ENVIRONMENT IMPACT ASSESSMENT

FOR THE PROPOSED

DREDGING COMPONENT OF THE RESORT DEVELOPMENT PROJECT

IN ITHAAFUSHI REEF, SOUTH MALE' ATOLL

July 2016

Prepared for

Ithaafushi Investments Private Limited

Consultant

CDE Consulting, Maldives

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List of Abbreviations

COADS	Comprehensive Ocean-Atmosphere Data Set
DO	Dissolved Oxygen
EIA	Envrionmental Impact Assessment
GPS	Global Positioning System
IPCC	Intergovernmental Panel on Climate Change
IPPC	International Plant Protection Convention
IUCN	International Union for Conservation of Nature
KWp	Kilowatt peak
MEE	Ministry of Environment and Energy
MHI	Ministry of Housing and Infrastructure
MoTAC	Ministry of Tourism, Arts and Culture
MoTCA	Ministry of Tourism and Civil Aviation
MSL	Mean Sea Level
MWSC	Maldives Water and Sewerage Company
NAPA	National Adaptation Programme of Action
NE	North East
NEAP II	National Environmental Action Plan II
NW	North West
PV	PhotoVoltaic
SAP	Strategic Action Plan
SE	South East
SW	South West
TDS	Total Suspended Solids
ToR	Term of Reference
UNFCCC	United Nations Framework Convention on Climate Change and the Kyoto Protocol

Acknowledgements

The lead author of this report is Dr. Ahmed Shaig

Additional assessments were undertaken by the following team members.

Ms. Shahdha (Socioeconomic Impact Assessment)

Mr. Mohamed Nishaman (Terrestrial Environment Surveys)

Mr. Ali Moosa Didi (Marine Surveys)

Mr. Ahmed Haiman Rasheed (Marine Surveys)

Mr. Mohamed Faizan (Marine Assessment)

Ms. Mariyam Hana Saeed (Stakeholder Consultations)

Mr. Mohamed Ali (Field Sampling)

The curriculum vitae's of the EIA consultants are attached in Appendix J of this report.

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Lead Consultant's Declaration

I certify that statements made in this Environment Impact Assessment are true, complete and correct to the best of my knowledge and available information.

Dr Ahmed Shaig

Proponent's Declaration

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(See Appendix K)

Executive Summary

This Environmental Impact Assessment (EIA) report is the evaluation of the potential environmental, socioeconomic and natural impacts of the proposed dredging component of resort development project in Ithaafushi reef. The EIA Regulations published by EPA has been used as the basis for preparing this document. The proponent of this project is Ithaafushi Investments Private Limited.

An EIA has been prepared and approved for the project on October 2015 under the Tourism Law. The First Addendum to the EIA was submitted MoT on June 2016 and is pending approval. This EIA has been specifically necessitated as the proponent has opted to use a Trailing Hopper Suction Dredger (THSD), which requires dredging from atoll lagoon. Any development outside the boundary of tourist property requires a separate EIA approval from EPA. Thus, this report only looks into the dredging component of the project.

The overall project involves reclaiming a total area of 20.8 Ha in Ithaafushi Reef and the development of the necessary infrastructure for the functioning of a stand-alone 240 bed (120 room) bed capacity. The property will comprise of three separate islands but will be operated as single property.

The component proposed under this EIA is to use a THSD to dredge about 500,000 cbm of sand from the atoll lagoon of North Male Atoll and reclaim the proposed island.

The rationale for the proposed dredging technology is due to the availability of a TSHD in the Maldives. THSD was proposed as the preferred option on the original EIA if a ship was to become available. The proposed borrow area is located in the atoll lagoon in North Male' Atoll approximately 27-30 km from Ithaafushi reef. Distance to nearest Marine Protected Area from the borrow site is 1.8 km and distance to sensitive environment is about 1.1 km. A total of 500,000 cbm of sand will be dredged for reclaiming Ithaafushi reef. The site has been identified due to the presence of sand, reusability and proximity to reclamation site. Dredging activity will take approximately two to two-and-a-half weeks and a total of 17 trips will be made by TSHD. Duration of the overall project is 24 to 30 months. The proposed borrow site has also been used to reclaim the Male' SW harbour area.

The proposed developments are generally in conformance to the relevant laws and regulations. Additional approvals are required for the following before commencement of project activities. They include dredging and reclamation approval from EPA, detailed drawings approval from the Ministry of Tourism and construction approval from Ministry of Tourism.

Existing environment utilises the baseline data collected for the original EIAs. Works already completed in the reef include construction of sand bunds for Island B and dredging the entrance channel. For this report, borrow area sediment quality, marine environment and marine water

quality around borrow sites was assessed. In addition, a detailed bathymetry survey was undertaken. Results of the assessment at proposed borrow site showed limited fines and 80 – 90% moderate sized material suitable for reclamation. The nearest MPA to the proposed dredging site *Giraavaru Kuda Haa* has excellent coral life and abundance fish.

The most significant negative impact from this project during construction are typical impacts associated with dredging and reclamation. All marine organisms within the footprint of dredging will be lost. In addition, increased levels of turbidity and sedimentation inhibit corals ability to successfully reproduce. Others include impacts on ambient noise level, air quality and greenhouse gas emission, marine water quality, changes in hydronamics, impacts on unique habitats and impacts on visual amenity for nearby resorts. Main socioeconomic impacts include the impacts on marine biodiversity and visibility around house reefs of nearby resorts and dive spots in the region. Loss of marine fauna and impact on reef systems will cause a direct impact on the revenue of the resorts. The presence of sensitive environment within the vicinity is a concern, particularly due to the recent coral bleaching event, cumulative impacts from the recently completed Hulhumale' reclamation project and cumulative impacts of dredging from the same site for Male' SW harbour construction project.

The key mitigation measures proposed for the construction stage include finding options to mitigate noise and air pollution, increased turbidity and sedimentation, resource and social conflicts. To mitigate turbidity and sedimentation, bund walls are proposed to control sediment dispersal during dredging and reclamation and use of 'green valves' in the TSHD to minimise impacts from the water overflow during loading into the hopper. Relevant stakeholder must be informed about the project at all stages to mitigate any resource and social conflicts.

Alternative options were evaluated for the activities that are identified to have significant impacts on the project. Alternative options have been explored for no changes to dredging method, shore protection and to master plan. Alternatives have also been explored for harbour options, outfall locations and alternative locations for borrow sites. Given strong benefits for the project it is recommended to proceed with changes and preferred option for harbour is proposed northwest corner for aesthetics. Four sites have been studied for potential borrow sites, but South Male' atoll is left untouched due to the manoeuvring difficulties for a large ship in the area. It is proposed to use the proposed borrow site with stringent adherence to TSHD overflow control.

The Environmental Management Plan (EMP) for this project is designed to produce a framework for anticipated impacts associated with THSD activities, including practicable and achievable performance requirements and systems for monitoring, reporting and implementing corrective actions.

The Monitoring plan is designed to assess any changes to the physical environment as well as operational aspects of the resort, particularly in relation to THSD operations. The monitoring plan in the addendum has been updated as per the changes made to the project. The total cost of mitigation and monitoring are estimated to be USD 5,000 per year. Since the project already has a monitoring programme approved for the original EIA under MoT, the overall programme must incorporate the programme presented in this report. The report must be submitted to both MoT and EPA.

Stakeholder consultations were held with Environmental Protection Agency, Marine Research Centre, The proponent, Baros Maldives, Centara Rasfushi Resort and Spa and Diver's Lodge Maldives. Attempts were made to consults with Kohdhipparu island but were non-responsive. Stakeholder consulted raised concerns on the impacts dredging activity will have on notable dives spots and house reefs of the nearby resorts. Given the vicinity of a MPA around the dredging site, stakeholders recommended exploring alternative borrow sites. The proponent emphasized on the importance of the changes made to the project. EPA noted that a separate EIA may be required to be approved by EPA. This EIA has been initiated based on this suggestion.

The main conclusion of this report is to move forward with the proposed changes with the proposed alternatives and the suggested mitigation measures. It has been proposed to move forward with THSD use as it reduces the timeframe of impacts by 6 months which is a substantial environmental benefit compared to a CSD.

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1 INTRODUCTION

1.1 Purpose of the EIA

This Environment Impact Assessment (EIA) report is an evaluation of the potential environmental, socio-economic and natural impacts of the proposed dredging activities of the resort development project in Ithaafushi Reef.

EIA approval for resort development activities usually falls under the purview of the Ministry of Tourism (MoT). An EIA has been approved for the project by MoT on 15 October 2016. An Addendum was submitted to MoT in June 2016 and is pending approval. This EIA has been necessitated due to a change in dredging technology to Trailing Hopper Suction Dredger (THSD), which requires dredging outside the resort boundary. Any work undertaken outside the resort boundary requires a separate EIA approval from EPA.

This document has been developed based on the Terms of Reference (Appendix A) issued by the Environmental Protection Agency (EPA) on 05 July 2016. This document is submitted to EPA by the proponent to fulfil the requirements of Environmental Protection and Preservation Act (EPPA) of the Maldives (4/93), more specifically the clause 5 of the Act which states that a report should be submitted before implementation of any project that may have a potential impact on the environment.

This report provides the background to the proposed dredging activity as well as an assessment of their likely environmental and social impacts, both beneficial and adverse. The proposed enhancement and mitigation measures are outlined where necessary together with an environment management plan and a monitoring programme.

This EIA only looks at the dredging activity, sand transportation and offloading to reclamation side. A more detailed assessment of the impacts from the project is provided in the Original EIA and First Addendum submitted to MoT.

1.2 Project Title

The project is called land reclamation and resort development in Ithaafushi Reef in South Male' Atoll.

1.3 Project Proponent

The proponent of this project is Ithaafushi Investments Private Limited. The company's name has been changed from Sumaia Holdings. Registered in 16 September 2012, Ithaafushi Investments Private Limited is an investment company in the Maldives with the Directors

having other established Companies in Qatar and Maldives in the fields of Hospitality, Construction and F&B. The directors of the company own companies that have developed several brand projects in Qatar and Maldives under UCC and HRC banners respectively. This project was leased to proponent on 27th May 2015 under the S&P agreement signed between Maldives Marketing and Public Relations Corporation and Ithaafushi Investments Private Limited.

The contact details of the proponent are as follows:

H.Sea Side
Boduthakurufaanu Magu, Male' 20009
Tel: 3325602, 3321997

Email: projects@hotelsresortsconstruction.com

1.4 Legal status of the reef

In 2015, the GOM leased Ithaafushi Reef (the name is given by the developer as no official name was available) for resort development by reclaiming land. This is part of the present Government Programme to lease reefs in Male' Atoll for resort development. The proposed location within the reef has been suggested by the Ministry of Tourism and the concept plan has been approved by the Ministry.

1.5 Background of the Project

The Government of the Maldives (GOM) in its efforts to enhance the economic potential of the Maldives has been trying to speed up the planned increase in tourist bed capacity in order to meet the steady increase in tourist arrivals. So far, the construction of resorts has lagged behind and there is a need to introduce more beds as soon possible. This project forms part of the overall effort to increase bed capacity.

The Male' region with its proximity to the Male' International Airport offers unparalleled advantages to develop certain types of tourism products. However, there are not enough islands in the Atoll or even the region to consider for new developments. Almost all available islands have been leased or handed over to relevant authorities for economic or infrastructure development. The only available option is to reclaim land from shallow reefs. A number of resorts have already been enlarged through reclamation such as One and Only Reethi Rah, the former Dhonveli Beach Resort, Sonevagili Island Resort, Paradise Island Resort, Fun Island Resort and Olhuveli Island Resort. These islands have increased their bed capacity through reclamation.

There are also a number of new islands being created from land reclamation in Male' Atoll such as Hulhumale' Island and Gulhifalhu Island. This method is now accepted in Maldives as the main means to relieve land shortage.

In 2015, the GOM decided to lease Ithaafushi Reef (the name is given by the developer as no official name was available) for resort development by reclaiming land. This is part of the present Government Programme to lease reefs in Male' Atoll for resort development. It is understood that over 10 reef were in various stages of planning and development at the time of this assessment.

It has to be noted that this would be the second time where an island is proposed to be reclaimed from scratch to develop a resort island. Approval has also been granted to reclaim and develop an island in Dhiffushi Reef and reclamation works are now ongoing.

The proposed location within the reef has been suggested by the Ministry of Tourism and the concept plan has been approved by the Ministry.

An EIA was approved for the project on October 2016. The dredging technology proposed at the time was Cutter Suction Dredger (CSD) as there was no Trailing Hopper Suction Dredger (THSD) available in the Maldives.. The original island had planned to reclaim 13 Ha. The plan was to reclaim three separate islands and develop a 5-star rated property.

Changes made to the project in January 2016 and a separate EIA addendum was submitted to MoT to evaluate the impacts of the changes. The EIA has been evaluated and the Decision Note is pending. The proposed changes include increasing the size of the island to 20 Ha and changing the shape of the island substantially. A THSD has also become available and the proponent preferred to use the dredger to reclaim the island. After evaluating the EIA and as suggested in the First Addendum Report, MoT requested the proponent to get approval from EPA as well since the borrow area falls under their jurisdiction.

1.6 Project Scope Summary

The overall project involves reclaiming a total area of 20.8 Ha in Ithaafushi Reef. It also involves the development of the necessary infrastructure for the functioning of a stand-alone 240 bed (120 room) bed capacity. The property will comprise of three separate islands but will be operated by the same operator.

The component proposed under this EIA is to use a THSD to dredge 500,000 cbm of sand from the atoll lagoon of North Male Atoll and reclaim the proposed island.

1.7 Project tasks completed

Master planning has been completed. Alterations have been brought to the layout of master plan and to island shape and design since the approval of the original EIA report. Some of the over water villas in the original design has been replaced by beach villas and BOH has been relocated island A. In addition, changes are also made to borrow site specifications.

As noted above EIA for all other works have been completed and approved.

In terms of detailed assessments, a number of studies including borehole drilling for geotechnical investigations, water depth surveys, marine assessments at proposed sand borrow sites have been undertaken. The concept master plan has been completed and approved. Dredging and reclamation plan has also been prepared and detailed design is underway

In terms of physical work, sand bund has also been constructed in island B. Bunding works for Island A are ongoing. A further contract has been signed with Van Oord to undertake dredging and reclamation using a THSD.

1.8 Project Objectives and Rationale

The aim of this project is to develop a multi-island resort in South Male' Atoll by reclaiming a shallow water lagoon. The proponent aims to use the proximity to Male' International Airport and continued growth in tourism arrivals in the Maldives to establish a successful and profitable resort.

1.8.1 Rationale from the industry perspective

The tourism arrivals in the Maldives are increasing at a steady level as expected (Ministry of Tourism, 2015). However, the bed capacity in the Maldives as envisaged in the Third Tourism Master Plan has not materialised (Ministry of Tourism and Civil Aviation, 2007). The year 2015 was supposed to add extra 1,900 beds to the market (Ministry of Tourism, 2013) but the slow rate of construction, lack of finance and contractual issues have prevented them from being materialised. The proposed project is part of the overall plan to increase the bed capacity in the Maldives under the Third Tourism Master Plan.

The proposal to develop a resort in Male' Atoll comes from the need to increase the bed capacity in the Male' Atoll to target specific markets which can only be served when in close proximity to the main international airport.

The decision by the Government to consider land reclamation as an option to create new resort islands stems from the shortage of islands in the Male' and Ari Atoll region. At present 90% of the islands in Male' Atoll is being utilised for various land uses. The remaining islands are either

too small to be utilised for an economic activity or are sand banks. Hence, the only option remaining is to reclaim new land from the shallow Male' Atoll reefs.

Given the lack of islands in Male' Atoll, the proposed works, as agreed principally between the two parties cannot be undertaken without the necessary additional land.

The investment by the proponent represents an opportunity for the Maldives to expand and diversify its tourism sector.

1.8.2 Rationale from proponent's perspective

The close proximity to the International Airport, existing tourism facilities in the atoll, relatively untouched North East Male' Atoll area and large size of the reef were the main reasons for considering the proposed site for development. Although the site was allocated by the Government of Maldives, the decision on the site was taken by the proponent based on available reefs offered by Ministry of Tourism.

The provision of high quality international standard accommodation and entertainment facilities within the beautiful physical environment setting of Maldives offers an unparalleled advantage over other similar destinations.

For the proponent, the justification is purely business benefits from a unique opportunity.

1.8.3 Rationale for using a THSD

The change in dredging technology is due to the availability of a THSD in the Maldives during July 2016. Van Ood, a Dutch dredging company, has mobilized a THSD to undertake a number of Government projects and the proponent would like to utilize this opportunity to complete the works in the shortest time possible. The original EIA also preferred a THSD if the equipment was available in the Maldives.

The use of THSD also limits environmental damage compared to a CSD. As CSD takes much longer to complete and requires dredging very close to the reef. THSD also limits damages the coral colonies in the deep lagoon.

