Ministry of Fisheries and Agriculture

Environmental Impact Assessment

Development of Aquatic Animal Quarantine Facility at Ibrahim Nasir International Airport

Report Prepared by LaMer Pvt Ltd:

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Proponents Name:
Ministry of Fisheries and Agriculture

Signature:

July 2016

Land and Marine Environmental Resources Group Pvt Ltd, Maldives

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Consultants Declaration

I certify that to best of my knowledge the statements made in this Environmental Impact Assessment report for Development of Aquatic Animal Quarantine facility at Ibrahim Nasir International Airport, are true, complete and correct.

Name: Hussein Zahir

Consultant Registration Number: 04-07

Signature: 

Company Name: Land and Marine Environmental Resource Group Pvt Ltd

Date: 20th July 2016

Proponents Declaration and commitment letter

Re: Development of Aquatic Animal Quarantine facility at Ibrahim Nasir International Airport

As the proponent of the proposed project WE guarantee that WE have read the report and to the best of our knowledge all non-technical information provided here are accurate and complete. Also we hereby confirm our commitment to finance and implement all mitigation measures and the monitoring program as specified in the report.

Signature: 

Name: Shafiya Naeem

Designation: Aquatic Pathologist

Ministry of Fisheries and Agriculture

Date: 20th July 2016

1 Non-technical Summary

Background

The non-technical summary outlines the findings of the Environmental Impact Assessment of the proposed construction of a live aquatic animal quarantine facility at the Ibrahim Nasir International Airport. The proponent of the project is the Ministry of Fisheries and Agriculture.

The proposed project is a part of the institutional strengthening component of the Mariculture Enterprise Development Project (MEDeP) implemented by the Ministry. It involves construction and set up of the live aquatic animal quarantine facility, which is inclusive of a quarantine building and pump station. The seawater for the holding tanks will be sourced through a seawater well located at the lagoon area to the west of project site (back reef area of Hulhule reef), while wastewater discharge will be through pipeline laid from facility to the western reef (pipeline south of facility and run near quay wall of harbor southern side of Hulhule Island Hotel, close to the along-side berthing area for fuel tanker ships).

Key impacts, mitigation measures and alternatives

Impacts on the environment from various activities of the construction work and during the operation of the facility have been identified through interviews with the project management team, field data collection and surveys. The impacts identified are also described according to their location, extent and characteristics.

Impact analysis was done using the Leopold matrix. Impacts due to project were few and minimal, mainly with low effects. Impacts were mainly envisaged on seawater quality and marine environment, as well as vegetation (due to removal of coconut palms). Details of impact analysis are discussed in Section 9 of the report.

Detailed mitigation measures are discussed in Section 11 of the report. Given the minimal impacts, mitigation measures due to project are few. However, the formulation of contingency plans in case of equipment breakdown or incidence of other events such as fire and floods should be given a priority.

Due to the scope of the project and the means of implementation, an alternative scenario has also been given for the means of wastewater disposal. The ‘no project’ alternative is also considered. Although this would mean avoidance of environmental impacts, this option is not feasible due to the necessity of the project, especially if the mariculture sector was to expand.

Hence the project, with current designs and methods is considered feasible, and Consultant feels that appropriate mitigation measures have been given in the report.

1. ޚުލާސާ

ތައާރަފު

މި ޚުލާސާއިން ދައްކައިދެނީ ހުޅުލޭގައި (އިބްރާހިމް ނާސިރު އިންޓަރނޭޝަނަލް އެއަރޕޯޓް) ހެދުމަށް ހަމަޖެހިފައިވާ ތަރައިވް އެކުއަޓިކް އެނިމަލް ޓްރާންސްޕޯޓް ފެސިލިޓީ ހެދުމުގެ ކުރިން ތައްޔާރުކޮށްފައިވާ ތިމާވެއްޓަށް އަސަރު ފޯރާނެ މިންވަރު ބަޔާންކުރާ ރިޕޯޓުގެ ހޯދުންތަކުގެ ޚުލާސާއެކެވެ. މިއީ މިމަޝްރޫއުގެ އޮޕަރޭޓަރ މިނިސްޓްރީ އޮފް ޓްރާންސްޕޯޓް އެންޑް ސިވިލް އޭވިއޭޝަން އެވެ.

މިމަޝްރޫއު އަކީ މިނިސްޓްރީ އިން ތަންފީޒުކުރުމަށް ގެނެސް ފުރިހަމަކުރަމުން އެންޓަރޕްރައިޒް ޑިވެލޮޕްމަންޓް ޕްރޮޖެކްޓްގެ "އިންސްޓިޓިއުޝަނަލް ސްޓްރެންތެނިންގ" ބައިގެ ދަށުން ކުރިއަށް ގެންދާ މަޝްރޫއެކެވެ. މިމަޝްރޫއުގެ ދަށުން ހުދު ތަރައްޤީން ފެސިލިޓީގައި ތަރައްޤީން އިމާރާތްތައް އިތުރުން ޕޮންޓޫން ސްޕީޑްބޯޓް އަދި ދުވަހުގައި ޕާކިން ނުވަތަ ބަދަލުކުރާ ހިމެނެއެވެ. ޕްރޮޖެކްޓް ނިމުމަށް ބަޔަށް ބައެއްޗަމުން ހަމަޖެހިފައިވާ ހުޅުލޭގެ ހުޅަނގު ފަރާތު ފަރުމާކުރެވެ.

ތިމާވެއްޓަށް ކޮށްފާނެ އަސަރު، އަދި މިއަސަރު ކުޑަކުރުމަށް އެޅިދާނެ ފިޔަވަޅުތަކާއި ބަދަލުގައި ކުރެވިދާނެ ކަންތައް

މިމަޝްރޫއުގެ ސަބަބުން ތިމާވެއްޓަށް ކޮށްފާނެ އަސަރާއި ބެހޭގޮތުން މައުލޫމާތު ހޯދައިދިނީ މަޝްރޫއު ހިންގާ ފަރާތްތަކާއި ވާހަކަ ދެކެވިގެންނާއި، ފީލްޑް މަސައްކަތުން އެއްކުރެވުނު މައުލޫމާތުގެ މައްޗަށް ބިނާކުރެވިގެންނެވެ. މިގޮތުން ހޯދިފައިވާ އަސަރުތައްވަނީ އަސަރުކުރާ ސަރަހައްދު، އަސަރުގެ ކުޑަ/ބޮޑުމިން އަދި އެހެނިހެން ސިފަތަކުގެ މައްޗަށް ބިނާކުރެވިފައެވެ.

މިމަޝްރޫއުގެ ސަބަބުން ތިމާވެށްޓަށް އަސަރުކޮށް ކުރިއަށްވެދާނެ ގޮތްތަކާއި ބެހޭގޮތުން ހިސާބުކޮށްފައެވެ. މިމަޝްރޫއުގެ ސަބަބުން މައިގަނޑު ކުރާ އަސަރުތަކަކީ މަދު އަދި ކުރު އަސަރުތަކެއްކަމަށް ފާހަގަ ކުރެވެއެވެ. މައިގަނޑު ގޮތުގައި އަސަރު ކުރާނީ ކުރިޔާކަމުން ފެންނަނީ ދުވަހުގެ މަސައްކަތާއި ދެކޮޅަށް ހިނގާ ސަބަބުން ކުރާ އަސަރެވެ. މަޝްރޫއުގެ ސަބަބުން ކުރާ ހިތި އަސަރުތަކުގެ ތަފްސީލު މިރިޕޯޓުގެ ސެކްޝަން 9ގައި ބަޔާން ކުރެވިފައިވާނެއެވެ.

މަޝްރޫއުގެ ސަބަބުން ތިމާވެށްޓަށް އަސަރުކުރާ ކުޑަކުރުމަށް އެޅިދާނެ ފިޔަވަޅުތަކަށްވެސް މިރިޕޯޓުގެ ސެކްޝަން 11ގައި ބަޔާންކޮށްފައިވާނެއެވެ. އަސަރުތަކުގެ ކުޑަމިނުން މިއީ ވަރަށް މަދު ފިޔަވަޅުތަކެކެވެ. އެހެންނަމަވެސް ބޭނުގެ މަސައްކަތް ކުރުމުގެ ކުރިން ކޮންޓްރެކްޓަރސް ޕްރޮޕޯން ހެދުމުގެ މުހިއްމުކަމަށް އަލިއަޅުވާލާފައިވާނެއެވެ.

މިމަޝްރޫއުގައި މަސައްކަތް ކުރިއަށް ގެންދިއުމަށް ނުވިތަފާ ގޮތުގެ ބަދަލުގައި ކުރެވިދާނެ ކަންތައްތަކެއް މަޝްރޫއު ނުވިތަފާ ގޮތުގެ ސަބަބުން، މަދެވެ. މިގޮތުން ބަޔާންކޮށްފައިވާ ހަމައެކަނި ބޮންތަކުން ބޮޑުކުރުމަށް ފުން ބޮޑުކުރުމަން ނުވިތަފާ

ތިމާވެއްޓަށް ސަބަބުން މިމަޝްރޫޢުގެ ހިޔާރުކޮށްފިނަމަ މިގޮތުން އެއީއެއްގޮތެވެ. ނުގެންދިއުނުވެސް ކުރިއަށް މަޝްރޫޢު ގޮތަށެވެ. ނުފެނެއެވެ. ގޮތެއްކަމަކަށް އެކަށޭނަ މިއީ ދުރިއްދުކަމުން މަޝްރޫޢުގެ އެހެންނަމަވެސް ނުކުރާނެވެ. އަސަރުތަކެއް ކުރާނެ ރާވިފައިވާ މަޝްރޫޢު ބެލުމަށްފަހު އަސަރުތަކަށް ކުރާ ސަބަބުން މަޝްރޫގެ އަދި ބަލައި ގޮތަށް ރާވިފައިވާ މަޝްރޫޢު އެހެންކަމުން ފެނެއެވެ. ގެންދެވިދާނެކަމަށް ކުރިއަށް ގޮތަށް

2 Introduction

The proposed project involves the construction and establishment of an aquatic animal quarantine facility at the Ibrahim Nasir International Airport, by the Ministry of Fisheries and Agriculture (MoFA). The project is a part of the institutional strengthening component of the Mariculture Enterprise Development Project (MEDeP), which is a five year project commenced in 2013 and being implemented by MoFA, with financial and technical assistance from International Fund for Agricultural Development (IFAD). The main goal of MEDeP is to expand livelihood opportunities and reduce vulnerability, while the development objective is to enhance income and employment especially for youth and women from mariculture activities. MEDeP has two components; Institutional strengthening and mariculture value chain development, each of which has a number of sub-components. As prior mentioned, the construction of a national quarantine facility falls under the institutional strengthening component.

While as a general policy MoFA discourages the import of live aquatic animals for mariculture purposes, the establishment of a quarantine facility will allow better quarantine of such animals in instances where import of live aquatic animals becomes necessary for mariculture development. It is anticipated that in the near future, only the brood stock of the sea cucumber Sandfish (*Holothuria scabra*) will be imported and quarantined at the facility as this species is already being cultured in the country, and has been for a number of years. Given the potential for further investments in the culture of this species, the need for establishment of a quarantine facility is evidently clear.

The estimated cost of the proposed project is MRF 5 million.

2.1 Purpose of the report and need for the EIA

This document presents the findings of an Environmental Impact Assessment (EIA) for establishment of an aquatic animal quarantine facility at Ibrahim Nasir International Airport. Developers of such development projects are required to carry out EIA studies under the Environmental Act of Maldives. The developer is required to obtain approval of the Environmental Protection Agency (EPA), prior to the implementation of any development activities on the island.

Land and Marine Environmental Resource Group Pvt Ltd won the bid for the project to prepare the EIA and to provide assistance in other environmental related activities. This EIA

is prepared in accordance with Environmental Impact Assessment Regulations 2012 and the environmental policy and guidelines of the Government of Maldives.

3 Terms of Reference (ToR)

All development projects that have a socioeconomic environmental relevance and are listed in Appendix Raa of the EIA Regulations 2012 are required to submit an Environmental Impact Assessment report which forms the basis for project approval. As such, projects are required to follow a screening process identifying the environmental impacts associated with the project. Projects which are not listed in the above mentioned Schedule has to follow a screening process, based on which EPA decides whether the project requires the submission of an Initial Environment Evaluation report or an Environmental Monitoring report. Based on the findings of this report, EPA as the regulator makes a decision on whether the specified project further requires the submission of an EIA based on the impacts associated with the project.

In accordance with the regulations of Ministry of Environment and Energy, an EIA application form and project brief was sent stating the nature of the project and likely impacts associated with the environment. The scoping meeting was held at the Environmental Protection Agency (EPA) on the 26th of May 2016 with the project proponent, consultant and EPA officials. Based on the discussions at the meeting, draft TOR which had been submitted was finalized and approved by EPA on the same day (see Appendix 2).

4 Project Setting

The project conforms to the requirements of the Environmental Protection and Preservation Act of the Maldives, Law no. 4/93. The EIA has been undertaken in accordance with the EIA Regulation 2012 of the Maldives by a registered consultant. Furthermore, it adheres to the principles underlined in the regulations, action plans, programs and policies of the following Ministries of the Government of Maldives.

- Ministry of Environment and Energy (MEE)
- Ministry of Fisheries and Agriculture (MoFA)

These are discussed in detail in Table 1 below.

Table 1. Legislations pertaining to the project

Legislation	How does current project conform to legislation
Environmental Protection and Preservation Act (Law 4/93)	EIA undertaken as stipulated in the Act, which states that any developmental project which has a potential impact on the environment should have an EIA done prior to commencement of the project. List of such projects are given in the EIA Regulations 2012
Third National Environment Action Plan (2009 – 2013) (NEAP III)	The plan sets out the agenda for environmental planning and management for the period of 2009 – 2013. One of the targeted goals of the plan is to strengthen the EIA process. By undertaking the EIA prior to the project, the project ensures that environmental impacts due to the project are minimized.
National Biodiversity Strategy and Action Plan (NBSAP)	The objective of NBSAP was to *"achieve biodiversity conservation and sustainable utilization of biological resources in the Maldives"* by integration of biodiversity conservation into all areas of national planning, policy development and administration (MHAHE, 2002). To achieve this objective, one of the first actions listed is "formulation and adoption of suitable development planning procedures, land use plans and strengthening of the EIA process". The current project conforms to this policy, by carrying out the EIA prior to commencement of the project, so as to minimize impact on the environment and to incorporate ways of environmental monitoring and management during the project works.
Regulation on import of live animals	The Regulation on import of live animals was formulated to establish measures and a quarantine system which should be followed when importing live animals. The Regulation defines measures which should be followed when importing live animals such as: • The presence of a veterinary certificate • Health standards of animals being imported

	• Animals of which import is prohibited • Quarantine measures if necessary The regulation has specific clauses for animals such as cattle, birds, cats. In addition, the regulation also specifies guidelines which should be met by the carrier vessels of these animals
By-law on cutting down, uprooting, digging out and export of trees and palms from one island to another	The bylaw states that the cuttings down, uprooting, digging out and export of trees and palms from one island to another can only be done if it is absolutely necessary and there is no other alternative. It further states that for every tree or palm removed in the Maldives two or more should be planted and grown in the island. The bylaw prohibits the removal of the following tree types; • The coastal vegetation growing around the islands extending to about 15 meters into the island are protected by this bylaw; • All the trees and palms growing in mangrove and wetlands spreading to 15 meters of land area are protected under this bylaw; • All the trees that are in a designated protected area; • Trees that are being protected by the Government in order to protect species of animal/organisms that live in such trees; • Trees/palms that are unusual in structure The coconut palms located at the plot will be transplanted elsewhere on the island by Maldives Airports Company Ltd.
Dewatering Regulation (2013/R-1697) – 31st January 2014	The Dewatering Regulation has been formulated to introduce measures so as to minimize impact on the environment and ecosystem due to dewatering which may be carried out as part of construction works or during other works. Any development which requires dewatering as part of the project, can only implement the dewatering phase after obtaining the required approval from the Environmental Protection Agency, which is the implementing agency for the regulation. The regulation does not apply to dewatering which may be required for the installation/cleaning of a groundwater well for personal use or use of groundwater for agricultural purposes. Prior to carrying out dewatering the proponent of such projects have to submit an application form to EPA with required documents which are detailed in the regulation and application form. It is also the responsibility of the proponent to inform the relevant councils, if there are residential areas or agricultural lands within 100m radius of the site where dewatering will be carried out. The regulation further details what should be done with the water extracted during dewatering, and what actions should

	be taken if dewatering impact resource users within 30m radius of the site. The regulation further specifies fines which will be applicable if the regulation is not followed. The proposed project will conform to the regulation, by first submitting an application to carry out dewatering within the project site. The proponent will also carry out all the additional measures necessary to obtain the approval for EPA and to abide by the regulation.
Waste Management Regulation (R-58/2013)	This Regulation was gazetted on the 5th of August 2013 and came into effect 6 months from the date, on 5th of February 2014. The main objective of this regulation is to implement the national policy on waste management. Article 8 of the regulation addresses management of hazardous waste, where Section Raa specifies that transport of hazardous waste from one location to another should be in a manner where the waste is packed in tightly sealed containers so as to prevent leakage. The Article further specifies that hazardous waste should not be dumped or burnt under any circumstance. Hazardous waste has to be separated and stored separately in a manner which ensures no leakage of waste. As per the regulation, hazardous waste generated during the project will be collected and stored separately and as per the regulation. Transportation will also be as per the Regulation. Waste from site will be managed by MACL commercial department as a commercial contract for waste collection and disposal (system already in place for all operators on Airport land).
Waste Incineration Guideline (2016)	The Waste Incineration Guideline prepared by EPA is intended to facilitate the construction and operation of waste incinerators safely and to mitigate the adverse environmental and health impacts that may arise. This guideline should be considered as minimum requirement applicable to all facilities.

5 Project Description

5.1 Project Proponent

The proponent of the proposed project is the Ministry of Fisheries and Agriculture.

5.2 The Project

The proposed project involves the construction and establishment of a live aquatic animal quarantine facility at the Ibrahim Nasir International Airport, for the instance whereby live animals to be used as brood stock for mariculture purposes need to be imported.

The quarantine facility is proposed to be a two-storey building, located next to the existing Terrestrial plant and animal quarantine facility located on the eastern side of Hulhule. The facility consists of a quarantine building, pump station that supplies sea water to the quarantine building and a Pathology laboratory (which is proposed to be housed in the existing quarantine facility). The site plan and structural designs are shown in Appendix 3 and 4 (respectively) of the report.

5.2.1 General building layout

The quarantine building of the facility is a two-storey building. The ground floor has the Seawater intake tank as well as the waste seawater discharge tank and the changing rooms. Six fiberglass tanks are also located on the ground floor, with additional 6 tanks being located on the first floor of the building. The first floor also has the storage area.

The pump station is located within the plot allocated for the quarantine facility. Seawater taken from the seawater well located in the lagoon area is supplied to the pump station, which then supplies this seawater to the quarantine building.

Aquatic animals are held in 5 ton fiberglass tanks with filtered and disinfected static seawater. The tanks are aerated. Within 24 hours 100% water in the tanks is renewed.

The seawater intake and discharge system includes the following components:

- Pump station
- Seawater well (close to reef edge)
- Seawater pit in the pump station
- Fresh seawater intake pipeline (between well and pit)

- Fresh seawater pumping pipeline (between pump and seawater collection tank in the quarantine building)
- Fresh and waste seawater collection tanks in the quarantine building
- Fresh and waste seawater filtration and disinfection mechanisms
- Waste seawater discharge pipeline (between waste seawater collection tank and sea)

Sand-filtered seawater from the reef-edge well is first collected in the pit in the pump station, from where it is pumped into the seawater collection tank in the quarantine building. At this collection tank, the water is sand-filtered, cartridge-filtered and UV-disinfected and sent to the holding tanks, where the animals to be quarantined are held. The waste water coming from the holding tanks is collected in waste seawater collection tank in the quarantine building, from where the water is sand-filtered, cartridge-filtered and UV-disinfected and sent to the sea. The wastewater discharge location is western reef southern side of Hulhule Island Hotel (pipeline run near southern side harbor quay wall and run on to western reef edge).

5.2.2 **Quarantine Facility Operational process**

The current focus of mariculture is on the Sandfish, *Holothuria scabra* which although not a native species, has been cultured in the Maldives for a number of years. Given that it is the brood stock of this species which is anticipated to be imported into the country in the near future, the current Standard Operating Procedure (SOP) for the Quarantine facility has been developed for quarantine of this species. The draft SOP provided by the Ministry of Fisheries and Agriculture is given in Appendix 5. The report summarizes key areas of the SOP and refers readers to Appendix 5 for the detailed SOP.

As identified in the SOP, “the purpose of this Sandfish quarantine SOP is to run the Sandfish quarantine facility smoothly according to predefined standards and procedures to minimize negative impacts of sandfish importation” (Ministry of Fisheries and Agriculture, 2016). Operation of the Quarantine facility and implementation of the SOP is under the mariculture development policy of MoFA. Quarantine of aquatic animals is currently carried out under the Regulation on import of live animals of MoFA.

The SOP identifies the personnel responsible for the operation of the facility, namely Head of the Quarantine facility, Quarantine Officers and an Administrator. It also details required qualifications of these personnel as well as their responsibilities.

Section 5 of the SOP details operation procedures for the following processes at the quarantine facility:

a) Getting in and out of the quarantine facility
b) Maintaining the facility when no animals are under quarantine
c) Getting documentation ready to receive a batch of quarantine animals
d) Facility cleaning and disinfection for receiving a batch of quarantine animals
e) Tank preparation
f) Water Intake, storage, filtration, disinfection and pumping into holding tanks
g) Waste water collection, filtration, disinfection and discharge into the Sea
h) Water quality management
i) Animal health observation and assessment
j) Dead animal disposal
k) Packing material Disposal
l) Facility cleaning and disinfection after quarantining a of batch animals
m) Health and safety

Each of the above process is described and explained in Section 5. For each processes, where relevant, the following information is also supplied:

n) Equipment and Materials
o) Records and Checklists
p) Health and Safety
q) Cautions and Interferences

Details of all the processes will not be discussed in the EIA report. Readers are referred to the Draft SOP given in Appendix 5 for these details. However, as TOR specifies to provide details of disposal of dead animals, this is given below as provided in the SOP.

a) Get authorization of HOCF for removing the dead bodies for disposal or laboratory examination
b) If the decision was to dispose the dead bodies:
    - Sterilize the dead bodies in autoclave
    - After sterilization incinerate the dead bodies

This is the first SOP for the quarantine facility and is living document which will be revised and improved based on knowledge and experience gained through operation of the facility.

