0.002 | 0.01 | 0.005 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |
| | Temperature | °C | 30 | < 3 (increase) | ≤ 35 | | Instrument Analysis Method | |
| | pH | - | 7.87 | 6-9 | 6.0 - 9.0 | | Instrument Analysis Method | |
| | SS*3 | mg/L | 82 | 50 | 50 | | APHA 2540D (Dry at 103-105°C Method) | |
| | DO | mg/L | 7.05 | - | - | | Instrument Analysis Method | |
| | BOD ₅ | mg/L | 8.32 | 50 | 30 | | APHA 5210 B (5days BOD Test) | |

| Location | Item | Unit | Measured Value (Max) | Country's Standard*2 | Target value to be applied*1 | Frequency | Method | Note (Reason of excess of the standard) |
|--------------------------------|--------------------------------|------------|----------------------|----------------------|------------------------------|----------------------|--|---|
| | COD _{Cr} | mg/L | 18.3 | 250 | 125 | | APHA 5220 D (Close Reflux Colorimetric Method) | Refer to water quality report |
| | Total Coliform*4 | MPN/100 ml | 54000 | 400 | 400 | | APHA 9221 B (Standard Total Coliform Fermentation Technique) | |
| | Oil and Grease | mg/L | <3.1 | 10 | 10 | | APHA 5520 B (partition Gravimetric Method) | |
| | Chromium | mg/L | 0.018 | 0.5 | 0.5 | | APHA (Inductively Coupled Plasma (ICP) Method) | |
| | Total Dissolved solids (TDS)*7 | mg/L | 764 | - | 2000 | | APHA 2540C (Total Dissolved Solids Dried at 180.C) | |
| | Iron*5,*7 | mg/L | 5.920 | 3.5 | 3.5 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |
| | Mercury*7 | mg/L | ≤ 0.002 | 0.01 | 0.005 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |
| SW-7 (Discharge d Point) | Temperature | °C | 30 | < 3 (increase) | ≤ 35 | Once per 2 months | Instrument Analysis Method | Refer to water quality report |
| | pH | - | 8.22 | 6-9 | 6.0 - 9.0 | | Instrument Analysis Method | |
| | SS | mg/L | 36 | 50 | 50 | | APHA 2540D (Dry at 103-105°C Method) | |
| | DO | mg/L | 6.24 | - | - | | Instrument Analysis Method | |
| | BOD ₅ | mg/L | 7.48 | 50 | 30 | | APHA 5210 B (5days BOD Test) | |
| | COD _{Cr} | mg/L | 2.9 | 250 | 125 | | APHA 5220 D (Close Reflux Colorimetric Method) | |
| | Total Coliform*4 | MPN/100 ml | 35000 | 400 | 400 | | APHA 9221 B (Standard Total Coliform Fermentation Technique) | |
| | Oil and Grease | mg/L | < 3.1 | 10 | 10 | | APHA 5520 B (partition Gravimetric Method) | |
| | Chromium | mg/L | 0.028 | 0.5 | 0.5 | | APHA (Inductively Coupled Plasma (ICP) Method) | |



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| Location | Item | Unit | Measured Value (Max) | Country's Standard ^{*2} | Target value to be applied ^{*1} | Frequency | Method | Note (Reason of excess of the standard) |
|---------------------------|--|------------|----------------------|----------------------------------|--|-------------------|--|---|
| | Total Dissolved solids (TDS) ^{*7} | mg/L | 150 | - | 2000 | | APHA 2540C (Total Dissolved Solids Dried at 180.C) | |
| | Iron ^{*5, *7} | mg/L | 9.062 | 3.5 | 3.5 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |
| | Mercury ^{*7} | mg/L | ≤ 0.002 | 0.01 | 0.005 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |
| GW-2 (reference point) | Temperature | °C | 27 | < 3 (increase) | ≤ 35 | Once per 2 months | Instrument Analysis Method | Refer to water quality report |
| | pH | - | 7.43 | 6-9 | 6.0 – 9.0 | | Instrument Analysis Method | |
| | SS | mg/L | 2.00 | 50 | 50 | | APHA 2540D (Dry at 103-105°C Method) | |
| | DO | mg/L | 6.83 | - | - | | Instrument Analysis Method | |
| | BOD ₅ | mg/L | 5.29 | 50 | 30 | | APHA 5210 B (5days BOD Test) | |
| | COD _{Cr} | mg/L | 5.1 | 250 | 125 | | APHA 5220 D (Close Reflux Colorimetric Method) | |
| | Total Coliform | MPN/100 ml | 17 | 400 | 400 | | APHA 9221 B (Standard Total Coliform Fermentation Technique) | |
| | Oil and Grease | mg/L | < 3.1 | 10 | 10 | | APHA 5520 B (partition Gravimetric Method) | |
| | Chromium | mg/L | ≤ 0.002 | 0.5 | 0.5 | | APHA (Inductively Coupled Plasma (ICP) Method) | |
| | Total Dissolved solids (TDS) ^{*7} | mg/L | 142 | - | 2000 | | APHA 2540C (Total Dissolved Solids Dried at 180.C) | |
| | Iron ^{*6, *7} | mg/L | 6.192 | 3.5 | 3.5 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |
| | Mercury ^{*7} | mg/L | ≤ 0.002 | 0.01 | 0.005 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |

*1Remark: Reference to the Water and Wastewater Quality Monitoring Report (June 2019)

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

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

*4Remark: For the monitoring point of SW2, SW-4 and SW-7, the result of total coliform exceeded than the target value due to three expected reasons i) natural bacteria existed in discharged creek because there are various kinds of vegetation of creature such as birds, and small animals in and along the discharged creek and ii) wastewater from the local industrial zone outside of Thilawa SEZ and iii) delivered from surrounding area by tidal effect. Total coliforms do not affect human health directly, self-monitoring was carried out to identify health impact by coliform bacteria. As for the result of E-Coli SW-7 was 14. It is considered that there is no significant impact to human health.

*5 Remark: For the monitoring point of SW-4 and SW-7, the result of iron exceeded than the target value due to the influence of natural origin (iron can reach out from the soil by run-off)

*6 Remark: For the monitoring point of GW-2, the result of iron exceeded than the target value due to i) corrosion of pipes because the water is pumped through the iron pipelines buried underneath the ground.

*7Remark: Recommendation from JICA Environmental expert (TSMC), to be more emphasized on Environmental and analyzing only

2) (b) Water Quality – August 2019

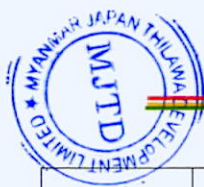
Measurement Point: Effluent of Wastewater (SW-2 and SW-4 are attached as reference point only and they are natural creek water which are combine all the wastewater from the Local industrial water and domestic water from existing living environment. SW-7 is the main discharging point. GW-2 is also as reference point for monitoring of existing tube well located in the Monastery Compound near Zone-B area)

- Are there any effluents to water body in this monitoring period?

☐ Yes, ☒ No

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





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| Location | Item | Unit | Measured Value (Max) | Country's Standard*2 | Target value to be applied*1 | Frequency | Method | Note (Reason of excess of the standard) |
|---------------------------|---------------------------------|------------|----------------------|----------------------|------------------------------|-------------------|--|---|
| SW-2 (reference point) | Temperature | °C | 26 | < 3 (increase) | ≤ 35 | Once per 2 months | Instrument Analysis Method | Refer to water quality report |
| | pH | - | 6.9 | 6-9 | 6.0 – 9.0 | | Instrument Analysis Method | |
| | SS*3 | mg/L | 78 | 50 | 50 | | APHA 2540D (Dry at 103-105°C Method) | |
| | DO | mg/L | 6.91 | - | - | | Instrument Analysis Method | |
| | BOD ₅ | mg/L | 4.1 | 50 | 30 | | APHA 5210 B (5days BOD Test) | |
| | COD _{Cr} | mg/L | 11.6 | 250 | 125 | | APHA 5220 D (Close Reflux Colorimetric Method) | |
| | Total Coliform*4 | MPN/100 ml | >160,000 | 400 | 400 | | APHA 9221 B (Standard Total Coliform Fermentation Technique) | |
| | Oil and Grease | | <3.1 | 10 | 10 | | APHA 5520 B (partition Gravimetric Method) | |
| | Chromium | mg/L | ≤0.002 | 0.5 | 0.5 | | APHA (Inductively Coupled Plasma (ICP) Method) | |
| | Total Dissolved solids (TDS) *6 | mg/L | 56 | - | 2000 | | APHA 2540C (Total Dissolved Solids Dried at 180.C) | |
| | Iron*6 | mg/L | 3.44 | 3.5 | 3.5 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |
| | Mercury*6 | mg/L | ≤ 0.002 | 0.01 | 0.005 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |
| SW-4 (reference point) | Temperature | °C | 26 | < 3 (increase) | ≤ 35 | Once per 2 months | Instrument Analysis Method | |
| | pH | - | 7.1 | 6-9 | 6.0 – 9.0 | | Instrument Analysis Method | |
| | SS*3 | mg/L | 232.00 | 50 | 50 | | APHA 2540D (Dry at 103-105°C Method) | |
| | DO | mg/L | 6.43 | - | - | | Instrument Analysis Method | |
| | BOD ₅ | mg/L | 2.99 | 50 | 30 | | APHA 5210 B (5days BOD Test) | |

| Location | Item | Unit | Measured Value (Max) | Country's Standard ² | Target value to be applied ¹ | Frequency | Method | Note (Reason of excess of the standard) |
|---------------------------|--|------------|----------------------|---------------------------------|---|-------------------|--|---|
| | COD _{Cr} | mg/L | 5.2 | 250 | 125 | | APHA 5220 D (Close Reflux Colorimetric Method) | Refer to water quality report |
| | Total Coliform ^{*4} | MPN/100 ml | 11000 | 400 | 400 | | APHA 9221 B (Standard Total Coliform Fermentation Technique) | |
| | Oil and Grease | mg/L | <3.1 | 10 | 10 | | APHA 5520 B (partition Gravimetric Method) | |
| | Chromium | mg/L | 0.02 | 0.5 | 0.5 | | APHA (Inductively Coupled Plasma (ICP) Method) | |
| | Total Dissolved solids (TDS) ^{*6} | mg/L | 68 | - | 2000 | | APHA 2540C (Total Dissolved Solids Dried at 180.C) | |
| | Iron ^{*5, *6} | mg/L | 11.924 | 3.5 | 3.5 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |
| | Mercury ^{*6} | mg/L | ≤ 0.002 | 0.01 | 0.005 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |
| SW-7 (Discharge Point) | Temperature | °C | 26 | < 3 (increase) | ≤ 35 | Once per 2 months | Instrument Analysis Method | Refer to water quality report |
| | pH | - | 9 | 6-9 | 6.0 – 9.0 | | Instrument Analysis Method | |
| | SS ^{*3} | mg/L | 326 | 50 | 50 | | APHA 2540D (Dry at 103-105°C Method) | |
| | DO | mg/L | 7.59 | - | - | | Instrument Analysis Method | |
| | BOD ₅ | mg/L | 4.36 | 50 | 30 | | APHA 5210 B (5days BOD Test) | |
| | COD _{Cr} | mg/L | 33.5 | 250 | 125 | | APHA 5220 D (Close Reflux Colorimetric Method) | |
| | Total Coliform ^{*4} | MPN/100 ml | 3300 | 400 | 400 | | APHA 9221 B (Standard Total Coliform Fermentation Technique) | |
| | Oil and Grease | mg/L | < 3.1 | 10 | 10 | | APHA 5520 B (partition Gravimetric Method) | |
| | Chromium | mg/L | 0.028 | 0.5 | 0.5 | | APHA (Inductively Coupled Plasma (ICP) Method) | |



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| Location | Item | Unit | Measured Value (Max) | Country's Standard ^{*2} | Target value to be applied ^{*1} | Frequency | Method | Note (Reason of excess of the standard) |
|------------------------|--|------------|----------------------|----------------------------------|--|-------------------|--|---|
| | Total Dissolved solids (TDS) ^{*6} | mg/L | 50 | - | 2000 | | APHA 2540C (Total Dissolved Solids Dried at 180.C) | |
| | Iron ^{*5, *6} | mg/L | 13.960 | 3.5 | 3.5 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |
| | Mercury ^{*6} | mg/L | ≤ 0.002 | 0.01 | 0.005 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |
| GW-2 (reference point) | Temperature | °C | 28 | < 3 (increase) | ≤ 35 | Once per 2 months | Instrument Analysis Method | Refer to water quality report |
| | pH | - | 7.3 | 6-9 | 6.0 – 9.0 | | Instrument Analysis Method | |
| | SS | mg/L | 2.00 | 50 | 50 | | APHA 2540D (Dry at 103-105°C Method) | |
| | DO | mg/L | 7.52 | - | - | | Instrument Analysis Method | |
| | BOD ₅ | mg/L | 1.58 | 50 | 30 | | APHA 5210 B (5days BOD Test) | |
| | COD _{Cr} | mg/L | 1.6 | 250 | 125 | | APHA 5220 D (Close Reflux Colorimetric Method) | |
| | Total Coliform | MPN/100 ml | 23 | 400 | 400 | | APHA 9221 B (Standard Total Coliform Fermentation Technique) | |
| | Oil and Grease | mg/L | < 3.1 | 10 | 10 | | APHA 5520 B (partition Gravimetric Method) | |
| | Chromium | mg/L | ≤ 0.002 | 0.5 | 0.5 | | APHA (Inductively Coupled Plasma (ICP) Method) | |
| | Total Dissolved solids (TDS) ^{*6} | mg/L | 138 | - | 2000 | | APHA 2540C (Total Dissolved Solids Dried at 180.C) | |
| | Iron ^{*6} | mg/L | 3.076 | 3.5 | 3.5 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |
| | Mercury ^{*6} | mg/L | ≤ 0.002 | 0.01 | 0.005 | | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | |

^{*1}Remark: Reference to the Water and Wastewater Quality Monitoring Report (August 2019)

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

*3Remark: For the monitoring point of SW2, SW-4 and SW-7, the result of SS exceeded than the target value due to three expected reasons i) delivered from upstream area such as natural origin and wastewater from local industrial zone outside of Thilawa SEZ, and ii) influence by water from the downstream of monitoring points due to flow back by tidal fluctuation iii) surface water run-off from bare land in Zone B.

*4Remark: For the monitoring point of SW2, SW-4 and SW-7, the result of total coliform exceeded than the target value due to three expected reasons i) natural bacteria existed in discharged creek because there are various kinds of vegetation of creature such as birds, and small animals in and along the discharged creek and retention pond ii) wastewater from the local industrial zone outside of Thilawa SEZ and iii) delivered from surrounding area by tidal effect. Total coliforms do not affect human health directly, self-monitoring was carried out to identify health impact by coliform bacteria. As for the result of E-Coli SW-7 was 5.5. It is considered that there is no significant impact to human health.

*5 Remark: For the monitoring point of SW-4 and SW-7, the result of iron exceeded than the target value due to the influence of natural origin i) iron is used as a construction material and in the rainy season the water run-off from the construction sites may contain iron particles ii) influence of natural origin (iron can reach out from soil by run-off)

*6 Remark: Recommendation from JICA Environmental expert (TSMC) , to be more emphasized on Environmental and analyzing only

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 Level (June 2019)

| Location | Item | Unit | Measured Value | Measured Value | Country's Standard | Target value to | Referred International | Frequency | Method | Note (Reason of) |
|----------|------|------|----------------|----------------|--------------------|-----------------|------------------------|-----------|--------|------------------|
| | | | | | | | | | | |

| | | | (Mean) | (Max) | | be applied* | Standard | | | excess of the standard) |
|------------------|---------------|-------|--------|-------|---------------------------------|-------------|--|------------------------|--|-------------------------|
| Residential Area | Leq (day) | dB(A) | 51 | 56 | Refer to NEQG Article 1.3 | 75 | Refer the section 2.4 in EIA main report | One time / 3 months | | |
| NV-2 | Leq (evening) | dB(A) | 50 | 53 | | 60 | | | | |
| | Leq(night) | dB(A) | 54 | 57 | | 55 | | | | |
| Along the road | Leq (day) | dB(A) | 61 | 64 | | 75 | | | | |
| (NV-1) | Leq(night) | dB(A) | 58 | 64 | | 70 | | | | |

*Remarks: Referred to the tentative target value of ambient air quality (EIA Report for industrial area, Table 2.4-8), Reference to the noise and vibration monitoring report (June 2019)

Complaints from Residents

- Are there any complaints 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 Complaints from Residents | Countermeasures |
|---------------------------------------|-----------------|
| | |

5) Solid Waste

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

Are there any wastes if sludge in this monitoring period?

☒ Yes, ☐ No

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

| Item | Date | Generated from | Unit | Value | Solid Waste Management Activities |
|------------------|--------------|--------------------|-------|-------|--|
| Amount of Sludge | 28-June-2019 | Construction Waste | Loads | 5 | Waste disposing to authorized waste collector (YCDC) |

| | | | | | |
|------------------|----------------|--------------------|-------|---|--|
| Amount of Sludge | 20-August-2019 | Construction Waste | Loads | 2 | Waste disposing to authorized waste collector (YCDC) |
|------------------|----------------|--------------------|-------|---|--|

6) (a) Ground Subsidence Hydrology

| Duration (Week) | Water Consumption | | Ground Level | | Note |
|--------------------|-------------------|-----------------------|--------------|------|------|
| | Quantity | Unit | Quantity | Unit | |
| 6-June-2019 | 156 | m ³ / week | + 6.300 | m | |
| 13- June -2019 | 220 | m ³ / week | + 6.303 | m | |
| 20- June -2019 | 138 | m ³ / week | + 6.299 | m | |
| 27- June -2019 | 168 | m ³ / week | + 6.298 | m | |

Remarks: Reference to Monthly Progress Report (June-2019)

6) (b) Ground Subsidence Hydrology

| Duration (Week) | Water Consumption | | Ground Level | | Note |
|--------------------|-------------------|-----------------------|--------------|------|------|
| | Quantity | Unit | Quantity | Unit | |
| 4-July-2019 | 189 | m ³ / week | + 6.300 | m | |
| 11- July -2019 | 213 | m ³ / week | + 6.299 | m | |
| 18- July -2019 | 220 | m ³ / week | + 6.298 | m | |
| 25- July -2019 | 196 | m ³ / week | + 6.301 | m | |

Remarks: Reference to Monthly Progress Report (July-2019)

6) (c) Ground Subsidence Hydrology

| Duration (Week) | Water Consumption | | Ground Level | | Note |
|--------------------|-------------------|-----------------------|--------------|------|------|
| | Quantity | Unit | Quantity | Unit | |
| 1-Aug-2019 | 180 | m ³ / week | + 6.300 | m | |



| | | | | | |
|---------------|-----|-----------------------|---------|---|--|
| 8- Aug -2019 | 175 | m ³ / week | + 6.290 | m | |
| 15- Aug -2019 | 159 | m ³ / week | + 6.300 | m | |
| 22- Aug -2019 | 190 | m ³ / week | + 6.299 | m | |
| 29 -Aug-2019 | 188 | m ³ / week | + 6.302 | m | |

Remarks: Reference to Monthly Progress Report (August-2019)

7) Offensive Odor (only operation phase)

Complaints from Residents

- Are there any complaints 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 Complaints from Residents | Countermeasures |
|---------------------------------------|-----------------|
| | |

Situations environmental report from tenants

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

☐ Yes, ☒ No

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

| Contents of Issues on Soil Contamination | Countermeasures |
|--|-----------------|
| | |

8) Infectious disease, Working Environment, Accident

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

- Are there any incidents regarding infectious disease, Working Environment, Accident in this monitoring period?

☐ Yes, ☒ No

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

| Contents of Incidents | Countermeasures |
|-----------------------|-----------------|
| | |

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

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

Information from TSMC

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

| Resentment Works | | Progress in Narrative | Remarkable Issues |
|----------------------------|---------------------------------|---|-------------------|
| Projected Affected Persons | Land Acquisition and Relocation | The number of PAH who already relocated; 1 PAH from Zone B (Area 2-1 Ex-2) | |
| | Income Restoration Program | 1) Supporting for Valuable People Program at Zone B for every month 2) Barrier Gate construction at Zone B (7 gates) 3) Start to make survey for Valuable People Program for Zone B Phase 3 (PAPs) | |
| Common Assets | Relocation | | |

- Are there any grievances submitted, solved and pending regarding resettlement works?