1.9 Project Location

Ithaafushi reef is located in South Male' Atoll. There is no official name for the reef. The Ministry of Tourism's initial communication regarding the site referred to the site as Falhu 9. Ithaafushi Reef is the name given to the site by the proponent. Table below summarizes the key information on the proposed reef. Figure 1.1 presents location of Ithaafushi Reef, an Figure 1.2 presents the locality map for the region.

The proposed borrow site is located in North Male' Atoll. Table 1.2 summarizes its location and Figure 1.3 presents the borrow area and its vicinity.

Table 1.1: Summary of key information about the proposed Ithaafushi Reef

Reef Name	*Ithaafushi Reef*
Alternative names	*Falhu 9*
Location	*73°22'57.86"E and 4°0'47.62"N*
Reef Area	
Over all area (within visible depth)	*83 Ha*
Length	*About 2700 m*
Width at the widest point	*About 700 m*
Distance to Hulhule Int. Airport	*About 25 km*
Distance to Male' City	*About 22 km*
Distance to nearest resort	*About 9 km to Jumeirah Vittaveli Maldives*

Table 1.2: Summary of key information about the borrow site

Located Atoll	*North Male' Atoll*
Location (Centre point)	*73°24'4.188"E and 4°14'32.228"N*
Total Area	*147 Ha*
Distance to nearest island	*About 0.87km to Kohdhipparu Island*
Distance to Ithaafushi Island	*About 27-30 km*
Distance to nearest resort	*3.7km (Centara Rasfushi); 4.4km Baros*
Distance to nearest MPA	*About 1.8 km*
Distance to nearest Sensitive Environment	*About 1.1 km*

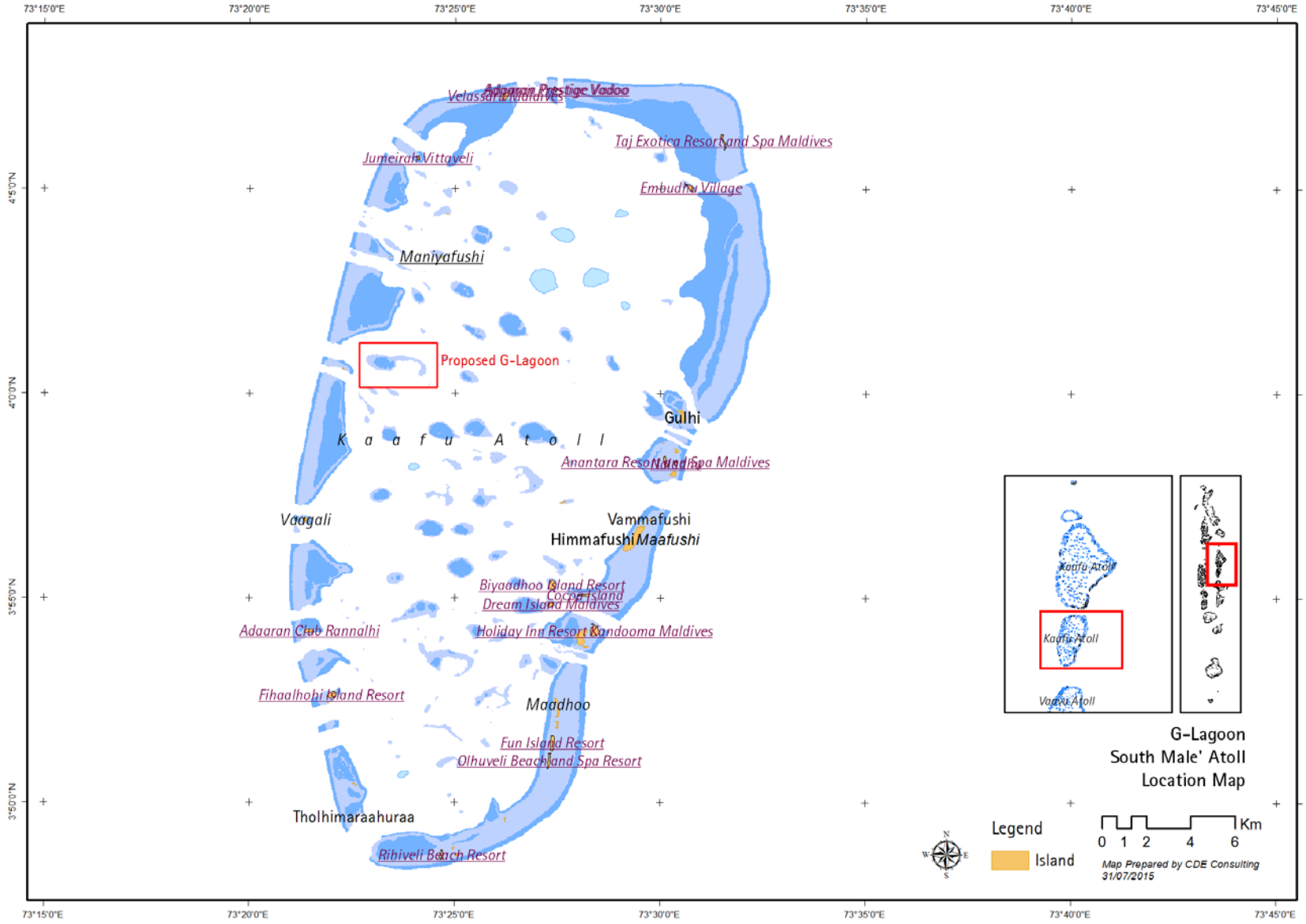


Figure 1.1: Location map of Proposed Island at Ithaafushi Reef

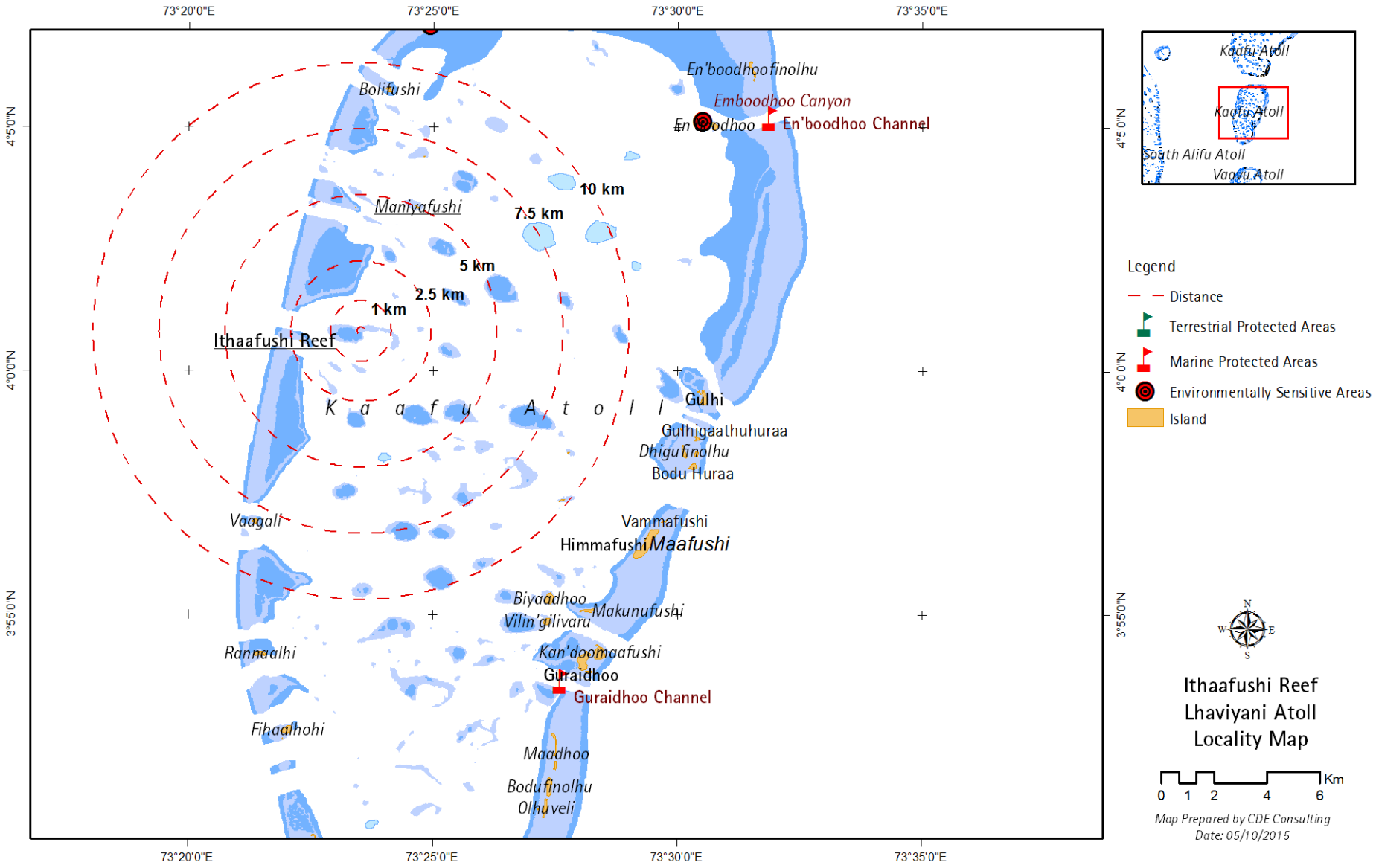


Figure 1.2: Locality map showing nearby islands and registered environmentally sensitive areas to Ithaafushi Reef

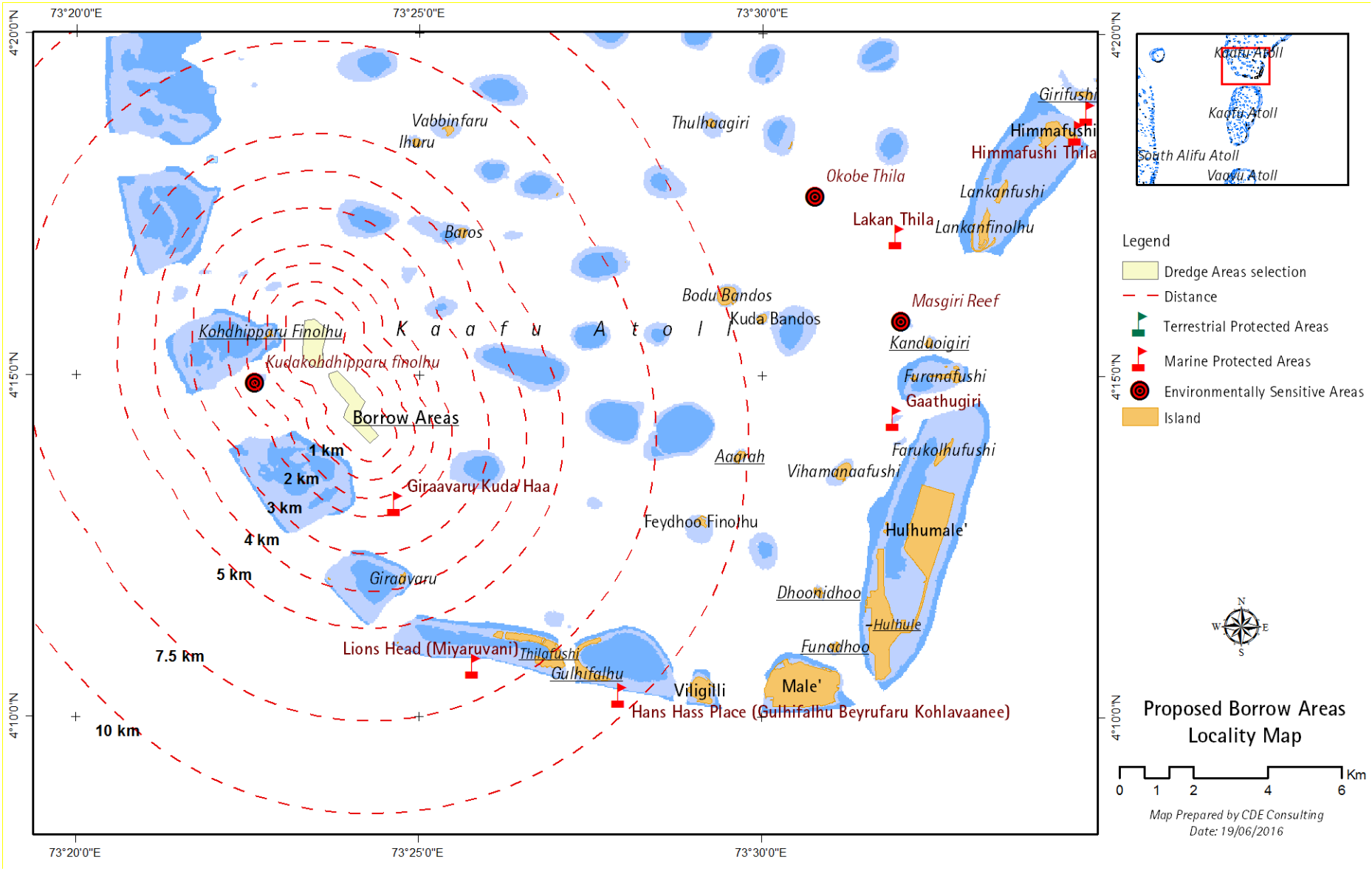


Figure 1.3: Locality map showing nearby islands and registered environmentally sensitive areas to the borrow site

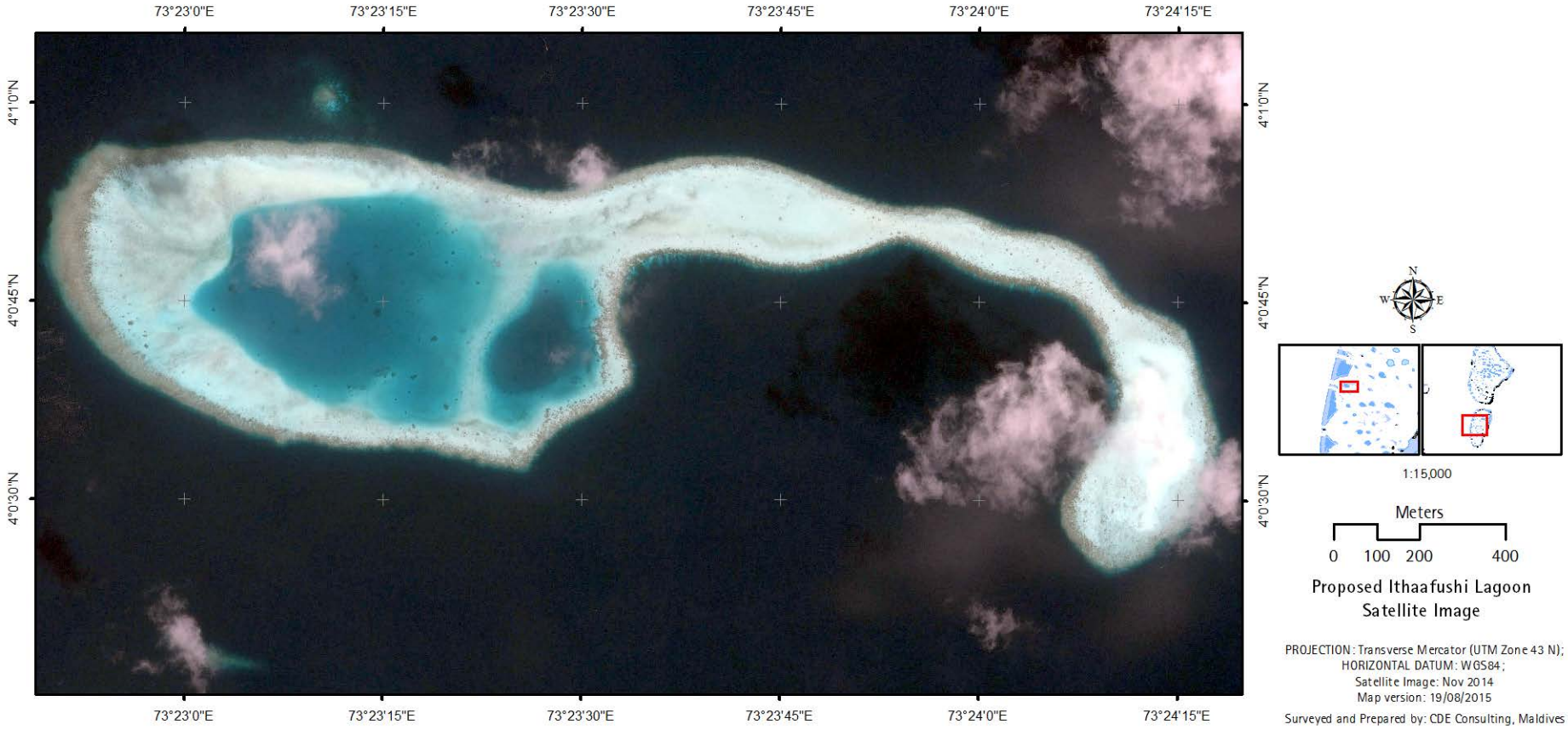


Figure 1.4: Satellite images of the Ithaafushi reef showing project location

1.10 Consultants, Contractors and Government Institutions

All the EIA related work is undertaken by consultants from CDE Consulting. The contractor for this project is Hotels & Resort Construction Private Limited and the resort concept is designed by Highness Architecture and Interiors. The coastal works contractors are MTCC and Van Oord.

