Environmental Impact Assessment

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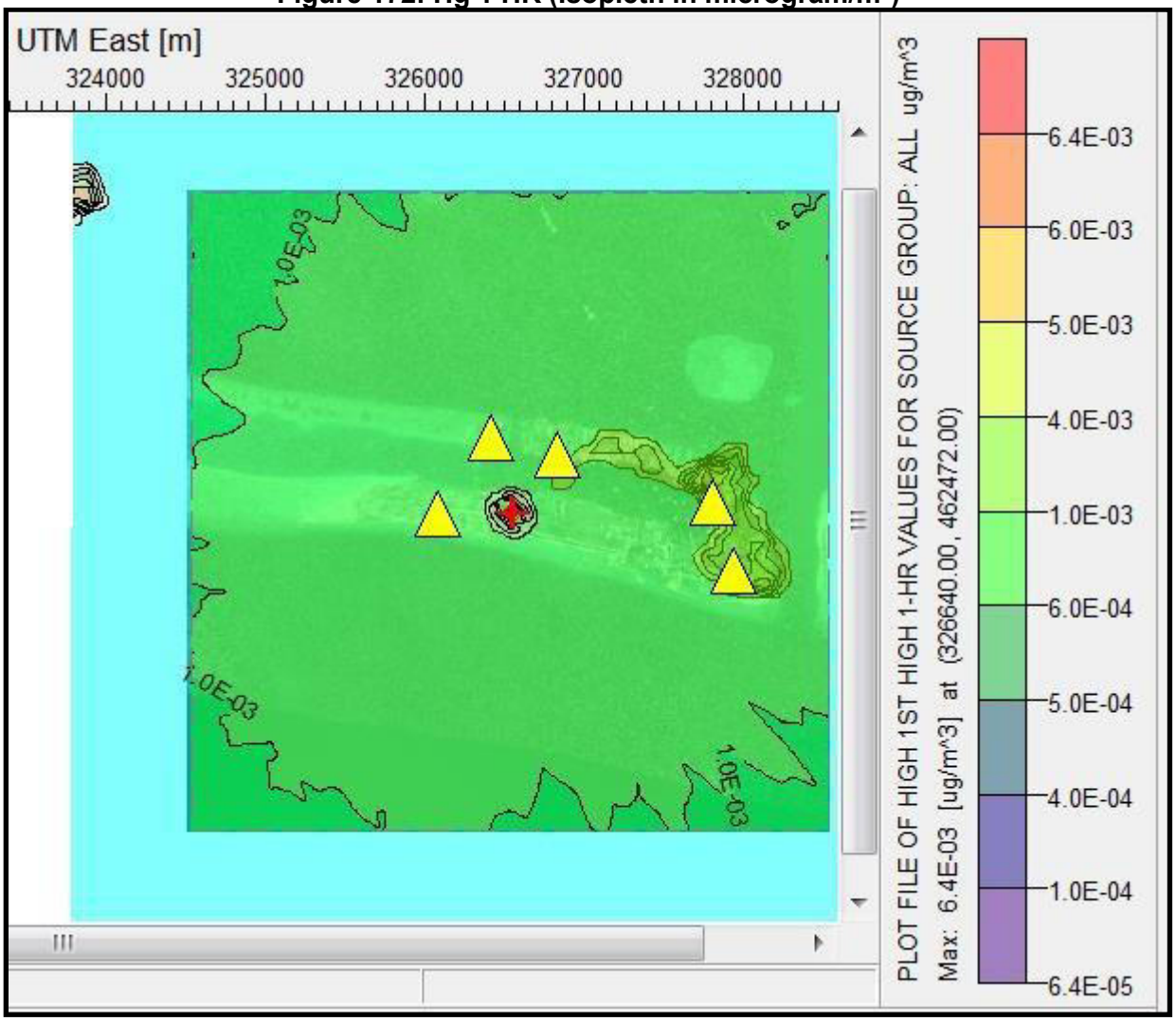
August 2023

Maldives: Greater Malé Waste-to-Energy Project – Waste to Energy Plant (Part C)

Main Report

Prepared by the Ministry of Environment, Climate Change and Technology for the Ministry of Finance and the Asian Development Bank. This is an updated version of the draft originally posted in July 2020 available on https://www.adb.org/projects/documents/mld-51077-003-eia-2.

Figure 172: Hg 1 HR (Isopleth in microgram/m^3)

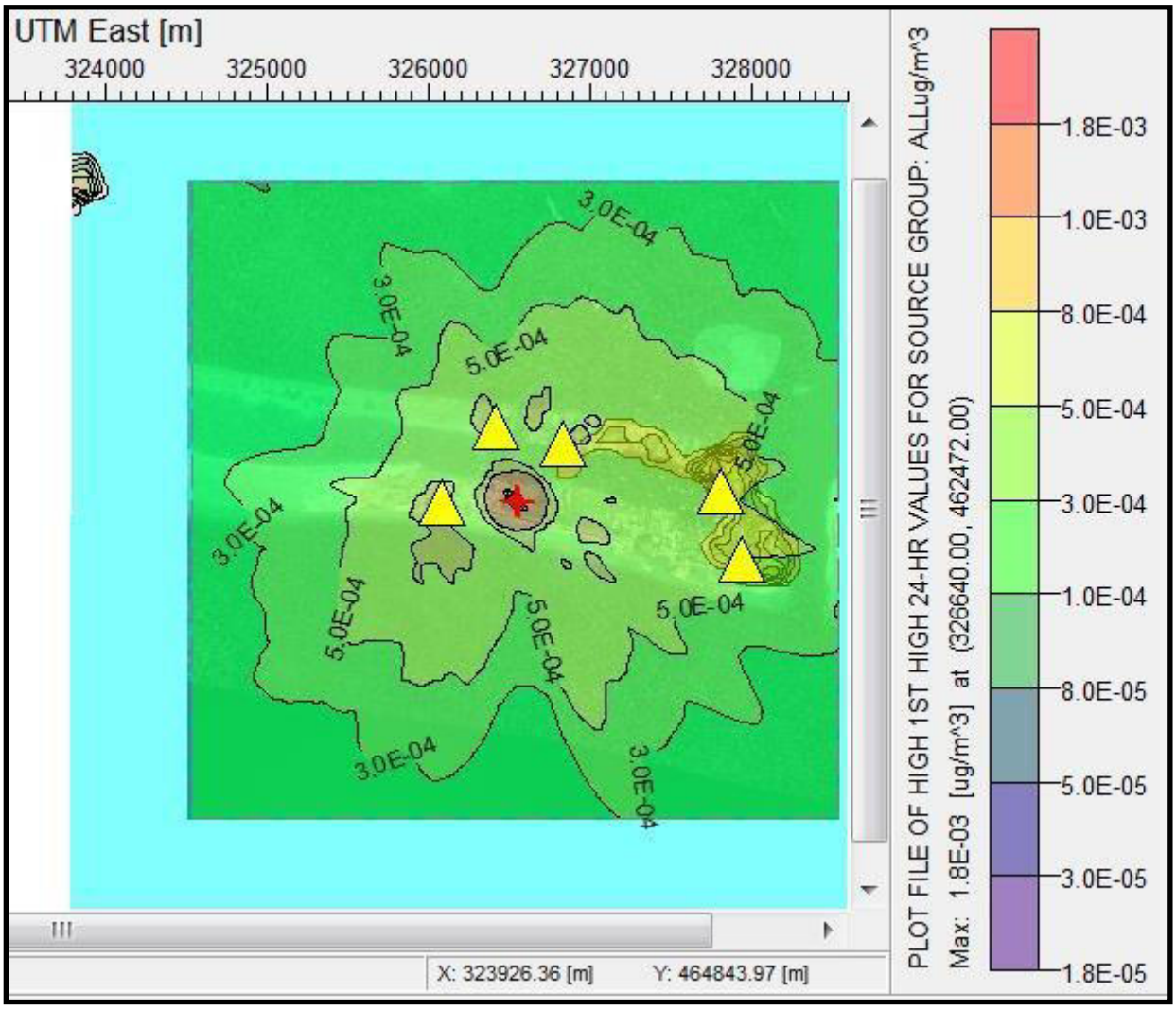


LEGEND:

Yellow Triangles refer to identified Area Sensitive Receptor (ASRs)

	Long	Lat
ASR1	327812	462536
ASR2	327938	462105
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 173: Hg 24 HR (Isopleth in microgram/m^3)

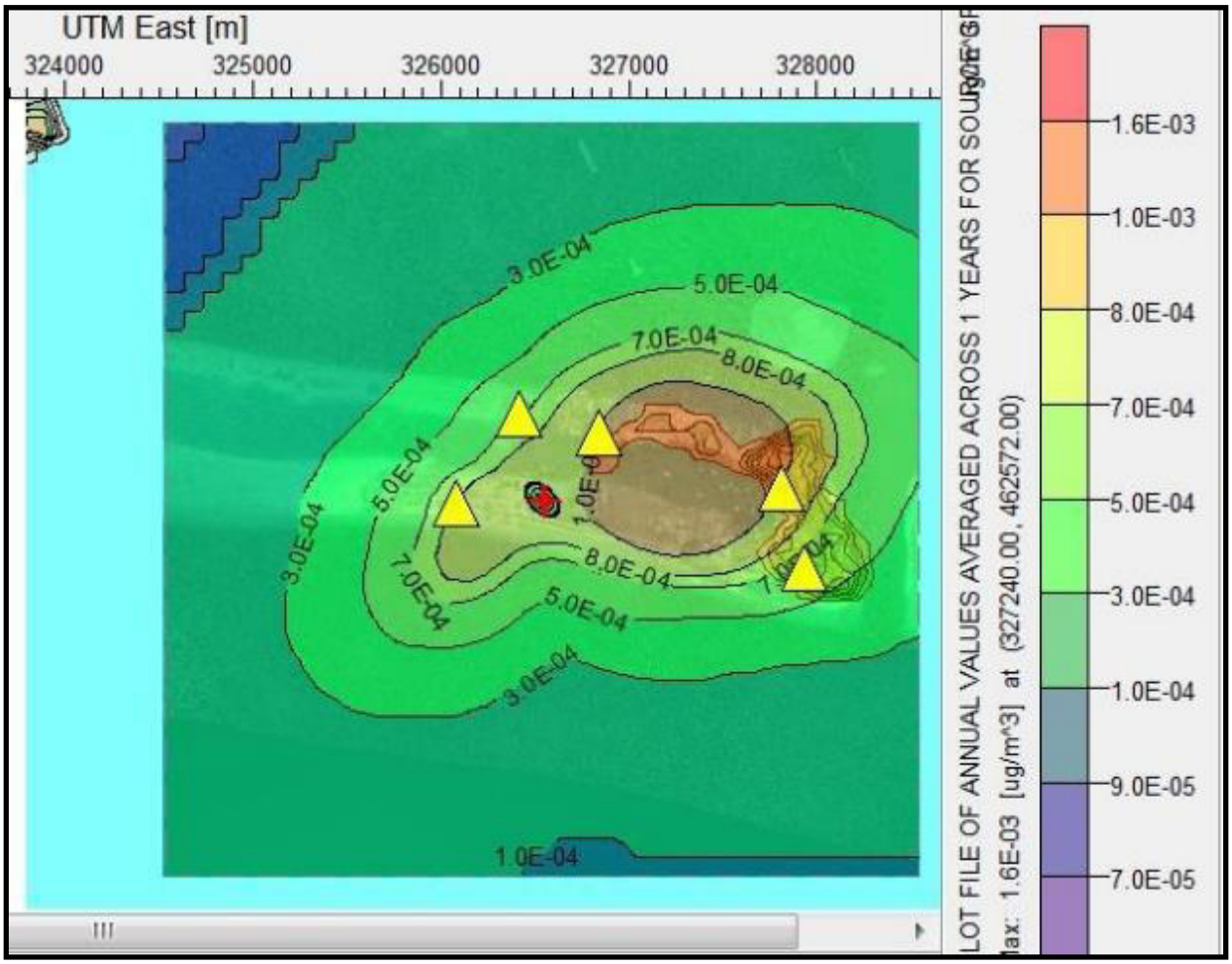


LEGEND:

Yellow Triangles refer to identified Area Sensitive Receptor (ASRs)

	Long	Lat
ASR1	327812	462536
ASR2	327938	462105
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 174: Hg 1 year (Isopleth in microgram/m^3)

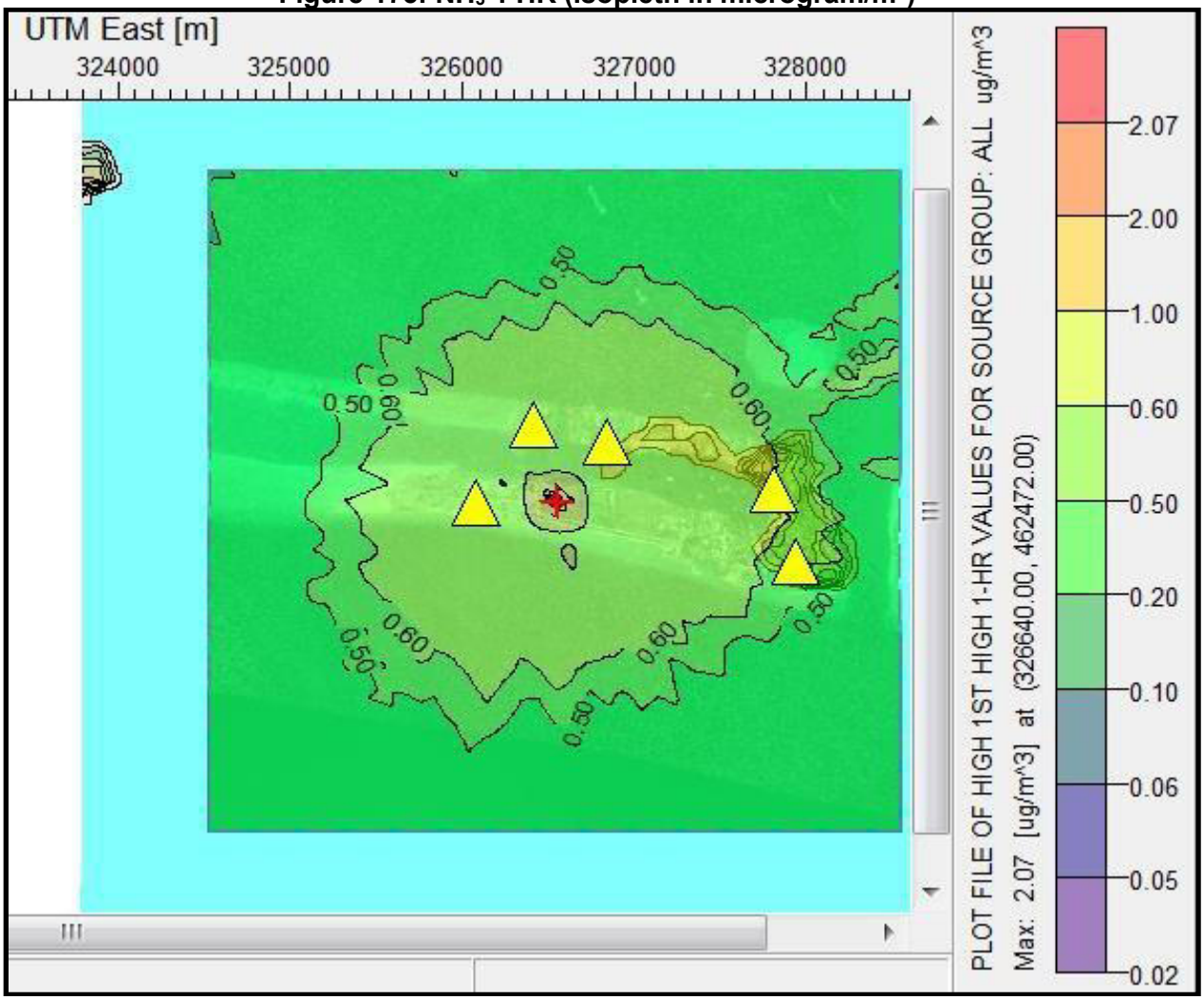


LEGEND:

Yellow Triangles refer to identified Area Sensitive Receptor (ASRs)

	Long	Lat
ASR1	327812	462536
ASR2	327938	462105
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 175: NH_3 1 HR (Isopleth in microgram/m^3)

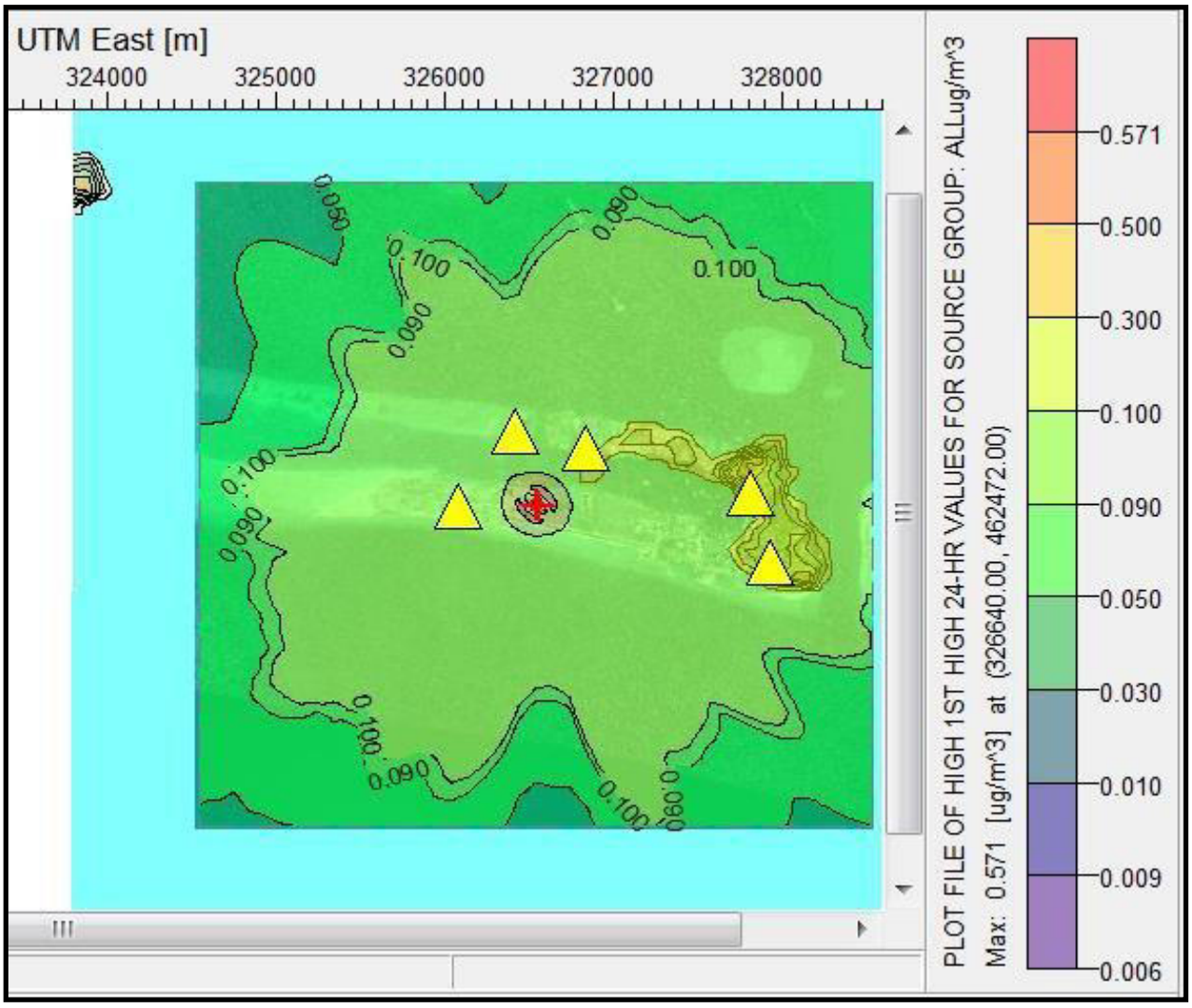


LEGEND:

Yellow Triangles refer to identified Area Sensitive Receptor (ASRs)

	Long	Lat
ASR1	327812	462536
ASR2	327938	462105
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 176: NH_3 24 HR (Isopleth in microgram/m^3)

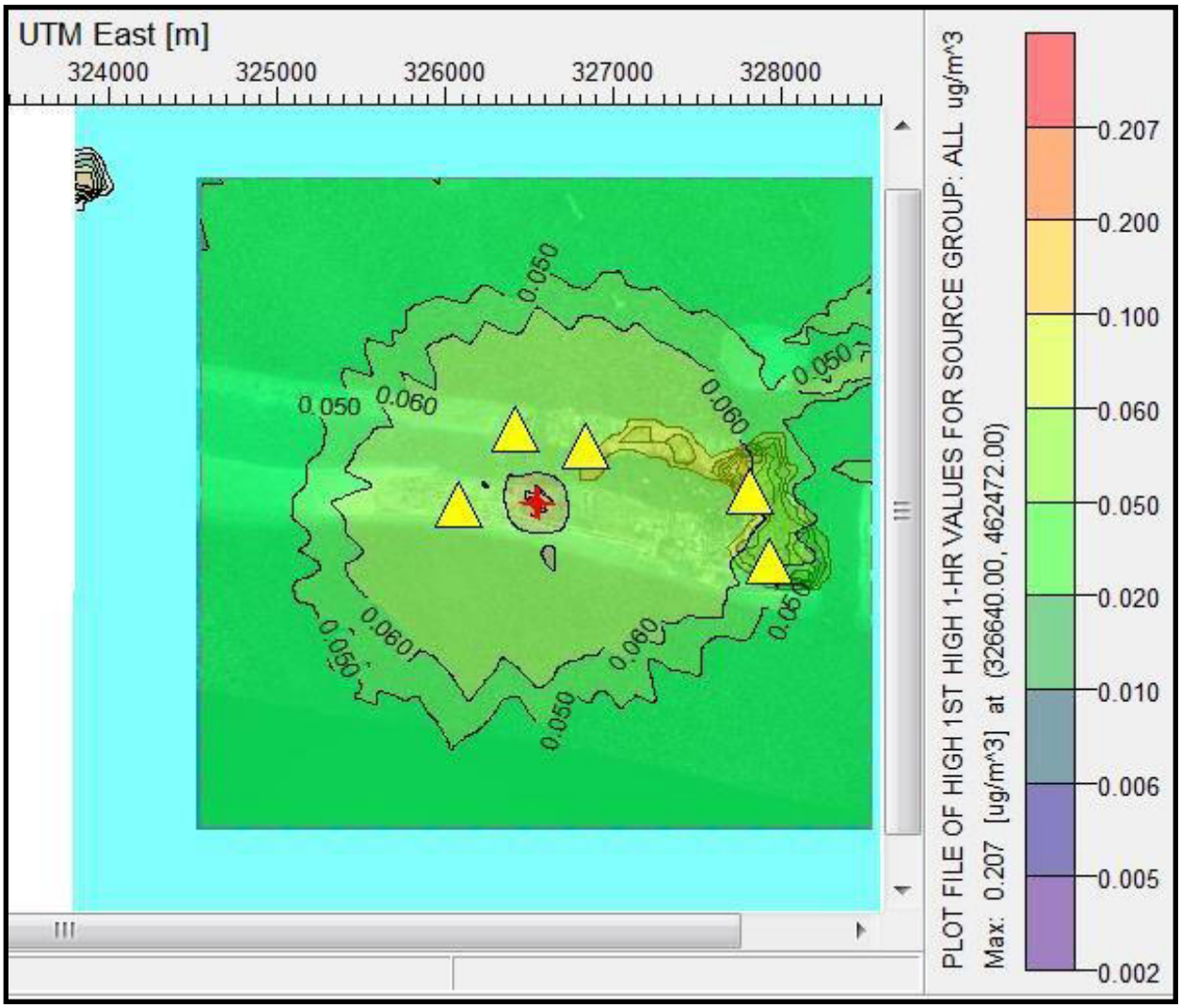


LEGEND:

Yellow Triangles refer to identified Area Sensitive Receptor (ASRs)

	Long	Lat
ASR1	327812	462536
ASR2	327938	462105
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 177: Hf 1 HR (Isopleth in microgram/m^3)

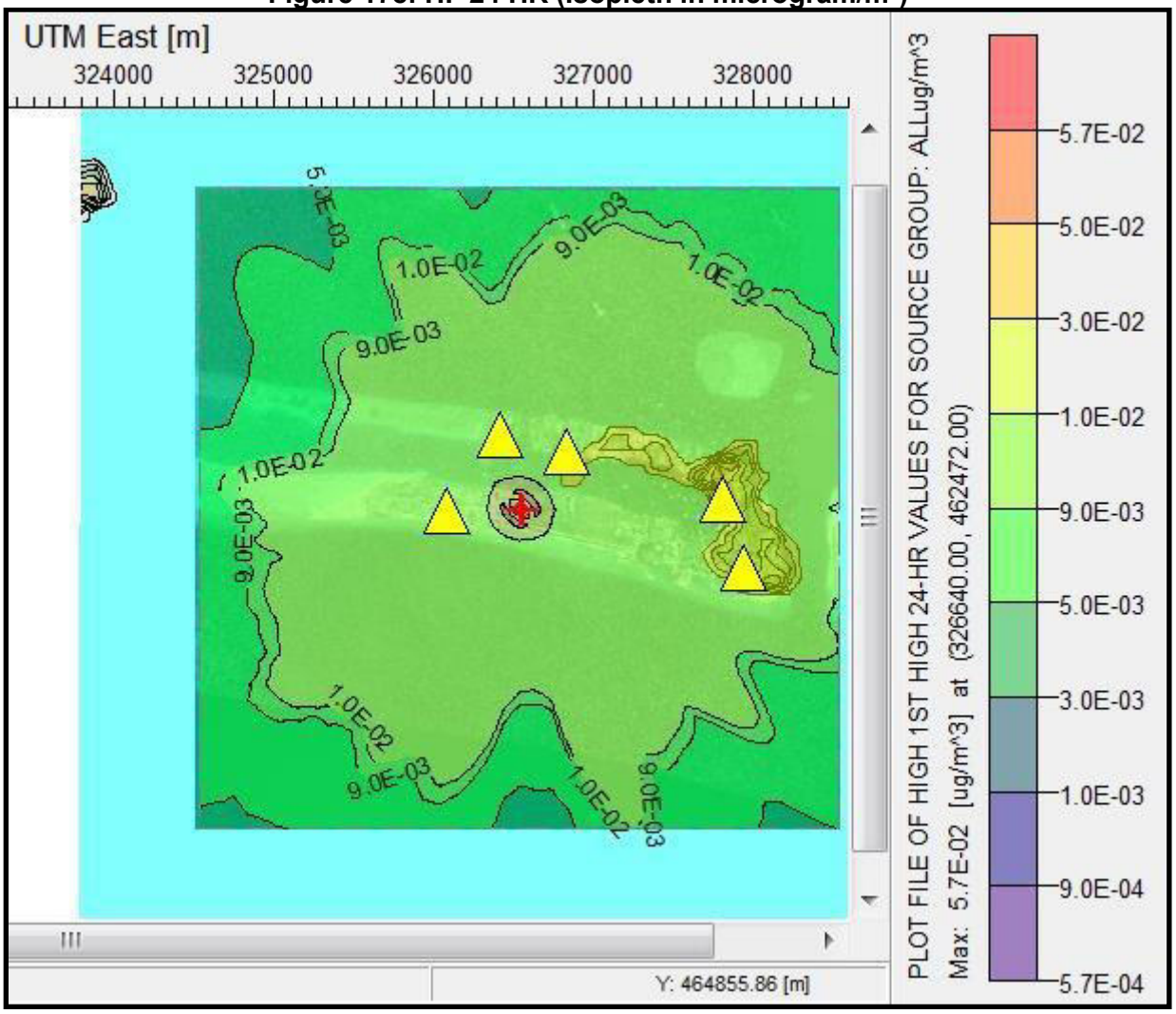


LEGEND:

