

**Thilawa Special Economic
Zone (Zone B) Development**

Environmental Monitoring Report Phase-3 (Construction Phase)



**Myanmar Japan Thilawa
Development Limited.**

December 2019

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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 2019 to November 2019 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 |
| 13 | Environmental Monitoring Report | Phase- 3 Construction Phase | December, 2019 |

Report (No.13 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 September, 2019

F. Monthly Progress Report for October, 2019

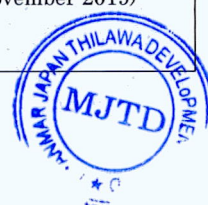
G. Monthly Progress Report for November, 2019

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 | September 2019, Air Quality Monitoring Report |
| Water Quality | Water temperature, pH, SS, DO, BOD ₅ , COD, coliforms, oil and grease, chromium | - Over flow of construction site to the creek (at least 3 sampling points/ mixing point: i) discharge water, ii) upstream water and iii) downstream water - Well near the construction site (1 point) | Once/ 2 month | October 2019 Water and Wastewater Quality Monitoring Report |
| Waste | Amount and kind of solid waste | Construction site | Once/ 3 month | Monthly Progress Reports (September, October, November 2019) |
| Noise and Vibration | - Noise and vibration level - Traffic Count | Preservation area such as residence around the proposed construction site (at least 1 point) Preservation site such as residence along the route for on-site vehicles (1 point for noise and vibration and 2 points for traffic count) | Once/ 3 month (peak period) | Noise and Vibration Monitoring Report September 2019 Traffic Count Monitoring Report September 2019 |
| Ground Subsidence | - Ground water level - Ground elevation level | Representative (1 point) | Every week | Monthly Progress Reports (September, October, November 2019) |
| Hydrology | - Consumption of ground water amount | | | |
| Risk for infectious disease such as AIDS/HIV | Status of measures of infectious disease | Construction site | Once/month | Monthly Progress Reports (September, October, November 2019) |
| Working conditions (including occupational safety) | Prehension of condition of occupational safety and health Prehension of infectious disease | Construction site | Once/ month | |



| Category | Item | Location | Frequency | Remark |
|----------|-----------------------|-------------------|-------------------|--------|
| Accident | Existence of accident | Construction site | As occasion arise | |





MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED

Thilawa Special Economic Zone (Zone B)
Development Project –Phase 3
Environment Monitoring Form

Environmental Monitoring Report (Construction Phase)



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 (September 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 | 0.029 | 0.110 | 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 *2 | mg/m ³ | 0.022 | 0.085 | 0.02 mg/m ³ (24 Hours) | 0.02 mg/m ³ (24 Hours) | - | | | |
| | CO | mg/m ³ | 0.099 | 0.219 | - | 10.26 mg/m ³ (24 Hours) | - | | | |
| | PM _{2.5} | mg/m ³ | 0.010 | 0.040 | 0.025 mg/m ³ (24 Hours) | 0.025 mg/m ³ (24 Hours) | - | | | |
| | PM ₁₀ | mg/m ³ | 0.012 | 0.042 | 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 (September 2019)

***Remarks:** The result of SO₂ in AQ1 is excess than target value due to four expected reasons i) combustion of fuel from nearby roads ii) operation activities of Myanmar International Terminals Thilawa Port iii) operation activities of local industrial zone iv) construction activities of Zone-B

Complaints from Residents

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

☐ Yes ☒ No

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

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

2) (b) Water Quality - October 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) |
|---------------------------|---------------------------------|------------|----------------------|----------------------|------------------------------|-------------------|--|---|
| SW-2 (reference point) | Temperature | °C | 31 | < 3 (increase) | ≤ 35 | Once per 2 months | Instrument Analysis Method | Refer to water quality report |
| | pH | - | 7.9 | 6-9 | 6.0 – 9.0 | | Instrument Analysis Method | |
| | SS*3 | mg/L | 70 | 50 | 50 | | APHA 2540D (Dry at 103-105°C Method) | |
| | DO | mg/L | 4.75 | - | - | | Instrument Analysis Method | |
| | BOD ₅ | mg/L | 6.81 | 50 | 30 | | APHA 5210 B (5days BOD Test) | |
| | COD _{Cr} | mg/L | 29.3 | 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 | 0.008 | 0.5 | 0.5 | | APHA (Inductively Coupled Plasma (ICP) Method) | |
| | Total Dissolved solids (TDS) *6 | mg/L | 196 | - | 2000 | | APHA 2540C (Total Dissolved Solids Dried at 180.C) | |
| SW-4 (reference point) | Iron*6 | mg/L | 4.052 | 3.5 | 3.5 | Once per 2 months | 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) | |
| | Temperature | °C | 29 | < 3 (increase) | ≤ 35 | | Instrument Analysis Method | |
| | pH | - | 7.6 | 6-9 | 6.0 – 9.0 | | Instrument Analysis Method | |
| | SS*3 | mg/L | 194 | 50 | 50 | | APHA 2540D (Dry at 103-105°C Method) | |
| | DO | mg/L | 7.43 | - | - | | Instrument Analysis Method | |
| | BOD ₅ | mg/L | 8.52 | 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 | 12.5 | 250 | 125 | | APHA 5220 D (Close Reflux Colorimetric Method) | Refer to water quality report |
| | 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 | 0.022 | 0.5 | 0.5 | | APHA (Inductively Coupled Plasma (ICP) Method) | |
| | Total Dissolved solids (TDS)*6 | mg/L | 278 | - | 2000 | | APHA 2540C (Total Dissolved Solids Dried at 180.C) | |
| | Iron*5, *6 | mg/L | 11.186 | 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 | 33 | < 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 | mg/L | 28 | 50 | 50 | | APHA 2540D (Dry at 103-105°C Method) | |
| | DO | mg/L | 8.26 | - | - | | Instrument Analysis Method | |
| | BOD ₅ | mg/L | 4.05 | 50 | 30 | | APHA 5210 B (5days BOD Test) | |
| | COD _{Cr} | mg/L | 10.8 | 250 | 125 | | APHA 5220 D (Close Reflux Colorimetric Method) | |
| | Total Coliform | MPN/100 ml | 46 | 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) | |



| 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 | 158 | - | 2000 | | APHA 2540C (Total Dissolved Solids Dried at 180.C) | |
| | Iron*6 | mg/L | 1.020 | 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 | - | 7.6 | 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 | 6.63 | - | - | | Instrument Analysis Method | |
| | BOD ₅ | mg/L | 8.00 | 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*7 | MPN/100 ml | 540 | 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) | |
| | Total Dissolved solids (TDS) *6 | mg/L | 128 | - | 2000 | | APHA 2540C (Total Dissolved Solids Dried at 180.C) | |
| | Iron*8,*6 | | 4.940 | 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) | |

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

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

*3Remark: For the monitoring point of SW2 and 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 iii) surface water run-off from bare land in Zone B.

*4Remark: For the monitoring point of SW2 and SW-4, 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, 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.

*7 Remark: For the monitoring point of GW-2, the results of total coliform exceeded than the target value due to two expected reasons i) poor maintenance of well which can increase the rate of bacteria and other harmful organisms ii) the well was not operated regularly and was not used for long time.

*8 Remark: For the monitoring point of GW-2, the results of iron exceeded due to expected reason i) it may be due to corrosion of pipe because the water is pumped through the iron pipelines buried underneath the ground.

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 (September 2019)

| Location | Item | Unit | Measured Value (Mean) | Measured Value (Max) | Country's Standard | Target value to be applied* | Referred International Standard | Frequency | Method | Note (Reason of excess of the standard) |
|-----------------------|---------------|-------|-----------------------|----------------------|---------------------------|-----------------------------|--|---------------------|--------|---|
| Residential Area NV-2 | Leq (day) | dB(A) | 52 | 56 | Refer to NEQG Article 1.3 | 75 | Refer the section 2.4 in EIA main report | One time / 3 months | | |
| | Leq (evening) | dB(A) | 51 | 53 | | 60 | | | | |
| | Leq(night) | dB(A) | 55 | 57 | | 55 | | | | |
| Along the road (NV-1) | Leq (day) | dB(A) | 65 | 64 | | 75 | | | | |
| | Leq(night) | dB(A) | 54 | 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 (September 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 | 20-Aug-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 | |
| 5- September -2019 | 184 | m ³ / week | + 6.301 | m | |
| 12- September -2019 | 172 | m ³ / week | + 6.299 | m | |
| 19- September -2019 | 158 | m ³ / week | + 6.300 | m | |
| 26- September -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 | |
| 3- October -2019 | 148 | m ³ / week | + 6.298 | m | |
| 10- October -2019 | 126 | m ³ / week | + 6.298 | m | |
| 17- October -2019 | 159 | m ³ / week | + 6.302 | m | |
| 24- October -2019 | 185 | 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 | |
| 7- November -2019 | 175 | m ³ / week | + 6.299 | m | |
| 14- November -2019 | 198 | m ³ / week | + 6.301 | m | |
| 21- November -2019 | 172 | m ³ / week | + 6.297 | m | |
| 28- November -2019 | 188 | m ³ / week | + 6.298 | 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 | <p>The number of PAHs who got land compensation;</p> <ul style="list-style-type: none"> • 6 PAHs from Zone B (Area 2-2 West (Part-1)) • 4 PAHs from Zone B(Candidate site of Cemetery) • 1 PAH from Zone B (Diverge Road Area) • 1 PAH from Shwe Pyauk Creek Expansion <p>The number of PAHs who already relocated;</p> <ul style="list-style-type: none"> • 1 PAH from Zone B (Area 2-1 Ex_2) • 11 PAHs from Zone B (Area 2_2 West (Part-1)) <p>The number of PAHs who got cultivation compensation;</p> | |



| | | | |
|---------------|----------------------------|--|--|
| | | <ul style="list-style-type: none"> 2 PAHs from Shwe Pyauk Creek Expansion 1 PAH from Zone B (Area 2-2 West (Part-1)) | |
| | Income Restoration Program | <ol style="list-style-type: none"> 1) Supporting for Valuable People Program at Zone B for every month 2) Tailoring training started in November for Zone B PAPs (Phase 2 &3) 3) Cleaning and digging for Creek which has full of trash and mud at Zone B relocation site <p>6th Monitoring survey started in December for Valuable People Program for Zone B Phase 2 (PAPs)</p> | |
| Common Assets | Relocation | | |

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

☒ Yes, ☐ No

| Contents of Grievance | Response/ Countermeasures |
|---|--|
| There was 2 grievance received during September to November 2019. These complains are about "Compensation" and "Labor" issue. | The situation of these 2 complains have been resolved. |

10) CSR activities such as Community Support Program

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

☒ Yes, ☐ No

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

| Date | Activities | Description (Location, Participant etc) |
|----------------|---|--|
| September 2019 | Monthly Scholarship Support | 15 high school students in Kyaut Tan and Thanlyin Township |
| | Plantation Activity | Zone A |
| | Students visit to TSEZ Factories | Yakult Factory |
| | Opening Japanese language Class | Fujiwork Myanmar Company Limited |
| | Medical Aids to Community Health Clinic (Aduttaw and Asoka) | Aduttaw Village and Kyauk Tan Township |
| October 2019 | Monthly Scholarship Support | 15 high school students in Kyaut Tan and Thanlyin Township |
| | Students visit to TSEZ Factories | Yakult Factory |
| November 2019 | Monthly Scholarship Support | 15 high school students in Kyaut Tan and Thanlyin Township |
| | TSEZ Community Run 2019 | Around TSEZ Area (Especially in Zone A) |
| | Kahtina Robe Offering Ceremony | Thilawa Monastery (Near Zone A) |

End of Document

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

Appendix

Water and Waste Water Monitoring Report

October 2019

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

(Bi-Monthly Monitoring)

October 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 is 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 | 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. |
| 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, 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 21 October 2019 and sampling time is shown in Table 2.4-1 to avoid tidal effect. The tide record for Yangon River, Myanmar on 21 October 2019 is shown in Table 2.4-2.

