

# FIRST ADDENDUM TO THE ENVIRONMENTAL AND SOCIAL ASSESSMENT REPORT

## Upgrading of Infrastructure at Regional Waste Management Facility Zone 2, Raa Vandhoo



Report Prepared by LaMer Group Pvt Ltd

Hussein Zahir

Shahaama A Sattar

Azim Musthag

January 2022

*Note: This report is referred to as Second Addendum to ESIA for North Regional Waste Management Facility Construction and Operation (ESIA 2012) as per the World Bank safeguard standards*

**First Addendum to the Environmental and Social Impact  
Assessment Report for Upgrading of Infrastructure at Regional  
Waste Management Facility Zone 2, Raa Vandhoo**

**Location: Vandhoo, Raa Atoll**

**LaMer Group Pvt Ltd**

**Hussein Zahir  
Shahaama A. Sattar  
Azim Musthag**

**Proponent: Ministry of Environment, Climate Change and Technology**

**January 2022**

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## **Consultants Declaration**

I certify that to best of my knowledge the statements made in this First Addendum to the Environmental and Social Impact Assessment report for Upgrading of Infrastructure at Regional Waste Management Facility at Zone II, R. Vandhoo are true, complete and correct.

Name: Hussain Zahir

Consultant Registration Number: EIA P04-2007

Signature:

A handwritten signature in black ink, appearing to read 'Hussain Zahir', with a horizontal line underneath.

Company Name: Land and Marine Environmental Resource Group Pvt Ltd

Date: 13<sup>th</sup> January 2022

# **Proponents Declaration**

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ



**Ministry of Environment, Climate Change and Technology**  
Male', Republic of Maldives



**PREVENT  
DOMESTIC  
VIOLENCE**

Date: 1 December 2021

No: 438-WMPC/203/2021/63

Ibrahim Naeem,  
Director General,  
Environmental Protection Agency,  
Green Building, Handhuvaree Hingun, Maafannu, Male', 20392,  
Maldives.

Dear Sir,

**Sub: Commitment to undertake Mitigation and Environmental Monitoring**

The First Addendum to the Environmental and Social Impact Assessment (ESIA) for the upgrading of infrastructure at Regional Waste Management Facility (RWMF) Zone II, Raa, Vandhoo (referred to as the Second Addendum as per the World Bank's standards) has been prepared in accordance to the EIA Regulations 2012 and its amendments issued by the Ministry of Environment, Climate Change and Technology.

We would like to confirm our commitment to the proposed mitigation measures and the monitoring programme that has been highlighted in the ESIA Addendum Report prepared for the above referenced project.

Sincerely,

Ahmed Murthaza,  
Director General

## **Executive Summary**

This First Addendum to the ESIA for Upgrading of Infrastructure at Regional Waste Management Facility Zone 2, Raa Vandhoo is formulated to address the proposed changes to the Masterplan and concept for Vandhoo RWMF. This report is referred to as Second Addendum to ESIA for North Regional Waste Management Facility Construction and Operation (ESIA 2012) as per the World Bank standards. The Chronology providing the historical background of Environmental and Social Process followed for Vandhoo RWMF is presented in the Introduction Section. The Addendum will assess the potential impacts associated with the following proposed changes of physical interventions to the site:

- Change to the proposed location of the fuel storage tanks;
- Arranging for Temporary fuel storage setup during construction;
- Minor extensions or connections to the road network as described in the initial ESIA (2012) and First Addendum (ESIA 2019);
- Preparation of a Traffic Management Plan; and
- Change of the sewerage system plan from a central system to a provisional septic tanks system to cater for the S2 staff accommodation block

The estimated investment cost of the proposed project is MVR 4 million. Funding for project has already been secured through grant money from the World Bank. During the formulation of the Addendum, it was identified that the installation of the septic as proposed is not feasible and hence the alternative (disposal of effluents to sea via outfall) is selected for this option. This alternative recommended for septic tank is estimated to cost an additional MVR 2 million to establish the provisional sewer network i.e. laying the pipes and the outfall. Hence additional financing needs to be sought from the local budget of the Government of Maldives for this component.

The overall objective of the Addendum is to determine whether the project is feasible in terms of the non-mitigable social and environmental impacts that would offset positive contributions from the proposed changes.

### **Key impacts**

Impacts on the environment during construction and operation of the facility have been identified through interviews with the project management team, field data collection and surveys. Assessment of the environmental impacts associated with project components has been carried out using the Rapid Impact Assessment Matrix (RIAM) which allows both subjective and quantitative assessment of the project components and natural environment to understand various impacts that

may arise from the project. The environmental components of the project are categorized into physical/chemical, biological/ecological, social/cultural and economic including operational aspects. The outcome of the matrix based on the project components against environmental components showed positive and negative outcomes. Significant negative impacts of the project are:

- Impacts due to vegetation clearance at fuel farm location and road extension areas
- Health and safety risks to the workers during construction and operational work (especially fuel farm operators)
- Potential impacts due to discharge of untreated effluent to ground
- Impacts due to presence of workforce (potential illegal immigrants, behavioural issues etc.)

Furthermore, while not an environmental impact, the proposed septic tanks has legislative impacts, due to non-compliance with the existing regulations with respect to this component.

### **Mitigation measures, monitoring and alternatives**

The ESMP identified in this document gives mitigation measures for all significant impacts due to the project. Mitigation measures such as the following have been identified in the ESMP:

- Transplant palms removed at Vandhoo and at Dhuvaafaru (location identified)
- Replant 2 palms for every palm which needs to be cut down at the allocated areas
- Ensure the temporary fuel storage setup is functional with the proper bunds in place and properly sealed containers
- Oil spill contingency plans should be formulated prior to work commencement
- Maintaining oil spill preparedness and response plan with recovery equipment
- Provision of all protective gear to workers during both construction and operations.
- Implementation of the Grievance Redress Mechanism which has been formulated by the proponent, both during construction and operations.

Monitoring programme identified in the report will enable the proponent to assess whether the mitigation measures which have been identified in the report are effective. Early identification of negative impacts will enable the proponent to rectify the issue.

Alternatives have also been discussed for road network extension areas, road paving methods and septic tank setup. The alternatives were assessed based on the environmental, social and economic aspects. After consideration of all alternatives, the proposed methods has been selected for the road paving method, while alternative options have been selected for the road network extensions and septic tank setup method, so as to conform to legislation.

The selected alternative for the septic tank component requires that all effluent (primary treated) is discharged to the ocean away from the reef, which is envisaged to have moderate impacts on the marine environment. Given that the effluent volume anticipated is small (due to low resident staff numbers at the facility), the release of primary treated (filtered effluents from septic tanks) to the marine environment is a viable option for the time being (given that the mitigation measures proposed are implemented as soon as possible). Hence, it is recommended for the septic tank system to be designed with provision for future connection to a treatment system (minimum secondary level treatment system to significantly reduce BOD) so that the nutrient in effluent disposed to the marine environment is further reduced to minimize the potential impact. Hence it is important that the proponent ensures development of the system as proposed.

To conclude, with due consideration to the environmental components identified and the extent of the project activities and their likely and predicted impacts identified, with proposed mitigation measures and monitoring followed, it is concluded that the project is feasible and justified.







# 1 Introduction

Solid Waste Management (SWM) and proper disposal has been a persistent issue in the Maldives for a long time. It may well be argued that this is the greatest challenge currently imposing on the fast-growing population of Maldives spread over 250 small islands. Improper handling and lack of proper waste disposal systems are not just a social nuisance but also a cause of a number of detrimental environmental impacts, especially on the marine environment, which drives the Maldivian economy.

In efforts to overcome this formidable challenge, the Government of Maldives took a decision to invest heavily in the waste sector with support from various donors and international agencies to build necessary infrastructure to develop an integrated and sustainable solid waste management system throughout the country on a zonal approach. This process was initiated in 2008 with the support of the World Bank Group, under the International Development Association (IDA) credit to develop an integrated SWM system for Zone II (Noonu, Raa, Baa and Lhaviyani Atoll) through the Maldives Environment Management Project (MEMP). This project was completed in 2015, by developing SWM systems on inhabited islands as well as a Regional Waste Management Facility (RWMF) in the uninhabited island of Raa Vandhoo for final disposal of residual wastes from Zone II islands (referred to more commonly as Vandhoo RWMF).

Following completion of MEMP project, the Government of Maldives applied for a grant from IDA for another regional waste management project under the title “Maldives Clean Environment Project” (MCEP), effective from September 2017. This project would also support investment activities in Zone II for operationalization of the facilities created under MEMP in Vandhoo.

The development of the facility at Vandhoo and further upgrades to the project area later, were carried out after the completion of a thorough Environmental and Social Impact Assessment (ESIA) in 2012 and a First Addendum to this ESIA in 2019 (considered as a standalone ESIA under the national Environmental Impact Assessment Regulation of the Maldives, since the validity terms of the 2012 ESIA had expired at the time of the preparation of the 2019 report (more than 5 years)). The First Addendum (ESIA 2019) was prepared to address impacts due to proposed upgrades to the facility, which were mostly changes to the storage and accommodation facilities.

The World Bank has agreed with the Government of Maldives to align the project safeguards requirements with the national requirements which allows for addendums to be done. The First Addendum completed in 2019 as a standalone report was cleared by the World Bank’s Regional Safeguards team. The ESIA process to date is summarized as follows.

- **The original ESIA conducted in 2012 prepared and financed as part of the Bank-Financed MEMP project**, implemented between 2008 to June 2016. The original ESIA was for the establishment of the Vandhoo-RWMF based on the BPEO and Feasibility Study for the Vandhoo RWMF. The ESIA was cleared by the EPA and the World Bank in 2013. The EPA of Maldives issued a decision note on 31st January 2013 and the World Bank approved the report in August 2013.
- **The First Addendum to the Original ESIA was prepared for the additional interventions introduced by and financed under MCEP in 2019**, which were mostly for storage and accommodation facilities. This standalone First Addendum Report was cleared by the Bank in 2019. The ESMP from this First Addendum is currently under implementation. The First Addendum was cleared by the World Bank on 10 June 2019. The report was also earlier approved by the Environmental Protection Agency (EPA) on 14 February 2019.

**This Second Addendum to the ESIA** will assess the potential impacts associated with the following proposed changes of physical interventions to the site:

- Change to the proposed location of the fuel storage tanks;
- Arranging for Temporary fuel storage setup during construction;
- Minor extensions or connections to the road network as described in the initial ESIA (2012) and First Addendum (ESIA 2019);
- Preparation of a Traffic Management Plan; and
- Change of the sewerage system plan from a central system to a provisional septic tanks system to cater for the S2 staff accommodation block

The estimated investment cost of the proposed project is MVR 4 million. Funding for project has already been secured through grant money from the World Bank.

## 1.1 Structure of the Addendum

The structure of the report is based on the Terms of Reference issued for the project (A copy of the Terms of Reference is given in Appendix 2). However, the sequence of these Sections is structured in a way that follows the iterative and systematic framework that is laid out by the RIAM method (described in Chapter 4), as well as to reduce the volume of the main body of the final Addendum. As a result, the Sections are structured according to the following sequence: -

Executive Summary

1. Introduction
2. Project Description

3. Policy, Legal and Administrative Framework
4. Methodology
5. Existing Environment
6. Stakeholder Consultations
7. Impact Assessment
8. Project Alternatives
9. Mitigation plan
10. Contingency Plan
11. Environmental Monitoring plan
12. Grievance Redress Mechanism
13. Conclusions and Recommendations

The proposed project involves changes to the concept plan discussed in the initial ESIA for the project (formulated in 2012) and the ESIA for the upgrading of the facility formulated in 2019. Given that the scope of work is small and is a part of what was discussed in the First Addendum (ESIA of 2019), an Addendum application for the proposed work was submitted to EPA. A draft Terms of Reference (TOR) was also submitted with the application. This TOR which had earlier been cleared by the Regional Safeguards Specialist (RSA) of the World Bank on 28<sup>th</sup> August 2021 was finalised and approved by EPA on the 26th of September 2021 (A copy of the Terms of Reference is given in Appendix 2).

## **2 Project Description**

### **2.1 The proponent**

The proponent of the proposed project is the Government of Maldives, who will implement the project through MoECCT. Financing of the project has already been secured through grant money from the World Bank.

### **2.2 Project objectives and components**

The proposed project will address the upgrading of ancillary facilities at the RWMF that has been identified via an assessment of operational needs at the site conducted under the MCEP project and updates from the Original Master Plan for the RWMF. This Second Addendum will assess the potential impacts associated with the following proposed changes of physical interventions to the site:

- Change to the proposed location of the fuel storage tanks;
- Arranging for Temporary fuel storage setup during construction;
- Minor extensions or connections to the road network as described in the original ESIA and the First Addendum (ESIA 2019);
- Preparation of a Traffic Management Plan; and
- Change of the sewerage system plan from a central system to a provisional septic tanks system to cater for the S2 staff accommodation block

Information used for the preparation of this, and subsequent Sections of the Addendum is cited in the subsections that follow and the referenced material can be found in the bibliography section in this report.

### **2.3 Land requirement**

Even though state owned, the island of Vandhoo was historically leased by Raa Atoll Council. On August 2010, an area of 0.15 km<sup>2</sup> (15 ha) was allocated for construction of the RWMF on this island (Riyan and NIRAS, 2012). However, as a bigger area was required for further upgrades in 2019, as well as for the expansion of waste management facility to Zone I islands, the whole island was then handed over to the Ministry of Environment (details and Land acquisition letter issued from the President's Office to the Ministry given in First Addendum (2019 ESIA) (LAMER Group, 2019)).

The proposed new location for developing the fuel storage tanks and associated road extension for access to this area are within the initial 15ha area of the facility. The other proposed road

extensions to provide access to 14A (land fill proposed for future development) and 11C (recycling and baling plant proposed for future development) are within the area proposed for the facility expansion in the 2019 ESIA cleared by the EPA and the World Bank for the requisite utilization. The septic tank will be placed within the land area allocated for staff accommodation facilities, also addressed through the 2019 ESIA. Hence, no additional permits are required with respect to land area and usage.

## 2.4 Need and justification of the project

The need for the different component proposed at RWMF is justified as follows:

- Relocation of fuel tanks: the fuel tanks located at the existing waste sorting area (Building 09A in Figure 1) will be relocated to Building 05 in Figure 1. The existing fuel storage tanks are required to be decommissioned and moved to the location of the new fuel farm to accommodate for the completion of building 9A in the Master Plan where the sorting line is proposed to be installed. The new fuel farm will have a total capacity of 124m<sup>3</sup> versus the existing 24m<sup>3</sup>. This increase of diesel storage capacity is required with the additional developments and the expansion of the facility proposed and addressed under the First Addendum (ESIA 2019 for upgrading of the facility), and additional equipment and vehicles to be brought to the island with the anticipated expansion of operations.
- The temporary fuel storage setup proposed will ensure that fuel transfer is unhindered during construction phase and that this transfer can be carried out without the need for a long hose stretching across the site from the harbour to the Powerhouse especially during construction phase
- Minor extensions or connections to the road network are required to provide access to area 14A (land fill proposed for future development) and 11C (recycling and baling plant proposed for future development) and also to provide a circuit route around the facility for easy access to all infrastructure. The traffic management plan which has been provided by the Consultant will ensure that traffic flow within the facility runs smoothly, especially during operations.
- The First addendum (ESIA 2019) proposed to setup a central sewerage system at the site, considering the proposed addition of one S2 type staff accommodation block, four S3 type staff accommodation blocks and guest/consultant accommodation buildings then proposed, which was envisaged to increase the work force / residential population of the facility. However, a central sewer system is not required at this stage, since only the S2 accommodation block is considered to be developed, which is expected to increase the residential population only by approximately 50 people. Hence the proponent proposes to construct a provisional septic tank system, with reservations in place to enable connection to a sewerage network and STP in the future, if required.

## 2.5 The Project

The proposed project addresses changes to the concept of the existing waste management facility, further to the changes discussed in the First Addendum (ESIA 2019). Scope of work includes the following:

1. Change to the proposed location of the fuel storage tanks
2. Arranging for Temporary fuel storage setup during construction
3. Minor extensions or connections to the road network as described in the original ESIA and the First Addendum (ESIA 2019);
4. Preparation of a Traffic Management Plan; and
5. Change of the sewerage system plan from a central system to septic tanks system

Figure 1 shows the locations of fuel tank and septic tank, as well as proposed road connections. Schematic of the existing facilities and proposed facilities are detailed in the drawings on Appendix 3 of this report.

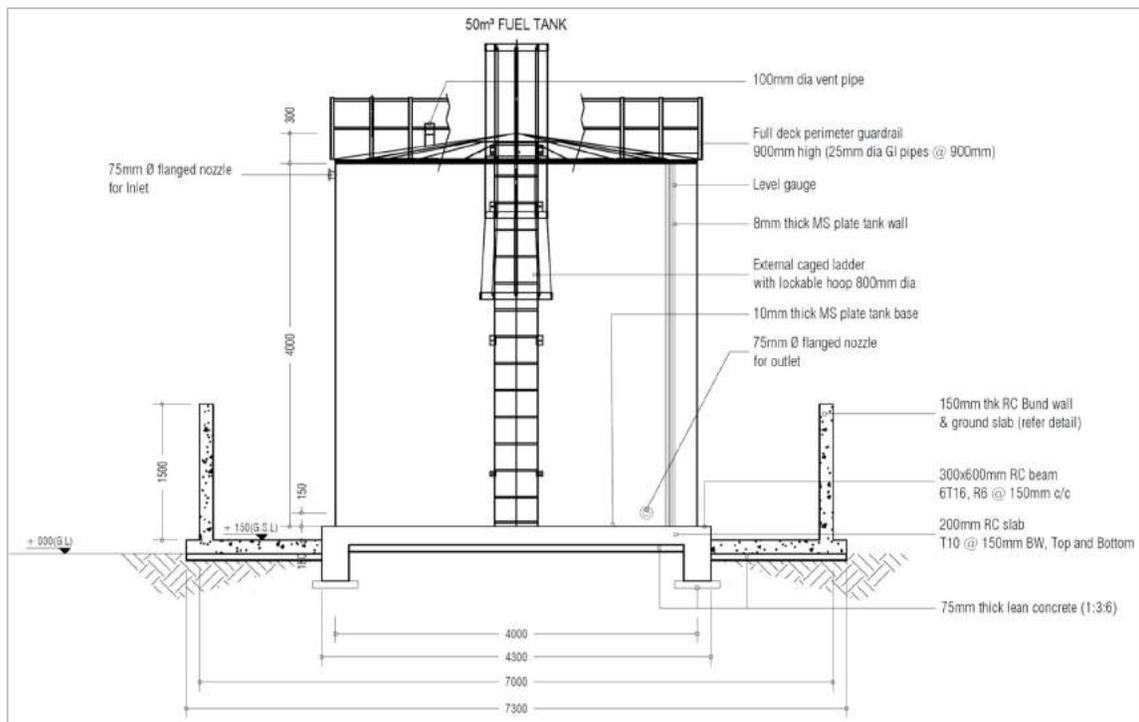


**Figure 1. Proposed location of fuel tanks (yellow highlight), septic tank (green highlight) and road connections (red hatch). The purple hatch shows roads proposed in earlier reports**

### 2.5.1 Change to the proposed location of fuel storage tanks

The fuel storage tanks are to be located on the northeastern side of the island, within the area initially developed in the 15ha (Figure 1). An area of approximately 150m<sup>2</sup> has been allocated for the purpose (dimensions of the plot are given in Figure 2, Appendix 4 gives large scale drawings of the design).





**Figure 3. Fuel tank design**

Pipes will be laid underground in trenches (Figure 4). The pipeline from the harbour front area to the fuel farm will be laid in Trench of depth 550mm and width 850mm. The trench has RC walls and a cover, all with a thickness of 150mm. All 4 pipelines (for diesel inlet / outlet and used oil inlet / outlet) will be laid alongside each other on a PVC pipe support slab (50 mm thick). The pipelines all have a diameter of 75mm and are 3mm thick.

The pipeline from the fuel storage area to the powerhouse will be laid on concrete support, although a segment of it close to the powerhouse will be in a 550mm deep, 600mm wide trench (type C). Designs of the fuel trenches are given in Figure 5 and Appendix 4.

The pipeline plan inside the fuel storage area is shown in Figure 6 (larger diagram in Appendix 4), which shows that the inlet pipeline for both diesel and used oil, connect to the respective storage tanks, with the diesel inlet pipeline having 3 separate connections to the three storage tanks. From the storage tanks, a pipeline runs to the respective pump within the facility. Pipeline going out from the pumps connect to the main pipeline and continue as shown in Trench layout diagrams.

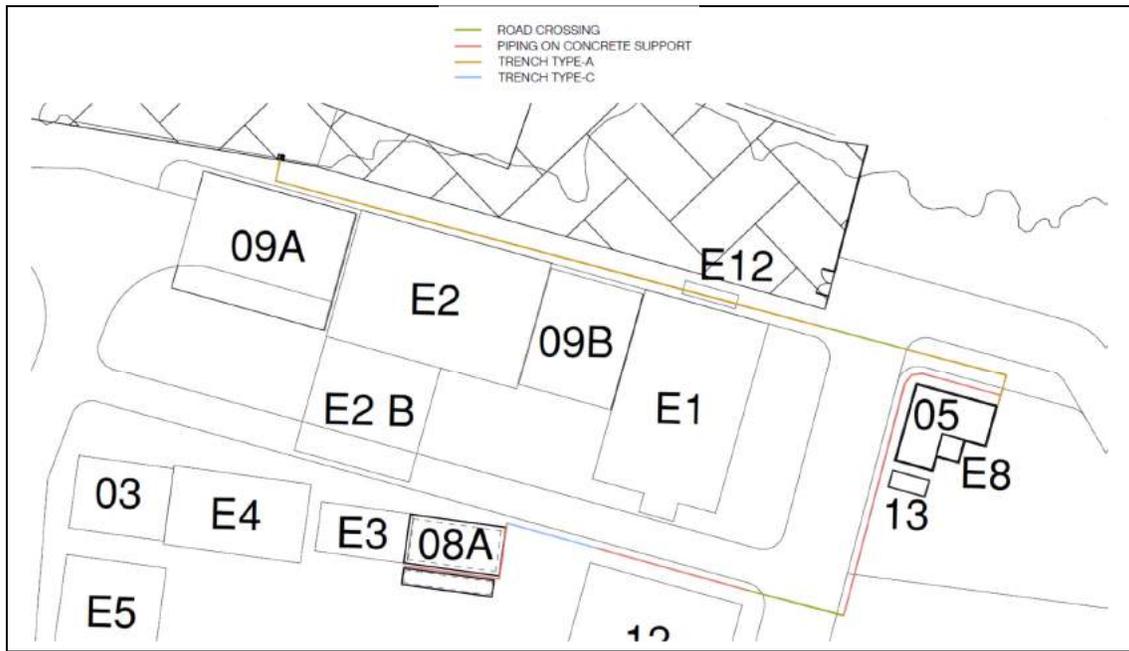


Figure 4. Fuel pipeline from harbor to fuel storage tanks and from fuel storage tanks to powerhouse

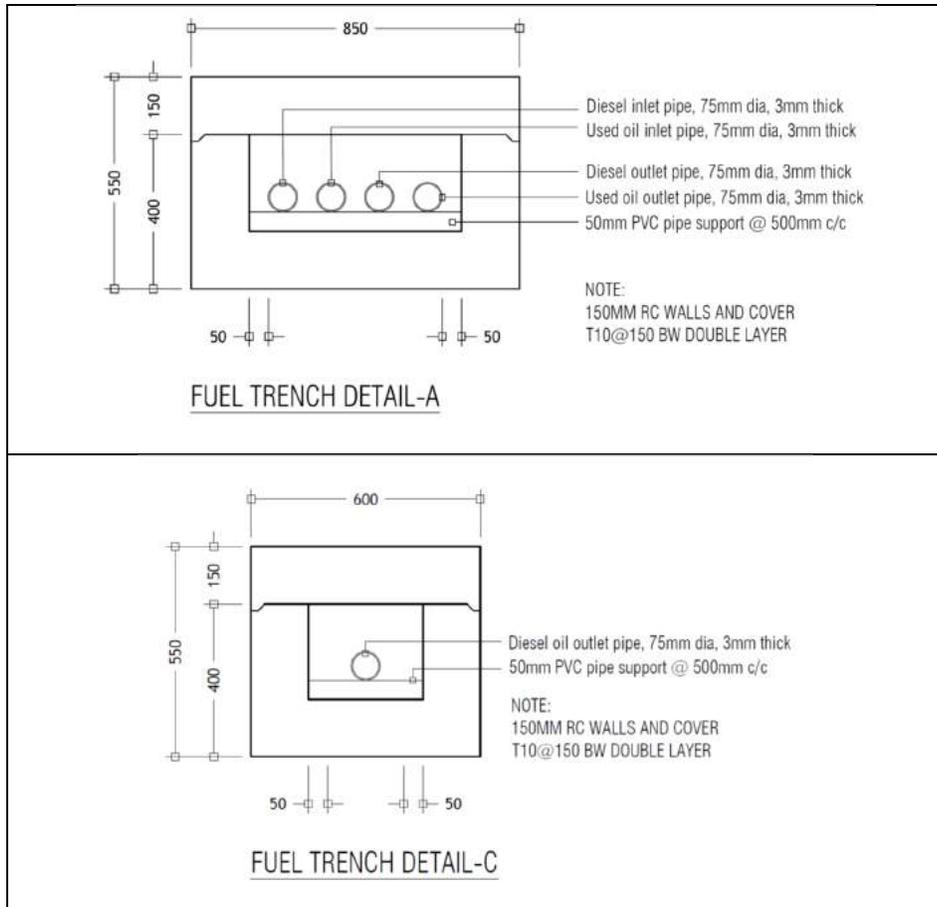
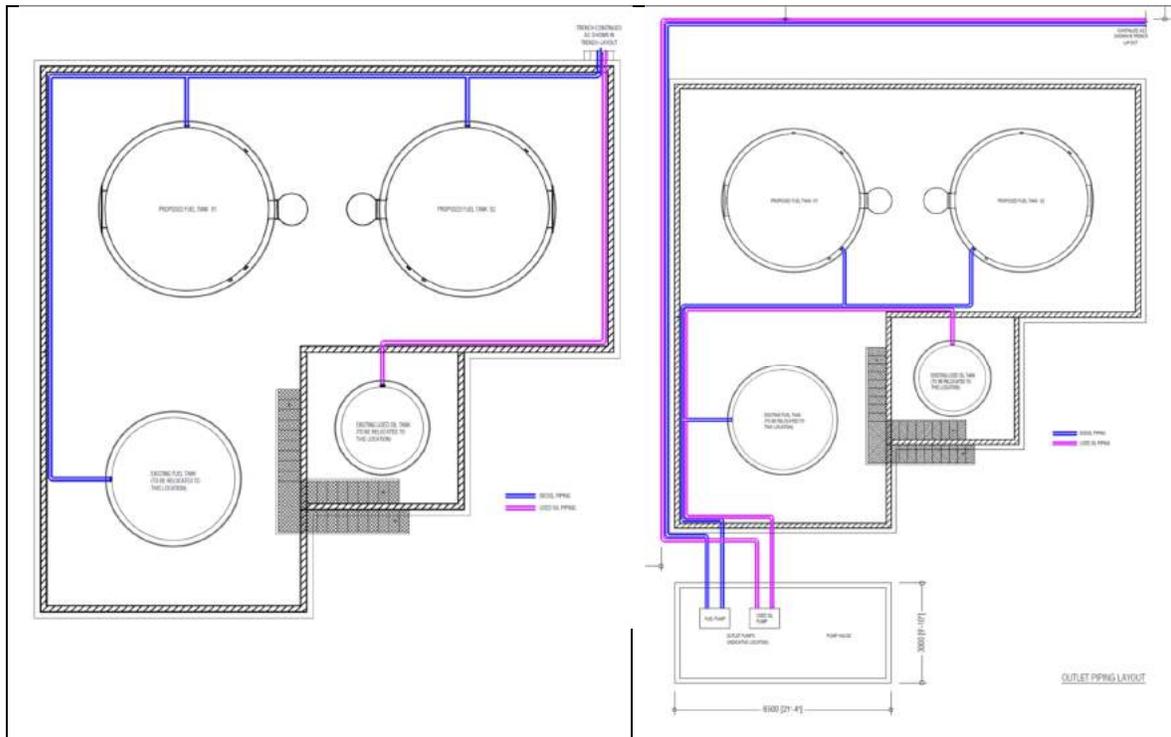


Figure 5. Trench layout diagrams (large scale diagrams given in Appendix 4)



**Figure 6. Piping plan inside the fuel storage area (pink: used oil pipeline, blue: diesel pipeline) (Left: Inlet piping plan, Right: outlet piping plan) (large scale drawings given in Appendix 4)**

A 150mm thick bund wall and ground slab will first be constructed at the location proposed for fuel tank construction. The bund wall has a height of 1.5m. Once the bund wall is completed, the fuel tank (50m<sup>3</sup> steel tanks) will be installed at the proposed location using a crane. Concrete bund wall is designed to encase any leak from the tanks; the volume encased by the bund walls will be able to hold the full volume of the storage tanks.

Although the fuel tanks are proposed to be moved to an area within the initially allocated 15ha of land on Vandhoo, the area was at the time demarcated for future use and hence not cleared. Details of vegetation present at the site and that which need to be cleared is given in Section 5.4.1 of this report. Key types of vegetation found were Coconut palms and Pandanus trees. Vegetation clearance will be undertaken with the use of excavators and wheel loaders and as per the guideline provided by PMU (given in 5). As the whole island of Vandhoo has now been handed over to MoECCT, all vegetation on the island belongs to the Ministry and hence there is no requirement for payment of compensation for any vegetation which needs to be cleared.

### 2.5.1.1 Fuel transport arrangement

Given that the relocation of the fuel storage tanks is an important feature of this Second Addendum, further information is provided here on the context and need behind the fuel tank requirements.

In the feasibility study and the 2012 ESIA, it was originally determined that a 24m<sup>3</sup> of diesel storage capacity will be sufficient to cater for the power requirements of the RWMF (i.e. for the start-up of the incinerator, operations of the 250KVA generator and fueling of the vehicles) under the initial scope of 15ha footprint area. Considering the additional developments and the expansion of the facility proposed and addressed under the First Addendum (ESIA 2019), and additional equipment and vehicles to be brought to the island with the anticipated expansion of operations, it was determined that the diesel storage capacity of Vandhoo should be significantly increased. Extra power was required for the operations of the proposed RO plant under increased capacity, planned staff accommodation blocks and staff facilities, a sorting line, weighbridge, glass crusher, woodchipper and mobile shredder, and the baler that has been installed and currently in operations. To facilitate this, a second 250KVA generator was installed and commissioned in Q4 of 2020 (covered in First Addendum). Furthermore, the expansion of operations involves vehicles which all need diesel to operate.

It is noted that when the Waste to Energy (WtE) boiler is fully operational it is expected to generate the electricity required to power up the entire island including present and future developments. However, the diesel generators installed are required as a backup power source, and are essential to prevent the facility-based island from going into total blackout for a prolonged period of time. Since other parts of site operations rely on this power it is needed to ensure the facilities can operate without the WtE running. Backup power supply is also required when a fault occurs with the WtE or when it is shut down for periodic servicing and maintenance. Most of all, the backup power source is absolutely vital as health and safety measure to mitigate against a sudden power failure of the WtE which could lead to a catastrophic failure of the boiler system if the backup power system were not in place.

In addition to this, the increased fuel storage capacity addressed by the First Addendum will significantly reduce the number of trips the fuel vessel has to come to Vandhoo. At present, fuel is supplied to Vandhoo by the fuel transport barges of Fuel Supplies Maldives operating in the North Region. The reduction in number of trips required will minimise the risk of spillage and associated impacts to marine biodiversity. It will also assist in reducing the carbon footprint generated by marine logistics. The fueling vessel takes up critical space within the small island harbour when delivering fuel and each transfer can take 2 to 3 hours. This creates a bottleneck with other vessels having to wait outside the harbour to load/offload waste materials.

The refueling frequency of the existing small storage tanks are twice a month, which is equivalent to 24 trips per annum. When the fuel storage capacity is increased to 124m<sup>3</sup> the refueling frequency is expected to be reduced to only 4 trips per annum. Moreover, at present the landing crafts (waste transfer vessels) providing collection services across Zone 2 islands and resorts are refueled separately either directly from the fuel vessel docked at Vandhoo harbour or from Male' region considering the current limited fuel storage capacity at Vandhoo. These 250-ton and 200-ton capacity landing crafts require 10m<sup>3</sup> of diesel to fully refuel the vessel tanks, while the 25-ton capacity landing craft requires 3m<sup>3</sup>. Two additional landing crafts are proposed to be added to the vessel fleet in the near future (Q3 of 2022).

### 2.5.2 Temporary fuel storage setup

It has been proposed to site 2 tanks outside site E2 (midway) surrounded by a concrete bund. One (1) tank will connect to the existing fuel line that runs to the incinerator. The second tank will be the holding tank for Powerhouse fuel. The tanks have a total capacity of 10,000L and are made from Medium Density Polyethylene.

In order to safely transfer the fuel from the powerhouse holding tank near E2 to the Powerhouse it is proposed to construct a portable bund (movable by the forklift) made of wood with an impermeable membrane inside and which can hold 2 of 200L steel drums (which are not open topped and have a screw cap). Fuel from the holding tank is transferred to the drums using an appropriately fitted tap and short hose. The Powerhouse uses approximately 450L per day. The drums will be taken to and from the powerhouse in the bund with the use of a forklift. The proposed route for the forklift movement is from E2, around Building 09A, along the short road and then left at the Vehicle extension shed 03 and then around the back of the Powerhouse (Figure 7).

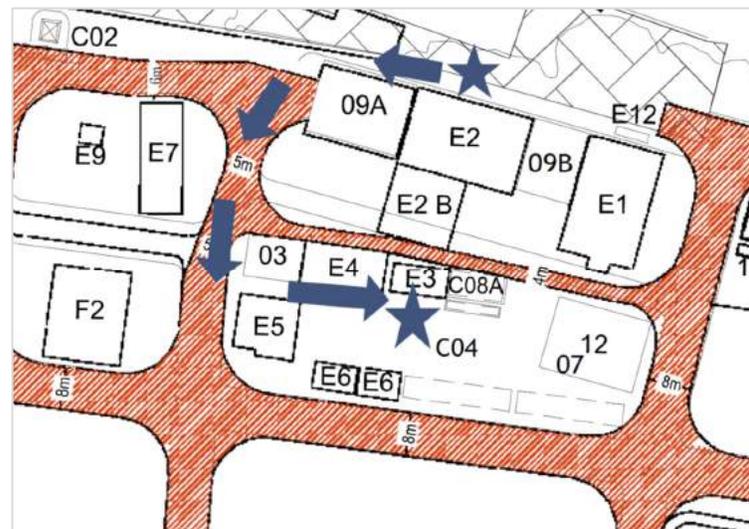


Figure 7. Proposed route for forklift movement (temporary fuel storage setup) (large scale drawing in Appendix 4)

Once the filled up drums are taken to the powerhouse, the fuel will be transferred to the powerhouse tank which can hold 1,000L. This could be done once a day and eliminates the need for a long hose stretching across the site from the harbour to the Powerhouse (thus minimizing ground pollution impacts as well as that on the site operations).

The existing fuel storage tank will be emptied (transferred to the proposed 200l drums) and cleaned and temporarily stockpiled at the proposed area for construction of new fuel storage tanks. It will be re-erected and commissioned after construction of the concrete slab of the fuel storage area is completed. Temporary fuel storage arrangement will be in place from the time of decommission of the existing fuel storage tank till the new fuel storage tanks are established. This temporary arrangement is expected to be in place for a period of one-year. Key personnel involved in this setup would be the fuel farm operator/ powerhouse staff and Engineer on site.

The bund around the tanks near E2 and the portable bund will ensure emergency leak management. The volume encased by the bunds will be able to hold the full volume of the storage tanks.

### **2.5.3 Minor extensions or connections to the road network as described in the original ESIA (ESIA 2012) and the First Addendum (ESIA 2019)**

Road extensions are proposed to provide access to the proposed new location for developing the fuel storage tanks (from both sides) and to site 14A (land fill proposed for future development) and 11C (recycling and baling plant proposed for future development) (red hatched roads in Figure 1). All these extensions are within the area initially included in the 15ha (2012 ESIA) and the area proposed for the facility expansion in the First Addendum (ESIA 2019) cleared by the EPA and the World Bank for the requisite utilization. The creation of the new road connections will also form a circuit route around the facility, enabling easy traffic movement.

All the roads proposed will be asphalt paved and have a width of 10m and are 2 lane roads, where traffic can flow in both directions. The roads will have a 2m green zones and curb stones on both sides. However, only one side will have a 1.2m sidewalk pavement and 0.8m green zone while the other side will have a dirt pathway / green walkway path where the mature/big trees will be retained (only the shrubs will be cleared on this side). Additionally, as stated in the First Addendum (ESIA 2019), provision for pipelines for utility services under the road will be provided. Typical road section is given in Figure 8 below with large scale drawing given in Appendix 6 of this report.

The traffic flow directions are given in the traffic management plan layout given in Appendix 7. The road is proposed to diverge near the Banyan Tree (marked as BT on site plan), with 4m

road on either side of the tree, so as to allow road construction without the need for removal of the tree.

Majority of vegetation to be cleared under proposed work were found along the road extension areas with a total of 74 Coconut palms observed. Additional types of vegetation observed include Pandanus trees, Country Almond and Sea hibiscus (details given in Section 5.4.1). Vegetation clearance will be undertaken with the use of excavators and wheel loaders and as per the guideline provided by PMU (given in Appendix 5).

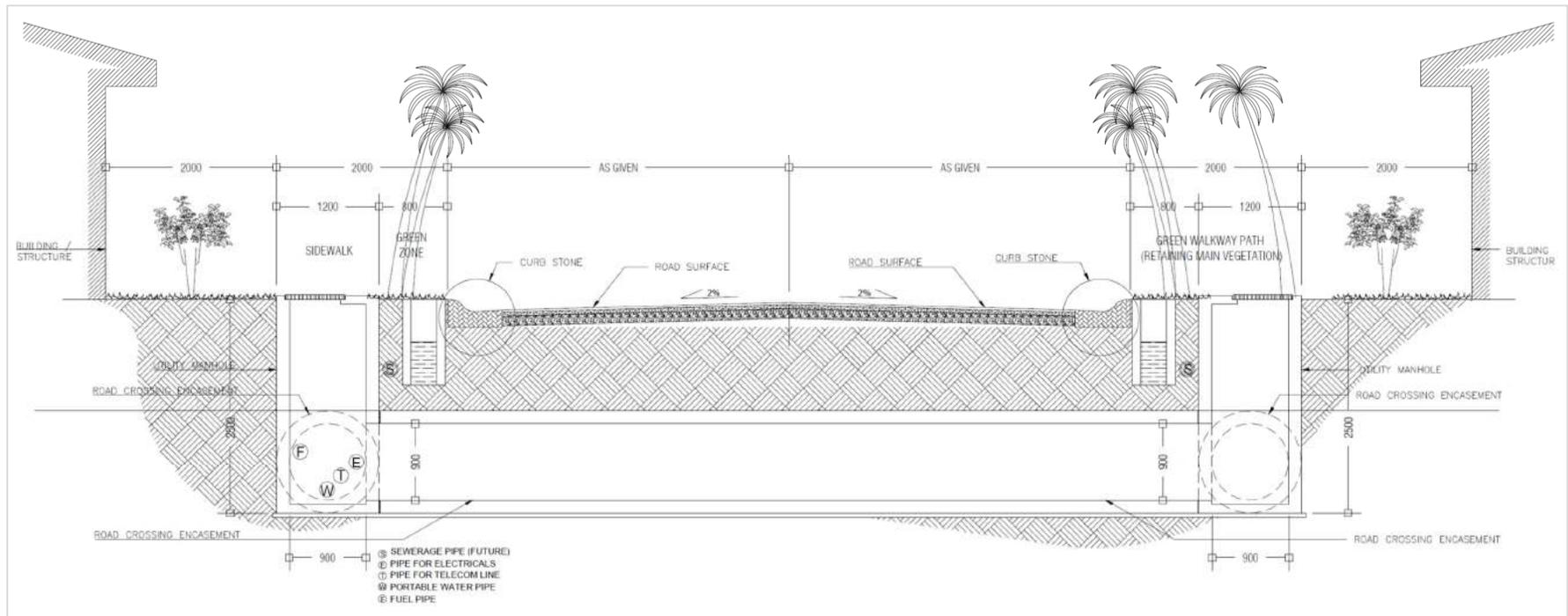


Figure 8. Road cross section (large scale drawing given in Appendix 6)

## 2.5.4 Traffic Management Plan

The expansion of the facility and its operations means that additional equipment and vehicles will also be brought in for operations. The vehicles which are at present being utilized at Vandhoo RWMF are:

- wheel-loader
- 1 skid-steer loader
- forklifts
- 1 Dump truck
- 1 Telehandler

In addition to these, the following will be brought in the near future

- 1 Wheel loader
- 1 Backhoe loader
- 1 Dump truck
- 1 Excavator
- transfer vessels / Landing crafts

A traffic management plan Vandhoo RWMF has been formulated by the Ministry's International Operations Consultant at Vandhoo RWMF (the plan is provided in Appendix 7, together with the traffic management plan layout). As stated in the document, the "Purpose of the document is to provide a narrative to be used in conjunction with the Traffic Management Plan Layout (TMPL). The TMPL defines the safe areas for movement of vehicles, equipment and pedestrians in and around Vandhoo Waste Management Facility". The plan highlights the following sections, while the traffic flow directions are given in the TMPL.

1. Visitor procedures
2. Speed limits
3. Direction of traffic
4. Waste deliveries
5. Supply deliveries
6. Fuel deliveries
7. Movement around the facility
8. Emergency assembly points

The different traffic signages which will be placed on the roads are the standard road signages such as:

- Speed sign boards (10 and/or 5mph as per Traffic Management Plan given in Appendix 7)
- "One Way" sign boards
- "No Entry" sign boards



**Figure 9. Examples of sign boards to be used at the site; Speed sign board (left), One Way sign board (centre) and No Entry signboard (right)**

As per information provided by the RWMF operator, exact locations for placement of these sign boards are not available at present, as the roads have not been developed. These will be finalised once the roads have been cleared and paved and will be communicated to all relevant parties at that stage.

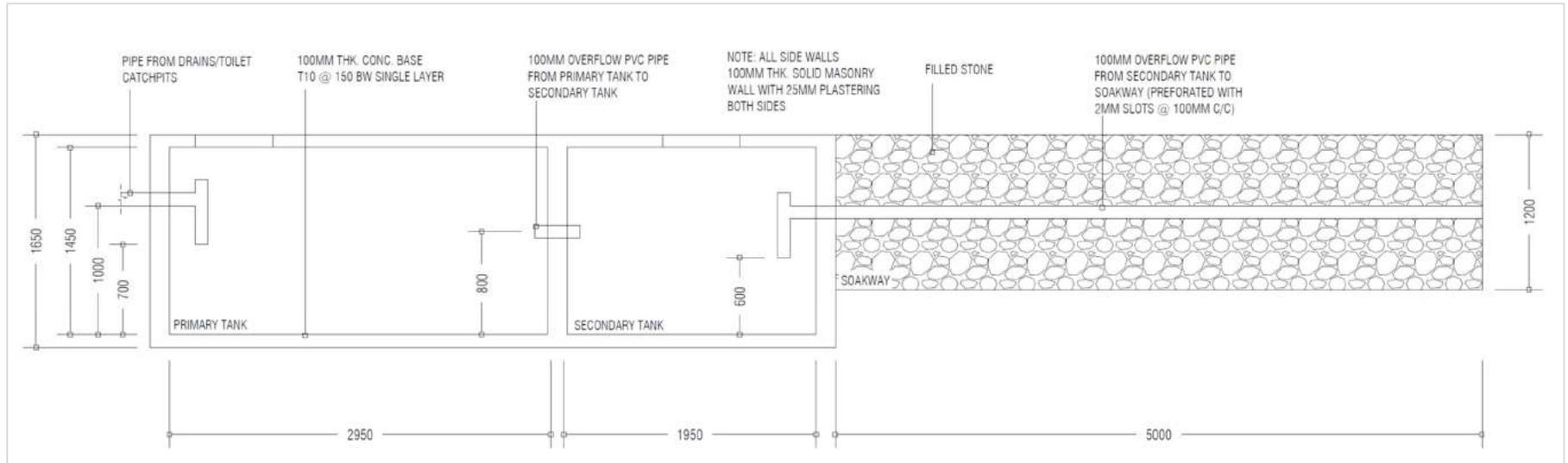
As described in Section 2.5.3, all the roads will have a 2m green zones and curb stones on both sides and a 1.2m sidewalk pavement and 0.8m green zone on one side. The other side of the road will have a dirt pathway / green walkway path where the mature/big trees will be retained (only the shrubs will be cleared on this side).

### **2.5.5 Change of the sewerage system plan from a central system to septic tanks system**

The septic tank is proposed to be located at the Staff Village, near the staff facilities building (see Figure 1). Construction of septic tanks are proposed to manage the sewage generated, as at present there is no need for a central sewerage network (due to the small sized workforce). The design of the septic tank will be made with provision for future connection to a STP or a central system (if and when required).

The septic tank being designed is consistent to Guidelines given in Annex D of the General Guideline: Domestic Wastewater Disposal (URA 2002:2021). The tanks will be constructed to ensure water tightness. Waterproof paint will be used on the masonry wall. The septic tanks consist of a primary tank of dimensions 2.95m by 2.2m and secondary tank of dimensions 2m by 2.2m. Both tanks are made of 100mm thick solid masonry wall with 25mm plastering on both sides. The

primary tank is 1.65m deep. The primary tank is connected by a 100mm diameter PVC pipe to the secondary tank of the same depth. There are two 100mm overflow PVC pipes going from the secondary tank to the soak way (perforated with 2mm slots) (Figure 10).



**Figure 10. Schematic of the septic tank proposed (large scale drawing given in Appendix 8)**

The 'primary tank' facilitates 'primary treatment'. The separation of liquids and solids by gravity - to take place. Raw sewage flows into the tank and the heavy solids, 'sludge', sink to the bottom, lighter solids, grease and oils or 'scum' float to the surface. Some of the sludge is degraded by naturally occurring anaerobic (without oxygen) bacteria. The liquid effluent flows to the secondary tank which has two 100mm overflow PVC pipes going from the secondary tank to the soak way to allow for discharge of liquid effluent into the land.

The most environmentally sound method for disposing the domestic sludge is allowing it for drying in a sludge drying bed. The dry sludge can be used following appropriate treatment. It can also be incinerated in the W2 module post drying as feed or used as compost for plant growing on site or landscaping. Sludge will be dried on a sludge drying bed. The proposed septic tank requires sludge removal once every 3 years.

## **2.6 Construction phase**

No demolition works is required for the proposed works although tank decommissioning (temporary) will be carried out. As stated earlier, the existing fuel storage tank will be emptied (transferred to the proposed 200l drums) and cleaned and temporarily stockpiled at the proposed area for construction of new fuel storage tanks. It will be re-erected and commissioned after construction of the concrete slab of the fuel storage area is completed.

Vegetation clearance is also necessary for the proposed plots and roads. The extent of vegetation clearance and types of vegetation to be removed are specified in section 5 of this report.

### **2.6.1 Major Inputs and Outputs**

#### **2.6.1.1 Inputs**

#### **Access to site, mobilization and material unloading**

Construction material for the project will be brought to the island on bigger vessels. Materials will be unloaded to the island at the existing harbor. Construction materials will be temporarily stored at the areas indicated on Figure 11 below (between building E1 (Incinerator) and 12 (waste storage shed)) as identified by the RWMF operator as the most optimal area for setup of temporary facilities for the construction duration.



**Figure 11. Recommended areas for temporary material storage (yellow highlight)**

### **Construction methodology**

The construction methodology and equipment planned to be utilized for the works proposed under this development is summarized in the inputs and outputs table below.

**Table 1. Inputs and Outputs for the proposed project**

<b>Inputs</b>			<b>Outputs</b>
<b>Materials</b>	<b>Equipment</b>	<b>Source</b>	
Steel rolled tapered panels (RTP panels)	Hydraulic jacks (tank erection) Excavator (foundation works)	Sourced locally if available or imported	Fuel storage tanks and pipeline
Tar/Asphalt	Conventional civil construction methods employed in Maldives		Paved roads
Cement			Foundation slab / Bund around fuel tank / septic tank
River sand			
Aggregate			
Timber			
Canvas / other impermeable material			

Conventional civil construction methods employed in Maldives will be used to pave the roads and construct the bunds and septic tank system. Mobile concrete machine will be used for concrete mixing, only a limited heavy machinery will be mobilized due to small scale of the project. Water for construction will be sourced from existing RO plant on the island.

## **2.6.2 Workforce, logistics and other considerations**

An estimated 15-20 workers will be involved in the various stages of the construction work. As per typical contractor workforce, the workforce will be comprised mainly of foreign workers (approximately 60% expatriates to 40% locals). Recruitment process of the workers/contractors will comply with the World Bank's tender process as well as the National Competitive Bidding process and the National labour laws. Workforce accommodation facilities will be arranged by respective contractors in nearby islands Rasmaadhoo and/or Innamaadhoo, at rented houses / guesthouses. Daily back and forth ferries are arranged by the Ministry for Vandhoo civil workers and these can be used by the workforce. Ferry timings are as below:

- Departure from the respective accommodation island 7:30AM
- Departure from Vandhoo 6:00PM

The contractors will make a temporary hut at Vandhoo close to the work site, where they can rest and eat. The location for temporary setup as identified by the operator of the RWMF has been given in Figure 10. Existing toilets will be used. A specific toilet is reserved at Vandhoo for workers of contractors undertaking civil works on the island.

Lunch is prepared at the accommodation island by the contractor and brought to the work site daily along with snacks and drinking water. Breakfast and Dinner is taken at the accommodation island (prepared at the building where they stay).

### **2.6.2.1 COVID 19 Special Considerations**

Special considerations with respect to COVID 19 when setting up the work site and accommodation facilities include measures such as the following. These have been sourced from the COVID19 Special Considerations in civil works contracts document prepared by the PMU (given in Appendix 9 of this Addendum).

- Identification of a focal point to ensure that the COVID-19 preventive measures are being enforced
- The contractor must ensure that the project team is fully equipped and geared to take preventive measures against the potential spread of COVID19 (PPEs and cleaning items such as thermometers, masks, gloves, disinfecting cleaning liquid, soap, sanitisers etc.).

- The accommodation facility must be properly ventilated and social distancing norms must be facilitated.
- Use of foot operated lidded bins at accommodation facilities
- Provision of adequate hand sanitisers at the accommodation facilities
- Daily cleaning of the accommodation facilities.
- Establish handwashing facilities at the work site and eating or resting areas and ensure handwashing facilities toilets, kitchen and dining area are supplied with soap, disposable paper towels and closed waste bins.
- Daily temperature checks to be made and recorded prior to leaving the stationed island
- Restricted movement of contractor workforce from harbor to worksite and back to the harbor (to avoid direct contact with Vandhoo staff or other workforce)
- The tools and equipment used by the workers must be cleaned when changing shifts.
- Cleaning staff shall use appropriate PPEs such as masks and gloves.
- Any waste produced during the care of ill workers should be collected and disposed of according to the SOPs of HPA and WHO.
- Provide daily briefings to workers prior to commencing work, focusing on COVID-19 specific considerations and place posters and signs around the site, with images and text in workers' local languages providing guidance on signs and symptoms of COVID-19, how it is spread, how to protect themselves and what to do if they or other people have symptoms.

These and additional measures are also included in the Mitigation table given in the report.

#### **2.6.2.2 Preventing Sexual Harassment and Gender Based Violence**

The Contractor hired for the work have to sign and abide by the “Company Code of Conduct - Implementing Environmental, Social, Health and Safety (ESHS) and Occupational Health and Safety (OHS) Standards and Preventing Gender Based Violence” (given in Appendix 10 of this Addendum). Key points in the document include:

- Identification of a ‘Focal Point’ for addressing ESHS, OHS and gender based violence (GBV) issues.
- All forms of GBV, are unacceptable, regardless of whether they take place on the work site, the work site surroundings, at worker’s camps or within the local community.
- Sexual harassment of work personnel and staff (e.g. making unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature) are acts of GBV and are prohibited.
- All employees, including volunteers and sub-contractors are highly encouraged to report suspected or actual acts of GBV by a fellow worker, whether in the same

company or not. Reports must be made in accordance with project's GBV Allegation Procedures.

- Managers are required to report and act to address suspected or actual acts of GBV as they have a responsibility to uphold company commitments and hold their direct reports responsible.

Additionally, all contractor workforce who will be mobilized to Vandhoo have to sign and abide by the "Individual Code of Conduct - Implementing ESHS and OHS Standards Preventing Gender Based Violence". This document is also given in Appendix 10.

WAMCO (the operator) also has a separate Sexual Harassment policy which is quite detailed and formulated under the Sexual Harassment Act (Law No. 16/2014) and its subsidiary Sexual Harassment Regulation (2014/R-377) of the Maldives. The policy defines procedures on increasing staff awareness on GBV and SH related issues and establishes procedures and protocols on how GBV and SH incidents will be identified, investigated and resolved. It also includes corrective actions, penalties and sanctions to be taken following investigation. The Policy and procedures in dealing with GBV are publicly displayed in Vandhoo RWMF, for all staff to be familiar with and hard copies of SH complaint forms are readily available from WAMCO's Vandhoo office.

The Grievance Redress Mechanism given in Chapter 12 shows the grievance redress procedure in place, identifying nodal point of contact, facilitation by the project and timeframes to address grievances.

### **2.6.3 Fire Hazard, Health and Safety**

#### **Fire hazard**

A firefighting system for Vandhoo RWMF was developed earlier this year, although has not been installed as yet (Riyan Pvt Ltd. 2021). As per this system, the following fire protection devices and firefighting equipment will be installed around the island.

- Fire hydrant system for the whole island
- Deluge system for high hazard areas
- Foam fire protection system for areas where oil is stored / used
- Aerosol fire suppression
- Portable fire extinguishers; air-pressurized water, carbon dioxide (CO<sub>2</sub>), and dry chemical

In order to detect fires, a complete analogue addressable, zoned and electrically supervised, Class A, multiple loops fire alarm and detection system, including initiating device and notification

appliances is proposed for the whole waste management facility. The fire detection and alarm system consist of the following,

- Addressable analogue Fire detection & alarm control panel.
- Smoke & heat detectors
- Thermal Imaging Sensor
- Flame Detector
- Manual pull stations (break glass type)
- Electronic Hooters cum strobes
- Conduits / wiring

From the above, the flame detectors, Manual pull stations and electronic hooters cum strobes will be installed at the fuel farm for fire detection while the foam fire protection system and external hydrants (installed as part of the fire hydrant system) will be installed for firefighting and protection. Additional details can be found in Riyan Pvt Ltd. 2021 (given in Appendix 11).

### Health and Safety

The Health and Safety sign boards currently used at Vandhoo RWMF shows details of the different Personal Protective Equipment to be used on the site during civil works (Figure 12). These include hard hats, safety shoes, safety gloves and safety harness. In terms of quantities, there should be sufficient numbers of each type of PPE for the workforce who will be carrying out the civil works. Given that estimated workforce is 15 to 20 personnel, similar quantities of each PPE should be available on site. Additionally, there should be at least one fully stocked First Aid box on the site, which is always refilled (when required).



Figure 12. Signboards setup at Vandhoo RWMF showing PPE to be used on site

With respect to COVID 19 special considerations, those discussed in Section 2.6.2 and of relevance to the worksite are applicable here, such as wearing of masks, availability of handwashing facilities and practicing this frequently, availability of sanitisers. Additional considerations could be division of workforce into shifts.

## 2.6.4 Waste Management

Waste is not expected to be generated for fuel storage tank component. However, waste will be generated for road and septic tank components. Main types of waste generated is anticipated to be green waste (from vegetation clearance) and empty bags and plastic wrapping (from construction materials).

With respect to green waste, Coconut palms of 20 – 30ft can be translocated to a different area at Vandhoo (depending on the number to be removed) or taken to a nearby island. As per the Proponent, a space from the newly reclaimed area of Dhuvaafaru has already been reserved for this purpose. However, larger palms (taller than 20-30 feet) and mature trees cannot be translocated out of the island (considering the size of the landing craft and rate of survival) and have to be felled. As per the guideline provided by the proponent the branches and root bulbs are to be cut using a chainsaw and the trunks stockpiled for selling or used for construction purpose. Branches shall be cut to a manageable size while leaves should be left for sun drying. Root bulbs can be used for backfilling during construction.”

As identified in the First Addendum (ESIA 2019), since the island itself is a waste management facility, all the construction waste will be segregated on site and then disposed of at the facility according to the current practice. The waste is segregated into combustible and non-combustible waste. Hazardous waste is also separated. Waste management is through the use of an incinerator and baler. Some metals (scrap metal) and plastics (loosely bagged) are stored separately.

## 2.6.5 Resource Requirement

### Construction phase

As earlier specified, meals and water for the contractor workforce will be provided by the Contractor, while water required for construction work will be sourced from the existing facilities on the island (WAMCO RO plant). Power will also be sourced from the existing power facilities. At present Vandhoo has 2 generator sets of 250KVA each (total capacity of 500KVA). This will be sufficient to cater to the needs of the construction work required as part of this project.

### Operational phase

The proposed work includes relocation of an earlier proposed fuel tank (proposed under the First Addendum (ESIA 2019)) and set up of a septic tank system instead of a central sewerage network. Due to this scope of work, it is not expected that additional staff will be required. The PMU has provided a list of minimum management and manpower required for Vandhoo and the

operational staff required for operations of these project components will be catered to by this list (Appendix 12).

Any power and water requirement during operational phase will be catered to by the existing facilities and these will be sufficient to cater to the additional needs, given the scope of work of current project

### 2.6.6 Project schedule

The project duration for the proposed work at Vandhoo RWMF is estimated to last about 9 months (inclusive of ESIA clearance period). Detailed work schedule as provided by the proponent is given in Table 2 below.

