# Environmental Monitoring Report

Project Number: 51077-003
Quarterly Report (January to March 2023)
June 2023

# Maldives: Greater Male Waste-to-Energy Project

Prepared by the Ministry of Environment, Climate Change and Technology for the Ministry of Finance for the Asian Development Bank.

## CURRENCY EQUIVALENTS
(As of 1 January 2023)

| Currency unit | – | Equivalent |
|---|---|---|
| 1 MVR | = | $ 0.06485 |
| $1.00 | = | MVR15.42 |

## ABBREVIATIONS

| | | |
|---|---|---|
| ADB | – | Asian Development Bank |
| CVRA | – | Climate Vulnerability and Risk Assessment |
| DBO | – | design-build-operate |
| EA | – | executing agency |
| EIA | – | environmental impact assessment |
| EMP | – | environmental management plan |
| EPA | – | Environmental Protection Agency |
| ER | – | employer's representative |
| IA | – | implementing agency |
| IEE | – | initial environmental examination |
| MoECCT | – | Ministry of Environment, Climate Change and Technology |
| MoF | – | Ministry of Finance |
| MTCC | – | Maldives Transport and Contracting Company |
| PMDCSC | – | project management, design and construction supervision consultant |
| PMU | – | project management unit |
| WAMCO | – | Waste Management Corporation Limited |
| WTE | – | waste-to-energy |

## WEIGHTS AND MEASURES

| | |
|---|---|
| °C | degree Celsius |
| dB | decibel |
| tpd | tons per day |
| cm | centimetre |
| km | kilometre |
| kg | kilogram |
| MW | megawatt |
| kW | kilowatt |
| µg/L | microgram per litre |
| µg/$m^3$ | microgram per cubic metre |

## NOTE{S}
In this report, "$" refers to United States dollars.

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# I. INTRODUCTION

## A. Greater Male Waste-to-Energy Project

1. The project will establish a sustainable regional solid waste treatment system in the Greater Malé capital region by (i) developing treatment (proven waste-to-energy [WTE] technology), recycling and disposal infrastructure; (ii) strengthening institutional capacities for sustainable solid waste services delivery and environmental monitoring; and (iii) improving public awareness on WTE and reduce-reuse-recycle (3Rs).

2. The project will be designed to reduce disaster risk and improve climate change resilience while creating a cleaner environment and reducing greenhouse gas (GHG) emissions.

3. The Greater Malé capital region and its outer islands (see Figure 1 for the project implementation area) suffer from severe environmental pollution and deteriorating livability because of inadequate collection and haphazard disposal of solid waste. The project area covers 32 inhabited islands in the North Ari Atoll (AlifuAlifu Atoll), South Atoll (AlifuDhaalu Atoll), Malé' Atoll (Kaafu Atoll) and Vaavu Atoll, including the capital city of Malé, with a total population of 295,000 (53% of Maldives) as stated by the National Bureau of Statistics (2018), Maldives Population Projections 2014-2054.

4. Lack of a sustainable system to manage the 836 tons per day (tpd) of solid waste (Feasibility Study, 2018) generated in the project area resulted in waste spillage into the ocean, and open dumping and burning of garbage at the 30-year-old, 10-hectare dumpsite on Thilafushi Island which has no pollution control measures, creating a public health and environmental hazard. Plumes of smoke visible from the capital Malé, the international airport and nearby resorts compromise air quality and pose nuisance to residents and tourists, while leachate and plastics contaminate the surrounding marine environment. This poses a critical threat to tourism and fisheries, both of which rely heavily on the country's pristine environment and are cornerstones to Maldives' economy.

## B. Project Outcome and Outputs

5. The project will have two outputs and Table 1 presents the subprojects and/or packages:

**Output 1**: Disaster- and climate-resilient regional waste management facility developed. This will include (i) a 500 tpd WTE plant with 15-year operations& maintenance (O&M) contract, including two treatment lines of 250 tpd each, energy recovery and air pollution control (APC) system; and (ii) a landfill for safe disposal of APC residues and non-marketable bottom ashes. The facility is expected to export 10.5 megawatt (MW) of electricity to the grid and will be designed to accommodate a third 250 tpd treatment line, required to respond to further demand increase. All facilities will adopt disaster- and climate-resilient features such as raised floor elevations, flood-proof mechanical and electrical equipment and landfill cells, and enhanced drainage systems.

**Output 2**: Institutional capacity in sustainable solid waste management (SWM) services delivery (WTE) and environmental monitoring strengthened, and public awareness on WTE and 3Rs improved. This will include (i) capacity building support in monitoring sustainable WTE operations, including the Ministry of Environment, Climate Change and Technology (MoECCT) and the Environmental Protection Agency (EPA) institutional capacity strengthening and training to monitor WTE O&M and environmental standards; (ii) public awareness on WTE and

3Rs in Greater Malé improved; and (iii) project management and supervision consultant support provided.

**Table 1: Subprojects/Packages**

| No. | Subproject / package | Type of contract |
|---|---|---|
| 1 | WTEplant and auxiliary facilities of plant with 15 years O&M contract | Design-Build-Operate (DBO) |
| 2 | Project management and supervision | Consulting services contract |
| 3 | Community awareness consultant | Consulting services contract |
| 4 | Individual Environmental Monitor | Consulting services contract |
| 5 | Joint Crediting Mechanism Auditor | Consulting services contract |

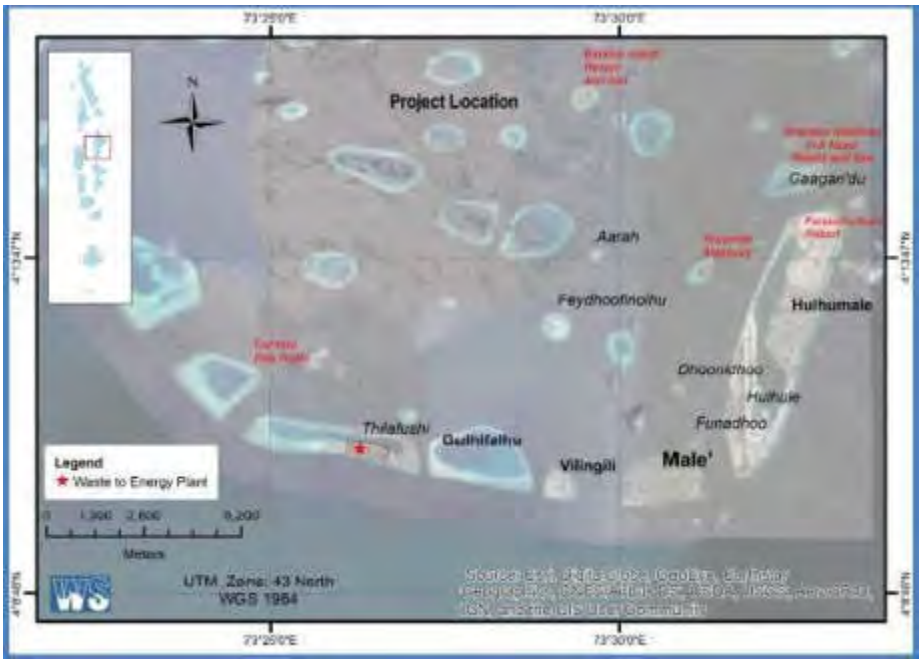
## C. Environmental Category

6. The project is classified as environmental category A according to Safeguard Policy Statement (SPS) 2009 of the Asian development Bank (ADB) due to construction and operation of a large WTE facility which may have potential significant adverse impacts. This project is classified as a Schedule D project by the EPA, Republic of Maldives based on the Regulation on the Preparation of Environmental Impact Assessment (EIA) Report (2012/R-27). The Approval/Decision Statement for this project has been received from the EPA on 21 January 2020 and extended until December 2021.

## D. About this Report

7. This is the quarterly environmental monitoring report (QEMR) prepared by the Project Management Unit (PMU), MoECCT for the monitoring period from1 January 2023 to 31 March 20232 (Q1-2023). This QEMR provides the status of project implementation, presents the preparation and implementation of environmental management, details of mitigation and monitoring actions, and status reports of compliance with the environmental management plan (EMP) and ADB loan covenants. This report covers the contract packages implemented under this project.

**Figure 1: Project Implementation Area**




## II. PROJECT IMPLEMENTATION ARRANGEMENTS

### A. Project and Safeguards Implementation Arrangements

8. The project's executing agency (EA) is the Ministry of Finance (MoF), while the implementing agency (IA) is the MoECCT. The PMU at the MoECCT will assist in: (i) project management; and (ii) function as project implementation unit to assist in day-to-day project implementation and operation of water supply, water resource management, and capacity building components.

9. A project steering committee (PSC), with membership comprising of officials from relevant ministries, representatives from other relevant institutions/agencies, provides overall policy and strategic guidance to the Project and ensures collaboration among central level agencies. The PSC is Chaired by the Minister, MoECCT (or a senior official designated by the Minister), and representative from MOF, Ministry of National Planning and Infrastructure, Ministry of Housing and Urban Development, Waste Management Corporation Limited (WAMCO), Ministry of Tourism, Ministry of Health, Ministry of Gender, Family and Social Services, Local Government Authority, Environmental Protection Agency, State Electric Company Limited (STELCO), and the Malé City Council.

10. MoECCT, through the PMU, is responsible for ensuring the project's compliance with the ADB loan covenants. Headed by the Project Director, the PMU is responsible for the day-to-day implementation of the project. The PMU is staffed with technical, financial, safeguards, capacity building/governance and procurement officers to manage all technical, procurement, safeguards, and loan account administration. The PMU's key technical and managerial staff are supported by the Project Management Design and Construction Supervision Consultant (PMDCSC).

11. PMU is responsible for the implementation of this project in compliance with ADB's SPS 2009 and the applicable government rules and regulations. PMU, through a Safeguards Specialist, oversees the implementation and monitoring of environmental safeguards and will be responsible for implementation, monitoring, reporting and compliance with safeguards related ADB loan covenants. PMU is supported by various experts, and the details of consultants, DBO contractor and monitoring experts involved in the contract are given below:

(i) Consultants for implementation and monitoring**.** PMU is assisted by the Environmental Officers of PMDCSC in environmental safeguards.

(ii) DBO Contractor**.** The WTE plant will be designed, constructed, operated, and maintained by a single contractor using the DBO contract. The O&M period under the DBO Contract will be 15 years. The DBO Contractor is responsible for the implementation of the EMP at all stages of the project. The DBO Contractor includes a full-time Environmental Specialist with extensive experience.

(iii) External monitoring**.** As required by SPS 2009 for a category A project, an Independent External Monitor (IEM), an environmental expert has been contracted for this project to verify its monitoring information and reports directly to ADB. The IEM shall not be involved in the day-to-day project implementation or supervision of the project but will closely coordinate his/her site visits and work with the PMU.

## B. Status of mobilization of staff resources

12. **Current status**. Table 2 shows the environmental safeguards staff engaged at all levels in the project including project agencies, consultants, contractors, and monitoring personnel. As of the end of this reporting period, only the PMU Safeguards Specialist has been mobilized.

**Table 2: Environmental Safeguards Team**

| No | Positions | Name of the expert/staff | Contact Number & Email | If not mobilized yet, indicate reason and likely date of mobilization |
|---|---|---|---|---|
| A | **PMU** | | | |
| 1 | Social and Environmental Safeguards Specialist | Ibrahim Mohamed | +9609811114 ibrahim.mohamed@environment.gov.mv | Appointed on 28 May2022 |
| B | **PMDCSC (Fichtner GmbH & Co. KG together with Renewable Energy Maldives)** | | | |
| 1 | Team Leader | Javier Varon | +34608147897 Javier.varon@fichtner.es | Appointed on 04 November 2022, replaced Arthur Dietrich |
| 2 | Project Manager | Maximilian Schrade | +601112201489 Maximilian.schrade@fichtner.de | Appointed on 27 February 2022 |
| 1 | Environmental Officer (local) | Ahmed Aslam | +9607957003 aslam-11@hotmail.com | Appointed on 19 July 2022 |
| 2 | Environmental Consultant (international) | Sunil Chandra Gupta | +91- 9759955477, 9412230242 heenagrawal1@yahoo.co.uk | Appointed on 28 May 2022 |
| C | **DBO Contractor (Urbaser and Sub-Contractor, Alke-Alkatas JV)** | | | |
| 1 | Project Manager, URBASER (DBO contractor) | Javier Gamero Sutil | +34914122000 / +34 914122907 jgamero@urbaser.com | Appointed |
| 2 | Contractor's Engineers (Project Manager) | Raymond Lee | +6590057789 rlee@ramboll.com | Ramboll as a company has been contracted on 15th March 2022 |
| 2 | Environmental Manager | Ta Hoa Binh | +84919511166 binh@aawte.com | Appointed on 11 November 2022 and replaced Mr. Sujith who left the site by end of September 2022 but provided support remotely until end of October 2022 via provisional arrangements with construction manager. |
| 3 | HSE manager | Dhamothara Kannan | +9609188331 dhamu@aawte.com | Joined facility from 01.04.2022 |
| 4 | Environmental Consultant (local) | Dr. Mahmood Riyaz | +9607890307 mahmood.riyaz@gmail.com | Joined facility from 06.03.2022 |
| D | **Independent External Monitor** | | | |
| 1 | Independent environmental monitoring expert | Nicholas Skinner | nick.skinner@vistaenvironment.com 0046736504583 | Appointed on 19 December 2021 |

## III. PROJECT IMPLEMENTATION STATUS

### A. Status of Bidding and Contract Award

13. The project has five contract packages. Details of contract packages are given in Table 3.

**Table 3: Status of Contract Packages**

| No. | Package Number/Name | Project components | Status | Name of contractor | Duration of contract | Contract start date |
|---|---|---|---|---|---|---|
| **1** | DBO a WTE plant in Thilafushi | WTE plant and balance of plant with 15 years O&M | Contract awarded | Urbaser SA | 18.5 years | 10 October 2021 |
| **2** | Project management, design and construction supervision | Project management, design and construction supervision | Contract awarded | Fichtner GmbH & Co. KG and Renewable Energy Maldives (REM) | 66 months | 30 January 2022 |
| **3** | Community Awareness consultant | Community Awareness consultant | Four consulting organizations have been shortlisted on the basis of EOI on March 6 2023 and preparation of RFP is in progress | - | - | Yet to be awarded bid evaluation process ongoing |
| **4** | Individual Environmental Monitor | Independent external monitor for environment category A project | Contract signed | Vista Environnent AB -Nicholas Skinner | 60 months | 19 December 2021 |
| **5** | Joint Crediting Mechanism (JCM) Auditor | To validate proposed JCM project and verify GHG emissions reduction | Not advertised yet | - | - | - |

## B. Implementation Status

14. Implementation status of awarded contract packages is presented in Table 4.

**Table 4: Implementation Status of Contract Packages**

| No. | Package | Progress during reporting period | Cumulative progress as of 31March 2023 | Components completed to date | List of main activities/works conducted during reporting period |
|---|---|---|---|---|---|
| **1** | WTE plant and balance of plant with 15 years O&M. | • Construction of temporary buildings such as dining hall, prayer room, accommodation building, laundry, etc. continues. However, Construction of one part of site temporary office has been completed and is in operation.<br>• Stripping of the Site by removing the vegetation of the Site is completed<br>• STP installation completed, awaiting URA approval. However, EIA Addendum for commissioning of STP was approved by EPA and the documents were sent to URA for approval on 23/02/2023.<br>• Permit from MNDF (Fire Approval Letter) has been obtained on 15/02/2023 for accommodations and offices at the camp site. | • Permitting design revision<br>• Geotechnical investigation of site completed and awaiting final report<br>• Additional baseline data gathering, environmental monitoring, and environmental impact assessment (EIA) updating ongoing<br>• Site temporary fencing completed, except for area near the landfill due to safety reasons.<br>• Construction of one part of site temporary office has been completed and is in operation.<br>• Installation of STP completed. | • CEMP and CEMP guide have been completed and given conditional approval by the PMU. The final approval is subjected to development of various plans and SOPs as part of EMS (to be aligned with ISO 14001 and ISO 45001) related to construction phase as mentioned in CEMP such as:<br>✓ *Waste Management plan.*<br>✓ *Environment Impact & Aspect Register & Obligations Register.*<br>✓ *Stakeholder Engagement Plan.*<br>✓ *Environmental Social Management Plan (ESMP).*<br>✓ *Environmental Social Action Plan (ESAP).*<br>✓ *Spill Control & Containment Plan.*<br>✓ *Chemicals & Hazardous Material* | • Permitting Design review has been ongoing, design review meeting took place early March 2023<br>• Geotechnical report has been submitted and reviewed. Final report is awaited and expected in the next Reporting Period.<br>• Updated EIA is yet to be finalized as impacts are to be assessed due to increase in power generation capacity from 10 MW (as per EIA report (July 2020) to 13 MW (as per contract)<br>• Site mobilization activities such as set up of labor camp, fencing, project site office establishment have been partially completed<br>• Site security is maintained with security posts on access points<br>• Site signages and sign boards erected |

| No. | Package | Progress during reporting period | Cumulative progress as of 31March 2023 | Components completed to date | List of main activities/works conducted during reporting period |
|---|---|---|---|---|---|
| | | • Necessary document have been submitted to obtain cable suppliers approval from URA, to HDC to get partial construction permit for building piling works and to get approval for operation of STP<br>• Monitoring of ambient air quality and noise level on monthly and ground water and marine water quality on quarterly basis (February 2023)<br>• Draft updated EIA report has been submitted but yet to be finalized.<br>• Most of draft HSE documents as mentioned in conditionally approved CEMP have been submitted but yet to be finalized | | *Management Plan.*<br>✓ *Public Health, Safety, and Security Plan.*<br>✓ *Traffic Management Plan.*<br>✓ *Security Management Plan.*<br>✓ *SOP for GRM.*<br>✓ *Emergency Response Plan (ERP).*<br>✓ *ERP and Site Procedure Manual.*<br>✓ *Training program documents: Driving awareness on requirements of ADB's SPS, hazards associated with various activities during construction and SOPs to ensure health and safety of workers and community* | |
| 2 | Project management, design and construction supervision | • Review of Permitting Design<br>• On-site meetings with DBO Contractor, stakeholders end of February/early March | • Key experts and team members confirmed on 7 July 2022<br>• Reviewing of all submissions by the Contractor as per ERQ Table 5-16<br>• Provision of trainings | Review of time schedule, concept design, permitting design, CEMP, CEMP Guide, Pre-Construction Environmental Monitoring Plan, Standard Operating Procedures | • Site visits undertaken and accompanied by the PMU<br>• On-site meeting with DBO Contractor, stakeholders end of February/early March<br>• Training workshop was conducted at |

| No. | Package | Progress during reporting period | Cumulative progress as of 31March 2023 | Components completed to date | List of main activities/works conducted during reporting period |
|---|---|---|---|---|---|
| | | • HSE Training workshop was conducted at project site from 7 to 9 March 2023 by PMDCSC for staff of EPC and DBO contractor to upgrade the understanding on technical and administrative requirements to comply with contractual obligations on HSE aspects and to facilitate the process of preparation of various HSE documents as mentioned in EIA report, H&S Plan and CEMP | • Regular monthly progress meetings and technical meetings<br>• Regular Site inspections, refer to Monthly Reports issued by the PMDCSC for witnessing contractors environmental monitoring and management of HSE aspects during pre-construction activity. | (SOPs) and GRM plan. | project site from 7 to 9 March 2023 by PMDCSC for staff of EPC and DBO contractor to upgrade the understanding on technical and administrative requirements to comply with contractual obligations on HSE aspects and to facilitate the process of preparation of various HSE documents as mentioned in EIA report, H&S Plan and CEMP |
| 3 | Community Awareness consultant | Four consulting organizations have been shortlisted on the basis of EOI on March 6 2023 and preparation of RFP is in progress | Four consulting organizations have been shortlisted on the basis of EOI on March 6 2023 and preparation of RFP is in progress | Four consulting organizations have been shortlisted on the basis of EOI on March 6 2023 | Four consulting organizations have been shortlisted on the basis of EOI on March 6 2023 |
| 4 | Individual Environmental Monitor | Visited project site on 21 and 22 March 2023 | • Contract signed<br>• Visited project site on 21 and 22 March 2023 | • Contract signed<br>• Visited project site on 21 and 22 March 2023 | • Contract signed<br>• Visited project site on 21 and 22 March 2023 |

15. During this reporting period, the DBO Contractor along with the PMDCSC have reviewed the Permitting Design as per ERQ table 5-16. The DBO Contractor is further developing their design for permitting and, in parallel, working on detail design.

## IV. COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS

### A. Status of Clearances

16. Details of clearances, permit and approvals required for the implementation of the subprojects/packages, status, and further actions required for compliance are presented in Table 5.

**Table 5: Status of Statutory Clearances**

| Clearance/Permit Required | Status | Further Actions/Remarks |
|---|---|---|
| **DBO Contract** | | |
| Environmental Clearance from EPA | Decision Statement (DS) obtained on 21January 2020 and extended until 31 December 2021 | • There is no need to apply or renew for the construction phase as site clearance and levelling works started on 28th December 2021 by the contractor and has been informed to EPA. As site works already started no renewal of permit required from EPA. Site works under taken after levelling involved securing of required Government permits, boundary fencing, setting up of project site office.<br>• EIA Addendum for commissioning of STP has been approved by EPA and the documents were sent to URA for approval on 23/02/2023.<br>• Monitoring program outlined in the EIA are being implemented during pre-construction phase and summary of environmental monitoring reports will be submitted to MoECCT as outlined in paragraph 8 of the Decision Statement. Failure to submit may result in the suspension or revocation of the permit.<br>• Once the pre-construction activities have started, the EPA was informed of the date of commencement of pre- construction activities. |
| Dewatering Permit | Required during the construction when excavation is undertaken and will be sought during the construction stage expected to begin in last week of May or first week of June 2023, subject to approvals and procedures in place. Application will be submitted in May 2023. Details will be included in next QEMR | Will be required before construction and must be obtained from the Maldives Utility Regulatory Authority (URA).<br>Dewatering is required for laying foundation which will take place after the piling works |

| Clearance/Permit Required | Status | Further Actions/Remarks |
|---|---|---|
| Sewerage and wastewater treatment permit from the Utility Regulatory Agency (URA). | For discharging treated grey water or black water to sea or ground permit is required | EIA Addendum was approved by EPA and the documents were sent to URA for approval on 23/02/2023. Approval from URA is awaited. |
| Desalination plant registration and License to operate a desalination plant from the URA | Will be required during the operation stage | For the desalination plant to be registered, it is required to submit the EIA Decision Note for this EIA report and completed application forms with all details of the plant to be registered. A copy of the relevant section of this EIA may be appended to the forms as justification for the desalination plant. |
| Permit/Consent to Construct | Will be required before construction | • Permit for fencing was obtained in June 2022.<br>• Permit from MNDF (Fire Approval Letter) has been obtained on 15/02/2023 for accommodations and offices at the camp site.<br>• Road Excavation Permit from HDC has been obtained on 20/02/2023 for WWTP discharge construction.<br>• Road Closing Permit from HDC has been obtained on 19/02/2023 for WWTP discharge construction.<br>• An application for the construction permits from the landowner of the Thilafushi Housing Development Corporation Ltd (HDC) will be applied prior to beginning of construction.<br>• All permits will be provided in the next QEMR |
| Fire Safety | Will be required once site is ready for construction | • No objection from the Maldives National Defense Force (MNDF) is required prior to the installation of any firefighting systems such as fire hydrants. This permit will be obtained prior to operation of the plant.<br>• Permit from MNDF (Fire Approval Letter) has been obtained on 15/02/2023 for accommodations and offices at the camp site. |

## V. COMPLIANCE STATUS WITH ENVIRONMENTAL REQUIREMENTS

### A. Compliance with Loan Covenants

17. The status of compliance with environmental safeguard related loan covenants is given in Table 6. All loan covenants are being complied with.

**Table 6: Status of Compliance with Loan Covenants**

| Loan Agreement | Covenant | Compliance Status | Proposed actions, if any |
|---|---|---|---|
| Schedule 4, paragraph 4<br><br>Environment | The Borrower, through the Project Executing Agency and the Implementing Agency, shall ensure that the preparation, design, construction, implementation, operation and decommissioning of the Project and all Project facilities comply with (a) all applicable laws and regulations of the Borrower relating to environment, health and safety (b) the Environmental Safeguards; and (c) all measures and requirements set forth in the EIA, the EMP, and any corrective or preventative actions set forth in a safeguards monitoring report. | Being complied. PMU is continuously monitoring to ensure that the Project activities should follow all applicable laws and regulations and the Safeguards Specialist of the PMU ensures that all measures and requirements set forth in the EIA and EMP are complied. | |
| Schedule 4, paragraph 6<br><br>Human and Financial Resources to Implement Safeguards Requirements | The borrower shall make available necessary budgetary and human resources to fully implement the EMPs. | Being complied as Social and Environmental Safeguard Specialist and PMDCSC (Fichtner together with REM) are assisting PMU in monitoring and in reviewing of documents and approval process. | |
| Schedule 4, paragraph 7<br><br>Safeguards-Related Provisions in Bidding Documents and Works Contracts | The Borrower through the Project Executing Agency and the Implementing Agency, shall ensure that all bidding documents and contracts for Works contain provisions that require the contractors to:<br><br>(a) comply with the measures relevant to the contractor set forth in the EIA and the EMP, and any corrective or preventative actions set forth in a Safeguards Monitoring Report; | Complied. All bidding documents related to the project included the EIA and the EMP, and compliance have been ensured by the Safeguards Specialist, PMU. | Any updated version of the EIA will be provided to the Contractor. Contractor shall be required to comply with all relevant requirements in the updated EIA (including any new requirements not included in the draft EIA and/or any amended requirements from the draft EIA) |

| Loan Agreement | Covenant | Compliance Status | Proposed actions, if any |
|---|---|---|---|
| | (b) make available a budget for all such environmental measures; and,<br><br>(c) provide the Borrower with a written notice of any unanticipated environmental, resettlement or indigenous peoples risks or impacts that arise during construction, implementation or operation of the Project that were not considered in the EIA and the EMP. | | |
| Schedule 4, paragraph 8<br><br>Safeguards Monitoring and Reporting | The Borrower, through the Project Executing Agency and the Implementing Agency, shall do the following:<br><br>(a) submit quarterly Safeguards Monitoring Reports to ADB during construction of the project facilities and semi- annual Safeguards Monitoring Reports thereafter, and disclose relevant information from such reports to affected persons promptly upon submission;<br><br>(b) if any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the Project that were not considered in the EIA and the EMP, promptly inform ADB of this occurrence of each risks or impacts, with detailed description of the event and proposed corrective action plan;<br><br>(c) no later than 3 months after the Effective Date, engage qualified and experienced external experts or qualified NGOs under a selection process and terms of reference acceptable to ADB, to verify information produced through the project monitoring process and facilitate the carrying out of any verification activities by such external experts; and,<br><br>(d) report any actual or potential breach of compliance with the measures and requirements set forth in the EMP promptly after becoming aware of the breach. | Being complied. Environmental monitoring reports are submitted to ADB accordingly and the Independent External Monitor has been engaged on 19 December 2021 to verify the monitoring information of the project. Any breach or potential breach will be reported. | |

## B. Status of Environmental Assessment, Reports, and Approval

18. The EIA has been cleared by ADB and disclosed in their website in July 2020 as complying with the requirements of SPS 2009. The EIA disclosed in July 2020 is now being updated by the DBO Contractor considering the approved concept design and will be submitted to ADB through the PMU for review, clearance, and disclosure to their website prior to the start of construction which is currently expected to begin in the last week of May or first week of June 2023, subject to approvals and procedures in place. The DBO Contractor has begun the additional environmental baseline data gathering for the EIA updating in July 2022 and was witnessed by both the PMU and the PMDCSC environmental experts. The updated EIA during the concept design was submitted on 12 December 2022 and is now being reviewed by ADB. The final EIA update will be submitted during the detailed design phase (i.e., final updated EIA). Table 7 presents the status of the EIA reports.

**Table 7: Status of EIA Reports**

| No. | Package | Status | | Remarks |
|---|---|---|---|---|
| | | Concept Design | Detailed Design | |
| 1 | WTE plant | • DBO Contractor has updated the EIA disclosed in July 2020 considering the concept design approved on 28 October 2022. The updated EIA was submitted by the PMU to ADB for review on 12 December 2022.<br>• Additional comments including impacts of increased power generation capacity to 13 MW (as per contract) from 10 MW (as per approved EIA report (July 2020)) from employer were received in March 2023 on modified EIA report submitted in February 2023. | In the process | • Draft EIA disclosed in ADB website in December 2019<br>• Updated EIAs disclosed in ADB website in March 2020 and July 2020 providing explanatory notes for the updates.<br>• Technical details on the basis of conceptual design will be established for additional pollution discharge (air emission and wastewater including cooling water) due to increased power generation capacity to 13 MW (as per contract) from 10 MW (as per approved EIA report (July 2020). Accordingly, dispersion modeling and other modeling will be carried out, if envisaged.<br>• The updated EIA will be similarly disclosed after review by ADB.<br>• Also, final EIA update with air quality dispersion modeling, thermal plume modeling, and other appropriate updates will be done based on the detailed design of the DBO Contractor. |

19. The link for the EIA disclosed in July 2020 at the ADB website is https://www.adb.org/projects/documents/mld-51077-003-eia-2 while the link for the project website is https://www.environment.gov.mv/v2/en/download/10368. Aside from this, the DBO Contractor has been informed to disclose the EIA in their website and same is now in the process of disclosure. Once the EIA (July 2020) has been updated (based on the concept design and detailed design), reviewed, and cleared by the PMU and the ADB, it will be similarly disclosed in the websites of ADB, the project, and the Contractor.

## C. Safeguards in Bid Documents and Contracts

20. The EIA has been included in the bid documents as well as in the Works contract. Table 8 presents the specific EHS clauses in the Contract and the status of compliance.