Table 2.4-1 Sampling Time of Each Station

| No. | Station | Sampling Time |
|-----|---------|------------------|
| 1 | SW-2 | 21/10/2019 14:24 |
| 2 | SW-4 | 21/10/2019 09:09 |
| 3 | SW-7 | 21/10/2019 13:53 |
| 4 | GW-2 | 21/10/2019 15:03 |

Source: Myanmar Koei International Ltd.

Table 2.4-2 Tide Record for Yangon River

| Date | Time | Height | Tide Conditions |
|------------|-------|--------|-----------------|
| 21/10/2019 | 03:29 | 1.71 | Low Tide |
| | 08:34 | 5.10 | High Tide |
| | 16:17 | 1.46 | Low Tide |
| | 21:41 | 4.68 | 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 and SW-4) 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.

As for the result of total coliform of surface water, results at surface water monitoring points (SW-2 and SW-4) 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.

As for the result of iron, the result at the monitoring point of surface water monitoring point (SW-2 and SW-4) exceeded the target value. The possible reasons may be due to the influence of natural origin (iron can reach out from soil by run-off). In Yangon, soil is naturally rich in iron. However, since it cannot reach to the conclusion of what is the reason for this result, the periodic monitoring will be necessary.

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 | 31 | 29 | 33 | ≤ 35 |
| 2 | pH | - | 7.9 | 7.6 | 9.0 | 6~9 |
| 3 | Suspended Solid (SS) | mg/L | 70.00 | 194.00 | 28.00 | 50 |
| 4 | Dissolved Oxygen (DO) | mg/L | 4.75 | 7.43 | 8.26 | - |
| 5 | BOD ₍₅₎ | mg/L | 6.81 | 8.52 | 4.05 | 30 |
| 6 | COD _(Cr) | mg/L | 29.3 | 12.5 | 10.8 | 125 |
| 7 | Total Coliform | MPN/100ml | >160000 | 35000 | 46 | 400 |
| 8 | Oil and Grease | mg/L | < 3.1 | < 3.1 | < 3.1 | 10 |
| 9 | Chromium | mg/L | 0.008 | 0.022 | ≤ 0.002 | 0.5 |
| 10 | Total Dissolved solids (TDS) | mg/L | 196 | 278 | 158 | 2000 |
| 11 | Iron | mg/L | 4.052 | 11.186 | 1.020 | 3.5 |
| 12 | Mercury | mg/L | ≤ 0.002 | ≤ 0.002 | ≤ 0.002 | 0.005 |
| 13 | Escherichia Coli | MPN/100ml | - | - | < 1.8 | (1000)* (CFU/100ml) |
| 14 | Flow Rate | m ³ /s | - | 0.51 | - | - |

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 results of total coliform and iron exceeded the target value.

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

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 | 28 | ≤ 35 |
| 2 | pH | - | 7.6 | 6~9 |
| 3 | Suspended Solid (SS) | mg/L | 2.00 | 50 |
| 4 | Dissolved Oxygen (DO) | mg/L | 6.63 | - |
| 5 | BOD ₍₅₎ | mg/L | 8.00 | 30 |
| 6 | COD _(Cr) | mg/L | 11.6 | 125 |
| 7 | Total Coliform | MPN/100ml | 540 | 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 | 128 | 2000 |
| 11 | Iron | mg/L | 4.940 | 3.5 |
| 12 | Mercury | mg/L | ≤ 0.002 | 0.005 |
| 13 | Escherichia Coli | MPN/100ml | 2.0 | (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/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, total coliform and iron at (SW-2 and SW-4) 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 and SW-4). 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.

As for the result of iron, the result at the monitoring point of surface water monitoring point (SW-2 and SW-4) exceeded the target value. The possible reasons may be due to the influence of natural origin (iron can reach out from soil by run-off). In Yangon, soil is naturally rich in iron. However, since it cannot reach to the conclusion of what is the reason for this result, the periodic monitoring will be necessary.

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

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.

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 and
- 3) To monitor the possibility of the domestic wastewater from construction sites.

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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Page 1 of 1

Report No. : GEM-LAB-201910194

Revision No. : 1

Report Date : 31 October, 2019

Application No. : 0001-C001

Analysis Report

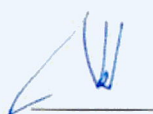
Client Name : Myanmar Koei International LTD (MKI)
Address : No, 35/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-SW-7-1021 Sampling Date : 21 October, 2019
Sample No. : W-1910173 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 October, 2019

| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-------------------|---|-----------|---------|-------|
| 1 | SS | APHA 2540D (Dry at 103-105°C Method) | mg/l | 28.00 | - |
| 2 | BOD (5) | APHA 5210 B (5 Days BOD Test) | mg/l | 4.05 | 0.00 |
| 3 | COD (Cr) | APHA 5220D (Close Reflux Colorimetric Method) | mg/l | 10.8 | 0.7 |
| 4 | Total Coliform | APHA 9221B (Standard Total Coliform Fermentation Technique) | MPN/100ml | 46 | 1.8 |
| 5 | Total Nitrogen | HACH Method 10072 (TNT Persulfate Digestion Method) | mg/l | 0.7 | 0 |
| 6 | Total Phosphorous | APHA 4500-P E (Ascorbic Acid Method) | mg/l | < 0.05 | 0.050 |
| 7 | Color | APHA 2120C (Spectrophotometric Method) | TCU | 3.87 | 0.00 |
| 8 | Odor | APHA 2150 B (Threshold Odor Test) | TON | 2 | 0 |
| 9 | Oil and Grease | APHA 5520B (Partition-Gravimetric Method) | mg/l | < 3.1 | 3.1 |
| 10 | Chromium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |

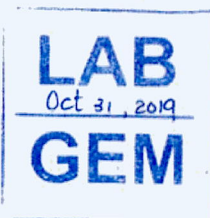
Remark : LOQ - Limit of Quantitation

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

Analysed By :



Ni Ni Aye Lwin
Assistant Manager



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-201910191
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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-2-1021 Sampling Date : 21 October, 2019
Sample No. : W-1910170 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 October, 2019

| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-------------------|---|-----------|----------|-------|
| 1 | SS | APHA 2540D (Dry at 103-105°C Method) | mg/l | 70.00 | - |
| 2 | BOD (5) | APHA 5210 B (5 Days BOD Test) | mg/l | 6.81 | 0.00 |
| 3 | COD (Cr) | APHA 5220D (Close Reflux Colorimetric Method) | mg/l | 29.3 | 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 | 2.4 | 0 |
| 6 | Total Phosphorous | APHA 4500-P E (Ascorbic Acid Method) | mg/l | 0.091 | 0.050 |
| 7 | Color | APHA 2120C (Spectrophotometric Method) | TCU | 12.20 | 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 | 0.008 | 0.002 |

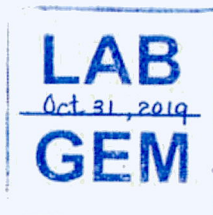
Remark : LOQ - Limit of Quantitation

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

Analysed By :



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Approved By :



Tomoya Suzuki Oct 31, 2019
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Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY October - 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-4-1021 Sampling Date : 21 October, 2019
Sample No. : W-1910171 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 October, 2019

| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-------------------|---|-----------|--------|-------|
| 1 | SS | APHA 2540D (Dry at 103-105°C Method) | mg/l | 194.00 | - |
| 2 | BOD (5) | APHA 5210 B (5 Days BOD Test) | mg/l | 8.52 | 0.00 |
| 3 | COD (Cr) | APHA 5220D (Close Reflux Colorimetric Method) | mg/l | 12.5 | 0.7 |
| 4 | Total Coliform | APHA 9221B (Standard Total Coliform Fermentation Technique) | MPN/100ml | 35000 | 1.8 |
| 5 | Total Nitrogen | HACH Method 10072 (TNT Persulfate Digestion Method) | mg/l | 2.9 | 0 |
| 6 | Total Phosphorous | APHA 4500-P E (Ascorbic Acid Method) | mg/l | 0.098 | 0.050 |
| 7 | Color | APHA 2120C (Spectrophotometric Method) | TCU | 3.78 | 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 | 0.022 | 0.002 |

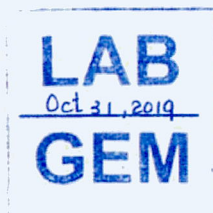
Remark : LOQ - Limit of Quantitation

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

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Approved By :



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

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Analysis Report

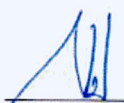
Client Name : Myanmar Koei International LTD (MKI)
Address : No, 36/A, 1st Floor, Grand Pho Sein Condominium, Pho Sein Road, Tamwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-GW-2-1021 Sampling Date : 21 October, 2019
Sample No. : W-1910174 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 October, 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 | 8.00 | 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 | 540 | 1.8 |
| 5 | Total Nitrogen | HACH Method 10072 (TNT Persulfate Digestion Method) | mg/l | 0.5 | 0 |
| 6 | Total Phosphorous | APHA 4500-P E (Ascorbic Acid Method) | mg/l | 0.678 | 0.050 |
| 7 | Color | APHA 2120C (Spectrophotometric Method) | TCU | 20.69 | 0.00 |
| 8 | Odor | APHA 2150 B (Threshold Odor Test) | TON | 1 | 0 |
| 9 | Oil and Grease | APHA 5520B (Partition-Gravimetric Method) | mg/l | < 3.1 | 3.1 |
| 10 | Chromium | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |

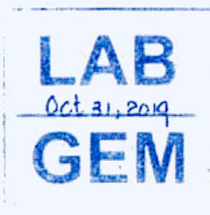
Remark : LOQ - Limit of Quantitation

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

Analysed By :



Ni Ni Aye Lwin
Assistant Manager



Approved By :



Tomoya Suzuki
Director



**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

motivate our planet
Doc No: GEM-LB-R004E/00
Page1of1

Report No. : GEM-LAB-201910167
Revision No. : 1
Report Date : 31 October, 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-7-1021 Sampling Date : 21 October, 2019
Sample No. : W-1910156 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 October, 2019

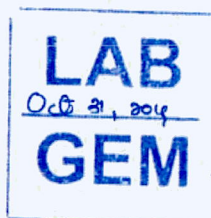
| No. | Parameter | Method | Unit | Result | LOQ |
|-----|------------------|--|-----------|--------|-----|
| 1 | Escherichia Coli | APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate | MPN/100ml | < 1.8 | 1.8 |

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
Assistant Manager



Approved By :

Tomoya Suzuki Oct 31, 2019
Director



**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-201910169
Revision No. : 1
Report Date : 31 October, 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-2-1021 Sampling Date : 21 October, 2019
Sample No. : W-1910158 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 October, 2019

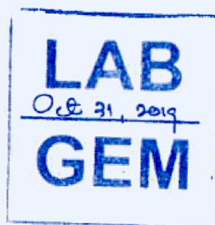
| No. | Parameter | Method | Unit | Result | LOQ |
|-----|------------------|--|-----------|--------|-----|
| 1 | Escherichia Coli | APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate | MPN/100ml | 2.0 | 1.8 |

Remark : LOQ - Limit of Quantitation

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

Analysed By :

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Assistant Manager



Approved By :

Tomoya Suzuki
Director

Oct 31, 2019



APPENDIX-4 LABORATORY RESULTS (SELF-MONITORING)