☒ Yes, ☐ No

If yes, please describe the contents of grievances to fill in below the table.

| Contents of Grievance | Response/ Countermeasures |
|-----------------------|---------------------------|
| | |

| | |
|--|---|
| There was 1 grievance received during July to August 2019. This complaint is about "Employee and Worker Behavior". | The situation of the complaint is under investigation on track. |
|--|---|

10) CSR activities such as Community Support Program

- Are there any CSR activities implemented in this monitoring period?

☒ Yes, ☐ No

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

| Date | Activities | Description (Location, Participant etc) |
|-------------|--|---|
| July 2019 | Free English Language Course | Myaing Tar Yar Pre School (About 40 students were attended) |
| July 2019 | Thilawa Community Coordination Meeting | MJTD |
| July 2019 | TCMP Roll out and Health Awareness Talk | Aduttaw Village/ BEMS (Aduttaw) |
| July 2019 | Prevention of Dengue fever (Applying Abate Insecticides) | Aye Mya Thida Village |
| August 2019 | Factory Visit to Yakult | Yakult |
| August 2019 | TB Diagnosis Program | Factories in TSEZ |

End of Document

**Thilawa Special Economic Zone (Zone B)
Development Project –Phase 2 & 3**

Appendix

Water and Waste Water Monitoring Report

June 2019

**WATER QUALITY MONITORING REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
IN THILAWA SEZ ZONE B
(PHASE 2 & 3 CONSTRUCTION STAGE)**

(Bi-Monthly Monitoring)

June 2019

Myanmar Koei International Ltd.



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CHAPTER 1: INTRODUCTION

1.1 General

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



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

CHAPTER 2: WATER QUALITY MONITORING

2.1 Monitoring Items

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

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

Table 2.1-1 Monitoring Items for Water Quality

| No. | Parameters | SW-2 | SW-4 | SW-7 | GW-2 | Remarks |
|-----|---|------|------|------|------|---------------------|
| 1 | Temperature | ○ | ○ | ○ | ○ | On-site measurement |
| 2 | pH | ○ | ○ | ○ | ○ | On-site measurement |
| 3 | DO | ○ | ○ | ○ | ○ | On-site measurement |
| 4 | BOD ₍₅₎ | ○ | ○ | ○ | ○ | Laboratory analysis |
| 5 | COD _(Cr) | ○ | ○ | ○ | ○ | Laboratory analysis |
| 6 | Suspended Solids | ○ | ○ | ○ | ○ | Laboratory analysis |
| 7 | Total Coliform | ○ | ○ | ○ | ○ | Laboratory analysis |
| 8 | Oil and Grease | ○ | ○ | ○ | ○ | Laboratory analysis |
| 9 | Chromium | ○ | ○ | ○ | ○ | Laboratory analysis |
| 10 | Total Dissolved solids (TDS) (Self-monitoring) | ○ | ○ | ○ | ○ | Laboratory analysis |
| 11 | Iron (Self-monitoring) | ○ | ○ | ○ | ○ | Laboratory analysis |
| 12 | Mercury (Self-monitoring) | ○ | ○ | ○ | ○ | Laboratory analysis |
| 13 | Escherichia Coli (Self-monitoring) | ○ | ○ | ○ | ○ | Laboratory analysis |
| 14 | Flow Rate | - | ○ | - | - | On-site measurement |

Source: Myanmar Koei International Ltd.

2.2 Description of Sampling Points

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

Table 2.2-1 Outline of Sampling Points

| No. | Station | Detailed Information |
|-----|---------|---|
| 1 | SW-2 | Coordinate- N - 16° 40' 20.69", E - 96° 17' 18.04" |
| | | Location - Upstream of Shwe Pyauk Creek |
| | | Survey Item - Surface water sampling |
| 2 | SW-4 | Coordinate- N - 16° 39' 42.84", E - 96° 16' 27.42" |
| | | Location - Downstream of Shwe Pyauk Creek |
| | | Survey Item - Surface water sampling and water flow rate measurement |
| 3 | SW-7 | Coordinate - N - 16° 40' 13.25", E - 96° 17' 5.66" |
| | | Location - Outlet of retention pond of Zone B construction site before connecting to Shwe Pyauk Creek |
| | | Survey Item - Discharge water sampling |
| 4 | GW-2 | Coordinate - N - 16° 39' 25.30", E - 96° 17' 15.60" |
| | | Location - In the monastery compound of Phalan village |
| | | Survey Item - Ground water sampling |

Source: Myanmar Koei International Ltd.



SW-2 (Reference Point)

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

SW-4 (Reference Point)

SW-4 was collected at the downstream of Shwe Pyauk creek, after mixing of discharge water from local industrial zone, construction site of Zone B and Zone A, which is flowing from east to west and then entering into the Yangon River. The distance is about 2.15 km downstream of SW-2. This sampling point is located in the west of Zone B area and in the south of Dagon-Thilawa road. The surrounding areas are Zone A in the northeast, local industrial zone in the east and paddy fields in the south and west respectively.

SW-7 (Discharged Point)

SW-7 is main discharged point of Zone B during construction stage. The distance is about 434 m downstream of SW-2. This sampling point is located at outlet of retention pond of Zone B construction site, in the north of Zone B area and in the south of Dagon-Thilawa road. The surrounding areas are Zone A in the north and local industrial zone in the east respectively.

GW-2 (Reference of Existing Tube Well)

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

2.3 Monitoring Method

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

Table 2.3-1 Analytic Method for Water Quality

| No. | Parameter | Method |
|-----|------------------------------|--|
| 1 | Temperature | Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker) |
| 2 | pH | Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker) |
| 3 | Dissolved Oxygen (DO) | Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker) |
| 4 | BOD ₍₅₎ | APHA 5210 B (5 days BOD Test) |
| 5 | COD _(Cr) | APHA 5220D (Close Reflux Colorimetric Method) |
| 6 | Suspended Solids (SS) | APHA 2540D (Dry at 103-105°C Method) |
| 7 | Total Coliform | APHA 9221B (Standard Total Coliform Fermentation Technique) |
| 8 | Oil and Grease | APHA 5520B (Partition-Gravimetric Method) |
| 9 | Chromium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) |
| 10 | Total Dissolved solids (TDS) | APHA 2540C (Total Dissolved Solids Dried at 180°C Method) |
| 11 | Iron | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) |
| 12 | Mercury | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) |
| 13 | Escherichia Coli | APHA 9221 F (Escherichia Coli Procedure Using Fluorogenic Substrate) |
| 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 monitoring were conducted on 5 June 2019 and sampling time is shown in Table 2.4-1 to avoid tidal effect. The tide record for Yangon River, Myanmar on 5 June 2019 is shown in Table 2.4-2.

Table 2.4-1 Sampling Time of Each Station

| No. | Station | Sampling Time |
|-----|---------|------------------|
| 1 | SW-2 | 05/06/2019 08:51 |
| 2 | SW-4 | 05/06/2019 11:41 |
| 3 | SW-7 | 05/06/2019 09:19 |
| 4 | GW-2 | 05/06/2019 14:18 |

Source: Myanmar Koei International Ltd.

Table 2.4-2 Tide Record for Yangon River

| Date | Time | Height | Tide Conditions |
|------------|-------|--------|-----------------|
| 05/06/2019 | 01:09 | 0.81 | Low Tide |
| | 05:31 | 5.64 | High Tide |
| | 12:54 | 0.86 | Low Tide |
| | 17:39 | 6.18 | High Tide |

Source: Myanmar Port Authority, Tide Table for the Yangon River and Elephant Point, 2019



2.5 Monitoring Results

Results of water quality monitoring at discharged point and discharged creek are summarized in Table 2.5-1. Analytical results of the laboratory are described in Appendix-2 and Appendix-3. The results were compared with the target value of effluent water quality discharged to water body stipulated in the EIA report.

2.5.1 Results of Discharged Point and Discharged Creek

As the comparison with the target value, the results of SS, total coliform and iron exceeded the target value. As for the result of SS, results at the surface water monitoring point (SW-4) exceeded the target value. The exceed result for SS may be due to two expected reasons; i) delivered from upstream area such as natural origin and wastewater from local industrial zone outside of Thilawa SEZ, and ii) influence by water from the downstream of monitoring points due to flow back by tidal fluctuation.

As for the result of total coliform of surface water, results at surface water monitoring points (SW-2, SW-4 and SW-7) exceeded the target value due to three expected reasons; i) natural bacteria existed in discharged creek because there are various kinds of vegetation and creature such as birds and small animals in and along the discharged creek and ii) wastewater from the local industrial zone outside of Thilawa SEZ and iii) delivered from surrounding area by tidal effect.

Since the composition of the total coliform include bacteria from natural origin, and even after total coliform do not affect human health directly, self-monitoring for E. Coli analysis was carried out to identify health impact by coliform bacteria. As for the result of E.Coli of surface water at SW-7, the result was under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point of SW-7 but it is considered that there is no significant impact on human health.

As for the result of iron, the result at the monitoring point of surface water monitoring point (SW-4 and SW-7) exceeded the target value due to the influence of natural origin (iron can reach out from the soil by run-off). Japan set effluent standards for two items as follows; i) health item and ii) living environment item. In the health item, there is no standard value for iron. On the other hand, for the living environment item, the standard value for soluble iron level is 10 mg/l. As the comparison with the living environment standard value in Japan, iron results in SW-4 and SW-7 are lower than the standard value. Therefore, it can be considered that there is no significant impact on the living environment.

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

| No. | Parameters | Unit | SW-2 | SW-4 | SW-7 | Target Value (Reference Value for Self-Monitoring) |
|-----|------------------------------|-------------------|---------|---------|---------|--|
| 1 | Temperature | °C | 29 | 30 | 30 | ≤ 35 |
| 2 | pH | - | 7.47 | 7.87 | 8.22 | 6~9 |
| 3 | Suspended Solid (SS) | mg/L | 10.00 | 82.00 | 36.00 | 50 |
| 4 | Dissolved Oxygen (DO) | mg/L | 3.03 | 7.05 | 6.24 | - |
| 5 | BOD ₍₅₎ | mg/L | 6.96 | 8.32 | 7.48 | 30 |
| 6 | COD _(Cr) | mg/L | 65 | 18.3 | 2.9 | 125 |
| 7 | Total Coliform | MPN/100ml | 35000 | 54000 | 35000 | 400 |
| 8 | Oil and Grease | mg/L | < 3.1 | < 3.1 | < 3.1 | 10 |
| 9 | Chromium | mg/L | 0.004 | 0.018 | 0.028 | 0.5 |
| 10 | Total Dissolved solids (TDS) | mg/L | 222 | 764 | 150 | 2000 |
| 11 | Iron | mg/L | 2.862 | 5.920 | 9.062 | 3.5 |
| 12 | Mercury | mg/L | ≤ 0.002 | ≤ 0.002 | ≤ 0.002 | 0.005 |
| 13 | Escherichia Coli | MPN/100ml | - | - | 14.0 | (1000)* (CFU/100ml) |
| 14 | Flow Rate | m ³ /s | - | 0.223 | - | - |

Note: Red color means exceeded value than target value.

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

Source: Myanmar Koei International Ltd.

2.5.2 Result of Reference Tube Well

Result of water quality monitoring at reference tube well monitoring point is shown in Table 2.5-2. As the comparison with the target value, the result of iron exceeded the target value.

As for the result of the iron, the result at the monitoring point of reference tube well (GW-2) exceeded the target value due to expected reason; 1) It may be due to the corrosion of pipes because the water is pumped through the iron pipelines buried underneath the ground. However, since it cannot reach to the conclusion of what is the reason for this result, the continuous monitoring will be necessary.

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

| No. | Parameters | Unit | GW-2 | Target Value (Reference Value for Self-Monitoring) |
|-----|------------------------------|-------------------|---------|--|
| 1 | Temperature | °C | 27 | ≤ 35 |
| 2 | pH | - | 7.43 | 6~9 |
| 3 | Suspended Solid (SS) | mg/L | 2.00 | 50 |
| 4 | Dissolved Oxygen (DO) | mg/L | 6.83 | - |
| 5 | BOD ₍₅₎ | mg/L | 5.29 | 30 |
| 6 | COD _(Cr) | mg/L | 5.1 | 125 |
| 7 | Total Coliform | MPN/100ml | 17 | 400 |
| 8 | Oil and Grease | mg/L | < 3.1 | 10 |
| 9 | Chromium | mg/L | ≤ 0.002 | 0.5 |
| 10 | Total Dissolved solids (TDS) | mg/L | 142 | 2000 |
| 11 | Iron | mg/L | 6.192 | 3.5 |
| 12 | Mercury | mg/L | ≤ 0.002 | 0.005 |
| 13 | Escherichia Coli | MPN/100ml | < 1.8 | (1000)* (CFU/100ml) |
| 14 | Flow Rate | m ³ /s | - | - |

Note: Red color means exceeded value than target value.

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

Source: Myanmar Koei International Ltd.



CHAPTER 3: CONCLUSION AND RECOMMENDATIONS

As described in Chapter 2 (Section 2.5), the results of SS at (SW-4), total coliform at (SW-2, SW-4 and SW-7) and iron at (SW4 and SW-7) in surface water and iron at (GW-2) in ground water exceeded the target value in this monitoring period for construction stage of Thilawa SEZ Zone B.

There are some possible reasons for exceeding the target values of SS at (SW-4) and total coliform at (SW-2, SW-4 and SW-7). They are by i) natural origin such as natural bacteria existed in discharged creek because there are various kinds of vegetation and creature such as birds and small animals in and along the discharged creek and ii) wastewater from the local industrial zone outside of Thilawa SEZ and iii) delivered from surrounding area by tidal effect.

Since the composition of the total coliform include bacteria from natural origin, and even after total coliform do not affect human health directly, self-monitoring for E. Coli analysis was carried out at SW-7 to identify health impact by coliform bacteria. As for the result of E.Coli of surface water at SW-7, the result was under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point of SW-7 but it is considered that there is no significant impact on human health.

As for the result of the iron, the result at the monitoring point of surface water monitoring point (SW-4 and SW-7) exceeded the target value due to the influence of natural origin (iron can reach out from the soil by run-off). Japan set effluent standards for two items as follows; i) health item and ii) living environment item. In the health item, there is no standard value for iron. On the other hand, for the living environment item, the standard value for soluble iron level is 10 mg/l. As the comparison with the living environment standard value in Japan, iron results in SW-4 and SW-7 are lower than the standard value. Therefore, it can be considered that there is no significant impact on the living environment.

As for the result of the iron, the result at the monitoring point of reference tube well (GW-2) exceeded the target value due to expected reason; 1) It may be due to the corrosion of pipes because the water is pumped through the iron pipelines buried underneath the ground. Water from this well is only suitable for washing and bathing and drinking of this ground water without proper treatment processes is not recommended.

However, it cannot reach to the conclusion of what the reason to be exceeded the target values is, thus the continuous monitoring and yearly trend analysis will be necessary to carry out based on the rainy and dry season data.

End of the Document



APPENDIX-1 FIELD SURVEY PHOTOS



FOR DISCHARGED POINT OF THILAWA SEZ ZONE B



Surface water sampling and onsite measurement at SW-7

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



Surface water sampling and onsite measurement at SW-2



Surface water sampling and onsite measurement at SW-4



Ground water sampling and onsite measurement at GW-2

APPENDIX-2 LABORATORY RESULTS



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY June - 2019)

FOR DISCHARGED POINT

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No E1, Thilawa SEZ Zone A, Yangon Region, Myanmar.
Phone No. Fax No: (+95) 1 2309051


motivate our planet
Doc No: GEM-LB-R004E/00
Page 1 of 1

Report No. : GEM-LAB-201906154
Revision No. : 1
Report Date : 20 June, 2019
Application No. : 0001-C001

Analysis Report

Client Name : Myanmar Koel International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-7-0605
Sample No. : W-19060154
Waste Profile No. :
Sampling Date : 5 June, 2019
Sampling By : Customer
Sample Received Date : 5 June, 2019

| No. | Parameter | Method | Unit | Result | LOQ |
|-----|----------------------------|---|-----------|---------|-------|
| 1 | SS | APHA 2540D (Dry at 103-105°C Method) | mg/l | 36.00 | — |
| 2 | BOD (5) | APHA 5210 B (5 Days BOD Test) | mg/l | 7.48 | 0.00 |
| 3 | COD (Cr) | APHA 5220D (Close Reflux Colorimetric Method) | mg/l | 2.9 | 0.7 |
| 4 | Total Coliform | APHA 9221B (Standard Total Coliform Fermentation Technique) | MPN/100ml | 35000 | 1.8 |
| 5 | Oil and Grease | APHA 5520B (Partition-Gravimetric Method) | mg/l | < 3.1 | 3.1 |
| 6 | Total Nitrogen | HACH Method 10072 (TNT Persulfate Digestion Method) | mg/l | 2.3 | 0 |
| 7 | Total Phosphorous | APHA 4500-P E (Ascorbic Acid Method) | mg/l | 0.208 | 0.050 |
| 8 | Color | APHA 2120C (Spectrophotometric Method) | TCU | 1.15 | 0.00 |
| 9 | Odor | APHA 2150 B (Threshold Odor Test) | TON | 1 | 0 |
| 10 | TDS | APHA 2540 C (Total Dissolved Solids Dried at 180°C Method) | mg/l | 150 | — |
| 11 | Mercury | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 12 | Zinc | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.2 | 0.002 |
| 13 | Arsenic | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.014 | 0.01 |
| 14 | Chromium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.028 | 0.002 |
| 15 | Cadmium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 16 | Selenium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.01 | 0.01 |
| 17 | Lead | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 18 | Copper | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 19 | Barium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.048 | 0.001 |
| 20 | Nickel | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.026 | 0.002 |
| 21 | Silver | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.236 | 0.002 |
| 22 | Iron | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 9.062 | 0.002 |
| 23 | Cyanide | HACH 8027 (Pyridine -Pyrazalane Method) | mg/l | < 0.002 | 0.002 |
| 24 | Total Cyanide | Distillation Process: APHA 4500-CN- C. Total Cyanide after Distillation, Determine Cyanide Concentration Process: HACH 8027 (Pyridine -Pyrazalane Method) | mg/l | 0.008 | 0.002 |
| 25 | Ammonia | HACH Method 10205 (Silicolyte TNT Plus Method) | mg/l | 0.485 | 0.020 |
| 26 | Hexavalent Chromium (Cr6+) | ISO 11093:1994 (Determination of chromium(VI) Spectrometric method using 1,5-diphenylcarbazide) | mg/l | < 0.05 | 0.05 |
| 27 | Fluoride | APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity) | mg/l | 0.117 | 0.014 |
| 28 | Total Residual Chlorine | APHA 4500 CL G (DPD Colorimetric Method) | mg/l | 0.1 | 0.1 |
| 29 | Free Chlorine | APHA 4500 CL G (DPD Colorimetric Method) | mg/l | < 0.1 | 0.1 |
| 30 | Sulphide | HACH 8131 (USEPA Methylene Blue Method) | mg/l | 0.351 | 0.005 |
| 31 | Formaldehyde | HACH 8110 (MBTH Method) | mg/l | 0.193 | 0.003 |
| 32 | Phenols | USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4AAP With Distillation)) | mg/l | 0.007 | 0.002 |

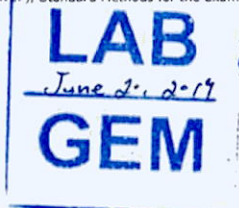
Remark : LOQ - Limit of Quantitation

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

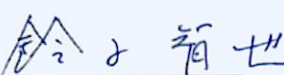
Analysed By :



Ni Ni Aye Lwin
Supervisor



Approved By :



Tomoya Suzuki
Director June 24 2019



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

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No E1, Thilawa SEZ Zone A, Yangon Region, Myanmar.
Phone No. Fax No: (+95) 1 2309051

Doc No: GEM-LB-R004E/00
Page 1 of 1

Report No. : GEM-LAB-201906151
Revision No. : 1
Report Date : 20 June, 2019
Application No. : 0001-C001