5.3 Need for the Project

Mariculture is gaining increasing importance in the Maldivian fisheries sector and as a business venture. While the general policy of the Ministry of Fisheries and Agriculture is to discourage import of live aquatic animals to be used as brood stock for such ventures, it has to be prepared for such instances where this is necessary. As per current scenario, the Sandfish, *Holothuria scabra* is cultured in the Maldives and while not a local species, the culture has been carried out for a number of years. It is anticipated that additional companies will invest in this business and thus the import of brood stock of this species will then be necessary. Therefore, the need for a quarantine facility is clear, to allow better monitoring of health of live aquatic animals which will be imported into the country.

5.4 Location and Extent of Site Boundaries

The quarantine facility is proposed to be constructed adjacent to the existing Terrestrial plant and animal quarantine facility located on the western side of Hulhule close to Hulhule Island Hotel (Figure 1 and Appendix 3: Site plan).

Figure 1. Location of project site at Hulhule (red boundary) (Imaged sourced from Google Earth)

5.5 Project management

5.5.1 Construction phase and schedule for implementation

The project duration for the construction and establishment of the live aquatic animal quarantine facility at Hulhule is expected to be completed in 5 months. Listed below are the construction phases and detailed work schedule (Table 2).

Table 2. Work schedule for construction of quarantine facility

Activity	2016				
	July	Aug	Sep	Oct	Nov
Hiring contractor					
Sit preparation					

Foundation, and underground concrete tanks					
Concrete structure: ground, fist and floors					
Masonry and plastering					
Fiberglass tank installation					
Seawater intake system: pump room, pumps, filtration, disinfection, and pipelines					
Seawater discharge system: pumps, filtration, disinfection, and pipelines					
Aeration system: air blowers and pipelines					
Operationalization					

5.5.2 Workforce requirements, availability and logistics

Contractor for the project has not been identified as yet. Hence, details of the workforce and logistics is assumed to be similar to other construction projects of this scale. It is estimated that a workforce of 20 to 30 workers will be required for the project. Given that the project is at Hulhule, no temporary facilities will be constructed for the accommodation, as workers are expected to travel between Hulhule and Male' on a daily basis.

5.6 Major Inputs and Outputs

5.6.1 Inputs (description of the project in terms of raw materials, processes, equipment and work force)

5.6.1.1 Access to site, mobilization and material unloading

Construction material such as cement, aggregate, sand and other materials will be brought to the island on barges and heavy cargo *dhonis*. Materials will be brought to the harbor area in front of Hulhule Island Hotel (closest to the project site) and unloaded at the harbor front. These will then be transported to the project site and stored on site in warehouses (or open air).

5.6.1.2 Land clearance

The existing vegetation at the site it is composed of very few Coconut palms (4 palms). These coconut palms will be transplanted elsewhere at Hulhule by the staff of the airport.

5.6.1.3 Construction work

Construction Material

Construction materials and machinery are shown in Table 3.

Table 3. Inputs to the project in terms of materials and machinery

	Input resource(s)	Source/Type	How to obtain resources
Construction Phase	20-30 workers	Foreign workers/local	Contractor staff
	Construction material	**Masonry works:** Construction blocks, river sand, cement	Purchased locally/ imported
		Roofing: Timber; wooden shingle for roof, prefabricated materials	
		Electrical: electrical cables and wires, DBs, MMCBs and MCBs, PVC pipes, light weight, PVC conduits, fittings for sewerage pipe connections	
		Finishing: floor and wall tiles, gypsum boards, zinc coated corrugated metal roof, paint, varnish, lacquer, thinner, dry walls etc.	
	Fresh water	Desalinated water	Use existing water supply at Hulhule'
	Electrical energy		Use existing power supply at Hulhumale'.
	Machinery and equipment	• Excavator • Loader • Tower crane • Concrete mixer • Concrete delivery pump • Material hoist • Truck crane • Dump truck	Contractor for construction work (machinery)
Operational phase	Fresh water and waste water	Desalinated water	MACL gird– connect to existing water supply and sewerage network
	Seawater	Seawater well in lagoon (for use in holding tanks)	Sourced from lagoon and transported to pump station through pipeline
	Electrical energy		MACL gird– connect to existing power grid
	Firefighting equipment	• Fire alarm system (smoke detectors) • Portable Fire Extinguishers • Hose reel system • Fire hydrant system • Fire blanket	All mainly imported from China
	Quarantine facility waste sea water disposal	Waste seawater pumped to western reef edge	Through pipeline laid to the western reef close to along-side berthing area for fuel tanker ships

Construction methodology

Seawater pump station and main building

- Foundation work and dewatering

The foundation systems of both the quarantine building and seawater pump station building is pad footing with tie beams.

The seawater pump station is a single storey building with foundation level at 0.8m. However the seawater collection tank within the pump station is partially sunk into the ground with the bottom slab of the tank at 3.6m below ground level. Hence dewatering would be required for this work and water extracted will be disposed off at nearby area, possibly within project site.

The main building or quarantine building is a two storey building with foundation proposed at a depth of 1.55m. Hence dewatering will be required and extracted water will again be disposed off at nearby areas.

Excavation will be undertaken using a combination of mechanical and hand excavation with the use of an excavator and dump truck. Excavated material will be reused for filling after foundation works are completed and any remaining will be disposed at MACL designated location at Hulhule.

- Main structure and masonry work

Masonry works will be done using construction blocks caste at site and locally purchased. Plastering will be done using river sand and cement.

Seawater well (seawater intake)

The seawater well is situated in the back reef area just off the Hulhule Island Hotel service harbor (western side). The well has a width of 1.8m with wall thickness of 150mm. The base of the well is located about 0.6m below seabed, while the top of the well is above sea level. The well will be constructed on land at the project site and installed at the given location in the lagoon.

Utility services during construction phase

Power and water requirement for the construction stage of the project will be met by existing power and water network.

Utility services during operational phase

Power and water requirement during the operational phase will also be sourced through connection to the existing networks for both utilities.

Waste management during construction phase

All construction related waste will be collected and transported to Thilafushi for proper disposal.

Waste management and disposal during operational phase

Solid waste generated during the operational phase (excluding dead/diseased animals or harmful waste) will be collected at a designated area and transported to Thilafushi for proper disposal. Harmful/toxic waste to be disposed will also be transported to Thilafushi, as per EPA guidelines.

Dead/diseased animals which are sent for disposal will be incinerated, after sterilization in the autoclave. Incineration will be undertaken using the existing incinerator installed at the Plant and Animal quarantine facility (adjacent to the proposed live aquatic animal quarantine facility).

Wastewater management and disposal mechanism for operational phase

The waste water coming from the holding tanks is collected in waste seawater collection tank in the quarantine building, from where the water is sand-filtered, cartridge-filtered and UV-disinfected and sent to the sea. The wastewater discharge location is within the harbor basin to the west of the facility.

Contingency plans

Contingency plans has not been developed as yet, though the proponent has said that these will be prepared prior to operation of the facility. These plans will address following issues:

- Incidence of fires
- Incidence of floods – follow disinfection procedures and drainage of water into the treatment reservoir prior to disposal
- Breakdown of equipment – installation of essential backup equipment

5.6.1.4 Emergency plan in the incidence of spills and safety

First aid kits will be available on site. In the event of minor injuries, where possible, first aid kit will be used. In the event of major injuries, workers will be taken to the Hospital at Hulhumale' or Male' if necessary.

All workers will be provided with sufficient work safety equipment, while contractor is responsible to ensure that all safety equipment are provided and are in good condition.

Fuel and hazardous material will be stored on land at the project site. Fuel will be stored in barrels; therefore spills are expected to be minor or insignificant. Furthermore the fuel and other hazardous material storage area will be plastered with anti-seep chemical (water proofing chemical).

5.6.1.5 Project management

Project management for the quarantine facility construction works will be handled by Project Implementation Unit of Ministry of Fisheries and Agriculture. Site based office and temporary accommodation facilities will not be constructed as part of the project due to small scale.

5.6.2 Outputs (development concept and built environment)

5.6.2.1 Site Planning and design

The site plans and structural designs have been drawn by BINArch Design Associates Pvt Ltd.

5.6.2.2 Quarantine building and pump station

The key outputs of the project are the two storey Quarantine Building which houses the holding tanks, pathological labs and the Pump station. The seawater intake pipeline will be laid on the western side reef (northern side of Hulhule Island Hotel); while the discharge pipeline will be laid southern side of Hulhule Island Hotel and run to the western reef edge.

6 Methodology

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 EIA 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 July 2016.

6.1 General condition of site

General condition of proposed site for quarantine facility construction was assessed visually for vegetation pattern and condition of plot.

General marine environment condition of the seawater intake pipeline location and discharge location were done by qualitative method. General substrate condition was assessed visually, estimating cover of live corals and other benthic categories (Refer to Figure 2 for survey site).

6.2 Water quality analysis

Groundwater and seawater samples were tested from ground pit, discharge water pipe end and in-take pipeline location using Hanna multi probe water test meter (HI 9828) and Hanna Turbidity meter (HI93703) (Figure 2).

Figure 2. Location and coordinates of points for reef survey (R1, R2) and seawater sampling (S1, S2) and ground water sampling site (G1).

7 Existing environment

7.1 Geographic location of Hulhule Island

Hulhule island where Ibrahim Nasir International Airport is located sits on the southern corner of North Male' Atoll at a distance of approximately 1.2km to the north east of Male'. Ibrahim Nasir International Airport is the main international airport and hence the ideal location for the development of a quarantine facility for plants and animals to be brought to Maldives.

The proposed location for the development of the quarantine facility is at the eastern side of Hulhule, adjacent to the existing Terrestrial Plant and Animal quarantine facility (Figure 3).

Figure 3. Location of Hulhule in North Male' Atoll (right) and location of project site with close-up (red block in left picture)

7.2 Climatology

7.2.1 Wind climate

Wind climate in the Maldives is dominated by the Indian monsoon climate South West (SW) monsoon and North East (NE) monsoon. The Indian monsoon system is one of the major climate systems of the world, impacting large portions of both Africa and Asia (Overpeck et, al., 1996). The monsoon climate is driven by the atmospheric pressure differences that arise as a result of rapid warming or cooling of the Tibetan Plateau relative to the Indian Ocean (Hastenrath 1991; Fein and Stephens 1987). During the summer of northern hemisphere the Tibetan Plateau warms rapidly relative to the Indian Ocean which results in an atmospheric pressure gradient (Low pressure over Asia and high pressure over the Indian Ocean) between the Asian landmass and the Indian ocean, which drives the prevailing wind from south to westerly directions. The period during which prevailing winds are from south to westerly direction is known as the SW monsoon. In the winter of northern hemisphere the continent cools relative to the ocean. This reverses the pressure gradient (low pressure over the Indian Ocean high pressure over the Asian landmass) and the prevailing winds become northeasterly. The period during which prevailing winds are from northeasterly directions is known as NE monsoon. The transitions from NE to SW monsoon and vice versa are distinctly different from SW or NE monsoon. During these transition periods the wind becomes more variable.

The SW monsoon lasts between May and September while the NE monsoon lasts between December and February. The period between March and April is the transition period from the NE monsoon to SW monsoon known locally as the Hulhangu Halha, while the transition period from SW monsoon to NE monsoon is known as Iruvai Halha. Iruvai halha lasts from October to November (Table 4). The SW monsoon is generally rough and wetter than the NE monsoon. Storms and gales are infrequent in this part of the world and cyclones do not reach as far south as the Maldivian archipelago (Ministry of Construction and Public Works, 1999).

Table 4. The months characterizing the two monsoon periods and the transition periods

Season	Month
NE-Monsoon (Iruvai)	December
	January
	February
Transition Period 1 (Hulhangu Halha)	March
	April
SW-Monsoon (Hulhangu)	May
	June

	July
	August
	September
Transition Period 2 (Iruvai Halha)	October
	November

Wind analysis is based on daily averaged wind data from Hulhule for the period of January 1989 – December 2008. In this analysis wind directions and speed were plotted as wind rose diagrams and the frequency distributions of the wind speeds from different directions were obtained.

Wind rose plot (Figure 4) and the frequency distribution of the wind speed (Table 5) shows that the prevailing directions of the westerly winds are between WSW and WNW. Wind from these directions sums up to 49.24% of the year. The prevailing directions of easterly winds are between NE and E that sums up to 26.69% of the year. Winds from all other directions sums less than 25% of the year. These prevailing westerly and easterly directions are also the directions from which the strongest winds blow. Wind speed distribution (Table 4) shows that for winds stronger than 8m/s, the westerly prevailing wind directions contribute up to 36% while the easterly prevailing directions contribute up to 16%. Based on these results it is evident that the winds at Male' Atoll are almost confined to 5 directions, WSW, W, WNW, NW and EEN.

Table 5. Frequency distribution of wind speed

Wind direction	Frequency of Occurance																		Sum (%)
	Wind Speed (Knots)																		
	<=2	>2 - 4	>4 - 6	>6 - 8	>8 - 10	>10 - 12	>12 - 14	>14 - 16	>16 - 18	>18 - 20	>20 - 22	>22 - 24	>24 - 26	>26 - 28	>28 - 30	>30 - 32	>32 - 34	>34 - 36	
N	0.16%	0.30%	0.85%	0.57%	0.26%	0.05%													2.19%
NNE		0.11%	0.43%	0.96%	0.48%	0.09%	0.03%												2.11%
NE		0.19%	0.92%	1.65%	1.68%	1.16%	0.54%	0.28%	0.11%	0.03%	0.02%								6.57%
ENE		0.06%	0.75%	1.60%	1.97%	2.72%	3.09%	2.10%	1.43%	0.65%	0.17%	0.02%							14.55%
E		0.25%	0.67%	0.90%	1.18%	0.87%	0.90%	0.40%	0.26%	0.09%		0.02%	0.03%						5.57%
ESE		0.14%	0.12%	0.37%	0.25%	0.11%	0.08%	0.08%	0.03%										1.18%
SE		0.02%	0.03%	0.14%	0.17%	0.03%	0.06%	0.02%	0.02%										0.48%
SSE		0.06%	0.23%	0.12%	0.02%	0.06%													0.50%
S		0.11%	0.37%	0.22%	0.19%	0.05%	0.02%												0.95%
SSW		0.26%	0.64%	0.71%	0.31%	0.25%	0.06%												2.24%
SW		0.08%	0.48%	1.13%	1.09%	0.51%	0.20%	0.09%	0.05%	0.02%									3.65%
WSW		0.25%	0.99%	1.79%	1.82%	1.46%	1.06%	0.73%	0.31%	0.11%	0.02%		0.02%	0.02%					8.56%
W		0.51%	2.02%	3.49%	4.30%	4.38%	3.06%	2.64%	1.37%	0.78%	0.48%	0.23%	0.02%	0.02%	0.02%				23.31%
WNW		0.42%	1.43%	2.33%	3.40%	3.12%	2.52%	1.89%	1.38%	0.31%	0.28%	0.12%	0.09%	0.03%	0.02%			0.03%	17.38%
NW		0.33%	1.01%	1.91%	1.68%	1.09%	0.93%	0.43%	0.30%	0.16%	0.05%								7.87%
NNW		0.28%	0.84%	0.85%	0.50%	0.22%	0.12%	0.06%	0.03%										2.90%

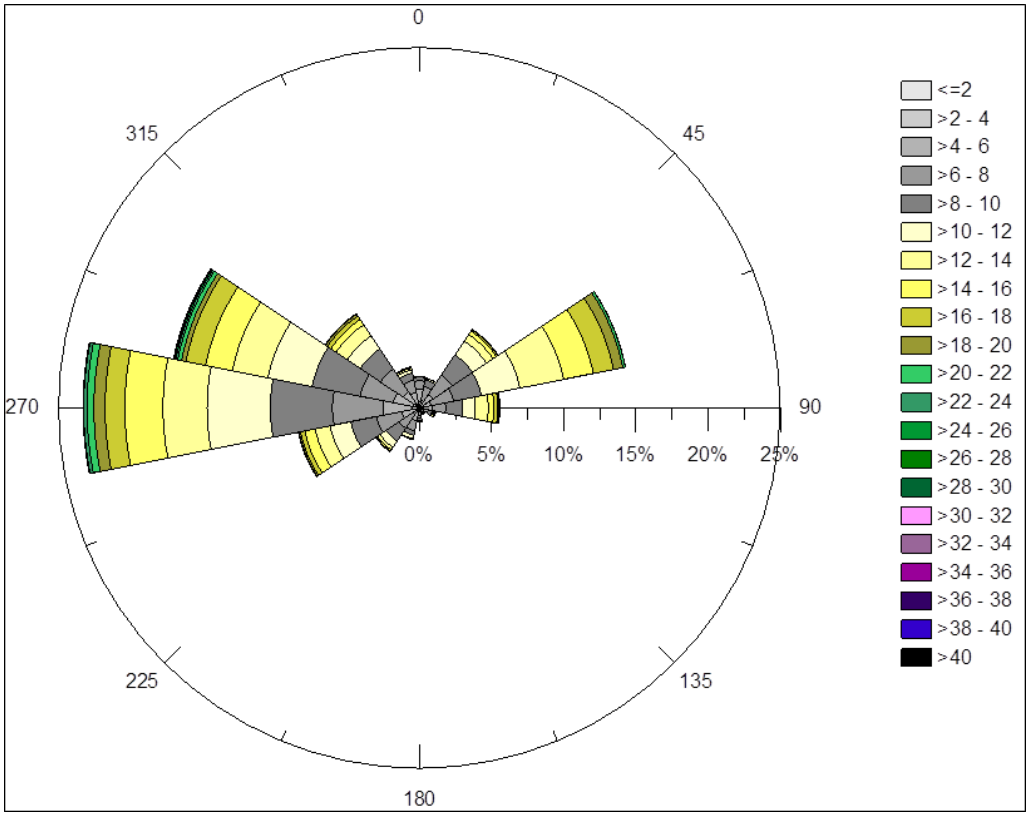

Figure 4. Wind rose graph for the daily averaged wind data from Male' International Airport (years 1989-2008)

7.3 Terrestrial environment

7.3.1 Vegetation at site

The project site is adjacent to the existing cleared area and thus has the presence of very few vegetation. The mature vegetation at site includes 4 Coconut palms (Figure 5) which will be removed and transplanted elsewhere on the island by the Maldives Airports Company Limited.

Figure 5. Coconut palms at the project area that needs to be transplanted (left)

7.3.2 **Groundwater and soil**

The proposed plot area is a reclaimed land very close to the harbor area. The soil is composed of coral sand and rocks. Groundwater sample was collected from northern side of project plot from an existing pit. Water test was done in-situ using Hanna Multiprobe test meter. Table 6 below shows the results of this test.

Table 6. In-situ water testing carried out near project site

Reading	Temperature (°C)	pH	Dissolved Oxygen (mg/l)	Conductivity (µS/cm)	Salinity (ppt)
1	28.61	8.89	1.11	29601.02	18.77
2	28.61	8.88	1.11	29601.02	18.77
3	28.61	8.88	1.11	29601.02	18.77
4	28.61	8.88	1.11	29601.02	18.77
5	28.61	8.88	1.11	29601.02	18.77
6	28.61	8.87	1.11	29601.02	18.77
7	28.61	8.87	1.12	29651.02	18.83
8	28.61	8.86	1.12	29651.02	18.83
9	28.61	8.87	1.12	29651.02	18.83
10	28.61	8.87	1.12	29651.02	18.83
Average	**28.61**	**8.875**	**1.11**	**29621.02**	**18.79**

7.4 **Marine environment**

The proposed seawater intake line (seawater well) at Hulhule is located just west of the Hulhule Island Hotel harbor. The reef flat area is shallow with average depth of 1.5- 2.0m deep. The reef substrate at the site is dominated by rock and rubble, while live coral cover is very low (<1%.). The only live coral observed at the site was Pocillopora colonies (Figure 6). The western reef area has been severly impacted by various development works at the airport island including large scale reclamation, coastal protection and also harbor development works.

Reef fish abundance at the site was sparse, with only few species observed. Juveniles of Acanthurids, Labrids and Pomacentrids were observed.

Similar to site R1, site R2 also was dominated by rock and rubble, while live coral cover was very low (<1%). The area was significantly impacted by reclamation works and coastal protection works (quay wall and seawalls). Average depth of back reef area up to the reef edge was 1.5-2.0m MSL.

Figure 6. General reef condition at the proposed seawater intake pipeline location (left), reef condition at discharge water pipe line area (right)

7.4.1 Seawater

Seawater testing was done in-situ at proposed discharge location (S1) and seawater intake site (S2) using Hanna multi-probe water test meter and Turbidity meter. Table 7 to 9 below shows results of the water test.

Table 7. Results of seawater test at Site S1 (proposed waste water discharge location)

Reading	Temperature (°C)	pH	Dissolved Oxygen (mg/l)	Electrical Conductivity (µS/cm)	Total Dissolved Solids (g/l)	Salinity (ppt)
1	29.13	8.19	5.67	50520	25	33.05
2	29.13	8.21	5.7	50740	25	33.22
3	29.13	8.21	5.7	50760	25	33.23
4	29.13	8.22	5.8	50780	25	33.24
5	29.13	8.22	5.8	50800	25	33.26
6	29.13	8.22	5.8	50820	25	33.27
7	29.13	8.22	5.8	50850	25	33.29
8	29.13	8.21	5.9	50860	25	33.31
9	29.13	8.21	5.9	50890	25	33.32
10	29.13	8.21	5.9	50900	25	33.33
Average	**29.13**	**8.21**	**5.797**	**50792**	**25**	**33.25**

Table 8. Results of seawater test at Site S2 (proposed seawater intake location)

Reading	Temperature (°C)	pH	Dissolved Oxygen (mg/l)	Electrical Conductivity (µS/cm)	Total Dissolved Solids (g/l)	Salinity (ppt)
1	28.61	8.71	6.19	50520	26	32.03
2	28.61	8.73	6.22	50740	26	32.2

3	28.61	8.73	6.22	50760	26	32.21
4	28.61	8.74	6.32	50780	26	32.22
5	28.61	8.74	6.32	50800	26	32.24
6	28.61	8.74	6.32	50820	26	32.25
7	28.61	8.74	6.32	50850	26	32.27
8	28.61	8.73	6.42	50860	26	32.29
9	28.61	8.73	6.42	50890	26	32.3
10	28.61	8.73	6.42	50900	26	32.31
Average	**28.61**	**8.73**	**6.32**	**50792**	**26.00**	**32.23**

Table 9. Turbidity test done in-situ using Hanna Turbidity meter

Site	Turbidity (FTU)*
S1	0.63
S2	0.25

*FTU is equivalent to NTU

8 Stakeholder consultation

8.1 Consultation with Health Protection Agency

As part of the consultation process for the EIA, the Health Protection Agency (HPA) of the Maldives was consulted to discuss their requirements in establishing such a facility. Their main concerns were the health clearance certificate that should come with any stock and the disposal of the dead animals and other waste produced at the quarantine facility. Since the first concern is a process that should be undertaken prior to the quarantine stage, the consultants mostly discussed the latter. It has been decided that the incinerator at the existing Terrestrial plant and animal quarantine facility of MoFA will be used for disposal of waste produced in the facility.