FOR DISCHARGED POINT

DOWA

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Doc No: GEM-LB-R004E/00
Page1of1

Report No. : GEM-LAB-201910186
Revision No. : 1
Report Date : 31 October, 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-7-1021 Sampling Date : 21 October, 2019
Sample No. : W-1910165 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 October, 2019

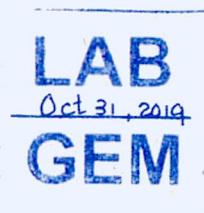
| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-----------|--|------|---------|-------|
| 1 | TDS | APHA 2540 C (Total Dissolved Solids Dried at 180°C Method) | mg/l | 158 | - |
| 2 | Mercury | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 3 | Iron | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 1.020 | 0.002 |

Remark : LOQ - Limit of Quantitation

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

Analysed By :

Ni Ni Aye Lwin
Assistant Manager



Approved By :

Tomoya Suzuki Oct 31, 2019
Director



**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
Page 1 of 1

Report No. : GEM-LAB-201910183
Revision No. : 1
Report Date : 31 October, 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-2-1021 Sampling Date : 21 October, 2019
Sample No. : W-1910162 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 October, 2019

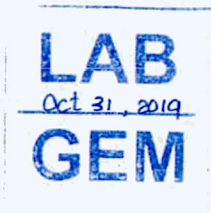
| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-----------|--|------|---------|-------|
| 1 | TDS | APHA 2540 C (Total Dissolved Solids Dried at 180°C Method) | mg/l | 196 | - |
| 2 | Mercury | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | ≤ 0.002 | 0.002 |
| 3 | Iron | APHA 3120 B (Inductively Coupled Plasma (ICP) Method) | mg/l | 4.052 | 0.002 |

Remark : LOQ - Limit of Quantitation

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

Analysed By :

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

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

Report No. : GEM-LAB-201910184
Revision No. : 1
Report Date : 31 October, 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-4-1021 Sampling Date : 21 October, 2019
Sample No. : W-1910163 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 October, 2019

| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-----------|--|------|---------|-------|
| 1 | TDS | APHA 2540 C (Total Dissolved Solids Dried at 180°C Method) | mg/l | 278 | - |
| 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 | 11.186 | 0.002 |

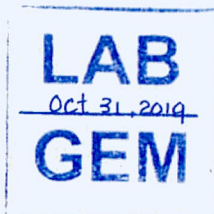
Remark : LOQ - Limit of Quantitation

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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Tomoya Suzuki Oct 31, 2019
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Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone B
(Bi-Monthly Monitoring in FY October - 2019)

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Doc No: GEM-LB-R004E/00
Page1of1

Report No. : GEM-LAB-201910187
Revision No. : 1
Report Date : 31 October, 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, Tarnwe Township, Yangon, Myanmar.
Project Name : Environment Monitoring report for Zone A & B
Sample Description
Sample Name : MKI-GW-2-1021 Sampling Date : 21 October, 2019
Sample No. : W-1910166 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 October, 2019

| No. | Parameter | Method | Unit | Result | LOQ |
|-----|-----------|--|------|---------|-------|
| 1 | TDS | APHA 2540 C (Total Dissolved Solids Dried at 180°C Method) | mg/l | 128 | - |
| 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 | 4.940 | 0.002 |

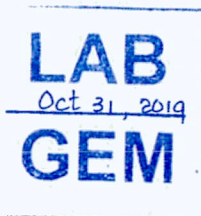
Remark : LOQ - Limit of Quantitation

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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Assistant Manager



Approved By :



Tomoya Suzuki Oct 31, 2019
Director



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

Appendix

Air Quality Monitoring Report

September 2019

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

(QUARTERLY MONITORING)

September 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 16 September 2019 – 23 September 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 16 Sep – 23 Sep, 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) |

Source: Myanmar Koei International Ltd.



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.



Source: Google Earth Pro

Figure 2.2-1 Location of Air Quality Monitoring Point

2.3 Monitoring Period

Air quality monitoring was conducted seven consecutive days from 16 September, 2019 – 23 September, 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 one minute 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.



Source: Myanmar Koei International Ltd.

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} and PM₁₀ were lower than the target value and seven days average concentration of SO₂ was slightly higher than the target value. Moreover, daily average concentration of SO₂ measured results for five 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 |
| 16~17 September, 2019 | 0.088 | 0.028 | 0.013 | 0.013 | 0.022 |
| 17~18 September, 2019 | 0.094 | 0.026 | 0.007 | 0.009 | 0.022 |
| 18~19 September, 2019 | 0.107 | 0.027 | 0.007 | 0.007 | 0.022 |
| 19~20 September, 2019 | 0.088 | 0.041 | 0.013 | 0.016 | 0.022 |
| 20~21 September, 2019 | 0.110 | 0.033 | 0.012 | 0.016 | 0.026 |
| 21~22 September, 2019 | 0.084 | 0.023 | 0.005 | 0.007 | 0.019 |
| 22~23 September, 2019 | 0.120 | 0.026 | 0.013 | 0.012 | 0.020 |
| 7 Days Average Value | 0.099 | 0.029 | 0.010 | 0.012 | 0.022 |
| Target Value | 10.26 | 0.1 | 0.025 | 0.05 | 0.02 |

Note: Red color mentions the exceeded value for 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 at 25°C and 1 atm condition
2. (NO₂, mg/m³) = (NO₂, ppm) * (Molecular Weight of NO₂ (46)) / 24.45 at 25°C and 1 atm condition
3. (SO₂, mg/m³) = (SO₂, ppm) * (Molecular Weight of SO₂ (64)) / 24.45 at 25°C and 1 atm condition

Source: Myanmar Koei International Ltd.

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

Table 2.5-2 Construction Activities of Thilawa SEZ Zone B

| Date | Time | Location | Construction Activities |
|-------------------|-------------|---|--|
| 16 September 2019 | 8:30- 17:00 | Phase1 Phase-2 (BL1 & 2) | Wild grass removing and yellow flower planting, Fence painting and repairing |
| 17 September 2019 | 8:00 -17:00 | Phase1 canals Phase-2 (BL1 & 2) | Wild grass removing and yellow flower planting, Fence painting and repairing |
| 18 September 2019 | 8:00 -17:00 | Dagon Thilawa road Phase1 canals Phase-2 (BL1 & 2) | Manual excavation at MH-6, Wild grass removing and yellow flower planting, Fence painting and repairing |
| 19 September 2019 | 8:00 -17:00 | Dagon Thilawa road Phase1 canals Phase-2 (BL1 & 2) Phase-3 | Manual excavation for pipe level, Wild grass removing and yellow flower planting, Fence painting and repairing, Precast Manhole Delivery and unloading |
| 20 September 2019 | 8:00 -17:00 | Dagon Thilawa road Phase1 canals Phase-2 (BL1 & 2) Phase-3 | Wild grass removing and yellow flower planting, Fence painting and repairing, Drainage manhole delivery and unloading |
| 21 September 2019 | 8:00-17:00 | Dagon Thilawa road Phase1 canals Phase-2 (BL1 & 2) | Ladder Painting at MH 1,2 & 3, Wild grass removing and yellow flower planting, Fence painting and repairing |
| 22 September 2019 | 9:00-17:00 | Phase1 canals Phase-2 (BL1 & 2) | Wild grass removing and yellow flower planting, Fence painting and repairing |
| 23 September 2019 | 8:30-17:00 | Dagon Thilawa road Phase1 canals Phase-2 (BL1 & 2) | Manual excavation for water proofing at MH-6, Wild grass removing and yellow flower planting, Fence painting and repairing |

Source: Myanmar Japan Thilawa Development Ltd.



Table 2.5- 3 SO₂ Results (During Construction Period)

| Day | Construction Time for each day | SO ₂ |
|----------------------|--------------------------------|-------------------|
| | | mg/m ³ |
| Day 1 | (8:00- 17:00) | 0.028 |
| Day 2 | (8:00 -17:00) | 0.022 |
| Day 3 | (8:00 -17:00) | 0.029 |
| Day 4 | (8:00 -17:00) | 0.030 |
| Day 5 | (8:00 -17:00) | 0.031 |
| Day 6 | (9:00-17:00) | 0.020 |
| Day 7 | (8:30- 17:00) | 0.029 |
| 7 days Average value | | 0.027 |
| Target Value | - | 0.020 |

Note: Red color mentions the exceeded value than target value

Source: Myanmar Koei International Ltd.

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.



Source: Google Earth Pro

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

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

Overall summary of total exceeded hours for Day 1 to Day 7 during construction and non-construction time for SO₂ are shown in Table 2.5-4. The summary of wind direction at AQ-1 is shown in Table 2.5-5.

Based on the summary table of total exceeded hours for SO₂, the total exceeded hours for seven days during construction and non-construction were 64 hours but exceeded hours for construction time was 36 hours. After detailed analyzed the SO₂ exceeded time according to the wind direction during construction period, 20 hours exceeded are come from other sides of Zone B and 16 hours exceeded are come from construction site of Zone B.

According to the summary of wind direction at AQ-1, 56.15% come from outside of Zone B and 43.85 % come from inside 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 and construction activities of Zone B.

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

| SO ₂ | | | | | | | | |
|-----------------|--------------------------------|----------------------|------------------------------------|--|--|---|--|---|
| | Construction Time for each day | Total Exceeded hours | Construction Period exceeded hours | Non-construction period exceeded hours | Non-construction period (wind from Zone B) | Non-construction period (wind from other sides) | Construction period (wind from Zone B) | Construction period (wind from other sides) |
| Day-1 | (8:00- 17:00) | 10 | 6 | 4 | 3 | 1 | 2 | 4 |
| Day-2 | (8:00 -17:00) | 9 | 3 | 6 | 3 | 3 | 2 | 1 |
| Day-3 | (8:00 -17:00) | 6 | 4 | 2 | 1 | 1 | 4 | 0 |
| Day-4 | (8:00 -17:00) | 11 | 6 | 5 | 1 | 4 | 2 | 4 |
| Day-5 | (8:00 -17:00) | 11 | 4 | 7 | 5 | 2 | 3 | 1 |
| Day-6 | (9:00-17:00) | 7 | 5 | 2 | 1 | 1 | 0 | 5 |
| Day-7 | (8:30- 17:00) | 10 | 8 | 2 | 2 | 0 | 3 | 5 |
| Total | | 64 | 36 | 28 | 16 | 12 | 16 | 20 |

Source: Myanmar Koei International Ltd.



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

| Wind Direction | | | | Inside/Outside Zone B | |
|----------------|---------|----------|------------|-----------------------|----------------|
| | All Day | Day Time | Night Time | | |
| N | 1.98% | 1.19% | 2.78% | 42.46% | Inside Zone B |
| NNE | 4.46% | 2.98% | 5.95% | | |
| NE | 13.19% | 6.55% | 19.84% | | |
| ENE | 12.20% | 6.15% | 18.25% | | |
| E | 10.62% | 7.54% | 13.69% | | |
| ESE | 11.51% | 11.11% | 11.90% | 56.15% | Outside Zone B |
| SE | 13.39% | 22.62% | 4.17% | | |
| SSE | 7.64% | 12.90% | 2.38% | | |
| S | 8.04% | 13.89% | 2.18% | | |
| SSW | 3.97% | 6.15% | 1.79% | | |
| SW | 4.07% | 4.56% | 3.57% | | |
| WSW | 6.05% | 4.17% | 7.94% | | |
| W | 1.49% | 0.20% | 2.78% | | |
| WNW | 0.30% | 0.00% | 0.60% | 1.39% | Inside Zone B |
| NW | 1.09% | 0.00% | 2.18% | | |
| NNW | 0.00% | 0.00% | 0.00% | | |

Source: Myanmar Koei International Ltd.