Analysis Report

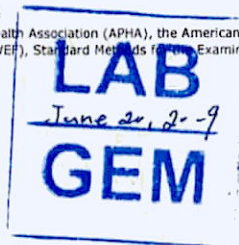
Client Name : Myanmar Koei International LTD (MKI)
Address : No. 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-2-0605 Sampling Date : 5 June, 2019
Sample No. : W-1906084 Sampling By : Customer
Waste Profile No. : Sample Received Date : 5 June, 2019

| No. | Parameter | Method | Unit | Result | LOQ |
|-----|----------------------------|---|-----------|---------|-------|
| 1 | SS | APHA 2540D (Dry at 103-105°C Method) | mg/l | 10.00 | — |
| 2 | BOD (5) | APHA 5210 B (5 Days BOD Test) | mg/l | 6.96 | 0.00 |
| 3 | COD (Cr) | APHA 5220D (Close Reflux Colorimetric Method) | mg/l | 65 | 0.7 |
| 4 | Total Coliform | APHA 9221B (Standard Total Coliform Fermentation Technique) | MPN/100ml | 35000 | 1.8 |
| 5 | Oil and Grease | APHA 5520B (Partition-Gravimetric Method) | mg/l | < 3.1 | 3.1 |
| 6 | Total Nitrogen | HACH Method 10072 (TNT Persulfate Digestion Method) | mg/l | 1.2 | 0 |
| 7 | Total Phosphorous | APHA 4500-P E (Ascorbic Acid Method) | mg/l | 0.174 | 0.050 |
| 8 | Color | APHA 2120C (Spectrophotometric Method) | TCU | 22.12 | 0.00 |
| 9 | Odor | APHA 2150 B (Threshold Odor Test) | TON | 1 | 0 |
| 10 | TDS | APHA 2540 C (Total Dissolved Solids Dried at 180°C Method) | mg/l | 222 | — |
| 11 | Mercury | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 12 | Zinc | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 13 | Arsenic | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.01 | 0.01 |
| 14 | Chromium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.004 | 0.002 |
| 15 | Cadmium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 16 | Selenium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.01 | 0.01 |
| 17 | Lead | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 18 | Copper | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 19 | Barium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.034 | 0.001 |
| 20 | Nickel | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.004 | 0.002 |
| 21 | Silver | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.042 | 0.002 |
| 22 | Iron | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 2.862 | 0.002 |
| 23 | Cyanide | HACH 8027 (Pyridine -Pyrazolone Method) | mg/l | < 0.002 | 0.002 |
| 24 | Total Cyanide | Distillation Process: APHA 4500-CN- C. Total Cyanide after Distillation, Determine Cyanide Concentration Process: HACH 8027 (Pyridine -Pyrazolone Method) | mg/l | 0.002 | 0.002 |
| 25 | Ammonia | HACH Method 10205 (Silicolyte TNT Plus Method) | mg/l | 0.490 | 0.020 |
| 26 | Hexavalent Chromium (Cr6+) | ISO 11083:1994 (Determination of chromium(VI) Spectrometric method using 1,5-diphenylcarbazide) | mg/l | < 0.05 | 0.05 |
| 27 | Fluoride | APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity) | mg/l | 0.099 | 0.014 |
| 28 | Total Residual Chlorine | APHA 4500 CL G (DPD Colorimetric Method) | mg/l | 0.1 | 0.1 |
| 29 | Free Chlorine | APHA 4500 CL G (DPD Colorimetric Method) | mg/l | 0.1 | 0.1 |
| 30 | Sulphide | HACH 8131 (USEPA Methylene Blue Method) | mg/l | 0.011 | 0.005 |
| 31 | Formaldehyde | HACH 8110 (MBTH Method) | mg/l | 0.128 | 0.003 |
| 32 | Phenols | USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4AAP With Distillation)) | 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, 22nd edition

Analysed By :

Ni Ni Aye Lwin
Supervisor



Approved By :

Tomoya Suzuki
Director June 20, 2019

Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY June - 2019)

DOWA

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Doc No: GEM-18-R004E/00
Page 1 of 1

Report No. : GEM-LAB-201906152
Revision No. : 1
Report Date : 20 June, 2019
Application No. : 0001-C001

Analysis Report

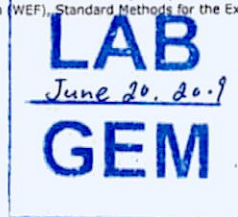
Client Name : Myanmar Koei International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-4-0605
Sample No. : W-1906085
Waste Profile No. : -
Sampling Date : 5 June, 2019
Sampling By : Customer
Sample Received Date : 5 June, 2019

| No. | Parameter | Method | Unit | Result | LOQ |
|-----|----------------------------|---|-----------|---------|-------|
| 1 | SS | APHA 2540D (Dry at 103-105°C Method) | mg/l | 82.00 | - |
| 2 | BOD (5) | APHA 5210 B (5 Days BOD Test) | mg/l | 8.32 | 0.00 |
| 3 | COD (Cr) | APHA 5220D (Close Reflux Colorimetric Method) | mg/l | 18.3 | 0.7 |
| 4 | Total Coliform | APHA 9221B (Standard Total Coliform Fermentation Technique) | MPN/100ml | 54000 | 1.8 |
| 5 | Oil and Grease | APHA 5520B (Partition-Gravimetric Method) | mg/l | < 3.1 | 3.1 |
| 6 | Total Nitrogen | HACH Method 10072 (TNT Persulfate Digestion Method) | mg/l | 1.7 | 0 |
| 7 | Total Phosphorous | APHA 4500-P E (Ascorbic Acid Method) | mg/l | 0.205 | 0.050 |
| 8 | Color | APHA 2120C (Spectrophotometric Method) | TCU | 6.22 | 0.00 |
| 9 | Odor | APHA 2150 B (Threshold Odor Test) | TON | 1 | 0 |
| 10 | TDS | APHA 2540 C (Total Dissolved Solids Dried at 180°C Method) | mg/l | 764 | - |
| 11 | Mercury | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 12 | Zinc | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.056 | 0.002 |
| 13 | Arsenic | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.01 | 0.01 |
| 14 | Chromium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.018 | 0.002 |
| 15 | Cadmium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 16 | Selenium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.01 | 0.01 |
| 17 | Lead | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 18 | Copper | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 19 | Barium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.036 | 0.001 |
| 20 | Nickel | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.018 | 0.002 |
| 21 | Silver | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.24 | 0.002 |
| 22 | Iron | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 5.920 | 0.002 |
| 23 | Cyanide | HACH 8027 (Pyridine -Pyrazolone Method) | mg/l | < 0.002 | 0.002 |
| 24 | Total Cyanide | Distillation Process: APHA 4500-CN- C. Total Cyanide after Distillation, Determine Cyanide Concentration Process: HACH 8027 (Pyridine -Pyrazolone Method) | mg/l | 0.003 | 0.002 |
| 25 | Ammonia | HACH Method 10205 (Silicilate TNT Plus Method) | mg/l | 0.260 | 0.020 |
| 26 | Hexavalent Chromium (Cr6+) | ISO 11083:1994 (Determination of chromium(VI) Spectrometric method using 1,5-diphenylcarbazide) | mg/l | < 0.05 | 0.05 |
| 27 | Fluoride | APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity) | mg/l | 0.216 | 0.014 |
| 28 | Total Residual Chlorine | APHA 4500 CL G (DPD Colorimetric Method) | mg/l | 0.1 | 0.1 |
| 29 | Free Chlorine | APHA 4500 CL G (DPD Colorimetric Method) | mg/l | 0.1 | 0.1 |
| 30 | Sulphide | HACH 8131 (USEPA Methylene Blue Method) | mg/l | 0.150 | 0.005 |
| 31 | Formaldehyde | HACH 8110 (MBTH Method) | mg/l | 0.126 | 0.003 |
| 32 | Phenols | USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4AAP With Distillation)) | mg/l | < 0.002 | 0.002 |


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

Analysed By :


Ni Ni Aye Lwin
Supervisor



Approved By :


Tomoya Suzuki
Director June 20, 2019



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY June - 2019)

DOWA

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Phone No Fax No (+95) 1 2309051

Doc No: GEM-LB-R004E/00
Page 1 of 1

Report No. : GEM-LAB-201906155
Revision No. : 1
Report Date : 20 June, 2019
Application No. : 0001-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-GW-2-0605
Sample No. : W-19060155
Waste Profile No. : -
Sampling Date : 5 June, 2019
Sampling By : Customer
Sample Received Date : 5 June, 2019

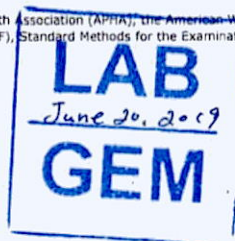
| No. | Parameter | Method | Unit | Result | LOQ |
|-----|----------------------------|---|-----------|---------|-------|
| 1 | SS | APHA 2540D (Dry at 103-105°C Method) | mg/l | 2.00 | - |
| 2 | BOD (5) | APHA 5210 B (5 Days BOD Test) | mg/l | 5.29 | 0.00 |
| 3 | COD (Cr) | APHA 5220D (Close Reflux Colorimetric Method) | mg/l | 5.1 | 0.7 |
| 4 | Total Coliform | APHA 9221B (Standard Total Coliform Fermentation Technique) | MPN/100ml | 17 | 1.8 |
| 5 | Oil and Grease | APHA 5520B (Partition-Gravimetric Method) | mg/l | < 3.1 | 3.1 |
| 6 | Total Nitrogen | HACH Method 10072 (TNT Persulfate Digestion Method) | mg/l | 0.8 | 0 |
| 7 | Total Phosphorous | APHA 4500-P E (Ascorbic Acid Method) | mg/l | 0.682 | 0.050 |
| 8 | Color | APHA 2120C (Spectrophotometric Method) | TCU | 1.63 | 0.00 |
| 9 | Odor | APHA 2150 B (Threshold Odor Test) | TON | 1 | 0 |
| 10 | TDS | APHA 2540 C (Total Dissolved Solids Dried at 180°C Method) | mg/l | 142 | - |
| 11 | Mercury | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 12 | Zinc | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.014 | 0.002 |
| 13 | Arsenic | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.01 | 0.01 |
| 14 | Chromium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 15 | Cadmium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 16 | Selenium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.01 | 0.01 |
| 17 | Lead | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 18 | Copper | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 19 | Barium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.012 | 0.001 |
| 20 | Nickel | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 21 | Silver | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 22 | Iron | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 6.192 | 0.002 |
| 23 | Cyanide | HACH 8027 (Pyridine -Pyrazolone Method) | mg/l | < 0.002 | 0.002 |
| 24 | Total Cyanide | Distillation Process: APHA 4500-CN- C. Total Cyanide after Distillation, Determine Cyanide Concentration Process: HACH 8027 (Pyridine -Pyrazolone Method) | mg/l | < 0.002 | 0.002 |
| 25 | Ammonia | HACH Method 10205 (Siliclyate TNT Plus Method) | mg/l | 0.257 | 0.020 |
| 26 | Hexavalent Chromium (Cr6+) | ISO 11083:1994 (Determination of chromium(VI) Spectrometric method using 1,5-diphenylcarbazide) | mg/l | < 0.05 | 0.05 |
| 27 | Fluoride | APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity) | mg/l | 0.095 | 0.014 |
| 28 | Total Residual Chlorine | APHA 4500 CL G (DPD Colorimetric Method) | mg/l | 0.1 | 0.1 |
| 29 | Free Chlorine | APHA 4500 CL G (DPD Colorimetric Method) | mg/l | < 0.1 | 0.1 |
| 30 | Sulphide | HACH 8131 (USEPA Methylene Blue Method) | mg/l | < 0.005 | 0.005 |
| 31 | Formaldehyde | HACH 8110 (MBTH Method) | mg/l | 0.015 | 0.003 |
| 32 | Phenols | USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4AAP With Distillation)) | mg/l | 0.005 | 0.002 |

Remark : LOQ - Limit of Quantitation

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

Analysed By :

Ni Ni Aye Lwin
Supervisor



Approved By :

Tomoya Suzuki
Director
June 20, 2019



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



FOR DISCHARGED POINT



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Doc No: GEM-LB-R004E/00
Page 1 of 1

Report No. : GEM-LAB-201906091
Revision No. : 1
Report Date : 17 June, 2019
Application No. : 0001-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-SW-7-0605 Sampling Date : 5 June, 2019
Sample No. : W-1906078 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 5 June, 2019

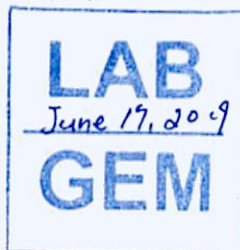
| No. | Parameter | Method | Unit | Result | LOQ |
|-----|------------------|--|-----------|--------|-----|
| 1 | Escherichia Coli | APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate | MPN/100ml | 14.0 | 1.8 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Remark : LOQ - Limit of Quantitation

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

Analysed By :

Ni Ni Aye Lwin
Supervisor



Approved By :

Tomoya Suzuki
Director June 17, 2019



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

DOWA

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Doc No: GEM-LB-R004E/00
Page1of1

Report No. : GEM-LAB-201906093
Revision No. : 1
Report Date : 17 June, 2019
Application No. : 0001-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-GW-2-0605 Sampling Date : 5 June, 2019
Sample No. : W-1906080 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 5 June, 2019

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

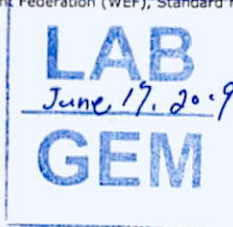
Remark : LOQ - Limit of Quantitation

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

Analysed By :



Ni Ni Aye Lwin
Supervisor



Approved By :



Tomoya Suzuki
Director June 17, 2019



**Thilawa Special Economic Zone (Zone B)
Development Project –Phase 2 & 3**

Appendix

Water and Waste Water Monitoring Report

August 2019

**WATER QUALITY MONITORING REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
IN THILAWA SEZ ZONE B
(PHASE 2 & 3 CONSTRUCTION STAGE)**

(Bi-Monthly Monitoring)

August 2019

Myanmar Koei International Ltd.



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| CHAPTER 2: WATER QUALITY MONITORING | 2 |
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| 2.2 Description of Sampling Points | 2 |
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CHAPTER 1: INTRODUCTION

1.1 General

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



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



CHAPTER 2: WATER QUALITY MONITORING

2.1 Monitoring Items

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

Water quality sampling was carried out at four locations. Among the four locations, water flow measurement was carried out at three locations (SW-2, SW-4 and SW-7) where can be measured by current meter. Monitoring items and sampling points are summarized in Table 2.1-1.

Table 2.1-1 Monitoring Items for Water Quality

| No. | Parameters | SW-2 | SW-4 | SW-7 | GW-2 | Remarks |
|-----|---|------|------|------|------|---------------------|
| 1 | Water Temperature | ○ | ○ | ○ | ○ | On-site measurement |
| 2 | pH | ○ | ○ | ○ | ○ | On-site measurement |
| 3 | DO | ○ | ○ | ○ | ○ | On-site measurement |
| 4 | BOD ₍₅₎ | ○ | ○ | ○ | ○ | Laboratory analysis |
| 5 | COD _(Cr) | ○ | ○ | ○ | ○ | Laboratory analysis |
| 6 | Suspended Solids | ○ | ○ | ○ | ○ | Laboratory analysis |
| 7 | Total Coliform | ○ | ○ | ○ | ○ | Laboratory analysis |
| 8 | Oil and Grease | ○ | ○ | ○ | ○ | Laboratory analysis |
| 9 | Chromium | ○ | ○ | ○ | ○ | Laboratory analysis |
| 10 | Total Dissolved solids (TDS) (Self-monitoring) | ○ | ○ | ○ | ○ | Laboratory analysis |
| 11 | Iron (Self-monitoring) | ○ | ○ | ○ | ○ | Laboratory analysis |
| 12 | Mercury (Self-monitoring) | ○ | ○ | ○ | ○ | Laboratory analysis |
| 13 | Escherichia Coli (Self-monitoring) | - | - | ○ | ○ | Laboratory analysis |
| 14 | Flow Rate | ○ | ○ | ○ | - | On-site measurement |

Source: Myanmar Koei International Ltd.

2.2 Description of Sampling Points

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

Table 2.2-1 Outline of Sampling Points

| No. | Station | Detailed Information |
|-----|---------|---|
| 1 | SW-2 | Coordinate- N - 16° 40' 20.69", E - 96° 17' 18.04" |
| | | Location - Upstream of Shwe Pyauk Creek |
| | | Survey Item - Surface water sampling and water flow rate measurement. |
| 2 | SW-4 | Coordinate- N - 16° 39' 42.84", E - 96° 16' 27.42" |
| | | Location - Downstream of Shwe Pyauk Creek |
| | | Survey Item - Surface water sampling and water flow rate measurement. |
| 3 | SW-7 | Coordinate - N - 16° 40' 13.25", E - 96° 17' 5.66" |
| | | Location - Outlet of retention pond of Zone B construction site before connecting to Shwe Pyauk Creek |
| | | Survey Item - Discharge water sampling and water flow rate measurement. |
| 4 | GW-2 | Coordinate - N - 16° 39' 25.30", E - 96° 17' 15.60" |
| | | Location - In the monastery compound of Phalan village |
| | | Survey Item - Ground water sampling |

Source: Myanmar Koei International Ltd.



SW-2 (Reference Point)

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

SW-4 (Reference Point)

SW-4 was collected at the downstream of Shwe Pyauk creek, after mixing of discharge water from local industrial zone, construction site of Zone B and Zone A, which is flowing from east to west and then entering into the Yangon River. The distance is about 2.15 km downstream of SW-2. This sampling point is located in the west of Zone B area and in the south of Dagon-Thilawa road. The surrounding areas are Zone A in the northeast, local industrial zone in the east and paddy fields in the south and west respectively.

SW-7 (Discharged Point)

SW-7 is main discharged point of Zone B during construction stage. The distance is about 434 m downstream of SW-2. This sampling point is located at outlet of retention pond of Zone B construction site, in the north of Zone B area and in the south of Dagon-Thilawa road. The surrounding areas are Zone A in the north and local industrial zone in the east respectively.

GW-2 (Reference of Existing Tube Well)

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



2.3 Monitoring Method

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

Table 2.3-1 Analytic Method for Water Quality

| No. | Parameter | Method |
|-----|------------------------------|--|
| 1 | Temperature | Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker) |
| 2 | pH | Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker) |
| 3 | Dissolved Oxygen (DO) | Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker) |
| 4 | BOD ₍₅₎ | APHA 5210 B (5 days BOD Test) |
| 5 | COD _(Cr) | APHA 5220D (Close Reflux Colorimetric Method) |
| 6 | Suspended Solids (SS) | APHA 2540D (Dry at 103-105°C Method) |
| 7 | Total Coliform | APHA 9221B (Standard Total Coliform Fermentation Technique) |
| 8 | Oil and Grease | APHA 5520B (Partition-Gravimetric Method) |
| 9 | Chromium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) |
| 10 | Total Dissolved solids (TDS) | APHA 2540C (Total Dissolved Solids Dried at 180°C Method) |
| 11 | Iron | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) |
| 12 | Mercury | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) |
| 13 | Escherichia Coli | APHA 9221 F (Escherichia Coli Procedure Using Fluorogenic Substrate) |
| 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 monitoring were conducted on 7 August 2019 and sampling time is shown in Table 2.4-1 to avoid tidal effect. The tide record for Yangon River, Myanmar on 7 August 2019 is shown in Table 2.4-2.

Table 2.4-1 Sampling Time of Each Station

| No. | Station | Sampling Time |
|-----|---------|------------------|
| 1 | SW-2 | 07/08/2019 14:47 |
| 2 | SW-4 | 07/08/2019 09:26 |
| 3 | SW-7 | 07/08/2019 15:16 |
| 4 | GW-2 | 07/08/2019 16:13 |

Source: Myanmar Koei International Ltd.

Table 2.4-2 Tide Record for Yangon River

| Date | Time | Height | Tide Conditions |
|------------|-------|--------|-----------------|
| 07/08/2019 | 04:03 | 1.31 | Low Tide |
| | 08:52 | 5.97 | High Tide |
| | 16:19 | 1.63 | Low Tide |
| | 21:10 | 5.72 | High Tide |

Source: Myanmar Port Authority, Tide Table for the Yangon River and Elephant Point, 2019



2.5 Monitoring Results

Results of water quality monitoring at discharged point and discharged creek are summarized in Table 2.5-1. Analytical results of the laboratory are described in Appendix-2, Appendix-3 and Appendix-4. The results were compared with the target value of effluent water quality discharged to water body stipulated in the EIA report.

