Environmental Impact Assessment

Document Stage: Updated
Project Number: 51077-003
July 2020

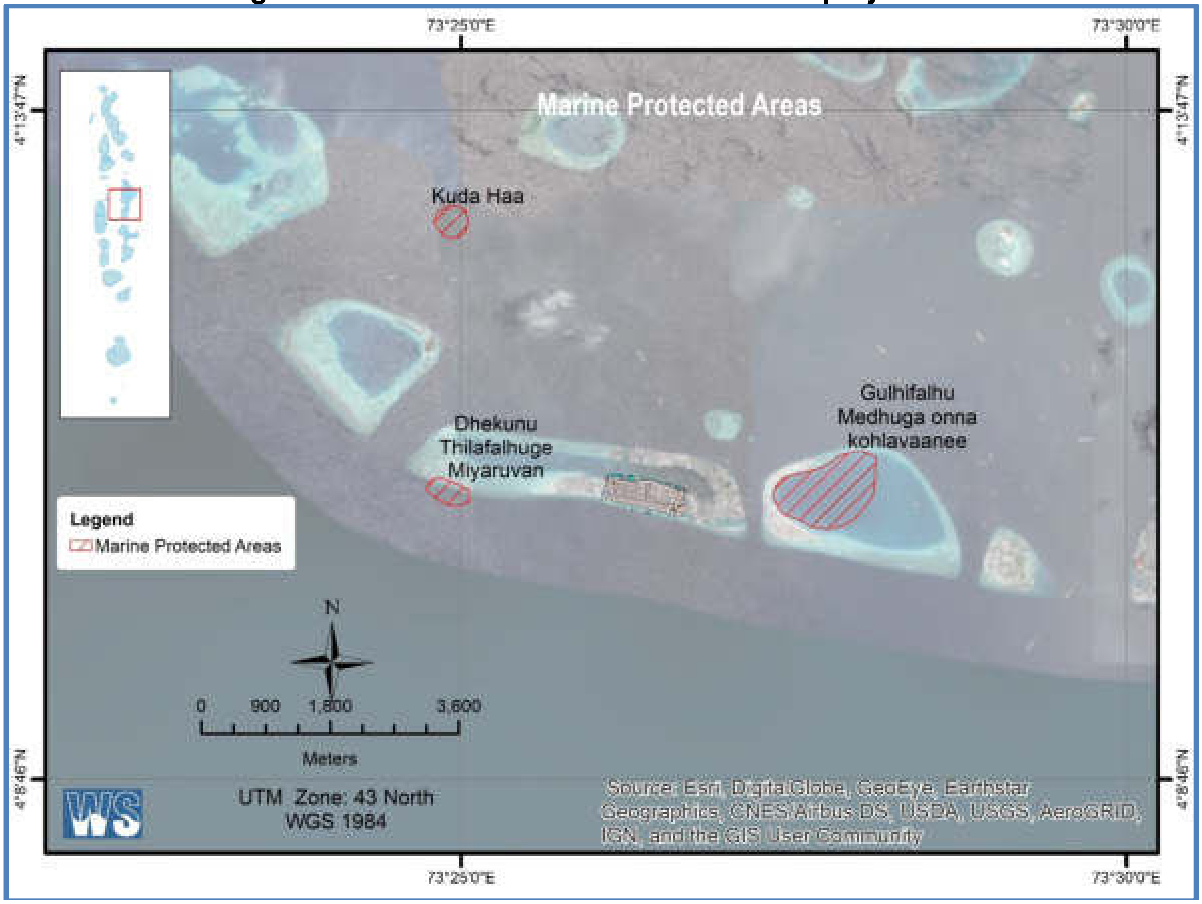
MLD: Greater Malé Waste-to-Energy Project – Waste to Energy Plant PART B

Prepared by Ministry of Environment of the Republic of Maldives for the Asian Development Bank.

F. Protected Areas and Critical Habitats

352. **Marine Protected Areas**. According to Maldives EPA, there are 3 Marine Protected Areas (MPAs) within 5km radius from the project site. They are; (i) Dhekunu Thilafalhuge Miyaruvani – this area is also referred to as Lions Head and is on the outside of the South Malé Atoll facing south into Vaadhoo Channel. (ii) Gulhifalhu Medhuga Onna Kollavaanee – this area is referred to as Hans Hass Place, which is the deep lagoon area at Gulhifalhu and (iii) Kuda Haa – isolated reef standing up from a sandy bottom at 30m, north to Giraavaru Island. In addition to the marine protected areas there are other areas that are also designated as ecologically sensitive areas in Kaafu atoll. However, none is located within 5 km radius of the project site.

Figure 115: MPAs within 5km radius of the project site



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

353. Dhekunu Thilafalhuge Miyaruvani (also known as "Lions Head") is the closest MPA to the project area. The edge of Lions Head is about 1 km from the project site's boundaries. Lions Head is on the outside of North Malé Atoll facing south into Vaadhoo Channel. From the reef edge at about 8m there is a step down to a steep rubble slope where one can sit to watch the sharks. To the right (west) as one faces out is a large overhang that leads down to over 30 m depth. To the left (east) there is a line of small overhangs in 10-15m that continues for about 150 m. The Maldives EPA consider the Lions Head as a protected seascape (IUCN Category V) which covers ocean with a natural conservation plan which accommodates a range of for-profit activities. It has been a marine protected site since 01 October 1995. As Thillafushi and its surrounding area have undergone a transformational development in the past two decades, Maldives EPA is considering

declassifying Lions Head from being a marine protected area to a more appropriate status reflecting current land use (industrial zone).

354. Gulhifalhu Medhuga Onna Kollavaanee (also known as “Hans Hass Place”) is on the outer reef of North Malé Atoll facing south into Vaadhoo Channel. It is an area about 100m long set back in a large recess in the reef. The reef top is at about 3m and drops vertically to a line of over-hangs at 8-10m. The western end is marked by a large cavern at 10-15m. There are further overhangs at 20-25m. Hans Hass Place is named in honor of the great pioneer of diving in Maldives.

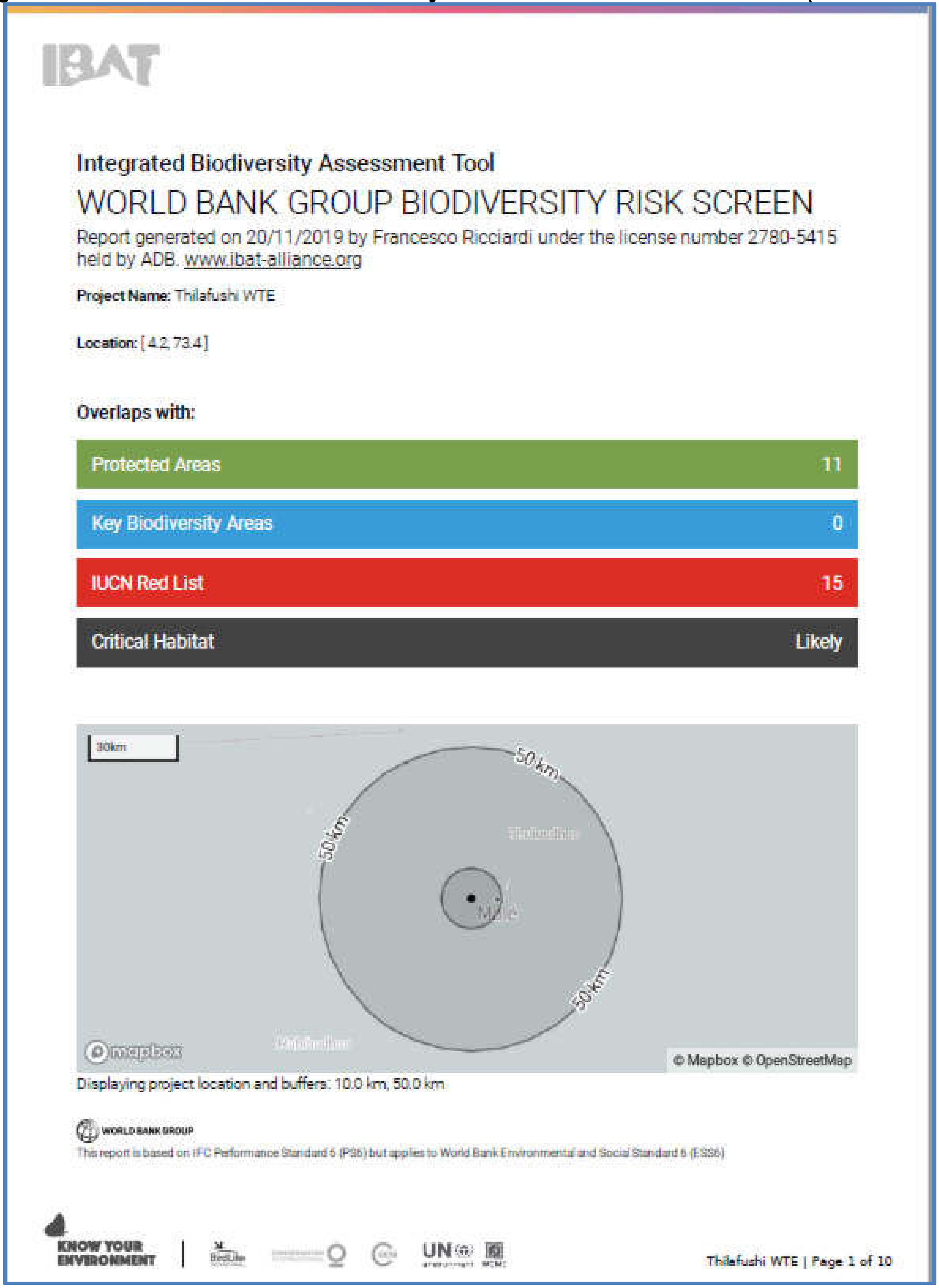
355. Kuda Haa is located about 4km north from the project site. It assumed that no direct impact will be caused to this MPA due to the distance and location.

356. Within the MPAs, anchoring (except in an emergency), coral and sand mining, dumping of waste, removal of any natural object or living creatures, fishing of any kind with exception of traditional live bait fishing and any other activity which may cause damage to the area or its associated marine life are prohibited under the Environment Act.

357. **Critical Habitats**. The Integrated Biodiversity Assessment Tool (IBAT) was initially used to screen and assess potential risks on the protected areas or critical habitat that may exist around the project site (default area of analysis of 50 km radius). Initial screening results show there are no key biodiversity area around the project site but likely to be critical habitat due to the identified MPAs and IUCN Red List species. Hence, a critical habitat assessment was undertaken. Results of the assessment show that the area of analysis, which encompasses the project site, is likely to be a critical habitat at least for a terrestrial insect (*Enallagma maldivense*). This insect normally thrives in freshwater habitats such as ponds. As the project is located in Thilafushi, an island with no freshwater body, it is highly unlikely that this insect is present within and around the island. More so that this insect is not found in the coastal areas and open seas surrounding Thilafushi island. The complete critical habitat assessment report is in Appendix 12. As precautionary measure, the EIA provides measures to ensure no critical habitats, or features for which they are qualified as critical habitats, will be impacted.

358. Figure 116 below shows the screen shots of the IBAT Proximity Test Results.

Figure 116: Screen Shot of IBAT Proximity Test Result for Thilafushi Island (50-kilometer)



Integrated Biodiversity Assessment Tool

WORLD BANK GROUP BIODIVERSITY RISK SCREEN

Report generated on 20/11/2019 by Francesco Ricciardi under the license number 2780-5415 held by ADB. www.ibat-alliance.org

Project Name: Thilafushi WTE

Location: [4.2, 73.4]

Overlaps with:

Protected Areas	11
Key Biodiversity Areas	0
IUCN Red List	15
Critical Habitat	Likely

© Mapbox © OpenStreetMap

Displaying project location and buffers: 10.0 km, 50.0 km

This report is based on IFC Performance Standard 6 (PS6) but applies to World Bank Environmental and Social Standard 6 (ESS6)

Thilafushi WTE | Page 1 of 10

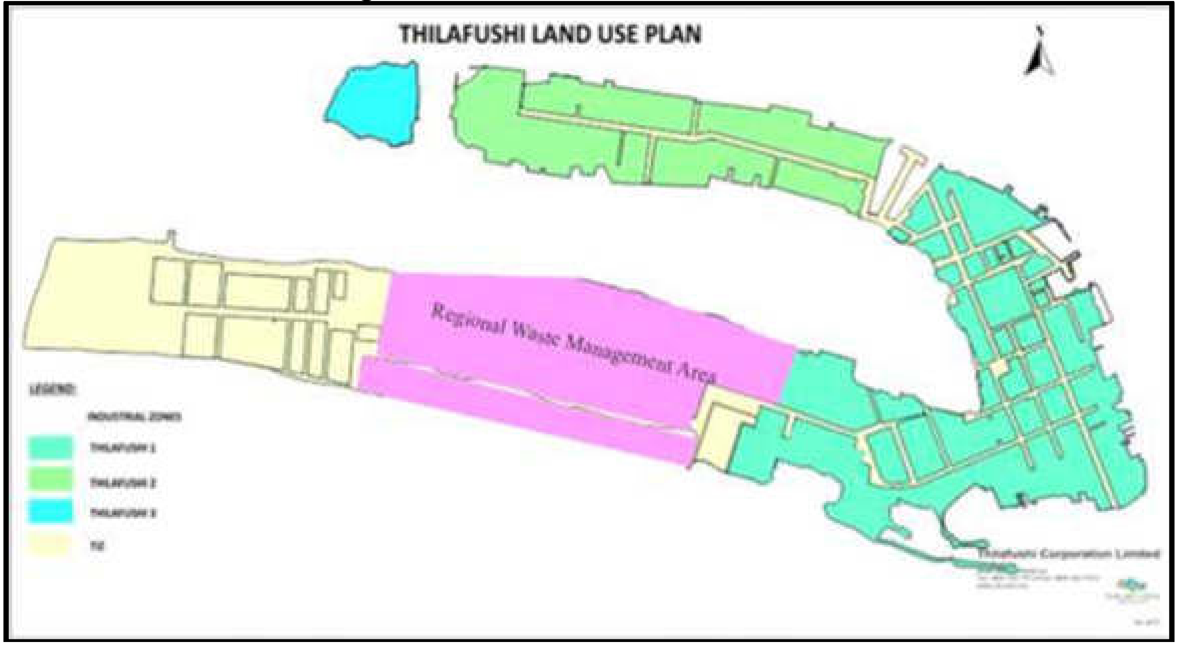
G. Socio-Economic Conditions

1. Physical Infrastructures

359. **Land Use**. Thilafushi is an island that has been reclaimed by dumping of wastes on the submerged “Thilafalhu” lagoon area since December 1992. The island was initially developed as a sand bank using dredged material from the Thilafushi Reef. Since then, land has been reclaimed by placing solid waste in dredged holes on the reef flat and later topping it up with fresh lagoon sand.

360. The land use system of Thilafushi was developed in an ad hoc manner without a master plan. Hence, the present land use patterns show a mixed approach to development with a variety of industrial, manufacturing and warehousing activities being undertaken on the island.

Figure 117: Thilafushi Land Use Plan



Source: Thilafushi Corporation Limited.

361. The bulk of the land in Thilafushi is used for manufacturing or industrial activities. These include activities like aluminum product assembly, construction prefabrication, boat building and workshops, among others. Most of these developments are located at Thilafushi 2 (see the legend in Figure 117). This is primarily due to the large plots of land leased from these areas. A number of new manufacturing activities have appeared on the old Thilafushi 1 Island, primarily in the form of workshops, construction related manufacturing and boat building. Some of these plots were initially allocated for warehousing.

362. **Industries**. With the development of Thilafushi as an industrial zone, numerous small and middle industries have been established on the island. The current (major) industrial activities in the island are boat manufacturing, cement packing, methane gas bottling and various large-scale warehousing. In March 2015, the Maldivian government decided to relocate the central commercial port from Malé to Thilafushi. This project is still pending.

363. **Commercial and Industrial Activities**. The major activities in Thilafushi are industrial activities, importing and stockpiling of construction materials and warehousing facilities, wholesale and retail trade, workshops and other industrial and commercial activities. There are more than 60 different companies established in Thilafushi, the number is more likely to get higher each year. There are both foreigners and locals employed in the island.

364. **Infrastructure facilities.** Desalinated water is supplied in bulk to the doorstep of each plot by the Maldives Water and Sewerage Company (MWSC), who operate a 150 m /day desalination plant on the island. There are also some small private desalination plants operating on the island. There is a high percentage of plots that use rainwater as the main source of drinking water. Drinking water is usually obtained from rainwater and desalinated water. Based on the socio-economic survey conducted in August – September 2019, 415 respondents confirmed they have flush latrine connected to a piped sewer system. Field surveys shows that 31% of the plots had their toilets connected to the sea and 68% had septic tank systems. There is no organized waste collection and management system on the island. Each tenant is responsible for daily and periodic waste collection and disposal to the dump site located on southern side of the island.

365. The main emergency services on the island the Fire Services and Police. The fire service is operated by Maldives National Defence Force (MNDF) 24 hours a day and is equipped to counter small to moderate fire events. The island is patrolled by the Maldives Police Services.

366. **Transportation**. The access to Thilafushi could be made by a ferry joining the capital Malé and operating every 30 minutes. Like other Islands Thilafushi is accessible through some docking points for speed boats and vessels. There is no other public transportation on the island. Transportation could be organized with the help of WAMCO, GMLZ or other private parties by car or lorries.

367. **Power Sources and Transmission**. Power is provided by the State Electric Company (STELCO) and from private generators (diesel generator sets). There is no exclusivity provision for STELCO as is the case in inhabited islands. However, 80% of the plots use STELCO electricity.

368. **Agriculture Development and Tourism**. Thilafushi is dedicated to industrial development and has no strategy and plans to become an agriculture or tourism island.

2. Social and Cultural Resources

369. **Population and Communities**. According to the 2014 census, there were 2,052 persons in Thilafushi Island. The total number of males and females are 2,048 and 4, respectively. Out of the 2,052 persons on the island, 333 persons were Maldivian. The dominant age group is 20-24 years comprising about a quarter of the population.

Table 35: Living population at Thilafushi

Total			**Maldivian**			**Foreigners**		
Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
2,052	2,048	4	333	332	1	1,719	1,716	3

370. There are no communities/residential areas in Thilafushi. The island is an industrial zone. A socio-economic survey was conducted in August to September 2019 as the Government of Maldives does not have an updated database that could describe the socio-economic conditions

in the island. The overall objective of the survey is to ascertain the baseline socio-economic profile of the workers in Thilafushi and residents in Gulhifalhu Islands. The survey also provides insight on the population's needs, current waste disposal practices and the willingness of the companies to pay for waste management services. A complete report of this socio-economic survey is attached as Appendix 13.

371. The survey was carried out using random sampling and two questionnaires, one questionnaire for individuals working and/or residing in Thilafushi and Gulhifalhu and the other for companies based on these islands. Four hundred and thirty (430) individuals and 35 companies were surveyed across Thilafushi and Gulhifalhu Islands. Respondents were mainly located in Thilafushi. Spatial distribution of these surveyed workers and companies in the islands are illustrated in Figure 118 and Figure 119 below.

Table 36: Number of Individuals Surveyed

Island	Individuals	Percentage	Males	Females
Thilafushi	374	86.98%	373	1
Gulhifalhu	56	13.02%	56	0
Total	**430**	**100%**	**99.77%**	**< 1%**

Table 37: Number of Companies Surveyed

Island	Companies	Percentage	Males	Females
Thilafushi	32	91.43%	31	1
Gulhifalhu	3	8.57%	3	0
Total	**35**	**100%**	**97.14%**	**2.86%**

Figure 118: Spatial Distribution of Surveyed Workers in Thilafushi and Ghulee Fahlu.

Figure 119: Spatial Distribution of Surveyed Companies in Thilafushi and Ghulee Fahlu.

372. As these islands are mainly used for manufacturing and industrial activities, respondents of the survey were predominantly male. There were only 2 female respondents,1 for each of the individual and company questionnaires. The woman who responded to the individual questionnaire is 40 years old from Bangladesh living in Thilafushi in accommodation provided by the employer. The woman who responded to the company questionnaire is Maldivian and works for a company in Thilafushi that provides housing to their employees in Malé. Her company provides health insurance for their employees. Three employees from her company were reported to have health issues within the past year for fever and common cold. They sought medical attention in a health facility in Malé. The respondent believes that the practices of waste disposal in Thilafushi, including burning, is causing health issues to her and her employees.

373. There are 319 individuals surveyed that stay in Thilafushi and 52 stay in Gulhifahu, which totals 371. Of these, 367 or 98.92% are provided housing by their employers. As a result, the overwhelming majority of individuals surveyed that are staying in Thilafushi and Gulhifalhu are provided housing by their employers. The remaining respondents live in Malé (51) and in other islands such as Hulhumalé and Villimalé. Almost 89% of all respondents are provided housing by their employers.

Table 38: Location of Accommodation of Individuals Surveyed

Island	Number of Respondents	Percentage
Thilafushi	319	74.19%
Gulhifalhu	52	12.09%
Malé	51	11.86%
Other islands	8	1.86%
Total	**430**	**100%**

Table 39: Housing Arrangement of Individuals Surveyed

Housing	Number of Respondents	Percentage
Provided by employer	382	88.84%
Renting	39	9.07%
Own property	5	1.16%
Not paying rent	4	< 1%
Total	**430**	**100%**

374. The individuals surveyed range from 18 to 67 years old and are mostly Muslims (81%) from Bangladesh (66%). The education level of the respondents' showed that 9% did not have any education, 12% had basic literacy skills, and 25% completed primary school. An estimate of 50% obtained secondary level education or higher but only 4% have completed a degree. Thus, an estimate of 56% of the respondents are unskilled laborers, 36% are skilled workers, 7% have a supervisor level position and <1% are managers. None of those surveyed are believed to be involved in fishing activities.

Table 40: Age of Individual Respondents

Age (years)	**Number of Respondents**	**Percentage**
18-29	186	43.26%
30-39	150	34.88%
40-49	68	15.81%
50-59	20	4.65%
60-67	6	1.40%
Total	**430**	**100%**

Table 41: Religion of Individuals Surveyed

Religion	**Number of Respondents**	**Percentage**
Islam	349	81.16%
Hinduism	53	12.33%
Buddhism	18	4.19%
Christianity	10	2.33%
Total	**430**	**100%**

Table 42: Nationality of Individuals Surveyed

Country of Nationality	**Number of Respondents**	**Percentage**
Bangladesh	283	65.81%
Maldives	66	15.35%
India	46	10.70%
Sri Lanka	23	5.35%
Nepal	10	2.33%
Indonesia	2	.47%
Total	**430**	**100%**

Table 43: Education Level of Individuals Surveyed

Education Level	**Number of Respondents**	**Percentage**
Secondary level and higher (non-degree)	216	50.23%
Primary level	108	25.12%
Basic literacy skills	50	11.63%
No education	37	8.60%
Degree level	19	4.42%
Total	**430**	**100%**

Table 44: Employment Level

Level	**Number of Respondents**	**Percentage**
Unskilled/ laborer	230	53.49%
Skilled/ expert	153	35.58%
Supervisor	32	7.44%
Manager	3	< 1%

Unknown	12	2.79%
Total	**430**	**100%**

375. Of the 35 companies surveyed, 18 did not provide detail on their type of business. The remaining 17 companies are engaged in the activities listed in Table 45. About 86% of companies surveyed reported that their employees are housed in Thilafushi and an estimate of 77% provide health insurance for their workers.

Table 45: Types of Companies Surveyed

Island	Business
Thilafushi	cooking
Thilafushi	tin sheet manufacturing
Thilafushi	sea and land transportation
Thilafushi	logistics
Thilafushi	boat repair and logistics
Thilafushi	water plant and electrical work
Thilafushi	Oil supplier; boat yard; port harbor; workshop
Thilafushi	garage
Thilafushi	tea shop
Thilafushi	repair and maintenance of heavy vehicles
Thilafushi	diesel seller
Thilafushi	boat building and repair
Thilafushi	police services
Thilafushi	cargo loading and unloading
Gulhifalhu	electricity provider
Gulhifalhu	island development
Gulhifalhu	storage and workshop

Table 46: Location of Employee Housing

Island	Number of Respondents	Percentage
Thilafushi	30	85.71%
Malé	4	11.43%
Gulhifalhu	1	2.86%
Total	**35**	**100%**

376. Twenty-four (24) or 69% of company respondents reported that they segregate their waste but only 10 or 29% stated that their waste is collected. Of those who reported that waste was collected from their company, collection frequency varied from daily to once a month. Thirteen (13) of the companies surveyed sell their recyclable waste.

377. Most of the laborers and companies are aware of the health issues related to inadequate waste management. The employers surveyed believe that the present waste disposal practices in Thilafushi affect their health and the health of their employees. The main reason was pollution due to burning of waste. Twenty-one (21) companies reported that they pay for waste disposal. However, of these, 18 reported that they were poorly satisfied with the waste collection services.

378. Of the total company respondents, 25 companies have stated their willingness to pay a higher amount than what they're currently paying for improved waste collection services. The survey found that smoke inhalation is perceived to be the main problem as the smoke can at times impair the visibility in Thilafushi. There are no fishing activities within the study area.

379. **Health Facilities**. Nearby healthcare facilities and hospitals are located in Malé. A health facility was opened in Thilafushi only recently in July 2019. However, the facilities and services offered are limited.

380. **Education Facilities**. There is no evidence of education facilities on Thilafushi. Nearby schools, high schools and other education facilities are located in Malé.

381. **Physical Cultural Resources**. No evidence of physical and cultural heritage could be found at Thilafushi. Similarly, no evidence of historical or archeological sites could be found at Thilafushi.

382. **Current use of land resources for traditional purposes**. No evidence of current use of land for traditional purposes could be found at Thilafushi.

383. **Sensitive Receptors**. Based on the results of the socio-economic survey (see discussion of survey results above), individuals were assessed if they will be directly affected negatively by the WTE project at any point during its implementation. Further, the extent of impact, if any, of the WTE project to these individuals was also assessed.

384. Assessment of the results of the survey show that the most sensitive receptor individuals are those workers who are employed without security of tenure and the elderly (65 years old and above). However, the project does not have influence or control over these individuals, nor will the project have impact on them. Summary of this assessment is in **Error! Reference source not found.**below:

Table 47: Assessment of Project Impacts to Potential Sensitive Receptors

Criteria Based on ADB SPS	Findings in the Survey	Impact of the Project
Below Poverty Line / Poor	The individuals surveyed are all employed at various positions and levels, from managerial positions to unskilled laborers.	None. The project will not cause displacement of workers in the island. Neither will the project impact the workers who may or may not be classified as belong to below the poverty line.
Female-headed HH	Not applicable. All workers including women in the island stay in housing or accommodation provided by employers. The island is not a residential area, and the status of determining households as female-headed or not is not applicable in this case.	None.
Landless or Without Legal Title to Land	Not applicable. All workers in the island stay in housing or accommodation provided by employers. The status of being landless or without legal title to land is not applicable in this case.	None. The project has not or will not displace any individual or entity with ownership to land or property. The project site is owned by the government (a reclaimed land) and no legal or illegal settlement exists on this site.
Elderly and Persons with Disabilities	No individuals surveyed were found to have disabilities.	None.

Criteria Based on ADB SPS	Findings in the Survey	Impact of the Project
	The senior citizen age in the Maldives is 65 years old. Of the 430 individuals surveyed, only 2 individuals are 65 years old or above. Both are laborers who perceive their economic status to be middle income level. One lives in Malé and the other lives in Thilafushi in housing provided by their employer.	
Security of Employment	The majority of those surveyed stated that they have work permits. However, 51 foreign individuals (not Maldivian) surveyed have reported that they do not have work permits or visas.	None. The project does not have any control on the vulnerability of these workers who may lose their jobs at any time. Likewise, the project does not impact the viability of the companies where these workers are employed.
Indigenous Peoples	None.	None.

385. The workers who are currently working at the dumpsite are contractually or permanently employed by WAMCO. Once the WTE Project operates and the dumpsite stops operation, these workers will still be working as WAMCO employees and may be assigned to other works SWM operations.

H. Additional Baseline Data Gathering.

386. During the detailed design phase of the project, the baseline survey shall be conducted to include monthly baseline data on ambient air quality, and quarterly groundwater quality and marine water quality. The DBO Contractor shall undertake progressive monitoring and sampling activities during this period to ensure robust baseline data and pre-works environmental conditions are documented. The results of the baseline survey are considered in the final detailed design of the project. In particular, the DBO Contractor shall:

(i) undertake ambient air quality measurements, marine water quality analysis, and marine underwater ecology survey for each season of the year at the identified sampling locations in this EIA report (and any other locations in and around Thilafushi island as may be deemed by the DBO Contractor as important sampling locations);
(ii) follow required sampling methodologies and locations, including appropriate averaging time for ambient air quality measurements as indicated in the WHO Ambient Air Quality Guidelines; and
(iii) include results of analyses in the updating of the EIA during the detailed design phase and consider these results in the final detailed design of the project as applicable.

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Overview of Anticipated Impacts and Mitigation Measures

387. Potential environmental impacts of the proposed WTE Plant for Project area in Thilafushi are presented in this section. Mitigation measures to minimize and/or mitigate negative impacts,

if any, are recommended along with the agency responsible for implementation. Monitoring actions to be conducted during the implementation phase are also recommended to reduce the impact.

388. Potential environmental impacts are categorized into four categories considering subproject phases: location impacts, design impacts (pre-construction phase), construction phase impacts, and operations and maintenance phase impacts.

389. Location impacts include impacts associated with site selection and include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood or any other structures by the development of that site.

390. Design impacts include impacts arising from project design, including technology used, scale of operation/throughput, fly ash and bottom ash production, discharge specifications, pollution sources and ancillary services.

391. Construction impacts include impacts caused by site clearing, earthworks, machinery, vehicles and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.

392. Operation and maintenance impacts include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams, and occupational health and safety issues.

393. Screening of environmental impacts has been based on the impact magnitude (negligible/moderate/severe – in the order of increasing degree) and impact duration (temporary/permanent).

394. As mentioned earlier, the project will be implemented under a Design-Build-Operate (DBO) contract and the detailed design phase will be carried out by the selected DBO Contractor. Hence, the impacts are based on the preliminary design prepared for the purpose of this EIA.

395. This section identifies the possible project-related impacts, in order to identify issues requiring further attention. ADB SPS requires that impacts and risks during pre-construction, construction and operational stages should be analyzed in the context of the project's area of influence.

B. Impacts Due to Location of Project

396. The location of the project is in the proximity of the dumpsite at Thilafushi. Thilafushi is an industrial island with the oldest and largest landfill in the country and host to numerous industrial companies. The WTE plant and ancillary facilities will be developed 15 hectares government-owned land which has been reclaimed from shallow lagoon. The old dumpsite, adjacent to the project site, will be closed and remediated when the WTE plant becomes operational.

397. Locating the WTE project in Thilafushi will reduce environmental risks associated with locating the project in another site or island, especially when the dumpsite is to be rehabilitated in the future anyway (impacts are limited to only one area, rather than in two areas). At the same time, Thilafushi is an industrial island and no residential areas will be affected. Therefore, no negative impacts are envisaged because of the location of the project.

C. Impacts Due to Physical Integrity of the Site

398. The physical integrity of proposed project site cause serious damage to the WTE Plant is not considered in the final detailed design of the project. In order to ensure the integrity of infrastructures of the WTE Plant, there is also a need to ensure the integrity of the project site itself. The Ministry of Environment will be responsible for undertaking a geotechnical study on the site and the DBO Contractor will ensure the WTE Plant infrastructure design considers the results of the geotechnical study. The DBO Contractor will also be responsible for undertaking a climate risk and vulnerability assessment on the site and ensure the WTE Plant infrastructure design considers the results of the assessment.

D. Impacts Due to Design of Project

399. Many aspects of the WTE Plant operations will negatively impact the environment if no proper measures are included or integrated in the detailed design of components of the plant. This section discusses all the design considerations that will be included in the final detailed design to ensure no adverse impact occur to the environment.

400. **Performance Guarantees**. Simultaneous with the preparation and conduct of EIA, the project has already undertaken preliminary steps to ensure it will not impact the environment significantly during its operations. As a project to be awarded under a DBO arrangement, a number of important measures have been proposed in the bidding and DBO contract documents. The bid document shall ensure that it requires the DBO contractor to meet the following performance requirements that will ensure the project will comply with applicable environmental standards as discussed in Section III hereof:

Table 48: WTE Plant Performance Requirements Per DBO Bid Document Related to Environmental Safeguards

Parameters	Performance Requirements[a]
Performance Guarantee (PG) 6: Total organic carbon-content bottom ash (TOC)	The Contractor shall ensure that the annual averaged TOC content of bottom ash shall be less than 3.0% by weight while none of the samples shall be with a TOC greater than 3.5%. The average TOC content shall be determined by analyzing two representative samples monthly (i.e. approximately one sample every 15 days). None of the measured TOC contents shall exceed 3.5% by weight dry matter. Measurement of TOC according to British Standard EN 131317. Six samples per year tested by external accredited laboratory.
PG 7: Temperature of cooling water outlet	The Contractor shall design and build the plant so that the cooling water outlet temperature shall be not more than 3 degrees Celsius above receiving water ambient temperature.
PG 8: Air emission standards	The Contractor shall operate the plant so that none of the half hourly and none of the daily aggregated pollutants' measurements and none of the discontinuously measured pollutants' concentrations exceed the limits stipulated in Annex VI of Directive 2010/75/EU of the European Parliament and the Council (Technical Provisions Relating to emission standards for waste incineration plants and waste co-incineration plants any time. Measurement will be done thru CEMS and calibrated every third year (at least) by an accredited laboratory or certification agency.
PG 9: Combustion conditions	The Contractor shall ensure that combustion conditions (temperature = 850 degrees Celsius for at least 2 seconds residence time) are maintained at all times. The requirements as per Chapter 5.16 (Permits and Licenses to be Obtained) of the bidding document shall be considered, which specifies the trail operations and performance

<table>
<tr>
<td></td>
<td>guarantees test. Combustion conditions include the need for proof by Contractor of maintaining the temperature and residence time, by submitting a methodology for how to validate that residence time and temperatures are kept under most unfavorable conditions.

Combustion conditions shall be met any time during tests to be done on the completion of WTE plant construction and thereafter.</td>
</tr>
<tr>
<td>PG 10: Leachate treatment plant (LTP) discharge standards</td>
<td>The maximum permissible concentrations of pollutants discharged from the LTP into the environment are specified in the bidding document, which lists the effluent standards that should be complied with:
<table>
<tr><th colspan="2">Parameters</th><th>unit</th><th>Limit</th></tr>
<tr><td>Chemical Oxygen demand</td><td>COD</td><td>mg/l</td><td>200</td></tr>
<tr><td>Biological Oxygen demand</td><td>BOD_5</td><td>mg/l</td><td>20</td></tr>
<tr><td>Total Inorganic Nitrogen</td><td>$N_{tot, inorg}$</td><td>mg/l</td><td>70</td></tr>
<tr><td>Nitrite</td><td>NO_2-N</td><td>mg/l</td><td>2</td></tr>
<tr><td>Sulfide</td><td>S</td><td>mg/l</td><td>1</td></tr>
<tr><td>Total Phosphate</td><td>P_{tot}</td><td>mg/l</td><td>3</td></tr>
<tr><td>Lead</td><td>Pb</td><td>mg/l</td><td>0.5</td></tr>
<tr><td>Cadmium</td><td>Cd</td><td>mg/l</td><td>0.05</td></tr>
<tr><td>Total Chromium</td><td>Cr</td><td>mg/l</td><td>0.5</td></tr>
<tr><td>Chromium (VI)</td><td>Cr VI</td><td>mg/l</td><td>0.1</td></tr>
<tr><td>Mercury (total)</td><td>Hg</td><td>mg/l</td><td>0.02</td></tr>
<tr><td>Nickel</td><td>Ni</td><td>mg/l</td><td>1</td></tr>
<tr><td>Zinc</td><td>Zn</td><td>mg/l</td><td>2</td></tr>
<tr><td>Copper</td><td>Cu</td><td>mg/l</td><td>0.5</td></tr>
<tr><td>Arsenic</td><td>As</td><td>mg/l</td><td>0.1</td></tr>
<tr><td>*Conductivity at 25°C**</td><td>-</td><td>*µS/ cm*</td><td>*2,500*</td></tr>
</table>
*used to monitor the performance of the LTP only</td>
</tr>
<tr>
<td>PG 11: Wastewater treatment discharge standards</td>
<td>The maximum permissible concentrations of pollutants discharged from the wastewater treatment plant into the environment are specified in the table of effluent standard for wastewater (see also **Table 13** of EIA report):
<table>
<tr><th colspan="2">Parameters</th><th>unit</th><th>Threshold Value</th></tr>
<tr><td>Chemical Oxygen demand</td><td>COD</td><td>mg/l</td><td>150</td></tr>
<tr><td>Biological Oxygen demand</td><td>BOD_5</td><td>mg/l</td><td>40</td></tr>
<tr><td>Suspended Solids</td><td>-</td><td>mg/l</td><td>100</td></tr>
<tr><td>Ammonia-N</td><td>NH4</td><td>mg/l</td><td>15</td></tr>
<tr><td>Total N</td><td>N</td><td>mg/l</td><td>30</td></tr>
<tr><td>N-hexane extract (mineral oils, grease)</td><td>-</td><td>mg/l</td><td>10</td></tr>
</table></td>
</tr>
<tr>
<td>PG 12: Sound pressure level</td>
<td>Sound pressure levels shall not exceed the 80 dBA at 1 min distance from the emitting source and different sound pressure levels at the site</td>
</tr>
</table>

	boundary: 70 dBA from 0700 to 2200 hours and 50 dBA from 2200 to 0700 hours. Measurement will be in-situ using decibel meter. Frequency of measurement specified in the EMP.

[a] Performance standards from the Maldives Environmental Protection Agency and international guideline values as specified in EU Directives are compared and whichever is more stringent is applicable.

401. **Air Pollution Control (APC) system**. The WTE Plant shall be equipped with dry flue gas cleaning with a reactor, sodium bicarbonate injection and limestone, activated carbon injection, bag filter and selective non-catalytic reduction (SNCR) for nitrogen oxides. The APC system shall be designed so that bypass operations are not required.

(i) Flue gas cleaning.
  a. The reactor shall be designed so that flue gases, sodium bicarbonate, limestone and activated carbon are mixed efficiently.
  b. For the regulation of the flue gas temperature, a quench with water shall be provided.
  c. The residues from the landfill leachate treatment shall be disposed of via the reactor.
  d. The bag house filter shall be designed with a maximum filter surface area load of 0.8 m^3/m^2 min. and a maximum operation temperature of 200°C.
  e. The pressure loss shall be smaller than 14 mbar.
  f. The bag filter shall be equipped for fully automated and controlled (by differential pressure measurement) cleaning of the filter hoses by compressed air impulses.
  g. The separated dust shall be transported via a water-cooled discharge screw into a big-bag filling station. The filled big bags shall be stored in a separate area of the adjacent landfill.

(ii) Nitrogen oxide removal system.
  a. The NO_x-removal system shall be a SNCR.
  b. With a SNCR-system, ammonia water with ammonia content < 25% or a water-urea-solution shall be injected in the first pass of the boiler at a temperature level of approximately 900°C.
  c. The system shall be required with 3 levels of injection nozzles in the first boiler pass.
  d. The tank for the ammonia water shall be an unpressurized vessel with a capacity of 30m^3.

402. **Continuous Emission Monitoring System (CEMS)**. For each of the stacks (i.e. incineration train), the DBO Contractor shall design and supply a CEMS with the following requirements:

(i) Include the necessary flue gas sampling points for the emission measurements. The flue gas sampling points shall be located at an appropriate height above the ground that shall allow easy access.

(ii) In addition to the continuously measured parameters covered in the performance guarantees, the pressure, flue gas temperature and flow, oxygen, water and carbon dioxide concentration shall be also continuously measured.

(iii) The flue gas samples shall be routed via heated pipes to avoid condensation under all operating conditions to the measuring room or a measuring container.

(iv) The analyzers shall be installed in cabinets. In addition, a computer and the holders for the test gas cylinders (zero gases and calibration gases), sample gases and carrier gases shall be arranged in the measuring room.
(v) The measuring room or container, respectively, shall be air-conditioned.
(vi) The analyzers shall be equipped with a periodically self-calibrating system using the test and calibrating gas. Each analyzer shall be provided with a suitable measurement range to allow the collection of emission data beyond the half hourly emission standards without compromising the accuracy in its lower measurement range.
(vii) The measuring instruments used shall comply with EN 14181 and EN 15267 or US EPA CFR 11 Part 60 and Part 75.
(viii) Raw emission data shall be compiled by the emission evaluation program to facilitate emissions statements according to the regulatory requirements.
(ix) The emissions computer shall be equipped with special software, e.g. according to DIN EN 16258, which fulfils the following requirements:
  a. Formation of overage values
  b. Correction calculation for O_2, temperature, pressure and flue gas humidity
  c. Simultaneous calculation of the concentration
  d. Archiving the raw data and the classified averages values with date and time stamp for stamp minimum 5 years.
(x) All measurement results shall be forwarded to the DCS and be displayed in the central control room. Subject to the requirements of the EPA, the emission data shall be also transmitted to EPA.

403. **Dust control system.** Notwithstanding the obligation to limit the dust emissions from the stack, the DBO Contractor shall design and build the facilities to prevent any dust emissions due to unloading, loading, landfilling or conveying and processing any dust prone materials such as bottom ash, chemicals for the APC system, APC residues etc. Any potential explosion hazard due to a dust laden environment shall be prevented. Subject to the considerations of the DBO Contractor, the design shall consider wherever appropriate measures such as, but not limited to:

(i) Covering all conveyors to prevent materials to be blown away by wind;
(ii) Using dust free bulk loading chutes during unloading or loading;
(iii) Dust free filling from or discharging into jumbo bags;
(iv) Using dust filter to remove dust from an exhaust;
(v) Minimizing drop height of automatic unloading or discharging systems; and
(vi) Operating dust laden atmosphere under sub-atmospheric pressure.

404. Signage to instruct the DBO Contractor's personnel of any potentially dust laden area and to use protection equipment shall be provided.

405. **Odor control system**. Odor emission from the plant may be due to handling waste, wastewater or chemicals (such as urea or ammonia). The DBO Contractor shall apply appropriate measures in the design of the plant such as but not limited to:

(i) Operating odorous atmospheres under sub-atmospheric pressure and deodorizing the atmosphere by using it as primary air for the combustion system (e.g. bunker, tipping hall):
(ii) Monitoring the continuous operation of ventilating systems (fans) and alarming in the event of failures;
(iii) Using gas tight connectors while unloading urea/ammonia; and
(iv) Providing an efficient and sufficient aeration to the wastewater treatment.

406. The DBO Contractor shall determine the potential fugitive and localized emission sources and shall submit these jointly with the odor control concept during the concept design phase.

407. **Landfill system**. The DBO Contractor shall ensure that the design of the residual waste landfill will be able to accommodate the volume of all generated incinerator bottom ash and fly ash during the entire operation of the WTE Plant, with the assumption that no bottom ash will be recycled and/or reused. The DBO Contractor shall include in the design the following criteria:

(i) The landfill arrangement shall be designed to maximize the useable landfill volume of the site;
(ii) The residual waste landfill cell arrangements shall be designed to allow for the progressive closure of individual landfill cells on completion and thereby to minimize the amount of leachate requiring treatment over the lifetime of the landfill;
(iii) The design shall allow for the development of individual cells in a coherent and logical sequence and in a manner, which ensures the stability of all working faces and of the waste mound as a whole.
(iv) The design shall incorporate appropriate back-up systems in the event of failure of any component of the environmental control and management systems;
(v) The residual waste landfill concept shall be designed to minimize the lateral and vertical extent of the working face and thereby the amount of deposited waste (bottom ash and fly ash) that is exposed to the environment;
(vi) The design shall ensure that residual waste can be deposited in a manner that prevents damage to the engineered barrier or liner, the leachate control system, and the collection and transfer system.
(vii) The residual waste landfill design shall incorporate an internal access corridor to allow for safe traffic movement and to accommodate site services and monitoring devices;
(viii) Measures shall be provided for controlling unauthorized access to the residual waste landfill including, as appropriate, the provision of ditches, berms, planting and fencing;
(ix) Slopes shall be graded to ensure long term slope stability. Graded slopes shall be a maximum of 25%;
(x) Soil erosion and dust generation shall be minimized;
(xi) All residual waste landfill construction materials shall be free of organic matter and debris; and
(xii) Measures shall be provided to monitor and manage groundwater beneath and adjacent to the residual waste landfill area.

408. With reference to the waste characteristics in Table 1, the wastes have the potential to contain hazardous substances. Therefore, both the bottom ash and fly ash may likewise contain these hazardous substances that could impact the environment if no sufficient measures are taken to contain them. In order to avoid this impact, the DBO Contractor shall design the residual waste landfill facility by applying international best practices on landfilling of hazardous wastes, such as the relevant requirements indicated in the EU Directive on the Landfill of Wastes.[26] Table 49 below summarizes these requirements.

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[26] Council Directive 1999/31/EC of 26 April 1999 on the Landfill of Waste.