The EIA consultant enquired about any existing guideline or protocol for disposing dead animals. HPA do not have any such guidelines, but they have guidelines for operating laboratories.

The representatives from HPA also mentioned that if the quarantine facility discover any disease in the aquatic animals that could impact the human health or other aquatic animals or crops, such information should be shared with the relevant authorities including HPA and immediate action should be taken to address the issue. List of people consulted with is given in Appendix 6

8.2 Consultation with Maldives Airports Company Limited

Consultation with Maldives Airports Company Limited was carried out at the facility on the 5th of July 2016. List of people consulted with is given in Appendix 6. The EIA consultant initially explained regarding the project and enquired about waste and wastewater disposal at the airport facility, so as to clarify whether these systems could be utilized by the project.

Solid waste generated at the airport is collected and transported to Thilafushi on a regular basis, as there is no Solid waste management facility (or incinerator) at Hulhule. When consulted, staff at MACL stated that an arrangement can be made to collect waste generated from the quarantine facility and send to Thilafushi for disposal (for a fee). However, it has been decided to use the incinerator at the existing Terrestrial plant and animal quarantine facility of MoFA. The plant incinerates waste at temperatures of 300^{o}C as per the FAO guidelines (information given by Mohamed Anees, Manager of Terrestrial plant and animal quarantine facility).

Sewage disposal is through direct disposal to sea, without any treatment. Hulhule network has specific areas with secondary treatment. The quarantine facility has few staff and effluent generation is not expected to have a significant impact on the marine environment, even with connection to the existing sewage network. Those consulted at MACL have no objections towards connection of sewage system at the facility to this system.

9 Environmental Impacts

9.1 Impact Identification

Various methods are available to categorize impacts and identify the magnitude and significance of the impact, such as checklists, matrices, expert opinion, modelling 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, field data collection surveys and based on past experience in similar development projects. Data collected during field surveys can be 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.

Possible impacts arising from the construction and operation works are described according to their location, extent (magnitude) and characteristics. They are also further categorized by intensity of impacts (negligible, minor, moderate and major) for identifying best possible remedial (mitigation measures) action to be taken. Below are the impact categories.

Table 10. Impact prediction categorized

Impact category	Description	Reversible/ irreversible	Cumulative impacts
Negligible	The impact has no significant risk to environment either short term or long term	Reversible	No
Minor	The impact is short term and cause very limited risk to the environment	Reversible	No
Moderate	Impacts give rise to some concern, may cause long term environmental problems but are likely short term and acceptable	Reversible	May or may not
Major	Impact is long term, large scale environmental risk	Reversible and Irreversible	Yes, mitigation measures has to be addressed

The concept of the Leopold Matrix (Leopold et. al., 1971) has been used to classify the magnitude and importance of possible impacts which may arise during the constructional and post constructional stage of the proposed project. This is one of the best known matrix methodology used for identifying the impact of a project on the environment. It is a two dimensional matrix which cross references between the activities which are foreseen to have

potential impacts on the environment and the existing conditions (environmental and social) which could be affected.

The matrix has the actions which may cause an impact on the horizontal axis and the environmental conditions which may be impacted on the vertical axis. While the original Leopold matrix lists 100 such actions and 88 environmental conditions, not all are applicable to all projects. Hence the matrix used in the current assessment is a modified matrix customized to this project.

Each action which is evaluated is done so in terms of magnitude of impact on the environmental condition and significance of this impact. In addition to this probability of impact as well as duration of impact is also assessed and shown separately. All probable and significant actions, their magnitude of impact and duration of impact are further described in the text.

This version of the Leopold Matrix has been adopted from Josimovic et. al (2014) and the EIA adopts the grading scales used in the paper referred. Listing of these grading scales are shown in Table 11 below.

Table 11. Grading scales for the four impact evaluation criteria

Evaluation criteria	Designation	Scale
Impact Probability	M	Impact is possible (probability <50%)
	V	Impact is probable (probability >50%)
	I	Impact is certain (probability = 100%)
Impact Magnitude	0	no observable effect
	1	low effect
	2	tolerable effect
	3	medium high effect
	4	high effect
	5	very high effect
Impact significance	P	limited impact on project site (immediate site)
	I	Impact of importance at Island level
	A	Impact of importance at Atoll level
	N	Impact of national character
	M	Impact of cross-border character
Impact duration	P	Occasional/temporary
	D	Long term/permanent

The proposed project involves construction and establishment of a live aquatic animal quarantine facility at Hulhule (Ibrahim Nasir International Airport). The construction phase of the project is not envisaged to have many environmental impacts, while the operational phase has few potential impacts which are discussed below.

The severity of impacts is predicted by reviewing the design plans and construction methodologies. Mitigation measures are formulated in light of the information revealed by the project engineers.

9.2 Limitation or uncertainty of impact prediction

Uncertainty of impact prediction are mainly due to the lack of long term data, inherent complexity of ecosystem and lack of coordinated monitoring programs with consistent methodologies which can be used to predict outcomes or reliability of predictions of previous projects.

The impacts are predicted by reviewing the survey data collected during the field visits and information revealed by the designers and engineers. The data collected during the field visit is limited in terms of number of days to a week or few more, which limits the overall understanding of even the short term environmental conditions.

The time limitation of EIA field data collection and report preparation is also a hindrance to properly understanding the environmental factors dictating the conditions of the habitat.

9.3 Constructional Impacts

In any development project major direct impacts to the environment (either short term or long term) occur mainly during the construction phase. Potential direct or indirect impacts on the environment from the proposed works include:

- Loss of marine habitat
- Impact on vegetation
- Impacts due to noise and vibration
- Risk of pollution on natural environment and workers

9.3.1 Loss of marine habitat

The seawell for collection of seawater for the quarantine facility is located within the lagoon area on the western side of Hulhule, close to the project site. Seawater collected from

the well is transported to the pump station. The location where sea well is proposed to be located has <1% live coral cover. Therefore average value of expected impact magnitude on marine habitat (due to positioning of sea well at the site) is 0.08 with impact on project site. This is envisaged to be a permanent impact as location of seawall will not change over time.

9.3.2 Impact on terrestrial vegetation

The key vegetation at the site consists of 4 coconut palms which will be transplanted elsewhere on the island by the Airport staff. Hence impact due to vegetation clearance is envisaged to negligible with an average value of impact magnitude of 0.15.

9.3.3 Impact on groundwater

Hulhule hosts the main International airport, where various infrastructure have been constructed over the years. The proposed project is of a relatively small scale, in comparison to the other work on-going at the airport (Run reclamation and airport expansion project). Furthermore, the project site is located quite close to the shoreline and hence even though dewatering is required for foundation laying works, the project is not expected to have any impact on the groundwater resource of the island.

9.3.4 Impacts due to noise and vibration

Generation of noise during construction projects is an unavoidable impact. However, the proposed project is at the airport and not close to residential areas and the noise generated is envisaged to be on the scale of that from other construction projects of this scale. Hence total average value of expected impact magnitude is negligible and mainly of significance to immediate project site and nearby facilities and will be felt for the project duration (temporary impact).

9.3.5 Pollution of the natural environment

Such development projects have the potential to pollute the environment during the construction phase, through improper disposal of waste and accidental spills. All construction waste will be collected and transported to Thilafushi for proper disposal. The operation of heavy machinery and all work will be carried out by an assigned contractor who is experienced in the work. Hence the impact potential for accidental spills is very minor, though in the instance it happens, the impact would be moderate with a long term effect on the environment.

9.3.6 Risk of accidents and pollution on workers

As mentioned earlier, the probability of accidents is low with work being carried out by experienced people. However, in the event of an accidental spill or any other source of environmental pollution, impact on the workers is envisaged to be of medium effect, with the potential to have a long term impact.

9.4 Operational impacts

9.4.1 Impact on marine environment

The proposed means of discharge of waste seawater is by discharge into the sea. The waste water is sand-filtered, cartridge-filtered and UV-disinfected prior to being sent to the sea. The wastewater discharge location is western side reef at southern side of Hulhule Island Hotel near the along-side berthing area for tanker ships supplying fuel to airport facility. The reef condition is similar to the reef survey site R1 (very low live coral cover) and hence impact on marine habitat due to discharge of waste water is envisaged to be negligible.

9.5 Impact Analysis

An analysis of the impacts due to the project was done using the Leopold matrix. Impacts are assessed according to probability of impact, significance of impact, magnitude of impact and duration of impact. Tables 12 to 15 gives the assessment for the impacts, and these are further discussed above with their scoring.

As evident from Tables below, the project has few activities which have the potential to have an impact (minimal on most cases) on the environment. All impacts are envisaged to be limited to the project site, though due to nature of impact, most are long term impacts.

Table 12. Assessment of Probability of impact from project activities

	Envisaged Impact factors	Construction phase				Operational phase
		Land clearance	Accidental fuel spillage	Excavation for laying of foundation	Installation of seawater well	Discharge of wastewater
Physical component	Sea Water		I			V
	Land					
	Coastal zone					
	Ground water			M		
	Air					
	Noise			I		
Biological component	Ecosystems quality	I	I		M	V
	Diversity of flora	I				
	Diversity of fauna					
Socio-cultural components	Landscape					
	Landuse					
	Economy					
	Accidents		M			

Table 13. Assessment of significance of impact from project activities

	Envisaged Impact factors	Construction phase				Operational phase
		Land clearance	Accidental fuel spillage	Excavation for laying of foundation	Installation of seawater well	Discharge of wastewater
Physical component	Sea Water		P			P
	Land					
	Coastal zone					
	Ground water			P		
	Air					
	Noise			P		
Biological component	Ecosystems quality	P	P		P	P
	Diversity of flora	P				
	Diversity of fauna					
Socio-cultural components	Landscape					
	Landuse					
	Economy					
	Accidents		P			

Table 14. Assessment of magnitude of impact due to project activities

	Envisaged Impact factors	Construction phase				Operational phase	Sum	Average
		Land clearance	Accidental fuel spillage	Excavation for laying of foundation	Installation of seawater well	Discharge of wastewater		
Physical component	Sea Water	0	3	0	0	2	5	1
	Land	0	0	0	0	0	0	0
	Coastal zone	0	0	0	0	0	0	0
	Ground water	0	0	1	0	0	1	0.2
	Air	0	0	0	0	0	0	0
	Noise	0	0	0	0	0	0	0
Biological component	Ecosystems quality	1	1	0	1	2	4	0.8
	Diversity of flora	1	0	0	0	0	1	0.2
	Diversity of fauna	0	0	0	0	0	0	0
Socio-cultural components	Landscape	0	0	0	0	0	0	0
	Landuse	0	0	0	0	0	0	0
	Economy	0	0	0	0	0	0	0
	Accidents	0	3	0	0	0	3	0.6
Cumulative values of IF according to environmental factors		2	7	1	1	4		
Average		0.15	0.53	0.08	0.08	0.31		

Table 15. Assessment of duration of impact due to project activities

	Envisaged Impact factors	Construction phase				Operational phase
		Land clearance	Accidental fuel spillage	Excavation for laying of foundation	Installation of seawater well	Discharge of wastewater
Physical component	Sea Water		D			D
	Land					
	Coastal zone					
	Ground water			P		
	Air					
	Noise			P		
Biological component	Ecosystems quality	D	D		D	D
	Diversity of flora	D				
	Diversity of fauna					
Socio-cultural components	Landscape					
	Landuse					
	Economy					
	Accidents		P			

10 Alternatives

The proposed project involves the construction of live aquatic animal quarantine facility at Ibrahim Nasir International Airport (Hulhule). Given the scale of the project, alternative measures are available only for few project activities. However, not all alternatives are better or reasonable alternatives and hence have not been considered. Considered alternatives are described below:

10.1 Considered alternatives

10.1.1 Wastewater discharge method

Proposed type: Discharge into sea after treatment (through pipeline laid from facility)

Alternate type: discharge through existing wastewater discharge pipeline on the island

Selected type: the proposed project will discharge large volumes of wastewater on a daily basis (during the period of quarantine operation). Hence discharge through existing pipeline is not a feasible option. Therefore the proposed method is selected.

10.1.2 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. However, impacts due to the project are envisaged to be minor. Furthermore, the project is a necessity, as a regulatory process and animal disease control of mariculture related project's import of brood stock. Hence the no-project scenario is not a feasible option.

11 Mitigation Plan

Impacts due to the project are few and of low intensity. However, mitigation measures have been identified for the few potential impacts due to the project. Mitigation measures are proposed to reduce or eliminate the severity of any predicted adverse environmental effects and improve the overall social and environmental performance of the project.

Mitigation measures are mainly discussed both for the construction and operation stage of the project (Table 16). While during the construction phase, it is important to minimize impacts due to the constructional methods used, development of contingency plans for the operational phase is key, for proper mitigation of potential impacts. Contingency plans should be developed for the incidences of equipment breakdown and natural incidences.

Commitment from the proponent for carrying out the proposed mitigation and monitoring plan is given in the declaration of the proponent.

Table 16. Identified possible impacts and their relevant mitigation measures

Possible Impacts	Mitigation measures	Location	Time frame (Phase)	Impact intensity	Institutional responsibility	Cost (MRF)
Impact on groundwater due to dewatering	Disposal of water at nearby areas to project site so as to allow re-percolation into the groundwater lens	Project development plot	During construction	Minor, short term impact	Project proponent/ contractor	N/A
Water contamination	Properly sealing empty oil cans, paints and other similar containers. Machinery and equipment properly serviced to avoid leakage of lubricants or any other hazardous material that can cause groundwater contamination	Project development plot	During construction	Minor, short term impact	Project proponent/ contractor	N/A
Solid waste generation	Dispose solid waste on a regular basis to Thilafushi	Land/Social	During construction	Minor, short term	Project proponent/ contractor	N/A
Vegetation clearance	Replant the 4 coconut palms removed from project site elsewhere on the island (by MACL staff) In the instance that a coconut palm or tree from the site is felled, two or more palms or trees should be planted elsewhere on the island as per stated in the "*By-law on cutting down, uprooting, digging out and export of trees and palms from one island to another*".	Land	During construction	Minor	Project proponent to facilitate with the help of MACL	N/A

12 Monitoring Program

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
- Improve EIA and monitoring process

Impact and mitigation monitoring is carried out to compare predicted and actual impacts occurring from project activities to determine the efficiency of the 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. Mitigation monitoring aims to compare predicted and actual (residual) impacts so that effectiveness of mitigation measures can be determined.

Monitoring will not be undertaken during construction work due to minimal impacts. Monitoring during the operational phase will be carried out according to the monitoring programme in Table 17. Cost for the monitoring (data collection) activities will be covered by the proponent (commitment to carrying out and financing the mitigation and monitoring work is given in the Proponents Declaration on Page vi).

Table 17. Monitoring programme for operational phase of the project

Monitoring parameter	Frequency or timing	Cost
Seawater quality (temperature, pH, salinity, turbidity, total dissolved solids and dissolved oxygen).	a. Immediately after construction b. After every quarantine batch	MRF 10,000.00 per test set or using portable test kit

The EIA monitoring report structure provided in the EIA report bylaw 2012 (2012/R-27) shall be used for the monitoring report preparation.

13 Conclusion

The environmental impacts associated with proposed project are considered minor and few due to the scope of the project. This conclusion is based on the evaluation of various components of the proposed project and the existing environment. The proposed project site is located at the reclaimed land area near existing infrastructure, where vegetation cover is minimal with presence of only few coconut palms (4 coconut palms). Marine environment within project scope is also devoid of live coral and already utilized as a harbor area. Hence impacts on terrestrial and marine environment is expected to be minor.

Although dewatering is required for foundation laying work, this is of small scale and water will be disposed off at shoreline or close to project site. Hence impact on groundwater table is also greatly minimized.

During the operational phase of the project, the infrastructure will be connected to existing power and water grid of the island, while effluents will be disposed through the existing sewerage network. Wastewater from the holding tanks will be disposed directly to sea after treatment, through a pipeline laid from the facility to the western side reef at southern side of Hulhule Island Hotel near the alongside berthing area for fuel tanker ships. While impacts due to these activities are not anticipated to have a significant impact, it is crucial that contingency plans are in place prior to commencement of the operation of the facility, so as to address issues due to equipment breakdown or other similar incidences.

Although the “no project” scenario has been considered, this is not feasible given the necessity of the project, especially if the mariculture of sea cucumber was to expand within the country. While the government does not encourage import of brood stock, there is great potential for this scenario, once the sector expands. Furthermore the facility will be part of regulatory framework in ensuring negative impacts such as spread of disease is avoided due to imported brood stock.

Therefore, with due consideration to the environmental components identified above and the extent of the project activities and their likely and predicted impacts identified, the consultant concludes that the project components and designs are feasible and appropriate mitigation measures have been considered to correct and minimize unfavorable environmental changes.

Acknowledgements

The consultant acknowledges the contribution provided by the team members in this report for the valuable contribution to the report writing process and at the field. The consultant also acknowledges the assistance provided by the Marine Research Centre and Maldives Airports Company Limited (MACL).

CVs of team members are given below.

بسم الله الرحمن الرحيم

CURRICULUM VITAE

1. POSITION: Environmental Specialist/EIA Consultant

2. NAME OF FIRM: LaMer Group

3. NAME: Hussain Zahir

4. DATE OF BIRTH: 10th February 1966

5. NATIONALITY: Maldives

6. EDUCATION:

Masters of Philosophy (MPhil) in Coral Reef Ecology
University of Newcastle upon Tyne. Newcastle Upon Tyne, United Kingdom
2006

Marine Biology B.Sc. (Hon)
University of Newcastle Upon Tyne.
Newcastle Upon Tyne,
United Kingdom
1993-1996

7. MEMBERSHIP OF PROFESSIONAL SOCIETIES:

8. OTHER TRAINING:

1988. Marine Science Institute, University of Philippines
Certificate of completion of training course on Scleractinian Coral Taxonomy

1989. Chulalongkorn University. Bangkok. Thailand
Certificate of Completion of training Course on Coral Taxonomy, Ecology and Management

1998 Okinawa International Centre, Okinawa, Japan
Certificate of participation on training course on Conservation and Sustainable Management of Coral Reefs

1999 Korean Research and Development Institute, Seoul, South Korea
Certificate of Completion of the Training Course on marine coastal zone conservation and management

1990. Department of Marine Sciences. Chulalongkorn University. Bangkok. Thailand
Workshop on Taxonomy of Soft Bottom Invertebrates (ASEAN-Australian Coastal Living Resources Project)

1991. Mc Master University, Hamilton, Ontario. Canada.
Training on Boring Sponges of Coral reefs in Maldives

1996 Turtle Specialist Group, Convention on the Conservation

of Migratory Species of Wild Animal (CMS) and government of India. Bhubaneshwar, India

Workshop and Strategic Planning Session for the Conservation of Sea Turtles of the Northern Indian Ocean

1999. United Nations Environment Program. Environment for South Asia and Pacific, organized by SACEP and Ministry of Home Affairs, Housing and Environment.

National Training for State of the Environment and Data Collection and Reporting

9. COUNTRIES OF WORK EXPERIENCE:

10. LANGUAGE AND DEGREE OF PROFICIENCY:

Dhivehi -Mother Tongue
English -Proficient

11. EMPLOYMENT RECORD:

Nov 2007- Present	Senior Reef Ecologist Marine Research centre, Ministry of Fisheries Agriculture and Marine Resources Male', Maldives.
Feb 2006- October 2007	Reef biologist Marine Research centre, Ministry of Fisheries Agriculture and Marine Resources Male', Maldives.
July 2001- January 2006	Senior Research Officer Marine Research centre, Ministry of Fisheries Agriculture and Marine Resources Male', Maldives.
June 2000 to Present	Marine Biologist/ Director (Part Time) Land and Marine Environmental Resource Group of Pte Ltd
July 1996 to July 2001	Research Officer Marine Research Centre , Ministry of Fisheries Agriculture and Marine Resources
1988 to 1992	Biological Aid Marine Research Centre , Ministry of Fisheries Agriculture and Marine Resources
1986 to 1988	Marine Research Centre , Ministry of Fisheries Agriculture and Marine Resources Trainee

12. DETAILED TASKS ASSIGNED:	WORK UNDERTAKEN THAT BEST ILLUSTRATES CAPABILITY TO HANDLE TASKS:
Marine Research Centre, Ministry of Agriculture and Marine Resources	**National coordinator of Global Coral Reef Monitoring Network** *Responsibilities:* Including Implementation and management of the programme activities in the country through the GCRMN Regional Node for south Asian Region in Srilanka. Current programme of activities include, establishing and monitoring of coral reefs to assess the recovery processes after the 1998 Bleaching and to monitor the temporal changes to the reef system. Responsibilities also include coordination and implementation of socioeconomic monitoring at designated pilot sites to asses the livelihood and their dependence on coral reef resources. Coordinating the establishment national reef database to share information at national, regional, and global level is also part of the program of activities. **Coral Reef Degradation in the Indian Ocean (CORDIO) Programme** *Responsibilities:* include implementation and management of the identified projects/ Studies funded by CORDIO. Currently involved biophysical studies designed to understand the reef recovery processes after a severe disturbance in coral reefs **Catalogue of Common Coral Reef of Maldives, 1996** *Year: 1996* *Location:* Maldives.
Task Undertaken Independent Consultant	**Initial Environmental Evaluation, Tsunami Emergency Assistance Project, Maldives** *Year: 2006* *Location:* Ha. Filladhoo, HDH. Nolhivaranfaru, Sh. Maroshi, N. Maafaru, DH. Meedhoo, M. Kolhufushi and Th. Madifushi, Maldives *Client: ADB* *Project features:* Rehabilitation of damaged infrastructures (electricity)due to the tsunami of December 2004 in the Maldives financed by ADB under Tsunami Emergency Assistance project *Positions held:* Domestic Environmental Specialist *Responsibilities:* Initial Environmental Evaluation for the Repair and Reconstruction of Diesel powered generator housed in the above 7 island communities. Environmental issues specific of diesel power generation in the local and national context were addressed following ADB environmental guidelines. I **Initial Environmental Evaluation, Tsunami Emergency Assistance Project, Maldives** *Year: 2005* *Location:* Ugoofaaru, Manadhoo , Dhidhdhoo, Maldives *Client: ADB* *Project features:* Rehabilitation of damaged infrastructures (harbours)due to the tsunami of December 2004 in the Maldives financed by ADB under Tsunami Emergency Assistance project *Positions held:* Domestic Environmental Specialist *Responsibilities:* Initial Environmental Evaluation of the project sites; Ugoofaaru, Manadhoo and Dhidhdhoo for the tsunami

emergency assistance project: TA-0001 (MLD). Specific Task include rapid environmental assessment of the project sites, prepare environmental evaluations based on filed data and community Consultants, predict environmental impacts and propose an environmental monitoring plan for the project activities.