**Table 8: Compliance to the EHS Clauses in the Contract**

| Items in the Contract | Description | Status |
|---|---|---|
| **5.11 Contractors EMP**: | | |
| 1. General | The Contractor shall prepare a Contractors Environmental Management Plan (CEMP) describing specific design features that will ensure environmental protection and setting out the working methods, management, and mitigation and monitoring measures that will be put in place, for each of the various construction activities, during the implementation of the Works.<br><br>The scope of the CEMP shall address all of the issues itemised in the project EMP contained with the Environmental Impact Assessment as listed in Appendix 3.2. The CEMP shall be consistent with the environmental management plan (EMP) in the EIA report of the project. The CEMP shall have the same level or stricter set of measures than those included in the EMP.<br><br>The CEMP shall consider ISO 14001 when detailing the environmental management system in place. | • CEMP, CEMP Guide, Pre-Construction Monitoring-Baseline Data Gathering Plan have been granted conditional approval on 07 December 2022 by the PMDCSC and subsequently by the PMU.<br>• Following are in process and yet to be approved:<br>1. Development of various plans as referred in CEMP.<br>2. Development of EMS including SOPs and Checklists for CEMP and H&S plan in alignment with ISO 14001 and ISO 45001 respectively. Documents will be reviewed by PMU through PMDSC. |
| 2. Environmental Manager and Officers | The Contractor shall appoint an Environmental Manager who shall be permanently based on the Site for the full duration of the Works from the date of the Contractor's mobilization until the commissioning of Works has been completed. In addition, the Contractor shall appoint at least one Environmental Officer for every shift during construction period that shall be trained accordingly. The Contractor shall ensure that no construction activities shall be without the Environmental Manager and/or one Environmental Officer on duty. | Following have been appointed on full time basis by contractor at site till the end of the contract period.:<br>1. *HSE Manager – one (Mr Senol Kircalli has started working on project from 15 March 2023 (from remote location) and joined project site on April1 2023)<br>2. Environment Manager- one<br>3. Environment officer- One |
| 3. Commitment | The Contractor shall ensure that his Project Manager, Environmental Manager, and all key personnel including but not limited to professional engineers, site supervisors and all persons responsible for directing work on the site are provided with appropriate training to ensure their understanding and compliance with the requirements of the CEMP. | • Ongoing and need more exhaustive training.<br>• Training workshop was conducted at project site from 7 to 9 March 2023 by PMDCSC for staff of EPC and DBO contractor to upgrade the understanding on |

| Items in the Contract | Description | Status |
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| | | technical and administrative requirements to comply with contractual obligations on HSE aspects and to facilitate the process of preparation of various HSE documents as mentioned in EIA report, H&S Plan and CEMP. |
| 4. Submission of CEMP | The CEMP shall be submitted to the Employer's Representative on the date indicated in sub-chapter 5.5 (Phasing Requirements) and no construction work shall be carried out on Site until the CEMP has been approved by the Employer's Representative.<br><br>If the Contractor fails to apply the CEMP or in any way fails to exercise due care of the natural environment, the Employer's Representative will arrange necessary measures to be implemented by others and to recover the cost from payments due to the Contractor.<br><br>This section of the specification shall prevail over any other section in the event of ambiguity or conflict in requirements for environmental protection or treatment of social issues. | CEMP, CEMP Guide, Pre-Construction Monitoring-Baseline Data Gathering Plan have been approved with conditions subject to the preparation and approval of the additional documents (please refer to Table 4 for the list of documents) by the PMDCSC on 07 December 2022 |
| 5. Equipment | The Contractor shall mobilize on-site the required field equipment for environmental monitoring as necessary to demonstrate compliance with the requirements of the CEMP.<br><br>All laboratory and test equipment shall comply with the relevant standards of the International Standards Organization (ISO). | It is being done via external agencies and laboratory in line with the method of statement given as Appendix of CEMP. |
| 6. Content of the CEMP | The CEMP shall, inter alia:<br><br>● Describe the features of the Contractor's design that will ensure environmental protection;<br>● Describe how the Contractor will address all the issues and recommendations of the project EMP;<br>● Identify the key environmental risks associated with all aspects the Contractor's construction activities, including:<br>○ dust emissions<br>○ emissions from equipment and vehicles<br>○ noise and vibration impact from construction traffic<br>○ risks from exploitation of sand, aggregates and rip rap materials<br>○ risks from spills/contamination of soil and groundwater<br>○ risks from soil handling<br>○ risks to surface water quality;<br><br>● Detail all site-specific measures that the Contractor will implement during construction to manage and mitigate the identified environmental risks;<br>● Describe the Contractor's procedures for | • All activities towards full compliance are ongoing:<br>a) CEMP, CEMP Guide, Pre-Construction Monitoring-Baseline Data Gathering Plan have been approved with conditions subject to the preparation and approval of the additional documents (please refer to Table 4 for the list of documents) by the PMDCSC on 07 December 2022<br>b) Standard Operating Procedures (SOPs) including checklists as part of the EMS to implement, monitor and review the CEMP are still under preparation.<br>c) Contractor's stakeholder grievance mechanism plan was submitted in October 2022 and PMDCSC made observations in form of CRS. Modified document is still awaited. |

| Items in the Contract | Description | Status |
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| | monitoring and reporting compliance with the CEMP;<br>● Detail the members of the Contractor's staff who will responsible for implementing the mitigation measures in the CEMP and monitoring compliance;<br><br>Describe the Contractor's stakeholder grievance mechanism for environmental matters. | |
| 7. Monitoring and Reporting | The CEMP shall be monitored on a monthly basis. The Contractor shall include a report on compliance with the CEMP in its Monthly progress reports.<br><br>a) Should any environmental incidents be observed or reported by the workers, this shall be reported to the Employer's Representative immediately. | • As per contract CEMP is applicable only during construction phase.<br>• Only Pre-construction environment monitoring is being carried out as per CEMP.<br>• However, at present during pre-construction activities, management system is in place but without documented plans and SOPs and need lot of improvements. Also, status of same is being audited by Contract engineer and PMDCSC on regular basis and findings are reported in monthly progress report by DBO contractor and HSE site inspection reports by PMDCSC. |
| **5.12 Health and Safety Plan:** | | |
| 1. General | The Contractor shall prepare a Health and Safety plan (H&S plan) describing all specific features that will ensure the health and safety of the Contractor's Personnel and Employer's Personnel on Site and persons who may visit the Site. The H&S plan shall be aligned with ISO 45001.<br><br>The plan will cover all types of construction activities during the implementation of the Works. The scope of the H&S plan shall address all of the issues itemised and committed in the National legal context with regard to:<br>● Labour<br>● Occupational and Community Health and Safety<br>and shall be aligned with international best practice standards. A H&S plan shall be in force at all times during the Contract. | • All activities towards full compliance (including improvement of quality of documents already prepared) are ongoing. Plan has been approved by PMDCSC and PMU, however:<br>a) The HSE Plan is being improved to ensure alignment with ISO 45001. Revised HSE Plan will be reviewed and approved by PMDSC and PMU.<br>b) Relevant standalone plans as mentioned in CEMP are yet to be approved.<br>c) Alignment of SOPs and Checklists with ISO 45001 for supervision, monitoring and review are yet to be submitted for approval. |
| 8. Health and Safety Manager and Officers | The Contractor shall appoint a Health and Safety Manager who shall be permanently based on the Site for the full duration of the Works from the date of the Contractor's mobilization until the commissioning of Works has been completed. In addition, the Contractor shall appoint at least one full time Health and Safety Officer (or equivalent) for every shift during the construction period and during the full duration of the Operation Service. | • Following have been appointed on full time basis by contractor at site till the end of contract period:<br>1. *HSE Manager – one (Mr Senol Kircalli has started working on project from 15 March 2023 (from remote |

| Items in the Contract | Description | Status |
|---|---|---|
| | The Contractor shall ensure that no construction activities or plant operation shall be without the Health and Safety Manager and/or one Health and Safety Officer on duty.<br><br>The Health and Safety Manager holds the power within the Contractor's organization to be able to suspend the Works if considered necessary in the event of health and safety non-conformities, and to allocate all resources, personnel and equipment required to take any corrective action considered necessary. | location) and joined project site on April1 2023)<br>2. H&S Manager- one<br>3. H&S officer- One<br>• A system is in place to make the role of the Health and Safety Manager visible but needs further improvements. |
| 9. Commitment | The Contractor shall ensure that all the personnel on site comply with the requirements of the approved H&S Plan.<br><br>The Contractor shall provide H&S training to the Contractor's Personnel and Employer's Personnel as necessary to ensure safe practices and compliance with the requirements of the H&S Plan. | At present during pre-construction activities, H&S plan is in place but without documented various plans and SOPs as referred in CEMP and need lot of improvements. Also, status of same is being audited by Contract engineer and PMDCSC on regular basis and findings are reported in monthly progress report by DBO contractor and HSE site inspection reports by PMDCSC. |
| 10. The H&S plan | The H&S plan shall detail all site-specific measures the Contractor shall implement during the construction period to identify, manage and reduce all risks to health and safety. The H&S Plan shall include measures to prevent accidents, arrangements for first aid and arrangements for emergency response. The plan shall be designed to ensure the protection of all Contractor's Personnel, the Employer's Personnel and all other persons who may visit the Site. The H&S Plan shall be consistent with the EIA report and applicable IFC EHS Guidelines.<br><br>The Health and Safety Plan shall include, but not be limited to, a description of how the Contractor will,<br><br>a) Carry out all its health and safety responsibilities as required under the applicable law;<br>b) Provide medical staff; first aid facilities and supplies; sick bay and means of emergency transfer to hospital facilities<br>c) Provide ongoing health and safety training for the Contractor's Personnel and Employer's Personnel;<br>d) Develop and manage all required health and safety monitoring and reporting procedures;<br>e) Manage all health and safety claims.<br><br>The H&S plan shall be submitted to the Employer's Representative on the date indicated in Section 5.6 (Contractor's documents) and no physical work shall be carried out until the H&S plan has been approved by the Employer's Representative. | • All activities towards full compliance (including improvement of quality of documents already prepared) are ongoing.<br>• HSE Plan has been approved by PMDCSC and PMU, however:<br>a) The HSE Plan is being improved to ensure alignment with ISO 45001. Revised HSE Plan will be reviewed and approved by PMDSC and PMU.<br>b) Relevant standalone plans as mentioned in CEMP are yet to be approved.<br>c) Alignment of SOPs and Checklists with ISO 45001 for supervision, monitoring and review are yet to be submitted for approval. |
| 11. Measures to be taken in event of | If the Contractor fails to apply the H&S plan or in any way fails to exercise due care, the Employer's | No need is envisaged to apply |

| Items in the Contract | Description | Status |
|---|---|---|
| H&S non-compliance | Representative will arrange necessary health and safety measures to be implemented by others and to recover the cost from payments due to the Contractor. | |
| 12. Reporting | The Contractor shall include a report on accidents on site, and health and safety compliance in its monthly progress reports.<br><br>Should any Health and Safety incidents be observed or reported by the workers, this shall be reported to the Employer's Representative immediately. | • Being complied.<br>• Two near miss incidents were reported as per details given below:<br>a) Sliding of dumped waste from adjacent waste dump site of WAMCO to project site on 11 Jan 2023<br>b) Security gate near quay wall north side was fell down on 6 March 2023 |
| **6.5 Health, Safety, Environmental and Social Requirements** | | |
| **6.5.1 Health and Safety on Site** | | |
| 1. Health and Safety on Site | The Contractor undertakes to comply, and to ensure its subcontractors comply, with the Health and Safety Plan (Operations).<br><br>The contents of the Health and Safety Plan (Operations) shall be as described in Chapter 6.4.10. | To be developed just before the completion of construction phase. |
| 2. H&S Manager | The Contractor shall appoint a Health & Safety Manager (the "H&S Manager") who shall be permanently based on the Site for the full duration of the Operation Service. The H&S Manager shall fulfil the role of Accident Prevention Officer under GCC sub clause 6.7 (Health and Safety) and shall also oversee medical personnel, first aid arrangements and supplies, sick bay and readiness to evacuate serious cases.<br><br>The H&S Manager shall have the authority within the Contractor's organization to be able to allocate such any resources, personnel and equipment as are required to correct H&S relating deficiencies.<br><br>During the shift cycles, the H&S Manager shall be represented by a suitably trained shift staff that shall be supervising all H&S related matters. | To be developed just before the completion of construction phase. |
| 3. Health and Safety ad Emergency Response Training | The Contractor shall provide health and safety training for each of the Contractor's Personnel (including the staff of its subcontractors) and shall keep records of such training.<br><br>The training activities shall be as specified in the approved Health and Safety Plan and approved Emergency Response Plan. They shall include (as applicable):<br><br>a) Induction training for all Contractor's Personnel;<br>b) Ongoing job-specific technical training;<br>c) Emergency response training; and<br>d) First aid training for designated first aid staff. | To be developed just before the completion of construction phase. |
| 4. Firefighting | The Contractor shall<br><br>a) Prepare and be able to implement a fire | To be designed and commissioned during the construction phase. |

| Items in the Contract | Description | Status |
|---|---|---|
| | response plan (which will form part of the Emergency Preparedness Plan);<br>b) Regularly inspect, test and maintain all firefighting installations and equipment;<br>c) Provide sufficient firefighting water according to the legal requirements; and<br>d) Train and inform periodically its staff, the Employer's dedicated staff and other authorities about the implemented firefighting measures and plans. | |
| **6.5.2 Contractor's Environmental Management Plan (Operations)** | | |
| 1. CEMP (Operations) | The Contractor shall update the Environmental Management Plan presented in the project Environmental Impact Assessment (EIA) in Appendix 3.2 in order to make it relevant to the Operation Service.<br><br>The Operation Service activities described in the CEMP shall follow the structure, norms, and standards defined in Chapter 5.1 and 6.1. and shall be consistent with and shall not relax conditions and requirements as per the EMP included in the EIA. | Not due yet. |
| 2. Environmental Manager | The Contractor shall appoint an Environmental Manager who shall be permanently based on the Site for the full duration of the Operation Service. The Environmental Manager shall fulfil the role defined under GCC sub clause 4.18 (Protection of the Environment) and in addition, be responsible for accident and illness response arrangements.<br><br>During the shift cycles, the Environmental Manager shall be represented by a suitably trained shift staff that shall be supervising all environmental related matters.<br><br>The roles Health and Safety Manager and Environmental Manager as well as the corresponding shift members (described in Chapter 6.5.1) may be vested in a single individual.<br><br>The Environmental Manager shall ensure that all key Contractor's personnel including but not limited to professional engineers, site supervisors and all persons responsible for directing work on the site are familiar with the CEMP and are required to adhere to its requirements. | To be complied after completion of construction. |
| 3. Provisions to be included in the CEMP | The Contractor shall consider the particular environment and location of the Site and shall pay particular attention shall be included, but not limited, to the following items below:<br>a) Air emissions and dust control;<br>b) Noise & vibration control;<br>c) Effluent management;<br>d) Waste management;<br>e) Hazardous substance handling and storage management, including spill contingency;<br>f) Erosion, soil & vegetation management;<br>g) Traffic management;<br>h) Recruitment and labour management, | It is yet to be developed. |

| Items in the Contract | Description | Status |
|---|---|---|
| | including the skills development and local procurement;<br>i) Flooding and natural hazards<br>j) Storm water management. | |

## VI. STATUS OF EMP IMPLEMENTATION

### A. Details of site visits/field verifications by Safeguard Staff

21. Table 9 provides the details of field/construction site visits conducted by the environmental safeguards' officers/experts for supervision and monitoring. The purpose of the site visits was to ensure compliance to contractual obligations on the HSE aspects including the status of documents (CEMP, CEMP Guide, H &S Plan, SOPs and others) for pre-construction and construction period, and the HSE requirements during pre-construction period etc.

**Table 9: Field Verification Visits by Safeguards Supervision & Monitoring Staff**

| No | Position of Environmental Safeguards staff/expert | Name | Date of visit | Name of work sites visited | Indicate if the onsite environmental staff of the contractor is available onsite during the visit |
|---|---|---|---|---|---|
| 1 | PMU Safeguards Specialist<br><br>PMDCSC<br>International Environment Safeguard Professional<br><br>Local Environment Safeguard Professional<br><br>Deputy Team Leader | Ibrahim Mohamed<br><br>Sunil Gupta<br><br>Ahmed Aslam<br><br>Naahee Nazim | • 17January 2023<br>• 18January 2023<br>• 26January 2023<br>• 29January 2023<br>• 18February 2023<br>• 27February 2023<br>• 6-9 March 2023<br>• 21 March 2023<br>• 23 March 2023 | WtE facility construction site in Thilafushi | Environmental Manager and HSE manager were present onsite |

22. The inspections included assessments of signages, compliance on personal protective equipment usage, heavy machinery operation procedures and logs of activities. Also, the pre-construction baseline environmental monitoring was verified. Appendix 1 presents a summary of the site inspections done by PMDCSC in January, February, and March 2023.

### B. DBO Plant Contract Package

23. This is a DBO contract wherein the detailed design will be developed by the DBO contractor based on the concept design. Table 10 presents the status of the EMP implementation during the design and pre-construction stage. The EMP during the construction stage, and post-construction/operation stage will be included in the reporting once they commence. Table 10 was

based on Table 64 (Environmental Management Plan Matrix) from the EIA (July 2020) which was disclosed in ADB website as well as in the project website. The EMP will be implemented and mitigation measures shall be duly integrated into the project detailed design.

### 1. Pre-Construction/Design Stage EMP

24. The CEMP has been given conditional approval on 7 December 2022 by the PMDCSC and the PMU. Other plans expected to be included in the CEMP are being finalized by the DBO Contractor (please refer to Table 4 for the list of incomplete plans required). Some documents/plans required as part of the CEMP have been prepared and are in the process of finalization while rest are yet to be submitted.

**Table 10: Design/Pre-Construction Mitigation Measures Implementation & Compliance**

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| **Pre-Construction/Design Stage** | | | | | | | |
| Invitation for Bids | • Bidding documents are issued without the EMP and/or the EIA prepared for the project | • No bidding documents shall be issued without having the mitigation measures and monitoring requirements in the EIA report included in the safeguard clauses of technical specifications in bidding and contract documents. | • Bidding and contract documents include safeguard provisions | During drafting of bidding and contract documents<br><br>Before the issuance of bidding documents for IFB<br><br>Before awarding of contracts | PMU | MoECCT | Complied and completed |
| Updating EIA report (July 2020) due to increased capacity of power generation from 10 MW (as per EIA (July 2020) to 13 MW (as per contract) by considering pre construction environment monitoring data and details from approved conceptual plan | • Possible impacts due to increased capacity of power generation from 10 MW (as per EIA (July 2020) to 13 MW (as per contract) | • To be updated based on finding of impacts analysis due to increase in power generation capacity. | To be updated based on finding of impacts analysis and mitigation measures due to increase in power generation capacity. | To be updated based on finding of impacts analysis and mitigation measures due to increase in power generation capacity. | DBO contractor | PMU | Yet to be complied |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| Locating intake and outfall of cooling/thermal water. | • Damage to reef and marine ecology around Thilafushi island due to high temperature and high concentration (brine solution). . | • If necessary, undertake coral and benthic study following Reef Check protocol.<br>• Confirm that the pre-identified best location for intake and outfall is acceptable to the DBO Contractor. If changes are planned, the DBO Contractor shall ensure that withdrawal of cooling water and discharge of cooling water will have no or minimum impact to underwater ecosystem.<br>• Contract documents to include performance guarantee by the facility that hot water discharge shall have maximum temperature difference of 3 degrees Celsius from the ambient temperature.<br>• Undertake hot water dispersion modeling along the planned area of discharge. Ensure that this area is with no or least marine species that could be affected based on the underwater ecology study (as described above). | Planned and implemented (modeling has been carried out considering 4 seasons) | Once to review modeling output on finalization of outfall configuration | DBO contractor through a pre-approved agency | PMU | • The contractor is undertaking the baseline monitoring of marine ecology and water quality on quarterly basis.<br>• No change as of yet even in concept design for the locations of the water intake and outfall<br>• Concept design ensures the parameters are compiled within this limit.<br>• DBO contractor will undertake modelling if any changes in location are made. |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| | | • If there will be changes in the location of cooling water discharge location, the DBO Contractor shall conduct confirmatory numerical modeling for brine discharge– both near and far-field, covering all 4 seasons (2 monsoon and 2 inter-monsoon) to ensure the location of discharge will not have significant impact to marine environment.<br>• Ensure that design considers achievement of proper mixing and rapid dilution within a small area around the outfall.<br>• Consider in the design of the combined outfall for hot water and treated wastewater to minimize impact to marine ecosystem. | | | | | |
| Location of ambient air quality monitoring stations | Improper sampling locations leading to underestimated ambient air quality condition and health risk to people. | • To prepare and implement point sources emission and fugitive emission plan including SOPs and checklists during construction phase following standards prescribed in IFC | • Output of air dispersion modelling<br>• Ambient air quality monitoring station sites map and historical windrose diagrams and other meteorological data<br>• Results of monitoring of ambient air quality | Once a month during the detailed design stage | DBO contractor | PMU | • Additional baseline ambient air quality data gathering is ongoing monthly since October 2023 seven locations |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| | | General EHS guidelines.<br>• Contract documents to include performance guarantee for the facility that emissions comply with applicable standards.<br>• Collect/Conduct meteorological data on daily basis for various seasons of the year to map projected wind directions, speeds at any season during plant operations.<br>• Design smoke stacks with height that will ensure emissions will have no or minimum impact to surrounding receptors within the direct and indirect impact zones.<br>• Undertake air dispersion modeling to show and understand the behavior and movement of components of flue gas from the stacks.<br>• Based on the dispersion modeling, identify the appropriate sampling locations for ambient air quality in Thilafushi island and other islands nearby, if | | | | | identified in the EIA (July 2020). Data gathering started in August 2022 but as methodology was changed to make it more efficient data collection from October is accepted.<br>• Concept design ensures compliance<br>• Air dispersion modelling to be conducted during detailed design stage |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| | | necessary and practical.<br>• Undertake baseline ambient air quality data gathering with due consideration of the direction of flow of smoke from the existing dumpsite | | | | | |
| Locating proper drainage system around the facility | Disturbance to and impedance of flow in natural drainage around the island. | • To prepare and implement wastewater management, dewatering and storm water drainage plan including SOPs and checklists during construction phase.<br>• Identify and demarcate drainage lines within and around the WTE site, including approach roads. Ensure that these channels do not disturb or impede natural flow of storm water from the island to the sea.<br>• Provide cross drainage structures wherever necessary along the new approach roads.<br>• Integrate the above considerations in the final drainage plan for the project site. | • Wastewater management, dewatering and storm water drainage plan including SOPs and checklists | Once during the detailed design stage | DBO contractor | PMU | Final drainage plans will be submitted in detailed design stage |
| Physical integrity of proposed project site. | Failure of site to withstand proposed project infrastructures. | • Integrate results of geotechnical study undertaken to the design of project infrastructures. | • Geotechnical study report.<br>• Recommendations of geotechnical study | Continuing during detailed design stage. | DBO contractor | PMU | Geotechnical report has been reviewed in the Reporting Period. Final report is |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| | | | integrated in detailed design. | | | | expected in the next quarter. |
| | Failure of site to withstand climate change, including extreme weather events. | • Undertake and include results of climate vulnerability and risk assessment (CVRA) in the design of the project.<br>• Provide site protections based on the risks identified in the CVRA. | • CVRA report<br>• Recommendations of the CVRA report integrated in detailed design. | Continuing during detailed design stage. | DBO contractor | PMU | CRVA to be conducted during the detailed design stage |
| | Failure of piles in the existing municipal waste dumped by WAMCO near the project site. | • Coordinate with WAMCO to ensure the stability of the municipal dumpsite.<br>• To prepare and implement mitigation measures and emergency response plan including SOPs and checklists during construction phase. | • Physical condition of the slope of piles of municipal waste dumped | Visual inspection on daily basis | DBO contractor | PMU | • Concern was raised to WAMCO for action.<br>• The site boundary is temporarily shifted away from the landfill and by approx. 20m and a temporary fence is installed |
| Work program and pre-approved plans | Unprecedented and multiple environmental impacts due to poor or inappropriate plans integrated in the design of the project. | • Develop the following plans that shall be included in the final detailed design and implemented during construction stage:<br>o Construction Waste Management Plan.<br>o Occupational Health and Safety Plan following international best practices on occupational | • Work plans included in the final detailed design of the project<br>• Work schedule for each plan included in the overall schedule of project implementation. | Once prior to start of construction works. | DBO contractor | PMU | • Activities towards full compliance are ongoing.<br>• CEMP have been approved by the PMDCSC and the PMU with conditions. However, H& S plan has already been approved.<br>• Contractor is to develop management plans as referred in |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| | | health and safety such as those in Section 4.2 of IFC EHS Guidelines on Construction and Decommissioning Activities.<br>○ Construction Camp Development and Management Plan.<br>○ Spill Control and Containment Plan<br>○ Marine and Beach Area Construction Work Plan<br>○ Erosion Control Plan for pipeline works<br>○ Traffic Management Plan including via sea around the construction site to ensure easy access and passage of workers and employees of establishments at two sides of the project site.<br>• Develop the following plans or manuals that shall be utilized during operation stage: | | | | | CEMP and SOPs including checklists align with ISO 14001 and ISO 45001. |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| | | ○ Operation and Maintenance Manual<br>○ Waste Screening Procedure / Plan to ensure all waste inputs to the facility comply with quantity and quality requirements, including accounting of hazardous / halogenated organic components in wastes.<br>○ In-house Solid Waste Management Plan.<br>○ Occupational Health and Safety Plan following international best practices on occupational health and safety such as those in IFC EHS Guidelines on Waste Management Facilities.<br>○ Spill Control and Containment Plan.<br>○ Emergency and Disaster Preparedness | | | | | |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| | | and Response Plan. | | | | | |
| Consents, permits, clearances, no objection certificate (NOC), etc. | Stoppage of activities due to lack of permits or clearances and compliance to applicable provisions of local regulations | • Obtain all necessary consents, permits, clearance, NOCs, prior to start of civil works.<br>• Ensure the compliance as required | • Clearances and approvals<br>• Compliance report | • Once prior to start of construction for clearances and approvals for clearances and approvals<br>• Compliance report on regular basis | DBO contractor | PMU | • Permits are sought as required<br>• DBO contractor is to develop legal compliance register with plan and SOPs including checklists to ensure compliance on regular basis. |
| Shifting of Utilities | Damage to existing utilities that will disturb operations of establishments or businesses near the site. | • Identify and include locations and operators of these utilities in the detailed design to prevent unnecessary disruption of services during the construction phase.<br>• Prepare a contingency plan to include actions to be taken in case of unintentional interruption of services, such as the following:<br>o In case of water supply disruption, provide temporary water supply source for the affected establishments.<br>o In case of power interruption, | • Maps showing utilities and likely disruptions | Once prior to start of construction. | DBO contractor | PMU | • No utilities are running through the site except the power cable of STELCO. Relocation of this cable is still pending. |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| | | provide prior notice to affected establishments. If interruption is unscheduled due to unforeseen incidents, provide a standby generator set to serve as temporary power supply to affected establishments.<br>• Identify the list of affected utilities and operators and coordinate closely with relevant government departments. | | | | | |
| Locating sites for construction work, camps, areas for stockpile, storage, and disposal | Increased level of impact or pollution due to location of worker camp, raw material storage areas and temporary waste/spoil storage sites | • Except disposal sites, all the work sites (camps, storage, stockpiles etc.) will be located within the selected site.<br>• No construction camp shall be located on the beach or overwater.<br>• Material shall be brought to site as and when required, and temporary storage of material (pipe, sand etc.,) shall be made near the work site.<br>• No temporary storage shall be located at the lagoon section | • Use of pre approved sites for construction work camps, areas for stockpile, storage, and disposal<br>• Waste Management Plan | Once prior to start of construction | DBO contractor | PMU | A site organization plan was submitted in May 2022 and was approved by the PMU before mobilization and pre-construction activities on site was permitted.<br><br>As construction is expected to begin in last week of May or first week of June 2023, the storage areas already identified in the site |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| | | • Waste shall be disposed in existing approved disposal sites; any new sites shall be developed considering siting guidelines, maintained, and operated accordingly | | | | | organization plan will be utilized. |
| Sourcing of construction materials | Environmental impacts (air, water, soil, biodiversity, etc.) at the source. | • Obtain construction materials for this project from the licensed quarries acceptable to government.<br>• For new borrow sites to borrow fill material and backfill material, prior permission must be obtained from Maldives EPA, and the environmental impacts of the operation should be properly examined and mitigated as necessary<br>• Make efforts to minimize the overall material requirement for the project by adopting various approaches – balanced cut and fill, re-use as much excavated material from this project as possible<br>• Submit to PMU monthly, documentation | Permits issued to quarries/sources of materials | Once prior to start of construction | DBO contractor | PMU | As most materials are imported from abroad, internationally accepted suppliers will be used to obtain materials used. |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| | | (materials quantities with source). | | | | | |
| Delivery route for construction materials and equipment | Port congestion at Thilafushi due to transport of construction equipment and raw materials at site | • Identify a separate berth location for loading and unloading construction heavy equipment and raw materials that will not disrupt day-to-day activities in the island. Avoid use of the common ports being used by locals.<br>• If no other areas available, execute agreement with WAMCO to use WAMCO's berths/docking ports when delivering heavy equipment and big-sized construction materials to the site. | Maps showing delivery routes. | Once prior to mobilization by DBO Contractor | DBO contractor | PMU | A dedicated berthing facility and quay wall are given to the contractor which includes a 30-meter buffer zone from the quay wall. The existing debris and shipwrecks are to be moved away from this site before materials are brought in, to ensure there are no obstacles during the unloading process. |
| Final Detailed Design Components | Air and marine water pollution due to inappropriate components included in the detailed design. | • Ensure the final detailed design will integrate the following mandatory requirements:<br>○ Use of best practical incineration technology as recommended in the EIA.<br>○ Use of stack height recommended in the EIA. If circumstances based on the recommended stack height is to | Detailed design that uses recommendations of the EIA report on discharge of waste material to air, water and soil. | Continuous during detailed design stage. | DBO Contractor | PMU | To be complied during the detailed design stage |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| | | be changed (e.g., change in dimensions of the WTE plant building structure), ensure to use a stack height that is based on a new modeling calculation.<br>○ Installation of air pollution control device that will ensure emissions in compliance with the emission standards as indicated in the EIA.<br>○ Ensure to include installation of a continuous monitoring system (CEMS) as a mandatory requirement in the design.<br>○ Appropriate sampling port at the stack for random grab sampling activities.<br>○ Leachate treatment plant designed based on (i) maximum expected volume of leachate generated, and (ii) full capacity | | | | | |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| | | operation of the WTE plant.<br>o Residual waste landfill designed based on (i) maximum volume of fly ash and bottom ash generation, and (ii) full capacity operation of the WTE plant.<br>o Provision of a sampling port for thermal water (heated cooling water) at appropriate and accessible location along the cooling water line. | | | | | |
| Additional Baseline Environmental Data Gathering | Inaccurate predicted impacts and proposed measures due to lack of robust baseline environmental data will lead to unforeseen environmental pollution or damage. | • During the detailed design phase of the project, in particular, the DBO Contractor shall:<br>o Undertake ambient air quality and noise level measurements (monthly), marine water and ground water quality analysis, and marine underwater ecology survey (quarterly) on first year after DBO contractor | Results of monthly ambient air quality measurements (TSP, $PM_{10}$, $PM_{2.5}$, $SO_x$, $NO_x$).<br><br>Results of monthly noise level measurements ($L_{eq}$daytime and $L_{eq}$night-time in dBA).<br><br>Results of quarterly marine and groundwater quality analysis (to follow parameters used in the first sampling activities).<br><br>Results of marine underwater ecology survey to be conducted once during pre- | Monthly sampling (air quality and noise level) and quarterly sampling for marine and groundwater quality and once underwater ecology survey during for minimum of one year after DBO contractor mobilization (to establish baseline | DBO Contractor | PMU | • Baseline data is gathered according to the methodology and standards from the EIA (July 2020) starting in October2022 onwards on a monthly basis. A method statement for monitoring was agreed before but approved by the PMDCSC on 5 December 2022 as part of CEMP. |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| | | mobilization, at the identified sampling locations in the EIA report (and any other locations in and around Thilafushi island as may be deemed by the DBO Contractor as important sampling locations).<br>○ follow required sampling methodologies, including appropriate averaging time for ambient air quality and noise level measurements as indicated in the WHO standards; and<br>○ include results of analyses in the updating of the EIA, and consider these results in the final detailed design of the project as applicable. | construction period and quarterly during construction period (to follow parameters, methodologies and locations used in the first set of surveys in the EIA process). | conditions prior to works). | | | • Air quality monitoring started in October 2022 and is conducted on monthly basis. Initial monitoring carried out in August 2022 was not conducted for 24-hour sampling as required by the World Bank Group Environment, Health, and Safety (EHS) General Guidelines 2007, hence the PMU advised the contractor to follow the appropriate sampling procedures.<br>• Noise level monitoring started in November 2022 and is conducted on monthly basis.<br>• Quarterly based marine and ground water samplings were conducted in November, 2022 |

| Field or Activity | Potential Impact/Issue | Mitigation Measures | Parameter/Indicator of Compliance | Monitoring Frequency | Implementation Agency | Monitoring Agency | Status of Compliance |
|---|---|---|---|---|---|---|---|
| | | | | | | | and February 2023.<br>• Underwater marine ecology survey was conducted in December 2022 |

### 2. Construction Stage EMP

25. The CEMP was given a conditional approval on 7 December 2022 by the PMDCSC and the PMU as some required plans expected to be included need revisions and must be finalized prior to construction stage which is expected to commence in the last week of May or first week of June 2023, subject to approvals and procedures in place. The Contractor has been mobilized and currently pre-construction activities are conducted on site including the project site office and labor camp settings. Temporary labor camp and other temporary facilities are now being constructed and is expected to be completed in the next quarter.

## C. Unanticipated Impacts

26. No unanticipated environmental impacts were encountered during the pre-construction/design stage.

# VII. IMPLEMENTATION OF HEALTH & SAFETY

## A. H&S COVID-19 Plan Preparation

27. Appendix 14 of EIA (July 2020) is on Standard Operating Procedure in Response to 2019 Corona Virus Disease prepared by the PMU, MoECCT as required by ADB in its advisory note on protecting the safety and wellbeing of workers and communities from COVID-19[1]. This has been referred to in the preparation of the Health & Safety (H&S) COVID-19 Plan and the status is given in Table 11. The Health & Safety COVID-19 Plan, as part of the CEMP,will be approved prior to the start of construction.