2.5.1 Results of Discharged Point and Discharged Creek

As the comparison with the target value, the results of SS, total coliform and iron exceeded the target value. As for the result of SS, results at the surface water monitoring point (SW-2, SW-4 and SW-7) exceeded the target value. The exceed result for SS may be due to three expected reasons; i) delivered from upstream area such as natural origin and wastewater from local industrial zone outside of Thilawa SEZ, and ii) influence by water from the downstream of monitoring points due to flow back by tidal fluctuation and iii) surface water run-off from bare land in Zone B.

As for the result of total coliform of surface water, results at surface water monitoring points (SW-2, SW-4 and SW-7) exceeded the target value due to three expected reasons; i) natural bacteria existed in discharged creek and retention pond because there are various kinds of vegetation and creature such as birds and small animals in and along the discharged creek and retention pond and ii) wastewater from the local industrial zone outside of Thilawa SEZ and iii) delivered from surrounding area by tidal effect.

Since the composition of the total coliform include bacteria from natural origin, and even after total coliform do not affect human health directly, self-monitoring for E. Coli analysis was carried out at SW-7 to identify health impact by coliform bacteria. As for the result of E.Coli of surface water at SW-7, the result was under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point of SW-7 but it is considered that there is no significant impact on human health.

As for the result of iron, the result at the monitoring point of surface water monitoring point (SW-4 and SW-7) exceeded the target value. The possible reasons may be i) iron is used as a construction material and in the rainy season, the water run-off from the construction sites may contain iron particles, ii) due to the influence of natural origin (iron can reach out from soil by run-off). In Yangon, soil is naturally rich in iron. This is expected as a temporary event as the iron from construction sites can enter into the water by run-off only in the rainy season.



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

| No. | Parameters | Unit | SW-2 | SW-4 | SW-7 | Target Value (Reference Value for Self-Monitoring) |
|-----|------------------------------|-------------------|---------|--------|--------|--|
| 1 | Temperature | °C | 26 | 26 | 26 | ≤ 35 |
| 2 | pH | - | 6.9 | 7.1 | 9.0 | 6~9 |
| 3 | Suspended Solid (SS) | mg/L | 78.00 | 232.00 | 326.00 | 50 |
| 4 | Dissolved Oxygen (DO) | mg/L | 6.91 | 6.43 | 7.59 | - |
| 5 | BOD ₍₅₎ | mg/L | 4.10 | 2.99 | 4.36 | 30 |
| 6 | COD _(Cr) | mg/L | 11.6 | 5.2 | 33.5 | 125 |
| 7 | Total Coliform | MPN/100ml | >160000 | 11000 | 3300 | 400 |
| 8 | Oil and Grease | mg/L | <3.1 | <3.1 | <3.1 | 10 |
| 9 | Chromium | mg/L | ≤0.002 | 0.02 | 0.028 | 0.5 |
| 10 | Total Dissolved solids (TDS) | mg/L | 56 | 68 | 50 | 2000 |
| 11 | Iron | mg/L | 3.440 | 11.924 | 13.960 | 3.5 |
| 12 | Mercury | mg/L | ≤0.002 | ≤0.002 | ≤0.002 | 0.005 |
| 13 | Escherichia Coli | MPN/100ml | - | - | 5.5 | (1000)* (CFU/100ml) |
| 14 | Flow Rate | m ³ /s | 4.04 | 3.42 | 2.92 | - |

Note: Red color means exceeded value than target value.

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

Source: Myanmar Koei International Ltd.

2.5.2 Result of Reference Tube Well

Result of water quality monitoring at reference tube well monitoring point is shown in Table 2.5-2. As the comparison with the target value, all the results were under the target value.

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

| No. | Parameters | Unit | GW-2 | Target Value (Reference Value for Self-Monitoring) |
|-----|------------------------------|-------------------|--------|--|
| 1 | Temperature | °C | 28 | ≤ 35 |
| 2 | pH | - | 7.3 | 6~9 |
| 3 | Suspended Solid (SS) | mg/L | 2.00 | 50 |
| 4 | Dissolved Oxygen (DO) | mg/L | 7.52 | - |
| 5 | BOD ₍₅₎ | mg/L | 1.58 | 30 |
| 6 | COD _(Cr) | mg/L | 1.6 | 125 |
| 7 | Total Coliform | MPN/100ml | 23 | 400 |
| 8 | Oil and Grease | mg/L | <3.1 | 10 |
| 9 | Chromium | mg/L | ≤0.002 | 0.5 |
| 10 | Total Dissolved solids (TDS) | mg/L | 138 | 2000 |
| 11 | Iron | mg/L | 3.076 | 3.5 |
| 12 | Mercury | mg/L | ≤0.002 | 0.005 |
| 13 | Escherichia Coli | MPN/100ml | <1.8 | (100)* (MPN/100ml) |
| 14 | Flow Rate | m ³ /s | - | - |

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

Source: Myanmar Koei International Ltd.



CHAPTER 3: CONCLUSION AND RECOMMENDATIONS

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

There are some possible reasons for exceeding the target values of SS and total coliform at (SW-2, SW-4 and SW-7). They are by i) natural origin such as natural bacteria existed in discharged creek and retention pond because there are various kinds of vegetation and creature such as birds and small animals in and along the discharged creek and ii) wastewater from the local industrial zone outside of Thilawa SEZ, iii) delivered from surrounding area by tidal effect and iv) surface water run-off from bare land in Zone B.

Since the composition of the total coliform include bacteria from natural origin, and even after total coliform do not affect human health directly, self-monitoring for E. Coli analysis was carried out at SW-7 to identify health impact by coliform bacteria. As for the result of E.Coli of surface water at SW-7, the result was under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point of SW-7 but it is considered that there is no significant impact on human health.

As for the result of iron, the result at the monitoring point of surface water monitoring point (SW-4 and SW-7) exceeded the target value. The possible reasons may be i) iron is used as a construction material and in the rainy season the water run-off from the construction sites may contain iron particles, ii) due to the influence of natural origin (iron can reach out from soil by run-off). In Yangon, soil is naturally rich in iron. This is expected as a temporary event as the iron from construction sites can enter into the water by run-off only in the rainy season.

However, it cannot reach to the conclusion of what the reason to be exceeded the target values is, the continuous monitoring and yearly trend analysis will be necessary to carry out based on the rainy and dry season data.

As for future subject for main discharged points of Thilawa SEZ Zone B, the following action may be taken to maintain the target value of SS, total coliform, iron and appropriate water quality monitoring:

- 1) To continue monitoring Escherichia coli (E. Coli) level to identify health impact by coliform bacteria
- 2) To monitor the possibility of the overflow water from construction sites
- 3) To monitor the possibility of the domestic wastewater from construction sites, and
- 4) To cover the iron containing construction materials during heavy rain.

End of the Document



APPENDIX-1 FIELD SURVEY PHOTOS



FOR DISCHARGED POINT OF THILAWA SEZ ZONE B



Surface water sampling and onsite measurement at SW-7

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



Surface water sampling and onsite measurement at SW-2



Surface water sampling and onsite measurement at SW-4



Ground water sampling and onsite measurement at GW-2

APPENDIX-2 LABORATORY RESULTS



FOR DISCHARGED POINT

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Doc No: GEM-LB-R004E/00
Page1of1

Report No. : GEM-LAB-201908215
Revision No. : 1
Report Date : 27 August, 2019
Application No. : 0001-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-SW-7-0807 Sampling Date : 7 August, 2019
Sample No. : W-1908077 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 7 August, 2019

| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-------------------|---|-----------|--------|-------|
| 1 | SS | APHA 2540D (Dry at 103-105°C Method) | mg/l | 326.00 | — |
| 2 | BOD (5) | APHA 5210 B (5 Days BOD Test) | mg/l | 4.36 | 0.00 |
| 3 | COD (Cr) | APHA 5220D (Close Reflux Colorimetric Method) | mg/l | 33.5 | 0.7 |
| 4 | Total Coliform | APHA 9221B (Standard Total Coliform Fermentation Technique) | MPN/100ml | 3300 | 1.8 |
| 5 | Total Nitrogen | HACH Method 10072 (TNT Persulfate Digestion Method) | mg/l | 4.2 | 0 |
| 6 | Total Phosphorous | APHA 4500-P E (Ascorbic Acid Method) | mg/l | 0.116 | 0.050 |
| 7 | Color | APHA 2120C (Spectrophotometric Method) | TCU | 1.79 | 0.00 |
| 8 | Odor | APHA 2150 B (Threshold Odor Test) | TON | 1 | 0 |
| 9 | Oil and Grease | APHA 5520B (Partition-Gravimetric Method) | mg/l | < 3.1 | 3.1 |
| 10 | Chromium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.028 | 0.002 |

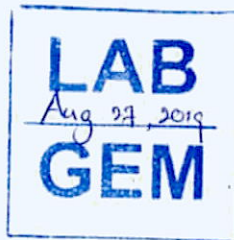
Remark : LOQ - Limit of Quantitation

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, 22nd edition


Analysed By :



Ni Ni Aye Lwin
Supervisor



Approved By :


Tomoya Suzuki
Director



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

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Report No. : GEM-LAB-201908212
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Application No. : 0001-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-SW-2-0807 Sampling Date : 7 August, 2019
Sample No. : W-1908074 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 7 August, 2019

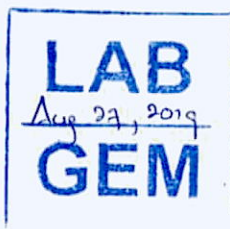
| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-------------------|---|-----------|----------|-------|
| 1 | SS | APHA 2540D (Dry at 103-105°C Method) | mg/l | 78.00 | - |
| 2 | BOD (5) | APHA 5210 B (5 Days BOD Test) | mg/l | 4.10 | 0.00 |
| 3 | COD (Cr) | APHA 5220D (Close Reflux Colorimetric Method) | mg/l | 11.6 | 0.7 |
| 4 | Total Coliform | APHA 9221B (Standard Total Coliform Fermentation Technique) | MPN/100ml | > 160000 | 1.8 |
| 5 | Total Nitrogen | HACH Method 10072 (TNT Persulfate Digestion Method) | mg/l | 2.6 | 0 |
| 6 | Total Phosphorous | APHA 4500-P E (Ascorbic Acid Method) | mg/l | 0.255 | 0.050 |
| 7 | Color | APHA 2120C (Spectrophotometric Method) | TCU | 6.54 | 0.00 |
| 8 | Odor | APHA 2150 B (Threshold Odor Test) | TON | 1 | 0 |
| 9 | Oil and Grease | APHA 5520B (Partition-Gravimetric Method) | mg/l | < 3.1 | 3.1 |
| 10 | Chromium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |

Remark : LOQ - Limit of Quantitation


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

Analysed By :


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Approved By :


Tomoya Suzuki Aug 27, 2019
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Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY August - 2019)

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Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-SW-4-0807 Sampling Date : 7 August, 2019
Sample No. : W-1908075 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 7 August, 2019

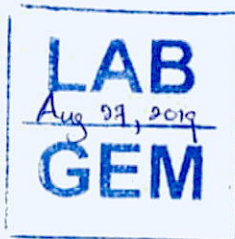
| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-------------------|---|-----------|--------|-------|
| 1 | SS | APHA 2540D (Dry at 103-105°C Method) | mg/l | 232.00 | - |
| 2 | BOD (5) | APHA 5210 B (5 Days BOD Test) | mg/l | 2.99 | 0.00 |
| 3 | COD (Cr) | APHA 5220D (Close Reflux Colorimetric Method) | mg/l | 5.2 | 0.7 |
| 4 | Total Coliform | APHA 9221B (Standard Total Coliform Fermentation Technique) | MPN/100ml | 11000 | 1.8 |
| 5 | Total Nitrogen | HACH Method 10072 (TNT Persulfate Digestion Method) | mg/l | 3.2 | 0 |
| 6 | Total Phosphorous | APHA 4500-P E (Ascorbic Acid Method) | mg/l | 0.470 | 0.050 |
| 7 | Color | APHA 2120C (Spectrophotometric Method) | TCU | 3.49 | 0.00 |
| 8 | Odor | APHA 2150 B (Threshold Odor Test) | TON | 1 | 0 |
| 9 | Oil and Grease | APHA 5520B (Partition-Gravimetric Method) | mg/l | < 3.1 | 3.1 |
| 10 | Chromium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 0.02 | 0.002 |

Remark : LOQ - Limit of Quantitation

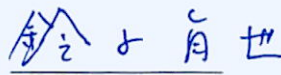
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


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Supervisor



Approved By :


Tomoya Suzuki
Director



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY August - 2019)

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Analysis Report

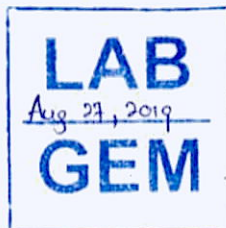
Client Name : Myanmar Koei International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-GW-2-0807 Sampling Date : 7 August, 2019
Sample No. : W-1908078 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 7 August, 2019

| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-------------------|---|-----------|---------|-------|
| 1 | SS | APHA 2540D (Dry at 103-105°C Method) | mg/l | 2.00 | - |
| 2 | BOD (5) | APHA 5210 B (5 Days BOD Test) | mg/l | 1.58 | 0.00 |
| 3 | COD (Cr) | APHA 5220D (Close Reflux Colorimetric Method) | mg/l | 1.6 | 0.7 |
| 4 | Total Coliform | APHA 9221B (Standard Total Coliform Fermentation Technique) | MPN/100ml | 23 | 1.8 |
| 5 | Total Nitrogen | HACH Method 10072 (TNT Persulfate Digestion Method) | mg/l | 1.9 | 0 |
| 6 | Total Phosphorous | APHA 4500-P E (Ascorbic Acid Method) | mg/l | 0.754 | 0.050 |
| 7 | Color | APHA 2120C (Spectrophotometric Method) | TCU | 7.76 | 0.00 |
| 8 | Odor | APHA 2150 B (Threshold Odor Test) | TON | 1 | 0 |
| 9 | Oil and Grease | APHA 5520B (Partition-Gravimetric Method) | mg/l | < 3.1 | 3.1 |
| 10 | Chromium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |

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

Analysed By :


Ni Ni Aye Lwin
Supervisor



Approved By :


Tomoya Suzuki
Director Aug 27, 2019



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



FOR DISCHARGED POINT

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No E1, Thilawa SEZ Zone A, Yangon Region, Myanmar.
Phone No Fax No: (+95) 1 2309051



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Doc No: GEM-LB-R004E/00
Page 1 of 1

Report No. : GEM-LAB-201908196
Revision No. : 1
Report Date : 22 August, 2019
Application No. : 0001-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-SW-7-0807 Sampling Date : 7 August, 2019
Sample No. : W-1908060 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 7 August, 2019

| No. | Parameter | Method | Unit | Result | LOQ |
|-----|------------------|--|-----------|--------|-----|
| 1 | Escherichia Coli | APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate | MPN/100ml | 5.5 | 1.8 |

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

Analysed By :

Ni Ni Aye Lwin
Supervisor



Approved By :

Yoshiyuki Narabe 22 August, 2019
Manager



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

DOWA

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Doc No: GEM-LB-R004E/00
Page1of1

Report No. : GEM-LAB-201908198
Revision No. : 1
Report Date : 22 August, 2019
Application No. : 0001-C001

Analysis Report

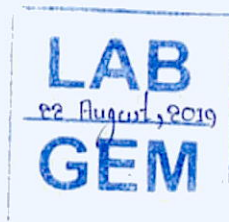
Client Name : Myanmar Koei International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-GW-2-0807 Sampling Date : 7 August, 2019
Sample No. : W-1908062 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 7 August, 2019

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

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

Analysed By :

Ni Ni Aye Lwin
Supervisor



Approved By :

Yoshiyuki Narabe 22 August, 2019
Manager



APPENDIX-4 LABORATORY RESULTS (SELF-MONITORING)



FOR DISCHARGED POINT

DOWA

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Doc No: GEM-LB-R004E/00
Page 1 of 1

Report No. : GEM-LAB-201908207

Revision No. : 1

Report Date : 23 August, 2019

Application No. : 0001-C001

Analysis Report

Client Name : Myanmar Koel International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-SW-7-0807 Sampling Date : 7 August, 2019
Sample No. : W-1908069 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 7 August, 2019

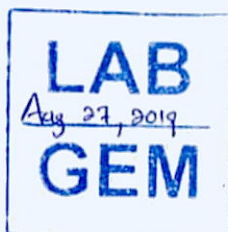
| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-----------|--|------|---------|-------|
| 1 | TDS | APHA 2540 C (Total Dissolved Solids Dried at 180°C Method) | mg/l | 50 | - |
| 2 | Mercury | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 3 | Iron | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 13.960 | 0.002 |

Remark : LOQ - Limit of Quantitation

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

Analysed By :

Ni Ni Aye Lwin
Supervisor



Approved By :

Tomoya Suzuki
Director
Aug 27, 2019



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

DOWA

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Doc No: GEM-LB-R004E/00
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Report No. : GEM-LAB-201908204
Revision No. : 1
Report Date : 23 August, 2019
Application No. : 0001-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-SW-2-0807 Sampling Date : 7 August, 2019
Sample No. : W-1908066 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 7 August, 2019

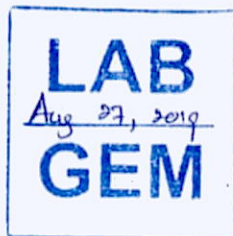
| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-----------|--|------|---------|-------|
| 1 | TDS | APHA 2540 C (Total Dissolved Solids Dried at 180°C Method) | mg/l | 56 | - |
| 2 | Mercury | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 3 | Iron | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 3.440 | 0.002 |

Remark : LOQ - Limit of Quantitation


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

Analysed By :


Ni Ni Aye Lwin
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Approved By :


Tomoya Suzuki
Director
Aug 27, 2019



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Report No. : GEM-LAB-201908205
Revision No. : 1
Report Date : 23 August, 2019
Application No. : 0001-C001

Analysis Report

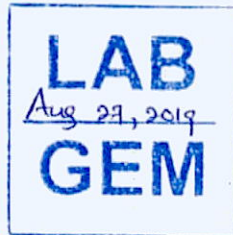
Client Name : Myanmar Koei International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-SW-4-0807 Sampling Date : 7 August, 2019
Sample No. : W-1908067 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 7 August, 2019

| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-----------|--|------|---------|-------|
| 1 | TDS | APHA 2540 C (Total Dissolved Solids Dried at 180°C Method) | mg/l | 68 | - |
| 2 | Mercury | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 3 | Iron | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 11.924 | 0.002 |

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

Analysed By :

Ni Ni Aye Lwin
Supervisor



Approved By :

Tomoya Suzuki
Director
Aug 27, 2019

Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY August - 2019)

DOWA

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Doc No: GEM-LB-R004E/00
Page1of1

Report No. : GEM-LAB-201908208
Revision No. : 1
Report Date : 23 August, 2019
Application No. : 0001-C001

Analysis Report

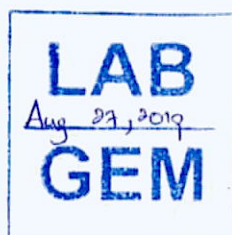
Client Name : Myanmar Koei International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-GW-2-0807 Sampling Date : 7 August, 2019
Sample No. : W-1908070 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 7 August, 2019

| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-----------|--|------|---------|-------|
| 1 | TDS | APHA 2540 C (Total Dissolved Solids Dried at 180°C Method) | mg/l | 138 | - |
| 2 | Mercury | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 3 | Iron | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 3.076 | 0.002 |

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

Analysed By :

Ni Ni Aye Lwin
Supervisor



Approved By :

Tomoya Suzuki
Director
Aug 27, 2019

**Thilawa Special Economic Zone (Zone B)
Development Project –Phase 2 & 3**

Appendix

Air Quality Monitoring Report

June 2019

AIR QUALITY MONITORING
REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
THILAWA SEZ ZONE B
(PHASE 2 & 3 CONSTRUCTION STAGE)

(QUARTERLY MONITORING)

June 2019
Myanmar Koei International Ltd.