Yellow Triangles refer to identified Area Sensitive Receptor (ASRs)

	Long	Lat
ASR1	327812	462536
ASR2	327938	462105
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 178: HF 24 HR (Isopleth in microgram/m^3)

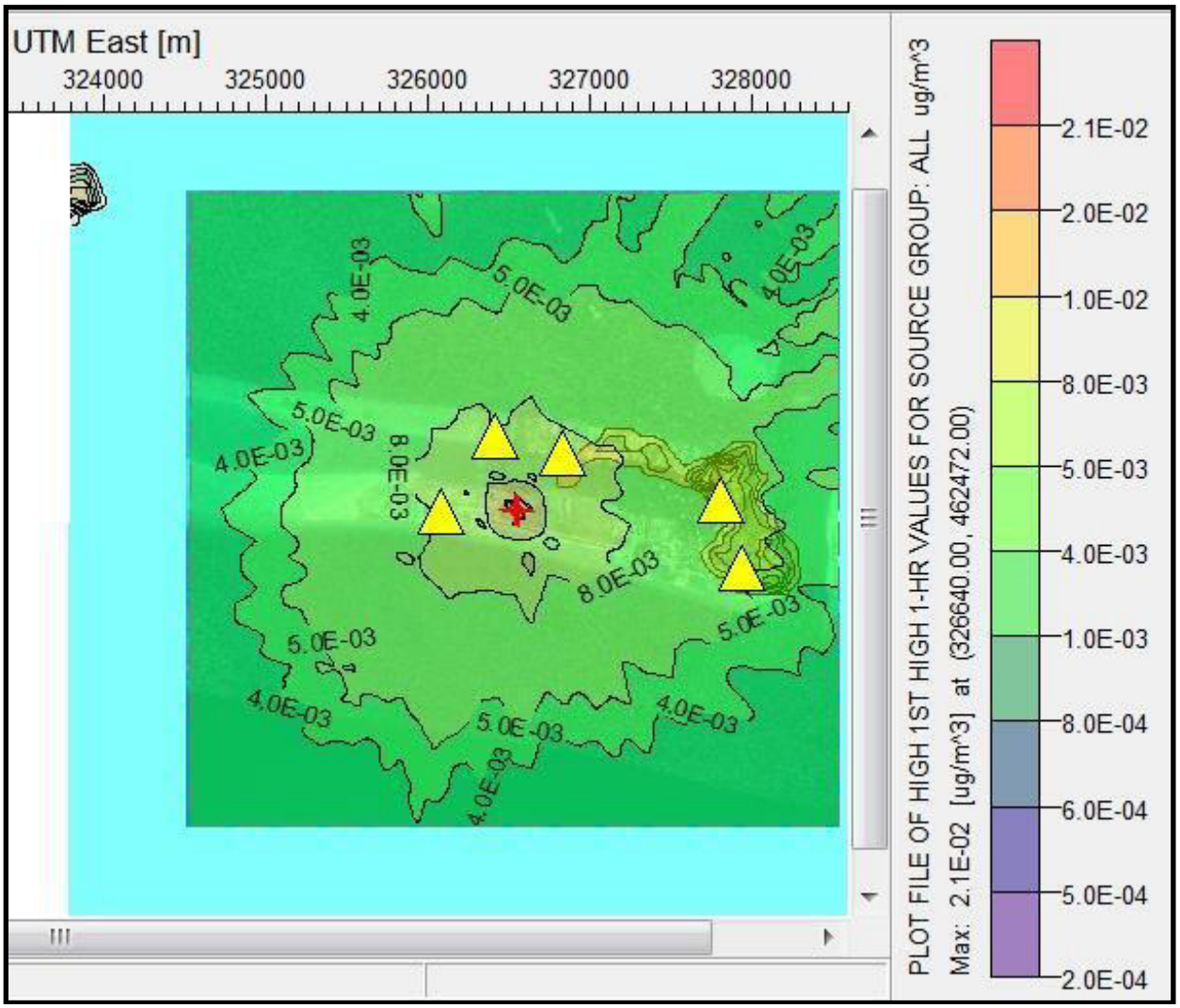


LEGEND:

Yellow Triangles refer to identified Area Sensitive Receptor (ASRs)

	Long	Lat
ASR1	327812	462536
ASR2	327938	462105
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 179: D/F 1 HR (Isopleth in microgram/m^3)

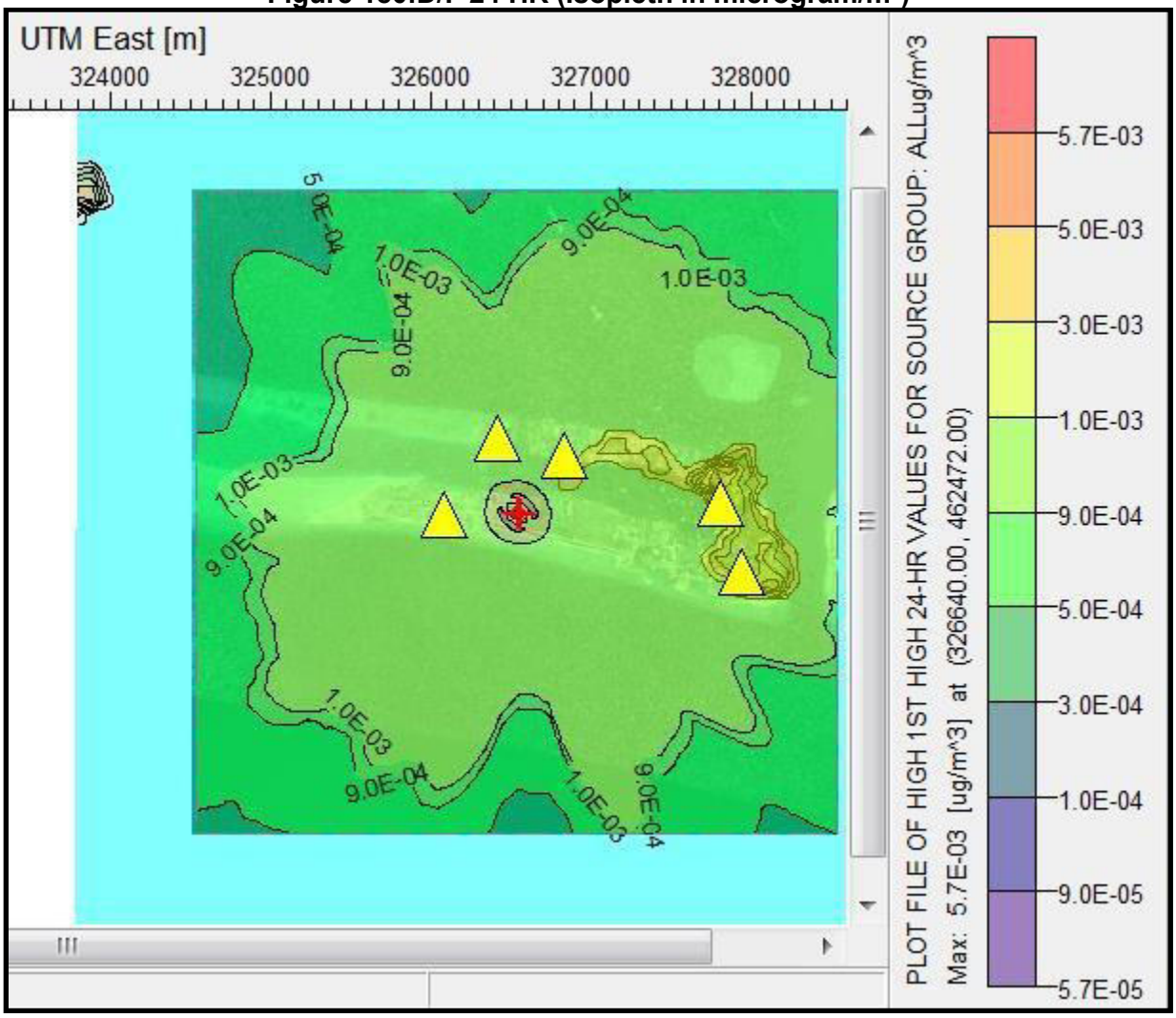


LEGEND:

Yellow Triangles refer to identified Area Sensitive Receptor (ASRs)

	Long	Lat
ASR1	327812	462536
ASR2	327938	462105
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 180:D/F 24 HR (Isopleth in microgram/m^3)

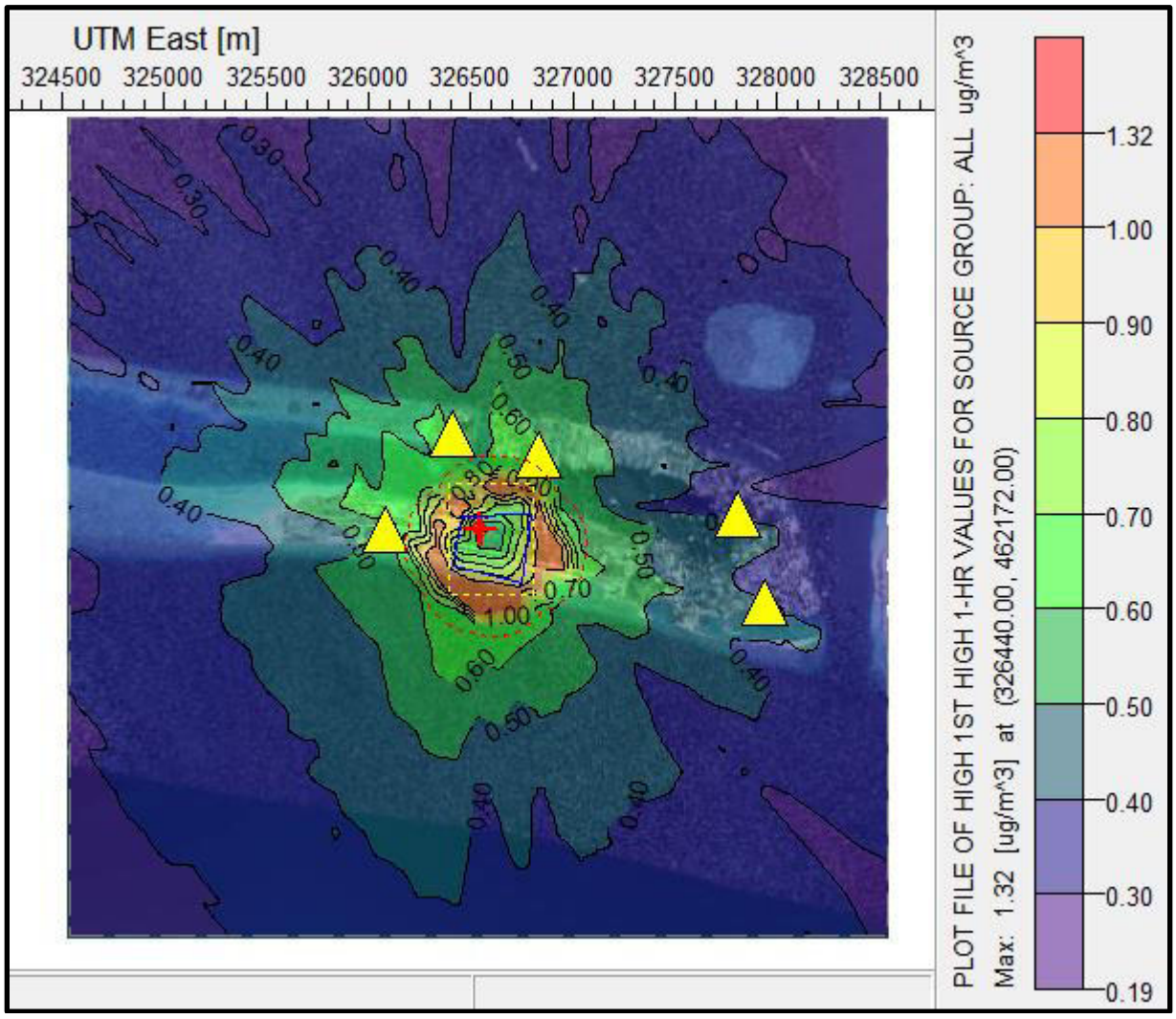


LEGEND:

Yellow Triangles refer to identified Area Sensitive Receptor (ASRs)

	Long	Lat
ASR1	327812	462536
ASR2	327938	462105
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 181: Sb 1 HR (Isopleth in microgram/m^3)

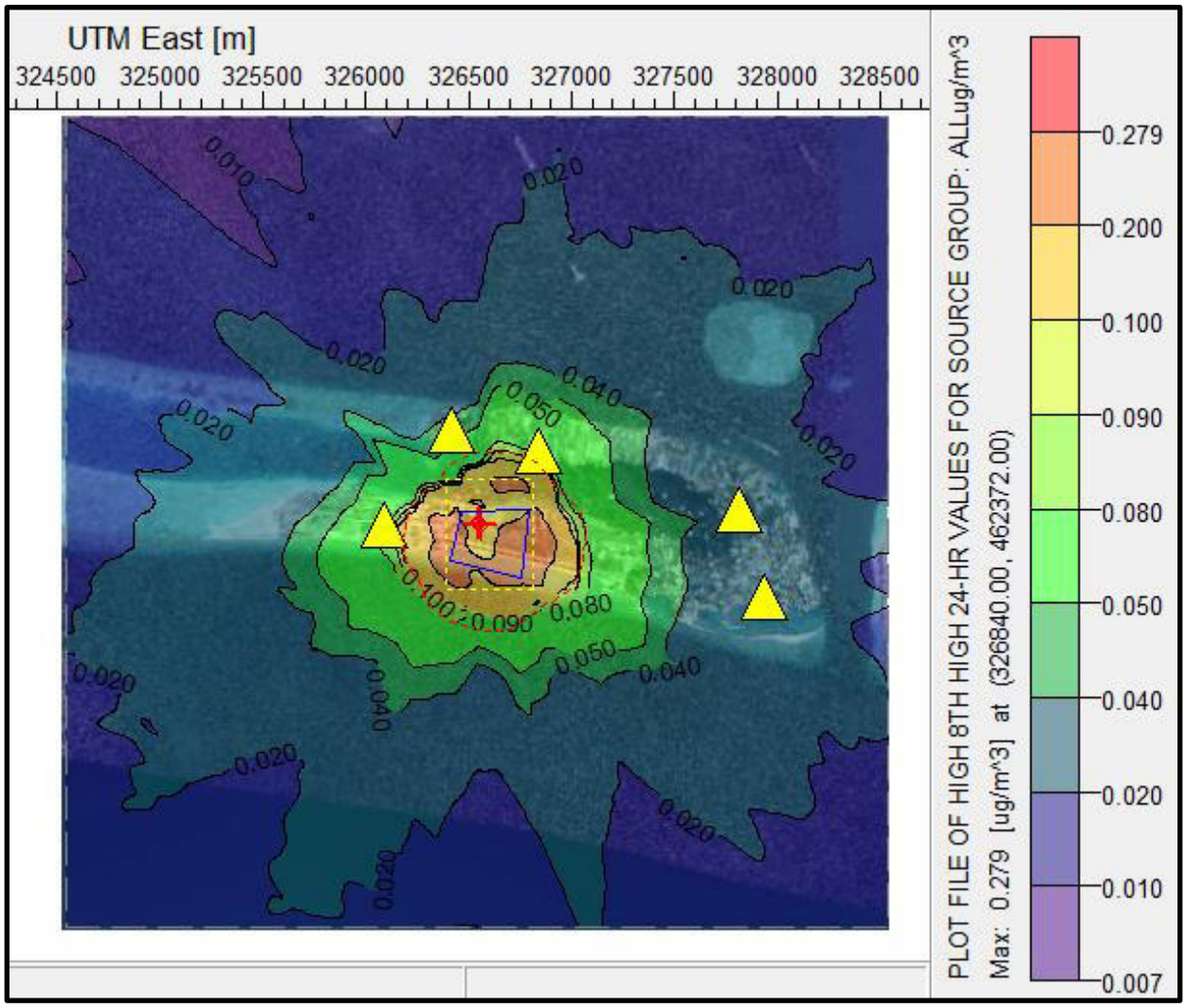


LEGEND:

Yellow Triangles refer to identified Area Sensitive Receptor (ASRs)

	Long	Lat
ASR1	327812	462536
ASR2	327938	462105
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 182: Sb 24 HR (Isopleth in microgram/m^3)

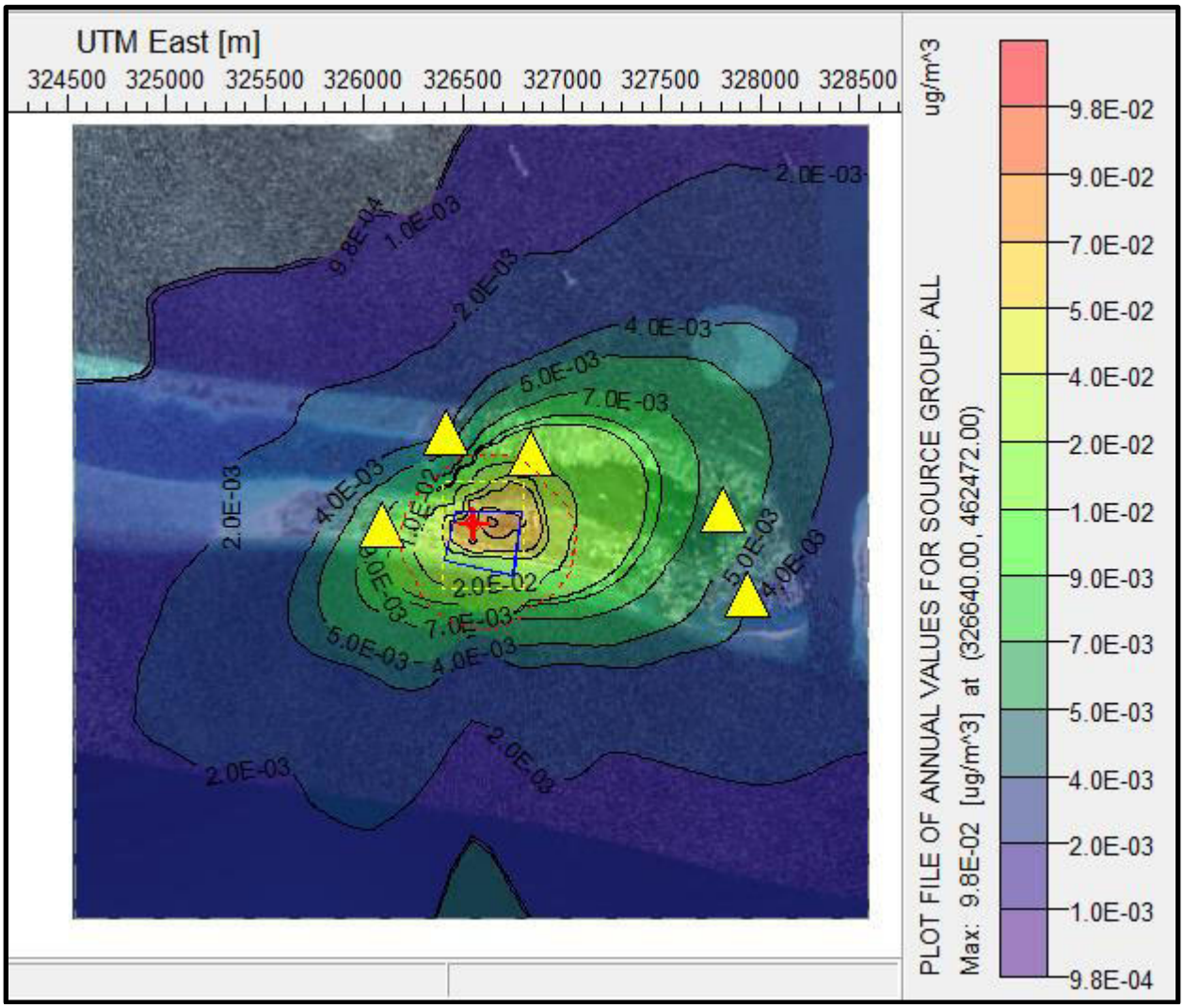


LEGEND:

Yellow Triangles refer to identified Area Sensitive Receptor (ASRs)

	Long	Lat
ASR1	327812	462536
ASR2	327938	462105
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 183: Sb 1 YR (Isopleth in microgram/m^3)

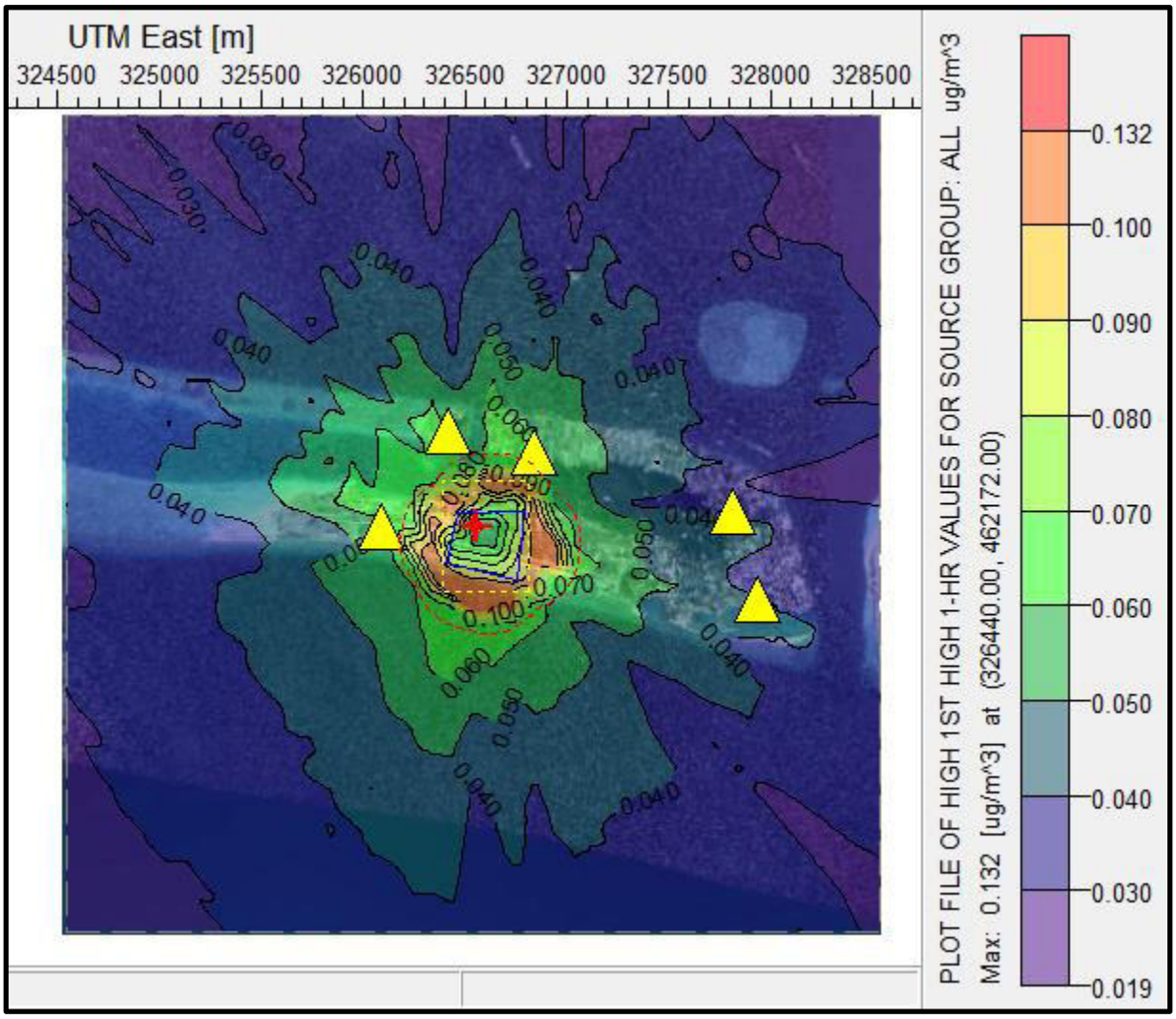


LEGEND:

Yellow Triangles refer to identified Area Sensitive Receptor (ASRs)

	Long	Lat
ASR1	327812	462536
ASR2	327938	462105
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 184: As 1 HR (Isopleth in microgram/m^3)

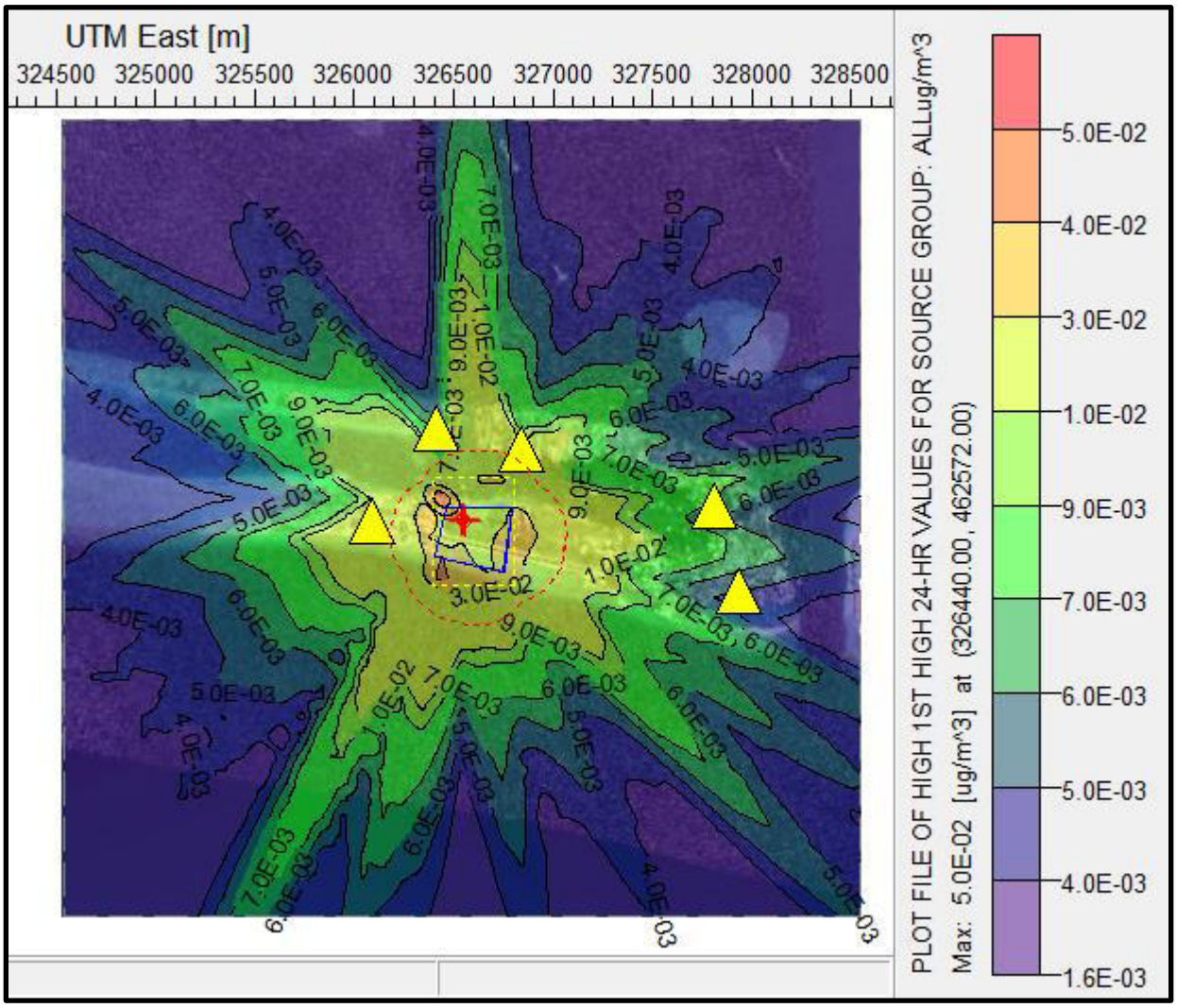


LEGEND:

Yellow Triangles refer to identified Area Sensitive Receptor (ASRs)

	Long	Lat
ASR1	327812	462536
ASR2	327938	462105
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 185: As 24 HR (Isopleth in microgram/m^3)



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	Long	Lat
ASR1	327812	462536
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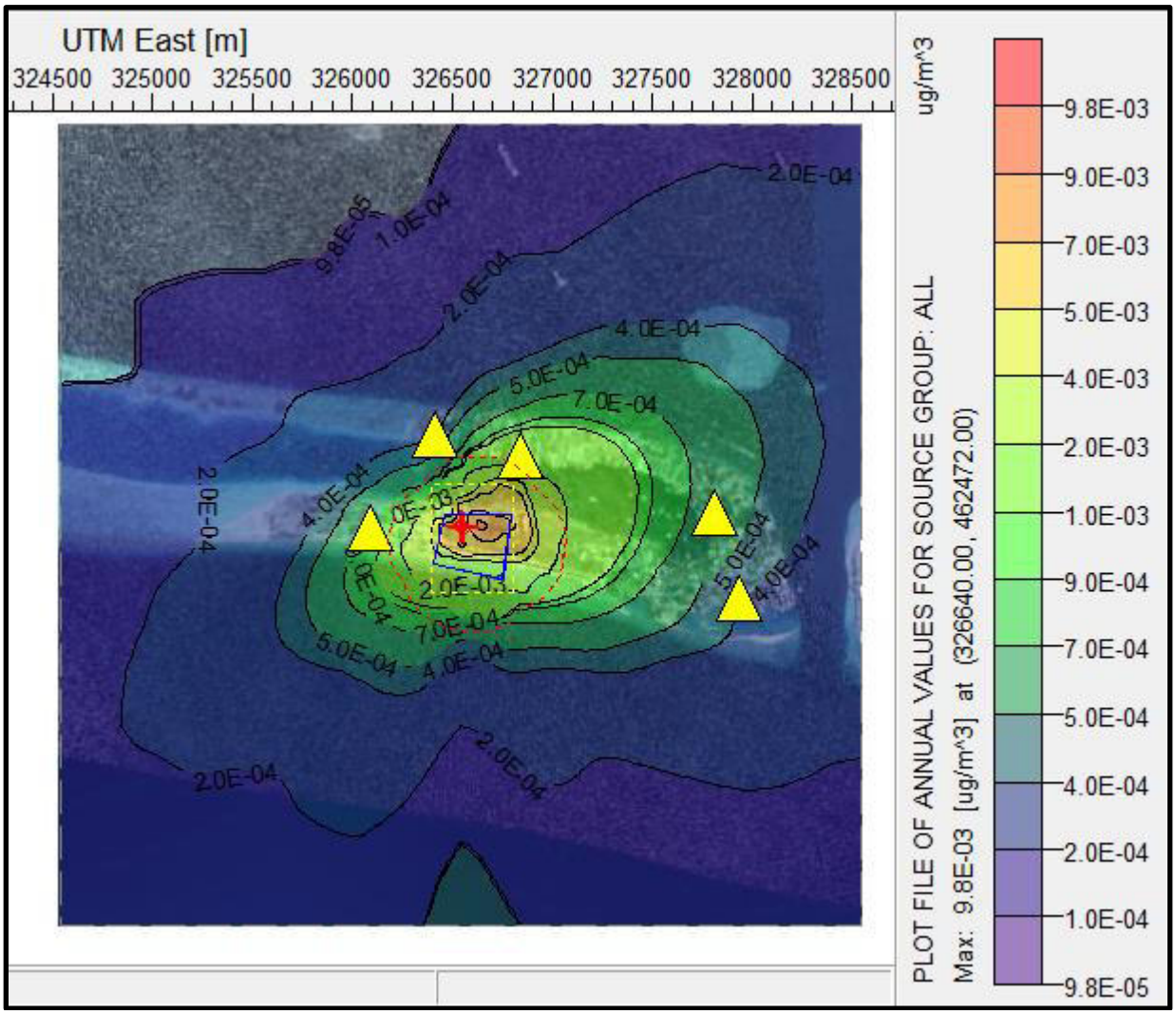
ASR4	326087	462455
ASR5	326416	462929

Figure 186: As 1 YR (Isopleth in microgram/m^3)



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ASR1	327812	462536
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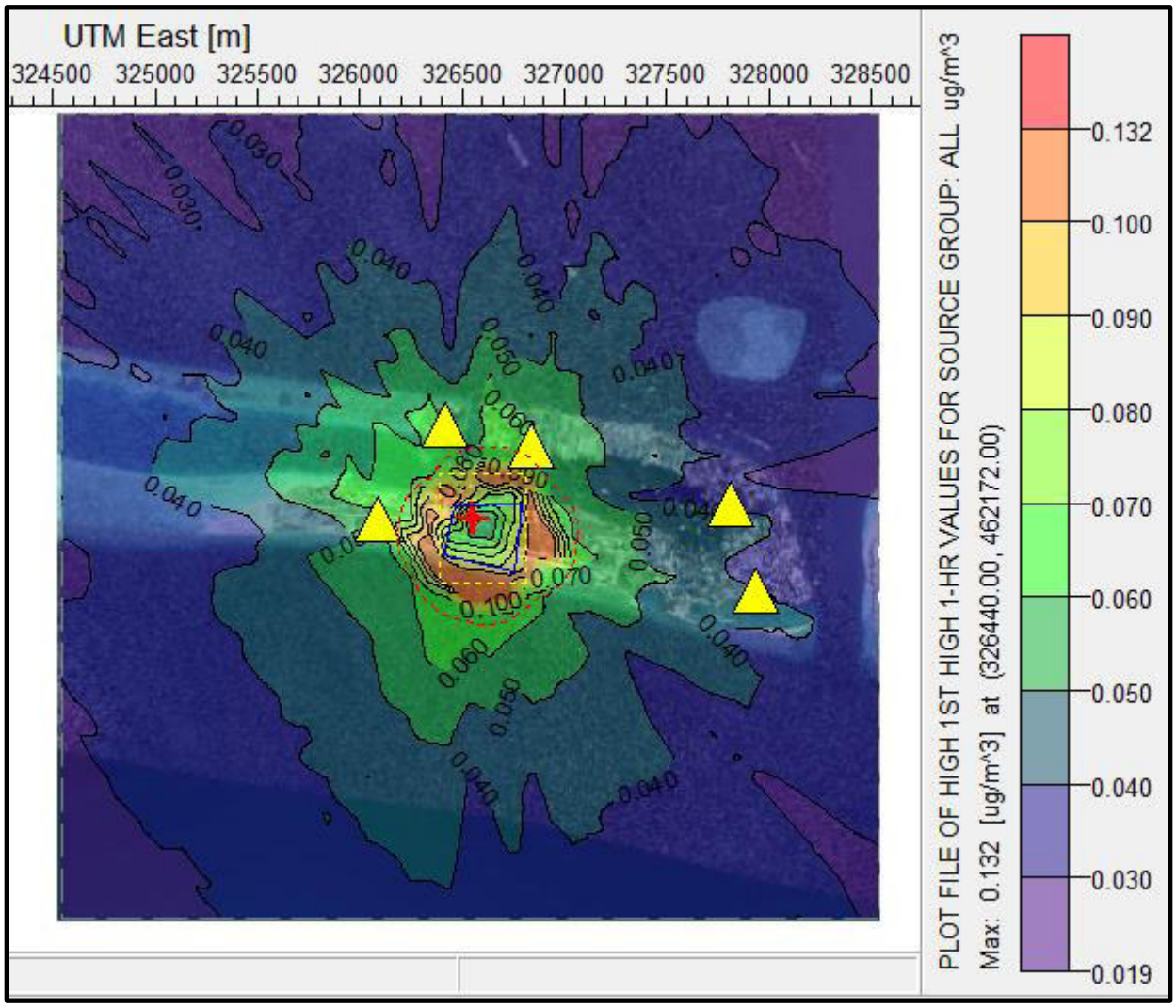
ASR4	326087	462455
ASR5	326416	462929

Figure 187: Tl 1 HR (Isopleth in microgram/m^3)



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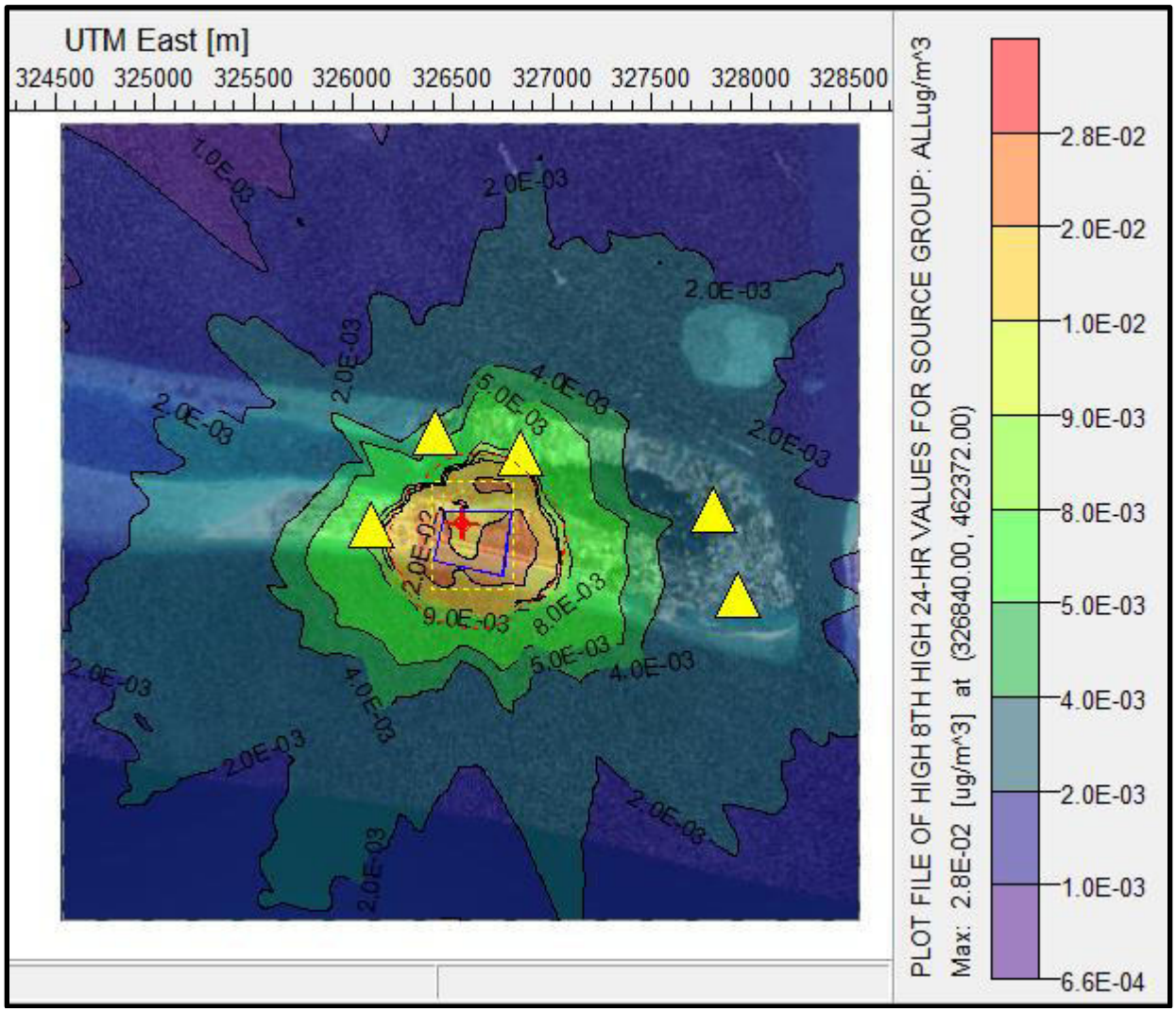
ASR1	327812	462536
ASR2	327938	462105
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 188: TI 24 HR (Isopleth in microgram/m^3)



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ASR1	327812	462536
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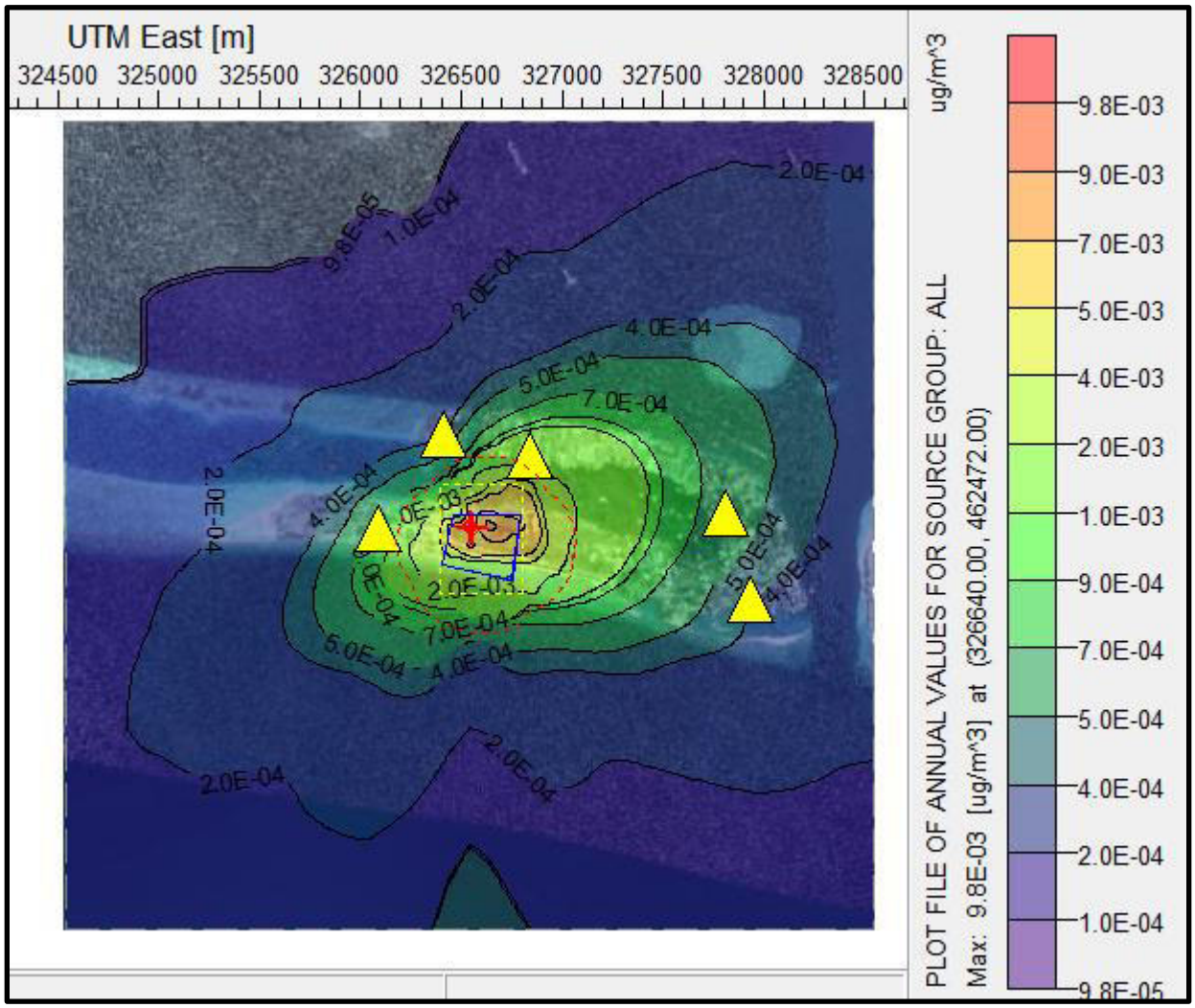
ASR3	326839	462822
ASR4	326087	462455
ASR5	326416	462929

Figure 189: TI 1 YR (Isopleth in microgram/m^3)



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ASR4	326087	462455
ASR5	326416	462929

477. For all the above parameters, controlled emissions have been validated to be in compliance with the TA Luft Standards as provided in the Austal2000 Report and with the USEPA standards and the WHO Air Quality Guidelines.

478. **Results**. AERMOD validation of the Austal2000 model results shows slightly higher results than the Austal2000 report but still within TA Luft Standards and USEPA Standards. For the deposition results, total dust, SO_2, NO_2 and Hg are confirmed to be way below the 1-year TA Luft precipitation standards. Three groups of toxic heavy metals were also run in the AERMOD validation model to show the potential maximum ground level concentrations using the design emission data. However, the results of the run for these group of heavy metals are for presentation only considering that there are no standards to compare them with.

479. Based on the design emission of the proposed WTE plant, proposed stack height of 50 m in the Austal2000 report was found to be favorable considering all predicted ground level concentrations in the AERMOD validation model are below the TA Luft and USEPA standards. The complete report on the AERMOD Modeling is in Appendix 16.

Table 71: Summary Maximum Ground Level Concentration - AERMOD

MAXIMUM GROUND LEVEL CONCENTRATION						German Standards (TA Luft)		USEPA	WHO Air Quality Guidelines	% of the WHO Standards	Non-degraded[a] >25%	Degraded[a] >10% short term >1% long term)
Parameters	Ave. Time	Conc (ug/Nm3)	Deposition (g/m2)	X	Y	Conc (ug/Nm^3)	Deposition (g/m2)	Conc (ug/Nm^3)	Conc (ug/Nm^3)	%		
Total Dust	1 hour	7.60628	0.00754	327040	462672	-	-	-	-	-	-	-
Total Dust	24 hours	3.18863	0.03805	327140	462572	-	-	-	-	-	-	-
Total Dust	1 year	0.34134	0.43994	326840	462572	-	0.35	-	-	-	-	-
PM10	1 hour	0.10288	0.00037	326640	462472	-	-	-	20	0.51	N	N
PM10	24 hours	0.02844	0.00078	326640	462472	50	-	150	50	0.06	N	N
PM10	1 year	0.0025	0.02508	327240	462572	40	-	50	20	0.01	N	N
SO2	1 hour	10.3398	-	326640	462472	350	-	212	-	4.88	N	N
SO2	24 hours	2.85793	-	326640	462472	125	-	365	20	14.29	N	Y
SO2	1 year	0.25302	-	327240	462572	50	-	79	-	0.32	N	N
NO2(NOx)	1 hour	48.91013	-	326640	462472	200	-	100 ppb	200	24.46	N	Y
NO2(NOx)	24 hours	14.16085	-	326640	462472	-	-	-	-	-	-	-
NO2(NOx)	1 year	2.1	-	324540	460472	40	-	53 ppb	40	5.25	N	Y
Hg	1 hour	0.00643	-	326640	462472	-	-	-	-	-	-	-
Hg	24 hours	0.00178	-	326640	462472	-	1	-	-	-	-	-
Hg	1 year	0.00157	-	327240	462572	-	0.05	-	-	-	-	-
NH3	1 hour	2.06667	-	326640	462472	-	-	-	-	-	-	-
NH3	24 hours	0.57123	-	326640	462472	-	-	-	-	-	-	-
NH3	1 year	0.00147	-	326340	461872	-	-	-	-	-	-	-
HCl	1 hour	2.06667	-	326540	462472	-	-	-	-	-	-	-
HCl	24 hours	0.57123	-	326540	462472	-	-	-	-	-	-	-
HCl	1 year	0.00147	-	324540	460472	-	-	-	-	-	-	-
Hf	1 hour	0.20705	-	326640	462472	-	-	-	-	-	-	-

MAXIMUM GROUND LEVEL CONCENTRATION						German Standards (TA Luft)		USEPA	WHO Air Quality Guidelines	% of the WHO Standards	Non-degraded[a] >25%	Degraded[a] >10% short term >1% long term)
Hf	24 hours	0.05723	-	326640	462472	-	-	-	-	-	-	-
Hf	1 year	0.00015	-	324540	460472	-	-	-	-	-	-	-
D/F	1 hour	0.02058	-	326640	462472	-	-	-	-	-	-	-
D/F	24 hours	0.00569	-	326640	462472	-	-	-	-	-	-	-
D/F	1 year	0.00002	-	324540	460472	-	-	-	-	-	-	-
Sum of Metals (Sb)[b]	1 hour	1.31607	-	326440	462172	-	-	-	-	-	-	-
Sum of Metals (Sb)[b]	24 hours	0.49540	-	326440	462572	-	-	-	-	-	-	-
Sum of Metals (Sb)[b]	1 year	0.09818	-	326440	462472	-	-	-	-	-	-	-
Sum of Metals (As)[c]	1 hour	0.13161	-	326440	462172	-	-	-	-	-	-	-
Sum of Metals (As)[c]	24 hours	0.04954	-	326440	462572	-	-	-	-	-	-	-
Sum of Metals (As)[c]	1 year	0.00982	-	326440	462472	-	-	-	-	-	-	-
Sum of Metals (Tl)[d]	1 hour	0.13161	-	326440	462172	-	-	-	-	-	-	-
Sum of Metals (Tl)[d]	24 hours	0.04954	-	326440	462572	-	-	-	-	-	-	-
Sum of Metals (Tl)[d]	1 year	0.00982	-	326440	462472	-	-	-	-	-	-	-

[a] Compared with applicable standards where available.
[b] Sum of metals: Antimony, Chromium, Copper, Manganese, Vanadium, in, Lead, Cobalt, Nickel
[c] Sum of metals: Arsenic / cadmium and its compounds (expressed as As and Cd), benzo (a) pyrene, water-soluble cobalt compounds (expressed as Co), chromium (VI) compounds (expressed as Cr)
[d] Sum of metals: Thallium and its compounds and cadmium

480. **Recommendations**. With regard to the results of modeling, the following were recommended:

(i) Retain the four existing ambient air quality monitoring stations as recommended by the AUSTAL2000 modeling. However, additional monitoring stations should be installed or established at the ASR2, ASR3 and ASR5 areas due to presence of residential/accommodation areas. See Figure 172. The map shows the Area Sensitive Receptor primary impact areas and location of recommended Ambient Air Quality Monitoring Stations. In cases of exceedance, these areas are likely to be affected.; and
(ii) Validation modeling should be conducted during the starting months of normal operation using actual CEMS and stack testing results to simulate actual operation of the plant.

481. Furthermore, in order to minimize generation of air pollutants from the WTE plant and to reduce the impact to the surrounding environment, the following were also recommended:

(i) Boilers should be regularly maintained, while structures such as the stacks and ducts should be regularly checked to avoid fugitive dusts sources and particulate accumulation;
(ii) Control devices such as the dry scrubber and baghouse should undergo regular checkup and maintenance;
(iii) Solid wastes should have acceptance criteria in terms of waste characteristics;
(iv) Waste should be dried to eliminate moisture, which is a precursor to incomplete combustion that results to higher particulate matter (PM) and carbon monoxide (CO) generation;
(v) Periodic watering of roads to minimize generation and resuspension of dust particles;
(vi) Forestation and plantation at the perimeter-buffer areas to serve as vegetation walls that can help control dispersion of air pollutants;
(vii) Regular ambient air quality monitoring should be conducted in hot spots and impacts areas based on the results of the modeling report. Actual ambient monitoring may be treated as validation of model results; and
(viii) Every modification and installation of new sources should be considered as additional contribution to emission of the plant. Hence, modeling updates should also be conducted to determine assimilative carrying capacity of the area based on the impacts of the new modification or installation.

Figure 190: Recommended monitoring sites

3. Additional Measures to Mitigate Impacts on Ambient Air Quality During Operation Phase

482. **Offset Activities Within Thilafushi**. The government plans to stop fires on Thilafushi and start baling waste by July 2020 as interim SWM solution to stop open dumping until the WTE facility is commissioned. It is expected that once these measures are implemented the air quality at the sampling locations will improve. The rehabilitation of the existing dumpsite will have the end view of shutting down the operation of the dumpsite. This activity will serve as the biggest offset to substantially reduce the impact of the WTE Plant operation to ambient air quality. Monitoring the benefits of this offset will continue throughout the operation phase and included in the environmental monitoring plan developed in this EIA report.

483. **Use of cleaner fuels or technologies**. The DBO Contract provides performance guarantees that will ensure use of cleaner fuels and technologies that have already been proven in other countries. These performance guarantees will ensure that the WTE plant will comply with the emission standards.

4. Water Pollution Due to Cooling Water and Brine

484. In Section IV (Alternatives Analysis), three alternative locations have been assessed on where the cooling water discharge pipe could be positioned at the 500-meter coastal stretch south of the project site. These alternative locations were tagged as M8, M9, and M10 in **Figure 18**. As initial step in the analysis, underwater marine survey was undertaken to profile the characteristics of the coral reef and extent of marine life, including pelagic species, along this stretch at various depths. Results show that profiles at these three tagged locations are identical and reveal the very few (or none at all) marine species at depth of less than 10m. The results further reveal that no significant marine life such as live corals, fishes or other pelagic organisms can be found at greater depths. This finding is particularly valid at the depth of more than 20 meters, wherein the seabed/reef wall is characterized by large expanse of rocks with rubbles scattered and no evidence of live corals anymore. Thus, the selection of the best option from among the three alternatives has been based on the slope of the reef instead. From engineering point of view, the discharge pipe can be anchored best in a gradually sloping seabed. Visual observation during the underwater survey suggest that the M8 section has the best slope to position the discharge pipe.

485. In the same alternatives analysis, positioning the outfalls at 30 meters deep would be the best alternative because the underwater marine survey revealed that there are no more corals and marine life at this depth in the area. Although the same marine survey revealed that no more corals or marine life exists starting at 20 meters depth, positioning the outfall deeper at 30 meters would provide additional precautionary measure for the project. The cooling water discharge will not pose any impact at this region.

486. The brine that will be generated from the desalination process will need to be disposed or discharged back to the sea. However, doing so may impact marine life at the discharge point. As a measure, the brine will be discharged through the cooling water discharge line. The volume of brine that will be generated from the desalination process is expected to be small compared to the volume of cooling water that will be used in the condenser cooling process. Hence, no significant change in the salinity of the cooling water is expected. This measure shall be integrated in the detailed design of the WTE plant by the DBO contractor.

5. Air, Water, and Land Pollution Due to Disposal of Ash and Other Residuals

487. The handling, treatment and disposal of ash and other residuals from the operation of the WTE plant will follow EHS Guidelines on Waste Management Facilities. The DBO Contractor will be required to integrate in the detailed design the following measures:

(i) Design the furnace to, as far as possible, physically retain the waste within the combustion chamber (e.g. narrow grate bar spacing for grates, rotary or static kilns for appreciably liquid wastes), and use a waste throughput rate that provides sufficient agitation and residence time of the waste in the furnace at sufficiently high temperatures, including any ash burn-out areas, in order to achieve a total organic carbon (TOC) value in the ash residues of below 3 weight percent and typically between 1 and 2 weight percent.
(ii) Manage bottom ash separately from fly ash and other flue gas treatment residues to avoid contamination of the bottom ash for its potential recovery;
(iii) Separate remaining ferrous and non-ferrous metals from bottom ash as far as practicably and economically viable, for their recovery;
(iv) Treat bottom ash on or off-site (e.g., by screening and crushing) to the extent that is required to meet the specifications set for its use or at the receiving treatment or disposal site (e.g., to achieve a leaching level for metals and salts that is in compliance with the local environmental conditions at the place of use);
(v) Bottom ash and residuals should be managed based on their classification as hazardous or non-hazardous materials. Hazardous ash should be managed and disposed of as hazardous waste. Non-hazardous ash may
(vi) be disposed of in an MSW landfill or considered for recycling in construction materials.[38]

6. Water Pollution Due to Discharge of Landfill Leachate

488. The leachate generated from the WTE Plant will be the leachate coming from the landfill cells. In order to avoid discharging untreated leachate to the marine environment, the construction of the landfill shall follow the following requirements that are included in the bidding documents:

(i) The landfill shall accommodate residues from the incineration facility (APC residues and non-marketable bottom ash).
(ii) The base liner system shall be of impermeable nature and shall prevent any leachate seepage towards the subsoil beneath the base liner system.