**Table 2. Proposed work schedule for the project components**

#	Subproject Components	2021		2022						
		Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
1	ESIA clearance and disclosure									
2	Setting up of temporary fuel storage									
3	Decommissioning and relocation of the existing 24m <sup>3</sup> fuel storage tank and 8m <sup>3</sup> used oil tank									
4	Construction of 2 x 50m <sup>3</sup> fuel storage tanks and recommissioning of the relocated tanks at the proposed amended location									
5	Clearance and levelling of roads									
6	Paving of roads and installation of traffic signages									
7	Construction of septic tank									

### 2.6.7 Outputs

Key outputs of the project include:

- Relocated fuel farm at plot 05 on site plan
- Septic tank system
- Road extensions and implementation of the traffic management plan

## **2.7 Operational phase**

The operational aspects of the different components of the project have already been discussed in the relevant sections as follows:

- Section 2.5.1 and subsections– Change to proposed location of fuel tanks and discussion of operations of fuel farm, including refueling trips.
- 2.5.3 and 2.5.4 - extensions to the road network and the proposed traffic management plan
- 2.5.5 – proposed septic tank system

### **2.7.1 Labour Requirements during Operations**

The proposed developments as identified above are mainly changes to what was earlier proposed and discussed in the First Addendum (ESIA 2019). Given that main components are change in proposed location of fuel tank and use of septic tank instead of central sewerage system for sewage management, requirement of additional staff (in addition to what is proposed in the First Addendum) for operational phase is not envisaged. As earlier stated, the PMU has provided a list of minimum management and manpower required for Vandhoo and this will cater to the staff requirements of the operations of proposed components as well.

### **2.7.2 Occupational health and safety**

WAMCO has formulated an exhaustive occupational health and safety procedure for the employees. All management and employees are thoroughly instructed and integrated into comprehensive safety philosophy when first hired. The occupational health and safety measures extracted from the operations and maintenance procedure of WAMCO for the RWMF at Vandhoo is attached in Appendix 10 the First Addendum (ESIA 2019) (LaMer Group Pvt Ltd., 2019).

With respect to COVID 19 pandemic, the operator ensures that all operational staff wear the required PPE to minimise spread of Covid. They also stress the importance of frequent handwashing and sanitising and ensure staff follows these measures. Any staff who has a fever should not report for work.

## **2.8 Location and Extent of Site Boundaries**

The locations proposed for the proposed facilities are shown on the Site plan in Appendix 3 of this report.

### 3 Policy, legal and administrative framework

This chapter describes national relevant laws and regulations, as well as international agreements that are pertinent to the construction and operation of the project. The Environmental Protection and Preservation Act of the Maldives (Law No. 4/93) is the governing legislation for the protection of the environment. Several regulations have been implemented pertaining to this legislation. The TOR for the Addendum states as follows “*Identify any additional new legislation, regulations and standards, and environmental policies that are not covered in the principal ESIA (LaMer Group Pvt Ltd, 2019), but might be of relevance and is applicable to the proposed changes envisaged for the project, and identify the appropriate authority jurisdictions that will specifically apply to the project.* Hence only those Acts, Regulations or other legislation which have not been prior discussed and are of relevance to the project are given in Table 3. The Government agencies that are specifically related to the project are;

- Ministry of Environment, Climate Change and Technology (MECCT)
- Environmental Protection Agency (EPA)
- Utility Regulatory Authority (URA)

Although not discussed in this report, the following pieces of legislation are of relevance to the project (please see Riyan and NIRAS (2012) and LaMer Group Pvt Ltd. (2019) for details):

- Environmental Protection and Preservation Act (Law 4/93)
- Environmental Impact Assessment Regulation (2012/R27) and amendments (5)
- Regulation on Environmental Liabilities (2011/R-9)
- Waste Management Regulation (R-58/2013)
- Dewatering Regulation (2013/R-1697)
- Regulation on fuel storage and use (2015/ R-160)
- By-law on cutting down, uprooting, digging out and export of trees and palms from one island to another
- National Waste management policy (2015)
- IFC guidelines:
  - Environmental, Health and Safety guidelines for Waste management facilities
  - EHS guideline on air emissions and ambient air quality
  - EHS guideline on Hazardous materials management

**Table 3. Legislation relevant to the project**

Legislation	Description	Relevance to the project
<b>National Laws and Regulations</b>		
Utility Regulation Authority Act (2020):	<p>The Utility Regulatory Act establishes the powers and responsibilities of the Authority formed to plan and implement the activities with respect to utility service provision. The Act also identifies the policies and guidelines to be followed in planning such service provision.</p> <p>In this act Utility services are referred to provision of freshwater, sewerage, power and waste management services for a fee or as a business.</p> <p>The Act has 7 key objectives, which are as follows:</p> <ul style="list-style-type: none"> <li>• Ensure that utility services are available to the whole population at a reasonable price, and in a trustworthy, robust and sustainable manner;</li> <li>• Ensure that utility services are planned in an efficient and environmentally friendly manner</li> <li>• Ensure that the utility service provision is successful, of good quality and are able to meet the needs of the population</li> <li>• Ensure that utility service provision is done in a just manner, and that there is continued development of the services through a competitive market</li> <li>• Formulate and implement policies and guidelines to be followed in utility service provision</li> <li>• Ensure utility service providers abide by this Act and all other relevant acts and regulations and establish a penalization system for those who break the law</li> <li>• Increase awareness about the rights provided to those who receive the services and the service providers</li> </ul> <p>The regulatory works for waste management has been transferred to newly established Utility Regulation Authority (URA).</p>	Operator of the RWMF shall abide by all requirements under the Act
Water and Sewerage Act (8/2020)	The Act was recently enacted on 5 <sup>th</sup> August 2020 with immediate effect. This act will precede any law or regulation that would coincide with this law. All related articles on water and sewerage	The sewage system setup on Vandhoo RWMF should meet the requirements specified in this act and fuel transfer should be in a manner

	<p>stipulated in the General Law will be redundant with the enactment of this law.</p> <p>The Act stipulates the establishment of safe and suitable potable water and appropriate sewerage systems for all the inhabited islands of the Maldives. The Act ensures the protection and conservation of the natural water resources available through guidelines and procedures stipulated within the act and also other relevant guidelines that will be formulated under this act.</p> <p>The Act reiterates the need of EIA for all water and sewerage establishments. It states that the permit for construction of the systems can only be given after the formulation and approval of EIA. This report attempts to fulfill this requirement.</p> <p>Articles that concerns the proposed project are briefly explained below:</p> <ul style="list-style-type: none"> <li>• In article 20 (raa) it states that a sewerage system appropriate for the island (based on the function of the island) should be established on all islands leased for tourism and industrial purposes</li> <li>• In article 18 (haa) it states that the groundwater resource of islands / reclaimed land areas leased for agricultural use, tourism and other industrial use is a protected resource.</li> <li>• In article 20 (haa) it states that any act which might contaminate the groundwater resource of the island should not be carried out.</li> <li>• In article 20 (noonu) it states that transfer of any material, on land, which has the potential to contaminate the groundwater resource should be done in a manner which will prevent spillage (as per stipulated in regulations formulated under this Act)</li> <li>• In article 20 (raa) it states that if transfer of any material which has the potential to contaminate groundwater is being done in individual containers, it should be ensured that the containers are properly secured to the vehicle carrying the containers to prevent them falling</li> <li>• In article 20 (baa) it states that in the instance there is a spillage, the personnel carrying out the work should take all responsibility of cleaning up the spillage</li> </ul>	<p>which conforms to the stipulations of the Act.</p> <p>URA states that no sewage effluent can be disposed into the ground without treatment. However, untreated effluent can be disposed to the marine environment as per currently set standards.</p> <p>Hence proponent proposes to discharge the sewerage effluent (primary treatment via septic tank system) via outfall pipeline to the reef slope (-15m) (discussed as an alternative to proposed method in Chapter 8)</p> <p>This stipulation in the Act and related regulations raises issues, when designing the optimal wastewater management systems for specific cases such as in the project, whereby the volume of effluent, which would also have undergone primary treatment would be low. However, given that the discharge of effluent to the ground is not allowed, the only option is to release it to the ocean, by laying a pipeline. This work itself would have a negative impact on the marine environment, which at times could be more significant than that due to release of low volume of primarily treated effluent to the ground.</p>
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	and implementing measures to rectify the impact on the groundwater resource.	
Climate Emergency Act (9/2021)	<p>The Climate Emergency Act was enacted on the 18<sup>th</sup> of May 2021 and came into effect on the same day. This Act was created to:</p> <ul style="list-style-type: none"> <li>• Formulate the policies necessary for the protection of Maldives and its citizens from the impacts of climate change,</li> <li>• Formulate the necessary legislature and institutional setup to enable the measures required for this protection,</li> <li>• Encourage the nation to be a lead voice in raising awareness at an international level about climate change and its impacts</li> <li>• To identify the steps necessary to make Maldives a carbon neutral nation and;</li> <li>• To identify the guidelines required to increase the coping capacity of the nation for its sustainable development</li> </ul> <p>The key objectives of this regulation are to achieve the following, with respect to Climate change:</p> <ol style="list-style-type: none"> <li>a. To acclimatise the nation and its citizens to climate change and its impacts, to minimise these impacts and to establish the measures required to protect human rights of the citizens from these impacts</li> <li>b. To ensure that the Maldives meets all the requirements of international treaties and agreements signed by the Maldives and to establish the reporting mechanism required to ensure institutional responsibility by all relevant government agencies</li> <li>c. To ensure that all formulation and implementation of all development plans, projects and guidelines take into consideration the inclusion of measures to be taken in instance of climate change impacts</li> <li>d. To increase the coping capacity of the nation in the face of climate change and to establish the system required to formulate all plans necessary to acclimatize the citizens and the environment to climate change and its impacts</li> <li>e. To carry out research in the field of climate change and to increase the technical,</li> </ol>	

	<p>human resource and financial capacity in this area</p> <ol style="list-style-type: none"> <li>f. To identify the responsibilities of the Government of Maldives in implementing all measures in relation to climate change</li> <li>g. To encourage the establishment of an institution which has both the trust and support of international and local community, and which will be responsible for managing all funds sourced in the field of climate change (for various activities related to climate change and its impacts)</li> <li>h. To enable the activities which will ensure that the nation becomes a carbon neutral nation by 2030</li> <li>i. To give the relevant parties, the authority to formulate and implement all programmes necessary to achieve the targets identified for Maldives to become a carbon neutral nation</li> <li>j. To identify the institutional responsibility for the formulation of policies and guidelines required for Maldives to become a carbon neutral nation</li> <li>k. To establish a system for carbon budgeting</li> <li>l. To identify systems required for acclimatizing the nation and its citizens to climate change impacts and to minimize these impacts</li> </ol> <p>The Act further identifies 6 principles which should be followed when implementing any measures related to climate change and its impacts.</p> <p>The Act has the following chapters</p> <ul style="list-style-type: none"> <li>• Chapter 2: Targets to be achieved in reducing carbon and carbon budgeting</li> <li>• Chapter 3: Administrative setup</li> <li>• Chapter 4: Responsibilities of the Minister (who has responsibility of implementing all policies with respect to climate change)</li> <li>• Chapter 5: Formulation and of the National Climate Change Action Plan and reporting</li> <li>• Chapter 6: Funds sourced from agencies/ parties in environmental and climate change field</li> </ul> <p>Article 11(haa) of the regulation states that a Ministerial level position titled “Special Envoy for Climate Change” should be created and a</p>	
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	<p>person appointed for the position within 30 days of enactment of this Act. The Special Envoy for Climate Change plays the key role in representing Maldives at all related forums at international .</p> <p>In addition to a Climate Change Directorate (department) has to be created on the day of enactment of the regulation. This Directorate has the responsibility of carrying out all work related to climate change and its impacts.</p>	
<p>Regulation on provision of water and sanitation service in the Maldives (R-23/2021)</p>	<p>This Regulation was published in the gazette on 11<sup>th</sup> February 2021 and came into effect on the same day. It will be implemented by the Utility Regulatory Authority (URA). The key objective of the Regulation is to establish policies/guidelines and procedures for the following activities:</p> <ol style="list-style-type: none"> <li>a. Design and establishment of water and sewerage networks</li> <li>b. Provision of service through water and sewerage networks</li> <li>c. Testing and certification of equipment and machinery used for the provision of these services</li> <li>d. Formulation of water and sanitation plans</li> <li>e. Ensure safety of the water and sewerage networks</li> </ol> <p>The regulation has a number of chapters based on these objectives and identifies the steps to be followed to achieve these objectives.</p> <p>Article 6 of the Regulation identifies the steps to be followed in establishment of the network and provision of service. The steps are as follows:</p> <ol style="list-style-type: none"> <li>1. Approval of the concept developed for the water and/or sewerage network</li> <li>2. Formulation and approval of the EIA report developed prior to development of the water and/or sewerage network</li> <li>3. Development of the water and/or sewerage network as per the detailed designs of the system and the conditions stated in the Decision statement (DS) issued for the EIA report.</li> </ol> <p>Article 7 (Shaviyani) details the points which should be taken into consideration when designing the water and sewerage networks for islands/ places leased for tourism or industrial use.</p>	

<p>Regulation of protection of natural water resources (R-22/2021)</p>	<p>This Regulation was published in the gazette on 11<sup>th</sup> February 2021 and came into effect on the same day. It will be implemented by the Utility Regulatory Authority (URA). The main objective of this Regulation is to ensure that use of natural water resources is in a sustainable manner, and that the resource is protected and conserved to ensure this sustainability. The enforcement of the Regulation will also ensure formulation of policies to achieve this sustainability.</p> <p>Key articles of the Regulation include:</p> <ul style="list-style-type: none"> <li>• Article 6: Protection and conservation of the groundwater lens; states that the groundwater lens is a protected resource as per stipulated in Article 18 (Haa) of the Water and Sewerage Act (8/2020).</li> <li>• Article 7: Use of water from resource bodies in instance of a disaster</li> <li>• Article 8: Recharge of the groundwater lens</li> <li>• Articles 10 to 16 discuss ways to prevent pollution of the groundwater resource due to sewage, fuel and chemicals, industrial activities, agriculture, waste management centres and hazardous medical waste</li> </ul> <p>In addition to these, the Regulation also highlights the following: economizing use of groundwater in daily use and agricultural use, points to be considered when formulating Land use plans of islands, roles and responsibilities of the Island Councils and the URA.</p> <p>The regulation also details reporting mechanisms and fines to be implemented in instances the regulation is breached.</p>	
<p>General Guideline: Domestic Wastewater Disposal (URA 2002:2021)</p>	<p>The purpose of this guideline is to improve public health through improved sanitation and cleaner and safer environment by regulating the disposal of domestic wastewater.</p> <p>This guideline addresses the safe disposal of domestic wastewater in the Maldives and has been developed in consultation with other authorities.</p> <p>Any person, company or organization that undertakes the construction or the provision of sewerage services shall comply with this guideline and standards set by the Authority. An application for a permit and subsequent approval</p>	<p>The proposed septic tank is designed consistent to the requirements of this guidelines and the submission of the Addendum is also in compliance with this guideline</p>

	<p>from the Authority is required before the installation of the system.</p> <p>This Guideline applies to all the islands in the Maldives. Special permission shall be obtained from the Authority for wastewater disposal from industrial areas/activities or industrial islands.</p> <p>The guideline identifies the general requirements of the sewerage system as well as consent requirements, which include the formulation and approval of an EIA report for all sewerage projects.</p>	
Second Amendment to Regulation on fuel storage and use (2021/R-67)	<p>The Second Amendment to Regulation on fuel storage and use (Regulation number 2021/ R-67) was published in the gazette on 11<sup>th</sup> of May 2021. The amendment brings changes to the Articles 12, 13, 17 and 20 of the main regulation. The amendment also adds an Appendix to the main regulation – Appendix 10 which details the firefighting systems which need to be established at fuel farms/ storage tanks of different capacities.</p> <ul style="list-style-type: none"> <li>• For fuel tanks capacity of 800 – 3,000L - there should be 1 foam trolley of 50L capacity</li> <li>• For fuel tanks capacity of 3001 – 30,000L - there should be 2 foam trolleys of 50L capacity each and a water hose (high pressure)</li> <li>• For fuel tanks capacity of 30,001 – 60,000L - there should be foam system (min. 400l of concentrated foam) and a water hose (high pressure)</li> <li>• For fuel tanks capacity of 60,001L – 100,000L - there should be Foam pouring system and a water drencher system</li> <li>• For fuel tanks capacity of 100,001L – 500,000L - there should be Foam pouring system and a water drencher system</li> </ul>	The proposed fire-fighting system at Vandhoo will be designed as per the main regulation and amendments
Regulation of Health and Safety measures specific for the Construction industry (2019/R-156)	<p>The Regulation on Health and Safety measures specific for the Construction industry was published in the government gazette on 30th January 2019 and came into effect on the same day. The implementing agency for the regulation is the Ministry which is mandated with enforcing the legislations relevant to the Construction industry at any given time (at present MNPHI).</p> <p>The main purpose of the Regulation is twofold:</p>	The proposed project will have to adhere to this regulation taking all precautionary measures identified in the regulation during the construction phase of the project.

	<ol style="list-style-type: none"> <li>1. Identify and specify the minimum measures which need to be in place to ensure safety of the workers and the general public</li> <li>2. Identify the penalties which will be given and personnel responsible for this action, in instances where construction projects do not abide by the Regulation</li> </ol> <p>Second chapter of the Regulation identifies the roles and responsibilities of the Contractors and Construction companies/workers. Key points include:</p> <ul style="list-style-type: none"> <li>• Formulation of a Health and Safety operations manual for projects exceeding MVR 1.5million in cost. These manuals will be used to train the workforce in this aspect</li> <li>• Formulation of an Emergency response plan</li> <li>• Appointment of a Site Safety Supervisor and details of their roles and responsibilities</li> <li>• Insurance scheme (to ensure compensation of workforce and/or neighboring houses should the need arise during construction work)</li> <li>• Measures to ensure public safety during construction work</li> <li>• Proper use of Personal Protective equipment (Contractor's responsibility to provide these to their workforce)</li> <li>• Regulation further specifies measures to be in place when working on different phases of the project and while using different equipment for work (working at levels 3m high from ground level, on rooftops, in enclosed areas, using scaffoldings, ladders, working with electricity, use of chemicals and welding, use of electric power tools and mechanical tools, heavy machinery)</li> <li>• Measures to be in place when storing materials for construction</li> <li>• Use of safety boards issued by relevant authorities</li> <li>• Use of safety measures (such as demarcation tape) to clearly demarcate construction site, so as to ensure safety of public</li> <li>• Operation procedures in instance of accidents at the site</li> </ul> <p>Chapter 3 of the Regulation identifies measures to be taken by enforcement authority in instances of an accident at the construction site. The chapter also details penalties to be issued in instances</p>	
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	where the Regulation is not adhered to during construction projects.	
Public Health Protection Act (07/12)	<p>The Public Health Protection Act aims to establish policies to protect public health and identify the institutional arrangement for implementing the polices, regulations and guidelines.</p> <p>The act has a chapter on health hazards which should be adhered in any development project as well.</p> <p>It also includes a section on establishing policies to respond to public health emergencies.</p>	<p>The proposed project should adhere to this act in relation to identifying the potential health hazards during construction and operation stage of the IWRMC.</p> <p>Furthermore, as per this act the policies and guidelines formulated under this act and the ones formulated for the ongoing COVID pandemic should be strictly followed during the development phase of the project.</p> <p>During the preparation of the ESMP, HPA guidelines are followed in carrying out the field surveys and also the stakeholder discussions.</p>
Labour and Working Conditions  National Laws	<p>The national laws and regulations relevant to labour and working conditions include:</p> <ul style="list-style-type: none"> <li>• Employment Act (2/2008)</li> <li>• Immigration Act (1/2007)</li> <li>• Anti-Human Trafficking Act (12/2013)</li> <li>• Pensions Act (8/2009)</li> <li>• Human Rights Act (6/2006)</li> <li>• Regulation on Employment of foreign workers in the Maldives (2011/R-22)</li> <li>• Work Visa Regulation (2010/R-7)</li> </ul>	<p>Contractors should ensure that all workers are treated according to the Employment Act.</p> <p>Contractor should ensure that all foreign workers have relevant documentations including the work visa as per Immigration Act and Work Visa Regulation.</p>
International legal frameworks		
IFC guidelines  Community Health and Safety	<p>This set of Guidelines complements the guidance provided in the environmental and occupational health and safety sections of IFC guidelines, specifically addressing some aspects of project activities taking place outside of the traditional project boundaries, but nonetheless related to the project operations, as may be applicable on a project basis. These issues may arise at any stage of a project life cycle and can have an impact beyond the life of the project.</p> <p>The Guideline has 7 main parts:</p> <ol style="list-style-type: none"> <li>1. Water Quality and Availability</li> </ol>	

	<ol style="list-style-type: none"> <li>2. Structural Safety of Project Infrastructure</li> <li>3. Life and Fire Safety (L&amp;FS)</li> <li>4. Traffic Safety</li> <li>5. Transport of Hazardous Materials</li> <li>6. Disease Prevention</li> <li>7. Emergency Preparedness and Response</li> </ol>	
<p>Labour and Working Conditions</p>	<p>Maldives has signed 10 convention of the International Labour Organisation with regards to labour and working conditions</p> <p>These includes:</p> <p>Fundamental 8 conventions</p> <ul style="list-style-type: none"> <li>• C029 - Forced Labour Convention, 1930 (No. 29) <i>ratified on 04 Jan 2013</i></li> <li>• C087 - Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87) <i>ratified on 04 Jan 2013</i></li> <li>• C098 - Right to Organise and Collective Bargaining Convention, 1949 (No. 98) <i>ratified on 04 Jan 2013</i></li> <li>• C100 - Equal Remuneration Convention, 1951 (No. 100) <i>ratified on 04 Jan 2013</i></li> <li>• C105 - Abolition of Forced Labour Convention, 1957 (No. 105) <i>ratified on 04 Jan 2013</i></li> <li>• C111 -Discrimination (Employment and Occupation) Convention, 1958 (No. 111) <i>ratified on 04 Jan 2013</i></li> <li>• C138 - Minimum Age Convention, 1973 (No. 138) Minimum age specified: 16 years <i>ratified on 04 Jan 2013</i></li> <li>• C182 - Worst Forms of Child Labour Convention, 1999 (No. 182) <i>ratified on 04 Jan 2013</i></li> </ul> <p>All these conventions are considered in-force in the Maldives. Hence these should be strictly adhered in relation to all labour and working affairs.</p>	<p>The contractor (s) should adhere to the measures mentioned in these conventions where relevant.</p> <p>Among the many things, abiding to these laws would ensure no exploitation of foreign migrant. The contractors should make timely payment to the workers (in full) and they should not hold documents of the workers against their will.</p> <p>It is important to know that foreign migrant workers are not required to pay recruitment fees and there should not be any forced labour.</p> <p>Contractors should ensure that all workers local or foreign should be treated with equality, dignity and respect.</p>

## **4 Methodology**

### **4.1 Context and General approach for data collection**

As per the approved TOR for the Addendum to EIA, environmental surveys are required for the vegetation clearance work, noise level and groundwater assessment. Detailed baseline survey of the island was done in the initial ESIA report (Riyan and NIRAS, 2012) and subsequent Addendum (ESIA of 2019).

The approach to data collection and compilation of this report includes;

- Consultation and discussion with the proponent with regard to design and work methodology that would be used to implement the proposed activities of the project,
- Examination of the existing environment to identify significant environmental components that are likely to be affected,
- Consultation with major stakeholders to exchange information on the project and to follow the ESIA procedures required for the report, and
- Evaluation of available and relevant literature on environmental impacts associated with similar projects.

Information on existing environment was collected during the field visit to the project site in October 2021.

### **4.2 The RIAM Approach**

The Rapid Impact Assessment Method (RIAM) was used in Riyan and NIRAS (2012) to understand the potential impacts associated with the construction and operation of RWMF at Vandhoo. The same approach was also used in LaMer Group Pvt Ltd. (2019) to assess impacts associated with upgrading of the facility. Hence, given that the proposed project is an Addendum to the ESIA of 2019, the same method is used to assess the environmental impacts as a result of this project. The methodology for this approach is explained in detail in Riyan and NIRAS (2012) and LaMer Group Pvt Ltd. (2019). Hence a summarized version is given in this sub-section and readers are referred to the prior reports for details.

The RIAM approach allows us to analyse and present the results of an all-inclusive EIA, which analyses impacts on all environmental components (physical, biological, social, cultural, economic etc.); the approach allows for data from these different components to be analysed against common important criteria within a common matrix, thus providing a rapid, clear assessment of the major impacts (Pastakia and Jensen, 1998).

Methodology description has been sourced from Pastakia and Jensen (1998). The approach is based on standard definition of important assessment criteria and collation of partially quantitative values for each of these criteria so as to achieve an accurate and independent score for each of the environmental conditions being assessed. The assessment criteria fall into two groups A and B as described in Table 4 below.

**Table 4. Assessment criteria used in RIAM approach**

Criteria		Scale	Description
A - Criteria that are of importance to the condition, and which can individually change the score obtained	A1 – importance of condition	4	Important to national/international interests
		3	Important to regional/national interests
		2	Important to areas immediately outside the local condition
		1	Important only to the local condition
		0	No importance
	A2 – Magnitude of change / effect	+3	Major positive benefit
		+2	Significant improvement in status quo
		+1	Improvement in status quo
		0	No change / status quo
		-1	Negative change to status quo
		-2	Significant negative disbenefit or change
		-3	Major disbenefit or change
	B - Criteria that are of value to the situation, but individually should not be capable of changing the score obtained.	B1 – Permanence	1
2			Temporary
3			Permanent
B2 – Reversibility		1	No change / not applicable
		2	Reversible
		3	Irreversible
B3 – Cumulative		1	No change / not applicable
		2	Non – cumulative / single
		3	Cumulative / synergistic

The value for each of these criteria is obtained through a series of simple formulae as below:

- $(A1) \times (A2) = AT$
- $(B1) + (B2) + (B3) = BT$
- Environmental score (for any given condition) =  $(AT) \times (BT)$

Multiplication of the values of group A ensures that the weight of each score is expressed, while summation of values of group B ensures that the individual value scores cannot influence the overall score, but that the collective importance of all values group (B) are fully considered.

Environmental components to be assessed are identified through the EIA process and in the RIAM approach, these are divided into four categories as below:

- Physical/Chemical (PC): covers all physical and chemical aspects of the environment
- Biological/Ecological (BE): covers all biological aspects of the environment
- Sociological/Cultural (SC): covers all human aspects of the environment, including cultural aspects.
- Economic/Operational (EO): qualitatively to identify the economic consequences of environmental change, both temporary and permanent.

A matrix is then produced for the different components identified for the project set against the different assessment criteria. Criteria scores are then given to each component and the environmental score for each component calculated using the formulas given above.

The scores obtained are then interpreted based on range bands, as given in Table 5. Each range band describes the level of an expected change (positive or negative) and they also represent the final assessment from the RIAM analysis. Once the ES score is set into a range band, these can be shown individually or grouped according to component type and presented in a graphical or numerical form as preferred.

**Table 5. Range bands used for RIAM approach**

ES	RV (Alphabetic)	RV (Numeric)	Description of range band
108 to 72	E	5	Major positive change/impact
71 to 36	D	4	Significant positive change/impact
35 to 19	C	3	Moderate positive change/impact
10 to 18	B	2	Positive change/impact
1 to 9	A	1	Slight positive change/impact
0	N	0	No change/status quo / not applicable
-1 to -9	-A	-1	Slight negative change/impact
-10 to -18	-B	-2	Negative change/impact
-35 to 19	-C	-3	Moderate negative change/impact
-71 to 36	-D	-4	Significant negative change/impact
-108 to 72	-E	-5	Major negative change/impact

### 4.3 Vegetation survey

Vegetation survey was done using georeferenced orthomosaic drone image with ground control points. The drone map was incorporated to the site plan. Coconut palms falling within footprint project activity areas were mapped. Trees such as Laurelwood, Sea hibiscus, Country almond was mapped using ground points taken with RTK GPS.

#### 4.4 Water quality

Groundwater sampling was done at the proposed fuel tank site, at the fuel line area and control site. Water samples collected were sent to MWSC Water Quality Assurance laboratory. Ground pits were dug to water level and samples collected in glass bottles at site G1 and G2, while the control site is an existing well far from fuel tank construction area (G3) (Figure 13).



Figure 13. Locations of groundwater sampling (G3 is control)

#### 4.5 Noise

Noise level measurements were taken at three locations, N1 near proposed fuel tank and incinerator, N2 road near powerhouse and N3 control site on southern side of leachate ponds. Noise level measurement was taken using OMEGA HHSL402SD model sound level meter.



Figure 14. Location of noise level measurement (N3 is control)

## **4.6 Socio-economic environment**

As per TOR, staff working at Vandhoo RWMF were interviewed to assess the living condition and working condition of the facility and also perception of staff. In addition to the general staff, Vandhoo Interim Manager of the facility (from WAMCO) was also consulted. Details of consultation outcome is provided in Chapter 6.

## **5 Existing environment**

### **5.1 General setting**

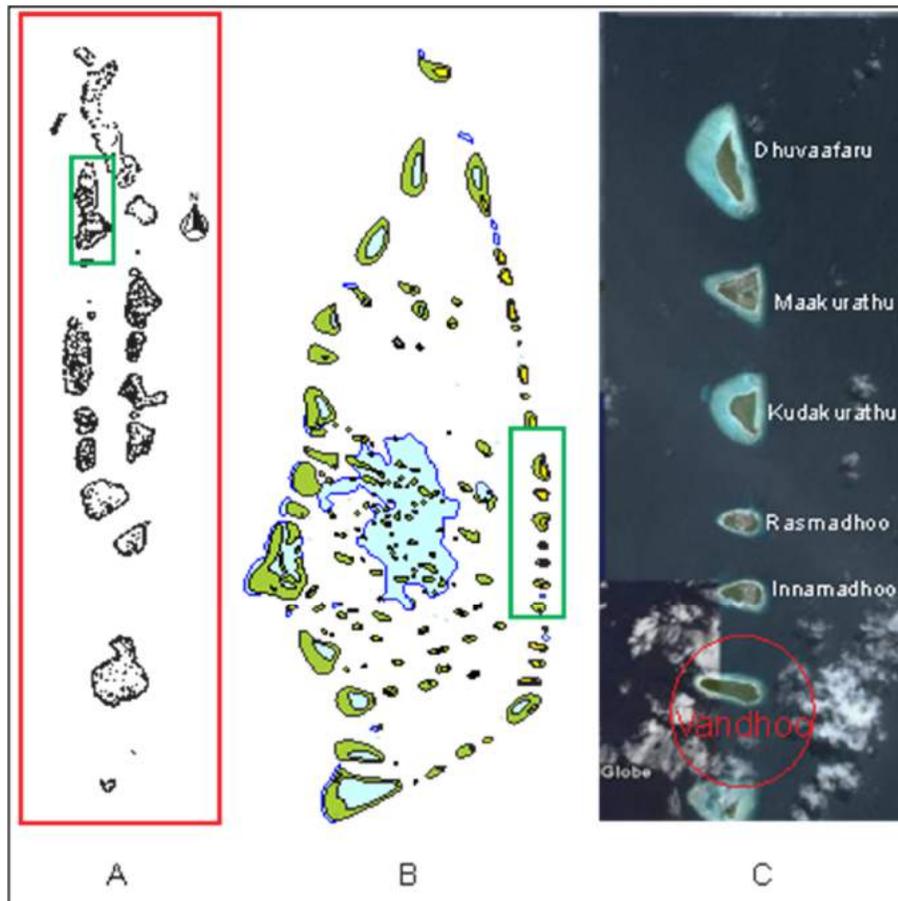
The double chain of 25 natural atolls that make up the Maldives archipelago are part of the largest submarine carbonate structure in the Indian Ocean lying on the submarine ridges known as Lacadive-Chagos ridge in the central part of the Indian Ocean. The atolls are separated by deep running channels that run predominantly east to west. The atolls contain 1190 islands that vary in shape from circular and oval to elliptical, of which only 198 are inhabited. The total reef area of Maldives is 4,493.85km<sup>2</sup> while the total land area is 227.45km<sup>2</sup> (Naseer, 2004). Approximately 80% of Maldivian land area is less than 1m above mean sea level.

The characteristics of reefs and coral islands of the Maldives vary considerably from north to south. The atolls to the north are broad banks discontinuously fringed by reefs with small coral islands and with numerous patch reefs and faros (the word faros is derived from the Maldivian word “*faru*”) in the lagoon. To the south the depth of atoll lagoon increases, faros and patch reefs are rare in the lagoon, the continuity of the atoll rim is greater and a large proportion of the perimeter of the atolls is occupied by islands (Woodroffe, 1992). The islands have shallow reef flats on their seaward side, some with shingle ramparts at the seaward limit of the reef flat. The islands and the shingle ramparts owe their origin to the deposition of shingle or coral debris during storms. A number of islands can be found on a single reef. These islands may be separated by shallow passages that run across the reef flat. The width of some of these passages could be less than 100m while some passages are over a few hundred meters wide.

### **5.2 Geographic location and general setting of Vandhoo**

Vandhoo is located on the eastern periphery of the Raa Atoll, some 158 km South-east of the capital located at Male’. The length and width of the island are approximately 1.27 km and 0.34 km respectively with an area of about 40.4 ha.

Vandhoo is about 15 km north from Ungoofaaruu which is the capital of Raa Atoll (Figure 15). The island is just 1.96 km to Innamaadhoo, the nearest inhabited island, and about 3.46 km to the north of Rasmaadhoo. The uninhabited island of Kottefaru is located about 2.42 km to the south.



**Figure 15. Geographic location of Vandhoo within the Raa Atoll**

### **5.3 Physical environment**

General physical environment description of the project island has been extensively covered in initial EIA for development of Vandhoo RWMF (Riyan and NIRAS, 2012) and Subsequent addendum to EIA report prepared for upgrading works (LAMER Group, 2019). According to the TOR under this addendum noise level will be covered.

#### **5.3.1 Noise level**

Noise level measurement taken at the three locations were approximately at the range of daytime noise level of inhabited island (Riyan and NIRAS, 2012), the background noise level was affected by the windy condition at the time of field surveys. Figure 16 shows location of noise level measurement and noise level.



Figure 16. Noise level measurement at Vandhoo (N3 is control site)

## 5.4 Biological environment

### 5.4.1 Vegetation survey

Vegetation surveys were done at the proposed fuel tank relocation area and additions to the road network. Vegetation survey of septic tank construction area has already been covered in Addendum to EIA which covers upgrading works (LaMer Group Pvt Ltd, 2019). Hence it is not included in this report. Majority of Coconut palms encountered were located at the road network addition areas; total of 74 Coconut palms were recorded at these areas (Table 6).

Table 6. Number and names of plants which fall into the building/road footprint areas

Location	Name of plant	Scientific name	Local Name	Qty (Nos.) / Area (sqm)
Proposed new location of Fuel storage	Pandanus tree	<i>Pandanus tectorus/ P.zeylanicus</i>	Boa-kashikeyo	8
	Coconut palm	<i>Cocos nucifera</i>	Dhivehi ruh	8
	Sea hibiscus	<i>Hibiscus tiliaceus</i>	Dhigga	7
	Country Almond	<i>Terminalia catappa</i>	Midhili	2
Additions to road network	Pandanus tree (thick bushes)	<i>Pandanus tectorus</i>	Boa-kashikeyo	372sqm
	Coconut palm	<i>Cocos nucifera</i>	Dhihevi ruh	74
	Sea hibiscus	<i>Hibiscus tiliaceus</i>	Dhigga	9
	Alexander Laurelwood	<i>Calophyllum inophyllum</i>	Funa	5
	Sea lettuce	<i>Scaevola taccada</i>	Magoo	1
	Country Almond	<i>Terminalia catappa</i>	Midhili	14
	Nit pitcha	<i>Guettarda speciosa</i>	Uni	3



Figure 17. Areas which require vegetation clearance to develop the plots (red) and roads (yellow) as per the proposed master plan

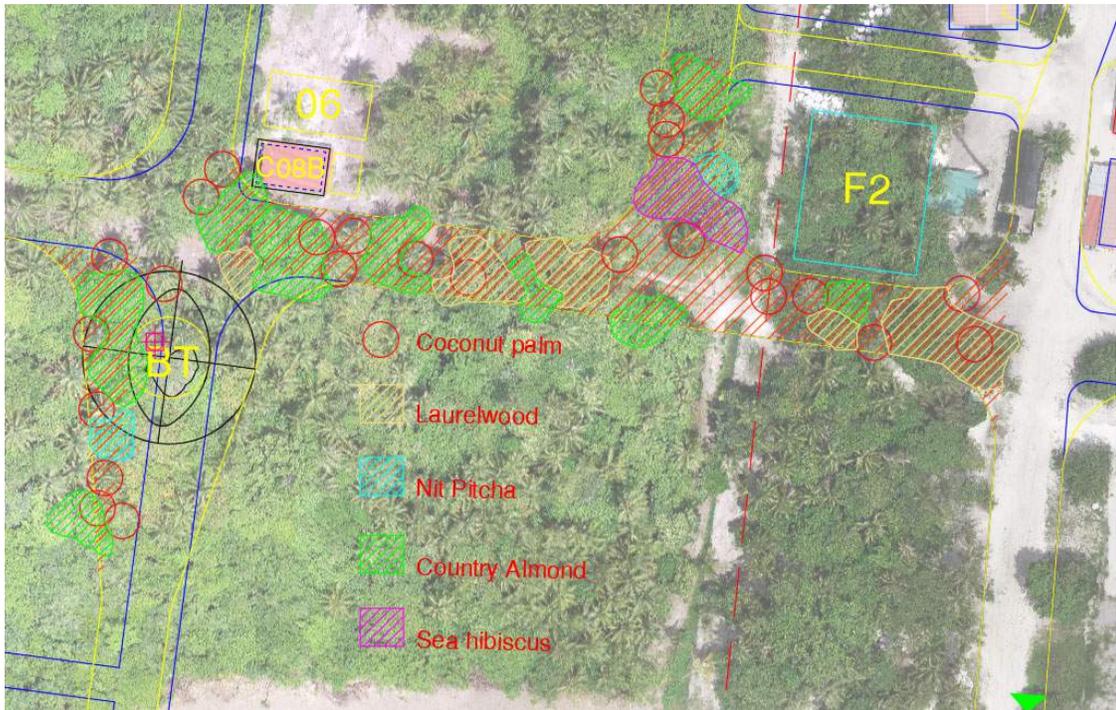
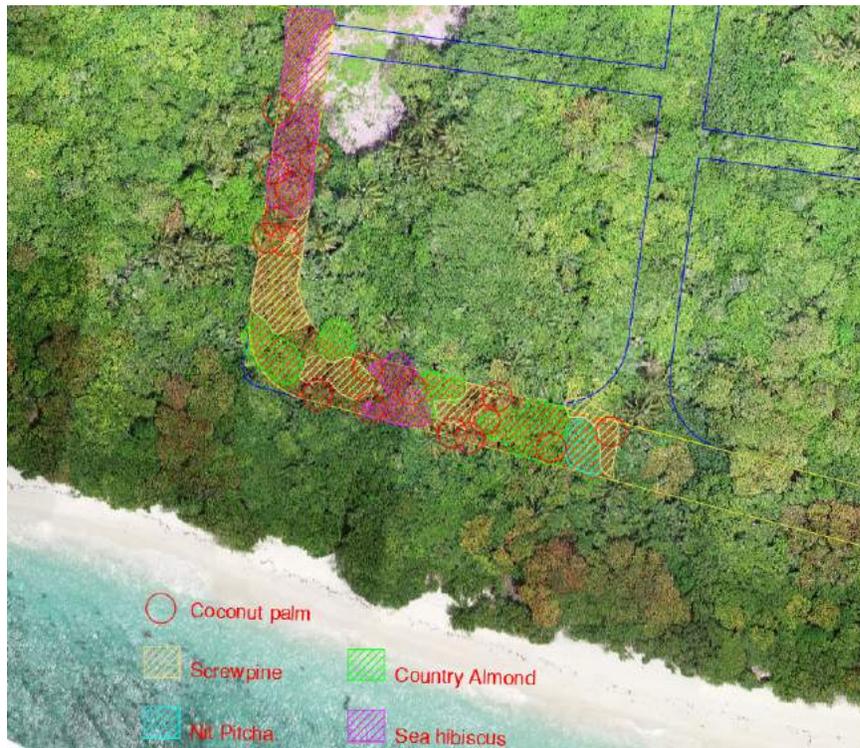


Figure 18. Road network designed changed area near C08B and Previously mapped Banyan tree area



**Figure 19. Additional loop to the proposed road network near accommodation area**

The vegetation is proposed to be removed will be either translocated along the periphery of the existing roads at Vandhoo (at least 20% of vegetation removed) (Figure 20) or taken to Dhuvaaafaru nearby, for replantation at the newly reclaimed land area at Dhuvaaafaru. As per the Proponent, a space from the newly reclaimed area of Dhuvaaafaru has already been reserved for this purpose (Letter from Council, in agreement to this is given in Appendix 13). However, larger palms (taller than 20-30 feet) and mature trees cannot be translocated out of the island (considering the size of the landing craft and rate of survival) and have to be felled. This will be done as per the guideline provided by the proponent for vegetation removal and detailed in Section 2.6.4 of this report.



**Figure 20. Areas where vegetation can be transplanted (red lines)**

#### **5.4.2 Groundwater quality**

Water quality results were compared with the reference ranges specified for groundwater by the EPA, Maldives (Table 7). All parameters were seen to be within the reference ranges given by EPA (reference range for salinity not available) (Table 8). However, for the water sample from the control site, all parameters showed slightly higher values than those for the other 2 sites. The control site is an existing well at the southern side of the island.

**Table 7. Optimal conditions for drinking water as specified by EPA, Maldives (source WHO)**

<b>Parameter</b>	<b>Reference range</b>
pH	6.5-8.5
Physical Appearance	Clear and colourless
Conductivity	< 1500 $\mu$ S/cm
Total Dissolved Solids	<1000 mg/l
Temperature	25 – 30°C

**Table 8. Results of water testing done for water from the three ground water sampling sites tested at the Water Quality Assurance Lab at Malé Water and Sewerage Company Pvt Ltd (full reports attached in Appendix 14).**

Parameter	Site		
	GW1	GW2	GW3 (Control)
Physical Appearance	Opaque and brown	Opaque and brown	Clear with particles
Temperature (°C)	20.0	20.1	20.8
pH	7.5	7.6	9.0
Conductivity (µS/cm)	446	428	987
Total Dissolved Solids (mg/l)	223	214	493
Salinity (‰)	0.21	0.21	0.49

### 5.4.3 Protected Areas, Environmentally Sensitive Sites and Areas of Historic and Cultural Significance

Protected Areas, Environmentally Sensitive Sites and areas of Historic and Cultural Significance within project proximity have been covered in the initial ESIA (Riyan and NIRAS, 2012) and Subsequent addendum to EIA report prepared for upgrading works (LaMer Group Pvt Ltd, 2019) and hence will not be reiterated here.

### 5.4.4 Hazard vulnerability

Hazard vulnerability of the project area is assessed based on the literature available and field data collection. A recent publication by the Asian Development Bank, Multihazard Risk Atlas of Maldives. This Atlas provides spatial information about Maldives and thematic maps necessary for assessing future development investments in terms of climate risks and geophysical hazards. The Atlas looks at natural hazards such as extreme weather, tsunamic, storm surge. Maldives has in the past experienced hazards such as cyclones, earthquakes, storm surge and tsunamis. As reported in the Atlas, the risk hazard maps generated for the Atlas, were prepared based on indexed risk tables generated from detailed analysis of relevant data obtained from the Ministry of Environment and National Disaster Management Centre of Maldives.

Table 9 which shows the numerical range of the hazard categories and Maps in this Section have been directly sourced from the above-mentioned publication.

Table 9. Hazard Categories and Index Ranges (sourced from the Multihazard Risk Atlas of Maldives)

Category	Minimum	Maximum
<b>Rain-Induced flood</b>		
Low	0.00	0.10
Medium	0.11	0.25
High	0.45	1.26
<b>Udha (big wave)</b>		
Low	0.00	0.05
Medium	0.14	0.32
High	0.71	7.65
<b>Wave, Rain, Wind (Flood) Hazard</b>		
Low	0.00	0.05
Medium	0.10	0.33
High	0.43	1.43
<b>Wind and wave hazard</b>		
Low	0.00	0.09
Medium	0.10	0.36
High	0.45	5.26
<b>Hydrometeorological multihazard</b>		
Low	0.009	
Medium	0.132	0.367
High	0.403	15.301

Figures 21 to 23 show the hazard risk maps for the whole of Maldives for the following hazards: Cyclonic winds, Surge and Tsunami.

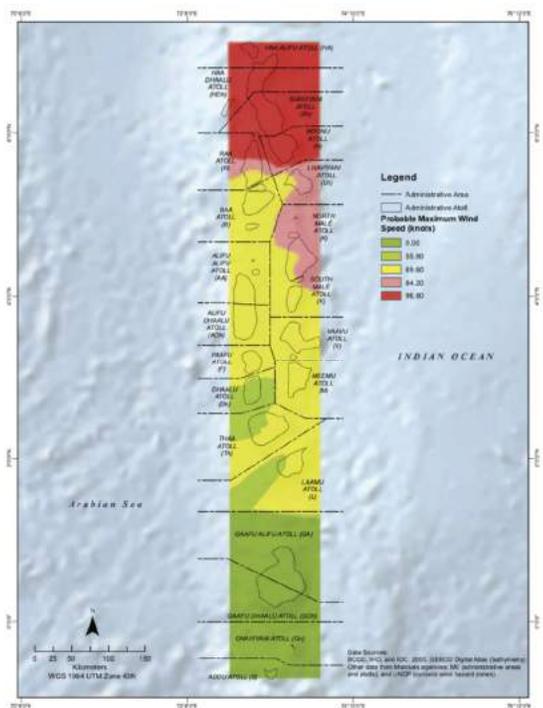
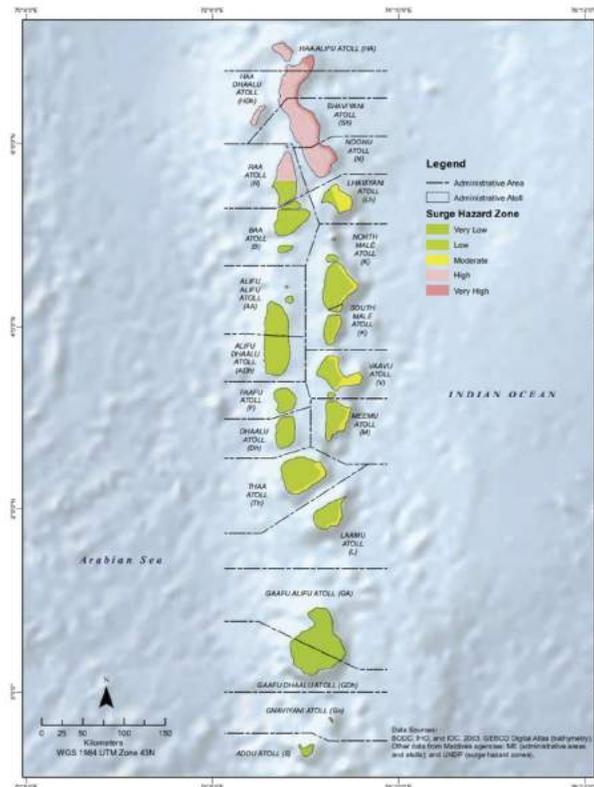


Figure 21. Cyclonic wind hazard zones (sourced from the Multihazard Risk Atlas of Maldives)

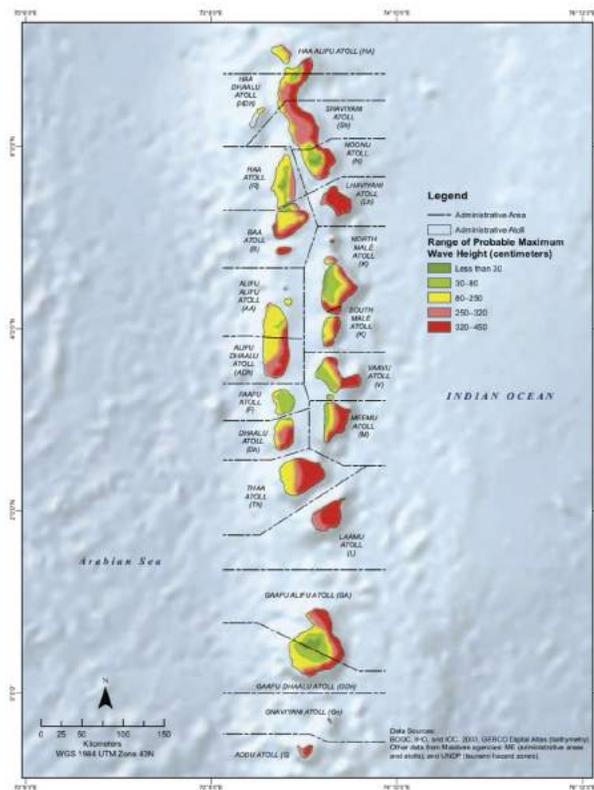
As evident from Figure 21 which depicts Cyclonic wind hazard zones, the northern region of Maldives, which also hosts Vandhoo has the highest risk due to cyclonic winds, with a probable maximum wind speed of 96.80 knots. The northern area of Raa Atoll has a very high risk due to cyclonic winds, while the central area and southern area have high and moderate risk respectively. Vandhoo falls into the border zone between high and moderate risk zone for cyclonic winds.



**Figure 22. Surge Hazard zones (sourced from the Multihazard Risk Atlas of Maldives)**

The northern regions of Maldives are at higher risk of Surge, especially on the eastern periphery of the Atolls. Islands on the eastern periphery of the central atolls are at moderate risk, while the western side of the atolls and the atolls in the south of Maldives are at low risk of surge hazard (Figure 22). Vandhoo is envisaged to fall into the low risk zone for this hazard.

Tsunami hazard for the atolls of Maldives is highest for those on the eastern periphery of all atolls, with a probable maximum wave height range of 320-450cm. The risk is moderate for the islands on the western side of atolls and lowest for islands in the centre of the atoll (Figure 23). Once again, as Vandhoo is on the eastern side peripheral reef of the atoll, the island is at high risk of tsunami.



**Figure 23. Tsunami Hazard Zones (sourced from the Multihazard Risk Atlas of Maldives)**

There is no available data on rainwater flooding hazard for the island of Vandhoo. However, consultation with staff revealed rainwater flooding issues at some blocks at present. Hence, there is moderate risk of rainwater flooding at the proposed fuel farm area as well. However, since tank area is sealed and the tank is enclosed within a concrete bund this risk is minor.

### ***Beach erosion***

The beach environment of Vandhoo was described in detail in the initial ESIA (Riyan and NIRAS, 2012) and in terms of erosions, the report states as follows “*Moderate signs of erosion are observed around the beaches, this is mostly due to seasonal shifting of beaches. Areas that are prone to erosion are the northwestern corner and eastern corner, which has shifting sand spit*”. Hence shoreline near proposed fuel farm is not seen to observe erosion.

### ***Associated hazards with the refueling and fueling operations***

Refuelling work will be undertaken by trained operators and with proper mitigation measures in place. The fuel tanks will be constructed with bund walls which have the capacity to hold the entire contents of the fuel tanks in instance of leakage. Hazard vulnerability due to these activities is seen to be low.

## 6 Stakeholder consultation

Stakeholder consultations were carried out with all relevant stakeholders as identified in the TOR:

- WAMCO Senior Management and Resident Staff of Vandhoo (randomly selected)
- Ministry's International Operations Consultant at Vandhoo RWMF
- Waste Management and Pollution Control Department (WMPCD) and other projects of MECCT that are investing in Vandhoo RWMF
- MNDF and MECCT's fire safety consultant
- Utility Regulatory Authority
- Innamaadhoo and Rasmaadhoo Island Councils and/or Women Development Committee (if any significant socio-economic impacts were identified through the impact analysis)

*Note: Women Development Committees of Innamaadhoo and Rasmaadhoo were not consulted as the proposed project scope was not envisaged to have any significant socio-economic impacts.*

### 6.1 WAMCO Senior Management and Resident Staff of Vandhoo (randomly selected)

#### *Consultation with Vandhoo Interim Manager from WAMCO*

Consultation was carried out with Vandhoo Interim Manager from WAMCO, Mr. Mohamed Shaan. The project brief was shared with the personnel and consultation was carried out via telephone, as well as email communication (email communication given in Appendix 15). The Consultant enquired about the following.

- Most suitable location for temp site setup (for workforce use): Personnel from WAMCO stated that the most ideal location will be the area in between building plot E1 and 12.
- EIA Consultant enquired about the current requirements for reporting on complaints/grievances including responding to Sexual Exploitation and Abuse and Sexual Harassment (SEA/SH) related issues. Personnel from WAMCO stated that all reports are filed at the RWMF office on Vandhoo, and from there the necessary action is taken.
- Consultant enquired whether additional labour will be required to operate newly proposed developments. Personnel from WAMCO stated that given the proposed work, he did not envisage new staff being required for their operations (although this might change depending on circumstances once operations start), although once the whole facility is operational, they would need new staff.

- Consultant enquired about the COVID19 special considerations which are applicable to operational staff of the facility. Personnel from WAMCO stated all operational staff should always wear the required PPE and hand washing and sanitizing should be practiced. The staff should also, not report to work if having fever. He further stated that 99.9% of operational staff have completed vaccination (one person has not been able to vaccinate due to health reasons).
- Consultant enquired about road signage placement in the TMP. Personnel from WAMCO stated that at present they are unable to give a final layout as the roads also have not been all developed as yet. They stated that once the contractor's work starts, they can arrange a safe possible means of driving vehicle in the RWMF.

### ***Consultation with Resident staff of Vandhoo***

Five resident staff of Vandhoo were consulted regarding the proposed work and their experience at Vandhoo.

- When asked about their opinion on the new proposed location of fuel tanks, all were in agreement with the new proposed location and some stated that it was better to keep it away from the incinerator, so as to minimize fire risk. Hence proposed location is suitable and the most appropriate place to have the fuel tanks.
- The staff were then asked about the living condition at Vandhoo and whether they were getting all their basic needs and required safety measures were in place.
- Majority of the staff are either from the nearby islands or are accommodated at these inhabited islands and return home island daily after their shift is over. This arrangement was agreeable by the staff as they are able to return to their island and see family. Overall the staff were satisfied with the conditions and meals, although they did state that there was only 1 room available for breaks and resting and 3 toilets. This at times created difficulties and they also felt was not safe, as there are about 30 to 40 staff. However, those who stay on Vandhoo noted that the current accommodation facility and mess room are too close to the area where waste sorting and disposal is carried out.
- They noted that the bunkers allocated for the different functions of the facility are laid out from east to west which makes it very difficult to work there during storms. They have issues with smell, smoke as well as flooding and rain entering the bunkers. Flooding is experienced at multiple blocks. Although ground level was taken into consideration during design and build of these structures, ground level was taken from the harbour area which is elevated in comparison to rest of the island. They noted that all blocks except the office block have this issue.
- Consultant enquired whether the staff were provided with all the necessary PPE and safety equipment and all respondents stated that all the required PPE is readily available.

However, some noted that although these are available for use, some staff do not consider safety as a critical issue and do not wear the PPE even if provided. Hence some staff were not comfortable working that way, where there were people who they worked with who were being careless as this puts everyone at risk.

## **6.2 International Operations Consultant at Vandhoo RWMF, MCEP**

Consultation with the International Operations Consultant, at Vandhoo RWMF, MCEP, Mr. Martyn Jones was carried out via telephone on the 11<sup>th</sup> of October 2021. The key issues of relevance to the Consultant were shared via email prior to the consultation.

Mr. Jones explained the temporary fuel storage setup as there was some confusion due to the way it was discussed in the project brief which had been provided to the EIA Consultant. He also explained that the forklift movement route proposed in the brief is the final route and explained the process of fuel transfer from the powerhouse holding tank to the storage tanks. He has further shared a schematic of the movement route, which has been included in the relevant section of this report.

With respect to the query from the EIA Consultant regarding road signs to be placed and their locations, he stated that the actual road signage placement has yet to be decided and that it is important that the Operator is also involved in finalizing these locations. The road signs to be used are the standard road signage such as those indicating speed, one way roads and no entry points. He stressed the importance of the facility operator being involved in all stages of these projects, so that they are aware of proposed changes and how it would impact the facility operations.

## **6.3 Waste Management and Pollution Control Department (WMPCD) and other projects of MECCT that are investing in Vandhoo RWMF**

A meeting was arranged with WMPCD and Small Scaled Waste to Energy (SSWtE) Project of the Ministry. The meeting was held on 4<sup>th</sup> October 2021 via Microsoft Teams. Representatives from the Maldives Clean Environment Project (proponent) also took part in the meeting. The EIA Consultant briefed the participants about the proposed work and enquired about their concerns regarding the project.

Participants of the meeting enquired whether there are any issues with the new proposed location for fuel tanks being close to the shoreline and whether there are any guidelines by Maldives National Defense Force (MNDF) regarding tank locations. Consultant explained that the guidelines by MNDF were mainly focused on safety aspect of fuel farms and fuel tanks.

The participant from the SSWtE project stated that they had no issues with the proposed changes and that it would not impact their project.

EIA Consultant enquired about staff allocation at Vandhoo and whether there were any other projects at present. MCEP personnel stated that they would share staff allocation details. The sewage component had been changed to a septic tank system rather than a full central sewerage system as the low staff numbers at present does not warrant a full system setup. However, the system will be developed with provision for STP connection in the future.

#### **6.4 MNDF and MECCT's fire safety consultant**

Consultation with MNDF was held via google meet on 27<sup>th</sup> of October 2021 at 10:30hrs. The meeting was also participated by representatives of the fire plan design consultant, Riyan Pvt Ltd and proponent (MCEP). List of participants is given in Appendix 15. The project brief had earlier been shared with meeting participants for their information. The Consultant also briefly explained the project and enquired about their concerns/ questions.

- Personnel from MNDF stated that there is a new Amendment to the Regulation on fuel storage and use (2015/ R-160), which states that if the fuel storage area has a total capacity which is greater than 60m<sup>3</sup> then the storage area has to have foam system (for firefighting) and water drencher system for the tanks. As the total capacity of the fuel farm to be setup is greater than 60m<sup>3</sup>, the setup at Vandhoo has to be as per specified in this Amendment
- They noted that the storage tanks for Diesel and Petrol have to have separate bund walls as per the regulation
- The Pump capacity of the water drenching system should be calculated based on the capacity of the biggest fuel storage tank
- The Design consultant noted that although there is an existing fire hydrant system on the island, it is not functioning properly and a new system has been proposed in the new plan for the firefighting system designed this year. The plan which had been formulated by Riyan Pvt Ltd has not been approved by MNDF as yet and personnel from MNDF stated that at present they do not have a network design where the firefighting system is shown on the actual site plan of the island. The Design Consultant agreed to share this document with MNDF for approval.
- Personnel from MNDF stated that for some of the resorts where the only water source is freshwater, both the fire hydrant system and water drencher system use freshwater. However, in the instance where seawater is available, they can opt to use seawater for the fire hydrant system and freshwater for the water drencher system.