CHAPTER 3: CONCLUSION AND RECOMMENDATION

The result of seven days average air quality of CO, NO₂, PM_{2.5} and PM₁₀ during seven days monitoring did not exceed the target value, thus there are no impacts on the surrounding environments. The result of seven days average air quality of SO₂ was slightly higher than the target value. In addition, daily average concentration of SO₂ measured results for five days exceeded the target value. During construction period, (Day 1 to Day 5 and Day 7) daily average results for SO₂ were also higher than the target values.

During the seven days (168 hours) monitoring period, 64 hours results were exceeded for SO₂. According to wind direction of Zone B during the construction period, total 36 exceeded hours are during construction period and 20 exceeded hours are come from outside of Zone B and 16 exceeded hours are come from construction site 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 and construction activities of Zone B. In the public health statement SO₂ reported by ATSDR (Agency for Toxic Substances and Disease Registry) in US, 100 ppm (261.8 mg/m³) SO₂ is considered immediately dangerous to life and health (short term). Lung function changes observed when 0.4 to 3 ppm (1.05mg/m³ to 7.85 mg/m³) exposure for 20 years or more (long term). Therefore, although the target value of SO₂ was slightly exceeded during monitoring period but it is considered that there is no significant impact on human health.

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





Air Quality Monitoring Report for Development of Industrial Area Thilawa SEZ Zone B
(Phase 3 Construction Stage, FY September 2019)

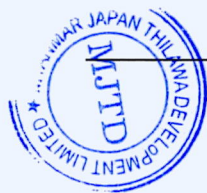
| Date | Time | CO | NO ₂ | PM _{2.5} | PM ₁₀ | SO ₂ | Wind Speed | Wind Direction | |
|--------------|---------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------|----------------|-----------|
| | | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | mg/m ³ | kph | Deg. | Direction |
| | | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly | Hourly |
| 16 Sep, 2019 | 14:00 ~ 14:59 | 0.085 | 0.004 | 0.034 | 0.019 | 0.022 | 1.30 | 136.00 | SE |
| 16 Sep, 2019 | 15:00 ~ 15:59 | 0.095 | 0.004 | 0.025 | 0.012 | 0.049 | 0.90 | 167.50 | SSE |
| 16 Sep, 2019 | 16:00 ~ 16:59 | 0.075 | 0.004 | 0.034 | 0.019 | 0.015 | 0.75 | 169.83 | S |
| 16 Sep, 2019 | 17:00 ~ 17:59 | 0.164 | 0.049 | 0.025 | 0.012 | 0.014 | 0.55 | 166.33 | SSE |
| 16 Sep, 2019 | 18:00 ~ 18:59 | 0.166 | 0.087 | 0.001 | 0.002 | 0.014 | 0.68 | 168.17 | SSE |
| 16 Sep, 2019 | 19:00 ~ 19:59 | 0.163 | 0.073 | 0.005 | 0.008 | 0.014 | 0.47 | 184.67 | S |
| 16 Sep, 2019 | 20:00 ~ 20:59 | 0.090 | 0.040 | 0.012 | 0.016 | 0.015 | 0.50 | 178.83 | S |
| 16 Sep, 2019 | 21:00 ~ 21:59 | 0.108 | 0.031 | 0.001 | 0.002 | 0.015 | 0.33 | 160.50 | SSE |
| 16 Sep, 2019 | 22:00 ~ 22:59 | 0.099 | 0.029 | 0.005 | 0.008 | 0.014 | 0.52 | 116.50 | ESE |
| 16 Sep, 2019 | 23:00 ~ 23:59 | 0.108 | 0.025 | 0.012 | 0.016 | 0.035 | 0.26 | 116.40 | ESE |
| 17 Sep, 2019 | 0:00 ~ 0:59 | 0.078 | 0.025 | 0.004 | 0.005 | 0.014 | 0.07 | 165.00 | SSE |
| 17 Sep, 2019 | 1:00 ~ 1:59 | 0.069 | 0.028 | 0.017 | 0.017 | 0.013 | 0.13 | 146.33 | SSE |
| 17 Sep, 2019 | 2:00 ~ 2:59 | 0.067 | 0.018 | 0.012 | 0.018 | 0.020 | 0.15 | 71.83 | ENE |
| 17 Sep, 2019 | 3:00 ~ 3:59 | 0.063 | 0.017 | 0.012 | 0.016 | 0.020 | 0.25 | 40.33 | NE |
| 17 Sep, 2019 | 4:00 ~ 4:59 | 0.049 | 0.008 | 0.017 | 0.020 | 0.016 | 0.60 | 38.67 | NE |
| 17 Sep, 2019 | 5:00 ~ 5:59 | 0.074 | 0.060 | 0.011 | 0.019 | 0.013 | 0.90 | 74.83 | ENE |
| 17 Sep, 2019 | 6:00 ~ 6:59 | 0.144 | 0.084 | 0.010 | 0.012 | 0.017 | 0.43 | 66.83 | ENE |
| 17 Sep, 2019 | 7:00 ~ 7:59 | 0.117 | 0.049 | 0.004 | 0.006 | 0.042 | 0.33 | 69.17 | ENE |
| 17 Sep, 2019 | 8:00 ~ 8:59 | 0.091 | 0.028 | 0.017 | 0.017 | 0.051 | 0.82 | 96.00 | E |
| 17 Sep, 2019 | 9:00 ~ 9:59 | 0.003 | 0.004 | 0.010 | 0.015 | 0.026 | 1.10 | 97.00 | E |
| 17 Sep, 2019 | 10:00 ~ 10:59 | 0.013 | 0.004 | 0.011 | 0.016 | 0.013 | 1.10 | 102.67 | ESE |
| 17 Sep, 2019 | 11:00 ~ 11:59 | 0.040 | 0.004 | 0.017 | 0.019 | 0.050 | 1.25 | 126.17 | SE |
| 17 Sep, 2019 | 12:00 ~ 12:59 | 0.064 | 0.004 | 0.011 | 0.019 | 0.005 | 1.28 | 129.50 | SE |
| 17 Sep, 2019 | 13:00 ~ 13:59 | 0.082 | 0.004 | 0.010 | 0.012 | 0.020 | 1.08 | 143.83 | SE |

| | | | | | |
|-----|-------|-------|-------|-------|-------|
| Max | 0.166 | 0.087 | 0.034 | 0.020 | 0.051 |
| Avg | 0.088 | 0.028 | 0.013 | 0.013 | 0.022 |
| Min | 0.003 | 0.004 | 0.001 | 0.002 | 0.005 |

| 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 Sep, 2019 | 14:00 ~ 14:59 | 0.039 | 0.004 | 0.006 | 0.008 | 0.014 | 1.24 | 134.80 | SE |
| 17 Sep, 2019 | 15:00 ~ 15:59 | 0.110 | 0.004 | 0.006 | 0.008 | 0.037 | 0.90 | 160.60 | SSE |
| 17 Sep, 2019 | 16:00 ~ 16:59 | 0.117 | 0.004 | 0.005 | 0.003 | 0.018 | 0.82 | 172.00 | S |
| 17 Sep, 2019 | 17:00 ~ 17:59 | 0.187 | 0.058 | 0.014 | 0.016 | 0.013 | 0.50 | 162.50 | SSE |
| 17 Sep, 2019 | 18:00 ~ 18:59 | 0.189 | 0.090 | 0.001 | 0.001 | 0.015 | 0.23 | 182.33 | S |
| 17 Sep, 2019 | 19:00 ~ 19:59 | 0.112 | 0.077 | 0.000 | 0.000 | 0.013 | 0.18 | 211.67 | SSW |
| 17 Sep, 2019 | 20:00 ~ 20:59 | 0.073 | 0.045 | 0.000 | 0.000 | 0.013 | 0.13 | 214.17 | SW |
| 17 Sep, 2019 | 21:00 ~ 21:59 | 0.116 | 0.044 | 0.001 | 0.001 | 0.016 | 0.18 | 216.33 | SW |
| 17 Sep, 2019 | 22:00 ~ 22:59 | 0.108 | 0.038 | 0.000 | 0.000 | 0.021 | 0.02 | 168.67 | SSE |
| 17 Sep, 2019 | 23:00 ~ 23:59 | 0.141 | 0.032 | 0.003 | 0.004 | 0.018 | 0.02 | 63.67 | ENE |
| 18 Sep, 2019 | 0:00 ~ 0:59 | 0.074 | 0.030 | 0.015 | 0.019 | 0.015 | 0.00 | 129.50 | SE |
| 18 Sep, 2019 | 1:00 ~ 1:59 | 0.033 | 0.028 | 0.014 | 0.018 | 0.014 | 0.02 | 118.50 | ESE |
| 18 Sep, 2019 | 2:00 ~ 2:59 | 0.047 | 0.018 | 0.002 | 0.002 | 0.014 | 0.02 | 168.50 | SSE |
| 18 Sep, 2019 | 3:00 ~ 3:59 | 0.095 | 0.030 | 0.001 | 0.001 | 0.026 | 0.02 | 92.00 | E |
| 18 Sep, 2019 | 4:00 ~ 4:59 | 0.054 | 0.012 | 0.001 | 0.002 | 0.021 | 0.03 | 192.50 | SSW |
| 18 Sep, 2019 | 5:00 ~ 5:59 | 0.192 | 0.024 | 0.027 | 0.015 | 0.057 | 0.03 | 105.50 | ESE |
| 18 Sep, 2019 | 6:00 ~ 6:59 | 0.126 | 0.033 | 0.019 | 0.012 | 0.034 | 0.02 | 62.80 | ENE |
| 18 Sep, 2019 | 7:00 ~ 7:59 | 0.093 | 0.011 | 0.024 | 0.032 | 0.035 | 0.08 | 81.17 | E |
| 18 Sep, 2019 | 8:00 ~ 8:59 | 0.092 | 0.004 | 0.003 | 0.005 | 0.055 | 0.42 | 47.67 | NE |
| 18 Sep, 2019 | 9:00 ~ 9:59 | 0.009 | 0.004 | 0.003 | 0.005 | 0.018 | 0.63 | 77.00 | ENE |
| 18 Sep, 2019 | 10:00 ~ 10:59 | 0.029 | 0.004 | 0.009 | 0.017 | 0.005 | 0.70 | 46.33 | NE |
| 18 Sep, 2019 | 11:00 ~ 11:59 | 0.059 | 0.004 | 0.008 | 0.016 | 0.020 | 0.77 | 61.33 | ENE |
| 18 Sep, 2019 | 12:00 ~ 12:59 | 0.073 | 0.004 | 0.007 | 0.017 | 0.013 | 0.75 | 99.00 | E |
| 18 Sep, 2019 | 13:00 ~ 13:59 | 0.082 | 0.014 | 0.007 | 0.017 | 0.015 | 0.73 | 114.67 | ESE |

| | | | | | |
|-----|-------|-------|-------|-------|-------|
| Max | 0.192 | 0.090 | 0.027 | 0.032 | 0.057 |
| Avg | 0.094 | 0.026 | 0.007 | 0.009 | 0.022 |
| Min | 0.009 | 0.004 | 0.000 | 0.000 | 0.005 |