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CHAPTER 1: OUTLINES AND SUMMARY OF MONITORING PLAN

1.1 General

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

1.2 Outlines of Monitoring Plan

To assess the environmental condition under the construction of industrial area in and around Thilawa SEZ Zone B, air quality had been monitored from 11 June 2019 – 18 June 2019 as follows;

Table 1.2-1 Outlines of Air Quality Monitoring Plan

| Monitoring Date | Monitoring Item | Parameters | Number of Point | Duration | Monitoring Methodology |
|------------------------------|-----------------|--|-----------------|----------|---|
| From 11 June – 18 June, 2019 | Air Quality | CO, NO ₂ , PM _{2.5} , PM ₁₀ and SO ₂ | 1 | 7 Days | On site measurement by Haz-Scanner Environmental Perimeter Air Station (EPAS) |



CHAPTER 2: AIR QUALITY MONITORING

2.1 Monitoring Item

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

2.2 Monitoring Location

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



Figure 2.2-1 Location of Air Quality Monitoring Point

2.3 Monitoring Period

Air quality monitoring was conducted seven consecutive days from 11 June 2019 – 18 June 2019.

2.4 Monitoring Method

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



Figure 2.4-1 Status of Air Quality Monitoring Point

2.5 Monitoring Results

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

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

| Date | CO | NO ₂ | PM _{2.5} | PM ₁₀ | SO ₂ |
|----------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ |
| 11~12 June, 2019 | 0.048 | 0.061 | 0.016 | 0.068 | 0.013 |
| 12~13 June, 2019 | 0.043 | 0.046 | 0.007 | 0.060 | 0.013 |
| 13~14 June, 2019 | 0.033 | 0.008 | 0.010 | 0.041 | 0.013 |
| 14~15 June, 2019 | 0.020 | 0.098 | 0.010 | 0.030 | 0.028 |
| 15~16 June, 2019 | 0.037 | 0.050 | 0.010 | 0.035 | 0.016 |
| 16~17 June, 2019 | 0.027 | 0.012 | 0.004 | 0.035 | 0.013 |
| 17~18 June, 2019 | 0.027 | 0.014 | 0.010 | 0.057 | 0.032 |
| 7 Days Average Value | 0.034 | 0.041 | 0.010 | 0.047 | 0.018 |
| Target Value | 10.26 | 0.1 | 0.025 | 0.05 | 0.02 |

Note: Red color mentions the exceeded value for PM₁₀ and SO₂.

The target value of CO, NO₂ and SO₂ were converted from ppm units to mg/m³. The conversion equation are as follows;

1. (CO, mg/m³) = (CO, ppm) * (Molecular Weight of CO (28)) / 24.45
2. (NO₂, mg/m³) = (NO₂, ppm) * (Molecular Weight of NO₂ (46)) / 24.45
3. (SO₂, mg/m³) = (SO₂, ppm) * (Molecular Weight of SO₂ (64)) / 24.45

Construction activities of Thilawa SEZ Zone B are described in Table 2.5-2. PM₁₀ results and SO₂ results during construction period are described in Table 2.5-3 and Table 2.5-4. During construction period, (Day 1 to Day 5) daily average results for PM₁₀ were lower than the target value while Day 6 and Day 7 daily average value for PM₁₀ were higher than the target value. During construction period, (Day 1 to Day 3 and Day 5 to Day 6) daily average value for SO₂ were lower than the target value while Day 4 and Day 7 daily average value for SO₂ were higher than the target value. During construction period, seven days average value of PM₁₀ and SO₂ comply with the target value.

Table 2.5-2 Construction Activities of Thilawa SEZ Zone B

| Date | Time | Location | Construction Activities |
|--------------|-------------|----------------|--|
| 11 June 2019 | 8:30- 17:30 | Near monastery | RBC 26 line backfilling, Canal 5 shoulder slope trimming, Road 7A buffer zone soil levelling, soil delivery, general use and electrical work. |
| 12 June 2019 | 8:30 -17:30 | Near monastery | Road 14 buffer zone soil levelling, electrical work, soil delivery and general use. |
| 13 June 2019 | 8:30 -17:30 | Near monastery | Road 7,10b, junction N buffer zone soil levelling, RBC 26 line backfilling, BA 1 levelling work, electrical work, material delivery and general use. |
| 14 June 2019 | 8:00 -17:30 | Near monastery | RBC 26 line backfilling, Road 10 buffer zone levelling work, Junction walkway excavation work, material delivery, BA 1 levelling work, electrical work and general use. |
| 15 June 2019 | 8:00 -17:30 | Near monastery | RBC 26 line backfilling work, Road 15a, 10b buffer zone levelling work, material delivery, electrical work, pond administration road sub-base compaction work and general use. |
| 16 June 2019 | 8:00-17:30 | Near monastery | RBC 26 line backfilling, Road 10b buffer zone levelling work, material delivery, pond administration road sub-base compaction work and general use. |
| 17 June 2019 | 8:00-17:30 | Near monastery | RBC 26 line backfilling, Road 10a, 15a buffer zone levelling work, BD7, road 9 soil compaction and general use. |
| 18 June 2019 | 8:30-17:30 | Near monastery | Road 15a buffer zone levelling work, RBC 26 line backfilling, material delivery, pond administration sub-base compaction work and general use. |



Table 2.5-3 PM₁₀ Results (During Construction Period)

| Day | Construction Time for each day | PM ₁₀ |
|----------------------|--------------------------------|-------------------|
| | | mg/m ³ |
| Day 1 | (8:30- 17:30) | 0.019 |
| Day 2 | (8:30 -17:30) | 0.016 |
| Day 3 | (8:30 -17:30) | 0.024 |
| Day 4 | (8:00 -17:30) | 0.026 |
| Day 5 | (8:00 -17:30) | 0.020 |
| Day 6 | (8:00-17:30) | 0.063 |
| Day 7 | (8:00-17:30) | 0.061 |
| 7 days Average value | - | 0.03 |
| Target Value | - | 0.05 |

Note: Red color mentions the exceeded value than target value

Table 2.5-4 SO₂ Results (During Construction Period)

| Day | Construction Time for each day | SO ₂ |
|----------------------|--------------------------------|-------------------|
| | | mg/m ³ |
| Day 1 | (8:30- 17:30) | 0.013 |
| Day 2 | (8:30 -17:30) | 0.013 |
| Day 3 | (8:30 -17:30) | 0.013 |
| Day 4 | (8:00 -17:30) | 0.050 |
| Day 5 | (8:00 -17:30) | 0.019 |
| Day 6 | (8:00-17:30) | 0.013 |
| Day 7 | (8:00-17:30) | 0.023 |
| 7 days Average value | | 0.02 |
| Target Value | - | 0.02 |

Note: Red color mentions the exceeded value than target value

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



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

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

Overall summary of total exceeded hours for Day 1 to Day 7 during construction and non-construction time for PM_{10} and SO_2 are shown in Table 2.5-5 and Table 2.5-6. The summary of wind direction at AQ-1 is shown in Table 2.5-7.

Based on the summary table of total exceeded hours for PM_{10} , the total exceeded hours for seven days during construction and non-construction time were 27 hours but exceeded hours for construction time was 6 hours. After detailed analyzed the PM_{10} exceeded time according to the wind direction during construction period, 6 hours exceeded are come from other sides of Zone B.

Based on the summary table of total exceeded hours for SO_2 , the total exceeded hours for seven days during construction and non-construction were 17 hours but exceeded hours for construction time was 7 hours. After detailed analyzed the SO_2 exceeded time according to the wind direction during construction period, 7 hours exceeded are come from other sides of Zone B.

According to the summary of wind direction at AQ-1, 92.5 % come from outside of Zone B and 7.5 % come from inside of Zone B.

Possible emission sources for PM_{10} are affected from natural origin such as dust from unpaved land area from outside of Zone B, transportation in and around the monitoring area.

Possible emission sources for SO_2 are affected from the combustion of fuel for vehicles from nearby roads, operation activities of Myanmar International Terminals Thilawa Port, operation activities of local industrial zone.

Table 2.5-5 Summary of Total Exceeded Hours for Day 1 to Day 7 During construction and non-Construction Period for PM₁₀

| PM ₁₀ | | | | | | | | |
|------------------|--------------------------------|----------------------|------------------------------------|--|--|---|--|---|
| | Construction Time for each day | Total Exceeded hours | Construction Period exceeded hours | Non-construction period exceeded hours | Non-construction period (wind from Zone B) | Non-construction period (wind from other sides) | Construction period (wind from Zone B) | Construction period (wind from other sides) |
| Day-1 | 8:30- 17:30 | 7 | 0 | 7 | 1 | 6 | 0 | 0 |
| Day-2 | 8:30 -17:30 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| Day-3 | 8:30 -17:30 | 5 | 0 | 5 | 3 | 2 | 0 | 0 |
| Day-4 | 8:00 -17:30 | 2 | 2 | 0 | 0 | 0 | 0 | 2 |
| Day-5 | 8:00 -17:30 | 6 | 0 | 6 | 1 | 5 | 0 | 0 |
| Day-6 | 8:00-17:30 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| Day-7 | 8:00-17:30 | 5 | 3 | 2 | 0 | 2 | 0 | 3 |
| Total | | 27 | 6 | 21 | 5 | 16 | 0 | 6 |

Table 2.5-6 Summary of Total Exceeded Hours for Day 1 to Day 7 During construction and non-Construction Period for SO₂

| SO ₂ | | | | | | | | |
|-----------------|--------------------------------|----------------------|------------------------------------|--|--|---|--|---|
| | Construction Time for each day | Total Exceeded hours | Construction Period exceeded hours | Non-construction period exceeded hours | Non-construction period (wind from Zone B) | Non-construction period (wind from other sides) | Construction period (wind from Zone B) | Construction period (wind from other sides) |
| Day-1 | 8:30- 17:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Day-2 | 8:30 -17:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Day-3 | 8:30 -17:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Day-4 | 8:00 -17:30 | 3 | 3 | 0 | 0 | 0 | 0 | 3 |
| Day-5 | 8:00 -17:30 | 2 | 2 | 0 | 0 | 0 | 0 | 2 |
| Day-6 | 8:00-17:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Day-7 | 8:00-17:30 | 12 | 2 | 10 | 1 | 9 | 0 | 2 |
| Total | | 17 | 7 | 10 | 1 | 9 | 0 | 7 |

Table 2.5-7 Summary of Wind Direction at AQ-1

| Wind Direction | | | | Inside/Outside Zone B | |
|----------------|---------|----------|------------|-----------------------|----------------|
| | All Day | Day Time | Night Time | | |
| N | 0.6% | 0.2% | 1.0% | 6.3% | Inside Zone B |
| NNE | 0.4% | 0.0% | 0.8% | | |
| NE | 1.5% | 0.8% | 2.2% | | |
| ENE | 1.2% | 0.2% | 2.2% | | |
| E | 2.6% | 0.6% | 4.6% | | |
| ESE | 9.7% | 9.1% | 10.3% | 92.5% | Outside Zone B |
| SE | 9.4% | 9.9% | 8.9% | | |
| SSE | 13.7% | 14.5% | 12.9% | | |
| S | 9.6% | 12.7% | 6.5% | | |
| SSW | 7.8% | 8.5% | 7.1% | | |
| SW | 36.0% | 39.1% | 32.9% | | |
| WSW | 6.1% | 4.2% | 7.9% | | |
| W | 0.2% | 0.2% | 0.2% | | |
| WNW | 0.6% | 0.0% | 1.2% | 1.2% | Inside Zone B |
| NW | 0.4% | 0.0% | 0.8% | | |
| NNW | 0.2% | 0.0% | 0.4% | | |



CHAPTER 3: CONCLUSION AND RECOMMENDATION

The result of seven days average air quality of CO, NO₂, PM_{2.5}, PM₁₀ and SO₂ during seven days monitoring did not exceed the target value, thus there are no impacts on the surrounding environments. However, daily average concentration of PM₁₀ measured results for three days, daily average concentration of SO₂ measured results for two days exceeded the target value. During construction period, (Day 1 to Day 7) daily average results for PM₁₀ and SO₂ were also lower than the target values.

During the seven days monitoring period, 27 hours results were exceeded for PM₁₀. According to wind direction of Zone B during the construction period, total 6 exceeded hours are during construction period and 6 exceeded hours are come from outside of Zone B. Possible emission sources for PM₁₀ are affected from natural origin such as dust from unpaved land area from outside of Zone B, transportation in and around the monitoring area. According to US Environmental Protection Agency (EPA) and WHO' health effect of particulate matter, there is no evidence of safe level of exposure or a threshold below which no adverse health effects occur. Exposure to PM₁₀ reduces the life expectancy of the population of the Region by about 8.6 months on average. Short term (hours, days) exposure to PM₁₀ can aggravate lung disease, causing asthma attacks and acute bronchitis, and may also increase susceptibility to respiratory infections. In people with heart disease, short term exposures have been linked to heart attacks and arrhythmias. However, healthy children and adults have not been reported to suffer serious effects from short term exposures. Long term exposures (months, years) have been associated with problems such as reduced lung function and the development of chronic bronchitis and even premature death.

During the seven days monitoring period, 17 hours results were exceeded for SO₂. According to wind direction of Zone B during the construction period, total 7 exceeded hours are during construction period and 7 exceeded hours are come from outside of Zone B. Possible emission sources for SO₂ are affected from the combustion of fuel for vehicles from nearby roads, operation activities of Myanmar International Terminals Thilawa Port, operation activities of local industrial zone. In the public health statement SO₂ reported by ATSDR (Agency for Toxic Substances and Disease Registry) in US, 100 ppm (261.8 mg/m³) SO₂ is considered immediately dangerous to life and health (short term). Lung function changes observed when 0.4 to 3 ppm (1.05mg/m³ to 7.85 mg/m³) exposure for 20 years or more (long term).

According to the summary of wind direction at AQ-1, 92.5 % come from outside of Zone B and 7.5 % come from inside of Zone B.

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

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

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

APPENDIX-1 HOURLY AIR RESULTS



| Date | Time | CO | NO ₂ | PM _{2.5} | PM ₁₀ | SO ₂ | Wind Speed | Wind Direction | |
|--------------|---------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------|----------------|-----------|
| | | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | kph | Deg. | Direction |
| | | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly |
| 11 Jun, 2019 | 10:00 ~ 11:00 | 0.073 | 0.079 | 0.001 | 0.015 | 0.013 | 1.23 | 115.00 | ESE |
| 11 Jun, 2019 | 11:00 ~ 12:00 | 0.030 | 0.015 | 0.001 | 0.009 | 0.013 | 1.58 | 114.20 | ESE |
| 11 Jun, 2019 | 12:00 ~ 13:00 | 0.002 | 0.026 | 0.007 | 0.028 | 0.013 | 1.28 | 124.67 | SE |
| 11 Jun, 2019 | 13:00 ~ 14:00 | 0.047 | 0.013 | 0.001 | 0.013 | 0.013 | 1.23 | 126.83 | SE |
| 11 Jun, 2019 | 14:00 ~ 15:00 | 0.045 | 0.004 | 0.017 | 0.034 | 0.013 | 1.35 | 119.17 | ESE |
| 11 Jun, 2019 | 15:00 ~ 16:00 | 0.031 | 0.052 | 0.018 | 0.021 | 0.013 | 1.52 | 234.33 | SW |
| 11 Jun, 2019 | 16:00 ~ 17:00 | 0.073 | 0.069 | 0.010 | 0.011 | 0.013 | 0.95 | 199.67 | SSW |
| 11 Jun, 2019 | 17:00 ~ 18:00 | 0.084 | 0.052 | 0.025 | 0.345 | 0.013 | 1.07 | 178.83 | S |
| 11 Jun, 2019 | 18:00 ~ 19:00 | 0.067 | 0.054 | 0.009 | 0.451 | 0.013 | 0.90 | 172.17 | S |
| 11 Jun, 2019 | 19:00 ~ 20:00 | 0.052 | 0.079 | 0.010 | 0.039 | 0.013 | 0.88 | 140.17 | SE |
| 11 Jun, 2019 | 20:00 ~ 21:00 | 0.087 | 0.074 | 0.012 | 0.036 | 0.013 | 0.80 | 155.17 | SSE |
| 11 Jun, 2019 | 21:00 ~ 22:00 | 0.025 | 0.073 | 0.011 | 0.048 | 0.013 | 0.65 | 148.83 | SSE |
| 11 Jun, 2019 | 22:00 ~ 23:00 | 0.047 | 0.074 | 0.029 | 0.060 | 0.013 | 0.83 | 176.17 | S |
| 11 Jun, 2019 | 23:00 ~ 0:00 | 0.035 | 0.070 | 0.019 | 0.048 | 0.013 | 0.67 | 150.67 | SSE |
| 12 Jun, 2019 | 0:00 ~ 1:00 | 0.042 | 0.072 | 0.031 | 0.061 | 0.013 | 0.62 | 139.67 | SE |
| 12 Jun, 2019 | 1:00 ~ 2:00 | 0.047 | 0.090 | 0.053 | 0.101 | 0.013 | 0.37 | 157.00 | SSE |
| 12 Jun, 2019 | 2:00 ~ 3:00 | 0.046 | 0.082 | 0.022 | 0.051 | 0.013 | 0.38 | 142.17 | SE |
| 12 Jun, 2019 | 3:00 ~ 4:00 | 0.055 | 0.076 | 0.029 | 0.057 | 0.013 | 0.58 | 100.83 | E |
| 12 Jun, 2019 | 4:00 ~ 5:00 | 0.033 | 0.069 | 0.020 | 0.048 | 0.013 | 0.85 | 105.17 | ESE |
| 12 Jun, 2019 | 5:00 ~ 6:00 | 0.063 | 0.075 | 0.016 | 0.040 | 0.013 | 0.98 | 111.33 | ESE |
| 12 Jun, 2019 | 6:00 ~ 7:00 | 0.064 | 0.079 | 0.030 | 0.048 | 0.013 | 0.88 | 127.50 | SE |
| 12 Jun, 2019 | 7:00 ~ 8:00 | 0.047 | 0.081 | 0.012 | 0.028 | 0.013 | 0.65 | 186.33 | S |
| 12 Jun, 2019 | 8:00 ~ 9:00 | 0.036 | 0.053 | 0.004 | 0.025 | 0.013 | 1.13 | 165.17 | SSE |
| 12 Jun, 2019 | 9:00 ~ 10:00 | 0.027 | 0.055 | 0.003 | 0.010 | 0.013 | 1.00 | 232.17 | SW |

| | | | | | |
|-----|-------|-------|-------|-------|-------|
| Max | 0.087 | 0.090 | 0.053 | 0.451 | 0.013 |
| Avg | 0.048 | 0.061 | 0.016 | 0.068 | 0.013 |
| Min | 0.002 | 0.004 | 0.001 | 0.009 | 0.013 |