- With respect to the location of the fuel farm and proximity to other facilities on the site, personnel from MNDF stated that they did not have any issues with the location and were in approval of the proposed site.

## 6.5 Utility Regulatory Authority

A meeting request was sent to URA, to arrange a consultation session regarding the proposed work, specifically the setup of septic tank at the accommodation blocks planned in Vandhoo. Project brief was also shared together with site plan, for their information. Based on the project brief, URA communicated their concerns via email which states as follows “18 (haa), of the Water and Sewerage Act (8/2020) states that the groundwater of an island given out for industrial use is a protected water source, and 20 (haa) of the Water and Sewerage Act (8/2020) states that, any act which might contaminate the groundwater should not be carried out. And also, because it is a regional waste management facility, a lot of chemicals will seep into the groundwater if a septic tank system is used. Therefore, a proper sewerage system along with a treatment plant is a must for such a site”. Copy of email communication is given in Appendix 15.

Due to this conflict, a meeting between the proponent [MCEP and Waste Management and Pollution Control Department of MoECCT (WMPCD)], the policy maker [Water and Sanitation Department of the MoECCT (WATSAN)] and the regulator (URA) was held on the 1st of November 2021. The EIA Consultant also participated in the meeting.

During the meeting the proponent clarified on the concern raised over hazardous materials potentially seeping into the ground as a result of the proposed septic tank. It was explained that the septic tank is exclusively designed to cater only for domestic sewage generated from the S2 staff accommodation block (which is expected to accommodate around 50 people) and that the accommodation area is sited far away from the waste processing areas of the facility, as well as separated by a significant green buffer zone. It was also highlighted that the facility already has proper leachate and stormwater containment measures in place which deals with the leachate generated from the waste processing areas of the facility. As such, there is a leachate collection pond and two stormwater retainment ponds, interconnected to one another, and with the system being designed in such a way that the water collected at these ponds gets recirculated through a sprinkler system to the engineered ash disposal landfill, the purpose of which is to irrigate the disposed bottom ash. These aspects are covered in detail under the original ESIA of the facility prepared in 2012. It was also brought to their attention that the facility does not accept chemicals or hazardous waste, and therefore there is absolutely zero chance of chemicals and other hazardous materials seeping into the ground as a result of the proposed septic tank. After this explanation, the doubts over the groundwater lens being contaminated by the proposed septic tank component was removed and it was well understood by all the meeting attendees.

However, URA stressed that since the legislation states that groundwater resource of industrial islands are protected, even secondary level filtered effluents from a septic tank cannot be released into the ground via a soak way and even though the usage of septic tank as a wastewater treatment is debatable, they cannot allow the use of a septic tank for even domestic sewage disposal. The only exception for a septic tank with a soak way is if the effluents get treated to a level where BOD5 reaches 5mg/l prior to releasing to the ground, which is drinking water quality standards that can only be achieved through a tertiary treatment. But the legislation allows disposing domestic raw sewage into the ocean beyond the reef edge at the required depth, considering that the ocean currents would flush it off and dilute it. In addition to this, it was mentioned that the Water and Sanitation Department (WATSAN) of the Ministry is currently working on determining the population threshold where a treatment plant is required, which is expected to be in excess of 700 to 1000 people.

The outcome of this meeting was to develop a provisional sewer network with an outfall and a pump station instead of the proposed septic tank. It was agreed that a treatment plant will not be required at this stage, since it is to cater for domestic sewage of a very small population (less than 100 people), which will also not be financially justifiable considering the high cost involved in setting up a treatment plant (believed to be in the range of MVR 3.4 million to 5.1 million, depending on the type of the technology). However, to mitigate potential negative impacts to marine environment due to release of raw sewage (however minor it is), the proponent suggested to still include the septic tank component, but rather than releasing it to the ground via the soak way to make a connection to the provisional sewer network, so that only filtered effluents to a secondary level will get released into the ocean via the outfall. This was agreeable to both URA and WATSAN. Hence, it was agreed that the use of a septic tank can be approved, but only if the effluent was to be discharged to the ocean. The proponent agreed to this method, and stated that the setup of an outfall was already addressed in the First Addendum (ESIA 2019) and hence the septic tank could be connected to this outfall.

## **6.6 Innamaadhoo Island Council**

Meeting with Innamaadhoo Council was held on 10<sup>th</sup> October 2021 via google meet. List of participants is given in Appendix 15. The Consultant explained the project and relevance to Innamaadhoo (accommodation of contractor workforce on the island) and enquired as to whether they had any issues or concerns.

Meeting personnel stated that at present there are many ongoing projects on the island and hence a lot of rental properties are already occupied by the different Contractors and their workforce. They will check availability of rooms / houses before they can confirm.

Meeting participants however did state the high number of expatriate workers on the island does create some issues such as some workers being undocumented and there being some minor behavioural issues which could possibly stem out of cultural differences. However, if there are rental properties available, they are willing to have the Contractor workforce setup their accommodation on the island. They did however stress the importance of having a local person (from Contractor side) who would act as a focal point and play a supervisory role in the group.

## **6.7 Rasmaadhoo Island Council**

Meeting with Rasmaadhoo Council was held on 10<sup>th</sup> October 2021 via google meet. List of participants is given in Appendix 15. The Consultant explained the project and relevance to Rasmaadhoo (accommodation of contractor workforce on the island) and enquired as to whether they had any issues or concerns.

Meeting participants stated that some staff of Vandhoo and Contractors are already accommodated on the island and they have not had an issue to date. However, they stated that during the early COVID 19 pandemic days, there were some illegal immigrants and non-work permit holders on the island as well, as part of Contractor workforce for different projects (though not of those related to any work at Vandhoo).

Meeting personnel stressed the importance of having a local (from Contractor side) as a focal point to liaise with, when required.

Meeting personnel stated that they had in the past had some incidents of sexual harassment by Contractor workforce (not Vandhoo related) and that in such instances they will immediately ask the person to leave and would not allow them to stay on the island. There is no police presence on the island (they are sited at Ungoofaaru) to monitor the island.

Approximately 30 workers were based in Rasmaadhoo for a number of construction works at Vandhoo, and they have not had an issue to date. Although this may be the case, Council reiterated that Vandhoo management has to ensure that all contract workers (if expatriate) have proper documentation and work visa.

## 6.8 Consultation outcomes

Key issues raised by the stakeholders during the consultation meetings were communicated to the PMU for their feedback. Issues raised and feedback from the PMU to the concerns, are given in Table 10.

**Table 10. Key issues raised during consultations and feedback from PMU**

Stakeholder	Issues	Feedback from PMU
Resident staff of Vandhoo	The current accommodation facility and mess room are too close to the area where waste sorting and disposal is carried out	This issue will be resolved once the S2 accommodation block (currently at tender stage) is completed, as S2 block is sited well away from the existing and proposed operational areas under the MP and also separated by a significant buffer.
	During heavy rainfall periods, flooding is experienced at a number of bunkers (at all blocks except, the office block), which makes it difficult to work	To remediate this a gutter will be installed between the building 09B (waste storing shed) and E1 (incinerator building). This has already been added to the scope of works of the contractor who is undertaking the extension of the building 09A (where the sorting line is proposed to be installed).
	Some workers do not wear the required PPE, even if they are available, which puts all workers at risk.	PPEs are now made mandatory and is even checked during daily toolbox talks. It is being stringently followed after the appointment of the new Interim Manager in August 2021.
Island Councils of Innamaadhoo and Rasmaadhoo	Issues due to illegal immigrants and non-work permit holders (though not for projects related to Vandhoo)	<p>Civil works subprojects related to Vandhoo have strict protocols where a full staff list, passport copies and work permits are collected prior to allowing the contractors to mobilize.</p> <p>Any breach of contract is effectively and immediately remediated and corrective measures implemented in a timely manner. Measures such as written notifications and withholding of payments are being employed. The World Bank is also informed and all details shared in writing (for WB funded projects).</p> <p>The project also checks compliance to the ESMP during random site visits and</p>

		<p>through the KoBo toolbox monitoring tool developed. At least 2 random checks are performed during the construction phase of each subproject. Interim monitoring reports are prepared and shared with the World Bank on a regular basis.</p>
	<p>Important to have a local as a focal point (from the Contractor's side), who they can liaise with when required</p>	<p>One of the mitigation measures proposed to minimize impacts due to arrival of workforce is to have a local within the workforce to act as a focal point, hence this will address the issue raised.</p> <p>The contact details of the site supervisor and the health and safety supervisor of contractors are included in the respective project boards. The project boards are currently placed at the designated work sites in Vandhoo. As an additional measure, the focal point contact details are also recommended to be displayed in the council notice board of the respective island where the contractor's workforce is being accommodated.</p>

## 7 Impact assessment and baseline for significant impacts

Various methods are available to categorize impacts and identify the magnitude and significance of the impact, such as checklists, matrices, expert opinion, modeling etc. Impacts on the environment from various activities of the project construction work (constructional impacts) and post construction (operational impacts) have been identified through interviews with the project management team and field data collection surveys. Data collected during field surveys have been used to predict outcomes of various operational and construction activities on the various related environmental components. This data can also be used as a baseline for future monitoring of the environment. The basis for environmental impact evaluation for this report is based on Rapid Impact Assessment Matrix (RIAM) which allows judgements (both subjective and quantitative assessments) to be made and provide good understanding of these decisions (Pastakia and Jensen, 1998).

### 7.1 Impact analysis methodology

The environmental impacts as a result of this project was analysed using the Rapid Impact Assessment Method (RIAM). The RIAM approach allows us to analyse and present the results of an all-inclusive EIA, which analyses impacts on all environmental components (physical, biological, social, cultural, economic etc.); the approach allows for data from these different components to be analysed against common important criteria within a common matrix, thus providing a rapid, clear assessment of the major impacts (Pastakia and Jensen, 1998).

Methodology description has been sourced from Pastakia and Jensen (1998). The approach is based on standard definition of important assessment criteria and collation of partially quantitative values for each of these criteria so as to achieve an accurate and independent score for each of the environmental conditions being assessed. The assessment criteria fall into two groups A and B as described in Table 11 below.

**Table 11. Assessment criteria used in RIAM approach**

Criteria		Scale	Description
A - Criteria that are of importance to the condition, and which can individually change the score obtained	A1 – importance of condition	4	Important to national/international interests
		3	Important to regional/national interests
		2	Important to areas immediately outside the local condition
		1	Important only to the local condition
		0	No importance
	A2 – Magnitude of change / effect	+3	Major positive benefit
		+2	Significant improvement in status quo
		+1	Improvement in status quo
		0	No change / status quo

		-1	Negative change to status quo
		-2	Significant negative disbenefit or change
		-3	Major disbenefit or change
B - Criteria that are of value to the situation, but individually should not be capable of changing the score obtained.	B1 – Permanence	1	No change / not applicable
		2	Temporary
		3	Permanent
	B2 – Reversibility	1	No change / not applicable
		2	Reversible
		3	Irreversible
	B3 – Cumulative	1	No change / not applicable
		2	Non – cumulative / single
		3	Cumulative / synergistic

The value for each of these criteria is obtained through a series of simple formulae as below:

- $(A1) \times (A2) = AT$
- $(B1) + (B2) + (B3) = BT$
- Environmental score (for any given condition) =  $(AT) \times (BT)$

Multiplication of the values of group A ensures that the weight of each score is expressed, while summation of values of group B ensures that the individual value scores cannot influence the overall score, but that the collective importance of all values group (B) are fully considered.

Environmental components to be assessed are identified through the EIA process and in the RIAM approach, these are divided into four categories as below:

- Physical/Chemical (PC): covers all physical and chemical aspects of the environment
- Biological/Ecological (BE): covers all biological aspects of the environment
- Sociological/Cultural (SC): covers all human aspects of the environment, including cultural aspects.
- Economic/Operational (EO): qualitatively to identify the economic consequences of environmental change, both temporary and permanent.

A matrix is then produced for the different components identified for the project set against the different assessment criteria. Criteria scores are then given to each component and the environmental score for each component calculated using the formulas given above.

The scores obtained are then interpreted based on range bands, as given in Table 12. Each range band describes the level of an expected change (positive or negative) and they also represent the final assessment from the RIAM analysis. Once the ES score is set into a range band, these can be shown individually or grouped according to component type and presented in a graphical or numerical form as preferred.

**Table 12. Range bands used for RIAM approach, with Environmental scores, criteria number and code**

Scoring values (ES)	Range band	Criteria Number	Criteria Colour Band Description
72 to 108	E	5	Major positive change/impact
36 to 71	D	4	Significant positive change/impact
19 to 35	C	3	Moderate positive change/impact
9 to 18	B	2	Positive change/impact
1 to 9	A	1	Minimal positive change/impact
0	N	0	No change/status quo / not applicable
-1 to -9	-A	-1	Slight negative change/impact
-10 to 18	-B	-2	Negative change/impact
-19 to -35	-C	-3	Moderate negative change/impact
-36 to -71	-D	-4	Significant negative change/impact
-72 to -108	-E	-5	Major negative change/impact

Possible impacts arising from the construction and operation works are categorized into physical (PC), biological (BE), socio cultural (SC) and economic (EO) including operational aspects of the project. Environmental impacts of the project are evaluated against these environmental components. The impacts identified are also described according to their location, extent (magnitude) and characteristics. Positive and negative impacts are categorized by intensity of impacts for identifying best possible remedial (mitigation measures) action to be taken. Below are the impact scale and categories.

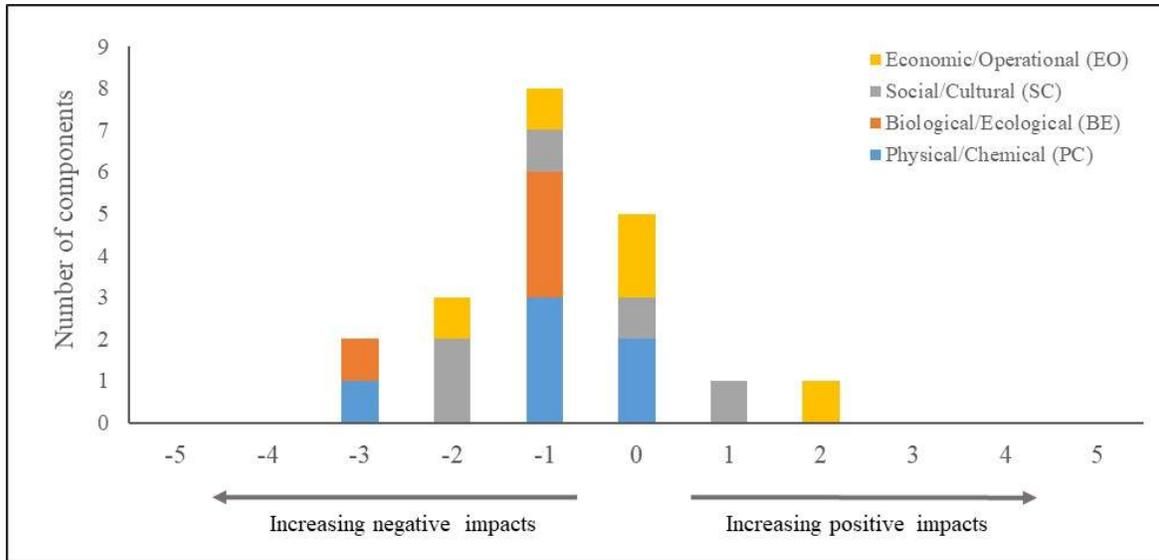
## 7.2 Impact Analysis

The significance of environmental impacts associated with the project (positive and negative) is ranked and colour coded to show the intensity of the impact for each environmental component as listed in Table 12. Impacts are assessed according to the respective probability, significance, magnitude and duration. Table 13 gives the assessment for the impacts, and these are further discussed in Sections 7.2.1 and 7.2.2.

Figure 24 provides a graphic summary of the overall impacts for all the environmental components considered. Negative impacts of the project and their negativity scale was in the low range (-A to -B). The most significant negative impacts were those that are associated with the need for vegetation clearance, impacts due to presence of workforce (potential illegal immigrants, behavioural issues, increased risk of spread of COVID 19 etc.) and impact on health and safety of workforce, especially those at the fuel farm, who will be responsible for fuel extraction, storage, refueling and overall all operations of the fuel storage area.

**Table 13. Outcome of the environmental impacts with reference to environmental components considered. (PC = Physical/Chemical, BE = Biological/Ecological, SC = Social/Cultural and EO = Economic/Operational. Colour codes refers to intensities of impact each component subjected to assess)**

Code	Description	RIAM Criteria Scores					Environmental Value Score (ES)	Range Value Band (RB)	Criteria number
		A1	A2	B1	B2	B3			
PC 1	Air pollution at the project site due to emissions associated with construction machinery and vehicles and dust	1	-1	2	2	2	-6	-A	-1
PC 2	Changes to the ambient noise due to construction work	1	0	1	1	1	0	N	0
PC 3	Impact on groundwater quality due to construction work and temporary fuel storage setup	1	-1	3	3	2	-8	-A	-1
PC 4	Impact on the marine and island environment (flora and fauna) due to accidents during material transfer	1	-2	1	1	1	-6	-A	-1
PC 5	Impact on natural environment due to vegetation clearance works	1	-3	3	3	2	-24	-C	-3
PC 6	Impact on staff buildings due to ground vibrations and other disturbances	0	0	0	0	0	0	N	0
BE 1	Impact on the marine and island environment (flora and fauna) due to accidents during material transfer	1	-2	1	1	1	-6	-A	-1
BE 2	Impact on groundwater quality due to construction work and temporary fuel storage setup	1	-1	3	3	2	-8	-A	-1
BE 3	Impact on groundwater quality due to proposed septic tank setup	1	-1	3	3	3	-9	-A	-1
BE 4	Impact on natural environment due to vegetation clearance works	1	-3	3	3	2	-24	-C	-3
SC 1	Health and safety risks to the workers due to proposed construction works	1	-2	3	3	2	-16	-B	-2
SC 2	Changes to the ambient noise due to construction work	1	0	1	1	1	0	N	0
SC 3	Impacts on island community due to arrival of workforce (illegal immigrants / grievances of different types)	1	-2	2	2	3	-14	-B	-2
SC 4	Impact due to local sourcing of construction materials	1	1	2	2	2	6	+A	1
SC 5	Impact on shared resources and facilities at Vandhoo due to additional workforce	1	-1	2	2	3	-7	-A	-1
EO 1	Employment opportunities during operations	0	0	0	0	0	0	N	0
EO 2	Changes to the ambient noise due to operations	1	0	0	0	0	0	N	0
EO 3	Impact on groundwater quality due to proposed septic tank setup	1	-1	3	3	3	-9	-A	-1
EO 4	Impact on operations due to better roads and traffic management	1	2	3	3	3	18	+B	2
EO 5	Risk to operational workforce (fuel farm, septic tank maintenance)	1	-2	3	3	3	-18	-B	-2



**Figure 24. Graphic summary of RIAM analysis for the proposed work at Vandhoo RWMF. Y-axis shows the number of components**

### 7.2.1 Construction phase

#### **Impacts due to noise pollution and disturbances (PC and SC)**

The current noise levels on site range between 51-59 dBs. This falls within the permissible parameters as per the World Bank ESHS Guidelines for an Incinerator operator facility. The expected civil works are not estimated to incur noise levels above 80 to 90 dBs, which is the range for most construction sounds fall (ANSI, 2018). This will not add an additional impact to the existing noise levels already on site and therefore will not cause a significant additional impact in terms of noise pollution.

#### **Impacts on groundwater table and quality due to construction work (PC and BE)**

Groundwater quality of the island is seen to be in good condition and all parameters tested (temperature, pH, conductivity and total dissolved solids) were seen to be within the reference ranges given by EPA. The proposed work has the potential to pollute the natural environment and groundwater due to accidental spill of fuels during the various transfer stages (especially with the temporary fuel transfer setup). However, given that bunds are proposed for the fuel tanks and mobile bunds are proposed for the fuel transfer work, this impact is seen to be minor, although in the event of accidental leakage, there could be significant consequences.

### **Impacts on resident staff buildings due to ground vibrations (PC)**

The staff residential buildings are at a distance of about 150m from the fuel farm area and about 500m from the proposed septic tank location. However, road extension work will be undertaken closer to the staff areas as well. Nevertheless, the scope of work and construction required is not envisaged to have any disturbances in terms of ground vibrations as no heavy machinery or vehicles will be used.

### **Impacts on air quality (PC)**

Being an industrial island, the site is already dry and dusty. Wind conditions at the site, depending on the time of the year would further exacerbate these conditions, with dust spread. The construction work requires civil works, with main machinery used being a cement mixing machine. The construction work is envisaged to have a negative impact on the air quality at the site, due to generation of additional dust during the working period. This will be a short-term impact, which would clear up after construction work is completed.

### **Impacts due to material spillage during transfer of construction materials to the project island (PC and BE)**

Construction material will be carried to site on barges and bigger vessels. There is always the chance of pollution of the marine environment during mobilization and material unloading, especially if done during rough weather periods. Significance of the impact has the potential to increase, especially if the materials to be transferred are not packed properly and there are loose items. Additionally, any oil spills during such trips has the potential to have a significant negative impact both on the physical (seawater quality, reef health) and biological aspects (marine fauna and flora) of the marine environment.

### **Impact due to vegetation removal (PC and BE)**

As identified in the vegetation survey carried out as part of the survey work, a number of palms / trees have to be removed during this scope of work (total of 82 coconut palms and 49 trees of different species, refer to Section 5.4.1 for details). The proponent states that vegetation will be transplanted along the periphery of roads developed on Vandhoo (approximately 20%) and that which cannot be planted at Vandhoo will be taken for replantation at the newly reclaimed area of Dhuvaafaru nearby. As per the proponent, a space on this land has already been reserved for this purpose and the Council is also in agreement to this plan. Given that Vandhoo is a heavily vegetated island, there is very little land area available for replantation and the only possible areas are the periphery of the roads to be developed, which as per design also have a green zone on both sides. Given that the majority of the vegetation removed has to be taken out of the island, this

component has a moderate negative impact on the environment of Vandhoo, due to the loss a large number of trees / palms, which have many benefits such as economic value, aesthetic value, provision of green buffer and shade. Furthermore, larger palms (taller than 20-30 feet) and mature trees cannot be translocated out of the island and will need to be cut down.

While the vegetation clearance has a moderate negative impact on the environment of Vandhoo, availability of these for replantation at newly reclaimed land area at Dhuvaafaru, will have a significant positive effect on the environment of Dhuvaafaru.

### **Impacts due to arrival of workforce (SC) – on accommodation island**

The proposed work will be carried out by an assigned contractor who have their own workforce. The proponent has stated that the contractor workforce will be accommodated at one of the nearby islands, Innamaadhoo or Rasmaadhoo. As majority of development projects are carried out by contractors with their own workforce, island communities are familiar with having them in the island.

The arrival of workforce, especially if comprised mainly of expatriates has the potential to have a significant negative impact in few scenarios, such as the presence of illegal immigrants, or instances where their behaviour is not within accepted social norms of Maldivian culture. Negative impacts may also arise due to cramped workforce quarters, which especially at present has the risk of outbreaks, such as that of COVID 19.

It should be noted here that during consultation with the Island Councils, it was stated that there have at times been some issues due to the external workforce (although not of those related to any workforce hired for Vandhoo projects), mainly behavioural issues, which could also stem out of cultural differences. They did note that it is important to have a local within the workforce, who acts as a focal point.

### **Impact on resources and shared facilities at Vandhoo, such as bathrooms, resting facilities etc. due to arrival of additional work force during construction period (SC)**

The workforce for the construction phase of the project is comprised of 15 to 20 workers which is a small number for such projects. The contractor will set up a separate resting area for the workforce, at a location agreed between Vandhoo management and the Contractor (location identified in Figure 11). The workforce will utilize the existing bathrooms setup on the facility (normally one bathroom is assigned to contractor workforce). Hence, additional contractor workforce on the island will inevitably have an impact on these facilities and those using it, especially in the instance where different contractors are working at the site.

## **Impacts due to illegal immigrants being potentially recruited by the contractor (S)**

In the instance that an illegal immigrant is hired by the contractor, there would be negative impacts in terms of loss of work and income for another person with proper documentation.

## **Impacts and risks associated with illicit behavior, Sexual Exploitation and Abuse and Sexual Harassment (SEA/SH) and gender-based violence (SC)**

In the instance that any such issue arises with any of the contractor workforce, the impact will be significant and consequences would be severe. Island communities do not accept such behaviour. While there is always the risk of such an issue arising, this risk is mitigated through the following measures.

The Contractor has the responsibility to ensure that the workforce do not engage in any illicit behaviour (sexual exploitation and abuse and sexual harassment and gender-based violence). Once the Contractor for the project is identified, the company will have to sign and abide by the “Company Code of Conduct - Implementing Environmental, Social, Health and Safety (ESHS) and Occupational Health and Safety (OHS) Standards Preventing Gender Based Violence” (given in Appendix 10 of this Addendum).

Additionally, all contractor workforce who will be mobilized to Vandhoo have to sign and abide by the “Individual Code of Conduct - Implementing ESHS and OHS Standards Preventing Gender Based Violence”. This document is also given in Appendix 10.

## **Risks related to non-compliance with labour regulations (SC)**

Non-compliance with labour regulations has the potential to have significant negative impacts on the project work, as this could lead to worker protests and refusal to work. In such instances, in addition to the impact on the reputation of the contractor company, there will also be significant economic loss for both the contractor and proponent due to delays in the project completion. Measures to mitigate such impacts are discussed in the Environmental and Social Management Plan for the project. A grievance redress mechanism (given in Chapter 12) should be in place to address and correct such events.

## **Benefit to local economy due to purchasing of locally available construction materials (SC)**

The contractor hired for the project will either source their materials through local suppliers or import if necessary. Purchase of materials locally would have a positive impact on the local economy, although not on a significant scale, due to the small scope of the project.

## **Health and safety of workforce (SC)**

Accommodation in cramped quarters, especially during the current COVID 19 pandemic has the potential to have a significant negative impact on the health and safety of the workforce and even the community of the island where accommodation is arranged, as this is a means of easy spread of diseases.

The proposed work includes a lot of fuel handling work, which will be done so through use of all required PPE and by experienced workforce. Hence impacts due to improper handling of fuel and waste oil is envisaged to be minor, although in the instance of accidents, such as spills the impact has the potential to be significant.

Exposure to Asphalt fumes has been shown to have certain detrimental effects on the workers, whereby research has revealed workers to show signs of acute respiratory and eye irritation as well as skin irritations, though all these symptoms have been mild and transitory (CDC, 2000). There is currently no evidence of long-term illnesses due to exposure to these fumes. Hence there is risk for the workers, though it is anticipated that this is a minor, short-term risk, especially if mitigation measures identified in report are followed.

Other work-related impacts include those due to exposure to high noise levels for prolonged periods of time, exposure to sun and heat for prolonged periods of time, which could result in temperature stress related injuries, working in dusty environment which could have significant impacts on the respiratory health of workers, and fatigue due to continuous hard work involved in the construction industry. All these factors combined has the potential to have a significant impact on the health and safety of workforce and hence should be appropriately mitigated. The Contractor has the responsibility to ensure the health and safety of the workforce. As such the Contractor must ensure that their accommodation, meals and break times are taken care of regularly. First aid kits available on site will ensure that any minor injuries are easily taken care of without delay

A traffic management plan for the facility has been formulated by the proponent and facility operator. However, this plan will be in effect during operational phase and hence traffic management during construction phase needs to be ensured for functionality of the facility as well

as the construction work. Impact due to traffic mismanagement has the potential to be significant due to unforeseen accidents and consequent injuries.

## 7.2.2 Operational phase

### **Impact on environment due to operations of the project components**

#### *Fuel transport and storage*

Fuel storage and operation of the fuel farm has the potential to have significant impacts on the environment and the workforce, in instances of accidental spills or any accidental fires. Impacts on natural environment and workforce health are described in detail below. The fuel farm will be setup as per the guidance provided by MNDF and as per their regulations on fuel storage facilities, which would ensure setup of proper firefighting equipment. This will aid to mitigate impacts.

Transfer of fuel from Male' to Vandhoo on a scheduled basis also comes with the risk of accidental spillage which would have significant detrimental impact on the marine environment. As discussed in Section 2.5.1.1. these scheduled trips also add to the carbon footprint due to the marine transfer logistics. However, the increase in storage capacity through this project will assist to minimise these impacts.

#### *Operation of septic tanks*

The proposed method of septic tank setup which is to remove the sludge and seep secondary level filtered liquid effluent into the ground via a soak way is not envisaged to have significant environmental impacts, especially due to the size of the operation. However, as the current legislative setup does not allow release of even secondary level filtered effluents from a septic tank into the ground this would have a significant negative impact in terms of issues which would arise with project continuation and obtaining the operations license.

The development of a septic tank system instead of a central sewer system also has indirect positive impacts as well. The construction of septic tank will be faster and relatively low-cost versus a central sewer system for which roads have to be cleared first and a significant amount of additional funding would need to be sought. Hence, the septic tank would assist to expedite the establishment of the S2 accommodation block, which as seen from stakeholder consultations and issues raised by resident staff of the facility is a much needed necessity. The new accommodation facility will also facilitate accommodation of key experts from the capacity building contractor (international).

### *Road network operations*

Traffic along the newly constructed road network will be managed as per the Traffic Management Plan given in this Addendum. However, even so, there is potential for accidents, especially in the initial days of operations, while the workforce acclimatizes to the new roads and the traffic flow. Poorly trained or inexperienced industrial vehicle drivers have increased risk of accident with other vehicles, pedestrians, and equipment. Furthermore, given that the roads are asphalt paved, heat and increased temperatures will also have an impact on the workforce. However, on the other hand, better paved roads with the new extensions, will allow better traffic flow on site, and easier access to key areas of the site.

### **Impacts on noise pollution and disturbances (PC and EO)**

The scope of the proposed work is not envisaged to have an additional impact on the ambient noise pollution and level of disturbance at the RWMF, during the operational phase.

### **Impacts on ground water table and quality due to operations (PC and EO)**

The fuel tanks will be constructed with bund walls which have the capacity to hold the entire contents of the fuel tanks in instance of leakage. Hence the impact due to leakage from the tanks and consequent pollution of groundwater is envisaged to be negligible.

The septic tank system to be placed will have a positive impact on the groundwater resource, although if not maintained and repaired when necessary, the pollution of groundwater through sewerage seepage would have a significant negative impact on the water quality. However, while this method of sewage management is not envisaged to have significant environmental impacts, due to the size of the operation, the current legislative setup does not allow seepage of untreated or even primarily treated effluents into the ground (refer Section 6.5 and Table 1). Hence, this option has significant negative impacts in terms of issues which would arise with project continuation and obtaining the operations license.

### **Health and safety of the fuel storage tank operators (SC and EO)**

Risks associated with the fuel farm include risks of fire. As a risk reduction measure, the occupational health and safety procedure formulated by WAMCO should be strictly followed by the workers. The fuel storage tank operators will also be given all necessary trainings and provided with all required safety equipment and attire. First aid kits will also be available on site to handle any minor injuries. Impact on health and safety during general operations is envisaged to be minor to major (if proper care is not taken).

Health and safety risks due to operations of the septic tank include that due to septic tank malfunction or breakdown, in which instance the operators would have a more direct exposure to raw sewage. However, in such instances, the workforce will be given proper PPE to be worn.

Health and safety risks due to new roads are those due to accidents and increased temperatures due to asphalt paving.

### **Employment opportunities to nearby islands and the region (SC / EO)**

During consultations with the operator of the RWMF, it was identified that the operations which would eventuate due to this scope of work is not envisaged to require additional staff. Hence proposed work will not provide additional employment opportunities to nearby islands during its operations.

## 8 Project alternatives

The proposed project involves minor changes to the concept of Vandhoo RWMF, with change to the proposed location of fuel storage tanks, minor extensions to the road network and change of sewerage system from a central system to septic tanks system. Additional components discussed in this report include the traffic management plan formulated by the Operator and the temporary fuel storage setup (for construction phase). Given the scope of the work, and impacts due to the work alternative options have only been considered for the changes to the road network and method of paving. Although fuel tank relocation also has an impact on the environment due to need for vegetation clearance, alternative has not been considered for this, (apart from keeping it at the same location), as relocation which is necessary will require vegetation clearance, even if being moved to another area.

### 8.1 Considered alternatives

#### 8.1.1 Changes to the road network

**Proposed road network:** Highlighted in blue in Figure 25.

**Alternate road network:** Indicated in red in Figure 25.



**Figure 25. Proposed road network extensions (blue highlight) and alternate road network extensions (red) for RWMF at Vandhoo, thick green line shows 20m offset from vegetation line (EPZ extent)**

**Selected road network:** Road extensions are proposed to provide access to the proposed new location for developing the fuel storage tanks (from both sides) and to site 14A (land fill proposed for future development) and 11C (recycling and baling plant proposed for future development). The creation of the new road connections will also form a circuit route around the facility, enabling

easy traffic movement. However, the road extension proposed on the northern side of the fuel storage tank locations encroach the buffer zone (EPZ) on that part of the island, which is in conflict with the Land use Planning Regulation. Alternative is to create the roads so that the roads on the eastern western side of the fuel farm ends at the northern side (as shown in Figure 22). This would still allow access to the area from both sides, without the need for clearance of the EPZ at the area. As this alternative achieves the desired output with less environmental impact, this option is considered the more feasible option and selected by the Consultant.

### 8.1.2 Road paving method

**Proposed method:** Asphalt paving

**Alternate method 1:** Unpaved roads

**Alternative method 2:** Use of interlocking blocks

The above options are evaluated in terms of Environmental, Social and Economic perspective. Appendix 16 gives a matrix of the environmental, economic and social aspects of these three road paving methods (Table 1 in Appendix 16). The Appendix also gives mitigation measures for each of the alternatives (Table 2 in Appendix 16). The environmental, social and economic aspects of asphalt paving method (proposed option) are;

- Environmentally friendly material
- Require 20% less energy to produce and construct than other types
- Better for water drainage
- Increase in air temperature depends on colour of asphalt – light coloured asphalt helps to mitigate this effect
- Do not leach
- Long lasting and durable
- Noise reduction
- Can be completed faster
- Damage preventable through maintenance and proper installation
- Exposure to Asphalt fumes have certain detrimental effects on the workers (acute respiratory and eye irritation as well as skin irritations)
- Can be repaired easily
- Capital cost high

**Selected method:** The proposed method of paving for the road extension area is the use of asphalt, which is what was also proposed for the road network in the ESIA of 2019. The alternative is to clear the area and leave the roads unpaved, which would result in uneven roads over time. A second alternative is the use of interlocking blocks for paving the roads, although this option is also not the most ideal for roads on industrial areas, with heavy vehicle activity. The uneven dirt roads have the potential to have a significant negative impact on the vehicles which use the roads, thus requiring frequent maintenance of the vehicles. In this aspect, although the asphalt paving will increase the financial cost of the project, it is the most ideal option, as these roads do not require frequent maintenance and are better suited for use by the vehicles operated by Vandhoo RWMF.

### 8.1.3 Septic tank setup

**Proposed:** discharge of liquid effluent into the ground via soak way

**Alternative:** discharge of liquid effluent from septic tank via outfall pipeline laid to the reef edge (Figure 26)



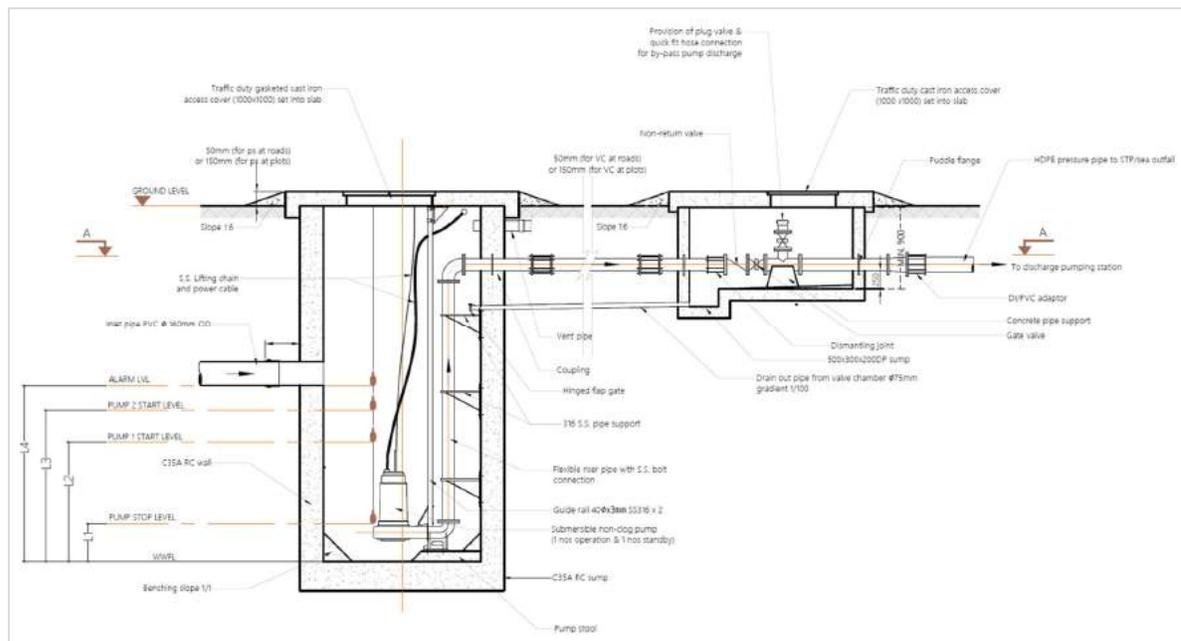
**Figure 26. Location of outfall (see Appendix 14 for scaled drawing)**

The above options are evaluated in terms of Environmental, Social and Economic perspective. Appendix 16 gives a matrix of the environmental, economic and social aspects of septic tank options discussed (Table 1 in Appendix 16). The Appendix also gives mitigation measures for each of the alternatives (Table 2 in Appendix 16). The environmental, social and economic aspects of discharge of liquid effluent from septic tank via outfall pipeline laid to the reef edge (now preferred option) are;

- Environmental impacts due to pipelaying work in the marine environment
- Environmental impact due to release of effluent to marine environment – minor due to size of operation, primary treatment and good flushing at the site
- Impact on groundwater due to accidental seepage due to septic tank damage and malfunction/ or from damage to sewerage network
- Legislatively accepted
- Operation license approval
- Higher cost due to network and pipelaying work

***Selected method:*** The proposed septic tank setup is to remove the sludge and seep secondary level filtered liquid effluent into the ground via a soak way. However, as per recent Water and Sewerage Act (8/2020) the groundwater resource of an island given out for industrial use is a protected water source and hence even the release of secondary level filtered effluents from a septic tank to the ground is not permitted, unless it is treated to a level where the BOD5 reaches 5mg/l, which is drinking water quality standards that can only be achieved via a tertiary treatment plant. This has also been identified and stressed during consultations with URA, who have stated that the operational license for the setup will not be given if it is developed as proposed. URA has requested to discharge the sewage to the surrounding waters through an outfall either with or without an STP.

The alternative proposed is the discharge of effluent to the ocean via the outfall proposed to be laid on the island (clearance for the location and outfall laying works obtained through ESIA of 2019). Figure 26 shows how the sewerage network will be connected to a pump station, from which the effluent will be discharged to sea. Even though legislation allows disposing of raw sewage to the ocean via an outfall laid beyond the reef edge at 15m depth, the proposed alternative considers to still construct the septic tank, but instead of the soak way to connect it to the sewer network and the outfall, so that only filtered effluents will get released into the ocean. The network setup will be done so with reservation for connection to a STP in the future (if the need arises). Schematic of a standard pump station is shown in Figure 27 below. Appendix 17 gives large scale drawings of the sewerage network and standard pump station.



**Figure 27. Schematic of a standard pump station by proponent**

As discussed in Section 7.2.2, the proposed method of sewage management is not envisaged to have significant environmental impacts, due to the size of the operation. However, as the current legislative setup does not allow release of even secondary level filtered effluents from a septic tank into the ground this would have a significant negative impact in terms of issues which would arise with project continuation and obtaining the operations license.

Environmental impacts due to the alternative method (laying out fall) have already been discussed in the ESIA of 2019, whereby the report states as follows “*Changes in live coral cover due to construction of brine and sewer outfalls are predicted to have moderate negative impacts as it may lead to loss of marine habitats*” (baseline condition of site is established in the First Addendum). The report further states for the operational phase as follows “*Wastewater and brine released from the sewer and brine outfalls are expected to impact negatively on the marine ecosystem. However, since sewer outfall will be extended beyond the reef edge and the area where outfalls are constructed is a high mixing zone, this impact is classified as a minimal negative change*”.

Hence, impacts due to release of sewage from the accommodation block to the outfall earlier proposed is envisaged to have similar impacts, although to a lesser extent since this addendum only considers sewage expected from the S2 staff accommodation block, versus the four additional S3 type staff accommodation blocks and the 6 guest/consultant accommodation buildings considered in the ESIA of 2019, which will not be developed at this stage or in the near future. It should also be stressed that impacts would be minimized by laying pipeline away from reef and

by flushing due to good currents at the area. Filtration of the effluents via the septic tank prior to releasing to the ocean through the outfall, would also be advantageous versus releasing untreated raw sewage.

Hence, given that the proposed method is not feasible as it does not meet the legislative requirements for the project, the alternative is selected and considered feasible. However, if the aforementioned additional accommodation areas proposed in the ESIA of 2019 are considered to be developed at a later stage and if the residential population of Vandhoo reaches the threshold that requires a treatment plant, an STP should be added in future as the release of effluents from a large population to the ocean would have a moderate, long term impact on the marine health.

#### **8.1.4 The no-project scenario**

The no-project scenario is also an available option. If this option is selected, the environmental impacts due to the project will be avoided. Selection of the no-project scenario means that the concept would remain as earlier proposed and hence, the needs for the project would not be met, especially the need for additional space to accommodate for the completion of building 9A in the Master Plan where the sorting line is proposed to be installed. This is an essential component and hence the no-project scenario would have a negative impact on the operations of the facility at its optimum.

With respect to the changes to the road network, the no-project scenario means that the access to the proposed areas would not be created.

The proposed change in sewerage system is based on the current need, whereby a central system is not required due to the small workforce on the island. Hence, given that impacts on the environment due to proposed changes are foreseen to be minor to moderate, while financial benefits due to some changes are also positive, selection of the no-project scenario is not seen to be a feasible option.

Mitigation measures for the different alternatives are discussed in Appendix 16.

## **9 Mitigation measures and Environmental and Social Management Plan**

Mitigation measures for environmental impacts that are associated with the project, both during construction and operational phase and which have been identified as significant impacts are discussed in this chapter. These are discussed in the context of various components of the project; evaluation of baseline environmental conditions at the project impact area and vicinity; concerns raised by the stakeholders through consultations and review of the literature of similar projects and experience of the ESIA Consultant.

Overall, the designs proposed in the project are environmentally, feasible, although there have been the need to change certain components so as to meet legislative requirements. These components have been discussed in the Alternatives chapter and mitigations discussed here are for the selected alternatives.

There are a number of actions that can be taken to minimize or avoid impacts altogether. Mitigation measures are selected to reduce or minimise the severity of any predicted adverse environmental effect and improve the overall environmental performance and acceptability (lower environmental damage) of the project from the perspective of construction and operation.

Mitigation measures are discussed for the construction and operational phase of the project with respect to various components and their likely impacts on physical, biological (within the project area), and social and economic environment (health, culture and economy). Impacts due to the project based on the assessment principles followed are foreseen as low to moderately negative to moderately positive. In order to further minimise potential negative impacts, mitigation measures have been discussed below (Table 14). Translation of the proposed ESMP in Dhivehi is given in Appendix 18 of this report.

**Table 14. Mitigation measures proposed for the project (ESMP matrix)**

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
<b><i>Detailed design and Planning Phase</i></b>					
Improper design of the proposed fuel tank, traffic management plant and septic tank system and associated environmental impacts	<ul style="list-style-type: none"> <li>Ensure detailed design takes into account details of the proposed layouts and all designs are as per specifications required, taking into account the environmental components that may be affected.</li> </ul>	Proponent	NA	NA	
Coastal erosion due to removal of vegetation buffer on northern side of proposed fuel farm, for road extension	<ul style="list-style-type: none"> <li>Vegetation buffer of 20m should be maintained and road extension work should be carried out as per selected Alternative in Section 8.1.1</li> </ul>	Proponent	NA	NA	
<b><i>Pre-construction Phase</i></b>					
Impact on marine and terrestrial environment during handling and transport of construction materials	<ul style="list-style-type: none"> <li>Material should be sourced from the closest point or should be brought in bulk and transported to the island.</li> <li>Detailed BOQ shall be made and should be followed to reduce the waste and to reduce the number of trips made to the island to provide the resources</li> <li>Ensure all materials being transferred are packed properly with no loose materials</li> <li>Oil spills should be monitored and recorded</li> <li>Maintenance work on machinery should be carried out as per a set schedule</li> </ul>	Contractor (implementation) Proponent (supervision)	N/A	N/A	

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
	<ul style="list-style-type: none"> <li>Oil spill contingency plans should be formulated prior to work commencement</li> <li>Oil spill preparedness and response plan with recovery equipment should be maintained</li> </ul>				
Impact on environment due to improper storage of materials	<ul style="list-style-type: none"> <li>Storage areas for construction materials should have an impermeable surface and should be covered</li> <li>Hazardous / toxic materials should be stored in appropriate containers</li> <li>Storage area should be regularly monitored for any leaks</li> <li>Storage facility should be setup within or close by to project site to minimize vehicle movements</li> </ul>	Contractor (implementation) Proponent (supervision)	N/A	N/A	
Impact on flora, fauna and groundwater due to handling of construction related materials and equipment	<ul style="list-style-type: none"> <li>Ensure workforce are trained and supervised to handle materials during transfer, and unloading so as to minimize accidental spills, littering etc.</li> <li>Ensure materials are properly packed and any oil/fuel is properly stored in containers used for that purpose</li> </ul>	Contractor (implementation) Proponent (supervision)	N/A	N/A	Pre-construction – site preparation phase
Sociocultural impact due to arrival of workforce	<ul style="list-style-type: none"> <li>Ensure that priority is given to local companies and Maldivians when hiring contractors for the work</li> </ul>	Contractor (implementation) Proponent (supervision)	Grievance Redress Mechanism given Section 9.4 to be enforced.		Council / MCEP PMU staff to be assigned as

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
	<ul style="list-style-type: none"> <li>• Ensure contractor complies with Maldives national labor laws when hiring staff such as: provision of contracts to workers, complying with terms and conditions related to hours of work, wages, overtime, etc</li> <li>• Ensure any expatriates in the workforce have all the required documentation and work visa and are not illegal immigrants</li> <li>• Workforce should be sensitized to the social norms and acceptable behaviour of the Maldivian culture, through a training programme conducted by the Contractor. This training should also cover topics related to Gender-based violence (GBV).</li> <li>• When arranging accommodations in neighboring Islands : <ul style="list-style-type: none"> <li>○ Contractor should consult with Island Councils before arranging accommodation facilities.</li> <li>○ Contractor should make community aware about the project and health/safety risks management / GBV prevention measure and GRM that will be put in place.</li> </ul> </li> </ul>				focal points hence no additional cost for implementation of GRM

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
	<ul style="list-style-type: none"> <li>○ Contractor should identify a focal point to coordinate with Island Councils on an ongoing basis to address any labor issues.</li> <li>● Contractor should set up gender segregated safe accommodation/ toilet facilities</li> <li>● Workforce should be fully aware of the Do's and Don'ts of the Maldivian culture.</li> <li>● Contractor's Code of Conduct (CoC) should be developed and signed by the workers (sample Code of Conduct formulated by PMU as per World Bank standards given in Appendix 10)</li> <li>● Grievance Redress mechanism given in the report should be established. Information displaying contact details of the focal points (Tier 1 and Tier 2), contractor's HS supervisor and work supervisor should be displayed on the project board. QR code for downloading the forms and information on GRM should be given in each of the media used</li> </ul>				
<b>Construction Phase</b>					

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
Vegetation clearance impacts	<ul style="list-style-type: none"> <li>• Palms which need to be removed should be transplanted and 2 palms for every palm which needs to be cut down should be replanted (if possible on Vandhoo)</li> <li>• Palms which cannot be planted at Vandhoo should be translocated to Dhuvaafaru, where a space has already been allocated for these palms at the newly reclaimed area</li> <li>• Vegetation falling outside project boundary shall not be harmed in any way.</li> <li>• For the larger palms which cannot be replanted at Vandhoo or taken to Dhuvaafaru, felling should be undertaken as per the guideline provided by the proponent - the branches and root bulbs are to be cut using a chainsaw and the trunks stockpiled for selling or used for construction purpose. Branches shall be cut to a manageable size while leaves should be left for sun drying. Root bulbs can be used for backfilling during construction</li> </ul>	Proponent / Contractor Island Council (Dhuvaafaru)	N/A	N/A	Transplantation work and cost should be included in construction contract
Noise pollution	<ul style="list-style-type: none"> <li>• Machinery should only be operated during daytime hours (6am to 6pm)</li> </ul>	Contractor (implementation)	N/A	N/A	

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
		Proponent (supervision)			
Air pollution / Dust	<ul style="list-style-type: none"> <li>Maintenance work on machinery should be undertaken regularly so as to reduce emissions</li> <li>Workers should be provided with masks and other required protective gear</li> <li>The worksite should be watered regularly to minimize dust (after work every day)</li> </ul>	Contractor (implementation) Proponent (supervision)	As per operational manual of machinery	N/A	Should be included in the construction contract
Impact on groundwater quality due to construction and temporary fuel storage setup	<ul style="list-style-type: none"> <li>Ensure the temporary fuel storage setup is functional with the proper bunds in place and properly sealed containers</li> <li>Oil spill contingency plans should be formulated prior to work commencement</li> <li>Oil spill preparedness and response plan with recovery equipment should be maintained</li> <li>MNDF's fuel handling procedure should be followed</li> </ul>	Contractor (implementation) Proponent (supervision)	N/A	N/A	
Impact on health and safety of workforce	Occupational Health and Safety measures <ul style="list-style-type: none"> <li>Contractor shall comply with the requirements for safety of the workers as per the national laws and regulations relevant to labour and working conditions (to the extent that those are applicable to this contract).</li> </ul>	Contractor / (implementation) Proponent (supervision)	Contractor to provide Health and Safety Plan	N/A	Should be included in the construction contract

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
	<ul style="list-style-type: none"> <li>• Ensure workers are well briefed on the health and safety measures to be followed during the project. Basic onsite safety training should be conducted for all laborers during the EMP training prior to the start of the construction activities.</li> <li>• Ensure work force are given all the appropriate safety equipment and gear required for the work (safety hats, boots, glasses, masks and gloves). In addition, the contractor shall maintain in stock at the site office, gloves, earmuffs, goggles, dust masks, safety harness and any other equipment considered necessary.</li> <li>• PPE requirement board should be displayed at site. The boards should show which PPE is required by the workers when carrying out different tasks of the construction work</li> <li>• Minimal use of manual lifting must be practiced.</li> <li>• Ensure set up of easy access toilets, wash basins at the site, either through rental from nearby area or installation of a portable toilet.</li> </ul>				

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
	<ul style="list-style-type: none"> <li>• Ensure provision of regular meals breaks, potable water supply on site and an onsite resting area for the workers, where they can rest during the breaks</li> <li>• Ensure provision of first aid kit on site and ensure readily available transfer in instances of emergency use. Signage providing instructions on first aid management, emergency contact and emergency operational procedures in local languages should be prominently displayed at the site</li> <li>• Ensure workforce are accommodated in appropriate quarters where they are not cramped.</li> <li>• All staff handling hazardous materials should be given the proper protective gear (protective eye gear, protective gloves)</li> <li>• The site supervisor shall undertake toolbox talks prior to commencement of daily work, where the workers should be briefed / reminded about the health and safety requirements and COVID19 measures.</li> </ul>				

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
	<ul style="list-style-type: none"> <li>• During paving work:               <ul style="list-style-type: none"> <li>○ Dermal exposure should be prevented</li> <li>○ Facial masks (to cover mouth and nose) and eye protection gear should be used</li> <li>○ The application temperature of heated asphalt should be kept as low as possible</li> <li>○ Engineering controls and good work practices should be used at all work sites to minimize worker exposure to asphalt fumes</li> </ul> </li> </ul> <p>COVID 19 related preventative measures</p> <ul style="list-style-type: none"> <li>• Ensure that there is set number of workers in each room so as to allow social distancing</li> <li>• Ensure that workforce follows all HPA guidelines at all times, with respect to COVID 19 pandemic.</li> <li>• Measures should be in place to undertake daily temperature checks of workforce and enable social distancing at the accommodation facilities and work site</li> </ul>				

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
	<ul style="list-style-type: none"> <li>Regular toolbox talks should be carried out on prevention measures specific to COVID 19</li> <li>Shift rosters for workforce should be implemented</li> <li>Ensure workforce have completed vaccination dose</li> </ul>				
Impact on health and safety of other personnel at Vandhoo RWMF	<ul style="list-style-type: none"> <li>Project areas should be clearly demarcated</li> <li>Ensure that non-contractor staff do not have access to the project site and appropriate signs are put up at the required areas</li> <li>Grievance Redress mechanism given in the report should be established. Information displaying contact details of the focal points (Tier 1 and Tier 2), contractor's HS supervisor and work supervisor should be displayed on the project board. QR code for downloading the forms and information on GRM should be given in each of the media used.</li> </ul>	Contractor (implementation) Proponent (supervision)	N/A	N/A	Should be included in the project cost
Fire safety	<ul style="list-style-type: none"> <li>Ensure construction workforce are trained in firefighting so as to address any fire hazards promptly</li> </ul>	Contractor (implementation)	Firefighting equipment at Vandhoo RWMF to be setup as per that	Should be included in	

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
	<ul style="list-style-type: none"> <li>A portable fire extinguisher should be used at the site.</li> <li>A fire hydrant / water point should be installation at the work site</li> </ul>	Proponent (supervision)	identified in Riyan Pvt Ltd. 2021	the project cost	
Waste Management During Construction Phase	<ul style="list-style-type: none"> <li>Construction waste should be segregated on site and then disposed off at the facility according to the current practice.</li> </ul>	Contractor / Island Proponent (supervision)	N/A	N/A	Should be included in the project cost
<b><i>Operation and maintenance phase</i></b>					
Ground water contamination, fuel handling, accidental oil spillage	<ul style="list-style-type: none"> <li>Concrete bunds should be constructed around the tank and fueling areas, sumps should be installed to pump out spilled products</li> <li>Daily inspection of fuel lines and bund wall should be undertaken to ensure detection of fuel leakages and remedial action taken to correct leakages</li> <li>Ensure emergency warning spill alert equipment are installed</li> <li>Oil spill contingency plans should be formulated prior to work commencement</li> <li>Oil spill preparedness and response plan with recovery equipment should be maintained</li> <li>MNDF's fuel handling procedure should be followed</li> </ul>	Waste Facility Operator (implementation)	N/A	N/A	Should be included in the project cost

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
Marine environment contamination due to release of sewage	<ul style="list-style-type: none"> <li>• The outfall should be constructed beyond the reef edge at the required depth (15m)</li> <li>• Ensure that the wastewater is treated at the primary level through a septic tank prior to releasing to the lagoon.</li> <li>• Ensure that sludge is removed and only effluents pass to the network.</li> <li>• Ensure outfall pipes are intact and in place with rigid anchoring.</li> <li>• Water quality at the outfall areas should be monitored and checked for optimal range of parameters</li> <li>• Monitor reef health at outfall site as per monitoring programme</li> <li>• Provision for future connection to the full sewer network proposed in the First Addendum (ESIA 2019) should be made when designing the network. The full sewer network should ensure secondary treatment of wastewater prior to releasing via outfall. The full sewer network shall be developed if additional accommodation blocks as proposed in the First Addendum (ESIA 2019) are considered</li> </ul>	Waste Facility Operator (implementation)	N/A	N/A	Should be included in the project cost

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
Health and safety of workforce, especially fuel farm operators	<ul style="list-style-type: none"> <li>• Proper and complete training should be provided to operators (in all aspects of operations)</li> <li>• All required PPE should be provided to the staff</li> </ul>	Waste Facility Operator (implementation)	N/A	N/A	Should be included in the project cost
Socio-cultural conflicts	<ul style="list-style-type: none"> <li>• Ensure locals are hired (especially from nearby island communities) in the instance additional staff are required for operations</li> <li>• Operator should set up gender segregated safe accommodation/ toilet facilities</li> <li>• Grievance Redress mechanism given in the report should be established. Information displaying contact details of the focal points (Tier 1 and Tier 2), WAMCO's HS supervisor and work supervisor should be displayed on the project board. QR code for downloading the forms and information on GRM should be given in each of the media used.</li> <li>• Ensure that staff contracts reflect SH and GBV clauses OR code of conducts are signed by staff</li> </ul>	Waste Facility Operator (implementation)	Costs associated with the contract	Not known	Should be included in project cost

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
Workplace safety	<ul style="list-style-type: none"> <li>• All required sign boards as per the Waste Management regulation should be set up around the site</li> <li>• Ensure all firefighting equipment required for the facility are in place and in good condition</li> <li>• All required protective gears should be provided to the workers.</li> <li>• PPE requirement board should be displayed at site. The boards should show which PPE is required by the workers when carrying out different tasks of the construction work</li> <li>• Ensure provision of a first aid kit on site so as to attend to any medical emergencies immediately.</li> <li>• Open wounds should be covered to prevent contact with the incoming loads</li> <li>• Emergency response plan and Health and Safety SOPs should be developed and implemented.</li> <li>• Ensure that a certified Occupational Health and Safety specialist and a first aid provider is present in the RWMF at all times.</li> </ul>	Waste Facility Operator (implementation)	Fire safety equipment to be installed as identified in Riyan Pvt Ltd (2021)	N/A	Should be include in project cost

Potential Environmental impacts	Proposed mitigation measures	Institutional responsibility (implementation and supervision)	Estimated quantities required and material specifications recommended	Cost estimates	Comments
	<ul style="list-style-type: none"> <li>• Health and Safety should be covered in daily toolbox talks.</li> <li>• Ensure that transport to a nearby health care provider is readily available at all times, to immediately address more serious incidents requiring critical medical attention.</li> <li>• Regardless of the size or type of vehicle, operators should implement the manufacturer recommended engine maintenance programs</li> <li>• Drivers should be instructed on the benefits of driving practices that reduce both the risk of accidents and fuel consumption, including measured acceleration and driving within safe speed limits</li> </ul>				

## 9.1 ESMP Implementation

The ESMP identifies the institutional responsibility for the implementation and supervision of the different mitigation measures identified in the ESMP (Table 14). The measures identified for the construction phase will be implemented mainly by the contractor and will not require additional staff (in addition to their allocated workforce for the project). Supervisory role will be played by the proponent, more specifically the E&S Specialist of the MCEP.