Table 49: General Requirements for Hazardous Waste Landfills

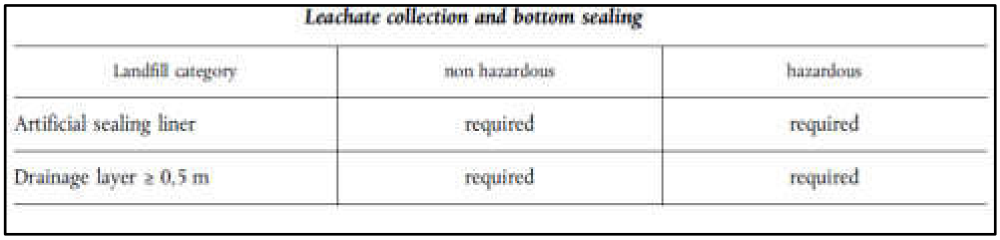
<table>
<tr><th>Design Parameters</th><th>Design Considerations and Requirements</th></tr>
<tr><td>Water control and leachate management</td><td>Appropriate measures shall be taken, with respect to the characteristics of the landfill and the meteorological conditions, in order to:
(i) control water from precipitations entering into the landfill body,
(ii) prevent surface water and/or groundwater from entering into the landfilled waste,
(iii) collect contaminated water and leachate,
(iv) treat contaminated water and leachate collected from the landfill to the appropriate standard required for their discharge following Table 13 of this EIA report.</td></tr>
<tr><td>Protection of soil and water</td><td>The landfill must be situated and designed so as to meet the necessary conditions for preventing pollution of the soil, groundwater or surface water and ensuring efficient collection of leachate as and when required. Protection of soil, groundwater and surface water is to be achieved by the combination of a geological barrier and a bottom liner during the operational/active phase and by the combination of a geological barrier and a bottom liner during the operational/active phase and by the combination of a geological barrier and a top liner during the passive phase/post closure.

The geological barrier is determined by geological and hydrogeological conditions below and in the vicinity of a landfill site providing sufficient attenuation capacity to prevent a potential risk to soil and groundwater.

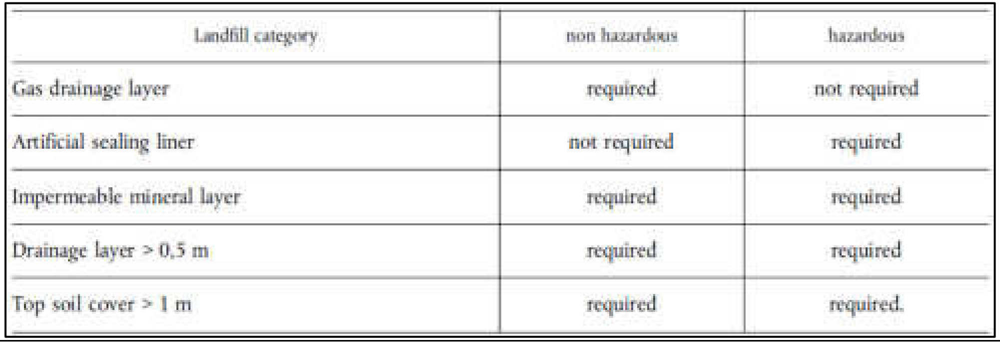
The landfill base and sides shall consist of a mineral layer which satisfies permeability and thickness requirements with a combined effect in terms of protection of soil, groundwater and surface water at least equivalent to the one resulting from the following requirements:
- landfill for hazardous waste: K <= 1.0 × 10^{-9} m/s; thickness >= 5 m,

Where the geological barrier does not naturally meet the above conditions, it can be completed artificially and reinforced by other means giving equivalent protection. An artificially established geological barrier should be no less than 0.5 meters thick.

In addition to the geological barrier described above a leachate collection and sealing system must be added in accordance with the following principles so as to ensure that leachate accumulation at the base of the landfill is kept to a minimum.


<i>Leachate collection and bottom sealing</i>
<table>
<tr><th>Landfill category</th><th>non hazardous</th><th>hazardous</th></tr>
<tr><td>Artificial sealing liner</td><td>required</td><td>required</td></tr>
<tr><td>Drainage layer ≥ 0,5 m</td><td>required</td><td>required</td></tr>
</table>

If the DBO Contractor finds that the prevention of leachate formation is necessary, a surface sealing may be prescribed. Recommendations for the surface sealing are as follows:</td></tr>
</table>

<table>
<tr><th>Design Parameters</th><th>Design Considerations and Requirements</th></tr>
<tr><td></td><td>
<table>
<tr><th>Landfill category</th><th>non hazardous</th><th>hazardous</th></tr>
<tr><td>Gas drainage layer</td><td>required</td><td>not required</td></tr>
<tr><td>Artificial sealing liner</td><td>not required</td><td>required</td></tr>
<tr><td>Impermeable mineral layer</td><td>required</td><td>required</td></tr>
<tr><td>Drainage layer > 0,5 m</td><td>required</td><td>required</td></tr>
<tr><td>Top soil cover > 1 m</td><td>required</td><td>required.</td></tr>
</table></td></tr>
<tr><td>Nuisances and hazards</td><td>Measures shall be taken to minimize nuisances and hazards arising from the landfill through:
- emissions of odors and dust,
- wind-blown materials,
- noise and traffic,
- birds, vermin and insects,
- formation and aerosols,
- fires.

The residual waste landfill shall be equipped with appropriate form of physical barriers so that dirt originating from the site is not dispersed onto public roads and the surrounding land.</td></tr>
<tr><td>Stability</td><td>The emplacement of waste on the site shall take place in such a way as to ensure stability of the mass of waste and associated structures, particularly in respect of avoidance of slippages. Where an artificial barrier is established it must be ascertained that the geological substratum, considering the morphology of the residual waste landfill, is sufficiently stable to prevent settlement that may cause damage to the barrier.</td></tr>
<tr><td>Barriers</td><td>The residual waste landfill shall be secured to prevent free access to the site. The gates shall be locked outside operating hours. The system of control and access to each facility should contain a program of measures to detect and discourage illegal dumping in the facility.</td></tr>
</table>

409. **Storm water collection system**. The DBO Contractor's design shall include surface water and storm water collection and diversion systems in order to protect the residual waste landfill area and minimize the generation of leachate. Sedimentation ponds shall be established to contain polluted drainage and runoff containing soil and sediment.

410. **Leachate treatment system.** The DBO Contractor shall ensure that design of the Leachate Treatment Plant (LTP) will also follow applicable requirements in the EU Directive on Landfill of Wastes as enumerated in Table 49 in order to prevent leachate contamination of marine water and groundwater. In addition to these requirements, the DBO Contractor shall also include the following requirements in the design of the LTP:

(i) An acid and alkali resistant floor finish shall be provided for all sections of the leachate treatment facility that may be exposed to acid or lye;
(ii) A drainage system shall be provided to collect liquids, spills etc. that is connected to the site's sewer system;
(iii) A collection and disposal system shall be provided for reverse osmosis rinsing and flushing liquids;

(iv) The necessary IT linkage shall be made to the site's LAN and telephone network and linkage to the DCS network;
(v) The level of the engineered barrier shall be no deeper than 1.5 meters above mean sea level and in accordance with the applicable environmental standards;
(vi) The leachate collection system shall provide for the progressive installation of control measures for the management of leachate;
(vii) The design shall ensure that piping is not blocked by sedimentation, debris, algal or fungal growth and that structural integrity is maintained at all times;
(viii) The system shall be capable of dealing with the maximum leachate flow at any time during the lifespan of the landfill;
(ix) Leachate shall be treated to meet the effluent discharge standards;
(x) The design shall provide for the segregation of surface water from leachate;
(xi) The design and selection of materials for the leachate management and storage system and location of discharge point into the sea shall be discussed with, and approved by, the Maldives EPA;
(xii) The design shall provide a suitable system for the transfer of leachate from the collection system to the leachate treatment plant;
(xiii) Leachate levels shall be monitored continuously and shall be capable of being read electronically; and
(xiv) The leachate treatment system shall be capable of running automatically between and above specified leachate levels and volumes.

411. All components of the leachate collection, extraction, transfer and treatment system shall be capable of being maintained in a clean condition to ensure effective operation. Concentrate may be re-injected in the flue gas treatment process of the WTE plant. The Contractor shall design and build or organize a system for the re-injection of the LTP concentrate.

412. **Wastewater treatment system.** An on-site wastewater treatment plant will be provided to treat the wastewater generated from floor/vehicle washing and from staff/visitors. The treated effluent will be reused in the incineration plant or for washdown and landscape irrigation within the facility. Efforts will be taken so that no effluent would be discharged to the ground or sea. Should wastewater be discharged, the DBO Contractor shall ensure the design of the wastewater treatment plant will comply with the effluent standards in Section III hereof and consistent with the applicable performance guarantee in the DBO Contract as indicated in Table 48.

E. Impacts on Marine Protected Areas

413. Thilafushi is still the largest waste management center in greater Malé and more widely in Project area and beyond. The impacts of waste to the marine environment through transferring or disposing still continues. This problem is exacerbated as the current situation lacks proper docking facilities and infrastructure. Further, toxic components of general waste and particularly ELVs are poorly managed and risks of contaminating surrounding water are high. Improvements to the waste vessel harbor and facilities enabling handling of large containers carrying waste from within Greater Malé and around Project area will reduce this risk.

414. There are three marine protected areas (MPAs) located near the project site. Illustration and maps showing the proximity of these MPAs are in Figure 115. The details of the sites are provided in Table 50 below.

Table 50: Protected areas in the vicinity of Thilafushi

Name	Type	Notes	Location relative to project site
Dhekunu Thilafalhuge Miyaruvani (Lions Head)	Reef	Situated on the reef face of the outer atoll, favored dive spot	Immediate Southwest of Thilafushi Island at a distance of around 1km from the project site.
Gulhee Falhu Kollavaani (Hans Hass Place)	Reef	Deep lagoon area	East of Gulhifalhu Island, 0.4km to the East of Thilafushi Island, and 2km from the project site.
Giraavaru Kuda Haa	Reef	Isolated reef approximately 30m above lagoon floor	4 km North (NNE) of Thilafushi Island.

415. The Lions Head is the closest and the most vulnerable MPA for this project. This is a famous dive site as many gray reef sharks were seen from this site. However, big fishes are not seen as often as it was in the past. On the steep outside, the reef has caves, colorful washouts and overhangs at about 10m of depth. From the 7 marine location surveys conducted for this EIA, live corals were found along the reef where Lion Head is located. Other areas mainly consisted of rock and rubble. The Maldives EPA is currently considering reclassifying “Dhekunu Thilafalhuge Miyaruvani” from Protected Landscape/seascape (IUCN Category V) to Protected Area with sustainable use of Natural resources (IUCN Category VI), in terms of reflecting current land use in the surrounding areas and conserve ecosystems and habitats, together with associated cultural values and traditional, natural resource management.

416. The dive site Hans Hass place located about 2km from the project. It is expected that the project will have no impact to this site knowing the distance and Gulhee Fahlu island that encloses it from the western side where Thilafushi is located. Giraavaru Kuda Haa is located about 4 km north from the project site. It expected that no direct impact will be caused to this MPA due to the distance and location.

417. The construction activities that will have impact on the marine environment includes laying the discharge pipes for brine, sewerage and cooling water from the incinerators, construction of the coastal protection measures and berth. Moreover, the project site consists of a recently reclaimed land. The construction impacts are discussed in the section on construction phase impacts and operational phase impacts.

418. The overall potential impact for this location due to the project will be long term, positive and significant and will cover both the immediate area around the islands and the wider marine environment in Project area and beyond.

F. Impacts on Groundwater and the Terrestrial Environment

419. Thilafushi Island is an artificial island and therefore, any vegetation present is from weed colonization and tree planting efforts by the different existing locators (industrial and commercial). Furthermore, there are no trees in or in the close proximity of the project site.

420. The groundwater in Thilafushi is presumed to be highly contaminated from the leachate generated from the open waste dumpsite. Baseline data for the quality of ground water in the island are documented in this EIA report and will serve as reference in future monitoring activities under the project. The quality of the groundwater is expected to improve after the remediation of the dumpsite (although not part of the project that is subject of this EIA). Therefore, the impact will be positive, significant and long-term.

G. Impacts on Avifauna

421. The birds attracted to the island as well as water birds that frequent surrounding waters will benefit from both the improved handling and treatment to remove hazardous fractions onto the landfill or into surrounding waters. The beneficial effect will be significant and long-term.

H. Impacts on Critical Habitats

422. In order to assess whether the WTE project is located in a critical habitat, an initial screening was undertaken using the Integrated Biodiversity Assessment Tool (IBAT).[27] Results show that the location of the WTE project is likely a critical habitat. Therefore, a critical habitat assessment is needed to confirm the results. Critical habitat assessment ideally takes place across sensible ecological or political units that are sufficiently large to encompass all direct and indirect impacts from the project. These areas of analysis (AoAs) are thus often much broader than the direct project footprint. AoAs may be separate or combined, depending on the ecology of the biodiversity concerned. Considering the extent of potential impacts on aquatic biodiversity from the project, an aquatic AoA for the project was identified as the 50-km study area to make consistent with the default range in the IBAT Screening. This area is approximately within the Zone 3 of Maldives, within which common biological communities and/or management issues exist.

423. The critical habitat assessment considered if critical habitat-qualifying biodiversity candidates or species identified in the IBAT Screening are actually or potentially present within the AoA. The IFC Guidance Note 6 (2019)[28] has been used to identify if a certain biodiversity candidate or species can qualify the project AoA as Critical Habitat. Reasons are identified for each biodiversity feature likely meeting or not meeting Critical Habitat.

424. Results confirmed that the site is likely a critical habitat only for one terrestrial insect (identified as *Enallagma maldivensis*). As discussed in this EIA report, the insect thrives in freshwater environment. Therefore, this particular species is highly unlikely to be present within or around the vicinity of the WTE project site. However, as a precautionary measure, the critical habitat assessment and EIA recommend 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. As part of the detailed design, the DBO contractor in coordination with PMU will be required to undertake additional biodiversity assessment around the project site. 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. In cases when future information determines the existence of critical habitat, the WTE project should be able to demonstrate that:

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[27] The Integrated Biodiversity Assessment Tool (IBAT) is a multi-institutional programme of work involving BirdLife International, Conservation International, IUCN, and UNEP-WCMC. IBAT provides a basic risk screening on biodiversity. It draws together information on globally recognised biodiversity information drawn from a number of IUCN's Knowledge Products: IUCN Red List of Threatened Species, Key Biodiversity Areas (priority sites for conservation) and Protected Planet/The World Database on Protected Areas (covering nationally and internationally recognised sites, including IUCN management categories I–VI, Ramsar Wetlands of International Importance and World Heritage sites).

[28] https://www.ifc.org/wps/wcm/connect/5e0f3c0c-0aa4-4290-a0f8-4490b61de245/GN6_English_June-27-2019.pdf?MOD=AJPERES&CVID=mRQjZva

(i) It does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values;
(ii) It does not lead to a net reduction in the global and/or national/regional population of any Critically Endangered or Endangered species over a reasonable period of time; and
(iii) It has integrated into its management program a robust, appropriately designed, and long-term biodiversity monitoring and evaluation program.

I. Impacts on Socio-Cultural Resources

425. **Loss of land and effects on property**. No private property will be affected, and no land acquisition will be required. No encroachment to any private property is expected at any stage of the project implementation. The project will utilize its own land, including the lands and ports of WAMCO, during the design and mobilization stage of the project.

Table 51: Summary of impacts based on location

Potential Impact	Assessment
Marine environment and ecosystem	Long term, Beneficially significant
Groundwater and terrestrial environment	Long term, Beneficially significant
Avifauna	Long term, Beneficially significant
Land and effects on property	NIL

J. Impacts During Construction Phase

1. Air Pollution and Noise

426. Air pollution sources during the construction phase will consist of vehicular pollution, and pollution from machineries used in construction work, which will release exhaust and cause dust to be produced. The ambient levels of air pollution at the site is already very high. The released pollutants are not expected to remain stagnant to any particular area as the site is close to the coast on both sides and therefore the pollutants would be dispersed.

427. Similar to the sources of air pollution, noise and vibrations generated in the construction site also caused by the operation of machinery, equipment and vehicles. As there are few residents living in Thilafushi and they do not live in close proximity to the project site, the impacts on human life in minimal. Furthermore, the residents in this environment are engaged in industrial activity.

428. The impacts of air pollution, noise and vibrations although negative, will be temporary and not significant during construction.

2. Water Pollution and Impacts to Marine Environment

429. Impacts on the marine environment during the construction will largely be from the construction of the berth and the discharge pipes for hot water from the incinerator and the utilities such as sewerage and brine from desalination. The berth is proposed to be located at the enclosed lagoon in the island. Excavation in the area will results in sedimentation. As this semi-enclosed area is quite stagnant, settlement rate will be higher than an area with regular currents and water flow. This will also be short lived as the size and scale small, if excavation is required. The marine survey conducted for this EIA shows that this area mostly consists or rock and rubble

and hardly any live coral. Therefore, impacts for coral due to sedimentation is negligible. The discharge pipes will be directed towards the South into deep sea. As some live corals are located in this area, according to the marine survey, pipes should be laid during calm sea conditions, with as much care as is feasible.

430. Sea vessels can cause risks of water pollution, in the events of leaks and spills of fuel, lubricants, hydraulic fluids or other fluids used for vehicle operation. These may be hazardous waste. Although this area is already contaminated, care should be taken to mitigate the risks and impacts of any spills of hazardous waste. Although these impacts will be negative, it is short term and not significant.

3. Waste Generation

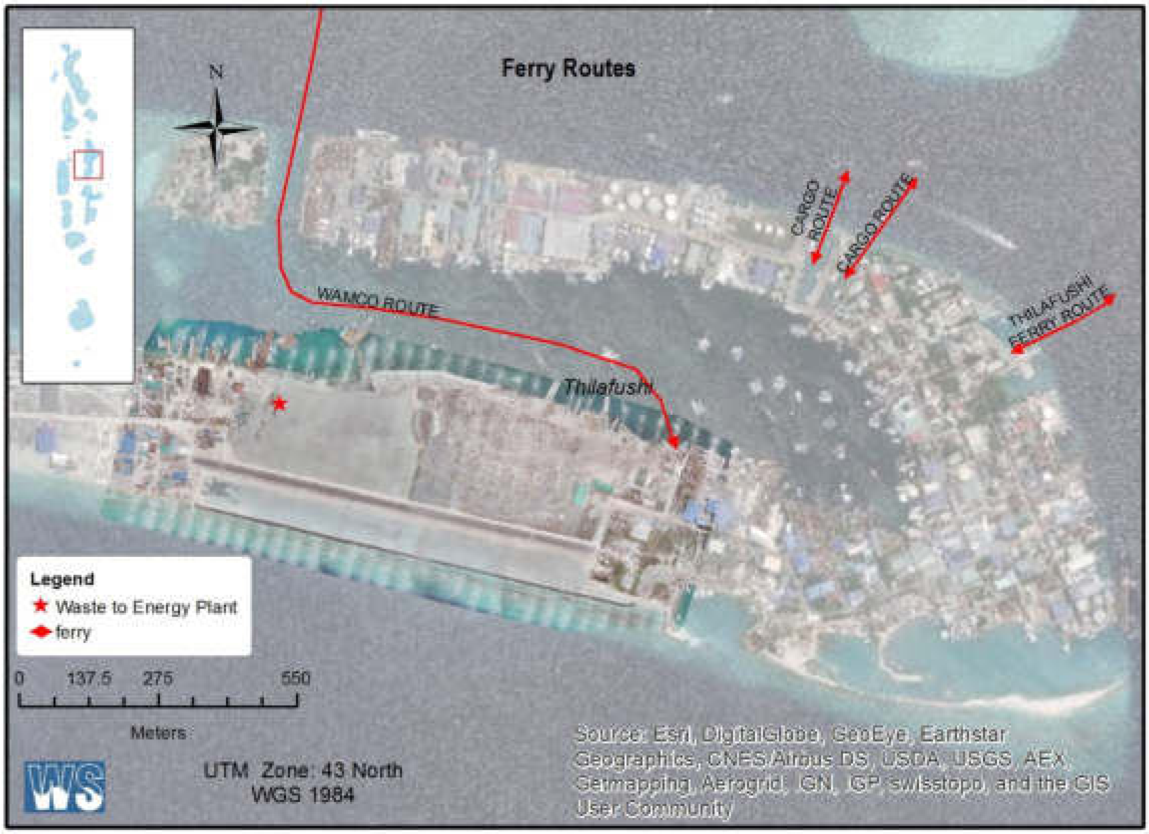
431. Waste generation will be expected during the construction phase. Expected wastes will include packaging of construction materials, equipment, fuels, lubricants, food and some rubble where existing structures need to be demolished. Mitigation measures for handling and disposal of these wastes are included in the EMP. Some specialist lubricants and paint may be hazardous. These will also be disposed of at the appropriate locations following the measures in the EMP. For toxic materials, approvals must be obtained from appropriate agency prior to importing materials rated as hazardous under the Globally Harmonized System of Classification and Labelling of Chemicals. Therefore, the potential impact is not significant.

4. Land-based and Marine Traffic Congestion

432. As there are few vehicles on Thilafushi, there will be no significant impact on land-based traffic. All vehicle and heavy equipment movements during construction phase will only be limited within the boundary of the project site.

433. Delivery of construction equipment and raw materials may increase marine traffic in the area. In order to avoid this impact, all delivery of equipment during mobilization phase and raw materials for the construction activities will be utilizing the exclusive docking ports of WAMCO, which are near or adjacent the project site. These docking ports or quays are where current solid wastes are unloaded from various parts of Project area. With this scheme, it is expected that no marine traffic and port congestion are expected that will affect the locator industries and workers at the island. Figure 120 below shows the marine route that will be utilized during construction and operation phase of the project. The figure also shows the location of docking ports of workers going in and out of the island, including the docking ports of ferries and other private marine vehicles.

Figure 120: Marine Traffic Route and Docking Port for the Project



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

5. Community and Occupational Health and safety

434. Impacts and risks for community and occupational health and safety are associated with heavy equipment in trafficked areas. The DBO contractor will be required to appoint a full-time environmental health and safety managers and maintain a pool of trained engineers to ensure the effective implementation of both environmental and occupational health and safety measures at the project site. The DBO Contractor shall establish its health and safety plan to be adopted at the site following international best practices and the World Bank EHS guidelines on construction and decommissioning activities. The DBO contractor has the responsibility to provide labor camps for migrant workers, and sufficient space for equipment, construction materials, consumables, and other supplies that will be required during construction phase. Office policies, benefits, facilities and compensations should not be distinguished between migrant and non-migrant workers.

435. During the detailed design phase, the DBO Contractor shall integrate international good practices on community and occupation health and safety in its construction methods and practices, such those included in ADB SPS and Section 4.2 of World Bank EHS Guidelines on Construction and Decommissioning activities.[29] Minimum requirements shall be the following:

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[29] IFC World Bank Group. 2007. Environmental, Health, and Safety (EHS) Guidelines – General EHS Guidelines: Construction and Decommissioning.

Community Health and Safety

(i) identify and assess the risks to, and potential impacts on, the safety of affected communities during the design, construction, operation, and decommissioning of the project, and will establish preventive measures and plans to address them in a manner commensurate with the identified risks and impacts;
(ii) avoid or minimize the exacerbation of impacts caused by natural hazards, such as landslides or floods, that could result from land use changes due to project activities;
(iii) inform affected communities of significant potential hazards in a culturally appropriate manner;
(iv) be prepared to respond to accidental and emergency situations. This preparation will include response planning document(s) that addresses the training, resources, responsibilities, communications, procedures, and other aspects required to respond effectively to emergencies associated with project hazards. Appropriate information about emergency preparedness and response activities, resources, and responsibilities will be disclosed to affected communities;
(v) engage qualified and experienced experts, separate from those responsible for project design and construction, to conduct a review as early as possible in project development and throughout project design, construction, and commissioning. This will ensure that structural elements or components situated in high-risk locations will not fail or malfunction and threaten the safety of communities;
(vi) implement risk management strategies to protect the community from physical, chemical, or other hazards associated with sites under construction and decommissioning;
(vii) restricting access to the site, through a combination of institutional and administrative controls, with a focus on high risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the local community;
(viii) removing hazardous conditions on construction sites that cannot be controlled affectively with site access restrictions, such as covering openings to small confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials; and
(ix) implement measure to prevent proliferation of vectors of diseases at work sites;
(x) adequate space and lighting, temporary fences, shining barriers and signage at active work sites;
(xi) contractor’s preparedness in emergency response;
(xii) adequate dissemination of GRM and contractor’s observance and implementation of GRM; and
(xiii) upon availability, local people should be given an opportunity for work in the project activities.

Occupational Health and Safety

(i) Communication and Training

  (a) Training of all workers on occupational health and safety prior to construction works;
  (b) Conduct of orientation to visitors on health and safety procedures at work sites;

(c) Signages strategically installed to identify all areas at work sites, including hazard or danger areas;
(d) Proper labeling of equipment and containers at construction and storage sites; and
(e) Suitable arrangements to cater for emergencies, including: first aid equipment; personnel trained to administer first aid; communication with, and transport to, the nearest hospital with an accident / emergency department; monitoring equipment; rescue equipment; firefighting equipment; and communication with nearest fire brigade station;

(ii) Physical Hazards

(a) Use of personal protective equipment by all workers such as earplugs, safety shoes, hard hats, masks, goggles, etc. as applicable, and ensure these are used properly;
(b) Avoidance of slips and falls through good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths, cleaning up excessive waste debris and liquid spills regularly, locating electrical cords and ropes in common areas and marked corridors, and use of slip retardant footwear;
(c) Use of bracing or trench shoring on deep excavation works;
(d) Adequate lighting in dark working areas and areas with night works;
(e) Rotating and moving equipment inspected and tested prior to use during construction works. These shall be parked at designated areas and operated by qualified and trained operators only;
(f) Specific site traffic rules and routes in place and known to all personnel, workers, drivers, and equipment operators; and
(g) Use of air pollution source equipment and vehicles that are well maintained and with valid permits;

(iii) General Facility Design and Operation

(a) Regular checking of integrity of workplace structures to avoid collapse or failure;
(b) Ensuring workplace can withstand severe weather conditions;
(c) Enough workspaces available for workers, including exit routes during emergencies;
(d) Fire precautions and firefighting equipment installed;
(e) First aid stations and kits are available. Trained personnel should be available at all times who can provide first aid measures to victims of accidents;
(f) Secured storage areas for chemicals and other hazardous and flammable substances are installed and ensure access is limited to authorized personnel only;
(g) Good working environment temperature maintained;
(h) Worker camps and work sites provided with housekeeping facilities, such as separate toilets for male and female workers, drinking water supply, wash and bathing water, rest areas, and other lavatory and worker welfare facilities; and

(i) Maintain records and make reports concerning health, safety and welfare of persons, and damage to property. Take remedial action to prevent a recurrence of any accidents that may occur.

436. **Construction Camps.** The construction camp site and accommodation of workers shall be established following international best practices to ensure welfare of workers is protected.[30] The DBO Contractor shall consider the following requirements, whichever are applicable, 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 1 meter space between each bed.
  (d) Separate sleeping areas are provided for men and women, except in family rooms if needed.

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[30] 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 or competent person of the DBO Contractor.
(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 60 m 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.

Table 52: Summary of Impacts During the Construction Phase.

Potential Impact	Assessment
Water pollution to marine environment	Short term, negative, not significant
Air pollution and noise	Short term, negative, not significant
Waste generation	NIL
Land-based and Marine Traffic Congestion	Short term, minimal negative, not significant
Community and occupational health and safety	Short term, negative, not significant.

437. **Response to emerging infectious diseases**. The DBO Contractor shall also adhere to necessary protocols in response to emerging infectious diseases such as the corona virus disease (COVID-19) consistent with the guidelines of relevant government healthcare agencies and the World Health Organization. A standard operating procedure (SOP) has been prepared by the project management unit at the Ministry of Environment which can be used by the DBO Contractor. This SOP is a living document that can be updated from time to time based on circumstances and developments about COVID-19 (or any emerging infectious diseases in the future). This SOP is attached as Appendix 14.

K. Impacts during Operational Phase

1. Air Pollution Due to Emission from WTE Plant

438. The DBO Contractor will finalize the detailed engineering design and O&M Manual based on the following:

(i) Incorporation of EHS Guidelines on Waste Management Facilities[31] such as prevention, minimization and control of air emissions through:

a. Conduct of waste segregation and/or presorting, subject to feasibility or practicality, by collaborating with the waste supplier to avoid incineration of wastes that contain metals and metalloids that may volatilize during combustion and be difficult to control through air emission technology (e.g., mercury and arsenic). However, regardless of any practical waste segregation effort, the DBO Contractor shall ensure full and efficient functioning of the APC system of the WTE plant at all times;

b. Follow applicable national requirements and internationally recognized standards for incinerator design and operating conditions, mainly rapid quenching of the flue gas after leaving all combustion chambers and before entering any dry particulate matter air pollution control device but also combustion temperature, residence time, and turbulence.[32] Standards for stationary incinerators which include temperature and afterburner exit gas quenching (i.e. rapid temperature reduction) requirements are preferred in order to nearly eliminate dioxins and furans. In case where rapid quenching is not practical for the WTE plant, follow applicable national requirements and internationally recognized standards for incinerator design and operating conditions, such as combustion temperature, residence time, turbulence, and reduced residence time of dust laden exhaust gases in the temperature range of 450 to 200 degrees Celsius;

c. Introduce wastes into the incinerator only after the optimum temperature is reached in the final combustion chamber.

d. The waste charging system should be interlocked with the temperature monitoring and control system to prevent waste additions if the operating temperature falls below the required limits;

e. Minimize the uncontrolled ingress of air into the combustion chamber via waste loading or other routes;

f. Optimize furnace and boiler geometry, combustion air injection, and, if used, NOx control devices using flow modeling;

g. Optimize and control combustion conditions by the control of air (oxygen) supply, distribution and temperature, including gas and oxidant mixing; the control of combustion temperature level and distribution; and the control of raw gas residence time;

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[31] IFC World Bank Group. 2007. Environmental, Health, and Safety (EHS) Guidelines For Waste Management Facilities.

[32] For example, according to Article 6 of EU Council Directive 2000/76, the gas resulting from the incineration process should be raised, after the last injection of combustion air to a temperature of 850 degrees Celsius (1,100 degrees Celsius for hazardous wastes with a content greater than 1% of halogenated organics) for a period of two seconds. Additional details on operating conditions are provided in this reference. Other sources of emissions standards include the U.S. EPA regulations for air emissions from stationary sources at 40 CFR Part 60.

h. Implement maintenance and other procedures to minimize planned and unplanned shutdowns;
i. Avoid operating conditions in excess of those that are required for efficient destruction of the waste;
j. Use auxiliary burner(s) for start-up and shut down and for maintaining the required operational combustion temperatures (according to the waste concerned) at all times when unburned waste is in the combustion chamber;
k. Use a boiler to transfer the flue-gas energy for the production of electricity and/or supply of steam/heat, if practical;
l. Use primary (combustion-related) NOx control measures and/or selective catalytic reduction (SCR) or selective noncatalytic reduction (SNCR) systems, depending on the emissions levels required;
m. Use flue gas treatment system for control of acid gases, particulate matter, and other air pollutants;
n. Minimize formation of dioxins and furans by ensuring that particulate control systems do not operate in the 200 to 400 degrees Celsius temperature range; identifying and controlling incoming waste composition; using primary (combustion-related) controls; using designs and operation conditions that limit the formation of dioxins, furans, and their precursors; and using flue gas controls;
o. Consider the application of waste-to-energy to help off-set emissions associated with fossil fuel-based power generation.[33]

2. Analysis of Impacts Based on Stack Emission Dispersion Modeling

439. Municipal waste incineration produces various pollutants that can affect air quality and human health. These pollutants are released through two specific waste products of incineration process known as bottom ash and fly ash. These wastes can include a combination of various heavy metals, dioxins and furans, and other persistent organic pollutants. Specifically, fly ash is the more hazardous waste product due to size and density that can go airborne with the combustion gases when released to the atmosphere and impact air quality.

440. Heavy metals and dioxin and furans are highly toxic compounds which when inhaled or ingested by humans may in the long term cause cancer and neurological damage, congenital malformations and infant mortality, respiratory illnesses, etc. Hence, it is paramount that the adoption of incineration technology has to come with it an accompanying APC technology or process which will enable efficient recovery of these toxic pollutants. However, even with the most advance technologies to date, complete removal of these toxic substances in the flue gases is difficult to achieve. It is for this reason that good international industry practices and standards, such as the emission standards in Annex VI of Directive 2010/75/EU of the European Parliament and the Council, are established to ensure emissions from these specific facilities do not impact the ambient conditions of the environment. Concomitantly, height of stack from where emissions should be discharged needs to be calculated and followed to ensure pollutants from emissions do not degrade the ground level ambient air quality. Air dispersion modeling is normally used to simulate how air pollutants disperse in the atmosphere and to analyze the potential impacts of these pollutants to ambient air quality given specific project and site information.

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[33] The possibility of applying waste-to-energy technologies depends on a number of issues which may include the project design specifications established by local government as well as laws applicable to the generation and sale electricity. Also, it should be noted that recycling options may often save more energy than what is generated by incineration of mixed solid waste in a waste-to-energy facility.

441. **AUSTAL2000**. The dispersion modeling for the pollutants was carried out using the dispersion model AUSTAL2000. The computer program AUSTAL2000 is a reference implementation developed on behalf of the German Federal Environmental Agency.[34] It also available in English version as it is used by other EU-member states.by other EU-member states.

442. AUSTAL2000 calculates the spread of pollutants and odors in the atmosphere. It is an extended implementation of Annex 3 of the German regulation TA Luft (Technical Instruction on Air Quality Control) demands for dispersion calculations using a Lagrangian particle model in compliance with the German guideline VDI 3945 Part 3. The modeling work was carried out by Ulbricht Consulting (Germany). The dispersion modeling report is attached as Appendix 15.

443. Steady-state Gaussian plume models assess pollutant concentrations and/or deposition fluxes from a variety of sources associated with an industrial source complex. Unlike the Gaussian models commonly used, this flexible modeling procedure used in AUSTAL2000 provides realistic results even when buildings and uneven terrain influence flue gas dispersion. The model calculates the contribution of specified air pollutants from a given point source to the background concentrations present in the ambient air at ground level in the area surrounding the source.

444. **Emission mass flow.** Using the calculation methodology from the German regulation TA Luft, the various substances potentially present in the emission coming out of the stacks use the mass concentration limits indicated in the said German regulation. Summary of resulting mass flows of each substance is outlined in Table 53 below.

Table 53: Emission mass flow (for R = 115 713 m^3/h, T = 180 °C, Ø = 2.12 m)

Substance	Mass Concentration [24-hour]	Mass Flow Q in kg/h	Factor S	Q/S in kg/h[a]
Total dust, including particulate matter (No 5.2.1 TA Luft)	5 mg/m^3	0.579	0.08	7.2
Fluorine and its compounds, indicated as hydrogen fluoride (5.2.4 Class II TA Luft)	1 mg/m^3	0.116	0.0018	64.3
Gaseous inorganic chlorine compounds, indicated as hydrogen chloride (5.2.4 class III TA Luft)	10 mg/m^3	1,157	0.1	11.6
Ammonia (5.2.4 class III TA Luft)	10 mg/m^3	1,157	-	-
Sulfur oxides (sulfur dioxide and sulfur trioxide), expressed as sulfur dioxide (5.2.4 Class IV TA Luft)	50 mg/m^3	5,786	0.1 4	41.3
Nitrogen oxides (nitrogen monoxide and nitrogen dioxide), expressed as nitrogen dioxide (5.2.4 (2), 2nd sentence TA Luft)	150 mg/m^3	11,108*	0.1	111.08*
Carbon monoxide (5.2.4 para. 2 sentence 1 TA Luft)	50 mg/m^3	5,786	7.5	0.77
Organic substances (expressed as total C) (TA Luft 5.4.10.20)	10 mg/m^3	1,157	0.1	11.6

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[34] Available as a free download at https://www.umweltbundesamt.de/themen/luft/regelungen-strategien/ausbreitungsmodelle-fuer-anlagenbezogene/austal2000n-download

Substance	Mass Concentration [24-hour]	Mass Flow Q in kg/h	Factor S	Q/S in kg/h[a]
Mercury and its compounds, reported as Hg (No 5.2.2 Class I TA Luft)	0.03 mg/m³	0.00347	0.00 013	26.7
Dioxins and furans	0.1 ng/m³	0.0000000116	-	-
Sum of heavy metals and their components: antimony, chromium, copper, manganese, vanadium, tin, lead, cobalt, nickel (5.2.2 TA Luft class II and III)	0.5 mg / m³	0.05786	0.05 0.1	1.157 0.579
Thallium and its compounds (5.2.2 TA Luft class I) cadmium	0.05 mg / m³	0.00579	0.005	1.16
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) (5.2.7.1.1 TA Luft Class I)	0.05 mg / m³	0.00579	0.00005	115.7

[a] According to point 5.5.3 TA Luft, the emission of nitrogen monoxide is based on a conversion rate of 60% to nitrogen dioxide, and is based on a ratio of NO/NO_2 = 90%/10%, cf. Annex 1.1

445. **Control of the necessity for dispersion calculation.** Following the guidance and methodology in the German regulation TA Luft, the determination of the emission characteristics is not required if the emissions of the air pollutants do not exceed the minor mass flows indicated in the regulation. Table 54 below summarizes these minor mass flows in the regulation and compared with the expected WTE mass flow.

Table 54: Minor Mass Flow According to TA Luft and WTE mass flow

Pollutants	Minor mass flow	WTE mass flow
	in kg / h	
Emissions derived from stacks		
Dust (without consideration of dust contents)	1	0.579
Fluorine and its compounds, indicated as hydrogen fluoride (5.2.4 Class II TA Luft)	0.15	0.116
Gaseous inorganic chlorine compounds, indicated as hydrogen chloride (5.2.4 class III TA Luft)	-	1.157
Ammonia (5.2.4 class III TA Luft)	-	1.157
Sulfur oxides (sulfur dioxide and sulfur trioxide), expressed as sulfur dioxide (5.2.4 Class IV TA Luft)	20	5.786
Nitrogen oxides (nitrogen monoxide and nitrogen dioxide), expressed as nitrogen dioxide (5.2.4 (2), 2nd sentence TA Luft)	20	11.108
Carbon monoxide (5.2.4 para. 2 sentence 1 TA Luft)	-	5.786
Organic substances (expressed as total C) (TA Luft 5.4.10.20)	-	1.157
Mercury and its compounds, reported as Hg (No 5.2.2 Class I TA Luft)	0.0025	0.00347
Dioxins and furans	-	0.0000000116
Sum of heavy metals and their components: antimony, chromium, copper, manganese, vanadium, tin, lead, cobalt, nickel (5.2.2 TA Luft class II and III)	0.025 lead, nickel (class II)	0.05786

Pollutants	Minor mass flow	WTE mass flow
	in kg / h	
Thallium and its compounds (5.2.2 TA Luft Class I)	0.0025	0.00579
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) (5.2.7.1.1 TA Luft Class I)	0.0025	0.00579

446. From Table 54 above, most of substances the values are below the minor mass flows. For mercury as well as heavy metals and their components (referred to thallium and arsenic/cadmium and lead/nickel) the values are over the minor flows, therefore there is a need to perform the dispersion modeling for these substances.

447. For ammonia and hydrogen chloride (5.2.4 Class III TA Luft), for carbon monoxide, for organic substances (expressed as total C) as well as dioxins and furans no minor mass flow are set in the regulations therefore there is no need to undertake a detailed dispersion modeling for these parameters either.

448. **Emergency Gen-set.** For the emissions mass flow calculation of the air pollutants of the emergency Gen-set, data from PMU have been made available. The following pollutants have to be considered. The exhaust gas volume flow was given as V_n = 12 470 mN^3/h and the exhaust gas temperature to T=180° C.

Table 55: Minor mass flow according to Section 4.6.1.1 TA Luft - system mass flow

Substance	Minor mass flow	Plant mass flow
	in kg / h	
Dust (without consideration of dust contents)	1	0.9976
Nitrogen oxides (nitrogen monoxide and nitrogen dioxide), expressed as nitrogen dioxide (5.2.4 (2), 2nd sentence TA Luft)	20	3.99
Carbon monoxide (5.2.4 (2) sentence 1 TA Luft)	-	.,741
Formaldehyde - HCHO	-	0.748

449. The minor mass flows have also been not exceeded by the Gen-set emission values, so that no dispersion calculation has to be carried out for these substances. For carbon monoxide and formaldehyde no minor mass flow has been set in the regulation. For these substances, no dispersion calculation is to be carried out.

450. **Air dispersion modeling for relevant parameter.** In order to estimate exposures to airborne pollutants from the incineration and emergency electricity generation, dispersion modeling was carried out. Modeling was done for the pollutants from the emergency electricity generator sets, such as dust, nitrogen monoxide and nitrogen dioxide, carbon monoxide, and formaldehyde. Similarly, modeling was done for the pollutants from the WTE plant, such as total dust including fine dust, fluoride and its compound specified as hydrogen fluoride, ammonia, sulfur (sulfur dioxide and sulfur trioxide), specified as sulfur dioxide, nitrogen oxide (nitrogen monoxide and nitrogen dioxide) specified as nitrogen dioxide, and mercury and its compound specified as mercury. The study zone was defined as a 5,000 m radius of influence from incinerator stack at Thilafushi.

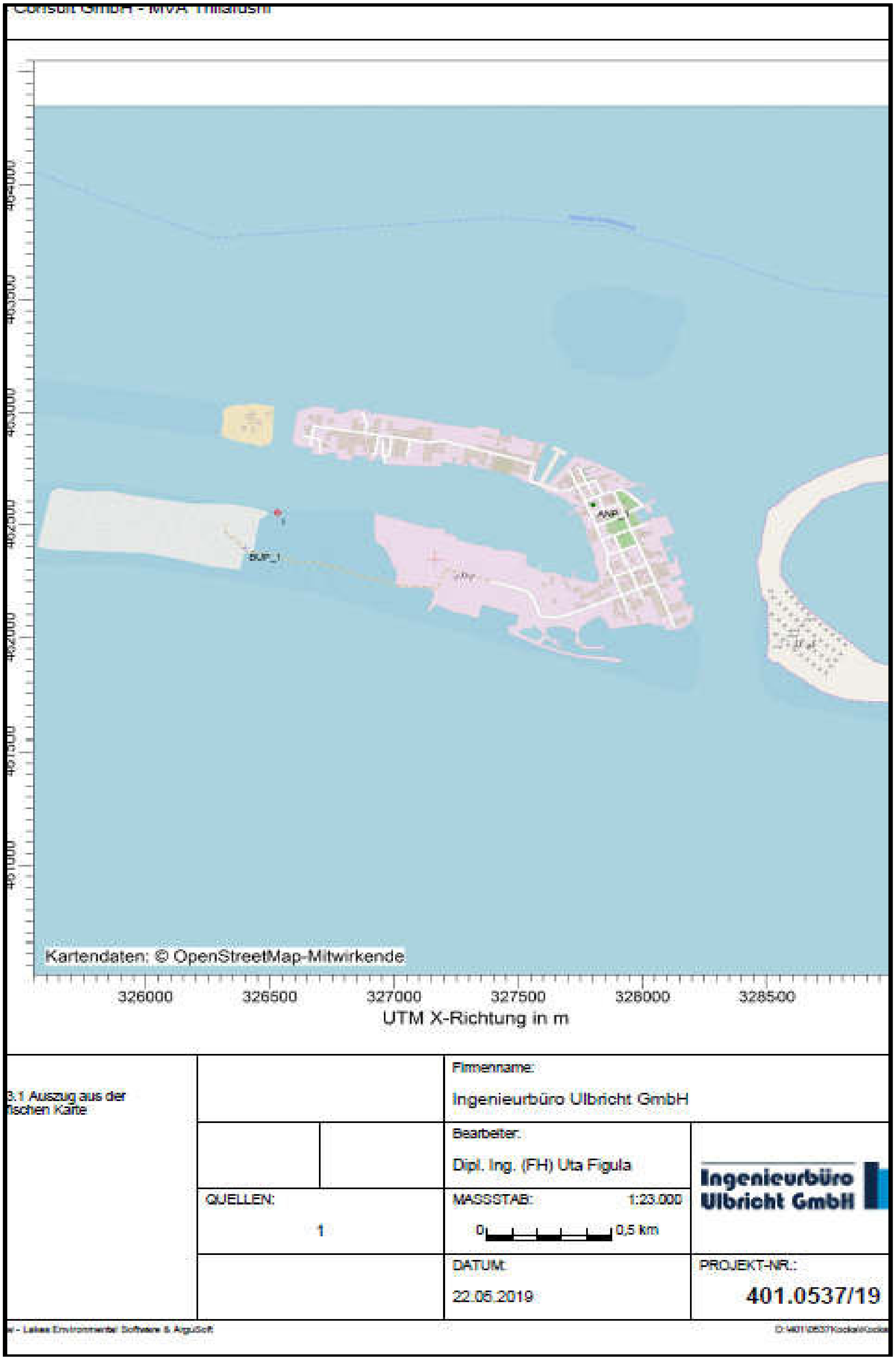
451. **Emission from installations.** The following emission sources have been considered:

(i) Exhaust stack: WTE

(ii) Operation time: 8,000 hours/year

452. **Emissions from guided sources.** For the incineration plant, the following pollutants have been taken into account in the dispersion calculation. The exhaust gas volume flow was given as Vn = 115,713 m^3/h and the exhaust gas temperature as T = 180 ° C. The air dispersion calculation was made with a stack height of 46.0 m. Increasing the stack height to 50 m has been recommended. Therefore, the calculated emissions are presenting the worst case. With the extension of the stack, the ambient air concentration value will be reduced at the reception point.

Figure 121: Location of the emission points where maximum load was calculated and examined



453. The following results apply exclusively taking into account the characteristics of the emission sources as discussed above. While the dispersion calculation is required only for mercury, all other results in Table 56 are presented for information only. As a guide, a comparison is made with the irrelevance values of the Technical Instruction on Air Quality Management. The detailed calculation results and the grid diagram for the substance mercury are given in Appendix 15.