**Table 11Status of H&S COVID-19 Plan**

| H&S COVID-19 Plan | Project level | Contractor | Remarks |
|---|---|---|---|
| Preparation | Being prepared and submitted to PMDCSC by DBO contractor for review in March 2023 under the CEMP | DBO contractor and EPC contractor | Contractor to submit H&S COVID-19 plan with other documents required for the CEMP (approved by the PMU with conditions on 7 December 2022). |
| Approval | - | - | Will be approved in May 2023 |
| Update | - | - | - |

## B. H&S COVID-19 Plan Implementation

28. The DBO Contractor has been mobilized and pre-construction activities are ongoing such as site preparations, construction of offices, warehouse & accommodation and geotechnical investigations. Given that the H&S COVID-19 Plan within the CEMP is being finalized, the SOPs provided in Appendix 14 of EIA (July 2020) are being followed. In March 2022, the government has lifted most of the COVID-19 restrictions such as the mandatory use of facial masks. When the construction stage commences, presumably in the last week of May or first week of June 2023, measures identified in the H&S COVID-19 within the CEMP will be implemented. Common measures are provision of wash stations, use of facial masks in confined workplaces, use of

[1] https://www.adb.org/sites/default/files/publication/614811/safety-well-beingworkers-communities-covid-19.pdf.

personal protective equipment, screening of workers, information/posters on COVID-19 at the worksites, etc. The implementation of the H&S COVID-19 Plan within the CEMP will be monitored for compliance as follows:

(i) measures implemented;
(ii) best practices;
(iii) incidents, if any, recorded/reported in the project;
(iv) findings; and,
(v) any actions for improvement

## C. CEMP and H&S Plan Implementation

29. As per monthly progress reports for January to March 2023 submitted by DBO and PMDCSC, brief of details is provided as per given below:

| Month | DBO Monthly Report Summary on HSE | PMDCSC monthly report Summary on HSE Activities |
|---|---|---|
| January 2023 | The following activities were accomplished<br>• Health and Safety Activities<br>a) 27 Toolbox Talks were conducted.<br>b) Covid-19 awareness program was conducted.<br>c) Training on Chemical handling was conducted.<br>d) 5 mass housekeeping were carried out.<br>e) One weekly HSE inspection was carried out by Ramboll on 11th January and 4 action items raised by Ramboll were closed out.<br>• Environment Activities<br>a) ER sent comments received on Updated EIA Report and revised Updated EIA Report is under preparation.<br>b) Ground water samples were collected and sent to the M.W.S.C laboratory for dewatering permit.<br>c) Revised MoS of Noise Monitoring (MDV-AAK-MOSXX-XX-PL-MGT-0002-000) has been received from EPC contractor on 10 January 2023.<br>d) Environmental Monitoring Report for December 2022 has been submitted by EPC contractor on 22 January 2023.<br>e) Ambient Air monitoring was conducted from 28 to 31 January 2023.<br>f) Method Statements for Wastewater Treatment Plant is being prepared.<br>g) EIA Addendum for discharge the wastewater into the sea has been completed and application will be made to the EPA for approval.<br>h) ER had sent the CRS sheets of their review and comments on documents | • New documents on Emergency Response Plan, Concept for mitigation pollution measurement, H&S measures were reviewed as part of permitting design.<br>• Already approved documents such as CEMP, CEMP Guide and Pre-Construction Monitoring Plan were again reviewed as part of permitting design.<br>• We have the following observations of monthly report submitted by DBO<br>a) HSE inspection reports by Ramboll<br>o No detail on status of closure of previous NCRs with action taken report<br>o No detail on suggested/recommended corrective/mitigation measures<br>o No detail on status of availability, compliance and adequacy of SOPs on the issues raised as NCR and others<br>o No detail on issue related to transportation of men and materials via sea.<br>b) Near Miss report: No details on actions taken/planned till the issue is resolved by WAMCO in continuation to findings of report analysis.<br>c) Fire drill report - Name and signature of team member conducted fire drill and prepared the report should be included. Also, names of participants are missing.<br>d) Air quality – No Comparison of air quality results monitored as pre-construction environment monitoring with values of same mentioned in EIA report. (Provide justification in case significant variations are observed). Also as discussed in ADB mission, supporting data such as |

| Month | DBO Monthly Report Summary on HSE | PMDCSC monthly report Summary on HSE Activities |
|---|---|---|
| | submitted for the permitting design and will be re-submitted<br>i) Noise level monitoring at five locations were conducted on 26 & 27 January 2023.<br>j) The following documents have been prepared and under review:<br>i. Waste Management System plan.<br>ii. Environment Impact & Aspect Register & Obligations Register.<br>iii. Stakeholder Engagement Plan<br>iv. Environmental Social Management Plan (ESMP)<br>v. Environment Social Action Plan (ESAP)<br>vi. Spill Control & Containment Plan<br>vii. Chemical & Hazardous Material Management<br>viii. Public Health, Safety and Security Plan.<br>ix. Traffic Management Plan<br>x. Security Management Plan<br>xi. SOP for GRM<br>xii. Emergency Response Plan<br>xiii. ERP and Site Procedure Manual<br>xiv. Training Program documents on Driving awareness safety, spillage response and Awareness<br>xv. of noise/record<br>• Project Staff: DBO staff: 5, OE's staff: 9 and Subcontractor: 124<br>• HSE Statistics: Total average manpower at Site: 69, Total Man hours: 16,340 and LTI Free days Completed 335. | surrounding conditions around sampling locations, meteorological data are to be incorporated.<br>e) No detail of manpower employed at project site in terms of locals and expatriate.<br>f) No response/action taken has been incorporated on issue raised in ER's monthly report for December-22<br>g) ER has not reviewed updated EIA report as mentioned in monthly report. |
| February 2023 | The following activities were accomplished<br>• Permitting design: DBO Contractor has responded with preliminary ER's comments in permitting design documents and clarification of some of the comments were discussed in the meeting held in Maldives.<br>• Sewage pipeline works from mobilization buildings to the WWTP are completed.<br>• Potable water pipeline works for the mobilization building are ongoing.<br>• EIA Addendum was approved by EPA and the documents were sent to URA for approval on 23/02/2023.<br>• Permit from MNDF (Fire Approval Letter) has been obtained on | The following activities were accomplished<br>• ER is scheduled to conduct rapid assessment of status and adequacy of documents in place and Training workshop on requirements and status of compliance of contract's obligation on HSE aspects for DBO and EPC contractors during the proposed visit of Mr. Sunil Gupta from 6 March 2023 to 9 March 2023.<br>• As per MOM dated 13.02.23, following issues were discussed and mentioned:<br>a. Recap of ADB EHS Mission: Key responsibilities and ADB expectations were clarified for the implementation period.<br>b. As per Monthly report, EHS documents are being reviewed by the DBO Contractor and status of submission to be confirmed |

| Month | DBO Monthly Report Summary on HSE | PMDCSC monthly report Summary on HSE Activities |
|---|---|---|
| | 15/02/2023 for accommodations and offices at the camp site.<br>• Road Excavation Permit from HDC has been obtained on 20/02/2023 for WWTP discharge construction.<br>• Road Closing Permit from HDC has been obtained on 19/02/2023 for WWTP discharge construction.<br>• Nine (09) CEMP supporting documents submitted to ER for Review.<br>• MOE sent a CRS for the EIA (Environmental Impact Assessment) study report and observations made in CRS were addressed by D.B.O/E.P.C and modified report was sent back to MoE and review for ADB.<br>• ER requested the DBO Contractor, through letter 4169A01_330_040 Location of fence at Eastern plant boundary, dated 15 February 2023, to propose the place to install the temporary fence and submit a cost estimate of additional cost incurred by the erection of the fence.<br>• ER sent comments to the January Monthly Report, through letter 4169A01_330_042 Monthly Report January, dated 24 February 2023<br>• HSE Statistics: Total Average Manpower at Site: 72, Total Man hours 16,530, Cumulative Man hours 110,574 and LTI Free days Completed 363.<br>• Project Staff: • DBO staff: 5 (International PD, Maldives PD, PM, 2xTechnical Office Engineer), • OE's<br>• staff: 9 (PM, HSEM and Technical experts) and Subcontractor: 124<br>• Activities related to Health and Safety<br>a. 24 Toolbox Talks conducted.<br>b. Dengue Fever Prevention Awareness session.<br>c. Working at height Training.<br>d. Mass housekeeping carried out.<br>e. 2 weekly HSE inspections were carried out by URB/RAM on 1st & 19th FEB 2023.<br>f. ADB representative MS. Ruby visited site on 8th Feb 2023 as part of ADB mission.<br>g. 3 risk assessments for spun pile drive, sea outfall drainage installation and relocating fence works was done. | c. Status of reviewing mechanism of CEMP, to be submitted as part of the EHS document submission<br>d. Method Statements for early site works to be submitted as part of the EHS document submission.<br>e. Training workshop to take place instead of the DAB meeting. To confirm and finalize schedule<br>f. Increase of gross output from 10 to 13MW and its impact on the permitting needs to be addressed. MOE suggests addressing this in the final update and that emission standards are not breached. MOE will address EPA accordingly. It is clarified that an increase of electrical output, while keeping the waste throughput constant, does not have any impact on the environment, as the amount of flue gas will remain the same.<br>• We have the following observations considering the various documents as per details given hereunder:<br>a. Monthly progress report for February 2023 submitted by DBO<br>○ Site inspections reports by Ramboll for month of February-2022 have not been enclosed.<br>○ Respective NCR number is to be mentioned in enclosed HSE Safety Observation Reports.<br>○ Findings of HSE Safety Observation Reports are to be included in HSE inspection report of next<br>○ period by Ramboll as confirmation and approval of adequacy of closure of respective NCR.<br>b. Monthly reports on Environment and Health & Safety by EPC<br>○ Pre-construction Environment Baseline monitoring results<br>i. Provide justification for considering results for June 22 for ambient air quality and noise level as baseline. However, it should be compared with data given in EIA report.<br>ii. As a part of ambient air quality monitored, zero values are reported for SO2 and NOx and also almost same values for PM10 and PM 2.5 are reported during January and February 2023. Provide justification, |

| Month | DBO Monthly Report Summary on HSE | PMDCSC monthly report Summary on HSE Activities |
|---|---|---|
| | • Environment activities<br>a. Ground water samples were collected and sent to the M.W.S.C laboratory for dewatering permit.<br>b. Environmental Monitoring Report – February 2023 has been submitted on 02 March 2023.<br>c. Environmental Monitoring Report – January 2023 has been submitted on 03 March 2023.<br>d. Ambient Air monitoring at 7 approved locations on 05-06-07-08 FEBRUARY 2023<br>e. Noise level monitoring at 5 locations on 15-16 February<br>f. Ground water samples were collected on 13 FEBRUARY 2023.<br>g. Marine water samples were collected on 13 February 2023. | iii. Justification for variation of Noise levels reported during day time and night time from base line data.<br>iv. Values of detection limits for each parameter are to be incorporated for which ND is reported.<br>v. Provide justification for marine water quality- data on temperature, Oil & grease, free ammonia, and Fiscal coliform are missing as mentioned in Pre-construction Environment baseline monitoring plan, value of BOD is reported as ND at location SW3, overall values of BOD reported for February 2023 are six times high than as reported in 2019. Also provide observations and justification on seasonal variation, if any considering quarterly monitored values and values reported in EIA report. Please note that Salinity is very critical parameter for marine water to consider<br>vi. Provided justification for ground water quality- variations observed in values of Chloride, Nitrate and Fiscal Coliform, iron, oil & grease, pH, TSS etc, Missing data on TDS, Presence of petroleum and other chemicals and seasonal variation, if any considering quarterly monitored values and values reported in EIA report.<br>vii. Site specific and monitoring period specific justification for variations observed and comments on adequacy of data are to be provided (as generic justifications are provided on the same).<br>viii. Incorporate detailed data on subject as Appendix for better understanding at our end.<br>○ Environment Monthly Report<br>i. As reported for various months, provide details including attendance sheets, contract etc. for subcontractor labor engaged<br>ii. As reported for various months, provide all details of DG sets used and corresponding permission from EPA.<br>iii. Consumption of resources (HSD, petrol, water etc.) and waste generated (solid waste, sewerage etc.) as reported in earlier reports are missing<br>○ Health and Safety Monthly report |

| Month | DBO Monthly Report Summary on HSE | PMDCSC monthly report Summary on HSE Activities |
|---|---|---|
| | | i. Check the data given on manpower (Male- 72, Female-0, Locals - 3 and expatriates-74)<br>ii. Provide nautical miles travelled by speed posts and include data pertaining to trips made by speed boat and other ships for men and material transportation in daily log books. Checklist of ensuring prior fitness of speed boat and other ship is to be prepared and implemented.<br>iii. Data pertaining to fuel consumption in transportation via speed boat and other ships, heavy equipment and machinery assessment of GHG.<br>iv. Provide date with attendance sheet and details of third party for each training program conducted as mentioned.<br>v. Provide MOM of DBO HSE meeting, Internal HSE meeting, Weekly inspection by client and details of Action item raised by client and status of compliance, Fire/emergency drills etc.<br>vi. Provide MOM for internal management meeting conducted including status of actions raised<br>vii. Provide status of SOP for house keeping<br>• Partial response/action taken has been incorporated on issues raised in ER's monthly report for January-23 including modified near miss report and fire drill report.<br>• Site Inspection Reports by ER<br>a. Probable risk of soil and ground water contamination due to presence of Shipwrecks adjacent to quay wall remains risk of working close to the WAMCO landfill still remains high<br>b. The format of the log books needs to be submitted to ER for approval.<br>c. Labour - health, safety and welfare<br>o SOPS are not fully implemented on site.<br>o Workers accommodated off site in Hulhumale island, however separate areas for dining and<br>o food storage maintained at site.<br>o Water storage on site, temporary toilets established with collection tanks.<br>o Site is kept generally clean and organized. |

| Month | DBO Monthly Report Summary on HSE | PMDCSC monthly report Summary on HSE Activities |
|---|---|---|
| | | ○ Boundary fence remains incomplete only towards the landfill area due to waste spillage. Gates<br>○ in place, and visitors register maintained.<br>○ Security guards in place at both entry points to the site. However, CCTV system is yet to be<br>○ installed. Adequate lighting needs to be installed around the site.<br>d. Community- health, safety and welfare: SOPS are not fully implemented on site and Grievance redress management system in place needs to be improved<br>• Inspection Report on Worker's accommodations located in Hulumale by ER<br>a. Rented accommodations consisting of Flats with two to four people accommodated within one room and individual flats with inadequate facilities.<br>b. The accommodation site is a temporary arrangement and is expected to be moved to Thilafushi in coming days. No documented SOP was in place on the subject. |
| March 2023 | The following activities were accomplished<br>• Health and Safety Activities<br>a. Twenty-six toolbox talks were conducted.<br>b. Training on PTW Procedures including (Area Authority, PTW Holder) and Security Awareness was conducted<br>c. Five Mass housekeeping were carried out.<br>d. Three combined weekly HSE Inspections were carried out by Contractor's engineer (Ramboll) and DBO contractor on 5th, 16th and 29th March.<br>e. ADB Mission visited the site along with MoE on 8th March.<br>f. Mr. Nick Skinner Independent Environment Engineer visited the Site on 21 and 22 March.<br>g. Risk Assessments have been completed for Spun pile drive, welding, and excavation.<br>h. Two SOPs for Spun Pile drive and welding activity were prepared, and SOP on excavation was revised by EPC contractor and submitted to the | The following activities were accomplished<br>• ER shared comments on HSE documents submitted in February 2023 by DBO contractor for permitting design approval.<br>• ER raise concerns to DBO contractor wide letter 4169A01_330_046 dated 22.03.23 on contractual requirement of mandatory approval of all pending HSE documents including mentioned in conditionally approved CEMP before commissioning of construction activities.<br>• Training workshop was conducted at project site from 7 to 9 March 2023 for staff of EPC and DBO contractor to upgrade the understanding on technical and administrative requirements to comply with contractual obligations on HSE aspects and to facilitate the process of preparation of various HSE documents as mentioned in EIA report, H&S Plan and CEMP on following topics:<br>1. ADB's SPS and requirements<br>2. IFC Performance standards & EHS guidelines and requirements<br>3. Contractual obligations on HSE aspects |

| Month | DBO Monthly Report Summary on HSE | PMDCSC monthly report Summary on HSE Activities |
|---|---|---|
| | DBO Contractor (under approval process).<br>• Environment Activities<br>a. Ambient Air monitoring at approved seven locations was carried from 19 to 22 March 2023.<br>b. Noise level monitoring at approved five locations was carried out from 25 to 26 March 2023.<br>c. One sample of water used and to be used for construction and camp sample was collected on 13 March 2023.<br>d. Documents have been submitted to HDC to get partial construction permit for building piling works.<br>• EIA update<br>a. New comments from Employer were received in March 2023 on modified EIA report submitted in February 2023.<br>b. MoE has sent a table for getting the details to establish the facts regarding change in discharges of pollution, if any due to change in power generation capacity to 13 MW while 10 MW was considered in EIA report (July 2020) and to establish the requirements of conducting modeling again.<br>c. In continuation to above given items a and b, DBO contractor has stated in their letter MDV-20220707-URB-MME-LT-0007 that this update of the EIA was not instructed by the Employer/ER. Nevertheless, in the spirit of collaboration, DBO Contractor has developed the different tasks for the EIA update. DBO Contractor reiterates their willingness to meet these new requirements. Nevertheless, this situation will create a delay in the program. The agreement with MoE and ADB was just to update the baseline, Site boundaries and some of the current conditions of the plot (buried cable, existing landfill within the boundaries or the existing road), but now the demands have been increased. Therefore, DBO Contractor considers necessary to formally proceed with a variation.<br>• DBO Contractor shared revised formal HSE management structure for project via document dated 19.03.23. | 4. Grievance Redressal Mechanism and requirements<br>5. Stakeholder consultation and requirements<br>6. Salient features of ISO 14001 and ISO 45001<br>7. Applicable provisions of local regulations and requirements (presented by DR Ibrahim from MOE)<br>8. Present status of compliance<br>• Main observations during meetings, site visits and document review<br>We have the following observations considering the discussion during meetings, findings during site visits made and various documents made available as per details given in the MOM of meeting at Male from 28.02.2023 to 02.03.2023.<br>a. Flue gas temperature will be changed to 145°C as per EIA; DBO confirms that dispersion model will be redone in the coming months.<br>b. Rapid EHS audit on site on 6th March and training workshops on 7th and 8th March and extended to 9th March<br>c. ER highlights that documents received are not compliant to certain standards, e.g. ISO 45100 or IFC performance standard, required as per contract. For instance, the grievance redress mechanism requires a different table of content, as commented before, to satisfy the requirements. DBO states that this has been already included in the EIA but Employer clarifies that the document should include more details as suggested in CRS.<br>d. DBO Contractor asks Employer to provide a list of documents requiring approval before construction can start.<br>e. Outstanding documents, ER to send CRSs latest by Friday 03.03.2023<br>f. Outstanding information for CEMP, some documents in particular SOPs needs to be provided before construction can start.<br>g. ER highlights that many documents required as part of the HSE documentation are missing, including SOPs, community engagement plan etc.<br>h. ER highlights that there is a lack of quality control on DBO Contractor side and requirements to comply with ADB requirements should be enforced more strictly on the EPC by the DBO. ER cannot |

| Month | DBO Monthly Report Summary on HSE | PMDCSC monthly report Summary on HSE Activities |
|---|---|---|
| | • HSE Statistics: Total Average Manpower at Site: 58, Total Man hours 15080, Cumulative Man hours 127454 and LTI Free days Completed 394.<br>• Project Staff: DBO staff: 5 (International PD, Maldives PD, PM, 2xTechnical Office Engineer), OE's staff: 9 (PM, HSEM and Technical experts) and Subcontractor: 124 | be the only party to make these comments to comply with ADB requirements. This slows down the process and may delay the start of construction. DBO Contractor acknowledges this and is trying to accommodate.<br>i. ER highlights that ultimately work would need to be stopped on site if documents are not in place or non-compliances are detected.<br>• Site visit for rapid HSE audit and conducting training workshop from 6 to 9 March 2023<br>a. Practically, no documented plan/SOP in place for pre-construction activities.<br>b. Presence of live electrical cable supplying electricity to project from STELCO on ground.<br>c. Near Miss Report: No detail on post incident actions taken/planned was provided.<br>d. On what basis NCRs are raised in inspection reports is unclear<br>e. Fire drill report: Names and signatures of team member conducted fire drill and prepared the report should be included. Also, names of participants are missing<br>f. Details of DG sets used are reported for various months in monthly report-Feb-23. Also found 350 KVA DG set connected with live electrical cable of STELCO on site. Needed approval from EPA.<br>g. Inadequate medical aid facilities at health centre located within project site although full-time qualified doctor has been posted.<br>h. Inadequate Competency of security guards and security logistics (CCTV cameras and light on boundary of project site)<br>i. Adequacy and status of wastewater management plan (domestic wastewater management plan, dewatering wastewater management plan and runoff during rains) including regulatory approval<br>j. Quality Assurance for baseline environment monitoring reports<br>o Adequacy and variations observed in ambient air quality- In Ambient air quality report, zero values are reported for $SO_2$ and NOx and also almost same values for PM10 and PM 2.5 are reported during January and February 2023<br>o Adequacy of marine water quality: data on temperature, Oil & grease, free ammonia, and Fiscal coliform are |

| Month | DBO Monthly Report Summary on HSE | PMDCSC monthly report Summary on HSE Activities |
|---|---|---|
| | | missing as mentioned in Pre-construction Environment baseline monitoring plan, value of BOD is reported as ND at location SW3, overall values of BOD reported for February 2023 are six times high than as reported in 2019 (as part of EIA).<br>o Adequacy of ground water Quality: in reported values for Feb -23 report, significant variations observed in values of Chloride, Nitrate and Fiscal Coliform, iron, oil & grease, pH, TSS etc. Missing data on TDS, Presence of petroleum and other chemicals.<br>o Adequacy and variations observed in noise level: Noise levels monitored values at all locations given in EIA report were found on higher side as compared to values reported in November and December 2022 and also January and February 2023.<br>k. Human Resource Management<br>o No documented human resource policies on various aspects and manual. Inadequate knowledge and update on applicable provisions of local regulations, ADB's SPS and IFC Performance Standards<br>o Inadequate status of compliance.<br>o Records of attendance sheets were kept in loose sheets (should be kept in register)<br>o 27 Number of workers without having proper documentation including contract were spotted working within project site<br>l. Inadequate GRM in place and GRM plan is not approved yet.<br>• MOM of online meeting dated 20 March 2023<br>a. ER gave a presentation on specific HSE observations made during the past two weeks while being on site and conducting the HSE training workshop from 7 to 9 March 2023<br>b. Consistency of data is highlighted by ER, DBO is required to scrutinize the report and find answers to anomalies of values, if any. It is highlighted that for any bigger discrepancy of data between EIA values and baseline values a justification should be given. Any out-of-the-range data, such as zero values for NOx, should be avoided. |

| Month | DBO Monthly Report Summary on HSE | PMDCSC monthly report Summary on HSE Activities |
|---|---|---|
| | | c. DBO highlights the impact of surrounding projects to the monitoring. Employer clarifies that a proper baseline is the best defense and continuous monitoring should be done and reporting of surrounding activities should be included. With a proper baseline in place, and SOPs and CEMP implemented including adequate housekeeping, the Contractor has strong arguments in case of any outside impacts. However, if any of the above is lacking, this gives reason to believe that the Contractor contributes to any adverse environmental impact. DBO agrees that the baseline is important and understand that it will be assessed against it to determine if they are contributing to any adverse impacts.<br>d. DBO asked to consider all the measures taken during pre-construction and mobilization as strong baseline, discarding anomalous values. If agreed, it will be resubmitted baseline and will be much stronger. Considering the sensitivity of observations shared on reported baseline environment monitoring results and HSE inspection reports submitted by DBO contractor, both parties decided to have a separate meeting to conclude and develop an understanding on the way forward.<br>e. Human resource management, issue of unregistered workers is raised, and Contractor understands and agrees about the seriousness and clarifies that proper checking is now in place.<br>• Site visit on 21 and 23 March<br>a. Presence of Shipwrecks adjacent to quay wall and movement of speed boats, ships (medium and large) on the route and adjacent to quay wall of island.<br>b. Leachate and runoff water from waste dumping site of WAMCO adjacent to project site.<br>c. Fencing works towards the WAMCO landfill on hold due to risk of working close to the WAMCO landfill.<br>• Health and Safety Report submitted by EPC contractor<br>a. Incomplete site inspections reports conducted by Contractor's Engineer (Ramboll) during March have been submitted for review of ER. As per our understanding, practically no management plans/SOPs is in place for pre-construction |

| Month | DBO Monthly Report Summary on HSE | PMDCSC monthly report Summary on HSE Activities |
|---|---|---|
| | | activities then what is the basis for raising NCRs.<br>b. Near miss report- As per report analysis (substandard condition not reported) and post report findings, nothing is mentioned on approval of design of gate before erection and commissioning and inspection report after commissioning of same. Hence it needs to be considered as modification in management practice in place.<br>• Environment monthly report submitted by EPC contractor<br>a. As per table 1, one excavator, one car mix, three diesel generators, two small mobile generators, two forklift etc. are reported. As per various discussions with DBO contractor, no diesel generator will be used as it needs permit from EPA.<br>b. Also, as per Table 2, fuel used has been given as 3000 liter however no detail of its transportation & storage at site and usages in different equipment/machinery was provided.<br>c. As per table 2, machine oil used was 1000 liter but no detail on waste machine oil generated was provided.<br>d. No detail of 30000 m3 of soils weathered excavation and its management and 30000 m3 filling earth (source, transportation and storage at site) as mentioned in table 2 was provided.<br>e. No proof such as receipt of waste material by WAMCO as mentioned in Table 3.<br>f. Ambient air quality<br>o Justify the lower values of PM10 and PM2.5 reported during March as compare to values reported in January and February while values of TSPM are in same range.<br>o Justify hourly value of SO2 reported at 14 hrs only as 72.31 µg/m3 at AQ4 in detailed report submitted by subcontractor but other hourly values are reported as zero.<br>o As per product certificate of air quality monitoring station (AIRQOON), ppb limit of performance warranty for SO2 and NO2 is <0.5 ppb which is equivalent to 1.31 µg/m3 for SO2 and 0.94 µg/m3 for NO2 hence it is advised to take as limit of Quantification (LOQ) and reported values lesser than LOQ is |

| Month | DBO Monthly Report Summary on HSE | PMDCSC monthly report Summary on HSE Activities |
|---|---|---|
| | | to mentioned as ND (Not deducted) in main table.<br>o No detail of surrounding activities at the time of monitoring.<br>g. Noise level: No detail of surrounding activities at the time of monitoring |

## VIII. ENVIRONMENTAL MONITORING

### A. DBO Contract

#### 1. Monitoring Activities - Proposed and Conducted

31. Considering the findings of the EIA study report (July 2020), a Pre-Construction Environmental Monitoring Plan was prepared and approved on 7 December 2022. Details are given in Table 12 and environmental monitoring activities will be carried out for one year during the design stage. From January to March, no construction works have been carried out except site preparation activities such as obtaining permits, boundary fencing, setting up of project site office and construction camp which are being completed in time for the construction phase expected to start in the last week of May or first week of June 2023, subject to approvals and procedures in place.

32. Aside from the additional baseline data gathering on ambient air quality, marine water quality, ground water quality monitoring was also carried out for ambient noise levels and water quality proposed to be used for construction and camp.

33. Sampling and testing have been carried out as per method of statement enclosed as Appendix of CEMP.

**Table 12 Additional Baseline Data Gathering during Design/Pre-Construction Stage**

| Assessment | Parameters | Location | Frequency | Status |
|---|---|---|---|---|
| Ambient air quality | • TSP<br>• $PM_{10}$<br>• $PM_{2.5}$<br>• $NO_2$<br>• $SO_2$ | Total of 7 monitoring locations (Refer to Figure *2)*<br>• AQ1 (downwind direction of the proposed project site)<br>• AQ2 (crosswind direction of the plume)<br>• AQ3 (crosswind direction of the smoke plume from the existing dump site at Thilafushi.<br>• AQ4 (Vilingili as a control site)<br>• ASR2 | Monthly sampling | Ambient air quality samplings were undertaken on the following dates:<br><br>1) 28-30 January 2023<br>2) 5-8 February 2023<br>3) 19-22 March 2023 |

| Assessment | Parameters | Location | Frequency | Status |
|---|---|---|---|---|
| | | • ASR3<br>• ASR5 | | |
| Ambient noise level | $L_{eq}$daytime and $L_{eq}$nighttime | Total of 5 monitoring locations (Refer to Figure *3)* | Monthly sampling | Noise level sampling was undertaken on the following dates:<br>1) 26-27 January 2023<br>2) 15-16 February 2023<br>3) 25-26 March 2023 |
| Marine water quality | Heavy metals (As, $Cr^{+6}$, Cu, Ni, Pb, Zn, Hg, Cd), nitrite, pH @ 24°C, turbidity, and BOD5 etc. | Sampling stations: SW1 to SW7 and any other locations as may be deemed by the DBO Contractor as important sampling locations or sites | Quarterly sampling | Marine water samples were collected from seven sampling stations - SW1, SW2, SW3, SW4, SW5, SW6, and SW7 on 15 February 2022. |
| Ground water quality | Oil and grease, fecal coliform, presence of petroleum, pH, Heavy metals (As, $Cr^{+6}$, Cu, Ni, Pb, Zn, Hg, Cd), etc. | • Water samples to be collected from the eight monitoring locations<br>• For each location, the sample was collected from mid-water level | Quarterly sampling | • Groundwater quality was conducted on 15 February 2023. |
| Water quality proposed to be used for construction and activity | pH, EC, TSS, Fecal coliform, total coliform, arebic plate count, FE, Cd, As, Pb, Hg, Nitrate etc. | • Supply line of Male Water and Sewerage Company Supply network at project site. | Once | • Grab sample was collected on13 March 2023 |

## 2. Monitoring Results

- **Ambient Air Quality**

34. As shown in Table 12, there were three sampling events during this reporting period - 1) 28-30 January 2023, 2) 5-8 February 2023, and 3) 19-22 March 2023.Measurements of parameter such as $PM_{10}$, $PM_{2.5}$, $SO_2$, $NO_2$ TSPM were done by using air quality monitoring station-based online sensor technology.

35. For the additional baseline data gathering, ambient air quality sampling was conducted at seven locations: 6 locations at Thilafushi (AQ1, AQ2, and AQ3 identified as baseline stations in the EIA and the ASR2, ASR3 and ASR5 based on the AERMOD study in the EIA), and one location at Villingili (AQ4) as control station. Figure 2 shows the ambient air quality sampling stations. Table 13 gives the description of the sampling stations while Table 14, Table 15, and Table 16 show the summarized results of ambient air quality sampling in January 2023, February 2023, and March 2023, respectively. Detailed reports on ambient air quality sampling conducted are given in Appendix 2.


**Figure 2: Ambient Air Quality Sampling Stations**

**Table13: Description of Ambient Air Quality Sampling Stations**

| Location | Description | Distance to Project Site (WtE facility construction) meter |
|---|---|---|
| AQ1 | Represents dense industrial area | 650 |
| AQ2 | Represents dense industrial area | 1000 |
| AQ3 | Represents dense industrial area | 500 |
| ASR2 | Represents dense industrial area | 700 |
| ASR3 | Represents dense industrial area | 500 |
| ASR5 | Represents dense industrial area | 1000 |
| AQ4 | Represents residential area with moderate urbanisation | 4500 |

## Table 14: Results of Ambient Air Quality Sampling in January 2023

| Parameters | Sampling Location | | | | | | | Averaging time | LOQ [1] | WHO Ambient AirQualityGuidelines (World Bank Group-International Finance Corporation EHS Guidelines April 2007) | Applicable to the Project |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Period of Sampling – 28 to 30 January 2023 | | | | | | | | | | |
| | AQ1 | AQ2 | AQ3 | AQ4 | ASR2 | ASR3 | ASR5 | | | | |
| $PM_{10}$ (µg/m$^3$) | 25.28 | 36.6 | 46.84 | 25.59 | 35.54 | 27.61 | 21.68 | 24 hours | | 50µg/m$^3$ | 50µg/m$^3$ |
| $PM_{2.5}$ (µg/m$^3$) | 25.13 | 36.45 | 46.64 | 25.56 | 35.46 | 27.57 | 21.66 | 24 hours | | 25µg/m$^3$ | 25µg/m$^3$ |
| $SO_2$ (µg/m$^3$) | ND | ND | ND | ND | ND | ND | ND | 24 hours | <0.5 ppb (1.3µg/m$^3$) | 20µg/m$^3$ | 20µg/m$^3$ |
| $NO_2$(µg/m$^3$) | ND | ND | ND | ND | ND | ND | ND | 1 hour | <0.5 ppb (0.94µg/m$^3$) | 200µg/m$^3$ | 200µg/m$^3$ |
| TSPM (µg/m$^3$) | 47.82 | 69.28 | 88.65 | 48.49 | 67.31 | 52.3 | 41.08 | 24 hours | | - | - |
| LOQ [1]Limit of Quantification (LOQ) is the lowest concentration of the pollutant that can be reliably measured | | | | | | | | | | | |

## Table 15: Results of Ambient Air Quality Sampling in February 2023

| Parameters | Sampling Location | | | | | | | Averaging time | LOQ [1] | WHO Ambient AirQualityGuidelines (World Bank Group-International Finance Corporation EHS Guidelines April 2007) | Applicable to the Project |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Period of Sampling – 5 to 8 February 2023 | | | | | | | | | | |
| | AQ1 | AQ2 | AQ3 | AQ4 | ASR2 | ASR3 | ASR5 | | | | |
| $PM_{10}$ (µg/m$^3$) | 40.11 | 35.54 | 46.84 | 29.1 | 23.63 | 32.44 | 35.62 | 24 hours | | 50µg/m$^3$ | 50µg/m$^3$ |
| $PM_{2.5}$ (µg/m$^3$) | 39.97 | 35.45 | 46.64 | 37.13 | 23.6 | 31.7 | 40.58 | 24 hours | | 25µg/m$^3$ | 25µg/m$^3$ |
| $SO_2$ (µg/m$^3$) | ND | ND | ND | ND | ND | ND | ND | 24 hours | <0.5 ppb (1.3µg/m$^3$) | 20µg/m$^3$ | 20µg/m$^3$ |
| $NO_2$(µg/m$^3$) | ND | ND | ND | ND | ND | ND | ND | 1 hour | <0.5 ppb (0.94µg/m$^3$) | 200µg/m$^3$ | 200µg/m$^3$ |
| TSPM (µg/m$^3$) | 75.21 | 68.2 | 88.65 | 58.81 | 45.28 | 60.61 | 68.17 | 24 hours | | - | - |
| LOQ [1]Limit of Quantification (LOQ) is the lowest concentration of the pollutant that can be reliably measured | | | | | | | | | | | |

## Table 16: Results of Ambient Air Quality Sampling in March 2023

| Parameters | Sampling Location | | | | | | | Averaging time | LOQ [1] | WHO Ambient Air Quality Guidelines (World Bank Group-International Finance Corporation EHS Guidelines April 2007) | Applicable to the Project |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Period of Sampling – 19 to 22 March 2023 | | | | | | | | | | |
| | AQ1 | AQ2 | AQ3 | AQ4 | ASR2 | ASR3 | ASR5 | | | | |
| $PM_{10}$ (µg/m$^3$) | 11.7 | 10.53 | 13.93 | 26.97 | 17.40 | 11.91 | 15.91 | 24 hours | | 50µg/m$^3$ | 50µg/m$^3$ |
| $PM_{2.5}$ (µg/m$^3$) | 7.23 | 7.83 | 12.16 | 17.81 | 13.16 | 11.87 | 13.27 | 24 hours | | 25µg/m$^3$ | 25µg/m$^3$ |
| $SO_2$ (µg/m$^3$) | ND | ND | ND | 3.01 | ND | ND | ND | 24 hours | <0.5 ppb (1.3µg/m$^3$) | 20µg/m$^3$ | 20µg/m$^3$ |
| $NO_2$(µg/m$^3$) | Max: 5.31 Min: ND | Max: 5.28 Min: ND | Max: 2.63 Min: ND | Max: 6.74 Min: ND | Max: 6.41 Min: ND | Max: ND Min: ND | Max: 19.73 Min: ND | 1 hour | <0.5 ppb (0.94µg/m$^3$) | 200µg/m$^3$ | 200µg/m$^3$ |
| TSPM (µg/m$^3$) | 61.4 | 29.57 | 32.72 | 53.83 | 45.10 | 26.71 | 38.31 | 24 hours | | - | - |
| LOQ [1]Limit of Quantification (LOQ) is the lowest concentration of the pollutant that can be reliably measured | | | | | | | | | | | |

36. In the EIA (July 2020), ambient air quality monitoring was conducted in four locations (AQ1, AQ2, AQ3 and AQ4). Monitoring at AQ1 was conducted from 25-31 March 2019, at AQ2 from 20-25 August 2019, at AQ3 from 19-25 March 2019 and at AQ5 from 3-9 March 2019 by using online Aeroqual series 500 monitors and sensors.

37. From Table 14 to Table 16, results of ambient air quality conducted during this reporting period show that it is within the limits set by the World Bank-IFC EHS Guidelines 2007 at all locations except for $PM_{2.5}$ during Jan-23 and February-23, and within limit for all parameter during March-23. Variations in the ambient air quality results compared to the baseline measurements in EIA (July 2020) may be attributed to the microclimate of the monitoring locations that may have background pollution sources as Thilafushi is an industrial site where various types of industrial works are conducted in addition to the local activities, and meteorological conditions at the time of sampling.

38. Male and Hulhumale are located in the E-N quadrant of the Thilafushi island. Based on the meteorology of the area, more specific to monthly variations, easterly winds are predominant from December to February. In March, it is a combination of easterly and NW winds, while westerly winds are predominant for the rest of the year. Two monsoon seasons are observed in Maldives: the Northeast (*Iruvai*) and the Southwest (*Hulhangu*) monsoon. The southwest monsoon lasts from May to September and the northeast monsoon occurs from December to February. The transition period of southwest monsoon, which is the driest part of the year, occurs between March and April while that of northeast monsoon occurs between October and November.

- **Noise level monitoring**

39. Ambient noise level measurements were conducted from 26-27 January 2023, 15-16 February 2023 and 25-26 March 2023 at five sampling stations identified in the EIA (July 2020). These are NQ1 to NQ5 (refer to Table 17 for description of the sampling stations and Figure 5 for location map). Thilafushi is considered an industrial area and the EPA has no noise level standards, thus, results of ambient noise level measurements were referred to the WB-IFC EHS Guidelines April 2007 (Table 1.7.1) of 70 dBA for both daytime and night-time. Hourly noise levels were measured during daytime and night-time using a handheld instrument. Results of noise sampling are presented in Table 18.