Measures identified for the operational phase will be implemented by the staff of the Waste management facility and overseen by onsite supervisors.

Estimated budget requirements for ESMP implementation is included in the Table 14 for relevant components.

## 10 Contingency Plan

The fuel tank construction and setup of temporary fuel storage setup has the greatest potential to have an impact on the natural environment due to accidental spills and leakage, especially during transfer. Mitigation measures to minimise these impacts have been proposed in the ESMP given in this Addendum and the Consultant feels that the measures proposed are sufficient to address these impacts. These measures are reiterated here:

- Oil spill contingency plans should be formulated prior to work commencement
- Maintain oil spill preparedness and response plan with recovery equipment
- Ensure the temporary fuel storage setup is functional with the proper bunds in place and properly sealed containers
- Provision of proper and complete training to operators (in all aspects of operations)
- Provision of all required PPE to the staff and ensure that they are always used
- Monitor oil spills and maintain machinery
- Ensure that the concrete bunds around the tank and fuelling areas are constructed as per design, install sumps to pump out spilled products and install emergency warning spill alert equipment
- During operational phase, daily inspection of fuel lines and bund wall to ensure detection of fuel leakages and remedial action taken to correct leakages

The Consultant also recommends more detailed contingency assessments and formulation of detailed contingency plans for risks such as fire and natural hazards, prior to commencement of operations at the site.

## 11 Environmental monitoring plan

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:-

- Compare predicted and actual impacts;
- Test the efficiency of mitigation measures;
- Obtain information about responses of receptors to impacts;
- Enforce conditions and standards associated with approvals;
- Prevent environmental problems resulting from inaccurate predictions;
- Minimize errors in future assessments and impact predictions;
- Make future assessments more efficient;
- Provide ongoing management information; and
- Improve EIA and monitoring process.

Impact and mitigation monitoring are carried out to compare predicted and actual impacts occurring from project activities to determine the efficiency of mitigation measures. This type of monitoring is targeted at assessing human impacts on the natural environment. Impact monitoring is supported by an expectation that at some level anthropogenic impacts become unacceptable and action will be taken to either prevent further impacts or re-mediate affected systems.

Table 15 shows the monitoring work to be carried out for the construction and operational phase of the project. Commitment to carrying out and financing the mitigation and monitoring work is given in the proponent's declaration at the beginning of the report.

*NOTE: marine environment monitoring required with the outfall pipe has already been addressed and given in the Monitoring programme given in the First Addendum (ESIA 2019) and will be carried out as per that schedule. Given that the outfall location is the same as in the First Addendum, monitoring of the reef and seawater quality is not reiterated in this monitoring programme.*

**Table 15. Monitoring programme for construction phase of the project**

<b>Proposed mitigation measure</b>	<b>Parameters to be monitored</b>	<b>Location</b>	<b>Measurements</b>	<b>Frequency of monitoring</b>	<b>Responsibility</b>	<b>Cost (MRF)</b>
<b>Pre-construction phase</b>						
<p>Ensure all expatriates in the workforce have all the required documentation and work visa and are not illegal immigrants</p> <p>Ensure all workforce (including locals) have worker contracts stipulating the terms and conditions employed such as hours of work, wages, overtime, etc.;</p>	<p>Check for all required documentation and work visa of all expatriate members of the workforce</p> <p>Check for validity period of documents</p> <p>Check all members of workforce have signed contracts with all required details</p> <p>Check if GBV prevention Code of Conduct is signed by all workers</p> <p>Check if in compliance with all mitigation measures proposed to minimize impact on social environment (of Vandhoo and accommodation island)</p>	N/A	Check for all required documentation	Once, prior to work commencement	Contractor / PMU	N/A
Monitor oil spills	Spill events	Sea/land	Logs of spill events	After every event	Contractor	N/A
<b>Construction phase</b>						
Monitor oil spills during fuel transfer	Spill events	Land	Logs of spill events	After every event	Contractor	N/A

Monitor groundwater quality (from the location of the fuel storage tanks, fuel line/transport locations and from one control site)	<ul style="list-style-type: none"> <li>• Temperature</li> <li>• Salinity</li> <li>• pH</li> <li>• Conductivity</li> <li>• Total Dissolved Solids (TDS)</li> <li>• Total Petroleum Hydrocarbon</li> </ul>	Project site and control site	Water samples tested in-situ using probe or sent to competent laboratory if necessary	Once every 2 months during construction phase	Contractor	6,000.00
Vegetation clearance impact mitigation	<p>Monitor number of trees/palms removed (fill the Vegetation removal form provided by PMU)</p> <p>Record number replanted at Vandhoo and those transported to Dhuvaafaru for replantation</p>	Project site and Dhuvaafaru	Record of species and numbers	During vegetation clearance period / replantation period	Contractor / Dhuvaafaru Island Council	6,000.00
Workforce health and safety	<p>Daily temperature checks</p> <p>General health and wellbeing of workforce</p>	Project site	Logs of any illness amongst workforce	Daily	Contractor	Part of the contract
Grievance redress mechanism	Monitor grievances by Vandhoo workforce or community (accommodations island)	Vandhoo / Whole island	Log of grievances filed and how these were handled	Continuous process	Contractor / Island Council / MCEP	Included in operational cost
<b>Operational phase</b>						
Monitor oil spills during fuel transfer / accidental leakage	Spill / leakage events	Land	Logs of spill /leakage events	After every event	RWMF Operator	N/A
Monitor groundwater quality (from the location of the fuel storage tanks, and from one control site)	<ul style="list-style-type: none"> <li>• Temperature</li> <li>• Salinity</li> <li>• pH</li> <li>• Conductivity</li> </ul>	Project site and control site	Water samples tested in-situ using probe or sent to competent	Once every 6 months	RWMF Operator	6,000.00

	<ul style="list-style-type: none"> <li>• Total Dissolved Solids (TDS)</li> <li>• Total Petroleum Hydrocarbon</li> </ul>		laboratory if necessary			
Monitor seawater quality from discharge location and all other baseline locations	<ul style="list-style-type: none"> <li>• Temperature</li> <li>• pH</li> <li>• Salinity</li> <li>• Electrical conductivity</li> <li>• Total Dissolved Solids (TDS)</li> <li>• Total Suspended Solids (TSS)</li> <li>• Turbidity</li> <li>• Ammonia</li> <li>• Phosphate</li> <li>• Sulfate</li> <li>• Total coliforms</li> <li>• Feecal coliforms</li> </ul>	Outfall location and baseline locations SW1, SW2, SW3 and SW4	Water samples tested in-situ using probe or sent to competent laboratory if necessary	Once every 6 months	RWMF Operator	8,000.00
Grievance redress mechanism	Monitor grievances by the community or other personnel	Whole island	Log of grievances filed and how these were handled	Continuous process	RWMF Operator / MCEP	Included in operational cost

## 11.1 Reporting Procedures and Implementation Schedule

The reporting procedures and schedule is for the various monitoring components are given in Table 16 below.

**Table 16. Reporting schedule for the monitoring programme**

Phase	Deliverables	Responsibility	Accountability
Pre-construction phase	Confirmation document submission which identifies the following: <ul style="list-style-type: none"> <li>• Details of labor hired</li> <li>• Ensure legal work permits available if any migrant workers are hired</li> <li>• Identify if GBV Codes of Conduct has been signed</li> <li>• Identify if contracts have been signed by all workers with terms and conditions related to hours of work, wages, overtime etc.</li> </ul>	Contractor	MCEP
Construction phase	Monitoring report (as per format provide by MCEP Safeguards Specialist) submitted every 3 months or earlier based on date of invoice submission by the Contractor which should include the following: <ul style="list-style-type: none"> <li>• Log of spill events during material transfer</li> <li>• Groundwater quality monitoring reports</li> <li>• Vegetation clearance / replantation logs</li> <li>• Outcomes of grievances filed</li> </ul>	Contractor	MCEP
Operational phase	Monitoring report submitted once a year (as per format provide by MCEP Safeguards Specialist) which should include the following: <ul style="list-style-type: none"> <li>• Logs of spill / leakage assessments</li> <li>• Groundwater quality monitoring reports</li> <li>• Outcomes of grievances filed</li> </ul>	RWMF Operator / Island Council	RWMF Operator

## 11.2 Stakeholder Engagement & Communication Plan for the sub-project

Stakeholder engagement and effective communications are essential for ensuring that the ESIA provisions are implemented efficiently and effectively. MCEP shall therefore ensure that all persons that have roles to play in the implementation of the ESIA and the mitigation measures within are competent with appropriate education, training or experience. Similarly, the contractors shall be required to undertake general HSE awareness for their project workforce and specific training for those whose work may significantly have an impact on the environment.

The following tables outlines a strategy /plan with timelines and methods for continuous stakeholder engagement that meets the needs of the different stakeholders during project implementation. This has been formulated by the PMU.

**Table 17. Stakeholder engagement and communication plan for the sub-project**

Stakeholder group	Information to be disclosed/ made aware and/ or topics to be discussed	Methods and channels	Timing	Responsibility
Waste Management and Pollution Control Department (WMPCD) and other projects of MECCT that are investing in Vandhoo RWMF	<ul style="list-style-type: none"> <li>Project plan, timeline and schedule</li> </ul>	Meeting	At project inception and after project completion	MCEP PMU
Managing Director, Project Manager and Site Supervisor of Contractor	<ul style="list-style-type: none"> <li>Project plan, timeline and schedule</li> <li>Material list for approval.</li> <li>Contact details of PMU key staff and RWMF operator's focal points assigned for project supervision.</li> <li>Applicable Health and Safety standards.</li> <li>COVID19 special considerations.</li> <li>SH and GBV related codes.</li> <li>Details of the GRM.</li> <li>Sample code of practices.</li> <li>Travel request form required for mobilization.</li> <li>Vegetation removal/translocation form and locations and source of trees for 2:1 replantation.</li> </ul>	Kick Off Meeting, Reporting Templates, Sample Codes, Infographics	Prior to Mobilization	MCEP PMU: Project Manager, Safeguards Specialist, Civil Engineer, and Zone II Project Coordinator

	<ul style="list-style-type: none"> <li>• Reporting template for monthly contractor's ESMP monitoring reports.</li> <li>• Grievance Redress Mechanism.</li> <li>• Details of safeguards clauses included in the contract.</li> <li>• Art work of Project Board and health and safety board.</li> <li>• ESIA decision statement</li> <li>• Staff list with identification documents and Work Permits of expats.</li> </ul>			
Contractor's Workers	<ul style="list-style-type: none"> <li>• Briefing about the code of conducts and translation of codes to different languages.</li> <li>• HSE Introduction / Orientation (site safety rules, PPE, Emergency response etc.)</li> <li>• Daily tool box talks for workers at the start of each day's job.</li> </ul>	Toolbox talks, Codes, Infographics.	Continuous throughout project implementation	Project Manager and Site Supervisor of Contractor
WAMCO staff at Vandhoo	<ul style="list-style-type: none"> <li>• Awareness of the details of the project</li> <li>• Work supervision assistance required from the operator.</li> <li>• Briefing of the remote project monitoring tool developed by the PMU.</li> <li>• Contact details of contractor's focal points.</li> <li>• Staff list, work permits, negative PCR results, vaccination cards and work permit of workers.</li> </ul>	Meetings, Documents	Prior to mobilization and monthly thereafter	MCEP PMU and Contractor
Innamaadhoo and Rasmaadhoo Island Councils and/or Women Development Committee	<ul style="list-style-type: none"> <li>• Awareness of the details of the project.</li> <li>• Details of Grievance Redress Mechanism (GRM).</li> <li>• Displaying of GRM information at the contractor's accommodation sites and the council notice boards.</li> <li>• Codes applicable to the contractor's workforce.</li> </ul>	Meetings, Posters, Documents.	Prior to mobilization and monthly follow-ups thereafter	MCEP PMU and the contractor

	<ul style="list-style-type: none"><li>• National and regional hotlines for SH and GBV cases.</li><li>• Staff list, PCR negative results, vaccination cards, and work permits.</li></ul>			
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## **12 Grievance Redress Mechanism**

The TOR states that the grievance redress mechanism (GRM) which was included in the principal ESIA should be reviewed and updated if necessary. However, the principal ESIA of 2012 and the report for upgrading of facility in 2019 do not give a GRM for the work.

However, the Maldives Clean Environment Project has formulated a Grievance Redress Mechanism (GRM) for Zone 2 Regional Waste Management Facility located in Raa Atoll Vandhoo of the Republic of Maldives and this document was provided as Additional information to the ESIA for upgrading of facilities (2019). The proposed GRM is based on the Environmental and Social Assessment and Management Framework (ESAMF) of MCEP and highlights the grievance redress procedure in place, identifying nodal point of contact, facilitation by the project and timeframes to address grievances. The GRM would facilitate the receiving and addressing of any grievances which may arise during both the construction and operational phase of the project.

The GRM formulated by MCEP is given in Appendix 19. Given the small scope of the project, the Consultant does not feel that the GRM has to be revised specifically for this scope of work.

## 13 Conclusion and recommendations

The key environmental components associated with the proposed work are mainly terrestrial, with the need for vegetation clearance having been identified as the most significant impact on the environment due to project work. In light of the field surveys and stakeholder consultations as well as based on past experience of the Consultant, the following have been identified as key impacts due to proposed work:

- Negative impact on environment due to need for vegetation clearance, especially from the buffer zone at the NE side of the island
- Setup of septic tank as proposed, which is in conflict with legislative setting for the project
- Impacts on health and safety of workforce, especially during operational phase (fuel farm operations which have many risks)

Given the significance of the first 2 impacts, alternatives have been considered for the proposed concepts for these 2 components and are discussed in Chapter 8 of this report.

Vegetation clearance is seen to have a moderate impact, due to the need for removal of significant number of coconut palms, especially from the road clearance areas. Furthermore, given that Vandhoo is a heavily vegetated island, there is limited space to replant these palms on the island itself. The proponent proposes to replant at least 20% of the palms which needs to be removed, on Vandhoo itself, while the remainder which will be transported to Dhuvaafaru for transplantation at the newly reclaimed land on Dhuvaafaru. Apart from the loss of vegetation, this component comes with a number of associated impacts such as the loss of a number of benefits such as economic and aesthetic value of vegetation, provision of green buffer and shade.

As discussed in Chapter 8, during consultations with the Utility Regulatory Authority (URA), it was identified that the setup of a septic tank for wastewater management from the accommodation block (proposed option) is not a valid option (even with secondary filtration), as this was anticipated to cause contamination of the groundwater resource of the island. URA stressed since the legislation states that groundwater resource of islands leased for industrial use is protected, contamination of the resource is prohibited, and the discharge of the effluent from septic tank system (primary treatment) for sewerage management will not be approved. However, the option of disposal of wastewater to the marine environment without treatment is legally permitted as per URA standards and URA has no objection to dispose the raw sewage to the marine environment through a sea outfall. Given that the effluent volume anticipated is small (due to low resident staff numbers at the facility), the release of primary treated (filtered effluents from septic tanks) to the marine environment is a viable option for the time being (given that the mitigation

measures discussed in Appendix 15 are implemented as soon as possible). Hence, it is recommended for the septic tank system to be designed with provision for future connection to a treatment system (minimum secondary level treatment system to significantly reduce BOD) so that the nutrient disposed to the marine environment is further reduced to minimize the potential impact. Hence it is important that the proponent ensures that the design and operation of the sewerage disposal system as proposed.

Other components of the project, which include relocation of the fuel tanks, setup of temporary fuel storage and implementation of a traffic management plan are envisaged to have a minor impact on the environment due to the method of construction proposed. These have been discussed in detail in this Addendum. Mitigation measures have also been identified to further minimize the impacts due to these components and are given in Chapter 9 of this report.

In conclusion, and based on the information available, the Consultant feels that the proposed work is feasible, with proper implementation of all mitigation measures given in the ESMP of this Addendum. The Consultant further stresses the importance of selecting the alternative options for those components which have been considered not feasible by the Consultant.

## **Acknowledgements**

The Consultant acknowledges the contribution provided by the team members in this report for the valuable contribution to the report and at the field. The consultant also acknowledges the assistance provided by the PMU, MCEP and WAMCO.

CVs of team members are given below.

## Curriculum Vitae

**Position** Environmental Consultant

**Name** Shahaama Abdul Sattar

**Address** G. Helengeli, Lily Magu  
Male', Rep. of Maldives

**Contact** Mobile: +9607904985  
Email: [shahaama.abdulsattar@lamer.com.mv](mailto:shahaama.abdulsattar@lamer.com.mv)  
[shahaama.sattar@gmail.com](mailto:shahaama.sattar@gmail.com)

**Date of Birth** 30 September 1980

**Nationality** Maldivian

**Education** **Master of Science (MSc)** in Fisheries Biology and Fisheries Management, University of Bergen. Bergen, Norway, 2004 - 2006  
**Bachelor of Science (BSc.)**, The Flinders University of South Australia, Adelaide, South Australia, 1999 - 2001

**Membership of Professional Associations** Small Island Research Group (SIRG) Maldives, Vice President

**Countries of Work Experience** Maldives

**Languages** **Dhivehi** Mother tongue  
**English** Fluent

### Employment Record

**From: 2008 - 2011**

Employer: Marine Research Centre, Ministry of Fisheries and Agriculture, Male', Maldives.  
Position: Fisheries Biologist

**From: 2006 to 2008**

Employer: Marine Research Centre, Ministry of Fisheries Agriculture and Marine Resources, Male', Maldives.  
Position: Senior Research Officer

**From: 2002 – 2004**

Employer: Marine Research Centre, Ministry of Fisheries Agriculture and Marine Resources, Male', Maldives.  
Position: Research Officer

**Line of work at MRC included:**

Assessment of the reef and grouper fisheries of Maldives, with surveys to monitor fisheries and fish species behavior. Compilation and analysis of data, for regular reviews and reporting and formation of management recommendations. Key role in the formulation of the Grouper Fisheries Management Plan / Grouper Fisheries and Export Regulation

Focal point for the IUCN funded project on identification of reef fish spawning aggregations in the Maldives through fishermen interviews (2007)

Secretariat and key organizer – Indian Ocean Cetacean Symposium 2009

Project Partner for Maldives for the Darwin Initiative Coral Reef Fish Project, Maldives

MRC Focal Point for the Atoll Ecosystem Conservation Programme, Ministry of Housing and Environment (2009 – 2011)

Participated in the Biodiversity Valuation survey of Baa Atoll Maldives carried out by AEC project and IUCN

**From: May 2011 – Dec 2012**

Employer: Darwin Reef Fish Project / Marine Research Centre (Maldives) and Marine Conservation Society (UK)

Position: Consultant, Darwin Reef Fish Project (4 year joint collaboration between MRC and MCS, UK)

Assess the various reef fisheries (grouper, aquarium and food fisheries) of the Maldives and aims to establish management plans for these fisheries. Provision of technical support and assistance to the project staff and MRC in implementing the project and formulation of the management plans.

**From: July 2011 – Dec 2011**

Employer: Bay of Bengal Large Marine Ecosystem Project

Position: BOBLME Sharks Working Group Coordinator

Coordinator for the Sharks WG of BOBLME project, and work with the focal points in the member countries, to assist in the formulation and implementation of their National Plans of Action for Sharks.

**From: June 2011 to Present**

Employer: Land and Marine Environmental Resource Group Pvt Ltd

Position: Environmental Consultant

**Workshops/Seminars Participated**

15-21 March 2003 - Training Workshop on the Implementation of Multilateral Agreements in the Conservation of Biodiversity with special focus on Marine Biodiversity. Kushiro, Japan

14-16 November 2006 – Sixth William R. and Lenore Mote International Symposium – Life history in Fisheries Ecology and Management. Sarasota, Florida

03-05 March 2008 – Olhugiri and Dhigalihaa Protected Areas Management Planning Workshop. Eydhafushi, Maldives

11 March 2008 – Applying the Ecosystem Approach to managing Atoll Ecosystems in the Maldives. Hulhule Island Hotel, Maldives

24-26 March 2008 – Regional Consultation on Preparation of Management Plans for Shark Fisheries. Beruwela, Sri Lanka

17-19 June 2008 – Workshop on Assessment and Management of the Offshore Resources of

South and Southeast Asia. Bangkok, Thailand

22-23 March 2009 – BOBP-IGO National Workshop on Monitoring, Control and Surveillance in Marine Fisheries. Male', Maldives

18 – 20 July 2009 – Indian Ocean Cetacean Symposium 2009. Paradise Island Resort and Spa, Maldives.

09-11 August 2009 – Second Regional Consultation on Preparation of Management Plans for Shark Fisheries. Kulhudhuffushi, Maldives

24-25 February 2010 – BOBLME Project – National Inception Workshop, Male', Maldives

2-3 June 2010 – BOBP-IGO Technical Advisory Committee – 5<sup>th</sup> Meeting, Male', Maldives

13-14 September 2010 – BOBLME Fisheries Assessment Working Group – 1<sup>st</sup> Meeting, Bangkok, Thailand

14-16 December 2010 – EWS-WWF 2<sup>nd</sup> Marine Conservation Forum for the Gulf Region In partnership with the Pew Environment Group – Local Actions for Global Challenges, Abu Dhabi, United Arab Emirates

18-19 January 2011 – Bay of Bengal Large Marine Ecosystem Project – Workshop on the Status of Marine Managed Areas in the Bay of Bengal, Penang, Malaysia

5-7 July 2011 – Bay of Bengal Large Marine Ecosystem Project – First meeting of the BOBLME Sharks Working Group, Male', Maldives

7-8 September 2011 – Workshop to formulate the Grouper Fisheries Management Plan, DRFP/MRC, Male', Maldives

15-17 September 2011 – SEAFDEC Special Meeting on Sharks Information Collection in Southeast Asia, Bangkok, Thailand

10 April 2014 - Stakeholder Consultation to present the National Plan of Action on the Conservation and Management of Sharks (NPOA-Sharks), Male', Maldives

## **Publications**

Sattar, S. A., Najeeb, A., Islam, F., Afzal, M. S. and Wood, E. (2012) Management of the grouper fishery of the Maldives, *Proceedings of the 12<sup>th</sup> International Coral Reef Symposium, Cairns, Australia, 9-13 July 2012, Session 13E* (in press)

Ushan, M., Wood, E., Saleem, M. and Sattar, S. A (2012) Maldives Sharkwatch Report for 2009 - 2010, *Proceedings of the 12<sup>th</sup> International Coral Reef Symposium, Cairns, Australia, 9-13 July 2012, Session 13D* (in press)

Sattar, S. A., Andréfouët, S., Ahsan, M., Adam, M. S., Anderson, C. R. and Scott, L (2012) Status of the Coral Reef Fishery in an Atoll under tourism development: the case of Central Maldives, *Atoll Research Bulletin 590*: 163-186

Sattar, S. A., Amir, H. and Adam, M. S. (2012) Reef fish tagging programme – Baa Atoll Pilot project, *Atoll Research Bulletin 590*: 187-200

BOBLME (2011) Report of the BOBLME Sharks Working Group, 5-7 July 2011, Male' Maldives,

*Prepared for the Bay of Bengal Large Marine Ecosystem Project by Sattar, S. A. and Anderson, R. C. Saleem, M., Sattar, S. A. (2009) Study on post-tsunami restoration and conservation projects in Maldives, Prepared for the International Union for Conservation of Nature.*

Tamelander, J., Sattar, S., Campbell, S., Hoon, V., Arthur, R., Patterson E. J.K., Satapoomin, U., Chandi, M., Rajasuriya, A. and Samoilys, M. (2009) Reef fish spawning aggregation in the Bay of Bengal: Awareness and Occurrence, *Proceedings of the 11th International Coral Reef Symposium, Ft. Lauderdale, Florida, 7-11 July 2008, Session 22*

Sattar, S. A., Jørgensen, C., Fiksen, Ø. (2008) Fisheries Induced Evolution of Energy and Sex Allocation. *Bulletin of Marine Science*, 83(1): 235-250

Sattar, S. A. (2008) Review of the Reef fishery of the Maldives, Marine Research Centre, Male', Maldives. 62 pp

Sattar, S. A. and M. S. Adam (2005) Review of the Grouper fishery of the Maldives with additional notes on the Faafu Atoll fishery. Marine Research Centre, Male', Maldives. 54 pp

### **Environmental Impact Assessments Reports and other studies**

The following are a selected list of the projects I have been involved in as an environmental consultant at LaMer Group Pvt Ltd.

<b>Name of assignment or project</b>	EIA for development of domestic airport facility at Funadhoo, Shaviyani Atoll
<b>Year</b>	2018
<b>Location</b>	Funadhoo, Shaviyani Atoll, Maldives
<b>Client</b>	Regional Airports, Ministry of Tourism
<b>Project features</b>	Development of domestic airport facility at Funadhoo
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA for agricultural development project at Hulhidhoo, Vaavu Atoll
<b>Year</b>	2017
<b>Location</b>	Hulhidhoo, Vaavu Atoll, Maldives
<b>Client</b>	Aarah Investments Pvt Ltd
<b>Project features</b>	Development of Hulhidhoo as a mix-use island with an agricultural (hydroponics) and tourism component
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA for development of 100 bed hospital at Addu City
<b>Year</b>	2017
<b>Location</b>	Addu City, Maldives
<b>Client</b>	Ministry of Housing and Infrastructure
<b>Project features</b>	Redevelopment of Equatorial Convention Centre as a 100 bed tertiary level hospital
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA for relocation of sewer outfalls at IGMH and Westpark area, Male' City
<b>Year</b>	2017
<b>Location</b>	Male', Maldives
<b>Client</b>	MWSC Pvt Ltd
<b>Project features</b>	Relocation of sewer outfalls at IGMH and Westpark area to industrial village area of Male'
<b>Positions held</b>	EIA team member

<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA for resort development at Islands I and E of Emboodhoofalhu Finolhu Development project
<b>Year</b>	2017
<b>Location</b>	Emboodhoofalhu Finolhu, Maldives
<b>Client</b>	Dream Islands Development Project
<b>Project features</b>	Development of reclaimed islands I and E of Emboodhoofalhu Finolhu as tourist resorts
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	Environmental Impact Assessment Report for aquatic animal quarantine facility at Hulhumale'
<b>Year</b>	2016
<b>Location</b>	Hulhule, Maldives
<b>Client</b>	Ministry of Fisheries and Agriculture
<b>Project features</b>	Setting up an animal quarantine facility within plant quarantine service area in Hulhule
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	Environmental Impact Assessment report for relocation of Male' Submarine cable landing
<b>Year</b>	2016
<b>Location</b>	Male', Maldives
<b>Client</b>	Dhiraagu
<b>Project features</b>	EIA related to relocation of the submarine cable from existing location to a new location
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	Socioeconomic Situation analysis of selected fishing communities as part of formulation of Master Plan for Sustainable Fisheries (MASPLAN)
<b>Year</b>	2015
<b>Location</b>	ADh. Mahibadhoo, F. Bilehdhoo, GA. Villingili, HA. Ihavandhoo, L. Gan, L. Maamendhoo, Lh. Naifaru, S. Maradhoo, Maldives, Maldives
<b>Client</b>	Ministry of Fisheries and Agriculture
<b>Project features</b>	Socioeconomic survey of selected islands, to undertake a situational analysis of the island communities
<b>Positions held</b>	Fisheries Management Consultant
<b>Responsibilities</b>	Carryout socioeconomic surveys in forms of group discussions and household surveys. Data collection and analysis and report formulation (trip reports and overall situational analysis).
<b>Name of assignment or project</b>	Development of Training material for project staff on mainstreaming and increasing awareness on climate change adaptation and mitigation measures in tourism operation
<b>Year</b>	2015
<b>Location</b>	Male', Maldives
<b>Client</b>	Ministry of Tourism
<b>Project features</b>	Mainstreaming and increasing awareness on climate change adaptation and mitigation measures in tourism operation
<b>Positions held</b>	Team member
<b>Responsibilities</b>	Material development and presentation
<b>Name of assignment or project</b>	Development of water supply and a sewerage system at Fuvahmulah
<b>Year</b>	2015
<b>Location</b>	Fuvahmulah, Gnaviyani atoll. Maldives
<b>Client</b>	Ministry of Environment and Energy
<b>Project features</b>	Setting up a water supply and a sewerage facility
<b>Positions held</b>	EIA team member

<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	Environmental Impact Assessment for soft coastal protection works at GDh. Thinadhoo
<b>Year</b>	2014
<b>Location</b>	GDh. Thinadhoo, Maldives
<b>Client</b>	Ministry of Environment and Energy
<b>Project features</b>	Beach Nourishment and Coastal protection
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	Beach Nourishment and Coastal Protection works at a private land at Praslin, Seychelles
<b>Year</b>	2014
<b>Location</b>	Praslin, Seychelles
<b>Client</b>	Ahmed Didi
<b>Project features</b>	Beach Nourishment and Coastal protection at Praslin, Seychelles
<b>Positions held</b>	Environmental assessment team member
<b>Responsibilities</b>	Preparation of the report submitted to the client
<b>Name of assignment or project</b>	1500 Housing Unit construction Project Maldives
<b>Year</b>	2014
<b>Location</b>	Fuvahmulah, Gadhdhoo, Hoadedhdhoo, Hithadhoo, Holhudhoo, Madaveli, Thinadhoo, Maldives
<b>Client</b>	Ministry of Housing and Infrastructure
<b>Project features</b>	Construction of Housing Units at the specified Islands
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA report for Coastal modification at Robinson Club Maldives
<b>Year</b>	2013
<b>Location</b>	Ga. Funamaudua, Maldives
<b>Client</b>	Robinson Club Maldives, Maldives
<b>Project features</b>	Coastal modification at the NW side of the island, construction of geo-bag revetment and harbor basin maintenance dredging works
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA report for construction of gravity type waste water collection system at ADh Omadhoo
<b>Year</b>	2013
<b>Location</b>	ADh Omadhoo, Maldives
<b>Client</b>	ADh Omadhoo Island Council Office
<b>Project features</b>	Construction of gravity type waste water collection system and sea outfall pumping system
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA report for upgrading of Maldivian Gas Pvt Ltd Gas jetty
<b>Year</b>	2013
<b>Location</b>	Thilafushi, Maldives
<b>Client</b>	Maldivian Gas Pvt Ltd
<b>Project features</b>	Reconstruction of existing gas jetty head and expansion of jetty head
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA report for Resort development at GDh Havvoodaa
<b>Year</b>	2013
<b>Location</b>	GDh Havvoodaa, Maldives
<b>Client</b>	Crystal Plaza Pvt Ltd, Maldives
<b>Project features</b>	Construction of a resort hotel and all the related amenities
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report

<b>Name of assignment or project</b>	EIA report for Coastal protection, coastal modification, beach nourishment, coral nursery setup and entrance channel maintenance dredging work
<b>Year</b>	2013
<b>Location</b>	Gili Lankanfushi, Maldives
<b>Client</b>	Gili Lankanfushi, Maldives
<b>Project features</b>	Coastal protection, coastal modification, beach nourishment, coral nursery setup and entrance channel maintenance dredging work
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA report for Harbor development project at Dh. Maaenboodhoo
<b>Year</b>	2013
<b>Location</b>	Dh. Maaenboodhoo, Maldives
<b>Client</b>	Ministry of Housing and Infrastructure
<b>Project features</b>	Development of harbor facility (dredging of harbor basin, construction of wharfs and breakwater)
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA report for Flood mitigation and reclamation work at Faresmaathoda
<b>Year</b>	2013
<b>Location</b>	GDh. Faresmaathodaa, Maldives
<b>Client</b>	United Nations Office for Project Services (UNOPS)
<b>Project features</b>	Construction of breakwater and reclamation of land
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA report for Development of Domestic Airport Facility
<b>Year</b>	2012
<b>Location</b>	Th. Thimarafushi, Maldives
<b>Client</b>	Maldives Airports Company Limited
<b>Project features</b>	Construction of runway apron
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA report for Wharf reconstruction and upgrading of existing berthing facility and slipway
<b>Year</b>	2012
<b>Location</b>	Thilafushi, Maldives
<b>Client</b>	Fuel Supply Maldives Pvt Ltd, Maldives
<b>Project features</b>	Reconstruction of wharf and upgrading of existing berthing facility and slipway
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA report for Resort development at B. Kanifinolhu
<b>Year</b>	2012
<b>Location</b>	B. Kanifushi, Maldives
<b>Client</b>	Coastline Hotels and Resorts Pvt Ltd, Maldives
<b>Project features</b>	Construction of a resort hotel and all the related amenities
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA report for Borehole construction at Cyprea Mrine Food Fish Factory
<b>Year</b>	2012
<b>Location</b>	K. Himmafushi, Maldives
<b>Client</b>	Cyprea Marine Food Pvt Ltd, Maldives
<b>Project features</b>	Construction of a 8 inch borehole at factory premise
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report

<b>Name of assignment or project</b>	EIA report for resort development at K. Kudavillingili, Maldives
<b>Year</b>	2011
<b>Location</b>	K. Kudavilingili, Maldives
<b>Client</b>	Yacht Tours Pvt Ltd, Maldives
<b>Project features</b>	Construction of resort hotels and all the related amenities. In addition a large reclamation of the shoreline as additional land as part of the resort development is also part of the project
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report
<b>Name of assignment or project</b>	EIA report for development of city hotel, hospitality institute and resort development at Gasfinolhu and Bodufinolhu, L. Atoll
<b>Year</b>	2011
<b>Location</b>	L. Gan, Bodufinolhu and Gasfinolhu, Maldives
<b>Client</b>	Premier Equities Pvt Ltd, Maldives
<b>Project features</b>	Construction of a resort hotel and required amenities including a training hotel for hospitality industry
<b>Positions held</b>	EIA team member
<b>Responsibilities</b>	Preparation of the EIA report

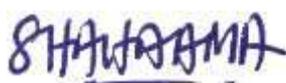
## Referees

Dr. Mohamed Shiham Adam, PhD  
Marine Research Centre  
Ministry of Fisheries and Agriculture  
Male', Republic of Maldives  
Tel. No: +960 331 3681  
Email: [msadam@mrc.gov.mv](mailto:msadam@mrc.gov.mv)

Dr. Charles Anderson  
[anderson@dhivehinet.net.mv](mailto:anderson@dhivehinet.net.mv)  
[charles.anderson11@btinternet.com](mailto:charles.anderson11@btinternet.com)

## Certification

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes my qualifications, my experience, and me. I understand that any willful misstatement described herein may lead to my disqualification or dismissal, if engaged.



Shahaama A. Sattar

Date: October 2018

## CURRICULUM VITAE

1. **POSITION:** Environment Analyst
2. **NAME OF FIRM:** LaMER Group Pvt.Ltd
3. **NAME:** Azim Musthag
4. **DATE OF BIRTH:** 13<sup>th</sup> December 1985
5. **NATIONALITY:** Maldivian
6. **PERSONAL ADDRESS:** M. Anthias, Fulooniya Magu, Malé, Maldives
7. **EDUCATION**  
Bachelor of Marine Science (Majoring in Marine Ecology),  
Griffith University, Queensland, Australia.  
  
DEL F (Diplôme d'études en langue française) Level A1 and  
Level A2
8. **MEMBERSHIP OF PROFESSIONAL SOCIETIES:** Master Instructor with the Scuba Schools  
International (SSI).
9. **OTHER TRAINING:**  
Fish Watch Training Workshop conducted by Darwin Reef Fish  
Project initiated by the Marine Research Centre of Maldives in  
collaboration with Marine Conservation Society (UK) in 2009.  
  
IUCN Manta Ray Workshop in 2013.  
  
National Coral Reef Monitoring Framework monitoring protocols  
training in 2014 conducted by IUCN Maldives.
10. **COUNTRIES OF WORK EXPERIENCE:** Maldives and Australia
11. **LANGUAGE AND DEGREE OF PROFICIENCY:**  
English - Native or bilingual proficiency  
Dhivehi - Native or bilingual proficiency  
French - Limited working proficiency
12. **EMPLOYMENT RECORD:**  
2005 - 2011 Dive Instructor,  
Maldivers Diving Centre, Malé.  
  
2012 – 2014 Dive Instructor,  
Diveoceanus Dive Centre at Paradise Island Resort  
  
2017 - 2017 Research Assistant  
Griffith University, Gold Coast, Australia.  
  
2018 (Present) Environmental Analyst  
Lamer Pvt Ltd
13. **DETAILED TASKS ASSIGNED:** **WORK UNDERTAKEN THAT BEST ILLUSTRATES  
CAPABILITY TO HANDLE TASKS:**  
  
**Project:** Ecological surveys for the proposed, potential UNESCO  
biosphere reserves.  
**Year:** 2018

**Location:** Maldives  
**Client:** IUCN Maldives  
**Main project features:** Surveying of 5 reefs and 3 islands.  
**Position:** Consultant.  
**Activities performed:**  
Conducted ecological (marine and terrestrial) surveys at the proposed sites  
Data compilation and analysis  
Assisted in the final report development.

**Project:** Environmental Monitoring Report for resort development  
**Year:** 2018  
**Location:** Maldives  
**Client:** Pearl Atoll Pvt Ltd  
**Main project features:** Survey for the Environmental Monitoring Report  
**Position:** Environmental Analyst  
**Activities performed:**  
Conducted the marine component of the survey. The seawater quality analysis, sedimentation analysis, reef benthic surveys, and fish surveys.

**Project:** Environmental Impact Assessment Report for resort development  
**Year:** 2018  
**Location:** Bodufushi, Raa Atoll.  
**Client:** Alibey Maldives Pvt Ltd  
**Main project features:** EIA Survey for an addendum  
**Position:** Environmental Analyst  
**Activities performed:**  
Conducted the marine component of the survey. The seawater quality analysis, reef benthic surveys, and fish surveys.

**Project:** Environmental Impact Assessment for Coastal Protection and Entrance Clearance.  
**Year:** 2018  
**Location:** Bandos Island Resort, Kaafu Atoll.  
**Client:** Bandos Island Resort.  
**Main project features:** EIA Survey  
**Position:** Environmental Analyst  
**Activities performed:**  
Conducted the marine component of the survey. The seawater quality analysis, reef benthic surveys, and fish surveys.

**Project:** Third Addendum to the Environmental Impact Assessment Report  
**Year:** 2018  
**Location:** Enboodhoo Finolhu Lagoon  
**Client:** Dream Islands Development Pvt Ltd  
**Main project features:** Reclamation of Islands for Resort Development at Enboodhoo Finolhu Falhu, South Malé Atoll  
**Position:** Environmental Analyst  
**Activities performed:**  
Conducted the marine component of the survey. The seawater quality analysis, reef benthic surveys, and fish surveys.

**14. Certification:**

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.



\_\_\_\_\_  
[Signature of staff member or authorized representative of the staff]

Date: 05<sup>th</sup> August 2018  
*Day/Month/Year*

Full name of staff member: Azim Musthag

## References

- ANSI (2018, October 26) How loud is Construction site noise? [Available online: [How Loud Is Construction Site Noise? - ANSI Blog](#)] (accessed on 2<sup>nd</sup> December 2021)
- Asphalt Pavement Association of Oregon (n.d.) Asphalt – environmentally friendly, sustainable pavement material [Available online: [Asphalt is Environmentally Friendly - Asphalt Pavement Association of Oregon \(apao.org\)](#)] (accessed on 7<sup>th</sup> December 2021)
- CDC, 2000. Hazard Review: Health effects of occupational exposure to Asphalt. U.S Department of Health & Human Services / NIOSH
- Pastakia, C.M.R., 1998. The rapid Impact Assessment Matrix: a new tool for Environmental Impact Assessment. IN: K. Jensen (ed.). Environmental Impact using the Rapid Impact Assessment matrix (RIAM). Olsen & Olsen, Fredensborg, DK.
- Greentech Consultants Pvt. Ltd., Riyan Pvt. Ltd., and CDE Pvt. Ltd., 2010. Maldives Environment Management Project (MEMP). *Consultancy on Social Assessment for the Solid Waste Management Component*. International Development Association (IDA) Funded.
- MEE, 2016. Maldives Clean Environment Project Environmental and Social Assessment and Management Framework (ESAMF) & Resettlement Policy Framework (RPF).
- Riyan Pvt. Ltd and NIRAS., 2012. *Environmental and social Impact Assessment for North Regional Waste Management Facility Construction and Operation*. Prepared for Ministry of Environment and Energy
- Riyan Pvt Ltd. 2021. *Preliminary Design report for firefighting system at R. Vandhoo Waste management facility*. Prepared for Ministry of Environment
- Senes Consultants Ltd., and CDE Pvt. Ltd., 2010. North Province Regional Waste management Project, Maldives: Best Practicable Environmental Option (BPEO) Report.
- WAMCO, 2018. Operations and Management Plan, Regional Waste Management Facility.
- LaMer Group Pvt Ltd., 2019. *Environmental and Social Impact Assessment Report for Upgrading of Infrastructure at Regional Waste Management Facility Zone 2, Raa Vandhoo*. Prepared for Ministry of Environment

# Appendices

## **Appendix 1 List of abbreviations**

DO – Dissolved oxygen  
EPA - Environment Protection Agency  
EPPA - Environmental Protection and Preservation Act  
ESAMF - Environmental and Social Assessment and Management Framework  
ESIA - Environmental and Social Impact Assessment  
EIA - Environmental Impact Assessment  
ESMP - Environmental and Social Management Program  
GBVv- Gender Based Violence  
GPS - Global Positioning System  
HS – Health and Safety  
IDA - Development Association  
MCEP - Maldives Clean Environment Project  
MECCT - Ministry of Environment, Climate Change and Technology  
MEMP – Maldives Environment Management Project  
MNDF - Maldives National Defense Force  
RIAM - Rapid Impact Assessment Method  
RWMF - Regional Waste Management Facility  
SWM - Solid Waste Management  
TDS - Total Dissolved Solids  
TOR - Terms of Reference  
TSS – Total Suspended Solids  
URA – Utility Regulatory Authority  
WAMCO - Waste Management Corporation  
WATSAN - Water and Sanitation Department

**Appendix 2 Terms of Reference (ToR)**



- **The original ESIA conducted in 2012 prepared and financed as part of the Bank-Financed MEMP project**, implemented between 2008 to June 2016. The original ESIA was for the establishment of the Vandhoo-RWMF based on the BPEO and Feasibility Study for the Vandhoo RWMF. The ESIA was cleared by the EPA and the World Bank in 2013. The EPA of Maldives issued a decision note on 31st January 2013 and the World Bank approved the report in August 2013.
- **The First Addendum to the Original ESIA was prepared for the additional interventions introduced by and financed under MCEP in 2019**, which were mostly for storage and accommodation facilities. This standalone First Addendum Report was cleared by the Bank in 2019. The ESMP from this First Addendum is currently under implementation and a status report is presented in Annex 1. A detailed update of status of interventions and what the First Addendum covered is included in the attached background note presented in Annex 1. The First Addendum was cleared by the World Bank on 10 June 2019. The report was also earlier approved by the Environmental Protection Agency (EPA) on 14 February 2019.
- **This Terms of Reference (ToR) has been developed to describe the scope of work for consultant services to conduct an environmental and social impact assessment Second Addendum to the ESIA for review and approval of the Maldives EPA and the World Bank.** It will address the upgrading of ancillary facilities at the RWMF that has been identified via an assessment of operational needs at the site conducted under the MECP project and updates from the Original Master Plan for the RWMF. The proponent of the project is **Ministry of Environment, Climate Change and Technology (MECCT)**. The ESIA consultant of the project is **Hussein Zahir (EIA P04/2007.)**

**SECTION B: Scope of Work**

This Second ESIA Addendum will exclusively focus on the proposed additional facilities that have been proposed via the amendments to the original master plan of the RWMF.

The ESIA Second addendum will be prepared as a standalone report taking into account the ESIA and 2019 ESIA First Addendum. ESIA addendums are prepared as standalone reports to supplement the main ESIA document as per the requirements of the Maldives EPA. All addendums are reviewed in conjunction with the main ESIA along with any approved addendums to date.

This second addendum will assess the potential impacts associated with the following proposed changes of physical interventions to the site. All technical details, drawings and associated information to be read in conjunction with the TOR are presented from Annex 2 onwards:

- Change to the proposed location of the fuel storage tanks.
- Arranging for Temporary fuel storage setup during construction
- Minor extensions or connections to the road network as described in the original ESIA and the First Addendum;
- Preparation of a Traffic Management Plan; and
- Change of the sewerage system plan from a central system to septic tanks system

The design and capacity of the fuel storage tanks are to remain exactly the same as previously proposed in 2019 ESIA (first addendum). The only proposed changed is with respect to a change in the proposed location of the fuel storage tanks to a site closer to the powerhouse and the WtE plant, which require fuel to operate.



- Traffic management plan indicating the routes that will be taken by vehicles during operations, type of vehicles proposed to be used, and types and locations of traffic signages shall be provided.
- The updated location of the fuel storage tanks including fuel trenches, road cross sections and piping on concrete support.
- A flow diagram with the locations of the temporary fuel tanks, the temporary bund and the route of the forklift movement; and
- The proposed location of the septic tanks.

Provide a full description and justification of the relevant parts of the proposed upgrading works, using maps at appropriate scale where necessary. All inputs and outputs related to the proposed activities shall be justified. The following should be provided.

- Land Requirement
  - Mention current extent of land and if additional land would be required and the extent for the expansion
  - Mention if any permits/approvals are required from any authorities for expanding beyond the current land boundaries.
- Updated location of the Fuel Storage Tanks (fuel farm):
  - Location of the fuel storage tanks with dimensions, design details and piping details.
  - Measure of containment such as how it will be bunded and what material the tanks will be made of and any contingency structural measures for emergency leak management etc. should be clearly defined.
  - The layout of the piping should be clearly defined on a map to understand where it will be laid out from the feed to the source. The nature of the piping, weather surface or underground should be clearly indicated.
  - Types and quantities of vegetation required to be removed from the proposed new plot.
  - Details of vehicles and machinery proposed for vegetation clearance and levelling works and erecting of the tanks.
- Temporary Fuel Storage Arrangements:
  - Location, details of the tanks including the capacity, expected storage volume during operations, process of fuel input during operation to the storage unit should be indicated.
  - Measure of containment such as how it will be bunded and what material the tanks will be made of and any contingency structural measures for emergency leak management etc. should be clearly defined.
  - Method of how fuel will be transferred from the feed to the source should be explained with clear indication of containment measures that will adopted during fuel transfer.
  - Where existing fuel storage facilities will be moved detailed should be provided on how these will be deconstructed and cleaned.
- Road Extensions or Connections:
  - Details of road extension not covered in the principal ESIA (LaMer, 2019) marked on a map using different colour codes and purpose of use should be indicated, to specify what would be the new additions this addendum will cover.
  - The width of the roads and road cross sections.
  - Materials to be used for paving (e.g., asphalts).
  - Types of utility services that will be laid under the roads and how it will be done (if different from the principal ESIA).

- Types and quantities of vegetation required to be removed to accommodate for road extensions and/or connections.
- Details of vehicles and machinery proposed for vegetation clearance, levelling works and road construction.
- Traffic Management Plan:
  - Details of the routes that will be taken by vehicles during operations marked on a map.
  - Types and quantities of vehicles proposed or likely to be used during operations.
  - Different types of traffic signages and their corresponding locations.
  - Pedestrian walkways and footpaths.
- Changes proposed to the sewerage system:
  - Location and design of the septic tanks. Provision for future connection to a STP or a central system shall be incorporated into the design of the septic tanks.
  - Sludge disposal method indicating how frequently the tanks should be cleaned.
- Labour management during construction:
  - Estimated number of workers (indicate whether local or expatriate and male or female).
  - Accommodation arrangements, whether on-site or at neighbouring islands.
  - Services for workers including how sanitary, food and drinking water arrangements will be provided at the work site
  - COVID 19 special considerations during setting up of the labour camp and work site such as provision for handwashing facilities, social distancing (each bedside to be separated by 3 – 6 ft) etc.
  - Requirements for reporting on complaints/grievances including responding to Sexual Exploitation and Abuse and Sexual Harassment (SEA/SH) related issues.
- Labour Requirements during Operations
  - Specify if additional labour will be required to operate the newly proposed developments.
  - COVID19 special considerations applicable to operational staff should be mentioned (as the 2019 ESIA was prepared prior to the pandemic).
- Fire Hazard, Health and Safety:
  - Types and estimated quantities of PPEs and first aid boxes that will be required to carry out the proposed works.
  - COVID 19 special consideration such as wearing mask, frequent hand washing, use of hand sanitizers etc.
  - Vulnerability analysis of the fuel storage tanks to fire hazard.
  - Provision to fire safety, including details of firefighting equipment that will be established, signage, alarm system etc.
- Waste Management
  - Details of waste management during construction and operational phase
  - Waste fuel and oil management details.
- Resource Requirement
  - Mention the resource requirement for construction and operational phase such the need for portable water and electricity and how these will be sourced. If it is to be sourced from existing facilities within the RWMF, indicate how these will be managed, as the facilities developed are targeted exclusive to the operational staff.

Note: If any of the aforementioned details are covered under the ESIA (LaMer, 2019) reference can be made to the relevant sections of original report.

Details of the works already completed shall be provided (if any).

**Task 2. Description of the environment** – Assemble, evaluate and present the environmental baseline study/data regarding the study area and timing of the project (e.g., monsoon season). Identify baseline data gaps and identify studies and the level of detail to be carried out by consultant. Consideration of likely monitoring requirements should be borne in mind during survey planning, so that data collected is suitable for use as a baseline. As such all baseline data must be presented in such a way that they will be usefully applied to future monitoring. The report should outline detailed methodology of data collection utilized.

Furthermore, since the initially proposed site for fuel storage tanks referred in the first ESIA addendum is to be changed, vegetation covers exclusively specific to the footprint of the proposed new location for establishing the fuel storage tanks (footprint area: 150 sqm) will be assessed through this study. The study will present an updated baseline summary in the context of the proposed interventions and sites.

The baseline data will be collected before construction and from at least two benchmarks. All survey locations shall be referenced with Geographic Positioning System (GPS) including water sampling points and vegetation transects for posterior data comparison. Information should be divided into the categories shown below:

Ecology

- Vegetation present at the sub project sites: Describe the number and type of vegetation present at the road extension areas or connection points and the foot print of the proposed new location of the fuel storage tanks, including scientific and local names. The amount of vegetation that require compensation and estimated cost must be indicated (if any such vegetation are present). Vegetation cover maps shall be included where appropriate (identifying the areas subjected for vegetation removal and translocation/replantation). Emphasis must be given to translocate trees (within the source island or out of the island in instances where space scarcity is an issue) as much as possible. Methods of vegetation removal and translocation must be described, which should yield the preferred method for the project site and access road. Locations for compensatory 2:1 replantation must be identified and indicated on a map.
- Ground Water Quality: parameters including temperature, salinity, pH, conductivity, Total Dissolved Solids (TDS) and Total Petroleum Hydrocarbon, (from the location of the fuel storage tanks, fuel line/transport locations and from one control site);
- Noise: noise outside within 1 m radius and within the nearest staff residential area (from location of the new fuel storage tanks and 1 control site)
- Protected Areas and Environmentally Sensitive Sites: Provide information on the environmentally protected and sensitive areas that exists close to the proposed new developments (such as turtle nesting sites and mangrove areas). Indicate distances from the project sites and if the protected area is in the project impact zone and if there are any observed potential impacts. Proximity of the site to surface water bodies or sensitive habitats (e.g. coasts, mangroves, wetlands) should also be identified.
- Areas of Historic and Cultural Significance: Provide information on areas of historic and cultural significance (such as mosques, graves etc.) that exist close to the proposed new developments. Indicate distance from the selected project site.

**Hazard vulnerability:**

- Vulnerability of the location of the fuel storage tanks to flooding, storm surge and beach erosion and associated hazards with the refueling and fueling operations of the storage. Including pipeline

Absence of facilities in the country to carry out the water quality tests will not exempt the proponent from the obligation to provide the necessary data. The report should outline the detailed methodology of data collection utilized to describe the existing environment.

*Note: If any of the aforementioned details are covered under the principal ESIA (LaMer, 2019) reference can be made to the relevant sections of original report.*

**Task 3. Legislative and regulatory considerations** – Identify any addition new legislation, regulations and standards, and environmental policies that are not covered in the principal ESIA (LaMer, 2019), but might be of relevance and is applicable to the proposed changes envisaged for the project, and identify the appropriate authority jurisdictions that will specifically apply to the project. Legal requirements:

- Approval of ESIA addendum from the World Bank and Environmental Protection Agency.

**Task 4. Alternatives Analysis**

All project alternatives that are reasonable and feasible and meet the purpose and need for the proposed sub project activities shall be identified, summarized in this section, and evaluated in the ESIA addendum as appropriate. In addition to the proposed project, such alternatives include alternative locations, alternative site configuration of elements of the project, alternative size, and alternative plans for construction, operation and decommissioning of the project including best practices that may avoid and/or reduce the adverse impacts to the physical, biological or social-economic-cultural environments. The following should be presented.

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” and alternative material and method for paving the roads. The comparison should yield the preferred alternative for implementation. Mitigation options should be specified for each component of the proposed project.

- Description of various alternatives like locations or layouts or technologies studied
- Description of each alternative
- Summary of adverse impacts of each alternative
- Selection of alternative

If the project area or the buffer zone of the project area for an alternative is in an ecologically fragile are, the description of the alternative must include a clear justification for not opting for another site. Identify which alternatives will be carried through the analysis in the ESIA addendum and the basis for that decision.

**Task 5. Potential impacts (environmental and socio-cultural) of proposed project, incl. all stages** – The ESIA report should identify all the impacts, direct and indirect, during and after construction, and evaluate the magnitude and significance of each. Particular attention shall be given to impacts associated with the following:

- a) **Physical / Chemical:** describe impacts on groundwater, soil, noise, air and waste.
  - Impacts of noise pollution and disturbances (both in construction and operations).

- Impacts on ground water table and quality due to construction, operations and accidental fuel spillages.
  - Impacts on ground vibrations to resident staff buildings.
  - Impacts on air quality due to dust and vehicle emissions.
  - Marine water pollution due to spillage during material transfer.
- b) Biological: describe impacts on vegetation and fauna.
- Impact due to vegetation removal (road extensions and location of the fuel storage tanks. New fuel storage location is to be compared with initially proposed location in the principal ESIA).
  - Impacts to vegetation and fauna due to improper handling and driving during material transportation.
  - Impacts due to material spillage during transfer of construction materials to the project island.
- c) Sociological / Cultural: describe impacts of road traffic, nearby sensitive areas, health and safety of resident staff / contracted labor and sociocultural conflict.
- Sociocultural conflict due to arrival of expatriate workers (if accommodation is to be arranged in nearby inhabited islands).
  - Impact on resources and shared facilities at Vandhoo, such as bathrooms, resting facilities etc. due to arrival of addition work force during construction period.
  - Impacts due to illegal immigrants being potentially recruited by the contractor.
  - Impacts and risks associated with illicit behavior, Sexual Exploitation and Abuse and Sexual Harassment (SEA/SH) and gender-based violence.
  - Risks related to non-compliance with labour regulations such as
    - Using workers without of contracts;
    - Not complying to terms and conditions related to hours of work, wages, overtime, etc.;
    - Lack of work permits if migrant workers are hired; and
    - Lack of a GRM for workers to raise/report on labor issues.
- d) Economic / Enhancement Plans: describe any potential benefits or losses to the economy.
- Employment opportunities to nearby islands and the region.
  - Benefit to local economy due to purchasing of locally available construction materials.
- e) Accidents, Injuries and Health and Safety
- Health and safety of construction workers and the fuel storage tank operators.
  - COVID19 restrictions and special considerations for the contractor (potential mitigation measures may include toolbox talks, daily temperature checks, cleaning procedures, shift roaster, arrangement for social distancing in labor camps, establishment of handwashing facilities at work site and labor camp etc.).
  - Fire hazard due to improper handling of fuel and waste oil.
  - Accidents and injuries due to traffic mismanagement.

The methods used to identify the significance of the impacts shall be outlined. The report should 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. Use interaction matrices (e.g., Leopold Matrix) to assess the magnitude and significance of the impacts.

**Task 6. Mitigation and management of negative impacts** –Identify possible measures to prevent or reduce significant negative impacts to acceptable levels. These will include both environmental and socio-economic





- Waste Management and Pollution Control Department (WMPCD) and other projects of ME that are investing in Vandhoo RWMF.
- MNDF and ME’s fire safety consultant- regarding fuel handling and storage requirements.
- Utility Regulatory Authority
- Innamaadhoo and Rasmaadhoo Island Councils and/or Women Development Committee (if any significant socio-economic impacts were identified through the impact analysis)

**Task 11. Grievance Redress Mechanism** – Review the grievance redress mechanism included in the principal ESIA and propose necessary revisions or updates to ameliorate it in line with the proposed new developments and the COVID19 pandemic situation (if required).