Marine Biodiversity assessment, Faafu atoll, Maldives,
Year: 2003
Location: Faafu atoll, Maldives
Client: ADB
Project features: Identification of potential biodiversity hotspots (sites/species) as part of identifying priority areas for an MCPA planning project funded by ADB. Project involves assessment of socioeconomic and biophysical assessment of the short listed sites identified for the project.
Positions held: Biodiversity Environmental Specialist
Responsibilities: Marine Biodiversity assessment Faafu atoll Maldives. ADB regional technical assistance for coastal and Marine resource management and poverty reduction in south Asia. (ADB RETA 5974). A project implemented by Ministry of Fisheries, Agriculture and Marine Resources. Assignment involves detail preparation of marine biodiversity and Coastal management issues with special reference to grouper fishery and resource management.

Environmental Impact Assessment Report for the Development of Fish Processing Plant at Ha. Huvahandhoo, Maldives,
Year: 2002
Location: Maldives
Client: Jausa Fishery Links
Project features: Construction of a tuna processing plant
Positions held: Marine Biologist
Responsibilities: The EIA report involves collection and assessment of baseline and secondary environmental data both at the marine and terrestrial environment of the project site. It also involved a risk assessment and evaluation report. An environmental management plan was also developed as part of the EIA.

Task Undertaken as an employee o f Land and Marine Environmental Resource Group Pte Ltd

Replacement of wastewater collection, septic tanks and disposal systems in Ga.Villingili, Ga.Dhaandhoo, Gdh.Gahdhoo
Year: 2007-Ongoing
Location: Ga.Villingili, Ga.Dhaandhoo, Gdh.Gahdhoo
Client: American Red Cross
Project features: Design and construction of wastewater disposal systems in the specific islands
Positions held: EIA Specialist
Responsibilities: Environmental Impact Assessment research and analysis.
Preparation and submission of the Environmental Impact Assessment Report.

Environmental Impact Assessment for Reethi Rah Resort Redevelopment
Year: 2005
Location: Reethi Rah Resort
Client: Kersner International, Hotel Group
Resort development at Reethi Rah Resort
Positions held: Marine Biologist
Responsibilities: The EIA involves collection and assessment of baseline and secondary environmental data and marine and terrestrial environment of the project site. This is one of the largest reclamation project for resort development and assessment of impact of dredging and reclamation on the coastal marine habitats was a major component of this study

Environmental Impact Assessment Report for Villa Hakatha at Thilafushi, Male Atoll
Year: 2001
Location: Male Atoll
Client: Villa Hakatha,Maldives
Positions held: Project Biologist
Responsibilities: The EIA report involves collection and assessment of baseline and secondary environmental data both at the marine and terrestrial environment of the project site. It also involved a risk assessment evaluation report. An environmental management plan was also developed as part of this EIA.

Development at Baa. Landaagiraavaru, Maldives
Year: 2000
Location: Baa. Landaagiraavaru, Maldives
Client: Club mediterranee *Project features:*
Positions held: Project Biologist
Responsibilities: The EIA involved collection of Oceanographic data, Study of the beach environment, Vegetation, reef quality and reef water quality. The study examined the impacts of the island and mitigation measures where appropriate. The study also forms the baseline data for future monitoring of the environmental changes due to the resort development

Environmental state for the proposed channel dredging & associated Barrier Island at Sun Island Resort.
Year: 2000
Location: Sun Island Resort, Maldives
Client: Tekton Design Associates Pvt. Ltd
Positions held: Project Biologist
Responsibilities: The Study involved assessment of the potential environmental impact on the coastal shoreline of the island and on to the reef environment within close proximity of the proposed project site.

Tasks undertaken as an employee of Riyan Design and Management Pte Ltd

Environmental Statement for the Proposed Redevelopment of Reethi Rah Resort
Year: 2000
Location: Reethi Rah Resort
Client: Reethi Rah Resort
Positions held: Project Biologist
Responsibilities: This Study Involved assessment of the existing

status of the islands environment and identification of potential environmental impact areas related to the proposed redevelopment plans. Formulation of an environmental monitoring plan that would enable the client to record the environmental changes that may be related to anthropogenic activities or natural.

Environmental Statement for the Proposed Redevelopment of Reethi Rah Resort
Year: 2000
Location: Reethi Rah Resort
Client: Reethi Rah Resort
Positions held: Project Biologist
Responsibilities: This Study Involved assessment of the existing status of the islands environment and identification of potential environmental impact areas related to the proposed redevelopment plans. Formulation of an environmental monitoring plan that would enable the client to record the environmental changes that may be related to anthropogenic activities or natural.

Proposed Beach Nourishment at M. Medhufushi. An assessment of Environmental Design Parameters
Year: 2000
Location: M.Medhufushi
Client: Vaaly Brothers Pte.Ltd
Positions held: Project Biologist
Responsibilities: The study involved examination of the beach characteristic
Including the sediment properties, beach profiles. Identification of a borrow site by Comparing the borrow sediment characteristics of the borrow site and the native beach sand.

Environmental Evaluation of Small-bore Sewer System (SBS) in Lh. Hinnavaru and K. Gulhi
Year:1999
Location: Lh. Hinnavaru and K. Gulhi
Client: Maldives Water and Sanitation Authority
Project features: The Study Involved ground water/ Seawater analysis of sewage pollution; reef surveys hydro graphic /oceanographic surveys and survey of the slopes of the sewage lines.
Positions held: Project Environmental Analyst

Assessment of Oil Contamination in Male' Groundwater from Vehicle Garages and Petrol Stations.
Year:1999
Location: Male', Maldives
Client: Maldives Water and Sanitation Authority
Positions held: Project Environmental Analyst
Responsibilities: The study involved Ground water analysis of oil contamination and assessment of general working conditions and practices in the vehicle garages and petrol stations in male'.

Environmental Impact Statement for the Proposed Beach Protection Works at Nika Island Resort
Year:1999

Location: Male', Maldives
Client: Nika Island Resort
Positions held: Project Biologist
Responsibilities: The project involves assessment of physical environmental condition such as the wave, current sediment characteristics, bathymetry at the project site (Nika Island Resort). Assessment of the status of the reef at the project site and an evaluation of the possible impacts on the reef and the physical environment as a result of the proposed beach protection work.

Environmental Monitoring of F. Filitheyo Resort Development
Year:1999
Location: F.Filitheyo
Client: AAA Trading Company Pvt.Ltd
Positions held: Project Biologist

Environmental Monitoring of M. Medhufushi Resort Development
Year:1999
Location: M. Medhufushi, Maldives
Client: Vaally Brothers Pte Ltd
Position Held: Project biologist

Environmental Monitoring of Lh. Kanuhuraa, Maldives
Year:1999
Location: Lh. Kanuhuraa
Client: SIMDI Hotel Management Pte Ltd
Positions held: Project Biologist

Environmental Monitoring of R. Meedhupparu Resort Development
Year:1999
Location: R. Meedhupparu
Client: Cowrie Investment Pvt Ltd, Maldives
Positions held: Project Biologist
Responsibilities: The Monitoring programmes involved periodic measurements of the beach profiles around the islands, reef quality surveys, ground water/ seawater analysis and environmental auditing

Tasks Under Taken as a Freelance Consultant

Environmental impact Assessment for the F. Filitheyo Resort Development
Year:1998
Location: F.Filitheyo
Client: AAA & Trading Company, Maldives
Positions held: Project Biologist

Environmental Impact Assessment for Lh. Madhiriguraidhoo Resort Development
Year:1997
Location: Lh. Madhiriguraidhoo
Client: Guardian Agency Pte Ltd
Positions held: Marine Biologist

Environmental Impact Assessment for B. Fonimagoodhoo Resort Development
Year:1997
Location: B. Fonimagoodhoo, Maldives
Client: Thasmeen Ali, M. Sheeraazeege, Maldives
Positions held: Marine Biologist

Environmental Impact Assessment for M. Hakuraahuraa Resort Development
Year:1997
Location: M. Hakuraahuraa
Client: Fantasea Pte Ltd, Maldives
Project features:
Positions held: Marine Biologist
Responsibilities: The EIA studies Involved collection of oceanographic data studies of the beach environment, vegetation, reef quality and ground water / Seawater quality. These studies examined the impacts of the development on the island and mitigation measures where appropriate. The studies also form the baseline data for the future monitoring of the environmental changes due to the resort development

13. 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.

Date: 7 May 2008
[*Signature of staff member or authorized representative of the staff]* *Day/Month/Year*

Full name of staff member Hussain Zahir
Full name of authorized representative:

CURRICULUM VITAE

1. POSITION: Geological Specialist

2. NAME OF FIRM: Riyan Pvt Ltd

3. NAME: Mohamed Aslam

4. DATE OF BIRTH: 6 October 1969

5. NATIONALITY: Maldivian

6. EDUCATION:

University of Auckland, NewZealand,
Master of Science (Msc) in Geography ,2004

University of Wales, United Kingdom
Bachelor of Science (Hons) (Bsc) ,in Geological Oceanography, 1997

7. MEMBERSHIP OF PROFESSIONAL GROUPS:

A presiding member of International EC-safety cooperation organisation (IESCO)

Member, Climate Change Technical Team, Integrated Climate Change Strategy - Maldives, Ministry of Environment, Water and Energy (Presently).

Member, Technical Committee on Harbour Construction and Land Reclamation, Ministry of Planning and National Development (April 2001 – July 2003).

Member, Project Co-ordinating Committee, Fuahmulaku Harbour Project, Ministry of Construction and Public Works (April 2001 – July 2003).

Member, Technical Focal Group, Maldives Protected Area Systems Project, Ministry of Home Affairs Housing Environment (2000 – 2003)

8. OTHER TRAINING:

9. COUNTRIES OF WORK EXPERIENCE:

10. LANGUAGE AND DEGREE OF PROFICIENCY:

English – Excellent
Dhivehi - Excellent

11. EMPLOYMENT RECORD:

Director
Land & Marine Environmental Resource Group-Maldives
March 2012 to present

Minister of Housing & Environment
Ministry of Housing & Environment
July 2010 – February 2012

Minister of Housing, Transport & Environment
Ministry of Housing, Transport & Environment
November 2008 – July 2010

Land & Marine Environmental Resource Group-Maldives, (2006 to 2008)
Director
Founding Partner and Director of Lamer Group

Director
Male',Maldives (12/05-03/06)
Ministry of Construction and Public Infrastructure,
Coastal and Civil Engineering Section

Deputy Director
Male',Maldives (07/05-12/05)
Ministry of Construction and Public Infrastructure

Deputy Director
Male',Maldives (01/05-07/05)
Ministry of Construction and Public Works

Oceanographer
Male',Maldives (09/97-08/03)
Ministry of Construction and Public Works

Secretary
Male',Maldives (07/90-09/92)
Ministry of Public Works and Labour

Private
Male',Maldives (10/89-07/90)
National Security Services

12. DETAILED TASKS ASSIGNED:

WORK UNDERTAKEN THAT BEST ILLUSTRATES CAPABILITY TO HANDLE TASKS:

- Lead the climate change negotiation and mitigation level in COP 15, COP16 & COP 17 an head of delegation of Maldives

- Deputy chair of the climate change council, the national body who advised the president on policy matter relating to climate negotiation and Environmental conservation, protection in the Maldives

- Founding Member of Regional task force on renewable energy, an ADB body that was forced in 2010

Topographic and Hydrographic Surveys for JBIC, Japan
Location: Maldives,
Year: 2008,
Time Spent: 5months,
Position: Project Director

The Topographic and Hydrographic Surveys were carried out to prepare topographic maps and bathymetric maps for the Tsunami Reconstruction project in the Maldives, and to analyze the characteristics of the Tide of the project areas through the field observation and analysis of the records.
The Service consists of the following surveys.
Topographic and Bathymetric Surveys at Sh. Funadhoo Harbor

Tide Observation and Establishment of MSL at the harbor project sites
Topographic Survey of the sewerage project islands
Inventory Survey of Septic Tanks in the sewerage project islands

The Surveys were carried out at the following islands:

- *Ga Dhaandhoo (Tide)*
- *L Isdhu (Tide)*
- *L Fonadhoo (Tide)*
- *Th. Dhiyamigili (Tide)*
- *M Muli (Topography)*
- *K Mafushi (Tide)*
- *B Eydhafushi (Topography)*
- *Sh Funadhoo (Topography, Hydrographic, Tide)*

Topographic Surveys of Tsunami rehabilitation project, sewer system designing for American Red Cross
Location: Maldives,
Year: 2007,
Time Spent: 2months,
Position: Project Director

The Topographic Surveys were carried out to prepare topographic and as-built maps for the Tsunami Reconstruction project in the Maldives
The topographic Surveys were carried out at the following islands:

- *GDh Gadhoo*
- *Ga Villigili*
- *Ga Dhaandhoo*

Topographic Surveys of Tsunami rehabilitation project, sewer system designing for UNOPS
Location: Maldives,
Year: 2007,
Time Spent: 2months,
Position: Project Director

The Topographic Surveys were carried out to prepare topographic and as-built maps for the Tsunami Reconstruction project in the Maldives
The topographic Surveys were carried out at the following islands:

- *Dh Meedhoo*
- *F Nilandhoo,*
- *R Ungoofaaru*

Lh Madivary Airport Development Topographic and Bathymetric Surveys for IAS, Maldives
Location: Maldives,
Year: 2007,
Time Spent: 2months,
Position: Project Director/Surveyor

The Topographic and Bathyetric Surveys were carried out to prepare topographic maps and bathymetric maps for the Island for the design of the runway and harbour facilities of the airport

Fuahmulaku Harbour Project
Location: Maldives,
Year: 1999 - 2003,
Time Spent: 4 years,
Position(s): Environmental Analyst (1999 – 2001)
then Project Manager (2001 – 2003)

Responsibilities:
The project involved dredging of a 2000sqm harbour basin with a sheet piled quay wall of length 650m and a rubble mound breakwater of 540m. The environmental analyst assisted the design consultant (Niras/Portconsult, Denmark) for the project to understand the specific environmental conditions of the project site and also carried out the bathymetric surveys required for the physical modelling of the harbour design.

As the project manager, duties included managerial review of all project components and making timely decisions on all matters to be dealt by the client for the effective implementation of the project.

Hulhumale Land Reclamation and Coastal Structures Development Project
Location: Maldives, *Year:* 2001 - 2002, *Time Spent:* 1 year,
Position: Project Engineer

Responsibilities:
The project involved reclamation of a land area of approximately 2sqkm that required approximately 3million cum of dredged material. This fill material was dredged from the deeper lagoon of Hulhule Lagoon. The coastal protection works included construction of a revetment and a sheet pile quay wall. As the project engineer, duties included overall supervision of the quality of works carried out by the contractor (Dredging International, Belgium) and making assessment of technical issues in the implementation of the project.

Environmental/Technical Study for Dredging and Reclamation Works Under the Hulhumale Project
Location: Maldives, *Year:* April 2002- June 2002, *Time Spent:* 3 months,
Position: Counterpart Environmental Specialist
Responsibilities:

This was study conducted to assess the technical feasibility of the reclamation works under the Hulhumale' project and to assess the environmental impacts associated with the dredging and reclamation works. The counterpart environmental specialist was responsible for carrying out the environmental data collection program. Some of the specific environmental data collected by the counterpart environmental specialist included current measurements at the site and a detailed bathymetric survey of the site. Preliminary assessment of the current data and processing and plotting of bathymetric data were also performed by the counterpart environmental specialist.

List of Some Technical Studies and Papers

EIA Ha Berimadhoo Resort Development
Location: Maldives, *Year:* February – March 2008, *Time Spent:* 2

month,

Position: Consultant

EIA Ga Kondeymathilabadhoo Resort Development
Location: Maldives, *Year:* January –February 2008, *Time Spent:* 2 month,

Position: Consultant

EIA Ga Munandhua Resort Development
Location: Maldives, *Year:* January 2008, *Time Spent:* 1 month,

Position: Consultant

EIA for Coastal Protection Works at Gdh. Lonudhuhutta

Location: Maldives, *Year:* 2006-2008, *Time Spent:* 2 years,

Position: Leading Consultant for Coastal Monitoring for 2 years and for the design of the coastal protection works

EIA GDh Vattavareha Resort Development
Location: Maldives, *Year:* July 2006, *Time Spent:* 1 month,

Position: Consultant

Beach Replenishment Technical Study. WhiteSands Resort and Spa, South Ari Atoll, Maldives
Location: Maldives, *Year:* March 2006, *Time Spent:* 1 month,

Position: Leading Consultant

Geological effects of tsunami on mid-ocean atoll islands: The Maldives before and after the Sumatran tsunami.
Paul S. Kench, Roger F. McLean, Robert W. Brander, Scott L. Nichol, Scott G. Smithers, Murray R. Ford, Kevin E. Parnell and **Mohamed Aslam** (2006). Geology: Vol. 34, No. 3, pp. 177–180.

Shore Protection Technical Study for Dhonveli Beach & Spa Resort, Maldives
Location: Maldives, *Year:* February 2006, *Time Spent:* 1 month,
Position: Leading Consultant

Environmental Impact Assessment Report for the Proposed Remodelling of the Coastal Environment of FunIsland Resort.
Location: Maldives, *Year:* September 2005, *Time Spent:* 2 month,
Position: Consultant (Coastal Environmental Specialist)

Environmental Impact Assessments (EIA) Report, Domestic Maritime Transport Study (ADB TA 4394-MLD)
Location: Maldives, *Year:* March 2005, *Time Spent:* 5 ½ month,
Position: Consultant (Environmental Specialist)

Environmental Impact Assessment Report Redevelopment of Reethi Rah as a Premium Nature Resort
Location: Maldives, *Year:* May 2005, *Time Spent:* 1 ½ months,
Position: Consultant (Coastal Environmental Specialist)

Regional Technical Assistance for Coastal and Marine Resources Management and Poverty Reduction in South Asia (ADB RETA 5974)
Location: Maldives, *Year:* April 2003, *Time Spent:* 3 months,
Position: Consultant (Coastal Environmental Specialist to assess the coastal zone issues in Faaf atoll, Maldives and formulation of an Integrated Coastal Zone Management Strategy and An Action Plan.

Proposed Shore Protection works at Hakuraahuraa – An Assessment of Environmental Design Parameters
Location: Maldives, *Year:* Sep 2001, *Time Spent:* 4 months,

Position: Leading Consultant
The study involved examination of the beach characteristics, nearshore current and wave patterns and how they affect the beach of the island. Based on these examinations a shore protection structure suitable for the island was proposed.

Environmental Study on the Proposed Beach Fill Project at K. Hudhuveli – An Assessment of Beach Fill Design Parameters
Location: K. Hudhuveli, *Time Spent:* September 2000 (1 ½ months),
Position: Leading Consultant

The study involved examination of the beach characteristics including the sediment properties, beach profiles. Identification of a borrow site by comparing the borrow sediment characteristics of the borrow site and the native beach sand.

Environmental Impact Assessment Study for the Resort Development at Baa. Landaagiraavaru
Location: Maldives, *Year:* June 2000, *Time Spent:* 2 months,
Position: Consultant (Coastal Environmental Specialist)

The EIA study involved collection of oceanographic data, study of the beach environment, vegetation, reef quality and groundwater/seawater quality. The study examined the impacts of the development on the island and mitigation measures where appropriate. The EIA study also recorded the baseline data for future monitoring of the environmental changes due to the resort development.

Proposed Beach Nourishment at M. Medhufushi. An assessment of Environmental Design Parameters
Location: M. Medhufushi, *Time Spent*: April 2000,
Position: Leading Consultant

The study involved examination of the beach characteristics including the sediment properties, beach profiles. Identification of a borrow site by comparing the borrow sediment characteristics of the borrow site and the native beach sand.

Environmental Evaluation of Small Bore Sewer System (SBS) in Lh. Hinnavaru and K. Gulhi (A study carried out for Maldives Water and Sanitation Authority, Maldives).
Location: Maldives, *Year:* 1999, *Time Spent:* 3 months,
Position: Consultant

The study involved groundwater / seawater analysis for sewage pollution, reef surveys hydrographic / oceanographic surveys and survey of the slopes of the sewage lines.

Assessment of Oil Contamination in Male groundwater from vehicle garages and petrol stations. . (A study carried out for Maldives Water and Sanitation Authority, Maldives).
Location: Maldives, *Year:* 1999, *Time Spent:* 3 months,
Position: Consultant

The study involved groundwater analysis for oil contamination and assessment of general working conditions and practices in the Vehicle Garages and Petrol Stations in Male.

Environmental Impact Assessment for R. Meedhupparu Resort Development
Location: Maldives, *Year:* 1998, *Time Spent:* 2 ½ months,
Position: Consultant

Environmental Impact Assessment for F. Filitheyo Resort Development
Location: Maldives, *Year:* 1998, *Time Spent:* 2 ½ months,
Position: Consultant

Environmental Impact Assessment for Alif Maamigili Airstrip Development
Location: Maldives, *Year:* 1997, *Time Spent:* 3 ½ months,
Position: Consultant

Environmental Impact Assessment for Lh Madhiriguraidhoo Resort Development
Location: Maldives, *Year:* 1997, *Time Spent:* 2 ½ months,
Position: Consultant

11.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]*
Mohamed Aslam

Shahaama Abdul Sattar

Personal Information

Date of birth:	30 September 1980
Address:	G. Helengeli Aage, Apt 2 B Rahdhebai Magu Male' Republic of Maldives
Contact No:	+ 960 7904985 (m)
Email:	shahaama@lamer.com.mv (LaMer Pvt Ltd) shahaama.sattar@gmail.com
Work Address:	Currently working independently

Education

Graduate and Postgraduate

Aug 2004 - Jun 2006	Master of Science in Fisheries Biology and Fisheries Management University of Bergen Department of Biology Postbox 7800 N-5020 Bergen, Norway
Feb 1999 - Dec 2001	Bachelor of Science The Flinders University of South Australia GPO Box 2100 Adelaide 5001, South Australia

Secondary

Apr 1997 – Jul 1998	G.C.E A'Level (London) Kolej Damansara Utama Damansara Jaya Selangor, Malaysia
Jan 1994 – Dec 1996	G.C.E O'Level (London) Aminiya School Male', Republic of Maldives

Work experience

Feb 2002	Volunteer work at Seal Bay, Kangaroo Island, South Australia. Work involved helping researchers with catching seals and removing tracking devices from the seals.

Dec 2001 – Feb 2002 Work experience at the South Australian Aquatic Sciences Centre
Work involved dealing with sea urchins, mainly cleaning their tanks, doing dissections on sea urchins and helping researchers with different aspects of the research.

May 2008 Participated in the Biodiversity Valuation survey of Baa Atoll Maldives carried out by AEC project and IUCN

Employment Record

May 2011 - Present Consultant, Darwin Reef Fish Project
Marine Research Centre, Maldives / Marine Conservation Society, UK

- Consultant to the Darwin Reef Fish Project (4 year joint collaboration between MRC and MCS, UK), which assesses 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.

June 2011 – Present LaMer Pvt Ltd

- Work part time in report writing for the various Environmental Impact Assessment projects conducted by the group.

July 2011 – Present BOBLME Sharks Working Group Coordinator, Bay of Bengal Large Marine Ecosystem Project

- 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.