Table 56: Ambient air quality additional charge (IZ) (including statistical uncertainty)

Ambient air quality points	**Irrel. IZ**	**IW**	**BUP 1**	**ANP 1**
Substance				
Mercury g/(m² d)	*0.05*	1	0.007	1.0
PMDEP g/(m² d)	*0.0105*	0.35	0.0001	0.0001
PM10 µg/m³	*1.2*	40	0	0
Hydrofluoric µg/m³	*0.04*	0.4	0	0.005
Sulfur dioxide µg/m³	*1.5*	50	0	0.2
Nitrogen oxides µg/m³	*1.2*	40	0	0.4
Ammonia µg/m³	-		0	0.04
Lead µg/(m² d)	*5*	100	0.2	17.0
Nickel µg / (m² d)	*0.75*	15	0.122	17.1
Thallium µg / (m²d)	*0.1*	2	0.01	1.7
Cadmium µg /(m² · d)	*0.1*	2	0.01	1.7

454. A pre-pollution with air pollutants at the site is not known (baseline), so it is assumed that the calculated values represent the total load.

455. **Evaluation point BUP 1.** At assessment point BUP 1, the values are below the “irrelevance thresholds” of TA Luft for the substances.

456. **Analysis point ANP 1.** At the ANP 1 analysis point, the air pollutants PM10, dust precipitation, sulfur dioxide, nitrogen oxides, hydrogen fluoride fall below the irrelevance values according to TA Luft.

457. If an orienting comparison is made with the air quality values of TA Luft, the following can be stated:

(i) For lead, thallium, cadmium, arsenic, the ambient air quality value of TA Luft is below. For mercury, the ambient air quality value of TA Luft is reached (not exceeded).

(ii) The specified ambient air quality value in the TA Luft for nickel is exceeded. In the calculation, the heavy metal nickel was considered representative of the group of heavy metals and their components: antimony, chromium, copper, manganese, vanadium, tin, lead, cobalt, nickel (5.2.2 TA Luft class II and III).

(iii) Taking into account the volumetric flow and the desired mass concentration (corresponding to the emission limit value (class II according to 5.2.2 TA Luft) for the group of heavy metals, the emission mass flow for the group of heavy metals was assigned to the substance nickel. From a technical perspective it is not expected that none of the further elements of the heavy metal group occur in the exhaust gas, so that the exceeding of the ambient air quality value for nickel is likewise not expected.

458. **Ammonia.** No ambient air quality value is specified for ammonia. The desired mass concentrations by means of flue gas cleaning are below the values specified in the TA Luft (limit values). A negative impact on the environment is therefore not expected.

459. **Hydrogen chloride, total C, carbon monoxide (CO), dioxins and furans.** No ambient air quality values are specified for these substances. The mass concentrations aimed at by means of flue gas cleaning are below the values stated in the TA Luft (limit values). A negative impact is therefore not to be feared.

Figure 122: Additional Load Mercury-Deposit from the Dispersion Model.

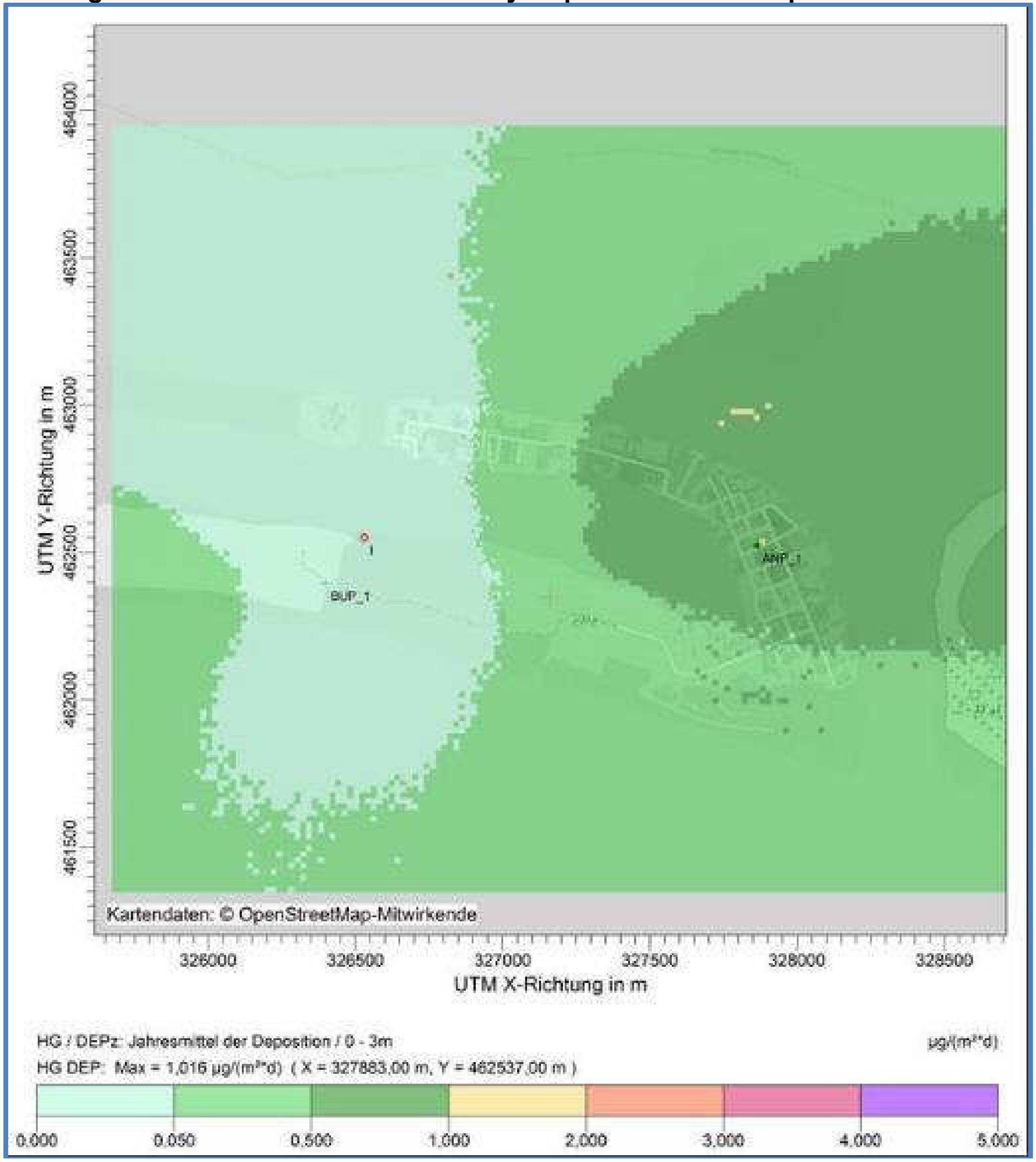


Figure 123: PM-Deposit from the Dispersion Model.

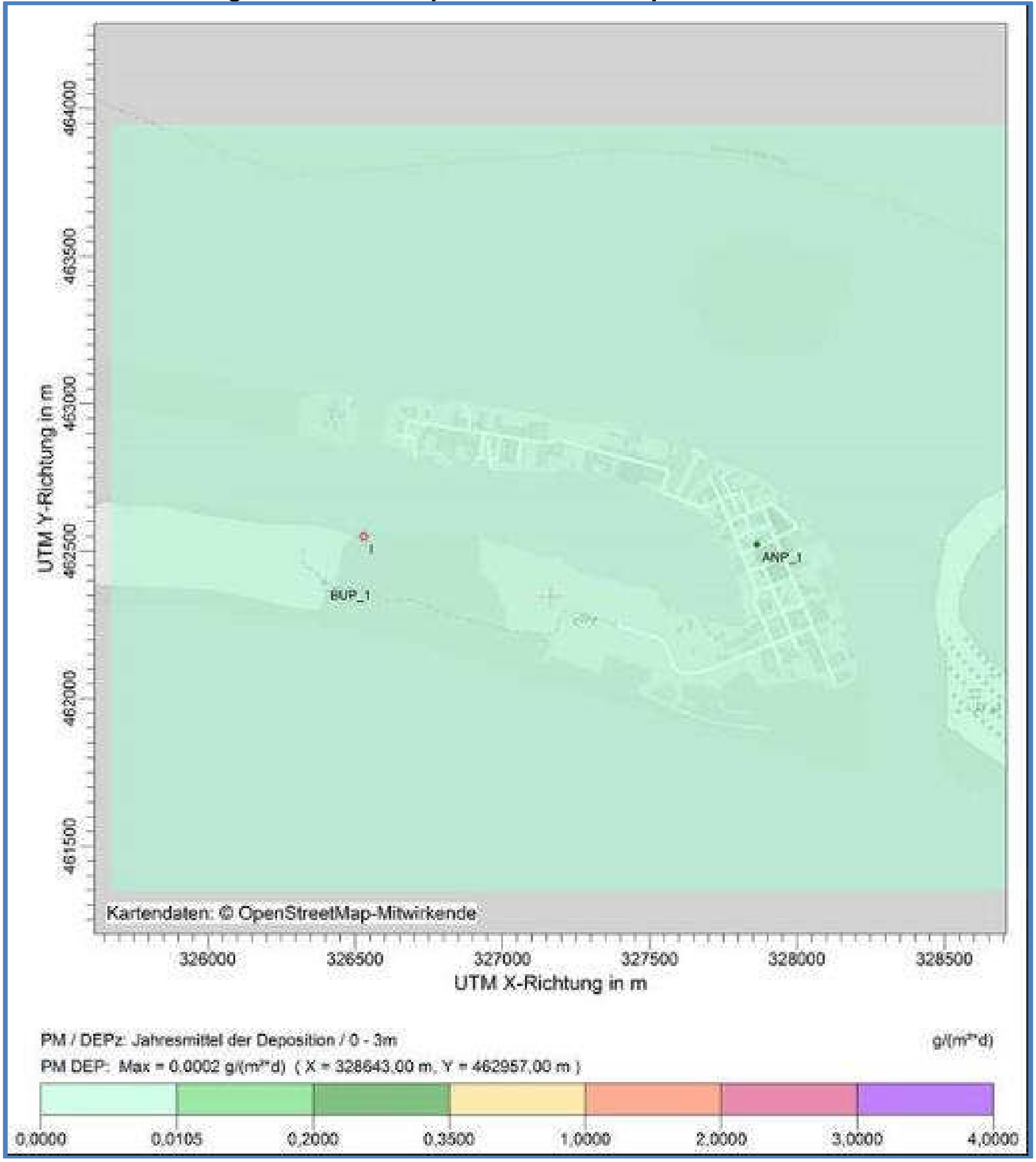


Figure 124: F-Deposit from the dispersion model.

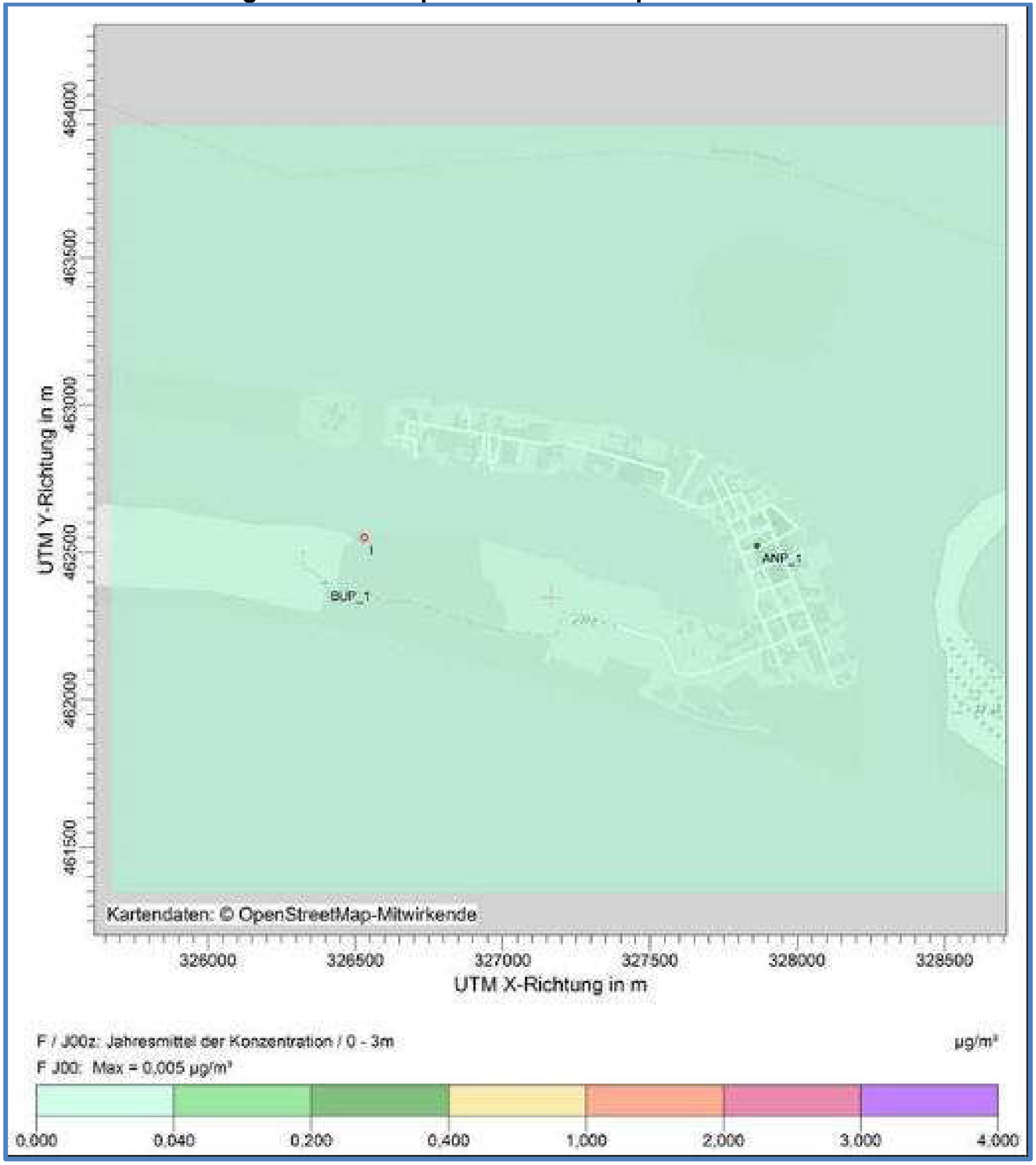


Figure 125: SO_2-Deposit from the Dispersion Model.

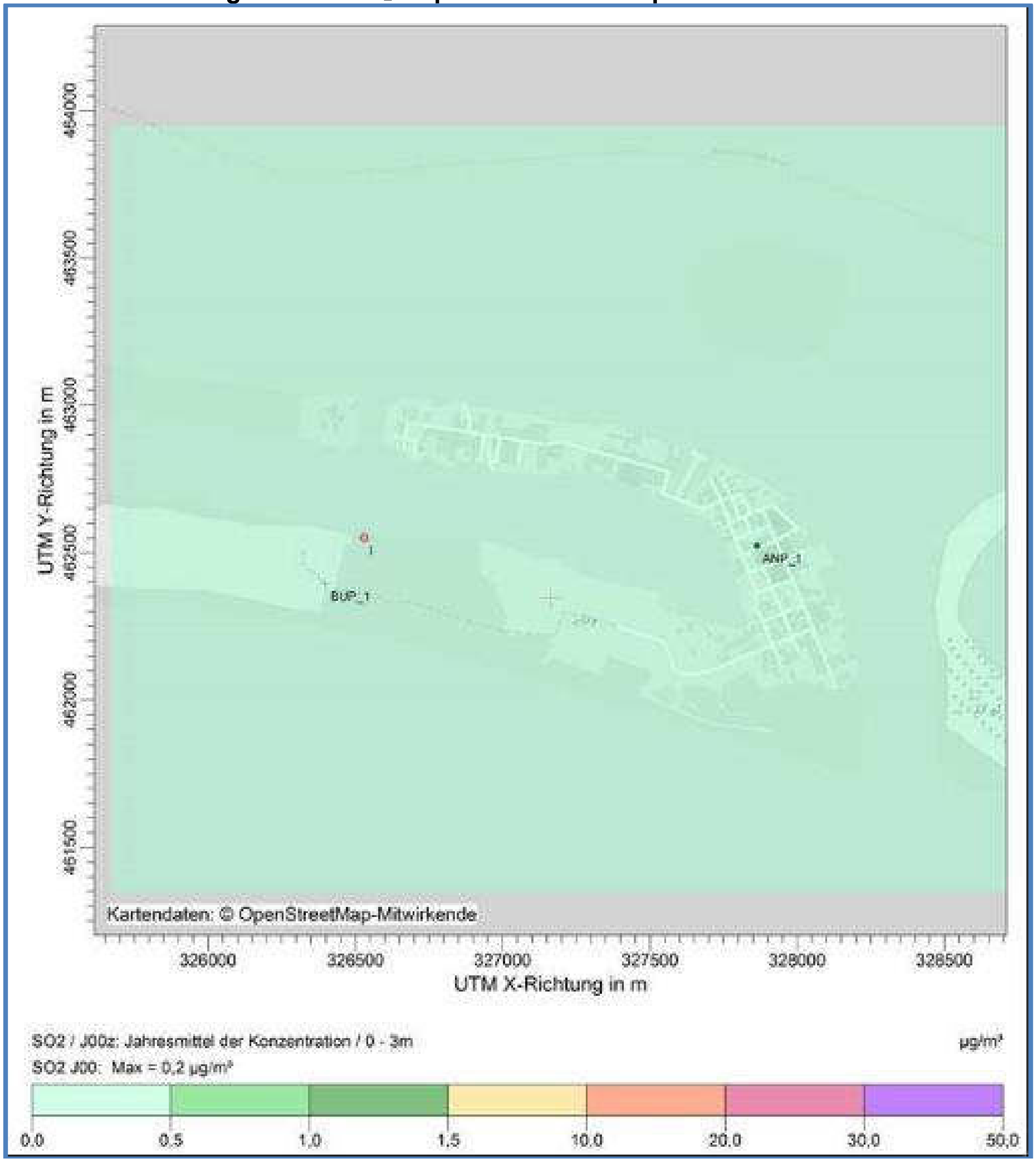


Figure 126: NOx-Deposit from the Dispersion Model.

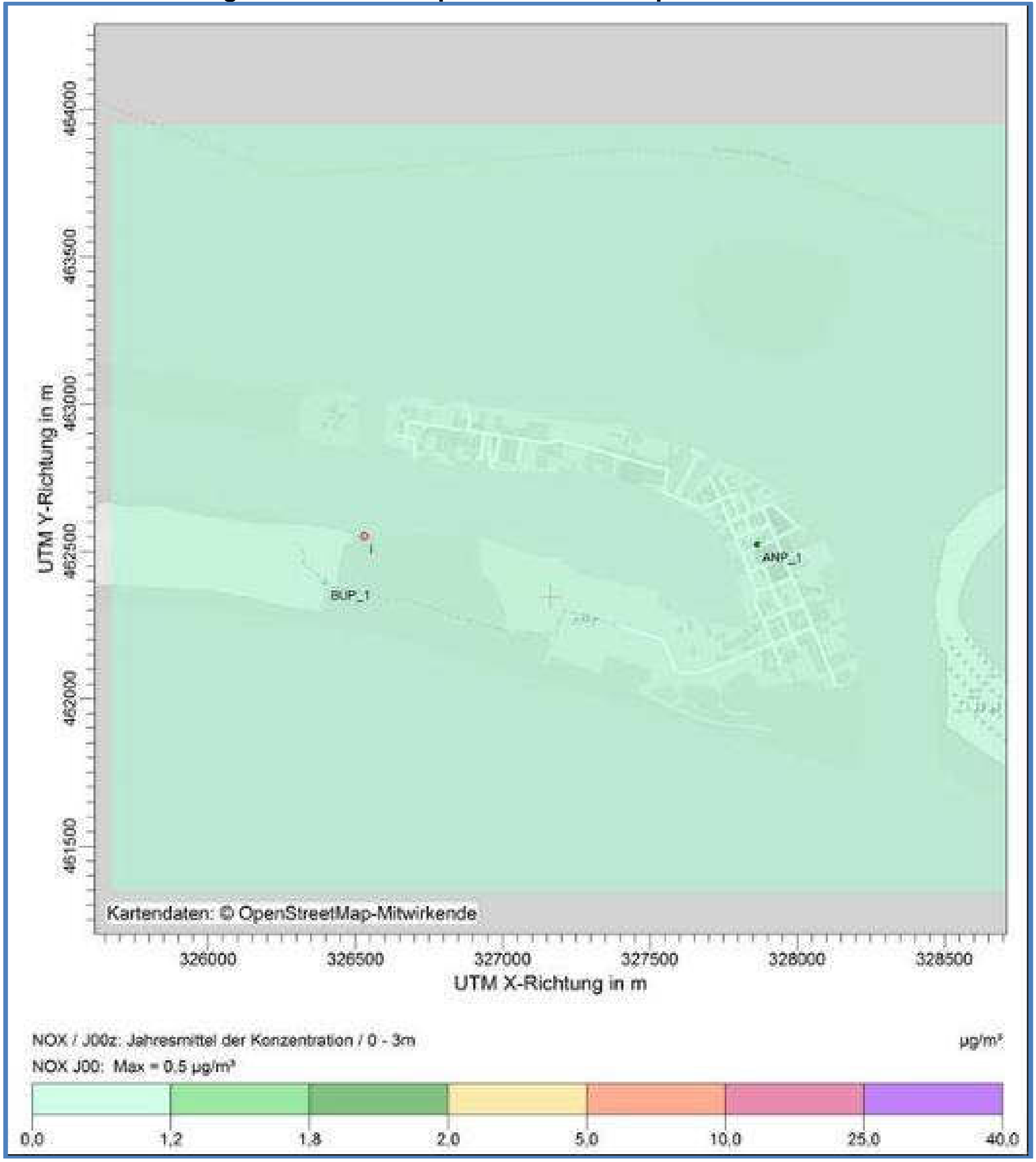


Figure 127: Pb-Deposit from the dispersion model.

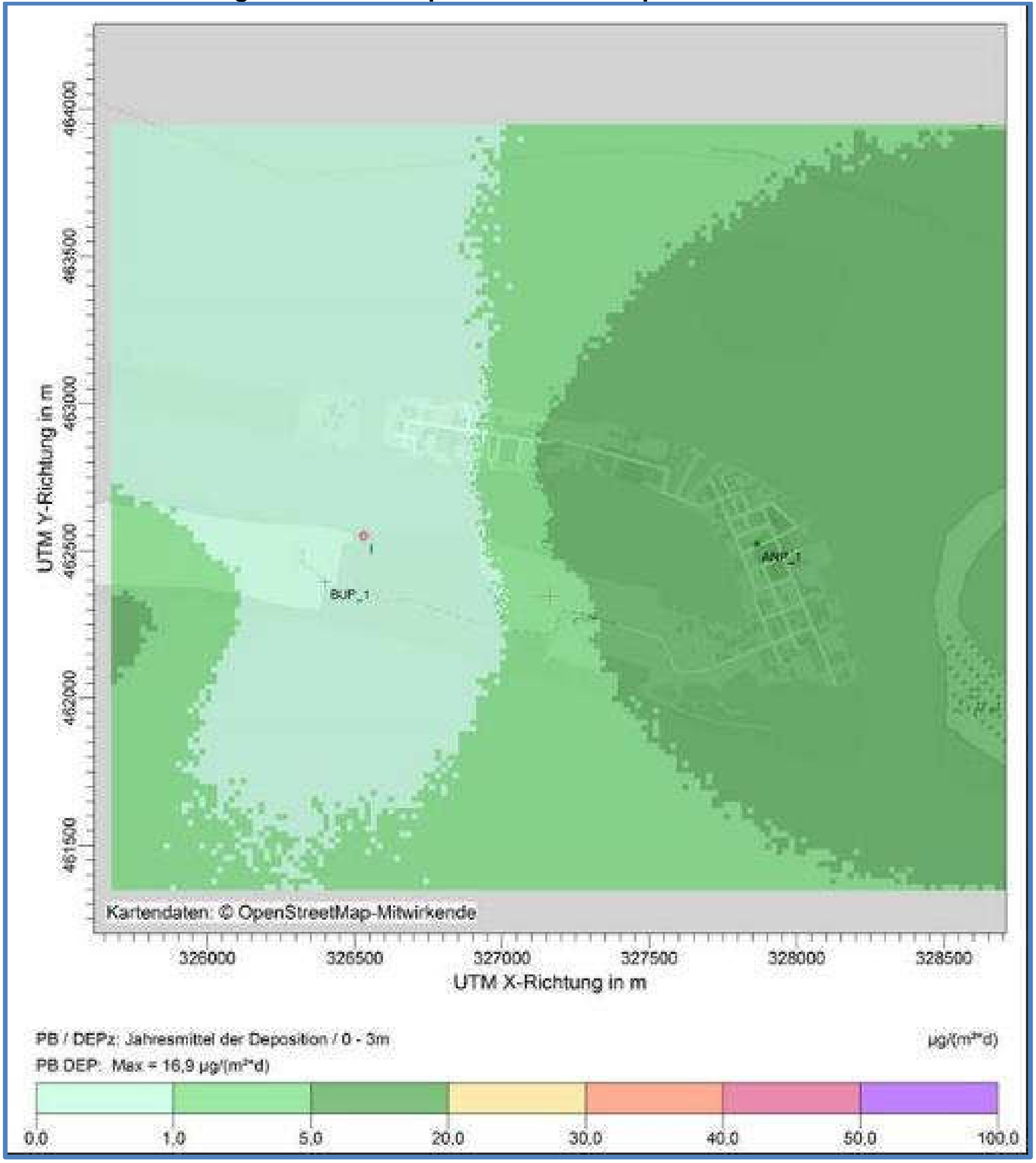


Figure 128: Ni-Deposit from the Dispersion Model.

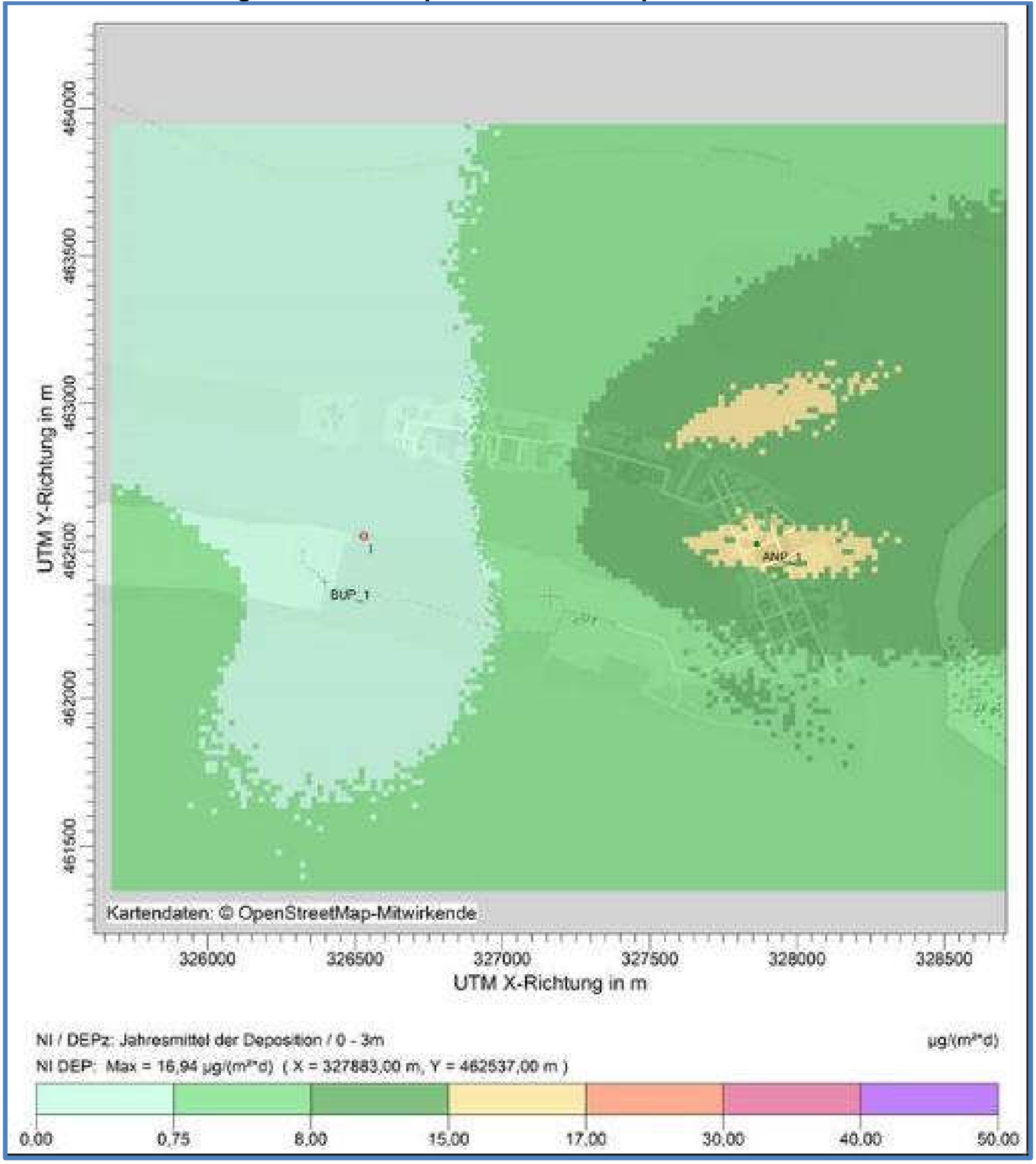


Figure 129: Tl-Deposit from the Dispersion Model

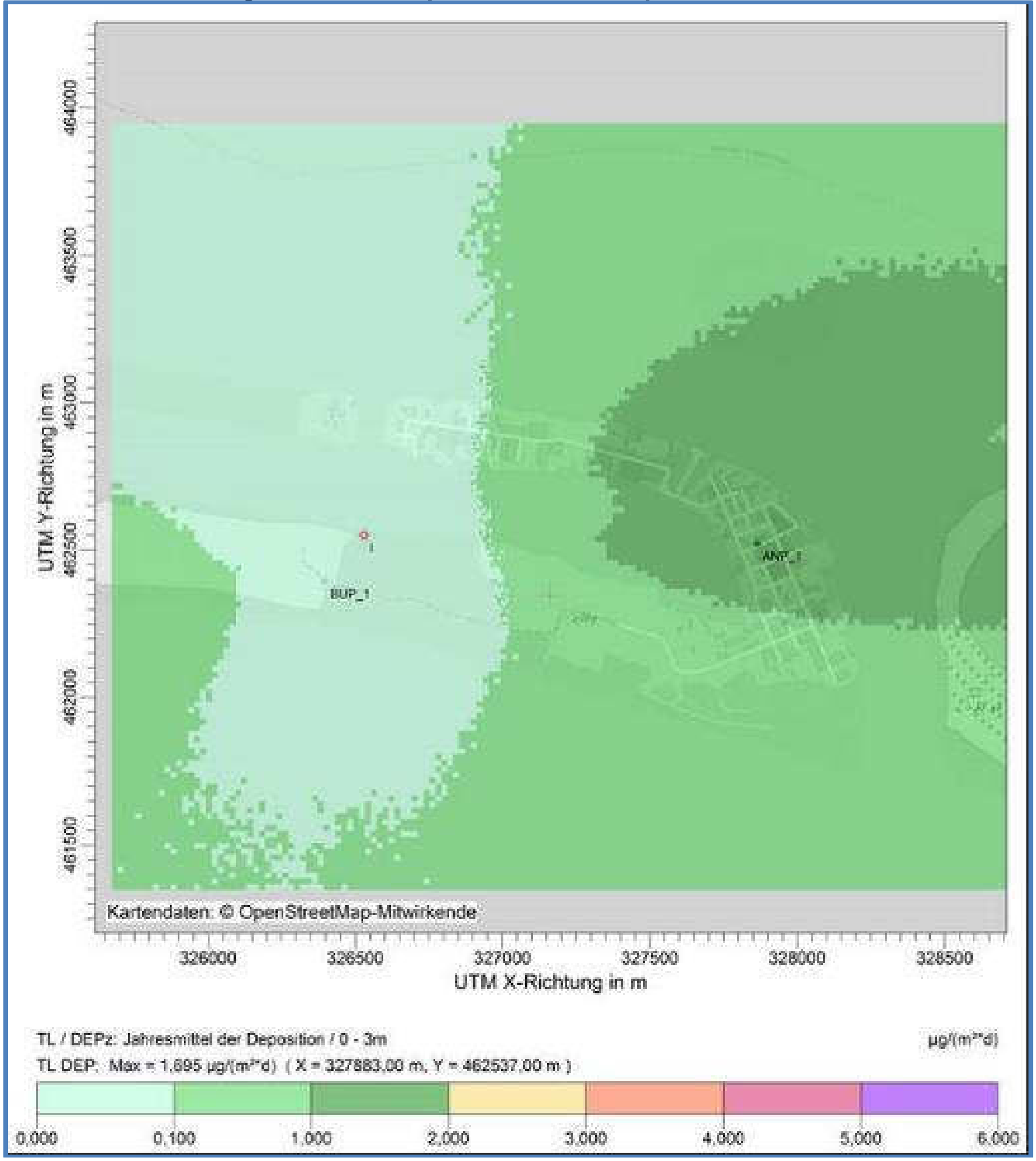


Figure 130: Cd-Deposit from the Dispersion Model.

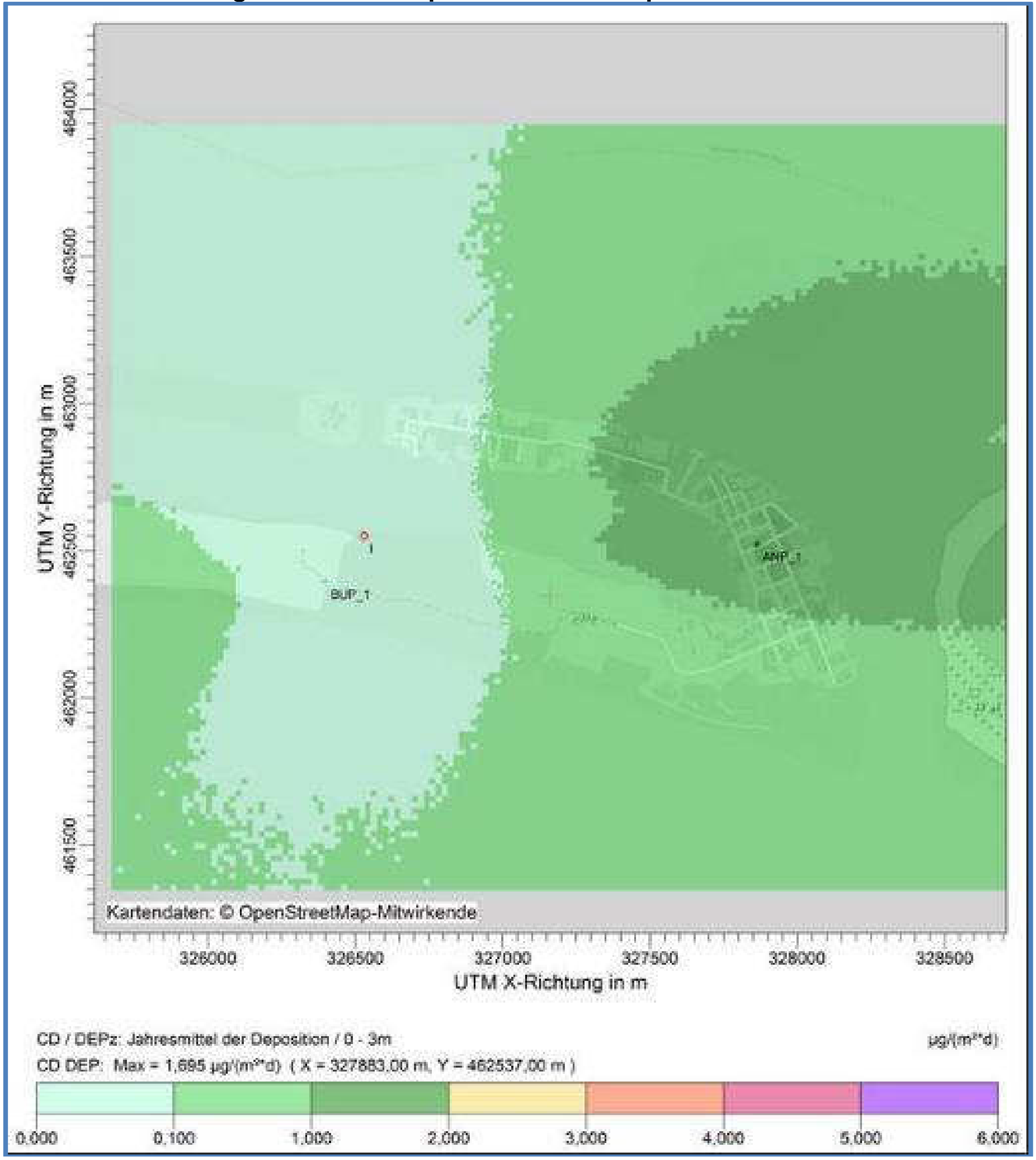
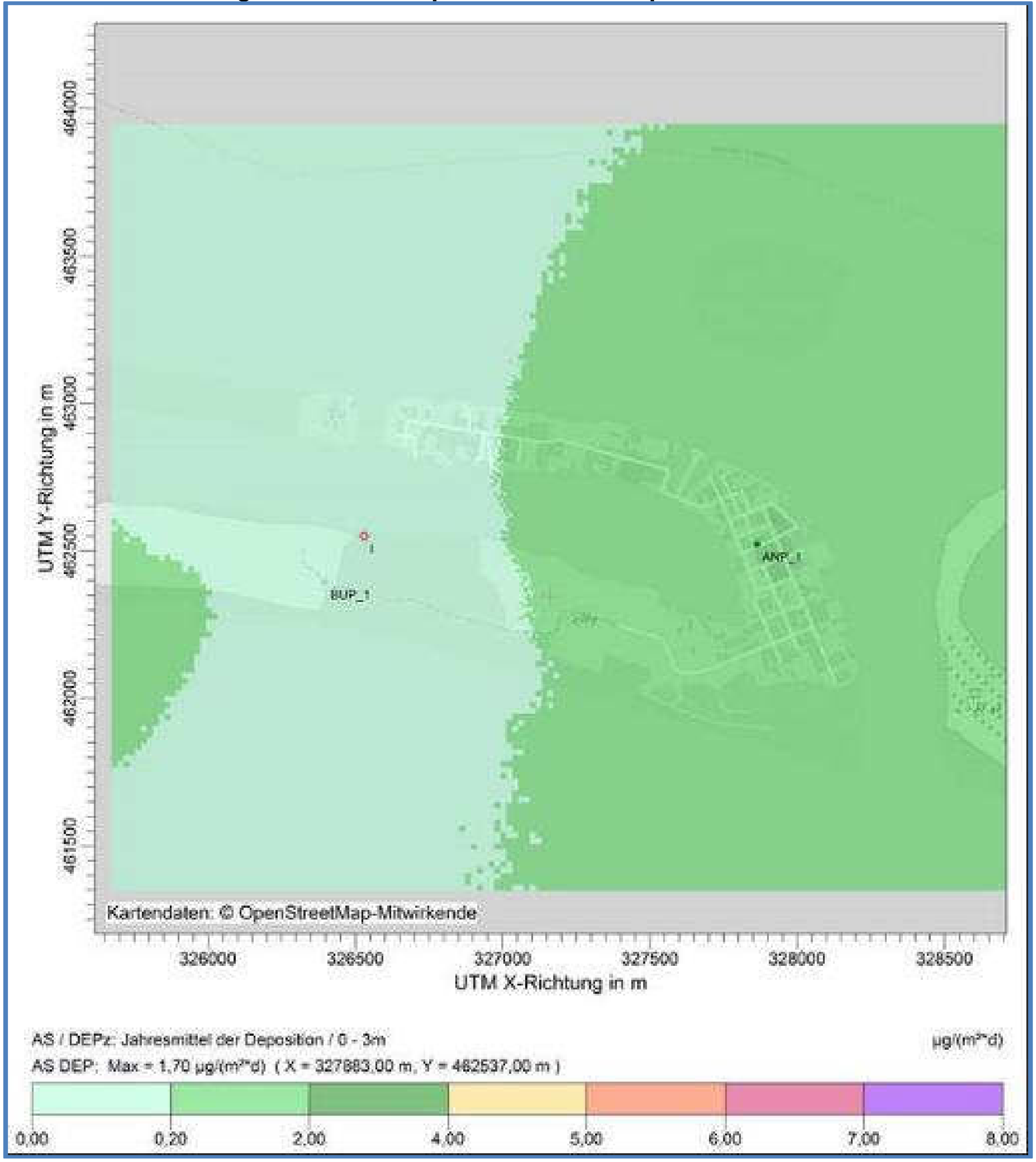


Figure 131: As-Deposit from the Dispersion Model



460. The overall air quality of the project site is expected to improve with time. More significantly when the existing dumpsite is closed. Therefore, a long term and positive significant impact is expected with the operation of this project.

461. **Conclusion**. The ambient air quality status of Maldives had been unknown due to the lack of air quality monitoring data. The air quality is generally considered good as the sea breezes flush the air masses over the small the islands. However, rapid urbanization and economic growth in the recent years has shown noticeable changes in the air quality, particularly in the Malé region. Thilafushi Island is being used to dump huge volume of wastes from the neighboring inhabited

islands (Malé, Villingili and Hulhumalé) and nearby resort islands. Open burning of mixed wastes is being practiced at the island to reduce the volume of the waste. The smoke generated from burning increases the air pollutant load in the local air shed and also affects the air quality of the island.

462. The air quality at the Thilafushi Island is expected to be polluted i.e. the values for the pollutants such as PM2.5, PM10, SO2 and NOx are expected to be higher in the region downwind of Thilafushi as the smoke plume generated from the open burning of waste frequently passes through this region. The numbers of stations and their locations was selected to collect ambient air quality data that is representative of the baseline air quality of the Thilafushi Island and its surrounding areas.

463. Air quality monitoring for baseline was conducted at four locations. One station was selected in the downwind direction of the plume of smoke from the WTE stack while another station was placed at the crosswind direction of the plume. One station was selected in the crosswind direction of the smoke plume from the existing dump site at Thilafushi. Additional station was selected at Vilingili as a control site. See Figure 73.

464. The ambient air quality results obtained from the monitoring at Villingili undertaken indicate that all parameters were within the WHO guidelines for ambient air quality at station AQ-4 (Villingili Island). The stations at AQ-1 AQ-2 and AQ-3 had all parameters that were beyond the WHO guidelines for ambient air quality. The monitoring results showed that the air quality of Thilafushi which are on downwind wind direction of the existing waste dump site is degraded with the smoke from the dumpsite.

465. In order to estimate exposures to airborne pollutants from the incineration and emergency electricity generation, air pollutant dispersion modelling was carried out. Modelling was done for the pollutants: total dust including fine dust, fluoride and its compound specified as hydrogen fluoride, ammonia, sulfur (sulfur dioxide and sulfur trioxide), specified as sulfur dioxide, nitrogen oxide (nitrogen monoxide and nitrogen dioxide) specified as nitrogen dioxide and mercury and its compound specified as mercury from the waste to energy plant.

466. The dispersion modelling for the pollutants was carried out using the dispersion model AUSTAL2000. The computer program AUSTAL2000 is a reference implementation developed on behalf of the German Federal Environmental Agency. AUSTAL2000 is a steady-state dispersion model that is designed for long-term sources and continuous buoyant plumes. Given that poor meteorological data coverage near the proposed project site, the dispersion model AUSTAL2000 was preferred to a popular dispersion model AERMOD, which requires high quality meteorological data to run the AERMOD.

467. The proposed site for the establishment of the WTE was reclaimed in 2018. The entire Island and the project location are mainly on the main level over MSL and do not present any substantial elevation.

468. The stack emission dispersion modelling showed, except for mercury as well as heavy metals and their components (referred to thallium and arsenic/cadmium and lead/nickel), maximum mass concentrations was achieved by the flue gas cleaning and will be mass concentration of the emission from the stack. Hence emission characteristics was not required as the emissions of the air pollutants do not exceed the minor mass flows. For mercury as well as other heavy metals and their components the values were over the minor flows, therefore dispersion modelling was carried out for these substances.

469. Dispersion modelling showed that the level of lead, thallium, cadmium, arsenic, would be below the ambient air quality value and for mercury, level in the ambient air quality would be reached but not exceeded. It is not expected that heavy metal group occur in the exhaust gas, so that the exceeding of the ambient air quality value for nickel is not expected. The desired mass concentrations by means of flue gas cleaning are below the limit values for ammonia and a negative impact on the environment is therefore not expected. Similar is with hydrogen chloride, total carbon, carbon monoxide, dioxins and furans as desired mass concentrations by means of flue gas cleaning would achieve below the emission value limits.

470. Based on the predicted concentrations and the post project concentrations of concerned pollutants, it can be inferred that the ambient air quality of the area is unlikely to be affected significantly due to proposed project. The overall air quality of the project site is expected to increase with time. More significantly when the existing dumpsite is closed. Therefore, a long term, positive, and significant impact is expected with the operation of this project.

471. **AERMOD**. AERMOD validation modeling was conducted in comparison with the Austal2000 German Lagrangian model. In said report, it was highly acknowledged that AERMOD is a “Stronger model” compared to Austal2000 in complex and urban terrain. It was also noted that Austal2000 was used as an alternative only because of the complexity of the meteorological data requirement of AERMOD. For the AERMOD validation run, the meteorological (metdata) provides a strong advantage because it accounts land use data, surface and upper air and its influence mechanical and convective mixing among other Planetary Boundary Layer (PBL) Parameters included met data set.