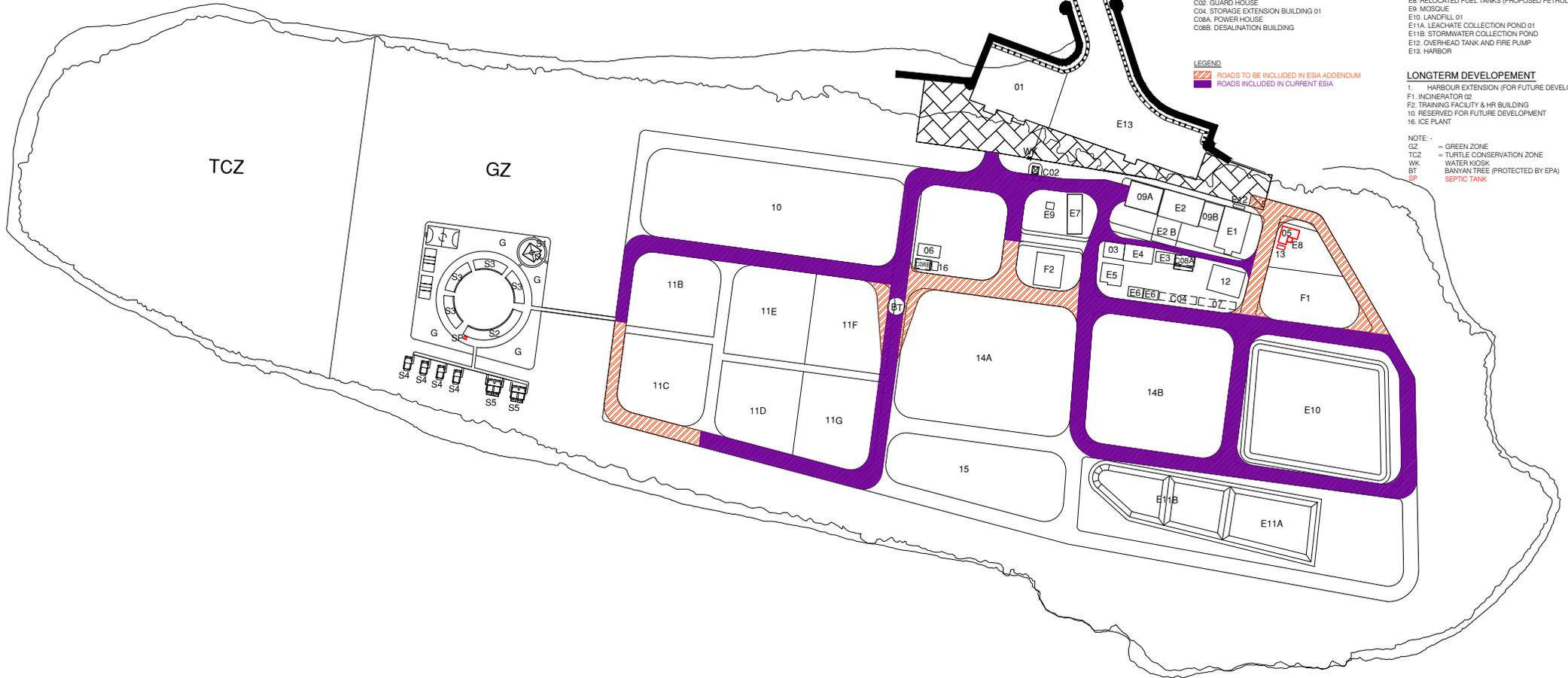
**Task 12. Conclusion** - This section shall specify the environmental acceptability of the project, taking into account the impacts and measures identified during the assessment process. It shall also identify any other conditions or external requirements for ensuring the success of the project.

- 3. Validation and Disclosure-** The draft executive summary and the ESMP (matrix table in mitigation chapter) in local language should be disclosed in the project island in printed format and disseminated as appropriate or made available via online means for public commenting. This should be completed prior to or at the time of submitting the report to the EPA and the World Bank for clearance, so the period for public commenting can be sequenced in parallel to the review process. The consultant will assist the project in disclosure documents in all major affected settlements and at the project island and national level. The final cleared version of the report will be disclosed in major project websites and social media platforms with a summary of major findings through the disclosure process reflected as an annex.
- 4. Presentation-** The ESIA addendum report 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 for any references used in interpreting those data. The environmental assessment report will be organized according to, but not necessarily limited by, the outline given in the Environmental Impact Assessment Regulation 2012 and subsequent amendments.
- 5. References**  
Submit a list of all references, (books, articles, technical reports and other information sources) cited in the various chapters of the ESIA study with full biographic references, and the following conventional procedures cited in the literature: author, year, title, source, number of pages, and city of publication or issuance.
- 6. Timeframe for submitting the EIA report** – The developer must submit the completed EIA report within 6 months from the date of this Term of Reference.

  
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26<sup>th</sup> September 2021



**Appendix 3 Revised Master Plan of RWMF at Vandhoo**



- PROPOSED FACILITIES**
- 03. VEHICLE SHED EXTENSION BUILDING (ONGOING)
  - 05. FUEL STORAGE TANKS
  - 06. WATER STORAGE TANKS
  - 07. STORAGE EXTENSION BUILDING 02
  - 09A/09B. WASTE SORTING SHED EXTENSION (ONGOING)
  - 11. WASTE MANAGEMENT FACILITIES
    - 11A - RESERVED FOR FUTURE USE
    - 11B - RECYCLABLES
    - 11C - RECYCLING (WITH COMPACTION AND BALING PLANT)
    - 11D - E-WASTE
    - 11E - BULK WASTE
    - 11F - COMPOST PACKAGING AND STORAGE
    - 11G - HAZARDOUS WASTE
  - 12. WASTE STORAGE SHED
  - 13. FUEL PUMP HOUSE
  - 14. PROPOSED LANDFILL
    - 14A - C&D WASTE
    - 14B - LANDFILL 02
  - 15. LEACHATE COLLECTION POND 02
  - WB. WEIGH BRIDGE
- COMPLETED FACILITIES**
- C02. GUARD HOUSE
  - C04. STORAGE EXTENSION BUILDING 01
  - C08A. POWER HOUSE
  - C08B. DESALINATION BUILDING

- PROPOSED STAFF VILLAGE**
- S1. MOSQUE
  - S2. STAFF FACILITIES BUILDING
    - STAFF KITCHEN
    - CAFETERIA
    - LAUNDRY
    - RECREATION
    - GYM
  - S3. STAFF ACCOMMODATION X4
  - S4. GUEST ACCOMMODATION X4
  - S5. CONSULTANTS ACCOMMODATION X2
- G. GREEN AREAS

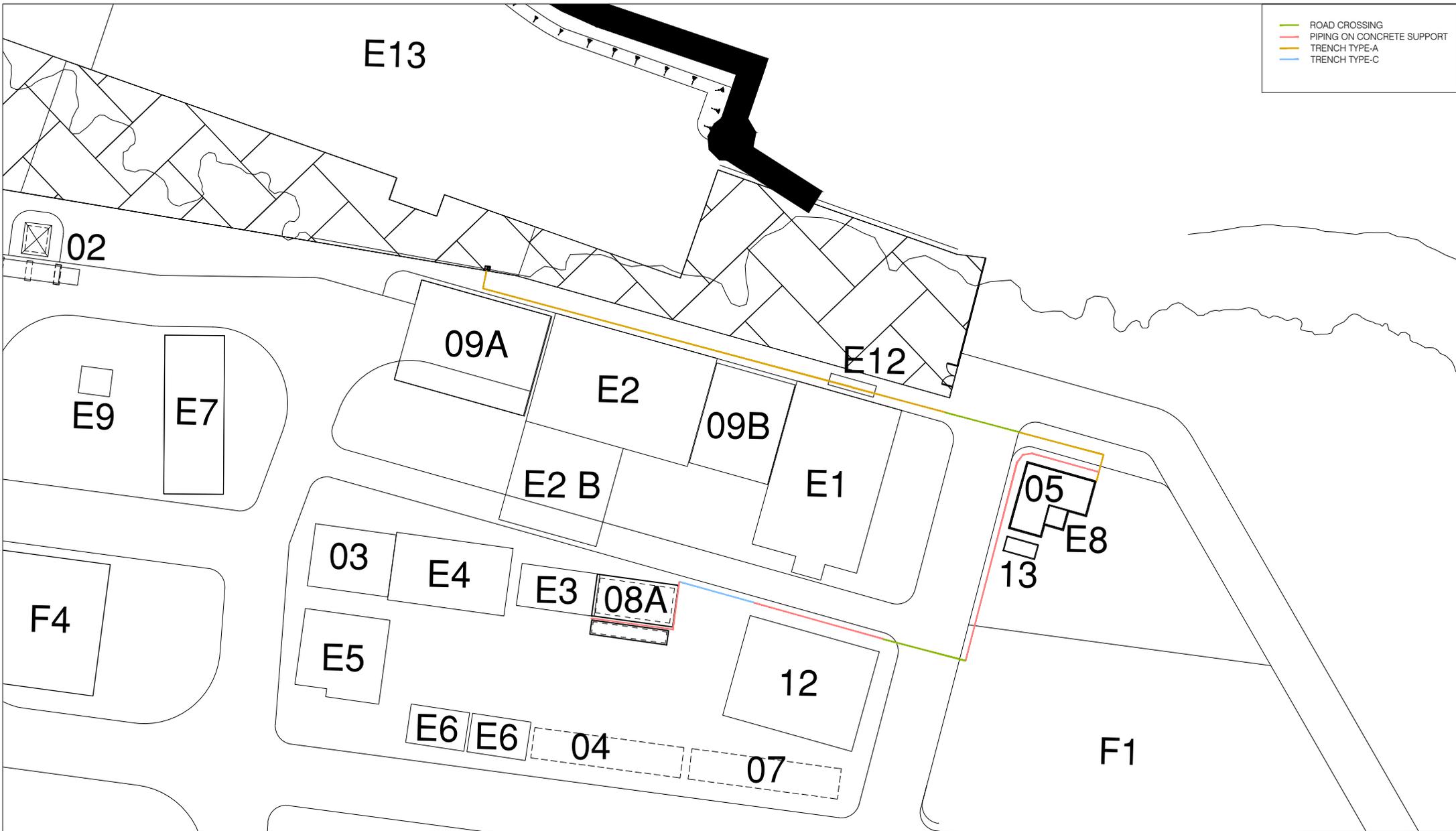
- EXISTING FACILITIES**
- E1. INCINERATOR 01
  - E2. WASTE SORTING SHED
  - E2B. WASTE SORTING SHED ANNEX (TO BE RELOCATED)
  - E3. UTILITY BUILDING
  - E4. VEHICLE SHED
  - E5. LOCKER ROOM FACILITY (EXISTING STAFF ACCOM.)
  - E6. STORAGE BUILDINGS
  - E7. OFFICE BUILDING (EXISTING ACCOM. BUILDING)
  - E8. RELOCATED FUEL TANKS (PROPOSED PETROL TANK)
  - E9. MOSQUE
  - E10. LANDFILL 01
  - E11A. LEACHATE COLLECTION POND 01
  - E11B. STORMWATER COLLECTION POND
  - E12. OVERHEAD TANK AND FIRE PUMP
  - E13. HARBOR

- LONGTERM DEVELOPMENT**
- 1. HARBOUR EXTENSION (FOR FUTURE DEVELOPMENT)
  - F1. INCINERATOR 02
  - F2. TRAINING FACILITY & HR BUILDING
  - 10. RESERVED FOR FUTURE DEVELOPMENT
  - 16. ICE PLANT

- NOTE:-**
- GZ = GREEN ZONE
  - TCZ = TURTLE CONSERVATION ZONE
  - WK = WATER KIOSK
  - BT = BANYAN TREE (PROTECTED BY EPA)
  - SP = SEPTIC TANK

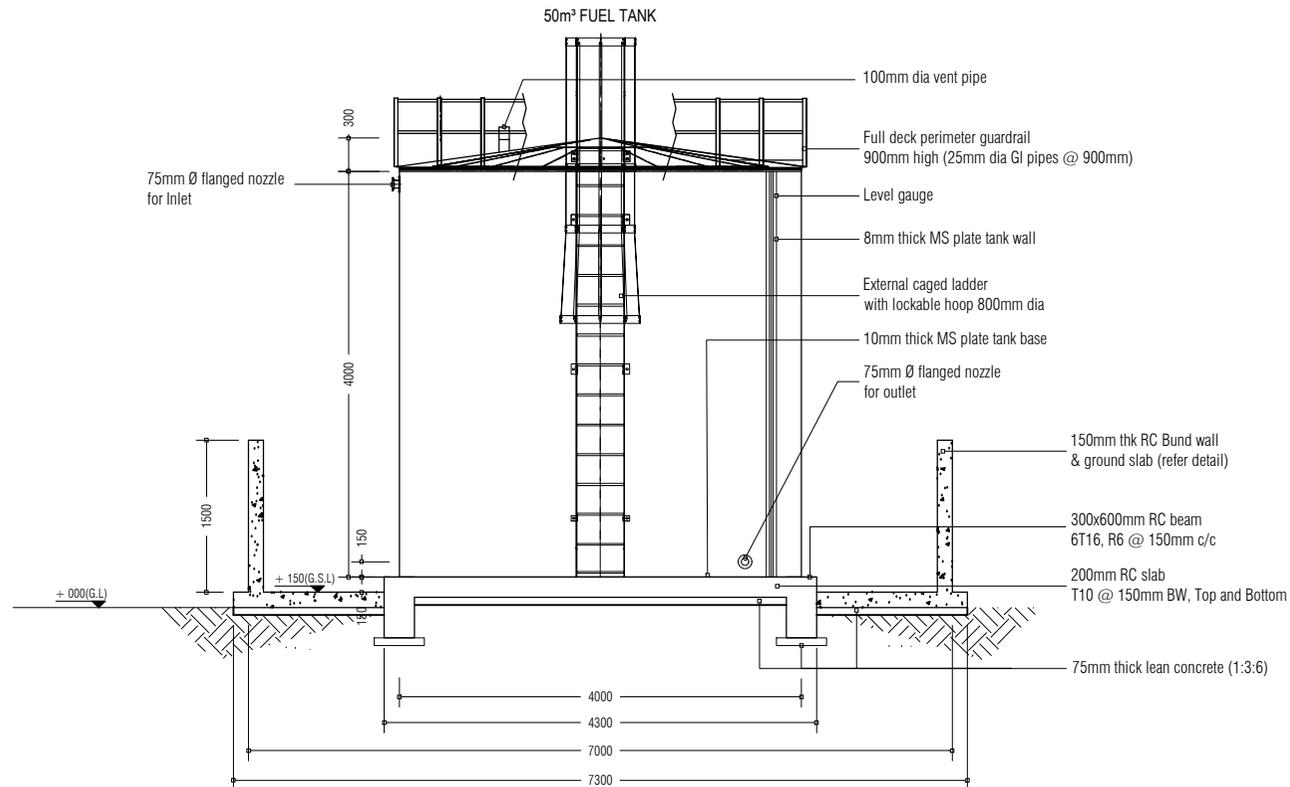
PREPARED BY	PROJECT	DESIGN BY	AMENDMENTS
 <p>MCEP MINISTRY OF ENVIROMENT GREEN BUILDING, HANDHUVAREE HIGUN, MAAFANNU, MALE' (20392), REPUBLIC OF MALDIVES, TEL: +960-3018431, +960-3018300, FAX: +960-328301</p>	REGIONAL WASTE MANAGEMENT FACILITY R.VANDHOO		REVISED AS PER EPA DECISION STATEMENT REVISED LOCATION OF WEIGHING BRIDGE
	<b>TITLE</b> MASTER PLAN - PROPOSED ROADS DEVELOPMENT	<b>STRUCTURE BY</b>	PROPOSED LOCATION OF BOAT BUILDING YARD ADDED PROPOSED LOCATION OF ICE PLANT ADDED
	<b>CLIENT DEPARTMENT</b> WMPC DEPARTMENT	<b>DRAWN BY</b> AFRAZ	FUEL TANKS RELOCATED COMPLETED BUILDINGS (OF PROPOSED BUILDINGS) LABELED SEPARATELY
	<b>PAPER SIZE</b> A4	<b>SCALE</b> 1:4500	
	<b>PAGE NO.</b> 01	<b>DWG NO.</b> VANDMP-R-A1-01(R4)	
		<b>DATE</b> 30.03.2021	

**Appendix 4 Fuel farm and fuel tank design**

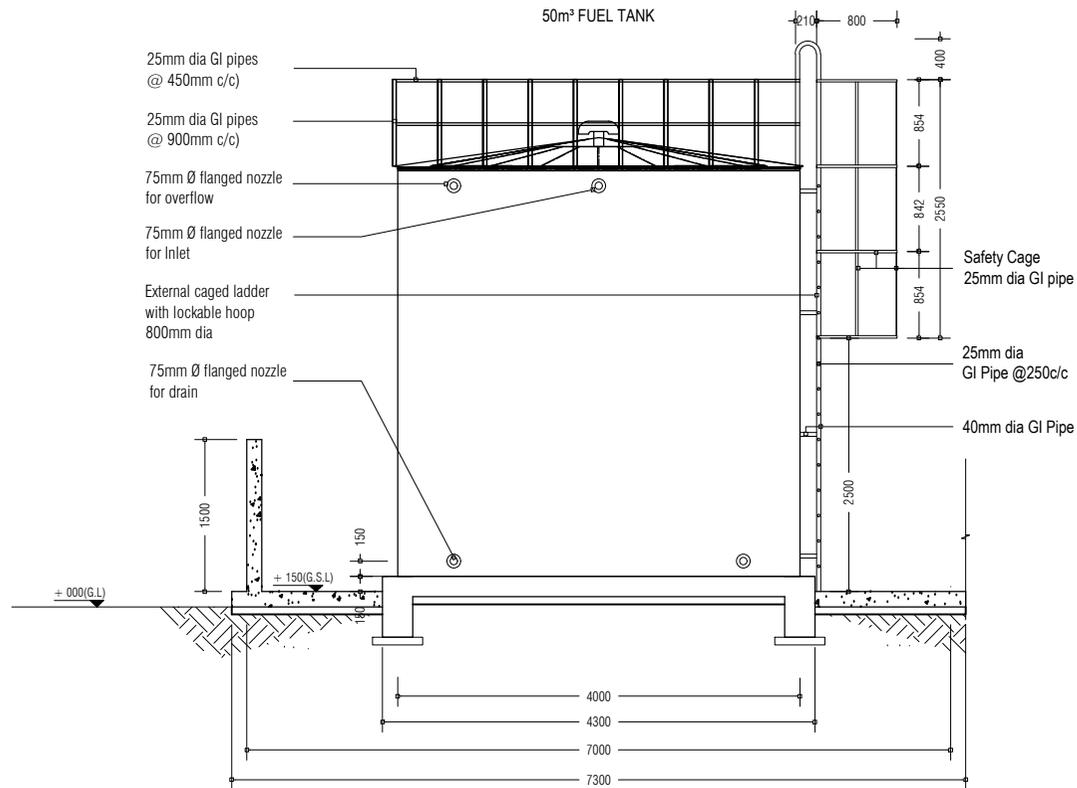


<b>APPROVED BY</b>   <b>MCEP</b> MINISTRY OF ENVIROMENT GREEN BUILDING, HANDHUVAREE HIGUN, MAAFANNU, MALE' (20392), REPUBLIC OF MALDIVES, TEL: +960-3018431, +960-3018300, FAX: +960-328301	<b>PROJECT</b> CONSTRUCTION OF NEW FUEL STORAGE TANKS R. VANDHOO	<b>DESIGN BY</b> AFRAZ	<b>AMENDMENTS</b> FUEL TANK LOCATION CHANGED
	<b>TITLE</b> TRENCH/PIPING LAYOUT	<b>STRUCTURE BY</b> AFRAZ	
	<b>CLIENT DEPARTMENT</b> WMPC DEPARTMENT	<b>DRAWN BY</b> AFRAZ	
	<b>PAPER SIZE</b> A4	<b>SCALE</b> 1:1000	
	<b>PAGE NO.</b> 01	<b>DWG NO.</b> VNDADFUEL A0-01(R)	
		<b>DATE</b> 14.01.2021	

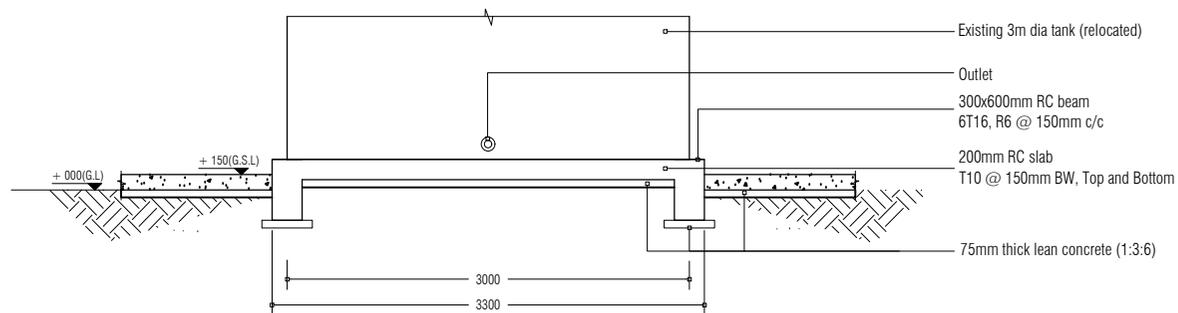




APPROVED BY	PROJECT	DESIGN BY	AMENDMENTS
 <p>MCEP MINISTRY OF ENVIROMENT GREEN BUILDING, HANDHUVAAREE HIGUN, MAAFANNU, MALE (20392), REPUBLIC OF MALDIVES, TEL: +960-3018431, +960-3018300, FAX: +960-328301</p>	CONSTRUCTION OF NEW FUEL STORAGE TANKS R. VANDHOO	AFRAZ	
	TITLE	STRUCTURE BY	
	SECTION X-X	AFRAZ	
	CLIENT DEPARTMENT	DRAWN BY	
	WMPC DEPARTMENT	AFRAZ	
	PAPER SIZE	A4	SCALE
PAGE NO.	03	DWG NO.	VNDADFUEL A2-03
		DATE	21.04.2020



APPROVED BY	PROJECT	DESIGN BY	AMENDMENTS
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	TITLE	STRUCTURE BY	
	SECTION Y-Y	AFRAZ	
	CLIENT DEPARTMENT	DRAWN BY	
	WMPC DEPARTMENT	AFRAZ	
	PAPER SIZE	A4	SCALE
PAGE NO.	04	DWG NO.	VNDADFUEL A2-04
		DATE	21.04.2020



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**PROJECT**

CONSTRUCTION OF NEW FUEL STORAGE TANKS  
R. VANDHOO

**DESIGN BY**

AFRAZ

**AMENDMENTS**

**TITLE**

SECTION A-A

**STRUCTURE BY**

AFRAZ

**CLIENT DEPARTMENT**

WMPC DEPARTMENT

**DRAWN BY**

AFRAZ

**PAPER SIZE**

A4

**SCALE**

1:75

**PAGE NO.**

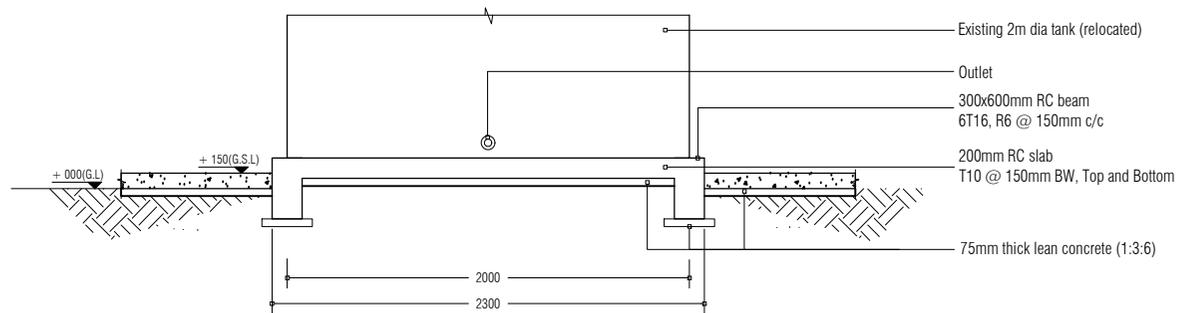
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**DWG NO.**

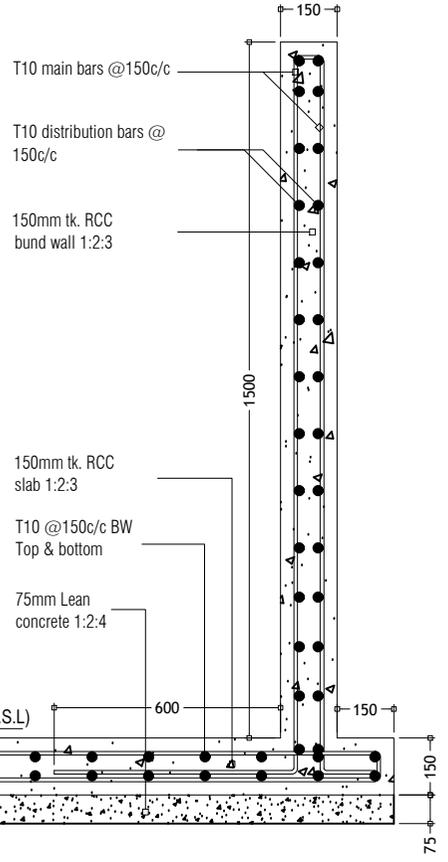
VNDADFUEL A2-05

**DATE**

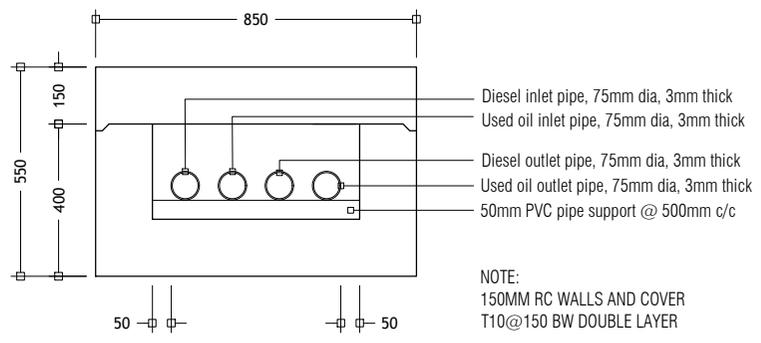
21.04.2020



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 <p>MCEP MINISTRY OF ENVIROMENT GREEN BUILDING, HANDHUVAAREE HIGUN, MAAFANNU, MALE (20392), REPUBLIC OF MALDIVES, TEL: +960-3018431, +960-3018300, FAX: +960-328301</p>	CONSTRUCTION OF NEW FUEL STORAGE TANKS R. VANDHOO	AFRAZ	
	TITLE	STRUCTURE BY	
	SECTION B-B	AFRAZ	
	CLIENT DEPARTMENT	DRAWN BY	
	WMPC DEPARTMENT	AFRAZ	
	PAPER SIZE	A4	SCALE
PAGE NO.	06	DWG NO.	VNDADFUEL A2-06
		DATE	21.04.2020

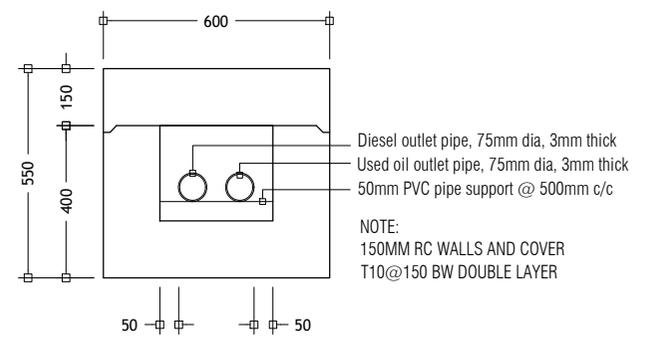


Note:  
Cover = 35mm  
Lap length 50Ø



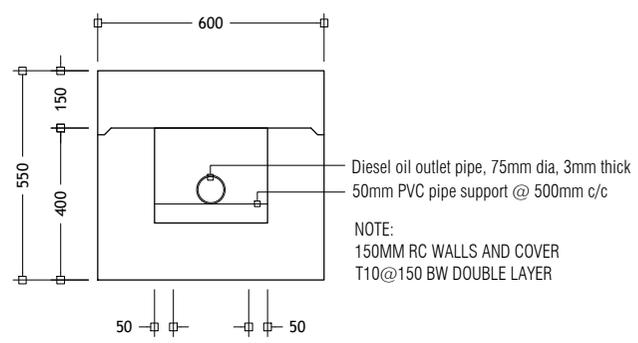
FUEL TRENCH DETAIL-A

NOTE:  
150MM RC WALLS AND COVER  
T10@150 BW DOUBLE LAYER



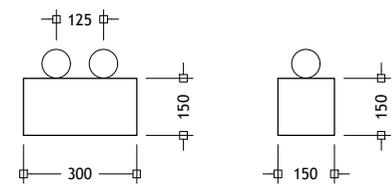
FUEL TRENCH DETAIL-B

NOTE:  
150MM RC WALLS AND COVER  
T10@150 BW DOUBLE LAYER



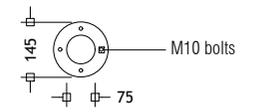
FUEL TRENCH DETAIL-C

NOTE:  
150MM RC WALLS AND COVER  
T10@150 BW DOUBLE LAYER



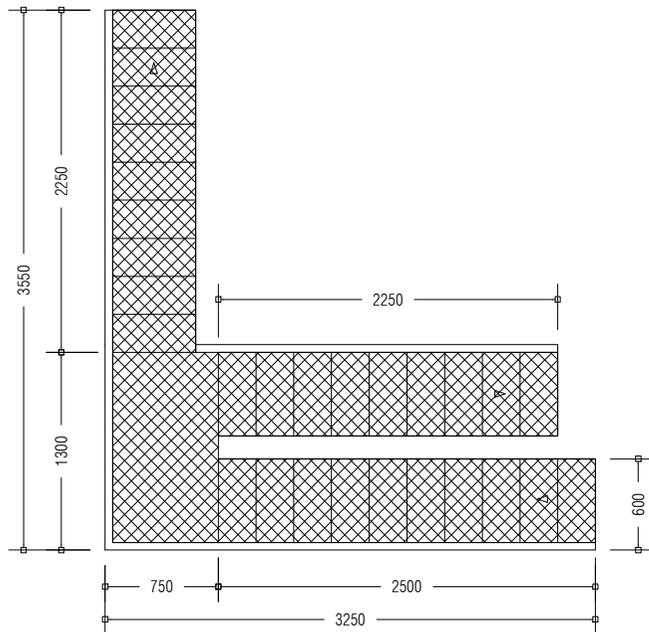
NOTE:  
150x150x300 RC BLOCKS FOR DUAL PIPE SUPPORT  
150x150x150 RC BLOCKS FOR SINGLE PIPE SUPPORT  
R6@100 BW DOUBLE LAYER  
BLOCKS SPACED @ 1000mm C/C  
PIPES FIXED TO BLOCKS WITH BRACKETS

PIPING SUPPORT BLOCKS DETAIL

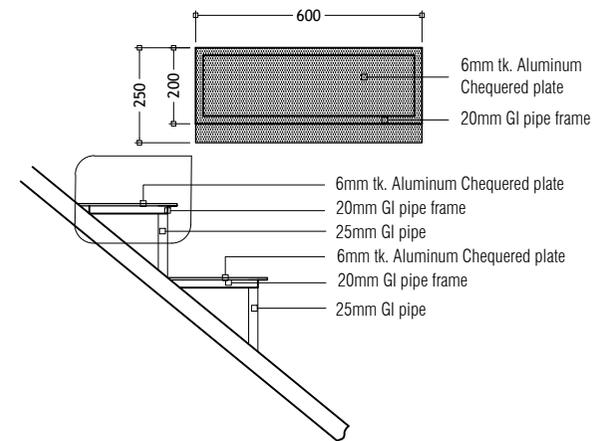
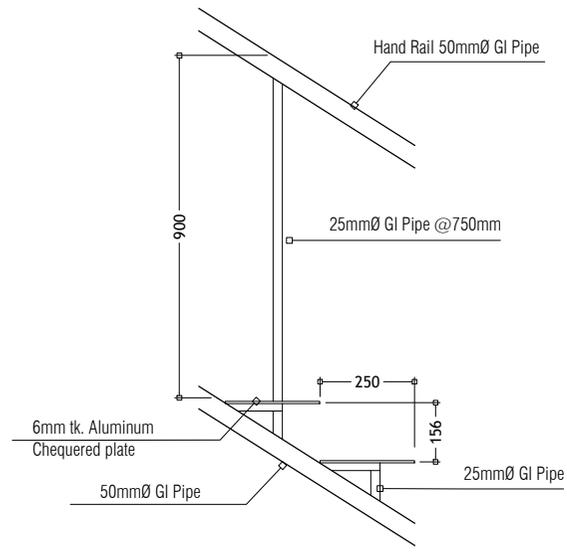


PIPING CONNECTION FLANGE DETAIL

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	TITLE	STRUCTURE BY	
	BUND WALL/SLAB, TRENCH, SUPPORT BLOCKS, FLANGE DETAILS	AFRAZ	
	CLIENT DEPARTMENT	DRAWN BY	
	WMPC DEPARTMENT	AFRAZ	
PAPER SIZE	A4	SCALE	1:20
PAGE NO.	07	DWG NO.	VNDADFUEL S1-07
		DATE	21.04.2020

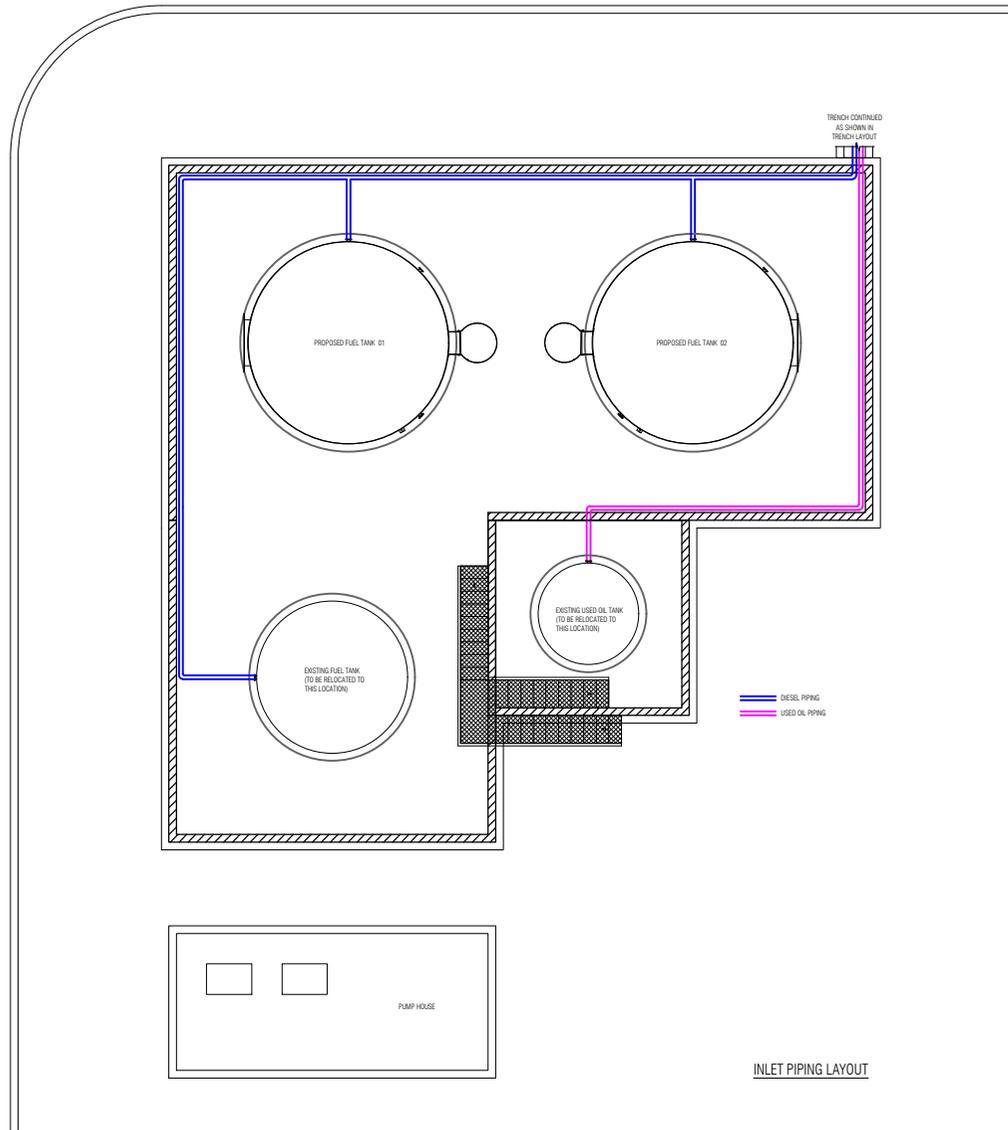


STAIRCASE PLAN

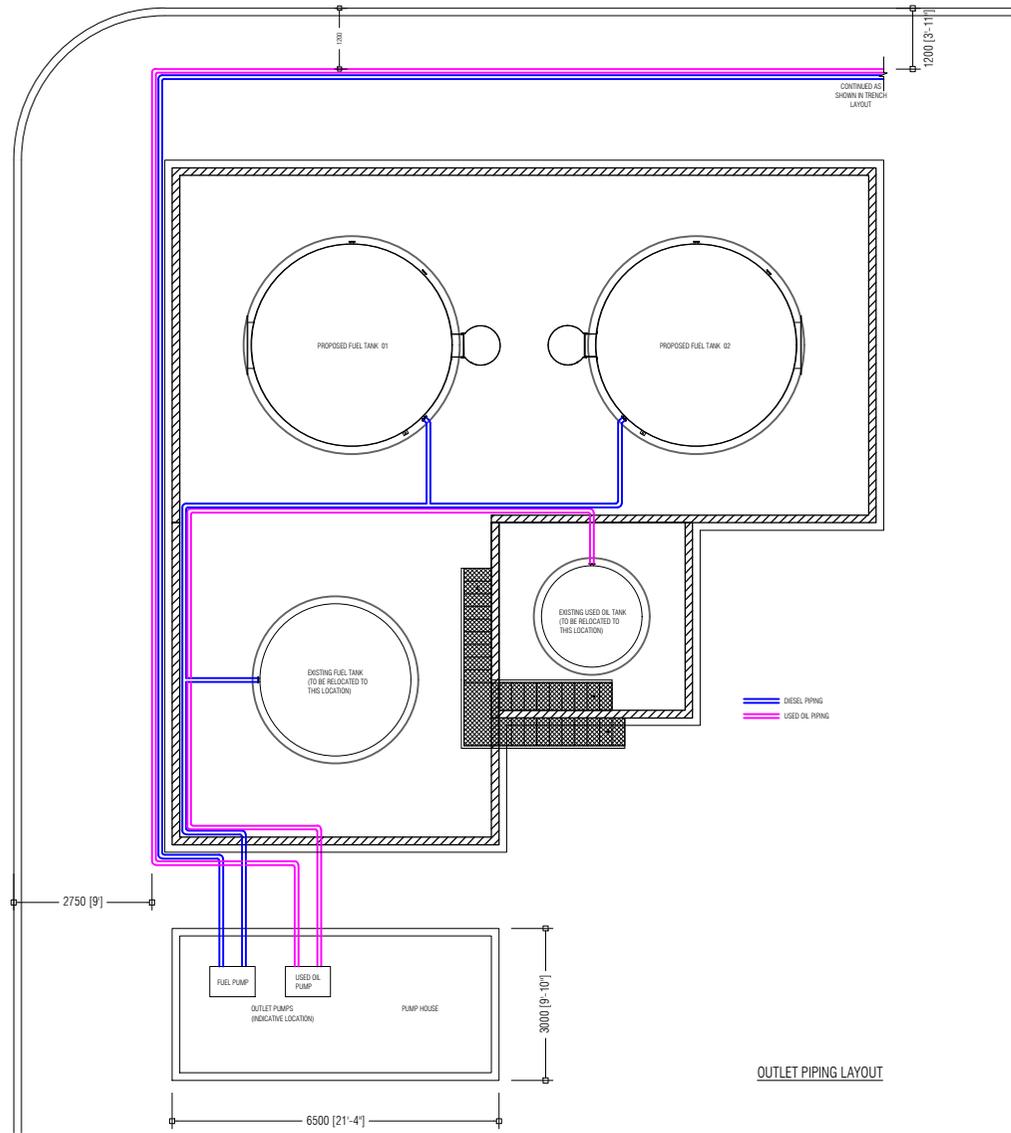


STAIRCASE DETAILS

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 <p>MCEP MINISTRY OF ENVIROMENT GREEN BUILDING, HANDHUVAREE HIGUN, MAAFANNU, MALE' (20392), REPUBLIC OF MALDIVES, TEL: +960-3018431, +960-3018300, FAX: +960-328301</p>	CONSTRUCTION OF NEW FUEL STORAGE TANKS R. VANDHOO	AFRAZ	
	TITLE	STRUCTURE BY	
	STAIRCASE PLAN AND DETAILS	AFRAZ	
	CLIENT DEPARTMENT	DRAWN BY	
	WMPC DEPARTMENT	AFRAZ	
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PAGE NO.	08	DWG NO.	VNDADFUEL S1-08
		DATE	21.04.2020

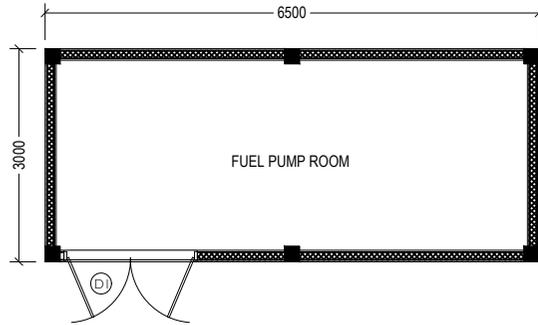


APPROVED BY	PROJECT	DESIGN BY	AMENDMENTS
 <p>MCEP MINISTRY OF ENVIROMENT GREEN BUILDING, HANDHUVAAREE HIGUN, MAAFANNU, MALE (20392), REPUBLIC OF MALDIVES, TEL: +960-3018431, +960-3018300, FAX: +960-328301</p>	CONSTRUCTION OF NEW FUEL STORAGE TANKS R. VANDHOO	AFRAZ	
	TITLE INLET PIPING PLAN	STRUCTURE BY AFRAZ	
	CLIENT DEPARTMENT WMPC DEPARTMENT	DRAWN BY AFRAZ	
	PAPER SIZE A4	SCALE 1:150	
	PAGE NO. 09	DWG NO. VNDADFUEL A1-09	
		DATE 21.04.2020	



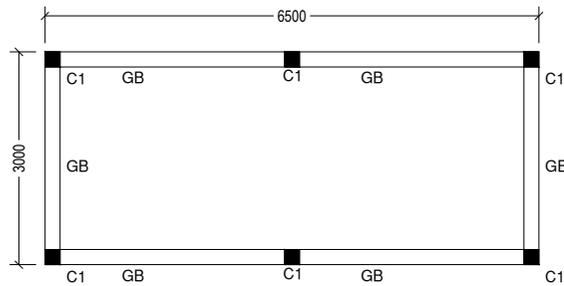
OUTLET PIPING LAYOUT

APPROVED BY	PROJECT	DESIGN BY	AMENDMENTS
 <p>MCEP MINISTRY OF ENVIROMENT GREEN BUILDING, HANDHUVAREE HIGUN, MAAFANNU, MALE (20392), REPUBLIC OF MALDIVES, TEL: +960-3018431, +960-3018300, FAX: +960-328301</p>	CONSTRUCTION OF NEW FUEL STORAGE TANKS R. VANDHOO	AFRAZ	
	<b>TITLE</b> OUTLET PIPING PLAN	<b>STRUCTURE BY</b> AFRAZ	
	<b>CLIENT DEPARTMENT</b> WMPC DEPARTMENT	<b>DRAWN BY</b> AFRAZ	
	<b>PAPER SIZE</b> A4	<b>SCALE</b> 1:150	
	<b>PAGE NO.</b> 10	<b>DWG NO.</b> VNDADFUEL A1-10	
		<b>DATE</b> 21.04.2020	



### GROUND FLOOR PLAN

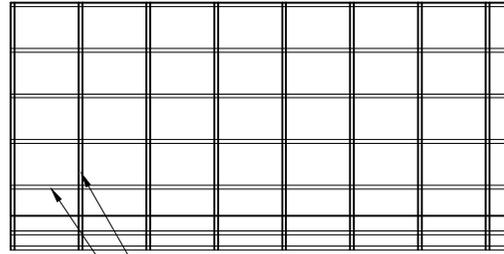
SCALE 1:100



### FOUNDATION PLAN

SCALE 1:100

NOTE:  
 SLAB THICKNESS = 100mm  
 REINFORCEMENT: T10@150 C/C BW

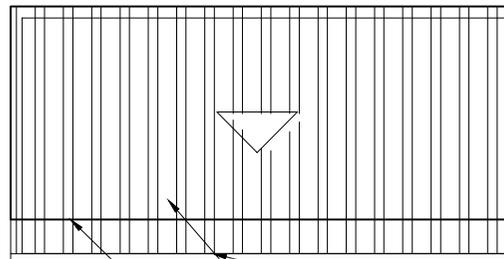


50X150mm TIMBER RAFTERS @ 900C/C

25X35mm TIMBER BATTENS @ 600C/C

### ROOF FRAMING PLAN

SCALE 1:100



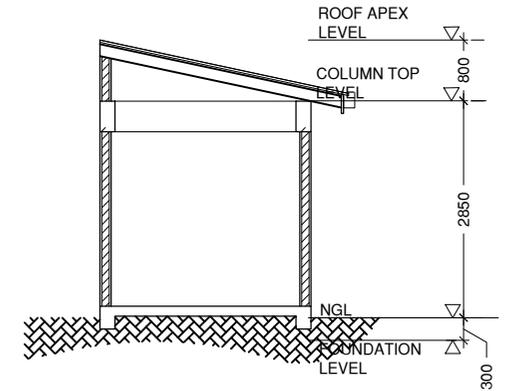
LYSAGHT STANDARD GUTTER

LYSAGHT STANDARD ROOFING SHEETS

BUILDING LINE

### ROOF FRAMING PLAN

SCALE 1:100

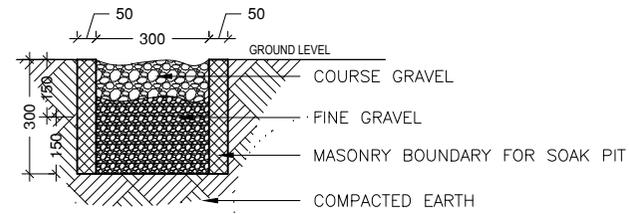
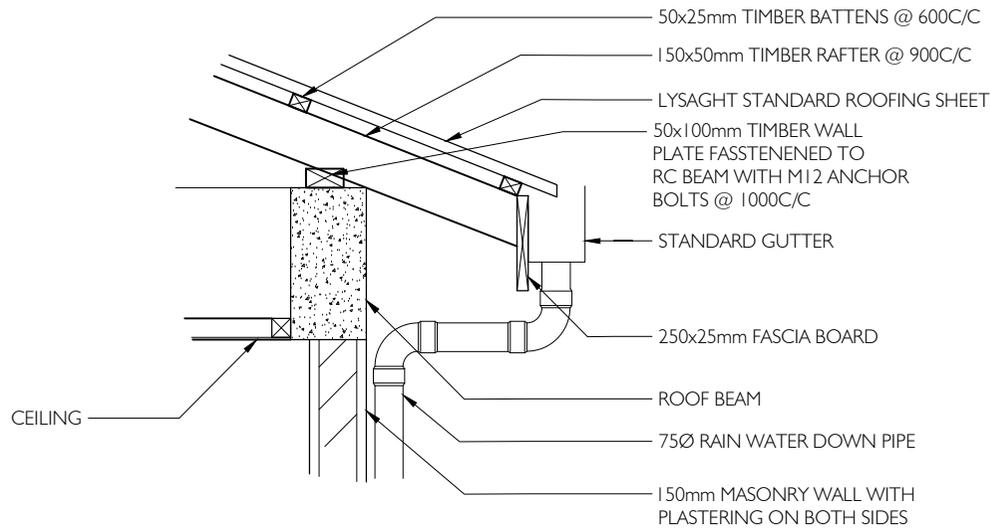


### SECTION X:X

SCALE 1:100

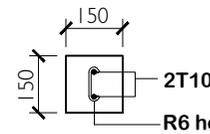


APPROVED BY	PROJECT	DESIGN BY	AMENDMENTS
 <b>MCEP</b> MINISTRY OF ENVIROMENT GREEN BUILDING, HANDHUVAREE HIGUN, MAAFANNU, MALE' (20392), REPUBLIC OF MALDIVES, TEL: +960-3018431, +960-3018300, FAX: +960-328301	CONSTRUCTION OF FUEL PUMP ROOM R. VANDHOO	AFRAZ	
	<b>TITLE</b> PLAN AND SECTION	<b>STRUCTURE BY</b> AFRAZ	
	<b>CLIENT DEPARTMENT</b> WMPC DEPARTMENT	<b>DRAWN BY</b> AFRAZ	
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		<b>DATE</b> 21.04.2020	



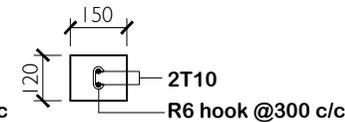
**TYPICAL SOAKPIT DETAIL**

SCALE 1:20



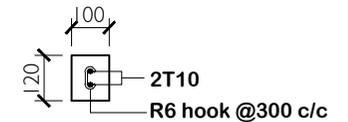
**STIFFENER COLUMN**

SCALE 1:20



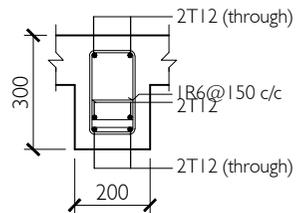
**CAPPING BEAM**

SCALE 1:20

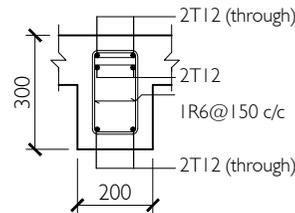


**LINTEL BEAM / SILL**

SCALE 1:20



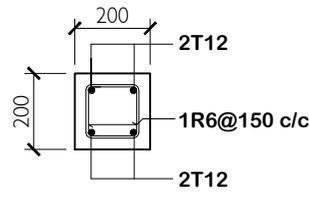
MID - SPAN



SUPPORT

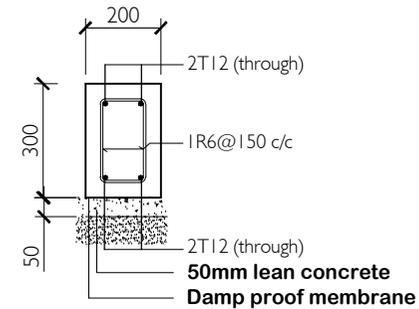
**BEAM 'B1'**

SCALE 1:20



**COLUMN 'C1'**

SCALE 1:20



**TIE BEAM 'GB'**

SCALE 1:20

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PROJECT

CONSTRUCTION OF FUEL PUMP ROOM  
 R. VANDHOO

DESIGN BY

AFRAZ

AMENDMENTS

TITLE

DETAILS

STRUCTURE BY

AFRAZ

CLIENT DEPARTMENT

WMPC DEPARTMENT

DRAWN BY

AFRAZ

PAPER SIZE

A4

SCALE

1:20

PAGE NO.

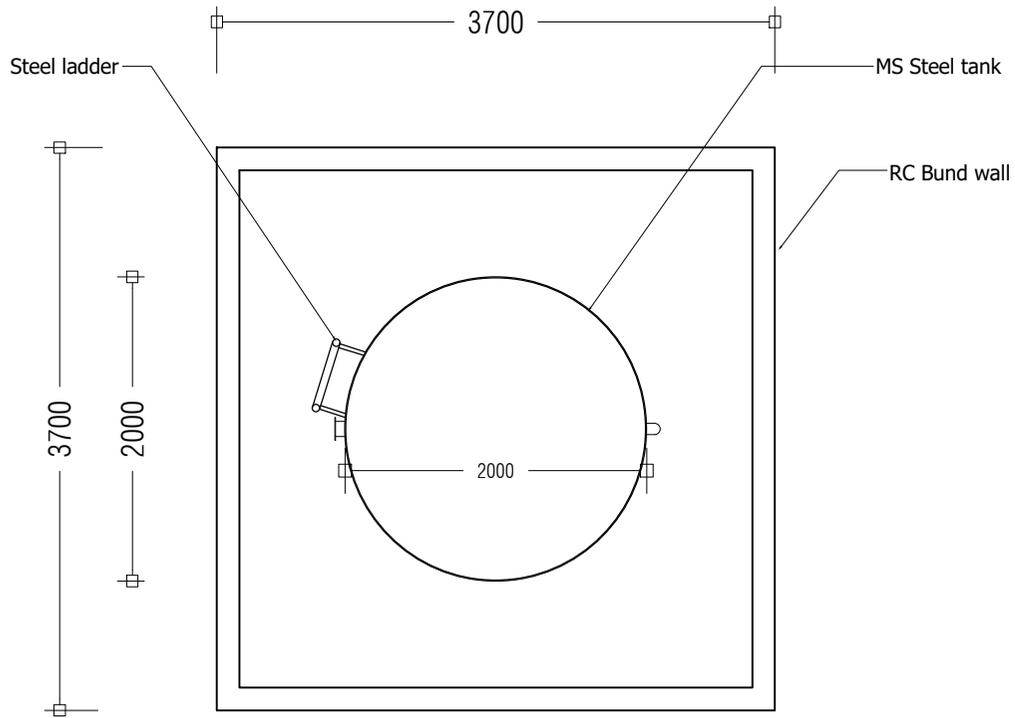
12

DWG NO.