Government agency relevant to this development is Ministry of Tourism.

1.11 Project Financing

The project is financed by private equity and bank loans. The project is executed by Ithaafushi Investments Private Limited.

1.12 EIA Scope and Terms of Reference

The scope of this EIA is broadly based on the Environmental Impact Assessment Regulations 2012. The assessment more specifically adheres to the Terms of Reference (ToR) issued by the Environmental Protection Agency on 5 July 2016. The ToR is based on scoping meetings held between the stakeholders at the EPA. A copy of the ToR is attached in Appendix A.

The baseline study of the original EIA and First Addendum was used for this study.

The EIA Addendum report contains the following main aspects:

- A description of the project including the need for the project, how the project will be undertaken, full description of the relevant parts of the project, methodology used in the assessment, implementation schedules, site plans and summary of project inputs and outputs *(Chapter 1 and 2).*
- A description of the pertinent national and international legislation, regulations and policies that are relevant and applicable to the project and a demonstration of how the project conforms to these aspects *(Chapter 3).*
- Information about the exiting baseline environmental conditions of the site. These include coastal and marine environment of the site and natural hazard vulnerability of the site *(Chapter 4).*
- An assessment of the potential impacts during both construction and operational stages of the project *(Chapter 5 & 6).*
- Evaluation of potential mitigation measures to prevent or reduce significant negative impacts during both construction and operation stages of the project *(Chapter 7).*
- Assessment of alternatives for the proposed project *(Chapter 8)*

- Environment Management Plan (Chapter 9)
- Details of the environmental monitoring plan *(Chapter 10).*
- Main conclusions (Chapter 11)

1.13 Assessment Methodology

1.13.1 General Approach

This EIA is broadly guided by the EIA Regulations 2012.

This report has been prepared to ensure that the significant environmental and social impacts of the proposed changes project have been considered and assessed at the project planning phase.

The process followed in the preparation of this EIA report consists of six parts. These are: scoping consultations; literature review; field surveys; stakeholder consultations; analysis of results; and compilation of the assessment in the form of a report.

In order to conduct a broad based and inclusive study, the proponent and the consultant have from the onset ensured the exercise is participatory. As such, discussions have been held with community members in the projects area and relevant stakeholders with the assistance and coordination of the proponent.

1.13.2 The Study Area

The area impacted by projects like these can be quite wide particularly when the socio-economic impacts are considered. The study area of this project considers the project work site in Ithaafushi reef, proposed borrow sites for reclamation and the surrounding areas that are likely to be affected by the proposed changes.

There are three resorts in the vicinity of the proposed borrow sites, Baros Maldives, Centara Rasfushi Resort & Spa and Kohdhipparu (See Figure 1.3), which are expected to experience the bulk of the impact from dredging.

A marine protected site also exists within the vicinity of the dredge location and with a number of other notable dive spots where unique marine species are found (See Figure 1.3).

Based on the results of the initial scoping of potential environmental impacts and the identification of sensitive aspects of the environment we have identified the following geographical areas likely to be affected at the various stages of the Project:

- During dredging and reclamation impacts will occur primarily around the vicinity of the borrow sites and in Ithaafushi reef. The most direct physical impact will be

on-site in the area of the actual physical interventions; particularly the dredging and reclamation sites, over water construction and the suggested islands. To ensure the impacts are fully covered the entire area within a 1 km radius from the site is studied.

- Secondary impacts are likely on the three resorts in the vicinity of the borrow sites, particularly from noise, visual impacts, water quality reduction and marine traffic.
- Secondary impacts on nearby reefs, dive spots and marine protected area, *Kuda Haa.*
- During operation of the resort most impacts will be confined to the area that will be affected by construction impacts.
- There will also be induced development impacts due to the project, mainly in the form of positive socio-economic benefits to the nearby islands, atoll and region.

Study area boundary for the new borrow area is presented in Figure 1.5 and survey locations map for the project is attached in Appendix F. Study area for the Ithaafushi Island is the same as presented in the original EIA.

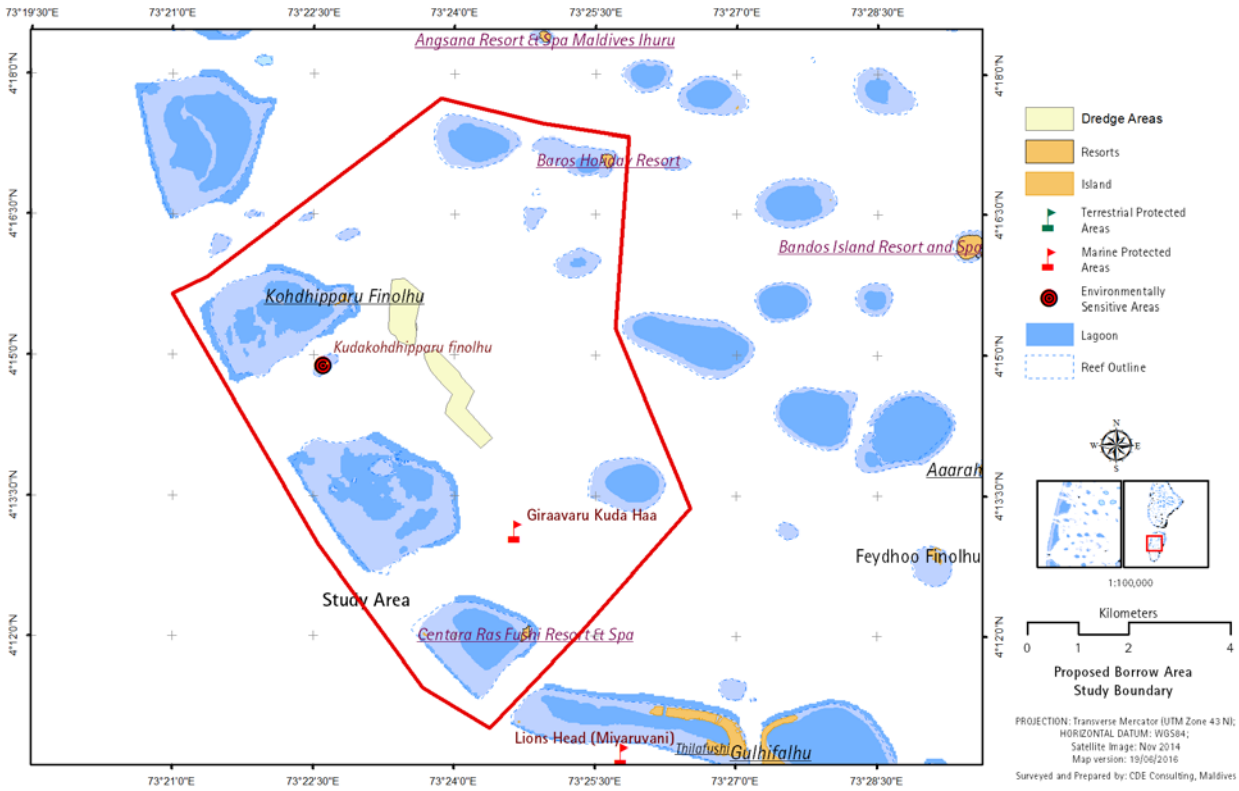


Figure 1.5: Study Area boundary

1.13.3 Field Observations

Field assessments were undertaken on 9th June 2016. Field visits include marine assessments and water quality assessments in the area around the proposed sand borrow sites. Field assessments conducted in Ithaafushi reef for the original EIA will be used as a baseline for this addendum.

Marine Assessments

Line Transect Survey

The composition of the substrate was assessed by taking twenty high-resolution images every 5 m (pictures covering 0.5 m^2 of the seabed) along the same transect line used for the fish surveys. These were later analysed using CPCe. CPCe, or Coral Point Count with excel extension, developed by the National Coral Reef Institute, is software designed to determine coral community coverage and diversity using transect photographs. Underwater photographic frames are overlaid by a matrix of randomly generated points, and the fauna/flora of species or substrate type lying beneath each point is identified. 20 random points per picture were analysed to characterize the substrate composition (sample size: 200 points per transect).

Fish Census

A category-based methodology was adopted to estimate fish abundance and the mean number of fish per category and observation was extracted to estimate species and family abundance. The categories used to estimate abundance is displayed in Table 1.3.

Table 1.3: Fish abundance categories

Category	Number of fish
1	1
2	2 - 4
3	5 - 16
4	17 - 64
5	65 - 256

Visual snorkelling surveys were carried out at select locations of the lagoon. General status of these sites were recorded, special attention was given to types of corals and fishes present at these sites and the environmental conditions that could affect growth such as suspended solids, depth, and other threats to coral life.

Water Quality

Water quality was assessed from MWSC laboratory. Water quality samples were taken at four locations around proposed sand borrow sites. Parameters tested include pH, temperature, turbidity, Total Suspended Solids (TSS), Nitrates, Phosphates and Biological Oxygen Demand. Samples were collected using 1500ml PET bottles at 1m depth.

Bathymetry and topographic survey

The bathymetric survey was conducted using a multi-beach echo-sounder (SES 2000 Standard, a parametric echo-sounder produced by Innomar) and GPS attached to a survey vessel. The bathymetric survey conducted using a 25 m grid with data collected up to the reef line.

Vertical control was established by doing a tide observation on site during the surveyed period. The observation was calculated and reduced to the MSL using the predicted tide table provided by Maldives Metrological Service, (UH SEA LEVEL CENTER Data). Predicted tide data of Hulhule tide station was used for the corrections.

1.13.4 Desk Study Review

A literature review was conducted to acquire background information on the site and its environment as well as to identify possible environmental impacts of similar developments in island settings. In this context, the EIA Regulations 2015, best practices from similar development activities, scientific studies undertaken in similar settings around Maldives and previous documents/historical publications was considered.

The literature review comprised of, but is not limited to, the following:

- The original EIA prepared for the proposed land reclamation and resort development project in Ithaafushi
- The First Addendum to the EIA prepared for the proposed land reclamation and resort development project in Ithaafushi
- Master plan concept submitted by the proponent to Ministry of Tourism.
- Site suitability assessment report for Ithaafushi Reef
- Environmental Impact Assessment Report for the proposed land reclamation (Phase III) of Gulhifalhu Island, Kaafu Atoll, Maldives.
- First addendum to the EIA of the proposed development of southwest harbour, Male' City.

1.13.5 Key Stakeholder Consultation

Stakeholder consultations were undertaken with the following stakeholders:

- Centara Grand Rasfushi Resort & Spa
- Baros Maldives
- Kohdhipparu Island
- Environmental Protection Agency (EPA)
- Marine Research Centre (MRC)

1.13.6 Data Analysis

The EIA experts used their experience and knowledge in their respective fields to analyse the data from the previous studies and field visits in order to determine the potential impacts of the proposed projects, the severity of effects arising from these impacts and how any adverse impacts can be best mitigated and positive impacts enhanced. This analysis provides the framework for the recommendations on corrective actions and remedial measures and provides the basis for the formulation of the environmental management plan which forms part of this report EIA.

1.13.7 Report Format

The report format and structure presented here follows the report formatting guidelines issued by EPA.

1.14 Study Team Members

The team members of this EIA are:
Dr. Ahmed Shaig (Lead EIA consultant)
Mr. Ali Nishaman Nizar (Terrestrial Environment Specialist)
Mr. Mohamed Faizan (Marine Specialist)
Ms. Shahdha (Socioeconomic impact assessment)
Ms. Mariyam Hana Saeed (Stakeholder consultations)
Mr. Haiman Rasheed (Marine Surveys)
Mr. Ali Moosa Didi (Marine Surveys)
Mr. Mohamed Ali (Field Surveys)
The curriculum vitae's of the EIA consultants are attached in Appendix J of this report.

1.15 Other Ongoing projects in the Vicinity

A review of major ongoing and recently completed projects within a 15 km radius, their status and main tasks are summarised in Table 1.7 below.

Table 1.4: Summary of recently completed, ongoing and planned project in the vicinity

Site / Project	Summary of project components	Status	Implications
Hulhumale Land reclamation project	Project involves land reclamation, shore protection of Hulhumale' phase II	Reclamation works completed	Cumulative impacts of dredging within the vicinity. Sediment plumes created during this project has created distrust among resorts about the impacts from such dredging
Thilafushi reclamation project	Major reclamation works planned for the reef	Planned and ongoing	Potential Cumulative effects due to dredging and reclamation but these works may be well delayed
Gulhifalhu Reclamation project	Major reclamation works planned for the reef	Planned and ongoing	Potential Cumulative effects due to dredging and reclamation but these works may be well delayed
Male' SW harbour reclamation project	Reclamation works on the SW corner of Male' to create the Industrial Village	Ongoing	Project uses the same borrow site. Cumulative impacts on the borrow site and vicinity; Extended cumulative duration of dredging in the area, affecting resorts

Site / Project	Summary of project components	Status	Implications
Other reefs leased for reclamation	Dredging and reclamation of other reefs such as Uthuru thilafalhu, Nakachaa huraa etc with in a 10 km radius; Borrow site smay also be used for other project using a THSD	Planned	Potential Cumulative effects due to dredging and reclamation
Kohdhipparu resort development project	Ongiong resort development, planned reclamation	Ongoing and planned	Potential Cumulative effects due to dredging and reclamation on house reef

1.16 Potential Data Gaps and Limitations of the study

The environment of Maldives is generally poorly understood. This is due to the lack of detailed studies on the Maldives. Much of the literature on coral islands is derived from studies done in the Pacific which unfortunately has very different climatic and geologic settings.

Despite the numerous land reclamation projects in the Maldives, very little knowledge is published on the actual impacts. This is due to the lack of monitoring activities and poor implementation of the EIA regulations. A lot remains to be known about the actual impacts on the marine, coastal and ground water environment following reclamation.

Detailed environmental analysis for an EIA is often required to be undertaken in a relatively short period of time. Give the seasonal climatic variations in Maldives and the differences in local geomorphologic and climate settings in individual islands such a short time frame is often too little to assess selected aspects of the environment. This problem is compounded by the absence of long-term studies in other parts of Maldives. Hence, most EIA's end up being based on an environmental snapshot of specific point in time. However, experienced EIA specialists can deliver a close match to reality based on a number of similar assessments.

Project information and planning and background data were not fully prepared or decided during the conduct of this study. Table 1.2 below provides a list showing data gaps in the study. Available documents in connection with data provided particularly the concept plan, experiences of CDE in other islands, particularly in the numerous resorts development assessments were used as the basis for preparation of this document. Therefore, it will be possible to analyse, implement mitigation and suggest monitoring measures to the most relevant negative impacts.

Environmental impact prediction also involves a certain degree of uncertainty as the natural and anthropogenic impacts can vary from place to place due to even slight differences in ecological, geomorphological or social conditions in a particular place. As note earlier, there is also no long

term data and information regarding the particular site under consideration, which makes it difficult to predict impacts. However, the level of uncertainty is partially minimised due to the experience of resort and operation in similar settings in the Maldives. Nevertheless, it is important to consider that there will be uncertainties and voluntary monitoring of natural processes as described in the monitoring programme is absolutely essential.

Table 1.5: Limitation of the study

Issue/Item	**Required Information**	**Current Status / action**
Resort Detailed Master Plan	Final Master Plan, discussed with and approved by Ministry of Tourism	At present, there is a concept plan but the details can be worked out after the EIA approval.
Natural Hazard Risks	Detailed modelling of flooding and storm damage risks	Data not available at local level; use broad level studies undertaken for Maldives
Environmental baseline data	Historical and long-term records on reef and lagoon environment. Long-term site specific or even regional data (at least 2 years). Most critical data include current and waves Air quality measurements	Baseline snapshots of the site taken to design mitigation measures Estimated based on other similar studies in Maldives Snapshot data for currents taken; wave studies in Baa atoll used Primary date collection will be time consuming; Secondary sources will be used
Environmental Standards	Environmental Standards for specific environmental features such Air and Noise Quality	USEPA and GBRMPA standards followed
Sediment plume dispersal modelling	Long to Medium-term site specific data	Not enough time to undertaken analysis.

2 PROJECT DESCRIPTION

2.1 Project Outline and Key Features

The proposed project involves the land reclamation, development and, operation of multi-island tourist facility on Ithaafushi Lagoon.

The overall project can be divided in to the following components:

COMPONENT I – Island reclamation, reef entrance dredging and shore protection works

1. Dredging and land reclamation: Three separate islands to be reclaimed with a 20.8 Ha of land. Sand to be dredged from atoll lagoon. About 500,000 cubic meters of sand required.
2. Permanent shore protection measures: About 50% of the island shoreline will be protected using various types of shore protection measures.
3. Dredging a reef entrance: Two reef entrances – one for the harbour and one for general transportation – will be constructed
4. Island access infrastructure: A harbour will be constructed in Island 1 for service use. All islands will have access jetties. All islands can be accessed separately via sea.