472. AERMOD meteorological data utilize surface characteristics in the form of albedo, surface roughness and Bowen ratio, plus standard meteorological observations such as wind speed, wind direction, temperature, and cloud cover. Using the AERMOD metdata processor AERMET, it calculates the PBL parameters such as: friction velocity, Monin-Obukhov length, convective velocity scale, temperature scale, mixing height, and surface heat flux. These parameters are then passed to the Interface within AERMOD where similarity expressions in conjunction with measurements are used to calculate vertical profiles of wind speed, lateral and vertical turbulent fluctuations, potential temperature gradient, and potential temperature. The AERMOD processes the MM5 formatted data to generate *.SFC and *.PFL met data files. See snapshot of the generated *.SFC met data file and *PFL met data file. Figure below also shows the AERMOD treatment of boundaries parameters.

473. In the same way as the Austal2000 model, AERMOD validation run has considered the effects of building downwash. Waste to Energy (WTE) dimensions: Approx. Length x width x height [m]: 100 x 70 x 30. Surrounding building location have been considered according to land use plan, topographical survey and Google Earth maps. The height of the buildings has been considered to maximum 10 m. This is another strong feature in AERMOD that the aerodynamic turbulence induced by nearby buildings cause a pollutant emitted from an elevated source to be mixed rapidly toward the ground (downwash), resulting in higher ground-level concentrations.

474. Terrain effects, such as elevations, were also incorporated which have impact on the air dispersion, deposition modeling results and potential risk to human health and the environment. Terrain elevation is the elevation relative to the facility base elevation. Complex Terrain are those elevations defined as anywhere within 50 km from the stack, are above the top of the stack being evaluated in the air modelling analysis. Terrain consideration was determined using SRTM3 terrain data processed by AERMAP terrain processor and has noted that highest elevations in the project area is at 7 meters only above sea level. Nevertheless, this AERMOD validated

executed terrain situations using SRTM3 terrain data processed by AERMAP terrain processor where model considers terrain height exceeds stack base elevation, model receptors are also assumed on elevated terrain. Terrain elevations for receptors in the receptor Pathway are also considered.

475. Output of model run includes: 1-hour, 24-hour, and 1 year averaging time plot files, isopleths diagrams, and table of worst-case scenarios. Meteorological data used is based on TIER 4 meteorological data, NCAR MM5 (5th-generation Mesoscale Model) prognostic meteorological model was the basis for meteorological background of the areas. Prognostic MM5 meteorological model are specified location and site domain. Once the MM5 preprocessing has been completed, the MM5 output file is converted into a format recognized by the AERMET model (meteorological preprocessor for the AERMOD model). The final output is generated by creating a pseudo met station at the specified site location.

476. **Area Sensitive Receptors (ASRs).** Area Sensitive Receptors (ASRs) include, but are not limited to residential areas, hospitals, schools, daycare facilities, elderly housing and convalescent facilities. These are areas where the occupants are more susceptible to the adverse effects of exposure to air pollutants. Extra monitoring and abatement efforts must be taken when dealing with contaminants and pollutants in close proximity to areas recognized as ASRs. For the WTE project and for the purpose of assessing potential impacts, Thilafushi islands' industrial areas are considered as ASRs as there are identified facilities with workers quarters. ASRs are located in the following area and details are provided in the main text of this report: (i) ASR1-ENE; (ii) ASR2-SSE; (iii) ASR3-NNE; (iv) ASR4- SSW; and (v) ASR5-NNW 474 to 1273 meters upwind and downwind directions from the center of the domain at UTM coordinates easting 326540 and northing 462472. This AERMOD Report includes results of the dispersion model showing the highest predicted ground level concentrations (GLC) in the ASRs.

477. The results and outputs of the models are compared with TA Luft Standards as specified in the Austal2000 Report and applicable United States Environmental Protection Agency (USEPA) standards and World Health Organization Air Quality Guidelines.

478. **Total Dust (TD).** Predicted short term (1 hour) for controlled[35] total dust (TD) maximum ground level concentrations is 7.60 ug/m3 located 280 meters ENE from the center of the domain. The 24-hour controlled total dust (TD) maximum ground level concentrations is 3.188 ug/m3 located 608 meters ENE from the center of the domain. Simulated concentrations for maximum ground level concentration for 1-hour total dust (TD) are generally very low. There is no available the Ambient Air Quality Standards for total dust in the Austal2000 Report. For the total dust (TD) deposition, AERMOD results shows 0.00754 g/m2 for 1-hour, 0.038505 g/m2 for 24 hr, and 0.43394 g/m2 for 1 year deposition. Deposition simulations are all below the TA Luft precipitation limit of 0.35 g/m2-d. There are no applicable USEPA standards and WHO Air Quality Guideline Values. Reference center of the domain is the location of the Boiler Stack-1 at Universal Transverse Mercator (UTM) coordinates Easting 326540 and Northing 462472.

479. **Particulate Matter 10 (PM-10).** Predicted short term (1 hour) for controlled particulate matter 10 (PM-10) maximum ground level concentrations is 0.102 ug/m3 located 100 meters E from the center of the domain. The 24-hour controlled PM-10 maximum ground level concentrations is 0.02844 ug/m3 located 100 meters E from the center of the domain. Simulated

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[35] Controlled emission parameters refer to post-air pollution control devices. For the WTE, each stack will include baghouse and electrostatic precipitators.

concentration for maximum ground level concentration for 24-hour PM10 is below the 35 ug/m3 TA Luft standards. There is no available Ambient Air Quality Standards for PM-10 in the Austal2000 report. For the PM-10 deposition, AERMOD results shows 0.00037 g/m2 for 1 hour, 0.0007g/m2 for 24 hour and 0.025 g/m2 for 1 year deposition. There is no TA Luft precipitation limit for PM10 in the Austal2000 report. Results are below WHO Air Quality Guideline Values. There are no USEPA standards. Reference center of the domain is the location of the Boiler Stack-1 at UTM coordinates Easting 326540 and Northing 462472.

480. **Sulfur Dioxide (SO_2).** Predicted short term (1 hour) for controlled sulfur dioxide (SO_2) maximum ground level concentrations is 10.34 ug/m3 located 100 meters E from the center of the domain. The 24-hour controlled SO_2 maximum ground level concentrations is 2.85 ug/m3 located 100 meters E from the center of the domain. For 1-year averaging time, result of maximum concentration is 0.25302 ug/m3. All simulated concentration for maximum ground level concentration for 1 hour, 24 hour and 1-year SO_2 are all below the TA Luft standards of 350 ug/m3 for 1 hour, 125 ug/m3 for 24 hr and 50 ug/m3 for 1 year respectively. Results are below USEPA standards and WHO Air Quality Guideline Values. Reference center of the domain is the location of the Boiler Stack-1 at UTM coordinates Easting 326540 and Northing 462472.

481. **Nitrogen Oxides (NOx)** Predicted short term (1 hour) for controlled NO_2 maximum ground level concentration is 48.91 ug/m3 located 100 meters E from the center of the domain. The 24-hour controlled NO_2 maximum ground level concentrations is 14.16 ug/m3 located 100 meters E from the center of the domain. For 1-year averaging time, results of maximum NO_2 concentration is 2.1 ug/m3. Simulated concentration for maximum NO_2 ground level concentration for 1 year is below the TA Luft standards of 18 ug/m3. Results are below USEPA standards and WHO Air Quality Guideline Values. Reference center of the domain is the location of the Boiler Stack-1 at UTM coordinates Easting 326540 and Northing 462472.

482. **Mercury (Hg).** Predicted short term (1 hour) for controlled mercury (Hg) maximum ground level concentrations is 0.00643 ug/m3 located 100 meters E from the center of the domain. The 24-hour controlled Hg maximum ground level concentrations is 0.00178 ug/m3 located 100 meters E from the center of the domain. For 1-year averaging time, result of maximum concentration is 0.0057 ug/m3. Simulated concentration for maximum ground level concentration for 1-year Hg is below the TA Luft standards of 0.05 ug/m3. There are no USEPA standards and WHO Air Quality Guideline Values. Reference center of the domain is the location of the Boiler Stack-1 at UTM coordinates Easting 326540 and Northing 462472.

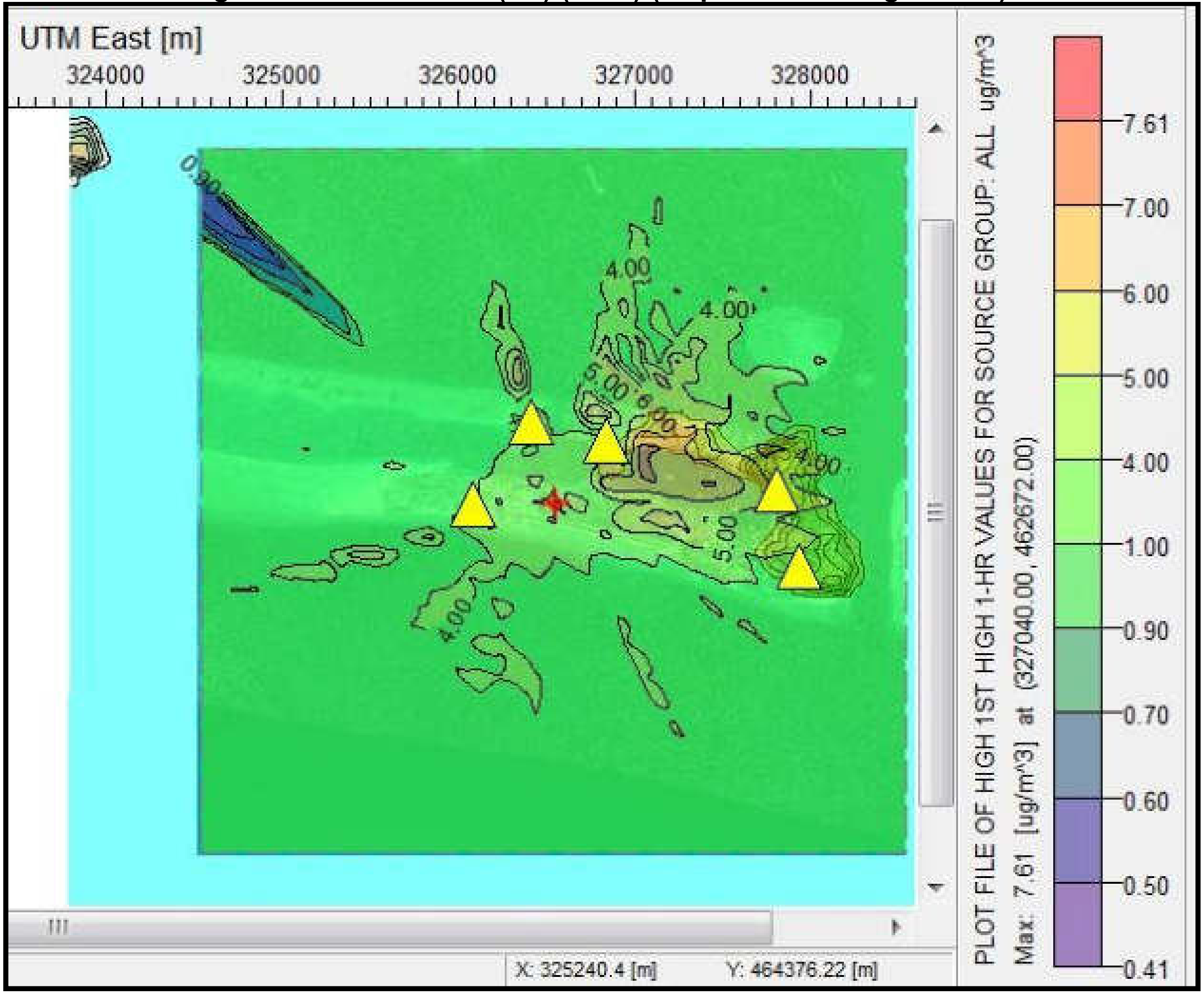
483. **Ammonia (NH_3).** Predicted short term (1 hour) for controlled ammonia (NH_3) maximum ground level concentrations is 2.066 ug/m3 located 100 meters E from the center of the domain. The 24-hour controlled NH_3 maximum ground level concentrations is 0.57123 ug/m3 located 100 meters E from the center of the domain. There are no NH_3TA Luft standards in the Austal2000 report. There are no USEPA standards and WHO Air Quality Guideline Values. Reference center of the domain is the location of the Boiler Stack-1 at UTM coordinates easting 326540 and northing 462472.

484. **Hydrogen Chloride (HCl).** Predicted short term (1 hour) for controlled hydrogen chloride (HCl) maximum ground level concentrations is 2.066 ug/m3 located 100 meters E from the center of the domain. The 24-hour controlled NH_3 maximum ground level concentrations is 0.57123 ug/m3 located 100 meters E from the center of the domain. There are no HCl TA Luft standards in the Austal2000 report. There are no USEPA standards and WHO Air Quality Guideline Values. Reference center of the domain is the location of the Boiler Stack-1 at UTM coordinates Easting 326540 and Northing 462472.

485. **Hydrogen Fluoride (HFl).** Predicted short term (1 hour) for controlled hydrogen fluoride (HFl) maximum ground level concentrations is 2.066 ug/m3 located 100 meters E from the center of the domain. The 24-hour controlled HFl maximum ground level concentrations is 0.57123 ug/m3 located 100 meters E from the center of the domain. There are no HFl TA Luft standards in the Austal2000 report. There are no USEPA standards and WHO Air Quality Guideline Values. Reference center of the domain is the location of the Boiler Stack-1 at UTM coordinates Easting 326540 and Northing 462472.

486. **Dioxins and Furans (D/F).** Predicted short term (1 hour) for controlled Dioxins and Furans maximum ground level concentrations is 0.0258 ug/m3 located 100 meters E from the center of the domain. The 24 hour-controlled Dioxins and Furans maximum ground level concentrations is 0.00569 ug/m3 located 100 meters E from the center of the domain. There are no Dioxins and Furans TA Luft standards in the Austal2000 report. There are no USEPA standards and WHO Air Quality Guideline Values. Reference center of the domain is the location of the Boiler Stack-1 at UTM coordinates Easting 326540 and Northing 462472.

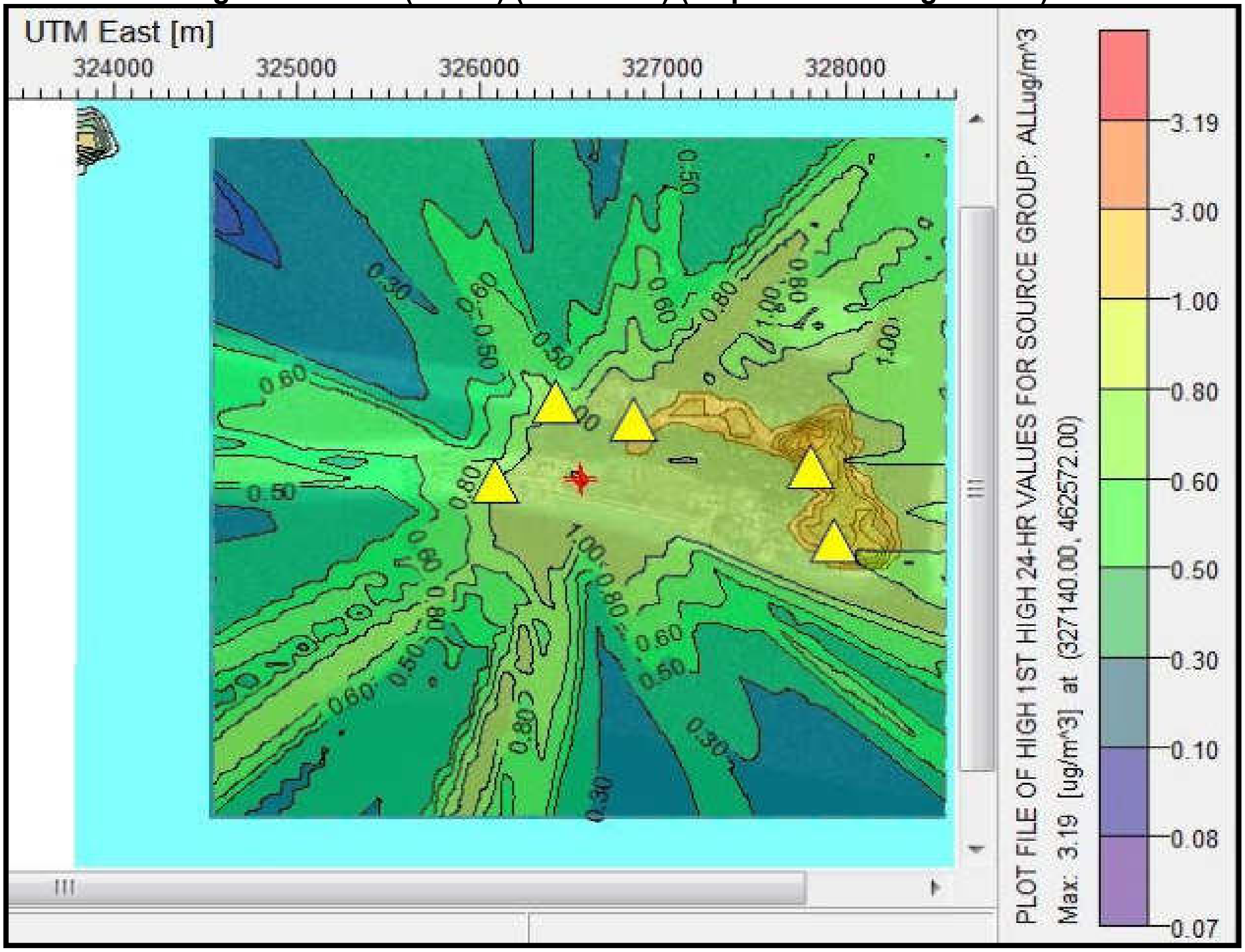
Figure 132: Total Dust (TD) (1 HR) (Isopleth in microgram/m3)



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

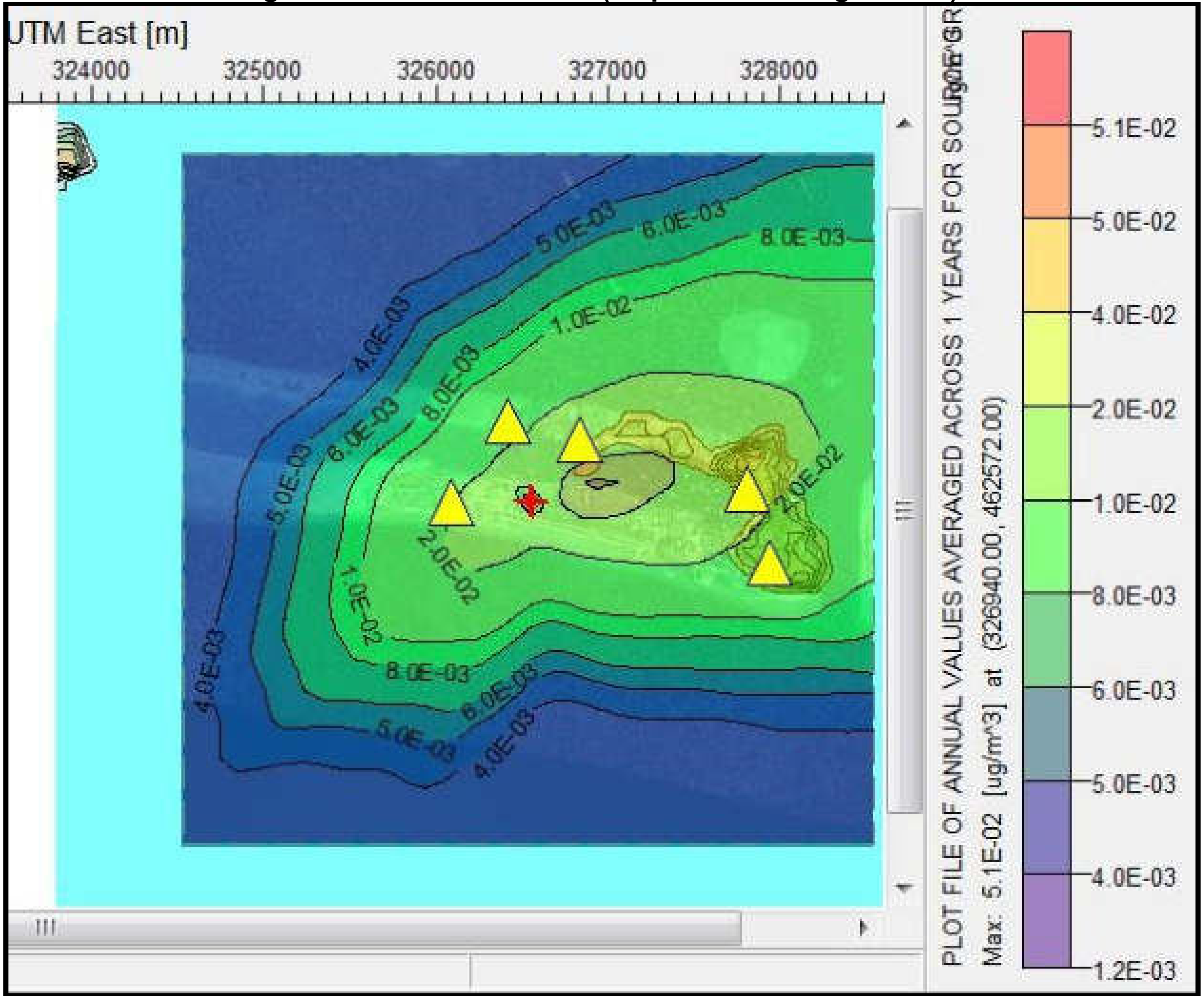
Figure 133: TD (24-HR) (1-HR RUN) (Isopleth in microgram/m3)



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 134: Total Dust 1YR (Isopleth in microgram/m3)

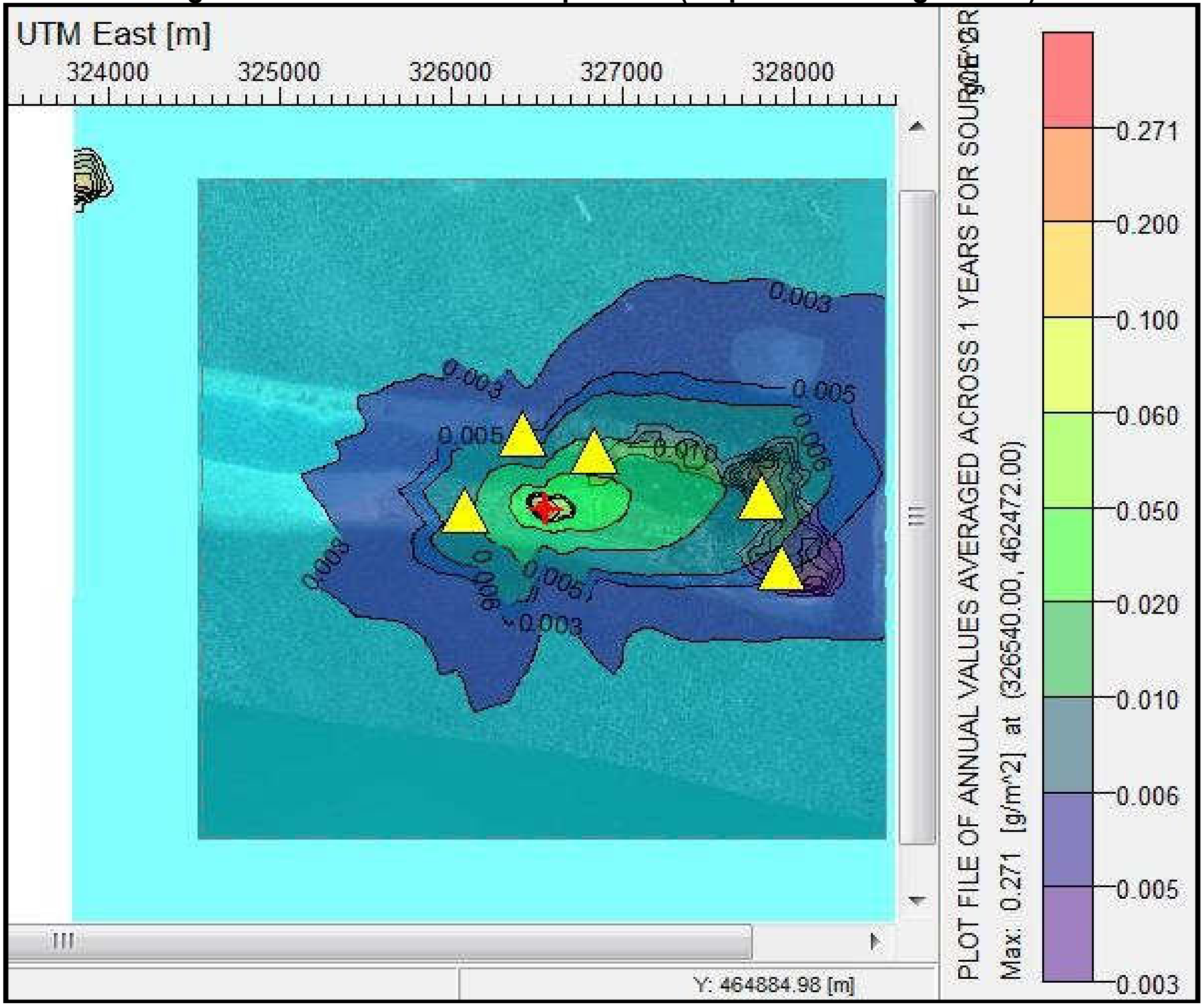


LEGEND:

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 135: Total Dust 1YR Deposition (Isopleth in microgram/m3)

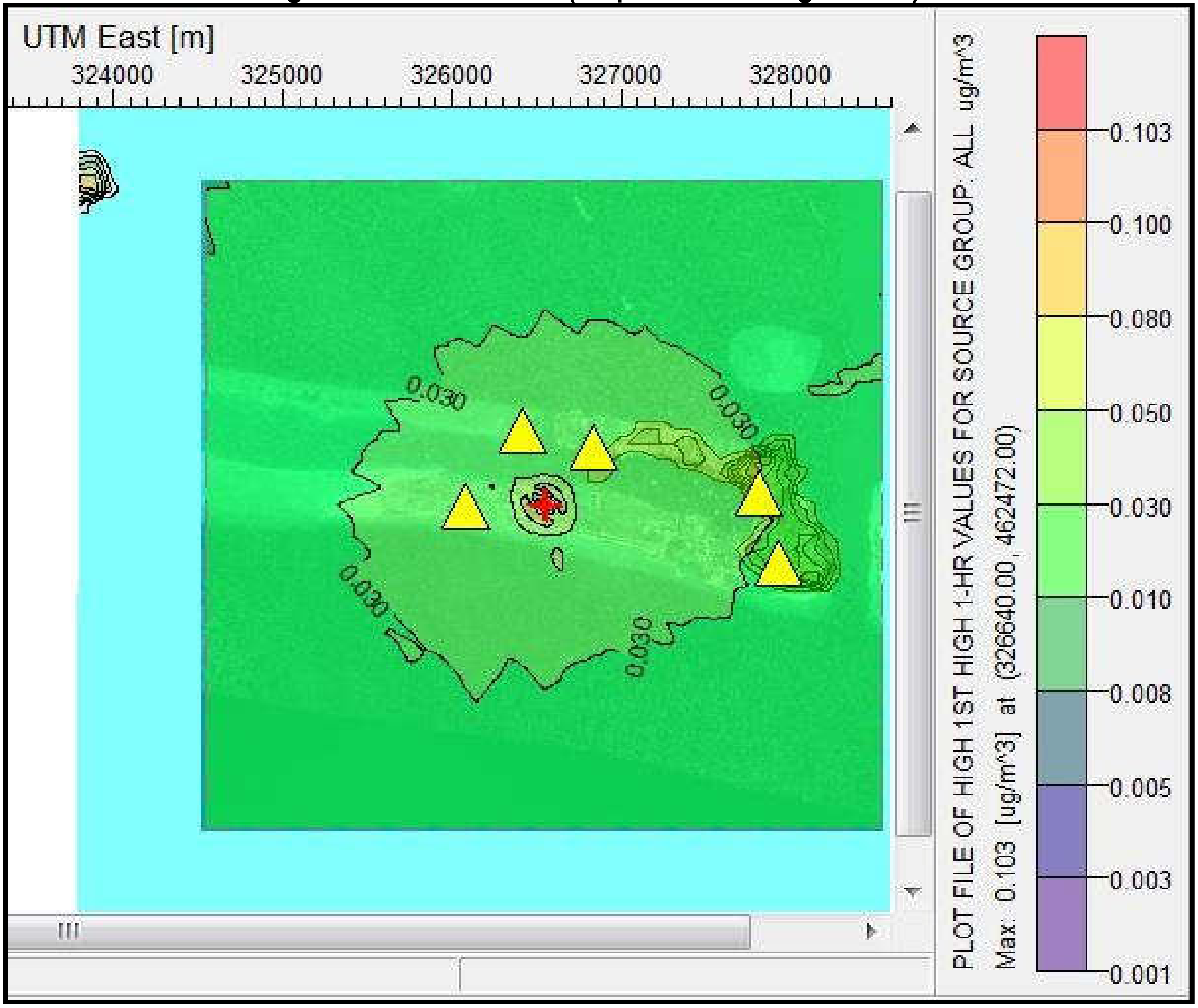


LEGEND:

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 136: PM10 1 HR (Isopleth in microgram/m3)

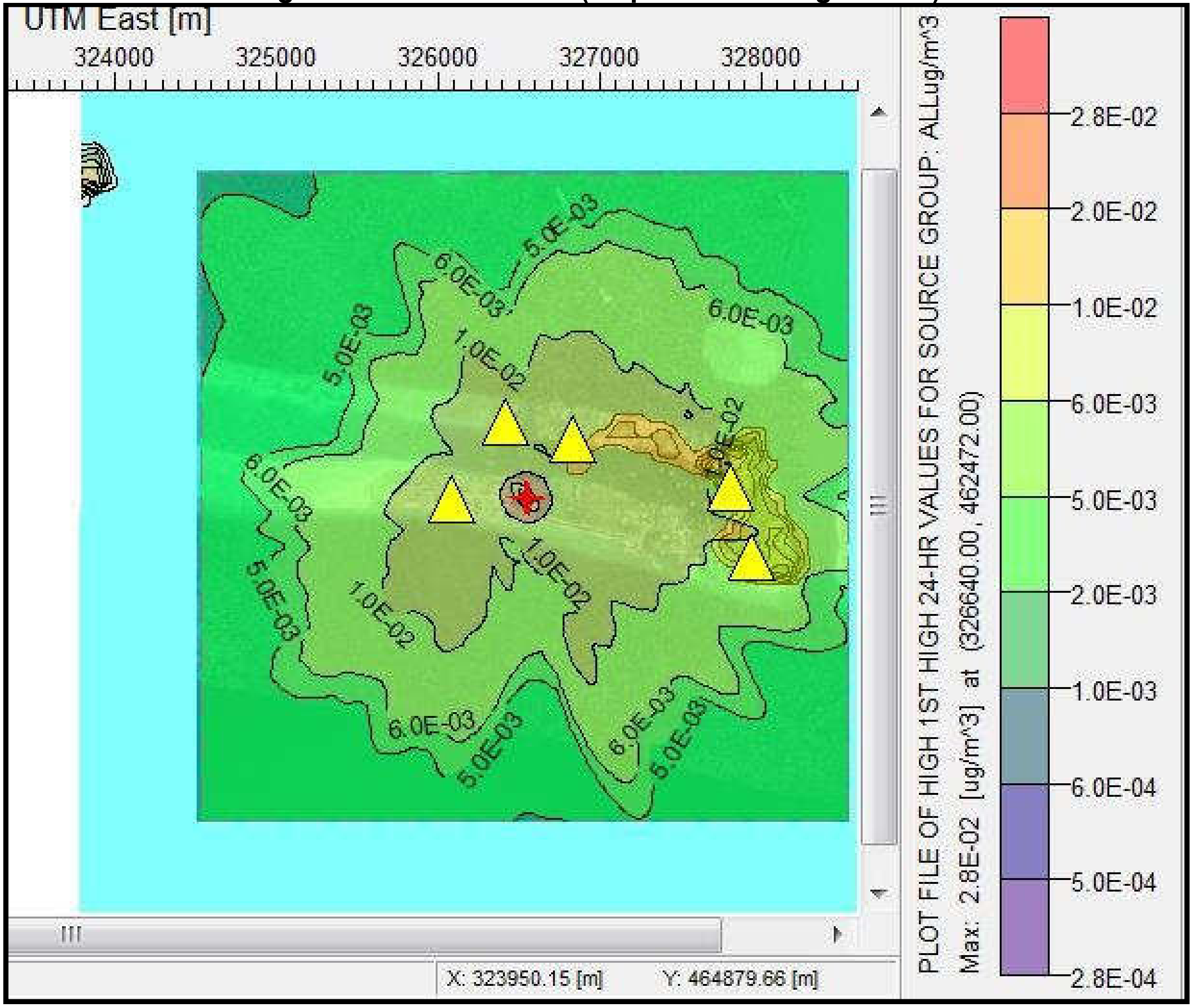


LEGEND:

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 137: PM10 24 HR (Isopleth in microgram/m3)

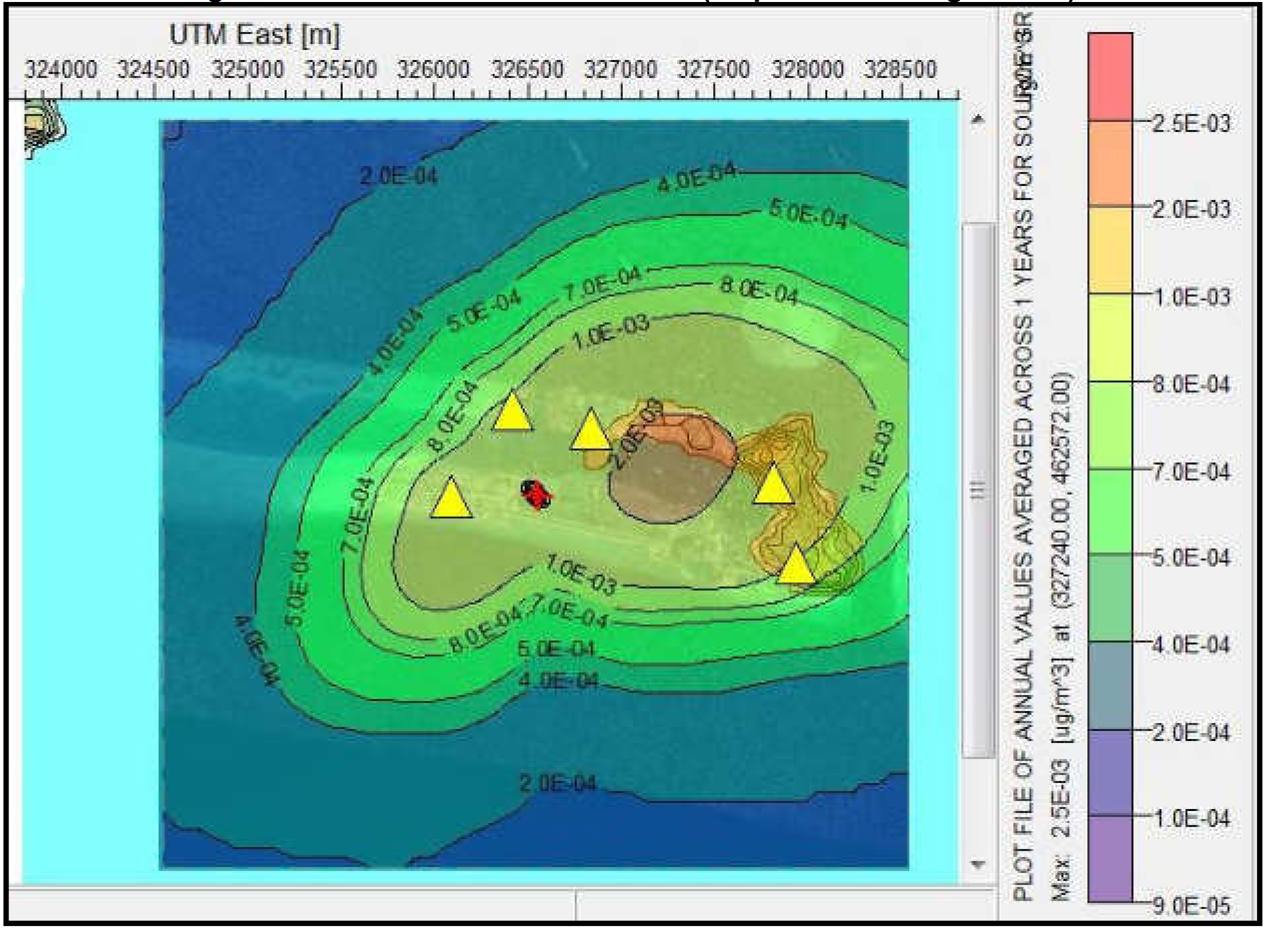


LEGEND:

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 138: PM10 1 YR DEPOSITION (Isopleth in microgram/m3)

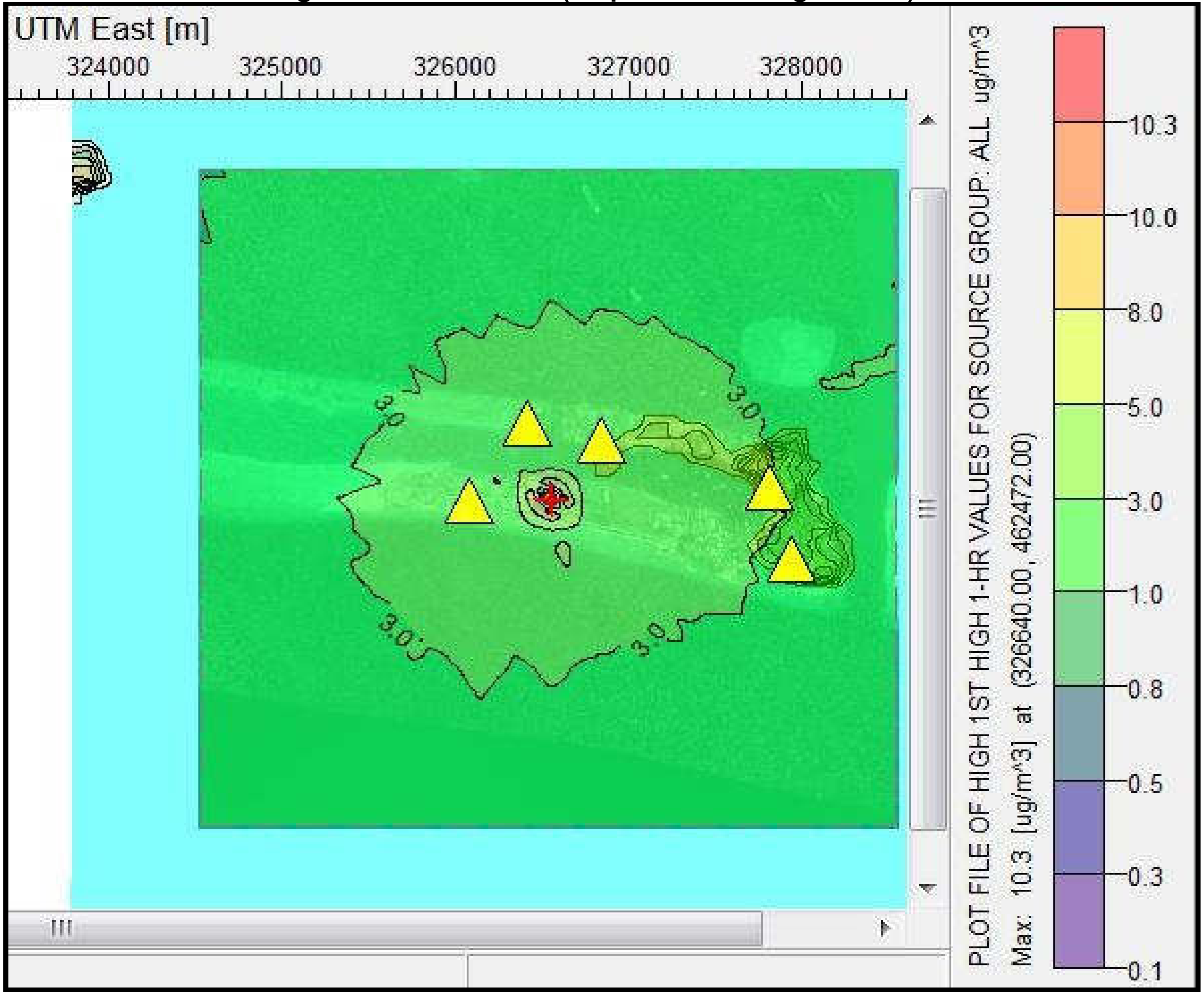


LEGEND:

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 139: SO2 1 HR (Isopleth in microgram/m3)

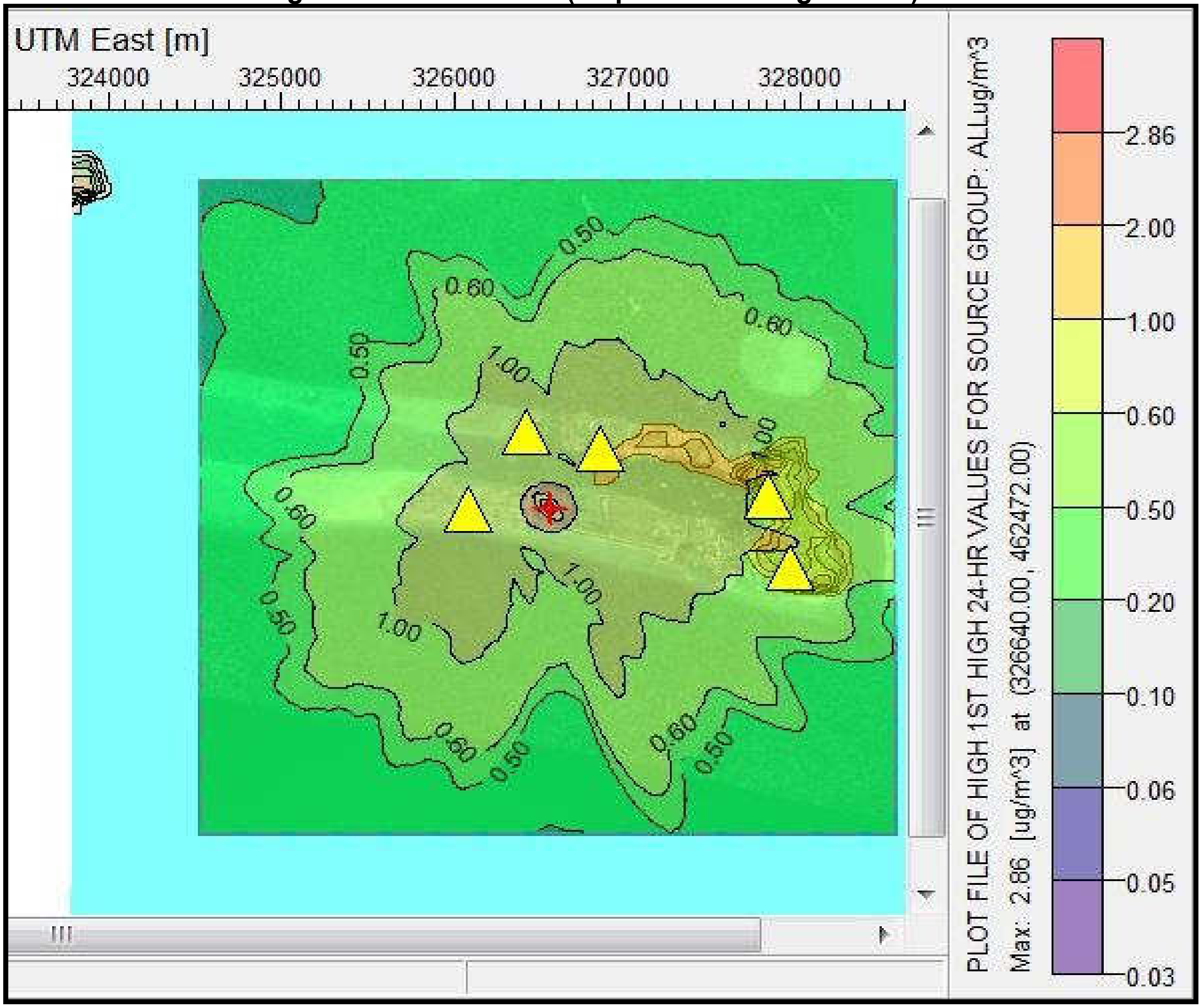


LEGEND:

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 140: SO2 24 HR (Isopleth in microgram/m3)