**Table 17: Description of Noise Sampling Stations**

| Station Identifier | Location | Description and rationale |
|---|---|---|
| NQ1 | 4°10'26.4 N 73°28'59.9 E | The station was selected as it represents a major industrial location of the island and is also located close to the harbour. The location lies north of the proposed facility on the opposite side of the lagoon. |
| NQ2 | 4°10'56.6 N 73°26'53.3 E | The station was selected as it represents a major industrial location of theisland. The location lies east ofthe proposed facility on the opposite side of the lagoon. The location has various industrial activities in its proximity |
| NQ3 | 4°10'58.3 N 73°26'09.6 E | This station was selected as it is located near theboundary of the proposed WTE facility. |
| NQ4 | 4°10'57.3 N 73°25'59.4 E | This station was selected as it is located west of proposed WTE facility. Thearea has less development and less activity during the daytime. |
| NQ5 | 4°10'57.3 N 73°26'14.4 E | This station was selected as it is located at the proposed WTE facility |

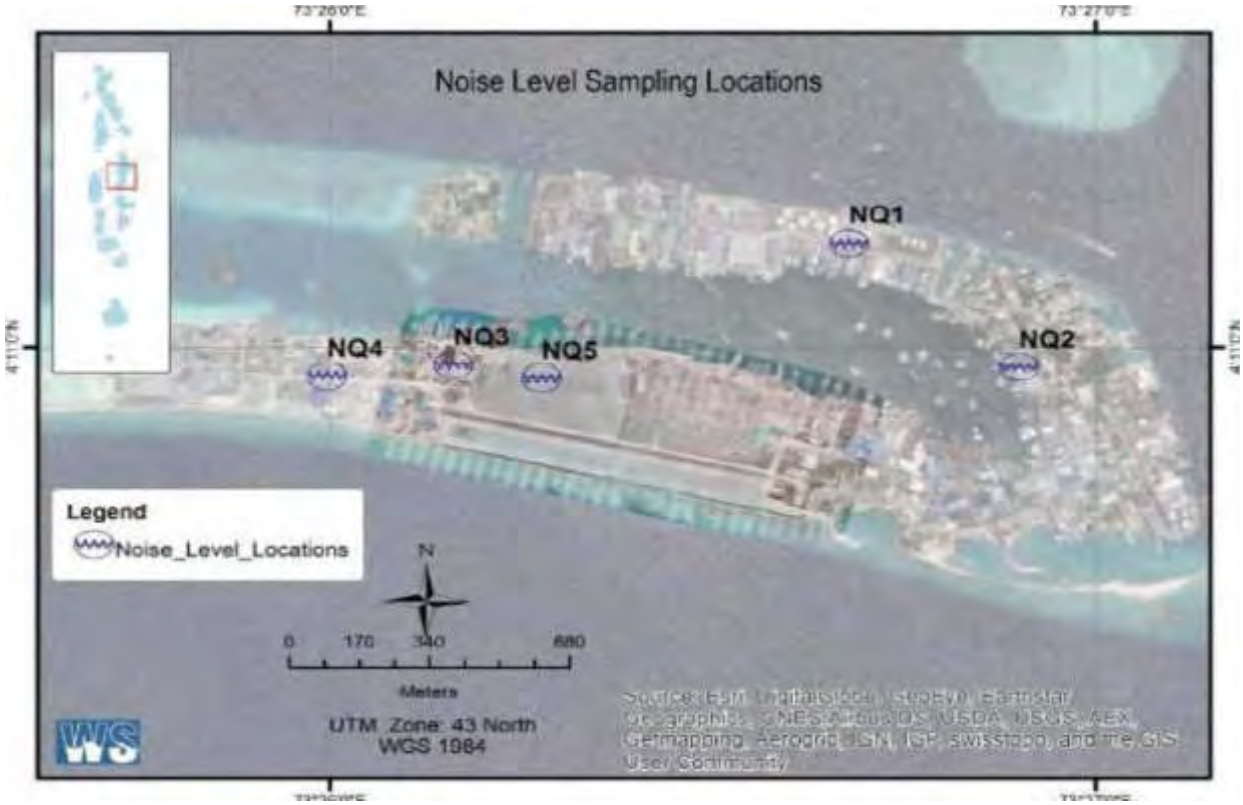


**Figure 3: Noise Sampling Stations**

**Table 18: Results of Ambient Noise Level Measurements**

| Station | Measured from 26-27 January 2023 | | Measured from 15-16 February 2023 | | Measured from 25-26 March 2023 | |
|---|---|---|---|---|---|---|
| | Noise level (dBA) daytime | Noise level (dBA) night-time | Noise level (dBA) daytime | Noise level (dBA) night-time | Noise level (dBA) daytime | Noise level (dBA) night-time |
| NQ1 | 61.9 | 55.6 | 59.4 | 56.2 | 57.2 | 52.5 |
| NQ2 | 55.2 | 50.5 | 57.0 | 51.0 | 55.7 | 46.6 |
| NQ3 | 52.4 | 54.0 | 55.0 | 52.7 | 55.6 | 46.1 |
| NQ4 | 53.8 | 56.1 | 55.0 | 52.0 | 54.6 | 49.0 |
| NQ5 | 51.0 | 44.0 | 53.9 | 49.6 | 56.0 | 46.0 |
| WHO Guidelines Value for Noise Levels Measured Out of Doors (One Hour $L_{Aeq}$ in dBA) Source: Guidelines for Community Noise. WHO. 1999 | 70 | 70 | 70 | 70 | 70 | 70 |

40. Results of ambient noise levels were found to be within the applicable standards for commercial and industrial areas during reporting period i.e., from January to March 2023. Compared to the ambient noise levels measured on 25 August 2019 in the same sampling stations from the EIA (July 2020), monitored noise levels were found in same range, however variations in the results may be attributed to the commercial and industrial activities at the time of measurements.

- **Marine Water Quality**

41. For the additional baseline data gathering, marine water quality sampling was done on 15 February 2023 from the same seven locations identified in the EIA (July 2020) given in Figure 4 below. Laboratory analysis of marine water was done by the Bureau Veritas Laboratory, Sri Lanka for the following parameters - heavy metals (As, Cr, Cu, Ni, Pb, Zn, Hg, Cd), total nitrogen, nitrites, pH, turbidity, five-day biochemical oxygen demand $(BOD)_5$ etc (see Table 19).The samples were brought to Sri Lanka and delivered to the laboratory within 24 hours from the field sampling. All the samples are kept in ice boxes to maintain the appropriate temperature and to conserve the samples. In-situ recording of pH, dissolved oxygen (DO), and electrical conductivity (EC) for each sample was conducted by using a handheld Hach SensION +MM156 water quality measurement meter. These results (Table 19) show compliance to the Maldivian Marine Monitoring Standards [Reference: Great Barrier Reef Marine Park Authority (2009) Outlook Report 2009]. Laboratory test results of marine water samples are given in Appendix 3.

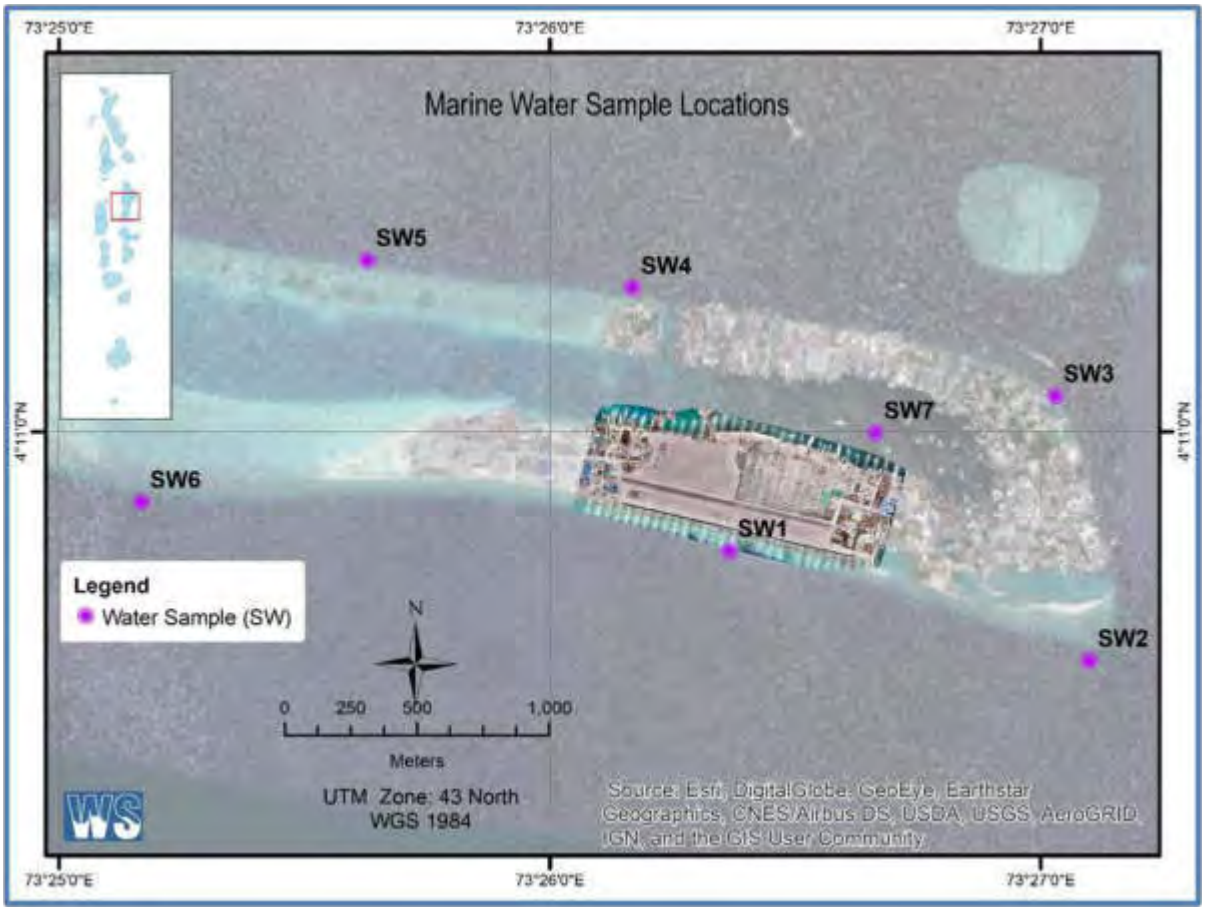


**Figure 4: Marine Water Quality Sampling Stations**

## Table 19 Marine Water Quality Results

| Parameters | Date of sampling : 15 February 2023 | | | | | | | LOQ[1] | Unit | Maldivian Marine water quality standard |
|---|---|---|---|---|---|---|---|---|---|---|
| | SW1 | SW2 | SW3 | SW4 | SW5 | SW6 | SW7 | | | |
| $BOD_5$ at 20 $^0C$ | 6 | 6 | ND | 6 | 6 | 6 | 6 | <1 | mg/L | <2mg/L |
| COD | 40 | 38 | 3 | 36 | 39 | 38 | 41 | | | |
| DO | 5.6 | 5.4 | 5.9 | 5.9 | 5.6 | 5.2 | 5.2 | - | mg/l | NA |
| Turbidity | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.3 | 0.4 | - | NTU | 3 – 5 NTU (max) |
| TSS | 3 | 4 | 4 | 4 | 4 | 3 | 3 | | mg/l | NA |
| pH at 24°C | 8.4 | 8.0 | 7.1 | 8.2 | 8.1 | 8.3 | 8.2 | - | - | 8-8.3 |
| Electrical Conductivity at 25ºC | 54.5 | 54 | 57.2 | 48.6 | 47.8 | 48 | 56 | | µS/cm | 48 to 62 |
| Nitrite (as NO2) | 0.3 | 0.3 | 0.1 | 0.3 | 0.4 | 0.3 | 0.4 | - | mg/L | None proposed |
| Total Nitrogen | 11.6 | 9.8 | ND | 11.6 | 10.4 | 11.8 | 10.9 | 0.5 | mg/L | None proposed |
| Total Phosphates (as $PO^{3-}$) | 0.05 | 0.05 | ND | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | mg/L | None proposed |
| Arsenic | ND | ND | ND | ND | ND | ND | ND | 0.001 | mg/L | 0.05 |
| Cadmium | ND | ND | ND | ND | ND | ND | ND | 0.0001 | mg/L | 0.002 |
| Lead | ND | ND | ND | ND | ND | ND | ND | 0.001 | mg/L | 0.005 |
| Mercury | ND | ND | ND | ND | ND | ND | ND | 0.00005 | mg/L | 0.0001 |
| Nickel | ND | ND | ND | ND | ND | ND | ND | 0.001 | mg/L | 0.015 |
| Copper | ND | ND | ND | ND | ND | ND | ND | 0.001 | mg/L | 0.005 |
| Zinc | ND | ND | ND | ND | ND | ND | ND | 0.001 | mg/L | 0.05 |
| Chromium | ND | ND | ND | ND | ND | ND | ND | 0.001 | mg/L | 0.05 |
| Hexavalent Chromium (as$Cr^{6+}$)* | ND | ND | ND | ND | ND | ND | ND | 0.05 | mg/L | 0.05 |

[1]Limit of Quantification (LOQ) is the lowest concentration of the contaminant that can be reliably measured.

42. As per Table 19, values of EC (47.8 to 56 µS/cm), nitrite (0.1 mg/L-0.4 mg/L), turbidity (0.2-0.4 NTU)and total nitrogen (ND-11.8 mg/L) are within the prescribed standards. The pH values ranged from 7.1 to 8.4. Also, $BOD_5$ values ranged from ND to 6 mg/L which are higher than the limit of < 2 mg/L except in SW3 which is 1 mg/L. Levels of heavy metals in all the sampling stations were tested to be below the detection limit.

43. From the EIA (July 2020), samples were collected from the same locations on 3 July 2018. Values of temperature (24.2ºC), nitrate (0.3 mg/L-0.5 mg/L), oil &grease, salinity (36 ppt -37 ppt), free ammonia (ND-0.05 mg/L), and $BOD_5$ (ND-1 mg/L) were similarly within the prescribed standards. The pH values ranged from 8.2 to 8.4 which is slightly higher than the limit of 8.3 in all the sampling stations except in SW7.Heavy metals, except for Zn (ND- 0.008 mg/L for SW2, SW3, SW6 & SW7), were tested to be below the detection limit. Variations in the results of marine water quality (Table 19) compared to the results from the EIA (July 2020) may be attributed to the environmental conditions at the time of sampling.

- **Groundwater Quality**

44. Environmental monitoring of groundwater quality for the pre-construction period was conducted on 15 February 2023. Water samples were collected from the eight monitoring stations identified in the EIA (July 2020) and these are GW1 to GW8 (refer to Figure 5). For each location, the sample was collected from mid-water level and brought for laboratory testing in Sri Lanka. General sampling procedure involves washing the glass sampling bottles with water from the sampling points. For microbial tests, samples were collected in sterile glass bottles and tested in the laboratory of Male' Water and Sewerage Company (MWSC).Table20 presents the analytical results of groundwater quality with detailed test results given in Appendix 3.

45. Ground water quality is not akin to drinking water standards as the island is originally reclaimed using waste and various sites have industrial activities. Water treatment will be required if groundwater in Thilafushi will be used as drinking water.

46. Results from Table 20 show that levels of PAH and heavy metals were found to be below detection limit while other parameter are: oil & grease (ND in GW1 and 0.9 mg/l in GW5), TSS (ND in GW1, GW2, GW6, GW7 & GW8 and 680 mg/L in GW5), electrical conductivity (13.5 µS/cm in GW3 to 49425 µS/cm in GW4), Feacal coliform (< 1.8 MPN/100 ml at all locations), pH(6.5 in GW1 to 8.3 in GW3), chloride (77.8 mg/L in GW1 and GW8 to 8640 mg/L in GW5), and nitrate (ND mg/L in GW1, GW7 & GW 8 to 0.6 mg/L in GW2 & GW5).

47. From the EIA (July 2020), samples were collected in the same sampling stations on 2 April 2019. Values of PAH, oil &grease, and heavy metals were found to be below the detection limit while for other parameters are: TDS (794 mg/L in GW1 to 12,946 mg/L in GW3), electrical conductivity (1.39mS/cm in GW1 to 25mS/cm in GW6), total coliform (4 MPN/100 ml in GW8 to >2,420 MPN/100 ml in GW1, GW3,GW5, and GW7), pH(7.1 in GW5 to 8.0 inGW4), chloride (183mg/L in GW1 to 6,325mg/L in GW6), and nitrate (1.7mg/L in GW1 to 34.5 mg/L in GW6).


**Figure 5: Groundwater Quality Sampling Stations**

**Table 20: Analytical Results of Groundwater Sampling, February 2023**

| Parameters | Results for Groundwater quality | | | | | | | | LoQ | Unit | Test Method |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Date of Sampling: 15 February 2023 | | | | | | | | | | |
| | GW1 | GW2 | GW3 | GW4 | GW5 | GW6 | GW7 | GW8 | | | |
| Nitrate* | ND | 0.6 | 0.5 | 0.5 | 0.6 | 0.1 | ND | ND | 0.05 | mg/L | HACH Method 8171 |
| Chloride | 77.8 | 219 | 110 | 296 | 8640 | 83.5 | 79.6 | 77.8 | - | mg/L | In-house Test method (Adapted from M926 Chloride analyser Operation Manual) |
| Phosphate | ND | 0.06 | 0.05 | 0.05 | 0.05 | ND | ND | ND | 0.05 | mg/L | HACH Method 8048 |
| Turbidity* | 0.2 | 0.2 | 0.4 | 0.4 | 8.7 | 0.3 | 0.2 | 0.2 | - | NTU | APHA 23rd ed: 2017: 2130 B |
| pH at 25°C* | 6.5 | 6.7 | 8.3 | 7.6 | 7.5 | 6.8 | 6.8 | 6.8 | - | mg/L | APHA 23rd ed: 2017 :4500H+ |
| Feacal Coliform | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | | MPN/ 100 ml | ColilertÂ®-18/Quanti-TrayÂ®2000 |
| Iron (as Fe) * | ND | ND | ND | ND | ND | ND | ND | ND | 0.001 | mg/L | CPSD-AN-0581:2019-V15by ICP-MS |
| Manganese (as Mn) | ND | ND | ND | ND | ND | ND | ND | ND | 0.001 | mg/L | CPSD-AN-0581:2019-V15by ICP-MS |
| Arsenic (as As) | ND | ND | ND | ND | ND | ND | ND | ND | 0.001 | mg/L | CPSD-AN-0581:2019-V15by ICP-MS |
| Total Suspended Solids* | ND | ND | 2 | 2 | 680 | ND | ND | ND | 1.0 | mg/L | APHA 23rd ed: 20 l 7: 2540 C |
| Electrical Conductivity at 25°C* | 577 | 3252 | 13.5 | 4925 | 15.5 | 1712 | 595 | 580 | - | µS/cm | APHA 23rd ed: 20 l 7: 2510 B |
| Cadmium (as Cd)* | ND | ND | ND | ND | ND | ND | ND | ND | 0.0001 | mg/L | CPSD-AN-00581:2019-V15by ICP-MS |
| Lead (as Pb)" | ND | ND | ND | ND | ND | ND | ND | ND | 0.001 | mg/L | CPSD-AN-00581:2019-V15by ICP-MS |
| Mercury (as Hg) | ND | ND | ND | ND | ND | ND | ND | ND | 0.0005 | mg/L | CPSD-AN-00581:2019-V15by ICP-MS |
| Oil and Grease | ND | 0.1 | 0.1 | 0.1 | 0.9 | 0.1 | 0.1 | ND | 0.1 | mg/L | APHA 23rd ed: 20 l 7: 5520 B |
| **Polynuclear Aromatic Hydrocarbons** | | | | | | | | | | | |
| Naphthalene | ND | ND | ND | ND | ND | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Acenaphthylene | ND | ND | ND | ND | ND | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Acenaphthene | ND | ND | ND | ND | ND | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Fluorene | ND | ND | ND | ND | ND | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Phenanthrene | ND | ND | ND | ND | ND | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Anthracene | ND | ND | ND | ND | ND | ND | ND | ND | 1 | µg/l | CPSD-AN-00576 |
| Fluoranthene | ND | ND | ND | ND | ND | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Pyrene | ND | ND | ND | ND | ND | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Benzo[a] anthracene | ND | ND | ND | ND | ND | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Chrysene | ND | ND | ND | ND | ND | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Benzo[a]pyrene | ND | ND | ND | ND | ND | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Benzo[e]pyrene | ND | ND | ND | ND | ND | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Indenol[ 1,2,3-cd]pyrene | ND | ND | ND | ND | ND | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Dibenzo [a,h ]anthracene | ND | ND | ND | ND | ND | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |

| Parameters | Results for Groundwater quality | | | | | | | | LoQ | Unit | Test Method |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Date of Sampling: 15 February 2023 | | | | | | | | | | |
| | GW1 | GW2 | GW3 | GW4 | GW5 | GW6 | GW7 | GW8 | | | |
| Benzo[g,h.i]perylene | ND | ND | ND | ND | | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Benzo[b[fluoranthene | ND | ND | ND | ND | | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Benzo[j]fluoranthene | ND | ND | ND | ND | | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |
| Benzo[k]fluoranthene | ND | ND | ND | ND | | ND | ND | ND | 1 | µg/l | CPSD -AN-00576 |

- **Water Quality proposed to be used for construction and camp**

48. One sample was collected from supply line of MWSC (Male Water and Sewerage company) network at project site and analyzed for limited parameter as per details given in Table 21.

49. Quality of water as given in Table 21 by and large is well within the acceptable limits except Electrical Conductivity which is slightly on higher side and need to be reconfirmed via more sampling and testing. Detailed report is enclosed as Appendix-4

**Table 21 : Water quality proposed to be used for construction and Camp**

| Test Parameter | Date of sampling: 13 March 2023 | | |
|---|---|---|---|
| | Unit | Results | Acceptable Limits* |
| Iron as Fe | mg/L | ND | Max 0.3 |
| Manganese as Mn | mg/L | < 0.001 | Max 0.1 |
| Nitrate (as NO3-) | mg/L | 1.8 | Max 45 |
| Arsenic as As | mg/L | < 0.001 | Max 0.001 |
| Cadmium as Cd | mg/L | < 0.001 | Max 0.003 |
| Lead as Pb | mg/L | < 0.001 | Max 0.01 |
| Chloride (as Cl-) | mg/L | 68.2 | Max 200 |
| Mercury as Hg | mg/L | < 0.001 | Max 0.001 |
| pH | -- | 7.0 | 6.5-8.5 |
| Turbidity | NTU | 0.1 | < 1.0 |
| Electrical Conductivity | µs/cm | 1280 | Max 1000 |
| Total Phosphates | mg/L | ND | -- |
| Total Suspended Solids | mg/L | 45 | 100 |
| Aerobic Plate Count | Cfu/ml | $1.7 \times 10^{1}$ | $1 \times 10^{2}$ |
| Total coliform | Mpn/100ml | <2/ Absent | Absent/100ml |
| Fecal coliform | Mpn/100ml | <2/ Absent | Absent/100ml |

## IX.TRAINING AND CAPACITY BUILDING ACTIVITIES

50. Details of DBO/EPC Contractor-driven trainings and training workshop conducted jointly by PMDCSC and PMU are given in Table 22 and photos are shown in Appendix 5.

**Table22: Training/Capacity Building Activities Conducted**

| No | Date | Training Activity | Training objective | Venue and duration | Target group | Number of participants (male, female) |
|---|---|---|---|---|---|---|
| 1 | 05.01.23 | Aids- HIV Prevention Awarnes Training | How disease transmission, Safe and Prevention, Awarness, | WtE, Site Thailafushi, 1 hrs | Site workers/ Staffs | 18 Male |
| 2 | 16.01.23 | Risk Assessment | Hazrad Identification, Identify Who might be harm, Evaluate the risk, Mitigation Measures, Recovery measures | WtE, Site Thailafushi, 1 hrs | Staffs | 10 Male |
| 3 | 19.02.2023 | Dengue Fever prevention | Transmission, Symptoms,warning sign, prevention Measures | WtE, Site Thailafushi, 1 hrs | Site workers / Staffs | 18 Male |
| 4 | 26.02.2023 | Working At Height | What is Working at Height, Hazards, Control Measures, Scaffolding, fall prevention, and Use of ladder | WtE, Site Thailafushi, 1 hrs | Site workers | 5 Male |
| 5 | 7.03.23 to 9.03.23 | In training workshop, project specific presentations were made by Mr Sunil Gupta from PMDCSC and DR Ibrahim from MOE on followings:<br>9. ADB's SPS and requirements<br>10. IFC Performance standards & EHS guidelines and requirements<br>11. Contractual obligations on HSE aspects | To upgrade the understanding on technical and administrative requirements to comply with contractual obligations on HSE aspects to facilitate the process of preparation of various HSE documents as mentioned in EIA report, H&S | WtE, Site Thailafushi, | Staff of DBO and EPC contractor | 11-16 Male |

| No | Date | Training Activity | Training objective | Venue and duration | Target group | Number of participants (male, female) |
|---|---|---|---|---|---|---|
| | | 12. Grievance Redressal Mechanism and requirements<br>13. Stakeholder consultation and requirements<br>14. Salient features of ISO 14001 and ISO 45001<br>15. Applicable provisions of local regulations and requirements<br>16. Present status of compliance | Plan and CEMP. | | | |
| 6 | 18.03.2023 | PTW Procedure | Procedures, Roles and responsibility, Types of PTW, PTW Process, Certificates | WtE, Site Thailafushi, 1 hrs | Staffs | 10 Male |
| 7 | 19.03.2023 | Security Responsibility | Duties and responsibility, Maintain In/Out register, Emergency Response | WtE, Site Thailafushi, 1 hrs | Security | 2 Male |

51. The PMU will be supported by a public awareness and community capacity building (PACCB consultant), a consulting firm that will help to generate awareness and strengthen skills in waste collection, segregation, compositing, recycling, and O&M targeting the poor and the women, including community awareness campaign for strengthening disaster risk reduction and climate change readiness. The PACCB consultant will be responsible for the information, education, and communications initiatives and public awareness on waste-to-energy. The recruitment of PACCB consultant is ongoing and four organizations have been shortlisted on the basis of EOI and RFP for the same is in process.

## X. PUBLIC CONSULTATIONS

52. MoECCT, through the PMU, will continue to conduct meaningful consultations during project implementation. The PACCB will support the PMU in managing stakeholders' consultations. The PMU will conduct consultations together with the PMDCSC and the DBO Contractor/EPC Contractor during the next quarter before construction begins.

53. The DBO contractor has been mobilized at the project site and has set up labor camps and detailed designs are ongoing. No consultation was done during this reporting period.

## XI. GRIEVANCE REDRESS MECHANISM

### A. Grievance Redress Mechanism

54. The outline of grievance redress mechanism (GRM) has been approved in July 2022 and Figure 17 presents the process of resolving complaints under the GRM. Every effort shall be given to find an amicable solution before higher tiers could be engaged. While resolving complaints is two-tiered, an aggrieved person can file a complaint directly through the country's judicial or legal system separately, which can be in parallel to or independent from any complaint filed through the project's GRM. However, DBO contractor yet to submit a detailed GRM plan and SOPs as part of the CEMP for approval.

55. Prior to the start of construction which is expected in the last week of May or first week of June 2023, subject to approvals and procedures in place, the DBO Contractor/EPC Contractor is expected to install sign boards on the GRM, details of focal persons, and contact phone numbers that will work in Maldives. However, GRM boxes with complaint forms haven been provided at entry gates of project site.

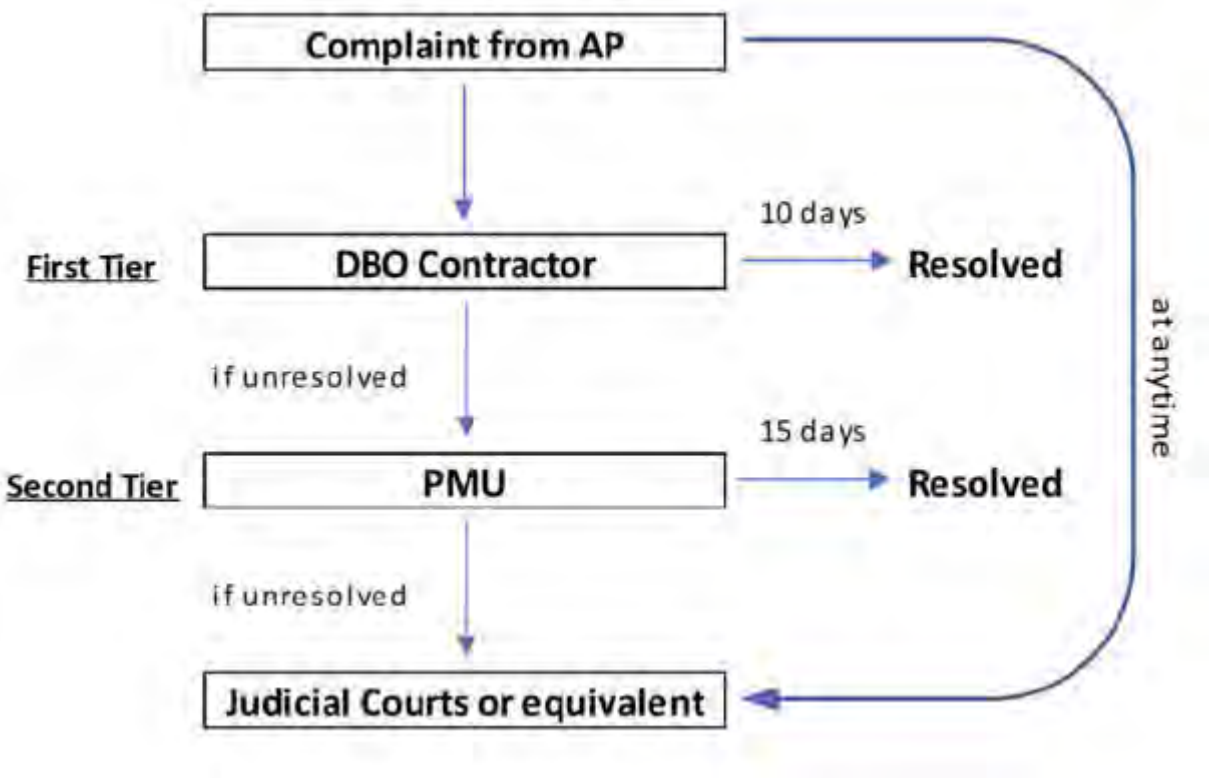


**Figure 6 Grievance Redress Mechanism Flowchart**

56. However, PMU (MOE) has published grievance redress mechanism (GRM) on its website and released the government notification on the same on 30th March 2023 as per links :
    a. en: http://www.environment.gov.mv/v2/en/download/19326 and

b. dv: http://www.environment.gov.mv/v2/dv/download/19328

### B. Complaints Received

57. No complaint was received for this reporting period.

### C. Composition of the Grievance Redress Committee (GRC)

58. A GRC for each tier in the GRM has been established. In the 1st tier, the grievances will be handled by the GRC under the Thilafushi DBO Contractor which is composed of the Contractor's Project Manager, Contractor's Resident Engineer, Contractor's Environmental/H&S Officer, and one representative from the PMDCSC. At the 2nd tier, grievances will be dealt with by the GRC consisting of the Project Manager/Director of PMU, Environment and Social Safeguard Specialist of PMU, Civil Engineer of PMU and IEC Specialist of PMU with a member from government, City council, and an NGO. Trainings will be conducted on the implementation of the GRM. No grievances were reported and hence no GRC meeting of second tier has been conducted in this reporting period.

## XII. FINDINGS & RECOMMENDATIONS

### A. Findings and Recommendations

59. The environmental clearance has been received from the EPA and has been extended. However, management plans and EMS including SOPs and checklists as referred in the conditionally approved CEMP are required from the DBO Contractor which is adding to the delay in start of construction work at site. Additional site mobilization, and additional baseline data gathering on ambient air quality, noise level marine water quality, HSE trainings were conducted during this reporting period. Table 23 presents the key issues and proposed remedial actions.