7. Socio-economic impacts

489. The project is expected to generate employment opportunities for waste collection, transportation, operation of the machineries and plants, and administrative support.

8. Community and Occupational health and safety

490. Operation of the WTE plant and its components poses significant occupation health and safety risks. To reduce the risks, contractors will be required to appoint health and safety officers for each site and to ensure regular briefing of the construction workforce on health and safety issues. The contractor shall establish its health and safety plans to be adopted at each site

[38] EPA (http://www.epa.gov)

following international best practices and the World Bank EHS guidelines on construction and decommissioning activities.

491. The machineries and plants require different chemicals and hazardous substances for operation. There is invariably a risk when such chemicals are handled. Although the WTE Plant is located away from residents, there is a considerable safety risk to workers at the plant and also surrounding environment in the event of any leak or spill.

492. Similar to impacts and measures during construction phase, the DBO Contractor shall integrate during detailed design applicable international good practices on community and occupation health and safety in its operation of the WTE, such those included in World Bank EHS Guidelines on Waste Management Facilities.[39] The most significant occupational health and safety impacts typically associated with workers at waste management facilities occur during the operational phase and include accidents and injuries, chemical exposure, and exposure to pathogens and vectors. Minimum requirements shall be the following:

493. **Accidents and Injuries**. Physical hazards encountered at waste management facilities are similar to those at other large industrial projects. Solid waste workers are particularly prone to accidents involving trucks and other moving equipment, so traffic management systems and traffic controllers are recommended. Accidents include slides from unstable disposal piles, cave-ins of disposal site surfaces, fires, explosions, being caught in processing equipment, and being run over by mobile equipment. Other injuries occur from heavy lifting, contact with sharps, chemical burns, and infectious agents. Smoke, dusts, and bioaerosols can lead to injuries to eyes, ears, and respiratory systems.[40] In addition to other standard measures adopted in most industrial facility operations, the applicable procedures following international best practices are recommended to prevent, minimize, and control accidents and injuries at the WTE plant and its associated facilities.

494. **Chemical Exposure**. Chemical hazards encountered at waste management facilities are similar to those at other large industrial facilities, such as toxic and asphyxiating gases, and are addressed in the IFC General EHS Guidelines. However, the full composition of wastes and their potential hazards is often unknown. Even municipal solid waste (MSW) often contains hazardous chemicals, such as heavy metals from discarded batteries, lighting fixtures, paints, and inks. The following procedures are recommended, whichever are applicable, to prevent, minimize, and control chemical exposure at the WTE plant:

(i) Control and characterize incoming waste (see waste receipt, unloading, processing and storage);
(ii) Provide adequate personnel facilities, including washing areas and areas to change clothes before and after work;
(iii) Ventilate enclosed processing areas (e.g., dust in waste size reduction areas, VOCs driven off by high temperatures during composting);
(iv) Monitor breathing zone air quality in work areas at processing, transfer and disposal facilities. Direct-reading instruments that measure methane and oxygen deficiency are of primary importance; these include combustible gas indicators, flame ionization detectors, and oxygen meters. At waste treatment/disposal facilities, volatile organics should also be analyzed in the biodegradation gases

[39] https://www.ifc.org/wps/wcm/connect/5b05bf0e-1726-42b1-b7c9-33c7b46ddda8/Final%2B-%2BWaste%2BManagement%2BFacilities.pdf?MOD=AJPERES&CVID=nPtj.3h
[40] Refer to Cointreau. S. (2006) for additional information.

being collected and/or vented. In waste handling, sorting, and composting facilities, monitoring for organic dust is needed;

(v) Prohibit eating, smoking, and drinking except in designated areas; and

(vi) Provide air filtered and air-conditioned cabs for heavy mobile equipment used at landfills as necessary.

495. **Pathogens and Vectors**. Workers can be exposed to pathogens contained in manure and animal excreta found in MSW from the disposal of sludge, carcasses, diapers, and yard trimmings containing domestic animal waste. Uncontrolled dumping of MSW attracts rats, flies, and other insects that can transmit diseases. Processing of MSW can also generate bioaerosols, suspensions of particles in the air consisting partially or wholly of microorganisms, such as bacteria, viruses, molds, and fungi. These microorganisms can remain suspended in the air for long periods of time, retaining viability or infectivity. Workers may also be exposed to endotoxins, which are produced within a microorganism and released upon destruction of the cell and which can be carried by airborne dust particles. The following measures are recommended to prevent, minimize, and control pathogens and vectors at the WTE plant:

(i) Provide and require use of suitable personal protective clothing and equipment;

(ii) Provide worker immunization and health monitoring (e.g., for Hepatitis B and tetanus);

(iii) Maintain good housekeeping in waste processing and storage areas;

(iv) Use automatic (non-manual) waste handling methods if practical;

(v) Clean and wash with disinfectant the cabins of heavy mobile equipment used at regular intervals;

(vi) Grade the area properly to prevent ponding (to minimize insect breeding areas);

(vii) Use integrated pest-control approaches to control vermin levels, treating infested areas, such as exposed faces and flanks with insecticide, if necessary;

(viii) Provide and require use of dust masks or respirators under dry and dusty conditions. Charcoal-filled respirators also reduce odor perception;

(ix) Provide prompt medical attention for cuts and bruises. Cover open wounds to prevent contact with the incoming loads or feedstock; and

(x) Fully enclose the waste management site with fencing so that no livestock or wildlife is able to come in contact with the waste, which contains significant potential to enable the spread of livestock and zoonotic disease, as well as spillover disease to wildlife. Provide daily cover of wastes to minimize the attraction to birds, which can become infected with avian influenza and other bird diseases that can then be carried off-site.

496. **General Occupational and Environmental Health Issues Associated with Waste Scavenging.** The presence of informal sector workers laboring in municipal or mixed waste disposal sites in search of commercially valuable materials is a common place occurrence in developing countries. The causes and dynamics are the result of complex social, cultural, labor, and economic factors that are clearly outside of the scope of this guidance document. However, the following principles, if applicable, should be considered in managing the occupational, health, and safety risks at the WTE site:

(i) Waste scavenging should not be allowed under any circumstances in hazardous and non-hazardous industrial waste management facilities;

(ii) Facilities dedicated to the management of MSW should work with government entities in the development of simple infrastructure that can allow for the sorting of waste, helping groups of scavengers form cooperatives or other forms of micro-

enterprises, or formally contracting them to provide this function. The outright displacement of scavenging workers as an occupational health and safety management strategy, without the provision of viable alternatives, should be avoided;

(iii) Operators of existing facilities with scavenging workers should exercise commercially viable means of formalizing their work through the creation of management programs that include:

(a) Allowing only registered adults on the site, excluding children and domestic animals. Striving to provide alternatives to access to childcare and education to children;
(b) Providing protective gear, such as shoes. face masks, and gloves;
(c) Arranging the disposal layout and provide sorting facilities to improve access to recyclables while reducing their contact with other operations, thus minimizing potential hazards;
(d) Providing water supply for washing and areas for changing clothes;
(e) Implementing education campaigns regarding sanitation, hygiene, and care of domestic animals;
(f) Providing a worker health surveillance program including regular vaccination and health examinations.

497. **Physical, Chemical, and Biological Hazards.** Visitors and trespassers at waste management facilities may be subject to many of the hazards described for site workers. In particular, waste pickers, looking for recyclable materials and food scraps for animal feeding, often work informally at waste transfer and disposal sites, especially MSW facilities, typically living adjacent to the site in poor housing conditions, with minimal basic infrastructure for clean water and sanitation. Waste pickers may encounter numerous risks, including contact with human fecal matter, paper that may have become saturated with toxic materials, bottles with chemical residues, metal containers with residue pesticides and solvents, needles and bandages (containing pathogenic organisms) from hospitals, and batteries containing heavy metals. Exhaust fumes of waste collection trucks traveling to and from disposal sites, dust from disposal operations, and open burning of waste all contribute to potential occupational health problems.[41] Recommended measures to prevent, minimize, and control physical, chemical, and biological hazards to the community around the WTE site include:

(i) Restrict access to waste management facilities by implementing security procedures, such as:

(a) Perimeter fencing of adequate height and suitable material, e.g. chain link, stock proof palisade;
(b) Lockable site access gate and buildings; o Security cameras at key access points linked to recording equipment and remote access CCTV, where required;
(c) Security alarms fitted to buildings and storage areas; o Review of site security measures annually or whenever a security breach is reported
(d) Use of a site visitor register; o Immediate repair of fencing/access points if damaged; and

[41] Sandra Cointreau, The World Bank Group, Occupational and Environmental Health Issues of Solid Waste Management Special Emphasis on Middle- and Lower-Income Countries, Urban Papers UP-2, July 2006.

(e) Lighting of site during night time where necessary. As this may cause light nuisance to neighbors, the lighting installations should be selected to minimize ambient light pollution.

498. **Workers Accommodation During Operations.** The accommodation of workers shall be established following international best practices to ensure welfare of workers is protected.[42] The DBO Contractor shall consider the following requirements in building these camps and accommodation facilities at the site, if any.

(i) The temporary campsite location should:

(a) Be free from any risk of flooding.
(b) Be sited a reasonable distance and have clear physical separation from any construction work, equipment and/or machinery.
(c) Provide clear separation between the camp and construction area through such means as a footpath, fence, etc.
(d) Where possible, be sited outside the boundary of the construction zone.

(ii) The site design should ensure:

(a) Adequate space to accommodate the number of workers throughout the project period, for accommodation, meals, toilets, bathing, etc.
(b) Considerations for needs of all types of workers: e.g. women, local laborers or travelers, etc.
(c) Adequate drainage is provided to prevent any stagnant water which can attract mosquitos and vermin and spread disease among workers,
(d) Buildings are structurally sound and can withstand wind and rain.
(e) Ensure that the worker camp area will have adequate ground surfacing (e.g. gravel, wood sheeting, grass) such that residents may move freely between buildings in their off time without walking through mud and water.
(f) Designated area for small fires during colder months, located a safe distance from buildings and any flammable materials.

(iii) The workers' accommodation should comply with the following requirements:

Dimensions and Design

(a) The height of room shall not be less than 2.4 meters.
(b) The sleeping area or resting area shall not be less than 3 m^2 per person.
(c) Separate bed for each worker provided, with minimum of 1m space between each bed.
(d) Separate sleeping areas are provided for men and women, except in family rooms if needed.

[42] From the draft Construction Code of Practice developed for urban development projects in Kathmandu, Nepal. This COP was developed with reference to the following: "Workers' accommodation: processes and standards: A guidance note by IFC and EBRD", IFC and EBRD, 2009 https://www.ebrd.com/downloads/about/sustainability/Workers_accomodation.pdf; and "Malaysian standards of temporary construction site workers' amenities and accommodation – code of practice. (MS 2593, 2015) http://www.sirim.my/srmc/documents/Aug-Sept-2014/12D024R0_PC.pdf

(e) Sleeping area should be separate from cooking/canteen areas, and far enough distance from toilets to avoid odors.
(f) Where possible, prefab-type structures could be considered.

Light and Air

(a) Both natural and artificial lighting are provided and maintained in living facilities. It is best practice that the window area represents not less than 5% to 10% of the floor area. Emergency lighting is provided.
(b) For cold weather months, accommodation must be such that the temperature is kept at a level of around 20 degrees Celsius notwithstanding the need for adequate ventilation.
(c) In warmer months, adequate ventilation (either cross-ventilation and/or fans) is provided.

Materials

(a) Roofing materials must be such that the structure can withstand high winds without risk of collapse and be leak-free during rainy season.
(b) Flooring material should be easily cleanable and free of bare nails or other sharp objects.

Provisions/furnishing

(a) Each worker is provided with a comfortable mattress, pillow, cover and clean bedding.
(b) Double or triple-deck bunk beds are prohibited. Double deck bunks may be used in special circumstances but must be approved by the Engineer.
(c) Each resident is provided facilities for the storage of personal belongings, such as a locker or shelving unit.
(d) Every resident is provided with adequate furniture such as a table, a chair, a mirror and a bedside light (small solar lights may be a good option). These may be shared among several workers.
(e) Separate storage provided for work boots and PPE. Drying/airing areas may need to be provided for PPE depending on conditions.
(f) Mosquito nets are provided in areas where mosquitos are present and/or at the request of workers.
(g) Rubbish bin with cover provided in each room and emptied regularly.
(h) Electrical outlets provided for charging mobile phones, radio, etc. Ensure that electrical wiring is done properly and presents no risk of electrical fire.
(i) All doors and windows should be lockable and be provided with mosquito screens.

(iv) The workers kitchen area should comply with the following requirements:

(a) The minimum area of kitchen should be not less than 4.5 m^2 and the minimum width should be more than 1.5 meters.
(b) Adequate height of kitchen should be not less than 2.25 meters.
(c) Provide where clean drinking water is always available – ensure that any open water tanks are covered.

(d) Kitchens are provided with facilities to maintain adequate personal hygiene including a sufficient number of washbasins designated for cleaning hands with clean water and materials for hygienic hand-drying.
(e) In order to enable easy cleaning, it is good practice that cooking stoves are not sealed against a wall, and benches and fixtures are not built into the floor.
(f) Design should consider if the kitchen within the camp will be used to service all workers for all meals (e.g. meals prepared for day laborers as well as residents) or will be limited to self-preparation of meals by residents.
(g) Wall surfaces adjacent to cooking areas are made of fire-resistant materials.
(h) Food preparation tables are equipped with a smooth, durable, easily cleanable, non-corrosive surface made of non-toxic materials.
(i) All cupboards and other fixtures have a smooth, durable and washable surface.
(j) All kitchen floors, ceiling and wall surfaces adjacent to or above food preparation and cooking areas are built using durable, non-absorbent, easily cleanable, non-toxic materials.
(k) Cooking gas canisters provided
(l) Fire extinguisher provided outside of cooking area.
(m) Rubbish bin(s) provided with cover
(n) Adequate facilities for cleaning, disinfecting and storage of cooking utensils and equipment are provided.

(v) The workers toilets should comply with the following requirements:

(a) Toilets should be located within same general area as accommodation, but at least 30 meters away from sleeping area/kitchen. Should not be more than 60m away.
(b) Toilets should be located at least 30 meters away from any water wells.
(c) An adequate number of toilets should be provided to workers. Standards range from 1 unit per 15 persons to 1 unit per 6 persons.
(d) Toilet rooms shall be located so as to be accessible without any individual having to pass through any sleeping room
(e) Toilet dimensions should be at least 1.5 m × 0.75 m (minimum width)
(f) Toilet facilities should be installed so as to prevent any odors reaching dining facilities or sleeping areas.
(g) Separate facilities provided for men and women.
(h) An adequate number of handwash facilities is provided to workers. Standards range from 1 unit per 15 persons to 1 unit per 6 workers. Handwash facilities should consist of a tap and a basin, soap and hygienic means of drying hands.
(i) Toilets should be constructed such that they are structurally sound during high winds and free from leaks during rains.
(j) Every toilet should be provided with natural lighting and natural ventilation by means of ≥ 1 openings, providing a total area of >0.2 m^2 per toilet. Such openings shall be capable of allowing a free, uninterrupted passage of air.
(k) In addition, all toilet rooms should be well-lit, with natural lighting and artificial lights at night.
(l) Ensure no discharge of toilets and showers that will contaminate water sources or common areas

(m) Sanitary and toilet facilities are designed to provide workers with adequate privacy, including ceiling to floor partitions and lockable doors
(n) Ensure toilets have rubbish bin in each cubicle

(vi) The shower and washing facilities should comply with the following requirements:

(a) An adequate number of shower facilities is provided to workers. Standards range from 1 unit per 15 persons to 1 unit per 6 persons.
(b) Shower/bathing facilities are provided with an adequate supply of clean water.
(c) Separate facilities for men and women.
(d) The flooring for shower facilities should be of hard washable materials, damp-proof and properly drained.
(e) Suitable light, ventilation and soap should be provided.
(f) Adequate space and hooks must be provided for hanging clothes/towels while bathing.
(g) Area for washing/drying clothes provided, including washbasin, soap and drying lines. Either piped water to the basin or standpipe for filling basins should be within close distance.
(h) Ensure area drains well and doesn't create a muddy environment.

(vii) Optional Amenities and Other Good Practices that should be followed as applicable:
(a) Paint the camp buildings to present a tidy and satisfactory appearance – this will help encourage workers to keep their camp in good condition.
(b) Provide signage in kitchen area, canteen, toilets, and other common areas to encourage good hygiene practices, cleanliness of kitchen and personal spaces, worker conduct, worker responsibilities, safety evacuation plan, etc.
(c) Involve laborers in design of the camp, e.g. to get their inputs on siting of buildings, and any specific needs of women.

9. Residual Impacts

499. The residual wastes from the waste incineration are bottom ash, slag and the residues from flue ash. Bottom ash and slag is a valuable fraction which may potentially be used for many purposes such as covering material for landfill, ballast layer or reinforcement layer in road construction or filler/aggregate for construction blocks. A study was commissioned under the project on the potential use of incinerator bottom ash for commercial purposes. Conclusion on the study says that the incinerator bottom ash has the potential for use in the construction industry. A copy of the complete report is in Appendix 5.

16. Under any circumstances that these options are not feasible, the sanitary landfill will be able to accommodate the residual wastes. The hazardous residues from the flue gas cleaning (fly ash) will be conditioned safely in sealed bags and disposed in a controlled way at the sanitary landfill. Similarly, the fly ash collected from flue gas cleaning is cooled down, stored in big bags and disposed in the same sanitary landfill.

10. Cumulative Impacts

500. As of the assessment, there are no other similar planned projects that will be established or put up in Thilafushi or adjacent islands. Therefore, the WTE plant will not contribute to any cumulative negative impact with other sources of similar impacts in Thilafushi, and/or any existing project or condition, and/or other project-related developments that are realistically defined at the time the assessment. The future plan of the project to expand by 50% will not have any cumulative negative effects because it will instead address the potential environmental impact of increased solid waste generation in the future. Nevertheless, a strategic environmental assessment will be undertaken in the future to evaluate the cumulative and other potential environmental impacts of future SWM projects in Thilafushi, and Maldives in general, including the planned expansion of the WTE plant by 50%.

11. Greenhouse Gas Emissions

501. The operation of the WTE Plant will be a potential source of greenhouse gas emissions due to the inherent combustion processes involved in plant operations. This GHG emission poses a potential transboundary impact on endangered species and habitats. However, comparing with the current practice of landfilling solid wastes in Maldives, the incineration process will greatly reduce the volume of the waste (in the form of residual ash) that need to be disposed in sanitary landfills. Therefore, the production of greenhouse gases due to landfilling will be reduced. The WTE plant will generate electricity for the industries on Thilafushi, replacing their dependence on fossil fuel use for power generation. Summing these all leads to an overall reduction of greenhouse gas emission by the Maldives. A complete accounting and analysis of GHG emission by the WTE Project resulted to GHG emission reduction of approximately 40,000 tCO_{2e}/year, which is the average annual reduction across the project life cycle.

Table 72: shows the summary of estimated GHG emission reduction from the WTE Plant. The complete report on the GHG emission inventory and analysis is in Appendix 17.

Table 72: Estimated GHG Emission Reduction from the WTE Plant

Year	Reference emissions		Project emissions		Emission reductions		Accumulated GHG ERs	
	GHG total	CO2 only	GHG total	CO2 only	GHG total	CO2 only	GHG total	CO2 only
Unit	tCO2e	tCO2	tCO2e	tCO2	tCO2e	tCO2	tCO2e	tCO2
2025	36,380.2	36,380.2	38,941.4	36,428.2	-2,561.2	-48.0	-2,561.2	-48.0
2026	61,931.4	54,930.2	43,075.9	40,276.0	18,855.5	14,654.2	16,294.3	14,606.2
2027	69,230.3	56,260.8	43,959.7	41,098.5	25,270.6	15,162.3	41,564.9	29,768.5
2028	75,150.0	57,518.6	44,799.4	41,880.0	30,350.6	15,638.6	71,915.5	45,407.1
2029	78,794.1	57,414.2	44,742.2	41,826.8	34,051.9	15,587.4	105,967.4	60,994.5
2030	81,741.5	57,425.0	44,757.8	41,841.3	36,983.7	15,583.7	142,951.1	76,578.2
2031	84,114.3	57,426.5	44,764.5	41,847.5	39,349.8	15,579.0	182,300.9	92,157.2
2032	86,078.3	57,430.1	44,768.9	41,851.6	41,309.4	15,578.5	223,610.3	107,735.7
2033	87,740.1	57,435.1	44,770.5	41,853.1	42,969.6	15,582.0	266,579.9	123,317.7
2034	89,173.8	57,440.9	44,769.2	41,851.9	44,404.6	15,589.0	310,984.5	138,906.7
2035	90,432.4	57,448.1	44,764.3	41,847.3	45,668.1	15,600.8	356,652.6	154,507.5
2036	91,552.3	57,456.0	44,755.9	41,839.5	46,796.4	15,616.5	403,449.0	170,124.0
2037	92,560.9	57,465.4	44,743.7	41,828.2	47,817.2	15,637.2	451,266.2	185,761.2
2038	93,477.5	57,476.2	44,727.6	41,813.2	48,749.9	15,663.0	500,016.1	201,424.2
2039	94,306.5	57,478.3	44,581.7	41,677.4	49,724.8	15,800.9	549,740.9	217,225.1
2040	95,071.9	57,509.3	44,456.4	41,560.8	50,615.5	15,948.5	600,356.4	233,173.6
2041	95,763.1	57,538.8	44,331.6	41,444.6	51,431.5	16,094.2	651,787.9	249,267.8
2042	96,392.8	57,569.0	44,207.0	41,328.7	52,185.8	16,240.3	703,973.7	265,508.1
**2043	96,392.8	57,569.0	44,207.0	41,328.7	52,185.8	16,240.3	756,159.5	281,748.4
**2044	96,392.8	57,569.0	44,207.0	41,328.7	52,185.8	16,240.3	808,345.3	297,988.7
Total	1,692,677.0	1,124,740.7	884,331.7	826,752.0	808,345	297,989		

Table 73: Summary of Impacts Due to Operation of the Project.

Potential Impact	Assessment
Water pollution and impacts on marine environment	Long-term, Negative, Significant
Air pollution and noise	Long-term, Negative, Significant
Impacts on biodiversity	Long-term, Negative, Significant
Socio-economic impacts	Long-term, Positive, Significant
Occupational health and safety	Long-term, Negative, Significant
Residual wastes	Long-term, Negative, Significant
Greenhouse gas emission	Long-term, Positive, Significant

VII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

502. This section provides the outcomes of the stakeholder consultations undertaken during the project preparatory stage. The objectives of the consultations are to ensure that project information is accurately and properly disseminated to all stakeholders, and to engage these stakeholders to participate in the environmental assessment process. The consultation process is also a way to ensure that all issues from the stakeholders about the project are considered in the environmental management planning and ultimately addressed in the environmental management plan. Stakeholder consultations also provide valuable guidance and direction to

safeguard the interests of the stakeholders, developers and the environment. This section outlines the consultations that were carried out with stakeholders and the community.

503. The approach for stakeholder consultations was to have an interaction with key stakeholders on issues that matter to them and those that are of material value for the project. The stakeholders were grouped into internal, external and others including private and civil society.

504. The internal stakeholders comprise the project proponent, Ministry of Environment, project management unit (PMU) and the Maldives EPA. The external stakeholders include other government regulators and service providers. Other stakeholders include NGOs and the civil society. Interviews with relevant persons from these groups were undertaken. During interviews, discussions focused on the perceptions on the project, the selected locations, environmental or social impacts when implementing the project, energy use and efficiency, harbor and road use, and other aspects. The consultations explored on issues with locations, concerns and suggestions for improving project implementation.

505. In 2017, the first round of stakeholder consultations commenced and undertaken by PMU. The initial stakeholders consulted were the community people at Thilafushi, the diving community in Maldives, and Bluepeace Maldives, which is an NGO active in the environment sector. **Table** 74 below summarizes the issues and views gathered during these consultation activities.

Table 74: Summary of Consultations in 2017

Date of Consultation	Organization/Group Consulted	Issues/Views on the Project
July 2017	Community Living in Thilafushi The people living on Thilafushi were consulted during July 2017 as part of the EIA work. The method included selecting people randomly who live on the island and asking them a set of questions regarding the project and their experience on the island and how they expect the project would affect them. The following are the major outcomes of the interviews with the residents of the island.	• Everyone surveyed in the island noted, that waste management is a big issue at the island. They do not think that waste management, treatment and disposal is being properly carried out by the authority. • Major issues the people noted were the smoke and the mosquitos. Some days, the smoke becomes so thick it becomes difficult for them to live. Similarly, mosquitos become a big issue during the rainy season. • Most of the people surveyed noted that the Thilafushi is seen as a dump site. Hence the overall hygienic condition of the island is low. • Some of residents noted that the area allocated for the waste management is small and the waste has become piled into mountains on the islands. Some noted that the waste mountains are growing rapidly, and they are do not know what will happen in the future • The island has a water supply network and desalinated freshwater is available on the island. However, the island does not have a proper sewerage network. • The roads on the islands are poorly maintained and the condition gets worse after each rainy season. Hence the transportation within in the islands is difficult. • Everyone noted that Thilafushi is connected to Malé via a regular ferry which starts early morning but stops early evening. However, the island is an isolated and not much recreation activity is available on the island.
24 October 2017	Bluepeace Maldives	• Bluepeace has been advocating to improve conditions on Thilafushi for a long time. Bluepeace has been voicing the

Date of Consultation	Organization/Group Consulted	Issues/Views on the Project
	Bluepeace Maldives is an NGO active in the area of environment and development. Bluepeace was consulted on 24th October 2017 at Water Solutions. Following are the main outcomes and summary of the discussion of the stakeholder meeting.	view that Thilafushi is fast becoming a serious ecological and health problem in the Maldives and something drastic needs to be done to improve the waste management practices at Thilafushi. • People could find garbage floating inside and outside of the lagoon during high tides on a daily basis. The floating waste becomes a navigation hazard. • Bluepeace strongly feels the solution to the issue of Waste can only be addressed within a National Framework for Solid Waste Management in the Maldives. There are a number of studies by different organizations on Solid Waste Disposal for the Maldives, including hazardous waste. Most of the studies have gathered dust on bookshelves. • The proposed project is important to develop the regional waste management facility at Thilafushi and in addition is needed to treat the existing waste mountain at the island. • Bluepeace strongly feels there is a need to undertake a detailed study on the environmental impact of landfilling which had been carried out at Thilafushi using waste collected.
	Diving Community of Maldives The diving community is one group of groups who have raised various concerns about waste management issues from Thilafushi for many years but have not been able to achieve any meaningful outcome due to the nature of the issue. Divers have always been exploring the reef around Thilafushi and other reefs in the nearby regions and considers that Thilafushi reef is also among the good diving sites in the region. Various experienced divers representing dive schools, veterans of diving and people who have vast knowledge of the	• According to Raazee, who is the Operations Manager of Best Dives managing many dive centers including the dive center in Centra Rasfushi located in the island of Giraavaru and Jumeriah Vittaveli, a lot of change that has been taking place at Lions Head over the years. This change is considered to be partly attributed to the waste management that began in Thilafushi. A reduced number of fishes has been observed, most importantly sharks. However, the shark population according to Raazee declined because of uncontrolled shark fishing throughout the Maldives and not necessarily because of Thilafushi. This site is now no longer considered as a protected site by many divers and most resorts avoid this site due to the thick smoke from Thilafushi and also due to the fact that most visitors are also aware of the famous garbage island. • The name, Lions Head was given to the dive site due to the presence of a large rock outcrop from the reef which resembles the head of a lion. The protected dive site popularly known as “Lions Head” was one of the most dived sites in the region and famous for shark watching. In the early 1980’s this was one of the top shark points in North Malé region. Dive schools from around the nearby resorts use this dive site on their daily dive roster. • Another industry expert, Hussain Rifau who has more than 20 years of diving in liveaboards, indicated that the decline in fish population cannot be attributed to Thilafushi alone as no proper studies have been done to verify this. It is not proven but may likely be a cause. Nevertheless, liveaboards do not dive here and one reason is that they do not want to give the impression to high paying divers that their dive site is contaminated with garbage. • The creation of Thilafushi has not necessarily increased garbage in the house reef. As it happens that the Thilafushi

Date of Consultation	Organization/Group Consulted	Issues/Views on the Project
	changes that took place in the nature of diving in the region were consulted and the following are some of the outcomes of the discussions and general comments made by these stakeholders.	reef is open to a channel, currents are very high and any floating solid waste material is quickly taken away from the house reef and this is why considering the condition of Thilafushi, the house reef is still quite appealing and does not contain a lot of garbage as one would expect. The focus is the southern side of the house reef which is exposed to the channel. • According to Adam Shareef who managed Ocean Dive Desk until 2012, Lions Head or a part of Thilafushi house reef was included in the list of dive sites during their operational period. However, with the worsening of Thilafushi island and as its waste management issues grew bigger, dives to this site were discontinued not because the dive site is not appealing, but due to the poor visible nature of Thilafushi. It became an unpractical routine to take divers who pay US $ 45 to 60 per boat dive to be taken close to an island where large chunks of garage are visible in the island; open burning is done with smoke plumes and frequent garbage dhoonis and boats bring garbage to the island. All these visible features were negative factors for divers and regardless of the contamination status of the reef, divers would not be comfortable to dive in such a place. This is the main reason why no resorts nor any dive centers operating in Malé region do not take divers to this site. • Despite the poor state of Thilafushi, the south-east corner of Thilafushi has a very interesting geographical formation with caves, overhangs and large gorgonians and similarly the south-west also has interesting caves and reef formation. These are features that many divers look for in a dive site.