June 2002 – May 2011 Fisheries Biologist (At time of resignation)
Marine Research Centre
Ministry of Fisheries and Agriculture
Male', Republic of Maldives

Line of work at MRC included:

- Conduct field surveys to monitor the reef fishery and fish species behaviour
- Compilation and analyses of the reef fisheries data, in particular the grouper and food fishery data
- Write reports and regular reviews on the status of fisheries including recommendations for management.
- Focal point for the IUCN funded project on identification of reef fish spawning aggregations in the Maldives through fishermen interviews (2007)
- Secretariat – 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)

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 – 5th Meeting, Male', Maldives

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

14-16 December 2010 – EWS-WWF 2nd 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

Publications

Sattar, S. A., Amir, H. and Adam, M. S. (2011) Reef fish tagging programme – Baa Atoll Pilot project (in press)

Sattar, S. A., Andréfouët, S., Ahsan, M., Adam, M. S., Anderson, R. C. and Scott, L (2011) Status of the Coral Reef Fishery in an Atoll under tourism development: the case of Central Maldives (in press)

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

Referees

Dr. Mohamed Shiham Adam, PhD
Marine Research Centre
Ministry of Fisheries, Agriculture and Marine Resources
Male', Republic of Maldives
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Associate Professor Øyvind Fiksen, PhD
Department of Biology,
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Postbox 7800
N-5020 Bergen, Norway
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Email: Christian.Jorgensen@bio.uib.no

Dr. Charles Anderson
anderson@dhivehinet.net.mv
charles.anderson11@btinternet.com

CURRICULUM VITAE

1.	**PROPOSED POSITION:**	Environmental Planner
2.	**FIRM:**	LaMer Pvt. Ltd
3.	**NAME:**	Aishath Abdulla
4.	**DATE OF BIRTH:**	10th September 1986
5.	**NATIONALITY:**	Maldivian
6.	**PERSONAL ADDRESS:**	H.Regalge, MajeedheeMagu Male' Rep. of Maldives
7.	**EDUCATION:**	2012 M. Environment, Australia 2010 BA (Hons) in Urban and Regional Planning, Malaysia
8.	**OTHER TRAINING:**	
9.	**LANGUAGE AND DEGREE OF PROFICIENCY:**	English – Fluent Dhivehi – Mother tongue
10.	**MEMBERSHIP OF PROFESSIONAL SOCIETIES:**	
11.	**COUNTRIES OF WORK EXPERIENCE:**	Maldives, Malaysia
12.	**EMPLOYMENT RECORD:**	

February 2013- Present	Senior Planner LAMER Group Pte Ltd Male' Maldives
November 2010 – January 2011	Planner/ Acting business development Manager Riyan Pte.Ltd Male' Maldives
May 2009 - July 2009	Trainee ANZ PLANNERS SDN. BHD Selangor Malaysia
August 2005 - October 2005	Surveyor Ministry of Fisheries and Agriculture Male' Maldives

	December 2003	Surveyor Ministry of Planning and National Development Male' Maldives
	May 2003-August 2003	Volunteer UNICEF Male' Maldives

13 DETAILED TASKS ASSIGNED:

WORK UNDERTAKEN THAT BEST ILLUSTRATES CAPABILITY TO HANDLE THE TASKS ASSIGNED:

Review and Update the Detailed Island Risk Assessment in the Maldives prepared for HDh. Kulhudhufushi and GDh. Thinadhoo
Year: 2013
Client: Ministry of Environment and Energy
Position Held: Social Planner/Project Coordinator
Duties Rendered: Review all relevant documents related to DIRAM study, study the social aspects impacting the risks of the islands and overall management of the project.

Preparation of Heritage Action Plan and Preliminary Inventory
Year: 2011
Client: Department of National Heritage
Position Held: Team Leader
Duties Rendered: Proposed action plan for the protection and safeguarding of national heritage. Prepared a preliminary inventory of the existing tangible and intangible heritage of Maldives

Preparation of Atoll and Island Development Plans for AA. Atoll
Year: 2011
Client: Secretariat of AA Atoll council
Position Held: Planner/ Project Manager
Duties: Manage and prepare the development plans

Reviewing the Third Tourism Master Plan 2005-2011
Year : 2011
Client: Ministry of Tourism Arts and Culture
Position Held: Planner/Project Coordinator
Duties Rendered: Provide input in planning perspective and also over all coordination of the project inclusive of conducting a workshop to present the findings

Integration of Climate Change Risk Resilience into Land Use Planning
Location: Maldives
Year: 2011

Client: Ministry of Housing and Environment
Position Held: Planner/Project Coordinator
Duties Rendered: Provide input in planning perspective and also over all coordination of the project inclusive of conducting a workshop to present the findings

Preparation of a detailed Layout Plan for Tourism Zone (Asseyri Project)
Year :2011
Client: Ministry of Tourism Arts and Culture
Position Held: Planner/Project Coordinator
Duties Rendered: Provide input in planning perspective through preparing the layout plan and also over all coordination of the project inclusive of conducting a workshop to present the findings

Appraisal of Hithadhoo Regional Hospital Development
Location: S. Hithadhoo, Maldives
Year :2010
Client:OPEC Fund for International Development (OFID)
Position Held: Socio Assessment Specialist/Project Coordinator
Duties Rendered: Overall Coordination of the project and carry out social Impact assessment study.

Mapping study of infrastructure and resources for Youth
Location:
Year :2010
Client:UNDP
Position Held: Assistant project coordinator
Duties Rendered: Assisting in overall coordination of the project

***Draf RancanganTempatan* DAERAH KUALA LANGAT (*Draft Local Plan* for Kuala Langat District)**
Location: Kuala Langat, Selangor, Malaysia
Year :2009
Client:JPBD (Town and country planning department, Selangor)
Position Held: Support consultant
Duties Rendered: Assisting in the planning process including the report writing, consultations, preparing layout plans and 3D sketch-up models

Reviewing the Master Plan
Location: Badra and Sweirra, Iraq
Year :2009
Client: City council, Badra and Sweirra
Position Held: Support consultant
Duties Rendered:providing consultancy on the master plan. Reviewing the EIA and preparing SIA for the master plan of Badra and Sweirra

HELIPAD Development; PRINCE COURT Hospital
Location: Ampang, Kuala Lumpur, Malaysia
Year :2009
Client:
Position Held: Support Consultant
Duties Rendered: Reviewing the guidelines for HELIPAD development, preparing proposal presentations for the development.

CERTIFICATION

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

Aishath Abdulla Date: 10 December 2013

Address: LaMER Group Pvt Ltd
3rd Floor, Azum, Ameenee Magu
Contact Number: + (960) 778 2143
Email: aishath.abdulla@lamer.com.mv

References

Allison, W.R., 1996. *Methods for surveying coral reef benthos*. Prepared for IMS, Zanzibar, 18 pp.

Defense, E., 2002. Fact Sheet - Air Quality

Fein, J. S. and P. Stephens, (Eds) 1987: Monsoons, Wiley-Interscience Publication, 632ppp, John Wiley and Sons, New York

Josimovic, B., Petric, J. and Milijic, S., 2014. The use of the Leopold Matrix in carrying out the EIA for windfarms in Serbia, Energy and Environment Research, 4(1), pp 43 - 54

Leopold, L. B., Clarke, F. E., Hanshaw, B. B. and Balsley, J. R. (1971) A procedure for evaluating Environmental Impact. Geological Survey Circular 645.U.S. Geological Survey, Washington. 30 pp

MHAHE, 2002. National Biodiversity Strategy and Action Plan of the Maldives. pp 110

MHTE, 2009. Third National Environment Action Plan. pp. 25

Ministry of Fisheries and Agriculture, 2016. Standard Operating Procedure for Sandfish Quarantine (*Draft*)

Naseer, A. and Hatcher, B. G., 2004. Inventory of the Maldives coral reefs using morphometrics generated from Landsat ETM+ imagery. Coral Reefs 23(1),pp 161-168.

Overpeck, J., Anderson, D., Trumbore, S., and Prell, W., 1996. The southwest Indian Monsoon over the last 18000 years; *Climate Dynamics* 12,pp213-225

Schott, F. A. and McCreary, J. P. Jr., 2001. The monsoon circulation of the Indian Ocean. *Progress in Oceanography*, 51 (1): pp. 1 – 123.

White, I., 1996. Fresh groundwater lens recharge, Bonriki, Kiribati: Preliminary Report. UNESCO IHP-V, Project 6-1, Technical Documents in Hydrology, No. 5, UNESCO, Paris, 34

Young I (1999). Seasonal variability of the global ocean wind and wave climate. International Journal on Climatology 19:931-950.

Appendices

Appendix 1 List of abbreviations

CBD – Convention on Biological Diversity
EIA – Environmental Impact Assessment
EPA – Environmental Protection Agency
IFAD - International Fund for Agricultural Development
MACL- Maldives Airports Company Limited
MEDeP - Mariculture Enterprise Development Project
MHAHE – Ministry of Home Affairs, Housing and Environment
MEE – Ministry of Environment and Energy
MHI – Ministry of Housing and Infrastructure
MHUD – Ministry of Housing and Urban Development
MoFA – Ministry of Fisheries and Agriculture
NBSAP - National Biodiversity Strategy and Action Plan
NEAP III – Third National Environment Action Plan
SOP – Standard Operating Procedure
ToR – Terms of Reference

Appendix 2 Terms of Reference (ToR)

بسم الله الرحمن الرحيم

TOR Number: 203-EIARES/30/2016/6

Terms of Reference for Environmental Impact Assessment for Development of Aquatic Animal Quarantine Facility at Ibrahim Nasir International Airport

The following is the Terms of Reference (ToR) following the scoping meeting held on 26/5/2016 for undertaking the EIA for the proposed *Development of Aquatic Animal Quarantine Facility at Ibrahim Nasir International Airport . The proponent of this project is Ministry of Fisheries and Agriculture.*

While every attempt has been made to ensure that this TOR addresses all of the major issues associated with the developmental proposal, they are not necessarily exhaustive. They should not be interpreted as excluding from consideration matters deemed to be significant but not incorporated in them, or matters currently unforeseen, that emerge as important or significant from environmental studies, or otherwise, during the course of preparation of the EIA report.

1. **Introduction and rationale** – Describe the purpose of the project and, if applicable, the background information of the project/activity and the tasks already completed. Objectives of the development activities should be specific and if possible quantified. Define the arrangements required for the environmental assessment including how work carried out under this project is link other activities that are carried out or that is being carried out within the project boundary. Identify the project financing and institutional arrangements relevant to the project.

2. **Study area** – Submit a minimumA3 size scaled plan with location of proposed facility. Specify the agreed boundaries of the study area for the environmental impact assessment highlighting the proposed development location and size.

3. **Scope of work** – Identify and number tasks of the project including preparation, construction and decommissioning phases.

Task 1. Description of the proposed project – Provide a full description and justification of development:

- General building layout
- Seawater pump station and discharge water pipeline location
- Construction method of pump station and main building (dewatering requirement)
- Quarantine Facility Operational Process
- Project duration and schedule
- Waste Management and Disposal Mechanism operational phase
- Contingency plans
- Disposal of dead animals/plants
- Water and Power generation for operational phase
- Wastewater management and disposal mechanism for operational phase

Temporary facilities

Describe construction methods, scheduling and operation of temporary facilities including power generation, oil storage, water supply, waste water treatment, accommodation facilities, waste management and decommissioning.

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Email: secretariat@epa.gov.mv
Website: www.epa.gov.mv

Project management: Include communication of construction details, progress, target dates and duration of works, construction/operation/closure of labor camps, access to site, safety, equipment and material storage, water supply, waste management from construction operations (mainly dredged materials), power and fuel supply temporary site setup;

Task 2. Descriptions 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.

The baseline data will be collected before construction and from at least two benchmarks.

All data must be collected as per the requirements of the EPA Data Collection Guidelines (published on www.epa.gov.mv). The report should outline detailed methodology of data collection utilized.

All survey locations shall be referenced with Geographic Positioning System (GPS) including water sampling points, reef transects, vegetation transects and manta tows sites for posterior data comparison. Information should be divided into the categories shown below:

Geology and geomorphology

- General description of proposed building location (ground condition and vegetation pattern)
- Ground Water (Salinity,Conductivity)

Marine environment

- General description of marine environment at the proposed intake pump station and discharge water pipeline location
- Seawater quality at the discharge water pipeline location (temperature, pH, salinity, turbidity, Total Dissolved Solids and Dissolved Oxygen)

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

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

Task 3. Legislative and regulatory considerations – Identify the pertinent legislation, regulations and standards, and environmental policies that are relevant and applicable to the proposed project, and identify the appropriate authority jurisdictions that will specifically apply to the project.

Task 4. Potential impacts (environmental and socio-cultural) of proposed project, incl. all stages – The EIA 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:

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The EIA 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:

Task 4. Potential impacts (environmental and socio-cultural) of proposed project– The EIA 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:

Impacts on the natural environment

- Impact on ground water
- Impact on seawater
- Impacts on marine environment

Construction related hazards and risks

- Pollution of the natural environment (e.g. spills, pollution from construction related waste);
- Risk of accidents and pollution on workers and local community,

The methods used to identify the significance of the impacts shall be outlined. One or more of the following methods must be utilized in determining impacts; checklists, matrices, overlays, networks, expert systems and professional judgment. Justification must be provided to the selected methodologies. 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.

Task 5. Alternatives to proposed project – Describe alternatives including the *"no action option"* should be presented. Determine the best practical environmental options. Alternatives examined for the proposed project that would achieve the same objective including the "no action alternative". This should include alternative location, construction technologies, taking into account environmental, social and economic factors. The report should highlight how the location was determined. All alternatives must be compared according to international standards and commonly accepted standards as much as possible. The comparison should yield the preferred alternative for implementation. Mitigation options should be specified for each component of the proposed project.

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 mitigation measures. Measures for both construction and operation phase shall be identified. Cost the mitigation measures, equipment and resources required to implement those measures. The confirmation of commitment of the developer to implement the proposed mitigation measures shall also be included. An Environmental management plan for the proposed project, identifying responsible persons, their duties and commitments shall also be given. In cases where impacts are unavoidable arrangements to compensate for the environmental effect shall be given.

Task 7. Development of monitoring plan – Identify the critical issues requiring monitoring to ensure compliance to mitigation measures and present impact management and monitoring plan for ground water and sea water quality. Ecological monitoring will be submitted to the EPA to evaluate the damages during construction, after project completion and every three months thereafter, up to one year and then on a yearly basis for five years after. The baseline study described in task 2 of section 2 of this document is required for data comparison. Detail of the monitoring program including the physical and biological parameters for monitoring, financial commitment from responsible person to conduct monitoring in the form of a commitment letter, detailed reporting scheduling, costs and methods of undertaking the monitoring program must be provided.

Task 8. Stakeholder consultation, Inter-Agency coordination and public/NGO participation) –
Identify appropriate mechanisms for providing information on the development proposal and its progress to all stakeholders, government authorities, NGOs, engineers/designers, development managers, staff and members of the general public. The

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EIA report should include a list of people/groups consulted and summary of the major outcomes. The following parties should be consulted

a) HPA
b) MACL

Presentation- The environmental impact assessment report, to be presented in digital format, will be concise and focus on significant environmental issues. It will contain the findings, conclusions and recommended actions supported by summaries of the data collected and citations f or 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 Regulations, 2012 and subsequent amendments.

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.

26 May 2016

Appendix 3 Site Plan

بسم الله الرحمن الرحيم

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ނަންބަރު: 116-H5/OTH/2016/195

މެރިން ރިސަރޗް ސެންޓަރުގެ ޑިރެކްޓަރ ޖެނެރަލް ޑރ. މުހައްމަދު ޝިޔާމް އާދަމް އަށް

ވަރަށް ސަލާމަތްވުމާ ދަންނަވަމެވެ.

ތިޔަ އޮފީހުގެ ނަންބަރު: 30-MRC-ADM/116/2016/1 (12 އޮކްޓޫބަރު 2016) ސިޓީއަށް ހަވާލާދީ ދަންނަވަމެވެ.

ހަވާލާދީފައިވާ ސިޓީއާއެކު ތިޔަ ފަރާތުން ހުށަހަޅުއްވާފައިވާ އެކުއަޓިކް އެނިމަލް ކަރަންޓީން ފެސިލިޓީގެ ކުރެހުމާއި އެއްގޮތަށް އެ ކުރެހުމުގައި ދައްކަވާފައިވާ ބިމުގައި އެ އިމާރާތް އެޅުމުގައާއި ކުރެހުމުގައިވާ ގޮތަށް އިންތިޒާމް އަދި އައްސޭރި ފާރުފަދައިން އެޅުމުގައި މި ކޮމްޕެނީގެ އިއުތިރާޒެއް ނެތްކަމަށް ދަންނަވަމެވެ.

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ވީމާ، މި ސިޓީއާއެކު ފޮނުވާފައިވާ ކުރެހުމާއި އެއްގޮތަށް އެކުއަޓިކް އެނިމަލް ކަރަންޓީން ފެސިލިޓީގެ އިމާރާތާއި ޕަމްޕް ސްޓޭޝަންގެ ޑިޒައިން ކުރެހުންތައް ތައްޔާރުކޮށް ކުރިއަށްގެންދެވުމަށް ދަންނަވަމެވެ. އަދި ދަންނަވަމެވެ. ހުއްދަދޭ ބިމަކީ ޖާގައިގެ ގޮތުން ވަރަށް ދަތި ބިމެއްކަމުގައި ވާތީ މި ހުރީ އައު އިމާރާތަކީ 03 ބުރީގެ އިމާރާތަކަށް ހެދުމަށް ވިސްނާ ކަމަށް މި ކުންފުނިން ދެކެމެވެ.

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10 ޝައުބާން 1437

17 މޭ 2016

ޚާދިމުކުމް

ލިޔާނާ މައުސޫމް

ޗީފް ޑިވެލޮޕްމަންޓް އޮފިސަރ

މެރިން ރިސަރޗް ސެންޓަރ،
މިނިސްޓްރީ އޮފް ފިޝަރީޒް އެންޑް އެގްރިކަލްޗަރ،
މާލެ، ދިވެހިރާއްޖެ.

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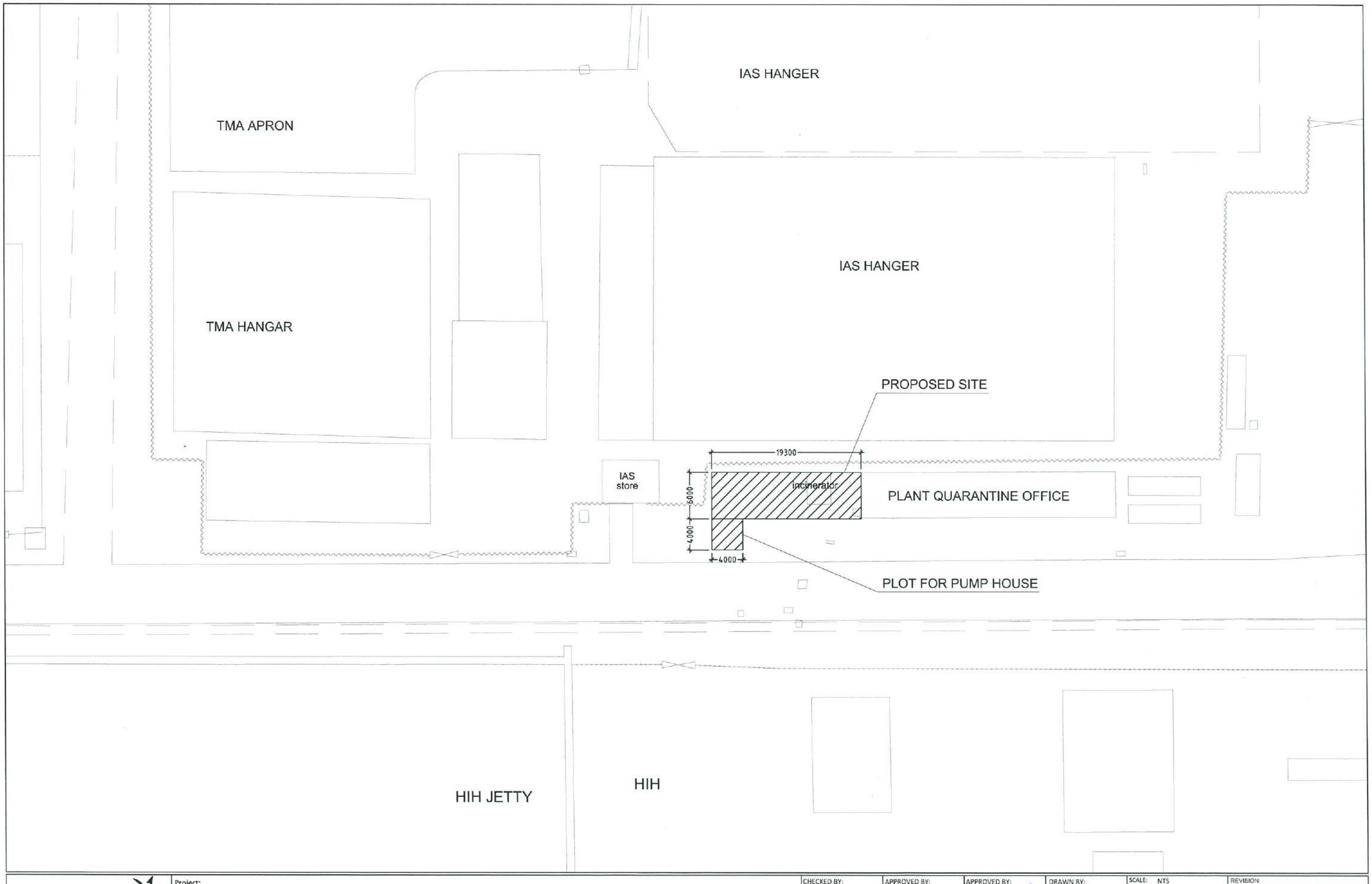
އީމެއިލް: info@macl.aero
ވެބްސައިޓް: www.macl .aero



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PROJECTS & PLANING SECTION
Maldives Airports Company Limited.
Ibrahim Nasir International Airport. Tel: 333 7213

Project: PROPOSED SITE FOR AQUATIC ANIMAL QUARANTINE FACILITY UNIT

Title: LOCATION PLAN

NOTE: ALL DIMENSIONS TO BE CHECKED ONSITE BEFORE CONSTRUCTION

CHECKED BY:	APPROVED BY:	APPROVED BY:	DRAWN BY:	SCALE: NTS	REVISION:
MOHAMED AMIR (PPS)	LIONNEL MAUGIS (CDO)	HUSSAIN FAZIL (GM - COMMERCIAL)	MAADHIH	DATE: 16th May 2016	01
DATE: 17 May 2016	DATE:	DATE: 17/05/2016		DRAWING NUMBER:	02
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Plot Date: 16 May, 2016 - 4:19 PM