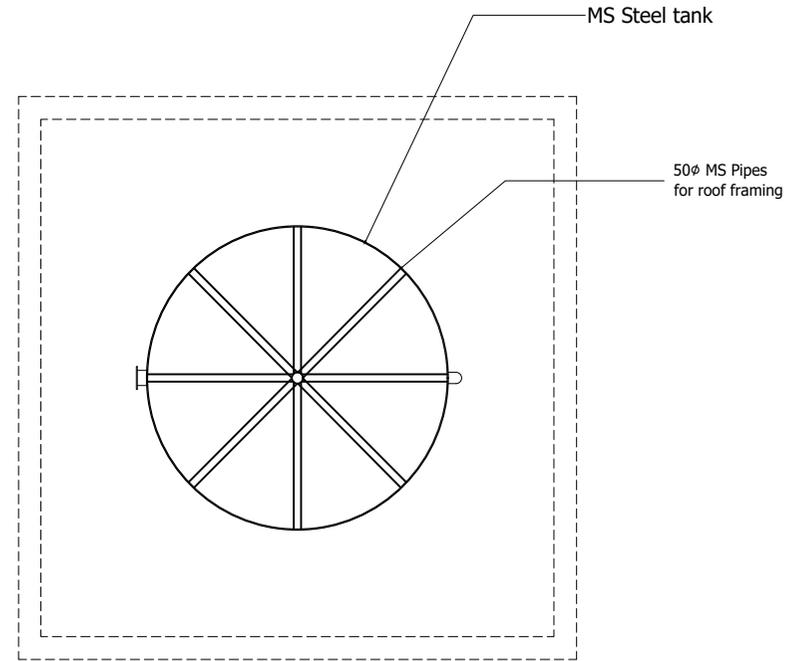
VNDADFUEL S1-10

DATE

21.04.2020



OIL TANK - PLAN



OIL TANK - ROOF FRAMING

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**PROJECT**

EXISTING FUEL TANK 01 - 8000L TANK  
 R. VANDHOO

**DESIGN BY**

AFRAZ

**AMENDMENTS**

**TITLE**

FLOOR PLAN

**STRUCTURE BY**

AFRAZ

**CLIENT DEPARTMENT**

WMPC DEPARTMENT

**DRAWN BY**

AFRAZ

**PAPER SIZE**

A4

**SCALE**

1:50

**PAGE NO.**

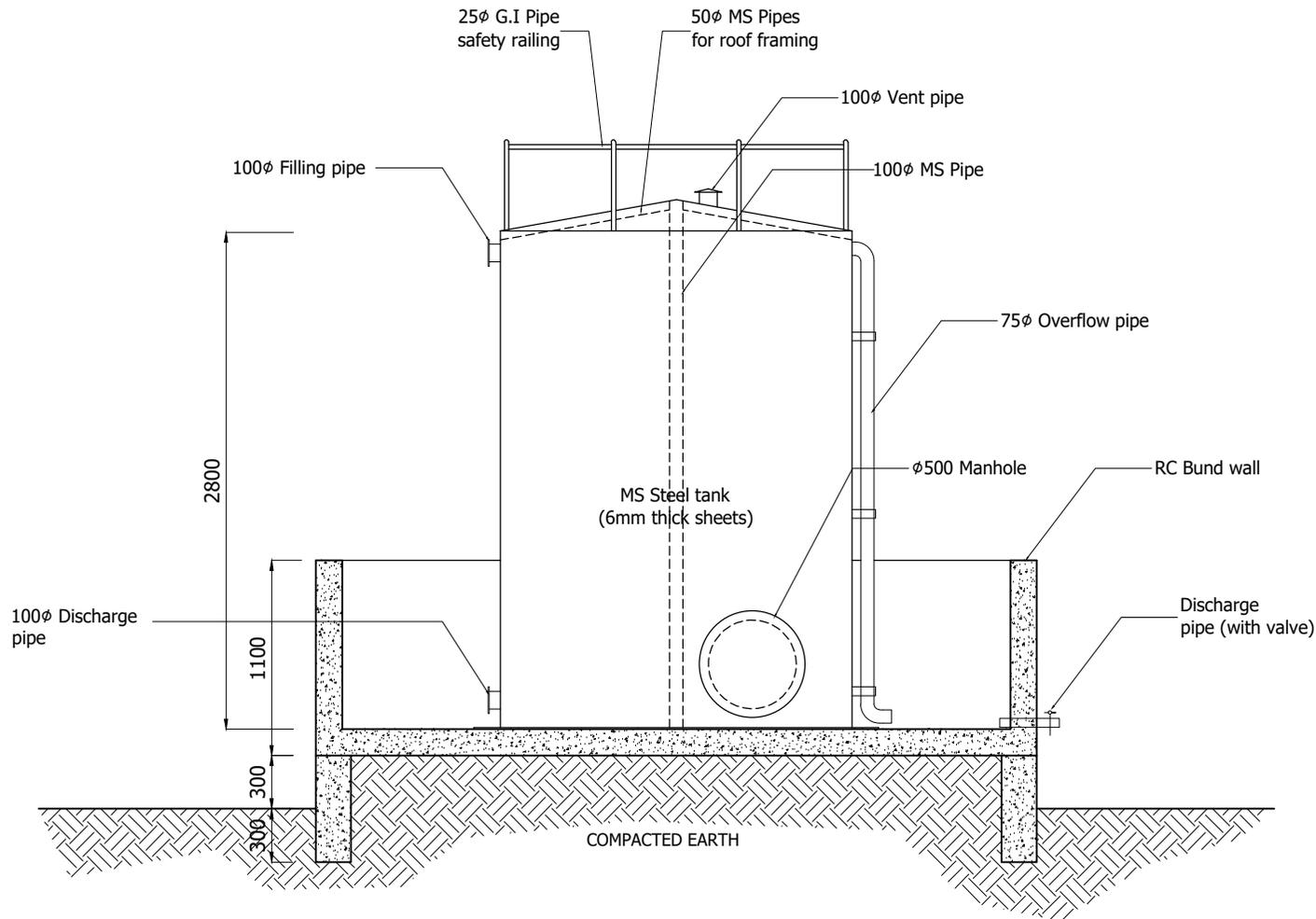
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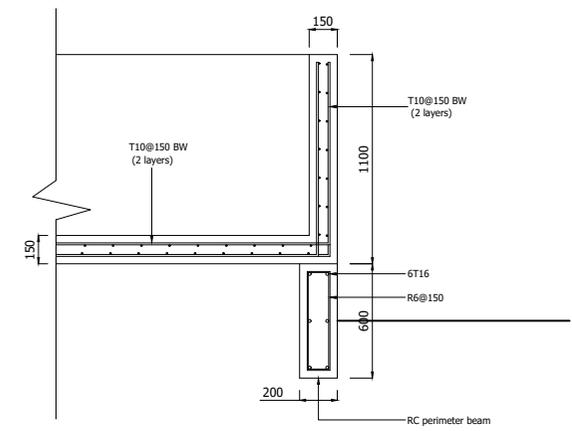
VNDADFUEL A1-13

**DATE**

21.04.2020

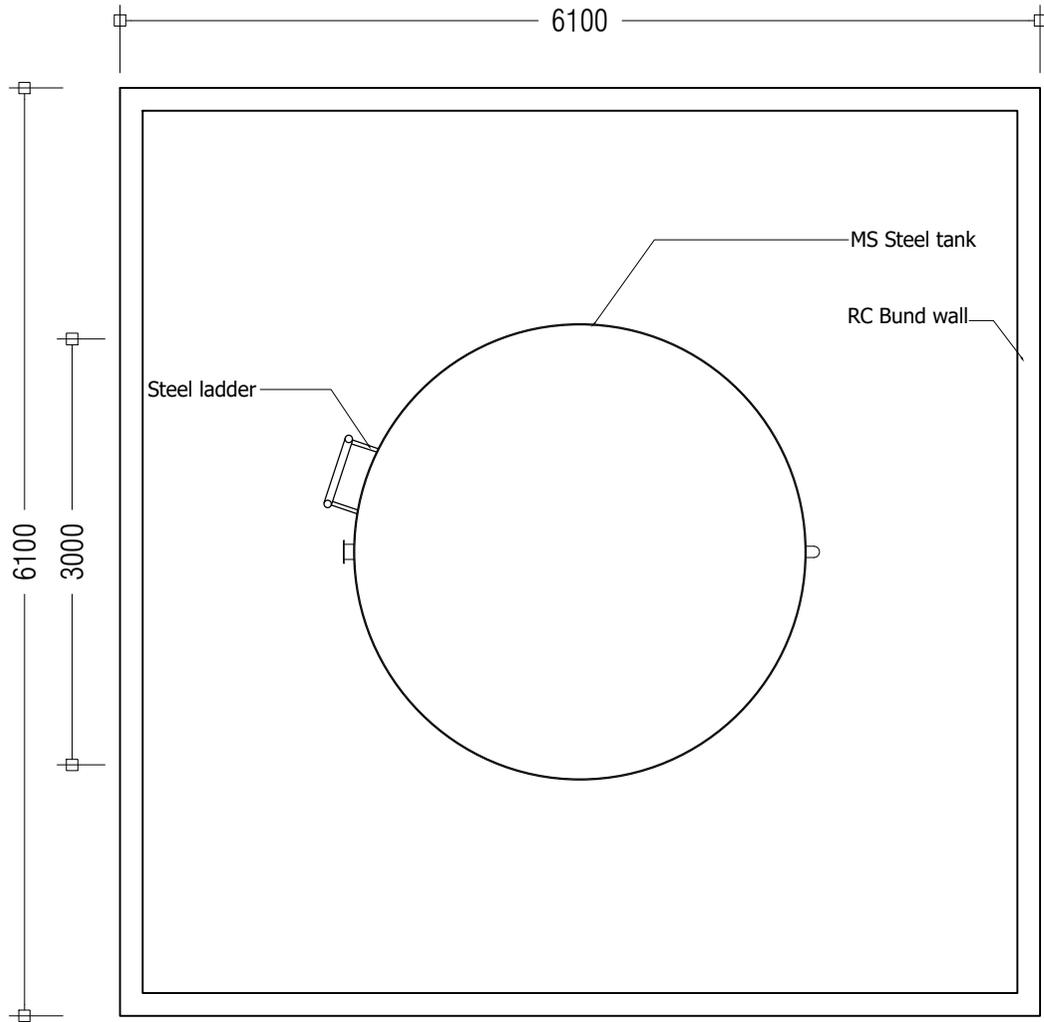


OIL TANK - SECTIONAL ELEVATION

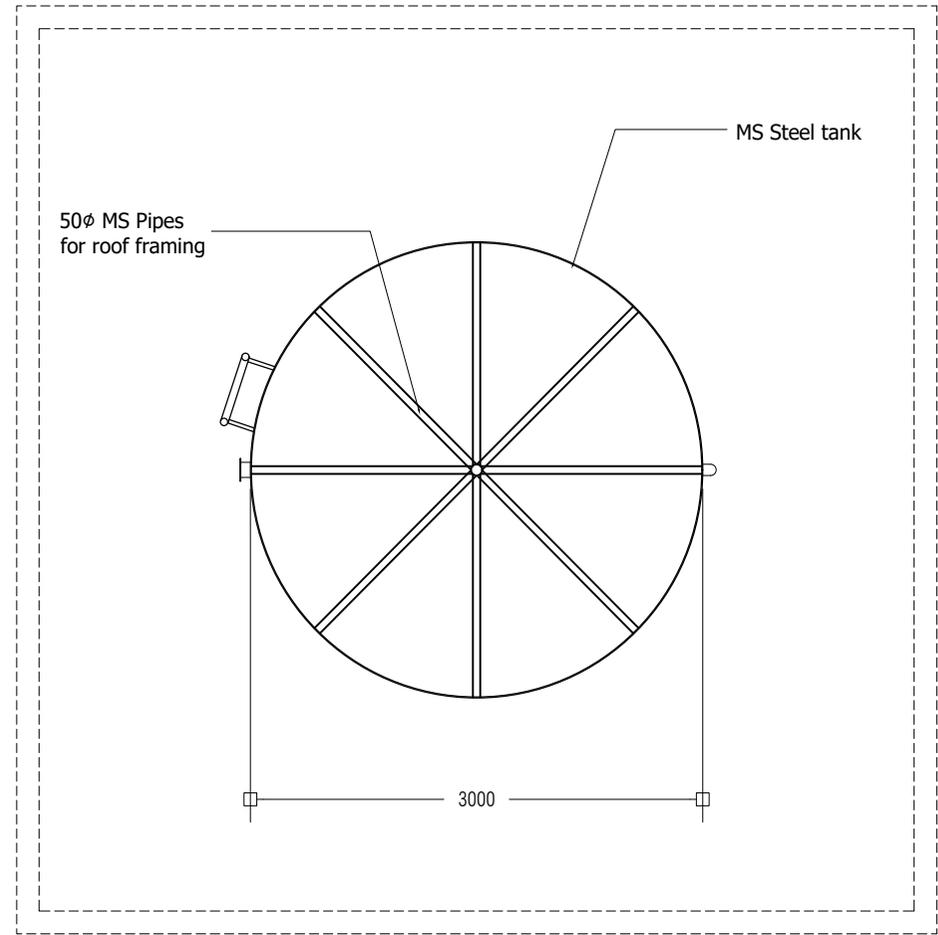


BUND WALL DETAIL

APPROVED BY	PROJECT	DESIGN BY	AMENDMENTS
 <p>MCEP            MINISTRY OF ENVIROMENT            GREEN BUILDING, HANDHUVAREE HIGUN,            MAAFANNU, MALE' (20392), REPUBLIC OF MALDIVES,            TEL: +960-3018431, +960-3018300, FAX: +960-328301</p>	EXISTING FUEL TANK 01 - 8000L TANK R. VANDHOO	AFRAZ	
	TITLE SECTION, DETAIL	STRUCTURE BY AFRAZ	
	CLIENT DEPARTMENT WMPC DEPARTMENT	DRAWN BY AFRAZ	
	PAPER SIZE A4	SCALE 1:40	
	PAGE NO. 14	DWG NO. VNDADFUEL A1-14	
		DATE 21.04.2020	

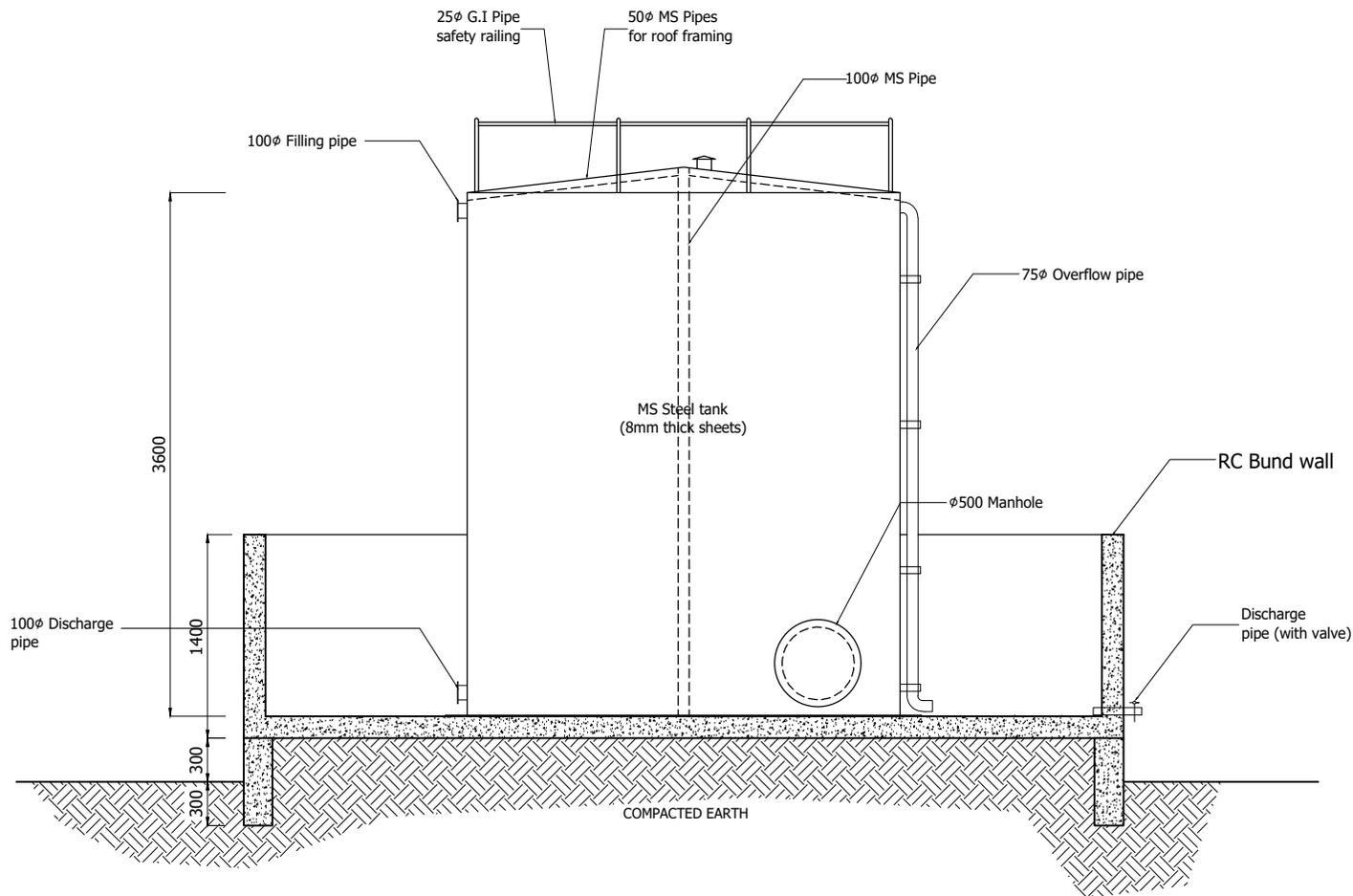


OIL TANK - PLAN

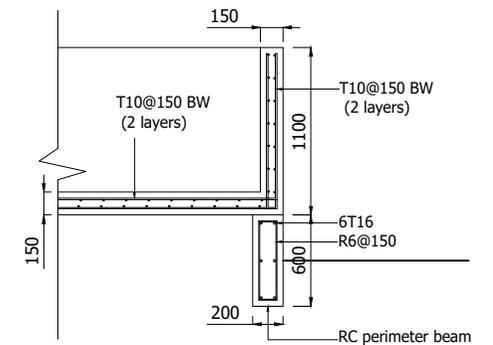


OIL TANK - ROOF FRAMING

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	<b>TITLE</b> FLOOR PLAN	<b>STRUCTURE BY</b> AFRAZ	
	<b>CLIENT DEPARTMENT</b> WMPC DEPARTMENT	<b>DRAWN BY</b> AFRAZ	
	<b>PAPER SIZE</b> A4	<b>SCALE</b> 1:50	
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		<b>DATE</b> 21.04.2020	

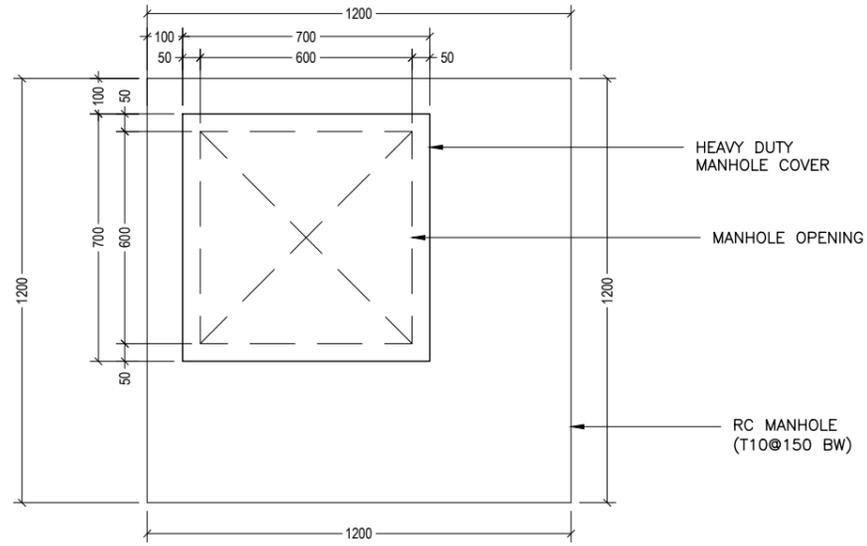


**OIL TANK - SECTIONAL ELEVATION**

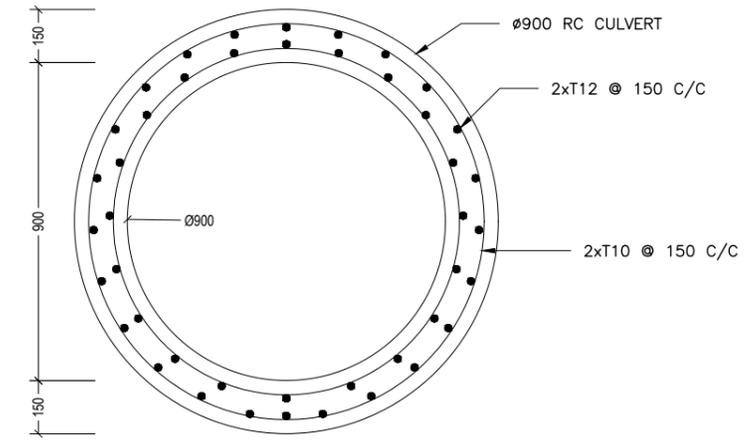


**BUND WALL DETAIL**

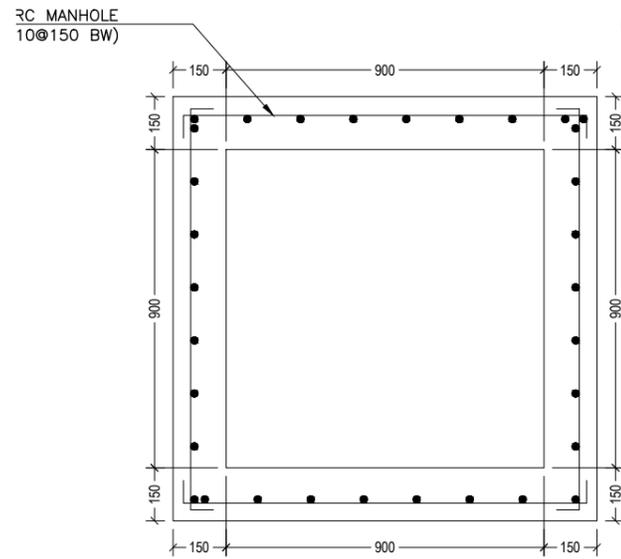
APPROVED BY	PROJECT	DESIGN BY	AMENDMENTS
 <p>MCEP MINISTRY OF ENVIROMENT GREEN BUILDING, HANDHUVAREE HIGUN, MAAFANNU, MALE (20392), REPUBLIC OF MALDIVES, TEL: +960-3018431, +960-3018300, FAX: +960-328301</p>	EXISTING FUEL TANK 02 - 24,000L TANK R. VANDHOO	AFRAZ	
	<b>TITLE</b> SECTION, DETAILS	<b>STRUCTURE BY</b> AFRAZ	
	<b>CLIENT DEPARTMENT</b> WMPC DEPARTMENT	<b>DRAWN BY</b> AFRAZ	
	<b>PAPER SIZE</b> A4	<b>SCALE</b> 1:50	
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		<b>DATE</b> 21.04.2020	



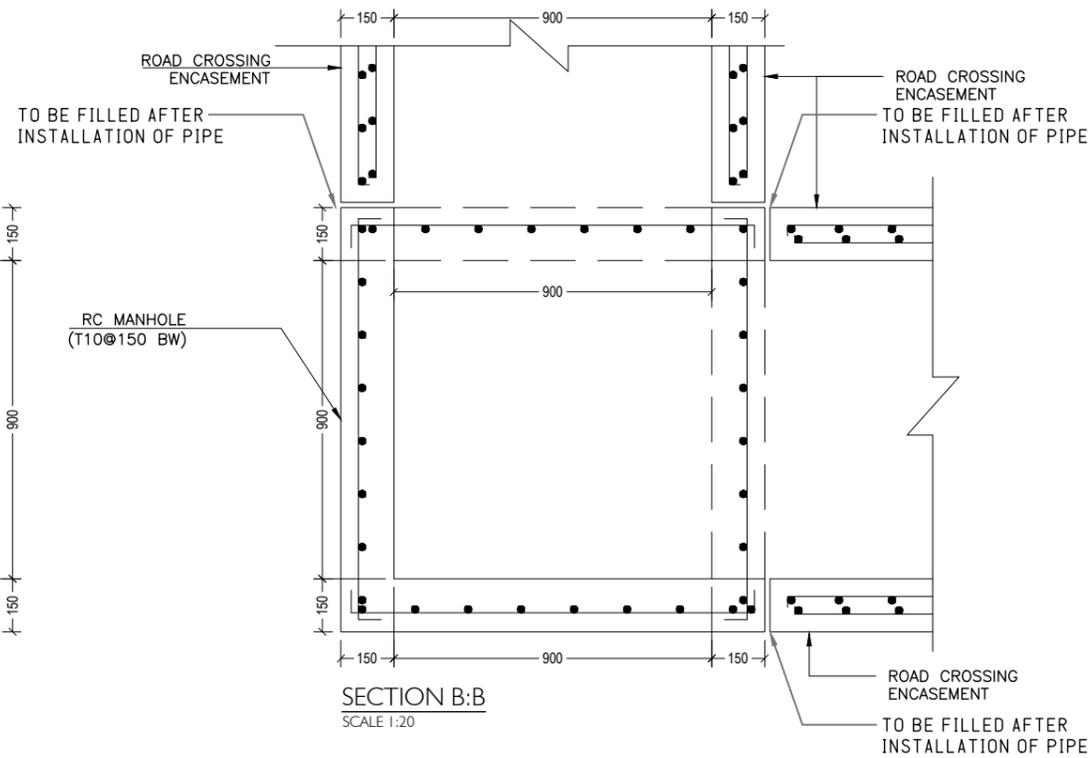
UTILITY MANHOLE - PLAN  
SCALE 1:20



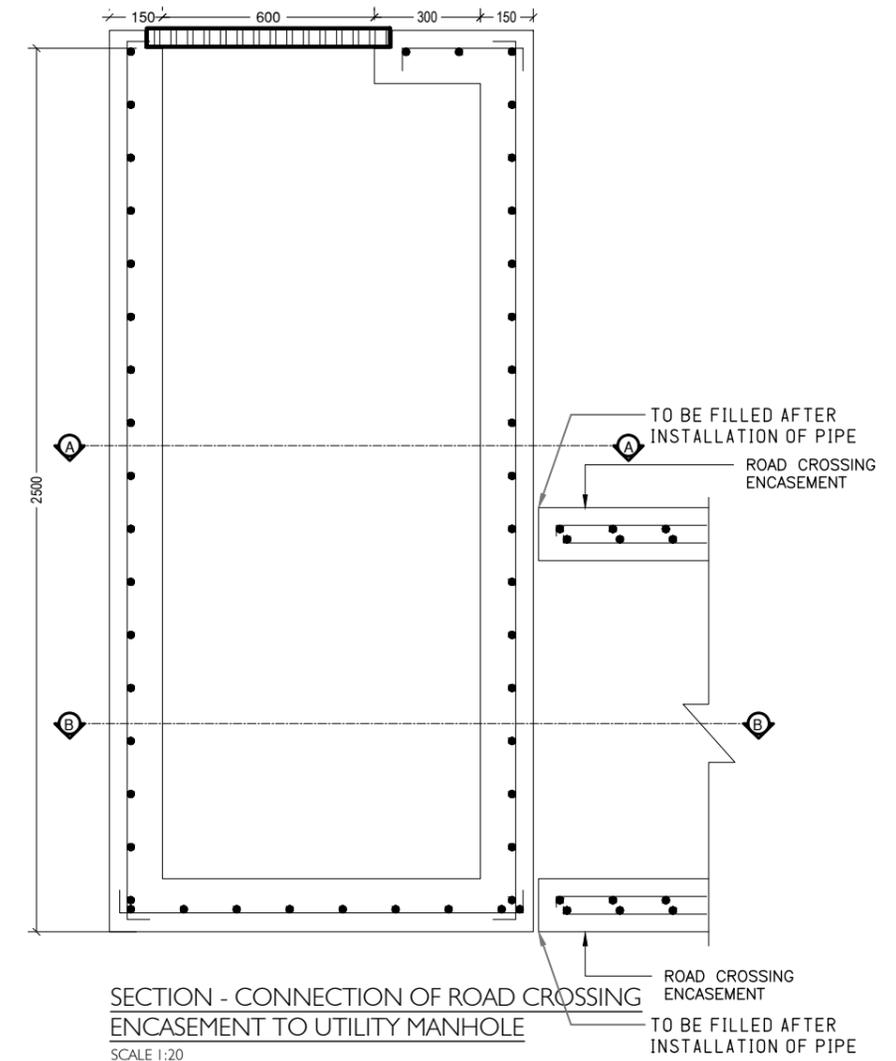
ROAD CROSSING ENCASEMENT (2m LONG)  
SCALE 1:20



SECTION A:A  
SCALE 1:20



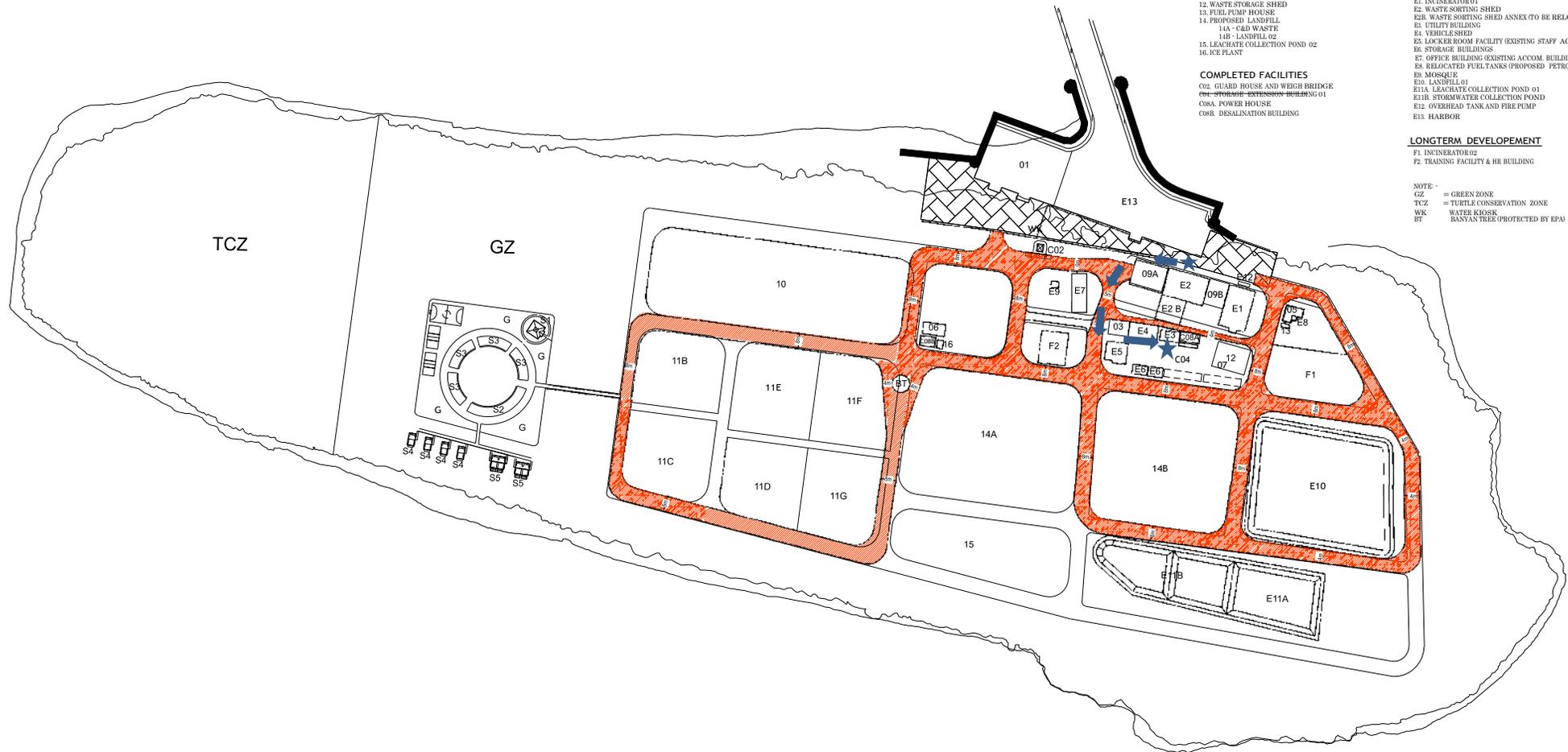
SECTION B:B  
SCALE 1:20



SECTION - CONNECTION OF ROAD CROSSING ENCASEMENT TO UTILITY MANHOLE  
SCALE 1:20

PROJECT : <b>R. VANDHOO</b> <b>PROJECT: SOLID WASTE MANAGEMENT FACILITY</b> CLIENT : MINISTRY OF ENVIRONMENT AND ENERGY CONSULTANT : <b>HUSSAIN SHAHEED</b>	DRAWN BY : ARIF CHECKED BY : HUSSAIN SHAHEED TITLE : AS GIVEN SCALE : AS GIVEN      DATE: 19.01.2019	DWG NO: VAN-TD-13-G-1.04-R0 REV. NO: R0-190119/01 REV. NOTES - - - - -	APPROVED BY:   APPROVED DATE:	
	PG NO.			

# Draft temporary fuel storage forklift movement route



- PROPOSED FACILITIES**
- 01. HARBOUR EXTENSION
  - 03. VEHICLE SHED EXTENSION BUILDING (ONGOING)
  - 05. FUEL STORAGE TANKS
  - 06. WATER STORAGE TANKS
  - 07. STORAGE EXTENSION BUILDING 02
  - 09A09B. WASTE SORTING SHED EXTENSION (ONGOING)
  - 10. BOAT BUILDING YARD
  - 11. WASTE MANAGEMENT FACILITIES
    - 11A - RESERVED FOR FUTURE USE
    - 11B - RECYCLABLES
    - 11C - RECYCLING WITH COMPACTION AND BALING PLANT
    - 11D - E-WASTE
    - 11E - BULK WASTE
    - 11F - COMPOST PACKAGING AND STORAGE
    - 11G - HAZARDOUS WASTE
  - 12. WASTE STORAGE SHED
  - 13. FUEL PUMP HOUSE
  - 14. PROPOSED LANDFILL
    - 14A - C&D WASTE
    - 14B - LANDFILL 02
  - 15. LEACHATE COLLECTION POND 02
  - 16. ICE PLANT
- COMPLETED FACILITIES**
- 002. GUARD HOUSE AND WEIGH BRIDGE
  - 004. STORAGE - EXTENSION BUILDING 01
  - 008A. POWER HOUSE
  - 008B. DESALINATION BUILDING

- PROPOSED STAFF VILLAGE**
- S1. MOSQUE
  - S2. STAFF FACILITIES BUILDING
    - STAFF KITCHEN
    - CAFETERIA
    - LAUNDRY
    - RECREATION
    - GYM
  - S3. STAFF ACCOMMODATION X4
  - S4. GUEST ACCOMMODATION X4
  - S5. CONSULTANTS ACCOMMODATION X2
  - G. GREEN AREAS

- EXISTING FACILITIES**
- E1. INCINERATOR 01
  - E2. WASTE SORTING SHED
  - E2B. WASTE SORTING SHED ANNEX (TO BE RELOCATED)
  - E3. UTILITY BUILDING
  - E4. VEHICLE SHED
  - E5. LOCKER ROOM FACILITY (EXISTING STAFF ACCOM.)
  - E6. STORAGE BUILDINGS
  - E7. OFFICE BUILDING (EXISTING ACCOM. BUILDING)
  - E8. RELOCATED FUEL TANKS (PROPOSED PETROL TANK)
  - E9. MOSQUE
  - E10. LANDFILL 01
  - E11A. LEACHATE COLLECTION POND 01
  - E11B. STORMWATER COLLECTION POND
  - E12. OVERHEAD TANK AND FIRE PUMP
  - E13. HARBOR

- LONGTERM DEVELOPMENT**
- F1. INCINERATOR 02
  - F2. TRAINING FACILITY & HR BUILDING
- NOTE**
- GZ = GREEN ZONE
  - TCZ = TURTLE CONSERVATION ZONE
  - WK = WATER KIOSK
  - BT = BANYAN TREE (PROTECTED BY EPA)

PREPARED BY	PROJECT	DESIGN BY	AMENDMENTS
 <b>MCEP</b> MINISTRY OF ENVIROMENT GREEN BUILDING, HANDBUVAREE HIGUN, MAAFANNU, MALÉ (20392), REPUBLIC OF MALDIVES, TEL: +960-3018431, +960-3018300, FAX: +960-328301	REGIONAL WASTE MANAGEMENT FACILITY R.VANDHOO		REVISED AS PER EPA DECISION STATEMENT
	<b>TITLE</b> MASTER PLAN – PROPOSED TRAFFIC MANAGEMENT PLAN v.02	<b>STRUCTURE BY</b>	PROPOSED LOCATION OF BOAT BUILDING YARD ADDED PROPOSED LOCATION OF ICE PLANT ADDED
<b>CLIENT DEPARTMENT</b> WMPC DEPARTMENT	<b>DRAWN BY</b> AFRAZ	FUEL TANKS RELOCATED COMPLETED BUILDINGS (OF PROPOSED BUILDINGS) LABELED SEPARATELY	
<b>PAPER SIZE</b> <b>PAGE NO.</b>	A4 01	<b>SCALE</b> <b>DWG NO.</b> <b>DATE</b>	1:4500 VANDMP-R-A1-01(R4) 10.04.2021

**Appendix 5 Vegetation clearance guideline provided by PMU**

# Upgrading of Infrastructure at Raa Vandhoo RWMF

## Vegetation Clearance Details

### 1. Type of Vegetation

Type of Vegetation	Method
Coconut Palms	- Relocation of palms below 20-30ft - Palms above 20-30ft shall be removed for timber
Mature Trees	- Removal for timber

### 2. Demarcation of Boundary

Only the vegetation that falls in the footprint of the infrastructure and roads shall be removed. Vegetation falling outside the boundary shall not be removed in any circumstance.

### 3. Relocation of Palms

Coconut palms below 20-30ft in length shall be carefully removed, with minimal root disturbances and replanted in Vandhoo or at a nearby islands. The root ball shall be burlapped and the leaves should be tied in a bundle, and then transported and stacked at the harbor area, where it will be transported out of the island in landing crafts.

Further information on method for relocation is provided below.

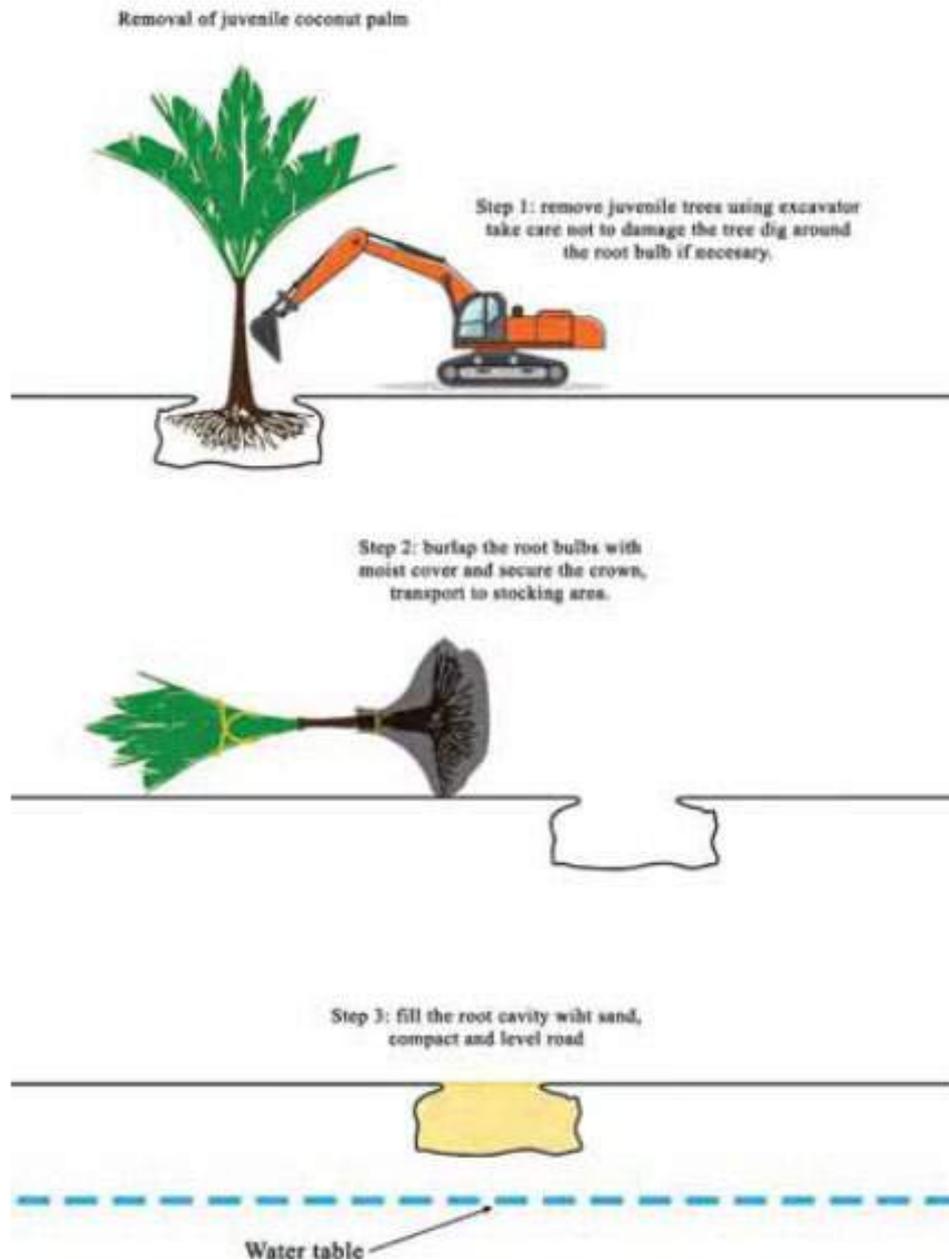
#### Trees for relocation

Trees identified for re-location shall be removed with extreme care as palms are not very tolerant of extreme root disturbances. According to literature, for palms less than fifteen feet in height, a root ball of shovel-width radius from the trunk is a common industry average for size of root ball that needs to be carefully extracted. This would provide for adequate root survival chance once the tree is replanted elsewhere (Broschat & Meerow, 1997).

Soils that cling to the root ball are the most amenable to mechanized harvest. Prior to digging, the soil around the root system will be thoroughly wetted to help keep the root ball together. Palms grown on sandy soils will usually need to have their root balls burlapped after digging, while palms grown on soils with greater structural integrity may not require burlapping. Excess sand shall be removed prior to burlapping. However, since trees will be stacked for some time before being transported to replanting site, it is recommended to burlap all palm trees removed for relocation. A supporting splint will be required to tie each trunk and this will extend up to the foliage to protect the bud.

The greatest loss of water in newly dug palms occurs from transpiration through the leaves. To minimize this, one half or more of the older leaves will be removed at the time of digging. The remaining leaves will be tied together in a bundle around the bud with a twine.

Once the palm tree is carefully extracted it will be transported and stacked at the harbour area, where it will be transported out of the island by concerned parties. The root ball cavity will be filled and levelled. Sand shall be used as a fill material for the root cavities before levelling. (See Figure 8 for an illustration of uprooting method)



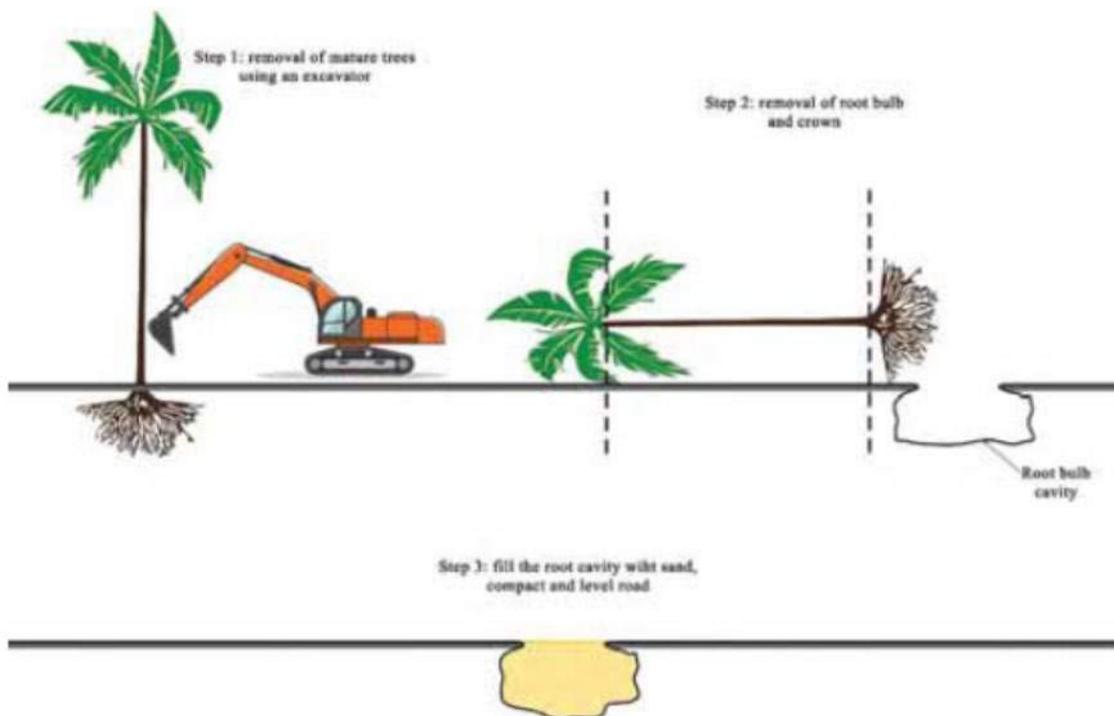
*Figure 8: Illustration of uprooting palm trees for re-plantation*

#### 4. Felling of palms and Mature Trees

Coconut palms above 20-30ft in length and mature trees found at the site shall be felled and stocked in Vandhoo to be sold as timber or firewood. The branches and root bulbs should be cut using a chainsaw and the trunks stockpiled for selling or used for construction purpose. Branches shall be cut to a manageable size while leaves should be left for sun drying. Root bulbs can be used for backfilling during construction.

##### Trees for timber

All fronds and root bulb and base of the trunk of the tree that is felled for timber or firewood shall be cut using a chainsaw and only trunk will be transported to the stockpiling area to be sold. Parts of the root bulb will be used for backfilling of the depression created (See Figure 9 for illustration of removal method). The use of root bulbs for backfilling or grinding the stump of the root bulb will minimise waste generated during site clearance, maintain original soil conditions as well as minimise additional sand needed for filling. All fronds and nuts will be removed from the terminal bulb and piled up separately. Nuts will be sold and fronds will be left to dry and eventually burned. All residual waste shall be disposed of as described in Section 2.3.16.



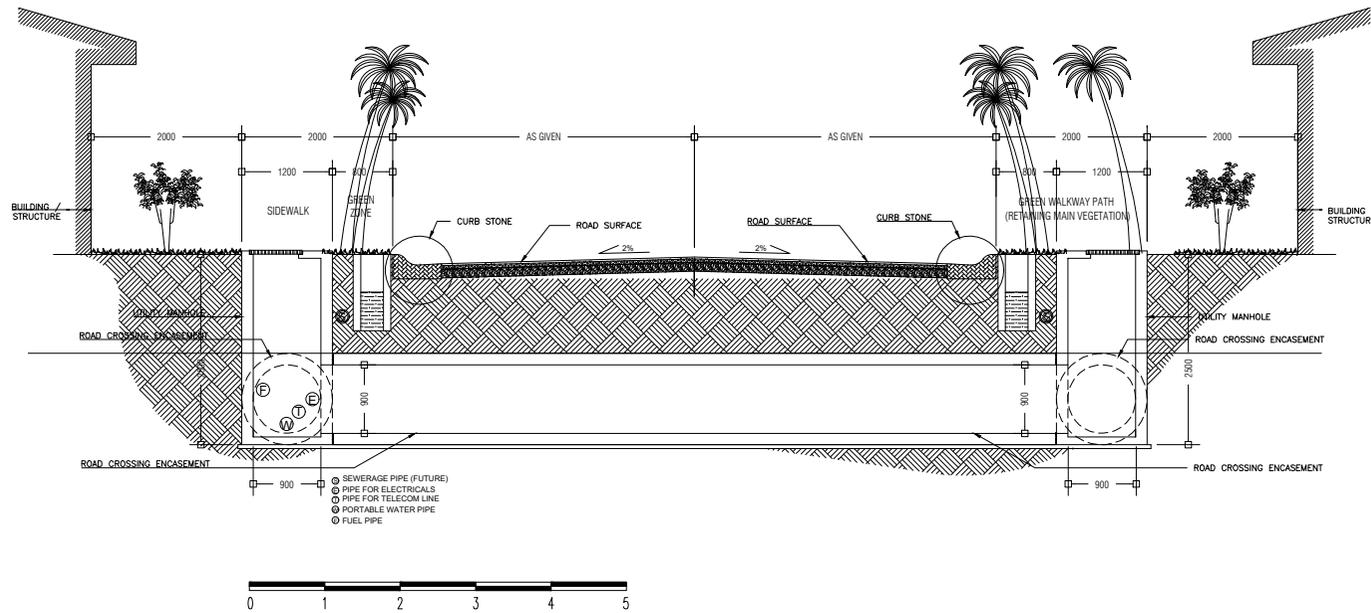
*Figure 9: Illustration of removal of trees for timber*

#### 5. 2:1 Replantation

For every vegetation removed two new trees/plams must be replanted. Non-ornamental trees shall be used for this purpose.



**Appendix 6 Typical road section drawing**



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 <p>MCEP MINISTRY OF ENVIRONMENT, CLIMATE CHANGE AND TECHNOLOGY GREEN BUILDING, HANDHUVAAREE HIGUN, MAAFANNU, MALE (20392), REPUBLIC OF MALDIVES, TEL: +960-3018431, +960-3018300, FAX: +960-328301</p>	REGIONAL WASTE MANAGEMENT FACILITY R.VANDHOO	MARTYN	REVISED AS PER EPA DECISION STATEMENT
	TITLE	STRUCTURE BY	
	CLIENT DEPARTMENT	DRAWN BY	
	PAPER SIZE	SCALE	
	PAGE NO.	DWG NO.	
		DATE	

**Appendix 7 Traffic Management Plan and layout formulated  
by PMU**

## Traffic Management Plan Narrative

Date: 25<sup>th</sup> May 2021

Author: Martyn Jones International Operations Consultant

### **Purpose:**

Purpose of this document is to provide a narrative to be used in conjunction with the Traffic Management Plan Layout (TMPL). The TMPL defines the safe areas for movement of vehicles, equipment and pedestrians in and around Vandhoo Waste Management Facility.

#### **1. Visitor Procedures:**

On arrival all visitors must report to the security building at the entrance/exit area **designated??** At the security buildings all visitors will be required to sign the visitors log stating:

- a. Name
- b. Company/Organisation
- c. Purpose of visit
- d. Whom they are visiting
- e. Date
- f. Time of arrival

All visitors must be wearing appropriate hi-visibility vests or will be provided with one from the security building that must be returned on exit.

No visitors will be allowed beyond this point until they are being escorted by an employee of the facility. Visitors will be taken to the waiting room where they will receive a safety briefing and then collected by a relevant party.

Where a visitor is required to tour the facility, they will not do so unescorted and will only be taken to authorised areas as deemed necessary by the facility Manager. All pedestrians must cross roads at the designated crossing points.

#### **2. Speed Limits:**

Facility speed limits are 10 MPH on all roads and must be adhered to except when traversing the weighbridge where the speed limit is reduced to 5 MPH. All drivers and operators must adhere to the speed limits. Speed limit signs will be posted around the facility.

#### **3. Direction of Traffic:**

All drivers and operators must adhere to the direction of traffic as indicated on the TMPL and by the directional signs as posted on roads around the facility. Not all roads will be 2-way traffic and some roads will be 1 way only as indicated.

#### **4. Waste Deliveries:**

Prior to the offloading of wastes the Vessel Captain will report to the security building and provide:

- a. Vessel Details
- b. Required paperwork pertaining to the waste including origin, waste type, delivery format i.e., loose or contained.

The above information will assist the staff in ensuring the correct equipment is provided to offload the Vessel. Once information is received then wastes will be offloaded and weighed across the weighbridge:

Vehicles will deliver and dispose of their loads as indicated to them by the security building i.e., wastes required into the Waste Storage Area will be directed to building 09A as indicated on the TMPL and at all times using the required route as in indicated.

**NOTE** for ease of operations the tare weight of all onsite vehicles and equipment will be taken and registered into the weighbridge system, this means that whilst offloading the vehicle and/or equipment does not have to weigh themselves again when empty every time they exit to collect another load.

### **1. Supply Deliveries:**

The same process as laid out in section 4 for all supplies being delivered to the facility.

### **1. Fuel Deliveries:**

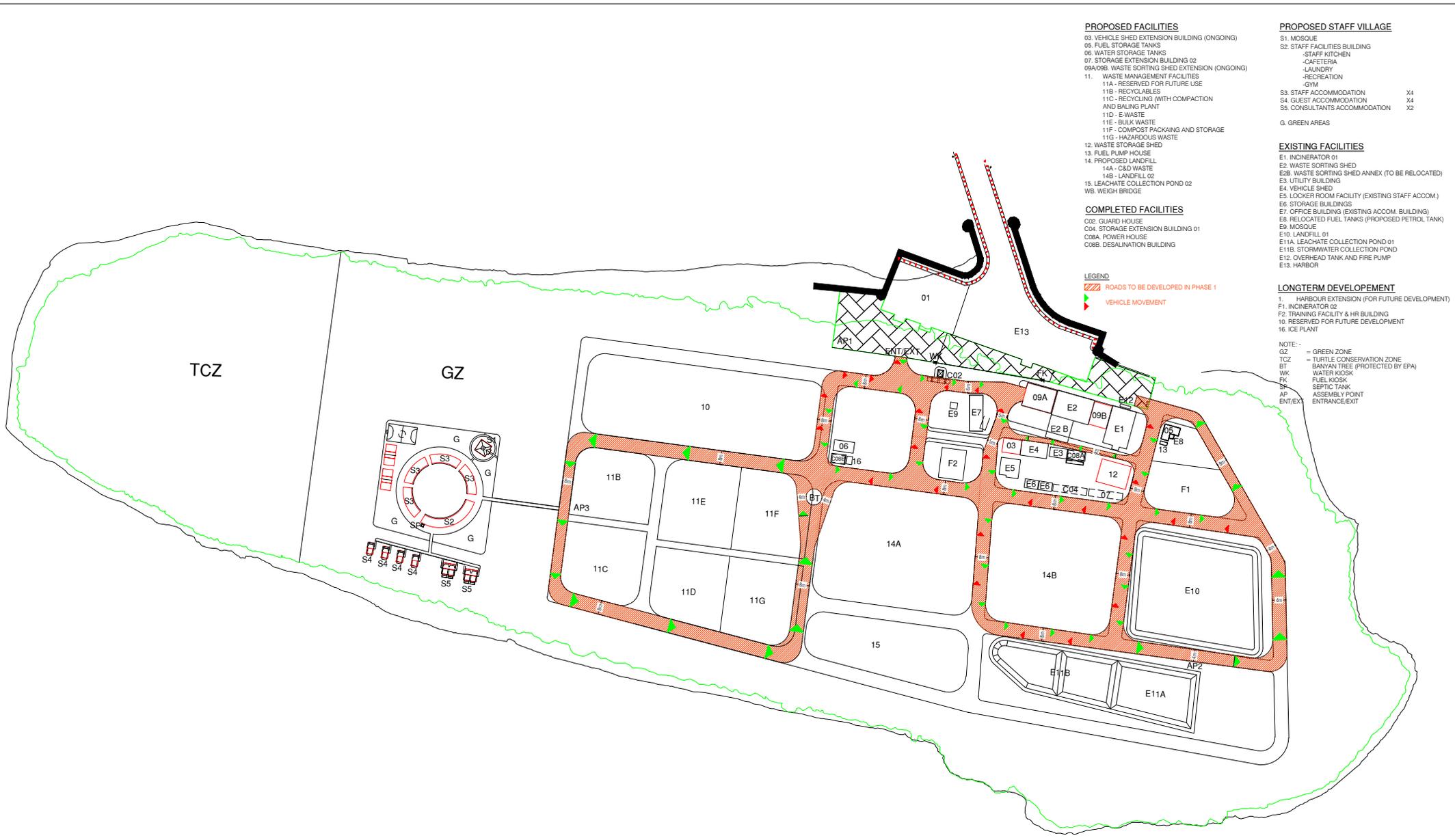
Fuel Vessel Captain should report his arrival to the security office. Vessel should be moored in the harbour area adjacent to the fuel delivery point **designated??**. All care should be taken whilst transferring fuel from the Vessel through the fuel delivery point to the fuel farm.

### **2. Movement Around the Facility:**

All vehicles and equipment should follow speed limits and directions at all times when moving around the facility. Road signs indication direction and speed limit will be regularly posted and on all junctions within the facility. All employees should familiarise themselves with the TMPL and this should be prominently displayed on all notice boards around the facility. At all times when walking around the facility pedestrians should be aware of the direction of traffic and use the designated crossing points.

### **3. Emergency Assembly Points:**

For the benefit of everyone's safety Emergency Assembly Points will also be included on the TMPL.



- PROPOSED FACILITIES**
- 03. VEHICLE SHED EXTENSION BUILDING (ONGOING)
  - 05. FUEL STORAGE TANKS
  - 06. WATER STORAGE TANKS
  - 07. STORAGE EXTENSION BUILDING 02
  - 09A/09B. WASTE SORTING SHED EXTENSION (ONGOING)
  - 11. WASTE MANAGEMENT FACILITIES
    - 11A - RESERVED FOR FUTURE USE
    - 11B - RECYCLABLES
    - 11C - RECYCLING (WITH COMPACTION AND BALING PLANT)
    - 11D - E-WASTE
    - 11E - BULK WASTE
    - 11F - COMPOST PACKAGING AND STORAGE
    - 11G - HAZARDOUS WASTE
  - 12. WASTE STORAGE SHED
  - 13. FUEL PUMP HOUSE
  - 14. PROPOSED LANDFILL
    - 14A - C&D WASTE
    - 14B - LANDFILL 02
  - 15. LEACHATE COLLECTION POND 02
  - WB. WEIGH BRIDGE
- COMPLETED FACILITIES**
- C02. GUARD HOUSE
  - 004. STORAGE EXTENSION BUILDING 01
  - C08A. POWER HOUSE
  - C08B. DESALINATION BUILDING

- PROPOSED STAFF VILLAGE**
- S1. MOSQUE
  - S2. STAFF FACILITIES BUILDING
    - STAFF KITCHEN
    - CAFETERIA
    - LAUNDRY
    - RECREATION
    - GYM
  - S3. STAFF ACCOMMODATION X4
  - S4. GUEST ACCOMMODATION X4
  - S5. CONSULTANTS ACCOMMODATION X2
- G. GREEN AREAS
- EXISTING FACILITIES**
- E1. INCINERATOR 01
  - E2. WASTE SORTING SHED
  - E2B. WASTE SORTING SHED ANNEX (TO BE RELOCATED)
  - E3. UTILITY BUILDING
  - E4. VEHICLE SHED
  - E5. LOCKER ROOM FACILITY (EXISTING STAFF ACCOM.)
  - E6. STORAGE BUILDINGS
  - E7. OFFICE BUILDING (EXISTING ACCOM. BUILDING)
  - E8. RELOCATED FUEL TANKS (PROPOSED PETROL TANK)
  - E9. MOSQUE
  - E10. LANDFILL 01
  - E11A. LEACHATE COLLECTION POND 01
  - E11B. STORMWATER COLLECTION POND
  - E12. OVERHEAD TANK AND FIRE PUMP
  - E13. HARBOR
- LONGTERM DEVELOPMENT**
- F1. HARBOUR EXTENSION (FOR FUTURE DEVELOPMENT)
  - F1. INCINERATOR 02
  - F2. TRAINING FACILITY & HR BUILDING
  - 10. RESERVED FOR FUTURE DEVELOPMENT
  - 16. ICE PLANT

**LEGEND**

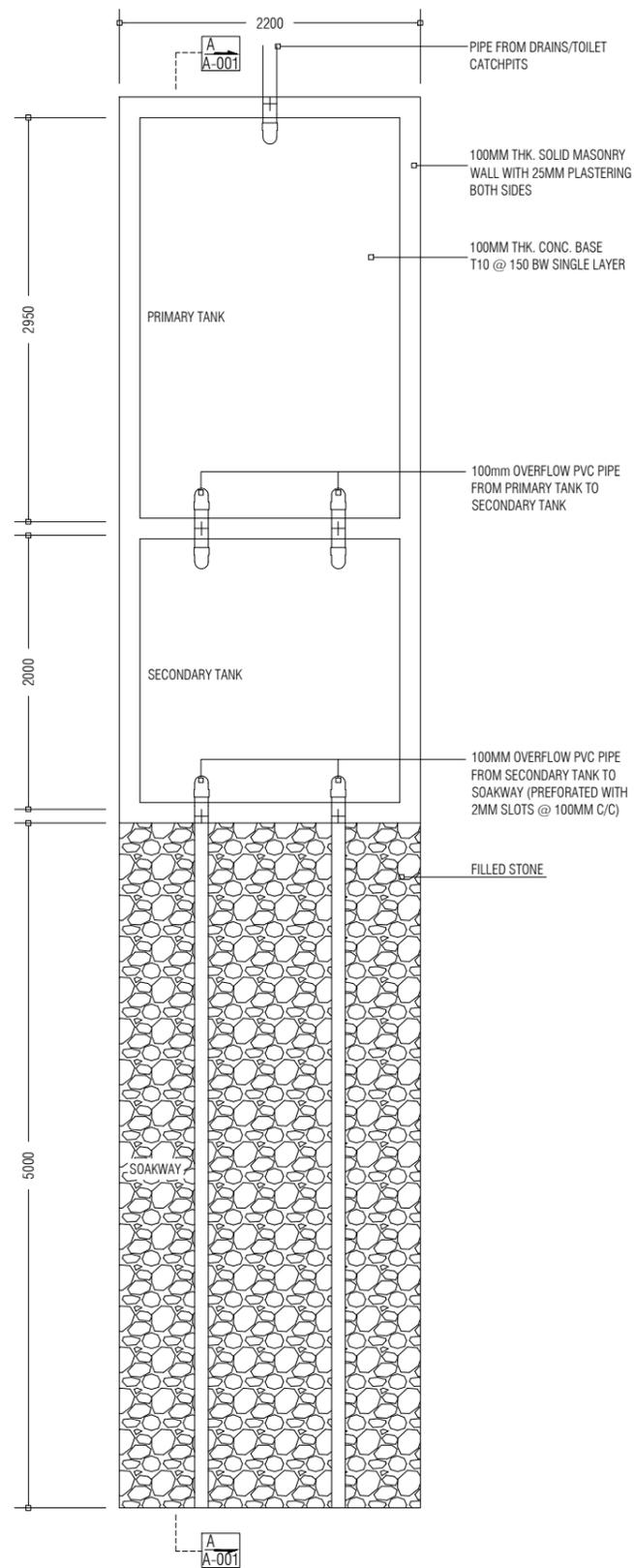
- ROADS TO BE DEVELOPED IN PHASE 1
- VEHICLE MOVEMENT

**NOTE:-**

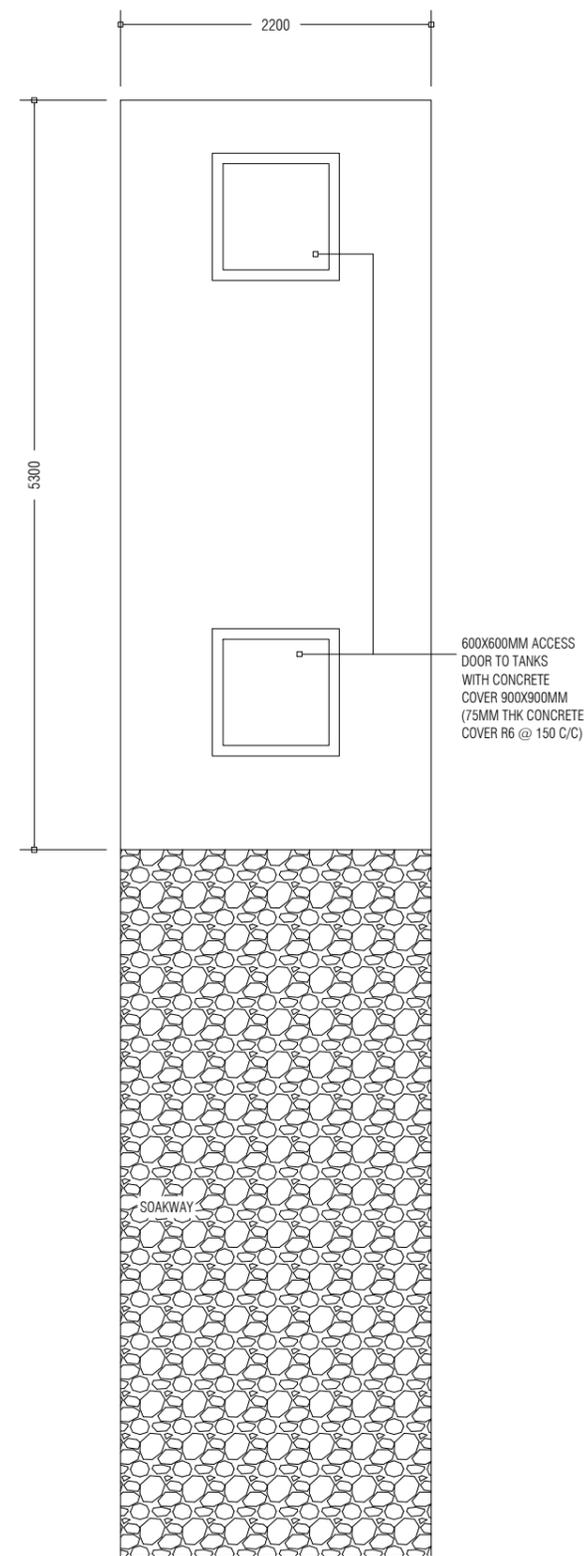
- GZ = GREEN ZONE
- TCZ = TURTLE CONSERVATION ZONE
- BT = BANJAN TREE (PROTECTED BY EPA)
- WK = WATER KIOSK
- FK = FUEL KIOSK
- ST = SEPTIC TANK
- AP = ASSEMBLY POINT
- ENT/EX = ENTRANCE/EXIT

<b>PREPARED BY</b>  MCEP MINISTRY OF ENVIROMENT, CLIMATE CHANGE AND TECHNOLOGY GREEN BUILDING, HANDHUVAAREE HIGUN, MAAFANNJU, MALE (20392), REPUBLIC OF MALDIVES. TEL: +960-3018431, +960-3018300, FAX: +960-328301	<b>PROJECT</b> REGIONAL WASTE MANAGEMENT FACILITY R.VANDHOO	<b>DESIGN BY</b> MARTYN	<b>AMENDMENTS</b> REVISED AS PER EPA DECISION STATEMENT REVISED LOCATION OF WEIGHING BRIDGE
	<b>TITLE</b> MASTER PLAN - TRAFFIC MANAGEMENT PLAN	<b>STRUCTURE BY</b>	PROPOSED LOCATION OF BOAT BUILDING YARD ADDED PROPOSED LOCATION OF ICE PLANT ADDED
	<b>CLIENT DEPARTMENT</b> WMPC DEPARTMENT	<b>DRAWN BY</b> AFRAZ	FUEL TANKS RELOCATED
	<b>PAPER SIZE</b> A4	<b>SCALE</b> 1:4500	COMPLETED BUILDINGS (OF PROPOSED BUILDINGS) LABELED SEPARATELY
	<b>PAGE NO.</b> 01	<b>DWG NO.</b> VANDMP-TMP-A1-01	REVISED ROAD WIDTHS AROUND SOUTH AND EAST OF LANDFILL (CONSISTENT WIDTH OF 4M)
		<b>DATE</b> 26.05.2021	

**Appendix 8 Schematic of the Septic tank proposed**



NOTE:  
ALL CONCRETE SHALL BE CAST WITH SULPHATE RESISTANT CEMENT.  
BITUMINOUS PAINT SHALL BE APPLIED TO ALL INSIDE SURFACES OF THE CONCRETE.  
ALL MASONRY WALLS INTERIOR SURFACES SHOULD BE PLASTERED WITH SULPHATE RESISTANT CEMENT, AND FINISHED WITH BITUMINOUS PAINTING.