506. In 2018, a second round of consultation activities took off targeting various institutional and organizational stakeholders under the project. Table 75 below summarizes the issues and views gathered during these consultation activities.

Table 75: Summary of Consultations in 2018

Date of Consultation	Organization/Group Consulted	Issues/Views on the Project
20 September 2018	Ministry of Environment (MOE)	• The project is one of the most significant projects for the Maldives as the outcome of this project would pave way for the government to address the biggest environmental issue currently faced. The success of this project is therefore essential for sustainable environmental management in the Maldives.
20 September 2018	Waste Management Corporation (WAMCO)	• As WAMCO is the operator of the waste management facilities, they are not involved in designing of any waste management project during the design stage and most of it would be undertaken by Ministry of Environment. As such, they have not been part of the decision-making process that decided the technology for the management and disposal of waste at Thilafushi.

Date of Consultation	Organization/Group Consulted	Issues/Views on the Project
20 September 2018	Greater Malé Industrial Zone Limited (GMIZ)	• GMIZ indicated that they are working on a new master plan for Thilafushi and a ring road is planned south of the proposed landfill site. • GMIZ indicated that they are considering making a channel on the southern side of the island to allow flushing in the bay area of Thilafushi. No detail of the concept for this development has been prepared regarding this project. • GMIZ enquired whether the traffic of landing crafts would increase in the future for the transportation of waste from project area. It was explained that the landing craft movement would reduce as the collection of waste and transportation would be carried out in an organized schedule. Hence the operationalization of the Regional Waste Management Facility at Thilafushi for Project area at Thilafushi would not create additional vessel movements inside the Thilafushi lagoon.
20 September 2018	Ministry of National Planning and Infrastructure (MPNI)	• MPNI indicated that the most important aspect of this project is to ensure that the Regional Waste Management Facility does not interfere with the Greater Malé Connectivity Project (GMCP). GCMP is a vision by the government to connect Thilafushi to Malé via Gulhifalhu and Villingili. This project thus aims to connect the greater Malé region through a bridge connection that would eventually be connected to a ring road on south of Thilafushi that is been planned by GMCP. There is a plan to develop a regional port on the western side of Thilafushi and the road connections would allow connectivity to the entire greater Malé islands. This project will not interfere with the road nor its width as the road is already designed and under construction. • Thus, MPNI does not foresee any issues this project will have on any of their projects currently implemented as well as GMPC.
20 September 2018	Parley Maldives	• Certainly, the existing landfill at Thilafushi is the most significant source of pollution in the entire region around the central Maldives. The garbage collected on the island is washed away during high tides and during other abnormal tidal surges as Thilafushi was reclaimed to a very low level. • Parley has been actively involved in reducing and recycling the plastic bottles in Thilafushi. Over 36 months, they have exported 504 containers, 40 feet each. • Each container costs US$ 5000 for logistics and export charges. • They are working with many local logistic companies in trying to reduce the plastic waste. As such, a few companies have been and are giving support to transport plastic bottles from islands to Thilafushi collection center. • According to Parley, their work of recycling plastics has some conflicting issues with WAMCO as they do not want third parties to get involved in waste management. WAMCO's business model was developed based on waste quantity and any reduction in waste quantity is bad for their business.

Date of Consultation	Organization/Group Consulted	Issues/Views on the Project
		• When parley got engaged in collecting plastics from Malé, it reduced the overall burden on WAMCO by reducing by two the daily trips to Thilafushi. • Parley raised the concern that the proposed Regional Waste Management Facility at Thilafushi for Project area has been designed based on incineration of waste. They expressed strong views regarding the importance of source segregation and establishment of a sorting facility at Thilafushi to sort the waste. It was explained that the incineration, or WTE process ensures breakdown of any plastics introduced to the plant through high temperatures and residence time in the furnace, although it was agreed that source separation both decreases the burden on waste transfer and incineration and increases scope for re-use and re-cycling.

507. Following are the list of people who had been consulted as part of this EIA.

Table 76: List of Institutions/Groups Consulted

Person Consulted	Institution
Director General	Ministry of Environment
Environmental Analyst	Ministry of National Planning and Infrastructure
Assistant Project Officer	Ministry of National Planning and Infrastructure
Director General	Environmental Protection Agency
Assistant Director	Environmental Protection Agency
Assistant Project Officer	Environmental Protection Agency
Assistant Oceanographic Observer	Environmental Protection Agency
Manager of Projects Implementation	GMIZ
Deputy Manager of Operations	GMIZ
Operations Officer	WAMCO
Facilities Manager	WAMCO
Executive Director	Bluepeace
Executive Director	Parley
Environment Consultant	Water Solutions
Environment Consultant	Water Solutions
Waste Management Specialist	Kocks Consult GmbH
Dive master	Freelance dive guide
Operations Manager	Best Dives Maldives
Former shareholder	Ocean Dive Desk of Maldives

A. Follow-On Consultation Activities and Focus Group Discussions

508. After undertaking the targeted consultation activities in 2017–2018, several follow-on consultation activities and focus group discussions (FGDs) were held and spearheaded by PMU in 2019, with two consultation activities observed by ADB representatives. Summary of these consultation activities and FGDs is presented in Table 77 below. Compilation of all minutes of consultation activities is attached as Appendix 18.

Table 77: Summary of Follow-on Consultations and Focus Group Discussions

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
5 August 2019	Ministry of Environment	10	Representatives of various national and local government offices Representatives of various tourist resorts around Thilafushi	• General dislike of the existing dumpsite. • Concern on the methane that would be formed in the capped waste and that it may explode. • Clamor to close the existing dumpsite and undertake sampling to determine the impact of leachate. • Concern on impact to the food chain due to heavy metals potentially assimilated in fishes found in Thilafushi. • Inquiry on the basis of design of the WTE, including the life or length of operation, measures to minimize disposal of bottom ash in landfill, impact of population and economic growth, etc. • Clarifications on the German model used in air dispersion modeling. • Operations of many resorts are getting affected due to proliferation of flies and smokes from the existing dumpsite. • Concerns on the floating wastes found around Thilafushi that float to the seas. • Concerns that some resorts and individuals would still continue dump in the sea if they did not want to pay for the services of WAMCO. • Monitoring on the health of the people to ensure they are not impacted by the project. • Concern on potential impact of the project to traffic situation in Thilafushi.
6 August 2019	Ministry of Environment	8	Workers/ employees in Thilafushi	• raised concern wastes dumped at the port at

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
			Representatives of NGOs	Thilafushi and inquired if there was any mechanism to monitor the waste being dumped to the port. • Raised the issue of recycling of plastic wastes instead of incinerating them. • Concerns on unutilized lots/sites in Thilafushi that become a hub for many migrant workers. It was also noted that these placed had very poor living standards and that it needed to be looked into. • Concern on the destruction of the coral reefs because of discharge of cooling water. • Suggestion to segregate wastes to minimize hazardous residuals. • Concern on health risks and status in Thilafushi (irritation of eyes, ears and skin, and also difficulty in breathing and an overall decline in health) which is the reason of increased absenteeism, affecting the productivity.
30 August 2019	Jumhoori Park, Male', Maldives	12	Female Expatriates / Domestic Workers from India	• All the participants have not been to Thilafushi yet. However, they understand that the island is where wastes are disposed. • The group felt that improving the waste management at Thilafushi will improve the condition of people working at the island.
30 August 2019	Jumhoori Park, Male', Maldives	12	Male foreign workers from Bangladesh	• Some of the participants has been to Thilafushi and understand the current situation at the island. All aware that the island is where wastes are disposed. • The group felt that improving the waste management at Thilafushi

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				will improve the condition of people working at the island.
30 August 2019	Jumhoori Park, Male', Maldives	6	Local residents of Male	• The group is supportive of the project and felt that improving the waste management at Thilafushi will improve the condition of people working at the island.
1 September 2019	Thilafushi	9	Male local and foreign workers at Thilafushi	• All workers understand the situation and aware of the current impact (e.g. smoke) of the existing dumpsite to the local people of Thilafushi. • Concern on hearing some explosions due to burning of bottles of canisters from the dump site at night time • Inquiry on when the smoke from the existing dumpsite will be stopped. They view the need to stop this as it endangers the health of the local people. • They are optimistic about the project and hope that the smokestack for the WTE plant will not emit black smoke as what they see now from the existing dump site. • The groups are supportive of the project and felt that improving the waste management at Thilafushi will improve the condition of people working at the island.
1 September 2019	Thilafushi	8	Male local and foreign workers at Thilafushi	
1 September 2019	Thilafushi	13	Male local and foreign workers at WAMCO	• Bad experiences working at the existing dumpsite and its surroundings, including the irritation of eyes and catching throat infection due to the smoke from the dumpsite. Taking sick leave becomes a normal case. • Views that the smoke from the dump site can be reduced if more equipment

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				are provided to manage the dumped wastes. • Happy to continue work at Thilafushi if the waste management is improved. • No worries on losing their jobs when the project is completed. • The groups are supportive of the project and felt that improving the waste management at Thilhafushi will improve the condition of people working at the island.
2 September 2019	Thilafushi	10	Male local and foreign workers at MTCC	• Concern on the need to stop work because the smoke from the dumpsite. • Smoke entering indoors. • Urgent need to address the smoke emission from the dumpsite and better waste management at the island. • Issue on workers getting sick which they believe it is due to the smoke. • Need to improve the situation at Thilafushi dump site. • The WTE project will improve situation at Thilafushi. This will eventually help improve their services by attracting good and experience professional to work at their site. • The group felt that improving the waste management at Thilhafushi will improve the condition of people working and living at the island. Everyone welcomes the project said they are hoping the implementation of the project would commence soon. They said they hope that the big stack at the new waste to energy plant will not have any visible

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				smoke when it becomes operational.
2 September 2019	Thilafushi	7	Male local workers at GMIZ	• The group felt that improving the waste management at Thilhafushi will improve the condition of people working and living at the island. Everyone welcomes the project said they are hoping the implementation of the project would commence soon. They said they hope that the big stack at the new waste to energy plant will not have any visible smoke when it becomes operational.
4 September 2019	Ministry of Environment	13	Residents of Malé and Hulhumale	• Inquiry on the rationale of using incineration instead of implementing 3Rs. • Incinerating high calorific materials such as plastics will discourage/disincentivize the use of single plastic. • Incineration does not encourage sorting or segregation of wastes. • Treatment of hazardous and medical wastes. • Ownership of the energy that will be generated by the WTE plant. • Clarification on the capacity of the WTE plant and if it foresees decline in the waste generation in the future. • Inquiry on the publication of the EIA report and whether or not the people can submit comments.
28 October 2019	MNU Auditorium, Male	12	Residents of Male, Representatives of civic groups/NGOs	**Timing and venue of the public consultation** • Some of the participants raised concern that the timing of the public consultation was not ideal as it falls within the official working hours. A participant also suggested that the

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				University Auditorium was not ideal and that the closed space would discourage people from attending the public consultation. It was suggested that future public consultations should be held after the official working hours in the evening and at a public space such as the "Jumhooree park" to encourage more people to attend. ○ *ME informed that the points mentioned would be taken into consideration for future public consultations* **High-level Technology fund** • A participant inquired what was meant by the high-level technology fund ○ *ME informed they would clarify and inform later. Towards the end of the discussion it was informed that a High-Level Technology Fund is a multi-donor trust fund that provides grant financing to encourage more widespread adoption of high-level technology (HLT) to address development challenges in ADB's developing member countries* **Capacity building** • A participant inquired since there is capacity building in GMEIWMP, what was already being done to acquire information ○ *ME informed that a firm would be hired for capacity building activity and that that the firm would be working throughout the project to*

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				build the capacity of the stakeholders, including island communities. **Involvement of Women**. • A participant inquired why involvement of women was specified in awareness raising. ○ *ME noted that the project aims to increase the involvement of women throughout the different activities planned in the project and as such even the committee under the Grievance Redress Mechanism also specifies that the president of the island's women's committee be included. Women had been involved in all stages of the project development.* **Reduction of Waste** • A participant inquired the plans to reduce waste. Another participant added that instead of incinerating, the solution would be to reduce wast, and decrease the import of items that would create waste. ○ *ME informed that under the project there were plans to increase community awareness with regard to waste reduction. The EIA consultant added that there would be a focus on 3R under the community awareness and behaviour change strategies.* • A participant raised concern that incineration was being used as the solution to reduce waste and stressed that incineration and re-using the 'gunk' from the

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				incineration plant was not the solution. ○ *In the management of waste, even after carrying out successful waste reduction strategies, there will be residual waste that need to be treated and disposed. Incineration has been recommended as an optimum technology for the Maldives. ME informed that the bottom ash could be utilised for road development and that currently a feasibility study was being undertaken.* • A participant inquired if the government's pledge to reduce waste to 3 percent would have an impact on the operation of the plant. ○ *The proposed waste management strategy had taken account to waste reduction strategies. The proposed system would have no impact with current change of policy to ban the use of single use plastic by 2024.* **Public involvement for the whole project** • A participant raised concern that the public consultation was only for the regional waste management facility and not for the whole project. • Moreover, it was added that public involvement should have been at an earlier stage, before incineration was chosen as the way forward to manage waste, as it is similar to the World Bank waste management project in Vandhoo which had failed.

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				○ *ME noted that the waste management project for Zone III has been formulated based on the lesson learnt from the Vandhoo Project. Vandhoo project was s a Design and Build project, and the project had failed because the operator of the facility was different and the Government took a while to handover the facility to WAMCO to run the facility. The current project for the Zone III is a DBO, Design, Built and Operate, building on the lessons from Vandhoo case.* • A participant added that they were not aware of the level of consultations which had taken place with regard to the project. And that since all government infrastructure development projects (such as the Gulhifalhu Reclamation, development of resorts on shallow, development of harbours in the islands) are related, it needs to be considered, and Mministries and other big companies needs to be consulted before undertaking such a project. ○ *ME informed that stakeholder consultations had taken place at all the stages of project formulation from feasibility to EIA. During the feasibility stage, stakeholders were consulted and stakeholder meetings were held. During the designing stage of the project, stakeholders were consulted. Various stakeholders and communities meeting*

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				were held for the EIA for this project in the past 24 months. During these meetings, relevant ministries, resorts and companies had also been invited to participate in the stakeholder meetings and workshops. • Many participants suggested that a multi sectoral discussion should be held for the consultation to be more meaningful. It was also noted that the outcome of the stakeholder meetings was not known to the public. • A participant inquired how much the comments received from the public would be incorporated. Another participant also inquired if the minutes of the meeting would be available. ○ *ME informed that the project formulation has been guided by the inputs from stakeholders in different stages of the project. The minutes of the consultations will be included in the EIA* **Sustainability of the project** • A participant inquired how the project aligns to the SDG goals 1,2,3. He also added that the project had no engagement of the community. He also stressed that civil society should be part of the project instead of creating mega-companies. He also questioned if such a project would be financially sustainable and the dollar value of the cost to the community. He also inquired how the project would affect the human

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				capital and enhance human development. He also drew examples of the Male' Sewerage Project which in his opinion had failed and did not work as designed, because there was no proper oversight from the regulator of the company. He also highlighted that a gap between the design, installation and operation of a project could affect the sustainability of the project, thus a systematic approach would be needed. Another participant also questioned if the approach was sustainable. ○ *ME noted that the various stakeholders including NGOs and Civil Society groups has been engaged in the project development. The project aims to build the overall institutional capacity in the country. And as such, improving the institutional capacity of EPA is a priority. Moreover, since it's a DBO (Design Build Operate) project, the operational issues would be minimized, and local capacity would be developed before the operation is handed over to the Ministry/WAMCO at the end of the DBO period.* • A participant inquired if ME could assure that project would be sustainable and the sustainability plans of the project. Similarly, another participant also questioned the sustainability of the project and inquired if all these aspects had been considered. ○ *ME informed that lessons from similar projects were*

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				being considered, and feasibility studies were undertaken to ensure the project was viable. **No solution for bottom ash** • A participant raised concern that there was no solution for the bottom ash produced from the WTE facility. And stressed that before the project starts there should a proper way for it to be utilised as currently it's only a study which is being undertaken. ○ *EIA consultant briefed that currently there is work going to study the alternative uses for the bottom ash. Presently the study is being focused to use the bottom ask on the production of paving blocks and other similar kind of use in the construction industry. It was also noted that a key objective of the project is to address the waste issue in Thilafushi.* **Producer responsibility and consideration of other government projects** • A participant inquired about the details of the grant and loans and suggested that producers should take responsibility of the waste they generate, and if not, it would be a misusing state funds. As such, she highlighted that resorts are one of the biggest generators of waste and that currently waste from all resorts are being taken to Thilafushi. Thus, the participant questioned how thoroughly the project had considered all these issues and stated that the project

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				seems like a reactionary project and a band-aid solution. She also inquired if the increasing number of resorts and other infrastructure projects had been considered. Another participant also inquired if the population growth in the Greater Male' region had been considered. ○ *EIA consultant briefed the waste to energy facility for the zone III is being financed by ADB through a grant/concessional loan. Resorts bring the waste to Thilafushi because current regulations require the waste from the resorts to be brought to Thilafushi for disposal. The feasibility considered that waste generated from the resorts in the zone III would be brought to Thilafuishi for treatment and disposal. WAMCO will be collecting the waste from the resort and the resorts will pay collection fee to WAMCO which includes the cost of treatment/disposal. The feasibility study considered the populations in the zone III, including the planned increase of resort beds in the region.* **EIA** • A participant also informed that they had been requesting for the EIA and was yet to receive it. Another participant also questioned the results of the EIA, as the participant stated that Thilafushi was dead in terms of biodiversity thus the results were questionable. ○ *ME informed that the EIA would be shared once the*

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				EIA is finalised. It was mentioned that the EIA and annexes including the studies that is part of the EIA would be made available at the ADB website soon for comments. It would be made available on the website for a period of 3 months. EPA would also publish it on their website, once the ME submits the final EIA to EPA. **Inefficiency and ineffectiveness of ME and EPA** • Participants raised concern over the ineffectiveness of Ministry of Environment and the Environmental Protection Agency. It was noted that they do not hear back from the organisations in a timely manner for other matters that they have contacted to those institutions. It was also noted that EPA should have the capacity monitor air emission levels from the project. ○ *PM noted that the project would response on any queries regarding this waste project. ME noted that part of the project is to build the capacity of EPA and strengthen institutional capacity to monitor the air pollution emissions. Air pollution emission stations are recommended to be established at Thilafushi to monitor the impacts of stack emission on Thilhafushi.* **Other waste** • A participant inquired how hazardous waste, medical

Date of Consultation	Location	No. of Participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				waste, construction and demolition waste, and end of life vessels would be handled at Thilafushi when this project is completed. o *ME noted that all the hospitals and health care facilities are required to have autoclaves to treat the medical waste before it is sent to Thilhafushi for treatment and disposal. The proposed facility can manage the hazardous waste in the household. The facility would store any other hazardous waste received. The facility can receive end of life vehicles. ME noted that the facility at Thilhafushi is a municipal solid waste incinerator facility. Government is developing another facility to treat hazardous waste.*

509. In summary of the outcome of the consultations undertaken, the overall impression suggests support of all stakeholders on the project with the view that the solid waste management system in Thilafushi and project area is improved. Main concern of stakeholders is the request to stop the continuous emission of smoke from the existing dumpsite in Thilafushi as they perceive it to be the major cause of health problems in the island. All issues raised that are related to potential impacts of the project have been taken into consideration in this EIA, particularly in providing mitigation measures to avoid or minimize these impacts. As part of full disclosure policy in ADB projects, this EIA report shall be made available to the public and could provide comments on its contents, if any. These comments shall be reviewed and included in further enhancing the EIA report.

B. Future Consultation Activities

510. MOECCT, through the PMU, will continue to conduct meaningful consultations[43] with all stakeholders to ensure they are engaged throughout the design, construction, commissioning and operational phases of the project. Meaningful consultation will be a continuing activity in order to establish a foundation of mutual trust and provide a forum for the exchange of information, through

[43] Per ADB SPS, meaningful consultation is a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle;1 (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

which any issues can be raised with the project team and addressed by agreed action where necessary. This will involve:

(i) Public meetings as the main forum through which the local community will be informed about the progress of the project and any elements that may affect them (such as temporary restrictions in access during the construction period, the timing of deliveries of large equipment items, etc.). These meetings could be held according to need, and the program will be agreed in advance and published on government gazette and in the local press.
(ii) Additional meetings will be held on an ad hoc basis with institutional stakeholders, including government officials where necessary. The aim will be to inform all relevant agencies of project progress and allow discussion and resolution of any specific issues as they may arise.
(iii) Focus group sessions could again be held with the local community when needed, to discuss and organize specific activities and to deal with any issues that can be handled in this way.

511. Four consultation events were held in January 2023 with the Environment Department of the MOECCT, HDC, and the National Disaster Management Authority. Table 78 presents the summary of discussions.

Table 78: Summary of Discussions During Consultations, January 2023

Date	Location	No of participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
03/01/2023	Via MS team	09	1- Ibrahim Mohamed (PMU) 2- Rayya Husain (MOECCT) 3- Bariscan Göğebakan (EPC Contractor) 4- Binh (EPC Contractor) 5- Civan Kalafat (EPC Contractor) 6- Mahmood Riyaz (EIA Consultant) 7- Burak Özdemir (EPC Contractor) 8- Afzal Hussain (MOECCT Water Department) 9- Ahmed Anwar (MOECCT Environment Department)	• EPC contractor representative gave a brief account about the proposed STP plant technology, its treatment level and the location of the plant and the outfall pipe, etc. • Water Department representative questioned about the source of power and questioned if the existing supply of electricity from STELCO would be enough and if there is any provision of a backup generator for the STP plant. • The EPC contractor said that they have a power purchase agreement with STELCO and they have the capacity to meet the requirement of

Date	Location	No of participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				STP. As for the backup generator they have no provision to install such a system as this will be a temporary plant just for the construction phase of the project. • Water Department also questioned about the treatment technology that will be used in the STP and the sludge treatment process. • EPC contractor responded that the STP will use sequencing batch reactors (SBR) technology and the sludge will be dried and disposed at appropriate location at Thilafushi. However, since the plant will be operated for about 3 years the amount of sludge produced from the system would not be a significant amount and it can be managed as per the URA regulations on the matter. • Environment Department representative questioned about the land use plan of Thilafushi and if the location of the WtE is within the designated use in the plan. • In this regard PMU responded this is designated land for WtE as per the land use plan. • Environment Department requested to assess the status of the reef and continue regular monitoring of the reef and take regular samples from the outfall locations. In

Date	Location	No of participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				response, the Consultant mentioned that this is ADB category A project so environmental standards are maintained and the regular monitoring is conducted on a quarterly basis from the reef ground water as well as sea water.
08/1/2023	Via MS team	11	HDC 1-Ibrahim Mohamed (PMU) 2- Rayya Husain (MOECCT) 3- Bariscan Göğebakan (EPC Contractor) 4- Binh (EPC Contractor) 5- Civan Kalafat (EPC Contractor 6- Mahmood Riyaz (EIA Consultant) 7- Burak Özdemir (EPC Contractor) 8-Ahmed Maisam Musthafa (HDC) 9-Dhimyan Ahmed Ismail (HDC 10-Hassaan Abdul Muhsin (HDC) 11- Mohamed Nail (HDC)	• The drawings that were shared with the HDC has the line drawing of the permanent discharge pipelines and one of the concerns raised by the HDC was that the proposed pipeline runs along outer road that is proposed to be developed in Thilafushi. To this point that the meeting is to discuss the temporary STP and the outfall that runs across the road into the outer reef about and will be discharged about 5 m deep. They requested to have the methodology of the proposed permeant discharge line at a later stage, which the EPC contractor confirmed that the details will be discussed with HDC at a later stage. With regard to the proposed temporary STP and discharge pipelines HDC raised the following issues: • They need to know the exact methodology of laying the pipe if it will be laid under the ground across the road or other

Date	Location	No of participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				method. For this EPC contractor mentioned that the pipe will be laid underground at about 1 m -1.5 m deep across the road. The EPA contract will share the detailed methodology with HDC. • They also inquired about the sewage treatment technology that will be used in the proposed STP and the processes involved. EPC contractor explained that the proposed technology is SBR and explained the processes and treatment steps of the STP. • One of the concerns raised by the EPC contractor is that how the pipeline will be laid on the seawall. For this HDC responded that since that the STP will be pumping out through the discharge line they want the pipeline to go on top of the seawall. If the pipeline goes through the seawall, it will be damaged and the integrity of the structure will be affected. Therefore, HDC wants the pipeline to be on top of the seawall. • EPC contractor also inquired about the approvals and permits and documents that will be required. In response they need the detailed drawing and methodology to be submitted to urban department ust@hdc.com.mv to obtain the necessary permits.