| 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 |
| 18 Sep, 2019 | 14:00 ~ 14:59 | 0.123 | 0.004 | 0.003 | 0.007 | 0.012 | 0.60 | 146.33 | SSE |
| 18 Sep, 2019 | 15:00 ~ 15:59 | 0.140 | 0.004 | 0.004 | 0.005 | 0.015 | 0.72 | 183.33 | S |
| 18 Sep, 2019 | 16:00 ~ 16:59 | 0.127 | 0.012 | 0.023 | 0.012 | 0.007 | 0.60 | 203.17 | SSW |
| 18 Sep, 2019 | 17:00 ~ 17:59 | 0.157 | 0.066 | 0.004 | 0.006 | 0.014 | 0.27 | 178.00 | S |
| 18 Sep, 2019 | 18:00 ~ 18:59 | 0.137 | 0.074 | 0.003 | 0.007 | 0.016 | 0.30 | 188.33 | S |
| 18 Sep, 2019 | 19:00 ~ 19:59 | 0.155 | 0.078 | 0.004 | 0.005 | 0.015 | 0.35 | 232.67 | SW |
| 18 Sep, 2019 | 20:00 ~ 20:59 | 0.119 | 0.061 | 0.022 | 0.012 | 0.014 | 0.42 | 236.67 | WSW |
| 18 Sep, 2019 | 21:00 ~ 21:59 | 0.111 | 0.041 | 0.005 | 0.005 | 0.016 | 0.95 | 248.83 | WSW |
| 18 Sep, 2019 | 22:00 ~ 22:59 | 0.112 | 0.042 | 0.003 | 0.007 | 0.017 | 0.40 | 228.83 | SW |
| 18 Sep, 2019 | 23:00 ~ 23:59 | 0.082 | 0.031 | 0.004 | 0.005 | 0.013 | 0.42 | 233.83 | SW |
| 19 Sep, 2019 | 0:00 ~ 0:59 | 0.080 | 0.040 | 0.023 | 0.012 | 0.013 | 0.85 | 245.50 | WSW |
| 19 Sep, 2019 | 1:00 ~ 1:59 | 0.076 | 0.042 | 0.004 | 0.006 | 0.013 | 0.68 | 243.17 | WSW |
| 19 Sep, 2019 | 2:00 ~ 2:59 | 0.073 | 0.034 | 0.003 | 0.007 | 0.014 | 0.87 | 243.83 | WSW |
| 19 Sep, 2019 | 3:00 ~ 3:59 | 0.082 | 0.032 | 0.004 | 0.005 | 0.018 | 0.87 | 257.83 | WSW |
| 19 Sep, 2019 | 4:00 ~ 4:59 | 0.075 | 0.020 | 0.022 | 0.012 | 0.017 | 0.27 | 197.50 | SSW |
| 19 Sep, 2019 | 5:00 ~ 5:59 | 0.122 | 0.020 | 0.013 | 0.019 | 0.026 | 0.17 | 156.67 | SSE |
| 19 Sep, 2019 | 6:00 ~ 6:59 | 0.117 | 0.004 | 0.007 | 0.007 | 0.015 | 0.37 | 30.83 | NNE |
| 19 Sep, 2019 | 7:00 ~ 7:59 | 0.155 | 0.010 | 0.000 | 0.001 | 0.020 | 0.33 | 37.67 | NE |
| 19 Sep, 2019 | 8:00 ~ 8:59 | 0.084 | 0.004 | 0.000 | 0.000 | 0.031 | 0.55 | 41.33 | NE |
| 19 Sep, 2019 | 9:00 ~ 9:59 | 0.107 | 0.004 | 0.000 | 0.000 | 0.058 | 0.57 | 38.17 | NE |
| 19 Sep, 2019 | 10:00 ~ 10:59 | 0.098 | 0.004 | 0.000 | 0.000 | 0.036 | 0.63 | 27.50 | NNE |
| 19 Sep, 2019 | 11:00 ~ 11:59 | 0.066 | 0.004 | 0.012 | 0.018 | 0.018 | 0.77 | 57.17 | ENE |
| 19 Sep, 2019 | 12:00 ~ 12:59 | 0.070 | 0.004 | 0.007 | 0.007 | 0.020 | 0.68 | 53.17 | NE |
| 19 Sep, 2019 | 13:00 ~ 13:59 | 0.091 | 0.004 | 0.000 | 0.001 | 0.081 | 0.82 | 58.20 | ENE |

| | | | | | |
|-----|-------|-------|-------|-------|-------|
| Max | 0.157 | 0.078 | 0.023 | 0.019 | 0.081 |
| Avg | 0.107 | 0.027 | 0.007 | 0.007 | 0.022 |
| Min | 0.066 | 0.004 | 0.000 | 0.000 | 0.007 |

| 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 |
| 19 Sep, 2019 | 14:00 ~ 14:59 | 0.102 | 0.004 | 0.016 | 0.001 | 0.056 | 0.68 | 63.20 | ENE |
| 19 Sep, 2019 | 15:00 ~ 15:59 | 0.136 | 0.005 | 0.016 | 0.001 | 0.031 | 0.62 | 93.17 | E |
| 19 Sep, 2019 | 16:00 ~ 16:59 | 0.179 | 0.062 | 0.020 | 0.026 | 0.014 | 0.58 | 144.00 | SE |
| 19 Sep, 2019 | 17:00 ~ 17:59 | 0.043 | 0.084 | 0.025 | 0.016 | 0.023 | 0.25 | 167.17 | SSE |
| 19 Sep, 2019 | 18:00 ~ 18:59 | 0.000 | 0.090 | 0.024 | 0.016 | 0.023 | 0.02 | 196.00 | SSW |
| 19 Sep, 2019 | 19:00 ~ 19:59 | 0.000 | 0.074 | 0.010 | 0.012 | 0.033 | 0.07 | 151.67 | SSE |
| 19 Sep, 2019 | 20:00 ~ 20:59 | 0.150 | 0.050 | 0.002 | 0.002 | 0.019 | 0.07 | 142.00 | SE |
| 19 Sep, 2019 | 21:00 ~ 21:59 | 0.166 | 0.047 | 0.023 | 0.024 | 0.022 | 0.05 | 138.50 | SE |
| 19 Sep, 2019 | 22:00 ~ 22:59 | 0.036 | 0.044 | 0.013 | 0.011 | 0.013 | 0.07 | 179.33 | S |
| 19 Sep, 2019 | 23:00 ~ 23:59 | 0.037 | 0.032 | 0.017 | 0.015 | 0.013 | 0.10 | 162.50 | SSE |
| 20 Sep, 2019 | 0:00 ~ 0:59 | 0.086 | 0.030 | 0.016 | 0.015 | 0.014 | 0.02 | 207.83 | SSW |
| 20 Sep, 2019 | 1:00 ~ 1:59 | 0.089 | 0.033 | 0.015 | 0.024 | 0.016 | 0.07 | 219.50 | SW |
| 20 Sep, 2019 | 2:00 ~ 2:59 | 0.093 | 0.051 | 0.010 | 0.020 | 0.013 | 1.00 | 97.33 | E |
| 20 Sep, 2019 | 3:00 ~ 3:59 | 0.120 | 0.110 | 0.014 | 0.029 | 0.013 | 0.80 | 131.50 | SE |
| 20 Sep, 2019 | 4:00 ~ 4:59 | 0.091 | 0.065 | 0.005 | 0.009 | 0.013 | 1.10 | 126.83 | SE |
| 20 Sep, 2019 | 5:00 ~ 5:59 | 0.105 | 0.052 | 0.005 | 0.023 | 0.013 | 0.57 | 166.83 | SSE |
| 20 Sep, 2019 | 6:00 ~ 6:59 | 0.121 | 0.052 | 0.010 | 0.038 | 0.017 | 0.22 | 168.83 | S |
| 20 Sep, 2019 | 7:00 ~ 7:59 | 0.219 | 0.072 | 0.018 | 0.019 | 0.028 | 0.20 | 96.33 | E |
| 20 Sep, 2019 | 8:00 ~ 8:59 | 0.123 | 0.013 | 0.009 | 0.002 | 0.026 | 0.42 | 172.00 | S |
| 20 Sep, 2019 | 9:00 ~ 9:59 | 0.050 | 0.004 | 0.008 | 0.008 | 0.011 | 0.57 | 102.50 | ESE |
| 20 Sep, 2019 | 10:00 ~ 10:59 | 0.022 | 0.000 | 0.005 | 0.023 | 0.042 | 0.63 | 125.00 | SE |
| 20 Sep, 2019 | 11:00 ~ 11:59 | 0.044 | 0.004 | 0.010 | 0.038 | 0.047 | 0.75 | 147.83 | SSE |
| 20 Sep, 2019 | 12:00 ~ 12:59 | 0.045 | 0.005 | 0.018 | 0.019 | 0.023 | 0.77 | 189.00 | S |
| 20 Sep, 2019 | 13:00 ~ 13:59 | 0.062 | 0.004 | 0.009 | 0.002 | 0.016 | 0.93 | 196.00 | SSW |

| | | | | | |
|-----|-------|-------|-------|-------|-------|
| Max | 0.219 | 0.110 | 0.025 | 0.038 | 0.056 |
| Avg | 0.088 | 0.041 | 0.013 | 0.016 | 0.022 |
| Min | 0.000 | 0.000 | 0.002 | 0.001 | 0.011 |



| 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 |
| 20 Sep, 2019 | 14:00 ~ 14:59 | 0.075 | 0.004 | 0.005 | 0.002 | 0.014 | 0.87 | 209.17 | SSW |
| 20 Sep, 2019 | 15:00 ~ 15:59 | 0.111 | 0.021 | 0.010 | 0.001 | 0.011 | 0.52 | 193.50 | SSW |
| 20 Sep, 2019 | 16:00 ~ 16:59 | 0.121 | 0.037 | 0.010 | 0.001 | 0.015 | 0.20 | 179.33 | S |
| 20 Sep, 2019 | 17:00 ~ 17:59 | 0.010 | 0.063 | 0.027 | 0.027 | 0.037 | 0.08 | 163.17 | SSE |
| 20 Sep, 2019 | 18:00 ~ 18:59 | 0.162 | 0.075 | 0.016 | 0.018 | 0.025 | 0.50 | 85.83 | E |
| 20 Sep, 2019 | 19:00 ~ 19:59 | 0.193 | 0.073 | 0.002 | 0.003 | 0.014 | 0.17 | 23.00 | NNE |
| 20 Sep, 2019 | 20:00 ~ 20:59 | 0.171 | 0.064 | 0.024 | 0.033 | 0.019 | 0.05 | 67.83 | ENE |
| 20 Sep, 2019 | 21:00 ~ 21:59 | 0.175 | 0.044 | 0.027 | 0.032 | 0.024 | 0.05 | 129.83 | SE |
| 20 Sep, 2019 | 22:00 ~ 22:59 | 0.215 | 0.031 | 0.016 | 0.016 | 0.037 | 0.00 | 100.83 | E |
| 20 Sep, 2019 | 23:00 ~ 23:59 | 0.182 | 0.034 | 0.019 | 0.019 | 0.015 | 0.03 | 47.83 | NE |
| 21 Sep, 2019 | 0:00 ~ 0:59 | 0.029 | 0.009 | 0.024 | 0.033 | 0.013 | 0.58 | 105.17 | ESE |
| 21 Sep, 2019 | 1:00 ~ 1:59 | 0.038 | 0.013 | 0.027 | 0.032 | 0.014 | 0.12 | 208.00 | SSW |
| 21 Sep, 2019 | 2:00 ~ 2:59 | 0.098 | 0.037 | 0.016 | 0.017 | 0.016 | 0.05 | 207.83 | SSW |
| 21 Sep, 2019 | 3:00 ~ 3:59 | 0.094 | 0.029 | 0.019 | 0.019 | 0.022 | 0.12 | 61.00 | ENE |
| 21 Sep, 2019 | 4:00 ~ 4:59 | 0.090 | 0.017 | 0.001 | 0.001 | 0.022 | 0.23 | 34.50 | NE |
| 21 Sep, 2019 | 5:00 ~ 5:59 | 0.068 | 0.029 | 0.001 | 0.001 | 0.013 | 0.52 | 53.50 | NE |
| 21 Sep, 2019 | 6:00 ~ 6:59 | 0.100 | 0.052 | 0.004 | 0.020 | 0.014 | 0.28 | 57.50 | ENE |
| 21 Sep, 2019 | 7:00 ~ 7:59 | 0.144 | 0.029 | 0.004 | 0.020 | 0.057 | 0.37 | 47.50 | NE |
| 21 Sep, 2019 | 8:00 ~ 8:59 | 0.029 | 0.004 | 0.004 | 0.026 | 0.037 | 0.65 | 74.83 | ENE |
| 21 Sep, 2019 | 9:00 ~ 9:59 | 0.068 | 0.004 | 0.006 | 0.008 | 0.085 | 0.85 | 95.17 | E |
| 21 Sep, 2019 | 10:00 ~ 10:59 | 0.102 | 0.033 | 0.003 | 0.011 | 0.013 | 0.57 | 43.17 | NE |
| 21 Sep, 2019 | 11:00 ~ 11:59 | 0.156 | 0.061 | 0.004 | 0.027 | 0.015 | 0.30 | 51.83 | NE |
| 21 Sep, 2019 | 12:00 ~ 12:59 | 0.114 | 0.017 | 0.006 | 0.008 | 0.044 | 0.23 | 82.67 | E |
| 21 Sep, 2019 | 13:00 ~ 13:59 | 0.107 | 0.017 | 0.003 | 0.011 | 0.045 | 0.48 | 146.50 | SSE |