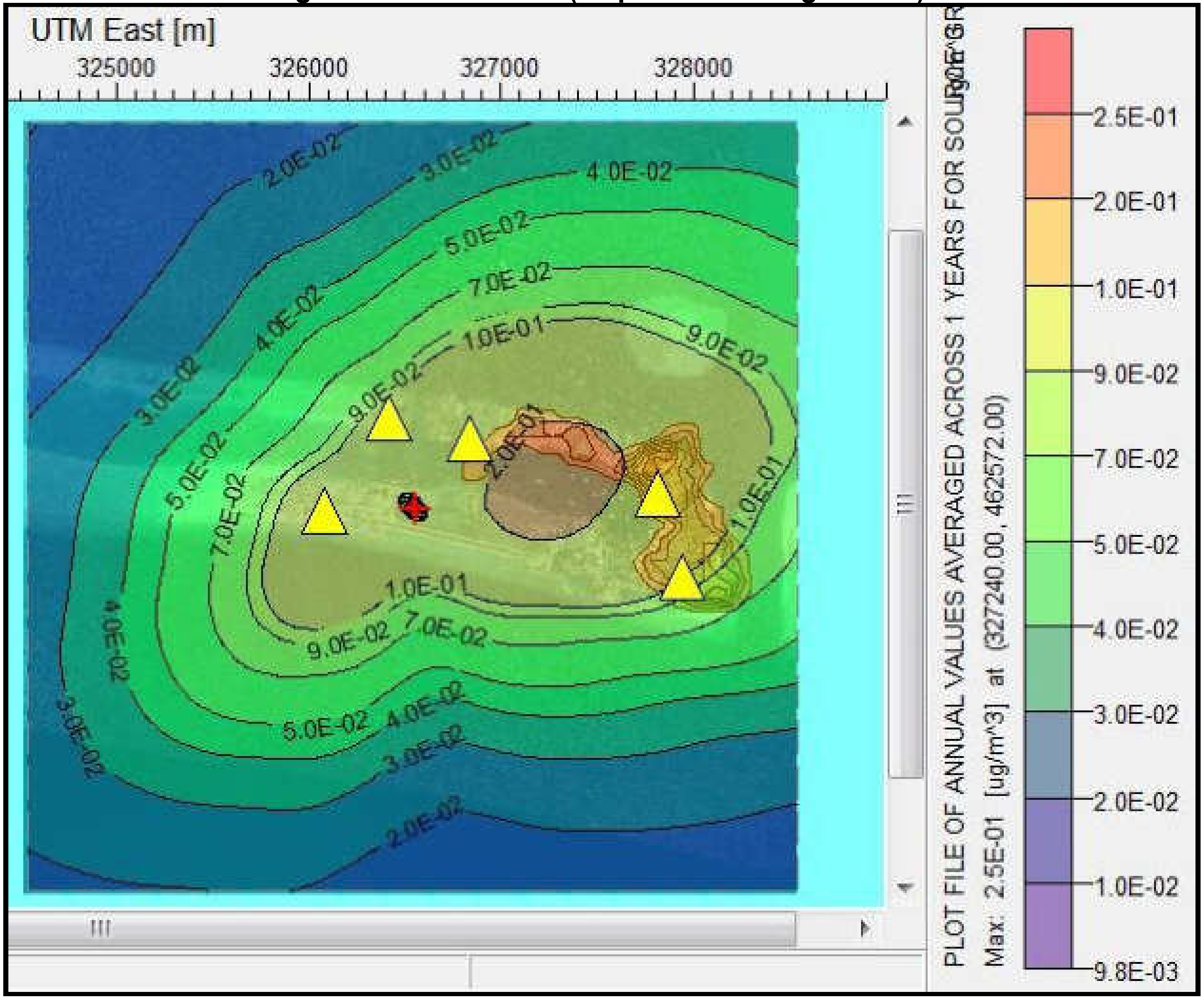


LEGEND:

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 141: SO2 1 YR (Isopleth in microgram/m3)

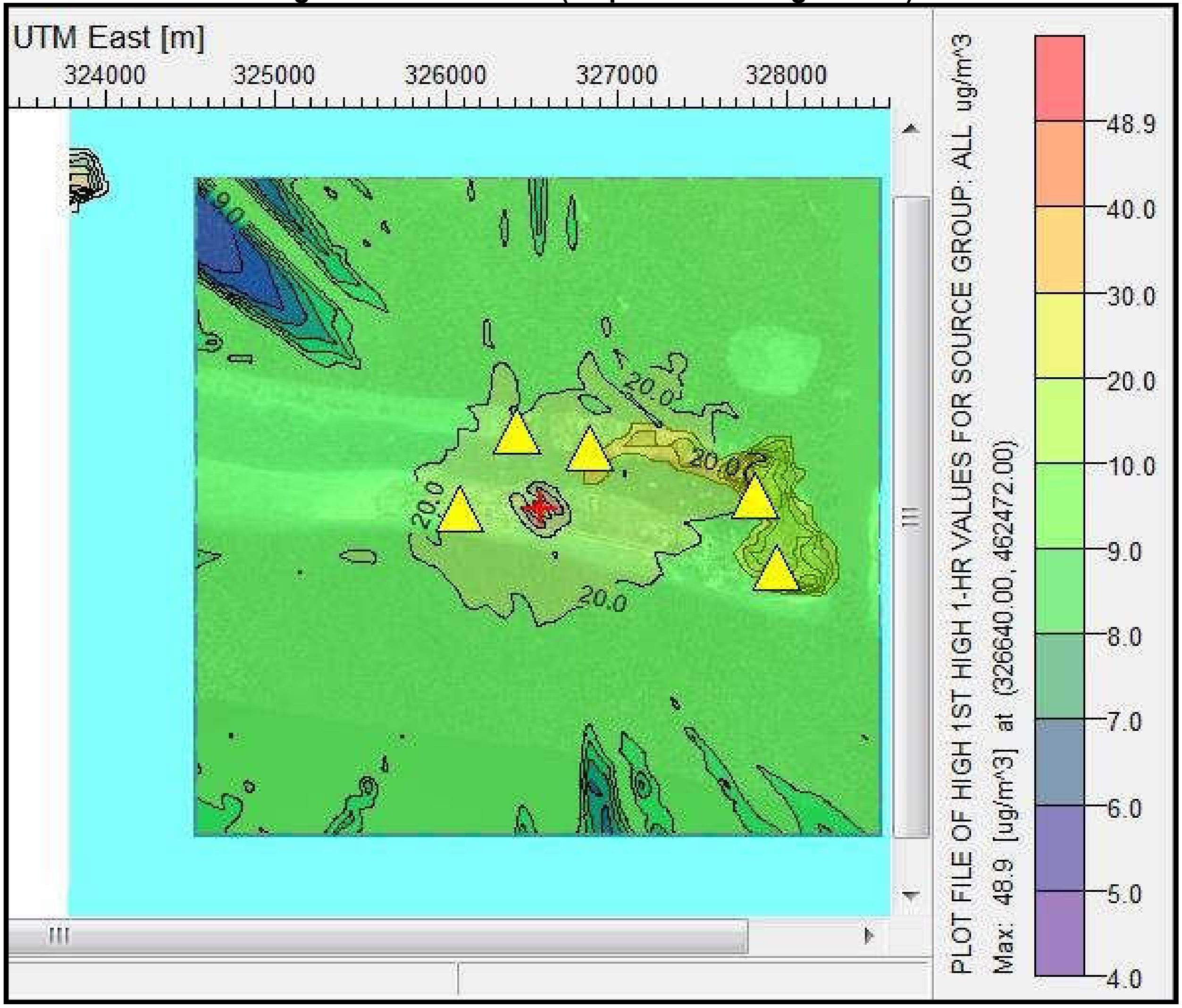


LEGEND:

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 142: NO2 1 HR (Isopleth in microgram/m3)

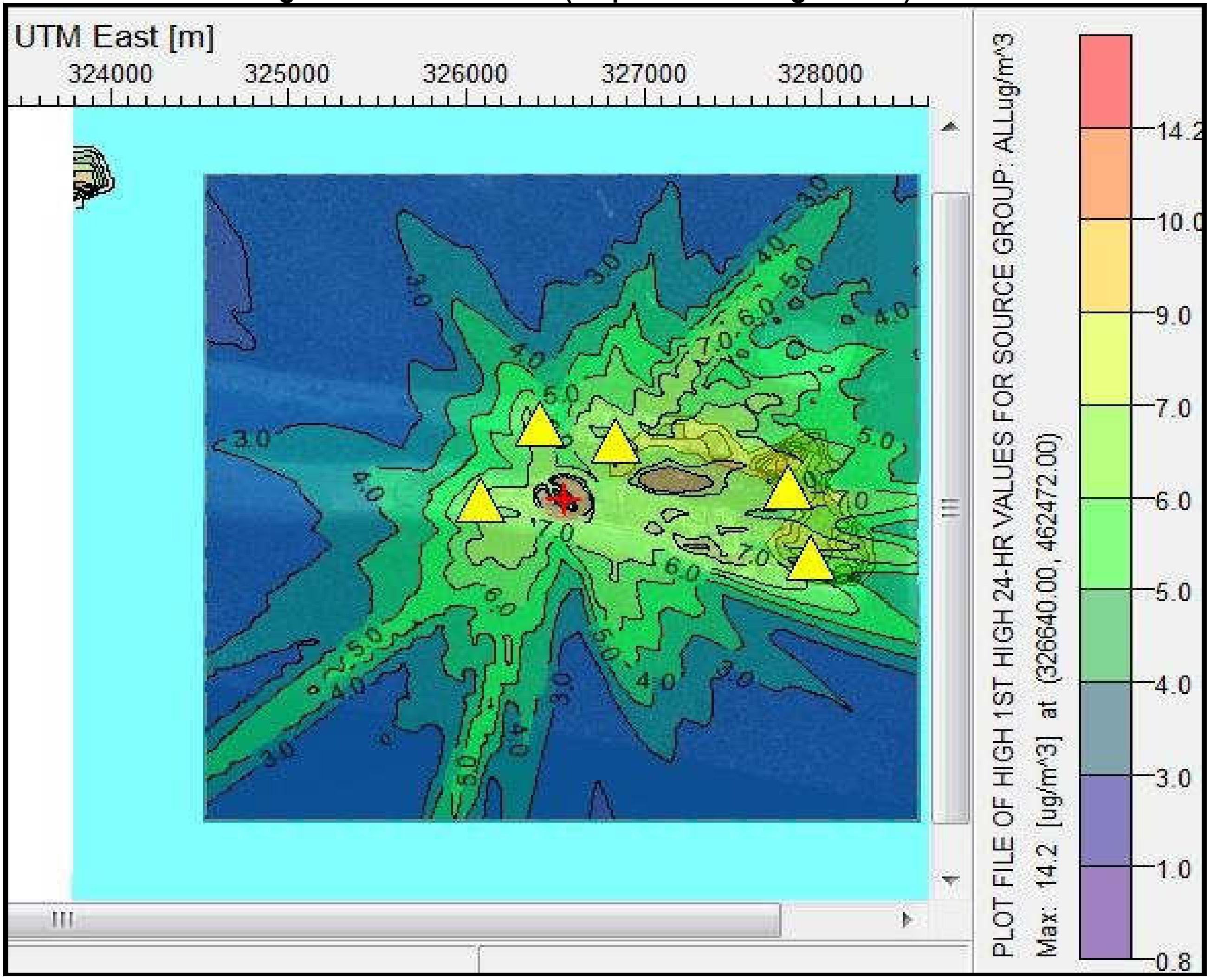


LEGEND:

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 143: NO2 24 HR (Isopleth in microgram/m3)

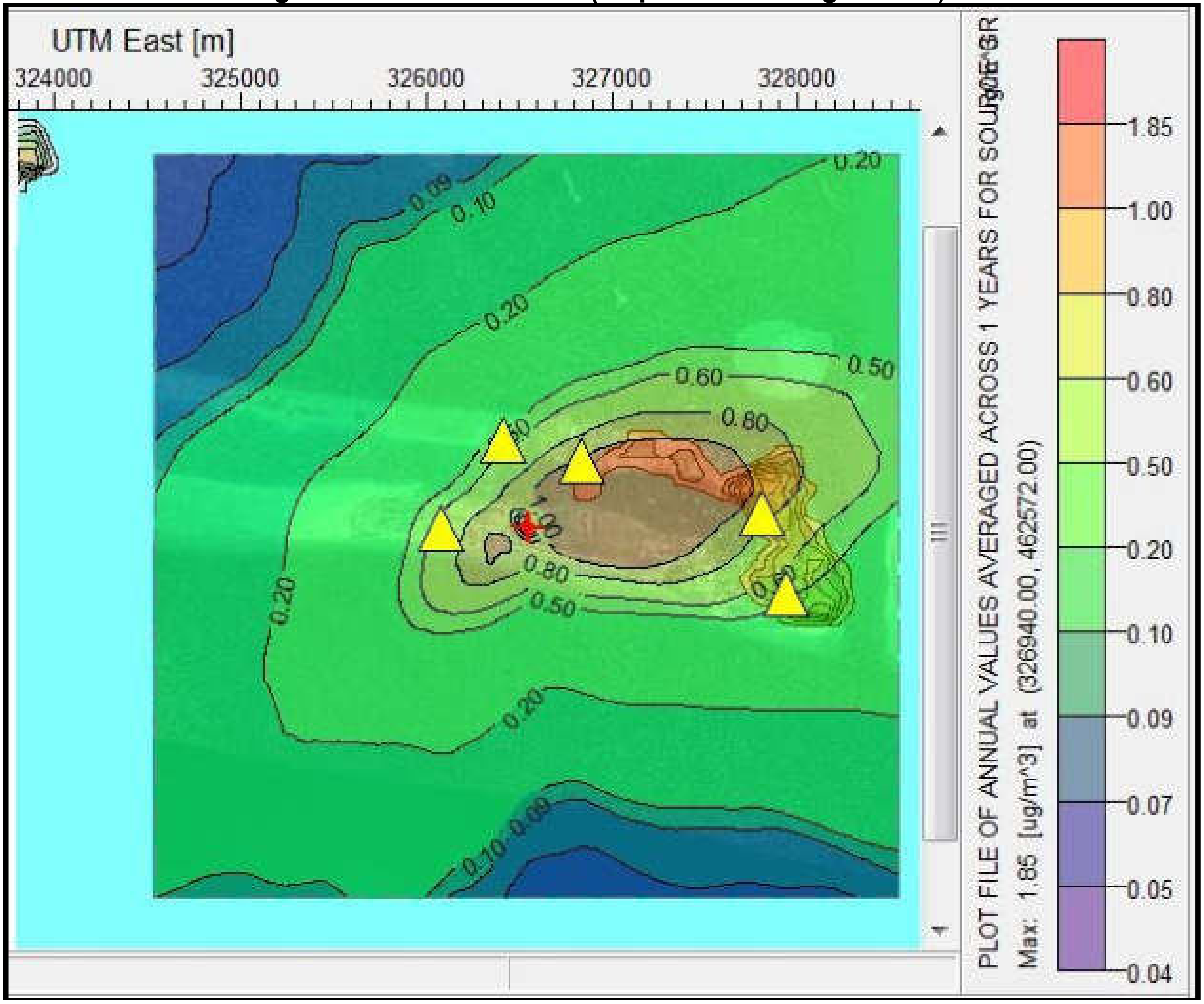


LEGEND:

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 144: NO2 1 YR HR (Isopleth in microgram/m3)

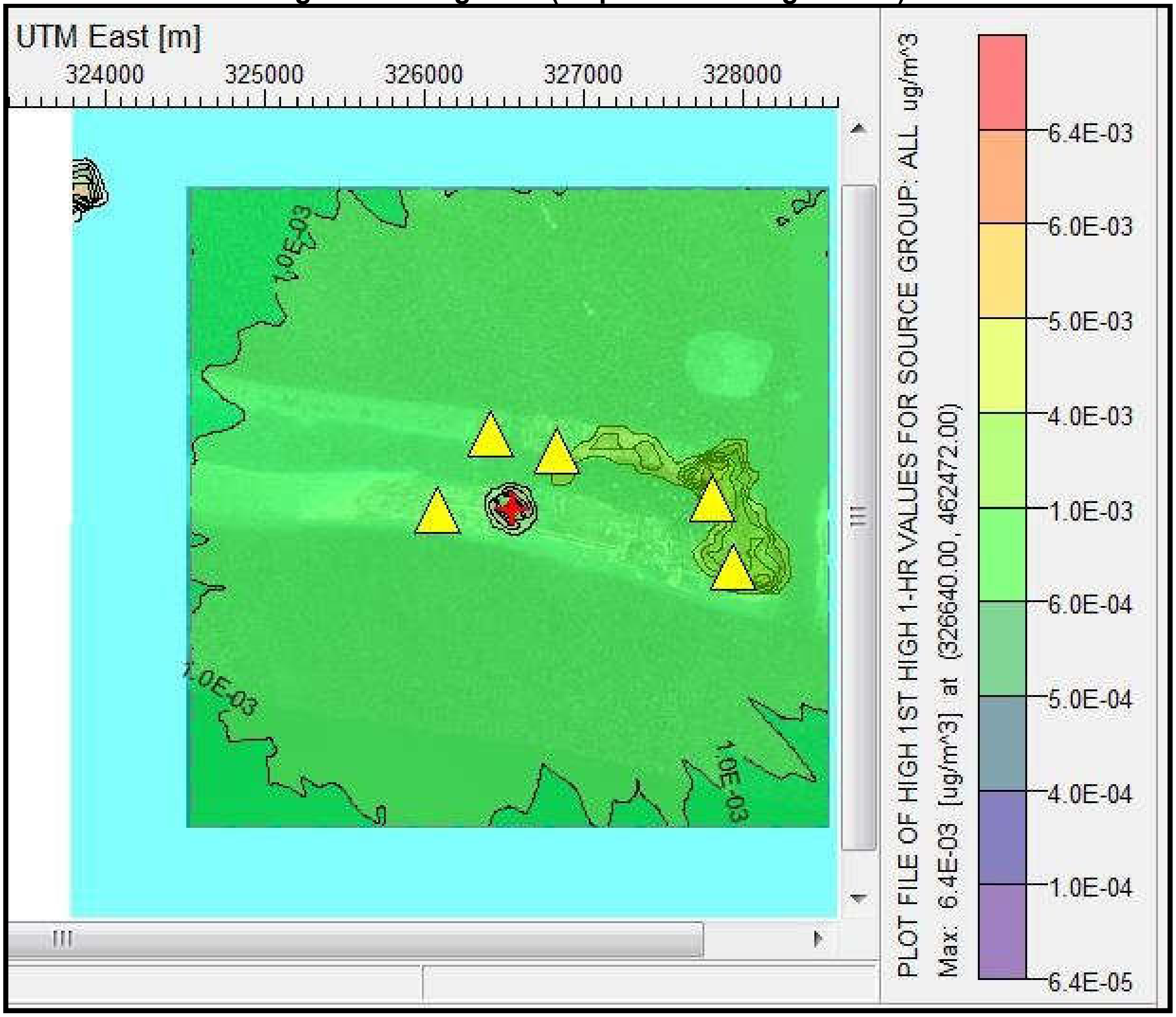


LEGEND:

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 145: Hg 1 HR (Isopleth in microgram/m3)

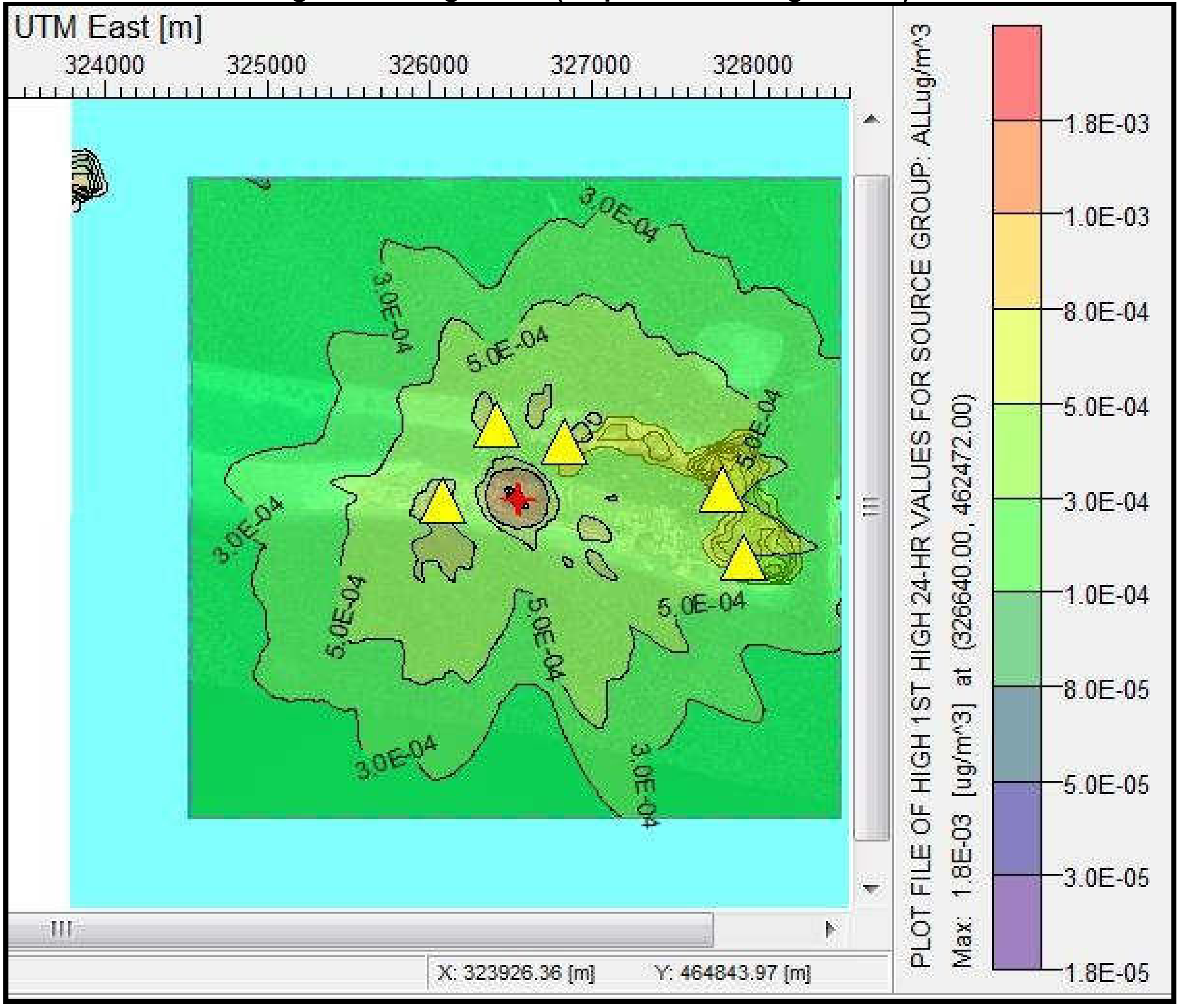


LEGEND:

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 146: Hg 24 HR (Isopleth in microgram/m3)

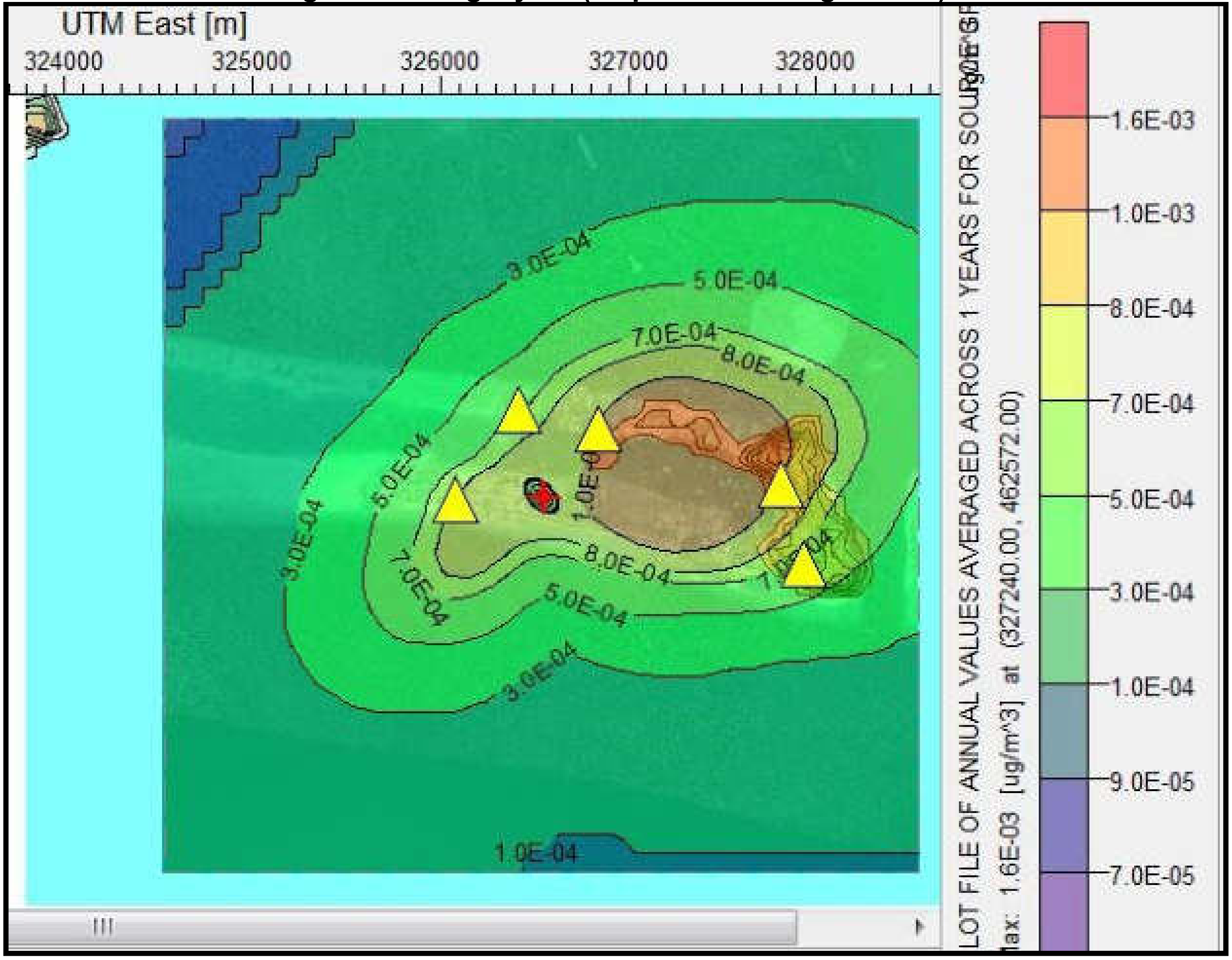


LEGEND:

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 147: Hg 1 year (Isopleth in microgram/m3)

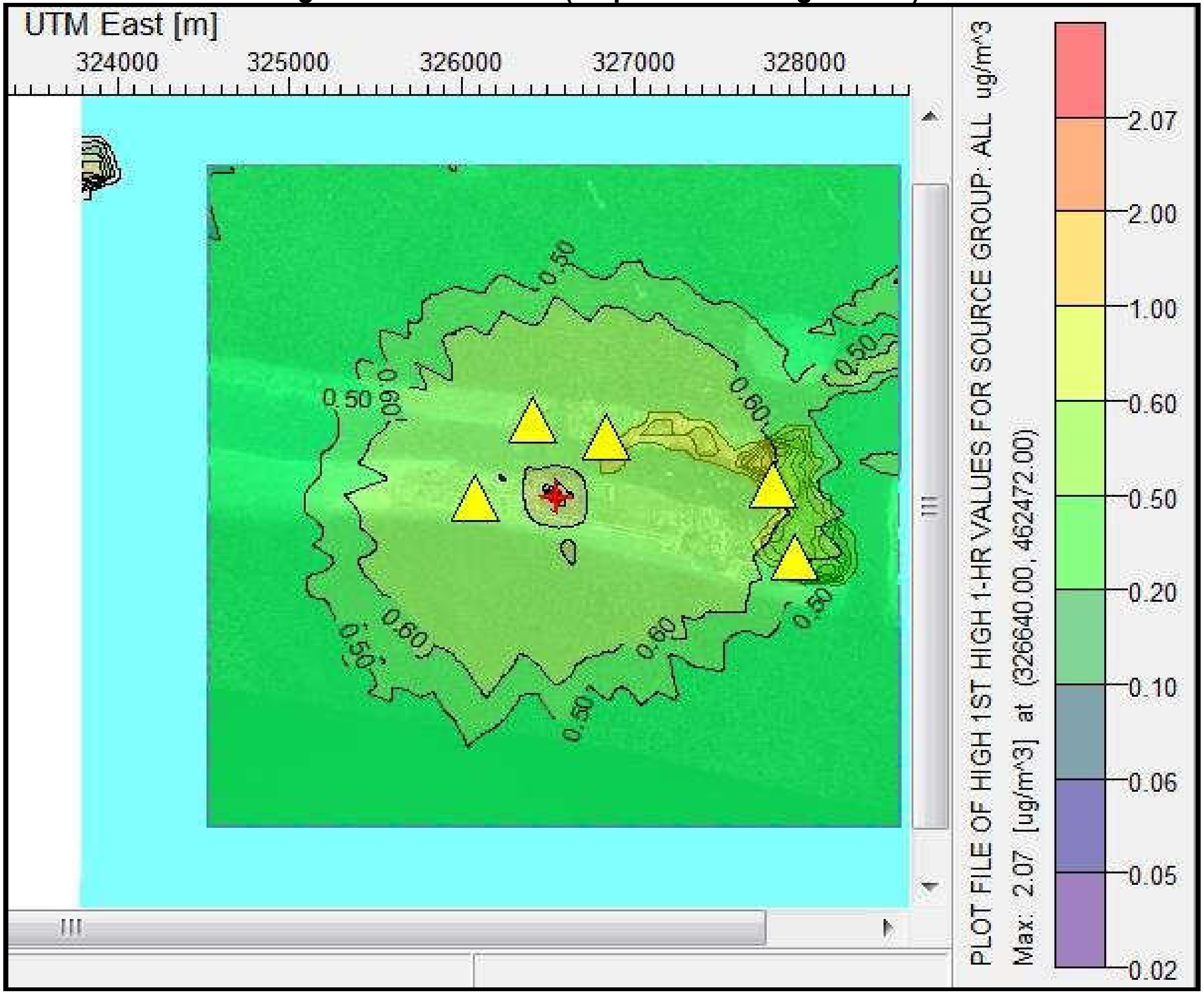


LEGEND:

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 148: NH3 1 HR (Isopleth in microgram/m3)

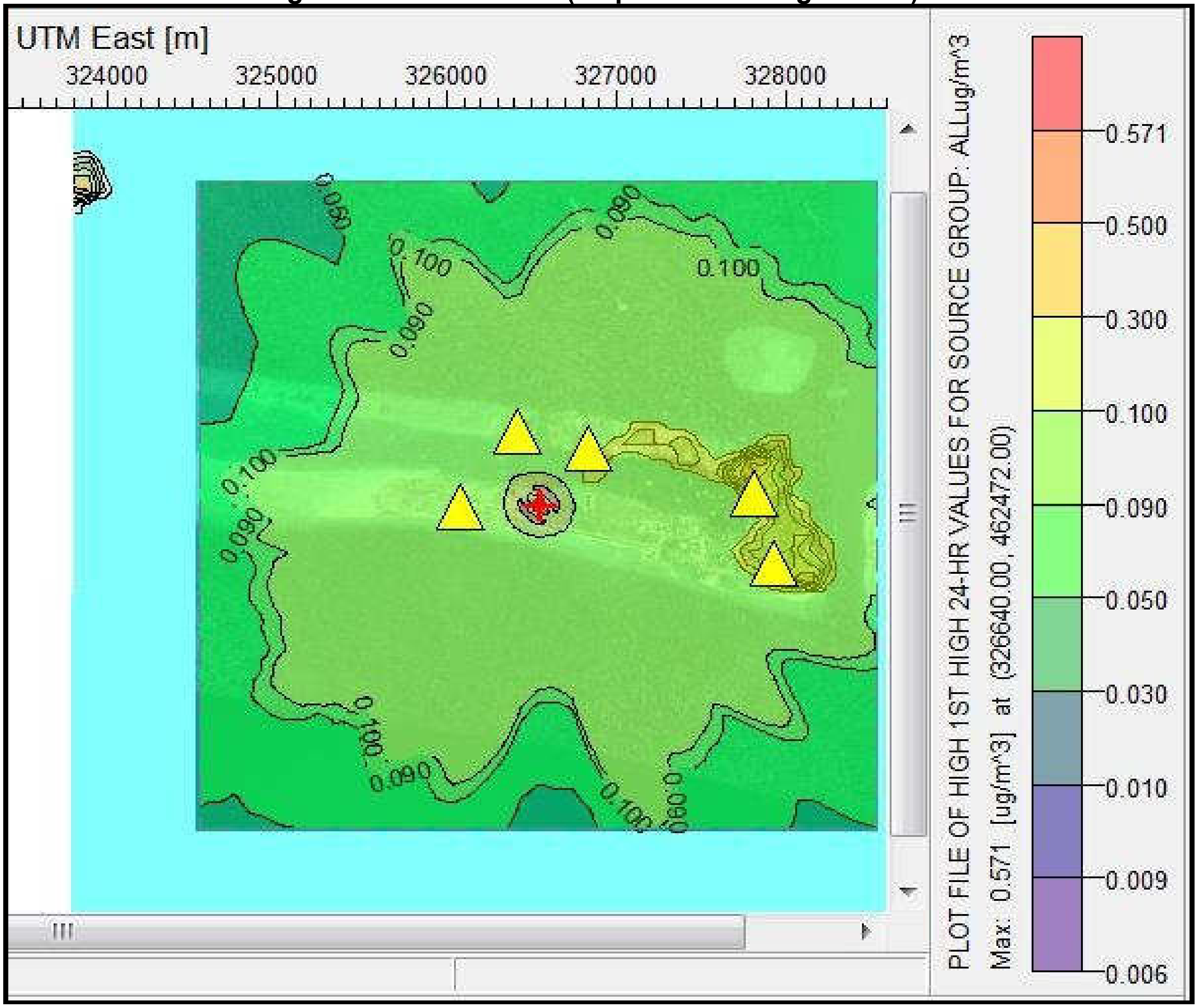


LEGEND:

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 149: NH3 24 HR (Isopleth in microgram/m3)

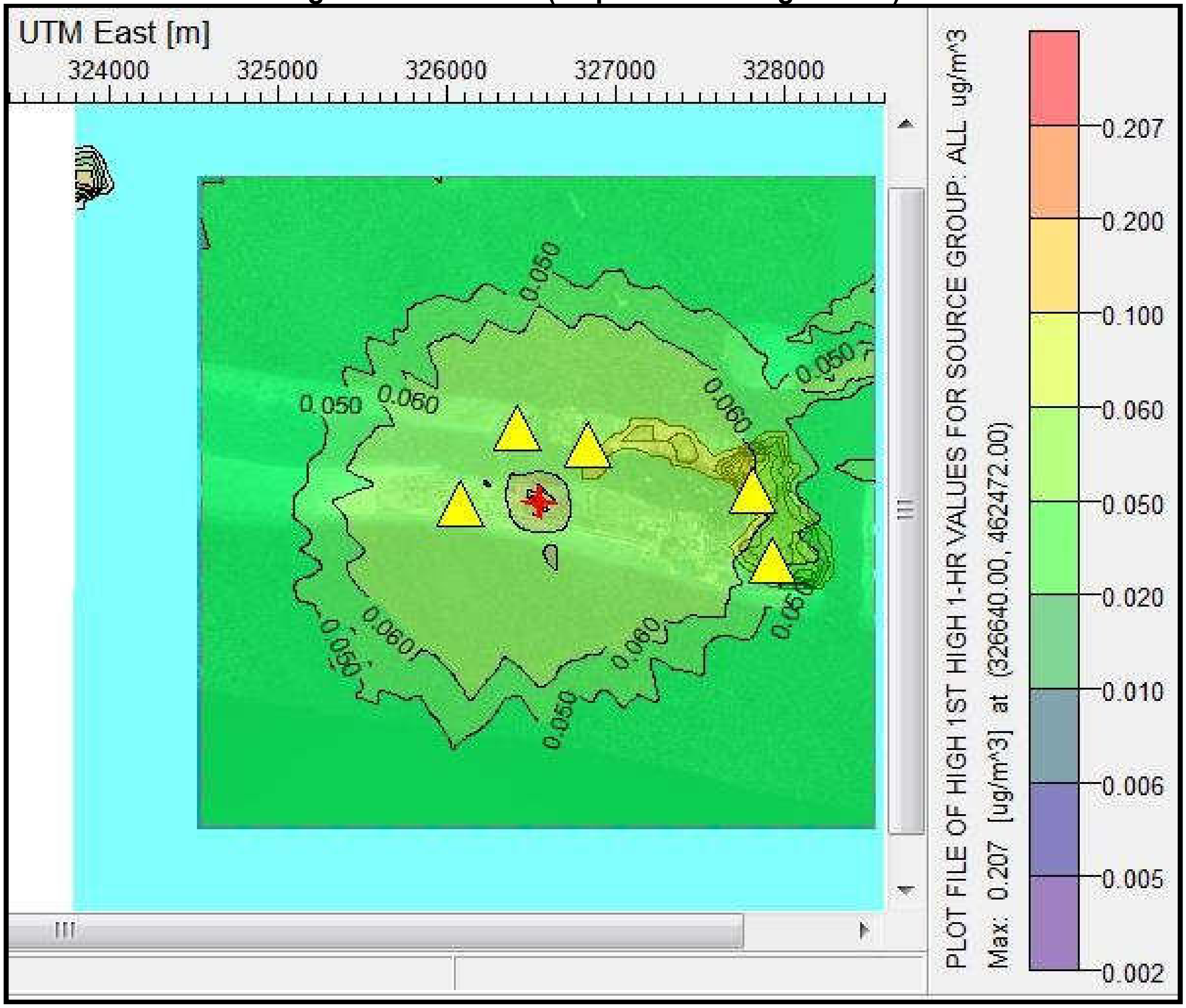


LEGEND:

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 150: Hf 1 HR (Isopleth in microgram/m3)

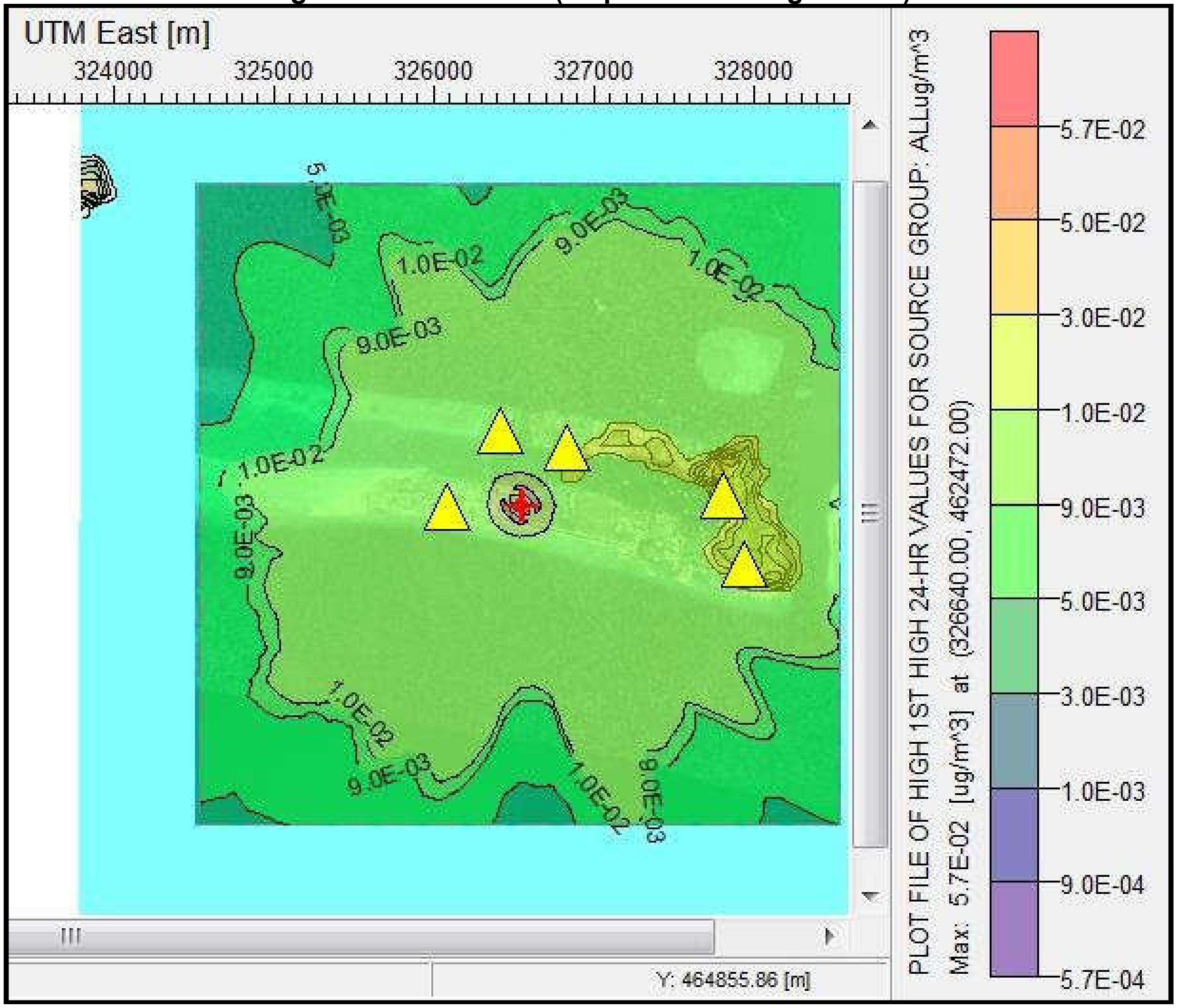


LEGEND:

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 151: HF 24 HR (Isopleth in microgram/m3)

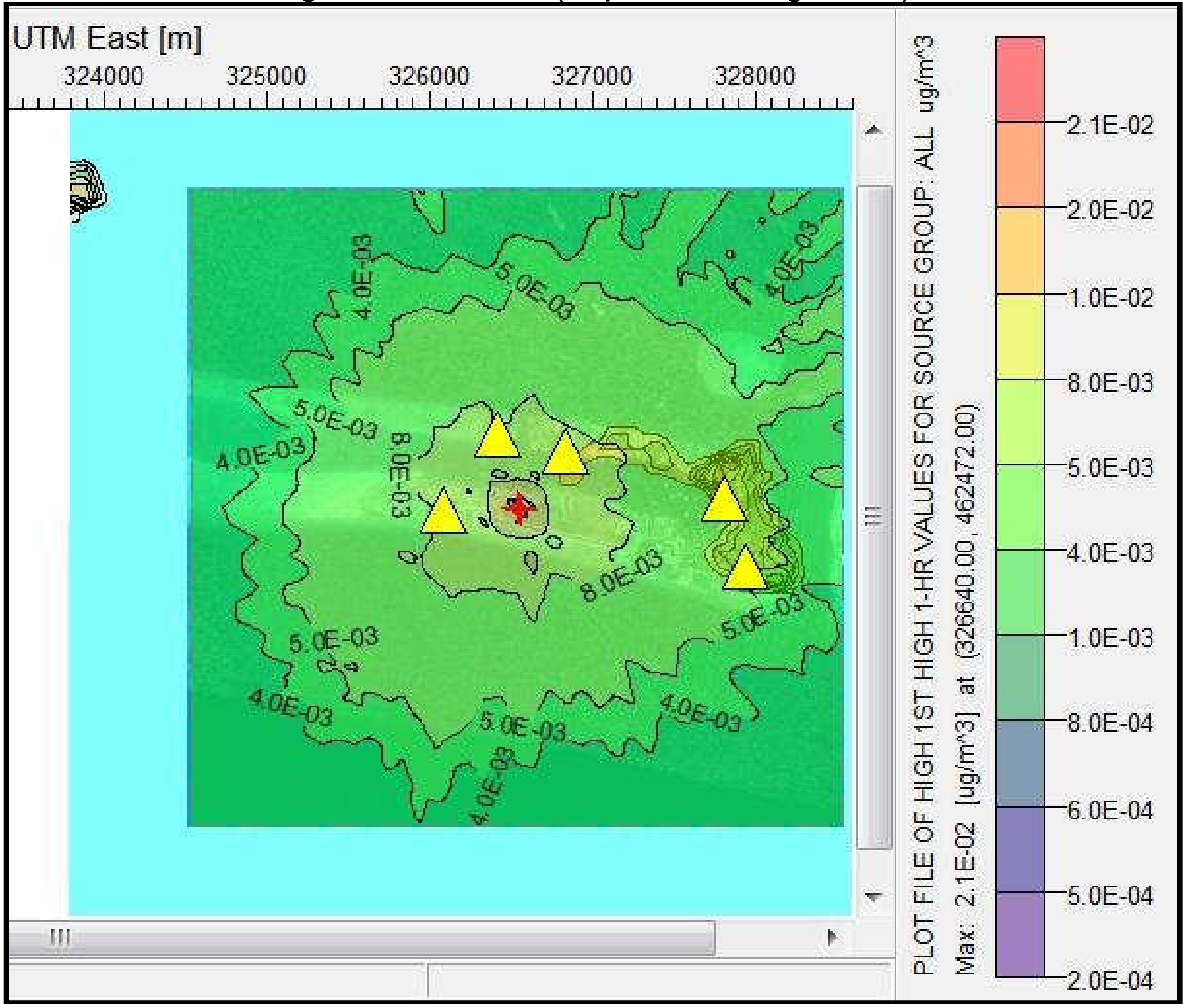


LEGEND:

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 152: D/F 1 HR (Isopleth in microgram/m3)