Date	Location	No of participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
03/01/2023	Via MS team	8	National Disaster Management Authority (NDMA) 1-Ibrahim Mohamed (PMU) 2- Rayya Husain (MOECCT) 3- Bariscan Göğebakan (EPC Contractor) 4- Binh (EPC Contractor) 5- Civan Kalafat (EPC Contractor 6- Mahmood Riyaz (EIA Consultant) 7- Burak Özdemir (EPC Contractor) 8-Haleemath Nahula (NDMA)	The following concerns were raised by the NDMA • Must have proper risk mitigation measures in place particularly in case of rain-induced flood or wave-induced flooding and bad weather conditions. • Proper fire mitigation measures and conduct regular fire drills and must have proper contingency plans response teams activities, etc • To this point the EIA consultant mentioned that there is a risk of slope failure from the existing waste dumpsite and objects falling or flooding in case of continuous heavy rains. A proper fencing and protection measures may be required. • The staff should be given proper training to use various types of equipment including fire and other safety measures • There must be a proper information- sharing mechanism in place in case an incident occurs. EPC contractor responded that they have HSE plan that addresses these issues and it is very seriously implemented in this project. • NDMA also suggested to keep records of all the incidents and report to authorities and there must be a established mechanism for the reporting procedures. EPC contractor responded that this is

Date	Location	No of participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				already covered, and the procedures are established in this project. Workers as well as employees will be trained to use the proposed system. • NDMA also requested to share the information on emergency incidents with them and other designated authorities. • Representative of NDMA mentioned that if they have any information on disaster in Thilafushi in the past she will share with the consultant.
03/07/2023	Green Building Auditorium	9 males and 4 females	1. Dr. Ibrahim Mohamed – Environmental and Social Safeguards (ESS) Specialist, Greater Malé Waste-to-Energy Project 2. Ahmed Azim – Information, Education & Communications (IEC) Specialist, Greater Malé Waste-to-Energy Project 3. Javier Gamero Sutil – Urbaser Project Manager at Thilafushi Facility Project (DBO Contractor) 4. Mohamed Akram, WAMCO 5. Aiminath Shafrath Adam, WAMCO 6. Suhail Jaufar, MWSC 7. Ahmed Hamad, MWSC 8. Shahina Ali, Parley Maldives 9. Mohamed Imad, Ministry of Planning 10. Ibrahim Miflal, Zero Waste Maldives	**Mohamed Imad:** Enquired how the public can report a grievance on the project's activities when the site is on a fenced location away from Malé City **Response:** As the site area is a fenced area, people who may be impacted are generally people who work and visit Thilafushi industrial area. There is no large population who will be impacted by the construction work being carried out in the Thilafushi site. **Suhail Jaufar:** Enquired about the sewage network in Thilafushi and if the WtE project site is connected to main water and sewer network. **Response:** The labor camp setup has been completed, including an STP (sewage treatment plant) ensuring international best

Date	Location	No of participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
			11. Ahmed Afrah Ismai, Zero Waste Maldives 12. Haleemath Shazleen, MoECT 13. Zainee Hussain Zamee, MoECT **Invitees who were unable to attend** Maldives National Association for Construction Industries, Urabnco, Maldives transport and Contracting Company, Utility Regulatory Authority Maldives Association for Tourism Industries Male' City Council Maldivian Red Crescent, Ministry of Tourism, Economic Ministry, Male Atoll Council WDC of Male' City Iss Rahvehinge Jamiyya (NGO),	practices for sewage treatment. Currently, water is stored to cater for two working days. The contractor has received an operational permit from the URA, authorizing the operation of the STP. Additionally, a temporary biological treatment plant is in operation, with regular analysis conducted every two weeks to monitor discharge parameters. As part of the project's compliance with EU standards, plans are in place to establish a leachate treatment plant and a waste water treatment plant on-site in the operation phase, utilizing reverse osmosis and biological treatment methods. **Ibrahim Miflal:** Enquired about the use of the treated waste water on-site **Response:** At the moment, the treated water is being discharged in to the open sea away from reefs edge. In the near future it will be used for cleaning, dust control, landscaping, and the water will be reused. **Mohamed Imad:** Enquired if the project design includes the provision for a visitor center **Response:** As the facility is being constructed at the site of an ongoing operation therefore, it is not safe for day-to-day visitors at the moment. However,

Date	Location	No of participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				there are provisions in the WtE facility for an auditorium and a walkway will be built to show the WtE facility in operation, once completed. Furthermore, the PMU is undertaking the development of a visitor center and supporting guidelines as part of the project's public awareness initiatives. **Ibrahim Miflal:** Enquired regarding the adequacy of the 15-year period for managing and operating a facility of this nature, including the ultimate state of the landfill upon the conclusion of the contract. **Response:** Urbaser will be managing it for 15 years, after which the Government of Maldives (GoM) will be taking over the operations. Furthermore, there will be a deliberate effort made by Urbaser to successfully transfer the operation skills back to the country for smooth handover. Furthermore, the 15-year period is more than sufficient to make a lasting positive impact on the challenges of waste management and treatment in the Maldives. **Ibrahim Miflal:** Enquired about the emissions and the environmental impact due to the steam released to the air and emission control measures.

Date	Location	No of participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				Response: The project aims to achieve minimal or negligible emissions. To ensure this, an emission monitoring system (EMS) will be installed at the plant. Additionally, an independent third-party will be involved in monitoring the emissions as part of the project. Urbaser already shares all relevant information related to the operations of its other WtE plants globally, following corporate policy. The EMS data from the Thilafushi facility will also be made publicly available. The reporting frequency of these systems will be determined based on regulatory requirements, and reports will be publicly available. **Ahmed Afrah Ismail:** Enquired about the number of air quality monitoring stations presently in use and if Gulhifalhu includes a station. **Response:** Seven air quality monitoring stations are operational, with six in Thilafushi and one in Villimalé. They collect monthly data and provide public statistical reports on air quality. Quarterly reports are submitted to the EPA and ADB for approval before being published on our website. No immediate plans for an

Date	Location	No of participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				AQM station in Gulhifalhu, but will be considered if necessary. **Ibrahim Miflal:** Enquired regarding potential risks to the project, specifically in terms of changes in public behavior and national policies. **Reponse:** The main challenge is the rising sea temperature, which can impact the efficiency of the turbine in the complex steam cycle designed for the plant. Efforts with the GoM are focused on increasing awareness among school children for proper waste segregation. Once operational, the facility will effectively manage waste and positively impact electricity production costs in the country. **Ibrahim Miflal:** Enquired about the minimum calorific requirement. **Response:** A total of 6,500 kJ of energy is required for the sustained operations of the plant. The initial study revealed that the waste composition at Thilafushi has a calorific value of 8,500 kJ. **Ibrahim Miflal:** Enquired regarding the plans for operating the plant in the event of a reduction in waste quantity or if the waste exceeds the daily manageable capacity of 500 tons. **Response:** WAMCO has been baling waste at Thilafushi for 12

Date	Location	No of participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				months, which will lead to a 3-year backlog to process when the WtE facility is operational. The bunker at the WtE facility has a 5-day storage capacity as well. To accommodate an increase in waste volume, WAMCO will continue waste baling or the project will consider activating the third line, capable of processing an additional 250 tons. **Ibrahim MIflal:** Enquired regarding the funding for the 3rd line. **Response:** The project encompasses the construction of the bunker and all operational facilities required for the third line, excluding the turbine. Funding has not been secured at this time. **Ibrahim MIflal:** Enquired on what could lead to a potential shut down of the plant. **Response:** In the event of a fire in the bunker, automatic monitors and a fire program will be installed to ensure safety. Smoke detectors with a capacity of 20 liters per second are already installed. Water for fire suppression will be sourced from rainwater and desalinated water through a recycling system integrated into the facility. Additionally, a rainwater harvesting system will be constructed at the plant. These measures aim to enhance fire safety and utilize sustainable water sources for firefighting purposes. **Ibrahim Miflal:**

Date	Location	No of participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				Enquired regarding whether Urbaser Maldives, as a Spanish firm, is required to report emission data to the EU. **Response:** The EU Commission does not have the authority to impose fines on Urbaser in this context. As the contract is between Urbaser and the Government of Maldives (GOM), the company would be subject to local legislation and regulations. **Ahmed Afrah Ismail:** Enquired regarding the operation of the plant for 11 months and on what will happen during the remaining month of the year. **Response:** The plant will be operational for 8,000hrs. per year. The plant will need to be turned off for routine maintenance, but it will be done systematically where one 250t line will continue to operate even during the maintenance period. **Mohamed Imad:** Enquired on the number of locals who will be employed at the facility. **Response:** Urbaser strives to employ local individuals for the project. However, it has been difficult to find locals willing to work at a waste treatment facility. To address this challenge, there are efforts being undertaken to engage local firms to subcontract certain aspects of the project, such as electricity works for the facility. This approach allows the

Date	Location	No of participants	Description/Affiliation of Participants	Issues and Views Raised by Participants
				project involve local businesses and contribute to the local economy while ensuring the successful establishment of the plant.

512. The PMU will also be supported by a public awareness and community capacity building (PACCB) consultant, a consulting firm that will help generate awareness and strengthen skills in waste collection, segregation, compositing, recycling, and O&M targeting the poor and women, including community awareness campaign for strengthening disaster risk reduction and climate change readiness. PACCB is responsible for the IEC initiatives and public awareness on waste-to-energy as described in Appendix 3 of the Project Administration Manual.

C. Information Disclosure

513. The MOECCT, through the PMU, will comply with the disclosure requirements of ADB SPS and national law, and will ensure that the final EIA report will be disclosed and made available for review by the local community and other stakeholders. PMU will submit a copy of the EIA report to ADB for final review and disclosure on ADB website. PMU will also disclose the ADB-approved version of the EIA report on the project website. For any updating of the EIA in the future, PMU will ensure that the updated or revised EIA report is submitted to ADB for another review and disclosure on ADB website. Similarly, all other reports such as quarterly environmental monitoring reports produced throughout the construction and operation stages of the project will also be reviewed and disclosed in the same way.

17. In compliance with the Maldives EIA Regulation, the EIA report will be submitted to the Maldives EPA for its consideration before such report is reviewed and approved. The Maldives EPA will make the report public on their website. The public can access the full EIA report from the Maldives EPA's website (www.epa.gov.mv). The project-affected groups and local nongovernment organizations can provide their comments/inputs to Maldives EPA in their deliberation, within 28 working days before the Maldives EPA makes a decision regarding acceptance of the Maldives EPA report for the project.

VIII. GRIEVANCE REDRESS MECHANISM

514. The project will adopt the grievance redress mechanism (GRM) as outlined in the EIA report. The GRM established and adapted for the project is provided in Appendix 25. This will ensure that consultation, disclosure and community engagement continue throughout project implementation. The grievance redress mechanism will allow for concerns and grievances about the project's social and environmental performance raised by individuals or groups from among project-affected communities to be received and to facilitate resolution of those concerns and grievances. The Grievance Redress Mechanism includes 3 tiers. Every effort shall be given to find an amicable solution before higher tiers could be engaged. The project GRM will not supersede any legal government grievance procedures. Affected people are to be informed about the mechanism through media and public outlets. This participatory process shall ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process. An information board providing the contact details will be made available at the project site at Thilafushi, and a register of grievances will be maintained at MOE.

A. First Tier (DBO Contractor)

515. An individual or an interest group can contact DBO Contractor for grievances.

(i) At the project location there will be an Information Board listing the names and contact telephones/emails.
(ii) If the complaint is resolved within 10 days, DBO Contractor must communicate the decision to the aggrieved party in writing.
(iii) If no satisfactory solution is reached through the Tier I process, the aggrieved party may notify the MOE, in writing of the intention to move to Tier II.

B. Second Tier (PMU/MOE)

516. An individual or an interest group can contact PMU/MOE for grievances.

(i) At the project location there will be an Information Board listing the names and contact telephones/emails.
(ii) If the grievance cannot be resolved informally by contacting DBO Contractor, an aggrieved party must submit a complaint on the Tier 2 by sending an email to secretariat@environment.gov.mv
(iii) If the complaint is resolved within 15 days MOE must communicate the decision to the aggrieved party in writing.
(iv) If a complaint requires more time to address, this requirement must be communicated to the aggrieved party in writing and the aggrieved party must consent and sign-off the request for the extension to take effect. An extension can be made to an additional 15 days.
(v) Complaint Form. A copy of the form should be provided to the aggrieved party as evidence of receipt. The complaint form should be available from the website of MOE.

C. Third Tier (Judiciary)

517. An individual or an interest group has the option of going to established judiciary system of the Maldives.

(i) The legal system is accessible to all aggrieved persons.
(ii) Assistance from the MOE would be available only for vulnerable person as per this grievance mechanism.
(iii) In cases where vulnerable person(s) are unable to access the legal system, the Attorney General´s office will provide legal support to the vulnerable person(s).
(iv) The verdict of the Courts will be final.
(v) A vulnerable person(s) for the purpose of this project is a person who is poor, physically or mentally disabled/handicapped, destitute, and disadvantaged for ethnic or social reasons, an orphan, a widow, a person above sixty-five years of age, or a woman heading a household.

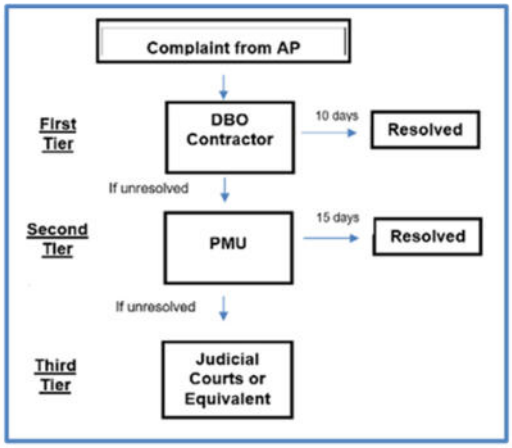
518. The affected persons can also direct contact (in writing) the ADB Project Officer at ADB headquarters. The complaint can be submitted in any of the official languages of ADB's Developing Member Countries. This may be done at any time by sending the written complaint to the following address:

Project Officer – Greater Malé Environmental Improvement and Waste Management Project
South Asia Urban Development and Water Division
South Asia Regional Department
Asian Development Bank
6 ADB Avenue, Mandaluyong City 1550
Metro Manila, Philippines

519. The APs can also use the ADB Accountability Mechanism (AM) through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB. The complaint can be submitted in any of the official languages of ADB's DMCs. The ADB Accountability Mechanism information will be included in the Project Information Document to be distributed to the affected communities, as part of the project GRM.

520. The GRM notwithstanding, an aggrieved person shall have access to the country's legal system at any stage through the Maldives judicial or appropriate administrative system. This can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM. The follow diagram of resolving complaints under GRC is shown in Figure 193 below.

Figure 191: Grievance Redress Mechanism Diagram



Grievance Redress Mechanism Complaint Form

Greater Malé Waste to Energy Project welcomes complaints, suggestions, queries and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing *(CONFIDENTIAL)* above your name. Thank you.

Date		**Place of registration**		
Contact Information/Personal Details				
Name		**Gender**	**Male** **Female**	**Age**
Home Address				
Village / Town				
District				
Phone no.				
E-mail				
Complaint/Suggestion/Comment/Question Please provide the details (who, what, where and how) of your grievance below: **If included as attachment/note/letter, please tick here:**				
How do you want us to reach you for feedback or update on your comment/grievance?				

FOR OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)	
If – then mode: ■ **Note/Letter** ■ **E-mail** ■ **Verbal/Telephonic**	
Reviewed by: (Names/Positions of Official(s) reviewing grievance)	
Action Taken:	
Whether Action Taken Disclosed:	**Yes** **No**
Means of Disclosure:	

This form can be emailed to: zone3wte@environment.gov.mv

GRIEVANCES RECORD AND ACTION TAKEN

Sr. No.	Date	Name and Contact No. of Complainant	Type of Complaint	Place	Status of Redress	Remarks

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Objectives

526. Environmental Management Plan (EMP) is the document through which mitigation measures are proposed following the assessment of the impacts of a project. The EMP sets out the mitigation measures to these impacts, monitoring plan and institutional arrangements that need to be observed during construction and operation of the WTE plant. The budgets to cover the cost of implementing the EMP, including costs associated with implementing the GRM, are also provided.

527. The purpose of the EMP is to ensure that the activities are undertaken in a responsible, non-detrimental manner with the objectives of: (i) providing a proactive, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on-site; (ii) guiding and controlling the implementation of findings and recommendations of the environmental assessment conducted for the project; (iii) detailing specific actions deemed necessary to assist in mitigating the environmental impact of the project; and (iv) ensuring that safety recommendations are complied with.

528. The EMP also sets out the mitigation measures that the DBO Contractor is required to provide during project design, construction and operation, and the manner in which the PMU requires the mitigation to be provided. The EIA report will be included in the DBO bidding and contract documents, so by accepting the contract, the chosen DBO Contractor will be legally obliged to implement all specified mitigation measures; including the allocation of budget to implement all mitigation measures and monitoring activities required in the EMP, and provisional sum that will ensure funding for any budget shortfall or for addressing any unanticipated impacts during the construction and operation phases of the project. The methods to be used for site preparation, construction, operation, and commissioning, as well as associated arrangements to ensure sound environmental management and safety at all times, are already defined in the bid documents. The DBO Contractor shall prepare a site-specific EMP (SEMP) based on the EMP presented in this EIA report in order to make it relevant to the construction and operation phases. The DBO Contractor shall prepare SEMP 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 project. The scope of the SEMP shall address all of the issues itemized in the EMP in this EIA report. The SEMP shall have the same level or stricter set of measures than those included in the EMP of this EIA report. The SEMP shall consider ISO 14001 when detailing the environmental management system in place. The DBO Contractor shall submit the updated EMP to PMU. PMU shall submit a copy of the updated EMP to ADB for review and disclosure.

529. However, if there will be significant changes in the final detailed design compared to the preliminary design used in the EIA, the DBO Contractor shall update the EIA report, including the EMP and EMOP, accordingly, including budget that will cover implementation of any added mitigation measures and monitoring activities. The DBO Contractor shall submit the updated EIA to PMU, and the PMU shall submit the updated EIA to ADB for final review and disclosure.

530. The DBO Contractor will be required to (i) establish an operational system for managing environmental impacts (ii) carry out all of the monitoring and mitigation measures set forth in the EMP and SEMP; (iii) implement any corrective or preventive actions set out in safeguards monitoring reports that PMU will prepare from time to time to monitor implementation of this EIA

and EMP; and (iv) allocate a budget for compliance with these EMP measures, requirements, monitoring activities and actions, including provisional sum where to draw budget for any shortfall in the initial budget estimates and for addressing any unanticipated impacts during construction and operation phases of the project.

B. Institutional Arrangement

531. Implementation Arrangements. The executing agency is the Ministry of Finance (MOF). The implementing agency is the Ministry of Environment, Climate Change and Technology (MOECCT) which establish a project management unit (PMU) comprising officials and staff from MOECCT. The PMU will be continuously strengthened with external experts as may be needed through the project implementation. The project steering committee chaired by Minister, through the MOE, will provide overall guidance and strategic directions to the project. The PMU will be supported by a project management, design and supervision consultant (PMDSC), a professional engineering and management consulting firm. PMDSC will assist in the delivery of the different project components, which include the design, construction and initial operations (including capacity building of EPA, MOECCT and PMU in monitoring operations) of WTE facility and associated landfill of air pollution control residuals and non-marketable incineration bottom ash. PMDSC will act as MOECCT's representative during the design and build period and the first two years after the successful commissioning of the WTE plant (operation period). PMDSC will have a national and international environmental safeguards specialist consultant responsible for overseeing implementation of environmental safeguards on behalf of MOECCT and PMU. The terms of reference for PMDSC is attached as Appendix 19. The DBO Contractor will be responsible for the design and implementation of the project, and other responsibilities as indicated in the DBO contract documents. The PMU will also be supported by a public awareness and community capacity building (PACCB) consultant, a consulting firm that will help generate awareness and strengthen skills in waste collection, segregation, compositing, recycling, and O&M targeting the poor and women, including community awareness campaign for strengthening disaster risk reduction and climate change readiness.

532. **Project Management Unit.** MOECCT has set up a PMU at its Waste Department. The PMU will oversee the implementation of the project by the DBO Contractor. PMU staff comprise eight staff as follows: (i) Project Director (part-time, Director General of Department), (ii) Project Manager, (iii) Procurement Specialist, (iv) Finance Specialist, (v) Safeguard Specialist, (vi) Civil Engineer, (vii) Information, Education and Communication (IEC) Specialist, and (viii) administrative assistant. The Project Director (part-time) is empowered to take official decisions, while remaining PMU staff (full time) are recruited from the market. The PMU will be supported by the PMDSC and PACCB consultants for project management, capacity building, monitoring, and technical design and supervision support.

533. **Terms of Reference for PMU Environment Officer.** Key tasks and responsibilities of the PMU environment officer are as follows:

(i) Ensure that EIA report with the EMP is updated based on final detailed designs, in coordination with the DBO Contractor;
(ii) Ensure that EIA report with the EMP is included in DBO bidding and contract documents;
(iii) Ensure that costs for implementing the EMP, including those special cost indicated in **Table 71**, are included in the BOQ (or equivalent) of the DBO bidding and contract documents;

(iv) Ensure that the DBO Contractor's SEMP is consistent with the EMP. The SEMP shall have the same level of detail or stricter mitigation measures than the EMP;
(v) Provide oversight on environmental management aspects of the project and ensure EMP and SEMP are implemented by the DBO Contractor;
(vi) Establish a system to monitor environmental safeguards of the project, including monitoring the indicators set out in the monitoring plan of the EMP;
(vii) Confirm compliance of DBO Contractor with obtaining statutory clearances or permits required under the project, including environmental clearances as applicable;
(viii) Review, monitor, and evaluate the effectiveness with which the EMPs are implemented, and recommend necessary corrective actions to be taken as necessary;
(ix) Consolidate monthly environmental monitoring reports from DBO Contractor and submit quarterly monitoring reports to ADB and required reports to Maldives EPA;
(x) Ensure timely disclosure of final EIA report in locations and form accessible to the public;
(xi) Address any grievances brought about through the grievance redress mechanism in a timely manner;
(xii) Provide assistance to DBO Contractor's EHS Manager (as may be needed) on delivering orientation to DBO Contractor's personnel regarding environmental management arrangements for the project;
(xiii) Visit worksites during construction phase and WTE plant site during operation phase, and provide guidance relating to supervision and compliance monitoring;
(xiv) Provide necessary support to the external environmental expert consultant who will be retained under the project (see below description of external environmental expert); and
(xv) Provide inputs to progress reports and the project completion report.

534. **PMDSC Environmental Safeguards Specialists.** The PMDSC Environmental Safeguards Specialist Consultants will have the following responsibilities:

(i) Assist PMU in meeting requirements of ADB SPS 2009 and government on environment, occupational health and safety, and labor standards.
(ii) Assist PMU in obtaining all necessary permissions and complying with statutory requirements;
(iii) Ensure DBO Contractor submits requirements per EMP and government clearances/permits,
(iv) Provide support to DBO Contractor in preparing the site-specific EMP (SEMP) to ensure ADB SPS 2009 and conditions in government clearances are incorporated accordingly;
(v) Assist PMU in updating the EIA for any change in scope, design, location, or unanticipated impacts that are not reported in the EIA;
(vi) Review any changes in the DBO Contractor's design and support PMU in ensuring environmental assessment, impacts avoidance and mitigation measures are reflected in the SEMP and updated EIA
(vii) Assist the DBO Contractor and the PMU in all EPA related clearances, and ADB's no-objection, and monitor and control construction and assembly compliance against the updated EIA, ADB SPS 2009, and SEMP;
(viii) Monitor the contractors' compliance with all safety requirements as stated in DBO contract and SEMP, during and prior to any construction activity.

(ix) Assist in preparation of accident report and keeping accident records on-site as required;
(x) Monitor the implementation of the SEMP during construction and pre/post construction phases;
(xi) Assist PMU in continuing stakeholders engagement, consultations, information disclosure and addressing complaints/grievances;
(xii) Develop public awareness program and materials to support wider understanding of the project, potential impacts and measures to ensure impacts are avoided, mitigated and affected people, if any, are compensated;
(xiii) Assist PMU in preparation of environmental monitoring reports
(xiv) Coordinate with external environmental experts on results of independent monitoring and support PMU to prepare corrective actions, if required
(xv) Provide and organize trainings/workshops/seminars on environmental safeguards, occupational health and safety, and labor standards
(xvi) Assist PMU in review of contractor's health and safety program and in monitoring its implementation;
(xvii) Support PMU during ADB review missions;
(xviii) Support PMU in developing data management system on environmental safeguards; and
(xix) Other tasks related to environmental safeguards, occupational health and safety, and labor standards.

535. **DBO Contractor**. The DBO Contractor will have primary responsibility for implementing the EMP during the construction stage and will:

(i) Appoint a qualified full-time environmental health and safety (EHS) manager to manage implementation of the EMP and monitoring plan;
(ii) Ensure that sufficient number of engineers/staffs are trained effectively on the implementation of the EMP and SEMP who will assist the EHS manager, subject to internal manpower arrangements. No shift schedules shall be without either the EHS manager or at least one trained engineer/staff on EMP and SEMP implementation;
(iii) Obtain necessary environmental license(s), permits, etc. from relevant agencies as prior to commencement of civil works contracts;
(iv) Undertake all necessary studies required in this EIA report, such as, climate vulnerability and risk assessment at the proposed site, among others as may be deemed necessary;
(v) Prepare all work program and pre-approved project plans required for implementing the EMP during construction phase as follows:

a. Construction Waste Management Plan;
b. Occupational Health and Safety Plan following international best practices on occupational health and safety such as those in Section 4.2 of IFC EHS Guidelines on Construction and Decommissioning Activities;
c. Construction Camp Development and Management Plan;
d. Spill Control and Containment Plan;
e. Marine and Beach Area Construction Work Plan;
f. Erosion Control Plan for pipeline works; and
g. Traffic Management Plan around the construction site to ensure easy access and passage of workers and employees of establishments at two sides of the project site;

(vi) Prepare all work program and pre-approved project plans required for implementing the EMP during operation phase as follows:

a. Operation and Maintenance Manual;
b. 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, if practical;
c. In-house Solid Waste Management Plan;
d. 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;
e. Spill Control and Containment Plan; and
f. Emergency and Disaster Preparedness and Response Plan;

(vii) Implement all mitigation measures in the EMP and activities in the Monitoring Plan, including allocation of budget to implement the EMP/SEMP, monitoring program and measures for any unanticipated impacts during the construction and operation phases of the project;
(viii) Ensure that all workers, site agents, including site supervisors and management participate in training sessions delivered by the project proponent;
(ix) Ensure compliance with environmental statutory requirements and contractual obligations;
(x) Participate in resolving issues as a member of the Grievance Redress Committee;
(xi) Respond promptly to grievances raised by the local community or any stakeholder and implement time-bound environmental corrective actions or additional environmental mitigation measures as necessary;
(xii) Based on the results of EMP monitoring, cooperate with the PMU to prepare and implement time-bound corrective action plans, as necessary; and
(xiii) Provide necessary support to the external environmental expert consultant who will be retained under the project (see below description of external environmental expert);

536. External Environmental Expert. In compliance with the requirement of ADB SPS 2009, the project, as a Category A undertaking with significant impacts and risks, shall retain an external environmental expert consultant who will verify monitoring information. The environmental expert shall have expertise on WTE project operations and experience in management and monitoring of environmental impacts of such kind of development projects. The environmental expert shall be retained starting from the time the DBO Contractor mobilizes up to the operation phase. The environmental expert will coordinate and work closely with PMU and the DBO Contractor when planning or fielding monitoring activities, including requests for information or documents that will facilitate the task. Per ADB SPS, the environmental expert shall not be involved in day-to-day project implementation or supervision of the project and will report directly to ADB, or occasionally through the PMU. The terms of reference of the environmental expert is attached as Appendix 20.