| | | | | | |
|-----|-------|-------|-------|-------|-------|
| Max | 0.215 | 0.075 | 0.027 | 0.033 | 0.085 |
| Avg | 0.110 | 0.033 | 0.012 | 0.016 | 0.026 |
| Min | 0.010 | 0.004 | 0.001 | 0.001 | 0.011 |

| 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 |
| 21 Sep. 2019 | 14:00 ~ 14:59 | 0.010 | 0.004 | 0.007 | 0.012 | 0.005 | 1.05 | 133.33 | SE |
| 21 Sep. 2019 | 15:00 ~ 15:59 | 0.043 | 0.004 | 0.007 | 0.012 | 0.021 | 1.05 | 150.33 | SSE |
| 21 Sep. 2019 | 16:00 ~ 16:59 | 0.090 | 0.004 | 0.011 | 0.009 | 0.025 | 1.30 | 141.83 | SE |
| 21 Sep. 2019 | 17:00 ~ 17:59 | 0.142 | 0.043 | 0.005 | 0.005 | 0.013 | 1.22 | 128.00 | SE |
| 21 Sep. 2019 | 18:00 ~ 18:59 | 0.219 | 0.079 | 0.007 | 0.012 | 0.013 | 0.88 | 116.67 | ESE |
| 21 Sep. 2019 | 19:00 ~ 19:59 | 0.134 | 0.080 | 0.011 | 0.009 | 0.014 | 0.52 | 112.50 | ESE |
| 21 Sep. 2019 | 20:00 ~ 20:59 | 0.102 | 0.063 | 0.005 | 0.006 | 0.013 | 0.40 | 111.50 | ESE |
| 21 Sep. 2019 | 21:00 ~ 21:59 | 0.077 | 0.042 | 0.002 | 0.002 | 0.019 | 0.47 | 92.83 | E |
| 21 Sep. 2019 | 22:00 ~ 22:59 | 0.077 | 0.035 | 0.012 | 0.009 | 0.013 | 0.38 | 79.83 | E |
| 21 Sep. 2019 | 23:00 ~ 23:59 | 0.056 | 0.029 | 0.005 | 0.005 | 0.013 | 0.45 | 80.17 | E |
| 22 Sep. 2019 | 0:00 ~ 0:59 | 0.038 | 0.019 | 0.002 | 0.002 | 0.013 | 0.48 | 98.33 | E |
| 22 Sep. 2019 | 1:00 ~ 1:59 | 0.042 | 0.020 | 0.001 | 0.001 | 0.013 | 0.58 | 83.33 | E |
| 22 Sep. 2019 | 2:00 ~ 2:59 | 0.049 | 0.019 | 0.002 | 0.002 | 0.014 | 0.60 | 113.50 | ESE |
| 22 Sep. 2019 | 3:00 ~ 3:59 | 0.046 | 0.017 | 0.012 | 0.009 | 0.016 | 0.53 | 105.17 | ESE |
| 22 Sep. 2019 | 4:00 ~ 4:59 | 0.052 | 0.015 | 0.005 | 0.006 | 0.015 | 0.52 | 102.67 | ESE |
| 22 Sep. 2019 | 5:00 ~ 5:59 | 0.066 | 0.023 | 0.002 | 0.002 | 0.015 | 0.40 | 75.50 | ENE |
| 22 Sep. 2019 | 6:00 ~ 6:59 | 0.068 | 0.027 | 0.001 | 0.001 | 0.015 | 0.78 | 65.00 | ENE |
| 22 Sep. 2019 | 7:00 ~ 7:59 | 0.151 | 0.014 | 0.001 | 0.004 | 0.028 | 0.48 | 82.33 | E |
| 22 Sep. 2019 | 8:00 ~ 8:59 | 0.100 | 0.004 | 0.010 | 0.027 | 0.063 | 0.32 | 133.83 | SE |
| 22 Sep. 2019 | 9:00 ~ 9:59 | 0.063 | 0.007 | 0.001 | 0.001 | 0.027 | 0.75 | 145.50 | SE |
| 22 Sep. 2019 | 10:00 ~ 10:59 | 0.055 | 0.004 | 0.001 | 0.004 | 0.016 | 1.70 | 106.67 | ESE |
| 22 Sep. 2019 | 11:00 ~ 11:59 | 0.127 | 0.004 | 0.010 | 0.026 | 0.031 | 1.58 | 112.67 | ESE |
| 22 Sep. 2019 | 12:00 ~ 12:59 | 0.114 | 0.004 | 0.001 | 0.001 | 0.013 | 2.00 | 119.17 | ESE |
| 22 Sep. 2019 | 13:00 ~ 13:59 | 0.086 | 0.004 | 0.001 | 0.001 | 0.025 | 1.90 | 137.17 | SE |

| | | | | | |
|-----|-------|-------|-------|-------|-------|
| Max | 0.219 | 0.080 | 0.012 | 0.027 | 0.063 |
| Avg | 0.084 | 0.023 | 0.005 | 0.007 | 0.019 |
| Min | 0.010 | 0.004 | 0.001 | 0.001 | 0.005 |



| 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 |
| 22 Sep, 2019 | 14:00 ~ 14:59 | 0.091 | 0.004 | 0.031 | 0.031 | 0.023 | 1.77 | 143.67 | SE |
| 22 Sep, 2019 | 15:00 ~ 15:59 | 0.161 | 0.004 | 0.013 | 0.001 | 0.043 | 1.73 | 133.33 | SE |
| 22 Sep, 2019 | 16:00 ~ 16:59 | 0.112 | 0.004 | 0.031 | 0.031 | 0.035 | 1.73 | 134.67 | SE |
| 22 Sep, 2019 | 17:00 ~ 17:59 | 0.157 | 0.047 | 0.013 | 0.001 | 0.013 | 1.18 | 145.83 | SE |
| 22 Sep, 2019 | 18:00 ~ 18:59 | 0.153 | 0.077 | 0.016 | 0.018 | 0.013 | 0.77 | 164.67 | SSE |
| 22 Sep, 2019 | 19:00 ~ 19:59 | 0.160 | 0.071 | 0.039 | 0.042 | 0.014 | 0.62 | 142.50 | SE |
| 22 Sep, 2019 | 20:00 ~ 20:59 | 0.211 | 0.026 | 0.017 | 0.018 | 0.013 | 0.52 | 121.33 | ESE |
| 22 Sep, 2019 | 21:00 ~ 21:59 | 0.194 | 0.033 | 0.040 | 0.042 | 0.013 | 0.30 | 83.33 | E |
| 22 Sep, 2019 | 22:00 ~ 22:59 | 0.034 | 0.040 | 0.014 | 0.014 | 0.013 | 0.25 | 100.67 | E |
| 22 Sep, 2019 | 23:00 ~ 23:59 | 0.109 | 0.035 | 0.002 | 0.003 | 0.013 | 0.03 | 95.00 | E |
| 23 Sep, 2019 | 0:00 ~ 0:59 | 0.143 | 0.038 | 0.008 | 0.012 | 0.014 | 0.13 | 48.83 | NE |
| 23 Sep, 2019 | 1:00 ~ 1:59 | 0.100 | 0.031 | 0.003 | 0.006 | 0.013 | 0.47 | 73.83 | ENE |
| 23 Sep, 2019 | 2:00 ~ 2:59 | 0.082 | 0.030 | 0.008 | 0.012 | 0.014 | 0.22 | 52.67 | NE |
| 23 Sep, 2019 | 3:00 ~ 3:59 | 0.074 | 0.022 | 0.004 | 0.006 | 0.015 | 0.52 | 59.17 | ENE |
| 23 Sep, 2019 | 4:00 ~ 4:59 | 0.078 | 0.025 | 0.000 | 0.001 | 0.013 | 0.55 | 77.33 | ENE |
| 23 Sep, 2019 | 5:00 ~ 5:59 | 0.097 | 0.025 | 0.000 | 0.001 | 0.015 | 0.37 | 68.83 | ENE |
| 23 Sep, 2019 | 6:00 ~ 6:59 | 0.132 | 0.023 | 0.001 | 0.001 | 0.026 | 0.23 | 38.00 | NE |
| 23 Sep, 2019 | 7:00 ~ 7:59 | 0.155 | 0.008 | 0.021 | 0.025 | 0.029 | 0.35 | 38.17 | NE |
| 23 Sep, 2019 | 8:00 ~ 8:59 | 0.108 | 0.004 | 0.001 | 0.001 | 0.038 | 0.48 | 53.00 | NE |
| 23 Sep, 2019 | 9:00 ~ 9:59 | 0.112 | 0.051 | 0.010 | 0.003 | 0.009 | 0.92 | 249.00 | WSW |
| 23 Sep, 2019 | 10:00 ~ 10:59 | 0.111 | 0.021 | 0.001 | 0.001 | 0.039 | 0.40 | 147.33 | SSE |
| 23 Sep, 2019 | 11:00 ~ 11:59 | 0.060 | 0.004 | 0.021 | 0.025 | 0.028 | 0.77 | 76.67 | ENE |
| 23 Sep, 2019 | 12:00 ~ 12:59 | 0.085 | 0.004 | 0.001 | 0.001 | 0.025 | 0.95 | 95.00 | E |
| 23 Sep, 2019 | 13:00 ~ 13:59 | 0.152 | 0.004 | 0.010 | 0.003 | 0.021 | 0.88 | 119.83 | ESE |

| | | | | | |
|-----|-------|-------|-------|-------|-------|
| Max | 0.211 | 0.077 | 0.040 | 0.042 | 0.043 |
| Avg | 0.120 | 0.026 | 0.013 | 0.012 | 0.020 |
| Min | 0.034 | 0.004 | 0.000 | 0.001 | 0.009 |

APPENDIX-2 CERTIFICATE OF CALIBRATION



| Model | Serial Number | Calibration Date | Next Calibration Due |
|-------|---------------|------------------|----------------------|
| EPAS | 914043 | April 16, 2019 | April 2020 |

| Calibration Span Accessory if purchased | Sensor A K= | Sensor B K= | Model: |
|--|----------------|----------------|--------|
| | | | |

| Technician | Supervisor |
|---|---|
|  Dan Okuniewicz |  Mark Sullivan |

Environmental Devices Corporation
4 Wilder Drive Building #15
Plaistow, NH 03865
ISO-9001 Certified



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

Appendix

Noise and Vibration Monitoring Report

September 2019

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

(QUARTERLY MONITORING)

**September 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 16 September 2019 – 18 September 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 17–18 Sep 2019 | Noise Level | L _{Aeq} (dB) | 1 (NV-1) | 24 hours | On-site measurement by “Rion NL-42 sound level meter” |
| From 16–17 Sep 2019 | Noise Level | L _{Aeq} (dB) | 1 (NV-2) | 24 hours | On-site measurement by “Rion NL-42 sound level meter” |
| From 17–18 Sep 2019 | Vibration Level | L _{v10} (dB) | 1 (NV-1) | 24 hours | On-site measurement by “Vibration Level Meter- VM-53A” |
| From 16–17 Sep 2019 | Vibration Level | L _{v10} (dB) | 1 (NV-2) | 24 hours | On-site measurement by “Vibration Level Meter- VM-53A” |

Source: Myanmar Koei International Ltd.