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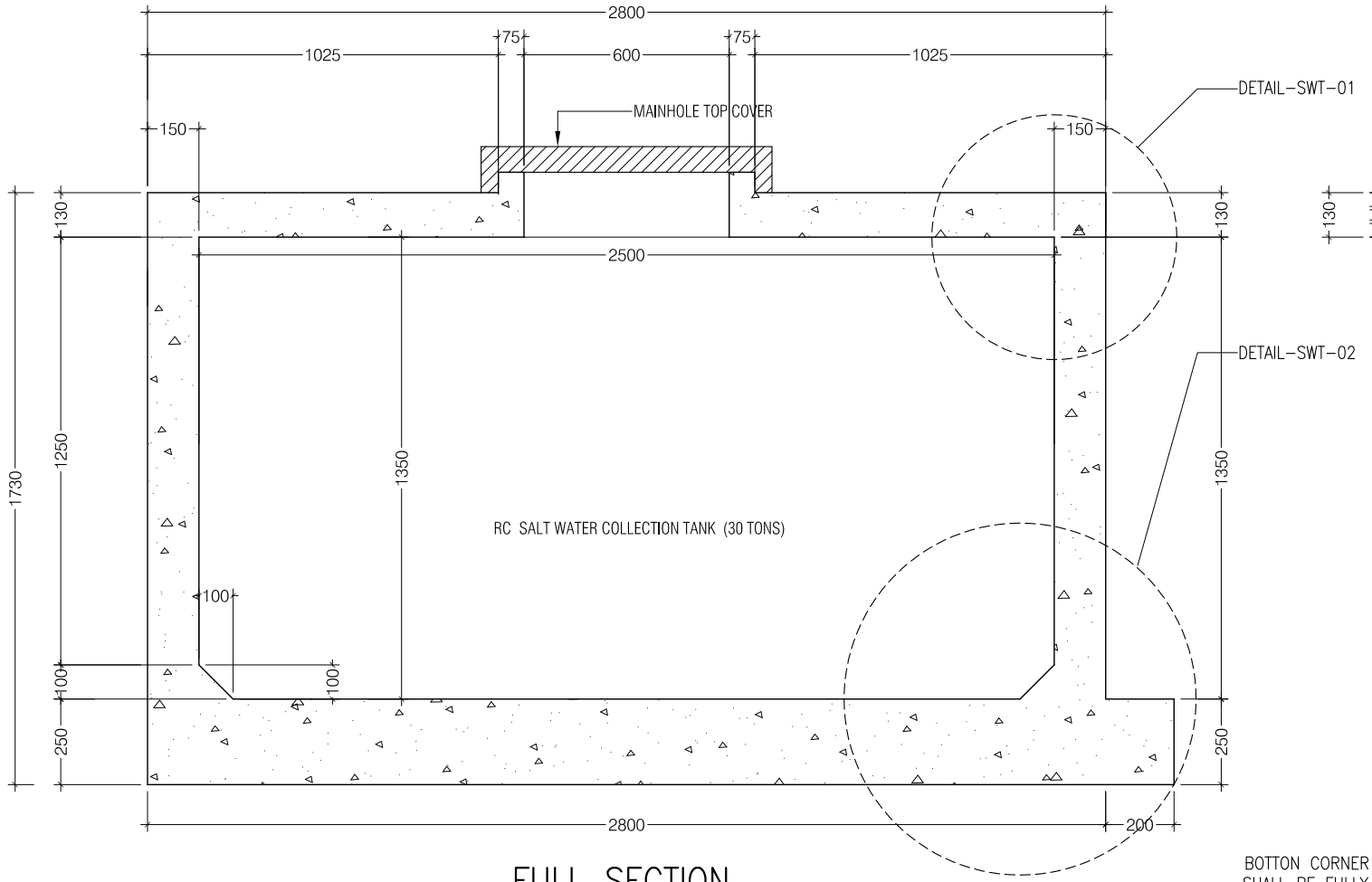
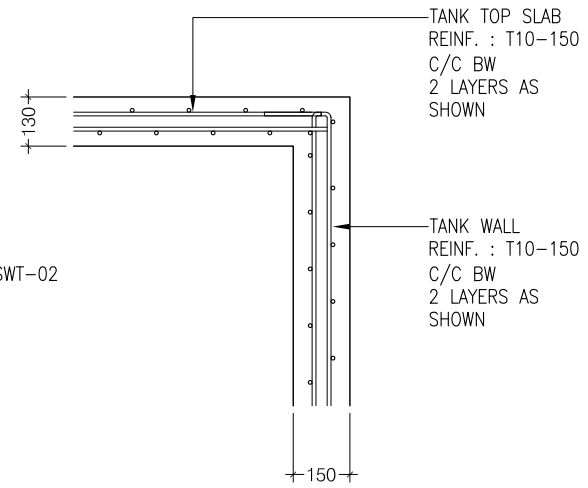
Clean seawater intake pipe
Seawater intake well
Proposed Aquatic Animal Quarantine Facility
Existing Plant & Animal Quarantine Facility
Outlet pipe for treated seawater discharge
Image © 2018 DigitalGlobe

Appendix 4 Floor plans of Quarantine facility and pump station



FULL SECTION
SECTION A-A



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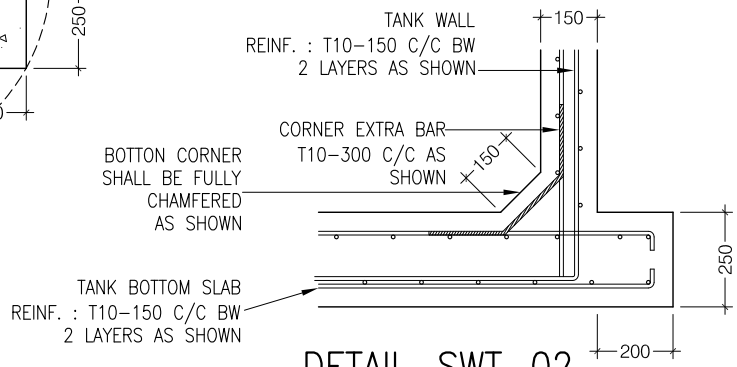
PROVIDE 40MM COVER



DETAIL-SWT-02
PROVIDE 40MM COVER

SEAWATER INTAKE TANK DETAILS

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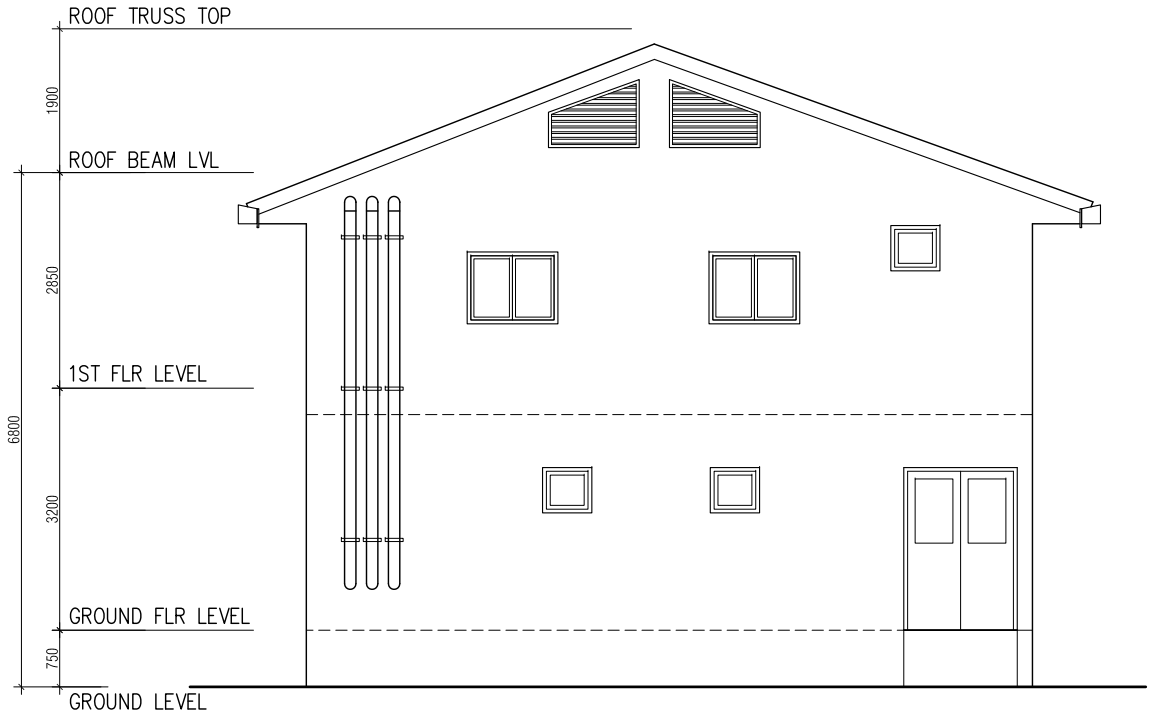

ELEVATION - A

SCALE 1:100

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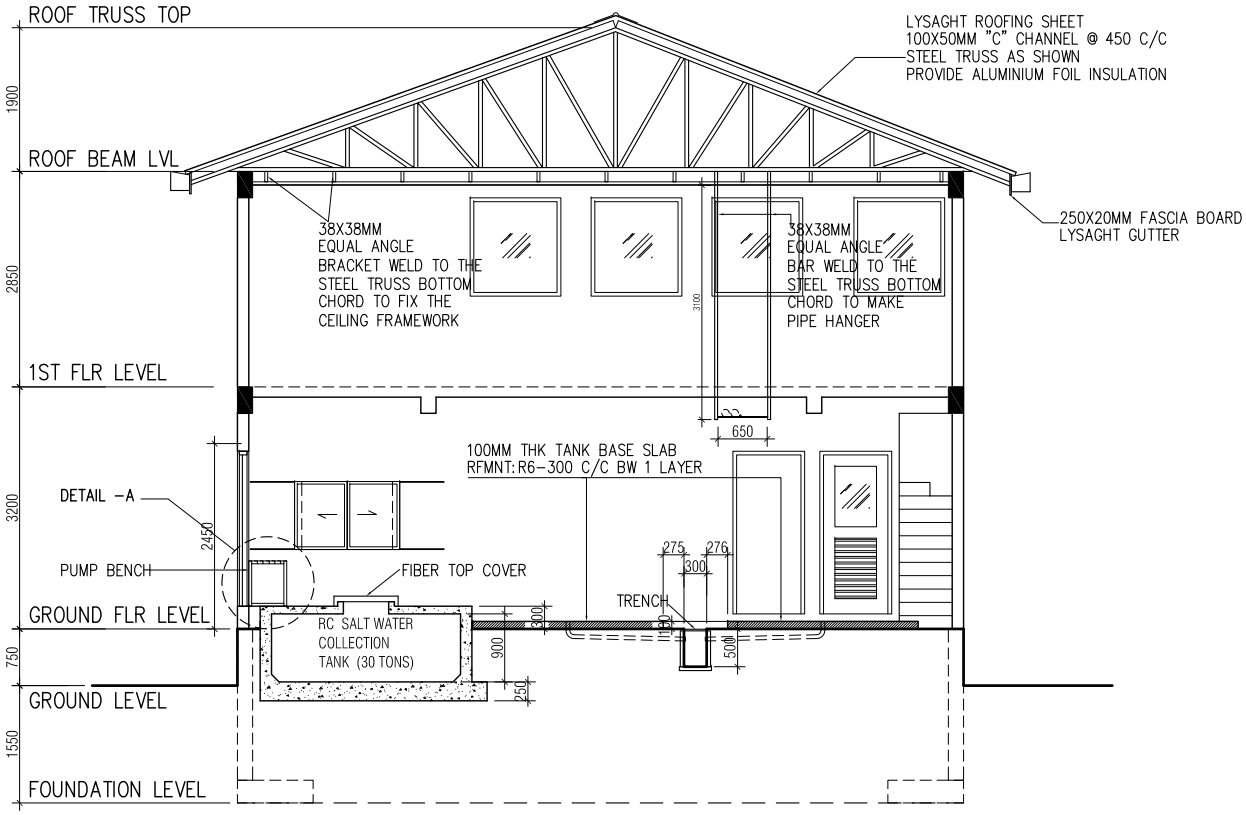

SECTION X-X

SCALE 1:100

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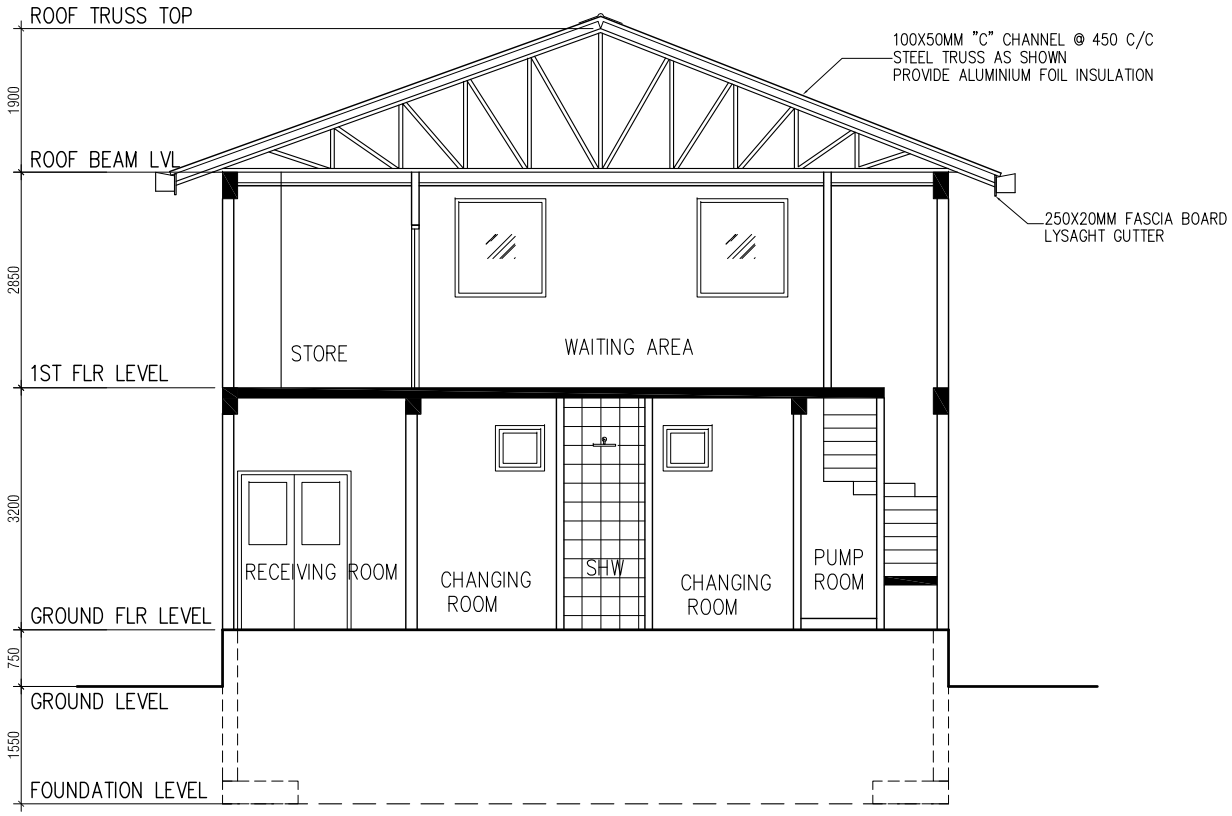

SECTION A-A

SCALE 1:100

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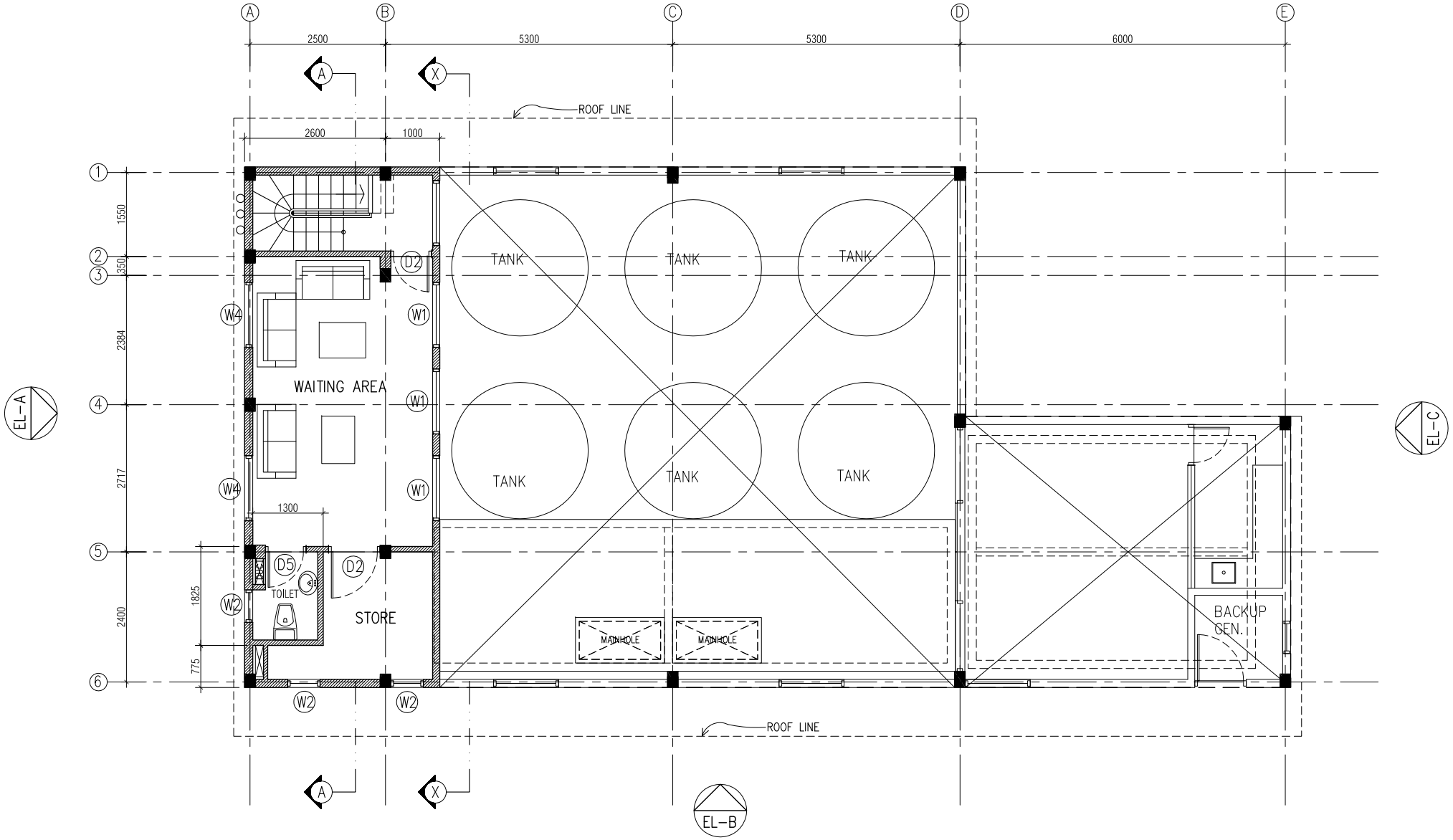

1ST FLOOR PLAN

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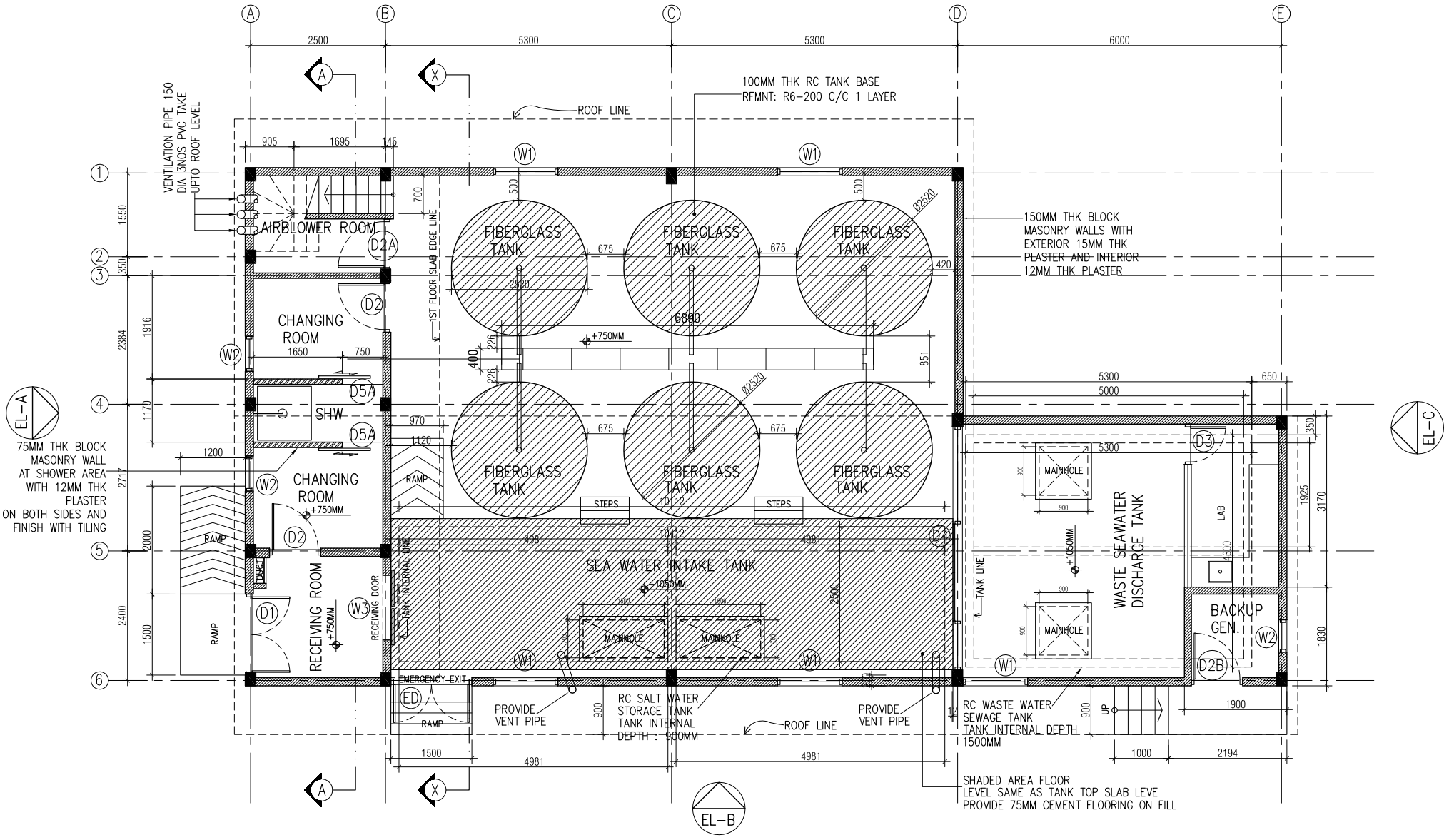