**Table 23: Key Issues and Proposed Remedial Actions**

| Monitoring aspect | Findings & Key issues | Further Actions/Remedial/Corrective Actions/Measures |
|---|---|---|
| Availability of safeguards personnel (PMU, PIU, Consultants, and contractors) | Complied.<br>DBO contractor/AAJV has one HSE manager, one environmental manager, one environment officer, one H&S manager and one H&S officer while PMDCSC has two environmental staff (one local and one international), and the PMU has a safeguards staff. | |

| Monitoring aspect | Findings & Key issues | Further Actions/Remedial/Corrective Actions/Measures |
|---|---|---|
| Compliance with statutory requirements (clearance/permits, etc.) | Being complied as per status of same given in Table 5. However, the following pending permits will be secured before the start of construction activities.<br>• Dewatering permit from URA for foundation works<br>• Permit for Commissioning and Operation of STP from the URA –<br>• HDC – Construction of main buildings and other ancillary buildings<br>• EPA- Environment Clearance - An addendum will be issued for EIA report after design is completed<br>• Approval for the power supply from the URA<br>• No Objection from FRS (Fire Rescue Services Department) from MNDF<br>• Agreement with HDC to commit to the safety measures around the construction area | PMU/ PMDCSC to monitor the status of pending permits and coordinate and facilitate with the DBO contractor. Relevant permits shall be obtained prior to any construction phase activities. No works shall proceed until the relevant permits are obtained. |
| Compliance with ADB loan covenants | Being complied. | • Various plans and EMS including SOPs and checklists as mentioned in the conditionally approved CEMP are be submitted by DBO contractor for approval. These will be approved prior to the start of any construction phase works.<br>• Operation of STP<br>• DBO/EPC contractor HSE team needs to understand the requirements and the preparation of the required documents to ensure compliance of contract's obligation on HSE aspects. |
| As required for environment category A project under SPS 2009, | Complied. | PMU to follow-up and/or coordinate more closely on the activities for this |

| Monitoring aspect | Findings & Key issues | Further Actions/Remedial/Corrective Actions/Measures |
|---|---|---|
| engage an independent environmental expert to conduct review and verify the environmental monitoring information, will work closely with PMU and DBO Contractor. | | engagement such as review of QEMRs and site visit. |
| Recruitment of PACCB consultants | Delayed. | Significant delays in recruiting consultants and as construction is expected to begin in last week of May or first week of June 2023, subject to approvals and procedures in place, and consultant needs to be mobilized before start of construction. |
| Compliance with preparation, approval, disclosure of draft EIA | Complied. | - |
| Preparation of the CEMP | Being complied partly as CEMP approved by the PMDCSC and the PMU on 7 December 2022 on conditions that the required additional management plans and SOPs as part of EMS are be prepared and finalized prior to construction works.<br><br>Delay in submission of required documents as above mentioned is part of the reason of delay in start of construction work | DBO Contractor/EPC Contractor to provide the management plans and SOPs as part of ESS as mentioned in the conditionally approved CEMP. PMU and PMDCSC to monitor compliance of the DBO Contractor and the EPC Contractor. These will be approved prior to the start of any construction phase works. |
| Compliance with preparation, approval, disclosure of updated final EIA | Being complied partially.<br>• EIA update is to be prepared considering updated project specific details for increased power generation capacity of 13 MW (as per contract) from 10 MW (as per EIA (July 2020).<br>• EIA update under preparation and need to be approved before start of construction work. | DBO contractor has to provide EIA update for review by the PMU, PMDCSC, and ADB. |
| Contractor compliance with pre-construction requirements | Being complied partially.<br>• Management plans and SOPs including checklists as for implementation, monitoring, reviewing, and documentation are inadequate and/or are not in place. However, some mitigation measures such as deputation of Environment and HSE managers, PPE, toolbox talks, signage, barricading of | Contractor will comply with all the pre-construction requirements prior to start of the construction phase PMU and PMDSC will monitor compliance and timely submission of quality outputs. These [re-construction requirements will be approved prior to the start of any construction phase works. |

| Monitoring aspect | Findings & Key issues | Further Actions/Remedial/Corrective Actions/Measures |
|---|---|---|
| | construction site are in place but found inadequate.<br>• Concept design was approved on 28 October 2022 and the CEMP approved on 7 December 2022 with conditions.<br>• Management plans and SOPs as part of EMS as mentioned in the conditionally approved CEMP are in process of finalization and yet to be approved by PMDCSC and PMU.<br>• The site has one HSE manager, one H&S Manager, one H&S officer, one Environmental Manager and one Environment officer who work fulltime onsite.<br>• Site inspections are being carried out by the PMDCSC and the DBO Contractor on regular basis on regular basis. | |
| EMP implementation, additional baseline data gathering, monitoring, and reporting | Being complied partially.<br>• Management plans and SOPs including checklists for implementation, monitoring, reviewing is inadequate and/or in the preparation stage.<br>• Additional baseline data gathering for ambient air quality, and marine water quality have been carried out during this reporting period. Aside from this, monitoring of ambient noise levels and groundwater quality was carried out. | • CEMP together with the final SOPs and management plans to be submitted by the DBO contractor for approval before the construction phase.<br>• PMU and PMDCSC to continue the review and monitor the quality of environmental monitoring results submitted by the Contractors. |
| Implementation of COVID-19 health and safety measures | • Being complied partly.<br>• The COVID-19 emergency restrictions have been lifted by the Government of Maldives since March 2022. The Contractor has mobilized a doctor and a clinic has been set-up onsite to provide emergency health care. However, facilities provided need improvements.<br>• Documented plan needs to be prepared for implementation. | • COVID -19 management plan along with SOPs and checklists need to be prepared and implemented. These will be approved prior to the start of any construction phase works.<br>• Requisite adequate facilities are to be provided in clinic at project site.<br>• PMU will continue to monitor and implement the COVID-19 Plan to prevent incidence of an outbreak. |
| Training and capacity building activities | • DBO/EPC contractors conduct regular HSE trainings<br>• Training workshop was conducted at project site from 7 to 9 March | • Adequate details on the trainings including attendance register are to be reported by the DBO |

| Monitoring aspect | Findings & Key issues | Further Actions/Remedial/Corrective Actions/Measures |
|---|---|---|
| | 2023 by PMDSC for staff of EPC and DBO contractor to upgrade the understanding on technical and administrative requirements to comply with contractual obligations on HSE aspects and to facilitate the process of preparation of various HSE documents as mentioned in EIA report, H&S Plan and CEMP. | contractor as part of the monthly progress report.<br>• Training calendar, plan, SOPs and checklists will be prepared by the DBO/EPC contractors to implement, review, and modify the training program on regular basis. |
| Public consultation | • No consultation has been conducted post EIA report (July 2020).<br>• Community Engagement Plan is yet to be submitted by the DBO contractor for approval. | • DBO contractor will develop a community engagement plan and SOP to comply with contractual obligations.<br>• Consultation to be conducted prior to commencement of construction works. |
| GRM establishment, operationalization, and complaint resolution | • Being complied partly.<br>• GRC has been set up and GRM is in operation (partially) and confined to project site only.<br>• GRM Plan and SOPs from the DBO Contractor have not yet been finalized.<br>• PMU (MOE) has published grievance redress mechanism (GRM) on its website and released the government notification on the same on 30th March 2023. | • GRM Plan and SOPs as part of the CEMP are to be approved and implemented before start of construction works. |

FICHTNER

Greater Male Waste to Energy Project

# Site Inspection Report

by the Employer's Representative

| Date and Time of the Visit | Conducted by [ER] | Signature | Witnessed by | Signature |
|---|---|---|---|---|
| 18th February 2023 09:30hrs | Nahee Nazim – Deputy Team Leader |  | Sathiyaraj Arunachalam - Deputy Project Manager - Urbaser |  |

## General Observations

| Sn | Particulars | Details / Remarks | Witnessed by | Reference |
|---|---|---|---|---|
| **1** | Change in construction methodology with reference to same given in EIA report, if any | - | - | - |
| **2** | Not anticipated project specific activity (ies) and impacts observed which were not considered in EIA study report, if any, either on site or adjacent by the Contractor or other stakeholders. | - | Sathiyaraj Arunachalam – D.B.O | - |
| **3** | Any activity or sign observed within and adjacent to project site which may lead to soil and ground & marine water contamination | Shipwrecks adjacent to quay wall remains in place, potential risk of contamination from these vessels is there. | Sathiyaraj Arunachalam – D.B.O | - |
| **4** | Total number of man power at project site as per attendance register on date of visit<br>a) DBO contractor<br>b) EPC contractor<br>c) Sub -contractor (s) | Average of 69 workers deployed.<br>2<br>40<br>10 | Sathiyaraj Arunachalam – D.B.O | - |
| **5** | Others, if any | - | - | - |

## Progress Observations

| No. | Particulars | Details / Remarks | Witnessed by | Reference |
|---|---|---|---|---|
| 1 | Fencing and Perimeter | Fencing works towards the WAMCO landfill on hold due to risk of working close to the WAMCO landfill still remains high. | Sathiyaraj Arunachalam – D.B.O | - |
| 2 | Site Preparation | Delays expected as several buildings still under construction, and the WWTP connections still remain incomplete. MWSC pump truck being used to pump out and dispose of the waste on a regularly basis. Survey Control points for the setting out of the plant and related buildings in place, the accuracy of these point shall be verified and survey reports should be submitted to the E.R. | Sathiyaraj Arunachalam – D.B.O | Photo 19 |
| 3 | Temporary facilities | Work on the temporary facilities on going with average 69 workers. Several buildings still remain to be completed, | Sathiyaraj Arunachalam – D.B.O | Photo 1,4,5,7 to 19 |

## Environmental Observations

| Sn | Particulars | Details / Remarks | Witnessed by | Reference |
|---|---|---|---|---|
| **1** | Status of adequacy of compliance of CEMP and ESMS including SOPs in place applicable to construction activities visited on the basis of assessment made on randomly basis, on site or adjacent.[1] | , | - | - |
| **2** | Status of adequacy of environment monitoring as envisaged in CEMP on the basis of assessment made on randomly basis. | Baseline water quality monitoring and ambient air quality and noise monitoring activities on going as scheduled. | B Sathiyaraj Arunachalam – D.B.O | - |
| **3** | Status of adequacy of level of understanding of environment hazards and corresponding designed mitigation measures of construction team including supervisors and workers on site or adjacent on the basis of assessment made on randomly basis. | - | - | - |
| **4** | Status of adequacy of record keeping including data reported in monthly environment report on the basis of assessment made on randomly basis. | Site log maintained, one near miss incident reported. | Sathiyaraj Arunachalam – D.B.O | - |

## Health and Safety Observation

| Sn | Aspects | Details / Remarks | Witnessed by | Reference |
|---|---|---|---|---|
| **Labour - health, safety and welfare** | | | | |
| **1** | Status of adequacy of HSE /Occupational Health and Safety management plan and ESMS including SOPs applicable to construction activities visited on the basis of randomly assessment made.[2] | SOPS are not fully implemented on site, E.P.C assures it will be in place, once construction starts. | Sathiyaraj Arunachalam – D.B.O | - |
| **2** | Status of adequacy of HSE monitoring as envisaged in CEMP, HSE Plan, ESMS & SOPs etc. | SOPS are not fully implemented on site, EPC assures it will be in place, once construction starts. | Sathiyaraj Arunachalam – D.B.O | - |

[1] *aspects includes (but not limited to) solid wastes (hazardous and non-hazardous including construction, plastic, E-waste, battery and bio-medical) management, Storage and handling of construction materials, waste water (from domestic and construction activities and run off due to rain) management, Air emission (from mainly DG sets, diesel driven machinery and equipment, Raw mix plan, fugitive, vehicular movement, etc.) management, management of construction noise level etc.*

[2] *e.g assessment of activity wise associated hazards, work permit, PPEs, first aid, tool box talk, barricading, COVID-19, electrical safety etc.*

| | | | | |
|---|---|---|---|---|
| **3** | Status of adequacy of on-site Emergency Preparedness and Response on the basis of randomly assessment made (emergency response team, safety committee, fire fighting, mock drills, assembly point, evacuation, accident/incident reporting etc.) | Assembly point established and safety signage in place, no incident reported. | Sathiyaraj Arunachalam – D.B.O | - |
| **4** | Status of adequacy of workers accommodations including fresh water for drinking & others, hygienic with reference to waste water and domestic solid waste management and other welfare facilities (e,g. Kitchen/food, medical, toilets, recreation, shelters, spray of mosquitos and odour repellent etc.) maintained at project site on the basis of randomly assessment made. | Workers accommodated off site in hulhumale' island, separate areas for dining and food storage maintained. Water storage on site, temporary toilets established with collection tanks. To be assessed by a visit yo Hulhumale' accommodation at a later date by ER. | Sathiyaraj Arunachalam – D.B.O | - |
| **5** | Status of adequacy of housekeeping within project site on the basis of randomly assessment made. | Site is kept generally clean and organized. | Sathiyaraj Arunachalam – D.B.O | Photo 25 |
| **6** | Status of adequacy of security management (availability of adequate number of security guards, fencing of project site, procedure(s) to allow entry for visitors and workers etc. understanding of role of security guards as per contract) of project site on the basis of randomly assessment made. | Boundary fence remains incomplete only towards the landfill area due to waste spillage. Gates in place, and visitors register maintained. Security guards in place at both entry points to the site. | Sathiyaraj Arunachalam – D.B.O | - |
| **7** | Status of adequacy of handling of workers complaint(s) received on HSE, human resources and welfare aspects as per complaint register kept at site on the basis of randomly assessment made. | HSE officer on site maintains incident log. | Sathiyaraj Arunachalam – D.B.O | - |
| **8** | Status of adequacy of record keeping including data reported in monthly HSE report on the basis of randomly assessment made. | HSE officer on site maintains incident log. | Sathiyaraj Arunachalam – D.B.O | - |
| **Community- health, safety and welfare** | | | | |
| **9** | Status of adequacy of Community Health and Safety plan and ESMS including SOPS on the basis of randomly assessment made (mainly during transportation of men, materials and machinery, influx of workers from other places, contamination of air, land and marine water and ecology, if any etc.) | SOPS are not fully implemented on site, EPC assures it will be in place, once construction starts. | Sathiyaraj Arunachalam – D.B.O | - |
| **10** | Status of adequacy of off-site Emergency Preparedness and Response on the basis of randomly assessment made (e.g response team, mock drills, mutual aids, evacuation plan, accident/incident reporting etc.) | Not assessed | | |
| **12** | Status of adequacy of handling of community complaint(s) received on Environment, HSE and welfare aspects on the basis of randomly assessment made. | Not assessed | | |

## Site Photos

**Photo 01** by Naahee 18/02/23 09:33hrs.
*E.R. office and accomidation building completed.*

**Photo 02** by Naahee 18/02/23 09:33hrs.
*Designated smoking area and safety signage around the site, workers area is separated by a fence within the site area.*


**Photo 03** by Naahee 18/02/23 09:33hrs.
*HSE statistics board placed near the E.P.C. site office.*

**Photo 04** by Naahee 18/02/23 09:34hrs.
*Construction of mess hall ongoing.*

**Photo 05** by Naahee 18/02/23 09:35hrs.
*ER's local team civil expert – Asiyath took part in the site visit – in conversation with* Sathiyaraj Arunachalam – D.B.O


**Photo 06** by Naahee 18/02/23 09:36hrs.
*Assembly point setup and fire fighting equipment placed.*

**Photo 07** by Naahee 18/02/23 09:37hrs.
*All workers assigned PPE and safety measures in place.*

**Photo 08** by Naahee 18/02/23 09:37hrs.
*Construction ongoing for workers mess hall.*

**Photo 09** by Naahee 18/02/23 09:38hrs.
*Fire escape stairs located on both ends of the hallway in the staff accommodation building, building completed.*

**Photo 10** by Naahee 18/02/23 09:38hrs.
*Prayer hall and recreation center under construction.*

**Photo 11** by Naahee 18/02/23 09:39hrs.
*Prayer hall under construction.*

**Photo 12** by Naahee 18/02/23 09:40hrs.
*Construction of temporary facilities, workers accommodation building ongoing.*

**Photo 13** by Naahee 18/02/23 09:40hrs.
*Metal fabrication work ongoing, all workers with PPE.*

**Photo 14** by Naahee 18/02/23 09:41hrs.
*Flooring works for temporary facilities, workers accommodation buildings ongoing.*

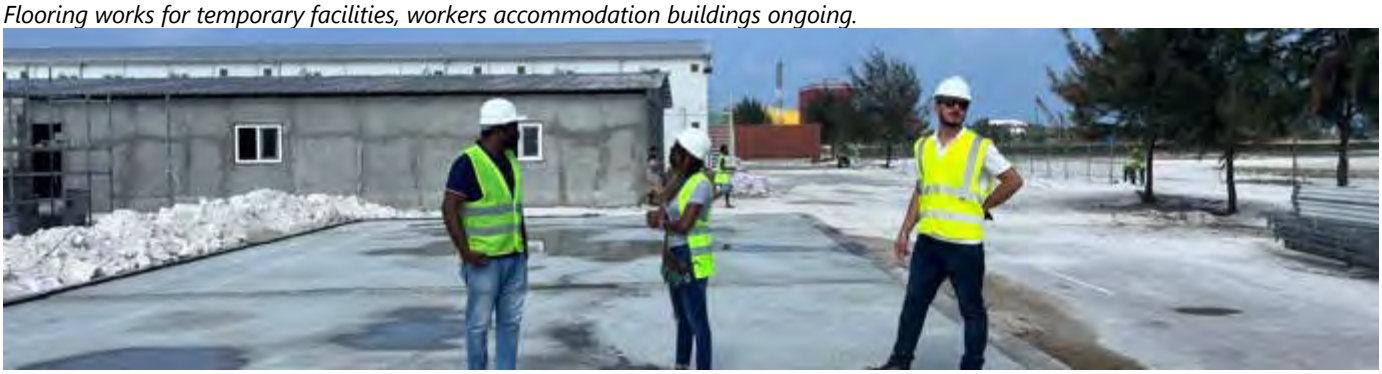

**Photo 15** by Naahee 18/02/23 09:41hrs.
*ER's Civil Expert – Asiyath asking about civil related matters from the D.B.O and E.P.C personal.*

**Photo 16** by Naahee 18/02/23 09:42hrs.*Some construction materials on site for the temporary facilities construction work thats ongoing.*

**Photo 17** by Naahee 18/02/23 09:43hrs.
*Masonry work for the workers accommodation building in progress, full blocks used, with reinforced concrete framing.*

**Photo 18** by Naahee 18/02/23 09:45hrs.
*WWTP connections yet to be made, and is not operational, currently temporary storage tanks and MWSC pump trucks still being utilized.*

**Photo 19** by Naahee 18/02/23 09:47hrs.
*Security guard post/tower under construction at the main site entrance, semi-permanent survey control points placed around the site as seen to the right bottom corner of this photo, and shall remain in place till completion of the project.*

**Photo 20** by Naahee 18/02/23 09:48hrs.
*Main site entrance with Project Sign Board in place, and gates in place.*

**Photo 21** by Naahee 18/02/23 09:51hrs.
*Site first aid room/clinic and doctors and nurse on site at all times when work is carried out.*


**Photo 22** by Naahee 18/02/23 09:53hrs..
*HSE related signage inside the first aid room.*


**Photo 23** by Naahee 18/02/23 09:53hrs
*HSE related signage inside the first aid room, with list of first aiders placed.*

**Photo 24** by Naahee 18/02/23 09:56hrs
*Storage building in use.*

**Photo 25** by Naahee 18/02/23 09:58hrs
*Waste collection area setup and in use.*

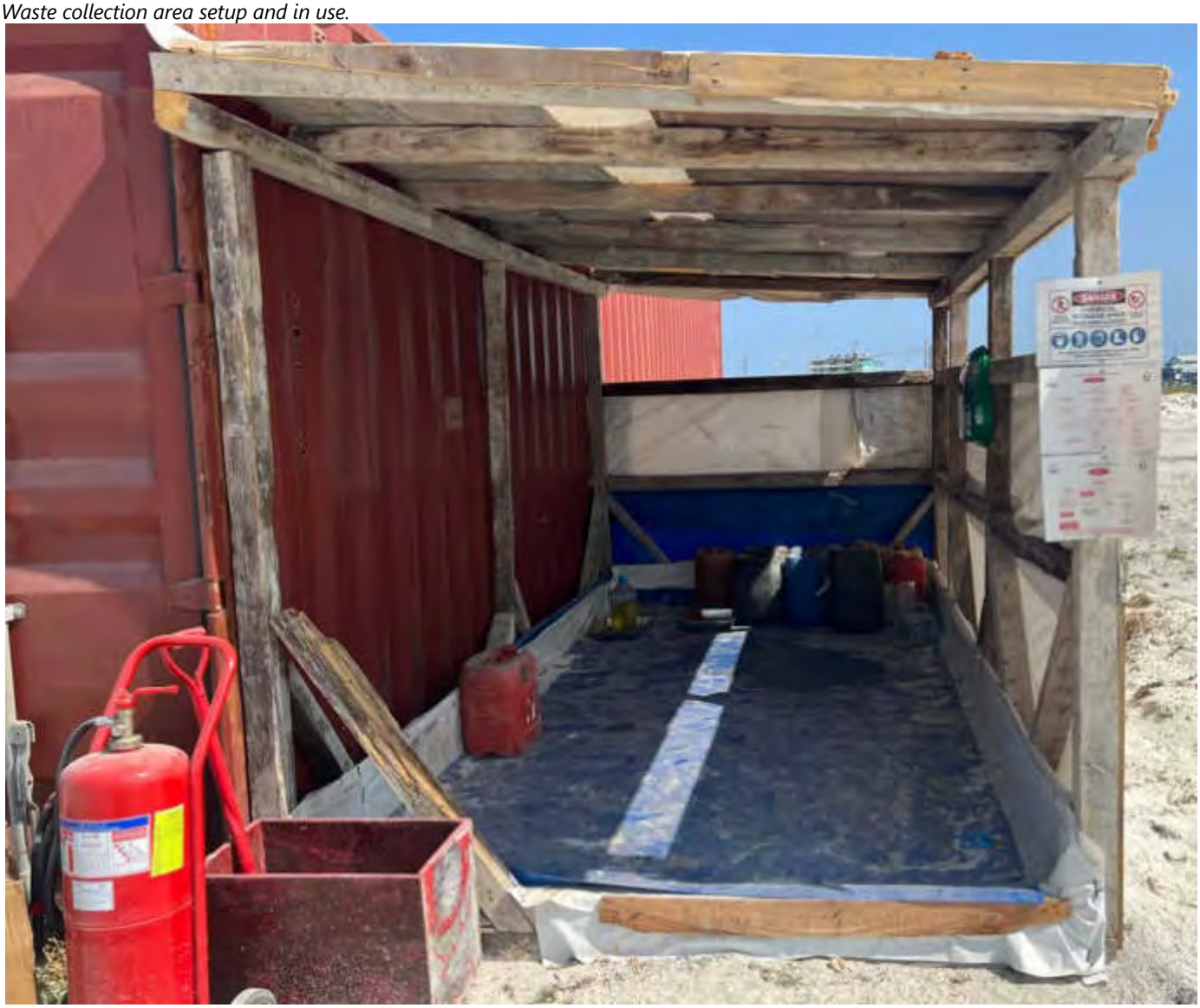

**Photo 26** by Naahee 18/02/23 09:56hrs
*Hazardous chemical storage not completed yet, work is on going and to be completed soon.*

**Photo 27** 18/02/23 10:07hrs
*Members from ER, DBO and EPC who took part in the site visit.*

**Photo 29** by Naahee 18/02/23 10:08hrs
*Manned security guard post, at the entrance gate on the seaside quay wall area, this is where the speed boat offloads all workers on and visitors onto site.*

**Photo 30** by Naahee 18/02/23 10:09hrs

*Railings placed along the walk path from the sea side entry gate to the workers area.*


**Photo 31** by Naahee 18/02/23 10:10hrs

*Site boundary fence along the quay wall with signage placed, the shipwrecks outside the site boundary still remain.*

**Photo 32** by Naahee 18/02/23 10:15hrs

*Speed boat along side the quay wall, main mode of transportation for the workers is this speed boat, operated by a third party hired by the E.P.C.*

FICHTNER

# Site Inspection Report

by the Employer's Representative

| Date and Time of the Visit | Conducted by [ER] | Signature | Witnessed by | Signature |
|---|---|---|---|---|
| 27th February 2023 15:30hrs | Nahee Nazim – Deputy Team Leader |  | Sathiyaraj Arunachalam - Deputy Project Manager - Urbaser | |

## General Observations

| Sn | Particulars | Details / Remarks | Witnessed by | Reference |
|---|---|---|---|---|
| **1** | Change in construction methodology with reference to same given in EIA report, if any | - | - | - |
| **2** | Not anticipated project specific activity (ies) and impacts observed which were not considered in EIA study report, if any, either on site or adjacent by the Contractor or other stakeholders. | - | Sathiyaraj Arunachalam – D.B.O | - |
| **3** | Any activity or sign observed within and adjacent to project site which may lead to soil and ground & marine water contamination | Shipwrecks adjacent to quay wall remains in place, potential risk of contamination from these vessels is there. | Sathiyaraj Arunachalam – D.B.O | - |
| **4** | Total number of man power at project site as per attendance register on date of visit<br>a) DBO contractor<br>b) EPC contractor<br>c) Sub -contractor (s) | Average of 50 workers deployed.<br>2<br>40<br>10 | Sathiyaraj Arunachalam – D.B.O | - |
| **5** | Others, if any | - | - | - |

## Progress Observations

| No. | Particulars | Details / Remarks | Witnessed by | Reference |
|---|---|---|---|---|
| 1 | Fencing and Perimeter | Fencing works towards the WAMCO landfill on hold due to risk of working close to the WAMCO landfill still remains high. | Sathiyaraj Arunachalam – D.B.O | - |
| 2 | Site Preparation | Delays expected as several buildings still under construction, and the WWTP connections still remain incomplete. MWSC pump truck being used to pump out and dispose of the waste on a regularly basis. Survey Control points for the setting out of the plant and related buildings in place, the accuracy of these point shall be verified and survey reports should be submitted to the E.R. | Sathiyaraj Arunachalam – D.B.O | Photo 19 |
| 3 | Temporary facilities | Work on the temporary facilities on going with average 50 workers. Several buildings still remain to be completed, | Sathiyaraj Arunachalam – D.B.O | Photo 1,4,5,7 to 19 |

## Environmental Observations

| Sn | Particulars | Details / Remarks | Witnessed by | Reference |
|---|---|---|---|---|
| 1 | Status of adequacy of compliance of CEMP and ESMS including SOPs in place applicable to construction activities visited on the basis of assessment made on randomly basis, on site or adjacent.[1] | SOPs are still in the process of being developed, the proposed SOP's by the E.P.C are not inline with ADB category A project requirements. | - | - |
| 2 | Status of adequacy of environment monitoring as envisaged in CEMP on the basis of assessment made on randomly basis. | Baseline water quality monitoring and ambient air quality and noise monitoring activities on going as scheduled. | B Sathiyaraj Arunachalam – D.B.O | - |
| 3 | Status of adequacy of level of understanding of environment hazards and corresponding designed mitigation measures of construction team including supervisors and workers on site or adjacent on the basis of assessment made on randomly basis. | These arenot inline with ADB category A project requirements, further improvement required. | - | - |
| 4 | Status of adequacy of record keeping including data reported in monthly environment report on the basis of assessment made on randomly basis. | Site log maintained, however these should be improved and approved by the ER. | Sathiyaraj Arunachalam – D.B.O | - |

## Health and Safety Observation

| Sn | Aspects | Details / Remarks | Witnessed by | Reference |
|---|---|---|---|---|
| **Labour - health, safety and welfare** | | | | |
| 1 | Status of adequacy of HSE /Occupational Health and Safety management plan and ESMS including SOPs applicable to construction activities visited on the basis of randomly assessment made.[2] | SOPS are not fully implemented on site, E.P.C needs to improve these to be inline with ADB category A project. | Sathiyaraj Arunachalam – D.B.O | - |
| 2 | Status of adequacy of HSE monitoring as envisaged in CEMP, HSE Plan, ESMS & SOPs etc. | SOPS are not fully implemented on site, E.P.C needs to improve these to be inline with ADB category A project. | Sathiyaraj Arunachalam – D.B.O | - |
| 3 | Status of adequacy of on-site Emergency Preparedness and Response on the basis of randomly assessment made (emergency response team, safety committee, fire fighting, mock drills, assembly point, evacuation, accident/incident reporting etc.) | Assembly point established and safety signage in place, no incident reported. Needs improvement to meet the requirements. | Sathiyaraj Arunachalam – D.B.O | - |

[1] *aspects includes (but not limited to) solid wastes (hazardous and non-hazardous including construction, plastic, E-waste, battery and bio-medical) management, Storage and handling of construction materials, waste water (from domestic and construction activities and run off due to rain) management, Air emission (from mainly DG sets, diesel driven machinery and equipment, Raw mix plan, fugitive, vehicular movement, etc.) management, management of construction noise level etc.*

[2] *e.g assessment of activity wise associated hazards, work permit, PPEs, first aid, tool box talk, barricading, COVID-19, electrical safety etc.*

| | | | | |
|---|---|---|---|---|
| **4** | Status of adequacy of workers accommodations including fresh water for drinking & others, hygienic with reference to waste water and domestic solid waste management and other welfare facilities (e,g. Kitchen/food, medical, toilets, recreation, shelters, spray of mosquitos and odour repellent etc.) maintained at project site on the basis of randomly assessment made. | Workers accommodated off site in hulhumale' island, separate areas for dining and food storage maintained. Water storage on site, temporary toilets established with collection tanks. | Sathiyaraj Arunachalam – D.B.O | - |
| **5** | Status of adequacy of housekeeping within project site on the basis of randomly assessment made. | Site is kept generally clean and organized. | Sathiyaraj Arunachalam – D.B.O | Photo 25 |
| **6** | Status of adequacy of security management (availability of adequate number of security guards, fencing of project site, procedure(s) to allow entry for visitors and workers etc. understanding of role of security guards as per contract) of project site on the basis of randomly assessment made. | Boundary fence remains incomplete only towards the landfill area due to waste spillage. Gates in place, and visitors register maintained. Security guards in place at both entry points to the site. CCTV system is yet to be installed. Adequate lighting needs to be installed around the site. | Sathiyaraj Arunachalam – D.B.O | - |
| **7** | Status of adequacy of handling of workers complaint(s) received on HSE, human resources and welfare aspects as per complaint register kept at site on the basis of randomly assessment made. | HSE officer on site maintains incident log. Grievance redress management system needs to be improved, a box and forms are in place however the system needs to be fully implemented, | Sathiyaraj Arunachalam – D.B.O | - |
| **8** | Status of adequacy of record keeping including data reported in monthly HSE report on the basis of randomly assessment made. | HSE officer on site maintains incident log. The format of the logs needs to be submitted to ER for approval. | Sathiyaraj Arunachalam – D.B.O | - |
| **Community- health, safety and welfare** | | | | |
| **9** | Status of adequacy of Community Health and Safety plan and ESMS including SOPS on the basis of randomly assessment made (mainly during transportation of men, materials and machinery, influx of workers from other places, contamination of air, land and marine water and ecology, if any etc.) | SOPS are not fully implemented on site, EPC assures it will be in place, once construction starts. Full compliance will be required, and D.B.O and E.P.C needs to develop all the SOPs required and get them approved by ER. | Sathiyaraj Arunachalam – D.B.O | - |
| **10** | Status of adequacy of off-site Emergency Preparedness and Response on the basis of randomly assessment made (e.g response team, mock drills, mutual aids, evacuation plan, accident/incident reporting etc.) | D.B.O and E.P.C requires to prepare and approve the system from ER before construction starts. | Sathiyaraj Arunachalam – D.B.O | |
| **12** | Status of adequacy of handling of community complaint(s) received on Environment, HSE and welfare aspects on the basis of randomly assessment made. | System in place is not adequate, needs improvement to comply with ADB requirements. | Sathiyaraj Arunachalam – D.B.O | |

**Photo 01** by Naif 27/02/23 15:33hrs.
*Pedestarian protected path from the site entrance to. Workers camp..*

**Photo 02** by Naif 27/02/23 15:34hrs.
*Security post setup near the site entrance,  and site entry log maintained.*


**Photo 03** by Naif 27/02/23 15:35hrs.
*Grievance redress forms and box established on site.*

**Photo 04** by Naif 27/02/23 15:40hrs.
*WAMCO landfill and fencing works incomplete.*


**Photo 05** by Naif 27/02/23 15:35hrs.
*Water stored in hazardous chemical storage containers, this should be avoided.*


**Photo 06** by Naif 27/02/23 15:46hrs.
*Visitor cards established and issued to each visitor after registration together with PPE.*

**Photo 07** by Naif 27/02/23 15:47hrs.
*PPE issued to visitors prior to access to site.*

**Photo 08** by Naif 27/02/23 15:53hrs.
*E.P.C HSE manager conducting the HSE induction to site.*


**Photo 09** by Naif 27/02/23 15:58hrs.
*P6 survey control point established, several control points established around the site, these will remain in place until completion of project.*


**Photo 10** by Naif 27/02/23 16:00hrs.
*Health and safety related posters placed at the site security post,*

**Photo 11** by Naif 27/02/23 16:02hrs.
*Tower crane delivered to site, yet to be setup and established.*


**Photo 12** by Naif 17/02/23 16:10hrs.
*Emergency assembly point setup at the site, within the workers camp.*

**Photo 13** by Naif 27/02/23 16:12hrs.
*Smoking area, workers dining mess, and contractors site office established within the worker camp.*

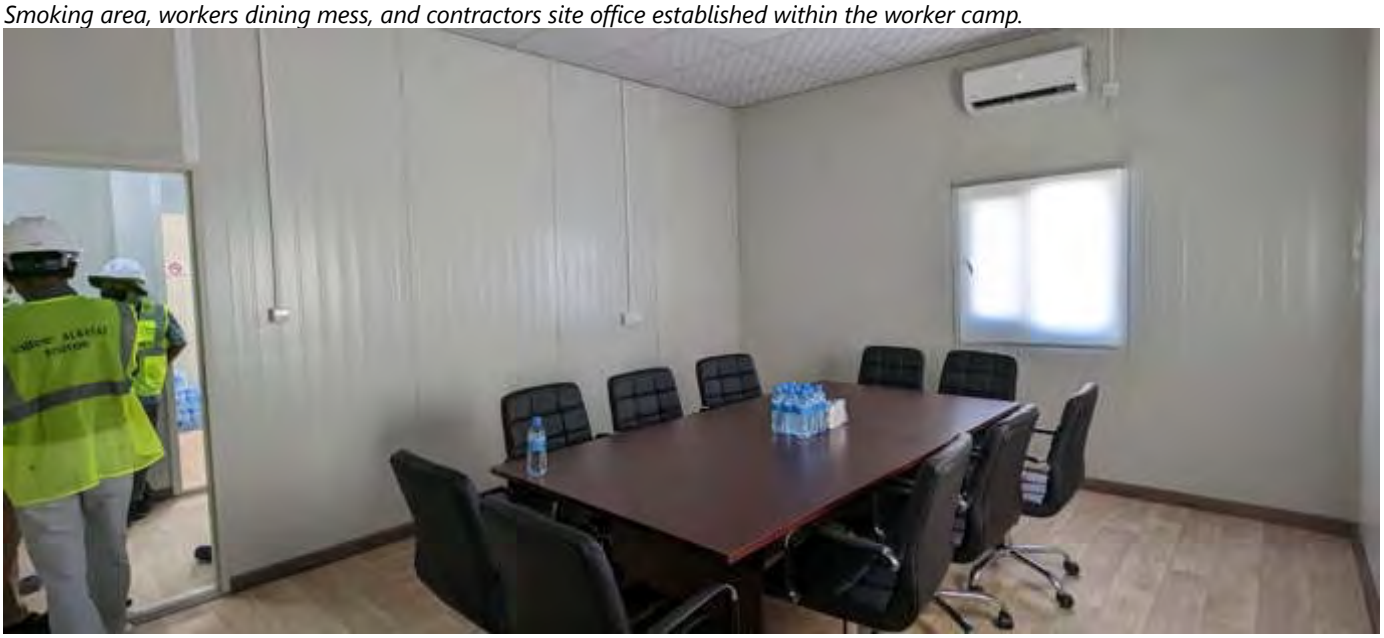

**Photo 14** by Naif 27/02/23 16:13hrs
*Meeting room within the ER site office.*

**Photo 15** by Naif 27/02/23 16:14hrs.
*Designated smoking area established within the worker camp.*

**Photo 16** by Naif 27/02/23 16:20hrs.
*Toilets in the ER site office.*

**Photo 17** by Naif 27/02/23 16:22hrs.
*ER site office completed, and ready to be used.*

**Photo 18** by Naif 27/02/23 16:23hrs.
*Notice board setup in the contractors site office.*

**Photo 19** by Naif 27/02/23 16:25hrs.
*Contractors site office in use.*

**Photo 20** by Naif 27/02/23 16:25hrs.
*Kitchen and eating area within the contractors site office..*


**Photo 21** by Naif 27/02/23 16:26hrs.
*HSE statistics board established on site, outside the contractors site office.*

**Photo 22** by Naif 27/02/23 16:30hrs.
*Sewerage collection tanks established within the site, MWSC collection truck is still being used.*


**Photo 23** by Naif 27/02/23 16:31hrs.
*E.P.C senior staff accommodation building on site, has been checked by MNDF and approved for use, in terms of fire fighting and fire escape requirements.*

**Photo 24** by Naif 27/02/23 16:33hrs.
*Senior E.P.C staff accomodations are ready for use, furniture not in place.*

**Photo 25** by Naif 27/02/23 16:35hrs.
*Electrical cables and communication cables not in use, should be secured properly.*


**Photo 26** by Naif 27/02/23 16:36hrs.
*Site safety related rules posted at site.*

**Photo 27** 27/02/23 16:36hrs.
*Several tripping hazards, ground needs to be levelled off and pipes properly capped and secured.*

**Photo 29** by Naif 27/02/23 16: 16:38hrs
*Fire escape path marked out, and stairways provided on both ends of the hall way to the rooms.*

**Photo 30** by Naif 27/02/23 16:40hrs.
*First aid room established, and doctor on site during working hours.*


**Photo 31** by Naif 27/02/23 16:42hrs
*Temporary electric distribution board in use, the stands require to be higher for safety, from flooding, and checked regularly for water proofing. Some sockets seen here are not waterproof.*

**Photo 32** by Naif 27/02/23 16:45hrs
*Foundations laid for workers accommodations, the prefab buildings are yet to be delivered to site.*

**Photo 33** by Naif 27/02/23 16:50hrs
*Members of MOE, ER, D.B.O and E.P.C conducting a site walk around.*

**Photo 34** by Naif 27/02/23 16:55hrs
*Workers accommodation building still under construction.*

**Photo 35** by Naif 27/02/23 16:56hrs
*Storage area and some heavy machinery on site.*

**Photo 36** by Naif 27/02/23 16:57hrs
*Members of MOE, ER, D.B.O and E.P.C conducting a site walk around.*

**Photo 37** by Naif 27/02/23 17:00hrs
*Members of MOE, ER, D.B.O and E.P.C conducting a site walk around.*


**Photo 38** by Naif 27/02/23 17:03hrs.
*Site boundary fence towards the WAMCO landfill area, has warning signs and work has been stopped at this side of the site.*

**Photo 39** by Naif 27/02/23 17:15hrs.
*Extra gate established for vehicles and materials movement.*

**Photo 40** by Naif 27/02/23 17:16hrs .
*Waste sorting and storage area established, requires a waste management plan to bbe developed and approved.*


**Photo 41** by Naif 27/02/23 17:18hrs
*Extra gate established for vehicles and materials movement.*

**Photo 42** by Naif 27/02/23 17:20hrs
*Site meeting with MOE, ER team.*

Appendix 2

# GOVERNMENT of MALDIVES

WtE Energy Facility Project

## PRE CONSGTRUCTION PHASE

## AIR QUALITY MEASUREMENT REPORT

Thilafushi Island/MALDIVES

**MALDIVES 2023**

**AIRS Air Quality Management Services Ltd**
Mustafa Kemal Mah. Via Green Is Mrk. B-36
Cankaya Ankara TURKEY
Tel: +90 312 221 02 45 Fax: +90 312 221 02 45
**www.airsaqms.com**

**Test Report**

| | |
|---|---|
| **Customer Name/Address** | Alke Alkatas Joint Venture Pvt Ltd<br>H.H.Moomiyaage 5A Asaree Hingun K.Male 20265 MALDIVES |
| **Order No.** | EN-M/2207/417_01 |
| **Name and identity of test item** | Immission (Air Quality) |
| **Remarks** | - |
| **Date of Test** | 18.03.2023-21.03.2023 |
| **Number of Pages of the Report** | 27 Pages |
| ***Test Method*** | Air Quality Sensors |
| ***Test results*** | The test results are given in the measurement result tables. |
| ***Enviromental conditions*** | Environmental conditions during the measurement are given in the measurement result tables. |
| ***Comments*** | - |

The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

| Reporter and Approval |
|---|
| Ismail Ulusoy<br>Environmental Engineer<br>  |

## TABLE OF CONTENTS

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## LIST OF FIGURES

## 1. INTRODUCTION

This report has been prepared with the aim of determining the air quality in the sensitive receptors located in the impact area of the The Greater Malé Waste to Energy Project. Air quality results were determined for $PM_{10}$, $PM_{2.5}$, $NO_2$, $SO_2$ and TSP parameters.