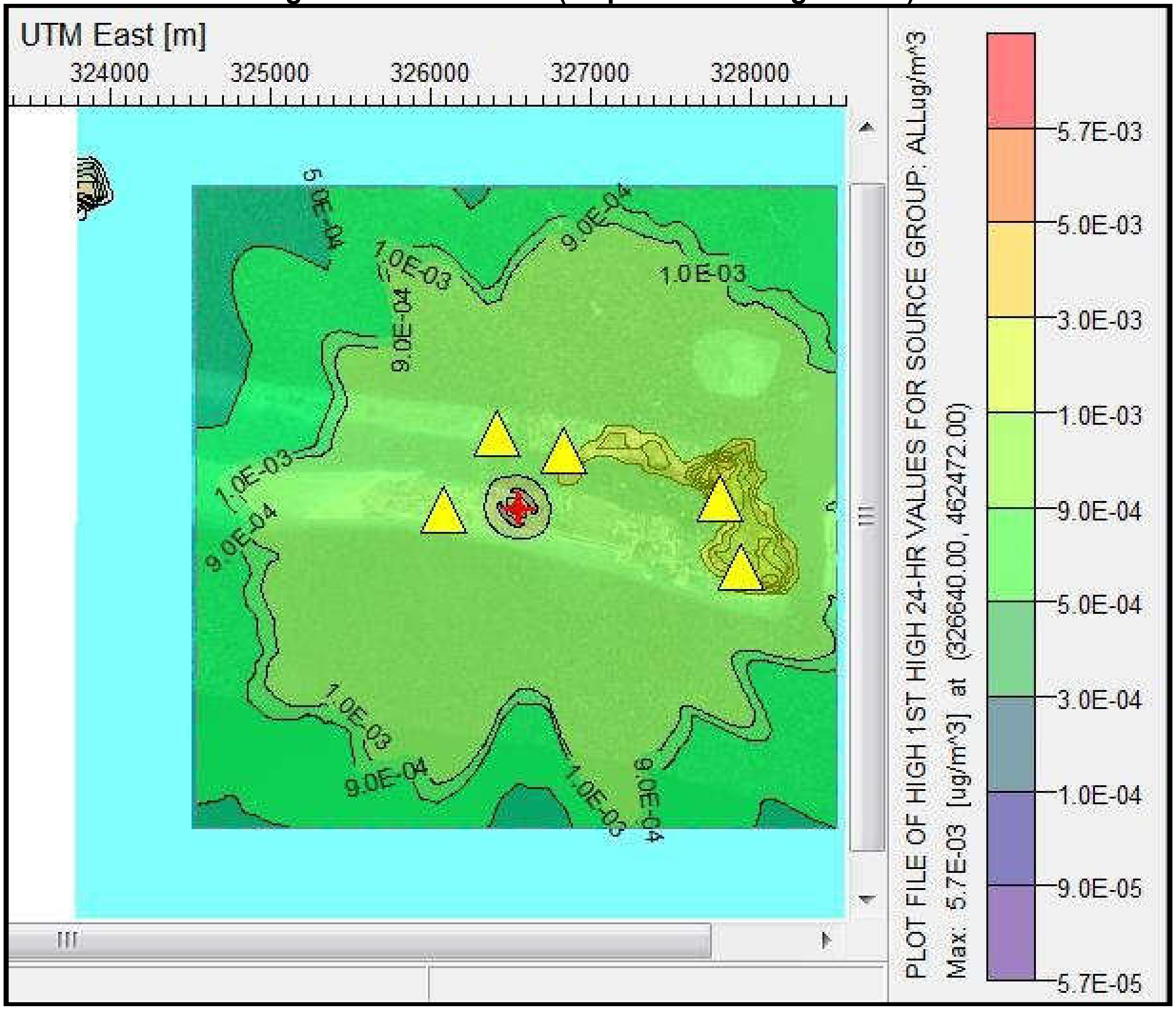


LEGEND:

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 153: D/F 24 HR (Isopleth in microgram/m3)

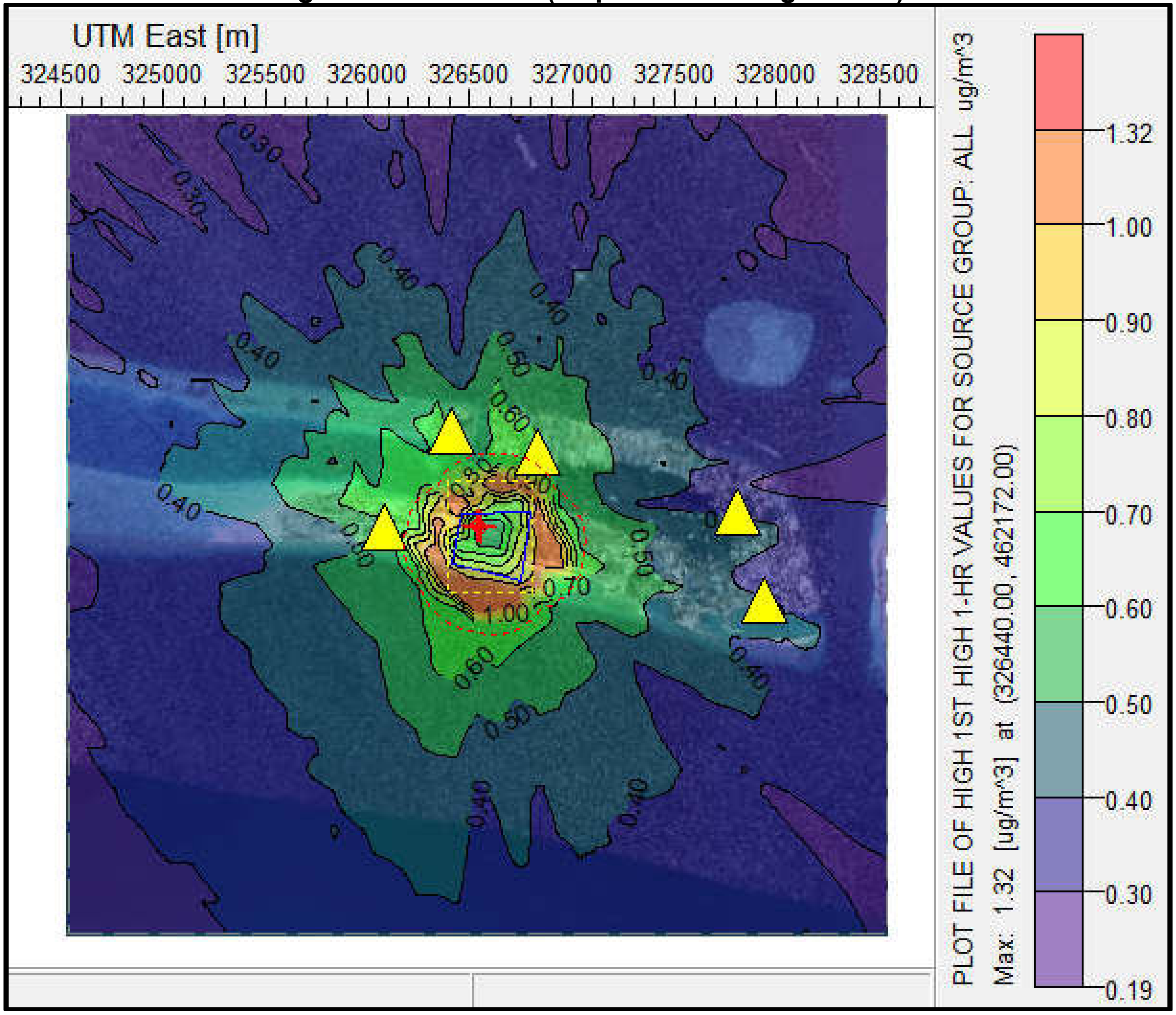


LEGEND:

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 154: Sb 1 HR (Isopleth in microgram/m3)

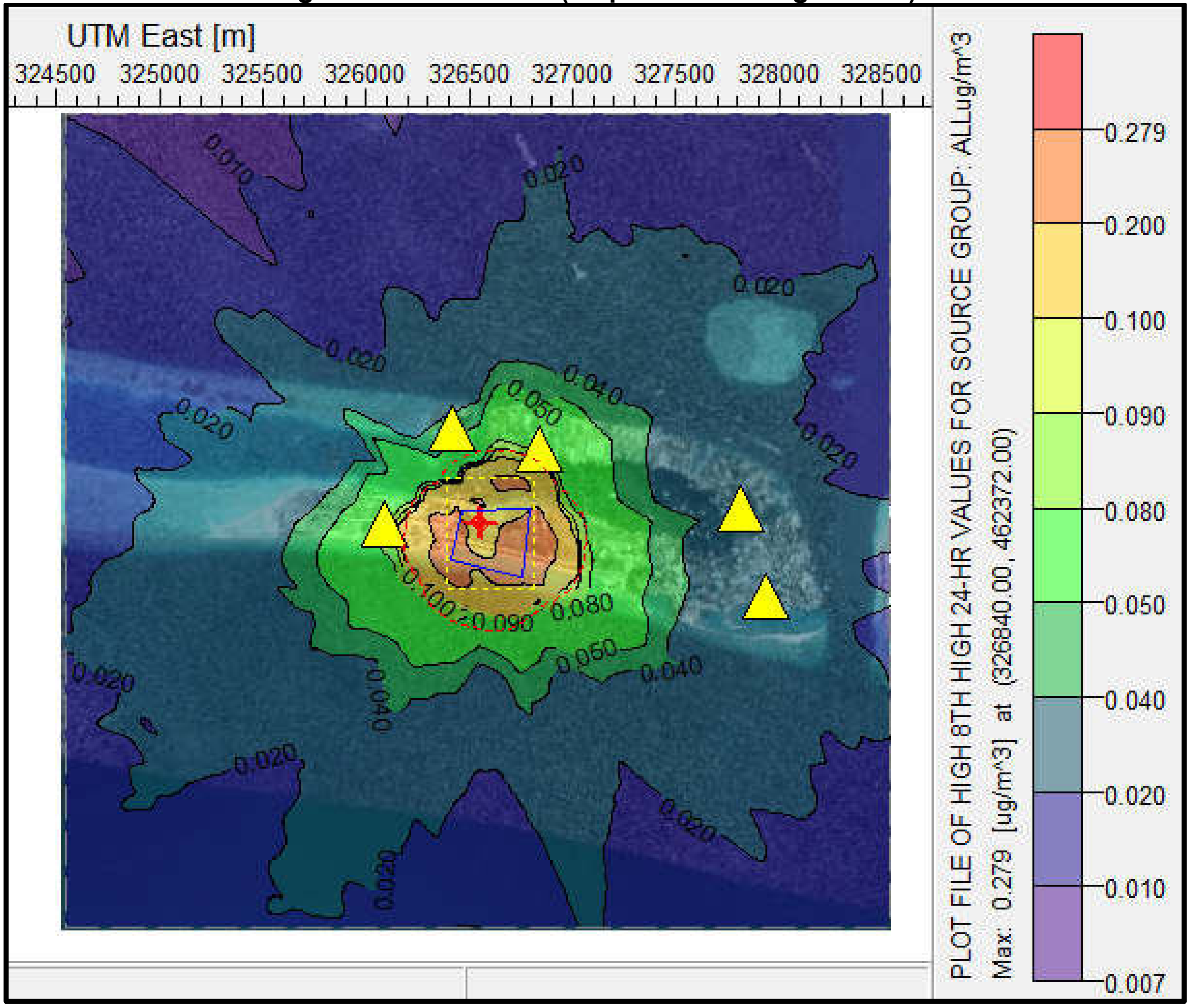


LEGEND:

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 155: Sb 24 HR (Isopleth in microgram/m3)

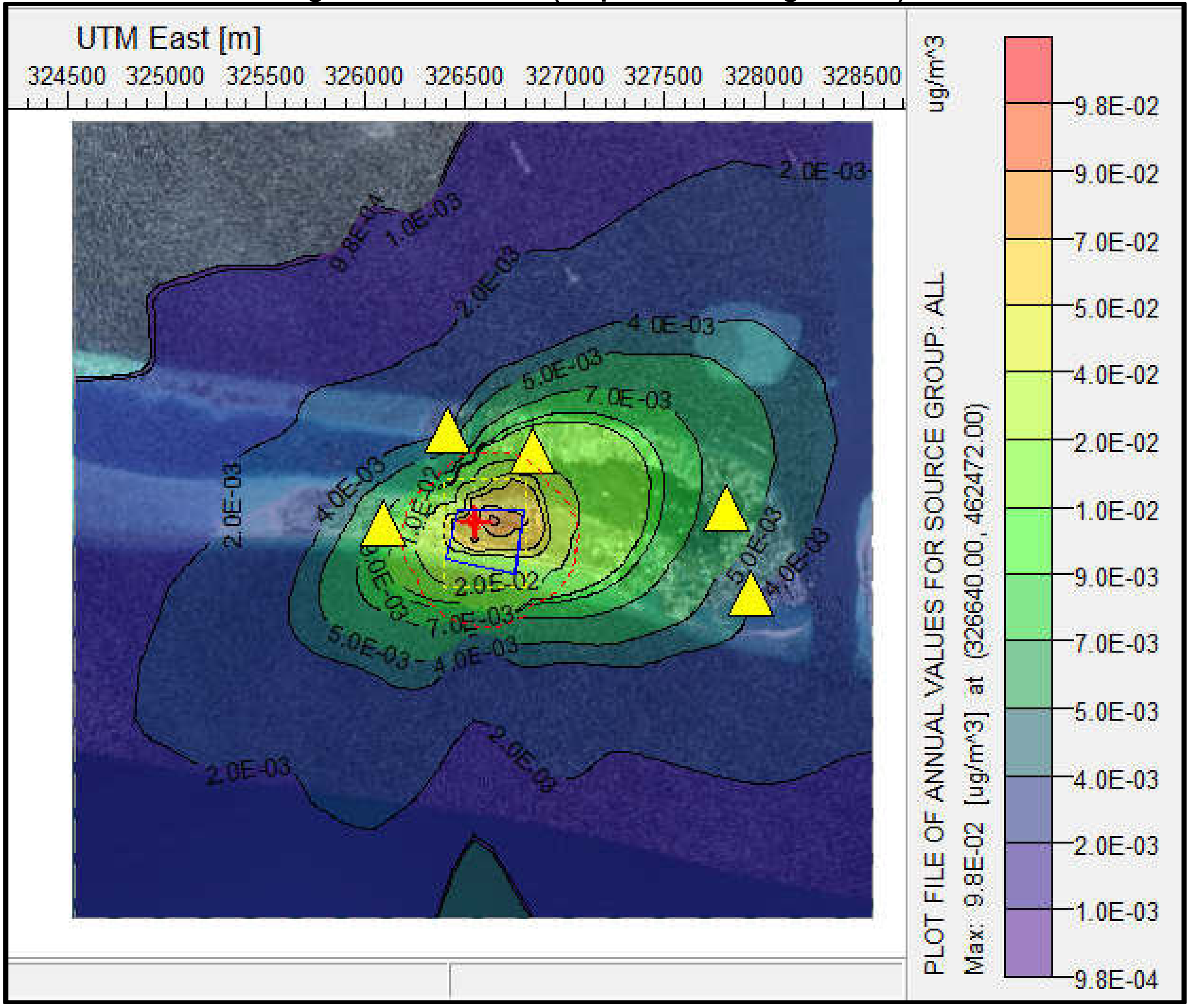


LEGEND:

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 156: Sb 1 YR (Isopleth in microgram/m3)

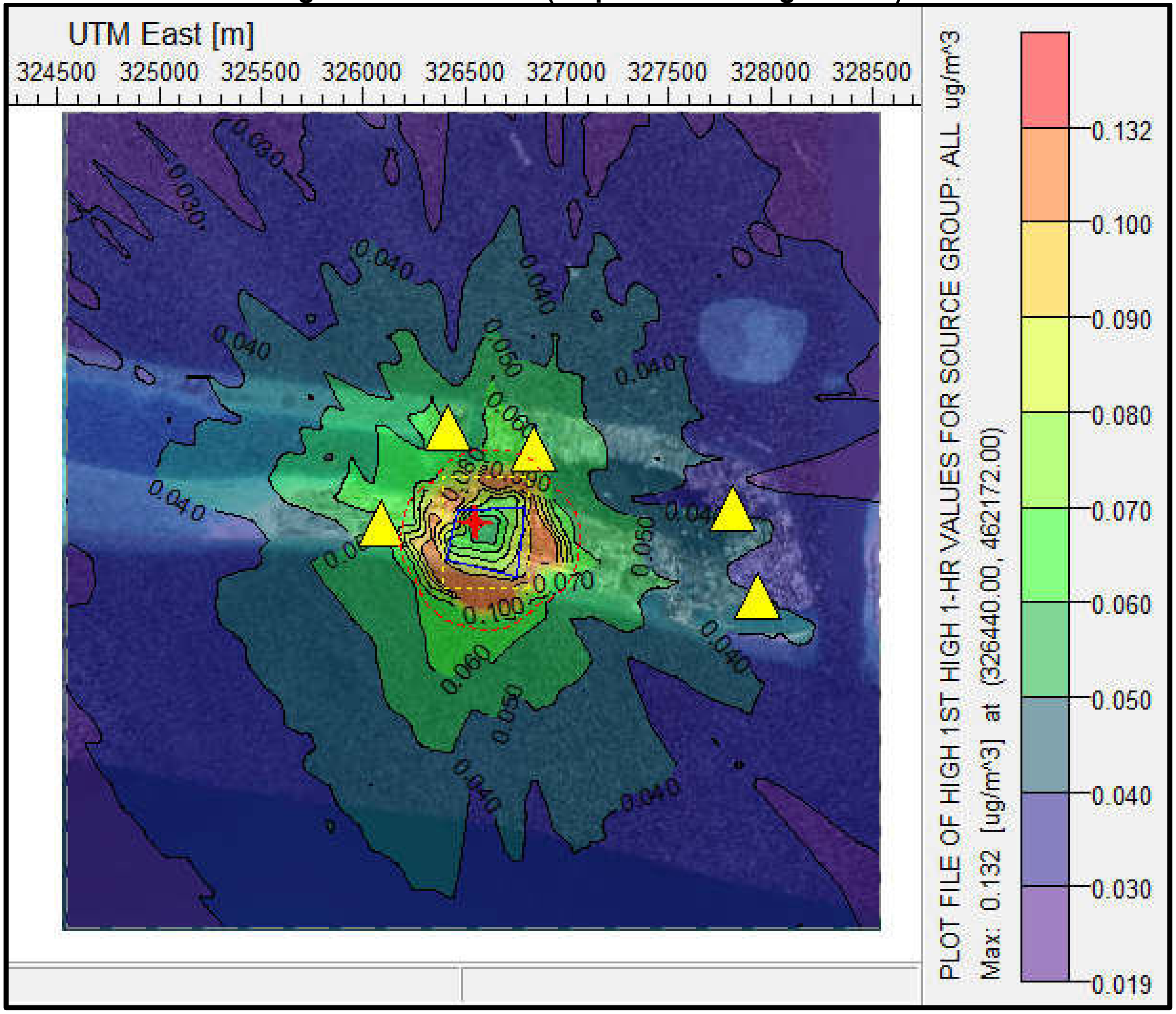


LEGEND:

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 157: As 1 HR (Isopleth in microgram/m3)

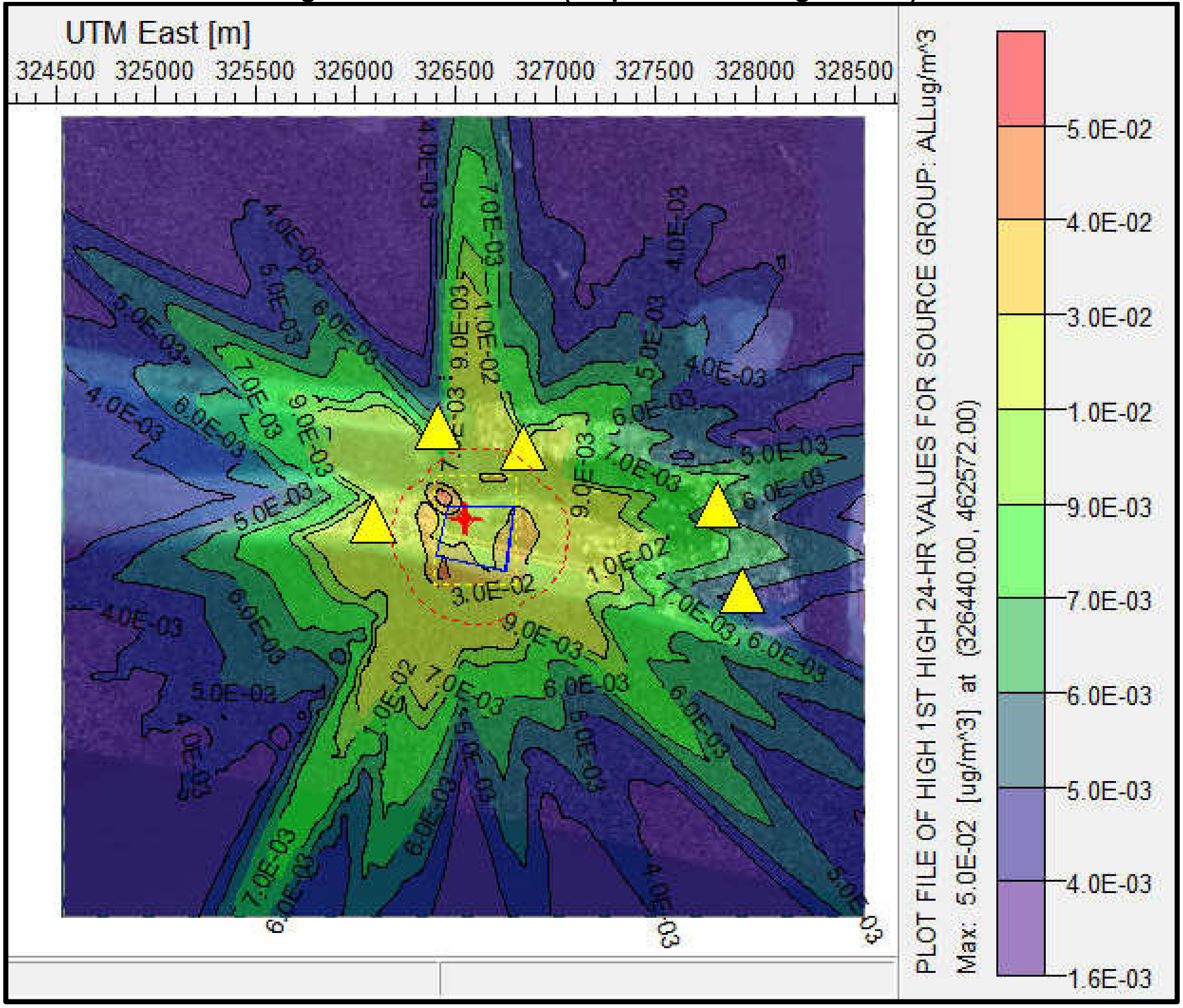


LEGEND:

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 158: As 24 HR (Isopleth in microgram/m3)

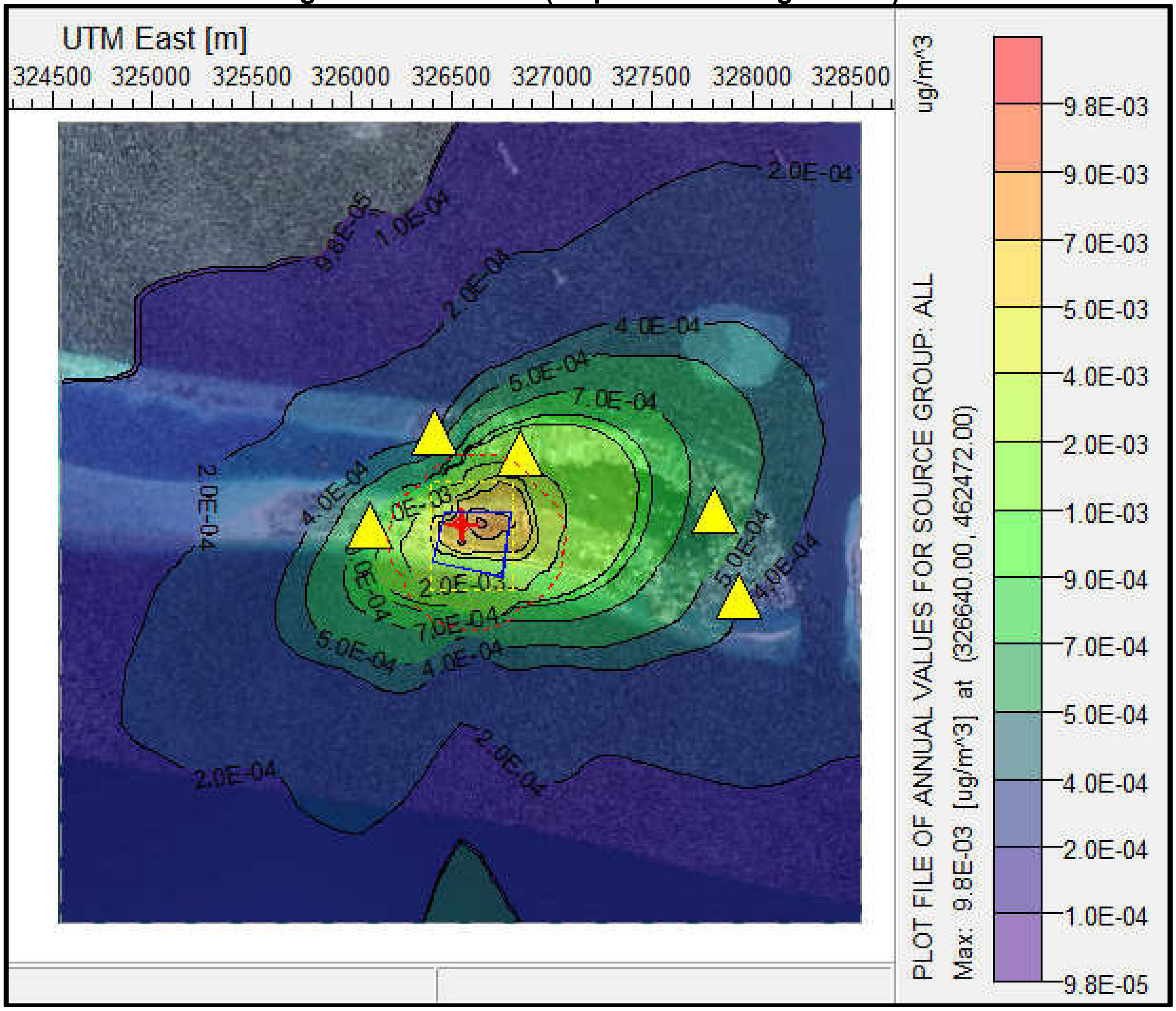


LEGEND:

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 159: As 1 YR (Isopleth in microgram/m3)

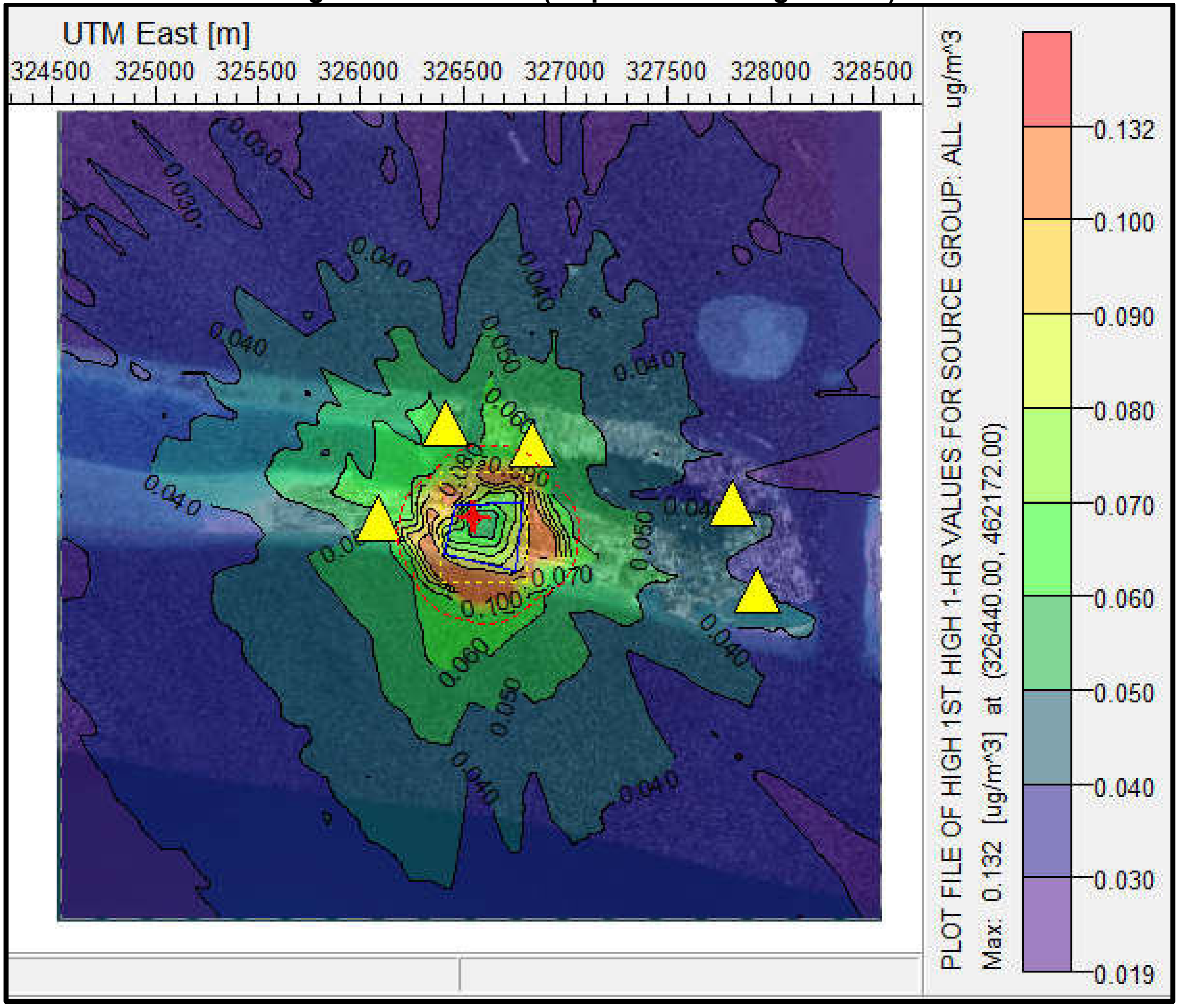


LEGEND:

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 160: Tl 1 HR (Isopleth in microgram/m3)

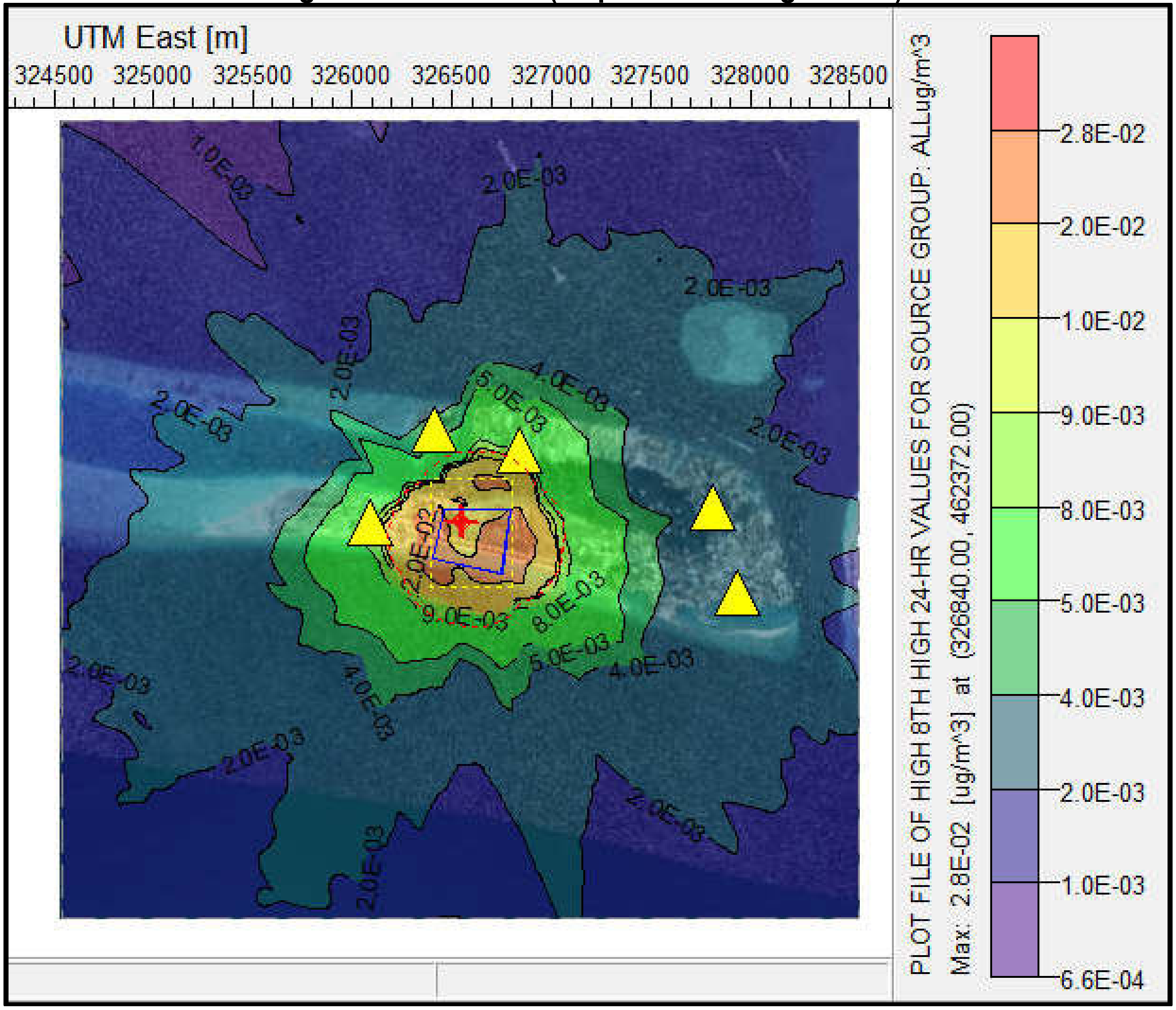


LEGEND:

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 161: Tl 24 HR (Isopleth in microgram/m3)

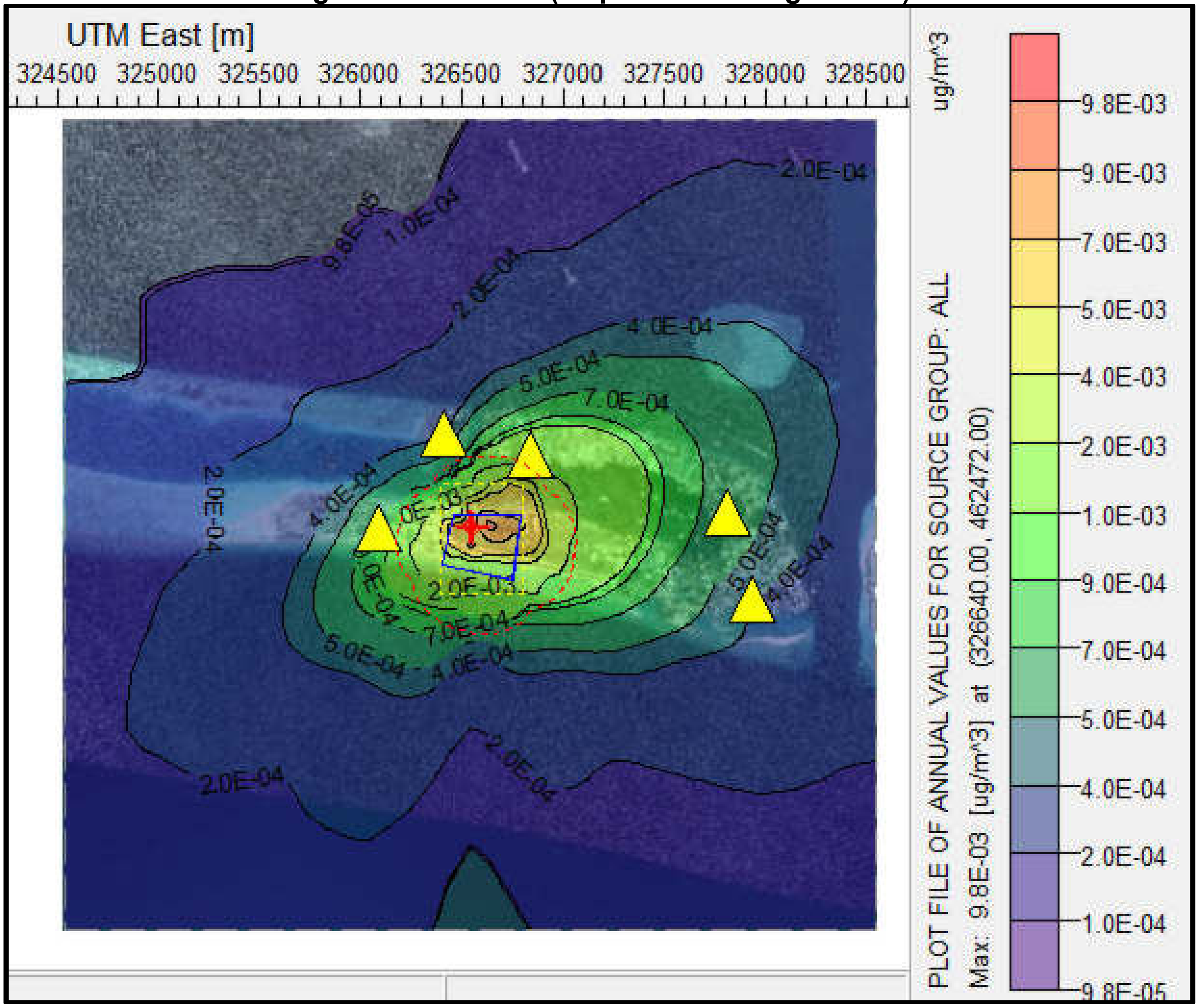


LEGEND:

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 162: Tl 1 YR (Isopleth in microgram/m3)



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

487. 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.

488. **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, SO2, NO2 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.

489. Based on the design emission of the proposed WTE plant, proposed stack height of 50 meters 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 57: 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

490. **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 163. 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.

491. 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 163: Recommended monitoring sites.

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

492. **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.

493. **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

494. 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 11. 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.

495. 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.

496. 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

497. 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.[36]

6. Water Pollution Due to Discharge of Landfill Leachate

498. 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

499. 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

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

501. 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.

502. 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 (footnote 31). 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:

503. **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

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

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.[37] 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.

504. **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 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 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.

505. **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;

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[37] Refer to Cointreau. S. (2006) for additional information.

(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.

506. **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.

507. **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 be 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.[38] 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
  (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.

508. **Workers Accommodation During Operations.** The accommodation of workers shall be established following international best practices to ensure welfare of workers is protected.[39] 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.

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[38] 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.

[39] 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

    (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.
    (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

509. 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.

510. 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

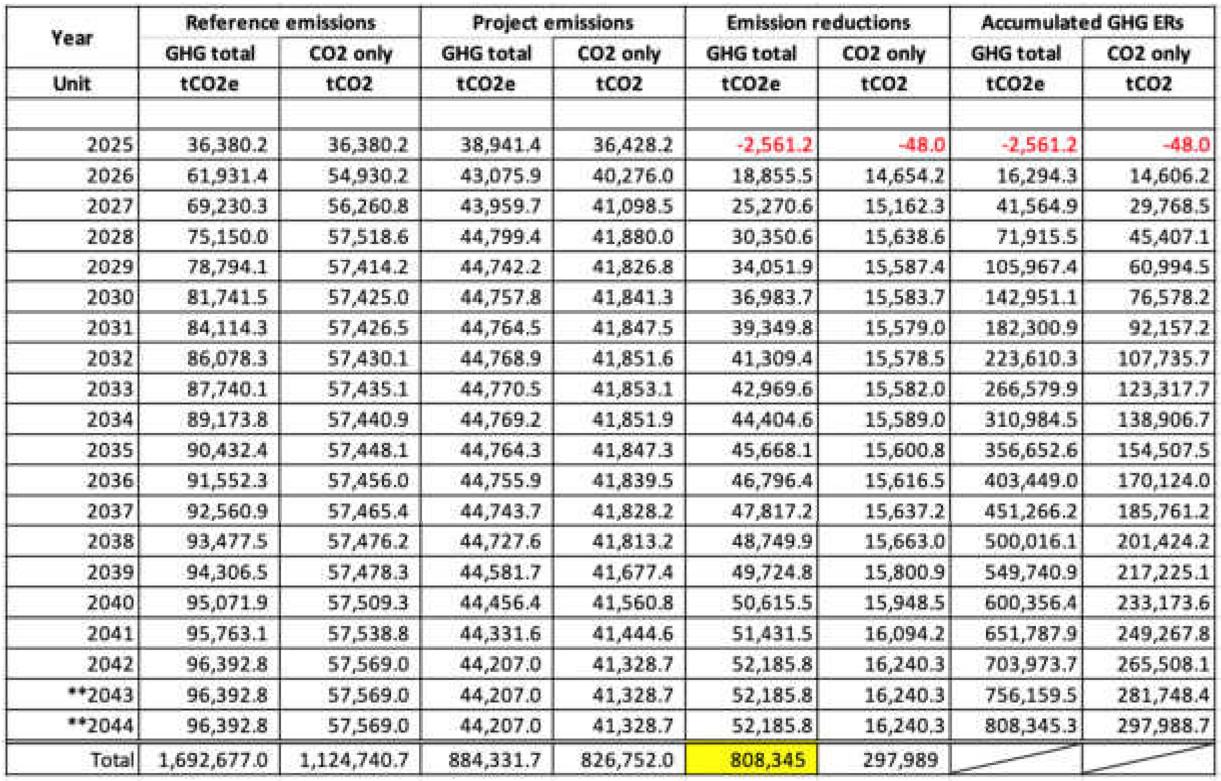
511. As of the assessment, there are no other similar planned projects that will be established or put up in Thilafushi or adjacent islands. Therefore, the WTE plant will not contribute to any cumulative negative impact with other sources of similar impacts in Thilafushi, and/or any existing project 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

512. 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 tCO2e/year, which is the average annual reduction across the project life cycle.

Table 58 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 58: 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 59: 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

513. 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.

514. 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.

515. 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.

516. 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 60 below summarizes the issues and views gathered during these consultation activities.

Table 60: 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 view

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.	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	• 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 reef is open

Date of Consultation	Organization / Group Consulted	Issues / Views on the Project
	sites in the region. Various experienced divers representing dive schools, veterans of diving and people who have vast knowledge of the 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.	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.

517. In 2018, a second round of consultation activities took off targeting various institutional and organizational stakeholders under the project. Table 61 below summarizes the issues and views gathered during these consultation activities.

Table 61: 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.
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.

Date of Consultation	Organization / Group Consulted	Issues / Views on the Project
		• 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. • 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.

Date of Consultation	Organization / Group Consulted	Issues / Views on the Project
		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.

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

Table 62: 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

519. 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 63 below. Compilation of all minutes of consultation activities is attached as Appendix 18.

Table 63: 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	• General dislike of the existing dumpsite. • Concern on the methane that would be formed in the capped waste and that it may explode.

Date of Consultation	Location	No. of Participants	Description /Affiliation of Participants	Issues and Views Raised by Participants
			Representatives of various tourist resorts around Thilafushi	• 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 Representatives of NGOs	• raised concern wastes dumped at the port at 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.

Date of Consultation	Location	No. of Participants	Description /Affiliation of Participants	Issues and Views Raised by Participants
				• 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 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.
1 September 2019	Thilafushi	8	Male local and foreign workers at Thilafushi	

Date of Consultation	Location	No. of Participants	Description /Affiliation of Participants	Issues and Views Raised by Participants
				• 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	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 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

Date of Consultation	Location	No. of Participants	Description /Affiliation of Participants	Issues and Views Raised by Participants
				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.
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 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

Date of Consultation	Location	No. of Participants	Description /Affiliation of Participants	Issues and Views Raised by Participants
				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 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*

Date of Consultation	Location	No. of Participants	Description /Affiliation of Participants	Issues and Views Raised by Participants
				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 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*

Date of Consultation	Location	No. of Participants	Description /Affiliation of Participants	Issues and Views Raised by Participants
				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. ○ *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*

Date of Consultation	Location	No. of Participants	Description /Affiliation of Participants	Issues and Views Raised by Participants
				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 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 capital and enhance human development. He also drew examples of the Male' Sewerage Project which in his opinion had failed and did not work

Date of Consultation	Location	No. of Participants	Description /Affiliation of Participants	Issues and Views Raised by Participants
				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. o *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. o *ME informed that lessons from similar projects were 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.

Date of Consultation	Location	No. of Participants	Description /Affiliation of Participants	Issues and Views Raised by Participants
				○ *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 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*

Date of Consultation	Location	No. of Participants	Description /Affiliation of Participants	Issues and Views Raised by Participants
				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 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*

Date of Consultation	Location	No. of Participants	Description /Affiliation of Participants	Issues and Views Raised by Participants
				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 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.*

520. 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

521. MOE, through the PMU, will continue to conduct meaningful consultations[40] with all stakeholders to ensure they are engaged throughout the design, construction, commissioning and

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[40] 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

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 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 be 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.

522. 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

523. The Ministry of Environment, 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.

524. 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.

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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.

VIII. GRIEVANCE REDRESS MECHANISM

525. The project will adopt the grievance redress mechanism (GRM) as outlined in the EIA report. 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)

526. 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)

527. 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)

528. 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.

529. 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:

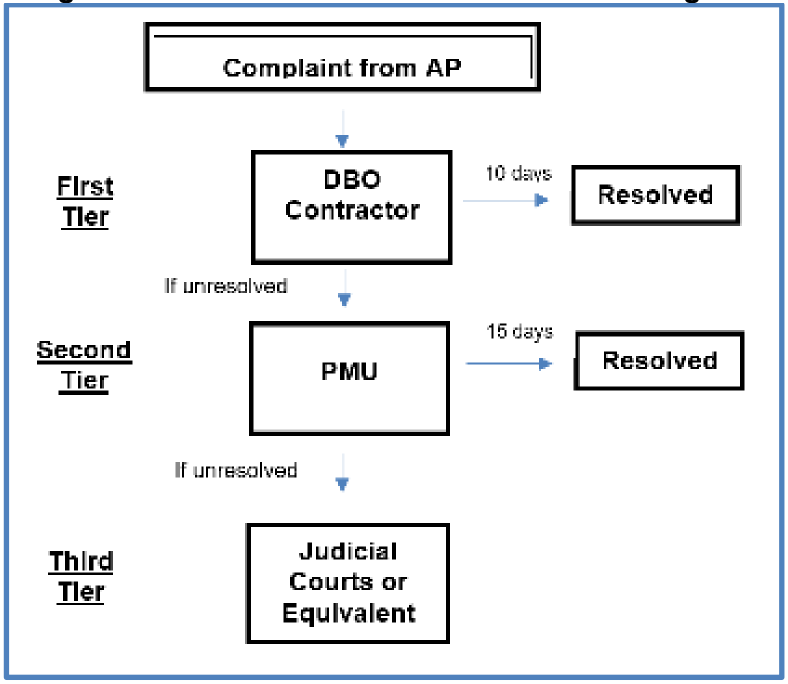
Project Officer – Greater Malé Environmental Improvement and Waste Management Project
South Asia Urban Development and Water Division
South Asia Regional Department
Asian Development Bank
6 ADB Avenue, Mandaluyong City 1550
Metro Manila, Philippines

530. 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.