GROUND FLOOR PLAN

SCALE 1:100

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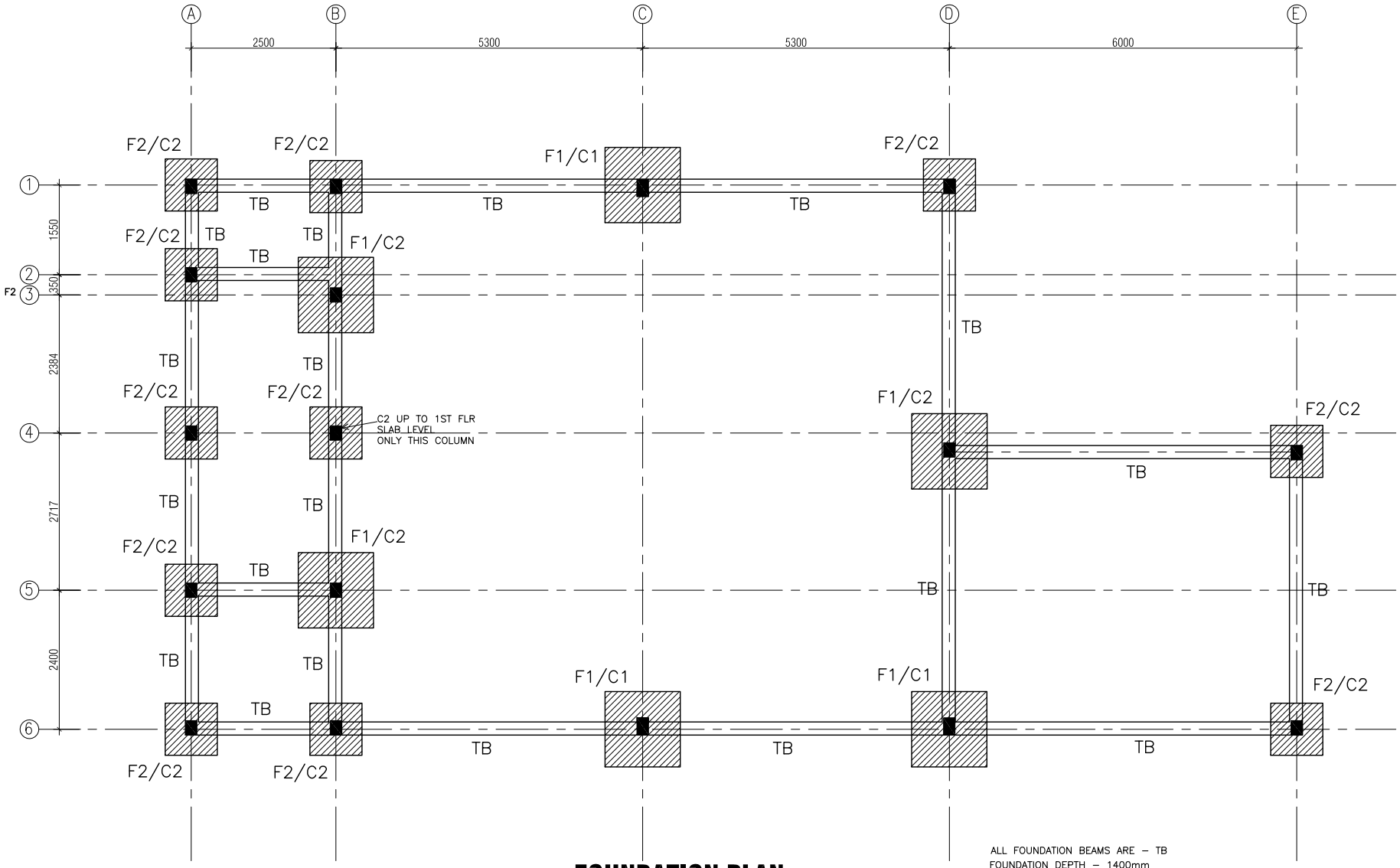

FOUNDATION PLAN

SCALE 1:100

ALL FOUNDATION BEAMS ARE – TB
FOUNDATION DEPTH – 1400mm

F1 – 1200x1200x300 – T10@150C/C B/W (B)
F2 – 900x900x300 – T10@150C/C B/W (B)

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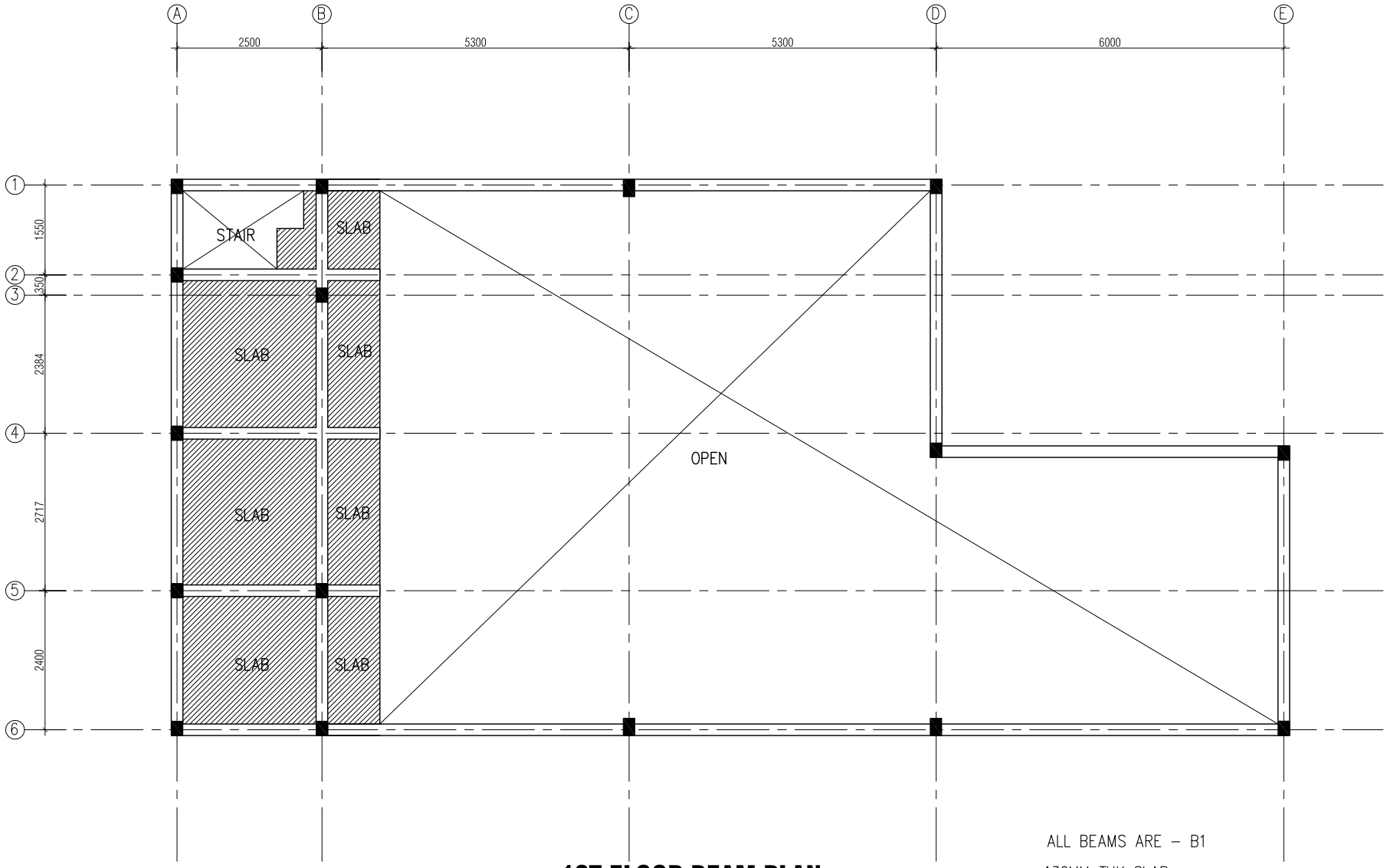

1ST FLOOR BEAM PLAN

SCALE 1:100

ALL BEAMS ARE – B1

130MM THK SLAB

REINF. – T10@150C/C B/W T&B

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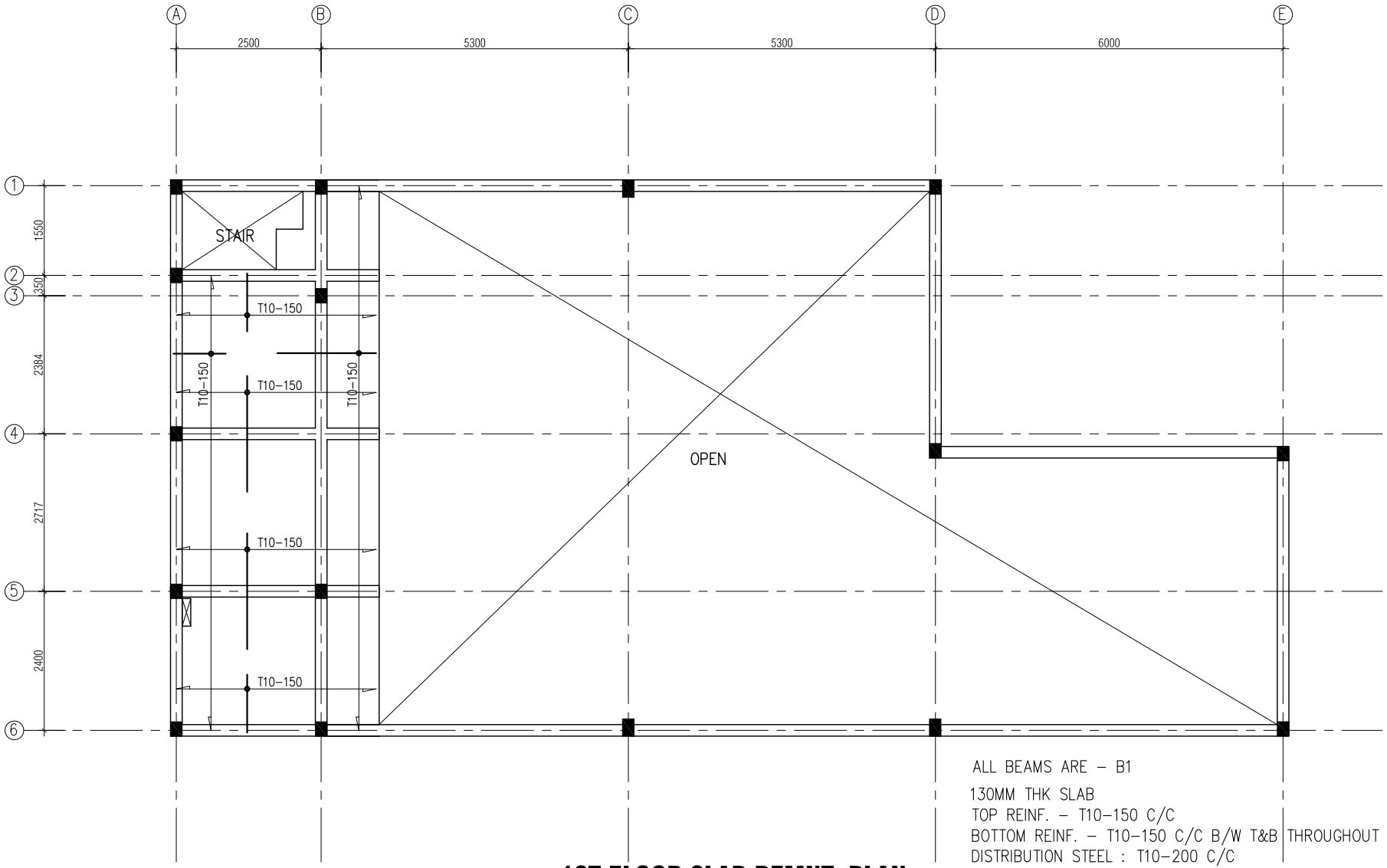

ALL BEAMS ARE – B1

130MM THK SLAB
TOP REINF. – T10–150 C/C
BOTTOM REINF. – T10–150 C/C B/W T&B THROUGHOUT
DISTRIBUTION STEEL : T10–200 C/C
PROVIDE 30–35MM CLEAR COVER

1ST FLOOR SLAB RFMNT. PLAN

SCALE 1:100

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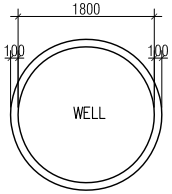
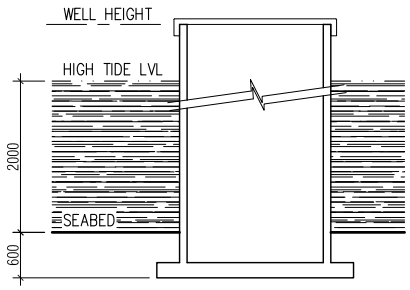


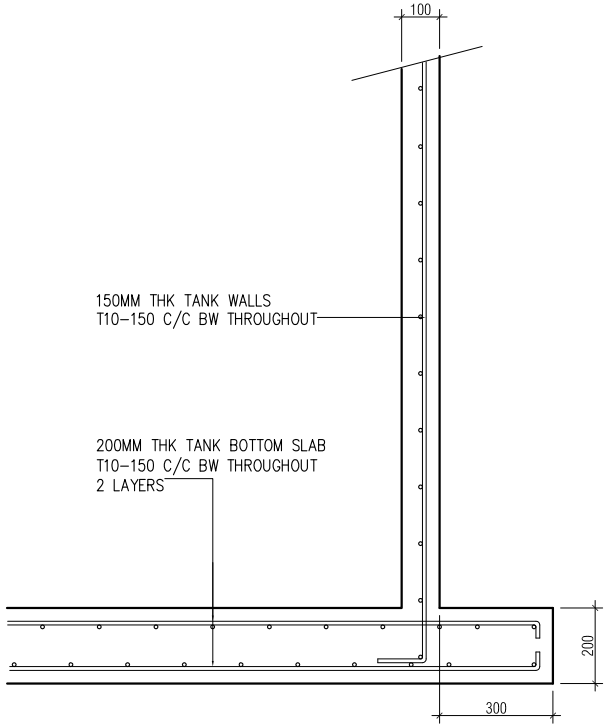
SEA TANK PLAN



SEA TANK SECTION

SEA TANK

SCALE 1:100



TANK SECTION DETAILS

SCALE 1:100

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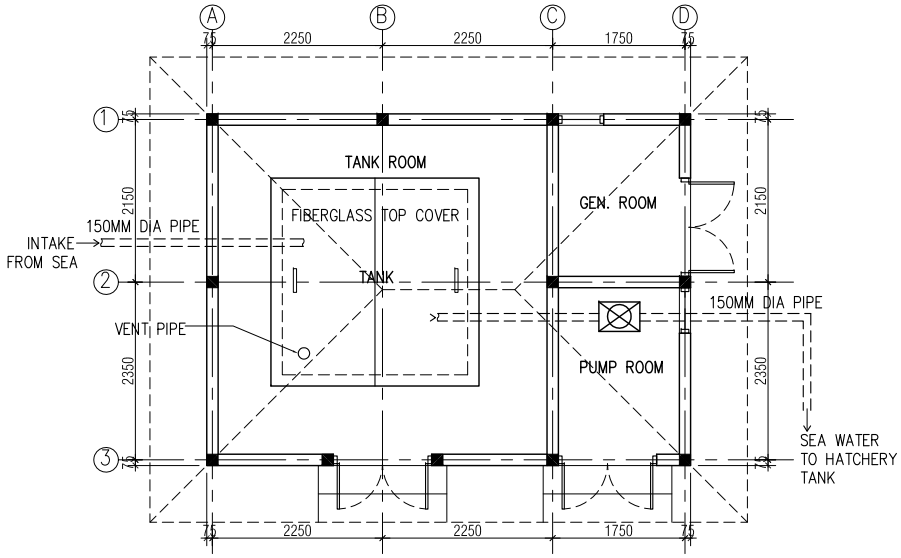
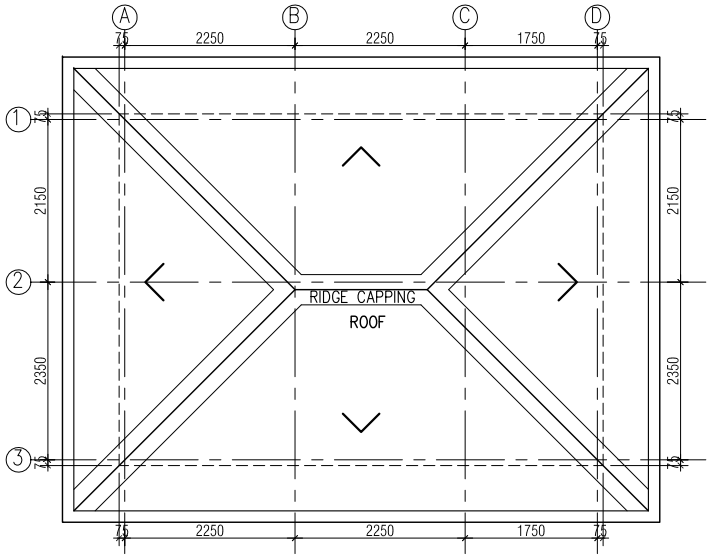


GROUND FLOOR PLAN

SCALE 1:100



ROOF PLAN

SCALE 1:100

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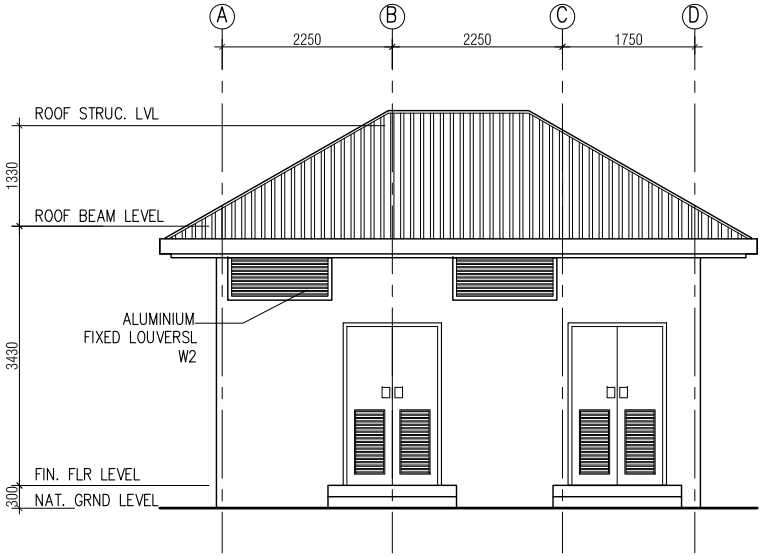
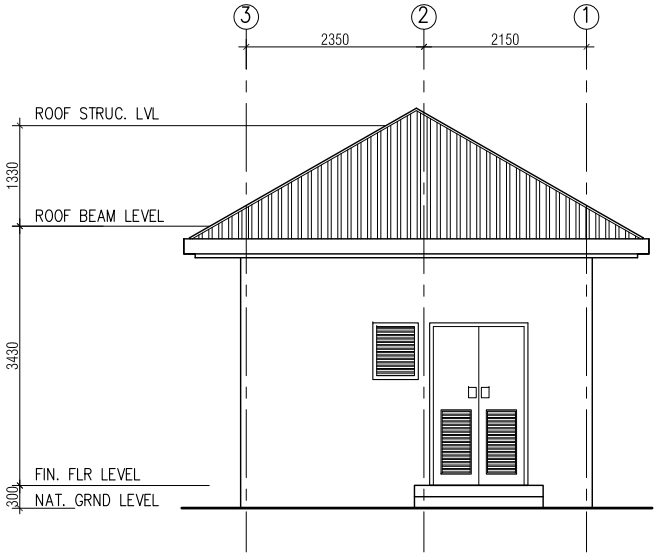


ELEVATION -A

SCALE 1:100



ELEVATION -B

SCALE 1:100

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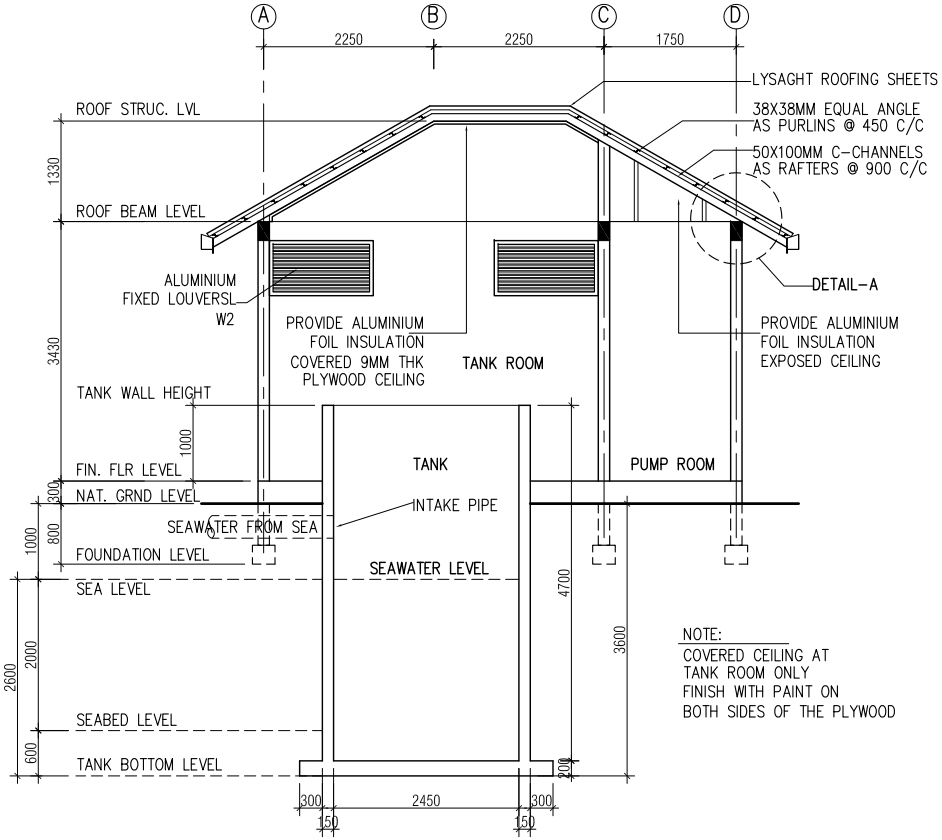
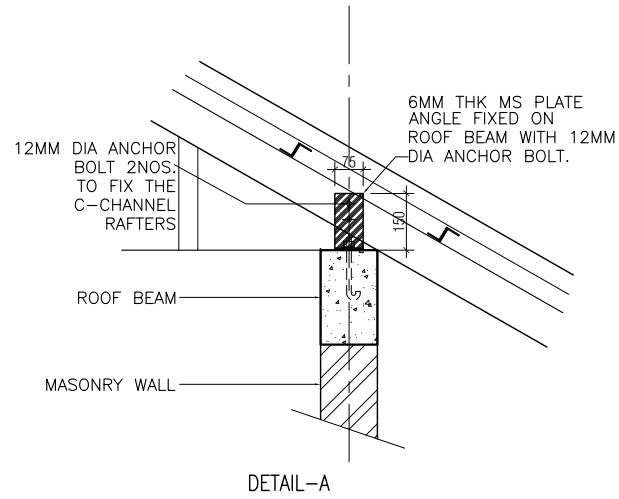