COMPONENT II – Construction of island access facilities and temporary facilities

5. Construction of temporary accommodation, utilities and storage areas: Temporary accommodation barges, on land accommodation facilities, temporary utilities and storage areas will be constructed on the island.
6. Equipment and material mobilization

COMPONENT III – Construction of the back-of-the-house facilities

7. Construction of the back-of the-house and administrative infrastructure: One of the islands will be specialised for BoH facilities and minimal facilities will be developed on the rest of the islands,
8. Construction of utilities: sewerage, power, water and waste management infrastructure will be developed centralized in two of the islands, each supplying selected islands.

COMPONENT IV – Construction of guest facilities

9. Construction of guest rooms – over water villas
10. Construction of guest rooms – land villas
11. Construction of guest facilities – restaurants, gym, spa, coffee shops, etc.
12. Construction of Marina support facilities: Facilities to be constructed include refuelling, food supplies and material supplies, customs services, banking services etc.

COMPONENT V – Revegetation and landscaping

Revegetation: Nurseries to be established on one of the island. The rest of the revegetation plan has not been developed yet.

The focus of this EIA is the dredging and reclamation component and more specifically the dredging, transportation and dredge material unloading. The next section provides details of these components.

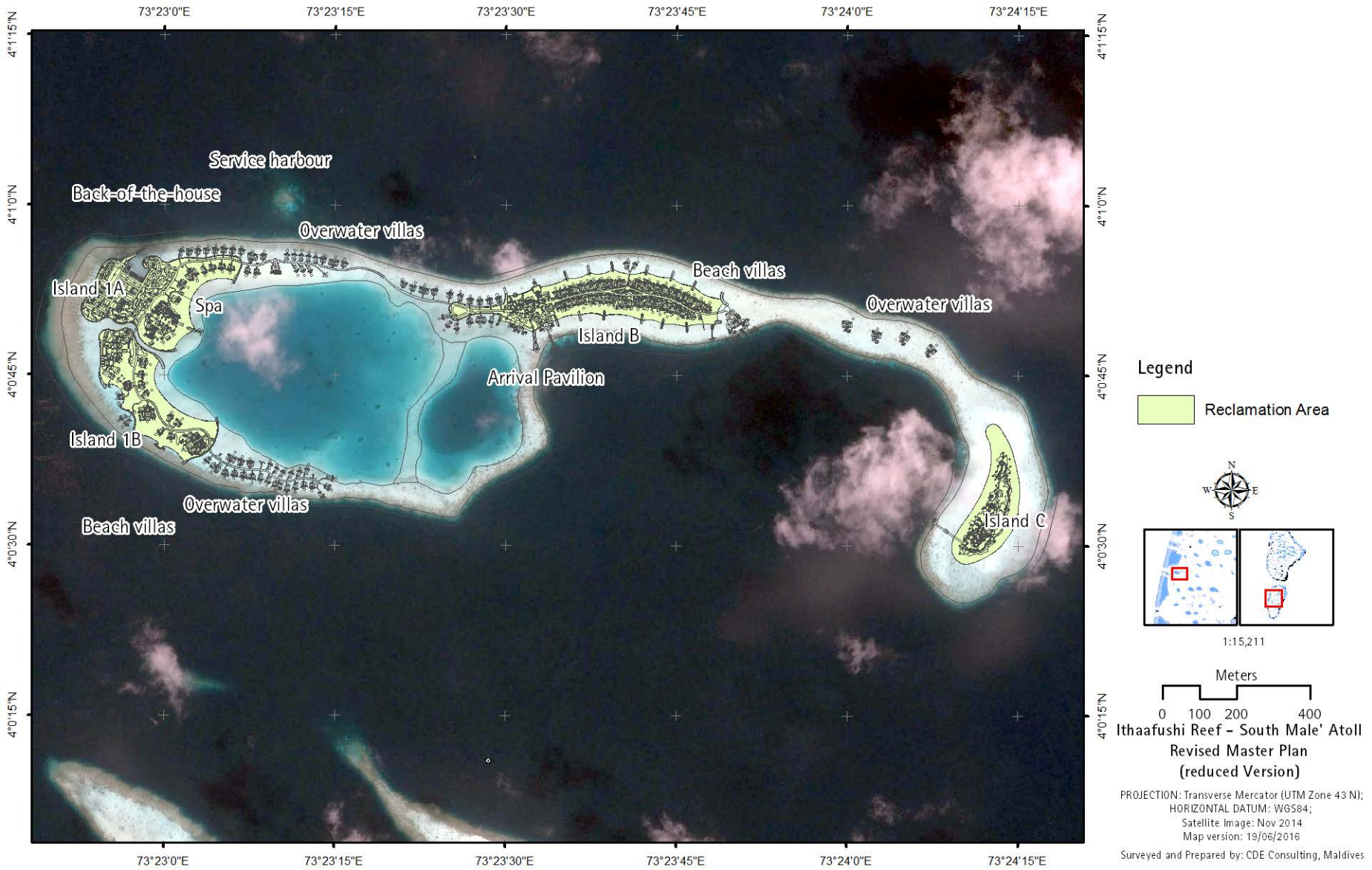


Figure 2.1: Site Plan Summary

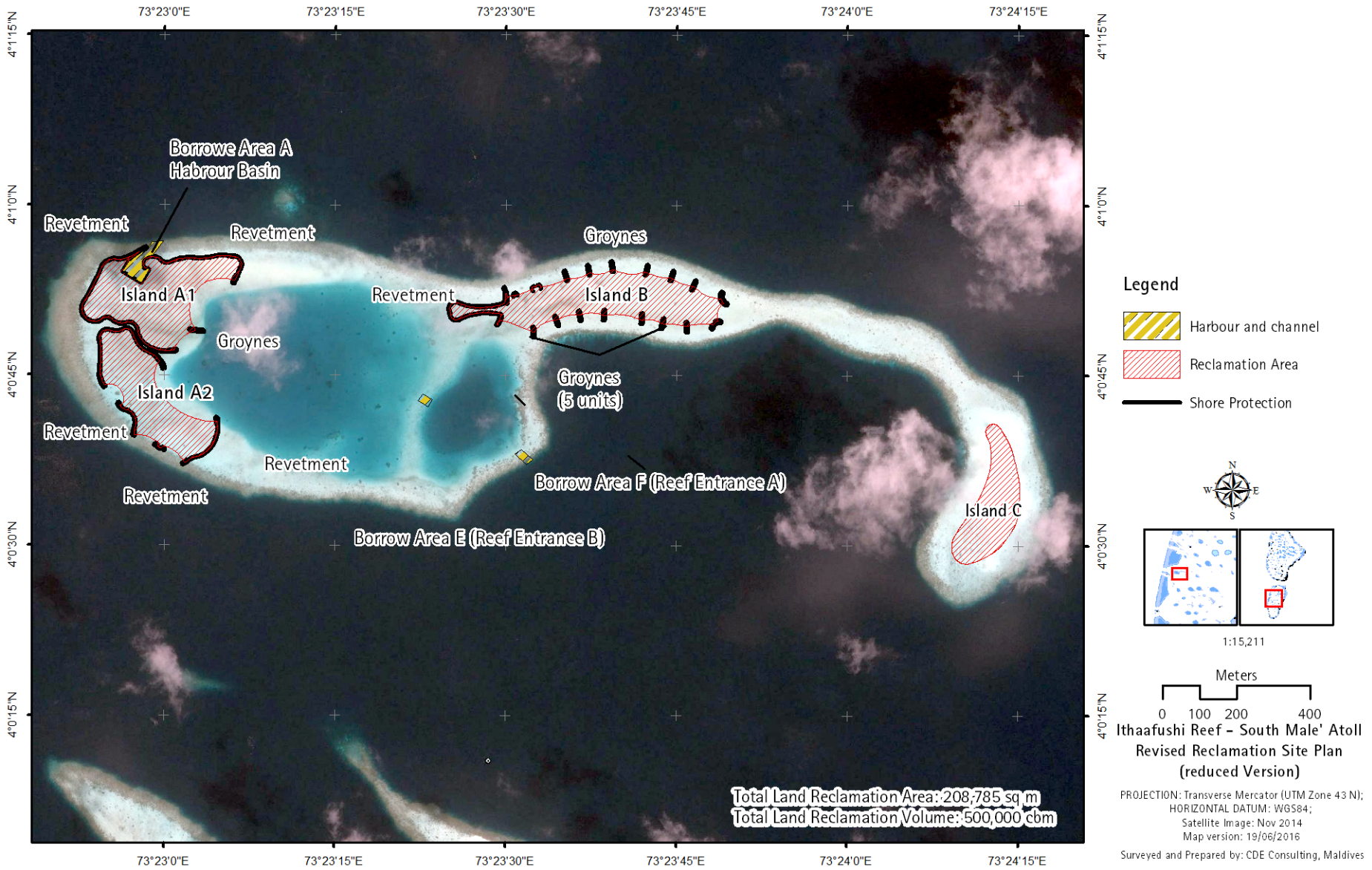


Figure 2.2: Reclamation Plan

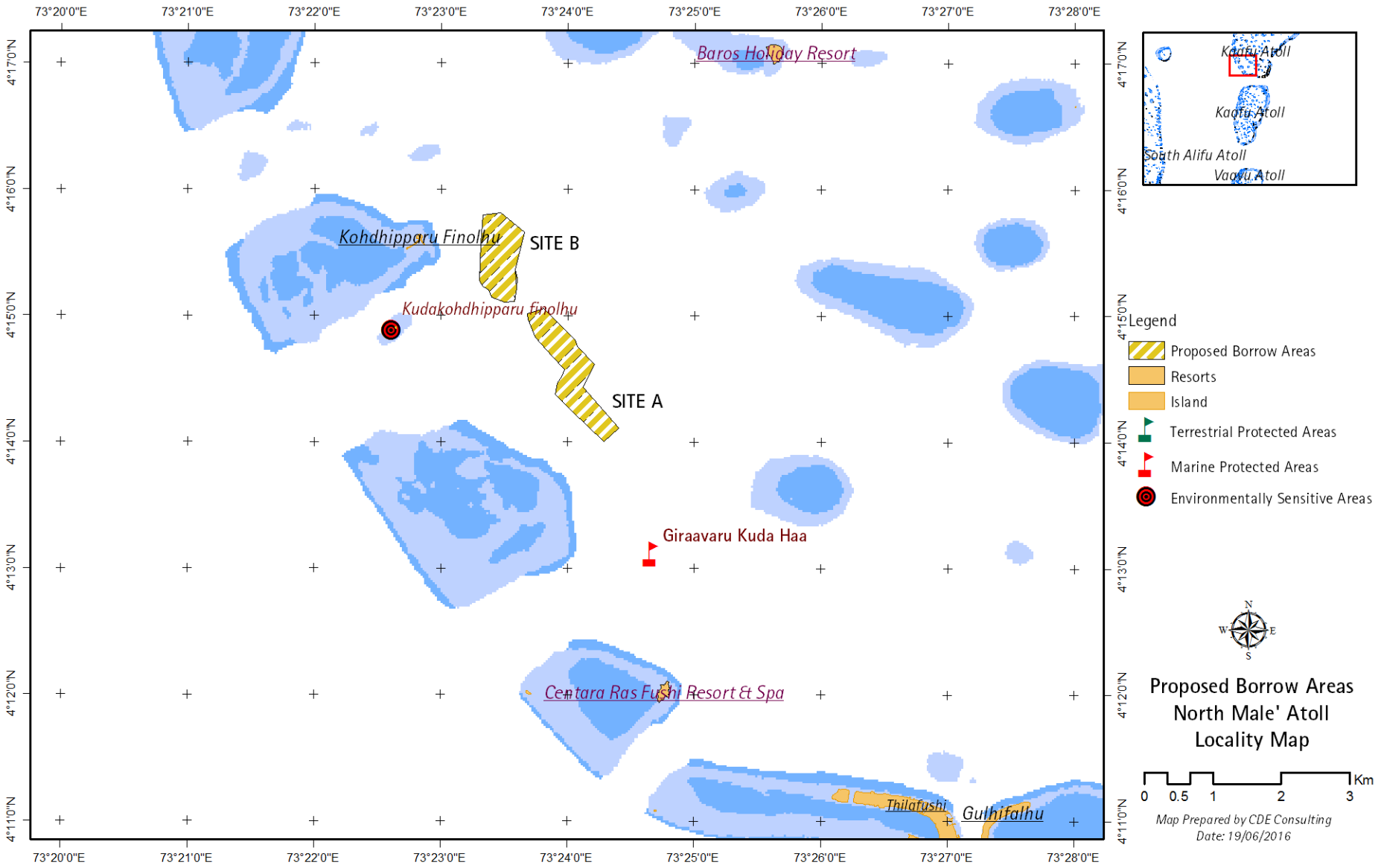


Figure 2.3: Brorrow Areas

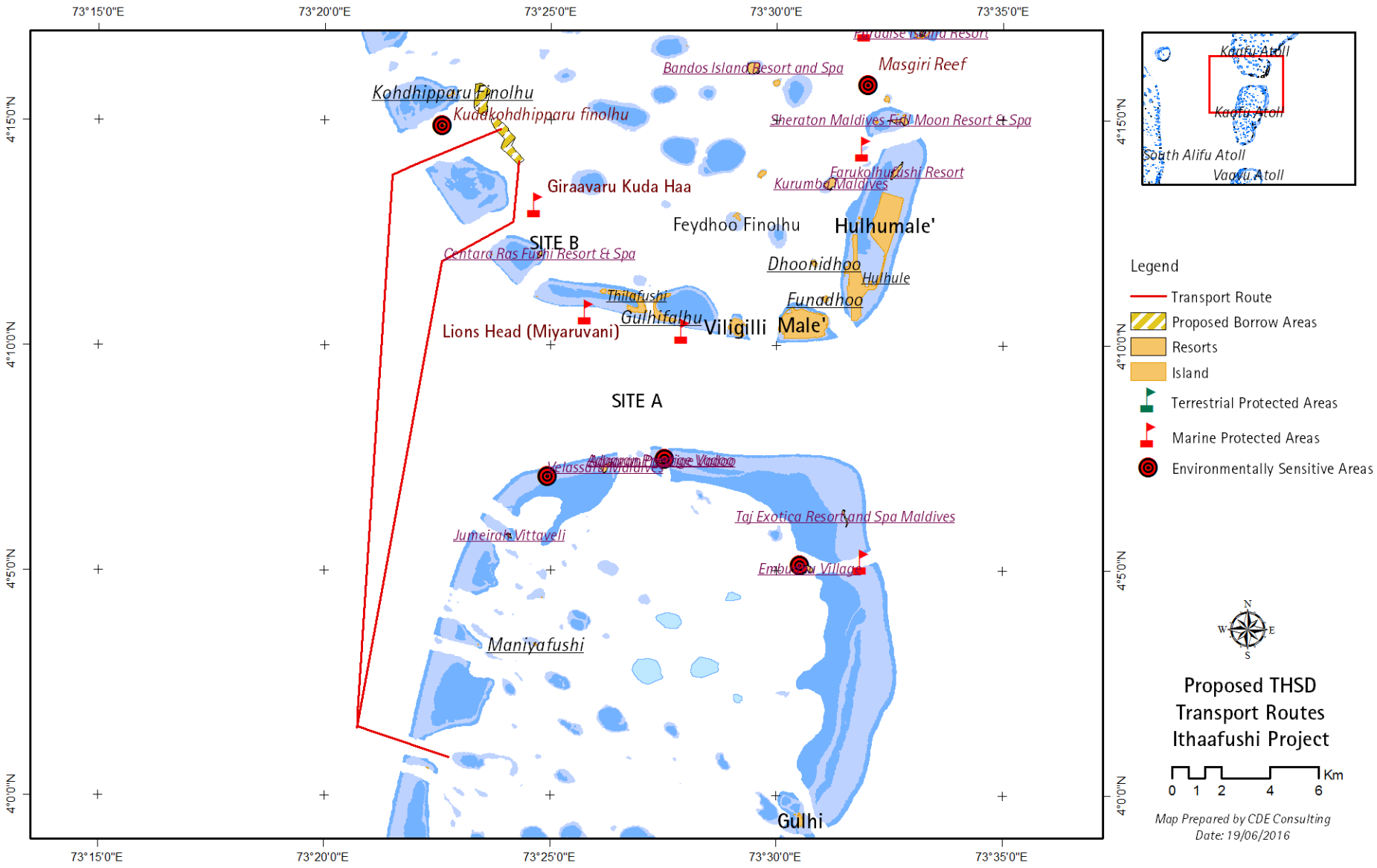


Figure 2.4: Dredger transport routes

2.2 Detailed Project Outline

2.2.1 Land Reclamation

2.2.1.1 Dredging

This component mainly involves dredging about 500,000 cbm of sand using a Trailing Suction Hopper Dredger.