C. Environmental Management Plan

537. Table 79 shows the Environment Management Plans (stage-wise) summarizing the potential adverse environmental impacts, proposed mitigation measures, responsible parties, and cost of implementation. This EMP will be included in the DBO bidding and contract documents and will be further reviewed and updated, including the specific costs, during detailed design

phase. Table 80 shows the proposed Environmental Monitoring Plan (EMOP) for the project. It includes all suggested environmental parameters, description of sampling stations, frequency of monitoring, applicable standards, and responsible parties. Likewise, the EMOP will be further reviewed and updated during the detailed design phase.

Table 79: Environmental Management Plan Matrix

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
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 Before the issuance of bidding documents for IFB Before awarding of contracts	PMU - Ministry of Environment	Ministry of Environment	None.
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. • 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 cooling water and discharge of cooling water will have no or minimum impact to underwater ecosystem. • 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. • Undertake hot water dispersion modeling along the planned area of discharge. Ensure that this area is with no or least	Planned and implemented Numerical modeling output for 4 seasons	Once to review modeling output. Once during finalization of outfall configuration	DBO contractor through a preapproved agency	PMU	Part of DBO Contract

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		marine species that could be affected based on the underwater ecology study (as described above). • 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. • Ensure that design considers achievement of proper mixing and rapid dilution within a small area around the outfall. • Consider in the design the combined outfall for hot water and treated wastewater to minimize impact to marine ecosystem.					
Locating ambient air quality monitoring stations	Improper locations of sampling locations leading to underestimated ambient air quality condition and health risk to people.	• Contract documents to include performance guarantee for the facility that emissions comply with applicable standards. • Conduct wind data gathering for various seasons of the year to map projected wind directions at any season during plant operations. • Design smokestacks with height that will ensure emissions will have no or minimum impact to surrounding receptors within the direct and indirect impact zones. • Undertake air dispersion modeling to show and	• Ambient air monitoring station site map	Once of during the detail design stage	DBO contractor	PMU	Part of DBO Contract

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		understand the behavior and movement of components of flue gas from the stacks. • Based on the dispersion modeling, identify the appropriate sampling locations for ambient air quality in Thilafushi island and other islands nearby, if necessary and practical. • 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.	• 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. • Provide cross drainage structures wherever necessary along the new approach roads. • Integrate the above considerations in the final drainage plan for the project site.	• Site drainage plan	Once of during the detail design stage	DBO contractor	PMU	Part of DBO Contract
Physical integrity of proposed project site.	Failure of site to withstand proposed project infrastructures.	• Integrate results of geotechnical study undertaken by the government to the design of project infrastructures.	• Geotechnical study report. • Recommendations of geotechnical study integrated in detailed design.	Continuing during detailed design stage.	DBO contractor	PMU	Part of DBO Contract
	Failure of site to withstand climate change, including extreme	• Undertake and include results of climate vulnerability and risk assessment (CVRA) in the design of the project.	• CVRA report • Recommendations of the CVRA report integrated in detailed design.	Continuing during detailed design stage.	DBO contractor	PMU	Part of DBO Contract

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
	weather events.	• Provide site protections based on the risks identified in the CVRA.					
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: o Construction Waste Management Plan. o Occupational Health and Safety Plan following international best practices on occupational health and safety such as those in Section 4.2 of IFC EHS Guidelines on Construction and Decommissioning Activities. o Construction Camp Development and Management Plan. o Spill Control and Containment Plan o Marine and Beach Area Construction Work Plan o Erosion Control Plan for pipeline works o Traffic Management Plan around the construction site to ensure easy access and passage of workers and employees of establishments at two sides of the project site. • Develop the following plans or manuals that shall be utilized during operation stage: o Operation and Maintenance Manual	• Work plans included in the final detailed design of the project • Work schedule for each plan included in the overall schedule of project implementation.	Once prior to start of construction works.	DBO contractor	PMU	Part of DBO Contract

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		○ 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. ○ In-house Solid Waste Management Plan. ○ 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. ○ Spill Control and Containment Plan. ○ Emergency and Disaster Preparedness and Response Plan.					
Consents, permits, clearances, no objection certificate (NOC), etc.	Stoppage of activities due to lack of permits or clearances from the local and national governments.	• Obtain all necessary consents, permits, clearance, NOCs, prior to start of civil works.	• Clearances and approvals	Once prior to start of construction	DBO contractor	PMU	No additional costs
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. • Prepare a contingency plan to include actions to be done in case of unintentional interruption of services, such as the following:	• Maps showing utilities and likely disruptions	Once prior to start of construction.	DBO contractor	PMU	No additional costs

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		○ In case of water supply disruption, provide temporary water supply source for the affected establishments. ○ In case of power interruption, 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. • 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	Greater 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. • No construction camp shall be located on the beach or overwater. • 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. • No temporary storage shall be located at the lagoon section • Waste shall be disposed in existing approved disposal sites; any new sites shall be developed considering siting guidelines, maintained and operated accordingly	• List of preapproved sites for construction work camps, areas for stockpile, storage and disposal • Construction Waste Management Plan	Once prior to start of construction	DBO contractor	PMU	No additional costs

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
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 • 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 • 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 • Submit to PMU on a monthly basis, documentation (materials quantities with source).	Permits issued to quarries/sources of materials	Once prior to start of construction	DBO contractor	PMU	No additional costs
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. • 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	No additional costs
Final Detailed Design Components	Air and marine water pollution due to inappropriate	• Ensure the final detailed design will integrate the following mandatory requirements:	Detailed design that uses recommendations of the EIA report.	Continuing during detailed design stage.	DBO Contractor	PMU	Part of DBO contract

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
	components included in the detailed design.	○ Use of best practical incineration technology as recommended in the EIA. ○ Use of stack height recommended in the EIA. If circumstances on the basis of the recommended stack height have 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. ○ Installation of air pollution control device that will ensure emissions comply with the emission standards as indicated in the EIA. ○ Ensure to include installation of a continuous monitoring system (CEMS) as a mandatory requirement in the design. ○ Appropriate sampling port at the stack for random grab sampling activities. ○ Leachate treatment plant designed based on (i) maximum expected volume of leachate generated, and (ii) full capacity operation of the WTE plant. ○ 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.					

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		○ Provision of a sampling port for thermal water (heated cooling water) at appropriate and accessible location along the cooling water line.					
Additional Baseline Data Gathering	Inaccurate predicted impacts and proposed measures due to lack of robust baseline will lead to unforeseen environmental pollution or damage.	• During the detailed design phase of the project, the baseline survey shall be conducted to include monthly (air quality) and quarterly (marine water quality and underwater ecology survey) baseline data. In particular, the DBO Contractor shall: ○ Undertake ambient air quality measurements (monthly), marine water quality analysis, and marine underwater ecology survey (quarterly) on first year after DBO contractor 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); ○ follow required sampling methodologies, including appropriate averaging time for ambient air quality measurements as indicated in the WHO Ambient Air Quality Guidelines; and ○ include results of analyses in the updating of the EIA,	Results of monthly ambient air quality measurements (TSP, PM_{10}, $PM_{2.5}$, SO_x, NO_x). Results of quarterly marine water quality analysis (to follow parameters used in the first sampling activities). Results of quarterly marine underwater ecology survey (to follow parameters, methodologies and locations used in the first set of surveys in the EIA process).	Monthly sampling (air quality) and quarterly sampling (marine water quality and underwater ecology survey) for minimum of 1 year after DBO contractor mobilization (to establish baseline conditions prior to works).	DBO Contractor	PMU	Part of DBO contract

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		and consider these results in the final detailed design of the project as applicable.					
Construction Stage							
Physical Characteristics							
Overall project site management	Poor environmental management by DBO Contractor	• Designate one full time and qualified Environment, Health and Safety (EHS) Manager who will be in charge of overall EMP implementation and other tasks as required in the EIA report. He/She shall be in place from the day of mobilization of DBO contractor. • In addition to the EHS Manager, designate one qualified trained engineer on EHs and EMP/SEMP implementation for every shift during construction stage who will assist the EHS Manager (either in his/her presence or absence) at all times. • Coordinate with the PMU on confirmatory surveys determined during design stage that need to be conducted once the DBO Contractor is selected; and complete these studies as required with support of external experts.	• Included in manpower requirements as indicated in bidding documents and final contract documents. • Hired EHS Manager and selected engineers trained on EHS and EMP/SEMP implementation based on required qualifications.	One-off during mobilization, and continuously throughout the contract period	DBO Contractor	PMU	Part of DBO contract
Marine Traffic	Port congestion at Thilafushi due to transport of construction equipment and raw materials at site	• Avoid using the docking ports used by the local people and industries in Thilafushi when transporting construction heavy equipment and raw materials at the site. • Transport and unload heavy equipment and raw materials at nighttime when marine traffic is	• No disturbance to normal day-to-day movement of locals at the port and in the island. •	At least quarterly and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO contract

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		low within and around the island. • Utilize the exclusive docking port area being used by WAMCO.					
Topography landforms, geology, and soils and river morphology and hydrology	Raw materials for construction (e.g. sand, gravel or crushed stone) will be extracted from sources causing changes in topography and landforms (if on land such as other islands in Maldives) or river morphology and hydrology (if on the river in other countries).	• Utilize readily available sources with environmental clearance and license. • Borrow areas and quarries comply with environmental requirements. • Coordinate with local authorities for quarrying at various parts of Maldives where these raw materials are sourced. Alternative sources should be identified.	Records of sources of materials	At least quarterly and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO contract
Marine water quality	Trenching and excavation, run-off from stockpiled materials and chemical contamination from fuels and lubricants may result to silt-laden runoff during rainfall, which may cause siltation	• Implement spoils management plan. • Reuse excess spoils and materials. • Temporary storage areas for excess spoils prior to disposal should be located as far as possible from the edge of the island or seawalls. • Disposal site in designated areas only. • Earthworks during dry season. Avoid earthworks during heavy rainy days, especially during	• Areas for stockpile storage of fuels and lubricants and waste materials; • Number of silt traps installed along trenches leading to water bodies; • No visible degradation to nearby drainage, water bodies due	At least quarterly for both visual inspections and water quality sampling, and results reported by DBO Contractor to PMU.	DBO Contractor	PMU	Part of DBO contract

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
	and degradation in the quality of marine water around Thilafushi.	monsoon season, to prevent run-off. • Stockyards are covered when possible and provided with drainage canals around. • Install temporary silt traps or sedimentation basins along drainage leading to the lagoon and sea. • Fuel, other petroleum products, and toxic and hazardous chemicals or substances stored at storage areas away from water drainage and protected by impermeable lining and bunded 110%. • Take precautions to minimize the overuse of water • Divert all wash water generated from site into sedimentation ponds prior to discharge to canals. • During excavations, water accumulation in the pits / should be disposed of only after being diverted in sedimentation basis or equivalent and clarified prior to discharge. • Conduct water quality monitoring at least quarterly or as necessary.	to construction activities • Marine water quality testing				
Air quality	Work at the dry season and transporting construction materials may increase dust, carbon, monoxide, sulfur oxides, particulate	• Use of physical controls such as water sprays, covers, compaction, screening, enclosure, windbreakers, binders and/or road surfacing to avoid or minimize airborne dust from construction activities and vehicle movements. Undertake water spraying several times of the day or as often as needed	• Location of stockpiles. • Number of complaints from sensitive receptors. • Heavy equipment and machinery with air pollution control devices.	At least quarterly and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO contract

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
	matter, nitrous oxides, and hydrocarbons in air environment	especially on windy days / dry seasons. • Cover delivery trucks during transport. • Construction vehicle's speed limited to 30 kilometers per hour (kph). • Prohibition of open burning of solid waste. • Minimize stockpile height. • If dust generation is significant, provide a dust screen of appropriate height • Workers and staff should be provided with dust masks & instructed to use them on site • Conduct work in stages to reduce dust impacts; clearing and then conducting construction in only a portion of the site at a time. • Control access to work area, prevent unnecessary movement of vehicles, workers, public trespassing into work areas; limiting soil disturbance will minimize dust generation • Contractor's environmental manager should monitor these activities and take action to apply the mitigation if dust production becomes significant. • Use tarpaulins to cover loose material (soil, sand, aggregate) when transported by trucks • Clean wheels and undercarriage of haul trucks prior to leaving construction site/quarry • Stabilize surface soils where loaders, support equipment and	• A certification that vehicles are compliant with Maldives vehicle emission standards. • Ambient air quality tests.				

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		vehicles will operate by using water and maintain surface soils in a stabilized condition • Ensure that all the construction equipment, machinery is fitted with pollution control devices, which are operating correctly. • Ensure that only those vehicles and equipment in good condition, and are in good maintenance are used for project construction • Vehicles / equipment should have a valid permits or licenses issued by relevant government agency. • Maintain record of these permits or licenses of all vehicles at all times for ready inspection at the work sites.					
	Degradation of ambient air due to operations of concrete batching plant.	• Ensure that batching plant is installed with built-in air pollution and dust control system for fugitive emissions and dust from loading area. • Provide dust screen around the components that generate emissions or fugitive dusts. • Ensure that plant is well operated and maintained at all times according to O&M manual of batching plant (provided by the equipment manufacturer). • The concrete loading area is equipped with a leak-proof concrete floor, from which all drainage is collected and treated as necessary prior to discharge. • Mixer trucks and mixer drums are washed out only in a	• Visual inspection. • Visual inspection report.	Daily or as necessary and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO contract

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		designated area, which should be equipped with a leak-proof floor, from which drainage is collected and treated as necessary. • All chemicals used in concrete preparation are properly stored, whether dry, in powder or granular form, or as liquids, at storage areas away from water drainage and protected by impermeable lining and bunded 110%. Storage facilities should be as specified in the appropriate international standard and should include equipment to extract dust and completely contain any spillage from leaks.					
Acoustic environment	Temporary increase in noise level and vibrations by excavation equipment, and the transportation of materials, equipment and people.	• Prepare work schedule and consult with local community and administration. • Maintain low noise levels. Noise level at the boundary of site shall not exceed 70 dB(A) during day and 50 dB(A) during night unless necessary to carry out construction works. • When possible, schedule noisy works at nighttime when most establishments in Thilafushi are closed. Minimize any high noise-generating activities during the daytime. • Use low noise generating equipment. Use modern vehicles and machinery with low noise emissions. Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-	• Number of complaints from sensitive receptors; • Use of silencers in noise-producing equipment • Use of sound barriers or enclosures for generators, if any; • Noise level measured at daytime and nighttime at pre-determined locations at site.	At least quarterly noise level measurement and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		reducing mufflers, and use portable street barriers to minimize sound impact to surrounding sensitive receptor. • Minimize drop heights for construction materials. • No use of horns unless necessary. • Avoid loud random noise from sirens, air compression, etc. • Avoid using multiple high noise generating equipment and activities simultaneously. • Install temporary or portable acoustic barriers around stationary construction noise sources. • Warning signs in noise hazard areas. • Identify vibration risk to nearby structures. Take caution working in such areas. • Conduct noise level monitoring at least every quarter or as necessary.				
Aesthetics	Indiscriminate disposal of solid waste (construction and domestic) around the site. Interference with the enjoyment of the area and creation of unsightly or offensive conditions	• Prepare and implement a Construction Waste Management Plan (CWMP) to identify specific steps on handling and disposal of all solid waste from construction activities, including the following: ○ Reuse as much waste sand in this project as possible; ○ Finding alternative beneficial uses for any unused sand, for example as infill in other construction works;	• Number of complaints from sensitive receptors; • Worksite clear of all types of wastes • Worksite clear of any wastes unutilized materials, and debris • Transport route and worksite cleared of dirt	Daily or as necessary and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		○ Disposal of debris and bulky solid waste materials after construction stage. ○ Minimizing stockpile size. ○ Clearing wastes regularly. ○ Avoiding stockpiling of excess spoils. ○ Covering delivery trucks during transportation. ○ Cleaning roads. ○ Using screening enclosure shade cloth, temporary walls around construction site. ○ Cleaning site regularly. ○ Following the principle of "Reduce, Reuse, Recycle, and Recover". • When applicable, solid wastes from the site shall be returned to the manufacturer of raw materials they were generated from, or dispose as per their specifications. • Hazardous waste shall be stabilized, encapsulated, and disposed as per internationally accepted practices. Provision will be made for secure storage of hazardous waste. • Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed of in approved disposal sites and/or third-party sources approved by Maldives EPA. • Prohibit burning of construction and/or domestic waste; • Ensure that wastes are not haphazardly thrown in and around the project site; provide proper collection bins, and					

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		create awareness to use the dust bins. • Conduct site clearance and restoration to original condition after the completion of construction works.					
Biological Characteristics							
Marine Biodiversity	Threat to marine and terrestrial species, or other marine animals due to (i) poaching or leisure catching by workers in the project area, and (ii) marine pollution.	• Implement the Marine and Beach Area Construction Work Plan. • Implement the Erosion Control Plan for pipeline works. • Ensure that all construction activities are conducted strictly within the site footprint (including offices, car parking and other activities that might normally be located in an exterior contractor's area). • Prohibit any deliberate killing or harming of animals on or off-site; any hunting or fishing at the site or in nearby areas by site personnel; preventive actions shall be put in place by contractor for protected marine species. • Ensure that all construction work or other activities near the site perimeter are conducted with particular care and include measures to reduce noise and dust to minimum possible. • Create awareness in all site staff & workers on the importance of the marine animals/species and plants around the site and their vulnerability. • To protect site personnel, training should also be provided	• Visual site inspection. • Visual site inspection reports. • Marine water quality tests. • Marine and Beach Area Construction Work Plan • Erosion Control Plan for pipeline works • Spill Control and Containment Plan	Daily or as necessary for visual inspection and reported by DBO Contractor At least quarterly for marine water quality testing and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		to enable them to recognize, and deal safely and humanely with all animals that may be encountered. • Implement the Spill Control and Containment Plan. • Marine works should be scheduled to occur in the north east monsoon season when the sea conditions are calmer to limit the spread of sediment around this operation. • Conduct the excavation, and deposit the excavated material in a more controlled manner minimizing the area that is disturbed. • Avoid the need to re-excavate by choosing right time (calmed sea conditions again), and quickly lowering the pipes into trench and refilling. • Limit the size of the construction area on the beach and to avoid any encroachment outside the specified area. • Monitor the turbidity & DO levels due to spread of sediment throughout the trenching operation and work should be stopped if levels exceed pre-determined values as per the guideline below: o The turbidity of the water is to be measured (ISO 7027) at the edge of the construction zone during trenching and backfilling activities; o When the turbidity exceeds the minimum of the					

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		background turbidity plus 20% or 100 NTU, the trenching is to cease until the turbidity returns to the background level plus 10%.					
Socio-economic Characteristics							

Existing provisions for pedestrians and other forms of transport	Potential road closures due to construction activities.
	
	Hauling of construction materials and operation of equipment on-site can cause traffic problems.
		• Implement the Traffic Management Plan that will elaborate the following:
		  ○ Suitable transportation routes.
		  ○ Safe passage for vehicles and pedestrians.
		  ○ Temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours.
		  ○ Scheduling of material deliveries on low traffic hours, particularly at nigh time when most establishments in Thilafushi island are already closed.
		• Erect and maintain barricades if required.
		• Consult with business and institutions for work schedules.
		• Erect display boards around strategic locations about nature, duration of construction and contact for complaints and/or issues about the project.
		• Complete quickly any work that is near adjacent establishments.
		• Restore damaged properties and utilities.
			• Traffic Management Plan. Traffic route during construction works, including number of permanent signs, barricades, and flagmen on worksite;
			• Number of complaints from sensitive receptors;
			• Some signage placed at the subproject location.
			• Number of walkways, signage, and metal sheets placed at subproject location
				Prior to start of construction, and weekly or as necessary during construction stage, and reported by DBO Contractor	DBO contractor	PMU	Part of DBO Contractor cost.

Socioeconomic status	Staffing will be required during construction. This can result	• Engage the local workforce. If not available in Thilafushi Island, engage workers from nearby islands including Malé if	• Employment records;	Monthly or as necessary and reported	DBO Contractor	PMU	Part of DBO Contractor cost.

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
	in an increase in local revenue.	available and sufficiently qualified. • Secure construction materials from local market, whenever available.	• Records of sources of materials • Records of compliance with labor act of Maldives.	by DBO Contractor			
Other amenities for community welfare	Civil works may result in an impact to the sensitive receptors such as residents, businesses, and the communities. Excavation may also damage infrastructure located alongside the roads.	• Before any excavation work, reconfirm location and nature of existing infrastructure, if any, identified during detailed design stage. • Minimize repeated disturbance to locals by integrating forms of infrastructures such as temporary safe walkways in areas with ongoing excavation works. Provide alternate routes in the area if necessary, to allow smooth movement of workers and vehicles in the area. • Inform through continuous meaning consultations with local people about nature, duration and possible impacts of the construction and integrate their concerns. • Promptly relocate infrastructure materials if found to be obstructing or disturbing free movement of local people. • Take prior permission from local authority for water use. • Restore damaged properties and utilities to pre-work conditions.	• Number of complaints from sensitive receptors	Daily or as necessary and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.
Community health and safety	Construction works will impede the access of residents and	• Restrict work force in designated areas. • Identify stockyard areas in consultation with local administration.	• The number of permanent signs, barricades, and flagmen on worksites per	Daily or as necessary and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
	business in limited cases. Construction works will raise danger to community people.	• Work on private land to require written permission of landowners. • Prefer small mechanical excavator for excavation works. • Prohibit alcohol and drugs on site. • Prevent excessive noise. • Code of conduct for workers includes restricting workers in designated areas, no open defecation, no littering, no firewood collection, no fire except designated places, no trespassing, no residence at construction sites, and no obligation to potentially dangerous work. • Follow international best practices on community health and safety such as those in Section 4.3 of IFC Environmental Health and Safety (EHS) Guidelines on Construction and Decommissioning Activities. These requirements are discussed in Section VI of the EIA report. • Maintain a complaint logbook in workers camp and take action promptly of complaints.	Traffic Management Plan. • Number of complaints from sensitive receptors. • Number of walkways, signs, and metal sheets placed at the subproject location. • Agreement between contractor and WAMCO in case of using WAMCO's property for storage or use. • Agreement between contractor and private property owners in case of using the latter's land for storage and use.				
Workers Health and Safety	There is invariably a safety risk when construction works such as excavation and earthmoving are conducted	• Comply with labor act of Maldives. • Implement the Occupational Health and Safety Plan, which shall follow all occupational health and safety requirements discussed in Section VI of the EIA report.	• Occupational Health and Safety Plan • Equipped first-aid stations • Medical insurance coverage for workers	Daily or as necessary and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
	in urban areas. Workers need to be mindful of the occupational hazards, which can arise from working at height and excavation works.	• Provide compulsory health and safety orientation training to all new workers to ensure that they are apprised of Occupational Health and Safety Plan including rules of work, use of personal protective equipment (PPE), preventing injury to fellow workers, etc. • Restrict public access to worksites. • Provide PPE to workers and ensure their effective usage. For example, require workers to (i) wear ear plugs while in noise hazard areas, and (ii) wear high visibility clothes or reflectorized vests at all times. • Document procedures to be followed for site activities. • Maintain accident reports and records. • Make first aid kits readily available. • Maintain hygienic accommodation in work camps. • Ensure uncontaminated water for drinking, cooking and washing. • Ensure clean eating areas. • Ensure sanitation facilities are readily available. • Provide medical insurance coverage for workers. • Provide orientation for guest visitors. • Ensure that visitors do not enter hazard areas unescorted. • Ensure moving equipment is outfitted with audible backup alarms.	• Number of accidents • Records of supply of uncontaminated water • Condition of eating areas of workers • Record of orientation training • Availability of personal protective equipment at construction site • Percentage of moving equipment outfitted with audible back-up alarms • Signage for storage and disposal areas • Condition of sanitation facilities for workers • Report summary on daily toolbox talks for workers.				

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		• Chemical and material storage areas need to be marked clearly. Display MSDS, train staff on storage and handling. • Hearing protection equipment enforced in noisy environment. • Conduct of daily toolbox talks to reiterate repeatedly all the above measures and prioritize safety briefings; leanings from previous incidents, their causes and risks, and other safety procedures as may be identified. • Conduct periodic safety audit, identify and remove potential hazards. • Ensure that qualified first aid is provided at all times; equipped first-aid stations shall be easily accessible throughout the work sites and camps. • For works in the marine environment, ensure that: ○ all persons engaged in the marine construction are competent swimmers. ○ Lifejackets are provided to workers and worn at all times. ○ Properly functioning ship-to-shore communications are provided. ○ No work during rough sea conditions. ○ Emergency rescue team is available at all times at the site during the marine work (such as rescue boat with divers).					

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		• Provide caution & information boards (traffic, safety, information etc.,) • Do not allow unauthorized / public entry into work sites / facilities • Undertake all necessary public safety measures, precautions • Ensure proper maintenance and cleanliness of the site and facilities Demarcate assembly area for emergencies • Provide medical aid facilities (first aid, doctor on call etc.,)					
Labor Camps	Indiscriminate environmental impact and pollution due to labor camps	• Avoid establishing labor camps by employing local workers as far as possible. • In unavoidable cases, establish camp within the site; and implement the Construction Camp Development and Management Plan (CCDMP). • Follow the layout plan included in the CCMP. • The CCDMP will consider all construction camp requirements discussed in Section VI of the EIA report, which, among others, are the following: ○ The camp, if possible in Thilafushi Island, is at least 50 m away from water bodies. ○ Clear separation of the workers living areas from material storage areas and work sites with fencing and separate entry and exit ○ Provision of proper liquid waste and solid waste	• Visual inspection. • Visual inspection reports. • CCDMP	Weekly and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		collection, treatment and disposal system. ○ Provision of drinking water, water for other uses, and sanitation facilities (e.g. separate toilets for men and women). ○ Livability at the highest standards possible at all times; living quarters provided with standard materials, space, and proper lighting and ventilation. ○ Fire safety, medical facilities.					
Post-Construction / Operation Stage							
Overall project site management	Poor environmental management by DBO Contractor	• Designate one full time and qualified Environment, Social, Health and Safety (EHS) Manager who will be in charge of overall EMP implementation and other tasks as required in the EIA report. He/She shall be in place from the day of mobilization of DBO contractor. • In addition to the EHS Manager, designate one qualified trained staff member on EHS and EMP/SEMP implementation for every shift who will assist the EHS Manager (either in his/her presence or absence) at all times. • Coordinate with the PMU on confirmatory surveys determined during the design stage that need to be conducted by the DBO Contractor during operation stage; and complete as required with support of external experts.	• Included in manpower requirements as indicated in bidding documents and final contract documents. • Hired EHS Manager and selected staff trained on EHS and EMP/SEMP implementation based on required qualifications. • Operation and Maintenance Manual • Waste Screening Procedure / Plan • Emergency and Disaster Preparedness and Response Plan	One-off during mobilization, and continuously throughout the contract period, and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		• Implement the Operation and Maintenance Manual. • Implement 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 • Implement the Emergency and Disaster Preparedness and Response Plan					
Physical Environment							
Aesthetics	Indiscriminate disposal of solid waste (construction and domestic) around the site. Interference with the enjoyment of the area and creation of unsightly or offensive conditions	• Implement the Solid Waste Management Plan for the operation of WTE facility to identify specific steps on handling and disposal of all solid wastes from the operation of the facility. • When applicable, solid wastes from the WTE plant shall be returned to the manufacturer of raw materials they were generated from, or dispose as per their specifications. • Hazardous waste shall be stabilized, encapsulated, and disposed as per internationally accepted practices. Provision will be made for secure storage of hazardous waste.	• Solid Waste Management Plan • Number of complaints from sensitive receptors; • Worksite clear of all types of wastes • Worksite clear of any wastes unutilized materials, and debris • Transport route and worksite cleared of dirt	Daily or as necessary and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.
Air quality	Degradation of ambient air quality.	• Consult with local community to present the day-to-day operation of the WTE plant. This will enable locals learn about the operations and identify the potential sources and time/duration of emissions.	• Number of complaints from sensitive receptors. • Machineries with air pollution control devices.	At least quarterly and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		• Ensure efficient functioning of the air pollution control device of the plant and CEMS. • Use of physical controls such as water sprays, several times of the day or as often as needed especially on windy days / dry seasons. • Greenery and plantation at the perimeter to help control dispersion of air pollutants. All plant species to be introduced shall be endemic or native species in Maldives. Avoid introduction of invasive alien species by following guidance reference document issued by the MOE; • Cover delivery trucks during transport. • Vehicle speed limited to 30 kilometers per hour (kph). • Prohibition of open burning of solid waste. • Vehicles / equipment should have a valid permits or licenses issued by relevant government agency. • Maintain record of these permits or licenses of all vehicles at all times for ready inspection at the work sites.	• A certification that vehicles are compliant with Maldives vehicle emission standards. • Ambient air quality tests. • Stack emission tests. • CEMS real time print reports.				
Marine water quality	Degradation in the quality of marine water around Thilafushi due to discharge of effluent from the WTE plant.	• Ensure efficient and continuous functioning of the leachate treatment plant. • Stockyards are covered when possible and provided with drainage canals around. • Install temporary silt traps or sedimentation basins along	• Areas for stockpile storage of fuels and lubricants and waste materials; • Number of silt traps installed along trenches leading to water bodies;	At least quarterly for both visual inspections and water quality sampling, and results reported by	DBO Contractor	PMU	Part of DBO Contractor cost.