## 2. MEASUREMENT METHODS

$PM_{10}$, $PM_{2.5}$, TSP, $SO_2$, and $NO_2$ parameters were monitored by using air quality monitoring stations based on sensor technology. The US EPA refers to the term 'air sensor' as a class of non-regulatory technology that is low-cost, portable, capable of measuring several pollutants simultaneously, and often easier to operate than regulatory stations. For example, monitoring air pollution with reference measurement methods (regulatory stations) requires skilled operators to maintain and calibrate measuring instruments. On the other hand, air sensors describe the hardware and software set that can be operated without human intervention and enable unskilled users to monitor air pollution without additional technical knowledge.

Sensor specifications which are used for measurement study are shown below.

| Parameter | | Unit | Value |
|---|---|---|---|
| SO2 | Sensitivity | nA/ppm at 2ppm $SO_2$ | 275 to 520 |
| | Range | ppm limit of performance warranty | 100 |
| | Linearity | error at 100ppm SO2, linear at zero and 10ppm SO2 | 0 to -2 |
| NO2 | Sensitivity | nA/ppm at 2ppm $NO_2$ | -200 to -650 |
| | Range | ppm $NO_2$ limit of performance warranty | 20 |
| | Linearity | ppb error at full scale, linear at zero and 20ppm | |
| Particles ($PM_{10}$, $PM_{2.5}$ and TSP) | Mass concentration precision | % | 5 |
| | Mass concentration range | $\mu g/m^3$ | 0 to 1000 |
| Temperature | Typ. temperature accuracy | $^0C$ | 0.45 |
| | Operating temperature range | $^0C$ | -10 to 50 |
| | Response time ($\tau$63%) | s | <60 |
| Humidity | Typ. relative humidity accuracy | %RH | 4.5 |
| | Operating relative humidity range | %RH | 0 to 100 |
| | Response time ($\tau$63%) | s | 20 |
| All | Temperature Range | $^0C$ | -30 to 50 |
| | Humidity Range | % RH | 5 to 99 |

The accuracy of these low-cost sensors is as critical as measuring the air quality. With the smart calibration process, low-cost sensors are corrected and accurate compared to reference stations. The Smart Calibration Algorithm consists of the below operational steps shown figure below.

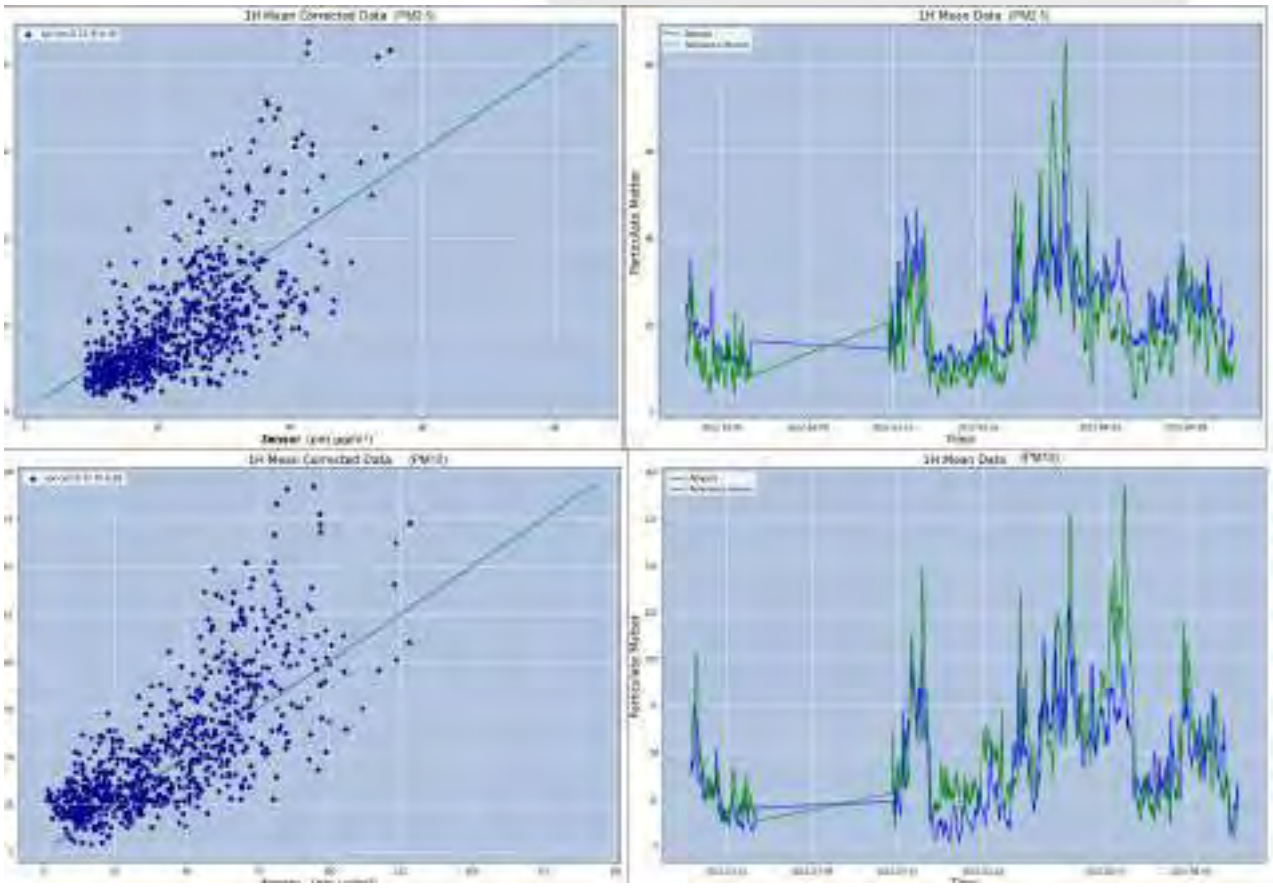
Sensor Units were calibrated using reference stations for a period before the deployment. The calibration process for particle matter and gas pollutants measurement is explained below.

**Table 1 Calibration Process for Pollutants**

| Description | Methodology | |
|---|---|---|
| | $NO_2$-$SO_2$-$O_3$ | $PM_{10}$-$PM_{2.5}$-TSP |
| Installation | Near Reference Station (3/4 meters) | Near Reference Station (3/4 meters) |
| Pre-Test | Quality Check in zero air conditions | Quality Check in zero air conditions |
| Co-Located Period | 4-5 weeks | 8 weeks |
| Sampling Period | 30 seconds. Hourly mean is used because the reference station measurements are hourly. | 60 seconds. Hourly mean is used because the reference station measurements are hourly. |
| Validation | Cross-validation is used. Also, some ranges of measurement are eliminated, where the reference station is not available. | Cross-validation is used. Also, some ranges of measurement are eliminated, where the reference station is not available. |
| Calibration Procedure | is obtained via $R^2$ and spearman correlation | is obtained via $R^2$ and spearman correlation |

## Calibration Result for PM

The corrected measurement results after the Smart Calibration Process are shown in the figures below. The correlation between Sensor Unit's $PM_{2.5}$ measurements between Reference Station's $PM_{2.5}$ measurements for hourly and daily mean of data is 0.73, and the correlation between Sensor Unit's $PM_{10}$ measurements between Reference Station's $PM_{10}$ measurements for hourly and daily mean of data is 0.77.



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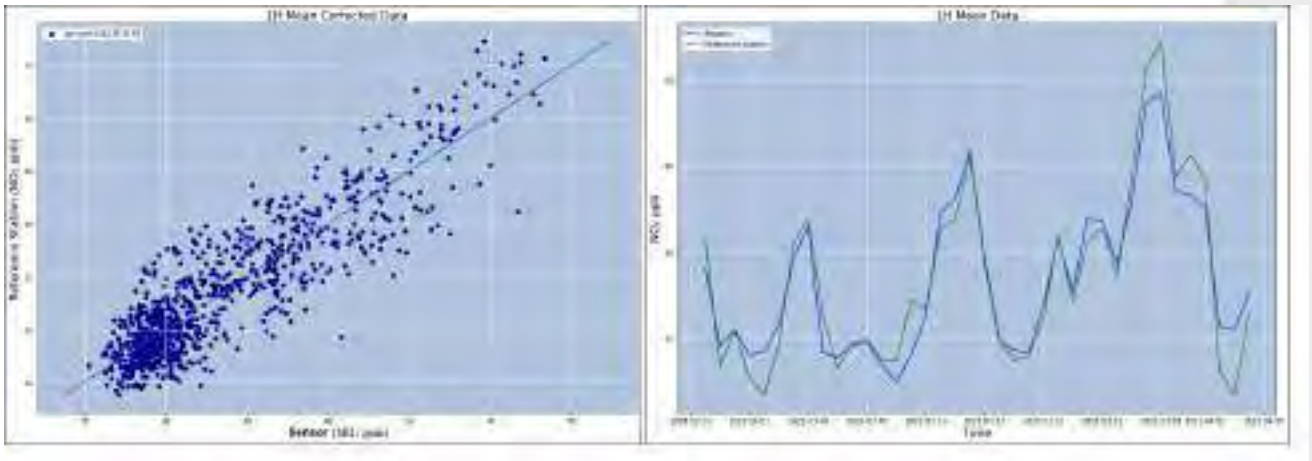
**Calibration Result for Gases**

The corrected measurement results after the Smart Calibration Process are shown in the figures below. The correlation between Sensor Unit's $NO_2$ measurements between Reference Station's $NO_2$ measurements for hourly and daily mean of data is respectively 0.823, 0.898



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## 2.1. FIELD APPLICATION

This section describes how the measurements, the general methodology of which is given above, are applied in the field.

**Preliminary Preparations**

Preliminary preparations for air quality measuring stations with sensors include factory calibrations and field calibrations. Factory calibrations are provided by the sensor manufacturer. Stations capable of making reference measurements were used for field calibrations, as described above. For this purpose, a 1-month comparison measurement was carried out at a reference station in the Turkish air quality monitoring network and the calibration factors were applied.

**During Measurements**

Air quality measurements were made with two sets of devices.

AQ2 and ASR2 measurements were conducted on the first day,

AQ1 and AQ3 measurements were conducted on the second day,

ASR3 and ASR5 measurements were conducted on the third day and

AQ4 measurement were conducted on the fourth day.

The locations of the sampling points are determined in the macro scale ESIA report. A site visit was made and a location was determined at the micro scale where the devices would be placed.

Measurements were made at a height of 1.5 to 4 meters from the ground, depending on the suitability of the sampling point.

24-hour measurements were made at each point. Parameters measured with sensor devices consist of the averages of instantaneous measurements taken at 10-minute intervals.

**After Measurements**

The values after the measurements were taken by reading directly on the air quality measuring devices with sensors.

## 3. MEASUREMENT LOCATION

For the Preconstruction baseline environmental assessment of the ambient air quality was conducted at seven locations: 6 locations at Thilafushi (AQ1, AQ2, and AQ3 in the EIA and the ASR 2, ASR3 and ASR5 recommended for monitoring in the EIA Report) and one location at Villingili (AQ4).

**Table 2 Sampling Point Coordinates and Sampling dates**

| No | Location | Description | Distance to Source (meters) |
|---|---|---|---|
| **1** | AQ1 | Represents dense industrial area | 650 |
| **2** | AQ2 | Represents dense industrial area | 1000 |
| **3** | AQ3 | Represents dense industrial area | 500 |
| **4** | ASR2 | Represents dense industrial area | 700 |
| **5** | ASR3 | Represents dense industrial area | 500 |
| **6** | ASR5 | Represents dense industrial area | 1000 |
| **7** | AQ4 | Represents dense housing and population area | 4500 |


**Figure 1** Sampling Points on satellite Map

## 4. LEGAL FRAMEWORK

Within the scope of the project, particle matter ($PM_{10}$-$PM_{2.5}$), $NO_2$, $SO_2$ AND TSP emissions were monitored. It is known that Maldives does not have a national air quality policy. Therefore, international standards were used for the evaluation. WHO defines limit values in "Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide" document. European Union directives also have limit values for air pollution prevention (EU Council Directive 2008/50/EC relating to health based standards and objectives for a number of pollutants in ambient air). Germany has an air pollution control regulation titled "Technical Instructions on Air Quality Control" (Technische Anleitung zur Reinhaltung der Luft) and commonly referred to as the TA Luft and determines the limit values to protect the general public and the neighborhood against harmful effects of air pollution on the environment. Comparison of these limit values and chosen parameters and values for the modeling study according to these standards are shown in Table 3.

**Table 3.** Limit Values Stipulated in the International Legislation

| Pollutant | Averaging Period | TA Luft | EU | WHO Ambient Air Quality Guideline Value | Project Standards |
|---|---|---|---|---|---|
| Particular Matter <10 µm ($PM_{10}$) | 24 hours | 50 µg/m$^3$ | 50 µg/m$^3$ | 45 µg/m$^3$ | 45 µg/m$^3$ |
| | 1-year | 40 µg/m$^3$ | 40 µg/m$^3$ | 15 µg/m$^3$ | 15 µg/m$^3$ |
| Particular Matter <2.5 µm ($PM_{2.5}$) | 24 hours | - | - | 15 (not to be exceeded more than 3-4 times a year) | 15 |
| | 1-year | - | 20 | 5 | 5 |
| Nitrogen Dioxide ($NO_x$) | 1-hour | 200 µg/m$^3$ | 200 µg/m$^3$ | - | 200 µg/m$^3$ |
| | 24 hours | - | - | 25 µg/m$^3$ | 25 µg/m$^3$ |
| | 1-year | 40 µg/m$^3$ | 40 µg/m$^3$ | 10 µg/m$^3$ | 10 µg/m$^3$ |
| Sulphur Dioxide ($SO_2$) | 1-hour | 350 µg/m$^3$ | 350 µg/m$^3$ | - | 350 µg/m$^3$ |
| | 24 hours | 125 µg/m$^3$ | 125 µg/m$^3$ | 40 µg/m$^3$ | 40 µg/m$^3$ |
| | 1-year | 50 µg/m$^3$ | - | - | 50 µg/m$^3$ |
| TSP* | - | - | - | - | - |

***There is no limit value for TSP.**

## 5. RESULTS

**Table 4 Measurement Results for Location 1**

| Location | Sampling Date | Air Quality Results ( µg/m³ ) | | | | | Ambient Conditions | |
|---|---|---|---|---|---|---|---|---|
| | | $PM_{10}$ | $PM_{2.5}$ | $NO_2$ | $SO_2$ | TSP | Humidity (%) | Temperature ($^0$C) |
| AQ1 | 2023-3-21 12:00:00 | 18.54 | 12.77 | 0 | 0 | 61.52 | 70.2 | 29.5 |
| | 2023-3-21 13:00:00 | 8.18 | 4.88 | 0 | 0 | 58.80 | 69.0 | 29.7 |
| | 2023-3-21 14:00:00 | 7.99 | 4.90 | 0 | 0 | 56.36 | 68.4 | 29.9 |
| | 2023-3-21 15:00:00 | 7.86 | 4.77 | 0.89 | 0 | 55.74 | 70.8 | 29.2 |
| | 2023-3-21 16:00:00 | 12.04 | 8.10 | 0.59 | 0 | 57.26 | 73.0 | 28.6 |
| | 2023-3-21 17:00:00 | 8.31 | 5.32 | 3.32 | 0 | 60.16 | 73.3 | 28.3 |
| | 2023-3-21 18:00:00 | 8.26 | 5.61 | 3.05 | 0.36 | 63.55 | 74.7 | 27.8 |
| | 2023-3-21 19:00:00 | 8.44 | 5.80 | 0.35 | 2.14 | 64.69 | 78.5 | 26.6 |
| | 2023-3-21 20:00:00 | 8.35 | 5.84 | 5.31 | 0 | 65.15 | 81.2 | 25.9 |
| | 2023-3-21 21:00:00 | 8.26 | 5.85 | 4.94 | 0 | 64.87 | 83.0 | 25.6 |
| | 2023-3-21 22:00:00 | 7.75 | 5.55 | 0.58 | 6.36 | 62.07 | 83.4 | 25.5 |
| | 2023-3-21 23:00:00 | 7.36 | 5.07 | 0.21 | 0 | 57.63 | 84.6 | 25.4 |
| | 2023-3-22 00:00:00 | 7.38 | 5.07 | 0.16 | 0 | 58.74 | 84.9 | 25.3 |
| | 2023-3-22 01:00:00 | 7.45 | 5.05 | 0 | 0 | 59.46 | 85.3 | 25.5 |
| | 2023-3-22 02:00:00 | 7.30 | 5.11 | 0 | 0 | 59.89 | 82.0 | 26.3 |
| | 2023-3-22 03:00:00 | 7.98 | 5.94 | 0 | 0 | 67.78 | 80.4 | 26.7 |
| | 2023-3-22 04:00:00 | 7.71 | 5.59 | 0 | 0 | 65.30 | 81.4 | 26.4 |
| | 2023-3-22 05:00:00 | 11.36 | 4.87 | 0 | 0 | 61.20 | 80.3 | 26.6 |
| | 2023-3-22 06:00:00 | 17.59 | 8.47 | 0 | 0 | 63.92 | 78.1 | 27.3 |
| | 2023-3-22 07:00:00 | 21.91 | 12.98 | 0 | 0 | 64.20 | 77.8 | 27.3 |
| | 2023-3-22 08:00:00 | 11.09 | 5.77 | 0 | 0 | 63.81 | 77.4 | 27.4 |
| | 2023-3-22 09:00:00 | 18.60 | 7.43 | 0 | 0 | 61.60 | 70.7 | 29.1 |
| | 2023-3-22 10:00:00 | 33.48 | 20.26 | 0 | 0.66 | 71.62 | 65.0 | 30.7 |
| | 2023-3-22 11:00:00 | 17.60 | 12.57 | 0.47 | 0.34 | 47.82 | 72.14 | 29.8 |
| **Hourly Limit Values** | **TA Luft** | - | - | 200 | 350 | - | - | - |
| | **EU** | - | - | 200 | 350 | - | - | - |
| | **WHO Ambient Air Quality Guideline Value** | - | - | - | - | - | - | - |
| **24 h Average** | | **11.70** | **7.23** | **0.83** | **0.41** | **61.38** | **76.90** | **27.52** |
| **Daily Limit Values** | **TA Luft** | 50 | - | - | 125 | - | - | - |
| | **EU** | 50 | - | - | 125 | - | - | - |
| | **WHO Ambient Air Quality Guideline Value** | 45 | 15 | 25 | 40 | - | - | - |

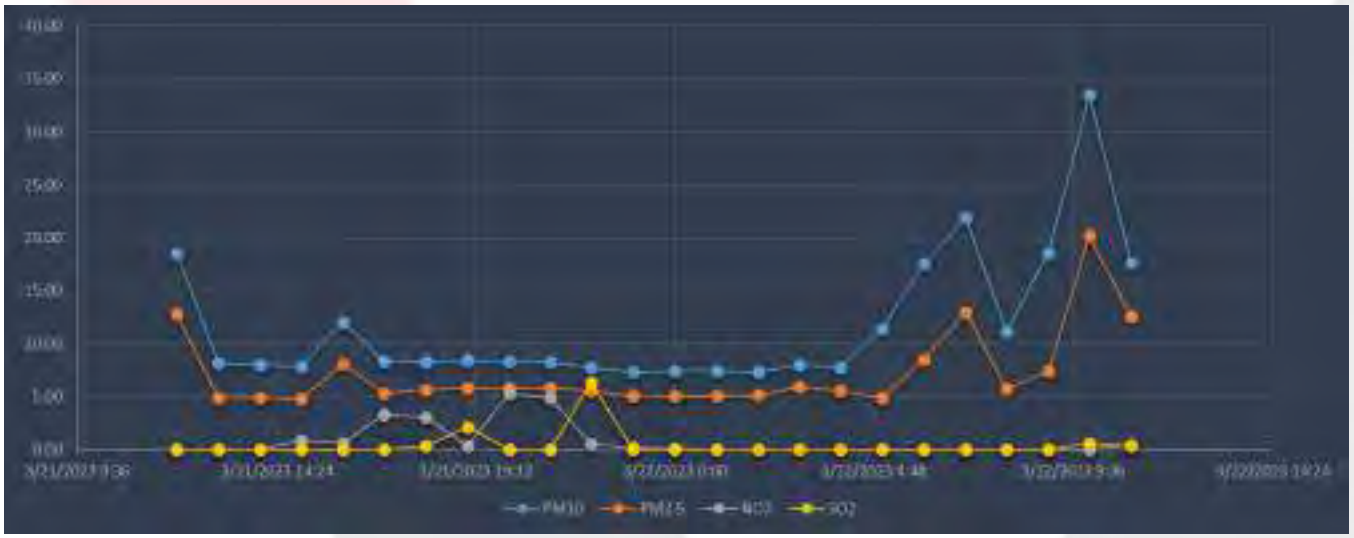


**Figure 2** Measurement Graphs for Location AQ1

**Table 5 Measurement Results for Location 2**

| Location | Sampling Date | Results ( µg/m³ ) | | | | | Ambient Conditions | |
|---|---|---|---|---|---|---|---|---|
| | | $PM_{10}$ | $PM_{2.5}$ | $NO_2$ | $SO_2$ | TSP (24 Hours Average) | Humidity (%) | Temperature ($^0$C) |
| AQ2 | 2023-3-19 12:00:00 | 12.81 | 9.25 | 0 | 0 | 36.27 | 62.24 | 30.52 |
| | 2023-3-19 13:00:00 | 13.40 | 9.74 | 0 | 0 | 37.24 | 62.83 | 30.47 |
| | 2023-3-19 14:00:00 | 11.93 | 8.75 | 0 | 0 | 33.50 | 54.56 | 29.43 |
| | 2023-3-19 15:00:00 | 11.44 | 8.42 | 0 | 0 | 32.15 | 51.30 | 29.01 |
| | 2023-3-19 16:00:00 | 11.67 | 8.61 | 0 | 0 | 32.53 | 51.16 | 29.09 |
| | 2023-3-19 17:00:00 | 11.37 | 8.43 | 0.85 | 0 | 31.74 | 51.90 | 28.70 |
| | 2023-3-19 18:00:00 | 10.88 | 8.11 | 5.28 | 0.7 | 30.40 | 53.64 | 28.23 |
| | 2023-3-19 19:00:00 | 10.53 | 7.88 | 0.89 | 2.18 | 29.36 | 55.69 | 27.45 |
| | 2023-3-19 20:00:00 | 10.68 | 7.98 | 0 | 0.22 | 29.76 | 62.98 | 27.20 |
| | 2023-3-19 21:00:00 | 10.99 | 8.20 | 0 | 0.18 | 30.65 | 67.77 | 27.94 |
| | 2023-3-19 22:00:00 | 11.18 | 8.36 | 0 | 0 | 31.30 | 69.61 | 27.53 |
| | 2023-3-19 23:00:00 | 11.51 | 8.60 | 0 | 0 | 32.27 | 69.96 | 26.36 |
| | 2023-3-20 00:00:00 | 11.52 | 8.61 | 0 | 0 | 32.43 | 70.86 | 26.22 |
| | 2023-3-20 01:00:00 | 11.44 | 8.55 | 0 | 0 | 32.34 | 71.42 | 26.13 |
| | 2023-3-20 02:00:00 | 9.94 | 7.47 | 0 | 0 | 28.16 | 84.97 | 26.26 |
| | 2023-3-20 03:00:00 | 8.12 | 6.12 | 0 | 0 | 22.65 | 83.79 | 26.15 |
| | 2023-3-20 04:00:00 | 8.35 | 6.26 | 0 | 0 | 23.27 | 84.64 | 25.94 |
| | 2023-3-20 05:00:00 | 8.72 | 6.54 | 0 | 0 | 24.40 | 85.52 | 25.83 |
| | 2023-3-20 06:00:00 | 9.01 | 6.81 | 0 | 0 | 25.49 | 84.75 | 25.74 |
| | 2023-3-20 07:00:00 | 9.16 | 6.79 | 0 | 0.41 | 26.13 | 85.33 | 26.65 |
| | 2023-3-20 08:00:00 | 9.08 | 6.76 | 8.4 | 0.86 | 25.85 | 85.24 | 27.66 |
| | 2023-3-20 09:00:00 | 8.77 | 6.55 | 1.36 | 0.14 | 24.69 | 83.59 | 27.20 |
| | 2023-3-20 10:00:00 | 9.99 | 7.41 | 0 | 0 | 27.99 | 72.35 | 28.23 |
| | 2023-3-20 11:00:00 | 10.30 | 7.63 | 0 | 0 | 29.19 | 64.32 | 29.74 |
| **Hourly Limit Values** | **TA Luft** | - | - | 200 | 350 | - | - | - |
| | **EU** | - | - | 200 | 350 | - | - | - |
| | **WHO Ambient Air Quality Guideline Value** | - | - | - | - | - | - | - |
| **Average** | | **10.53** | **7.83** | **0.70** | **0.20** | **29.57** | **69.60** | **27.65** |
| **Daily Limit Values** | **TA Luft** | 50 | - | - | 125 | - | - | - |
| | **EU** | 50 | - | - | 125 | - | - | - |
| | **WHO Ambient Air Quality Guideline Value** | 45 | 15 | 25 | 40 | - | - | - |

**Figure 3** Measurement Graphs for Location AQ2

**Table 6 Measurement Results for Location 3**

| Location | Sampling Date | Results ( µg/m³ ) | | | | | Ambient Conditions | |
|---|---|---|---|---|---|---|---|---|
| | | $PM_{10}$ | $PM_{2.5}$ | $NO_2$ | $SO_2$ | TSP (24 Hours Average) | Humidity (%) | Temperature ($^0$C) |
| AQ3 | 2023-3-21 12:00:00 | 10.48 | 7.75 | 0 | 0 | 33.07 | 69.7 | 30.0 |
| | 2023-3-21 13:00:00 | 16.43 | 13.86 | 0 | 0 | 32.87 | 74.7 | 28.2 |
| | 2023-3-21 14:00:00 | 11.38 | 9.87 | 0 | 0 | 33.71 | 79.6 | 27.1 |
| | 2023-3-21 15:00:00 | 13.93 | 10.93 | 0 | 0 | 33.57 | 80.7 | 26.9 |
| | 2023-3-21 16:00:00 | 13.46 | 11.34 | 2.63 | 0 | 33.62 | 81.6 | 26.7 |
| | 2023-3-21 17:00:00 | 13.11 | 11.51 | 0 | 0 | 33.71 | 82.4 | 26.6 |
| | 2023-3-21 18:00:00 | 12.94 | 11.98 | 0 | 0 | 33.92 | 83.8 | 26.4 |
| | 2023-3-21 19:00:00 | 13.38 | 12.43 | 0 | 0 | 33.54 | 85.3 | 26.1 |
| | 2023-3-21 20:00:00 | 14.11 | 12.95 | 0 | 0 | 33.60 | 82.9 | 26.0 |
| | 2023-3-21 21:00:00 | 13.35 | 11.35 | 0 | 0 | 34.85 | 84.2 | 25.8 |
| | 2023-3-21 22:00:00 | 13.30 | 10.97 | 0 | 0 | 35.91 | 84.1 | 25.8 |
| | 2023-3-21 23:00:00 | 13.33 | 10.66 | 0 | 0 | 36.85 | 84.0 | 25.7 |
| | 2023-3-22 00:00:00 | 13.47 | 11.93 | 0 | 0 | 37.75 | 84.3 | 25.6 |
| | 2023-3-22 01:00:00 | 13.44 | 12.39 | 0 | 0 | 38.07 | 83.7 | 25.6 |
| | 2023-3-22 02:00:00 | 14.69 | 13.78 | 0 | 0 | 35.03 | 82.0 | 26.4 |
| | 2023-3-22 03:00:00 | 15.56 | 13.72 | 0 | 0 | 28.39 | 67.8 | 30.2 |
| | 2023-3-22 04:00:00 | 15.01 | 13.88 | 0 | 0 | 26.80 | 62.5 | 31.8 |
| | 2023-3-22 05:00:00 | 14.97 | 13.89 | 0 | 0 | 27.96 | 61.0 | 32.3 |
| | 2023-3-22 06:00:00 | 15.03 | 13.57 | 0 | 0 | 32.59 | 63.5 | 31.5 |
| | 2023-3-22 07:00:00 | 15.26 | 13.50 | 0 | 0 | 29.07 | 63.7 | 31.7 |
| | 2023-3-22 08:00:00 | 14.94 | 13.30 | 0 | 0 | 29.63 | 61.5 | 32.1 |
| | 2023-3-22 09:00:00 | 14.41 | 12.74 | 0 | 0 | 29.15 | 61.0 | 32.5 |
| | 2023-3-22 10:00:00 | 14.20 | 11.97 | 0 | 0 | 29.92 | 60.1 | 32.6 |
| | 2023-3-22 11:00:00 | 14.22 | 11.56 | 0 | 0 | 31.78 | 61.4 | 32.3 |
| **Hourly Limit Values** | **TA Luft** | - | - | 200 | 350 | - | - | - |
| | **EU** | - | - | 200 | 350 | - | - | - |
| | **WHO Ambient Air Quality Guideline Value** | - | - | - | - | - | - | - |
| **Average** | | **13.93** | **12.16** | **0.11** | **0.00** | **32.72** | **74.40** | **28.58** |
| **Daily Limit Values** | **TA Luft** | 50 | - | - | - | - | - | - |
| | **EU** | 50 | - | - | - | - | - | - |
| | **WHO Ambient Air Quality Guideline Value** | 45 | 15 | 25 | - | - | - | - |