A TSHD is a normal sea-going ship equipped with one or two suction pipes. At the end of each suction pipe is a drag head, which can be lowered onto the seabed while the TSHD navigates at a reduced speed. The material loosened by the drag head, together with some transport water, is sucked into the suction pipe by means of a centrifugal pump, and subsequently placed in the hopper of the dredger. The TSHD will transport the sediments to the reclamation where they will be brought to shore.

Most of the turbidity generated by a trailer suction hopper dredge is caused by the overflow of turbid water during the hopper filling operations. Overflow is the flowing overboard of excessive process water, together with a large part of the finest material. Overflow is used to maximize the load of sand inside the hopper. When dredging pure sandy sediments the amount of overflow of particles is mainly determined by the grain size distribution of the dredged sediment. It is to be noted that the overflow process will not be a continuous activity, since its duration will be limited to operational dredging time, which is usually less than half the total cycle time.

The suspension of sediments and the effects on the coral reefs will mainly depend on the grain size distribution, the local currents and the distances to the coral reef areas.

An excavator on sand bed and barge will be used for the dredging of the harbor area.

Dredging Fleet and Equipment

The proposed dredged vessel is a HAM 318 Trailing Suction Hopper Dredger by Van Oord. The hopper capacity of this model is 37,293 cbm and measures 227.20 m by 32.05 m. The vessel was built in 2001 and was upgraded in 2008. Details of the dredge vessel are provided in Appendix J.

Figure 2.5: Proposed dredger HAM 318 TSHD

In addition, the following equipment are expected to be mobilized

1. Two general purpose mechanised vessels for transport
2. Five wheel loaders
3. Five Excavators (bucket size of 1.5 cbm)
4. One small dinghy for transport
5. One safari type vessel for initial accommodation of senior staff and technical staff

Sand Borrow Area

The proposed location for the sand borrow areas are located in North Male' Atoll, approximately 4 km to the west of Baros Maldives and 4 km to the north of Centara Rasfushi Resort and Spa (See Figure 2.3 and Appendix C for site plan). Alternative sites have also been identified and have similar foot print and dredge depths (See Section 7.5).

The rationale for choosing the proposed sites in the design is due to the presence of sand, reusability, proximity to reclamation site and due to the use of a Trailing Suction Hopper Dredger. More analysis of the alternatives is presented in the Alternatives Chapter. The sites are surveyed and chosen by the contractors.

In addition, the material dredged from the proposed harbour dredging will also be used to reclaim the island, if found suitable.

Quantity, quality and characteristics of fill material

The quantity of fill material required for the project is 500,000 cbm. This figure is based on the reclamation parameters defined in the next section below.

The quantity of dredged material available from dredge sites and alternative sites are summarized in table below.

Table 2.1: Borrow area details

Site	Area (Sq m)	Dredge Depth (m from surface)	Final Water depth (m MSL)	Volume Available (cbm)
SITE A	822,400	~ 1		822,400
SITE B (Alternative)	645,650	~ 1		645,650
Harbour	4,182	-3	-4	13,225

Site A will be the site used for this project. An alternative area is identified close to it (Site B). Additional alternative sites are evaluated in Chapter 7.

The final figure of dredged material depends on the percentage of reclamation quality sand available on the site. At the moment the useable material is estimated at 95%. The proposed areas have sufficient sand for the project.

As an indication of guarantees for sufficient availability of fill material, the contractors have carry out a survey of the proposed borrow area. The details of fill material quality are presented in Chapter 4.

Transportation

The sand dredged at the borrowing site will be stored in the hopper of the TSHD. Once the hopper reaches its maximum storage capacity, the dredger will move to the reclamation site where the sand will be unloaded. The distance between the borrow area and reclamation sites on average is 27 km which is well within the range of dredger capacity. The TSHD used for this project has a hopper capacity of 37,393 cbm. It is estimated that a total number of 17 trips will be made between borrow sites and reclamation site.

The potential travel route for the dredger is shown in Figure 2.4.

Positioning the dredger

The TSHD will be positioned in the atoll lagoon using on board high precision GPS system and automated positioning systems. In addition, an automated thrusting system with continuous echo sounder measurements will be used to control the ships dredging activities. Dredge depth is electronically controlled.

Emergency Plan for Spills

At times of emergencies such as pipe breakage, pipe leakage of bund failure, the THSD will cease pumping to avoid sediment spills in unprotected locations.

Duration of Dredging Activity

Total duration of dredging activity is 2 – 2.5 weeks. Given that the hopper capacity is 37,293 m^3 and approximately a total of 17 trips can be made by the TSHD. Table 2.2 provides an estimated duration of dredging activity for this project.

Labour Requirements and Availability

The tentative list of labour requirements is given in Table 2.2

Table 2.2: List of labour requirements for dredging and reclamation

Activity or work group	Specialists	Labourers
Dredge fleet	8	10
Dry fill	4	15
Special equipment	4	10
Workshop	2	4
Administration	2	5
Total	**20**	**44**

Housing of Temporary Labour

Majority of the initial workforce will be accommodated on board the dredge vessel and on board safari type vessels. Once the island is established accommodation facilities will be built on the island.

Justifications of locations, design and equipment

The use of THSD dredger for reclamation is due to the availability of a dredger for the project, speed of completion and lower overall cost. A CSD is also likely to damage the house reef of Ithaafushi due to the intense dredging. A THSD is also more desirable as it does not leave dredge holes in the lagoon.

The justification for choosing the borrow site in North Male' is based on the availability of sand. A sand source survey was carried out by the contractor in the Male' region and they found the

proposed sites to be most suitable. The site is also planned to be used for dredging sand for Male' southwest harbour reclamation project.

2.2.1.2 Reclamation

Reclamation Design Levels

Taking into account the presently occurring water levels, the predicted sea-level rise, and the relatively high-value tourism, the finished level of the reclaimed land will be +1.5 m MSL. The initial reclamation will be made at +1.6 m to allow for settlement.

It is noted that most of the other resort islands in the Maldives are at +1.0 m MSL to +1.4 m MSL; so called "Safe Islands" are presently constructed at +1.4 m MSL.

The design details for land reclamation are as follows.

Table 2.3: Design details of reclamation

SiteID	Area (sq m)	Elevation (m MSL)	Volume (cbm)
Island A1	60,526	1.5	151,314
Island A2	47,509	1.5	118,773
Island B	65,082	1.5	162,706
Island C	35,668	1.5	89,170
Total	**208,785**		**521,963**

Sediment Containment and discharge control

Figure 2.6 shows the revised construction site plan of dredging works.

Design of sediment containment measures considered three options. These are:

Option 1: Enclosed reclamation area with bunds

Option 2: Open reclamation area without bunds

Option 3: Silt screens around the reclamation and borrow area

Option 1 involves more complicated logistics since the proposed site is completely submerged and there is no material to create bunds with at the start of the development. Material needs to be excavated to create the bunds. Thus, an excavator needs to be deployed in the shallow lagoon area and temporary send bed will need to be created by dredging. The excavator will then continue to build bund in sections.

The impacts on the environment are localised (limited to an area around the site and inside the lagoon where the construction of the bund takes place) and manageable. The bunds will reduce the size of the impact area during reclamation activities by keeping the excess water containing fine sediment within the bunded area. Release of this water is manageable. The import of sand, the equipment and the long execution time make this logistically challenging.

Option 2 has simple logistics since no preparations need to be made prior to the reclamation. The impacts on the environment significant, including temporary increased turbidity levels and a relatively high load of sediment which is potentially difficult to control (due to the fact that excess water will be released on all sides of the reclamation and during each phase). Environmental impacts are therefore more difficult to manage. This makes this option environmentally prohibitive.

Option 3, placing silt screens around the reclamation area will contain the sediment from seeping on to the reef slope. However, experience from other projects in Maldives has shown that the chances of the silt screen failing is very high due to wave conditions and vessel movements. This option also involves significant costs as the screens of such length and depth are unavailable locally.

Preferred option

Option 1 will have the least impact on the ecology of the nearby reefs and nearby resorts. Therefore the preferred option is Option 1 i.e. to enclose reclamation area to contain the sediment.

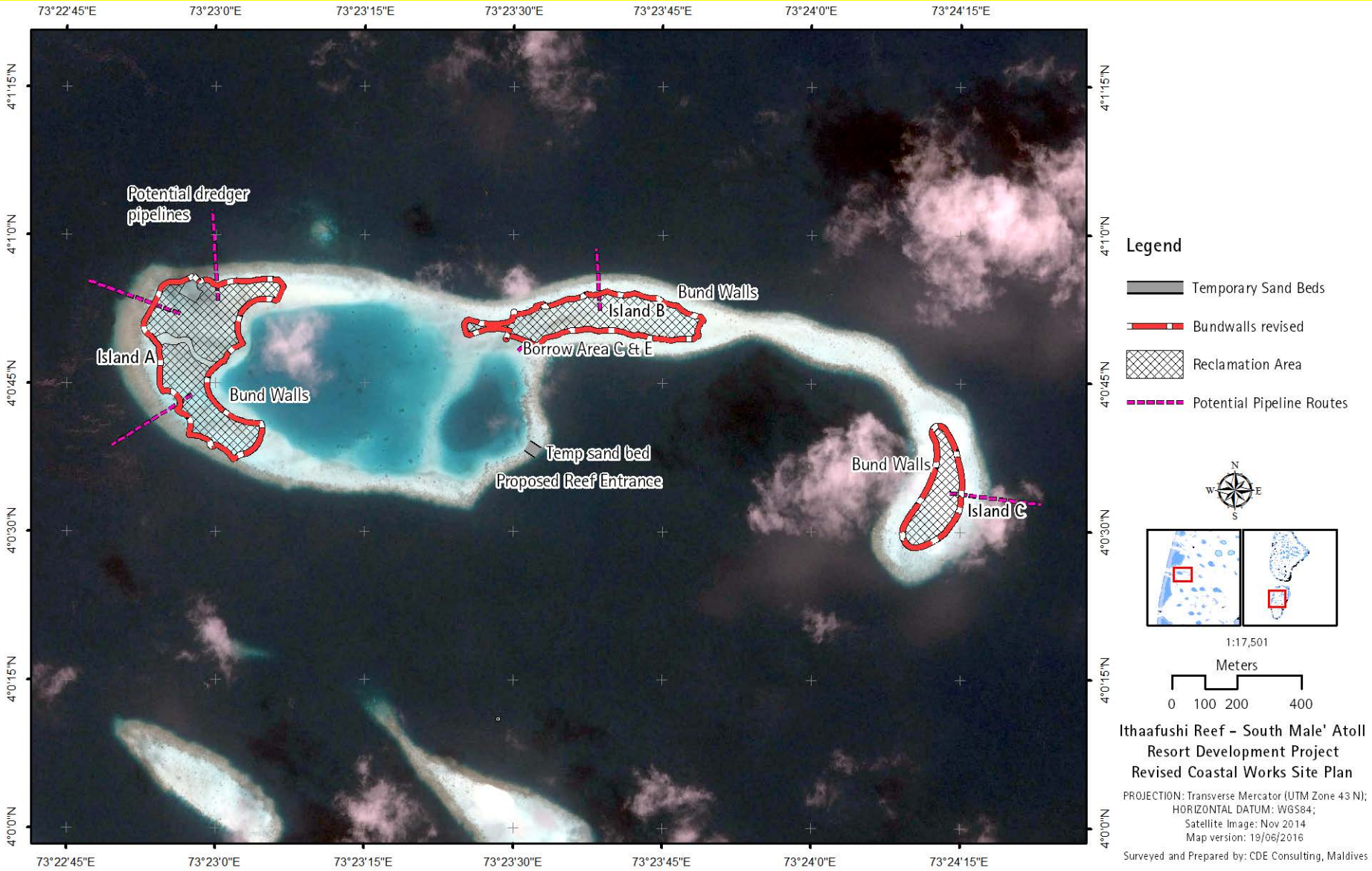


Figure 2.6: Revised dredging and reclamation activities site plan

Method and Fill Material Unloading

The method for unloading material is through pipeline mixed with water. Once the water has settled leaving the sand, loaders will level the material to the required heights and extents. The extent of reclamation will be identified by the sand bunds.

Need for and Location of Temporary Stockpiles

Temporary stockpiles can be placed on the island for future use during construction and erosion mitigation. No specific location within the island has been identified yet.

Stability of Reclamation

Rate and volume of pumping sediment will be faster than the rate of erosion. Sediment will be highly mobile within the first 10 m from the shoreline and erosion will be prevalent in the zone. It is proposed to protect the entire shoreline using an armour rock revetment.

Safety Measures during Construction

The contractor would ensure that Health and Safety procedures are complied with at all times. Construction activities would be carried out under the supervision of a suitably experienced person. All reasonable precautions will be taken for the safety of employees, and equipment will be operated by competent persons. Warning signs, barricades or warning devices will be provided and used. Necessary safety gear will be worn at all times.

Additional Waste Disposal

The proposed dredge site has been carefully selected to minimise coral rubble and coral boulders. Hence, over 90% of the material is expected to be of the required quality for land reclamation. Any excess larger material will be buried on the island, used for future resort construction activities or as base material for the shore protection measures.

2.2.1.3 Shore protection measures

It is proposed to protect the newly reclaimed island shoreline using a combination of revetments and groynes.

The proposed shore protection areas are presented in Appendix C. Shore protection designs are presented in Appendix D. Alternative options have been evaluated in the Alternatives Chapter.

Island 1 receives the strongest wave energy particularly on its western side and to some extent on the northern side. It has been decided not to keep a beach on these areas and to use a revetment to absorb wave energy. Static bays are created on the southern side of Island 1B to

provide some beach access. These areas have been protected using a series of revetment and groynes. The eastern side of Island 1 has been left open as much as possible with only groynes to manage the beach.

A channel has been constructed to allow water flow between Island 1A and Island 1B. revetment has been proposed to protect both the shorelines.

Island 2 is mostly protected using groynes due to the east-west orientation. The western end is protected using a revetment as the area is too narrow. The heavy use of groynes is due to the proximity of the shoreline to the reef edge.

Island 3 will be left as is it is with no protection to allow the island to adjust naturally. Shore protection will be designed after it stabilizes. The project intends to develop Island 3 at a later stage.

2.3 Work Methodology

2.3.1 Mobilisation of Equipment and Materials

Site mobilisation involves the mobilisation of construction equipment, materials and workforce to the island and providing necessary storage for materials and site access and services for the workforce. This activity has its environmental consequences including transport-related impacts, site-access related impacts and workforce related impacts. These will be considered in detail in Chapter 5 of this report. All site mobilisation and construction related activities would be undertaken in a planned manner in order to avoid excessive cost and environmental implications.

2.3.2 Dredging and Reclamation

Method and Equipment Used for Dredging

The method proposed for main island reclamation is sourcing sand from the bed of the reef lagoon using a Trailing Suction Hopper Dredger (TSHD).

A TSHD is a normal sea-going ship equipped with one or two suction pipes. At the end of each suction pipe is a drag head, which can be lowered onto the seabed while the TSHD navigates at a reduced speed. The material loosened by the drag head, together with some transport water, is sucked into the suction pipe by means of a centrifugal pump, and subsequently placed in the hopper of the dredger. The TSHD will transport the sediments to the reclamation where they will be brought to shore.

Most of the turbidity generated by a trailer suction hopper dredge is caused by the overflow of turbid water during the hopper filling operations. Overflow is the flowing overboard of excessive

process water, together with a large part of the finest material. Overflow is used to maximize the load of sand inside the hopper. When dredging pure sandy sediments the amount of overflow of particles is mainly determined by the grain size distribution of the dredged sediment. It is to be noted that the overflow process will not be a continuous activity, since its duration will be limited to operational dredging time, which is usually less than half the total cycle time.

The suspension of sediments and the effects on the coral reefs will mainly depend on the grain size distribution, the local currents and the distances to the coral reef areas.

Dredging the channel requires a separate method as this is the first step required for the project and the dredger to access the deep lagoon. The dredging method used for the reef entrance is excavator mounted on a barge (initially) and on a sand bed. The details are as follows:

- The excavator will have a bucket size of about 1.5 m^3.

Dredging will begin by using an excavator deployed on a barge. Once entry has been made into the shallow reef areas, the excavator will be deployed on the shallow areas and a temporary sand bed will be created. Dredged material will be transported to the designated site.

2.4 Project Schedule and Life Span

Mobilisation for the project will begin after the EIA is approved. The only major change to the work plan is the reduction in the timeframe for dredging and reclamation. Land reclamation is now expected to take 2-3 weeks to complete. Shore protection works are expected to begin during dredging activities and are expected to be completed in 6 months. The whole project is expected to be completed within 24 to 30 months. See Appendix E for the overall work plan.

The dredge is set to mobilize on the 12th of July.