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		drainage leading to the lagoon and sea. • Fuel, other petroleum products, and toxic and hazardous chemicals or substances stored at storage areas away from water drainage and protected by impermeable lining and bunded 110%. • Divert all wash water generated from site into sedimentation ponds prior to discharge to canals. • Conduct treated leachate water quality monitoring at least quarterly or as necessary.	• No visible degradation to nearby drainage, water bodies. • Marine water quality tests • Effluent water quality tests. • Thermal water temperature tests.	DBO Contractor to PMU.			
Acoustic environment	Noise pollution due to plant operations.	• Consult with local community to present the day-to-day operation of the WTE plant. This will enable locals learn about the operations and identify the potential sources and time/duration of noise generation. • Maintain low noise levels. Noise level at the boundary of site shall not exceed 70 dB(A) during day and 50 dB(A) during night. • Use low noise generating equipment. Use modern vehicles and machinery with low noise emissions. • No use of horns unless necessary. • Avoid loud random noise from sirens (except sirens for emergency alarms), air compression, etc.	• Number of complaints from sensitive receptors; • Use of silencers in noise-producing equipment • Use of sound barriers or enclosures for generators, if any; • Noise level measured at daytime and nighttime at pre-determined locations at site.	At least quarterly noise level measurement and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		• Avoid using multiple high noise generating equipment and activities simultaneously. • Install temporary or portable acoustic barriers around stationary machineries (e.g. generator sets). • Warning signs in noise hazard areas. • Conduct noise level monitoring at least every quarter or as necessary.					
Biological Characteristics							
Biodiversity	Threat to marine species or animals due to unmanaged or mismanaged cooling water intake infrastructures	• Implement the Spill Control and Containment Plan • Ensure that intake is operated as per the design • Conduct monitoring of marine species infringed in the intakes. Undertake corrective measures if required. • Proper handling of live aquatic organisms (fishes, crabs, turtles etc.,) that enter intake and trapped at fine screen. Ensure to return these organisms or species back into the sea at locations away from the intake and outfall structures. • Wastes collected from the intake line and screens be disposed as per the internationally accepted procedures. These wastes shall not be mixed with brine for disposal or in the sea or by open dumping. They may be disposed as feed to the incinerator.	• Spill Control and Containment Plan • Inspection and incident reports, including photo documentations.	Daily or as frequent as possible by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
	Threat to marine species or animals due to unmanaged or mismanaged thermal water (heated cooling water) discharge.	• Ensure cooling water system and condenser system of the WTE plant operate at designed efficiency. • Ensure to maintain the mandatory temperature required for thermal water (heated cooling water) being discharged to the sea. • Maintain the thermal water (heated cooling water) discharge flowrate as per design. • Conduct temperature monitoring of thermal water (heated cooling water) on a daily basis or as necessary.	• Inspection and temperature monitoring reports.	Daily or as frequent as possible by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.
Socio-Economic Characteristics							
Marine Traffic	Port congestion at Thilafushi due to delivery of solid wastes.	• Continuing coordination with WAMCO to ensure use of the exclusive berth or docking port area for waste delivery at all times.	• Complaints from locals due to disturbance to normal day-to-day movement of locals at the port and in the island. • Visual inspection reports.	At least quarterly and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.
Workers Health and Safety	There is invariably a safety risk to workers, occupational hazards, which can arise from working within and around the WTE Plant.	• Comply with labor act of Maldives. • Implement the Occupational Health and Safety Plan. • Provide compulsory health and safety orientation training to all new workers to ensure that they are apprised of Occupational Health and Safety Plan including rules of work, use of personal protective equipment (PPE), preventing injury to fellow workers, etc.	• Occupational Health and Safety Plan • Equipped first-aid stations • Medical insurance coverage for workers • Number of accidents • Records of supply of uncontaminated water	Daily or as necessary and reported by DBO Contractor	DBO Contractor	PMU	Part of DBO Contractor cost.

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		• Restrict public access to the WTE Plant. • Provide PPE to workers and ensure their effective usage. For example, require workers to (i) wear ear plugs while in noise hazard areas, and (ii) wear high visibility clothes or reflectorized vests at all times. • Document procedures to be followed for site activities. • Maintain accident reports and records. • Make first aid kits readily available. • Maintain hygienic accommodation in workers accommodation or camps. • Ensure uncontaminated water for drinking, cooking and washing. • Ensure clean eating areas. • Ensure sanitation facilities are readily available. • Provide medical insurance coverage for workers. • Provide orientation for guest visitors. • Ensure that visitors do not enter hazard areas unescorted. • Ensure moving equipment is outfitted with audible backup alarms. • Chemical and material storage areas need to be marked clearly. Display MSDS, train staff on storage and handling. • Hearing protection equipment enforced in noisy environment. • Conduct of daily toolbox talks to reiterate repeatedly all the	• Condition of eating areas of workers • Record of orientation training • Availability of personal protective equipment at construction site • Percentage of moving equipment outfitted with audible back-up alarms • Signage for storage and disposal areas • Condition of sanitation facilities for workers • Report summary on daily toolbox talks for workers.				

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		above measures and prioritize safety briefings; leanings from previous incidents, their causes and risks, and other safety procedures as may be identified. • Conduct periodic safety audit, identify and remove potential hazards. • Ensure that qualified first aid is provided at all times; equipped first-aid stations shall be easily accessible throughout the work sites and camps. • For maintenance works in the marine environment, ensure that: ○ all persons engaged in the marine construction are competent swimmers. ○ Lifejackets are provided to workers and worn at all times. ○ Properly functioning ship-to-shore communications are provided. ○ No work during rough sea conditions. ○ Emergency rescue team is available at all times at the site during the marine work (such as rescue boat with divers). • Provide caution & information boards (traffic, safety, information etc.,) • Do not allow unauthorized / public entry into WTE Plant. • Undertake all necessary public safety measures, precautions					

Field or Activity	Potential Impact / Issue	Mitigation Measures	Parameter / Indicator of Compliance	Monitoring Frequency	Implementation Agency	Monitoring Agency	Estimated Cost
		• Ensure proper maintenance and cleanliness of the site and facilities Demarcate assembly area for emergencies • Provide medical aid facilities (first aid, doctor on call etc.)					

D. Environmental Monitoring Plan

538. Monitoring is the systematic collection of information over a long period of time. It involves the measuring and recording of environmental variables associated with the development impacts. Monitoring is needed to:

(i) Compare predicted and actual impacts;
(ii) Assess the effectiveness of mitigation measures;
(iii) Obtain information about responses of receptors to impacts;
(iv) Enforce and ensure legal standards and statutory requirements are complied with;
(v) Prevent and take remedial measures for negative environmental issues resulting from inaccurate predictions;
(vi) Minimize errors in future assessments and impact predictions;
(vii) Make future assessments more efficient;
(viii) Provide information for environmentally responsible project management; and
(ix) Improve the EIA and monitoring process.

539. Impact and mitigation monitoring will be carried out to compare predicted and actual impacts occurring from project activities and determine the efficiency of the mitigation measures. This type of monitoring will be targeted at assessing project-related impacts on the physical and biological resources, economic development, and/or socio-cultural resources including communities surrounding the project site.

540. Table 80 below show the environmental monitoring plan (EMOP) covering the construction and operational phases of the project. Costs for the monitoring activities shall be borne by either the DBO Contractor or PMU depending on whose responsibilities these activities are as indicated in the EMP.

Table 80: Environmental Monitoring Plan

Activity	Location	Parameters to be Monitored	Means of Monitoring	Frequency	Implementation Responsibility
Construction Stage					
Ambient air quality sampling and monitoring	Pre-identified monitoring stations at Thilafushi Island (the same sampling locations as during baseline data gathering). Other additional location/s as may be needed and identified during construction stage.	TSP, PM_{10}, $PM_{2.5}$, SO_x, NO_x	Mandatory ambient air quality monitoring using appropriate instruments; and Visual inspection	Quarterly (24-hour at sampling locations used during baseline data gatherin)	DBO Contractor to implement monitoring activity (PMU to check compliance)
Noise level monitoring	West side boundary (nearest establishments) of the WTE plant (the same locations as used during baseline data gathering). Other additional pre-identified noise level monitoring site/s at Thilafushi Island.	Day time and nighttime noise levels dB(A)	Ambient noise level monitoring equipment	Once prior to start of construction works (both day time and night time); Once during conduct heavy construction work expected to generate high noise level (either or both day time and night time, depending on when such heavy construction work is undertaken); Monthly during normal construction activities (both day time and night time)	DBO Contractor to implement monitoring activity (PMU to check compliance)

Activity	Location	Parameters to be Monitored	Means of Monitoring	Frequency	Implementation Responsibility
Marine water quality monitoring	Pre-identified sampling locations at the northern and southern sides of the construction site (same sampling points as used during baseline data gathering).	BOD, DO, TSS, Oil and Grease, Fecal Coliform	Grab sampling at northern and southern sea sides relative to the location of construction site.	Once every quarter	DBO Contractor to implement monitoring activity (PMU to check compliance)
Groundwater quality monitoring	Pre-identified sampling wells, as used during baseline data gathering.	Oil and Grease, Fecal Coliform, Presence of petroleum and other chemicals use in the baseline data.	Grab sampling from deep wells.	Once every quarter	DBO Contractor to implement monitoring activity (PMU to check compliance)
Condition of disposal areas	All designated disposal areas	General condition of area, estimated capacity of disposed spoils, estimated remaining capacity that can be accommodated.	Visual inspection, Actual measurements in the area.	Weekly or monthly depending on the frequency of spoil disposal	DBO Contractor to implement monitoring activity (PMU to check compliance)
Condition at construction camp sites	Construction camp site.	All good housekeeping practices as specified in the EMP.	Visual inspection, Interview with occupants.	Weekly	DBO Contractor to implement monitoring activity (PMU to check compliance)
Assessment of occupational health and safety measure implementation	(i) Construction work site; and (ii) Construction camp site.	All occupation health and safety measures as specified in the EMP	Visual inspection, Interview with workers at sites and occupants at camp sites	Weekly	DBO Contractor to implement monitoring activity (PMU to check compliance)
Assessment of community health and safety measure implementation	Vicinity of construction work site and around Thilafushi Island.	All community health and safety measures as specified in the EMP	Visual inspection, Interview with locals.	Weekly	DBO Contractor to implement monitoring activity (PMU to check compliance)
Construction of cooling water lines, intake, and discharge points.	Construction site and previously identified alignment and location of cooling water lines,	Exact locations if complying with pre-approved and recommended locations per EIA report.	Visual inspections.	Continuous as the construction progresses (by DBO Contractor).	DBO Contractor to implement monitoring activity (PMU to check compliance)

Activity	Location	Parameters to be Monitored	Means of Monitoring	Frequency	Implementation Responsibility
	intake location and outfall location.			Random inspection by PMU but at least once a week.	
Post-Construction					
Demobilization of construction heavy equipment	Construction site	Schedule of transport of heavy equipment to ensure no disruption or disturbance to marine traffic around Thilafushi Island.	Schedule of demobilization Visual inspection	Continuing or as needed during the demobilization activities.	DBO Contractor to implement monitoring activity (PMU to check compliance)
Site clearing	Construction site	Types of construction wastes remaining at site. Disposal site of remaining construction wastes.	Visual inspection of wastes and location of disposal site.	Continuing or as needed during the site clearing activities.	DBO Contractor to implement monitoring activity (PMU to check compliance)
Operation Stage					
Stack emission sampling and monitoring.	Stack sampling ports	TSP, SO_x, NO_x, Organic Carbon, CO, HCl, HF, Hg and its compounds, NH_3, Cd, As, Dioxins/Furans, sum of heavy metals and their compounds.	Mandatory stack emission sampling using appropriate instruments. Mandatory emission monitoring through CEMS. Visual inspection.	At least annually for stack emission sampling. Continuous monitoring through installed CEMS. Daily visual monitoring	DBO Contractor to implement monitoring activity (PMU to check compliance)
Ambient air quality sampling and monitoring	Pre-identified monitoring stations at Thilafushi Island (the same sampling locations as during baseline data gathering). Other additional location/s as may be needed and	TSP, PM_{10}, $PM_{2.5}$, SO_x, NO_x	Mandatory ambient air quality monitoring using appropriate instruments; and Visual inspection end	Once every quarterly at the identified baseline sampling locations	DBO Contractor to implement monitoring activity (PMU to check compliance)

Activity	Location	Parameters to be Monitored	Means of Monitoring	Frequency	Implementation Responsibility
	identified during operation stage.				
Noise level monitoring	West side boundary (nearest establishments) of the WTE plant (the same locations as used during baseline data gathering). Other additional pre-identified noise level monitoring site/s at Thilafushi Island.	Day time and nighttime noise levels dB(A)	Ambient noise level monitoring equipment	Once prior to start of operations (both day time and night time); Once every time generator set is utilized (either or both day time and night time, depending on when the generator set/s is/are used); Monthly during normal operating conditions (both day time and night time)	DBO Contractor to implement monitoring activity (PMU to check compliance)
Marine water quality monitoring	Pre-identified sampling locations at the northern and southern sides of the WTE site (same sampling points as used during baseline data gathering).	BOD, DO, TSS, Oil and Grease, Fecal Coliform	Grab sampling at northern and southern sea sides relative to the location of WTE site.	Once every quarter	DBO Contractor to implement monitoring activity (PMU to check compliance)
Effluent quality sampling and monitoring	Effluent sampling ports of leachate treatment plant and wastewater treatment plant	COD, BOD5, Total Inorganic Nitrogen, Nitrate, Sulfur, Phosphorus, Lead, Cadmium, Chromium, Hexavalent Chromium, Mercury, Nickel, Zinc, Copper, Arsenic	Mandatory effluent quality monitoring using appropriate instruments; and Visual inspection	Monthly (grab sampling) Daily (visual)	DBO Contractor to implement monitoring activity (PMU to check compliance)

Activity	Location	Parameters to be Monitored	Means of Monitoring	Frequency	Implementation Responsibility
Cooling water discharge monitoring	Sampling port along thermal water discharge line	Temperature, Physical condition surrounding the outfall location	On the spot/ on-site temperature monitoring using appropriate instruments; and Visual inspection (through diving activity) to monitor the vicinity of the outfall	Daily or as frequent as necessary by DBO Contractor Once every quarter	DBO Contractor to implement monitoring activity (PMU to check compliance)
Groundwater quality monitoring	Pre-identified sampling wells, as used during baseline data gathering.	Oil and Grease, Fecal Coliform, Presence of petroleum and other chemicals.	Grab sampling from deep wells.	Once every quarter	DBO Contractor to implement monitoring activity (PMU to check compliance)
Condition at WTE workers accommodation, if any.	Workers accommodation.	All good housekeeping practices as specified in the EMP.	Visual inspection, Interview with occupants.	Weekly	DBO Contractor to implement monitoring activity (PMU to check compliance)
Assessment of occupational health and safety measure implementation	WTE plant	All occupation health and safety measures as specified in the EMP	Visual inspection, Interview with workers at WTE plant.	Weekly	DBO Contractor to implement monitoring activity (PMU to check compliance)
Assessment of community health and safety measure implementation	Vicinity of WTE plant and around Thilafushi Island.	All community health and safety measures as specified in the EMP	Visual inspection, Interview with locals.	Weekly	DBO Contractor to implement monitoring activity (PMU to check compliance)

Figure 192: Recommended Ambient Air Quality Monitoring Stations in Thilafushi Island

E. Reporting

541. **DBO Contracto**r. The DBO Contractor will be required to submit monthly monitoring reports to PMU during the implementation phase of the project. PMU may require DBO Contractor submit any additional information and reports that will be needed to fulfill the reporting obligation of MOECCT to ADB and Maldives EPA.

542. PMU Reporting to ADB. PMU will prepare and submit reports to ADB and Maldives EPA. PMU will prepare reports to be sent to ADB on a quarterly basis during construction phase and semiannual basis during the operation phase. Semiannual reports during operation are to be prepared and submitted until ADB issues a project completion report. The suggested outline of quarterly environmental monitoring reports is attached as Appendix 21. To facilitate monitoring and enable responses to emerging issues, monthly reports will be prepared by the PMU.

543. **PMU Reporting to Maldives EPA**. PMU will likewise prepare and submit reports to Maldives EPA as required by the schedule and report structure shown in Environmental Impact Assessment Guidelines by Maldives EPA. A detailed environmental monitoring report is to be compiled and submitted to the Maldives EPA on the format provided in the Maldives EPA's Environmental Impact Assessment Guidelines, following monitoring activities at each stage.

544. The monitoring report shall include details of the site, means of data collection and analysis, quality control measures, sampling frequency and monitoring analysis and details of methodologies and protocols followed.

545. Currently, Maldives does not have specific set of national standards for monitoring waste to energy plants. Hence an attempt could be made during the environmental monitoring stage to compare the performance of the environmental monitoring program with internationally recognized standards using the baseline that had been established with this study.

F. Cost of EMP Implementation

546. Table 79 shows that most of the mitigation measures proposed by this EIA study comprise activities that are standard practice on most modern construction sites (e.g., preparing and implementing a site EHS Plan, planning access routes to avoid sensitive areas, etc.). Even the less commonly encountered measures (e.g., limiting the size construction areas to reduce ecological damage, conducting hot water outfall construction in calm conditions to limit the spread of disturbed sediment, etc.) would not be unusual for contractors who are used to working in similar environments. Most of the mitigation specified by this EMP therefore requires normal or good site practice and applies construction standards to which an experienced international contractor would work as a matter of course. The costs of these mitigation measures will therefore be covered by the DBO Contractor's normal budget estimates for project design, construction and operation. Indicative cost estimated for EMP implementation and monitoring activities are included in the EIA report and DBO bid documents. The exact and more specific budget for EMP implementation, monitoring, capacity development, and other safeguards requirements will be determined once the DBO contractor is on board and will be included in the Final EIA report.

547. However, there are some measures that contractors would not normally budget for, and these are the measures that are required because of the unique aspects of this project site. These include ecological marine surveys of coral reef to collect data and plan mitigation for the at-risk of marine environment; data collection and revised numerical modeling studies; turbidity monitoring

to reduce the spread of suspended sediment; and longer-term monitoring of the impacts of the project on marine benthos and fish.

548. The estimated cost of these activities is shown in **Table 81** below. These based on the cost of similar exercises on other projects in Maldives and elsewhere. This shows that the total cost of implementing those aspects of the EMP that will not be covered by standard budgets for plant design, construction and operation. These costs would be included in bidding documents, and DBO Contractor can provide budget and quote in the budget as per the requirement of EMP in bidding document towards environmental surveys and social and environmental awards campaigns.

Table 81: Costs of the Monitoring Program[a]

Description	Total ($)
1. Design Stage	
Confirmatory surveys (protected/rare species of flora, fauna)	50,000
Green buffer zone	30,000
Numerical Modeling	50,000
Preparation of various plans suggested in the EMP	45,000
2. Construction Stage	
Environment & ecological monitoring	100,000
replantation of trees	50,000
3. Operation Stage	
Environmental Monitoring	50,000
4. Implementation support	
External environmental expert, supervision, monitoring etc.	150,000
Total	**525,000**

[a] These are only the costs that are not normally covered in standard budget line items of a BOQ.

G. Future Review and Revision of Documents

549. This EIA was conducted in the pre-tender period based on feasibility study and preliminary design. Guidance on potential approaches to construction and operation was obtained from experienced engineers and solid waste management experts, and descriptions of the likely construction and operation processes were prepared accordingly, adopting the basic operational parameters provided by the feasibility study and draft tender documents for the DBO contract. Potential impacts of the project were assessed on the basis of these descriptions and with the aid of primary baseline data on the existing environmental conditions gathered at the project site and its surroundings, secondary information obtained from published literature, and new data from surveys conducted during the EIA process.

550. The EIA report and EMP will be updated at detailed design stage and revisited at key stages throughout the project and will be updated at each stage to reflect any changes in design or approach, and to amend the impact assessment and mitigation and monitoring proposals as may be necessary. This process will also allow any unforeseen impacts to be documented, mitigated and monitored. The EIA report will be reviewed and updated, if necessary, by the DBO Contractor at the following key stages:

(i) after finalization of designs;
(ii) during construction (months 6 and 18);
(iii) at the end of facility commissioning (i.e. before operations begin); and
(iv) at the end of the first and second years of facility operation.

551. The review and revision process will be conducted by the DBO Contractor with the assistance of the external environmental expert hired under the project, and to be reviewed and approved by the Maldives EPA. It should be emphasized that it may not be necessary to revise the document at each stage, as this should only be done to address significant deviations from what is presented in this EIA report or its latest version in the future.

552. If there will be significant changes in the final detailed design compared to the preliminary design used in the EIA and/or if during the detailed design phase there will be identified associated facilities relative to the project per definition of ADB SPS, the DBO Contractor shall update the EIA report, including the EMP and EMOP, accordingly. The DBO Contractor shall submit the updated EIA report to PMU, and the PMU shall submit the updated EIA report to ADB for final review and disclosure.

X. CONCLUSION AND RECOMMENDATIONS

553. The EIA of GMWTEP has been prepared based on review of technical specifications of the project as included in the DBO bid documents, primary and secondary information of the site and its surroundings. The overall findings of this EIA are:

(i) The project will result in significant environmental benefits because the current condition in Thilafushi and the project area will be improved;
(ii) During construction, the project will not have significant adverse environmental impacts and potential adverse impacts are manageable through the effective implementation of the EMP;
(iii) During operations, the project will have potential impacts on ambient air quality, marine water quality, marine ecology, noise, and occupational and community health and safety. However, with the performance guarantees required to be complied by the DBO contractor, significant impacts are avoided, and residual impacts can be mitigated by measures specified in the EMP; and
(iv) No social impacts pertaining to land loss, land fragmentation, physical displacement, loss of income, loss of productive land, potential income loss for fishermen and preventing fishing-related activities and fishing routes.

554. In view of the results of the studies undertaken in this EIA, following are the major recommendations that DBO Contractor shall undertake:

(i) Engage external expert(s) for verification of environmental monitoring reports and EMP implementation. External expert(s) are not involved in day-to-day project implementation or supervision;
(ii) Establish the ambient air quality monitoring stations in Thilafushi and Villingili as identified in the AUSTAL2000 and AERMOD air dispersion modeling studies and utilize these stations for monitoring activities during the operation phase as indicated in the environmental monitoring plan. The proposed locations are in Figure 173;
(iii) Conduct validation modeling during the starting months of normal operation of the WTE plant using actual CEMS and stack testing results to simulate actual operation of the plant;
(iv) Conduct validation of the thermal dispersion model during the starting months of normal operation of the WTE plant using actual temperatures taken within the thermal plume as described in MIKE 21 model and CORMIX.

(v) Install the cooling water discharge line at section M8 (as identified in the EIA report) and position the three outfalls of the discharge lines at a distance of 75 meters from the shoreline and 30 meters deep from the sea surface. The outfalls shall be laid 20 meters apart. See Figure 22;
(vi) Install the intake of the cooling water line at the vicinity of M1-M8 (the same vicinity of the outfalls as identified in the EIA report) to ensure minimal impact during construction phase. See Figure 67; and
(vii) Continuous monitoring around Thilafushi island to confirm the extent of biodiversity in various seasons of the year, including assessment of features pertinent to critical habitats. This is to ensure pre-construction works conditions and biodiversity risks are considered in the design, construction and operation, and to examine and mitigate the potential impacts of the project on areas significant for biodiversity.

555. In this EIA update and stage of project implementation, the following has been undertaken:

(i) An external environmental expert to verify environmental monitoring reports and EMP implementation has been engaged in December 2021. This external expert is not involved in the day-to-day project implementation or supervision.
(ii) Seven ambient air quality sampling stations have been established as identified in AUSTAL2000 and AERMOD air dispersion modeling. Six sampling stations are in Thilafushi and one sampling station in Vilingili that will serve as the control station (refer to Figure 81). Additional monthly ambient air quality measurements are ongoing since October 2022 for PM_{10}, $PM_{2.5}$, NO_2, SO_2 and TSP.
(iii) Environmental quality measurements for additional baseline data on air quality, marine water quality, groundwater quality, noise, and marine underwater ecology started in June 2022.

556. GRM has been disclosed by the MOECCT in their website and the engagement of the public awareness and community capacity building consultant is ongoing.

557. Mitigation measures during operation phase are described in the EMP of this EIA report. Apart from all the mitigation measures in the EMP, the following are further recommendations that DBO Contractor shall consider:

(i) A system with controlled burning and a good air pollution control system should be included in the WTE plant design;
(ii) Incinerator with a stack height of minimum 45.7 m (per air dispersion modeling calculations) to reduce the impacts of air pollutants on the surrounding environment. Increasing this height further will be more favorable;
(iii) Environmental and occupational health and safety procedures for all processes should be established and enforced;
(iv) There should be strict inspection and testing during the installation of the HDPE membrane (or similar) and the various protective / drainage layers for the landfill;
(v) Preventive measures should be implemented to avoid loss of waste during transport and loading / off-loading;
(vi) There should be appropriate sanitation facilities and workshops (for machinery), as well as secure storage facilities for fuel and chemicals, including toxic and hazardous wastes;
(vii) Boilers should be regularly maintained, while structures such as the stacks and ducts should be regularly checked to avoid fugitive dusts sources and particulate accumulation;

(viii) Control devices such as the dry scrubber and baghouse should undergo regular checkup and maintenance;
(ix) Solid wastes should have acceptance criteria in terms of waste characteristics;
(x) Periodic watering of roads to minimize generation and resuspension of dust particles;
(xi) Greenery and plantation at the perimeter or buffer areas to serve as vegetation walls that can help control dispersion of air pollutants. All plant species to be introduced shall be a known species that thrive in Thilafushi or Maldives. If necessary, the DBO Contractor shall obtain permission from relevant agency of the government to ensure such plant is endemic or native species in Maldives;
(xii) Ensure to follow the government policy on preventing introduction of invasive alien species in the island. In particular, DBO Contractor to use as reference the guidance issued by the MOECCT attached as Appendix 22;
(xiii) Regular ambient air quality monitoring should be conducted in hotspots and impact areas based on the results of the modeling report. Actual ambient monitoring may be treated as validation of model results; and
(xiv) Every modification and installation of new sources should be considered as additional contribution to emission of the plant. Hence, modeling updates should also be conducted to determine assimilative carrying capacity of the area based on the impacts of the new modification or installation.

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