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}) |

Source: Myanmar Koei International Ltd.

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.

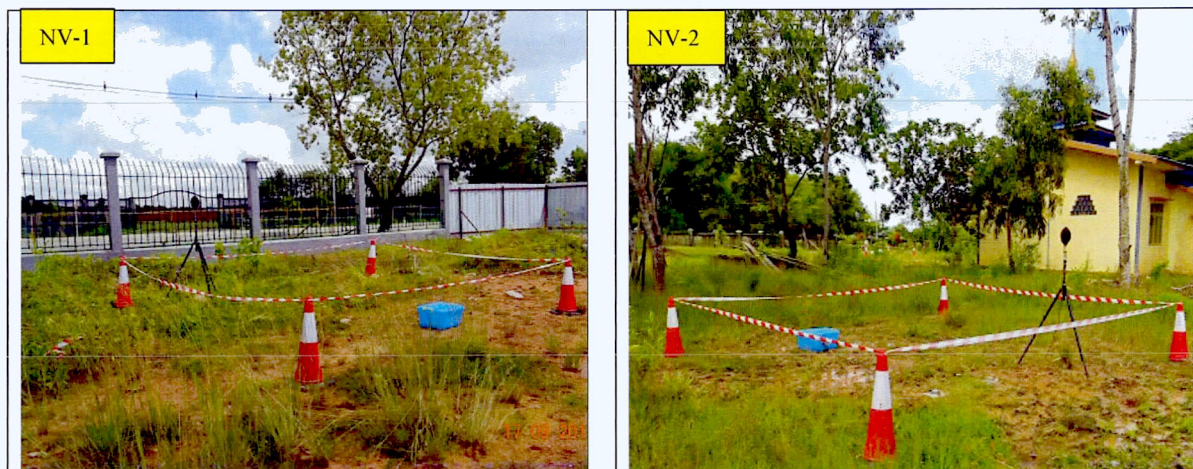
NV-2

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.



Source: Myanmar Koei International Ltd.

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 four hours. And there were no construction activities at that time. According to the field surveyor record, the result in early morning (2:00 AM to 6:00 AM) at NV-2 was exceeded the target value due to sound from crowing of rooster, crowing of birds, passing of motorcycles and motorcycles horn, etc. in surrounding village. 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) |
| 17 – 18 Sep 2019 | 65 | 54 |
| 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).

Source: Myanmar Koei International Ltd.

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) |
| 16 – 17 Sep 2019 | 52 | 51 | 55 |
| 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).

Source: Myanmar Koei International Ltd.



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 |
|------------------|-------------|-------------------------|---------------------------------------|--------------------------------------|--|
| 17 - 18 Sep 2019 | 6:00-7:00 | 59 | 65 | 75 | No construction Activities |
| | 7:00-8:00 | 64 | | | |
| | 8:00-9:00 | 69 | | | Construction activities of Zone B (Wild grass removing and yellow flower planting, fence painting and repairing, manual excavation, etc.,) |
| | 9:00-10:00 | 65 | | | |
| | 10:00-11:00 | 69 | | | |
| | 11:00-12:00 | 68 | | | |
| | 12:00-13:00 | 62 | | | |
| | 13:00-14:00 | 63 | | | |
| | 14:00-15:00 | 64 | | | |
| | 15:00-16:00 | 65 | | | |
| | 16:00-17:00 | 63 | | | |
| | 17:00-18:00 | 65 | | | |
| | 18:00-19:00 | 60 | | | |
| | 19:00-20:00 | 59 | 54 | 70 | No construction Activities |
| | 20:00-21:00 | 59 | | | |
| | 21:00-22:00 | 54 | | | |
| | 22:00-23:00 | 56 | | | |
| | 23:00-24:00 | 54 | | | |
| | 24:00-1:00 | 55 | | | |
| | 1:00-2:00 | 50 | | | |
| | 2:00-3:00 | 54 | | | |
| | 3:00-4:00 | 52 | | | |
| | 4:00-5:00 | 55 | | | |
| | 5:00-6:00 | 53 | | | |

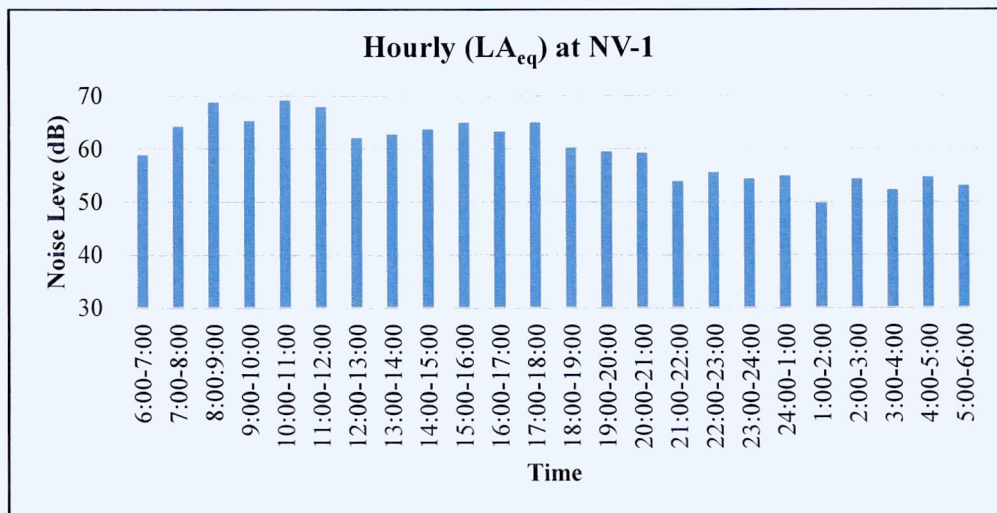
Source: Myanmar Koei International Ltd.

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 |
|------------------|-------------|-------------------------|---|---|--|
| 16 - 17 Sep 2019 | 7:00-8:00 | 50 | 52 | 75 | No construction Activities |
| | 8:00-9:00 | 50 | | | Construction activities of Zone B (Wild grass removing and yellow flower planting, fence painting and repairing, etc.,) |
| | 9:00-10:00 | 53 | | | |
| | 10:00-11:00 | 50 | | | |
| | 11:00-12:00 | 48 | | | |
| | 12:00-13:00 | 45 | | | |
| | 13:00-14:00 | 47 | | | |
| | 14:00-15:00 | 48 | | | |
| | 15:00-16:00 | 52 | | | |
| | 16:00-17:00 | 57 | | | |
| | 17:00-18:00 | 57 | | | |
| | 18:00-19:00 | 48 | | | |
| | 19:00-20:00 | 51 | 51 | 60 | No construction Activities |
| | 20:00-21:00 | 51 | | | |
| | 21:00-22:00 | 52 | | | |
| | 22:00-23:00 | 50 | | | |
| | 23:00-24:00 | 49 | 55 | 55 | |
| | 24:00-1:00 | 49 | | | |
| | 1:00-2:00 | 49 | | | |
| | 2:00-3:00 | 59 | | | |
| 3:00-4:00 | 56 | | | | |
| 4:00-5:00 | 56 | | | | |
| 5:00-6:00 | 57 | | | | |
| 6:00-7:00 | 50 | | | | |

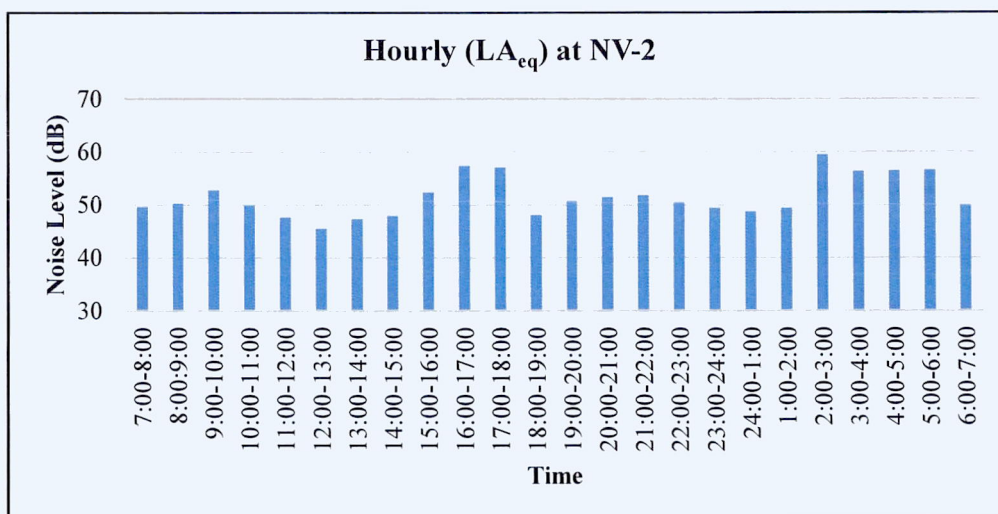
Source: Myanmar Koei International Ltd.





Source: Myanmar Koei International Ltd.

Figure 2.4-1 Results of Noise Levels (LA_{eq}) Monitoring at NV-1



Source: Myanmar Koei International Ltd.

Figure 2.4-2 Results of Noise Levels (LA_{eq}) 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) |
| 17 – 18 Sep 2019 | 45 | 37 | 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).

Source: Myanmar Koei International Ltd.

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) |
| 16 – 17 Sep 2019 | 33 | 30 | 16 |
| 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).

Source: Myanmar Koei International Ltd.