The work sequence for the dredging and reclamation component are as follows:

a. Construct sand bunds and environmental mitigation measures
b. Setup unloading pipes and equipment at Ithaafushi reef
c. Undertake dredging and reclamation works
d. Level and finish reclamation
e. Demobilize dredger
f. Construction shore protection

2.5 Summary of Project Inputs and Outputs

The types of materials that will go into the development and from where and how this will be obtained are given in Table 2.4 and the type of outputs (products and waste streams) and what is expected to happen to the outputs are given in Table 2.5.

Table 2.4: Major Project Inputs

Input resource(s)	Source/Type	How to obtain resources
Construction workers	Local and foreign, mainly foreign	Recruiting agencies, etc.
Construction material	Floating pipe lines, geotextile	Import – Main Contractor's responsibility.
Maintenance material	Similar to above	Import or purchase locally where available
Main equipment	THSD dredger, loaders, bull dozers, excavators, trucks, service vessels	
Water supply (during construction)	On board dredge vessel	Onsite water tank
Electricity/Energy (during construction)	Diesel	30 kVA portable generation
Transport (air and sea)	International air travel, domestic air and sea transport	
Food and Beverage	Mainly imported sources except a few locally available products.	Import and purchase locally
Fire fighting equipment	Carbon Dioxide and Foam Fire Extinguishers, etc.	Local suppliers
Fuel	Diesel, Petrol, Lubricants	Local suppliers

Table 2.5: Major Project Outputs

Output Source/Type	Quantity	How it will be dealt with
Dredge waste	None	-
Construction waste (general)	Small quantities	Combustibles: Burnt/incinerated Others: Sent to designated landfill
General/domestic waste	>20x60L rubbish bags per month	Combustibles: incinerated Others: Sent to designated landfill

3 POLICY AND LEGAL FRAMEWORK

3.1 Relevant Environment Legislation

3.1.1 Environment Protection and Preservation Act (Act no. 4/93)

The Environmental Protection and Preservation Act (*4/93*) enacted on 19 March 1993 is the framework law related to environment protection in the Maldives. The authority responsible for the Environment Act is the Ministry of Environment and Energy.

Articles 2, 4, 5, 6, 7, and 8 of the law are relevant to the Ithaafushi Project.

Article 2 states that the concerned government authorities shall provide the necessary guidelines and advise on environmental protection in accordance with the prevailing conditions and needs of the country. All concerned parties shall take due considerations of the guidelines provided by the government authorities.

The project developers and contractors shall abide by any guidelines or advice given by the concerned Government authorities for the project.

Article 4 states that the Ministry of Environment shall be responsible for identifying protected areas and natural reserves and for drawing up the necessary rules and regulations for their protections and preservation.

The project developers and contractors shall ensure that there is no negative impact from the proposed project on sensitive environments in the vicinity or protected species.

According to Article 5 (a) of the Act, an Environmental Impact Assessment study shall be submitted to the Ministry of Environment before implementing any development project that may have a potential impact on the environment.

According to Article 5 (b), The Ministry of Environment shall formulate the guidelines for EIA and shall determine the projects that need such assessment as mentioned in paragraph (a) of this clause.

This report is prepared to fulfil this clause.

According to Article 6, the Ministry of Environment has the authority to terminate any project that has any undesirable impact on the environment. A project so terminated shall not receive any compensation.

All project developer and contractors shall be aware of this provision and contractors shall take all practical measures to ensure there is no irreversible and significant negative impact of the projects on the environment

Article 7 of the EPPA (4/93) states that any type of waste, oil, poisonous gases or any substances that may have harmful effects on the environment shall not be disposed within the territory of the Maldives. In cases where the disposal of the substances becomes absolutely necessary, they shall be disposed only within the areas designated for the purpose by the government. If such waste is to be incinerated, appropriate precaution should be taken to avoid any harm to the health of the population.

All project contractors shall comply with the Environmental Management Plan presented in this report, which specifies how the wastes, oil and gases generated by the project will be disposed.

Article 8 of the EPPA (4/93) states that Hazardous/ Toxic or Nuclear Wastes that is harmful to human health and the environment shall not be disposed anywhere within the territory of the country.

Any hazardous wastes that may be generated from this project shall be transferred to the designated waste site in Thilafushi for disposal according to Government regulations and standards. It should not be disposed on the Island, as it does not have the necessary facility.

3.1.2 Tourism Act (Act no. 2/99)

The main law on tourism in the Maldives (Act no. 15/79) was passed by the Citizen's Majlis in November 1979, outlining the basic regulations for the resorts on registration and operation, and tax policies. The original law had seven clauses in it and amendments were made to the original law through law no: 11/80, 14/80, 4/82, 6/83 and 2/87. The present law (2/99) came into force on the first of November 1999.

The project shall comply with the Tourism Act in terms of its title to build and operate a resort on the lagoon, development concept and operational standards.

With the Tourism Law as the basis, a number of regulations, standards and controls have been specified by the Ministry of Tourism, for operations within the tourism sector. The book of tourism regulations comprises of important regulatory measures including Building Standards, Sanitation Standards, Disposal of Garbage, Carrying Capacity, Electricity Code and Tourist Behaviour.

The project shall comply with all the relevant Tourism Regulations with regard to its concept designs, construction and operation.

The Tourism Related Environment Impact Assessment Regulation (regulation 2015/R-157) was gazetted on 3rd August 2015. This regulation addresses all issues related to the EIA process for all tourism related development activities.

The project has an EIA approval and the First Addendum is pending approval.

A tourism planning permission has to be obtained from the Ministry of Tourism, before undertaking any tourism related project. Such permission often requires a study of the environment and the likely impacts.

Accordingly, the concept design of the proposed tourist resort development in Ithaafushi Reef has been approved by the Ministry of Tourism.

3.1.3 Employment Act (2/2008)

The Employment Act is the legal framework to govern the rights and responsibilities of the migrant workers in the Maldives is included in the Employment Act (2/2008) that was ratified and signed into law in May 2008. The Employment Act provides for the creation of a Labour Relations Authority, an Employment Tribunal and an Advisory Board on wages.

To date, four amendments have been brought to the Employment Act (2/2008). All contractors shall be required to undertake ethical recruitment and responsible employment of workers during the construction stage of the project.

During the operation stage an ethical recruitment and responsible employment policy and system will be developed and implemented and amendments were made through the following Acts: 14/2008; 12/2010; 3/2014; 14/2015.

All contractors shall be required to undertake ethical recruitment and responsible employment of workers during the construction stage of the project.

During the operation stage an ethical recruitment and responsible employment policy and system will be developed and implemented.

3.1.4 Immigration Act (1/2007)

The Maldives Immigration Act (1/2007) lays down the rules for entry, departure and deportation of foreign nationals. Article 15 of the Act provides for work visa: the permit to remain in the Maldives for the duration of a work permit granted to a foreign national visiting the Maldives for the purpose of working, where a work permit has been obtained by that foreign national consistent with the regulations of the concerned Government authority.

It is anticipated that a very high number of foreign migrant workers will be employed both during construction and operation stage of the project. Special emphasis will need to be given to ensure that all workers have the relevant work visas and proper documentation while working in the Maldives

3.2 Relevant Regulations and Guidelines

3.2.1 Environmental Impact Assessment Regulations 2012

Environmental Impact Assessment regulations were issued by Environment Environmental Impact Assessment regulations were issued by Environment Ministry on 8 May 2012. The first step in environmental assessment process involves screening of the project to be classified as one that requires an EIA or not. Based on this decision, the Ministry then decides the scope of the EIA, which is discussed with the proponent and the EIA consultants in a "scoping meeting". The consultants then undertake the EIA starting with baseline studies, impact prediction and finally reporting the findings with impact mitigation and monitoring programme. This report follows the principles and procedures for EIA outlined in the EIA regulations.

The EIA report is reviewed by MEE following which an EIA Decision Note is given to the proponent who will have to implement the Decision Note accordingly. As a condition of approval, appropriate environmental monitoring may be required and the proponent shall have to report monitoring data at required intervals to the Ministry. The project proponent is committed to implement all impact mitigation measures that are specified in this EIA report. Furthermore, the proponent is committed to environmental monitoring and shall fulfil environmental monitoring requirements that may be specified in the EIA decision note as a condition for project approval.

This report complies with the EIA regulations

3.2.2 Regulation on Sand and Coral Mining

Regulation on sand mining covers sand mining from uninhabited islands that have been leased; sand mining from the coastal zone of other uninhabited islands; and aggregate mining from uninhabited islands that have been leased and from the coastal zone of other uninhabited islands.

Coral mining from house reef and atoll rim has been banned through a directive from President's Office dated 26 September 1990.

There is no existing island at the moment and the regulation does not apply. However, once the island is on place, sand should not be mined from any part of an existing island. Sand should

also not be mined from within 100 ft. of the shoreline of the existing Ithaafushi Island. Please see regulation on dredging and reclamation for further controls.

3.2.3 Regulation on Dredging and Land Reclamation

The regulation of Dredging and Land Reclamation was published on 2 April 2013 with the aim of minimising environmental impacts associated with dredging activities in islands and reefs across Maldives.

- The regulation defines the rationales acceptable for dredging as those related to approved development activities on inhabited islands and economic islands. It defines that those activities should be if utmost necessity for dredging to be considered.
- All dredging and reclamation activities must be approved by EPA in writing. The process includes the submission of project information to EPA along with a scaled before and after map.
- The regulation defines rationales for reclamation as those absolutely necessary for social, economic or safety purposes.
- Beach replenishment is restricted from 10 m of the registered shoreline in resort islands
- Dredging is restricted in the following areas:
    - 500 m from the ocean side reef edge
    - 50 m from any island vegetation line
    - An environmentally sensitive site
- Land reclamation is restricted within 200 m of a sensitive area.
- Land reclamation cannot exceed 30% of the house reef area

The proposed dredging design of borrow area has been prepared according to this regulation. The Marine Protected Area is located 3 km from the dredge site and the sensitive environment is located about 1 km from the site.

3.2.4 Waste Management Regulation 2013

Waste Management Regulation (WMR) was published on August 2013 and came into effect in February 2014. It is implemented by EPA. The aim of WMR is to implement the national waste policy, which contains specific provisions to:

- Implement measures to minimize impacts on human health

- Formulate and implement waste management standards
- Implement an integrated framework for sustainable waste management
- Encourage waste minimisation, reuse and recycling
- Implement Polluter-Pays Principle
- Introduce Extended Producer Responsibility

WMR contains four main sections:

- Waste management standards: Defines standards for waste collection, transfer, treatment, storage, waste site management, landfills and managing hazardous waste.
- Waste management Permits: Defines approval procedures for waste sites
- Waster transfer: Standards and permits required for waste transport on land and sea, including trans-boundary movements.
- Reporting requirements: Defines reporting and monitoring requirements and procedures.
- Enforcement: Defines procedures to implement WRM and penalties for non-compliance.

This project is compliance with the Ministry of Tourism standards for waste management, which requires the island to manage most of its waste. Any waste taken out of the island and the receiving waste management site shall be in compliance with this regulation. Thilafushi is the designated waste disposal site.

3.2.5 The Environmental Liability Regulation (Regulation 2011/R-9)

This law is pursuant to Article 22 of national constitution that states that protection, preservation and maintenance of the Maldivian natural environment, the richness of the living species, the natural resources and the beauty of the Maldives for the present generations as well as for the future generations is a basic obligation of the Maldivian government. The government shall enforce that the activities conducted in order to gain economic and social development should be of sustainable nature that protect the environment and such activities shall not deteriorate the environment, endanger any species, damage the environment, and shall not waste any natural resources.

This regulation is also pursuant to Environment Protection and Preservation Act of Maldives (4/93). The regulation is aimed at maintaining equal standards for reprimanding and enforcing environmental liabilities, fines for those who violate the rules and regulations and give guidance to those who are involved in the implementation process of the regulations pursuant to Preservation Act of Maldives (4/93).

One of the key objectives of the environmental liability regulation is also to practice polluter-pay-principles in the Maldives.

All project developer and contractors shall be aware of this provision and contractors shall take all practical measures to ensure that all relevant laws and regulations, and the EMP proposed in this EIA is followed.

3.2.6 Regulation on Migratory Birds (Regulation No. 2014/R-169)

This regulation is drafted under the Act number 4/93 (Maldives Environment Protection and Preservation Act) and issued on 21st August 2014. Birds which migrate to the Maldives during different monsoon periods are considered as an integral part of the Environment of Maldives and the main purpose of this regulation is to protect migratory bird species by deterring any activities that may harm their population levels.

Under this regulation, all birds found in the Maldives with the exception of the following are considered as Migratory birds;

- Dhivehi Kambili
- Huvadhoo Raa'Bondhi
- Dhivehi Raa'Bondhi
- Medhu-Raajetherey Raa'Bondhi
- Dhivehi Koveli
- Kaalhu

And, for such migratory birds, it is illegal to carry out any activity that involves;

- Rearing in captivity,
- Trade of birds or their eggs,
- Poaching birds or their eggs,
- Eating bird meat or their eggs, and
- Harming birds or their nests.

This regulation is to be enforced by the Environmental Protection Agency (EPA) of the Maldives, and if any such activity is to be carried out for any research purposes in any of the islands in Maldives, it shall be done by gaining a written approval from the enforcing agency or an agency assigned by the enforcing body.

A fine not exceeding Rf50,000/- may be charged for violation with an incremental Rf1,000/- for repeat offenses.

The proposed Ithaafushi Reef has a sand bank used as a roosting and an occasional nesting site for sea birds, including some migratory birds. There is not enough information to determine this status in the short time frame for this EIA preparation.

All workers must comply with this regulation.

3.2.7 Compliance

In general, the proposed developments are in compliance with the laws and regulations described above. Where there is a special requirement to comply, the EMP identifies measures and mechanisms required to comply.

3.3 Environmental Permits Required for the Project

3.3.1 Approval of the concept and site plan

The Ministry of Tourism will have to approve the concept plan and site plan for the proposed project before the EIA could be approved. This project has approval from Ministry of Tourism (See Appendix D).

3.3.2 Environmental Impact Assessment (EIA) Decision Note from EPA

The most important environmental permit to initiate project work would be a decision regarding this EIA. The EIA Decision Note, as it is referred to, shall govern the manner in which the project activities must be undertaken. This EIA report assists decision makers in understanding the existing environment and potential impacts of the project. Therefore, the Decision Note may only be given to the Proponent after a review of this document following which the Ministry may request for further information or provide a decision if further information is not required. In some cases, where there are no major environmental impacts associated with the project, the Ministry may provide the Decision Note while at the same time requesting for further information.

The Decision Note issued by EPA will be only for dredging from Atoll Lagoon.

3.3.3 Environmental Impact Assessment (EIA) Decision Note from MoT

A separate EIA Decision Note is required to undertake the reclamation works on the Ithaafushi Reef. The EIA process of MoT must be followed to achieved this.

This project already has an approved Decision Note for the project. The First Addendum to the EIA has been approved but the Decision Note is pending.

3.3.4 Dredging and Reclamation Permit

Prior to any coastal work that requires dredging or reclamation, a special permit has to be taken from the EPA. A specific form published by EPA has to be completed and submitted for the approval. EIA application form will only be accepted when the form is submitted with the costal modification approval given by EPA in writing.

Dredging and Reclamation approval will be issued from the EPA with the EIA Decision Note, if the EPA Decides to move forward with the project.

3.4 Responsible Institutions

3.4.1 Ministry of Environment

The Ministry of Environment and Energy (formed in 2012) formerly the Ministry of Housing and Environment is mandated for the effective implementation of the Environmental Protection Act of the country and has the statutory power over issues related to the environment. It has the central control over the environment protection, management, conservation and environmental emergencies. The Ministry operates mainly at a policy level and the more regulatory and technical assessment activities are mandated to the Environmental Protection Agency (EPA). In this respect EPA has now been mandated to manage all issues relating to Environmental Impact Assessment of individual projects.

3.4.2 Ministry of Tourism, Arts and Culture

The Ministry of Tourism is main agency responsible for approving and overseeing the development of a resort property in Ithaafushi Lagoon. The concept for the resort development has been approved by the ministry. Detailed drawings for the resort need to be submitted to the ministry once the EPA and MoT have approved the EIAs, and once the project is initiated.

3.4.3 Atoll Council

Under the Decentralization Act, Kaafu Atoll has elected Atoll Council comprising representatives from the islands within the atoll. Kaafu Atoll Council is located in Thulusdhoo Island. The Council Office is the main focal point of Government Ministries in Kaafu Atoll and they co-ordinate and liaises with Government Ministries and elected island councils on all issues relating to the Atoll.

A copy of this EIA will have to be submitted to Male' Atoll Council.

3.5 Guiding Policies and Documents

3.5.1 National Environmental Action Plan II (NEAP II)

The aim of NEAP II is to protect and preserve the environment of the Maldives and to sustainably manage the country's natural resources for the collective benefit and enjoyment of present and future generations.