| Date | Time | CO | NO ₂ | PM _{2.5} | PM ₁₀ | SO ₂ | Wind Speed | Wind Direction | |
|--------------|---------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------|----------------|-----------|
| | | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | kph | Deg. | Direction |
| | | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly |
| 12 Jun, 2019 | 10:00 ~ 11:00 | 0.036 | 0.053 | 0.005 | 0.027 | 0.013 | 0.95 | 203.50 | SSW |
| 12 Jun, 2019 | 11:00 ~ 12:00 | 0.056 | 0.052 | 0.001 | 0.019 | 0.013 | 1.68 | 230.17 | SW |
| 12 Jun, 2019 | 12:00 ~ 13:00 | 0.053 | 0.052 | 0.001 | 0.019 | 0.013 | 1.85 | 225.67 | SW |
| 12 Jun, 2019 | 13:00 ~ 14:00 | 0.021 | 0.005 | 0.004 | 0.005 | 0.013 | 0.92 | 232.50 | SW |
| 12 Jun, 2019 | 14:00 ~ 15:00 | 0.019 | 0.026 | 0.008 | 0.016 | 0.013 | 1.45 | 229.33 | SW |
| 12 Jun, 2019 | 15:00 ~ 16:00 | 0.060 | 0.077 | 0.001 | 0.004 | 0.013 | 0.60 | 212.50 | SSW |
| 12 Jun, 2019 | 16:00 ~ 17:00 | 0.111 | 0.078 | 0.002 | 0.007 | 0.013 | 0.27 | 187.50 | S |
| 12 Jun, 2019 | 17:00 ~ 18:00 | 0.100 | 0.069 | 0.002 | 0.007 | 0.013 | 0.43 | 190.83 | S |
| 12 Jun, 2019 | 18:00 ~ 19:00 | 0.063 | 0.061 | 0.005 | 0.015 | 0.013 | 0.33 | 147.50 | SSE |
| 12 Jun, 2019 | 19:00 ~ 20:00 | 0.009 | 0.064 | 0.008 | 0.014 | 0.013 | 0.48 | 137.83 | SE |
| 12 Jun, 2019 | 20:00 ~ 21:00 | 0.011 | 0.061 | 0.008 | 0.022 | 0.013 | 0.28 | 174.00 | S |
| 12 Jun, 2019 | 21:00 ~ 22:00 | 0.016 | 0.062 | 0.013 | 0.025 | 0.013 | 1.15 | 226.50 | SW |
| 12 Jun, 2019 | 22:00 ~ 23:00 | 0.030 | 0.056 | 0.002 | 0.014 | 0.013 | 0.37 | 225.33 | SW |
| 12 Jun, 2019 | 23:00 ~ 0:00 | 0.022 | 0.051 | 0.010 | 0.023 | 0.013 | 0.25 | 199.67 | SSW |
| 13 Jun, 2019 | 0:00 ~ 1:00 | 0.031 | 0.051 | 0.012 | 0.028 | 0.013 | 0.32 | 176.17 | S |
| 13 Jun, 2019 | 1:00 ~ 2:00 | 0.026 | 0.047 | 0.010 | 0.023 | 0.013 | 0.47 | 136.83 | SE |
| 13 Jun, 2019 | 2:00 ~ 3:00 | 0.024 | 0.047 | 0.011 | 0.028 | 0.013 | 0.62 | 208.67 | SSW |
| 13 Jun, 2019 | 3:00 ~ 4:00 | 0.033 | 0.049 | 0.005 | 0.023 | 0.013 | 0.53 | 174.50 | S |
| 13 Jun, 2019 | 4:00 ~ 5:00 | 0.029 | 0.039 | 0.008 | 0.018 | 0.013 | 0.57 | 160.00 | SSE |
| 13 Jun, 2019 | 5:00 ~ 6:00 | 0.120 | 0.038 | 0.021 | 1.005 | 0.013 | 0.20 | 184.33 | S |
| 13 Jun, 2019 | 6:00 ~ 7:00 | 0.034 | 0.030 | 0.012 | 0.027 | 0.013 | 0.85 | 156.33 | SSE |
| 13 Jun, 2019 | 7:00 ~ 8:00 | 0.088 | 0.019 | 0.007 | 0.031 | 0.013 | 0.57 | 160.50 | SSE |
| 13 Jun, 2019 | 8:00 ~ 9:00 | 0.032 | 0.004 | 0.005 | 0.028 | 0.013 | 0.67 | 138.17 | SE |
| 13 Jun, 2019 | 9:00 ~ 10:00 | 0.004 | 0.004 | 0.011 | 0.024 | 0.013 | 0.80 | 130.17 | SE |

| | | | | | |
|-----|-------|-------|-------|-------|-------|
| Max | 0.120 | 0.078 | 0.021 | 1.005 | 0.013 |
| Avg | 0.043 | 0.046 | 0.007 | 0.060 | 0.013 |
| Min | 0.004 | 0.004 | 0.001 | 0.004 | 0.013 |

| Date | Time | CO | NO ₂ | PM _{2.5} | PM ₁₀ | SO ₂ | Wind Speed | Wind Direction | |
|--------------|---------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------|----------------|-----------|
| | | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | kph | Deg. | Direction |
| | | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly |
| 13 Jun, 2019 | 10:00 ~ 11:00 | 0.001 | 0.004 | 0.005 | 0.031 | 0.013 | 0.80 | 155.00 | SSE |
| 13 Jun, 2019 | 11:00 ~ 12:00 | 0.000 | 0.004 | 0.006 | 0.030 | 0.013 | 0.78 | 173.67 | S |
| 13 Jun, 2019 | 12:00 ~ 13:00 | 0.006 | 0.057 | 0.020 | 0.030 | 0.013 | 1.72 | 166.67 | SSE |
| 13 Jun, 2019 | 13:00 ~ 14:00 | 0.075 | 0.044 | 0.008 | 0.009 | 0.013 | 0.87 | 124.33 | SE |
| 13 Jun, 2019 | 14:00 ~ 15:00 | 0.069 | 0.004 | 0.001 | 0.003 | 0.013 | 0.78 | 154.17 | SSE |
| 13 Jun, 2019 | 15:00 ~ 16:00 | 0.076 | 0.004 | 0.002 | 0.019 | 0.013 | 0.73 | 179.33 | S |
| 13 Jun, 2019 | 16:00 ~ 17:00 | 0.098 | 0.004 | 0.011 | 0.033 | 0.013 | 0.67 | 166.00 | SSE |
| 13 Jun, 2019 | 17:00 ~ 18:00 | 0.062 | 0.004 | 0.013 | 0.031 | 0.013 | 0.75 | 148.50 | SSE |
| 13 Jun, 2019 | 18:00 ~ 19:00 | 0.001 | 0.004 | 0.004 | 0.014 | 0.013 | 0.72 | 122.00 | ESE |
| 13 Jun, 2019 | 19:00 ~ 20:00 | 0.003 | 0.004 | 0.001 | 0.004 | 0.013 | 0.83 | 145.83 | SE |
| 13 Jun, 2019 | 20:00 ~ 21:00 | 0.000 | 0.004 | 0.038 | 0.063 | 0.013 | 0.70 | 233.00 | SW |
| 13 Jun, 2019 | 21:00 ~ 22:00 | 0.012 | 0.004 | 0.007 | 0.033 | 0.013 | 1.50 | 226.50 | SW |
| 13 Jun, 2019 | 22:00 ~ 23:00 | 0.033 | 0.004 | 0.004 | 0.021 | 0.013 | 1.83 | 226.50 | SW |
| 13 Jun, 2019 | 23:00 ~ 0:00 | 0.038 | 0.004 | 0.003 | 0.024 | 0.013 | 1.70 | 226.50 | SW |
| 14 Jun, 2019 | 0:00 ~ 1:00 | 0.027 | 0.004 | 0.006 | 0.033 | 0.013 | 0.78 | 228.50 | SW |
| 14 Jun, 2019 | 1:00 ~ 2:00 | 0.027 | 0.004 | 0.005 | 0.037 | 0.013 | 0.57 | 229.17 | SW |
| 14 Jun, 2019 | 2:00 ~ 3:00 | 0.033 | 0.004 | 0.005 | 0.076 | 0.013 | 0.07 | 94.33 | E |
| 14 Jun, 2019 | 3:00 ~ 4:00 | 0.023 | 0.004 | 0.012 | 0.177 | 0.013 | 0.18 | 83.00 | E |
| 14 Jun, 2019 | 4:00 ~ 5:00 | 0.037 | 0.004 | 0.012 | 0.048 | 0.013 | 0.20 | 70.83 | ENE |
| 14 Jun, 2019 | 5:00 ~ 6:00 | 0.107 | 0.008 | 0.041 | 0.079 | 0.013 | 0.05 | 107.17 | ESE |
| 14 Jun, 2019 | 6:00 ~ 7:00 | 0.044 | 0.016 | 0.039 | 0.081 | 0.013 | 0.17 | 57.00 | ENE |
| 14 Jun, 2019 | 7:00 ~ 8:00 | 0.000 | 0.004 | 0.005 | 0.046 | 0.013 | 0.63 | 127.67 | SE |
| 14 Jun, 2019 | 8:00 ~ 9:00 | 0.017 | 0.004 | 0.002 | 0.038 | 0.013 | 1.12 | 126.83 | SE |
| 14 Jun, 2019 | 9:00 ~ 10:00 | 0.000 | 0.004 | 0.001 | 0.013 | 0.013 | 0.92 | 148.50 | SSE |

| | | | | | |
|-----|-------|-------|-------|-------|-------|
| Max | 0.107 | 0.057 | 0.041 | 0.177 | 0.013 |
| Avg | 0.033 | 0.008 | 0.010 | 0.041 | 0.013 |
| Min | 0.000 | 0.004 | 0.001 | 0.003 | 0.013 |





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| Date | Time | CO | NO ₂ | PM _{2.5} | PM ₁₀ | SO ₂ | Wind Speed | Wind Direction | |
|--------------|---------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------|----------------|-----------|
| | | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | kph | Deg. | Direction |
| | | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly |
| 14 Jun, 2019 | 10:00 ~ 11:00 | 0.000 | 0.256 | 0.006 | 0.027 | 0.065 | 1.10 | 169.50 | S |
| 14 Jun, 2019 | 11:00 ~ 12:00 | 0.000 | 1.069 | 0.010 | 0.021 | 0.201 | 1.35 | 162.50 | SSE |
| 14 Jun, 2019 | 12:00 ~ 13:00 | 0.000 | 0.373 | 0.010 | 0.013 | 0.140 | 1.87 | 175.33 | S |
| 14 Jun, 2019 | 13:00 ~ 14:00 | 0.011 | 0.004 | 0.016 | 0.019 | 0.013 | 1.27 | 221.17 | SW |
| 14 Jun, 2019 | 14:00 ~ 15:00 | 0.011 | 0.004 | 0.012 | 0.016 | 0.013 | 1.52 | 167.17 | SSE |
| 14 Jun, 2019 | 15:00 ~ 16:00 | 0.002 | 0.004 | 0.007 | 0.013 | 0.013 | 1.00 | 123.17 | ESE |
| 14 Jun, 2019 | 16:00 ~ 17:00 | 0.016 | 0.004 | 0.010 | 0.015 | 0.013 | 0.93 | 139.17 | SE |
| 14 Jun, 2019 | 17:00 ~ 18:00 | 0.007 | 0.004 | 0.013 | 0.026 | 0.013 | 1.00 | 134.50 | SE |
| 14 Jun, 2019 | 18:00 ~ 19:00 | 0.015 | 0.004 | 0.015 | 0.025 | 0.012 | 0.98 | 163.83 | SSE |
| 14 Jun, 2019 | 19:00 ~ 20:00 | 0.027 | 0.004 | 0.013 | 0.028 | 0.013 | 1.73 | 228.83 | SW |
| 14 Jun, 2019 | 20:00 ~ 21:00 | 0.035 | 0.033 | 0.002 | 0.005 | 0.013 | 0.30 | 232.33 | SW |
| 14 Jun, 2019 | 21:00 ~ 22:00 | 0.009 | 0.043 | 0.004 | 0.019 | 0.013 | 0.48 | 205.83 | SSW |
| 14 Jun, 2019 | 22:00 ~ 23:00 | 0.019 | 0.056 | 0.005 | 0.031 | 0.013 | 1.03 | 233.50 | SW |
| 14 Jun, 2019 | 23:00 ~ 0:00 | 0.037 | 0.070 | 0.010 | 0.046 | 0.013 | 0.67 | 226.83 | SW |
| 15 Jun, 2019 | 0:00 ~ 1:00 | 0.023 | 0.059 | 0.007 | 0.038 | 0.013 | 0.47 | 226.67 | SW |
| 15 Jun, 2019 | 1:00 ~ 2:00 | 0.015 | 0.051 | 0.010 | 0.039 | 0.013 | 0.22 | 211.67 | SSW |
| 15 Jun, 2019 | 2:00 ~ 3:00 | 0.028 | 0.055 | 0.002 | 0.045 | 0.013 | 0.23 | 167.00 | SSE |
| 15 Jun, 2019 | 3:00 ~ 4:00 | 0.033 | 0.064 | 0.003 | 0.038 | 0.013 | 0.32 | 185.50 | S |
| 15 Jun, 2019 | 4:00 ~ 5:00 | 0.026 | 0.061 | 0.007 | 0.041 | 0.013 | 0.37 | 217.00 | SW |
| 15 Jun, 2019 | 5:00 ~ 6:00 | 0.075 | 0.050 | 0.016 | 0.045 | 0.013 | 0.40 | 175.00 | S |
| 15 Jun, 2019 | 6:00 ~ 7:00 | 0.064 | 0.053 | 0.013 | 0.034 | 0.013 | 0.35 | 179.33 | S |
| 15 Jun, 2019 | 7:00 ~ 8:00 | 0.005 | 0.027 | 0.008 | 0.031 | 0.013 | 0.90 | 198.67 | SSW |
| 15 Jun, 2019 | 8:00 ~ 9:00 | 0.017 | 0.004 | 0.014 | 0.055 | 0.013 | 1.53 | 228.17 | SW |
| 15 Jun, 2019 | 9:00 ~ 10:00 | 0.000 | 0.004 | 0.030 | 0.053 | 0.013 | 2.53 | 228.33 | SW |

| | | | | | |
|-----|-------|-------|-------|-------|-------|
| Max | 0.075 | 1.069 | 0.030 | 0.055 | 0.201 |
| Avg | 0.020 | 0.098 | 0.010 | 0.030 | 0.028 |
| Min | 0.000 | 0.004 | 0.002 | 0.005 | 0.012 |

| Date | Time | CO | NO ₂ | PM _{2.5} | PM ₁₀ | SO ₂ | Wind Speed | Wind Direction | |
|--------------|---------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------|----------------|-----------|
| | | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | kph | Deg. | Direction |
| | | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly |
| 15 Jun, 2019 | 10:00 ~ 11:00 | 0.000 | 0.004 | 0.006 | 0.027 | 0.013 | 1.02 | 229.67 | SW |
| 15 Jun, 2019 | 11:00 ~ 12:00 | 0.000 | 0.004 | 0.005 | 0.025 | 0.013 | 1.35 | 217.50 | SW |
| 15 Jun, 2019 | 12:00 ~ 13:00 | 0.000 | 0.004 | 0.005 | 0.024 | 0.013 | 1.30 | 183.33 | S |
| 15 Jun, 2019 | 13:00 ~ 14:00 | 0.000 | 0.004 | 0.001 | 0.011 | 0.040 | 1.35 | 209.00 | SSW |
| 15 Jun, 2019 | 14:00 ~ 15:00 | 0.000 | 0.004 | 0.001 | 0.014 | 0.040 | 1.02 | 218.33 | SW |
| 15 Jun, 2019 | 15:00 ~ 16:00 | 0.000 | 0.007 | 0.003 | 0.010 | 0.013 | 1.30 | 218.00 | SW |
| 15 Jun, 2019 | 16:00 ~ 17:00 | 0.006 | 0.005 | 0.016 | 0.029 | 0.013 | 2.55 | 230.50 | SW |
| 15 Jun, 2019 | 17:00 ~ 18:00 | 0.063 | 0.035 | 0.007 | 0.021 | 0.013 | 0.87 | 231.50 | SW |
| 15 Jun, 2019 | 18:00 ~ 19:00 | 0.201 | 0.047 | 0.025 | 0.053 | 0.013 | 0.42 | 155.50 | SSE |
| 15 Jun, 2019 | 19:00 ~ 20:00 | 0.047 | 0.086 | 0.029 | 0.059 | 0.013 | 0.22 | 90.83 | E |
| 15 Jun, 2019 | 20:00 ~ 21:00 | 0.093 | 0.109 | 0.028 | 0.056 | 0.013 | 0.08 | 125.00 | SE |
| 15 Jun, 2019 | 21:00 ~ 22:00 | 0.107 | 0.111 | 0.009 | 0.010 | 0.013 | 0.25 | 106.00 | ESE |
| 15 Jun, 2019 | 22:00 ~ 23:00 | 0.052 | 0.107 | 0.011 | 0.035 | 0.013 | 0.07 | 130.00 | SE |
| 15 Jun, 2019 | 23:00 ~ 0:00 | 0.025 | 0.107 | 0.008 | 0.067 | 0.013 | 0.42 | 195.67 | SSW |
| 16 Jun, 2019 | 0:00 ~ 1:00 | 0.036 | 0.086 | 0.009 | 0.150 | 0.013 | 0.50 | 246.33 | WSW |
| 16 Jun, 2019 | 1:00 ~ 2:00 | 0.031 | 0.062 | 0.041 | 0.090 | 0.013 | 0.50 | 253.67 | WSW |
| 16 Jun, 2019 | 2:00 ~ 3:00 | 0.020 | 0.046 | 0.007 | 0.035 | 0.013 | 0.87 | 236.83 | WSW |
| 16 Jun, 2019 | 3:00 ~ 4:00 | 0.019 | 0.049 | 0.010 | 0.037 | 0.013 | 2.58 | 226.33 | SW |
| 16 Jun, 2019 | 4:00 ~ 5:00 | 0.034 | 0.080 | 0.003 | 0.020 | 0.013 | 2.28 | 229.50 | SW |
| 16 Jun, 2019 | 5:00 ~ 6:00 | 0.058 | 0.086 | 0.001 | 0.024 | 0.013 | 1.43 | 232.33 | SW |
| 16 Jun, 2019 | 6:00 ~ 7:00 | 0.066 | 0.081 | 0.001 | 0.004 | 0.013 | 0.63 | 213.50 | SSW |
| 16 Jun, 2019 | 7:00 ~ 8:00 | 0.021 | 0.049 | 0.001 | 0.007 | 0.013 | 0.70 | 203.83 | SSW |
| 16 Jun, 2019 | 8:00 ~ 9:00 | 0.002 | 0.022 | 0.001 | 0.019 | 0.013 | 1.42 | 228.50 | SW |
| 16 Jun, 2019 | 9:00 ~ 10:00 | 0.005 | 0.005 | 0.001 | 0.017 | 0.013 | 1.00 | 213.17 | SSW |

| | | | | | |
|-----|-------|-------|-------|-------|-------|
| Max | 0.201 | 0.111 | 0.041 | 0.150 | 0.044 |
| Avg | 0.037 | 0.050 | 0.010 | 0.035 | 0.016 |
| Min | 0.000 | 0.004 | 0.001 | 0.004 | 0.013 |