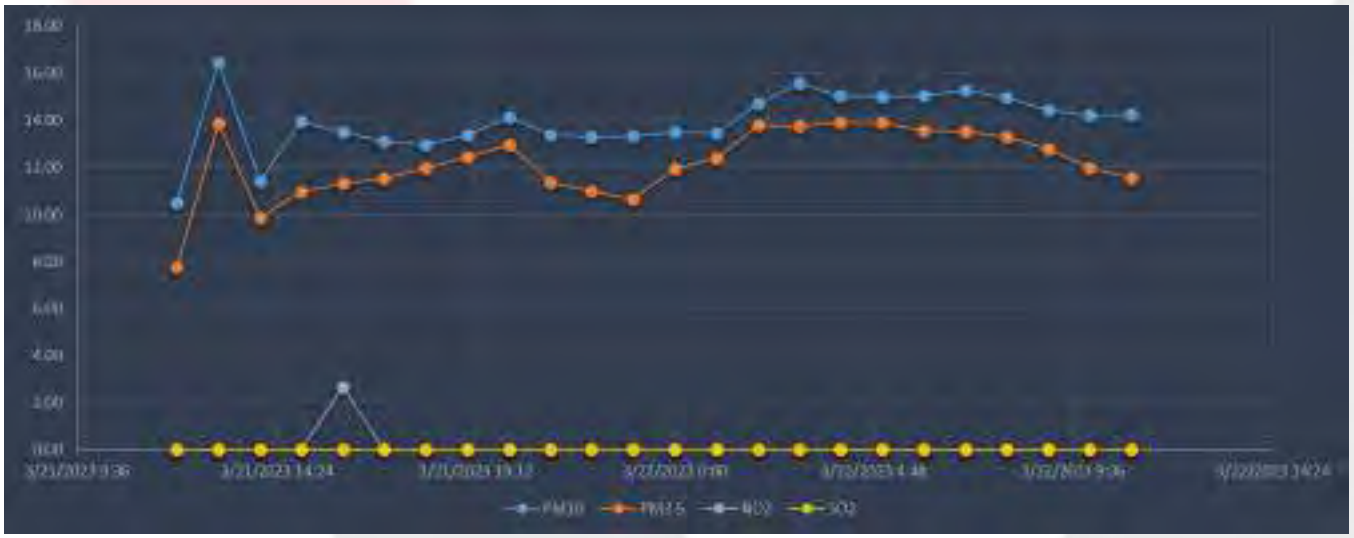

**Figure 4** Measurement Graphs for Location AQ3

**Table 7 Measurement Results for Location 4**

| Location | Sampling Date | Results ( µg/m³ ) | | | | | Ambient Conditions | |
|---|---|---|---|---|---|---|---|---|
| | | $PM_{10}$ | $PM_{2.5}$ | $NO_2$ | $SO_2$ | TSP (24 Hours Average) | Humidity (%) | Temperature ($^0$C) |
| ASR2 | 2023-3-19 12:00:00 | 14.18 | 9.85 | 0 | 0 | 37.69 | 67.53 | 29.98 |
| | 2023-3-19 13:00:00 | 15.12 | 11.80 | 0 | 0 | 40.74 | 70.19 | 29.21 |
| | 2023-3-19 14:00:00 | 15.13 | 12.04 | 0 | 0 | 40.07 | 68.61 | 28.03 |
| | 2023-3-19 15:00:00 | 15.66 | 12.40 | 0 | 1.24 | 41.14 | 67.70 | 27.97 |
| | 2023-3-19 16:00:00 | 15.67 | 11.56 | 6.41 | 11.18 | 41.53 | 68.40 | 27.83 |
| | 2023-3-19 17:00:00 | 16.65 | 12.58 | 0 | 4.32 | 43.74 | 68.89 | 27.59 |
| | 2023-3-19 18:00:00 | 19.53 | 14.74 | 1.96 | 0 | 50.40 | 69.81 | 27.24 |
| | 2023-3-19 19:00:00 | 16.94 | 12.79 | 0 | 0 | 44.22 | 71.62 | 26.81 |
| | 2023-3-19 20:00:00 | 16.13 | 12.19 | 0 | 2.61 | 42.38 | 75.94 | 25.55 |
| | 2023-3-19 21:00:00 | 17.38 | 13.11 | 0 | 0 | 45.40 | 78.59 | 24.73 |
| | 2023-3-19 22:00:00 | 19.21 | 14.46 | 0 | 0 | 49.70 | 80.50 | 24.41 |
| | 2023-3-19 23:00:00 | 20.64 | 15.55 | 0 | 0 | 53.18 | 80.50 | 24.30 |
| | 2023-3-20 00:00:00 | 20.43 | 15.40 | 0 | 0 | 52.62 | 81.69 | 24.20 |
| | 2023-3-20 01:00:00 | 19.88 | 14.98 | 0 | 0 | 51.19 | 82.06 | 24.15 |
| | 2023-3-20 02:00:00 | 18.96 | 14.29 | 0 | 0 | 48.49 | 84.71 | 25.46 |
| | 2023-3-20 03:00:00 | 18.23 | 13.73 | 0 | 0 | 46.39 | 81.07 | 26.38 |
| | 2023-3-20 04:00:00 | 18.10 | 13.65 | 0 | 0 | 46.14 | 79.21 | 26.82 |
| | 2023-3-20 05:00:00 | 17.44 | 13.18 | 0 | 0 | 44.69 | 80.64 | 26.49 |
| | 2023-3-20 06:00:00 | 18.59 | 14.05 | 0 | 0 | 47.39 | 79.67 | 26.67 |
| | 2023-3-20 07:00:00 | 18.47 | 13.94 | 0 | 0 | 46.82 | 76.78 | 27.61 |
| | 2023-3-20 08:00:00 | 16.80 | 12.71 | 4.08 | 0 | 42.93 | 76.54 | 27.58 |
| | 2023-3-20 09:00:00 | 15.82 | 11.97 | 0 | 0 | 40.75 | 76.33 | 27.60 |
| | 2023-3-20 10:00:00 | 16.45 | 12.47 | 0 | 0 | 42.71 | 71.23 | 28.92 |
| | 2023-3-20 11:00:00 | 16.26 | 12.32 | 0 | 0 | 42.10 | 65.23 | 30.49 |
| **Hourly Limit Values** | **TA Luft** | - | - | 200 | 350 | - | - | - |
| | **EU** | - | - | 200 | 350 | - | - | - |
| | **WHO Ambient Air Quality Guideline Value** | - | - | - | - | - | - | - |
| **Average** | | **17.40** | **13.16** | **0.52** | **0.81** | **45.10** | **75.14** | **26.92** |
| **Daily Limit Values** | **TA Luft** | 50 | - | - | 125 | - | - | - |
| | **EU** | 50 | - | - | 125 | - | - | - |
| | **WHO Ambient Air Quality Guideline Value** | 45 | 15 | 25 | 40 | - | - | - |


**Figure 5** Measurement Graphs for Location ASR2

**Table 8 Measurement Results for Location 5**

| Location | Sampling Date | Results ( µg/m³ ) | | | | | Ambient Conditions | |
|---|---|---|---|---|---|---|---|---|
| | | $PM_{10}$ | $PM_{2.5}$ | $NO_2$ | $SO_2$ | TSP (24 Hours Average) | Humidity (%) | Temperature ($^0$C) |
| ASR3 | 2023-3-22 12:00:00 | 15.05 | 14.98 | 0 | 0 | 28.42 | 60.58 | 30.95 |
| | 2023-3-22 13:00:00 | 13.59 | 13.52 | 0 | 0 | 28.55 | 61.19 | 30.76 |
| | 2023-3-22 14:00:00 | 13.05 | 12.98 | 0 | 0 | 27.33 | 55.96 | 30.15 |
| | 2023-3-22 15:00:00 | 12.77 | 12.73 | 0 | 0 | 26.77 | 54.67 | 29.55 |
| | 2023-3-22 16:00:00 | 13.90 | 13.83 | 0 | 0 | 26.29 | 54.74 | 29.49 |
| | 2023-3-22 17:00:00 | 12.49 | 12.45 | 0 | 0 | 26.60 | 55.55 | 29.15 |
| | 2023-3-22 18:00:00 | 12.70 | 12.65 | 0 | 0 | 26.59 | 58.08 | 28.32 |
| | 2023-3-22 19:00:00 | 13.00 | 12.94 | 0 | 0 | 26.63 | 61.28 | 27.22 |
| | 2023-3-22 20:00:00 | 13.41 | 13.35 | 0 | 0 | 27.43 | 66.63 | 27.59 |
| | 2023-3-22 21:00:00 | 11.78 | 11.71 | 0 | 0 | 27.83 | 70.25 | 27.58 |
| | 2023-3-22 22:00:00 | 14.99 | 14.93 | 0 | 0 | 28.40 | 71.92 | 26.24 |
| | 2023-3-22 23:00:00 | 15.02 | 14.96 | 0 | 0 | 28.47 | 72.49 | 26.12 |
| | 2023-3-23 00:00:00 | 15.37 | 15.30 | 0 | 0 | 29.10 | 74.32 | 26.95 |
| | 2023-3-23 01:00:00 | 10.93 | 10.89 | 0 | 0 | 29.75 | 74.53 | 26.82 |
| | 2023-3-23 02:00:00 | 10.28 | 10.25 | 0 | 0 | 27.73 | 84.84 | 26.16 |
| | 2023-3-23 03:00:00 | 9.33 | 9.28 | 0 | 0 | 24.13 | 84.21 | 26.07 |
| | 2023-3-23 04:00:00 | 9.30 | 9.28 | 0 | 0 | 24.04 | 84.35 | 25.92 |
| | 2023-3-23 05:00:00 | 9.62 | 9.59 | 0 | 0 | 24.95 | 84.98 | 25.82 |
| | 2023-3-23 06:00:00 | 9.88 | 9.86 | 0 | 0 | 26.27 | 84.33 | 25.78 |
| | 2023-3-23 07:00:00 | 11.23 | 11.20 | 0 | 0 | 26.19 | 84.39 | 25.72 |
| | 2023-3-23 08:00:00 | 11.08 | 11.05 | 0 | 0 | 26.05 | 81.89 | 25.71 |
| | 2023-3-23 09:00:00 | 9.14 | 9.10 | 0 | 0 | 24.25 | 78.24 | 26.20 |
| | 2023-3-23 10:00:00 | 8.93 | 8.92 | 0 | 0 | 24.20 | 73.08 | 29.00 |
| | 2023-3-23 11:00:00 | 9.08 | 9.06 | 0 | 0 | 25.15 | 65.21 | 30.48 |
| **Hourly Limit Values** | **TA Luft** | - | - | 200 | 200 | - | - | - |
| | **EU** | - | - | 200 | 350 | - | - | - |
| | **WHO Ambient Air Quality Guideline Value** | - | - | - | - | - | - | - |
| **Average** | | **11.91** | **11.87** | **0.00** | **0.00** | **26.71** | **70.74** | **27.65** |
| **Daily Limit Values** | **TA Luft** | 50 | - | - | 125 | - | - | - |
| | **EU** | 50 | - | - | 125 | - | - | - |
| | **WHO Ambient Air Quality Guideline Value** | 45 | 15 | 25 | 40 | - | - | - |


**Figure 6** Measurement Graphs for Location ASR3

**Table 9 Measurement Results for Location 6**

| Location | Sampling Date | Results ( µg/m³ ) | | | | | Ambient Conditions | |
|---|---|---|---|---|---|---|---|---|
| | | $PM_{10}$ | $PM_{2.5}$ | $NO_2$ | $SO_2$ | TSP (24 Hours Average) | Humidity (%) | Temperature ($^0$C) |
| ASR5 | 2023-3-22 12:00:00 | 14.89 | 11.72 | 0 | 0 | 36.73 | 65.42 | 30.67 |
| | 2023-3-22 13:00:00 | 14.75 | 11.66 | 0 | 0 | 36.37 | 68.47 | 30.76 |
| | 2023-3-22 14:00:00 | 14.91 | 11.84 | 19.73 | 0 | 35.70 | 68.93 | 30.71 |
| | 2023-3-22 15:00:00 | 15.25 | 11.94 | 8.44 | 2.21 | 35.64 | 68.77 | 30.73 |
| | 2023-3-22 16:00:00 | 14.62 | 11.72 | 1.25 | 6.14 | 34.87 | 68.71 | 30.87 |
| | 2023-3-22 17:00:00 | 15.08 | 12.47 | 5.67 | 1.38 | 36.31 | 68.72 | 30.68 |
| | 2023-3-22 18:00:00 | 17.08 | 14.76 | 9.04 | 0.96 | 40.25 | 69.86 | 30.34 |
| | 2023-3-22 19:00:00 | 15.00 | 12.70 | 2.91 | 0 | 36.67 | 72.72 | 29.49 |
| | 2023-3-22 20:00:00 | 14.54 | 12.13 | 2.87 | 1.06 | 36.36 | 77.39 | 28.06 |
| | 2023-3-22 21:00:00 | 15.08 | 13.27 | 3.28 | 0 | 38.01 | 80.54 | 26.99 |
| | 2023-3-22 22:00:00 | 16.50 | 14.55 | 0 | 0 | 40.73 | 82.57 | 26.62 |
| | 2023-3-22 23:00:00 | 17.67 | 15.53 | 0 | 0.38 | 42.68 | 82.44 | 26.50 |
| | 2023-3-23 00:00:00 | 17.62 | 15.54 | 0 | 0 | 42.93 | 83.67 | 26.36 |
| | 2023-3-23 01:00:00 | 17.56 | 15.21 | 0 | 0 | 42.47 | 84.26 | 26.27 |
| | 2023-3-23 02:00:00 | 17.07 | 14.50 | 0 | 0 | 41.05 | 83.91 | 26.45 |
| | 2023-3-23 03:00:00 | 16.56 | 13.69 | 0 | 0 | 38.44 | 80.71 | 27.20 |
| | 2023-3-23 04:00:00 | 16.32 | 13.69 | 0 | 0 | 38.91 | 79.56 | 27.52 |
| | 2023-3-23 05:00:00 | 15.84 | 13.25 | 0 | 0 | 38.40 | 80.91 | 27.22 |
| | 2023-3-23 06:00:00 | 16.81 | 14.02 | 0 | 0 | 39.88 | 79.70 | 27.38 |
| | 2023-3-23 07:00:00 | 17.34 | 14.54 | 0 | 0 | 41.71 | 77.49 | 28.13 |
| | 2023-3-23 08:00:00 | 15.89 | 13.09 | 0.53 | 0 | 38.80 | 77.36 | 28.09 |
| | 2023-3-23 09:00:00 | 14.72 | 12.01 | 0 | 0 | 35.14 | 76.52 | 28.23 |
| | 2023-3-23 10:00:00 | 15.25 | 12.37 | 0 | 0 | 35.37 | 69.61 | 30.19 |
| | 2023-3-23 11:00:00 | 15.39 | 12.39 | 0 | 0 | 36.06 | 62.90 | 30.21 |
| **Hourly Limit Values** | **TA Luft** | - | - | 200 | 350 | - | - | - |
| | **EU** | - | - | 200 | 350 | - | - | - |
| | **WHO Ambient Air Quality Guideline Value** | - | - | - | - | - | - | - |
| **Average** | | **15.91** | **13.27** | **2.24** | **0.51** | **38.31** | **75.46** | **28.57** |
| **Daily Limit Values** | **TA Luft** | 50 | - | - | 125 | - | - | - |
| | **EU** | 50 | - | - | 125 | - | - | - |
| | **WHO Ambient Air Quality Guideline Value** | 45 | 15 | 25 | 40 | - | - | - |

**Figure 7** Measurement Graphs for Location ASR2

**Table 10 Measurement Results for Location 7**

| Location | Sampling Date | Results ( µg/m³ ) | | | | | Ambient Conditions | |
|---|---|---|---|---|---|---|---|---|
| | | $PM_{10}$ | $PM_{2.5}$ | $NO_2$ | $SO_2$ | TSP (24 Hours Average) | Humidity (%) | Temperature ($^0$C) |
| AQ4 | 2023-3-22 12:00:00 | 22.16 | 14.93 | 0 | 0 | 44.42 | 73.82 | 30.80 |
| | 2023-3-22 13:00:00 | 22.14 | 14.92 | 0 | 0 | 44.38 | 75.92 | 30.03 |
| | 2023-3-22 14:00:00 | 25.36 | 16.85 | 6.74 | 72.31 | 50.69 | 76.77 | 30.33 |
| | 2023-3-22 15:00:00 | 27.24 | 17.98 | 0.98 | 0 | 54.37 | 77.78 | 29.97 |
| | 2023-3-22 16:00:00 | 28.32 | 18.63 | 5.16 | 0 | 56.49 | 79.19 | 29.62 |
| | 2023-3-22 17:00:00 | 31.14 | 20.32 | 5.06 | 0 | 62.02 | 79.74 | 29.39 |
| | 2023-3-22 18:00:00 | 30.66 | 20.03 | 5.95 | 0 | 61.08 | 81.10 | 29.00 |
| | 2023-3-22 19:00:00 | 34.25 | 22.19 | 2.47 | 0 | 68.11 | 83.70 | 28.28 |
| | 2023-3-22 20:00:00 | 29.08 | 19.08 | 0.09 | 0 | 57.98 | 85.43 | 27.53 |
| | 2023-3-22 21:00:00 | 31.67 | 20.64 | 0.57 | 0 | 63.05 | 87.47 | 27.09 |
| | 2023-3-22 22:00:00 | 28.67 | 18.84 | 0.53 | 0 | 57.17 | 88.20 | 26.93 |
| | 2023-3-22 23:00:00 | 29.02 | 19.05 | 0.09 | 0 | 57.86 | 88.70 | 26.82 |
| | 2023-3-23 00:00:00 | 29.01 | 19.04 | 0.44 | 0 | 57.83 | 89.29 | 26.74 |
| | 2023-3-23 01:00:00 | 28.99 | 19.03 | 0 | 0 | 57.80 | 89.39 | 26.81 |
| | 2023-3-23 02:00:00 | 28.84 | 18.94 | 0.23 | 0 | 57.51 | 88.35 | 27.80 |
| | 2023-3-23 03:00:00 | 28.14 | 18.52 | 0 | 0 | 56.14 | 81.80 | 29.53 |
| | 2023-3-23 04:00:00 | 26.67 | 17.64 | 0 | 0 | 53.25 | 79.79 | 29.10 |
| | 2023-3-23 05:00:00 | 28.47 | 18.72 | 0 | 0 | 56.78 | 79.34 | 29.22 |
| | 2023-3-23 06:00:00 | 25.24 | 16.78 | 0 | 0 | 50.45 | 78.94 | 29.30 |
| | 2023-3-23 07:00:00 | 23.14 | 15.52 | 0 | 0 | 46.34 | 77.92 | 30.70 |
| | 2023-3-23 08:00:00 | 27.25 | 17.99 | 0 | 0 | 54.39 | 76.96 | 30.84 |
| | 2023-3-23 09:00:00 | 21.39 | 14.47 | 0 | 0 | 42.91 | 74.07 | 31.67 |
| | 2023-3-23 10:00:00 | 18.36 | 12.65 | 0 | 0 | 36.97 | 69.78 | 31.79 |
| | 2023-3-23 11:00:00 | 21.96 | 14.81 | 0 | 0 | 44.02 | 71.08 | 31.84 |
| **Hourly Limit Values** | **TA Luft** | - | - | 200 | 350 | | - | - |
| | **EU** | - | - | 200 | 350 | | - | - |
| | **WHO Ambient Air Quality Guideline Value** | - | - | - | - | | - | - |
| **Average** | | **26.97** | **17.81** | **1.18** | **3.01** | **53.83** | **80.61** | **29.21** |
| **Daily Limit Values** | **TA Luft** | 50 | - | - | 125 | | - | - |
| | **EU** | 50 | - | - | 125 | | - | - |
| | **WHO Ambient Air Quality Guideline Value** | 45 | 15 | 25 | 40 | | - | - |

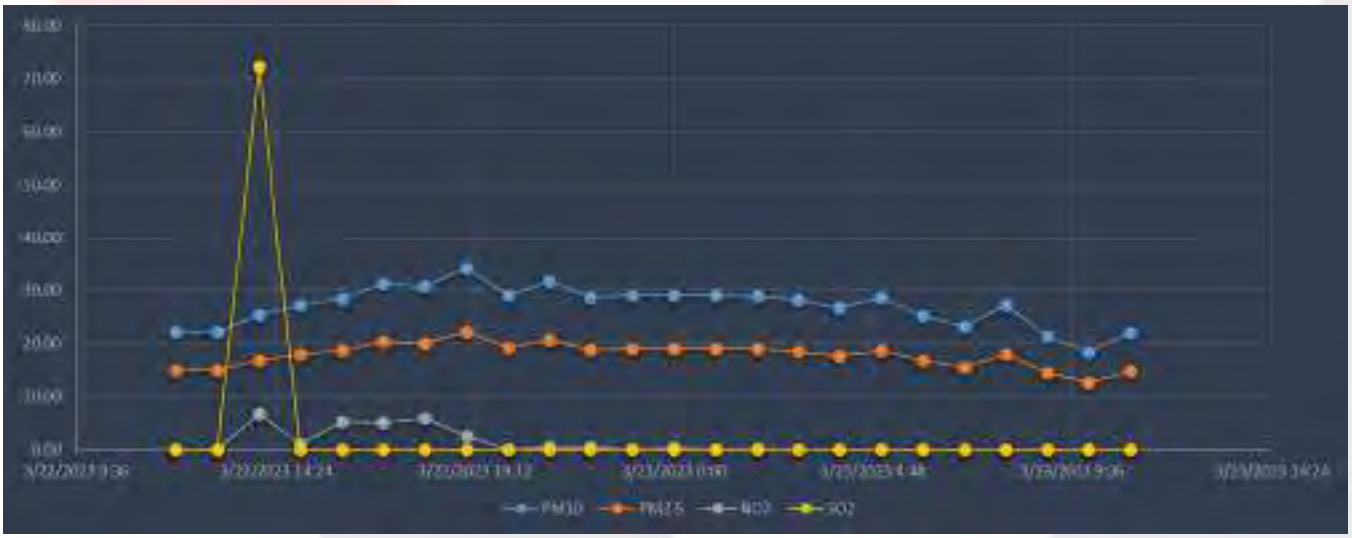


**Figure 8** Measurement Graphs for Location AQ4

## 6. ASSESSMENT

The air quality measurement study was carried out with the aim of determining the air pollutants on ambient air quality. Results were assessed according to the TA LUFT, EU Council Directive 2008/50/EC and WHO limit values and this report was prepared. According to air quality measurement studies, background air quality values are comply with air quality standards.

Environmental monitoring Report Pre-Construction–Stage WtE Facility at Thilafushi

# Noise Level Measurments (March 2023)

Prepared by: Mahmood Riyaz

GeotechMaldives

29th March 2023

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# List of Figures

# 1. INTRODUCTION

This is the ambient noise level monitoring report prepared as part of the pre-construction environmental monitoring of the waste to energy (WtE) facility at Thilafushi, Maldives. This report presents methodologies and results of the ambient noise level measurements conducted to fulfill the requirements of the EIA and the Project Environmental Management Plan that is being developed to meet the anticipated environment impacts, health and safety, as well as to ensure the sustainability of the Project.

# 2. NOISE LEVEL

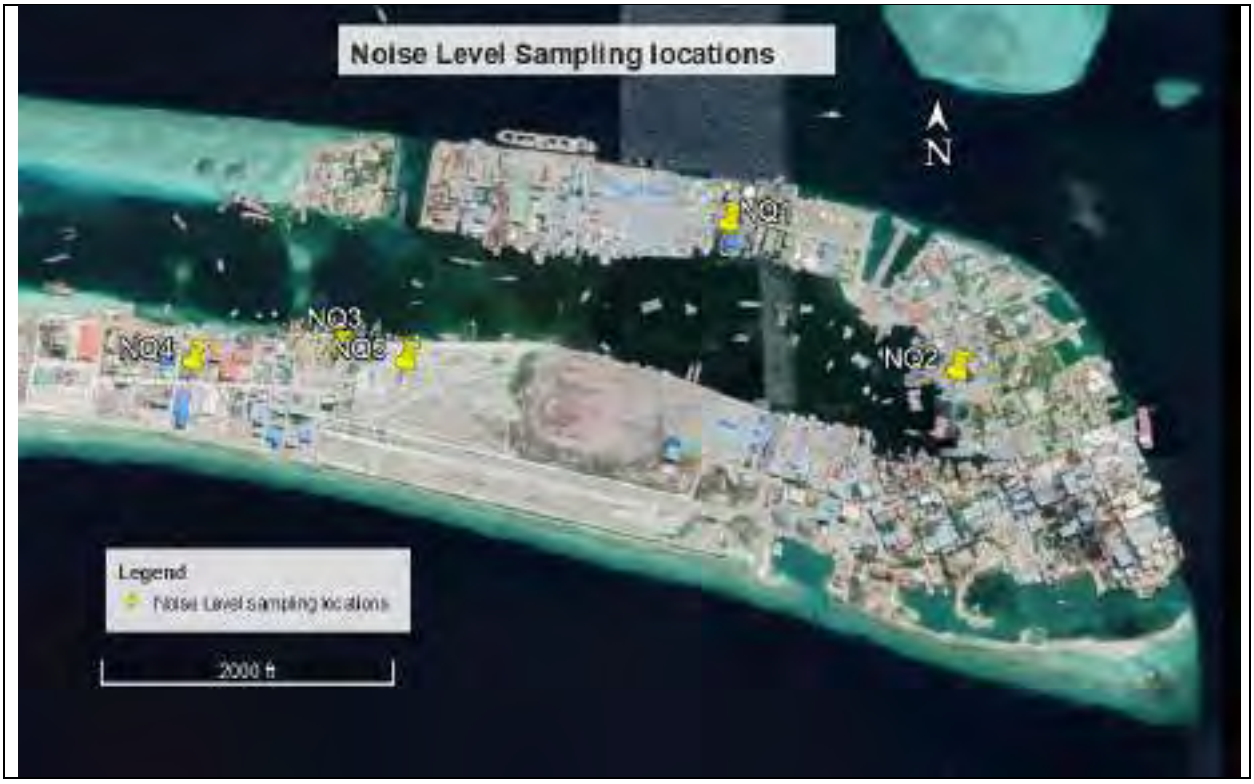
As part of the pre-construction monitoring of Thilafushi Waste to Energy facility, ambient noise levels measurements were repeated at the same five locations used in the EIA report. Ambient noise level measurement was done using a handheld sound level meter (ET-958 Professional Sound Level Meter) Measurements are recorded in NQ1, and NQ2 NQ3, NQ4 and NQ5 from 25th March 2023 22:00 to 26th march 2023 22:00 continuously for 24 four hours. Table 1 summarizes the explanation on the selection of baseline monitoring stations given in the EIA report. **Figure 1** is the map that shows the sampling locations. Graph showing the noise levels in five locations is in **Figure 2**

At each station hourly 7-8 readings are recorded for a duration of 30-50seconds at each location. Average of ambient noise level in dB(A) was recorded and the average noise of each location is calculated Table 2. Ambient noise levels recorded with the EIA levels presented in the EIA report is given in **Table 2**

**Table 1: Locations selected for Ambient Noise Level Measurements**

| Station name | Geographic Coordinates | Reason for selection |
|---|---|---|
| NQ1 | 4°10'26.4 N, 73°28'59.9 E | Included in the original EIA |
| NQ2 | 4°10'56.6 N, 73°26'53.3 E | Included in the original EIA |
| NQ3 | 4°10'58.3 N, 73°26'09.6 E | Included in the original EIA |
| NQ4 | 4°10'57.3 N,73°25'59.4 E | Included in the original EIA |
| NQ5 | 4°10'57.3 N, 73°26'14.4 E | Included in the original EIA |

**Figure 1: Ambient noise level sampling locations**



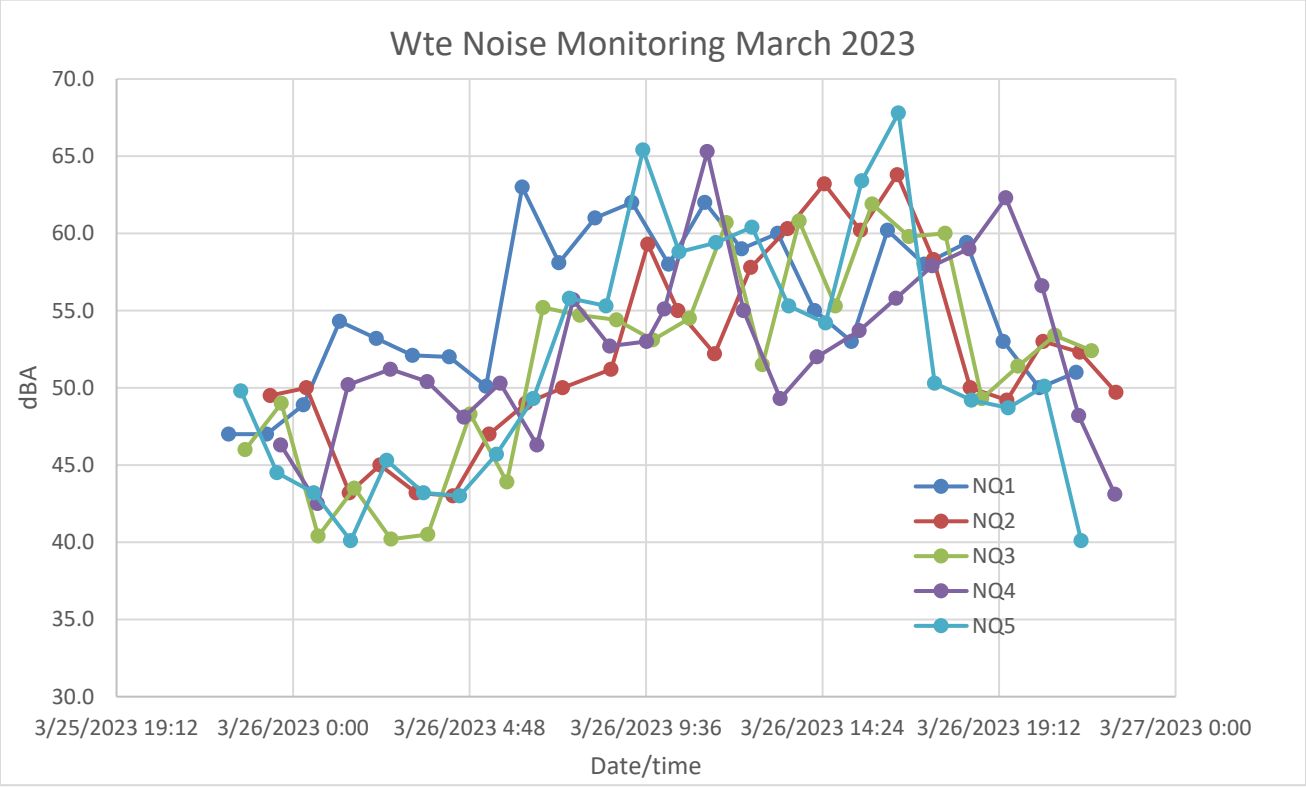

## 2.1 Results

**Table 2: Noise measurement records in (dBA), 25-26 March 2023 Thilafushi**

| NQ1 | | NQ2 | | NQ3 | | NQ4 | | NQ5 | |
|---|---|---|---|---|---|---|---|---|---|
| Date and time) | dB(A | Date/time | dB(A) | Date/time | dB(A) | Date/time | dB(A) | Date/time | dB(A) |
| 3/25/2023 22:15 | 47 | 3/25/2023 23:23 | 49.5 | 3/25/2023 10:42 | 46 | 3/25/2023 23:40 | 46.3 | 3/25/2023 22:35 | 49.8 |
| 3/25/2023 23:17 | 47 | 3/26/2023 0:22 | 50 | 3/25/2023 23:41 | 49 | 3/26/2023 0:40 | 42.5 | 3/25/2023 23:34 | 44.5 |
| 3/26/2023 0:17 | 48.9 | 3/26/2023 1:32 | 43.2 | 3/26/2023 0:41 | 40.4 | 3/26/2023 1:30 | 50.2 | 3/26/2023 0:34 | 43.2 |
| 3/26/2023 1:16 | 54.3 | 3/26/2023 2:22 | 45 | 3/26/2023 1:40 | 43.5 | 3/26/2023 2:39 | 51.2 | 3/26/2023 1:34 | 40.1 |
| 3/26/2023 2:16 | 53.2 | 3/26/2023 3:21 | 43.2 | 3/26/2023 2:40 | 40.2 | 3/26/2023 3:39 | 50.4 | 3/26/2023 2:33 | 45.3 |
| 3/26/2023 3:15 | 52.1 | 3/26/2023 4:21 | 43 | 3/26/2023 3:40 | 40.5 | 3/26/2023 4:39 | 48.1 | 3/26/2023 3:33 | 43.2 |
| 3/26/2023 4:15 | 52 | 3/26/2023 5:20 | 47 | 3/26/2023 4:49 | 48.3 | 3/26/2023 5:38 | 50.3 | 3/26/2023 4:32 | 43 |
| 3/26/2023 5:15 | 50.1 | 3/26/2023 6:20 | 49 | 3/26/2023 5:49 | 43.9 | 3/26/2023 6:38 | 46.3 | 3/26/2023 5:32 | 45.7 |
| 3/26/2023 6:14 | 63 | 3/26/2023 7:20 | 50 | 3/26/2023 6:48 | 55.2 | 3/26/2023 7:37 | 55.7 | 3/26/2023 6:32 | 49.3 |
| 3/26/2023 7:14 | 58.1 | 3/26/2023 8:39 | 51.2 | 3/26/2023 7:48 | 54.7 | 3/26/2023 8:37 | 52.7 | 3/26/2023 7:31 | 55.8 |
| 3/26/2023 8:13 | 61 | 3/26/2023 9:39 | 59.3 | 3/26/2023 8:48 | 54.4 | 3/26/2023 9:37 | 53 | 3/26/2023 8:31 | 55.3 |
| 3/26/2023 9:13 | 62 | 3/26/2023 10:28 | 55 | 3/26/2023 9:47 | 53.1 | 3/26/2023 10:06 | 55.1 | 3/26/2023 9:31 | 65.4 |
| 3/26/2023 10:13 | 58 | 3/26/2023 11:28 | 52.2 | 3/26/2023 10:47 | 54.5 | 3/26/2023 11:16 | 65.3 | 3/26/2023 10:30 | 58.8 |
| 3/26/2023 11:12 | 62 | 3/27/2023 12:27 | 57.8 | A/26/2023 11:47 | 60.7 | 3/26/2023 12:15 | 55 | 3/26/2023 11:30 | 59.4 |
| 3/26/2023 12:12 | 59 | 3/27/2023 13:27 | 60.3 | 3/27/2023 12:46 | 51.5 | 3/26/2023 13:15 | 49.3 | 3/26/2023 12:29 | 60.4 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3/26/2023 13:11 | 60 | 3/27/2023 14:27 | 63.2 | 3/26/2023 13:46 | 60.8 | 3/26/2023 14:15 | 52 | 3/26/2023 13:29 | 55.3 |
| 3/26/2023 14:11 | 55 | 3/26/2023 15:26 | 60.2 | 3/26/2023 14:45 | 55.3 | 3/26/2023 15:24 | 53.7 | 3/26/2023 14:29 | 54.2 |
| 3/26/2023 15:11 | 53 | 3/26/2023 16:26 | 63.8 | 3/26/2023 15:45 | 61.9 | 3/26/2023 16:24 | 55.8 | 3/26/2023 15:28 | 63.4 |
| 3/26/2023 16:10 | 60.2 | 3/26/2023 17:25 | 58.3 | 3/26/2023 16:45 | 59.8 | 3/26/2023 17:23 | 57.9 | 3/26/2023 16:28 | 67.8 |
| 3/26/2023 17:10 | 58 | 3/26/2023 18:25 | 50 | 3/26/2023 17:44 | 60 | 3/26/2023 18:23 | 59 | 3/26/2023 17:27 | 50.3 |
| 0/26/2023 18:19:00 | 59.4 | 3/26/2023 19:25 | 49.2 | 3/26/2023 18:44 | 49.3 | 3/26/2023 19:23 | 62.3 | 3/26/2023 18:27 | 49.2 |
| 3/26/2023 19:19 | 53 | 3/26/2023 20:24 | 53 | 3/26/2023 19:43 | 51.4 | 3/26/2023 20:22 | 56.6 | 3/26/2023 19:27 | 48.7 |
| 3/26/2023 20:18 | 50 | 3/26/2023 21:24 | 52.3 | 3/26/2023 20:43 | 53.4 | 3/26/2023 21:22 | 48.2 | 3/26/2023 20:26 | 50.1 |
| 3/26/2023 21:18 | 51 | 3/26/2023 22:23 | 49.7 | 3/26/2023 21:43 | 52.4 | 3/26/2023 22:21 | 43.1 | 3/26/2023 21:26 | 40.1 |
| Average dB(A) | **55.3** | | 52.3 | | 51.6 | | 52.5 | | 51.5 |
| Daytime | **57.2** | | 55.7 | | 55.6 | | 54.6 | | 55.6 |
| Night time | **52.5** | | 46.6 | | 46.1 | | 49 | | 45.9 |
| WHO guideline for ambient noise level | 70 | | | | | | | | |

**Figure 2. Graph showing the Ambient noise level recorded**




There are no designated national standards for ambient noise level in outdoor industrial area in the Maldives. Compared to WHO and ADB specified noise level standards for outdoors industrial and commercial area the noise level in Thilafushi island and the subproject area is below the noise level standards. The results show that in all the stations ambient noise level are below threshold levels specified by the WHO standards.