Accordingly, the key strategies of the NEAP II are:

- Continuous assessment of the state of the environment in the Maldives, including impacts of human activities on land, atmosphere, freshwater, lagoons, reefs and the ocean; and the effects of these activities on human well-being
- Development and implementation of management methods suitable for the natural and social environment of the Maldives and maintain or enhance environmental quality and protect human health, while at the same time using resources on a sustainable basis
- Ensure stakeholder participation in the decision making process by consultation and collaboration with all relevant sectors of society
- Preparation and implementation of comprehensive national environmental legislation in order to provide for responsible and effective management of the environment
- Adhering to international and regional environmental conventions and agreements and implementation of commitments embodied in such conventions.

Furthermore, NEAP II specifies priority actions in the following areas:

- Climate change and sea level rise; coastal zone management;
- Biological diversity conservation; integrated reef resources management;
- Integrated water resources management;
- Management of solid waste and sewerage;
- Pollution control and management of hazardous waste;
- Sustainable tourism development;
- Land resources management and sustainable agriculture
- Human settlement and urbanization.

3.5.2 Waste Management Policy

The aim of the waste management policy is to formulate and implement guidelines and means for solid waste management in order to maintain a healthy environment. Accordingly, the key elements of the policy include:

- Ensure safe disposal of solid waste and encourage recycling and reduction of waste generated;
- Develop guidelines on waste management and disposal and advocate to enforce such guidelines through inter-sectoral collaboration;
- Ensure safe disposal of chemical, hazardous and industrial waste.

The proponents of this project must be aware of the policy and all solid and hazardous waste produced in this project should be disposed according to the Environmental Management Plan for the project, which reflects the principles of the Waste Management Policy.

3.6 International Conventions

3.6.1 Convention on Biological Diversity

The Maldives is a party to the United Nations Convention on Biological Diversity. The objective of the convention is "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding". The proposed development activities outlined in this project does not fall on any area recognised for its ecological value. Therefore it is unlikely there will be a major loss of biodiversity. The loss is not going to be significant at atoll or national level. Yet, it is recommended that the developer ensure that silt screens are used during dredging works, construction of the jetty and breakwaters to minimise any impact on the marine biodiversity.

3.6.2 UNFCCC and Kyoto Protocol

The Maldives is a party to the United Nations Framework Convention on Climate Change and the Kyoto Protocol to the UNFCCC. The objective of the Convention is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food

production is not threatened and to enable economic development to proceed in a sustainable manner.

The IPCC defines mitigation "as an anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases." The greenhouse gas inventory of the Maldives forms an integral part of the First National Communication of the Maldives to the UNFCCC. In March 2009, the President of the Maldives has announced the target to make Maldives carbon neutral by 2020. Hence, in the implementation of the project, careful attention needs to be given to ensure energy efficiency and reduce transport related fuel consumption. Furthermore, planting of beach vegetation would help in mitigation of greenhouse gas emissions from the project.

The IPCC defines adaptation "as an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects." Various type of adaptation include anticipatory and reactive adaptation; private and public adaptation; and autonomous and planned adaptation. The adaptation policies and strategies of the Maldives are given in the Maldives National Adaptation Programme of Action (NAPA). The replenishment of the beach can be considered as a long-term adaptation measure against beach erosion caused by rising sea levels.

3.6.3 Convention on the Law of the Sea

UNCLOS provides a legal order for the seas and oceans to facilitate international communication, promote the peaceful uses of the seas and oceans, the equitable and efficient utilization of their resources, the conservation of their living resources, and the study, protection and preservation of the marine environment.

3.6.4 International Convention for the Prevention of Pollution from Ships (MARPOL)

MARPOL is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. It is a combination of two treaties adopted in 1973 and 1978 and includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes Prevention of Pollution by Oil; Control of Pollution by Noxious Liquid Substances in Bulk; Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form; Prevention of Pollution by Sewage from Ships; Prevention of Pollution by Garbage from Ships; and Prevention of Air Pollution from Ships.

The dredge vessel must comply with MARPOL Conventions.

4 EXISTING ENVIRONMENT

The existing environment utilizes the baseline original baseline line data. Please refer to original report for detailed baseline description of the environment. The following subsections will present the relevant baseline conditions from the borrow areas and its surroundings. In addition, the works already completed are summarised.

4.1 Works completed

The only activities undertaken on the site is the construction of sand bunds and settlement basins for Island B (See Figure 4.1) and dredging the entrance channel. These activities were undertaken under the original EIA. Bunding works for Island A is ongoing.

Figure 4.1: Satellite image showing the completed bunds and reef entrance

4.2 Physical Environment

4.2.1 Geological Setting of Ithaafushi Reef

The proposed site is a small 126 Ha reef with no permanent island or land. The length of the reef is 2,800 m and width at its widest point is 750 m. The reef system is oriented in an east-west direction. There is a seasonal sand bank on the eastern end of the reef and is about 0.05 Ha within low tide area. The reef is characterised by a deep lagoon of about 17 Ha (covering 30 % of the reef) separated by a narrow strip of coral rubble and sand, a shallow reef flat of about 68.5 Ha (covering 54% of the reef) and a reef slope..

The reef is odd-shaped compared to the other circular shaped reefs in South Male' Atoll. There seem to be two distinct parts of the reef: a usual oval shaped section on the western half and a narrow elongated reef on the eastern half. This formation gives the island a hook shape. The Atoll lagoon (with depths over -25 m) separate the two halves on the southern side. The western half contains two distinct inner lagoons.

The average reef flat depth is between -1.0 to -1.7 m MSL on the shallow reef flat. The depth within the western deep lagoon is between and -6.0 to -13.0 in the deep lagoon and depths in the eastern deep lagoon reached -18 m. The shallowest zone on the reef is on the eastern side with elevation reaching above mean sea level during some seasons around a small sand bank. The reef is characterised by a gentle sloping reef on the western side, and a relatively steep slopes around the rest of the reef. These patterns correlate to strength of wave activity around the reef.

There is a small submerged reef north of the reef system and is connected to the main reef at depth around -12 to -15 m. This reef appears to grown at the same rate as the main reef during the Holocene Period (see below) but may have drowned at some point due to its failure to keep up with the rising sea level. This area now plays a role in the hydrodynamics around the main reef.

Recent findings on the geological history of Maldivian Atolls, including Male' Atoll, indicate that it differs from the traditionally believed subsidence model proposed by Charles Darwin. Instead, it is believed to have been formed through carbonate accumulation of over 3000 m throughout the Tertiary period (66 million to 2.58 million years ago), through various phases of aggradation and progradation associated with sea level variations (Aubert and Droxler, 1992; Purdy and Bertram, 1993; Belopolsky and Droxler, 2003). During the Quaternary Period (2.6 million years to present day), reef growth was dominated by vertical growth associated with sea level fluctuations. The present morphology of Maldives is the result of vertical growth during the Holocene Period over the last 10,000 years (Kench et al., 2009). The thickness of the Holocene growth was measured between 12 to 14 m (Gischler et al., 2008; Kench et al., 2009).

The modern islands themselves are known to have been formed between 5,500 - 4000 years across the infilled lagoon, and stabilised around 3,500 years ago (Kench et al., 2005).

Borehole assessments have not been undertaken for the site. However. geological investigations undertaken in reefs in Male' Atoll indicate that the reef substrata usually contain areas of coral rubble mixed with coarse sand. Layers of loose coral sand are usually presented in relatively thin layers. Results also show that areas of larges coral pieces or a comparatively harder surface is generally reached around 13 m.

Reef flat sediments on the surface appeared to be mostly fine to medium sands with a moderate percent of coarse material, indicating the fragmentation of biogenic fragments across the reef flat from the carbonate productive reef margins. The material in the deep lagoon surface is fine (clayish in some parts), which partly explains the reasons for murky conditions in the lagoon.

A summary of the physiographic conditions on the surface of the reef is summarised in Figure 2.5. Within the shallow reef zone, most of the surface areas are covered with sand and coral rubble. A zone of fine coral sand was observed on the eastern end of the reef due to the convergence of waves in that area (see next section). The area with substantial volume of fine sand is expected to be found on the western slope of the deep lagoon. This zone contains sediments transported over the reef and deposited due to the prevalent wave patterns. As noted above, a zone of old coral rubble is found on the western rim of the reef due to the strong wave activity in the area. Limited coral zones were observed within the shallow reef flat. In contrast, the deep lagoon comprised of scattered live coral patches

4.2.2 Meteorology

4.2.2.1 Climate

The climate in Maldives is warm and humid, typical of the tropics. The average temperature ranges between 25°C to 30°C and relative humidity varies from 73 percent to 85 percent. The annual average rainfall is approximately 1,948 mm. As Maldives lies on the equator, Maldives receives plenty of sunshine throughout the year. Significant variation is observed in the climate between the northern and the southern atolls. The annual average rainfall in the southern atolls is higher than the northern atolls. In addition, greater extremes of temperature are also recorded in the southern atolls. On average southern atolls receive 2704 hours of sunshine each year. Table 4.1 provides a summary of key meteorological findings for Maldives.

Table 4.1: Key Meteorological Information of the Maldives

Parameter	**Data**
Average Rainfall	9.1mm/day in May, November; 1.1mm/day in February
Maximum Rainfall	184.5 mm/day in October 1994
Average air temperature	30.0 C in November 1973; 31.7 C in April
Extreme Air Temperature	34.1 C in April 1973;17.2 C in April 1978
Average wind speed	3.7 m/s in March; 5.7 m/s in January, June
Maximum wind speed	W 31.9 m/s in November 1978
Average air pressure	1012 mb in December; 1010 mb in April

4.2.2.2 Monsoons

The climate of Maldives is characterised by the monsoons of the Indian Ocean. Monsoon wind reversal significantly affects weather patterns. Two monsoon seasons are observed in Maldives: the Northeast (Iruvai) and the Southwest (Hulhangu) monsoon. The parameters that best distinguish the two monsoons are wind and rainfall patterns. The southwest monsoon is the rainy season while the northeast monsoon is the dry season. The southwest monsoon occurs from May to September and the northeast monsoon is from December to February. The transition period of southwest monsoon occurs between March and April while that of northeast monsoon occurs from October to November.

4.2.2.3 Winds

The winds that occur across Maldives are mostly determined by the monsoon seasons. The two monsoons are considered mild given that Maldives is located close to the equator. As a result, strong winds and gales are infrequent although storms and line squalls can occur, usually in the period May to July. During stormy conditions gusts of up to 60 knots have been recorded at Male'.

Wind has been uniform in speed and direction over the past twenty-plus monsoon seasons in the Maldives (Naseer, 2003). Wind speed is usually higher in central region of Maldives during both monsoons, with a maximum wind speed recorded at 18 ms-1 for the period 1975 to 2001. Mean wind speed as highest during the months May and October in the central region. Wind analysis indicates that the monsoon is considerably stronger in central and northern region of Maldives compared to the south (Naseer, 2003).

Besides the annual monsoonal wind variations there are occasional tropical climatic disturbances (tropical storms or low intensity tropical cyclones) in the central region which increases wind speeds up to 110 km/h, precipitation to 30 to 40 cm over a 24 hour period and storm surges up to 3 m in open ocean (UNDP, 2006).

Table 4.2 summarises the wind conditions in central Maldives throughout a year. Medium term meteorological data from Hulhule meteorological centre (see Figure 4.1, Figure 4.2 and Figure 4.3) and findings from long-term Comprehensive Ocean-Atmosphere Data Set (COADS) are used in this analysis.

Table 4.2: Summary of General Wind Conditions from National Meteorological Centre

Season	**Month**	**Wind**
NE - Monsoon	December	Predominantly from NW-NE.
	January	High Speeds from W
	February	
Transition Period 1	March	From all directions. Mainly W.
		High Speeds from W.
	April	
SW - Monsoon	May	Mainly from W.
	June	High Speeds from W.
	July	
	August	
	September	
Transition Period 2	October	Mainly from W.
	November	High Speeds from W

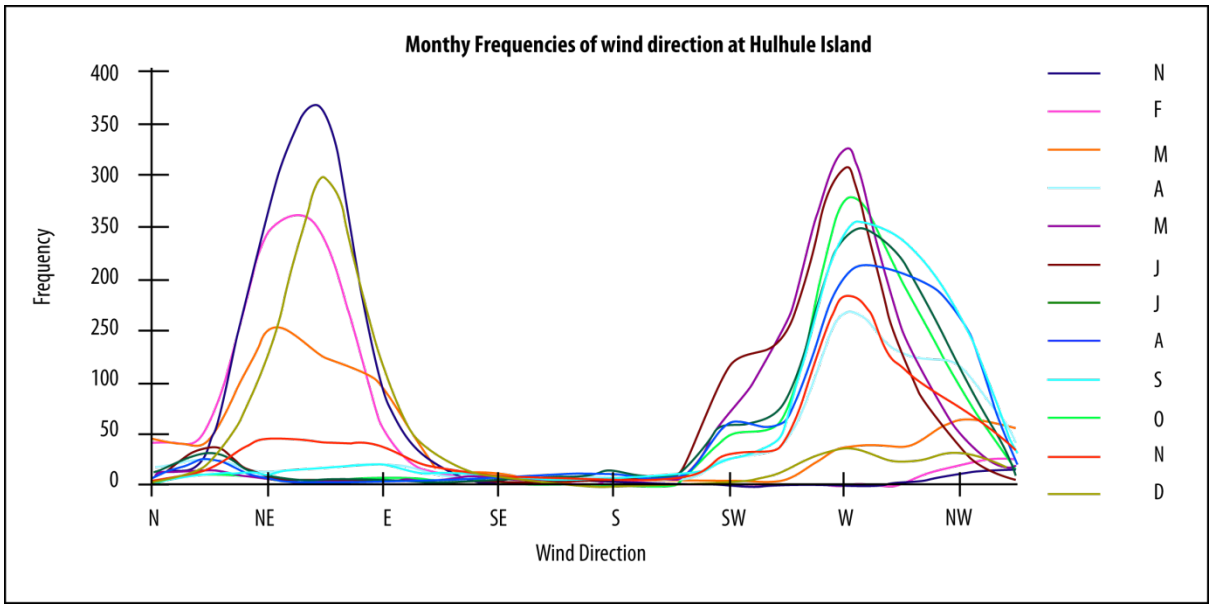


Figure 4.1: Monthly Frequencies of Wind Direction in Central Maldives based on National Meteorological Center 10 year Data (adapted from Naseer, 2003).

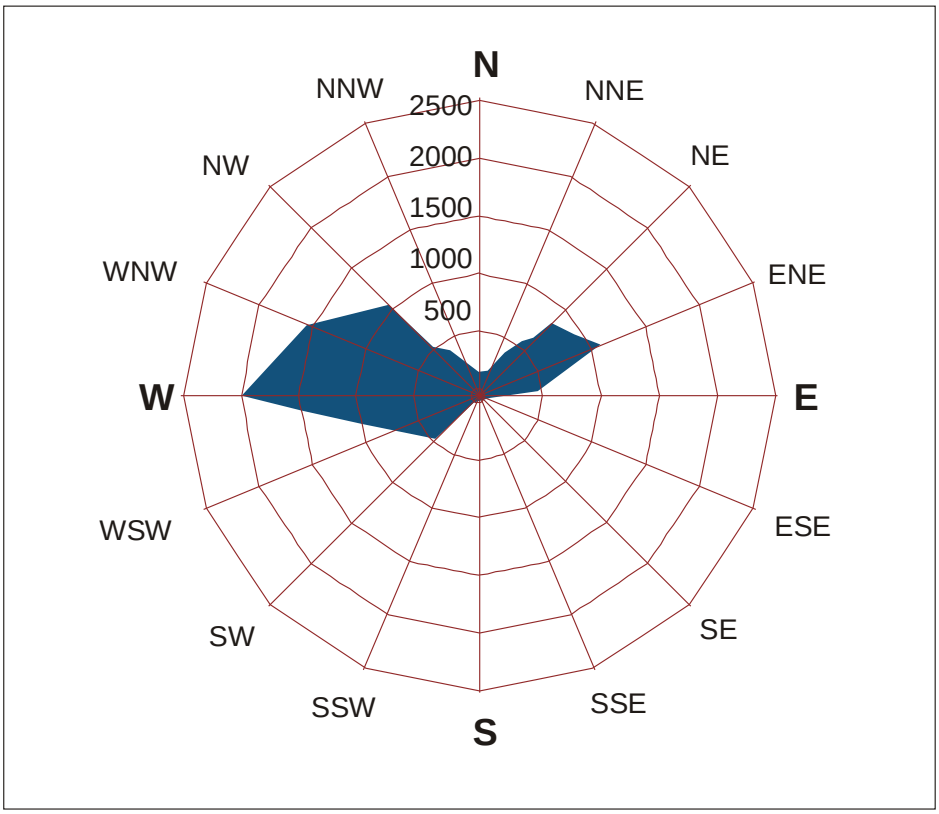


Figure 4.2: 24 Year Wind Frequency Recorded at National Meteorological Center.