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| Date | Time | CO | NO ₂ | PM _{2.5} | PM ₁₀ | SO ₂ | Wind Speed | Wind Direction | |
|--------------|---------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------|----------------|-----------|
| | | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | kph | Deg. | Direction |
| | | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly |
| 16 Jun, 2019 | 10:00 ~ 11:00 | 0.004 | 0.004 | 0.001 | 0.483 | 0.013 | 1.03 | 164.67 | SSE |
| 16 Jun, 2019 | 11:00 ~ 12:00 | 0.000 | 0.004 | 0.001 | 0.048 | 0.013 | 1.18 | 170.50 | S |
| 16 Jun, 2019 | 12:00 ~ 13:00 | 0.000 | 0.004 | 0.001 | 0.005 | 0.013 | 1.33 | 187.83 | S |
| 16 Jun, 2019 | 13:00 ~ 14:00 | 0.000 | 0.004 | 0.004 | 0.015 | 0.013 | 1.75 | 216.67 | SW |
| 16 Jun, 2019 | 14:00 ~ 15:00 | 0.000 | 0.043 | 0.002 | 0.003 | 0.013 | 1.97 | 229.67 | SW |
| 16 Jun, 2019 | 15:00 ~ 16:00 | 0.000 | 0.004 | 0.001 | 0.002 | 0.013 | 1.22 | 201.33 | SSW |
| 16 Jun, 2019 | 16:00 ~ 17:00 | 0.000 | 0.004 | 0.002 | 0.009 | 0.013 | 1.67 | 211.00 | SSW |
| 16 Jun, 2019 | 17:00 ~ 18:00 | 0.033 | 0.004 | 0.003 | 0.007 | 0.013 | 2.25 | 236.00 | SW |
| 16 Jun, 2019 | 18:00 ~ 19:00 | 0.052 | 0.005 | 0.004 | 0.008 | 0.013 | 1.83 | 232.67 | SW |
| 16 Jun, 2019 | 19:00 ~ 20:00 | 0.032 | 0.063 | 0.002 | 0.005 | 0.013 | 1.48 | 235.17 | SW |
| 16 Jun, 2019 | 20:00 ~ 21:00 | 0.076 | 0.016 | 0.001 | 0.014 | 0.013 | 0.83 | 243.67 | WSW |
| 16 Jun, 2019 | 21:00 ~ 22:00 | 0.064 | 0.012 | 0.006 | 0.012 | 0.013 | 0.68 | 240.17 | WSW |
| 16 Jun, 2019 | 22:00 ~ 23:00 | 0.059 | 0.004 | 0.004 | 0.011 | 0.013 | 1.23 | 230.00 | SW |
| 16 Jun, 2019 | 23:00 ~ 0:00 | 0.039 | 0.004 | 0.005 | 0.013 | 0.013 | 0.92 | 227.33 | SW |
| 17 Jun, 2019 | 0:00 ~ 1:00 | 0.031 | 0.004 | 0.008 | 0.020 | 0.013 | 0.17 | 195.00 | SSW |
| 17 Jun, 2019 | 1:00 ~ 2:00 | 0.026 | 0.004 | 0.006 | 0.018 | 0.013 | 0.15 | 209.00 | SSW |
| 17 Jun, 2019 | 2:00 ~ 3:00 | 0.015 | 0.004 | 0.010 | 0.018 | 0.013 | 0.83 | 218.50 | SW |
| 17 Jun, 2019 | 3:00 ~ 4:00 | 0.031 | 0.012 | 0.006 | 0.015 | 0.013 | 2.17 | 228.67 | SW |
| 17 Jun, 2019 | 4:00 ~ 5:00 | 0.024 | 0.022 | 0.002 | 0.010 | 0.013 | 1.57 | 230.50 | SW |
| 17 Jun, 2019 | 5:00 ~ 6:00 | 0.056 | 0.024 | 0.003 | 0.012 | 0.013 | 1.13 | 229.50 | SW |
| 17 Jun, 2019 | 6:00 ~ 7:00 | 0.045 | 0.024 | 0.003 | 0.020 | 0.013 | 1.08 | 228.17 | SW |
| 17 Jun, 2019 | 7:00 ~ 8:00 | 0.066 | 0.007 | 0.006 | 0.036 | 0.013 | 0.48 | 216.17 | SW |
| 17 Jun, 2019 | 8:00 ~ 9:00 | 0.005 | 0.004 | 0.005 | 0.037 | 0.013 | 1.25 | 228.17 | SW |
| 17 Jun, 2019 | 9:00 ~ 10:00 | 0.000 | 0.004 | 0.005 | 0.025 | 0.013 | 2.53 | 227.17 | SW |

| | | | | | |
|-----|-------|-------|-------|-------|-------|
| Max | 0.076 | 0.063 | 0.010 | 0.483 | 0.013 |
| Avg | 0.027 | 0.012 | 0.004 | 0.035 | 0.013 |
| Min | 0.000 | 0.004 | 0.001 | 0.002 | 0.013 |

| Date | Time | CO | NO ₂ | PM _{2.5} | PM ₁₀ | SO ₂ | Wind Speed | Wind Direction | |
|--------------|---------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------|----------------|-----------|
| | | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | kph | Deg. | Direction |
| | | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly |
| 17 Jun, 2019 | 10:00 ~ 11:00 | 0.001 | 0.004 | 0.001 | 0.006 | 0.013 | 2.38 | 224.50 | SW |
| 17 Jun, 2019 | 11:00 ~ 12:00 | 0.000 | 0.004 | 0.002 | 0.003 | 0.013 | 2.08 | 221.33 | SW |
| 17 Jun, 2019 | 12:00 ~ 13:00 | 0.003 | 0.004 | 0.024 | 0.141 | 0.013 | 2.53 | 227.00 | SW |
| 17 Jun, 2019 | 13:00 ~ 14:00 | 0.005 | 0.004 | 0.025 | 0.151 | 0.013 | 3.08 | 233.33 | SW |
| 17 Jun, 2019 | 14:00 ~ 15:00 | 0.002 | 0.004 | 0.004 | 0.014 | 0.013 | 3.38 | 232.33 | SW |
| 17 Jun, 2019 | 15:00 ~ 16:00 | 0.008 | 0.004 | 0.004 | 0.006 | 0.013 | 2.60 | 230.17 | SW |
| 17 Jun, 2019 | 16:00 ~ 17:00 | 0.011 | 0.006 | 0.002 | 0.006 | 0.013 | 2.57 | 225.50 | SW |
| 17 Jun, 2019 | 17:00 ~ 18:00 | 0.042 | 0.013 | 0.001 | 0.007 | 0.013 | 1.82 | 224.83 | SW |
| 17 Jun, 2019 | 18:00 ~ 19:00 | 0.000 | 0.008 | 0.002 | 0.006 | 0.013 | 1.02 | 223.00 | SW |
| 17 Jun, 2019 | 19:00 ~ 20:00 | 0.010 | 0.015 | 0.002 | 0.004 | 0.012 | 0.43 | 146.83 | SSE |
| 17 Jun, 2019 | 20:00 ~ 21:00 | 0.022 | 0.020 | 0.006 | 0.014 | 0.013 | 0.40 | 125.00 | SE |
| 17 Jun, 2019 | 21:00 ~ 22:00 | 0.045 | 0.034 | 0.006 | 0.095 | 0.016 | 0.47 | 204.67 | SSW |
| 17 Jun, 2019 | 22:00 ~ 23:00 | 0.091 | 0.168 | 0.032 | 0.374 | 0.035 | 0.20 | 243.50 | WSW |
| 17 Jun, 2019 | 23:00 ~ 0:00 | 0.074 | 0.004 | 0.007 | 0.036 | 0.023 | 0.02 | 211.50 | SSW |
| 18 Jun, 2019 | 0:00 ~ 1:00 | 0.035 | 0.004 | 0.003 | 0.019 | 0.042 | 0.03 | 121.83 | ESE |
| 18 Jun, 2019 | 1:00 ~ 2:00 | 0.047 | 0.004 | 0.005 | 0.023 | 0.023 | 0.10 | 48.67 | NE |
| 18 Jun, 2019 | 2:00 ~ 3:00 | 0.047 | 0.004 | 0.006 | 0.020 | 0.045 | 0.02 | 128.50 | SE |
| 18 Jun, 2019 | 3:00 ~ 4:00 | 0.031 | 0.004 | 0.008 | 0.025 | 0.053 | 0.18 | 167.50 | SSE |
| 18 Jun, 2019 | 4:00 ~ 5:00 | 0.042 | 0.004 | 0.013 | 0.037 | 0.057 | 0.38 | 227.83 | SW |
| 18 Jun, 2019 | 5:00 ~ 6:00 | 0.059 | 0.004 | 0.008 | 0.036 | 0.057 | 0.30 | 217.17 | SW |
| 18 Jun, 2019 | 6:00 ~ 7:00 | 0.062 | 0.004 | 0.017 | 0.043 | 0.067 | 0.23 | 200.00 | SSW |
| 18 Jun, 2019 | 7:00 ~ 8:00 | 0.000 | 0.004 | 0.009 | 0.028 | 0.083 | 0.63 | 155.67 | SSE |
| 18 Jun, 2019 | 8:00 ~ 9:00 | 0.005 | 0.004 | 0.016 | 0.026 | 0.075 | 0.78 | 184.83 | S |
| 18 Jun, 2019 | 9:00 ~ 10:00 | 0.000 | 0.004 | 0.032 | 0.247 | 0.051 | 2.53 | 216.17 | SW |

| | | | | | |
|-----|-------|-------|-------|-------|-------|
| Max | 0.091 | 0.168 | 0.032 | 0.374 | 0.083 |
| Avg | 0.027 | 0.014 | 0.010 | 0.057 | 0.032 |
| Min | 0.000 | 0.004 | 0.001 | 0.003 | 0.012 |



**Thilawa Special Economic Zone (Zone B)
Development Project –Phase 2 & 3**

Appendix

Noise and Vibration Monitoring Report

June 2019

**NOISE AND VIBRATION
MONITORING REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
THILAWA SEZ ZONE B
(PHASE 2 & 3 CONSTRUCTION STAGE)**

(QUARTERLY MONITORING)

June 2019

Myanmar Koei International Ltd.



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CHAPTER 1: OUTLINES AND SUMMARY OF MONITORING PLAN

1.1 General

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

1.2 Outlines of Monitoring Plan

To assess the environmental condition under the construction of industrial area in and around Thilawa SEZ Zone B, noise and vibration levels had been monitored from 10 June 2019 – 12 June 2019 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 11–12 Jun 2019 | Noise Level | L_{Aeq} (dB) | 1 (NV-1) | 24 hours | On-site measurement by “Rion NL-42 sound level meter” |
| From 10–11 Jun 2019 | Noise Level | L_{Aeq} (dB) | 1 (NV-2) | 24 hours | On-site measurement by “Rion NL-42 sound level meter” |
| From 11–12 Jun 2019 | Vibration Level | L_{v10} (dB) | 1 (NV-1) | 24 hours | On-site measurement by “Vibration Level Meter- VM-53A” |
| From 10–11 Jun 2019 | Vibration Level | L_{v10} (dB) | 1 (NV-2) | 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 in the northeast corner of the Thilawa SEZ Zone B, monitoring point (NV-1); N: 16°40'18.22", E: 96°17'18.18" for traffic noise concerned and in the south of the Thilawa SEZ Zone B, monitoring point (NV-2); N: 16°39'24.90", E: 96°17'16.70", inside the monastery compound of Phalan village. The location of the noise and vibration monitoring points are shown in Figure 2.2-1.



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

NV-1

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

NV-2

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

2.3 Monitoring Method

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

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

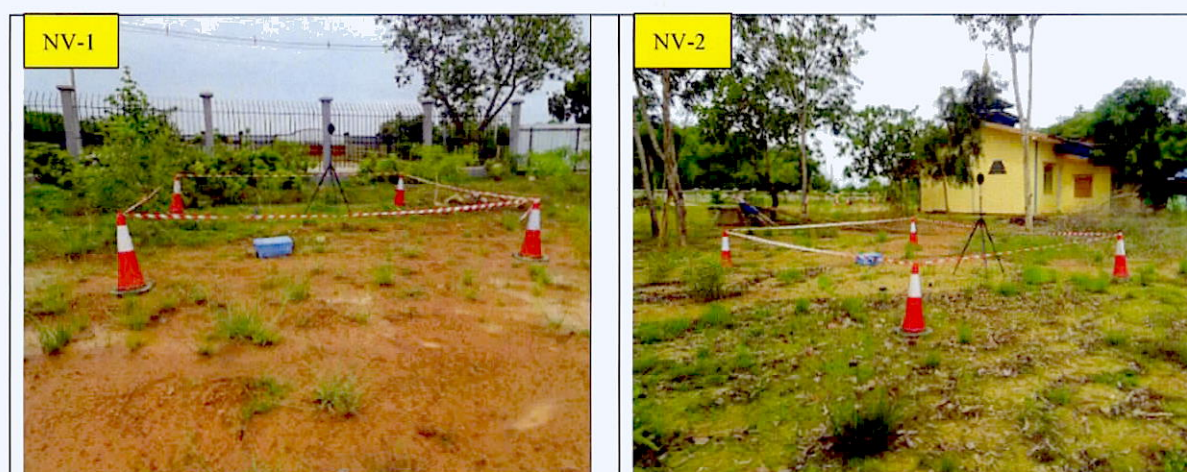


Figure 2.3-1 Status of Noise and Vibration Level Monitoring at NV-1 and NV-2

2.4 Monitoring Results

Noise Monitoring Results

Noise monitoring results are separated as daytime (6:00 AM to 10:00 PM) and evening time (10:00 PM to 6:00 AM) time frames for NV-1 and daytime (7:00 AM to 7:00 PM), evening time (7:00 PM to 10:00 PM) and night time (10:00 PM to 7:00 AM) time frames respectively for NV-2. Noise measurement was carried out for one location on a 24-hour basis. The monitoring results are summarized in Table 2.4-1 and Table 2.4-2. Hourly noise level (L_{Aeq}) monitoring results at NV-1 and NV-2 are shown in Table 2.4-3 and Table 2.4-4.

Figure 2.4-1 and Figure 2.4-2 showed the results of noise level (L_{Aeq}) at NV-1 and NV-2. Comparing with the target value of noise level in construction stage prescribed in EIA report for Thilawa SEZ development project Zone B, all results were under the target values. However, hourly noise level monitoring results at NV-2 during night time was slightly higher than the target value for three hours. And there were no construction activities at that time. According to the field surveyor record, this is due to the heavy rain at that time. Therefore, it is considered that there is no impact from construction activities of Zone B to the surrounding environment.

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

| Date | (Traffic Noise Level) Equivalent Noise Level (L_{Aeq} , dB) | |
|------------------|---|------------------------------------|
| | Day Time (6:00 AM – 10:00 PM) | Night Time (10:00 PM – 6:00 AM) |
| 11 – 12 Jun 2019 | 61 | 58 |
| 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 2.4-2 Results of Noise Levels (L_{Aeq}) Monitoring at NV-2

| Date | (Residential area & monastery located less than 150m from the construction site) Equivalent Noise Level (L_{Aeq} , dB) | | |
|------------------|--|--------------------------------------|------------------------------------|
| | Day Time (7:00 AM – 7:00 PM) | Evening Time (7:00 PM – 10:00 PM) | Night Time (10:00 PM – 7:00 AM) |
| 10 – 11 Jun 2019 | 51 | 50 | 54 |
| Target Value | 75 | 60 | 55 |

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



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

| Date | Time | (L _{Aeq} , dB) | (L _{Aeq} , dB) Each Category | (L _{Aeq} , dB) Target Value | Remark | |
|------------------|-------------|-------------------------|---------------------------------------|--------------------------------------|---|--|
| 11 - 12 Jun 2019 | 6:00-7:00 | 56 | 61 | 75 | No construction Activities | |
| | 7:00-8:00 | 62 | | | Construction activities of Zone B (Slope trimming work, line backfilling, soil levelling and delivery, electrical use and general use, etc.,) | |
| | 8:00-9:00 | 62 | | | | |
| | 9:00-10:00 | 61 | | | | |
| | 10:00-11:00 | 60 | | | | |
| | 11:00-12:00 | 61 | | | | |
| | 12:00-13:00 | 59 | | | | |
| | 13:00-14:00 | 61 | | | | |
| | 14:00-15:00 | 64 | | | | |
| | 15:00-16:00 | 61 | | | | |
| | 16:00-17:00 | 62 | | | | |
| | 17:00-18:00 | 63 | | | | |
| | 18:00-19:00 | 60 | | | | |
| | 19:00-20:00 | 57 | | | No construction Activities | |
| | 20:00-21:00 | 58 | | | | |
| | 21:00-22:00 | 64 | | | | |
| | 22:00-23:00 | 64 | 58 | 70 | | |
| | 23:00-24:00 | 62 | | | | |
| | 24:00-1:00 | 57 | | | | |
| | 1:00-2:00 | 53 | | | | |
| | 2:00-3:00 | 47 | | | | |
| | 3:00-4:00 | 48 | | | | |
| | 4:00-5:00 | 45 | | | | |
| | 5:00-6:00 | 54 | | | | |

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

| Date | Time | (L _{Aeq} , dB) | (L _{Aeq} , dB) Each Category | (L _{Aeq} , dB) Target Value | Remark |
|------------------|-------------|-------------------------|---|---|--|
| 10 - 11 Jun 2019 | 7:00-8:00 | 50 | 51 | 75 | No construction Activities |
| | 8:00-9:00 | 50 | | | Construction activities of Zone B (Slope trimming work, backfilling, soil levelling and delivery, electrical use and general use, etc.,) |
| | 9:00-10:00 | 50 | | | |
| | 10:00-11:00 | 48 | | | |
| | 11:00-12:00 | 49 | | | |
| | 12:00-13:00 | 50 | | | |
| | 13:00-14:00 | 48 | | | |
| | 14:00-15:00 | 53 | | | |
| | 15:00-16:00 | 49 | | | |
| | 16:00-17:00 | 53 | | | |
| | 17:00-18:00 | 56 | | | |
| | 18:00-19:00 | 51 | | | |
| | 19:00-20:00 | 47 | 50 | 60 | No construction Activities |
| | 20:00-21:00 | 53 | | | |
| | 21:00-22:00 | 48 | | | |
| | 22:00-23:00 | 55 | | | |
| | 23:00-24:00 | 57 | 54 | 55 | |
| | 24:00-1:00 | 57 | | | |
| | 1:00-2:00 | 49 | | | |
| | 2:00-3:00 | 56 | | | |
| 3:00-4:00 | 53 | | | | |
| 4:00-5:00 | 50 | | | | |
| 5:00-6:00 | 54 | | | | |
| 6:00-7:00 | 53 | | | | |

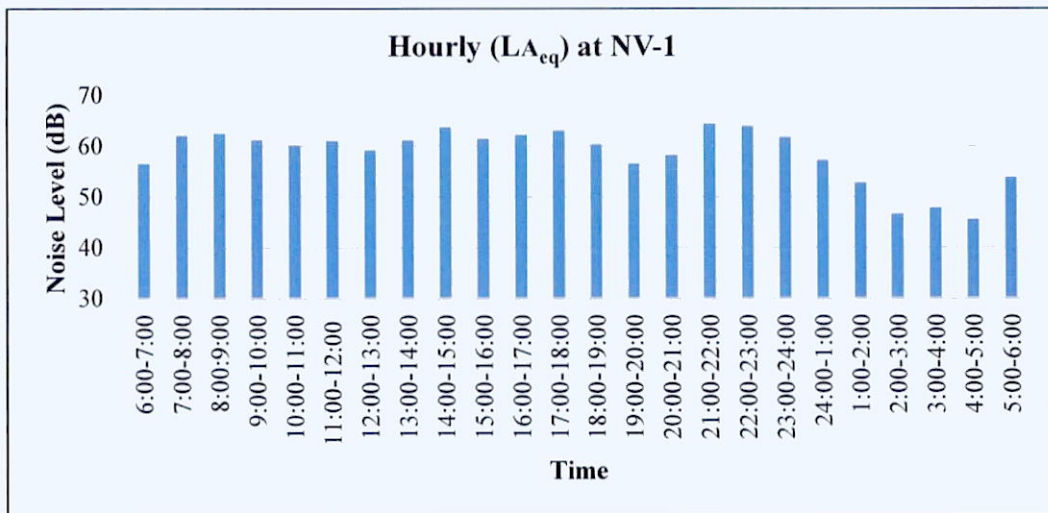


Figure 2.4-1 Results of Noise Levels (L_{Aeq}) Monitoring at NV-1

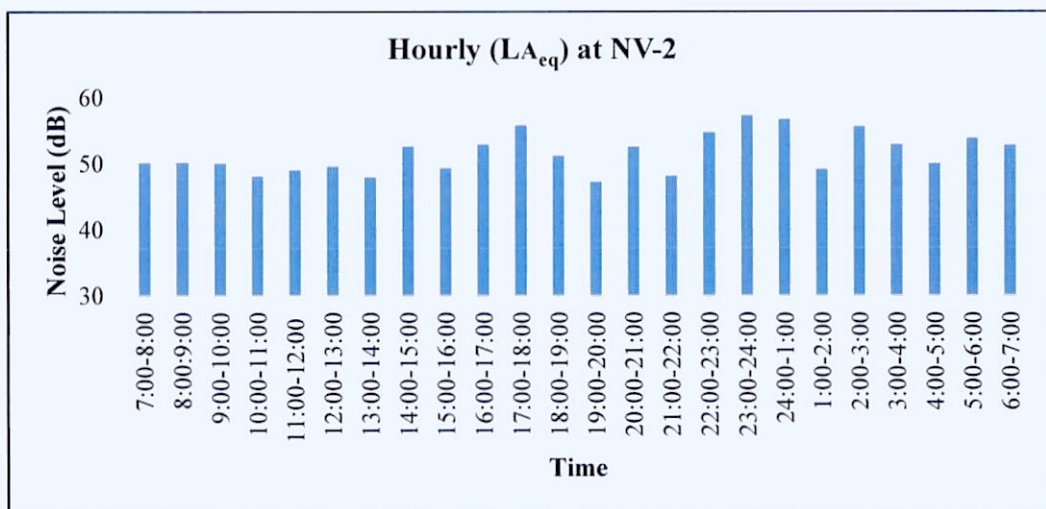


Figure 2.4-2 Results of Noise Levels (L_{Aeq}) Monitoring at NV-2



Vibration Monitoring Results

Vibration monitoring results are separated as 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 both NV-1 and NV-2. Vibration measurement was carried out for one location on a 24-hour basis. The results of vibration level (L_{v10}) monitoring at NV-1 and NV-2 are shown in Table 2.4-5 and Table 2.4-6. Hourly vibration level (L_{v10}) monitoring results at NV-1 and NV-2 are shown in Table 2.4-7 and Table 2.4-8. Figure 2.4-3 and Figure 2.4-4 showed the graph of vibration level monitoring results at NV-1 and NV-2. By comparing with the target vibration level in construction stage in EIA report for Thilawa SEZ development project Zone B, all of results were under the target values.