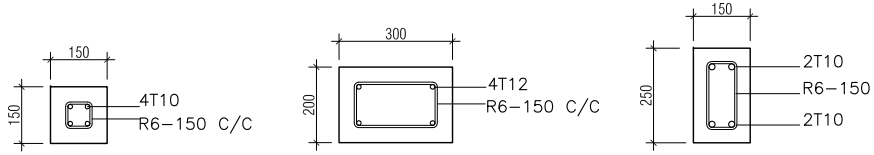
NOTE:
COVERED CEILING AT TANK ROOM ONLY FINISH WITH PAINT ON BOTH SIDES OF THE PLYWOOD

SECTION X-X

SCALE 1:100



DETAIL-A



Note:	
Covers:	Beams bend-up bars = 12xØ
Foundation Level = 50mm	Anchor bars = 45xØ
Floor Slab = 30mm	Lapping bars = 45xØ
Beam = 30-35mm	Mid bars = 0.85 x span
Column =35-40mm	Support bars = $\frac{1}{3}$ x span

STRUCTURE DETAILS

SCALE 1:20

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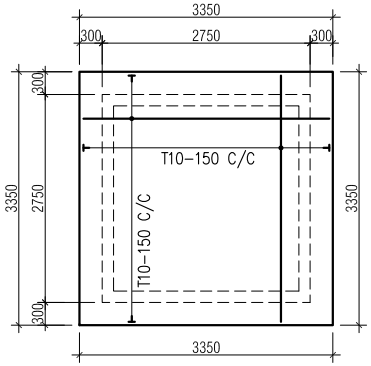
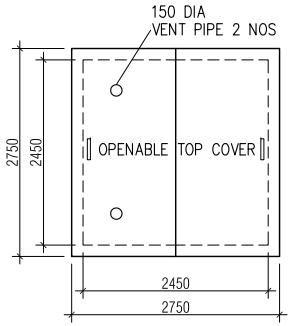


BOTTOM SLAB THICKNESS: 200MM
RFMNT. T10–150 C/C BW THROUGHOUT
TOP & BOTTOM AS SHOWN

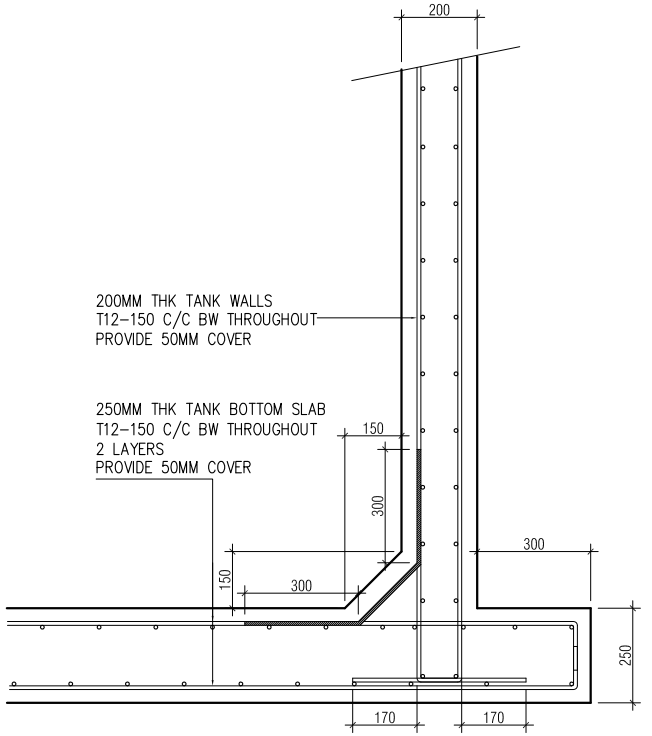
TANK BOTTOM SLAB PLAN

SCALE 1:100



TANK PLAN

SCALE 1:100



TANK SECTION DETAILS

SCALE 1:100

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Appendix 5 Standard Operating Procedure for the facility

Standard Operating Procedure for Sandfish Quarantine

Draft

April 2016

Ministry of Fisheries and Agriculture

Male', Maldives

Table of Contents

1. INTRODUCTION

Development of mariculture is a high priority of the government, as this industry creates jobs in the outer atolls, brings export revenue to the country. Government is currently implementing Mariculture Enterprise Development Project (MEDeP) with the goal of expanding livelihood opportunities and reducing vulnerability of island communities.

The livelihoods of the communities have been dependent on tuna fishery for centuries. Sea cucumber fishery and other reef fisheries have become an additional or alternative source of income to tuna and other fishermen. Promotion of alternative livelihoods such as sea cucumber culture has become very important today as the income of the communities from tuna and sea cucumber fisheries are declining.

MEDeP is promoting Sandfish, *Holothuria scabra*, culture. This species, which is not native to Maldives, has been successfully cultured in the country for some years. Culture of this high valued species has become very popular in the country. The species is now spreading to different parts of the country. There is a need to manage the culture of this species. To continue the culture of this species broodstock needs to be imported. The importation requires quarantine of the species to minimise introduction of diseases and other negative impacts.

As the importation of aquatic animals may be needed in mariculture development MEDeP has planned capacity building in aquatic animal quarantine under its institutional strengthening component. Capacity building includes construction of a quarantine facility at International Airport in Hulhule, training, and development of regulations and Standard operating procedure (SOP) for quarantine of aquatic animals. Current SOP is developed by MEDeP for quarantining Sandfish in the facility.

2. OVERVIEW

Development of mariculture is a high priority of the government. Mariculture Enterprise Development Project (MEDeP) is currently being implemented to introduce and develop mariculture in the country. Sandfish a priority culture species of the project. This species, which is not native to Maldives, has been successfully cultured in the country for some years. To continue the culture of this species broodstock needs to be imported. The importation requires quarantine of the species to minimise introduction of diseases and other negative impacts.

The purpose of this Sandfish quarantine SOP is to run the Sandfish quarantine facility smoothly according to predefined standards and procedures to minimize negative impacts of sandfish importation.

The quarantine facility will be operated by a Head, Quarantine Officers and an Administrator, who have relevant qualification and experience.

Quarantine facility is operated and its SOP is carried out under mariculture development policy of MoFA. Aquatic animal quarantine is currently carried out under the Plant and Animal Quarantine Regulation of MoFA.

This SOP is involved with the processes of:

a) conducting quarantine,
b) cleaning and disinfecting the quarantine facility and its equipment,
c) water intake and circulation,
d) water filtration, disinfection and discharge,
e) dead animal and packing material disposal,
f) water quality management; animal health observation and assessment, and
g) health and safety of the staff operating the facility

Equipment and materials are identified for each process as well as for the health and safety measures related with it. Trouble shooting is also given for the processes.

3. GENERAL ASPECTS

This section explains scope and purpose of the SOP. It documents the history and the development of the SOP, gives the policy and legal framework within which the SOP operates, defines the qualification of the staff implementing the SOP, and shows arrangements for implementing the SOP...

3.1. History and Development

This is the first SOP for the quarantine facility, which has been prepared as an activity of the institutional strengthening component of MEDeP. This is a living document. It needs to be improved and revised as experience and knowledge are gained in operating the quarantine facility and keeping Sandfish in captivity. The history and development of the SOP needs to be documented as it evolves.

3.2. Purpose

The purpose of this SOP is to run the quarantine facility smoothly according to predefined standards and procedures to minimize negative impacts of sandfish importation.

3.3. Scope

This SOP is applicable to the quarantine facility established at the international airport in Hulhule. It deals with the quarantine of i Sandfish, *Holothuria scabra*, which are expected to be imported in batches of 250 individuals.

3.4. Pre-requisites and Qualifications

3.4.1. Head of the Quarantine Facility

This staff is required to have a M.Sc. degree in aquatic animal health or aquatic veterinary science with minimum five years of practical experience in these fields. Number required 1.

3.4.2. Quarantine Officers

These staff are required to have B.Sc. degree in aquaculture with minimum five years of practical experience in this field. Number required 6.

3.4.3. Administrator

This staff is required to have a diploma in office administration with minimum five years of practical experience in this field. Number required 1.

3.5. Responsibilities

3.5.1. Head of the Quarantine Facility (HOCF)

a) Coordinate the work of the quarantine facility
b) Supervise the work of other quarantine aquatic laboratory staff
c) Ensure quarantine work proceeds according the set procedures, standards and policies
d) Carry out aquatic disease diagnostic work
e) Issue quarantine reports

3.5.2. Quarantine Officers (QO)

a) Observe animals under quarantine
b) Collect and analyze data on quarantine animals and procedures
c) Maintain records of quarantine data
d) Prepare quarantine reports
e) Maintain quarantine facility equipment in working conditions

3.5.3. Administrator

a) Carry out day-to-day administrative work of the quarantine facility
b) Process quarantine applications
c) Ensure adequacy and completeness of documents needed for each batch of quarantine animals
d) Check if the quarantine facility has enough material and supplies for quarantine work

3.6. Coordination

The work of aquatic animal quarantine is coordinated by the Head of the quarantine facility. Coordination is needed among MoFA, plant Quarantine Department, staff of the quarantine facility and quarantine applicants. As aquatic and terrestrial animal quarantine work is done under one administration and one complex, coordination between these two divisions is very important.

3.7. Policies, Standards and Regulations

Quarantine facility is operated and its SOP is carried out under mariculture development policy of MoFA. Standards for operating the quarantine facility are set by the Technical Committee of MoFA. Aquatic animal quarantine is currently carried out under the Plant and Animal Quarantine Regulation of MoFA. This arrangement will continue until new fisheries bill and aquaculture regulations come into effect.

4. ABBREVIATIONS, ACRONYMS AND TERMINOLOGY

4.1. Abbreviations and Acronyms

SOP: Standard Operating Procedure

CO: Quarantine Officer

HOCF: Head of quarantine facility

4.2. Terminology

FAO definitions

Quarantine – maintaining a group of aquatic animals in isolation with no direct or indirect contact with other aquatic animals, in order to undergo observation for a specified length of time and, if appropriate, testing and treatment, including proper treatment of the effluent waters (OIE, 2006a).

Quarantine facility (also referred to as a "quarantine premise" or a "transitional facility") – any place approved for the quarantine of live aquatic animals.

Quarantine officer – a technically competent person authorized by the Competent Authority for purposes of inspecting and certifying compliance with the health requirements of the Competent Authority concerning the import and export of live aquatic animals.

Quarantine period – a minimum period of quarantine, typically as specified in an aquatic animal import health standard or other legally binding document (e.g. national or state regulations).

Standard operating procedures (SOPs) – a set of instructions having the force of a directive, covering those features of operations that lend themselves to a definite or standardized procedure without loss of effectiveness - *http:// en.wikipedia.org/wiki/Standing_operating_procedure.*

5. METHODOLOGIES AND PROCEDURES

This section examines the SOP in detail while the previous sections have set the stage for it. Quarantine facility staff have to be thorough with this section for the smooth implementation of the SOP.

The following processes are involved with the SOP.

a) Getting in and out of the quarantine facility
b) Maintaining the facility when no animals are under quarantine
c) Getting documentation ready to receive a batch of quarantine animals
d) Facility cleaning and disinfection for receiving a batch of quarantine animals
e) Tank preparation
f) Water Intake, storage, filtration, disinfection and pumping into holding tanks
g) Waste water collection, filtration, disinfection and discharge into the Sea
h) Water quality management
i) Animal health observation and assessment
j) Dead animal disposal
k) Packing material Disposal
l) Facility cleaning and disinfection after quarantining a batch animals
m) Health and safety restated

Each of the above process is described and explained in Section 5. For each processes, where relevant, the following information is also supplied:

a) Equipment and Materials
b) Records and Checklists
c) Health and Safety
d) Cautions and Interferences

Health and Safety, while discussed under each process, they are also compiled in one place under the heading “Health and Safety Restated” for ease of reference.

5.1. Getting In and Out of the Quarantine Facility

5.1.1. Procedure

When getting into the facility:

a) Enter the outer changing room
b) Keep your outdoor clothes and footwear in the outer changing room
c) Take a shower
d) Enter the inner changing room
e) Wear your in-facility clothes and footwear
f) Enter the quarantine areas (Fig. x)

When getting out of the facility:

a) Enter the inner changing room
b) Keep your in-facility clothes and footwear in the inner changing room
c) Take a shower
d) Enter the outer changing room
e) Wear your outdoor clothes and footwear
f) Get out of the facility

5.1.2. Fire Safety

a) Get familiarize with evacuation plan in case of fire, which is found in every workstation
b) Know where you are in the building
c) Follow the evacuation plan in case of fire

5.2. Getting Documentation Ready to Receive a Batch of Quarantine Animals

5.2.1. Records and Checklists

Application for the import

a) Import permit
b) Notice of the arrival date of the shipment
c) Health certificates for the import batch

5.2.2. Procedure

Check if the quarantine facility has received the following documents:

a) Application for the import
b) Import permit
c) Notice of the arrival date of the shipment
d) Health certificates for the import batch

5.2.3. Cautions and Interferences

a) Ensure that the conditions of the permit that need to be fulfilled to date have been met. If not contact MOFA.

5.3. Maintaining the Facility When no Animals are Under Quarantine

5.3.1. Records and Checklists

a) Pump logbook

5.3.2. Procedure

Animals are quarantined in batches. When quarantining of one batch is complete the next batch starts. In between two quarantine process the facility should be maintained as follows:

a) Keep the facility completely dry
b) Clean the floor and surfaces of pipes and tanks in every two weeks
c) Pump some seawater from the lagoon well into the reservoir tanks and discharge it into the sea through the bypass pipeline in every two weeks to prevent water stagnation in the well
d) Fill pump logbook

5.3.3. Health and Safety

a) Follow safety measures in operating pumps.

5.3.4. Cautions and Interferences

a) Follow Caution and Interferences in Section: Water Intake, storage, filtration, disinfection and pumping into holding tanks

5.4. Facility Cleaning and Disinfection for Receiving a Batch of Quarantine Animals

5.4.1. Equipment and materials

a) Hypochlorite
b) Iodophore solution
c) Sodium thiosulphate
d) Face mask
e) Gloves

5.4.2. Records and Checklists

a) Facility cleaning and disinfection record sheet

5.4.3. Procedure

a) Make solution of hypochlorite
b) Make iodophore solution of required strength
c) Make solution of Sodium thiosulphate
d) Thoroughly clean floor, tanks and pipe surfaces
e) Disinfect tanks and pipe surfaces with hypochlorite solution at 200 ppm concentration
f) for 5 minutes or with an approved iodophore solution containing iodine at
g) 0.5 percent available iodine for 5 minutes
a) Disinfect floor with hypochlorite solution
b) Neutralize discharge hypochlorite solution with Sodium thiosulphate

5.4.4. Health and Safety

a) Observe safety measures in using hypochlorite, iodine and sodium thiosulphate

5.5. Tank Preparation

5.5.1. Equipment and Materials

a) Disinfected (autoclaved) carbonate sand
b) Aeration tubes
c) Aeration valves
d) Aeration joints
e) Airstones

5.5.2. Records and Checklists

a) Tank record sheet

5.5.3. Procedure

a) Connect aeration tubes with valves and air stones to the main aeration line
b) Spread thin layer of sand on the bottom of the tank
c) Fill the tank with seawater
d) Adjust aeration intensity
e) Adjust water flow into the tank
f) Put on tank lids

5.6. Water Intake, Storage, Filtration, Disinfection and Pumping into Holding Tanks

5.6.1. Equipment and Materials

a) Multi-stage electrical pump connected with the water intake system
b) Sand filter connected with the water intake system
c) Cartridge filter connected with the water intake system
d) UV sterilizer connected with the water intake system

5.6.2. Records and Checklists

a) Pump logbook
b) UV sterilizer logbook

5.6.3. Procedure

a) Put on the electrical pump
b) Check if water is flowing in the filters and getting into the reservoir tank
c) Check water flow rate
d) Fill pump logbook
c) Fill UV sterilizer logbook
d) Backwash sand pump every three days when water intake is continuous
e) Change cartridge filter every three days when water intake is continuous

5.6.4. Health and Safety

a) Observe safety measures in using hypochlorite, iodine and sodium thiosulphate and UV steriliser

5.6.5. Cautions and Interferences

a) If water is not flowing prime the pump
b) Check if priming water is maintained in the pump
c) If priming water is not maintained in the pump check foot valve for leaks
d) If foot valve is leaking replace the foot valve and start the pump again

5.7. Waste Water Collection, Filtration, Disinfection and Discharge into the Sea

5.7.1. Equipment and Materials

a) Multi-stage electrical pump connected with the water intake system
b) Sand filter connected with the water intake system
c) Cartridge filter connected with the water intake system
d) UV sterilizer connected with the water intake system
e) Hypochlorite
f) Iodine
g) Sodium thiosulphate
h) Face masks
i) Gloves

5.7.2. Records and Checklists

a) Pump logbook
b) UV sterilizer logbook
c) Chlorination record sheet

5.7.3. Procedure

a) Add hypochlorite to wastewater collection tank to achieve a minimum chlorine concentration of 200 parts per million (ppm) (200 mg/litre) at 1 hr post-treatment.
b) Following addition of hypochlorite agitate the tank water for 1 hour
c) Test the water for chlorine if the concentration of 200 parts per million (ppm) (200 mg/litre)
d) If the chlorine concentration is less than the standard rechlorinate the tank water

e) Make solution of Sodium thiosulphate
f) Neutralize the chlorine in the wastewater adding sodium thiosulphate at a rate of 1.25 g (2.5 ml of 50 percent sodium thiosulphate solution) per l of treated wastewater,
g) Agitate the waste water for not less than 10 minutes
h) Pass the wastewater through sand filter, cartridge filter and UV steriliser and discharge it into the sea

5.7.4. Health and Safety

a) Observe safety measures in using hypochlorite, iodine and sodium thiosulphate and UV steriliser

5.8. Water Quality Management

5.8.1. Equipment and Materials

a) Water quality test kits
b) Water quality test manual

5.8.2. Records and Checklists

a) Water quality record sheet

5.8.3. Procedure

Test and check holding tank intake water, holding take water and discharge tank water for

a) Nitrites
b) Nitrates
c) Phosphates
d) Dissolved oxygen
e) Salinity, and
f) pH

5.8.4. Health and Safety

a) Observe general safety measures for using chemicals

5.9. Animal Health Observation and Assessment

5.9.1. Equipment and Materials

a) Tongs
b) Gloves
c) Designated refrigerator
d) Designated freezer

5.9.2. Records and Checklists

a) Health record sheet
b) Mortality record sheet

5.9.3. Procedure

Observe the sea cucumber in tanks for

a) movement from place to place
b) burying behavior (time of burying, time of surfacing)
c) extending, shortening, curving and straightening the body
d) luster and mucus on the body
e) any sign of ulceration and body infection
f) mortality, and
g) record the observations in the Health record sheet

With the authorization of the HOCF:

h) preserve the dead animals in the freezer, refrigerator or by any other method

5.10. Dead Animal Disposal

5.10.1. Equipment and Materials

a) Tongs
b) Gloves
c) Face masks
d) Autoclave
e) Incinerator
f) Designated refrigerator
g) Designated freezer

5.10.2. Records and Checklists

a) Mortality record sheet
b) Authorization sheet for dead body removal (for disposal or laboratory examination)
c) Incineration record sheet

5.10.3. Procedure

a) Get authorization of HOCF for removing the dead bodies for disposal or laboratory examination
b) If the decision was to dispose the dead bodies:
c) Sterilize the dead bodies in autoclave
d) After sterilization incinerate the dead bodies

5.11. Packing Material Disposal

5.11.1. Equipment and Materials

a) Tongs
b) Gloves
c) Face masks
d) Incinerator
e) Hypochlorite
f) Iodophore solution

5.11.2. Records and Checklists

a) Incineration record sheet

5.11.3. Procedure

a) Disinfect the material with hypochlorite solution at 200 ppm concentration for 5 minutes or with an approved iodophore solution containing iodine at 0.5 percent available iodine for 5 min
b) Incinerate the materials

5.12. Facility Cleaning and Disinfection After Quarantining a Batch of Animals

5.12.1. Equipment and Materials

a) Hypochlorite
b) Iodophore solution
c) Sodium thiosulphate
d) Face mask
e) Gloves

5.12.2. Records and Checklists

a) Facility cleaning and disinfection record sheet

5.12.3. Procedure

h) Make solution of hypochlorite
i) Make iodophore solution of required strength
j) Make solution of Sodium thiosulphate
k) Thoroughly clean floor, tanks and pipe surfaces
l) Disinfect tanks and pipe surfaces with hypochlorite solution at 200 ppm concentration
m) for 5 minutes or with an approved iodophore solution containing iodine at
n) 0.5 percent available iodine for 5 minutes
c) Disinfect floor with hypochlorite solution
d) Neutralize discharge hypochlorite solution with Sodium thiosulphate

5.12.4. Health and Safety

a) Observe safety measures in using hypochlorite, iodine and sodium thiosulphate

6. HEALTH AND SAFETY RESTATED

6.1. Fire Safety

a) Get familiarize with evacuation plan in case of fire, which is found in every workstation
b) Know where you are in the building
c) Follow the evacuation plan in case of fire

6.2. Seawater Intake and Discharge

6.2.1. Measures

a) Follow safety measures in operating pumps

6.3. Cleaning and Disinfection

6.3.1. Equipment and Materials

a) Face mask
b) Gloves

6.3.2. Measures

a) Observe safety measures in using hypochlorite, iodine and sodium thiosulphate and UV steriliser
b) Observe general safety measures for using chemicals

7. REFERENCES

J. Richard Arthur, Melba G. Bondad-Reantaso, Rohana P. Subasinghe. Procedures for the quarantine of live aquatic animals: a manual. Food and Agriculture Organization of the United Nations, Rome 2008.

Appendix 6 List of Stakeholders consulted

Name	Designation	Contact No.
Mohamed Anees	Manager, Terrestrial Plant and Animal Quarantine Facility	7901330
Aishath Abdul Rahman	Engineer / (Expansion Projects) Maldives Airports Company Ltd	3315366
Mohamed Nizam Ahmed	Manager / Waste Management Section (MACL)	3315366
Abdul Fahthah	Water Supply Dept. (MACL)	7775805
Nishan Ahmed	Senior Public Health Program Officer Health Protection Agency	7512240
Aminath Shaufa	Public Health Program Coordinator Health Protection Agency	3014496