Annex 1. Noise level Hourly recorded

**Thilafushi WtE Project Environmental Monitoring (Ambient Noise level)**

| | | | |
|---|---|---|---|
| Client | ALAKJV WtE | Station No | NQ1 Thilafushi |
| Location | 4°10'26.4 N, 73°28'59.9 E | Consultant | Mahmood Riyaz |
| Technician | Hussain Fazeel | Weather condition | |
| Start time | 3/25/2023 22:15 | sunny and clear | |
| End time | 3/26/2023 21:18 | Isolated showers | |

| Date/time | dBA | Remarks noise level |
|---|---|---|
| 3/25/2023 22:15 | 47.0 | Quite Library |
| 3/25/2023 23:17 | 47.0 | Quite Library |
| 3/26/2023 0:17 | 48.9 | Quite Library |
| 3/26/2023 1:16 | 54.3 | Quite Office |
| 3/26/2023 2:16 | 53.2 | Quite Office |
| 3/26/2023 3:15 | 52.1 | Quite office |
| 3/26/2023 4:15 | 52.0 | Quite Office |
| 3/26/2023 5:15 | 50.1 | Quite Office |
| 3/26/2023 6:14 | 63.0 | Conversation |
| 3/26/2023 7:14 | 58.1 | Quite office |
| 3/26/2023 8:13 | 61.0 | Conversation |
| 3/26/2023 9:13 | 62.0 | Conversation |
| 3/26/2023 10:13 | 58.0 | Quite Office |
| 3/26/2023 11:12 | 62.0 | Conversation |
| 3/26/2023 12:12 | 59.0 | Quite Office |
| 3/26/2023 13:11 | 60.0 | Conversation |
| 3/26/2023 14:11 | 55.0 | Quite office |
| 3/26/2023 15:11 | 53.0 | Quite Office |
| 3/26/2023 16:10 | 60.2 | Conversaton |
| 3/26/2023 17:10 | 58.0 | Quite Office |
| 3/26/2023 18:19 | 59.4 | Quite Office |
| 3/26/2023 19:19 | 53.0 | Quite Office |
| 3/26/2023 20:18 | 50.0 | Quite Office |
| 3/26/2023 21:18 | 51.0 | Quite Office |

| | |
|---|---|
| Average | 55.3 |
| Day time avr | 57.3 |
| Night time average | 52.6 |

**Thilafushi WtE Project Environmental Monitoring (Ambient Noise level)**

| | | | |
|---|---|---|---|
| Client | ALAKJV WtE | Station No | NQ2 Thilafushi |
| Location | 4°10’56.6 N, 73°26’53.3 E | Consultant | Mahmood Riyaz |
| Technician | Hussain Fazeel | Weather condition | Temperature:31.5 oC |
| Start time | 3/25/2023 23:23 | sunny and clear | Wind: NE 3-13miles |
| End time | 3/26/2023 22:23 | Isolated showers | Humidity: 71% |

| Date/time | dBA | Remarks noise level |
|---|---|---|
| 3/25/2023 23:23 | 49.5 | Quite Library |
| 3/26/2023 0:22 | 50.0 | Quite Office |
| 3/26/2023 1:32 | 43.2 | Quite Library |
| 3/26/2023 2:22 | 45.0 | Quite Library |
| 3/26/2023 3:21 | 43.2 | Quite Library |
| 3/26/2023 4:21 | 43.0 | Quite Library |
| 3/26/2023 5:20 | 47.0 | Quite Library |
| 3/26/2023 6:20 | 49.0 | Quite Library |
| 3/26/2023 7:20 | 50.0 | Quite Office |
| 3/26/2023 8:39 | 51.2 | Quite Office |
| 3/26/2023 9:39 | 59.3 | Quite Office |
| 3/26/2023 10:28 | 55.0 | Quite Office |
| 3/26/2023 11:28 | 52.2 | Quite Office |
| 3/26/2023 12:27 | 57.8 | Quite Office |
| 3/26/2023 13:27 | 60.3 | Conversation |
| 3/26/2023 14:27 | 63.2 | Conversation |
| 3/26/2023 15:26 | 60.2 | Conversation |
| 3/26/2023 16:26 | 63.8 | Conversation |
| 3/26/2023 17:25 | 58.3 | Quite Office |
| 3/26/2023 18:25 | 50.0 | Quite Office |
| 3/26/2023 19:25 | 49.2 | Quite Library |
| 3/26/2023 20:24 | 53.0 | Quite Office |
| 3/26/2023 21:24 | 52.3 | Quite Office |
| 3/26/2023 22:23 | 49.7 | Quite Library |

| | |
|---|---|
| Average | 52.3 |
| Day time avr | 55.7 |
| Night time average | 46.7 |

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**Thilafushi WtE Project Environmental Monitoring (Ambient Noise level)**

| | | | |
|---|---|---|---|
| Client | ALAKJV WtE | Station No | NQ3 Thilafushi |
| Location | 4°10’58.3 N, 73°26’09.6 E | Consultant | Mahmood Riyaz |
| Technician | Hussain Fazeel | Weather condition | Temperature:31.5 oC |
| Start time | 3/25/2023 22:42 | sunny and clear | Wind: NE 3-13miles |
| End time | 3/26/2023 21:43 | Isolated showers | Humidity: 71% |

| Date/time | dBA | Remarks Noise level |
|---|---|---|
| 3/25/2023 22:42 | 46.0 | Quite Library |
| 3/25/2023 23:41 | 49.0 | Quite Library |
| 3/26/2023 0:41 | 40.4 | Quite Library |
| 3/26/2023 1:40 | 43.5 | Quite Library |
| 3/26/2023 2:40 | 40.2 | Quite Library |
| 3/26/2023 3:40 | 40.5 | Quite Library |
| 3/26/2023 4:49 | 48.3 | Quite Library |
| 3/26/2023 5:49 | 43.9 | Quite Library |
| 3/26/2023 6:48 | 55.2 | Quite office |
| 3/26/2023 7:48 | 54.7 | Quite office |
| 3/26/2023 8:48 | 54.4 | Quite office |
| 3/26/2023 9:47 | 53.1 | Quite office |
| 3/26/2023 10:47 | 54.5 | Quite office |
| 3/26/2023 11:47 | 60.7 | Conversation |
| 3/26/2023 12:46 | 51.5 | Quite office |
| 3/26/2023 13:46 | 60.8 | Conversation |
| 3/26/2023 14:45 | 55.3 | Quite office |
| 3/26/2023 15:45 | 61.9 | Conversation |
| 3/26/2023 16:45 | 59.8 | Quite office |
| 3/26/2023 17:44 | 60.0 | Conversation |
| 3/26/2023 18:44 | 49.3 | Quite library |
| 3/26/2023 19:43 | 51.4 | Quite office |
| 3/26/2023 20:43 | 53.4 | Quite office |
| 3/26/2023 21:43 | 52.4 | Quite office |

| | |
|---|---|
| Average | 51.7 |
| Day time avr | 55.6 |
| Night time average | 46.2 |

**Thilafushi WtE Project Environmental Monitoring (Ambient Noise level)**

| | | | |
|---|---|---|---|
| Client | ALAKJV WtE | Station No | NQ4 Thilafushi |
| Location | 4°10’57.3 N,73°25’59.4 E | Consultant | Mahmood Riyaz |
| Technician | Hussain Fazeel | Weather condition | Temperature:31.5 oC |
| Start time | 3/25/2023 23:43 | sunny and clear | Wind: NE 3-13miles |
| End time | 3/26/2023 22:21 | Isolated showers | Humidity: 71% |

| Date/time | dBA | Remarks Noise level |
|---|---|---|
| 3/25/2023 23:40 | 46.3 | Quite Library |
| 3/26/2023 0:40 | 42.5 | Quite Library |
| 3/26/2023 1:30 | 50.2 | Quite Office |
| 3/26/2023 2:39 | 51.2 | Quite Office |
| 3/26/2023 3:39 | 50.4 | Quite Office |
| 3/26/2023 4:39 | 48.1 | Quite Library |
| 3/26/2023 5:38 | 50.3 | Quite Office |
| 3/26/2023 6:38 | 46.3 | Quite Library |
| 3/26/2023 7:37 | 55.7 | Quite Office |
| 3/26/2023 8:37 | 52.7 | Quite Office |
| 3/26/2023 9:37 | 53.0 | Quite Office |
| 3/26/2023 10:06 | 55.1 | Quite Office |
| 3/26/2023 11:16 | 65.3 | Conversation |
| 3/26/2023 12:15 | 55.0 | Quite Office |
| 3/26/2023 13:15 | 49.3 | Quite Library |
| 3/26/2023 14:15 | 52.0 | Quite Office |
| 3/26/2023 15:24 | 53.7 | Quite Office |
| 3/26/2023 16:24 | 55.8 | Quite Office |
| 3/26/2023 17:23 | 57.9 | Quite Office |
| 3/26/2023 18:23 | 59.0 | Quite Office |
| 3/26/2023 19:23 | 62.3 | Conversation |
| 3/26/2023 20:22 | 56.6 | Quite Office |
| 3/26/2023 21:22 | 48.2 | Quite Library |
| 3/26/2023 22:21 | 43.1 | Quite Library |

| | |
|---|---|
| Average | 52.5 |
| Day time avr | 54.6 |
| Night time average | 49.0 |

**Thilafushi WtE Project Environmental Monitoring (Ambient Noise level)**

| | | | |
|---|---|---|---|
| Client | ALAKJV WtE | Station No | NQ5 Thilafushi |
| Location | 4°10'57.3 N, 73°26'14.4 E | Consultant | Mahmood Riyaz |
| Technician | Hussain Fazeel | Weather condition | Temperature:31.5 oC |
| Start time | 3/25/2023 22:35 | sunny and clear | Wind: NE 3-13miles |
| End time | 3/26/2023 21:57 | Isolated showers | Humidity: 71% |

| Date/time | dBA | Remarks Noise level |
|---|---|---|
| 3/25/2023 22:35 | 49.8 | Quite Library |
| 3/25/2023 23:34 | 44.5 | Quite Library |
| 3/26/2023 0:34 | 43.2 | Quite Library |
| 3/26/2023 1:34 | 40.1 | Quite Library |
| 3/26/2023 2:33 | 45.3 | Quite Library |
| 3/26/2023 3:33 | 43.2 | Quite Library |
| 3/26/2023 4:32 | 43.0 | Quite Library |
| 3/26/2023 5:32 | 45.7 | Quite Library |
| 3/26/2023 6:32 | 49.3 | Quite Library |
| 3/26/2023 7:31 | 55.8 | Quite Office |
| 3/26/2023 8:31 | 55.3 | Quite Office |
| 3/26/2023 9:31 | 65.4 | Conversation |
| 3/26/2023 10:30 | 58.8 | Quite Office |
| 3/26/2023 11:30 | 59.4 | Quite Office |
| 3/26/2023 12:29 | 60.4 | Conversation |
| 3/26/2023 13:29 | 55.3 | Quite Office |
| 3/26/2023 14:29 | 54.2 | Quite Office |
| 3/26/2023 15:28 | 63.4 | Conversation |
| 3/26/2023 16:28 | 67.8 | Conversation |
| 3/26/2023 17:27 | 50.3 | Quite Office |
| 3/26/2023 18:27 | 49.2 | Quite Library |
| 3/26/2023 19:27 | 48.7 | Quite Library |
| 3/26/2023 20:26 | 50.1 | Quite Office |
| 3/26/2023 21:26 | 40.1 | Quite library |

| | |
|---|---|
| Average | 51.6 |
| Day time avr | 55.6 |
| Night time average | 46.5 |

Care Labs
assuring quality check

**Approved by Food Safety Standards Authority of India FSSAI,**
**Accredited by NABL, Recognized by MoEF & Climate Change, Govt of India**

# TEST REPOR

**Issued To:**

**Issue Date**: 20 Mar 2023

**Alke Alkatas Joint Venture (Pvt) Ltd**
H.H. Moomiyaage, 5A, Asaree Hingun. 20265 Male
Republic of Maldives
**Sub contracted by NSURE Private Limited**

| | | | |
|---|---|---|---|
| **Sampling information** | Care Labs has not drawn the sample | **Sample Collection Date** | 13 Mar 2023 |
| **Sample Package** | Covered sterile plastic container | **Sample Collection Time** | Not Applicable |
| **Sample Quantity** | 1 Liter x 1 Bottle | **Sample Received by Care labs on** | 14 Mar 2023 |
| **Sample condition** | Sufficient & Acceptable for analysis | **Date of Registration** | 14 Mar 2023 |
| **Sample Code** | AAJV/2023/001-5268 | **Analysis Starting Date** | 14 Mar 2023 |
| **Location** | Not Applicable | **Date of Completion** | 20 Mar 2023 |
| **Sample Name** | Water For Construction And Camp | | |

## MICROBIOLOGICAL TEST RESULTS

| S.No | Test Parameter | Units | Test Method | Results | Acceptable Limits |
|---|---|---|---|---|---|
| 1 | Total coliform | Mpn/100ml | IS 5402 : 2012 | <2/ Absent | Absent/100ml |
| 2 | Fecal coliform | Mpn/100ml | IS 5401(Part –1) : 2002 | <2/ Absent | Absent/100ml |
| 3 | Aerobic Plate Count | Cfu/ml | IS 5402 :2012 | $1.7 \times 10^1$ | $1 \times 10^2$ |

## CHEMICAL TEST RESULTS

| S.No | Test Parameter | Units | Test Method | Results | Acceptable Limits |
|---|---|---|---|---|---|
| 1 | Iron as Fe | mg/L | APHA-3120-B | ND | Max 0.3 |
| 2 | Manganese as Mn | mg/L | APHA-3120-B | < 0.001 | Max 0.1 |
| 3 | Nitrate (as NO3-) * | mg/L | APHA-4500$NO_3$-B | 1.8 | Max 45 |
| 4 | Arsenic as As | mg/L | APHA-3120-B | < 0.001 | Max 0.001 |
| 5 | Cadmium as Cd | mg/L | APHA-3120-B | < 0.001 | Max 0.003 |
| 6 | Lead as Pb | mg/L | APHA-3120-B | < 0.001 | Max 0.01 |
| 7 | Chloride (Cl) | mg/L | APHA-4500Cl-B | 68.2 | Max 200 |
| 8 | Mercury as Hg | mg/L | APHA-3120-B | < 0.001 | Max 0.001 |
| 9 | pH | -- | APHA-4500-B | 7.0 | 6.5-8.5 |
| 10 | Turbidity | NTU | APHA-2130-B | 0.1 | < 1.0 |
| 11 | Electric Conductivity | µs/cm | APHA-2510-B | 1280 | Max 1000 |
| 12 | Total Phosphates | mg/L | APHA 23rd :2017:4500-PC | ND | -- |
| 13 | Total Suspended Solids (TSS) | mg/L | APHA-2540-D | 45 | 100 |

**Examined By**

**Certified Signature**

**NABL** **FSSAI** **MoEF**

**Address**: Regd Office: Plot No. 1, 3rd Floor, Shiva Ganga Colony, L. B. Nagar, Hyd – 500074
**Call center no**: 7391 05 0050
**Office Numbers**: 9885436529, 8886055529

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## TEST REPOR

**Remarks**

Acceptable Limits as per Maldives URA (Utility Regulatory Agency)
As per Microbiological Standards, <2 result indicates the minimum detection limit of bacteria in given sample.

**Note**

1. APHA – American Public Health Association
2. CFU – Colony Forming Unit
3. MPN – Most Probable Number
4. IS – Indian Standard
5. NTU – Nephelometric Turbidity Unit

**Examined By**

**Certified Signature**



**Address**: Regd Office: Plot No. 1, 3rd Floor, Shiva Ganga Colony, L. B. Nagar, Hyd – 500074
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Care Labs
assuring quality check

**Approved by Food Safety Standards Authority of India FSSAI,**
**Accredited by NABL, Recognized by MoEF & Climate Change, Govt of India**

| **Issued To:** | **Issue Date:** 20 Mar 2023 |
|---|---|
| **Alke Alkatas Joint Venture (Pvt) Ltd**<br>H.H. Moomiyaage, 5A, Asaree Hingun. 20265 Male<br>Republic of Maldives<br><br>**Sub contracted by NSURE Private Limited** | |

| **Sample Received by Care labs on:** 14 Mar 2023 | **Date of Registration:** 14 Mar 2023 |
|---|---|

## SUMMARY REPORT

| Sample Name | Test Parameter | Unit | Results | Acceptable Limits* | Satisfactory / Unsatisfactory |
|---|---|---|---|---|---|
| **Water for Construction Camp** | Iron as Fe | mg/L | ND | Max 0.3 | Satisfactory |
| | Manganese as Mn | mg/L | < 0.001 | Max 0.1 | Satisfactory |
| | Nitrate (as NO3-)* | mg/L | 1.8 | Max 45 | Satisfactory |
| | Arsenic as As | mg/L | < 0.001 | Max 0.001 | Satisfactory |
| | Cadmium as Cd | mg/L | < 0.001 | Max 0.003 | Satisfactory |
| | Lead as Pb | mg/L | < 0.001 | Max 0.01 | Satisfactory |
| | Chloride (as Cl-) | mg/L | 68.2 | Max 200 | Satisfactory |
| | Mercury as Hg | mg/L | < 0.001 | Max 0.001 | Satisfactory |
| | pH | -- | 7.0 | 6.5-8.5 | Satisfactory |
| | Turbidity | NTU | 0.1 | < 1.0 | Satisfactory |
| | Electrical Conductivity | µs/cm | 1280 | Max 1000 | Unsatisfactory |
| | Total Phosphates | mg/L | ND | -- | -- |
| | Total Suspended Solids | mg/L | 45 | 100 | Satisfactory |
| | Aerobic Plate Count | Cfu/ml | $1.7 \times 10^1$ | $1 \times 10^2$ | Satisfactory |
| | Total coliform | Mpn/100ml | <2/ Absent | Absent/100ml | Satisfactory |
| | Fecal coliform | Mpn/100ml | <2/ Absent | Absent/100ml | Satisfactory |

*As per Maldives URA (Utility Regulatory Agency)

Satisfactory - All tested parameters are within the applicable limits.

Not satisfactory – One or more parameters are below / exceeding the applicable limit.

**Examined By**

**Certified Signature**

**NABL** **FSSAI** **MoEF**

**Address**: Regd Office: Plot No. 1, 3rd Floor, Shiva Ganga Colony, L. B. Nagar, Hyd – 500074
**Call center no**: 7391 05 0050
**Office Numbers**: 9885436529, 8886055529

REPUBLIC OF MALDIVES

MINISTRY of ENVIRONMENT, CLIMATE CHANGE and TECHNOLOGY

DBO CONTRACTOR:

urbaser

RAMBOLL

EMPLOYER REPRESENTATIVE

FICHTNER

Review & Approval:

EPC CONTRACTOR:

alke ALKATAŞ

ALKE-ALKATAŞ JV

| | |
|---|---|
| Project Title: | Design, Build and Operate of a Waste to Energy Facility at Thilafushi<br><br>Contract No: (AGR)438-WPMC/PRIV/2021/71 |
| Document Name: | **AIR MONITORING RESULT JUSTIFICATION REPORT FOR JANUARY AND FEBRUARY 2023** |
| Status: | For Approval |

| | | | | |
|---|---|---|---|---|
| Design: | Company: | Name: | Date: | Document No: |
| Prepared by: | AIRS | İsmail ULUSOY | 19.03.2023 | |
| Checked by: | AAJV | Ta Hoa BINH | 19.03.2023 | MDV-AAK-HSEXX-XX-NF-MGT-0001-000 |
| | URB/RAM | | | |
| Released by: | | | | |

## TABLE OF CONTENTS

## ABBREVIATIONS

| | |
|---|---|
| NOx | Nitrous Oxide |
| SOx | Sulphure Oxide |
| WTE | Waste to Energy |

# 1 INTRODUCTION

Some monitoring is being done to see the environmental effects of the WtE project. Air quality monitoring is showing the project to the air effect. In this report, air monitoring result of Baseline, January and February 2023 was given below.

| 1 | Air quality monitoring location |
|---|---|
| AQ1 | Represents dense industrial area, Distance to Source: 650m |
| AQ2 | Represents dense industrial area, Distance to Source: 1000m |
| AQ3 | Represents dense industrial area, Distance to Source: 500m |
| AQ4 | Represents dense housing and population area, Distance to Source: 4500m |
| ARS2 | Represents dense industrial area, Distance to Source: 700m |
| ARS3 | Represents dense industrial area, Distance to Source: 500m |
| ARS5 | Represents dense industrial area, Distance to Source: 1000m |
| | |

**Air quality monitoring result**

| | Baseline result | | | | | | | January 2023 | | | | | | | February | | | | | | | Stand Value WH0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AQ 1 | AQ 2 | AQ 3 | AQ 4 | ARS 2 | ARS 3 | ARS 5 | AQ 1 | AQ 2 | AQ 3 | AQ 4 | ARS 2 | ARS 3 | ARS 5 | AQ 1 | AQ 2 | AQ 3 | AQ 4 | ARS 2 | ARS 3 | ARS 5 | |
| PM10 µg/m3 | 21.46 | 14.2 | 25.14 | 25.03 | 19.94 | 14.63 | 16.88 | 25.28 | 36.6 | 46.84 | 25.59 | 35.54 | 27.61 | 21.68 | 40.11 | 35.54 | 46.84 | 29.1 | 23.63 | 32.44 | 35.62 | 50 |
| PM2.5 µg/m3 | 7.69 | 4.37 | 8.67 | 8.09 | 6.63 | 3.38 | 5.78 | 25.13 | 36.45 | 46.64 | 25.56 | 35.46 | 27.57 | 21.66 | 39.97 | 35.45 | 46.64 | 37.13 | 23.6 | 31.7 | 40.58 | 25 |
| NOx µg/m3 | 9.42 | 2.57 | 0.69 | 1.6 | 9.94 | 0 | 7.66 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 200 |
| SO2 µg/m3 | 3.83 | 5.96 | 0.5 | 0.07 | 4.18 | 0 | 2.93 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 |
| TSP µg/m3 | 41.4 | 27.1 | 38.6 | 39.4 | 30.9 | 40.3 | 28 | 47.82 | 69.28 | 88.65 | 48.49 | 67.31 | 52.31 | 41.08 | 75.21 | 68.2 | 88.65 | 58.81 | 45.28 | 60.61 | 68.17 | - |


**Figure 1.1 of Air Monitoring Locations**

# 2 SOX AND NOX RESULT EXPLANATION REPORT FOR THE AIR QUALITY MAESUREMENTS

## 2.1 SCOPE

The purpose of this report is to clarify the distinctions between the most recent NOx and SOx outcomes and those of previous ones. The January and February

2023 results for these measures were found to vary from baseline results. The report will detail the distinctions in relation to various factors such as equipment, sensors, emission origins, timeframe, and weather conditions in the subsequent section.

## 2.2 SPECIFIC WEATHER CONDITION OF MONITORING DAYS

**January 2023**

| Date | Time | Atmospheric temperature in $^{o}F$ | Atmospheric pressure in Hg | Wind speed mph | Wind direction | Air Humid % |
|---|---|---|---|---|---|---|
| 26 Jan 2023 | Night | +79° | 29.8 | 9.4 | North East | 84 |
| | Morning | +81° | 29.8 | 10.5 | East | 77 |
| | Day | +84° | 29.8 | 11.4 | East | 74 |
| | Evening | +82° | 29.8 | 11.2 | East | 69 |
| 27 Jan 2023 | Night | +81 | 29.8 | 12.3 | East | 77 |
| | Morning | +81 | 29.8 | 11.4 | North East | 84 |
| | Day | +86 | 29.8 | 11.4 | North East | 72 |
| | Evening | +82 | 29.8 | 11.6 | North East | 75 |
| 28 Jan 2023 | Night | +82 | 29.8 | 11.6 | North East | 78 |
| | Morning | +82 | 29.8 | 10.7 | North East | 80 |
| | Day | +86 | 29.8 | 12.1 | North East | 75 |
| | Evening | +82 | 29.8 | 13 | North East | 74 |

| Date | Time | Atmospheric temperature in $^{o}F$ | Atmospheric pressure in Hg | Wind speed mph | Wind direction | Air Humid % |
|---|---|---|---|---|---|---|
| 29 Jan 2023 | Night | +81 | 29.8 | 9.6 | North East | 74 |
| | Morning | +84 | 29.8 | 7.6 | North | 85 |
| | Day | +84 | 29.7 | 11.4 | North East | 83 |
| | Evening | +81 | 29.8 | 8.3 | East | 78 |
| 30 Jan 2023 | Night | +81 | 29.8 | 8.1 | North East | 70 |
| | Morning | +86 | 29.9 | 8.7 | North East | 77 |
| | Day | +84 | 29.9 | 9.2 | North | 71 |
| | Evening | +81 | 29.9 | 7.8 | North East | 77 |

**Table 2.1 Weather conditions in monitoring days of air quality and noise level measurement- Jan 2023**

**February 2023**

| Date | Time | Atmospheric temperature in $^{o}C$ | Atmospheric pressure in Hg | Wind speed Km/h | Wind direction | Air Humid % |
|---|---|---|---|---|---|---|
| 5th Feb 2023 | Night | $28^{o}C$ | 29.8 | 20 | East | 81 |
| | Morning | $28^{o}C$ | 29.8 | 22 | East | 76 |
| | Day | $31^{o}C$ | 29.8 | 22 | East North East | 73 |
| | Evening | $28^{o}C$ | 29.8 | 16 | East North East | 68 |
| 6th Feb 2023 | Night | $28^{o}C$ | 29.8 | 16 | East North East | 83 |
| | Morning | $28^{o}C$ | 29.8 | 20 | East North East | 74 |
| | Day | $31^{o}C$ | 29.8 | 19 | East | 70 |
| | Evening | $28^{o}C$ | 29.8 | 17 | East North East | 76 |

| Date | Time | Atmospheric temperature in $^{o}C$ | Atmospheric pressure in Hg | Wind speed Km/h | Wind direction | Air Humid % |
|---|---|---|---|---|---|---|
| 7th Feb 2023 | Night | 28°C | 29.8 | 14 | East West | 84 |
| | Morning | 30°C | 29.8 | 12 | East North East | 79 |
| | Day | 31°C | 29.8 | 13 | North-North East | 77 |
| | Evening | 28°C | 29.8 | 14 | North | 82 |
| 8th Feb 2023 | Night | 28°C | 29.8 | 11 | North-North East | 82 |
| | Morning | 31°C | 29.8 | 12 | North | 73 |
| | Day | 32°C | 29.7 | 15 | North | 68 |
| | Evening | 29°C | 29.8 | 10 | North | 79 |

**Table 2.2 Weather conditions in monitoring days of air quality and noise level measurement-February 2023**

## 2.3 EMISSION SOURCES

The largest source of NOx and SOx in the atmosphere is the burning of fossil fuels. Monitoring sites have following emission sources.

Vehicles: Because of the industrial characterization of the field, it is always possible to see heavy duty vehicle traffic within the island. While western part of the island has less density, AQ2 location exposes less vehicle movement. ASR5 location is in another island run buy a private company and no traffic movement occurs. AQ4 is Villingili Island and gas fuel motor vehicles are prohibited. All other locations can be considered within dense area but because of their physical structure, it is not easy to impacted by vehicle emissions directly because they do not have direct air flow to roadways.

Industrial Activities: As it is known, project site located in an industrial area. There are different kind of activities within this area. On the other hand, only AQ2 location open to expose general air pollution, because of its location. All other locations apart from Villingili are exposed their local emission sources and it can

be say that they are not direcly effected by other sources.

Vessels: Vessels are important air pollutants. They can impact air quality when they are cruising (sea traffic) or they are hoteling/maneuvering in the port. While it can be say that there is a sea traffic near the project area, this traffic is not as high as to impact air quality significantly. In some monitoring locations, there are some local vessel movements sometimes and their impacts can be seen in air quality monitoring results, if there is during the monitoring period.

Small burning activities: It is possible to occur some individual burning activities within the project area. It is known that there is no continuous burning facilities such as boilers or heaters. On the other hand, some waste burning activities or small burning activities can be done by workplaces. These kinds of activities are not predictable nor determinable but if there is, it can be seen in monitoring results for short time.

Transportation from vicinities: Nearest high polluted location of the project area is Male city center, and it is possible to transport pollution from Male to project site under meteorological conditions. On the other hand, it is expected to chemical transformation during that distance and cannot be affect significantly.

The project site has a characterization where all emission sources work together, work individually, or do not work at all, from time to time. It was observed that in some monitoring times, depend on the location, some industrial activities were not working.

### 2.4 TIME PERIOD

Both background monitoring for EIA report and pre-construction monitoring had conducted for one day for each location. It means that results represent only this day's temporal changes. These changes can be emission sources and meteorological conditions. Especially for these kinds of areas, emission sources can be change from day to day.

### 2.5 DEVICES AND SENSORS

Air quality monitoring devices use electronic sensors. Within these devices following sensors were used.

Alphasense NO2-B43F Compact, 4-electrode, low ppb

Alphasense SO2-B4 Compact, 4-electrode, low-ppb

Sensor selection was carried out with carefully, taking into account the project characteristics. Alphasense is world's leading sensor productor. Alphasense is the world's foremost producer of sensors. Although they offer a range of sensors besides those mentioned, it was determined that the project required more accurate and precise sensors with lower detection limits to identify gases with extremely low concentrations. The B series, which includes 4-electrode sensors, is Alphasense's top-of-the-line sensor product and is capable of meeting all project requirements.

## 2.6 TEST AND CALIBRATION PROSEDURE

In order to provide best accurate results, sensors are tested and calibrated both in the factory by Alphasense and in the field by station producer AIRS. Alphasense test sensors electronically and they produce a calibration factor.

After sensors used in monitoring stations, AIRS conducts one month field test. These tests are performed nest to reference air quality monitoring station which run by Ministry of Environment of Turkey. After February 2023 monitoring, devices sent to one month monitoring again.

## 2.7 QUESTION ABOUT SENSORY ISSUES

Capability: As explained above, all devices have NOx and SOx sensors inside and they are capable to measure these parameters.

Calibration: Every sensor and every device calibrated both in the factory and in the field for all parameters.

Malfunctioning, damage, contamination etc: After January and February monitoring, field test continued in Turkey and results were similar with reference station.

Expert opinion: This report was prepared to give an explanation by an air quality expert. CV of this expert is attached to this report.

Sensor Aging: All sensors are produced on November 2022.

Electrical problems: Stations are supported by big batteries and they are supported by solar panels. It was tested that batteries can support sensors around

two weeks without sun. If there had been an electrical support issue, also dust sensor would be affected. Also, after measurement, field tests were continued and if there had been another electronical problem apart from the power, it would have seen in the field.

# 3 EVALUATION OF THE RESULT

## 3.1 AREAL EVALUATION

Air quality changes in a place depending on the emission sources and meteorological conditions. While topography is another factor of the dispersion of the air pollutants, it was not considered in this report because of its stability. Project site emission sources are explained above. As it was mentioned before, there is no any continuous emission sources within the examination area. On the other hand, because of the super local position of some locations, they are only impacted by their own sources. A location map of the monitoring stations is shown at the end of this report. As it can see in the map, some monitoring locations are located within working places. Also, these places are covered by buildings and they are close to air flow from outside sources. Especially the locations ASR2, AQ1, AQ3 and ASR3 are uncovered by buildings and that makes air flow from within island difficult. These locations have their own micro airsheds and they do not affect by other sources easily. It is possible to see these locations effected by other sources if the source emits high air pollution continuously and if meteorological conditions appropriate to dispersion. AQ2 and AQ4 (Villingili island- not shown on map) locations are the best locations represent general air quality of their locations. Main emission source of this location is vehicle movement. It was observed that there is no heavy vehicle traffic on this location. On the other hand, this location is expected to represent all emission sources its around but this area is not industry dense and we do not expect to get burning emissions in this location. AQ4 is Villingili island. Within this island, gas fuel vehicles are forbidden and there are only electrical vehicles. There is a power plant within this island and it is possible to monitor gas emissions as long as meteorological conditions disperse pollution through inside the island.

## 3.2 TEMPORAL EVALUATION

As it was explained above, air quality is dependable on emission sources and meteorology. These two factors can be change in temporal base. Air quality monitoring studies were conducted for one day period during the EIA for baseline and during the pre-construction phase. One day monitoring represents that day's sources and meteorological conditions. It is possible to encounter a day which any emission source work, or a day which there may be a heavy work

within the monitoring site. Therefore, it is not a surprise to get zero results for one period for all locations and very high results for another period. It is important to choosing the temporal period according to cover a general working period of the emission sources and general meteorological conditions, especially wind direction.

## 4 CONCLUSION

As it was explained above, difference between previous and current results are caused by environmental conditions (such as source and meteorology) rather than the devices. In background measurement and 2022 measurements, it was observed that, there was big vessel activity close to area, one written name is `another day in paradise`. Also, it was observed that there was dense power plant emission occurred through project area. It is possible that these sources effected monitoring locations during these times. On the other hand, when background results and current results are compared, there is no big difference between the results. Background NO2 results are between 0-10 µg/m3 and SO2 results are 0-6 µg/m3. Considering the all factors were explained above, difference between background and current measurement can be considered reasonable. As an expert review, one day background monitoring result represented some specific emissions sources for that day. Every pre-construction monitoring result for one day will represent their own monitoring day sources. Therefore, it is possible to see results from zero to a few hundred depending on the source conditions.

Appendix 3

**photos**

Mobilization Activities.

MoE, FIT and URB representatives visited the site and held the meeting regarding to landfill activities by WAMCO.

Ground water samples have been collected for dewatering permit.

**Ambient Air monitoring**

Noise Level Monitoring for Pre-Construction Monitoring.


Tool Box TALKS conducted by URB/RAM on site visit


vivo V23 · DH Cashire
Jan 14, 2023, 08:52

Mobilization Activities.

Mobilization Activities.

Mobilization Activities.


MoE, FIT, RAM and URB representatives visited the site.

Outfall Pipeline installation to discharging sewage from WWTP to the sea was completed.

Mobilization Activities.

Mobilization Activities.

Stripping of the site by removing the vegetation of the site to be prepared for the piling activity is ongoing.

HSE workshop was conducted for DBO and EPC Contractors staff personnel by Fichtner representative.

ADB and MoE representatives visited to the site.

Installation of the WWTP was completed