PREPARED BY

PROJECT

DESIGN BY

AMENDMENTS

SEPTIC TANK AT STAFF ACCOMMODATION BLOCK  
R.VANDHOO

MA

TITLE

STRUCTURE BY

PLAN

MA

CLIENT DEPARTMENT

DRAWN BY

WMPC DEPARTMENT

MA

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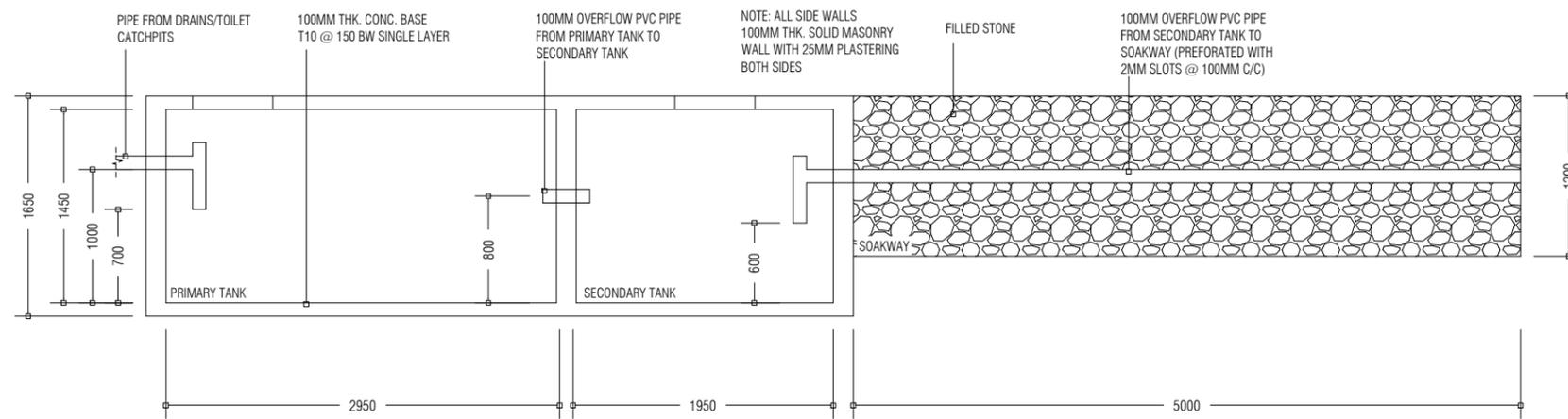
VANDST-A1-01

DATE

14.10.2021



MCEP  
MINISTRY OF ENVIRONMENT, CLIMATE CHANGE AND TECHNOLOGY  
GREEN BUILDING, HANDHUVAREE HIGUN,  
MAAFANNU, MALÉ (20392), REPUBLIC OF MALDIVES,  
TEL: +960-3018431, +960-3018300, FAX: +960-328301



PREPARED BY

PROJECT  
SEPTIC TANK AT STAFF ACCOMMODATION BLOCK  
R.VANDHOO

DESIGN BY  
MA

AMENDMENTS



MCEP  
MINISTRY OF ENVIRONMENT, CLIMATE CHANGE AND TECHNOLOGY  
GREEN BUILDING, HANDHUVAREE HIGUN,  
MAAFANNU, MALÉ (20392), REPUBLIC OF MALDIVES,  
TEL: +960-3018431, +960-3018300, FAX: +960-328301

TITLE  
SECTION  
CLIENT DEPARTMENT  
WMPC DEPARTMENT

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MA

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DWG NO. VANDST-A1-02  
DATE 14.10.2021

**Appendix 9 COVID19 Special Considerations in civil works contracts document prepared by PMU**

## COVID19 SPECIAL CONSIDERATIONS IN CIVIL WORKS CONTRACTS

### 1. PRECONSTRUCTION / PREPARATORY PHASE

#### 1.1. ACTIONS NEEDED PRIOR TO MOBILIZATION

The contractor must take all precautionary measures to ensure that the workers are not at risk or doesn't not carry the risk of infection. As such, the contractor must provide all necessary details related to the project team by using the spread sheet presented in **Annex 1** and submit to the PMU along with the signed declaration presented in **Annex 2**. If expatriate workers are included in the project team, copies of their work permit should be submitted.

The project team shall not include:

- A worker that falls in the high-risk category for COVID19; aged 65 and above, under long term medication or having chronic disease.
- A worker that has made contact with a COVID19 positive case.
- A resident of a house put under monitoring or quarantine.
- An illegal immigrant.

Refer to the latest update sheet from the following link for the list of places under monitoring or quarantine.

<https://covid19.health.gov.mv/downloads/>

The contractor should identify an Environmental and Social focal point to ensure that the mitigation measures presented in the ESIA are being properly implemented and to enforce COVID-19 preventive measures. The focal point can be a work supervisor or a health and safety specialist. This person is responsible for coordinating preparation of the site and making sure that the measures taken are communicated to the workers, those entering the site and Vandhoo resident staff. It is also advisable to designate at least one back-up person; in case the focal point becomes ill; that person should be aware of the arrangements that are in place. A health and safety briefing should be provided to the workers prior to mobilization. In addition to this, it is recommended to assign a specific staff to assume cleaning duties.

Furthermore, if the project involves mobilization of a team or a member from an island under COVID19 monitoring to the project island (R. Vandhoo) or the island at which accommodation, travel permit from HEOC must be attained (with a negative PCR test) and the PMU notified accordingly.

The contractor must ensure that the project team is fully equipped and geared to take preventive measures against the potential spread of COVID19 and must travel with and carry sufficient quantities of all the required PPEs and cleaning items. Some of such items are listed below:

- Thermometer
- First-aid kit
- General flu medicine
- Masks
- Gloves
- Foot operated lidded dustbins
- Dustbin bags
- Disinfecting liquid such as bleach

- Cleaning equipment (broom, mop etc.)
- Hand sanitizers
- Soap

The contractor is required to submit a full list of such health and safety related items and their respective quantities by using the spread sheet provided in **Annex 3**.

**The information presented in this section must be provided to the PMU prior to mobilization.**

### ***1.2. MOBILIZATION AND SETTING UP WORK SITE AND ACCOMMODATION***

The following guidance should be considered when setting up the labor camp:

- Social distancing norms must be facilitated. Each bed must be separated by a distance of at least 3 to 6 feet.
- The accommodation facility must be properly ventilated. It is advisable to keep the windows open.
- A foot operated lidded bin is recommended to be kept at or just outside the accommodation to collect general waste generated by the workers. Foot operated lidded bins should also be kept at the work site and at the kitchen and dining area to collect general waste.
- Hand sanitizers are to be kept at entrance point to the accommodation (wall mounted or kept on top of a table) as well as inside the accommodation facility preferably at each bed side.
- Establish handwashing facilities at the work site and eating or resting areas. Hand Sanitizers can be used as an alternative.
- Ensure handwashing facilities supplied with soap, disposable paper towels and closed waste bins exist at toilets, kitchen and dining area. Alcohol based sanitizer (if available, 60-95%alcohol) can also be used.
- Place posters and signs around the site, with images and text in workers' local languages providing guidance on signs and symptoms of COVID-19, how it is spread, how to protect themselves (including regular handwashing and social distancing) and what to do if they or other people have symptoms. Examples of WASH guidance from the WHO and important contact numbers are provided in **Annex 4 and 5**.

## 2. CONSTRUCTION PHASE

### 2.1. CHECKS ON COMMENCEMENT OF WORK

Entry/exit to the work site should be controlled and documented. The following actions are recommended:

- Daily temperature should be taken and recorded prior to leaving the stationed island
- If a member is having a temperature of 37.8C or greater or having any symptoms of flu he should not travel and must be referred to a healthcare provider with HPA also being notified. The staff with symptoms should not be involved in the project team until cleared by the respective authorities.
- The movement of the workers should be strictly restricted from harbor to worksite and back to the harbor. Direct contact with Vandhoo resident staff or workers of other contractors should be avoided at all costs.
- Provide daily briefings to workers prior to commencing work, focusing on COVID-19 specific considerations including cough etiquette, hand hygiene and distancing measures, using demonstrations and participatory methods.
- During the daily briefings, remind workers to self-monitor for possible symptoms (fever, cough) and to report to the supervisor or the COVID-19 focal point if they have symptoms or are feeling unwell.

### 2.2. CLEANING AND WASTE DISPOSAL

- The tools and equipment used by the workers must be cleaned when changing shifts.
- Cleaning staff shall use appropriate PPEs such as masks and gloves.
- The labor camp must be cleaned frequently (at least once a day) including accommodation facility, kitchen, dining area and toilets. The floor, walls and door knobs should be properly cleaned using 1:9 bleach solution. Sheets and linings must be changed at least weekly.
- Any waste produced during the care of ill workers should be collected separately in designated containers or bags and treated and disposed of according to the SOPs of HPA and WHO. This includes placing double bags inside the bins, properly tying and removing the bags when 2/3 are full and disinfected by spraying with 1:9 bleach solution.

### 2.3. ADJUSTING WORK PRACTICES

Consider changes to work processes and timings to reduce or minimize contact between workers, recognizing that this is likely to impact the project schedule. Such measures could include:

- Changing to a 24-hour work rotation.
- Adapting or redesigning work processes for specific work activities and tasks to enable social distancing, and training workers on these processes.
- Consider changing canteen layouts and phasing meal times to allow for social distancing.
- Consider using of dust masks in addition to the general construction PPEs.

**Appendix 10 Codes of Conduct formulated by PMU**

## Company Code of Conduct Implementing ESHS and OHS Standards Preventing Gender Based Violence

The company is committed to ensuring that the project is implemented in such a way which minimizes any negative impacts on the local environment, communities, and its workers. This will be done by respecting the environmental, social, health and safety (ESHS) standards, and ensuring appropriate occupational health and safety (OHS) standards are met. The company is also committed to creating and maintaining an environment where children under the age of 18 will be protected, and where Sexual Exploitation and Abuse (SEA) and sexual harassment have no place. Improper actions towards children, SEA and sexual harassment are acts of Gender Based Violence (GBV) and as such will not be tolerated by any employee, sub-contractors, supplier, associate, or representative of the company.

Therefore, to ensure that all those engaged in the project are aware of this commitment, the company commits to the following core principles and minimum standards of behavior that will apply to all company employees, associates, and representatives, including sub-contractors and suppliers, without exception:

### **General**

1. The company—and therefore all employees, associates, representatives, sub-contractors and suppliers—commits to complying with all relevant national laws, rules and regulations.
2. The company commits to full implementing the “Construction Phase Mitigation Measures” given in the “Environmental and Social Impact Assessment (ESIA) for the Upgrading of Infrastructure at the Regional Waste Management Facility Zone II, Raa, Vandhoo” (2019) which forms part of the contract.
3. The company commits to fully implement the COVID19 special considerations and requirements of the client.
4. The company commits to fully implement the turtle management plan of the ESIA.
5. The company commits to treating women, children (persons under the age of 18), and men with respect regardless of race, color, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status. Acts of GBV are in violation of this commitment.
6. The company shall ensure that interactions with local community members are done with respect and non-discrimination.
7. Demeaning, threatening, harassing, abusive, culturally inappropriate, or sexually provocative language and behavior are prohibited among all company employees, associates, and its representatives, including sub-contractors and suppliers.
8. The company will follow all reasonable work instructions (including regarding environmental and social norms).
9. The company will protect and ensure proper use of property (for example, to prohibit theft, carelessness or waste).

### **Health and Safety**

10. The company will ensure that the project’s OHS Management Plan is effectively implemented by company’s staff, as well as sub-contractors and suppliers.

11. The company will ensure that all persons on-site wear prescribed and appropriate personal protective equipment, preventing avoidable accidents, and reporting conditions or practices that pose a safety hazard or threaten the environment.
12. The company will prohibit the use of alcohol, narcotics or other substances which can impair faculties at all times.
13. The company will ensure that the COVID19 special considerations and requirements are implemented, such as:
  - The staff is properly wearing face masks at all times during working hours and when commuting to and from the job site.
  - Handwashing and/or hand sanitation facilities are available at the work site, eating and resting places and at the accommodation house or building. The workers must be instructed to practice frequent handwashing. Construction tools should also be cleaned daily using disinfectants (1:9 bleach solution).
  - Social distancing is maintained by all staff when commuting to and from the job site.
  - The staff are not interacting with Vandhoo resident staff or other contractors' employees unless it is an emergency, and even then, social distancing is maintained.
  - The staff are not leaving their accommodations, and meeting island residents unless it's an emergency, and even then, social distancing must be maintained.
  - Daily body temperature of all the staff are taken and recorded prior to leaving the stationed island and temperature logs sent Vandhoo focal point and the data is shared with the client on a regular basis. If a member is having a temperature of 37.8C or greater or any signs of COVID19 he/she should not be allowed to travel and must be referred to a healthcare provider with HPA also being notified. The staff with symptoms should not be involved in the project team until cleared by the respective authorities.
  - Prior travel approval is attained from one of the following Vandhoo resident staff on each working day:
    1. Mohamed Shaan (WAMCO)
    2. Hussain Zareer (WAMCO)
    3. Hussain Shafiu (WAMCO)
    4. Martyn Jones (MCEP)
  - If any member of the project team is travelling to another island other than the stationed island or R.Vandhoo, approval must be attained from the relevant authorities and the client must be properly notified about the intended duration and traveling island(s).
  - The supervisor monitors the aforementioned measures closely and reports to the company's head office regularly.
  - Sanction penalties on all employees who fail to follow the rules.
14. The company will ensure that project's grievance redress mechanism is implemented.
15. The company will not hire children under the age of 18 for construction work, or allow them on the work site, due to the hazardous nature of construction sites.
16. The company will ensure that adequate sanitation facilities are available on site and at any worker accommodations provided to those working on the project.

## **Gender Based Violence**

17. Acts of GBV constitute gross misconduct and are therefore grounds for sanctions, which may include penalties and/or termination of employment and, if appropriate, referral to the Police for further action.
18. All forms of GBV, are unacceptable, regardless of whether they take place on the work site, the work site surroundings, at worker's camps or within the local community.

19. Sexual harassment of work personnel and staff (e.g. making unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature) are acts of GBV and are prohibited.
20. Sexual favors (e.g. making promises of favorable treatment such as promotions, threats of unfavorable treatment such as losing a job, payments in kind or in cash dependent on sexual acts) and any form of humiliating, degrading or exploitative behavior are prohibited.
21. The use of prostitution in any form at any time is strictly prohibited.
22. Sexual contact or activity with children under 18—including through digital media—is prohibited. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not a defense or excuse.
23. Unless there is full consent<sup>1</sup> by all parties involved in the sexual act, sexual interactions between the company's employees (at any level) and members of the communities surrounding the work place are prohibited. This includes relationships involving the withholding/promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex (including prostitution). Such sexual activity is considered "non-consensual" within the scope of this Code.
24. In addition to company sanctions, legal prosecution of those who commit acts of GBV will be pursued if appropriate.
25. All employees, including volunteers and sub-contractors are highly encouraged to report suspected or actual acts of GBV by a fellow worker, whether in the same company or not. Reports must be made in accordance with project's GBV Allegation Procedures.
26. Managers are required to report and act to address suspected or actual acts of GBV as they have a responsibility to uphold company commitments and hold their direct reports responsible.

## **Implementation**

To ensure that the above principles are implemented effectively the company commits to:

27. Ensuring that all managers sign the project's 'Manager's Code of Conduct' detailing their responsibilities for implementing the company's commitments and enforcing the responsibilities in the 'Individual Code of Conduct'.
28. Ensuring that all employees sign the project's 'Individual Code of Conduct' confirming their agreement to comply with ESHS and OHS standards, and not to engage in activities resulting in GBV, child endangerment or abuse, or sexual harassment.
29. Displaying the Company and Individual Codes of Conduct prominently and in clear view at workers' camps, offices, and in public areas of the work space. Examples of areas include waiting, rest and lobby areas of sites, canteen areas and health clinics.
30. Ensuring that posted and distributed copies of the Company and Individual Codes of Conduct are translated into the appropriate language of use in the work site areas as well as for any international staff in their native language.
31. Ensuring that an appropriate person is nominated as the company's 'Focal Point' for addressing ESHS, OHS and GBV issues.
32. Ensuring that all employees are properly briefed and that they are familiar with the company's commitments to ESHS and OHS standards, and the project's GBV Codes of Conduct.

## **Sanction**

In case of a major breach of this Code of Conduct, the client is entitled to take disciplinary action against the company (as per the contract) which could include:

- 33. Informal warning.
- 34. Formal warning.
- 35. Withholding of payments.
- 36. Deduction from retention payment.
- 37. Termination of contract.
- 38. Report to the Police if warranted.

*I do hereby acknowledge that I have read the foregoing Company Code of Conduct, and on behalf of the company agree to comply with the standards contained therein. I understand my role and responsibilities to support the project's OHS and ESHS standards, and to prevent and respond to GBV. I understand that any action inconsistent with this Company Code of Conduct or failure to act mandated by this Company Code of Conduct may result in disciplinary action.*

Company name: \_\_\_\_\_

Signature: \_\_\_\_\_

Printed Name: \_\_\_\_\_

ID or PP No: \_\_\_\_\_

Date: \_\_\_\_\_

**Appendix 11 Firefighting system developed for Vandhoo by  
Riyan Pvt Ltd**

# PRILIMINARY DEISGN REPORT FOR FIRE FIGHTING SYSTEM AT R.VANDHOO WASTE MANAGEMENT FACILITY



RI/2020/039

Riyan Pvt. Ltd.

Client: Ministry of Environment

Issued date: 21<sup>st</sup> February 2021



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**Appendices**

Appendix A - Highlighted Drawing



## 1 INTRODUCTION

There are various types of waste related fire that occur. However, the most common type of waste related fires commonly found in the Maldives are:

- **Spontaneous combustion:** This type of fires are caused due to self-heating. Due to the high composition of organic waste.
- **Controlled open burning:** This is the types of fire that are burnt in open outdoor. Most commonly found in island waste yards, on a daily basis.
- **Arson:** Deliberately setting waste piles on fire. This has led to loss of vegetation from the surrounding area as well as immeasurable damage to the waste yards has been occurred.

There are several precautions that are needed in handling various types of wastes. However, according to WAMCO, currently they do not handle any chemical waste or large quantities of hazardous waste and such waste should be stored in a secure area till taken care of.

The different categories of wastes such as medical, plastics, hazardous and etc, are handled depending on type of waste and are advised to handle minimally. Pre-treatment; Shredding, filtration, blending maybe required for some of the wastes. However, medical waste and plastics can go directly into the incinerator and these wastes should not be reactive or corrosive.

R.Vandhoo waste management facility is a facility where large number of dry combustible materials and hazard materials at a single location are handled. According to WAMCO, currently the incinerator capacity in R. Vandhoo is 36tons per day. Estimated waste that will be transferred to Vandhoo is around 60-80tons per day.

Therefore, under any circumstances even if a fire incident occurs, an undisrupted operation of the facility needs to be ensured. The main objective of this report is to design a fire detection and protection that shall provide:

- Life safety of occupants.
- Property protection.
- Compliance with all relevant statutory requirements.
- Minimum disruption during an emergency to the operations.



The report highlights the overview of a new fire detection and protection system design, before proceeding the detail design and system specifications.

## **2 STANDARD AND CODES**

The design and planning of fire protection, detection and PA system shall be done by maintaining the following codes and standards (latest editions):

- International fire code 2018
- BIS: 3844, 15105, 2189 and other relevant standards
- Local Fire Authority
- NFPA 13, Sprinkler System
- NFPA 14, Hydrant System
- NFPA 72, Fire Alarm System
- NFPA 10, Fire Extinguishers
- NFPA 230, Fire Protection of Storage

## **3 FIRE FIGHTING FOR WASTE MANAGEMENT FACILITY**

Following fire protection and fighting systems are proposed to R.Vandhoo waste management facility based on their fire fighting requirements.

### 3.1 Fire hydrant system

Fire Hydrant system with ring main is proposed to this island which will be running underground. This system will cover the whole island with lockable isolation valves for each and every branch off to buildings.

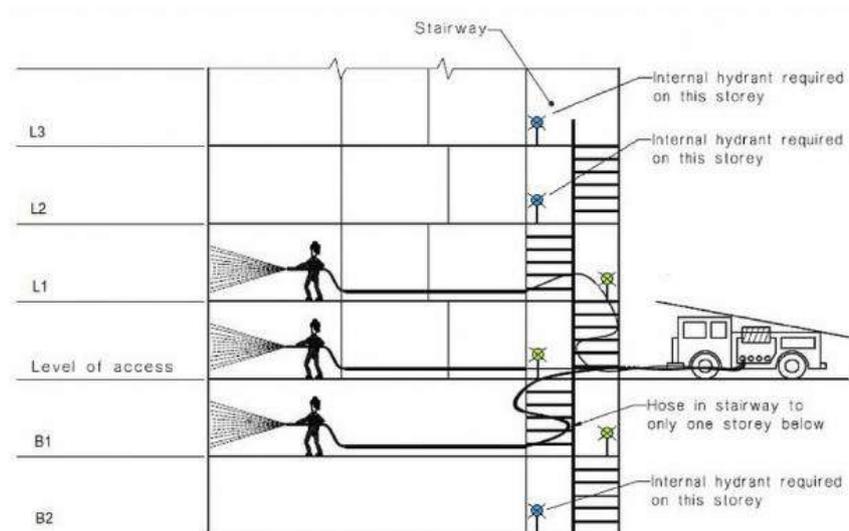
Additionally, the yard hydrant points are also extended from the same mains where internal hydrants, deluge systems and hose reels for the buildings are connected from the mains with isolation and pressure reduction valves.

All pipes running underground for the hydrant system will be heavy duty (either HDPE or PPR) and will be according to the requirement in table 3 of BS 1387: 1967. Furthermore, all pipes will be painted with two coat of primer and a finish coat.



### 3.1.1 Internal Hydrants / Hose Reels

Internal hydrant systems with hose reel, will be installed for buildings required according to the floor area and will be placed near staircases or corridors. This will be as a first stage fire fighting equipment for the occupants in case of a fire incident. The figure below shows how the internal hydrant system works.



*Figure 1: Internal hydrant system*

The hydrant system will be installed according to BS: 3169 or equivalent standards. Every hose reel will be selected based on BS: 3169 or equivalent standards.

### 3.1.2 External Hydrants

For external hydrants, minimum distance that should be maintained between the two hydrants is 150m and also not more than 70m from entrance to the buildings. Each Hydrant's outlet is 2.5inches at diameter and it accomplish with 2 no's of 30m length and 2.5 Inch diameter delivery Hoses.

(See appendix A for the External Hydrants coverage layout for R.Vandhoo)

### 3.1.3 Fire Pumps

Fire pumps serves as a critical and an essential component for fire fighting system. For the proposed system at R. Vandhoo, the systems will consists of one engine driven and one



electrically driven centrifugal pumps set. Moreover, one electrically driven booster pump is also included which helps to maintain the system pressure.

Below describes how the proposed system will be functioning.

- a) A fall in the piping installation pressure activates the pressure switch.
- b) The pressure switch transmits a signal to the pump control panel which automatically activates the electric booster pump.
- c) The pump control panel will indicate the actuation of the pump and transmit a signal to the fire alarm panel (FAP) with a volt free contact interface module.
- d) The FAP indicates the operation of the booster pump both audibly and visually.
- e) Upon failure of the duty pump and or further pressure drop in the piping installation a second pressure switch shall activate the standby engine driven pump.
- f) A signal shall be displayed at the FAP and pump control panel indicating the failure of the duty pumps and or the operation of the standby pump.
- g) Moreover, under any circumstances any malfunction such as low fuel level, high engine temperature, and low battery voltage, failure to start, common fault, auto manual status, electrical fire panel power status or on/off status will be indicated on the FAP via volt free interface modules, fire engine pump in form of alarm signals.

#### 3.1.4 Booster Pumps

Booster pumps maintains the system pressure during the installation of a wet riser system. The following general requirements will apply to booster pumps.

- a) A fall in the system pressure during installation, the control valve will activate the pressure switch automatically which controls the booster Pump.
- b) The pressure switch communicates through a signal to the booster pump control panel and activates the booster pump to maintain system pressure during the installation of wet riser system.
- c) Booster pump shall have rated capacities not less than normal leakage rate and sized to make up the allowable leakage within 10 minutes at a flow rate not exceeding 4 litres/min.
- d) Booster pump should have a shut-off pressure not exceeding the working pressure rating of the fire protection equipment.



- e) Power supply to the booster pump should not affect the power supply to the main fire pump under any circumstances.

Moreover, the design will be based on UL listed and FM approved fire pump and accessories only.

### 3.1.5 Fire Pump Control Panel

This is a device that consists of several electrical components which assists in the operation of the fire pump. The control panel for the fire pump should be a self-contained, extensible, wall-mounted flush-fronted metal cubicle board completely assembled, wired and tested by the manufacturer prior to delivery.

The controller should be placed independently not further than 3m from the pump and it should be covered with an enclosure in such a way that it can be accessed from the rear. It should be designed where it can receive an electrical supply of 415/240V, 3 phase, and 50 Hz AC current.

All motor starters should be incorporated within the control panel and also spare contacts that will close upon operation of the electrical or any warning signal should be integrated. These contacts shall energize a remote electrical bell or lamp within the main fire alarm panel. All switches, which are required to keep the controller in the 'automatic' positions should be in locked cabinets with break glass panels.

## 3.2 Deluge System

A deluge fire protection system has an unpressurized dry piping and open sprinkler heads. The system is directly connected to a water supply. Though a regular sprinkler system with closed heads activates each sprinkler head individually, a deluge system offers a quicker response to a fire by discharging water through all its open heads at once when activated by a heat or smoke detection system. Therefore, the deluge system is more effective in high hazard situations.



*Figure 2: Water Deluge System Operation*

Deluge systems are used in high hazard areas such as power plants, aircraft hangars, and chemical plants. These systems are very effective in such areas since they release water or another fire suppressant to all the open sprinkler heads simultaneously. This total flood method douses a fire before it has the chance to grow uncontrollably.

(See appendix A for the proposed hydrants system and deluge system schematic)

### 3.3 Foam Fire Protection System

This type of protection systems is designed for areas that deals with oil (diesel, heavy duty furnace oil). There are mainly two functions in a foam system; extinguishing fire from the oil tank and also helps to cool the tank from outside by installing close circular pipelines around the tank and maintaining the temperature under control in case of neighbouring tank fire. This helps to minimize the fire spread from one tank to another as well.

#### 3.3.1 Foam Fire Protection System Comprises of

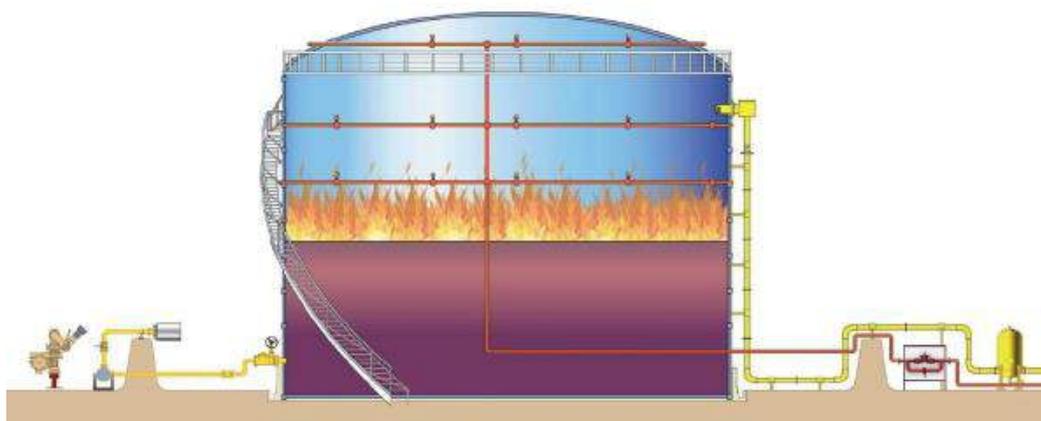
This system comprises of foam concentration tank, proportioning device, automatic controlling valves, controlling panel, foam producer, discharge outlet. Foam concentration is a crucial factor in this system.

Concentration tank: in this tank foam is stored. Tank can be of cylindrical vertical or horizontal type stainless steel.



Proportioning devices: for discharging the sufficient amount of foam- concentrate into the spray-water based on specific requirement. These devices are sized and during the design stage it is important to consider to minimize the pressure loss

Foam-chambers: automatic foam protection system mainly includes areas where fuel oil storage tanks are built. Apart from this, it covers all the sensitive areas of the power plant where hydrant system and spray system do not perform fairly



*Figure 3: Fuel tank fire protection system*

### 3.3.2 Foam Fire Protection System Design Principles

Prior to a foam system there are few essential design requirements that needs to be considered.

1. This system is should be in accordance to NFPA-11 regulations.
2. The system will should operate automatically with the assistance of fire detection system around the tank.
3. This system should forms a network pipe near all the fuel oil storage tanks.

One of the crucial factor is the concentration in the foam. This should be 100% AFFF type, and should be stored in a tank which has twice the capacity. This foam will be discharged via a foam pump which has a capacity of 200%.



The minimum effective capacity for the foam pumps and concentration tanks should be designed to protect one of the largest fuel tanks for at least 60 minutes at its design capacity. Automatic foam protection system covers an area of its oil tank and surroundings. They starts functioning automatically when smoke is sensed from the surrounding.

The foam gets sucked in by the two foam inductors functioning at 100% capacity, with one driven by motor engine pump and by diesel engine pump. While designing, the minimum effective capacity of foam concentrate tank should be considered with an extra margin of 10 percent over calculated capacity.

The material used should be Grade B Carbon Steel with an inner lining of 2mm of FRP. LDO tanks are equipped with foam proportioner while water is supplied by hydrant system mains. The supply line of oil tank must have an automatic solenoid at the upstream of the foam proportioner.

In foam protection system, all pipeline below ground level should be done on RCC Foundation where the pipelines are made of steel. Special component valves like non-return valves, strainers and isolation valves of pumps should be used. This is to avoid mixing of water and with foam concentration.

### 3.4 Aerosol Fire Suppression

Condensed aerosol fire suppression is a particle based form of fire extinction that is similar to gaseous fire suppression (dry chemical fire extinction). The fire extinguishing agent used contains very fine solid particles and gaseous matter.

The condensed aerosol micro particles and effluent gases are produced from the exothermic reaction where the particles remain in a vapour stage till they are discharged. Afterwards, it is condensed within the device and discharged in the form of solid particles.

Compared to gaseous suppressants (which emit only gas) and dry chemical suppression agents (which are powder-like particles of a large size - 25–150 micrometres), the NFPA defines condensed aerosols as those that release finely divided solids of less than 10 micrometres in diameter.



The solid particulates have a considerably smaller mass median aerodynamic diameter (MMAD) than those of dry chemical suppression agents. The particulates also remain airborne significantly longer and leave much less residue within the protected area.

Condensed aerosols are flooding agents which are effective regardless of the location and height of the fire. This can be contrasted with dry chemical systems that must be directly aimed at the flame. The condensed aerosol agent can be delivered by means of mechanical, electric, or combined electro-mechanical operation. Wet chemical systems which are generally found in foam extinguishers must be sprayed directionally onto the fire just like dry system.



*Figure 4: Aerosol generator installation*

### 3.5 Portable Fire Extinguishers

The portable fire extinguishers shall be provided as per NFPA 10, standards for portable fire extinguishers. Additional fire extinguishers should be provided as per requirement of local fire services as well.

Each type of extinguisher will fight a specific type of fires. The three most common types of fire extinguishers are air-pressurized water, carbon dioxide (CO<sub>2</sub>), and dry chemical.

- One of the most commonly used agents for ordinary combustibles is water. Approximately two thirds of it is filled with water and then pressurized with air. Air pressurized water extinguishers put out fires by cooling the surface of the fuel to remove the heat element of the fire triangle. It must never be used to extinguish flammable liquid or liquid fires.



- CO2 extinguishers are filled with CO2 which is a non-flammable gas under pressure. These extinguishers put out fires by displacing the oxygen, and the high pressure provides a cooling effect on fires. CO2 extinguishers are designed for flammable liquid and electrical fires only.
- Dry chemical extinguishers put out fires by coating the fuel with a thin layer of fire-retardant powder, separating the fuel from the oxygen.

The following table shows the fire protection system installation matrix for R. vandhoo.

BUILDING		EXTERNAL HYDRANTS	INTERNAL HYDRANTS	HOSE REEL	DELUGE SYSTEM	AEROSOL SYSTEM	FOAM SYSTEM	FIRE EXTINGUISHERS	COMMENT
<b>NO.</b>	<b>Waste Management Facilities</b>								
1	Harbour Extension	x							
2	Guard House And Weigh Bridge							x	
3	Vehicle Shed Extension Building			x	x			x	
4	Storage Extension Building	x		x	x			x	
5	Fuel Farm	x					x		
6	Water Storage Tanks								NR
7	Mechanical Storage			x				x	
08A	Power House	x				x			
08B	Desalination Building			x				x	
09A/0 9B	Waste Sorting Shed Extension			x	x			x	
10	Receiving Bunkers			x				x	
11	Waste Management Facilities	x						x	
11A	Reserved For Future Use	x						x	
11B	Recyclables	x						x	
11C	Recycling (With Compaction And Baling Plant	x						x	
11D	E-Waste	x						x	
11E	Bulk Waste	x						x	



11F	Compost Packaging And Storage	x							NR
11G	Hazardous Waste	x						x	
12	Unprocessed Waste Bunker	x						x	
13	Pump House	x						x	
14	Proposed Landfill	x						x	
14A	C&D Waste	x						x	
14B	General Waste	x						x	
15	Proposed Leachate Collection								NR
	<b>Existing Buildings</b>								
E1	Incinerator								
E2	Waste Sorting Shed			x	x			x	
E2B	Waste Sorting Shed Annex (To Be Relocated)								
E3	Utility Building	x		x				x	
E4	Vehicle Shed			x				x	
E5	Locker Room Facility (Existing Staff Accommodation)							x	
E6	Storage Buildings			x				x	
E7	Office Building (Existing Accommodation Building)							x	
E8	Relocated Fuel Tanks (Proposed Petrol Tank)						x		
E9	Mosque							x	
E10	Existing Landfill	x							
E11A	Existing Leachate Collection Pond								NR
E11B	Existing Storm water Collection Pond								NR
E12	Existing Overhead Tank And Fire Pump								NR
E13	Existing Harbour	x							
	<b>Staff Village</b>								
S1	Mosque	x						x	
S2	Staff Facilities Building	x						x	
	Staff Kitchen	x						x	
	Cafeteria	x						x	
	Laundry	x						x	



	Recreation	x						x	
	Gym	x						x	
S3	Staff Accommodation X4	x						x	
S4	Guest Accommodation X4	x						x	
S5	Consultants Accommodation X2	x						x	

*Table 1: fire protection system installation matrix for R. vandhoo*

### 3.6 Addressable Fire Detection & Alarm System

Complete analogue addressable, zoned and electrically supervised, class a, multiple loops fire alarm and detection system, including initiating device and notification appliances are proposed to covering total waste management facility. The proposed system consists with 4 loop fire alarm panel for minimize loop lengths around the facility.

- The Fire detection and alarm system is consisting with the following,
- Addressable analogue Fire detection & alarm control panel.
- Smoke & heat detectors
- Thermal Imaging Sensor
- Flame Detector
- Manual pull stations (break glass type)
- Electronic Hooters cum strobes
- Conduits / wiring

(See appendix A for the proposed fire alarm system coverage and system architecture)

### 3.7 The Main Features Of System As Under

Fire alarm system integrates with the hydrant systems, fuel farm form system, aerosol system and incinerator fire protection system at fire alarm control panel (FACP). This is installed in the fire control room located at guard house and repeated at staff accommodation block.

### 3.8 Fire Alarm System Interface



- a. **Fire Pump Status:** Each fire pump should have status indication for power failure, pump running and phase reversal. An audible trouble signal shall sound until acknowledged and automatically restored. The running condition of pump shall be permitted to be alarm condition whereas all other status of pumps shall be permitted to be supervisory condition.
- b. The operation of deluged water flow switch, valve supervisory switch and pressure switches shall cause an alarm / supervisory condition at fire alarm control panel.
- d. **Exhaust and supply fan tripping:** When the fire detector or the manual call point is activated in case of a fire incident, it will automatically command to switch off the air handling units of affected area and simultaneously the respective fire damper.
- f. **External dampers:** When the fire detector or the manual call point is activated in case of a fire incident, it will automatically command to switch off associated dampers of duct crossing through fire resistant wall.
- g. **Smoke control system:** When the fire detector or the manual call point is activated in case of a fire incident, it will automatically command to switch off /on the smoke control fan of associated zone.
- h. **Facility management system (FMS):** the FACP is incorporated with facility management system for monitoring of fire net by FMS. The proposed fire design will consists of a BACNet open protocol interfacing facility with FMS or BMS. In addition, the FACP facilitate with remote GSM gateway to provide remote notification to mobile user and MNDF.

Moreover, the above selected detection system installation will help to minimize the fire risk for the facility significantly. Specific detection methods are also incorporated with the new design, in addition to the traditional methods for fire detection such as smoke detection and heat detection systems.

### 3.9 Thermal Imaging

Thermal imaging systems will be used in the facility to detect delicate changes in temperature and alerts when an action is required. It automatically acts to de-escalate the situation quickly and effectively. This helps in alerting the risk of a fire development much earlier than alternatives, providing time to react accordingly and reduces damage.



### 3.10 Flame Detection

A flame detection system will detect the presence of a flame and react accordingly, by sounding your fire alarms and activating the fire suppression systems.

The mechanisms used to detect flames can make flame detectors faster to react than smoke or heat detectors so it saves time which is vital to safety

### 3.11 Spark detection

Dust and sparks are produced in a lot of industries so spark detectors are crucial for this process. It is commonly used in the ducting process which transports raw materials from one part of the machine to another.

In this situation, a rogue spark could be enough to cause an explosion and can cause severe damages. Spark detectors immediately detect sparks in your systems, extinguishing them and acting to close down both ends of the machine if required.

The following table shows the fire detection devises installation matrix.

BUILDING		SMOKE DETECTOR	HEAT DETECTOR	THERMAL IMAGING SENSOR	FLAME DETECTOR	MANUAL PULL STATIONS	ELECTRONIC HOOTERS CUM STROBES	COMMENT
<b>NO.</b>	<b>Waste Management Facilities</b>							
1	Harbour Extension					X	X	
2	Guard House And Weigh Bridge	X				X	X	
3	Vehicle Shed Extension Building	X		X	X		X	
4	Storage Extension Building	X	X	X	X	X	X	
5	Fuel Farm				X	X	X	
6	Water Storage Tanks						X	
7	Mechanical Storage	X	X			X	X	
08A	Power House	X	X	X		X	X	
08B	Desalination Building	X	X			X	X	



09A/09B	Waste Sorting Shed Extension	x	x	x	x	x	x	
10	Receiving Bunkers	x	x	x	x	x	x	
11	Waste Management Facilities	x				x	x	
11A	Reserved For Future Use						x	
11B	Recyclables	x			x	x	x	
11C	Recycling (With Compaction And Baling Plant)	x		x	x	x	x	
11D	E-Waste	x		x	x	x	x	
11E	Bulk Waste	x		x	x	x	x	
11F	Compost Packaging And Storage	x					x	
11G	Hazardous Waste	x		x	x	x	x	
12	Unprocessed Waste Bunker	x		x	x	x	x	
13	Pump House	x				x	x	
14	Proposed Landfill			x	x		x	
14A	C&D Waste			x	x		x	
14B	General Waste	x			x	x	x	
15	Proposed Leachate Collection							
	<b>Existing Buildings</b>							
E1	Incinerator		x	x		x	x	
E2	Waste Sorting Shed	x		x	x	x	x	
E2B	Waste Sorting Shed Annex (To Be Relocated)							
E3	Utility Building	x				x	x	
E4	Vehicle Shed		x			x	x	
E5	Locker Room Facility (Existing Staff Accommodation)	x				x	x	
E6	Storage Buildings	x			x	x	x	
E7	Office Building (Existing Accommodation Building)	x				x	x	
E8	Relocated Fuel Tanks (Proposed Petrol Tank)	x					x	
E9	Mosque		x			x	x	



E10	Existing Landfill			x			x	
E11A	Existing Leachate Collection Pond							
E11B	Existing Storm water Collection Pond							
E12	Existing Overhead Tank And Fire Pump						x	
E13	Existing Harbour					x	x	
	<b>Staff Village</b>							
S1	Mosque		x			x	x	
S2	Staff Facilities Building							
	Staff Kitchen		x			x	x	
	Cafeteria		x			x	x	
	Laundry	x	x			x	x	
	Recreation	x				x	x	
	Gym	x				x	x	
S3	Staff Accommodation X4	x				x	x	
S4	Guest Accommodation X4	x				x	x	
S5	Consultants Accommodation X2	x				x	x	

*Table 2: fire detection devises installation*

### 3.12 Public Address System

A public address system or voice evacuation is an effective, safer and a quicker evacuation process for the occupants in the buildings in a fire incident. In such incidents panicking and getting disoriented can be minimized if these are installed, since these system will be activated prior to a fire being escalated. Voice evacuation systems allow for a controlled evacuation as people may be given clear and concise directions of where to evacuate. Intelligent fire alarm systems combined with a voice evacuation system helps to improve survivability in the event of a fire.

The benefits of voice evacuation systems include:

- a. An effective, fast, safe evacuation guide during emergencies.
- b. All instructions are verbally clear and concise for occupants when it comes to location/proximity to the fire emergency.



- c. The voice evacuation systems come with a back-up voice evacuation amplifier to increase survivability and reduce other emergency risks that could prevent safe evacuations.
- d. Voice evacuation messages are highly customizable to provide the best life safety and fire emergency alerts.

This system will be located close to the fire alarm control panel in the fire command centre in the guard house. In the event of activation of a fire detector or a manual call from any location, the fire marshal/security personnel can select the public address speaker on the affected floor by operating the particular floor switch on the switching console and announce evacuation message.

### 3.13 FIRE SIGNAGES

The fire signage for evacuation of each building, zone and floors will be provided. These signboards must be made out of 3mm opaque PVC Foam Board with PVC non-reflective self-adhesive vinyl painted foam board.

1. Signage with printed "IN CASE OF FIRE, USE STAIRS UNLESS INSTRUCTED OTHERWISE" of 1.5cm height letters in red with white background.

The size of the board shall be 25cm x 30 cm and shall be fixed at the height of 2mts. from finished floor near Manual call points.

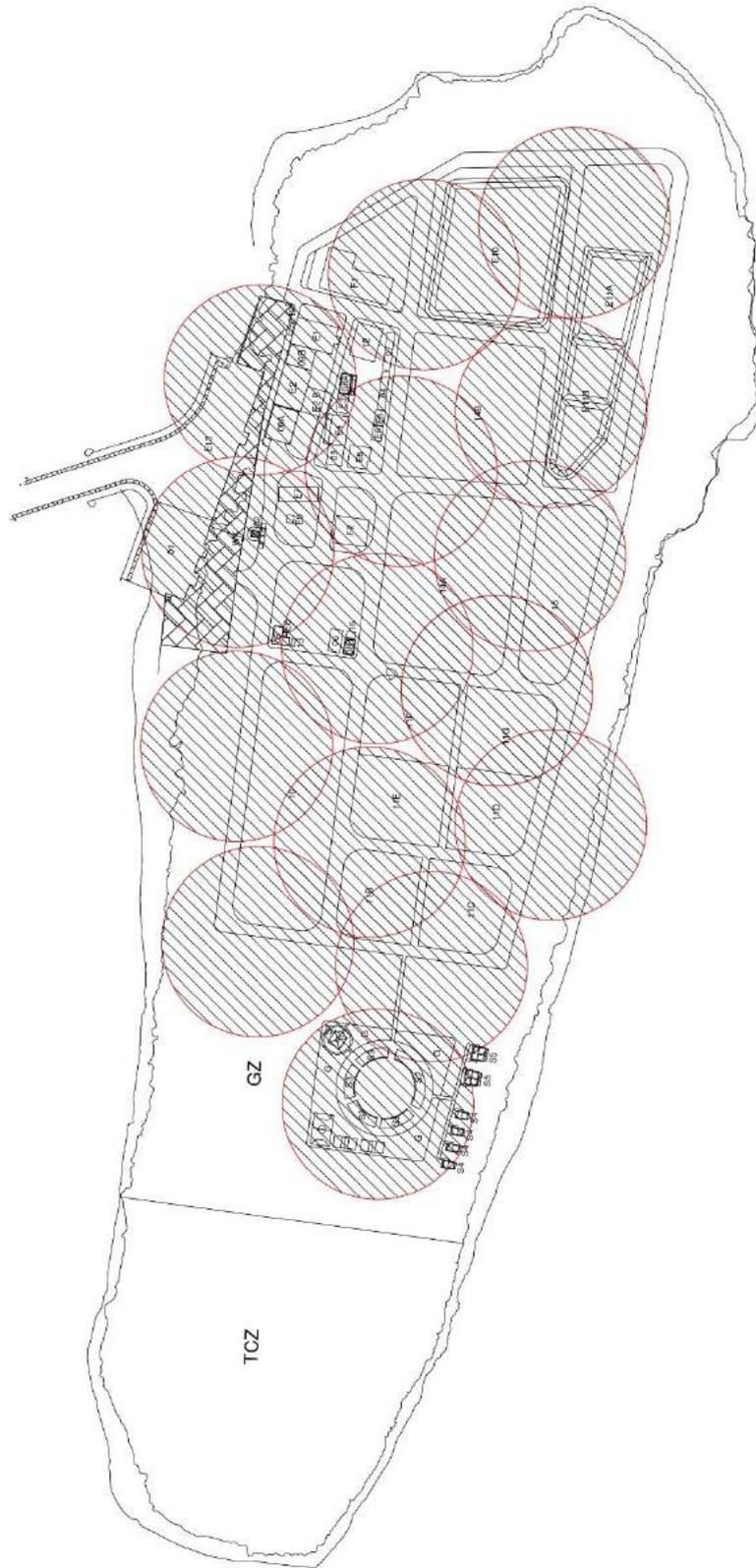
2. Floor identification signage (i.e., GROUND FLOOR ...etc.) at each stair enclosure on every floor, indicating the floor number in words,

Lettering size shall be 7.5 cm with contrasting colour from background. Size shall be 15cm x 60cm.

3. Plant rooms and equipment room signage need to be considered for identifications.



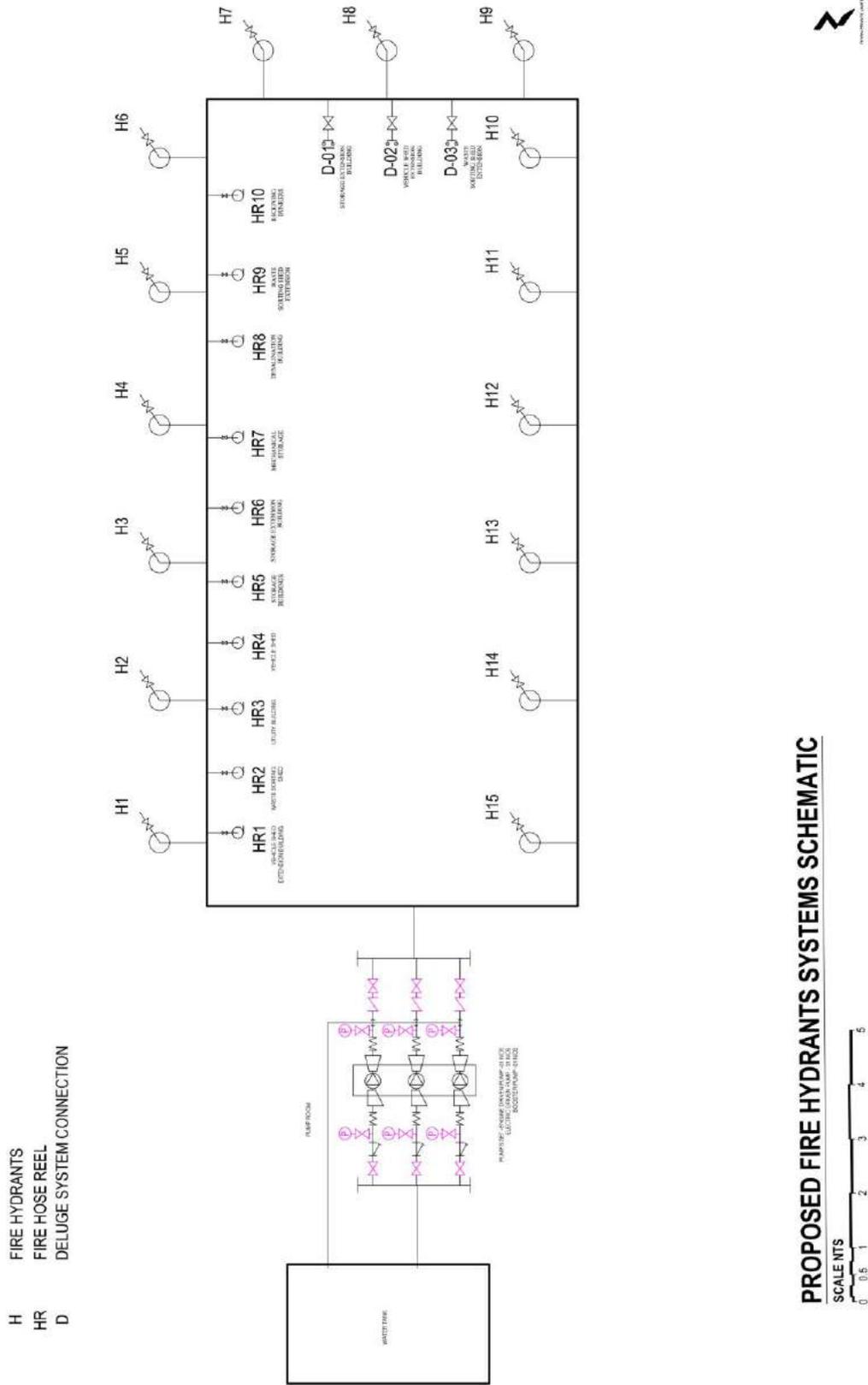
## Appendix A



**PROPOSED EXTERNAL FIRE HYDRANTS COVERAGE MAP**

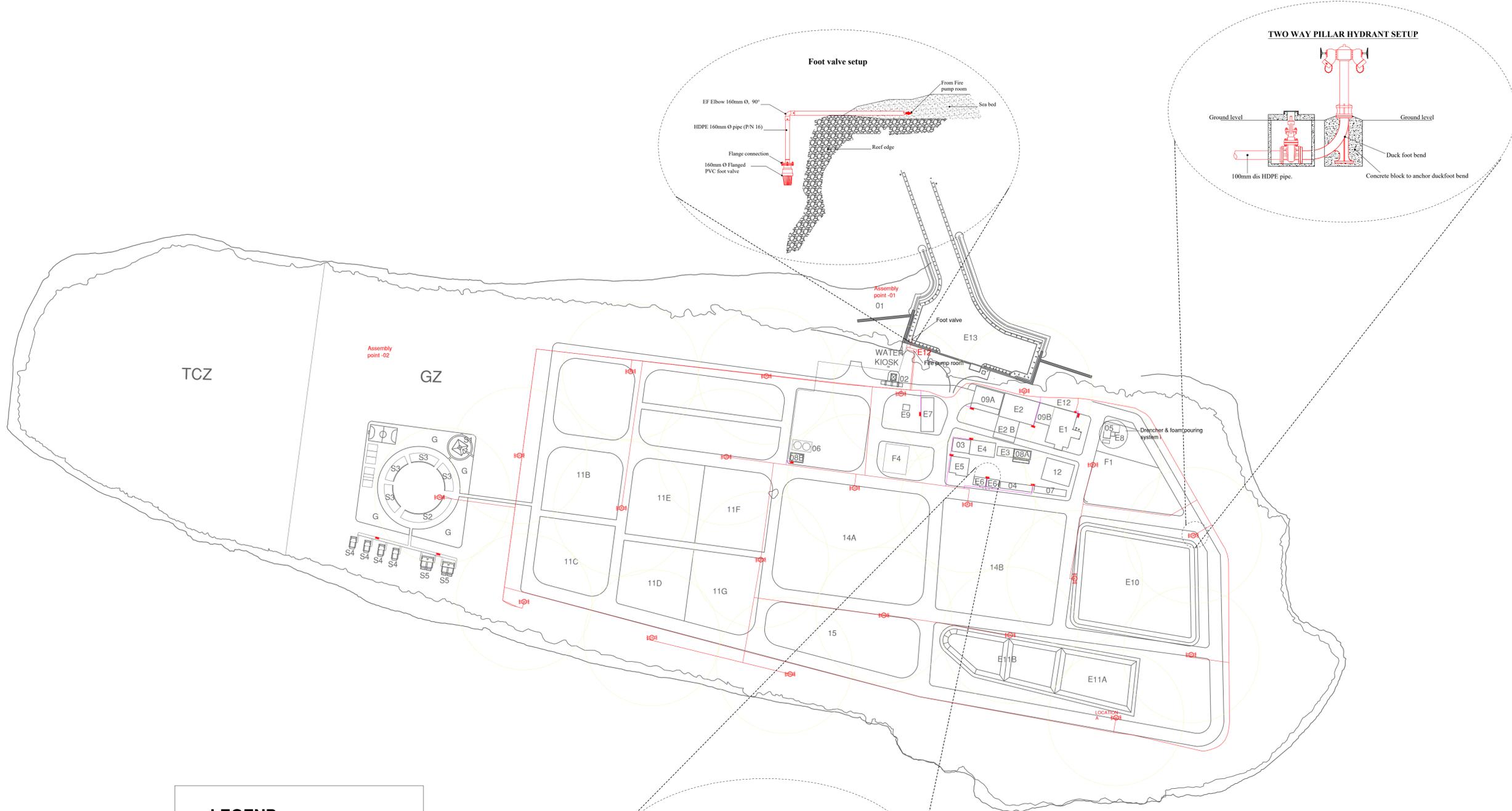


  
R. VANDHOO AND SUPERVISION  
ENGINEERS  
11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000





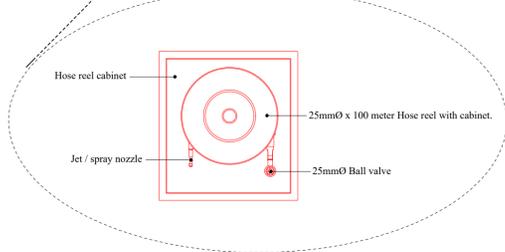




**LEGEND**

- Smoke detector with base unit
- Fire hose reel c/w 25mmØ x 30 m hose
- HDPE Pipe 6"Ø, PN16, PE100, SDR11
- HDPE Pipe 2"Ø, PN16, PE100, SDR11

1. ALL PIPES SHOULD BE GALVANIZED, SCHEDULE 40.
2. ALL PIPE SHALL BE PAINTED IN RED AS PER REGULATION.
3. ALL SUPPORT/BRAKET SHALL BE HOT DIPPED GALVANIZED TO 100MM.
4. ALL FIRE EXTINGUISHER INSIDE CABINETS. (CABINET SHOULD BE PROVIDED)



- WASTE MANAGEMENT FACILITIES**
- 01. HARBOUR EXTENSION
  - 02. GUARD HOUSE AND WEIGH BRIDGE
  - 03. VEHICLE SHED EXTENSION BUILDING
  - 04. STORAGE EXTENSION BUILDING
  - 05. FUEL FARM
  - 06. WATER STORAGE TANKS
  - 07. MECHANICAL STORAGE
  - 08A. POWER HOUSE
  - 08B. DESALINATION BUILDING
  - 09A/09B. WASTE SORTING SHED EXTENSION
  - 10. RECEIVING BUNKERS
  - 11. WASTE MANAGEMENT FACILITIES
    - 11A - RESERVED FOR FUTURE USE
    - 11B - RECYCLABLES
    - 11C - RECYCLING (WITH COMPACTION AND BALING PLANT)
    - 11D - E-WASTE
    - 11E - BULK WASTE
    - 11F - COMPOST PACKAGING AND STORAGE
    - 11G - HAZARDOUS WASTE
  - 12. UNPROCESSED WASTE BUNKER
  - 13. PUMP HOUSE
  - 14. PROPOSED LANDFILL
    - 14A - C&D WASTE
    - 14B - GENERAL WASTE
  - 15. PROPOSED LEACHATE COLLECTION
- REJECT LINE (275 MTR)
- FUTURE DEVELOPMENT**
- F1. FUTURE INCINERATOR LOCATION
  - F2. FUTURE WASTE MANAGEMENT FACILITIES
  - F3. FUTURE FOOTBALL FIELD
  - F4. TRAINING FACILITY & HR BUILDING
- STAFF VILLAGE**
- S1. MOSQUE
  - S2. STAFF FACILITIES BUILDING
    - STAFF KITCHEN
    - CAFETERIA
    - LAUNDRY
    - RECREATION
    - GYM
  - S3. STAFF ACCOMMODATION X4
  - S4. GUEST ACCOMMODATION X4
  - S5. CONSULTANTS ACCOMMODATION X2
- EXISTING BUILDINGS**
- E1. INCINERATOR
  - E2. WASTE SORTING SHED
  - E2B. WASTE SORTING SHED ANNEX (TO BE RELOCATED)
  - E3. UTILITY BUILDING
  - E4. VEHICLE SHED
  - E5. LOCKER ROOM FACILITY (EXISTING STAFF ACCOM.)
  - E6. STORAGE BUILDINGS
  - E7. OFFICE BUILDING (EXISTING ACCOM. BUILDING)
  - E8. RELOCATED FUEL TANKS (PROPOSED PETROL TANK)
  - E9. MOSQUE
  - E10. EXISTING LANDFILL
  - E11A. EXISTING LEACHATE COLLECTION POND
  - E11B. EXISTING STORMWATER COLLECTION POND
  - E12. EXISTING OVERHEAD TANK AND FIRE PUMP
  - E13. EXISTING HARBOR

Project Name: Detailed design for fire protection system in R. Vandhoo and Supervision at regional waste management facility  
 Client: Ministry of Environment  
 Project Number: RI/2020/039  
 Date: November 2020

Date

Rev no

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**MASTER PLAN R.VANDHOO FIRE FIGHTING SYSTEM**



**RIYAN PRIVATE LIMITED**

t: +9603315049 f: +9603310776  
 e: info@riyan.com.mv  
 w: www.riyan.com.mv  
 3rd floor, H. Azum, Ameenemaggu, Male'

Title: Master plan FP layout  
 Page: FP 00

**Appendix 12 List of minimum management and manpower required for Vandhoo (provided by PMU)**

Date: 4<sup>th</sup> January 2021

## Vandhoo Manpower Requirement

### Manpower/Management:

I have said from the start that manpower and management is crucially lacking on Vandhoo and fails to meet the minimum requirement to safely and efficiently operate as a 24/7 Regional Waste Management Facility. To this end the following is a minimum acceptable level of management and manpower expected:

#### **1. Site Manager:**

- a. A Site Manger should have a minimum 10 years' experience in managing a waste management facility
- b. Minimum undergraduate degree in waste management processing and environmental management.
- c. PRINCE 2 or similar in project management.
- d. Full knowledge of international best practice laws and regulations surrounding waste management.
- e. Full knowledge and experience in the operation of incineration with a minimum daily throughput of 50 tonnes backed by vocational certification.
- f. WtE with a minimum output of 0.5Mw backed by vocational certification.
- g. Landfill construction; operation and remediation backed by vocational certification.
- h. Acceptance; processing and recycling of waste utilizing automated and semi-automated systems backed by vocational certification.
- i. Leachate management and remediation backed by vocational certification.
- j. Experience in the operation of RO plants backed by vocational certification.
- k. Logistics planning.
- l. Experience in managing a multi-cultural workforce.
- m. Excellent communicator both orally and written.
- n. Excellent man management skills.
- o. Experience in managing client expectations and ability to communicate to top tier clients.
- p. Understanding of contract management.
- q. Excellent computer literacy

#### **2. Assistant Site Manager:**

- a. A Site Manger should have a minimum 5 years' experience in managing a waste management facility
- b. Minimum undergraduate degree in waste management processing and environmental management.