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 | | |
|------------------|-------------|-------------------------|---|---|---|----|----|
| 17 - 18 Sep 2019 | 7:00-8:00 | 41 | 45 | 70 | No construction Activities | | |
| | 8:00-9:00 | 50 | | | Construction activities of Zone B (Wild grass removing and yellow flower planting, fence painting and repairing, manual excavation, etc.,) | | |
| | 9:00-10:00 | 47 | | | | | |
| | 10:00-11:00 | 43 | | | | | |
| | 11:00-12:00 | 47 | | | | | |
| | 12:00-13:00 | 41 | | | | | |
| | 13:00-14:00 | 42 | | | | | |
| | 14:00-15:00 | 43 | | | | | |
| | 15:00-16:00 | 43 | | | | | |
| | 16:00-17:00 | 43 | | | | | |
| | 17:00-18:00 | 43 | | | | | |
| | 18:00-19:00 | 40 | 37 | 70 | No construction Activities | | |
| | 19:00-20:00 | 38 | | | | | |
| | 20:00-21:00 | 38 | | | | | |
| | 21:00-22:00 | 29 | | | | | |
| | 22:00-23:00 | 30 | | | | 31 | 65 |
| | 23:00-24:00 | 32 | | | | | |
| | 24:00-1:00 | 26 | | | | | |
| | 1:00-2:00 | 24 | | | | | |
| | 2:00-3:00 | 22 | | | | | |
| 3:00-4:00 | 26 | | | | | | |
| 4:00-5:00 | 29 | | | | | | |
| 5:00-6:00 | 26 | | | | | | |
| 6:00-7:00 | 38 | | | | | | |

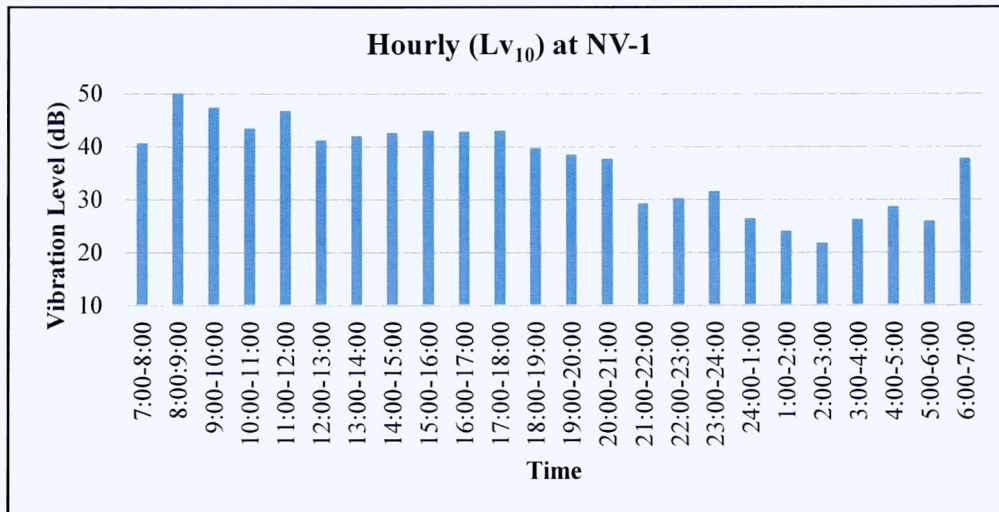
Source: Myanmar Koei International Ltd.

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 |
|------------------|-------------|-------------------------|---|---|--|
| 16 - 17 Sep 2019 | 7:00-8:00 | 18 | 33 | 65 | No construction Activities |
| | 8:00-9:00 | 30 | | | Construction activities of Zone B (Wild grass removing and yellow flower planting, fence painting and repairing, etc.,) |
| | 9:00-10:00 | 33 | | | |
| | 10:00-11:00 | 34 | | | |
| | 11:00-12:00 | 32 | | | |
| | 12:00-13:00 | 29 | | | |
| | 13:00-14:00 | 33 | | | |
| | 14:00-15:00 | 33 | | | |
| | 15:00-16:00 | 34 | | | |
| | 16:00-17:00 | 34 | | | |
| | 17:00-18:00 | 33 | 30 | 65 | No construction Activities |
| | 18:00-19:00 | 35 | | | |
| | 19:00-20:00 | 33 | | | |
| | 20:00-21:00 | 31 | | | |
| | 21:00-22:00 | 22 | 16 | 60 | |
| | 22:00-23:00 | 15 | | | |
| | 23:00-24:00 | 16 | | | |
| | 24:00-1:00 | 15 | | | |
| | 1:00-2:00 | 15 | | | |
| | 2:00-3:00 | 15 | | | |
| | 3:00-4:00 | 14 | | | |
| | 4:00-5:00 | 15 | | | |
| | 5:00-6:00 | 18 | | | |
| | 6:00-7:00 | 18 | | | |

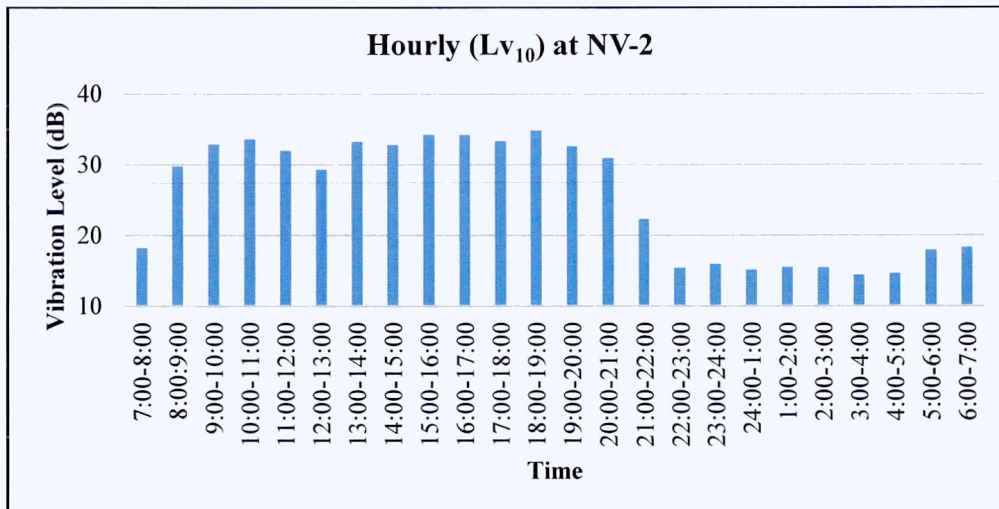
Source: Myanmar Koei International Ltd.





Source: Myanmar Koei International Ltd.

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



Source: Myanmar Koei International Ltd.

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. However, hourly noise level monitoring results at NV-2 during night time was slightly higher than the target value for four hours. And there were no construction activities at that time. According to the field surveyor record, the result in early morning (2:00 AM to 6:00 AM) at NV-2 was exceeded the target value due to sound from crowing of rooster, crowing of birds, passing of motorcycles and motorcycles horn, etc. in surrounding village. 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 3**

Appendix

**Traffic Volume Monitoring Report
September 2019**

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

(QUARTERLY MONITORING)

September 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 17 September 2019 to 18 September 2019 as follows;

Table 1.2-1 Outlines of Traffic Volume Monitoring

| Monitoring Date | Monitoring Item | Parameters | Number of Points | Duration | Monitoring Methodology |
|------------------------------|-----------------|------------|------------------|----------|------------------------|
| 17 Sep 2019 - 18 Sep 2019 | Traffic Volume | - | 1 (TV-1) | 24 hours | Manual Count |

Source: Myanmar Koei International Ltd.

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) |

Source: Myanmar Koei International Ltd.

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 |

Source: Myanmar Koei International Ltd.

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.



Source: Myanmar Koei International Ltd.

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 three 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 | 17 Sep 2019 - 18 Sep 2019 | Tuesday & Wednesday | 2,908 | 1,364 | 438 | 63 | 4,773 |
| | Dagon-Thilawa road to Phalan village | | | 2,911 | 1,280 | 422 | 48 | 4,661 |

Source: Myanmar Koei International Ltd.

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. In the evening peak hours, traffic volume from Phalan village to Dagon-Thilawa road is higher than another direction. It may be possible commuting vehicles are passing from Dagon-Thilawa road to Phalan village in the morning peak hours and returning from Phalan village to Dagon-Thilawa road 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 | |
| 13:00 | 14:00 | 86 | 87 | 31 | 4 | 208 |
| 14:00 | 15:00 | 80 | 85 | 34 | 3 | 202 |
| 15:00 | 16:00 | 100 | 111 | 26 | 4 | 241 |
| 16:00 | 17:00 | 190 | 112 | 49 | 7 | 358 |
| 17:00 | 18:00 | 410 | 154 | 30 | 6 | 600 |
| 18:00 | 19:00 | 215 | 92 | 20 | 3 | 330 |
| 19:00 | 20:00 | 140 | 70 | 14 | 2 | 226 |
| 20:00 | 21:00 | 92 | 32 | 15 | 3 | 142 |
| 21:00 | 22:00 | 69 | 25 | 11 | 1 | 106 |
| 22:00 | 23:00 | 30 | 4 | 4 | 1 | 39 |
| 23:00 | 0:00 | 6 | 5 | 3 | 1 | 15 |
| 0:00 | 1:00 | 3 | 4 | 6 | 0 | 13 |
| 1:00 | 2:00 | 2 | 3 | 2 | 0 | 7 |
| 2:00 | 3:00 | 5 | 1 | 2 | 0 | 8 |
| 3:00 | 4:00 | 6 | 2 | 1 | 0 | 9 |
| 4:00 | 5:00 | 6 | 0 | 6 | 0 | 12 |
| 5:00 | 6:00 | 14 | 5 | 0 | 0 | 19 |
| 6:00 | 7:00 | 230 | 61 | 9 | 2 | 302 |
| 7:00 | 8:00 | 535 | 82 | 17 | 4 | 638 |
| 8:00 | 9:00 | 220 | 88 | 26 | 9 | 343 |
| 9:00 | 10:00 | 115 | 79 | 30 | 4 | 228 |
| 10:00 | 11:00 | 120 | 90 | 52 | 2 | 264 |
| 11:00 | 12:00 | 145 | 98 | 36 | 6 | 285 |
| 12:00 | 13:00 | 89 | 74 | 14 | 1 | 178 |
| Total | | 2908 | 1364 | 438 | 63 | 4773 |

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 | |
| 13:00 | 14:00 | 143 | 110 | 32 | 6 | 291 |
| 14:00 | 15:00 | 105 | 83 | 33 | 2 | 223 |
| 15:00 | 16:00 | 110 | 82 | 46 | 5 | 243 |
| 16:00 | 17:00 | 160 | 64 | 43 | 5 | 272 |
| 17:00 | 18:00 | 405 | 98 | 35 | 7 | 545 |
| 18:00 | 19:00 | 195 | 66 | 19 | 0 | 280 |
| 19:00 | 20:00 | 160 | 40 | 19 | 0 | 219 |
| 20:00 | 21:00 | 112 | 46 | 4 | 3 | 165 |
| 21:00 | 22:00 | 58 | 21 | 8 | 1 | 88 |
| 22:00 | 23:00 | 15 | 4 | 4 | 1 | 24 |
| 23:00 | 0:00 | 17 | 4 | 7 | 0 | 28 |
| 0:00 | 1:00 | 0 | 3 | 2 | 0 | 5 |
| 1:00 | 2:00 | 4 | 1 | 2 | 0 | 7 |
| 2:00 | 3:00 | 4 | 1 | 1 | 0 | 6 |
| 3:00 | 4:00 | 6 | 2 | 4 | 0 | 12 |
| 4:00 | 5:00 | 6 | 5 | 4 | 0 | 15 |
| 5:00 | 6:00 | 14 | 3 | 0 | 0 | 17 |
| 6:00 | 7:00 | 155 | 20 | 2 | 2 | 179 |
| 7:00 | 8:00 | 610 | 153 | 23 | 5 | 791 |
| 8:00 | 9:00 | 250 | 162 | 37 | 6 | 455 |
| 9:00 | 10:00 | 75 | 67 | 19 | 1 | 162 |
| 10:00 | 11:00 | 94 | 88 | 19 | 2 | 203 |
| 11:00 | 12:00 | 125 | 99 | 40 | 2 | 266 |
| 12:00 | 13:00 | 88 | 58 | 19 | 0 | 165 |
| Total | | 2911 | 1280 | 422 | 48 | 4661 |

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 September 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 |
| | | 17 Sep – 18 Sep 2019 | Tuesday & Wednesday | 2,908 | 1,364 | 438 | 63 | 4,773 |

Source: Myanmar Koei International Ltd.



**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 |
| | | 17 Sep – 18 Sep 2019 | Tuesday & Wednesday | 2,911 | 1,280 | 422 | 48 | 4,661 |

Source: Myanmar Koei International Ltd.

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 three 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 September 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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