531. 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.

532. The flow diagram of resolving complaints under the GRC is shown in Figure 164 below.

Figure 164: Grievance Redress Mechanism Diagram



IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Objectives

533. 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.

534. 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.

535. 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.

536. 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.

537. 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

538. **Implementation Arrangements**. The executing agency is the Ministry of Finance (MOF). The implementing agency is the Ministry of Environment (MOE) which establish a project management unit (PMU) comprising officials and staff from MOE. 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, MOE 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 MOE'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 MOE 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.

539. **Project Management Unit.** MOE 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.

540. **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 66, 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.

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

(i) Assist PMU in meeting requirements of ADB SPS 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 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, 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.

542. **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);

543. **External Environmental Expert**. In compliance with the requirement of ADB SPS, 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

544. Table 64 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 65 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 64: 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: o Suitable transportation routes. o Safe passage for vehicles and pedestrians. o Temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours. o 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: o all persons engaged in the marine construction are competent swimmers. o Lifejackets are provided to workers and worn at all times. o Properly functioning ship-to-shore communications are provided. o No work during rough sea conditions. o 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: o The camp, if possible in Thilafushi Island, is at least 50 m away from water bodies. o Clear separation of the workers living areas from material storage areas and work sites with fencing and separate entry and exit o 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. o Provision of drinking water, water for other uses, and sanitation facilities (e.g. separate toilets for men and women). o Livability at the highest standards possible at all times; living quarters provided with standard materials, space, and proper lighting and ventilation. o 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: o all persons engaged in the marine construction are competent swimmers. o Lifejackets are provided to workers and worn at all times. o Properly functioning ship-to-shore communications are provided. o No work during rough sea conditions. o 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

545. 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.

546. 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.

547. Table 65 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 65: 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	DBO Contractor to implement monitoring activity (PMU to check compliance)

Activity	Location	Parameters to be Monitored	Means of Monitoring	Frequency	Implementation Responsibility
				time and night time)	
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	Exact locations if complying with pre-approved and	Visual inspections.	Continuous as the construction	DBO Contractor to implement monitoring

Activity	Location	Parameters to be Monitored	Means of Monitoring	Frequency	Implementation Responsibility
	and location of cooling water lines, intake location and outfall location.	recommended locations per EIA report.		progresses (by DBO Contractor). Random inspection by PMU but at least once a week.	activity (PMU to check compliance)
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).	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
	Other additional location/s as may be needed and 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	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
		Chromium, Mercury, Nickel, Zinc, Copper, Arsenic			
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 165: Recommended Ambient Air Quality Monitoring Stations in Thilafushi Island

E. Reporting

548. **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 MOE to ADB and Maldives EPA.

549. **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.

550. **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.

551. 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.

552. 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

553. Table 64 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.

554. 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.

555. The estimated cost of these activities is shown in Table 66 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 66: 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

556. 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.

557. 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.

558. 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.

559. 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

560. 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.

561. 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 163;
(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 15**;
(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 60; 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.

562. 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 MOE 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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- Abdul Aleem, Environment Consultant and Marine Environment Specialist
- Ahmed Fazeel, Junior Environmental Consultant (EIA Consultant Registration number: EIA T01/2019)
- Ibrahim Faiz (EIA Consultant Registration number: EIA P05/2017)
- Mohamed Umaru, Junior Environmental Consultant (EIA Registration No: EIA P06/2017)
- Nashfa Nashidh, Junior Environmental Consultant
- Fathmath Inash Adil, Civil and Marine Engineer
- Faruhath Jameel, Chief Surveyor (National Building Practitioners Registration Number: BP02406)
- Mohamed Affan Shakir, Hydrographic Surveyor (National Building Practitioners Registration Number: BP09218)
- Hamdhulla Shakeeb, Survey Specialist

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Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (SDES) for endorsement by the Director, SDES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title:	MLD / Greater Malé Waste-to-Energy Project
Sector Division:	SAUW

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area…			The WTE project will be located in Thilafushi, an island on the southern rim of North Malé atoll, and on the eastern line of atolls within the archipelago. Thilafusi is an island classified as industrial zone and about 9.5km from Malé, the capital city of Maldives. In terms of geographic coordinates, Thilafushi is located at 04° 11' 00" N and 73° 26' 44" E.
▪ Densely populated?		✓	The island is classified as industrial island with no residential area. Population density is low. Baseline socio-economic profile shows there are no communities in Thilafushi. It is estimated that there 140 companies and less than 1,500 workers in the whole island.
▪ Heavy with development activities?		✓	Most locators in the island do not engage in heavy development activities. Survey shows that most establishments are warehouses and workshops only.
▪ Adjacent to or within any environmentally sensitive areas?			
o Cultural heritage site		✓	Not applicable. No cultural heritage site in the island.
o Protected Area	✓		The project site is located near 3 protected areas (Lions Head – 1 km away; Hans Hass – 2 km away; and Kuda Haa – 5 km away). Assessment of likely impacts of the project to these protected areas has been included in the EIA.
o Wetland		✓	Not applicable. No wetland in and around the island.
o Mangrove		✓	Not applicable. No mangrove in and around the island.

Screening Questions	**Yes**	**No**	**Remarks**
○ Estuarine		✓	Not applicable. No estuarine in and around the island.
○ Buffer zone of protected area		✓	Not applicable. No buffer zone in and around the island.
○ Special area for protecting biodiversity		✓	Not applicable. Apart from the protected areas mentioned above, there is no other special area for protecting biodiversity in and around the island.
○ Bay		✓	The island is situated within a large atoll (Kaafu Atoll). The project site is bordered by marine waters on its northern and southern boundaries. However, these coastal/marine waters are not regarded as sensitive or protected areas.
B. Potential Environmental Impacts Will the Project cause…			
▪ impacts associated with transport of wastes to the disposal site or treatment facility		✓	Not applicable. The project does not include component associated with transport of wastes.
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		✓	There are no historical or cultural monuments in Thilafushi Island.
▪ degradation of aesthetic and property value loss?		✓	**Not anticipated.** The project will improve the existing situation in Thilafushi Island.
▪ nuisance to neighboring areas due to foul odor and influx of insects, rodents, etc.?		✓	**Not anticipated.** The current condition (dumpsite and unscientific waste management) will significantly improve due to the closing down and eventual rehabilitation of the existing dumpsite.
▪ dislocation or involuntary resettlement of people?		✓	**Not applicable.** The project will not cause or involve dislocation and involuntary resettlement of people.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		✓	**Not applicable.** The project site is a newly built site in an industrial island (with no displaced humans or residential areas). The island is also not a host to any indigenous peoples or vulnerable groups.
▪ risks and vulnerabilities related occupational health and safety (OSH) due to physical, chemical, biological, and radiological hazards during project construction and operation?	✓		**Anticipated during construction and operation phases.** OHS risks are inherent to construction activities and WTE plant operations. These impacts will be mitigated by measures in the EMP and bidding documents following internationally recognized best practices and standards, such as the World Bank EHS Guidelines on Construction and Decommissioning Activities, and Guidelines on Waste Management Facilities.
▪ public health hazards from odor, smoke from fire, and diseases transmitted by flies, insects, birds and rats?		✓	**Not anticipated.** The project will improve the existing situation in Thilafushi Island.

Screening Questions	Yes	No	Remarks
- deterioration of water quality as a result of contamination of receiving waters by leachate from land disposal system?	✓		**Anticipated during operation.** The project includes a residual wastes landfill that will accommodate bottom ash and fly ash. The residual waste landfill cells may produce leachates that could potentially impact water quality of groundwater and marine waters. As measure included in the EMP and bidding documents, the landfill cells will be designed following internationally recognized best practices and standards for bottom ash/fly ash landfills to ensure no leachate will seep into the ground or flow out to the marine waters surrounding the project site.
- contamination of ground and/or surface water by leach ate from land disposal system?	✓		**Anticipated during operation.** The residual wastes landfill may produce leachates that could potentially impact water quality of groundwater and marine waters. However, as measure included in the EMP and bidding documents, the landfill cells will be designed following internationally recognized best practices and standards for bottom ash/fly ash landfills to ensure no leachate will seep into the ground or flow out to the marine waters surrounding the project site.
- land use conflicts?		✓	**Not applicable.** The project will utilize land that has been newly developed for the purpose.
- pollution of surface and ground water from leachate coming from sanitary landfill sites or methane gas produced from decomposition of solid wastes in the absence of air, which could enter the aquifer or escape through soil fissures at places far from the landfill site?		✓	**Not anticipated.** The project does not include any solid waste landfilling. During operation phase of the WTE plant, wastes that will be used as buffer will be baled and stored in storage areas protected with flooring and linings that will prevent seepage of leachate.
- inadequate buffer zone around landfill site to alleviate nuisances?		✓	Buffer zone and greenery is included in the design for the WTE plant.
- road blocking and/or increased traffic during construction of facilities?		✓	**Not anticipated.** The transport of construction materials will utilize an exclusive route being used by the government in transporting solid wastes to Thilafushi island. This route is different from the route being taken by locals, including private and commercial marine vehicles in the island.
- noise and dust from construction activities?	✓		**Anticipated**, but duration is short-term, site-specific within a relatively small area. Measures to mitigate these impacts are included in the EMP and bidding documents following internationally recognized best practices and standards. Environmental monitoring is included in the EMP.
- temporary silt runoff due to construction?	✓		**Anticipated**, but duration is short-term, site-specific within a relatively small area. Measures to mitigate this impact are included in the EMP and bidding documents following internationally recognized best practices and standards.
- hazards to public health due to inadequate management of landfill site caused by inadequate institutional and financial capabilities for the management of the landfill operation?		✓	**Not applicable.** The project includes institutional and financial capabilities for the management of the facilities.

Screening Questions	Yes	No	Remarks
▪ emission of potentially toxic volatile organics from land disposal site?	✓		**Anticipated.** The design of landfill for the bottom ash and fly ash includes cover and engineering measures to ensure no emissions of potentially toxic volatile organics.
▪ surface and ground water pollution from leachate and methane gas migration?	✓		**Anticipated.** Leachate will be generated during operations. However, the leachate collection and treatment system will be lined to ensure groundwater and marine waters are not polluted. Generation of methane gas is not anticipated.
▪ loss of deep-rooted vegetation (e.g. tress) from landfill gas?		✓	**Not applicable.** The project does not involve solid waste landfill operation.
▪ explosion of toxic response from accumulated landfill gas in buildings?		✓	**Not applicable.** Generation of methane gas is not anticipated.
▪ contamination of air quality from incineration?	✓		**Anticipated.** Air emission from the WTE plant will potentially contaminate the air and deteriorate ambient air quality in the island. However, this impact will be mitigated by the engineering design and requirements of the project. The DBO Contractor will be required to comply with a set of performance guarantees, which includes assurance that air emission will comply with internationally accepted emission standards for incinerator plants.
▪ public health hazards from odor, smoke from fire, and diseases transmitted by flies, rodents, insects and birds, etc.?		✓	**Not anticipated.** The project will improve the situation in Thilafushi Island. The shutting down of operation and eventual rehabilitation of the existing dumpsite will reduce the proliferation of disease vectors affecting the island and other nearby islands. During operation phase, the EMP will define measures to mitigate hazards following internationally recognized best practices and standards, such as the World Bank EHS Guidelines on Waste Management Facilities.
▪ health and safety hazards to workers from toxic gases and hazardous materials in the site?	✓		**Anticipated during construction and operation phases.** The EMP includes measures to mitigate impacts, such as the mandatory use of personal protective equipment by workers. Regular training will also be conducted to ensure that workers are aware of construction hazards and risks of chemicals during O&M.
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	**Not anticipated.** Similar to workers of other industries in Thilafushi island, most workers of the project are expected to be residents of nearby islands such as Gulhi Fahlu, Villingili and Male. For workers who will be staying at the project site, the DBO Contractor will be required to establish a workers' camp with complete facilities.
▪ social conflicts if workers from other regions or countries are hired?		✓	**Not anticipated.** Priority in employment will be given to local residents of Maldives. Workers from other regions or countries will be considered only if no counterpart expertise is available locally.

Screening Questions	Yes	No	Remarks
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	✓		**Anticipated.** Fuels and other chemicals will be used during the construction and operation of the WTE plant, and these may raise risks of explosions or fires at the site. However, the EMP will define measures to manage these risks, including the implementation of proper handling and storage of these chemicals, following internationally recognized best practices and standards, such as the World Bank EHS Guidelines on Construction and Decommissioning Activities, and Guidelines on Waste Management Facilities.
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components (e.g., landfill or incinerator) of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	✓		**Anticipated.** These risks are potential in the operation of the WTE plant. However, the EMP will define measures in order to manage these risks based on internationally accepted best practices and standards, such as the EHS Guidelines on Waste Management Facilities. Operational area will be clearly demarcated and access will be controlled. Only workers and project concerned members will be allowed to visit the WTE plant site.

A CHECKLIST FOR PRELIMINARY CLIMATE RISK SCREENING

Screening Questions		**Score**	**Remarks[1]**
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	2	Project location is in an island in Maldives that will likely be affected by floods due to rains or sea level rise.
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc.)?	2	Project location is in an island in Maldives that will likely be affected by floods due to rains or sea level rise. Therefore, the project design needs to consider the impact of flooding and sea level rise.
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	No significant effect
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	No significant effect
Performance of project outputs	Would weather/climate conditions and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	No significant effect

Options for answers and corresponding score are provided below:

Response	**Score**
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): High Risk

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[1] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Appendix 2

Compliance with Terms of Reference Issued by the Maldives Environmental Protection Agency for the Conduct of EIA for the WTE Plant.

Scope of work — The EIA shall include but not necessarily be limited to the following tasks:	**Compliance**
Task 1. Description of the Proposed Project	
• Describe the RWMF (incinerator & ash disposal cells) and associated infrastructure (harbor, fuel storage, power supply etc.) to be developed including location, plant layout and its position using maps and drawings where appropriate. • Describe the current operational condition of Thilafushi, including the tonnage of waste received, method of waste management, operator of the facility, number of staff employed, and difficulties faced. • Describe the need and justification for the proposed facility and the methodology employed. • Provide detailed description of the proposed facilities. Describe the level of waste treatment that will occur. • Describe the methodology for air quality measurement. • Describe how hazardous waste are going to be processed. • Describe how electronic waste is going to be processed. • Describe how plastic is going to be processed. • Describe how all organic and inorganic waste is going to be processed. • Describe the steps involved from waste collection to transport to delivery to final location. • Describe the lessons learnt that was adopted from current operations at regional waste management facility at Vandh00. • Describe the operations of the RWMF including waste catchment area to be serviced by the facility, and waste type, volumes and composition to be received at the facility. Indicate the project life span, • Identify the emission releases likely to be of concern and the environmental aspects of the project area which may potentially be impacted by the proposal. • Describe the type of incinerator plant to be installed including specifications, performance characteristics and operational flow diagrams. Provide details of the ash disposal cells including capacity, dimensions, design specifications and phased development plans. • Describe the lifetime of the sanitary landfill site, for how many years is the sanitary landfill designed. • Provide requirements for new infrastructure to service the project such as water supply and sewerage infrastructure. Describe details of all equipment and vehicles that are going to be procured for the new operations. • Provide details of the amount of energy that will be generated from the waste to energy component and how it will be utilized.	Task 1 refers to various requirements covered under Phase 1 and Phase 2, including rehabilitation of the existing dumpsite. The draft EIA is intended to be submitted for the ADB approval process. Therefore, Section I and Section II of the draft EIA report discuss items related to the WTE Plant only. The draft EIA does not include detailed discussions on the activities under Phase 1 and rehabilitation of the existing dumpsite (although background information is included). Since the project will be awarded as a DBO contract, many of detailed information required are not completely described. In a separate submission to Maldives EPA, Ministry of Environment may submit additional document that would discuss compliance with the other

• Describe the model of management that will be adopted for the operations. • Justify the final elevation of structures (including as ash disposal cells) with reference to the height above the mean high tide, highest annual tides and risk of flood inundations during seasonal high tide regimes. • Describe the existing condition of the site and how Thilafushi is going to be restored. • Describe all project inputs and outputs. Including equipment and resources required both for construction and operational phase. Provide a detailed schedule of the project. • Describe how this project facilitates to achieve the 3R concept of waste management. That is reduce, reuse and recycle concept.	required items under Task 1.
Task 2. Description of the Environment - Assemble, evaluate and present baseline data on the relevant environmental characteristics of the study area, focused on the marine, terrestrial and air environment. Aspects of the environment shall be described to the extent necessary for assessment of the environmental impacts of the proposed development. The extent and quality of the available data shall be characterized indicating significant information deficiencies and any uncertainties associated with the prediction of impacts. This section should provide details of the environment in the vicinity of the proposed development site. Data collection methodology used to describe the existing environment shall be detailed. All survey locations, sampling points, reef transects, vegetation transects, manta tows and soil sampling sites shall be referenced with Geographic Positioning System (GPS). All marine water samples shall be taken at a depth of 1m below the mean sea level or mid water depth for shallow areas. Baseline data collection shall focus on key issues needing to be examined for the EIA Consideration of likely monitoring requirements shall be borne in mind during survey planning, so that the data collected is suitable for use as a baseline for impacts monitoring. All available data from previous studies, if available shall be presented. Information required includes the following:	Compliance in Section V.
Physical environment;	

• Describe the meteorology (rainfall, wind, waves and tides), sea currents, surface hydrology, climatic and oceanographic conditions in the area, and bathymetry of the hot-water outfall location. • Describe the existing air quality within project site at Thilafushi and at the nearest islands. Ambient Air Quality measuring the following parameters: Particulate matter (PMIO, PM2), Sulphur dioxide (S02), Oxides of nitrogen (NOx), Methane (CH4), Carbon monoxide (CO), Cadmium (Cd), Lead (Pb), Mercury (Hg), Hydrocarbons (HCs). Measurements should be made from all locations from which data was taken in 2011 ELA report. • Dispersion model for air pollution taking into account wind direction. • Describe noise sources contributing to ambient noise levels (day/night) at the nearest and adjacent islands. • Sensitive noise receptors adjacent to all project components shall be identified and typical background noise estimated based on surveys at representative sites. A justification for an ambient noise baseline (dBA) at the nearest and adjacent inhabited islands shall be provided. Ambient Noise should be measured from the facility location, harbor location and also from the waste transfer road location. • An indication of the quality and quantity of water resources in the vicinity of the project site should be given including spatial and temporal monitoring to accurately characterize baseline groundwater characteristics and present water uses. Groundwater quality measuring following parameters pH, color, odor, turbidity, Electrical Conductivity, nitrate, phosphate, chloride, total dissolved solids, mercury, lead, arsenic, manganese, cadmium, iron, Total Coliform and polyaromatic hydrocarbons. From all locations from which water quality was assessed in 2011 and from the reclaimed areas following 2011. • Marine water quality should be assessed. The following parameters needs to be investigated. This includes Temperature, pH, salinity, Total Suspended Solids (TSS), phosphate, nitrate, ammonia, sulphate, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Arsenic and Total Coliform. Assessment should be undertaken at all waste transfer routes and from locations from which data was taken in 2011 report. • Currents data should be measured from the harbor and channel locations and from the lagoon. Comparisons should be made with the data collected from 2011 EIA report. Dispersion model of waste in water should be presented, taking into account currents.	
<u>Biological environment:</u>	

• Description of the terrestrial environment of the site including current condition of the site, • Assessment of the marine environment should be undertaken from all locations from which data was taken in 2011 ELA report. This assessment should cover coral cover and fish census information. • Plankton Assessment from 5 different locations around Thilafushi. • Areas of special sensitivity including coral reefs and marine protected areas near Thilafushi shall be marked on a map and described. This shall include environmentally sensitive areas, protected areas and significant dive sites.	
Socio-cultural environment:	
• Describe the natural features and landscapes of the project site which may have a cultural significance. • Describe the visual amenity from the nearest and adjacent islands to Thilafushi. • Describe any Structures on the project site which may have cultural or religious significance. • Provide details of the land use plan in Thilafushi. This shall refer to current and future envisioned development projects.	
Hazard Vulnerability	
• Vulnerability of proposed project area to flooding and storm surges need be described.	
Task 3. Legislative and regulatory considerations — Identify the pertinent legislation, regulations and standards, and environmental policies that are relevant and applicable to the proposed project, and identify the appropriate authority jurisdictions that applies to the project. Outline the pertinent policies, regulations and standards governing project location, land use, environmental quality, and public health and safety. Relevant sections of the regulations need to be highlighted and how the project complies with these sections indicated. Specific attention needs to be given to the waste management regulation and waste policy and how the project complies with these documents and how the relevant approvals will be attained.	Compliance in Section III.
Task 4. Determination of Potential impacts of proposed project — Identify the major issues of environmental and social concern and indicate their relative importance to the design of the project. Distinguish construction and postconstruction phase impacts, significant positive and negative impacts, and direct and indirect impacts. Identify impacts that are cumulative, unavoidable or irreversible. Particular attention shall be given to impacts associated with the following:	Compliance in Section VI.

Site preparation. construction and commissioning:

- RWMF construction impacts including a description of the relevant parts and nature of the works, an indicative construction timetable, including expected commissioning and start-up dates and hours of operation, and a description of major work programs for the construction phase, including an outline of construction methodologies.
- Commissioning impacts — including a description of the regional waste management facility commissioning process.

Incinerator operation:

- Describe solid waste management activities during operations, with particular reference to waste collection, transport, sorting, incinerator loading, and disposal of incinerator ash.
- Characteristics of any hazardous materials resulting from or involved in the project, indicating appropriate management strategies (e.g. handling, storage, treatment, disposal).
- Provide an inventory of projected annual emissions for each relevant greenhouse gas, with total emissions expressed in 'C02 equivalent' terms.

Air Quality:

- Characterize the nature of emissions to air likely to be produced during the incineration process including flue gas composition, volumes, expulsion height, ejection velocity and temperature.
- Describe the pollution control equipment, techniques and the features of the incinerator designed to suppress or minimize emissions to air.
- Air dispersion modelling outcomes which estimate the effect of the expected emissions from the proposed incinerator on ambient air quality within the air shed with particular reference to the nearest and adjacent islands. The air dispersion modelling exercise shall evaluate the extent and concentration of following pollutants which are typical constituents of solid waste combustion: sulfur dioxide, nitrogen oxides (as nitrogen dioxide), TSP, PM2.5 and PM 10. Air emissions shall be stated in respect stack and ground level concentrations, using a dispersion model.

Ground Water

- Provide details of potential impacts on the quality of ground and marine waters. Reference shall be made to leachate from ash disposal, the potential of wastewater to contaminate ground and marine water, and impact on current and future potential groundwater usage from the Thilafushi.

• Describe the pollution control equipment and design features of the proposed development for prevention and minimization of contamination of groundwater resources.	
Natural Environment	
• The proximity of the facility to any sensitive areas shall be described. Describe measures to be taken to avoid and minimize potential adverse impacts of the proposal on sensitive terrestrial and aquatic environments. • Describe potential issues relevant to sensitive areas, or areas which may have low resilience to environmental change a rising from the construction, operation of the project including clearing, salvaging or removal of vegetation. Areas of special sensitivity include coral reefs, marine protected areas and communities. The capacity of the environment to assimilate discharges/emissions shall be assessed. Short-term and long-term effects shall be considered with comment on whether the impacts are reversible or irreversible. The discussion shall cover all likely direct and indirect environmental harm due to the project on flora and fauna particularly sensitive areas. • If construction and operation of the project are likely to cause adverse impacts on sensitive areas or areas which may have low resilience to environmental changed describe environmental offsets that would counterbalance the impact on these values.	
Noise Amenity,	
• Describe the impacts of noise generated during the construction and operation of the proposed facility on nearest and adjacent islands. An analysis of noise impacts shall include the estimated noise levels generated by the proposed development assessed against typical background levels on the islands, and the impact of noise at all potentially sensitive receivers compared with an acceptable international standard. • If noise is likely to cause an adverse impact propose measures to minimize or eliminate these effects, including details of any screening, lining, enclosing or bunding of facilities, or timing schedules for construction and operations.	
Socio-cultural:	

• Describe the impacts of the proposed development on the natural features and landscapes of the project site which may have socio - cultural significance. Use sketches, diagrams, elevation drawings to portray the near views and far views of the completed structures and their surroundings from visually sensitive locations. • Describe measures to be taken to avoid and minimize potential adverse impacts of the proposal on visual amenity. Justify the proposed development with particular reference to potential for visual amenity. • Describe the impact of the proposed development on any structures which may have cultural or religious significance. Describe measures to be taken to avoid, manage or mitigate potential impacts on these structures during construction and operation of the proposed development. • The methods used to identify the significance of the impacts shall be outlined. One or more of the following methods shall be utilized in determining impacts; checklists, matrices, overlays, networks, expert systems and professional judgment. Justification shall be provided to the selected methodologies. The report shall outline the uncertainties in impact prediction and also outline all positive and negative/short and long-term impacts. Identify impacts that are cumulative and unavoidable.	
Task 5. Alternatives to proposed project — Describe alternatives including the "no action option" should be presented. Determine the best practical environmental options. Alternatives examined for the proposed project that would achieve the same objective including the "no action alternative" which represents current conditions. This section shall include a comparison of the technologies and methods for management and control of contaminants which may potentially impact on the environment including alternatives for ash disposal. All alternatives shall be compared according to international standards and commonly accepted standards as much as possible. Mitigation options shall be specified for each component of the proposed project. A cost benefit analysis needs to be presented in this section for the different alternative methods of waste management proposed. Analysis from environmental, social and economic perspective needs to be presented.	Compliance in Section IV
T**ask 6. Environmental Management Plan (mitigation 'monitoring)** — The Project's environmental management plan (EMP) shall consists of a set of mitigation, monitoring, and institutional measures to be taken during implementation and operation to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels. In cases where impacts are unavoidable	Compliance in Section IX. However, specific details on institutional arrangements are yet to be agreed upon between ADB and the

arrangements to compensate for the environmental effect shall be given. The plan shall include off-set measures if mitigation measures are not feasible, cost-effective, pr sufficient. Specifically, the EMP shall:	Government of Maldives.
Mitigation and management of negative impacts	
• Identify and summarizes all anticipated significant adverse environmental impacts (coral reef and marine environment, air and groundwater (as applicable); • Describe each mitigation measure, including the type of impact to which it relates and the conditions under which it is required, together with designs, equipment descriptions, and operating procedures, including: - General operating procedures for managing and mitigation risks to the environment from general facility, operations including waste collection, transport, incinerator loading, hazardous waste handling, fuel, transfer and storage, litter management disposal of incinerator ash and residues, - Manufacturer's operational guidelines specifically outlining safety and emission control procedures as well, as recommended maintenance practices. - General operating procedures for implementing back-up measures that will act in the event of failure of primary measures to minimize the likelihood of adverse air impacts. • Estimate any potential environmental impacts of these measures; • Provide linkage with any other mitigation plans required for the project.	
Monitoring	
• Provide (a) a specific description, and technical details, of monitoring measures, including the parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions; and (b) monitoring and reporting procedures to; - (i) Ensure early detection of conditions that necessitate particular mitigation measures, and - (ii) Furnish information on the progress and results of mitigation. Specifically, the plan shall address physical groundwater quality, air emissions, coral reef and marine environment (as applicable).	
Capacity Development and Training	
Specifically, the EMP shall provide a specific description of institutional arrangements who is responsible for carrying out the mitigation and monitoring measures (e.g., for operation, supervision,	

enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training). EMP shall cover steps to strengthen environmental management capability in the agencies responsible for its implementation.	
<u>Implementation Schedule and Cost Estimates</u>	
The EMP shall provide (a) an implementation schedule for measures that shall be carried out as part of the project, showing phasing and coordination with overall project implementation plans; and (b) the capital and recurrent cost estimates and sources of funds for implementing the EMP. This shall be presented for mitigation, monitoring, and capacity development required for the implementation of the EMP.	
Task 8. Stakeholder Consultation — The stakeholder consultation process shall provide opportunities for stakeholders, community involvement and education. It may include interviews with individuals, public communication activities, interest group meetings, production of regular summary information and updates (i.e. newsletters), and other consultation mechanisms to encourage and facilitate active stakeholder consultation. Stakeholders consultation should cover Ministry of Environment and Energy, Greater Male' Investment Limited, WAMCO, EPA, STELCO, Maldives Energy Authority (MEA), Energy Department (MEE), Waste Department (MEE), nearby resorts, Male' City Council, Ministry of Housing and Infrastructure, existing businesses in Thilafushi, existing workers of the facility, NGOs and the general public shall be consulted. Stakeholder consultation processes (community engagement) for all parts of the EIA shall be integrated. Sufficient information about the development and the consultation process shall be provided to the community at an early stage and in accessible and culturally appropriate ways. Information about the development should inform the community about the benefits, disadvantages, trade-offs, potential issues and implications as required, enabling them to formulate their views. Information about the consultation processes conducted and their results shall be provided including: The methodology adopted, a list of stakeholders consulted during the program and how their involvement was facilitated, the processes conducted to date and the future consultation strategies and programs including those during the operational phase of the project, Recommendations on how the project might address concerns raised during public consultation. List of those who are consulted including their names and contacts should be provided in the EIA report,	Compliance in Section VII.

Task 8. Climate Change Risk Assessment — Review of literature on climate change specific to the Maldives shall be carried out. Following this, climate change considerations shall be suggested for the project, including sea level rise, tropical cyclonic winds, storm surges, probable maximum precipitation. Climate change adaptation considerations for the design shall be discussed.	Compliance with this task is covered across the different sections of the EIA report, but not explicit because the assessment is yet to be undertaken through a CVRA. Since the project will be awarded under a DBO contract, the risks due to climate change will be integrated in the final detailed design that is to be undertaken during design phase.
Presentation- The environmental impact assessment report, to be presented in digital format, shall be concise and focus on significant environmental issues. It shall contain the findings, conclusions and recommended actions supported by summaries of the data collected and citations of or any references used in interpreting those data. The environmental assessment report shall be organized according to, but not necessarily limited by, the outline given in the Environmental Impact Assessment Regulations, 2012 and relevant amendments.	Yet to be complied.
Timeframe for submitting the EIA report — The developer shall submit the completed EIA report within 6 months from the date of this Term of Reference.	

Comparative Analysis of Maldives Framework and ADB Safeguard Policy Statement

(A) ADB Safeguard Policy Statement	(B) Corresponding Legal Provisions of the draft of the Law on EIA [1]	(C) Extent of Equivalence [2]	(D) Recommended Gap-filling Measures
Policy Principle 1: Use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment so that appropriate studies are undertaken commensurate with the significance of potential impacts and risks.			
Key element (1) Use a screening process to determine the appropriate extent and type of environmental assessment	The **EIA regulations**, in particular Part III elaborates the process by which screening is used to identify proposals that have little or no environmental impact that are separated by projects that require an in-depth study. Schedule D of the EIA regulations list of projects that need to undertake an EIA because of likely severity of impacts. Proposals not listed in Schedule D are required to submit a Development Proposal Screening Form (Schedule C 1 of EIA Regulations) that is submitted to the Ministry of Environment where a decision is made either to approve the project or determine if further information is required through the preparation of an IEE needs (Schedule C 3 of EIA Regulations provides the Development Proposal Screening Decision Form). For projects falling under Schedule D an EIA application needs to be submitted along with TORs for the EIA to the Ministry of Environment for approval with or without proposed revisions. An EIA then should be prepared based on the TORs approved by the Ministry of Environment	Full Equivalence	None required
Policy Principle 2: Conduct an environmental assessment for each proposed project to identify potential direct, indirect, cumulative, and induced impacts and risks to physical, biological, socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical cultural resources in the context of the project's area of influence. Assess potential trans-boundary and global impacts, including climate change. Use strategic environmental assessment where appropriate.			

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[1] There are relevant provisions of the Environment Protection and Preservation Act of 1993, Environmental Protection Regulations of 2007 that deal with environmental assessment and management..

[2] "Full Equivalence" denotes that the Maldives legal requirement(s) are in complete harmony with the corresponding ADB Safeguard Objective, Scope and Trigger, Policy Principle or Key Element thereof. "Partial Equivalence" denotes that the Maldives legal requirement is in partial harmony with the corresponding ADB Safeguard Objective, Scope and Trigger, Policy Principle or Key Element; and "No Equivalence" denotes that no Maldives legal requirement can be found that corresponds to the particular ADB Safeguard Objective, Scope and Trigger, Policy Principle or Key Element.

(A) ADB Safeguard Policy Statement	(B) Corresponding Legal Provisions of the draft of the Law on EIA [1]	(C) Extent of Equivalence [2]	(D) Recommended Gap-filling Measures
Key element (1) Identify indirect as well as direct impacts	**Schedule E of the EIA Regulations** requires that the direct and indirect environmental impacts on bio-physical, economic and human environment, including impacts on human well-being be assessed	Full compliance	None required
Key element (2) Identify cumulative impacts	The **EIA Regulations**, defines "EIA" as a means of identifying, predicting, evaluating and mitigating the biophysical, social, cumulative, economic and other relevant effects of a proposed development and "Cumulative Impacts" as the contained effect on the environment of two or more activities, or parts of projects, including synergistic projects Similarly, the EIA Regulations require the project proponent to provide information on other similar projects in the area and IEEs and EIAs done for those projects	Full equivalence.	None required
Key element (3) Identify induced impacts	**The EIA Regulations** requires the assessment of indirect impacts, which are defined as "indirect results….as those caused by an action or actions and are later in time or further removed in distance, but are still reasonably foreseen, and includes growth-regulating effects and other effects to induced changes in the patterns of land-use, population density or growth rate and related effects on air, water and other natural systems, including ecosystems"	Full equivalence	None required
Key element (4) Identify physical impacts	**Schedule E of the EIA Regulations** requires that the direct and indirect environmental impacts on bio-physical, economic and human environment, including impacts on human well-being be assessed and that includes the description and direct and indirect impacts on the following: - Soil, relief, landforms, land use and drainage systems - Surrounding infrastructure and drainage; and - Beach systems, including composition, stability, tide and wave dynamics	Full Equivalence.	None required
Key element (5)	**Schedule E of the EIA Regulations** requires that the direct and indirect environmental impacts on bio-physical, economic and human environment, including the impacts on the following biological elements:	Full Equivalence.	None required

(A) ADB Safeguard Policy Statement	(B) Corresponding Legal Provisions of the draft of the Law on EIA [1]	(C) Extent of Equivalence [2]	(D) Recommended Gap-filling Measures
Identify biological impacts	- Flora, fauna, rare or endangered species, sensitive habitats of ecological importance, including mangroves and wetlands; and - Marine environment, including sandy and rocky bottoms, coral reefs and sea grass beds		
Key element (6) Identify socioeconomic impacts (including on livelihood through environmental health and safety, vulnerable groups, and gender issues)	In the **EIA Regulations**, "EIA" is defined as a means of identifying, predicting, evaluating and mitigating the biophysical, social, cumulative, economic and other relevant effects of a proposed development and "the Human Environment" as the natural and physical environment and the relationships of people. **Schedule C.1 of the EIA Regulations Part 3** requires the EIA to identify and assess the impacts on public well-being, public health, public safety, public transport, employment and economic status.	Partial Equivalence There is no reference in the EIA legislation regarding need to assess impacts on vulnerable groups and gender issues.	For full equivalence, the EIA Regulations should include assessment of the impact on vulnerable groups and gender related impacts.
Key element (7) Identify impacts on physical cultural resources	**Part II (2) of the EIA Regulations** requires EIAs and IEEs to consider effects of development programs on:……….(d) material assets and cultural heritage. **Schedule E of the EIA Regulations** requires description of natural, economic and human environment, that includes among other things…..socio-economic characteristics….., including unique cultural characteristics.	Full equivalence	None required
Key element (8) Identify impacts in the context of the project's area of influence	There is reference to defining the boundaries of the area affected by the development project, but no specific reference to the context of the project's area of influence, although the **EIA regulations** refers to induced impacts relating to changes patterns of land-use, population density or growth rate and related effects on air, water and other natural systems, including ecosystems, that might extend beyond the boundaries of the project area	Full equivalence	None required
Key element (9) Assess potential trans-boundary impacts	There is no explicit reference to "assessment of trans-boundary impacts" in the legal framework.	No Equivalence.	For full compliance, new or revised legislation/regulations should require assessment of trans-boundary impacts
Key element (10) Assess potential global impacts, including climate change	**Part II Section 4 of the EIA Regulations** requires that project proponents take into account all policies and legislation, including commitments as Party to relevant International Conventions and Protocols	Full Equivalence	None required

(A) ADB Safeguard Policy Statement	(B) Corresponding Legal Provisions of the draft of the Law on EIA [1]	(C) Extent of Equivalence [2]	(D) Recommended Gap-filling Measures
Key element (11) Use strategic environmental assessment	There is no explicit reference to conduct of strategic environmental assessment in the legislation	No equivalence	To achieve full compliance the EIA regulations or similar legislation should require the conduct of SEAs, including assessment of plans, programs and policies
Policy Principle 3: Examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts and document the rationale for selecting the particular alternative proposed. Also consider the no-project alternative.			
Key element (1) Examine alternatives to the project's location, design, technology.	**Schedule E of the EIA regulations** discusses the need for consideration of alternatives such as: (i) To identify and describe at least 3 alternatives, one of which should be the no-development option, define clear criteria to evaluate the alternatives, and determine the preferred alternative; (ii) Discuss whether the project be undertaken elsewhere, perhaps an alternate locations with less likely impacts; and (iii) Include discussion of alternative ways in which the project can may be carried out to cause less harm to the environment. (iv) Discuss the preferred alternative and why it was selected	Full equivalence	None required
Key element (2) Consider the no-project alternative	**Schedule E of the EIA regulations** requires the need to: (i) To identify and describe at least 3 alternatives, one of which should be the no-development option, define clear criteria to evaluate the alternatives, and determine the preferred alternative;	Full equivalence	None required
Policy Principle 4: Avoid, and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts by means of environmental planning and management. Prepare an environmental management plan (EMP) that includes the proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators. Key considerations for EMP preparation include mitigation of potential adverse impacts to the level of no significant harm to third parties, and the polluter pays principle.			
Key element (1) Avoid, and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts	**The EIA Regulations** recognizes the following explicit mitigation actions to emanate from the EIA process: (a) Avoiding the impact altogetherby not taking a cetain action or a part of an action (b) Minimizing negative impacts by limiting the degree and magintude of the action and its implementation	Full equivalence	None required

(A) ADB Safeguard Policy Statement	(B) Corresponding Legal Provisions of the draft of the Law on EIA[1]	(C) Extent of Equivalence[2]	(D) Recommended Gap-filling Measures
and enhance positive impacts by means of environmental planning and management	(c) Optimizing the positive impacts of development (d) Rectifying the impact by repairing, rehabilitating or restoring the affected environemnt (e) Reducing or eliminating the impact over time by conservation operations during the life of the action; and (f) Compensating for the impact by replacing or providing substitute resources or environments		
Key element (2) Prepare an environmental management plan (EMP)	**Schedule E of the EIA Regulations "Contents of an IEE of EIA study"** outlines the Content of an IEE study or EIA study report that development proponents are expected to prepare and submit to the Ministry of Environment for review and provision of environmental clearance of a development project, that includes a report with proposed measures to mitigate adverse environmental impacts.	Full equivalence	None required
Key Element (3) Prepare an environmental management plan (EMP) that includes the proposed… environmental monitoring and reporting requirements	**Schedule E of the EIA Regulations "Contents of an IEE of EIA study" under title "Environmental Monitoring"** requires the preparation of an environmental monitoring plan that includes provisions for on-site monitoring during (i) site preparation; (ii) construction/implementation and (iii) decommissioning phases, as well as the longer-term maintenance requirements **Schedule M of the EIA Regulations "Format for Environmental Monitoring Reports"** requires the submission of summary reports at 2 monthly intervals and a final report at the end of the decommissioning phase or as specified in the Environmental Decision Statement to be submitted to the Ministry	Full Equivalence	None required
Key Element (4) Prepare an environmental management plan (EMP) that includes… related institutional or organizational arrangements	**Schedule I of the EIA Regulations "Review of IEE or EIA study"** Number 7: "Mitigation" requires the mitigation measures or "EMP' Plan to define in specific, practical terms the costs, manpower, equipment, timing and technology needed	Partial Equivalence While, the EMP is required to provide for manpower requirements for its implementation, it is not explicit in terms of requiring institutional or organization arrangements for its implementation	To attain full equivalence, the EMP should explicitly require the definition of institutional or organization arrangement
Key Element (5) Prepare an environmental management plan (EMP) that includes the	**Schedule I of the EIA Regulations "Review of IEE or EIA study"** Number 7: "Mitigation" requires an assessment of institutional capacity to carry out mitigation measures	Partial Equivalence The requirement for capacity development and training for	To attain full equivalence, the legislation should made explicit reference for including capacity building and training

(A) ADB Safeguard Policy Statement	(B) Corresponding Legal Provisions of the draft of the Law on EIA [1]	(C) Extent of Equivalence [2]	(D) Recommended Gap-filling Measures
proposed... capacity development and training measures		implementation of EMP is implicit, rather than explicit in the legislation	needs in the EMP
Key Element (6) Prepare an environmental management plan (EMP) that includes the proposed …implementation schedule	**Schedule I of the EIA Regulations "Review of IEE or EIA study"** Number 7: "Mitigation" requires the mitigation measures or "EMP' Plan to define in specific, practical terms the costs, manpower, equipment, timing and technology needed	Full Equivalence	None required
Key Element (7) Prepare an environmental management plan (EMP) that includes the proposed… cost estimates	**Schedule I of the EIA Regulations "Review of IEE or EIA study"** Number 7: "Mitigation" requires the mitigation measures or "EMP' Plan to define in specific, practical terms the costs, manpower, equipment, timing and technology needed	Full Equivalence	None required
Key element (8) Prepare an environmental management plan (EMP) that includes the proposed …performance indicators	**Schedule M of the EIA Regulations "Format for Environmental Monitoring Reports"** is comprehensive, including requirements for monitoring and reporting on (i) implementation of mitigation measures; (ii) monitoring results, including date, time frequency and duration; (iii) presentation of environmental quality performance and standards; (iv) presentation of monitored parameters, etc.	Full Equivalence	None required
Key Element (9) Key considerations for EMP preparation include mitigation of potential adverse impacts to the level of no significant harm to third parties, and the polluter pays principle.	The legislation is implicit in terms of the requirement to avoid or minimizing the impact on the environment or human health and safety	Partial Equivalence There is no explicit reference to the polluter play principle	To attain full equivalence, the legislation should explicitly made requirement for ensuring that the developer or polluter pay if there is damage to the environment or third party
Policy Principle 5: Carry out meaningful consultation with affected people and facilitate their informed participation. Ensure women's participation in consultation. Involve stakeholders, including affected people and concerned nongovernment organizations, early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address issues related to environmental assessment. Establish a grievance redress mechanism to receive and facilitate resolution of the affected people's concerns and grievances regarding the project's environmental performance.			
Key element (1) Carry out meaningful	**Schedule E of the EIA Regulations** lists the Public Consultation requirements as follows:	Partial equivalence	For full equivalence, the EIA Regulations should explicitly

(A) ADB Safeguard Policy Statement	(B) Corresponding Legal Provisions of the draft of the Law on EIA [1]	(C) Extent of Equivalence [2]	(D) Recommended Gap-filling Measures
consultation with affected people and facilitate their informed participation	That the IEE and EIA process and report should include: (a) A list of persons consulted including persons in statutory bodies, atolls and island offices, community groups and NGOs, local residents, local fishermen, tourism operators and others likely to be affected by the proposed development (b) Information on how, when and where consultations were conducted, e.g. stakeholder meetings in affected area, individual meetings, questionnaires; and (c) Summary of outcome of consultations, including the main concerns identified.	There is no clear timeline established when consultation should occur, if consultation should take place throughout project implementation and the means for resolution of any affected person's concerns	identifying the different stages at which consultation should take place (e.g. early in EIA process, before finalization of EIA and during project implementation and monitoring) as well as means to address people's concerns and grievances
Key element (2) Ensure women's participation in consultation	There is no explicit reference to women's participation in the consultative process, although reference to consultation in the EIA regulations.	No equivalence	For full equivalence the EIA Regulations should explicitly require consultation and participation of women in the EIA process and during project implementation
Key element (3) Involve stakeholders, including affected people and concerned nongovernment organizations, early in the project preparation process.	While there is explicit reference in **Schedule E of the EIA Regulations** of the requirements for involving stakeholders and affected people as outlined below, it does not specify the stages (including early in project preparation process) that consultation is mandatory: That the IEE and EIA process and report should include: (a) A list of persons consulted including persons in statutory bodies, atolls and island offices, community groups and NGOs, local residents, local fishermen, tourism operators and others likely to be affected by the proposed development (b) Information on how, when and where consultations were conducted, e.g. stakeholder meetings in affected area, individual meetings, questionnaires; and (c) Summary of outcome of consultations, including the main concerns identified.	Partial equivalence There is no reference in the legislation to the stages and timing of consultations	To attain full equivalence, the EIA Regulations should explicitly identifying the different stages at which consultation should take place, including early in the project preparation process
Key element (4) Establish a grievance redress mechanism	There is no explicit reference to establishment of a grievance redress mechanism at the project level.	No equivalence	For full equivalence the EIA Regulations should specify mechanisms for addressing people's grievances both during the EIA process and during project implementation
Policy Principle 6: Disclose a draft environmental assessment (including the EMP) in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to			