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

| Date | (Residential and commercial and industrial areas) Equivalent Vibration Level (L_{v10} , dB) | | |
|------------------|---|--------------------------------------|------------------------------------|
| | Day Time (7:00 AM – 7:00 PM) | Evening Time (7:00 PM – 10:00 PM) | Night Time (10:00 PM – 7:00 AM) |
| 11 – 12 Jun 2019 | 39 | 35 | 31 |
| Target Value | 70 | 70 | 65 |

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

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

| Date | (Monastery and residential area) Equivalent Vibration Level (L_{v10} , dB) | | |
|------------------|--|--------------------------------------|------------------------------------|
| | Day Time (7:00 AM – 7:00 PM) | Evening Time (7:00 PM – 10:00 PM) | Night Time (10:00 PM – 7:00 AM) |
| 10 – 11 Jun 2019 | 29 | 25 | 19 |
| Target Value | 65 | 65 | 60 |

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

Table 2.4-7 Results of Hourly Vibration Levels (L_{v10}) Monitoring at NV-1

| Date | Time | (L _{v10} , dB) | (L _{v10} , dB) Each Category | (L _{v10} , dB) Target Value | Remark |
|------------------|-------------|-------------------------|---|---|---|
| 11 - 12 Jun 2019 | 7:00-8:00 | 39 | 39 | 70 | No construction Activities |
| | 8:00-9:00 | 38 | | | Construction activities of Zone B (Slope trimming work, line backfilling, soil levelling and delivery, electrical use and general use, etc.,) |
| | 9:00-10:00 | 38 | | | |
| | 10:00-11:00 | 40 | | | |
| | 11:00-12:00 | 39 | | | |
| | 12:00-13:00 | 38 | | | |
| | 13:00-14:00 | 38 | | | |
| | 14:00-15:00 | 38 | | | |
| | 15:00-16:00 | 39 | | | |
| | 16:00-17:00 | 39 | | | |
| | 17:00-18:00 | 40 | | | |
| | 18:00-19:00 | 39 | | | |
| | 19:00-20:00 | 37 | 35 | 70 | No construction Activities |
| | 20:00-21:00 | 33 | | | |
| | 21:00-22:00 | 34 | | | |
| | 22:00-23:00 | 35 | | | |
| | 23:00-24:00 | 34 | 31 | 65 | |
| | 24:00-1:00 | 29 | | | |
| | 1:00-2:00 | 30 | | | |
| | 2:00-3:00 | 20 | | | |
| | 3:00-4:00 | 21 | | | |
| | 4:00-5:00 | 20 | | | |
| | 5:00-6:00 | 29 | | | |
| | 6:00-7:00 | 34 | | | |

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

| Date | Time | (L _{v10} , dB) | (L _{v10} , dB) Each Category | (L _{v10} , dB) Target Value | Remark | |
|------------------|-------------|-------------------------|---|---|---|--|
| 10 - 11 Jun 2019 | 7:00-8:00 | 20 | 29 | 65 | No construction Activities | |
| | 8:00-9:00 | 22 | | | Construction activities of Zone B (Slope trimming work, backfilling, soil levelling and delivery, electrical use and general use, etc.,) | |
| | 9:00-10:00 | 30 | | | | |
| | 10:00-11:00 | 28 | | | | |
| | 11:00-12:00 | 26 | | | | |
| | 12:00-13:00 | 20 | | | | |
| | 13:00-14:00 | 29 | | | | |
| | 14:00-15:00 | 30 | | | | |
| | 15:00-16:00 | 32 | | | | |
| | 16:00-17:00 | 33 | | | | |
| | 17:00-18:00 | 31 | | | | |
| | 18:00-19:00 | 28 | | | | |
| | 19:00-20:00 | 25 | 25 | 65 | No construction Activities | |
| | 20:00-21:00 | 24 | | | | |
| | 21:00-22:00 | 26 | | | | |
| | 22:00-23:00 | 21 | | | | |
| | 23:00-24:00 | 20 | 19 | 60 | | |
| | 24:00-1:00 | 21 | | | | |
| | 1:00-2:00 | 18 | | | | |
| | 2:00-3:00 | 20 | | | | |
| | 3:00-4:00 | 13 | | | | |
| | 4:00-5:00 | 12 | | | | |
| | 5:00-6:00 | 18 | | | | |
| | 6:00-7:00 | 16 | | | | |

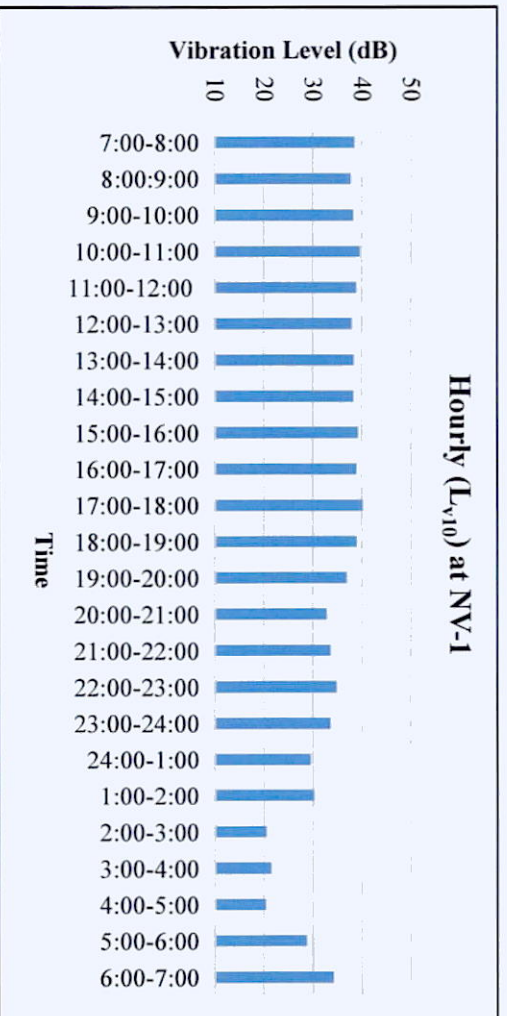


Figure 2.4-3 Results of Vibration Levels (L_{v10}) Monitoring at NV-1

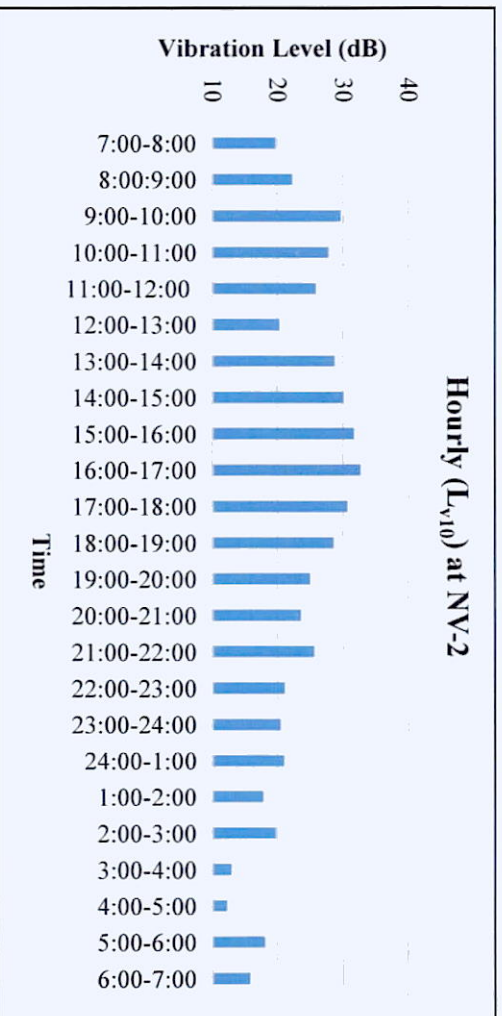


Figure 2.4-4 Results of Vibration Levels (L_{v10}) Monitoring at NV-2

CHAPTER 3: CONCLUSION AND RECOMMENDATION

By comparing with the target noise and vibration level in construction stage in EIA report for Thilawa SEZ development project Zone B, all results were under the target values at NV-1 and NV-2. As for the detailed analysis of noise level at NV-1 and NV-2 for 24 hours, all results were under the target value except for NV-2 during night time. Hourly noise level monitoring results at NV-2 during night time was slightly higher than the target value for three hours. And there were no construction activities at that time. According to the field surveyor record, this is due to the heavy rain at that time. Therefore, it is considered that there is no impact from construction activities of Zone B to the surrounding environment. The results of vibration level for NV-1 and NV-2 were also lower than the target levels. Thus, there is no negative impact on noise and vibration from construction activities of Zone B to the surrounding environment.

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



**Thilawa Special Economic Zone (Zone B)
Development Project –Phase 2 & 3**

Appendix

Traffic Volume Monitoring Report

June 2019

TRAFFIC VOLUME MONITORING REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
THILAWA SEZ ZONE B
(PHASE 2 & 3 CONSTRUCTION STAGE)

(QUARTERLY MONITORING)

June 2019

Myanmar Koei International Ltd.



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CHAPTER 1: OUTLINES AND SUMMARY OF MONITORING PLAN

1.1 General

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

1.2 Outlines of Monitoring Plan

To assess the environmental condition under the construction of industrial area in and around Thilawa SEZ Zone B, Traffic volume had been monitored from 11 June 2019 to 12 June 2019 as follows;

Table 1.2-1 Outlines of Traffic Volume Monitoring

| Monitoring Date | Monitoring Item | Parameters | Number of Points | Duration | Monitoring Methodology |
|------------------------------|-----------------|------------|------------------|----------|------------------------|
| 11 Jun 2019 - 12 Jun 2019 | Traffic Volume | - | 1 (TV-1) | 24 hours | Manual Count |

CHAPTER 2: TRAFFIC VOLUME MONITORING









2.1 Monitoring Item

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

Table 2.1-1 Monitoring Parameters for Traffic Volume

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

Table 2.1-2 Classification of Vehicles Types

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

2.2 Monitoring Location

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



Figure 2.2-1 Location of Traffic Volume Monitoring Point

TV-1

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

2.3 Monitoring Method

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



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

2.4 Monitoring Results

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

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

| Survey Point | Direction | Date | Weekday | 2-wheel Vehicles | 4-wheel Light Vehicles | 4-wheel Heavy Vehicles | Others | Total |
|--------------|--------------------------------------|---------------------------|---------------------|------------------|------------------------|------------------------|--------|-------|
| TV-1 | Phalan village to Dagon-Thilawa road | 11 Jun 2019 - 12 Jun 2019 | Tuesday & Wednesday | 2,743 | 1,158 | 278 | 58 | 4,237 |
| | Dagon-Thilawa road to Phalan village | | | 2,940 | 1,200 | 244 | 54 | 4,438 |

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

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

| From | To | Classification | | | | Total |
|-------|-------|---------------------|----------------------------|----------------------------|--------|-------|
| | | Type of vehicles | | | | |
| | | Two-wheeled vehicle | Four-wheeled light vehicle | Four-wheeled heavy vehicle | Others | |
| 11:00 | 12:00 | 138 | 93 | 30 | 3 | 264 |
| 12:00 | 13:00 | 119 | 94 | 25 | 3 | 241 |
| 13:00 | 14:00 | 106 | 81 | 13 | 1 | 201 |
| 14:00 | 15:00 | 91 | 67 | 17 | 5 | 180 |
| 15:00 | 16:00 | 113 | 82 | 19 | 6 | 220 |
| 16:00 | 17:00 | 147 | 81 | 25 | 3 | 256 |
| 17:00 | 18:00 | 343 | 124 | 34 | 5 | 506 |
| 18:00 | 19:00 | 226 | 84 | 17 | 6 | 333 |
| 19:00 | 20:00 | 115 | 46 | 8 | 2 | 171 |
| 20:00 | 21:00 | 64 | 25 | 2 | 1 | 92 |
| 21:00 | 22:00 | 40 | 33 | 10 | 0 | 83 |
| 22:00 | 23:00 | 16 | 6 | 5 | 0 | 27 |
| 23:00 | 0:00 | 7 | 8 | 9 | 0 | 24 |
| 0:00 | 1:00 | 2 | 3 | 3 | 0 | 8 |
| 1:00 | 2:00 | 9 | 2 | 2 | 0 | 13 |
| 2:00 | 3:00 | 5 | 4 | 3 | 0 | 12 |
| 3:00 | 4:00 | 0 | 3 | 0 | 0 | 3 |
| 4:00 | 5:00 | 13 | 1 | 1 | 0 | 15 |
| 5:00 | 6:00 | 38 | 9 | 1 | 0 | 48 |
| 6:00 | 7:00 | 306 | 59 | 3 | 2 | 370 |
| 7:00 | 8:00 | 372 | 53 | 11 | 6 | 442 |
| 8:00 | 9:00 | 212 | 61 | 11 | 7 | 291 |
| 9:00 | 10:00 | 162 | 78 | 15 | 3 | 258 |
| 10:00 | 11:00 | 99 | 61 | 14 | 5 | 179 |
| Total | | 2743 | 1158 | 278 | 58 | 4237 |

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

| From | To | Classification | | | | Total |
|-------|-------|---------------------|----------------------------|----------------------------|--------|-------|
| | | Type of vehicles | | | | |
| | | Two-wheeled vehicle | Four-wheeled light vehicle | Four-wheeled heavy vehicle | Others | |
| 11:00 | 12:00 | 122 | 96 | 17 | 3 | 238 |
| 12:00 | 13:00 | 156 | 86 | 16 | 2 | 260 |
| 13:00 | 14:00 | 150 | 98 | 19 | 4 | 271 |
| 14:00 | 15:00 | 126 | 69 | 13 | 5 | 213 |
| 15:00 | 16:00 | 113 | 92 | 21 | 6 | 232 |
| 16:00 | 17:00 | 167 | 74 | 20 | 2 | 263 |
| 17:00 | 18:00 | 452 | 82 | 17 | 4 | 555 |
| 18:00 | 19:00 | 190 | 50 | 19 | 0 | 259 |
| 19:00 | 20:00 | 127 | 31 | 9 | 1 | 168 |
| 20:00 | 21:00 | 132 | 38 | 2 | 2 | 174 |
| 21:00 | 22:00 | 51 | 19 | 3 | 0 | 73 |
| 22:00 | 23:00 | 35 | 8 | 5 | 0 | 48 |
| 23:00 | 0:00 | 8 | 8 | 1 | 0 | 17 |
| 0:00 | 1:00 | 10 | 4 | 3 | 0 | 17 |
| 1:00 | 2:00 | 1 | 3 | 2 | 0 | 6 |
| 2:00 | 3:00 | 3 | 3 | 0 | 0 | 6 |
| 3:00 | 4:00 | 1 | 3 | 1 | 0 | 5 |
| 4:00 | 5:00 | 6 | 1 | 1 | 0 | 8 |
| 5:00 | 6:00 | 28 | 3 | 2 | 0 | 33 |
| 6:00 | 7:00 | 200 | 34 | 10 | 3 | 247 |
| 7:00 | 8:00 | 425 | 126 | 19 | 5 | 575 |
| 8:00 | 9:00 | 250 | 102 | 9 | 8 | 369 |
| 9:00 | 10:00 | 120 | 83 | 15 | 4 | 222 |
| 10:00 | 11:00 | 67 | 87 | 20 | 5 | 179 |
| Total | | 2940 | 1200 | 244 | 54 | 4438 |

The summary of traffic volume results during quarterly monitoring at TV-1 is shown in Table 2.4-4 and Table 2.4-5 respectively. In the summary of traffic volume results during quarterly monitoring surveys at TV-1, comparison of traffic volume results for more than two years was described. Among the traffic monitoring surveys (quarterly), traffic volume results for September 2017 is the lowest compared with other quarterly monitoring surveys. Traffic volume results are increasing start from December 2017. Traffic volume results of June 2019 are the highest compared with other quarterly monitoring surveys from Phalan village to Dagon Thilawa Road and from Dagon Thilawa Road to Phalan village.

**Table 2.4-4 Summary of Traffic Volume Results During Quarterly Monitoring Surveys at TV-1
(From Phalan Village to Dagon Thilawa Road)**

| Survey Point | Direction | Date | Weekday | 2-wheel Vehicles | 4-wheel Light Vehicles | 4-wheel Heavy Vehicles | Others | Total |
|--------------|--------------------------------------|----------------------|----------------------|------------------|------------------------|------------------------|--------|-------|
| TV-1 | Phalan village to Dagon-Thilawa road | 29 Mar – 30 Mar 2017 | Wednesday & Thursday | 1,712 | 545 | 216 | 29 | 2,502 |
| | | 22 Jun – 23 Jun 2017 | Thursday & Friday | 1,402 | 528 | 352 | 47 | 2,329 |
| | | 19 Sep – 20 Sep 2017 | Tuesday & Wednesday | 1,254 | 509 | 393 | 17 | 2,173 |
| | | 7 Dec – 8 Dec 2017 | Thursday & Friday | 1,800 | 652 | 339 | 43 | 2,834 |
| | | 15 Mar – 16 Mar 2018 | Thursday and Friday | 2,210 | 830 | 360 | 52 | 3,452 |
| | | 5 Jun – 6 Jun 2018 | Tuesday & Wednesday | 2,253 | 847 | 323 | 54 | 3,477 |
| | | 5 Sep – 6 Sep 2018 | Wednesday & Thursday | 2,146 | 826 | 242 | 41 | 3,255 |
| | | 11 Dec – 12 Dec 2018 | Tuesday & Wednesday | 2,404 | 865 | 371 | 50 | 3,690 |
| | | 12 Mar – 13 Mar 2019 | Tuesday & Wednesday | 2,484 | 916 | 377 | 68 | 3,845 |
| | | 11 Jun – 12 Jun 2019 | Tuesday & Wednesday | 2,743 | 1,158 | 278 | 58 | 4,237 |

**Table 2.4-5 Summary of Traffic Volume Results During Quarterly Monitoring Surveys at TV-1
(From Dagon-Thilawa Road to Phalan Village)**

| Survey Point | Direction | Date | Weekday | 2-wheel Vehicles | 4-wheel Light Vehicles | 4-wheel Heavy Vehicles | Others | Total |
|--------------|--------------------------------------|----------------------|----------------------|------------------|------------------------|------------------------|--------|-------|
| TV-1 | Dagon-Thilawa road to Phalan village | 29 Mar – 30 Mar 2017 | Wednesday & Thursday | 1,534 | 500 | 236 | 28 | 2,298 |
| | | 22 Jun – 23 Jun 2017 | Thursday & Friday | 1,291 | 542 | 357 | 43 | 2,233 |
| | | 19 Sep – 20 Sep 2017 | Tuesday & Wednesday | 1,195 | 486 | 372 | 19 | 2,072 |
| | | 7 Dec – 8 Dec 2017 | Thursday & Friday | 1,695 | 682 | 322 | 40 | 2,739 |
| | | 15 Mar – 16 Mar 2018 | Thursday and Friday | 2,062 | 812 | 312 | 48 | 3,234 |
| | | 5 Jun – 6 Jun 2018 | Tuesday & Wednesday | 2,048 | 799 | 322 | 52 | 3,221 |
| | | 5 Sep – 6 Sep 2018 | Wednesday & Thursday | 2,117 | 865 | 250 | 41 | 3,273 |
| | | 11 Dec – 12 Dec 2018 | Tuesday & Wednesday | 2,388 | 944 | 384 | 65 | 3,781 |
| | | 12 Mar – 13 Mar 2019 | Tuesday & Wednesday | 2,618 | 970 | 362 | 57 | 4,007 |
| | | 11 Jun – 12 Jun 2019 | Tuesday & Wednesday | 2,940 | 1,200 | 244 | 54 | 4,438 |

CHAPTER 3: CONCLUSION AND RECOMMENDATION

The results of the traffic volume show that the number of 2-wheel vehicles are distinctly and highly utilized in this monitoring period. The number of 4-wheel heavy vehicles are four times significantly lower than the number of 4-wheel light vehicles for each direction. It seems that commuting vehicles are more utilized during this monitoring period as compared with construction related vehicles (4-wheel heavy vehicles). By comparing the previous quarterly traffic surveys, the traffic volume is increasing, starting from December 2017. Traffic volume results of June 2019 are the highest compared with other quarterly monitoring surveys from Phalan village to Dagon Thilawa Road and from Dagon Thilawa Road to Phalan village.

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



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