- c. Full knowledge of international best practice laws and regulations surrounding waste management.
  - d. Full knowledge and experience in the operation of incineration with a minimum daily throughput of 50 tonnes backed by vocational certification.
  - e. WtE with a minimum output of 0.5Mw backed by vocational certification.
  - f. Landfill construction; operation and remediation backed by vocational certification.
  - g. Acceptance; processing and recycling of waste utilizing automated and semi-automated systems backed by vocational certification.
  - h. Leachate management and remediation backed by vocational certification.
  - i. Experience in the operation of RO plants backed by vocational certification.
  - j. Logistics planning.
  - k. Experience in managing a multi-cultural workforce.
  - l. Excellent communicator both orally and written in English.
  - m. Excellent man management skills.
  - n. Experience in managing client expectations and ability to communicate to top tier clients.
  - o. Understanding of contract management.
  - p. Excellent computer literacy
- 3. Health and Safety specialist x 2:**
- a. NEBOSH qualified, IOSH qualifications acceptable with experience in related field.
  - b. Environmental management qualification.
  - c. 5 Years industry experience.
  - d. Ability to undertake RISK assessments; SOP review; Safe Systems of Work.
  - e. Fire RISK assessments and monitoring.
  - f. First aid monitoring experience.
  - g. Accident reporting and investigation experience.
  - h. Experience in raising and approval of permits to work i.e., confined spaces/work at height.
  - i. Experience in raising and delivering tool box talks.
  - j. Identify and provide Health and Safety trainings.
  - k. Experience in managing a multi-cultural workforce.
  - l. Excellent communicator both orally and written in English.
  - m. Excellent man management skills.
  - n. Excellent computer literacy.
- 4. Warehousing/Document Controllers x2:**
- a. Relevant NVQ in warehousing and storage control.
  - b. Relevant NVQ in document control.
  - c. Experienced in the management, control and monitoring of spares; parts; fuel; food and water.
  - d. Experienced in the management and monitoring of all required documents securely and routinely.
  - e. Previous experience on large camp-based projects desirable.
  - f. Experience in managing a multi-cultural workforce.
  - g. Excellent communicator both orally and written in English.

- h. Excellent man management skills.
  - i. Excellent computer literacy.
- 5. Chief Site Engineer x2:**
- a. HNC/HND or equivalent in industrial and mechanical engineering.
  - b. 5 years' industry related experience in all aspects of maintenance control and monitoring.
  - c. Experienced in troubleshooting and solving maintenance issues across a broad spectrum of industry related equipment.
  - d. Experience in working in a multi-cultural workforce.
  - e. Excellent communicator both orally and written in English.
  - f. Excellent man management skills.
  - g. Excellent computer literacy.
- 6. Process/Mechanical Engineer x2:**
- a. HNC/HND or equivalent in industrial and mechanical engineering.
  - b. 5 years' industry related experience.
  - c. Experience in working in a multi-cultural workforce.
  - d. Excellent communicator both orally and written in English.
  - e. Excellent computer literacy.
- 7. Electrical mechanical Engineers x 4:**
- a. HNC/HND or equivalent in industrial and mechanical engineering and power generation.
  - b. 5 years' industry related experience.
  - c. Experience in working in a multi-cultural workforce.
  - d. Excellent communicator both orally and written in English.
  - e. Excellent computer literacy.
- 8. Instrumentation and Control Engineer x2:**
- a. HNC/HND or equivalent in industrial and mechanical engineering.
  - b. 5 years' industry related experience.
  - c. Qualified in Siemens Programmable Logic Control (PLC) systems to be able to identify and reprogramme PLC's.
  - d. Experience in working in a multi-cultural workforce.
  - e. Excellent communicator both orally and written in English.
  - f. Excellent computer literacy.
- 9. Hydraulic Engineer x2:**
- a. HNC/HND or equivalent in industrial and mechanical engineering.
  - b. 5 years' industry related experience.
  - c. Experience in working in a multi-cultural workforce.
  - d. Excellent communicator both orally and written in English.
  - e. Excellent computer literacy.
- 10. Incinerator/WtE Engineers x 8:**
- a. HNC/HND or equivalent in industrial and mechanical engineering.
  - b. 5 years' industry related experience.
  - c. Experience in working in a multi-cultural workforce.
  - d. Excellent communicator both orally and written in English.
  - e. Excellent computer literacy.

11. **Vehicle; Heavy Equipment mechanics x 6:**
  - a. HNC/HND or equivalent in industrial and mechanical engineering.
  - b. 5 years' industry related experience.
  - c. Experience in working in a multi-cultural workforce.
  - d. Excellent communicator both orally and written in English.
  - e. Excellent computer literacy.
12. **Heavy equipment operators x 8:**
  - a. Relevant licences and experience in:
    - i. Heavy Front Loader
    - ii. Back Hoe Loader
    - iii. Telehandler
    - iv. Tipper Truck
    - v. Fork Lift
13. **Supervisors x 4:**
  - a. Minimum 5 years' experience at Supervisory level on industrial related projects.
  - b. Relevant licences on operating heavy equipment desired.
  - c. Posses excellent man management skills.
  - d. Excellent communicator both orally and written in English.
  - e. Computer literate.
14. **Laborers x 30:**
  - a. Must be physically fit.
  - b. Ability to be trained to operate baling; sorting and shredding equipment.
  - c. Good literacy skills.
  - d. Able to work in a team environment and under pressure.
15. **Security x 4:**
  - a. Must be physically fit.
  - b. Good literacy skills.
  - c. Able to work in a team environment and under pressure.
16. **Canteen/Kitchen Head Cook:**
  - a. Minimum 5 years' experience in catering for large numbers.
  - b. Qualification in food hygiene; preparation and nutrition.
  - c. Ability to provide quality and varied diet on a budget.
  - d. Previous experience at hotel or camp level desirable.
17. **Canteen/Kitchen Assistants x 3:**
  - a. Minimum 2 years' experience in catering.
  - b. Qualification in food hygiene and preparation.
  - c. Previous experience at restaurant or camp level desirable.

Total required: 84 employees.

**Appendix 13 Letter from Dhuvaafaru Island Council**



بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ



දුරකථන මාර්ගගතව ප්‍රකාශිත නිවේදනයක්  
ප්‍රකාශනය  
ප්‍රකාශනය

Municipal Services

දුරකථන මාර්ගගතව

304-MS/438/2021/4 : ප්‍රකාශනය

දුරකථන මාර්ගගතව ප්‍රකාශිත නිවේදනයක්, ප්‍රකාශනයක් සම්බන්ධයෙන් ප්‍රකාශනයක් සම්බන්ධයෙන්  
ප්‍රකාශනයක් ප්‍රකාශනයක්.

ප්‍රකාශනයක් ප්‍රකාශනයක් (438-WMPC/304/2019/1) දී ප්‍රකාශනයක් ප්‍රකාශනයක්.

ප්‍රකාශනයක් ප්‍රකාශනයක් ප්‍රකාශනයක් ප්‍රකාශනයක් ප්‍රකාශනයක් ප්‍රකාශනයක්  
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01 දුරකථන මාර්ගගතව 1443

05 ප්‍රකාශනයක් 2021

ප්‍රකාශනයක්  
Hassan/Hakem



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Imagery ©2021 CNES / Airbus, Maxar Technologies, Map data ©2021 100 m

## **Appendix 14 Water Test results reports from MWSC**

**Male' Water & Sewerage Company Pvt Ltd**

**Water Quality Assurance Laboratory**

Quality Assurance Building, 1st Floor, Male' Hingun, Vilimale', Male' City, Maldives  
Tel: +9603323209, Fax: +9603324306, Email: wqa@mwsc.com.mv



**LB-TEST-090**

**WATER QUALITY TEST REPORT**

Report No: 500188881

**Customer Information:**

Land & Marine Environment Resources  
H.Azum  
Ameeneemagu  
Male' MALE

Report date: 31/10/2021

Test Requisition Form No: 900192867

Sample(s) Recieved Date: 26/10/2021

Date of Analysis: 26/10/2021 - 26/10/2021

Sample Description ~	Vandhoo GW1	Vandhoo GW2	Vandhoo GW3	TEST METHOD	UNIT
Sample Type ~	Ground Water	Ground Water	Ground Water		
Sample No	83223191	83223192	83223193		
Sampled Date ~	11/10/2021 09:00	11/10/2021 09:00	11/10/2021 09:00		
PARAMETER	ANALYSIS RESULT				
Physical Appearance	Opaque and brown	Opaque and brown	Clear with particles		
Conductivity *	446	428	987	Method 2510 B. (adapted from Standard methods for the examination of water and waste water, 23rd edition)	µS/cm
pH *	7.5	7.6	9.0	Method 4500-H+ B. (adapted from Standard methods for the examination of water and waste water, 23rd edition)	-
Salinity	0.21	0.21	0.49	Method 2520 B. (adapted from Standard methods for the examination of water and waste water, 23rd edition)	‰
Temperature	20.0	20.1	20.8	Electrometry	°C
Total Dissolved Solids	223	214	493	Electrometry	mg/L

**Keys:** µS/cm : Micro Seimen per Centimeter, ‰ : Parts Per Thousand, °C : Degree Celcius, mg/L : Milligram Per Liter

Checked by

Aminath Sofa  
Laboratory Executive

Approved by

Mohamed Eyman  
Quality Manager

**Notes:**

Sampling Authority: Sampling was not done by MWSC Laboratory.

This report shall not be reproduced except in full, without written approval of MWSC.

This test report is ONLY FOR THE SAMPLES TESTED.

~ Information provided by the customer. This information may affect the validity of the test results.

\*Parameters accredited by EIAC under ISO/IEC 17025:2017

\*\*\*\*\* END OF REPORT \*\*\*\*\*

## Appendix 15 List of Stakeholders Consulted

Institution	Name	Designation	Contact
WAMCO	Mohamed Shaan	Vandhoo Interim Manager	mohamed.shaan@wamco.com.mv
MECCT	Martyn Jones	International Operations Consultant at Vandhoo RWMF/ MCEP	7832870
	Aishath Rashfa	Assistant Director, Waste Management and Pollution Control Department	aishath.rashfa@environment.gov.mv
	Ahmed Anwar	Finance Officer, Small Scaled Waste to Energy Project	ahmed.anwar@environment.gov.mv
	Ahmed Saleem	Assistant Project Coordinator	9808189
	Mohamed Musthafa	Water and Sanitation Department	Director General
	Afsal Hussain		Director
MNDF	Ahmed Hassan	Warrant Officer 1	7795838
	Mohamed Ashraf	Staff Sergeant	7776098
Riyan Pvt Ltd	Aishath Ahmed	Vandhoo RWMF Firefighting system – Design Consultant	Aishath.ahmed@riyan.com.mv
	Janaka Gunatilake	Engineer	janaka@ems.lk
URA	Mohamed Shujuan Ibrahim		mohamed.shujuan@ura.gov.mv
	Yazeed Ahmed	Chief Executive	yazeed.ahmed@ura.gov.mv
Innamaadhoo Island Council	Imran	Council member	9122102
Rasmaadhoo Island Council	Mohamed Asif	President	658-0049
	Abdul Hameed Hassan	Vice President	

## Appendix 16 Alternatives proposed and respective mitigation measures

The following matrix provides a comparative assessment of the options considered for the road paving method and septic tank component, from environmental, social and economic perspective (Table 1).

**Table 1. Comparison of proposed option with alternatives considered for road paving method and septic tank component**

Project component	Options	Environmental aspects	Social aspects	Economic aspects
Road paving method	Asphalt paving (preferred option)	<ul style="list-style-type: none"> <li>• Environmentally friendly material</li> <li>• Require 20% less energy to produce and construct than other types</li> <li>• Better for water drainage</li> <li>• Do not leach</li> <li>• Increase in air temperature depends on colour of asphalt – light colored asphalt helps to mitigate this effect</li> </ul>	<ul style="list-style-type: none"> <li>• Long lasting and durable</li> <li>• Noise reduction</li> <li>• Can be completed faster</li> <li>• Damage preventable through maintenance and proper installation</li> <li>• Exposure to Asphalt fumes have certain detrimental effects on the workers (acute respiratory and eye irritation as well as skin irritations)</li> <li>• Can be repaired easily</li> </ul>	<ul style="list-style-type: none"> <li>• Capital cost high</li> </ul>
	Unpaved roads	<ul style="list-style-type: none"> <li>• Frequent usage, results in creation of potholes</li> <li>• Flooding would make roads difficult to use during these periods</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Least labour intensive method</li> <li>• Uneven roads</li> <li>• Difficult to use especially with heavy vehicles</li> <li>• Cause damage to vehicles, thus requiring frequent maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• Cheap method</li> <li>• Vehicle maintenance cost high</li> </ul>
	Paving using interlocking blocks	<ul style="list-style-type: none"> <li>• Uneven paving would result in uneven roads</li> <li>• Difficult to use especially with heavy machinery on site</li> </ul>	<ul style="list-style-type: none"> <li>• Do not require frequent maintenance</li> <li>• Takes long to complete</li> <li>• Labour intensive</li> </ul>	<ul style="list-style-type: none"> <li>• Less costly than asphalt paving</li> <li>• More costly than unpaved roads</li> </ul>

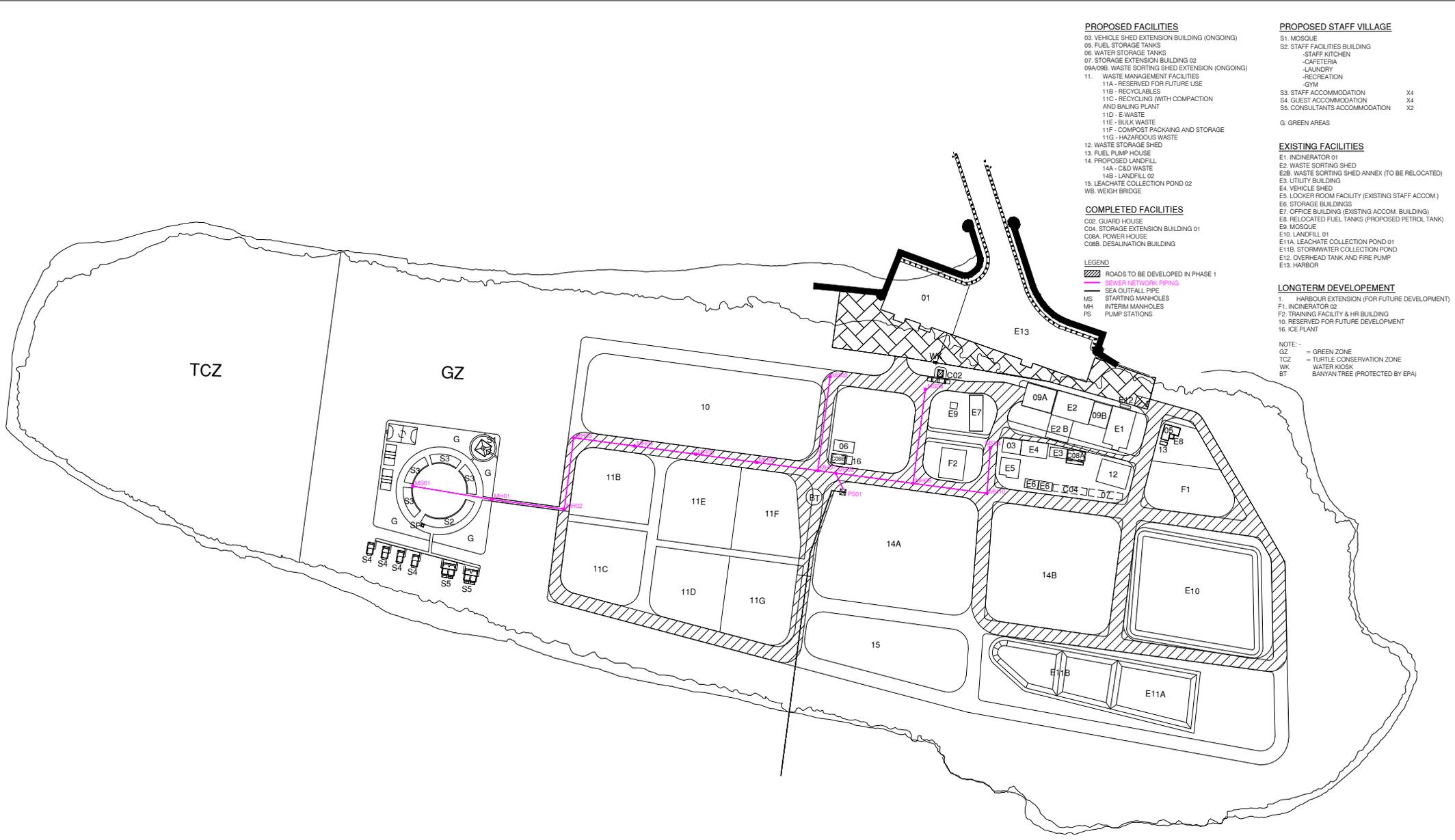
The following table provides impact mitigation measures proposed for the alternatives discussed for road clearance areas and method of paving

**Table 2. Mitigation measures proposed for the alternatives discussed**

<b>Component</b>	<b>Alternative</b>	<b>Mitigation measures proposed</b>
Road extension area	Proposed road network	<ul style="list-style-type: none"> <li>This option is not viable as the <i>Land Use Planning Regulation</i> states that the buffer area of 20m around the island should be left as the EPZ. Furthermore, in the <i>By-law on cutting down, uprooting, digging out and export of trees and palms from one island to another</i> it is stated that the coastal vegetation growing around the islands extending to about 15 meters into the island are protected by this bylaw</li> </ul>
	Alternate road network (selected)	<ul style="list-style-type: none"> <li>Mitigation measures for the process as reported in ESMP matrix given in this report (Chapter 9, Table 13)</li> </ul>
Road paving method	Asphalt paving (selected option)	<ul style="list-style-type: none"> <li>Mitigation measures for the process as reported in ESMP matrix given in this report (Chapter 9, Table 13)</li> </ul>
	Unpaved road	<ul style="list-style-type: none"> <li>Cleared road should be levelled and made even</li> <li>Regular maintenance of road to ensure evenness of the path without potholes etc.,</li> <li>Ensure setup of proper drainage to prevent flooding during heavy rain periods</li> <li>Regular and frequent maintenance of the heavy vehicles operated at the facility to minimize impact due to unpaved roads</li> </ul>
	Interlocking blocks	<ul style="list-style-type: none"> <li>Regular maintenance of road to ensure evenness of the path without loose blocks, potholes etc.,</li> </ul>
Septic tank setup	Proposed discharge of liquid effluent into the ground via soak way	<ul style="list-style-type: none"> <li>Regular monitoring of groundwater should be undertaken to check for leachates</li> <li>Emergency procedures should be pre-defined in case of leakage</li> </ul>
	Alternative: discharge of liquid effluent from septic tank via outfall pipeline laid to the reef edge (selected option)	<ul style="list-style-type: none"> <li>Mitigation measures for the process as reported in ESMP matrix given in this report (Chapter 9, Table 13)</li> </ul>

Septic tank component	Septic tank setup - remove the sludge and seep secondary level filtered liquid effluent into the ground via a soak way (proposed)	<ul style="list-style-type: none"> <li>• Minimal impact on environment due to size of operation</li> <li>• Impact on groundwater due to accidental seepage due to septic tank damage and malfunction</li> </ul>	<ul style="list-style-type: none"> <li>• Legislatively not feasible</li> <li>• Operational license will not be authorized</li> </ul>	<ul style="list-style-type: none"> <li>• Less costly</li> </ul>
	Discharge of liquid effluent from septic tank via outfall pipeline laid to the reef edge (preferred option)	<ul style="list-style-type: none"> <li>• Environmental impacts due to pipelaying work in the marine environment</li> <li>• Environmental impact due to release of effluent to marine environment – minor due to size of operation, primary treatment and good flushing at the site</li> <li>• Impact on groundwater due to accidental seepage due to septic tank damage and malfunction/ or from damage to sewerage network</li> </ul>	<ul style="list-style-type: none"> <li>• Legislatively accepted</li> <li>• Operation license approval</li> </ul>	<ul style="list-style-type: none"> <li>• Higher cost due to network and pipelaying work</li> </ul>

**Appendix 17 Schematic of sewerage network and pump station**



**PROPOSED FACILITIES**

- 03. VEHICLE SHED EXTENSION BUILDING (ONGOING)
- 05. FUEL STORAGE TANKS
- 06. WATER STORAGE TANKS
- 07. STORAGE EXTENSION BUILDING 02
- 09A/09B. WASTE SORTING SHED EXTENSION (ONGOING)
- 11. WASTE MANAGEMENT FACILITIES
  - 11A - RESERVED FOR FUTURE USE
  - 11B - RECYCLABLES
  - 11C - RECYCLING (WITH COMPACTION AND BALING PLANT)
  - 11D - E-WASTE
  - 11E - BULK WASTE
  - 11F - COMPOST PACKAGING AND STORAGE
  - 11G - HAZARDOUS WASTE
- 12. WASTE STORAGE SHED
- 13. FUEL PUMP HOUSE
- 14. PROPOSED LANDFILL
  - 14A - C&D WASTE
  - 14B - LANDFILL 02
- 15. LEACHATE COLLECTION POND 02
- WB. WEIGH BRIDGE

**COMPLETED FACILITIES**

- C02. GUARD HOUSE
- 004. STORAGE EXTENSION BUILDING 01
- 008A. POWER HOUSE
- 008B. DESALINATION BUILDING

**LEGEND**

- ROADS TO BE DEVELOPED IN PHASE 1
- SEWER NETWORK PIPING
- SEA OUTFALL PIPE
- STARTING MANHOLES
- INTERIM MANHOLES
- PUMP STATIONS

**PROPOSED STAFF VILLAGE**

- S1. MOSQUE
- S2. STAFF FACILITIES BUILDING
  - STAFF KITCHEN
  - CAFETERIA
  - LAUNDRY
  - RECREATION
  - GYM
- S3. STAFF ACCOMMODATION X4
- S4. GUEST ACCOMMODATION X4
- S5. CONSULTANTS ACCOMMODATION X2
- G. GREEN AREAS

**EXISTING FACILITIES**

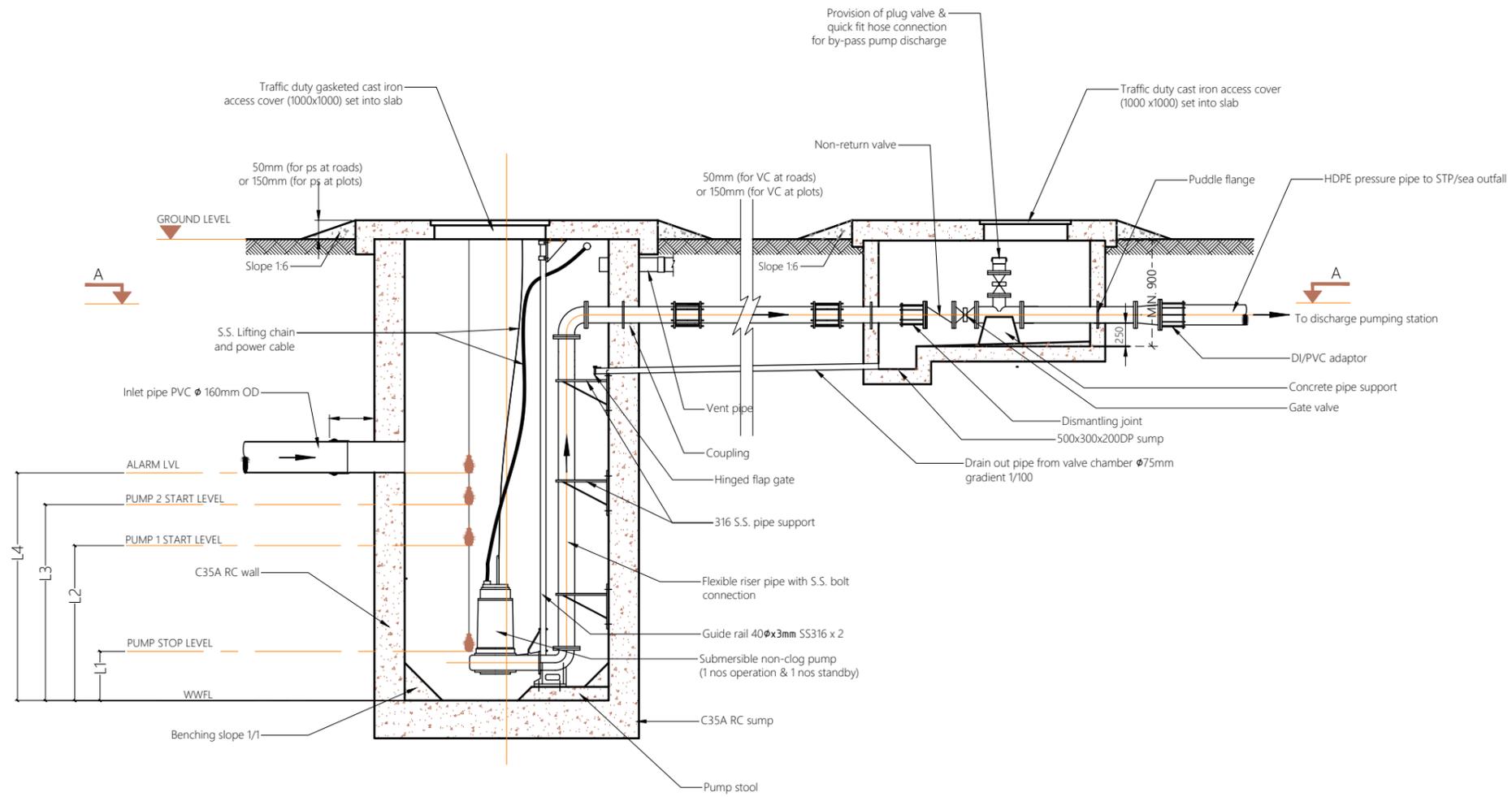
- E1. INCINERATOR 01
- E2. WASTE SORTING SHED
- E2B. WASTE SORTING SHED ANNEX (TO BE RELOCATED)
- E3. UTILITY BUILDING
- E4. VEHICLE SHED
- E5. LOCKER ROOM FACILITY (EXISTING STAFF ACCOM.)
- E6. STORAGE BUILDINGS
- E7. OFFICE BUILDING (EXISTING ACCOM. BUILDING)
- E8. RELOCATED FUEL TANKS (PROPOSED PETROL TANK)
- E9. MOSQUE
- E10. LANDFILL 01
- E11A. LEACHATE COLLECTION POND 01
- E11B. STORMWATER COLLECTION POND
- E12. OVERHEAD TANK AND FIRE PUMP
- E13. HARBOR

**LONGTERM DEVELOPMENT**

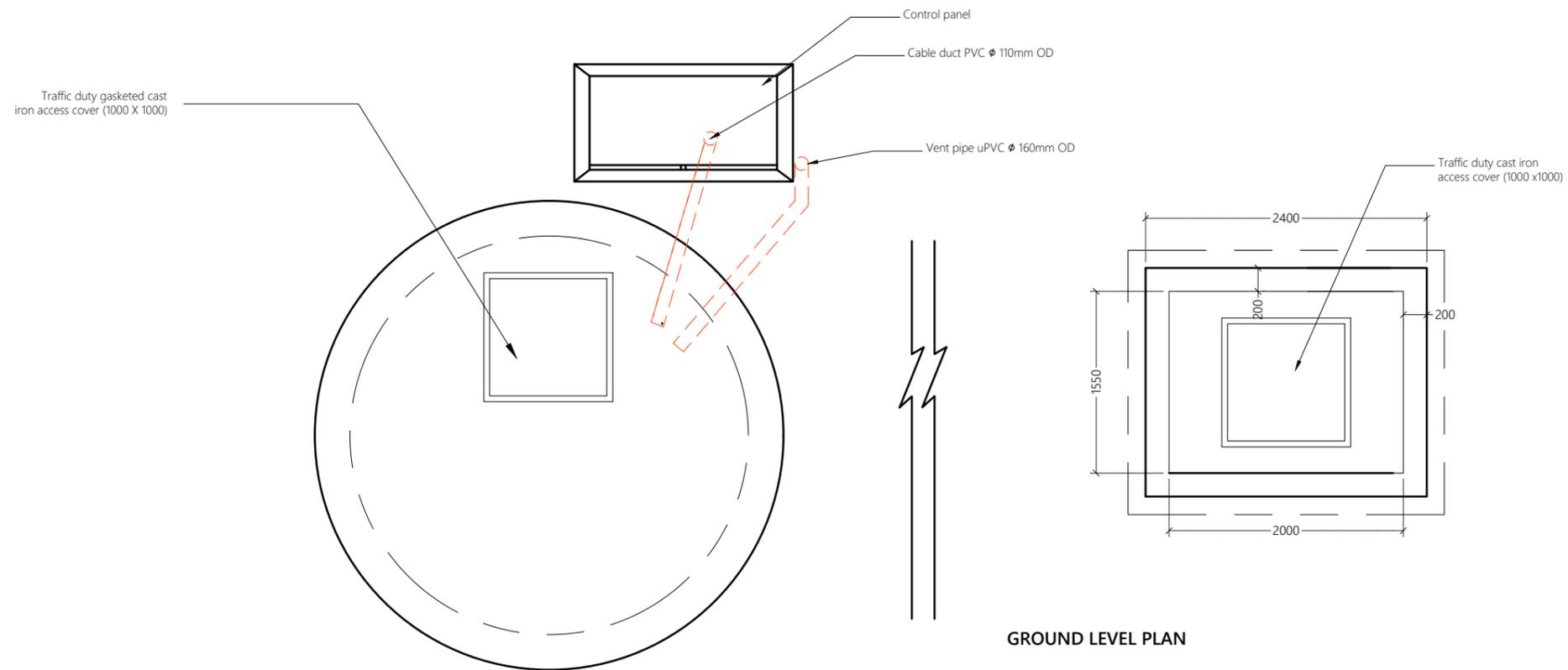
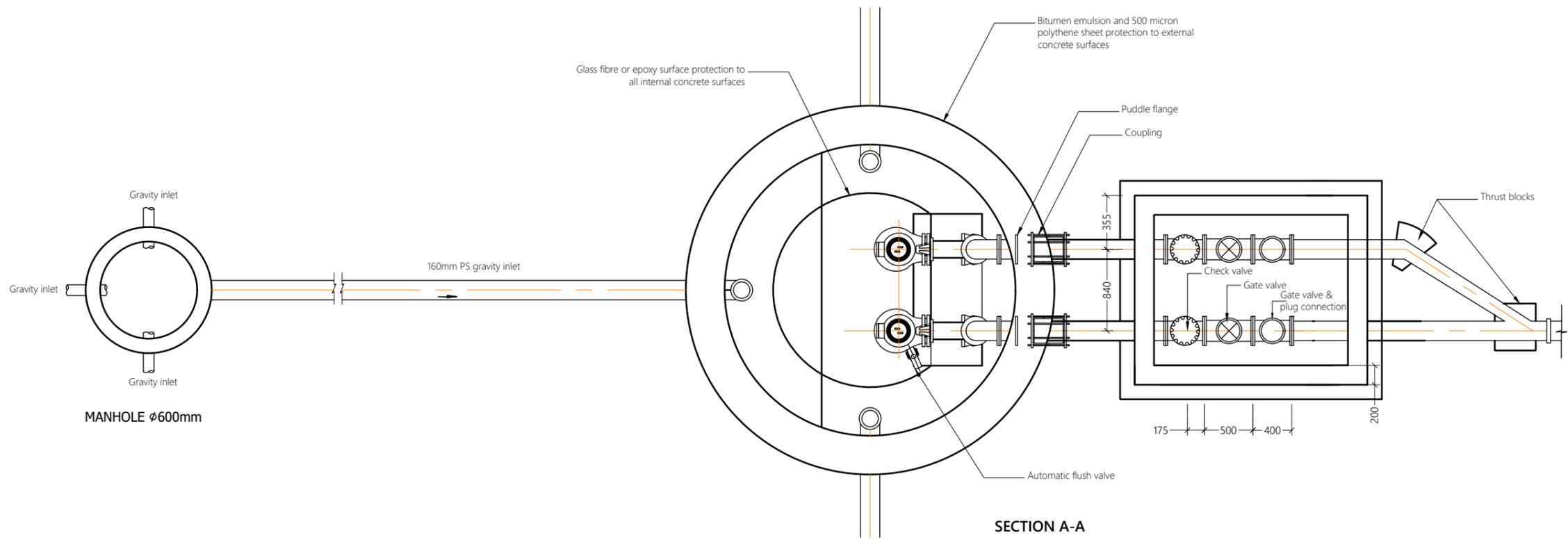
- 1. HARBOUR EXTENSION (FOR FUTURE DEVELOPMENT)
- F1. INCINERATOR 02
- F2. TRAINING FACILITY & HR BUILDING
- 10. RESERVED FOR FUTURE DEVELOPMENT
- 16. ICE PLANT

- NOTE:-
- GZ = GREEN ZONE
  - TCZ = TURTLE CONSERVATION ZONE
  - WK = WATER KIOSK
  - BT = BANYAN TREE (PROTECTED BY EPA)

<b>PREPARED BY</b>  MCEP MINISTRY OF ENVIROMENT, CLIMATE CHANGE AND TECHNOLOGY GREEN BUILDING, HANDHUVAREE HIGUN, MAAFANNU, MALE (20392), REPUBLIC OF MALDIVES, TEL: +960-3018431, +960-3018300, FAX: +960-328301	<b>PROJECT</b> REGIONAL WASTE MANAGEMENT FACILITY R.VANDHOO	<b>DESIGN BY</b> MA	<b>AMENDMENTS</b> REVISED AS PER EPA DECISION STATEMENT REVISED LOCATION OF WEIGHING BRIDGE	<b>NOTES</b> SEWERAGE NETWORK LAYOUT SHOWN IS AN INDICATIVE LAYOUT ONLY
	<b>TITLE</b> PRELIMINARY SEWERAGE NETWORK LAYOUT	<b>STRUCTURE BY</b>	PROPOSED LOCATION OF BOAT BUILDING YARD ADDED PROPOSED LOCATION OF ICE PLANT ADDED	DETAILED LEVELING SURVEY IS REQUIRED BEFORE DETAILED DESIGN CAN BE DONE
	<b>CLIENT DEPARTMENT</b> WMPC DEPARTMENT	<b>DRAWN BY</b> MA	FUEL TANKS RELOCATED COMPLETED BUILDINGS (OF PROPOSED BUILDINGS) LABELED SEPARATELY	
	<b>PAPER SIZE</b> A4	<b>SCALE</b> 1:4500	SEWER NETWORK CONNECTION TO PS ADDED	
	<b>PAGE NO.</b> 01	<b>DWG NO.</b> VANDMP-SW-A1-01(R2)		
		<b>DATE</b> 15.11.2021		



**PUMP STATION DETAILS - LONGITUDINAL SECTION**  
NTS



**PUMP STATION DETAILS - PLAN VIEW**

NTS

**Appendix 18 Translation of the ESMP**



				<p>- ארבעה סוגים של פירות יבשים          זיתים, תאנים, אגוזים, שקדים          ופירות יבשים אחרים</p>	
-	-	-	<p>- ארבעה סוגים של פירות יבשים          זיתים (המיוצגים בארבעה סוגים)          פירות יבשים אחרים (המיוצגים בארבעה סוגים)</p>	<p>- ארבעה סוגים של פירות יבשים          זיתים, תאנים, אגוזים, שקדים          ופירות יבשים אחרים</p> <p>- ארבעה סוגים של פירות יבשים          זיתים, תאנים, אגוזים, שקדים          ופירות יבשים אחרים</p> <p>- ארבעה סוגים של פירות יבשים          זיתים, תאנים, אגוזים, שקדים          ופירות יבשים אחרים</p>	<p>ארבעה סוגים של פירות יבשים          זיתים, תאנים, אגוזים, שקדים          ופירות יבשים אחרים</p>
-	-	-	<p>- ארבעה סוגים של פירות יבשים          זיתים (המיוצגים בארבעה סוגים)          פירות יבשים אחרים (המיוצגים בארבעה סוגים)</p>	<p>- ארבעה סוגים של פירות יבשים          זיתים, תאנים, אגוזים, שקדים          ופירות יבשים אחרים</p> <p>ארבעה סוגים של פירות יבשים          זיתים, תאנים, אגוזים, שקדים          ופירות יבשים אחרים</p> <p>ארבעה סוגים של פירות יבשים          זיתים, תאנים, אגוזים, שקדים          ופירות יבשים אחרים</p> <p>ארבעה סוגים של פירות יבשים          זיתים, תאנים, אגוזים, שקדים          ופירות יבשים אחרים</p>	<p>ארבעה סוגים של פירות יבשים          זיתים, תאנים, אגוזים, שקדים          ופירות יבשים אחרים</p>



				<p>○ <math>\frac{1}{x^2} = x^{-2}</math> <math>\frac{d}{dx} x^{-2} = -2x^{-3} = -\frac{2}{x^3}</math></p> <p><math>\frac{d}{dx} \frac{1}{x^2} = -\frac{2}{x^3}</math></p> <p><math>\frac{d}{dx} \frac{1}{x^3} = -\frac{3}{x^4}</math></p> <p><math>\frac{d}{dx} \frac{1}{x^4} = -\frac{4}{x^5}</math></p> <p><math>\frac{d}{dx} \frac{1}{x^5} = -\frac{5}{x^6}</math></p> <p><math>\frac{d}{dx} \frac{1}{x^6} = -\frac{6}{x^7}</math></p> <p><math>\frac{d}{dx} \frac{1}{x^7} = -\frac{7}{x^8}</math></p> <p><math>\frac{d}{dx} \frac{1}{x^8} = -\frac{8}{x^9}</math></p> <p><math>\frac{d}{dx} \frac{1}{x^9} = -\frac{9}{x^{10}}</math></p> <p><math>\frac{d}{dx} \frac{1}{x^{10}} = -\frac{10}{x^{11}}</math></p>	
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				<p>- דַּסְוֵהוּ נִהְיֶה אִם יִמְשָׁלוּ תְּרוּפָה דְּלִילֵי  דְּהִיבֵי 3 נִהְיֶה, אִתְּרֵי דְּוִיבֵי דְּמִילֵי אִתְּרֵי  אִילֵי זֶה דְּלִילֵי לִיבֵי הַיְּהוּדִים חֵטְאֵי הַיְּהוּדִים  - דַּסְוֵהוּ נִהְיֶה סְוֵהוּ אִתְּרֵי תְּרוּפָה  אִם יִמְשָׁלוּ יִבְעֵי רִבְיָאֵי אִתְּרֵי אִתְּרֵי תְּרוּפָה  רְחוּקֵי אִתְּרֵי הַיְּהוּדִים אִתְּרֵי אִתְּרֵי רִבְיָאֵי  אִתְּרֵי הַיְּהוּדִים</p> <p>- דַּסְוֵהוּ נִהְיֶה תְּרוּפָה אִתְּרֵי הַיְּהוּדִים  הַיְּהוּדִים תְּרוּפָה אִתְּרֵי הַיְּהוּדִים הַיְּהוּדִים  אִתְּרֵי הַיְּהוּדִים (תְּרוּפָה אִתְּרֵי הַיְּהוּדִים)</p> <p>- תְּרוּפָה אִתְּרֵי הַיְּהוּדִים אִתְּרֵי הַיְּהוּדִים  אִתְּרֵי הַיְּהוּדִים אִתְּרֵי הַיְּהוּדִים אִתְּרֵי הַיְּהוּדִים  אִתְּרֵי הַיְּהוּדִים אִתְּרֵי הַיְּהוּדִים אִתְּרֵי הַיְּהוּדִים  חֵטְאֵי רִבְיָאֵי אִתְּרֵי הַיְּהוּדִים</p> <p>- לִיבֵי תְּרוּפָה דַּסְוֵהוּ אִתְּרֵי הַיְּהוּדִים  סְוֵהוּ אִתְּרֵי הַיְּהוּדִים אִתְּרֵי הַיְּהוּדִים  נִהְיֶה תְּרוּפָה (אִתְּרֵי הַיְּהוּדִים 19 אִתְּרֵי  אִתְּרֵי הַיְּהוּדִים אִתְּרֵי הַיְּהוּדִים  אִתְּרֵי הַיְּהוּדִים)</p> <p>דְּלִילֵי הַיְּהוּדִים דַּסְוֵהוּ אִתְּרֵי הַיְּהוּדִים:</p> <p>- דַּסְוֵהוּ אִתְּרֵי הַיְּהוּדִים אִתְּרֵי הַיְּהוּדִים  דַּסְוֵהוּ אִתְּרֵי הַיְּהוּדִים אִתְּרֵי הַיְּהוּדִים</p>	
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<p>٤٤٤ ٤٤٤ ٤٤٤</p>	<p>٤٤٤ ٤٤٤ ٤٤٤</p>	<p>٤٤٤ ٤٤٤ ٤٤٤</p>	<p>٤٤٤ ٤٤٤ ٤٤٤</p>	<p>٤٤٤ ٤٤٤ ٤٤٤</p>	<p>٤٤٤ ٤٤٤ ٤٤٤</p>
<p>-</p>	<p>-</p>	<p>-</p>	<p>-</p>	<p>-</p>	<p>-</p>
<p>٤٤٤ ٤٤٤ ٤٤٤</p>					
<p>-</p>	<p>٤٤٤ ٤٤٤ ٤٤٤</p>	<p>٤٤٤ ٤٤٤ ٤٤٤</p>	<p>٤٤٤ ٤٤٤ ٤٤٤</p>	<p>٤٤٤ ٤٤٤ ٤٤٤</p>	<p>٤٤٤ ٤٤٤ ٤٤٤</p>







# **Appendix 19 Grievance Redress Mechanism formulated by PMU**



		the details of people consulted should be maintained.	
Second Tier: Ministry of Environment (ME)	Environmental and Social Safeguards Specialist at the Project Management Unit (PMU) will be the focal point.	<p>If the grievance cannot be resolved through Tier 1 to the satisfaction of the aggrieved party, or if the grievance was not resolved during the designed time period, the aggrieved party may submit a complaint at tier 2. Tier 2 complaints shall be submitted via the designated complaint form (provide in Annex 1) which should give information about how the issue was addressed at tier 1. The form should be submitted via email to <a href="mailto:mcep@environment.gov.mv">mcep@environment.gov.mv</a>.</p> <p>The contact details (phone and email) of the nodal person at tier 2 should be displayed in the project site board. The project board should provide the QR code or link for downloading the complaint form.</p> <p>PMU will screen the grievance and determine if its related to MCEP. If it is unrelated, the aggrieved party must be notified in writing and the way forward must be outlined to them including the necessary government institutions to follow up.</p> <p>PMU will discuss the matter with WAMCO, EPA and other relevant institutions, where deemed necessary and attains views of them. PMU will also arrange site visits and hold onsite discussions and meetings if necessary.</p> <p>The PMU will be responsible to ensure that there is no cost imposed on the aggrieved person, due to the grievance mechanism at the second tier.</p> <p>If the complaint is resolved within 15 working days, the decision must be communicated to the aggrieved party in writing.</p> <p>The aggrieved party must acknowledge the receipt of decision and submit their agreement or disagreement with the decision within 10 working days.</p> <p>If no acknowledgement is submitted from the aggrieved party, then the decision will be considered as accepted.</p>	15 working days

		<p>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 working days.</p> <p>If the grievance is not resolved to the satisfaction of the aggrieved party within 15 working days of submission of the grievance to tier 2 then the aggrieved party may notify the ME, in writing, of the intention to move to tier 3.</p>	
Third Tier: Judiciary Power / Assistance to Vulnerable Persons beyond the Project's Grievance Redress Mechanism	Judiciary system is an option for an aggrieved person and/or community in case that the other tiers have not been effective	<p>The legal system is accessible to all aggrieved persons.</p> <p>Assistance from the PMU of MCEP is available only for vulnerable person(s)* as per this grievance mechanism.</p> <p>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). The PMU must assist the vulnerable person(s) in getting this support from Attorney General's Office. PMU must also ensure that there is no cost imposed on the aggrieved person if the person belongs to the vulnerable groups. The list of vulnerable groups is as defined in the footnote but may be further defined by MEE.</p> <p>The verdict of the Courts will be final.</p>	As per established Judicial Procedure
<b>Operational Phase</b>			
First Tier: WAMCO	Call center staffs, supervisors and Vandhoo RWMF Management	<p>The main grievances related to island level collection and operation of the facility during operational phase will be addressed through WAMCOs official helpline.</p> <p>Grievances can be address informally through phone (by dialing to 1666) or formally via email (<a href="mailto:1666@wamco.com.mv">1666@wamco.com.mv</a>). All technical queries have to be addressed via email. The call center staff will provide appropriate guidance to the aggrieved party on how to submit technical queries.</p> <p>The call center staff will forward technical queries to the respective department within 24 hours of receiving the mail. The aggrieved party will also be</p>	As per the SOPS of WAMCO

		<p>notified of the receipt of the mail within 24 hours. The call center staff will regularly follow up with the department on the complaint and issue.</p> <p>Replies for non-technical queries will be drafted by the call center staff attending the matter and subsequently approved by the respective supervisor before being sent to the aggrieved party.</p> <p>Log records of all complaints will be maintained in the complaint's sheet of 1666 hotline.</p> <p>Further details of WAMCO's call center SOPs are provided in Annex 2.</p>	
Second Tier: EPA	Environmental Compliance and Assessment Department	<p>The aggrieved party can file a complaint to EPA, if grievances related to environmental compliance (issues such as waste spillage, stack emissions / air quality and turtle conservation), were not resolved to the satisfaction of the aggrieved party at tier 1.</p> <p>Grievances can be addressed either through EPA's hotline, Facebook page or in writing. Phone calls and messages received at the hotline will be logged into the online compliance system. If a complaint requires technical discussions, the subject issue will be immediately uploaded to the EPA viber group and discussed among relevant staffs. The rooted division or section will be referred in the online compliance system.</p> <p>Matters requiring assistance of environmental police will be discussed with them through their hotline.</p> <p>Senior staffs of EPA should be consulted when preparing written responses, where required.</p> <p>Further details of EPA's GRM system provided in Annex 3.</p>	As per SOP of EPA
Third Tier: Judiciary Power / Assistance to Vulnerable Persons beyond the	Judiciary system is an option for an aggrieved person and/or community in case that the other tiers have	<p>The legal system is accessible to all aggrieved persons.</p> <p>Assistance from the PMU of MCEP is available only for vulnerable person(s)* as per this grievance mechanism.</p>	As per established Judicial Procedure

Project's Grievance Redress Mechanism	not been effective	<p>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). The PMU must assist the vulnerable person(s) in getting this support from Attorney General's Office. PMU must also ensure that there is no cost imposed on the aggrieved person if the person belongs to the vulnerable groups. The list of vulnerable groups is as defined in the footnote but may be further defined by MEE.</p> <p>The verdict of the Courts will be final.</p>	
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\*Vulnerable person(s): A vulnerable person(s) for the purpose of this project is a person who is poor, physically or mentally disabled/handicapped, destitute, disadvantaged for ethnic or social reasons, an orphan, a widow, a person above sixty years of age, or a woman heading a household.

**Appendix 20 Evidence of report submission to Atoll Council**



محکمہ ماحولیات و آب و ہوا کے تحفظ اور ماحولیات کے تحفظ کے لیے

APPROVAL OF ENVIRONMENTAL IMPACT ASSESSMENT

Number: 203-ECA/438/2022/3 سہ ماہی

محکمہ ماحولیات و آب و ہوا کے تحفظ اور ماحولیات کے تحفظ کے لیے... (EIA P04/2007)

This Environmental Decision Statement is issued for the purpose of communicating the decision regarding the First addendum to the Environmental Impact Assessment for the Upgrading of Infrastructure at Regional Waste Management Facility Zone 2, Raa Vandhoo, which was submitted for evaluation on 22nd December 2021, Ministry of Environment, Climate Change and Technology. The EIA consultant of this project is Mr. Hussain Zahir (EIA P04/2007).

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

محکمہ ماحولیات و آب و ہوا کے تحفظ اور ماحولیات کے تحفظ کے لیے... (EIA P04/2007)

Handwritten signature

محکمہ ماحولیات و آب و ہوا کے تحفظ اور ماحولیات کے تحفظ کے لیے





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.

ދިވެހިސަރުކާރުގެ ނަމުގައި ހިމާރުކުމަށް ފަހު ނިންމާ ނުވާ ނަމަ ނިންމާ ނުވާ ސަބަބު ފާހަގަ ކުރުމަށް ބަޔާންކޮށް ދިވެހި ސަރުކާރުގެ ނަމުގައި ފޮނުވާ ލިޔެކިޔުން ހުށަހަޅާ ނެވެ.

- 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. ދިވެހި ސަރުކާރުގެ ނަމުގައި ހިމާރުކުމަށް ފަހު ނިންމާ ނުވާ ނަމަ ނިންމާ ނުވާ ސަބަބު ފާހަގަ ކުރުމަށް ބަޔާންކޮށް ދިވެހި ސަރުކާރުގެ ނަމުގައި ފޮނުވާ ލިޔެކިޔުން ހުށަހަޅާ ނެވެ. ނިންމާ ނުވާ ނަމަ ނިންމާ ނުވާ ސަބަބު ފާހަގަ ކުރުމަށް ބަޔާންކޮށް ދިވެހި ސަރުކާރުގެ ނަމުގައި ފޮނުވާ ލިޔެކިޔުން ހުށަހަޅާ ނެވެ.

( ހ ) ދިވެހި ސަރުކާރުގެ ނަމުގައި ހިމާރުކުމަށް ފަހު ނިންމާ ނުވާ ނަމަ ނިންމާ ނުވާ ސަބަބު ފާހަގަ ކުރުމަށް ބަޔާންކޮށް ދިވެހި ސަރުކާރުގެ ނަމުގައި ފޮނުވާ ލިޔެކިޔުން ހުށަހަޅާ ނެވެ.

( ށ ) ދިވެހި ސަރުކާރުގެ ނަމުގައި ހިމާރުކުމަށް ފަހު ނިންމާ ނުވާ ނަމަ ނިންމާ ނުވާ ސަބަބު ފާހަގަ ކުރުމަށް ބަޔާންކޮށް ދިވެހި ސަރުކާރުގެ ނަމުގައި ފޮނުވާ ލިޔެކިޔުން ހުށަހަޅާ ނެވެ.

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

iv. ދިވެހި ސަރުކާރުގެ ނަމުގައި ހިމާރުކުމަށް ފަހު ނިންމާ ނުވާ ނަމަ ނިންމާ ނުވާ ސަބަބު ފާހަގަ ކުރުމަށް ބަޔާންކޮށް ދިވެހި ސަރުކާރުގެ ނަމުގައި ފޮނުވާ ލިޔެކިޔުން ހުށަހަޅާ ނެވެ.

- 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

v. ދިވެހި ސަރުކާރުގެ ނަމުގައި ހިމާރުކުމަށް ފަހު ނިންމާ ނުވާ ނަމަ ނިންމާ ނުވާ ސަބަބު ފާހަގަ ކުރުމަށް ބަޔާންކޮށް ދިވެހި ސަރުކާރުގެ ނަމުގައި ފޮނުވާ ލިޔެކިޔުން ހުށަހަޅާ ނެވެ.





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. تاريخ انتهاء الصلاحية المذكور في بيان قرار القرار البيئي هو المدة الممنوحة لبدء أنشطة المشروع الموافق لهذا القرار البيئي.

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

x. بمجرد بدء أنشطة المشروع، يجب على المتقدم إعلام وكالة حماية البيئة، تاريخ بدء أنشطة المشروع.

<b>Date of Issue:</b> 12 <sup>th</sup> January 2022	تاريخ الإصدار: 12 من كانون الثاني 2022
<b>Date of expiry:</b> 12 <sup>th</sup> January 2023	تاريخ انتهاء الصلاحية: 12 من كانون الثاني 2023
<b>Name:</b> Mr. Ibrahim Naeem	الاسم: السيد إبراهيم نعيم
<b>Designation:</b> Director General	المنصب: مدير عام
<b>Signature:</b>	 