(A) ADB Safeguard Policy Statement	(B) Corresponding Legal Provisions of the draft of the Law on EIA [1]	(C) Extent of Equivalence [2]	(D) Recommended Gap-filling Measures
affected people and other stakeholders. Disclose the final environmental assessment, and its updates if any, to affected people and other stakeholders.			
Key element (1) Disclose a draft environmental assessment (including the EMP) in a timely manner, before project appraisal, in an accessible place.	The EIA Regulations require public consultations, and the invent that the project is complex and sufficiently controversial, the Ministry of Environment can request additional public consultation. This would take place before the EA report is finalized.	Partial equivalence There is no guidance on the disclosure of draft EA (and EMP), including timing, location and language	To achieve full equivalence, the EIA Regulations should clearly specify the timing, location, language and other specifies regarding the disclosure of the draft EA (and EMP)
Key element (2) Disclose the final environmental assessment, and its updates if any, to affected people and other stakeholders	There is no guidance in the legislation regarding the disclose of the final EA report and EMP, although the decision of approval or environmental clearance has to be disclosed	No equivalence	For full equivalence, the EIA Regulation should explicitly specify the need for disclosure of the final EA and EMP reports in an accessible location and in a language that is understandable to the affected people and other stakeholders
Policy Principle 7: Implement the EMP and monitor its effectiveness. Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports.			
Key element (1) Implement the EMP and monitor its effectiveness.	**The EIA Regulations, Schedule J "Environment Decision Statement"** issued to the developer by the Ministry of Environment, Item 2 (i) (ix) requires that all mitigation measures proposed in the EIA report for the construction phase and operational phase as outlined in page/s (as per the EIA Report) shall be fully implemented.	Full equivalence	None required
Key element (2) Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports.	**The EIA Regulations, Part IV Item 13 "Environmental Monitoring and Mitigation** has the following instructions: (i) The proponent shall fund and conduct environmental monitoring and implementing mitigation measures for the development proposal if specified and required by virtue of the Environmental Decision Statement (ii) The proponent shall regularly submit summary environmental monitoring reports….. (iii) The proponent shall maintain records of all monitoring data and on request make these available to the Ministry of Environment (iv) The proponent shall submit a final environmental monitoring and mitigation report to the	Partial equivalence There is no requirement for public disclosure of the monitoring results, disclosure is limited to submission to government agencies	For full equivalence, the EIA Regulations should specify requirement for public disclosure of monitoring results

(A) ADB Safeguard Policy Statement	(B) Corresponding Legal Provisions of the draft of the Law on EIA [1]	(C) Extent of Equivalence [2]	(D) Recommended Gap-filling Measures
	Ministry of Environment when the project is completed or at such time as may be specified in the Environment Decision Statement (v) The Ministry of Environment may request to put in place necessary additional measures based on the finding of the monitoring reports		
Policy Principle 8: Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area. In an area of natural habitats, there must be no significant conversion or degradation, unless (i) alternatives are not available, (ii) the overall benefits from the project substantially outweigh the environmental costs, and (iii) any conversion or degradation is appropriately mitigated. Use a precautionary approach to the use, development, and management of renewable natural resources.			
Key Element (1) Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated.	**The EIA Regulations** defines natural environment as: (i) Natural features consisting of physical and biological formations or groups of such formations (ii) Geological and physiological, geomorphical, lithostratigraphical, palaeontological and hydrological functions and precisely declined areas which constitute the habitat of threatened species of fauna and flora; and (iii) Natural sites of precisely delineated areas of value from the point of view of science, scenic value, conservation or natural beauty. The **EIA Regulations Schedule B** further requires development to ensure that economic development is sustainable and that any development project assess the "presence or absence of critical ecosystems" that would "Environmental Sensitive Areas" (ESA) that have been identified by the Ministry of Environment. If such an ESA has been identified in the development area, that that site should be either removed for consideration for future development or that development could to take place, taking into consideration the conservation of the sensitive area, there by mitigating the negative impacts.	Full Equivalence	None required
Key Element (2) If a project is located within a legally protected area, implement additional programs to promote and enhance conservation aims of the protected area	The **EIA Regulations Schedule B** further requires development to ensure that economic development is sustainable and that any development project assess the "presence or absence of critical ecosystems" that would "Environmental Sensitive Areas" (ESA) that have been identified by the Ministry of Environment. If such an ESA has been identified in the development area, that that site should be either removed for consideration for future development or that development could to take place, taking into consideration the conservation of the sensitive area, there by mitigating the negative impacts. However **Schedule B of the EIA Regulations** clarifies that if a site/island or its surrounding reef is part of the island/reef ecosystem included in the ESA sites listed for special protection, such sites should not be	Partial Equivalence	To attain full equivalence, the legislation should be explicit if development can take place in protected areas or ESAs, and if so under what conditions and what added measures are necessary for enhancing conservation of the area

(A) ADB Safeguard Policy Statement	(B) Corresponding Legal Provisions of the draft of the Law on EIA [1]	(C) Extent of Equivalence [2]	(D) Recommended Gap-filling Measures
	considered for any development. Also, any site/island selected for development must have at least a 20 m space (measured from the seaward edge inland) for maintenance of an undisturbed band of vegetation that could serve as a "no-development" buffer zone, or else it should be removed from any development activity		
Key Element (3) In an area of natural habitats, there must be no conversion or degradation, unless (i) alternatives are not available; (ii) the overall benefits from the project substantially overweigh the environmental costs, and (iii) any conversion or degradation is appropriately mitigated	While, the legislation recognizes the need to ensure that development is excluded from specially designed environmentally sensitive sites, **the EIA Regulations** calls for evaluation of alternatives ways to development that cause less harm of the environment (that is defined as fauna, flora and natural habitats….)	Partial equivalence There is no explicit requirement for evaluating cost and benefits of damaging the environment (including natural habitats) in decision-making on conversion or degradation of natural habitats	To attain full equivalence, the legislation should specify the options for conversion and/or degradation of natural habitats including assessment of costs and benefits of conversion and mitigation options
Key Element (4) Use a precautionary approach to the use, development, and management of renewable natural resources	**Schedule B of the EIA Regulations** states that development that is in harmony with the natural environment is the preferred approach for the Maldives and environment is defined as the fauna, flora, natural habitat and the human environment. However, there is no specific reference to use of a precautionary approach to management of renewable natural resources	No Equivalence	To attain full equivalence, the legislation should require the explicit use of a precautionary approach to use and management of renewable natural resources
Policy Principle 9: Apply pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous materials from their production, transportation, handling, and storage. Avoid the use of hazardous materials subject to international bans or phaseouts. Purchase, use, and manage pesticides based on integrated pest management approaches and reduce reliance on synthetic chemical pesticides.			
Key element (1) Apply pollution prevention and control technologies and practices consistent with international good practices.	The main piece of legislation that provides regulations for the protection and prevention of pollution is the **Environment Protection and Preservation Act of 1993** Under section 1 of Act, requires the Government and citizens to give special attention to the protection of its environment including both sea and the atmosphere. The relevant Government authorities shall also provide guidelines for the protection and preservation and everyone is required to respect such guidelines. Under section 7(a), any type of wastes, oils, poisonous gases or any substance that may have harmful	Partial equivalence While the EPPA does not make reference to international standards of pollution management	For full equivalence, guidelines are required as stipulated by the EPP Act to manage and deal with the pollution of air, water, land based on internationally recognized standards

(A) ADB Safeguard Policy Statement	(B) Corresponding Legal Provisions of the draft of the Law on EIA [1]	(C) Extent of Equivalence [2]	(D) Recommended Gap-filling Measures
	effects on the environment shall not be disposed of within the territory of the Maldives. In cases where the disposal of such substances becomes absolutely necessary, they shall be disposed of only within those areas designated for such purposes by the Government. If such waste is to be incinerated, appropriate precautions should be taken to avoid any harm to the health of the population. Similarly, the Act also states that wastes that are harmful to human health and the environment shall not be disposed of anywhere within the territory of the country and permission should be obtained from the relevant authority at least 3 months in advance of any trans-boundary movement of such wastes through the territory of the Maldives.		
Key Element (2) Adopt cleaner production processes and good energy efficiency practices	**Schedule E of the EIA Regulations "Project Description**" requires the project proponent to identify measures to be adopted to promote sustainable development, including cleaner production, renewable energy systems) during the implementation and operational phases of the project	Full Equivalence	None required
Key Element (3) Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous materials from their production, transportation, handling, and storage.	**Environment Protection and Preservation Act** in Article 7 and 8 address the issues related to waste disposal and hazardous toxins. **Article 7 "Waste disposal, Oil and Poisonous Substances"** states that (a) Any types of waste oil, poisonous gases or any substance that may be harmful on the environment shall not be disposed within the territory of the country (b) In case, where the disposal of substances stated in (a) becomes absolutely necessary, they shall be disposed within the areas designated by the government. If such wastes are incinerated, appropriate precautions should be taken to avoid harm to the health of the population **Article 8 Hazardous/Toxic or Nuclear Wastes** states that such wastes that is harmful to human health and the environment shall not be disposed in the territory of the country, Permission is required for any transboundary movement of such wastes through the territory of the Maldives	Partial Equivalence There is no recognition of load minimization and control, including measures for generation, release, handling and storage	To attain full equivalence, the legislation should require avoidance and control of emission and discharge loads and handling, production and storage of such materials
Key Element (4) Avoid the use of hazardous materials subject to international bans or phase-outs	The legislation (Environmental Protection and Preservation Act) refers to disposal of hazardous wastes and transboundary movement of such wastes, but is silent on its use and phase-outs	Partial Equivalence	To attain full equivalence, the legislation should deal explicitly with the use of hazardous materials on the basis of international norms and phase out schedules
Key Element (5) Purchase, use, and	There is no specific legislation that governs the purchase, use and management of pesticides in the	No Equivalence	To attain full equivalence, the legislation should provide

(A) ADB Safeguard Policy Statement	(B) Corresponding Legal Provisions of the draft of the Law on EIA [1]	(C) Extent of Equivalence [2]	(D) Recommended Gap-filling Measures
manage pesticides based on integrated pest management approaches and reduce reliance on synthetic chemical pesticides.	Maldives. The Environment Protection and Preservation Act deals more broadly with the impacts of development related activities on the environment (fauna, flora, natural resources, etc.) and on the health and well being of the people. The direct and indirect impacts on air, water, and other natural systems (that likely refers to soil, renewable and non-renewable natural resources.		guidance on the purchase, use and management (production, transport, storage, handing, disposal) of chemicals use in agriculture
Policy Principle 10: Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities.			
Key Element (1) Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease.	**Articles 73 -76 of The Employment Act of 2008,** provides coverage of measures for the safety and protection of employees at the work place……….. Such measures shall include:- i. implementation of a safe work place and procedures, procurement of secure tools and machinery for carrying out work, and ensuring the continued safety of the same; ii. provide safe materials to work with; iii. provide protective equipment and safety equipment in the event that the nature of work is such that it is not possible to eliminate or control health hazards arising out of the work; iv. provide education and training to employees on the use of protective gear and safety equipment, and disseminate to employees information on all issues of related concern; v. conduct regular health checks for employees engaged in work involving chemical or biological materials that may cause a hazard to physical health or employees involved in any work that may cause physical ill health; vi. provide or arrange for appropriate medical care for employees injured while carrying out employment; and vii. arrange the facilitation of first aid to employees in emergencies or accidents. 74. The following are duties imperative upon every employee:- i. maintenance of safe work practices at work to avoid danger to the safety and well being of the employee and co-workers which may be caused by inattentiveness to safety and security measures; ii. assist the employer and co-workers in maintenance of measures designed to ensure health and safety in the work place; iii. use safety equipment and protective gear as instructed in accordance with the training and education provided for use of such equipment and gear; iv. report to the employer any damage, loss of or destruction of protective gear or safety equipment; v. inform the employer or his designated supervisor immediately of the occurrence of any incident which the employee believes may cause danger and which the employee is unable to resolve; vi. inform the employer or his designated supervisor of any accidents or damage sustained occurring at	Full equivalence	None required

(A) ADB Safeguard Policy Statement	(B) Corresponding Legal Provisions of the draft of the Law on EIA [1]	(C) Extent of Equivalence [2]	(D) Recommended Gap-filling Measures
	work or related to work.		
Key Element (2) Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities	**The Disaster Management Act of 2006** recognizes that it is the state responsibility to protect its people, their property and the natural and built environment they live in from natural and man-made disasters as well as requiring the government to act to manage risks, ensure preparedness, relief and recovery through capacity building, and establishing partnerships with organized local communities and international organizations, as well as preparing a national disaster management plan and national emergency operations plan. The intent is to promote an integrated and coordinated system of disaster management with emphasis on prevention and mitigation, communication, public awareness, knowledge, community participation, etc.	Full Equivalence	None required
Policy Principle 11: Conserve physical cultural resources and avoid destroying or damaging them by using field-based surveys that employ qualified and experienced experts during environmental assessment. Provide for the use of “chance find” procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation.			
Key Element (1) Conserve physical cultural resources and avoid destroying or damaging them by using field-based surveys that employ qualified and experienced experts during environmental assessment.	The **EIA regulations** requires the need to conserve and protect cultural resources	Partial equivalence The legislation lacks mention of the need to use field-based surveys and qualified experts during the EIA process	To attain full equivalence, the legislation should require the use of field based surveys and qualified experts to assess impacts on cultural resources during EIA preparation
Key Element (2) Provide for the use of “chance find” procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation	None	There is no guidance on how to deal with “chance finds”	For full equivalence, the EIA regulations or other legislation should provide for the us of “chance find” procedures

ENVIRONMENTAL AUDIT OF THE THILAFUSHI RECLAMATION PROJECT

I. INTRODUCTION

1. ADB Safeguard Policy Statement (SPS) requires that for projects involving facilities and/or business activities that already exist or are under construction, the borrower/client will undertake an environment compliance audit, including on-site assessment, to identify past or present concerns related to impacts on the environment. The objective of the compliance audit is to determine whether actions were in accordance with ADB's safeguard principles and requirements for borrowers/clients and to identify and plan appropriate measures to address outstanding compliance issues.

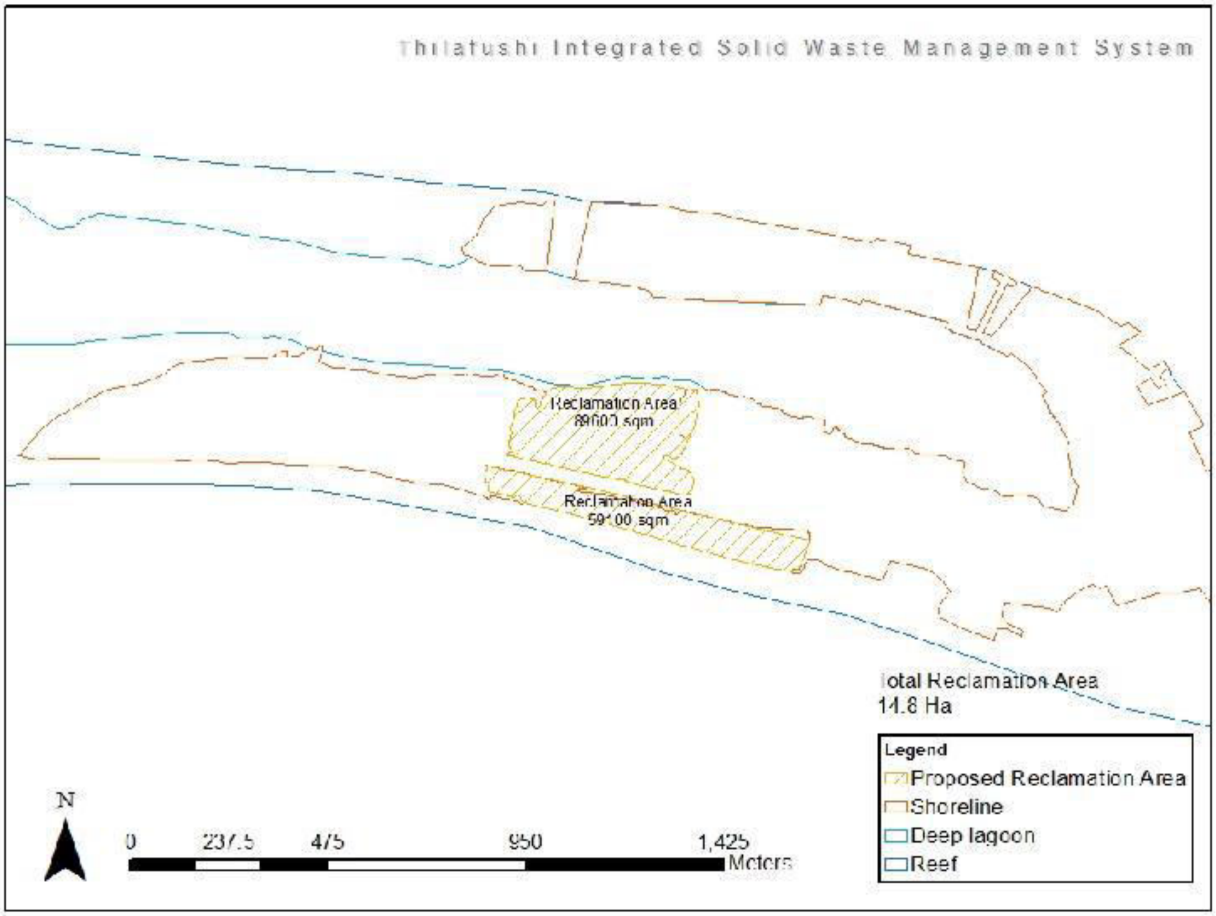
2. The proposed Waste-to-Energy (WTE) Facility Project at the island of Thilafushi in Maldives will be financed by ADB together with Asian Infrastructure Investment Bank (AIIB). This WTE Facility Project is part of Phase 2 of the Government of Maldives initiative to set up an integrated Regional Waste Management Facility (RWMF) for Zone 3. As part of the environmental impact assessment (EIA) of the WTE Facility Project, all past and present projects associated with the RWMF have been assessed if any of these is/are considered existing or associated facility/ies per definition of ADB SPS. Evaluation showed that the RWMF project component named as "Reclamation of 15 hectares of land at Thilafushi for development of the Regional Waste Management Facility (RWMF) for Zone 3" (Reclamation Project) has been identified as an existing facility relative to the WTE Facility Project. Therefore, an environmental audit is required.

3. As such, an environmental audit has been carried out for the Reclamation Project. Since the Reclamation Project has been completed, the methodology adopted for this audit is documentary review in nature. The environmental safeguard documents of the project were reviewed to identify if it has complied with the relevant national laws, rules and regulations, and to determine if there were issues identified during the implementation of the project that remained outstanding or relevant to the present. The audit was also supplemented by visit to the completed project site (the reclaimed land) and interviews with the people who have been involved in the project implementation.

II. DESCRIPTION OF THE LAND RECLAMATION PROJECT

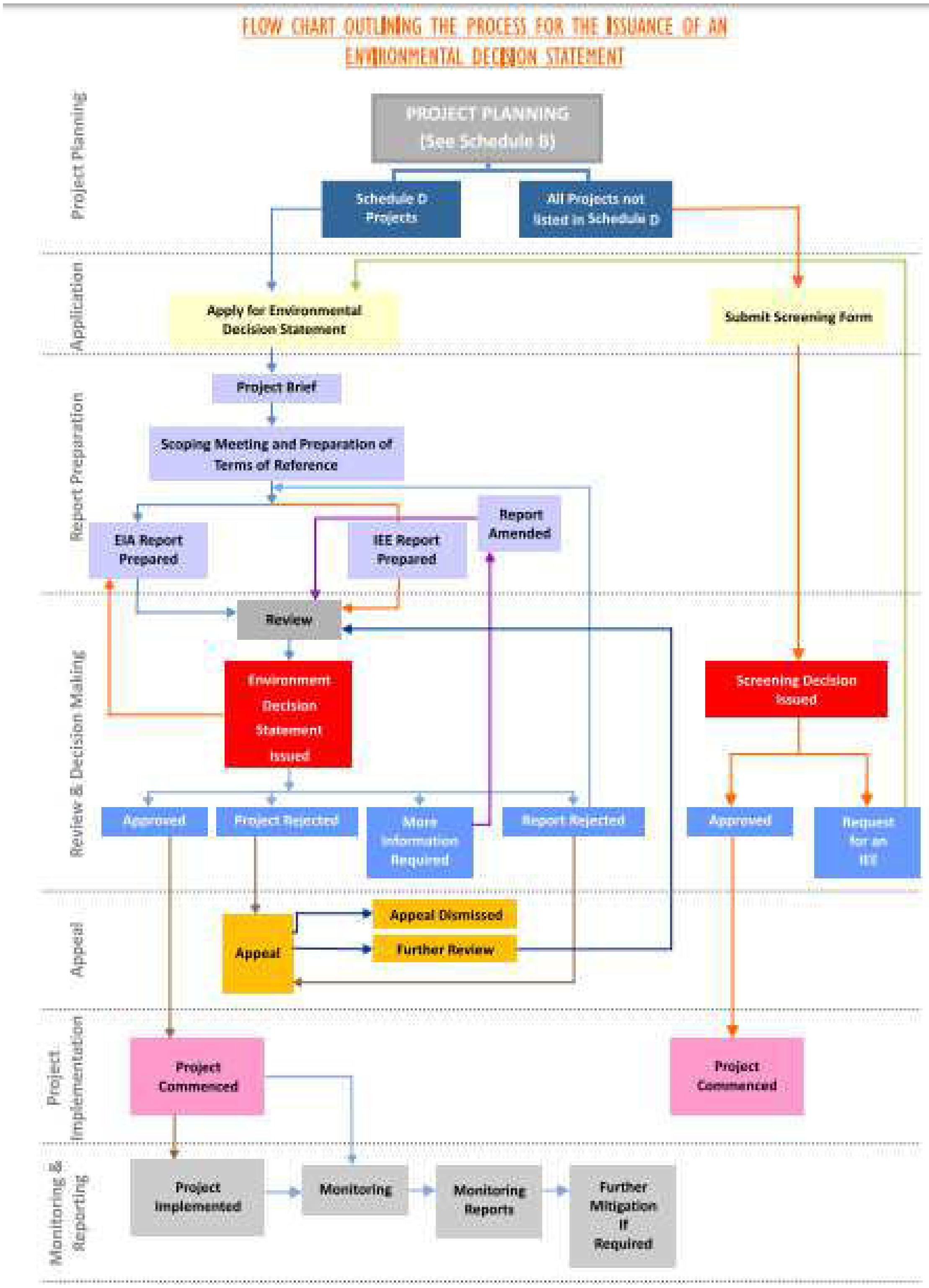
4. The Reclamation Project involved a dredging and a reclamation component to create the additional land in Thilafushi Island. The reclaimed land is planned as additional site for the various components of the RWMF, including the WTE Facility Project, which this environmental audit has been carried out for.

5. The material for the reclamation was obtained from dredging in the deep seas around Thilafushi Island. The project was designed to reclaim a total area of 15 hectares with an estimated volume of 525,000 cubic meters of dredged materials. The project was also designed to elevate the reclaimed land to a height of +2.0m from mean sea level. The design of the Reclamation Project also included a coastal protection component to protect the created land from erosion. The coastal protection was built by building a revetment using geo-textile containers. Geo-textiles, bags and tubes were filled with sand and placed on the boundary of the reclaimed land as a revetment. The revetment was constructed to a height of +2.5 m from mean sea level. Figure below shows the area that was reclaimed.



III. ENVIRONMENTAL COMPLIANCE OF THE PROJECT

6. **Environmental Impact Assessment**. In 2017, an environmental impact assessment (EIA) was undertaken for the project. The EIA process was based on the requirements of EIA Regulation (2012/R-27), the Government of Maldives governing EIA regulation for all projects in the country. This regulation provides the detailed guidelines outlining the EIA process, including the roles and responsibilities of proponent (in this case the Ministry of Environment) and consultant undertaking the EIA. In summary, the project took all the necessary steps in order to finish the EIA and secure approval from the Maldives Environmental Protection Agency (EPA). The following illustration depicts the steps followed:



7. As a result, an EIA report was prepared and submitted to the Maldives EPA. A copy of the EIA report is available to public through the Maldives EPA website. The EIA report is also available from the Ministry of Environment. The front cover of this EIA report is attached as Annex 1 to this audit document.

8. On 17 December 2017, the Maldives EPA issued an approval of the EIA through Environmental Decision Statement No. 203-EIARES/438/2017/180. A copy of this approval document is attached as Annex 2 of this audit document.

9. On 21 February 2018, the contract for the project was awarded to Maldives Transport and Contracting Company Plc. After the award, significant development happened when the proposed methodology under the project was changed due to economic and technical issues. In particular, the initial plan to use Cutter Suction Dredger (CSD) was changed to use of Trailing Suction Hopper Dredger (TSHD). Accordingly, among many other reasons, use of TSHD was deemed more economical compared to use of CSD due to reduced reclamation time. Consequently, the reduction of reclamation time was also deemed as tantamount to having lesser environmental impacts arising from the activities. In view of this, an addendum to the EIA was prepared and submitted to Maldives EPA for approval.

10. On 07 May 2018, the Maldives EPA issued an approval of the First Addendum to the EIA through Environmental Decision Statement No. 203-EIARES/438/2018/87. Accordingly, the mitigation measures proposed in the initial EIA were sufficient for the project. The front cover of the Addendum to the EIA is attached as Annex 3 of this audit document. Also, a copy of the approval document of the First Addendum to the EIA is attached as Annex 4 of this audit document.

11. **Compliance with the conditions of the EIA**. The Environmental Decision Statement provides the conditions with which the proponent should comply with during the implementation of the Reclamation Project. Below is a summary of these conditions and the corresponding compliance by the proponent:

Conditions	Status of Compliance
1. In the event the project activity has not commended within one (1) year from the date of issue, of if the duration of this Environmental Decision Statement has not been extended, this Environmental Decision Statement shall be considered null and void. In order to extend the duration of this Environmental Decision Statement, the Proponent shall write to the Minister for an extension according to Clause 14 of the 2nd Amendment to the Environmental Impact Assessment Regulations 2012.	Complied. The project has been completed prior to the expiry of the Environmental Decision Statement.
2. In the evert the project activities has been delayed for more than one (1) year due to unforeseen circumstances, the Ministry shall have the discretion to extend the duration of the Environmental Decision Statement, or to terminate it. In such circumstances the proponent shall write to the Minister for an extension clearly stating out the reasons for the delay.	Complied. The project has been completed prior to the expiry of the Environmental Decision Statement.
3. The Minister, or his designate, may issue a cessation order requiring persons working on	Complied.

a Development Proposal to cease working until the order is withdrawn, if: (a) This Environmental Decision Statement has been withdrawn or; (b) There has been a breach of the conditions of this Environmental Decision Statement.	
4. It is the Developer's responsibility to undertake all project activities in accordance with the relevant laws and regulations of the Maldives.	Complied. The Developer has not been issued any notices or violation (or similar forms) and the project was completed without any breach of relevant laws and regulations.
5. The Developer shall submit environmental monitoring report as outlined in Paragraph viii of this Environmental Decision Statement. Failure to submit the requisite monitoring report may result in the suspension or revocation of the permit under this Decision Statement.	Complied. One Environmental Monitoring Report have been submitted and reviewed as part of this audit. The monitoring report confirmed that overall the environmental performance of the project is acceptable and further monitoring was recommended.
6. The Developer is aware that under the National Environment Protection Act (Law No. 4/93) and the Environmental Impact Assessment Regulations the Ministry reserves the right to terminate any activity without compensation if found that such an activity has caused significant, irreversible impacts on the environment.	Complied. No termination of activities happened.
7. All mitigation measures proposed in the EIA report for all the phases of the project shall be fully implemented.	Complied. No termination of activities happened. It is viewed that all mitigation measures have been implemented.
8. The environmental monitoring program outlined in the Environmental Impact Assessment Report shall be undertaken and implemented and summary environmental monitoring reports shall be submitted to the Ministry.	Complied. Environmental Monitoring Reports and Physical Progress Reports have been prepared and submitted to the Ministry.
9. The date of expiry stated in this Environmental Decision Statement is the duration given to commence the project activities approved under this Environmental Decision Statement.	Complied. The project was accomplished within the duration of the Environmental Decision Statement.
10. Once the project activities have started, the Proponent must inform the Environmental Protection Agency, the date of commencement of project activities.	Complied. Accordingly, this activity was monitored closely by the Maldives EPA.

IV. CONCLUSION

12. The Reclamation Project has long been accomplished prior to this environmental audit. No actual dredging activities was observed as part of this audit. However, based on all documents and records reviewed, statutory requirements were complied with and that the necessary

environmental impact assessment was undertaken and approved by the government. There is an indication that the environmental performance of the reclamation project was satisfactory, and that the development activities did not cause any significant adverse impacts to the environment.

Annex 1

ENVIRONMENTAL IMPACT ASSESSMENT

Reclamation of 15 hectares of land at Thilafushi for development of the Regional Waste Management Facility for Zone 3

DRAFT

June 2017

Proposed by
Ministry of Environment and Energy

Prepared by
Ahmed Jameel (EIA P07/2017)
Ibrahim Faiz (EIA P05/2017)
Akeed Ahmed (EIA T/2017)

For Water Solutions Pvt. Ltd

Annex 2

ތިމާވެށްޓަށް އަސަރު ފޯރާނެ މިންވަރު ވަޒަންކުރާ ރިޕޯޓް ގަބޫލުކުރުން
APPROVAL OF ENVIRONMENTAL IMPACT ASSESSMENT

Number: 203-EIARES/438/2017/180 ނަންބަރު:

ތިމާވެށީގެ ގޮތުން ނިންމިގޮތުގެ ބަޔާން ދޫކުރަނީ، ކ. ތިލަފުށި ޒޯން 3ގައި ރީޖަނަލް ވޭސްޓްމެނޭޖްމަންޓް ފެސިލިޓީއެއް ގާއިމް ކުރުމަށް 15 ހެކްޓަރުގެ ބިމެއް ހިއްކުމުގެ މަޝްރޫއުގެ މަސައްކަތްކުރުމުގައި ގުޅޭ ގޮތުން މިނިސްޓްރީ އޮފް އެންވަޔަރަންމަންޓް އެންޑް އެނަރޖީގެ ފަރާތުން 20 ނޮވެމްބަރ 2017 ގައި މުރާޖަޢާކުރުމަށް ހުށަހަޅުއްވާފައިވާ އަދި 12 ޑިސެމްބަރ 2017 ގައި އިތުރު މަޢުލޫމާތު ހުށަހަޅުއްވާފައިވާ ތިމާވެށްޓަށް އަސަރު ފޯރާނެ މިންވަރު ވަޒަންކުރާ ރިޕޯޓާއި ބެހޭ ގޮތުން ނިންމިގޮތް އަންގައިދިނުމަށެވެ. މި މަޝްރޫއުގެ އީ.އައި.އޭ ކޮންސަލްޓަންޓުންނަކީ މިސްޓަރ އަޙްމަދު ޖަމީލް (EIA P07/2017) އަދި މިސްޓަރ އިބްރާހިމް ފާއިޒް (EIA P05/2017) އެވެ.

*This Environmental Decision Statement is issued for the purpose of communicating the decision regarding the Environmental Impact Assessment for **Reclamation of 15 hectares of Land for Development of Regional Waste Management Facility at Thilafushi (Zone III), Kaafu Atoll,** which was submitted for evaluation on **20th November 2017 by Ministry of Environment and Energy.** The EIA consultants of this project are **Mr. Ahmed Jameel (EIAP07/2017) and Mr. Ibrahim Faiz (EIA P05/2017).***

1. This Environmental Decision Statement has been issued on behalf of the Environmental Protection Agency (hereinafter referred to as the Ministry) pursuant to the Environmental Impact Assessment Regulations 2012 (2012/R-27) to advise that the Ministry has decided that the proposed Development Proposal can proceed according to the Environmental Impact Assessment Report.

1. ތިމާވެށްޓަށް އަސަރު ފޯރާނެ މިންވަރު ބަޔާންކުރާ ރިޕޯޓު ހެދުމާބެހޭ ގަވާއިދު 2012 ގެ ދަށުން (މި ލިޔުމުގައި މީގެ ފަހުން މިނިސްޓްރީ ކަމަށް ބުނެ ކިޔައިފައިވާ) މިގަވާއިދުގެ ތަންފީޒު ކުރާ، އެންވަޔަރަންމަންޓަލް ޕްރޮޓެކްޝަން އެޖެންސީގެ ފަރާތުން މި ތިމާވެށީގެ ގޮތުން ނިންމިގޮތުގެ ބަޔާން ދޫކުރަނީ، މަތީގައި ބަޔާންކޮށްފައިވާ ތަރައްގީގެ މަޝްރޫއު ތިމާވެށްޓަށް އަސަރު ފޯރާނެ މިންވަރު ބަޔާންކުރާ ރިޕޯޓުގައި ބަޔާންކޮށްފައިވާ ގޮތަށް ކުރިއަށް ގެންދިއުމުގެ ހުއްދަ ދިނުމެވެ.

2. The decision has been made by the Ministry on the following conditions:

2. މި ހުއްދަ މިނިސްޓްރީން ދީފައިވަނީ ތިރީގައި މިވާ ޝަރުތުތަކުގެ ދަށުންނެވެ:

   i. In the event the project activity has not commenced within one (1) year from the date of issue, or if the duration of this Environmental Decision Statement has not been extended, this Environmental Decision Statement shall be considered null and void. In order to extend the duration of this Environmental Decision Statement, the Proponent shall write to the Minister for an extension according to Clause 14 of the 2nd Amendment to the Environmental Impact Assessment Regulations 2012.

   i. ތިމާވެށީގެގޮތުން ނިންމުންތަކުގެ ލިޔުން ދޫކުރި ތާރީޚުން ފެށިގެން 1 (އެކެއް) އަހަރު ދުވަހުގެ ތެރޭގައި މަޝްރޫޢުގެ އަމަލީ މަސައްކަތް ނުފެށިއްޖެ ނަމަ ނުވަތަ ތިމާވެށީގެ ގޮތުން ނިންމުންތަކުގެ ލިޔުމުގެ މުއްދަތު އިތުރުކޮށްދީފައިނުވާނަމަ، މި ތިމާވެށީގެ ގޮތުން ނިންމުންތަކުގެ ލިޔުމާއި އަދި މި ލިޔުމުގެ 1 ވަނަ ނަންބަރުގައި ދީފައިވާ ހުއްދަ ބާޠިލުވާނެއެވެ. މި ތިމާވެށީގެ ގޮތުން ނިންމުންތަކުގެ ލިޔުމުގެ މުއްދަތު އިތުރުކުރުމަށް އެދެވޭނީ ތިމާވެއްޓަށް އަސަރުކުރާނެ މިންވަރު ދިރާސާ ކުރުމާ ބެހޭ ގަވާއިދު 2012 ގެ ދެވަނަ އިސްލާހުގެ 14 ވަނަ މާއްދާގެ (ހ) ގައިވާ ގޮތަށެވެ.

   ii. In the event the project activities has been delayed for more than one (1) year due to unforeseen circumstances, the Ministry shall have the discretion to extend the duration of the Environmental Decision Statement, or to terminate it. In such circumstances the proponent shall write to the Minister for an extension clearly stating out the reasons for the

   ii. 1 ވަނަ ނަންބަރުގައިވާ ހުއްދައިގެ ދަށުން މަޝްރޫޢުގެ އަމަލީ މަސައްކަތް ނުފެށި 1 (އެކެއް) އަހަރަށްވުރެ ލަސްވި ކުރިއަށް ލަފާކުރަން ނޭނގޭ ކަހަލަ ކަމެއް ދިމާވެގެން ކަމަށްވާނަމަ، މުއްދަތު އިތުރުކުރުމުގެ އިޚްތިޔާރު ނުވަތަ ހުއްޓުވުމުގެ އިޚްތިޔާރު މިނިސްޓްރީއަށް ލިބިގެންވެއެވެ. މިފަދަ ހާލަތްތަކުގައި މުއްދަތު ހަމަވުމުގެ ކުރިން ސަބަބު ސާފުކޮށް ބަޔާންކޮށް [illegible] ގެ [illegible] މިނިސްޓްރީއަށް ލިޔުންފޮނުވަންވާނެއެވެ.

delay.

iii. The Minister, or his designate, may issue a cessation order requiring persons working on a Development Proposal to cease working until the order is withdrawn, if:

a) This Environmental Decision Statement has been withdrawn or;

b) There has been a breach of the conditions of this Environmental Decision Statement.

iii. ތިރީގައި ބަޔާން ކުރާފަދަ ކަމެއް ދިމާވެއްޖެނަމަ، މިނިސްޓަރ ނުވަތަ އޭނާ ޢައްޔަން ކުރާފަރާތަކުން، ހިނގަމުންދާ ތަރައްޤީގެ މަޝްރޫޢުގައި ކުރިއަށް ގެންދާ ބަޔަކަށް މަސައްކަތް އަމުރު ފަހަރާ އަނބުރާގެންދަންދެން ހުއްޓުމަށް އެންގިދާނެއެވެ.

ހ) މި ތިމާވެށީގެ ގޮތުން ނިންމުމުގެ ބަޔާން ބާޠިލުކުރުން ނުވަތަ

ށ) މި ތިމާވެށީގެ ގޮތުން ނިންމުމުގެ ބަޔާނުގެ ޝަރުޠުތަކާ ހިލާފުވުން

iv. It is the Developer's responsibility to undertake all project activities in accordance with the relevant laws and regulations of the Maldives.

iv. މަޝްރޫޢުގެ ހިންގުމާއި ގުޅުންހުރި ހުރިހާކަމެއް އަމަލުކުރަމުންދާ ޤާނޫނުތަކާއި ގަވާއިދުތަކާއި އެއްގޮތަށް މަސައްކަތް ކުރުން ގެންދިއުމަކީ ޑިވެލޮޕަރުގެ ޒިންމާއެކެވެ.

v. The Developer shall submit environmental monitoring report as outlined in Paragraph viii of this Environmental Decision Statement. Failure to submit the requisite monitoring report may result in the suspension or revocation of the permit under this Decision Statement.

v. މި ތިމާވެށީގެ ގޮތުން ނިންމުމުގެ ބަޔާނުގެ VIII ވަނަ ޕެރެގްރާފުގައިވާ ގޮތަށް މޮނިޓަރިންގ ރިޕޯޓް ފޮނުވަމުންދާ ރިޕޯޓު ހުށަހަޅަން ޖެހޭނެ ވާނެއެވެ.

vi. The Developer is aware that under the National Environment Protection Act (Law no. 4/93) and

vi. ޑިވެލޮޕަރގެ ތިމާވެށި ރައްކާތެރިކުރުމުގެ ޤާނޫނު (ނަންބަރު 4/93) އާއި ތިމާވެށީގެ އަސާސީ ޤާނޫނު ދިވެހި ރާއްޖޭގެ ޤާނޫނު

the Environmental Impact Assessment Regulations the Ministry reserves the right to terminate any activity without compensation if found that such an activity has caused significant, irreversible impacts on the environment.

ގަވާއިދު 2012 ގެ ދަށުން ރާއްޖޭގެ ތިމާވެށްޓަށް
އަނބުރާ [illegible] ނުކުރެވޭ ފަދަ [illegible] [illegible]
[illegible]
[illegible]
[illegible]
[illegible]

vii. All mitigation measures proposed in the EIA report for all the phases of the project shall be fully implemented.

vii. ތިމާވެށްޓަށް އަސަރު ކުރާނެ މިންވަރު [illegible]
ރިޕޯޓުގައި މަޝްރޫޢުގެ ހުރިހާ [illegible]
ތިމާވެށްޓަށް [illegible] އަސަރުތައް ކުޑަކުރުމަށް
އަޅަންޖެހޭ ހުރިހާ ފިޔަވަޅެއް ރިޕޯޓުގައި
ބަޔާންކޮށްފައިވާ [illegible] [illegible]

viii. The environmental monitoring program outlined in the Environmental Impact Assessment Report shall be undertaken and implemented and summary environmental monitoring reports shall be submitted to the Ministry.

viii. ތިމާވެށްޓަށް އަސަރު ކުރާނެ މިންވަރު [illegible]
ރިޕޯޓުގައި [illegible] އަންނަމުންދާ ބަދަލުތައް
[illegible]
[illegible] ފުރިހަމަ ކުރުމަށްފަހު، [illegible]
އަންނަމުންދާ ބަދަލުތައް ދެނެގަތުމުގެ ޚުލާސާ،
ރިޕޯޓުގައިބަޔާންކޮށްފައިވާ ގޮތުގެ މަތިން މި
އެޖެންސީއަށް ހުށަހަޅަންވާނެއެވެ.

ix. The date of expiry stated in this Environmental Decision Statement is the duration given to commence the project activities approved under this Environmental Decision Statement.

ix. ތިމާވެށީގެ ނިންމުމުގެ ލިޔުމުގައި މުއްދަތު ހަމަވާ
ތާރީޚް [illegible] ބަޔާންކޮށްފައިވާ [illegible]
[illegible] މަސައްކަތް ފަށަން ދޭ މުއްދަތެވެ.

x. Once the project activities have started, the Proponent must inform the Environmental Protection Agency, the date of commencement of project activities.

x. މަޝްރޫޢުގެ މަސައްކަތް ފެއްޓުމަށްފަހު، ފެށި ތާރީޚް އެންވަޔަރަމަންޓަލް ޕްރޮޓެކްޝަން އެޖެންސީއަށް ލިޔުމުން އަންގަންވާނެއެވެ.

Date of Issue: 17th December 2017

ދޫކުރި ތާރީޚު :17 ޑިސެމްބަރ 2017

Date of expiry: 17th December 2018

މުއްދަތު ހަމަވާ ތާރީޚު:17 ޑިސެމްބަރ 2018

Name: Yazeed Ahmed

ނަން: ޔަޒީދު އަޙްމަދު

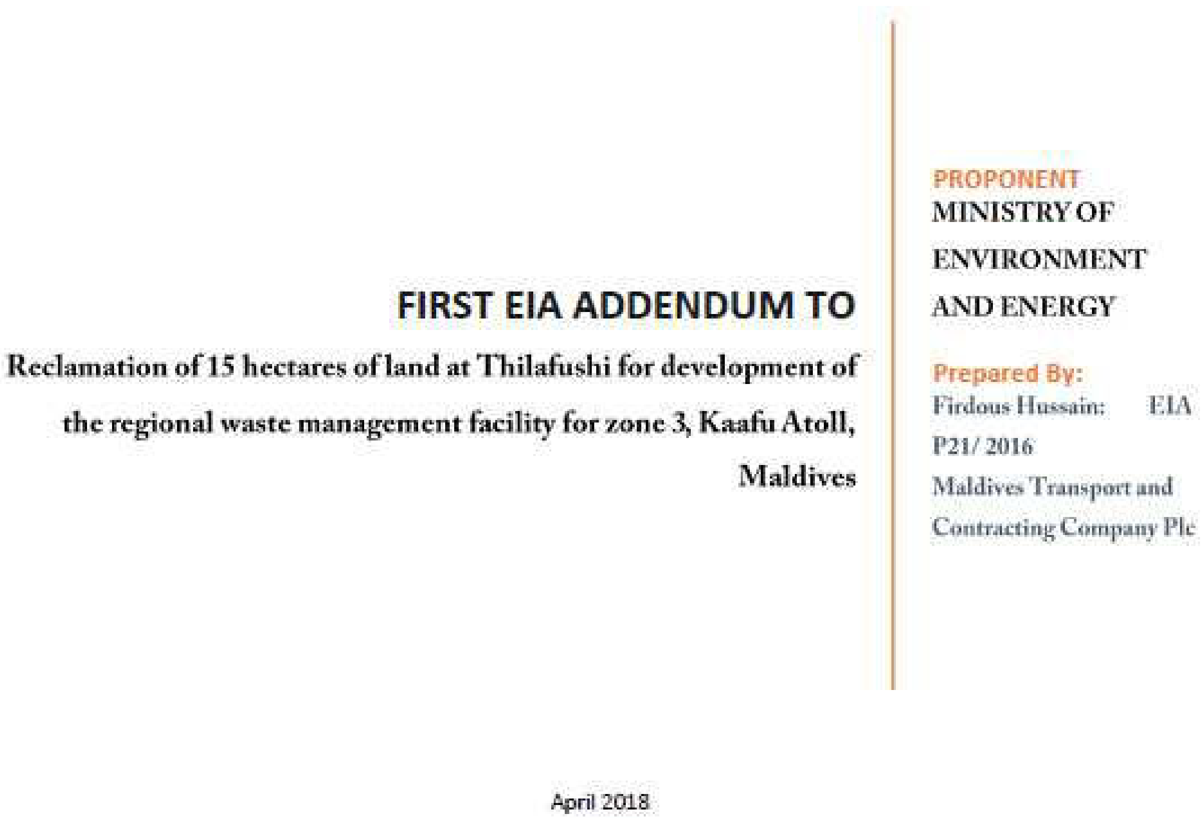
Designation: Director, Environment Assessment

މަޤާމް: ޑިރެކްޓަރ، އެންވަޔަރަމަންޓް އެސެސްމަންޓް

Signature:

ސޮއި:

Annex 3



FIRST EIA ADDENDUM TO

Reclamation of 15 hectares of land at Thilafushi for development of the regional waste management facility for zone 3, Kaafu Atoll, Maldives

PROPONENT
MINISTRY OF
ENVIRONMENT
AND ENERGY

Prepared By:
Firdous Hussain: EIA
P21/ 2016
Maldives Transport and
Contracting Company Plc

April 2018