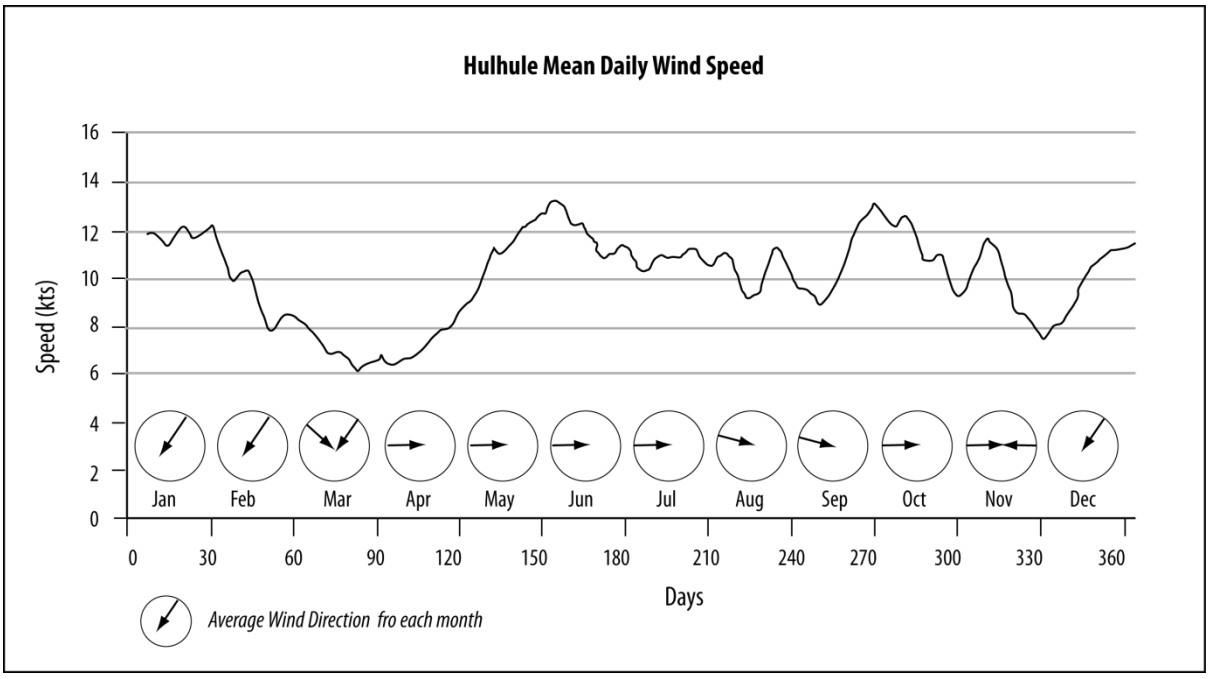


Figure 4.3: Mean Daily Wind Speed and Direction Recorded at National Meteorological Centre (1978 – 2004)

The Disaster Risk Profile of Maldives (UNDP, 1006) reports 11 cyclonic events over the Maldives in the last 128 years and only one event over the central Maldives. All of these events were of category 1 cyclones. There have been no cyclonic events since 1993.

Ithaafushi is located in a moderate risk cyclonic hazard zones (UNDP, 2006). The project site is expected to receive regular annual strong winds during the peak SW monsoon.

4.2.2.4 Rainfall

The average annual rainfall for the archipelago is 2,124 mm. There are regional variations in average annual rainfall: southern atolls receive approximately 2,280 mm, and northern atolls receive approximately 1,790 mm annually (MEC, 2004). Mean monthly rainfall also varies substantially throughout the year with the dry season getting considerably less rainfall. This pattern is less prominent in the southern half, however. The proportions of flood and drought years are relatively small throughout the archipelago, and the southern half is less prone to drought (UNDP, 2006).

The nearest meteorological station to Ithaafushi is the National Meteorological Centre in Hulhule' Island. The mean annual rainfall in Hulhule' is 1991.5 mm with a Standard Deviation of 316.4 mm and the mean monthly rainfall is 191.6 mm. Rainfall varies throughout the year with mean highest rainfall during October, December and May and lowest between February and April (See Figure 4.4).

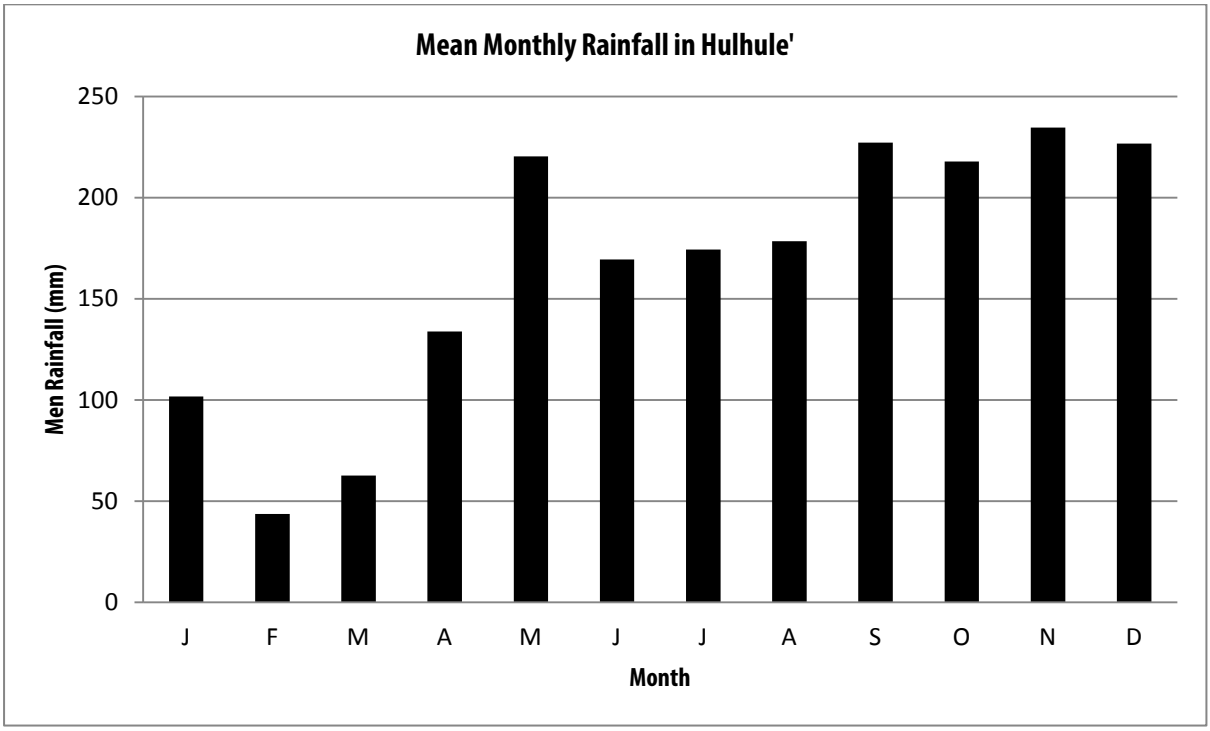


Figure 4.4: Mean Monthly Rainfall in Hulhule' (1975-2004)

Analysis of daily maximum annual rainfall data shows high variability, including extremes (see Figure 4.5 below). However, no significant long term trends are evident in the Hulhule data.

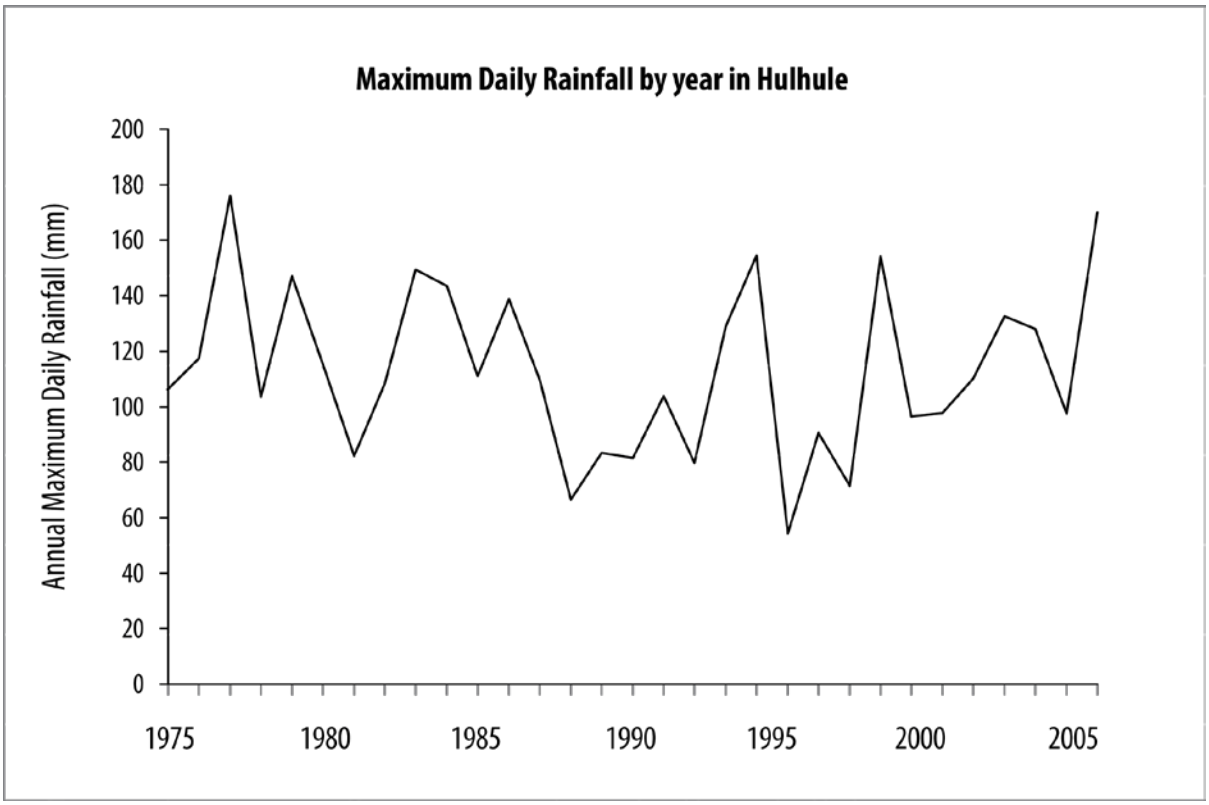


Figure 4.5: Maximum daily rainfall by year in Hulhule' (1975-2005) - (Source: Hay, 2006)

The probable maximum precipitations predicted for Hulhule' by UNDP (2006) are shown in Table 4.3.

Table 4.3 Probable Maximum Precipitation for various Return periods in Hulhule'

Station	**Return Period**			
	50 year	100 year	200 year	500 year
Hulhule'	187.4	203.6	219.8	241.1

Source (UNDP, 2006)

4.2.2.5 Temperature

Daily temperatures of Maldives vary little throughout the year with a mean annual temperature of 28°C. The annual mean maximum temperature recorded for Male' during the period 1967-1995 was 30.4°C and the annual mean minimum temperature for the same period was 25.7°C. The highest recorded temperature for Male' was 34.1°C on 16th and 28th of April 1973. The hottest month recorded was April 1975 with a maximum monthly average temperature of 32.7°C, the next highest being 32.6°C in April 1998. The lowest minimum average temperature of 23.7°C was recorded in July 1992.

There is considerable inter annual variability in extreme temperatures for Hulhule as shown in Figure 4.6. A maximum temperature of at least 33.5^{o}C is rare at Hulhule and has a return period of 20 years (Hay, 2006).

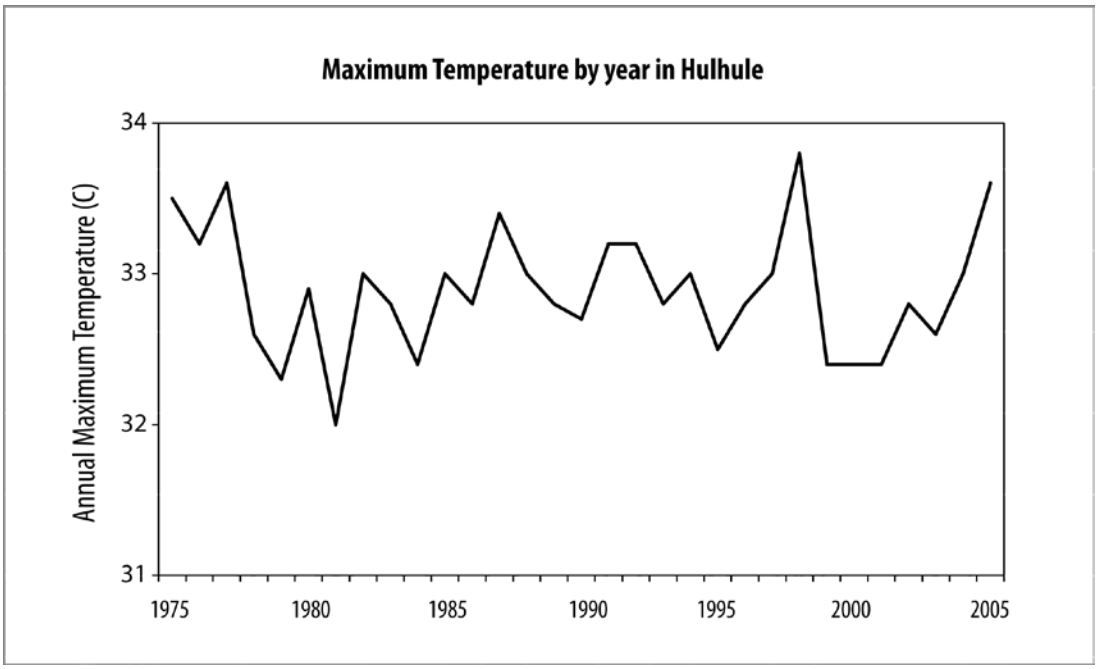


Figure 4.6: Maximum Temperature by year in Hulhule'- 1975-2005 (Source: Hay, 2006)

4.2.3 Hydrology

4.2.3.1 Tidal Pattern

Water levels at the site vary mainly in response to tides, storm surge or tsunamis. Tides in the Maldives are mixed and semi-diurnal/diurnal.

Tidal variations are referred to the standard station in at Hulhulé Island located approximately 25 km from Ithaafushi. Typical spring and neap tidal ranges are approximately 1.0 m and 0.3 m, respectively (MEC, 2004). Maximum spring tidal range in Hulhulé is approximately 1.1m. There is also a 0.2m seasonal fluctuation in regional mean sea level, with an increase of about 0.1m during February to April and a decrease of 0.1m during September to November. Table 4.4 summarizes the tidal elevations reported at Hulhulé, which is representative of tidal conditions at the project site.

Table 4.4: Tidal Variations at Hulhule International Airport

Tide Level	Referred to Mean Sea level
Highest Astronomical Tide (HAT)	+0.64
Mean Higher High Water (MHHW)	+0.34
Mean Lower High Water (MLHW)	+0.14
Mean Sea Level (MSL)	0.00
Mean Higher Low Water (MHLW)	-0.16
Mean Lower Low Water (MHLW)	-0.36
Lowest Astronomical Tide (LAT)	-0.56

The predicted tide curve for the period between 02 March and 1st May 2011 is presented in Figure 4.7 below. Details of the two months are presented in Figure 4.8 and the details for the month of April are presented in Figure 4.9. The largest measured tide during the short monitoring period had a range of about 1.05 m.

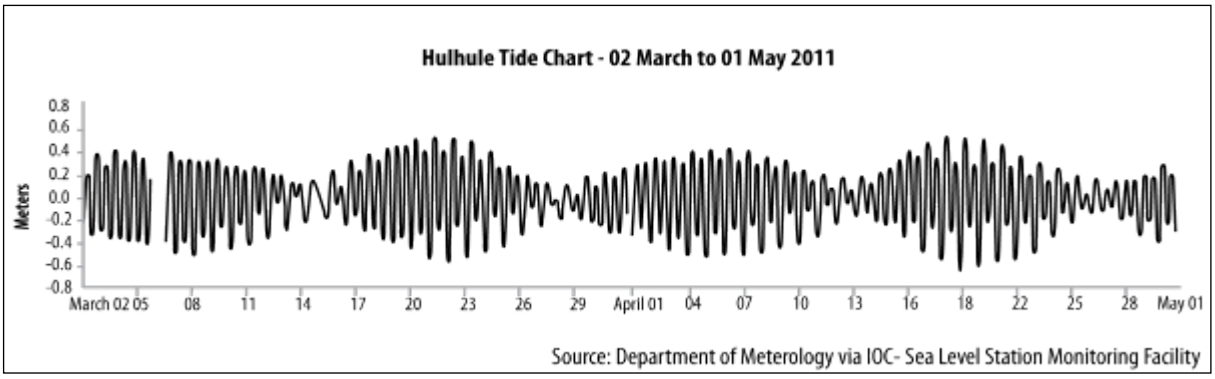


Figure 4.7: Predicted tides for March and April 2011, based on data supplied by Department of Meteorology, Maldives

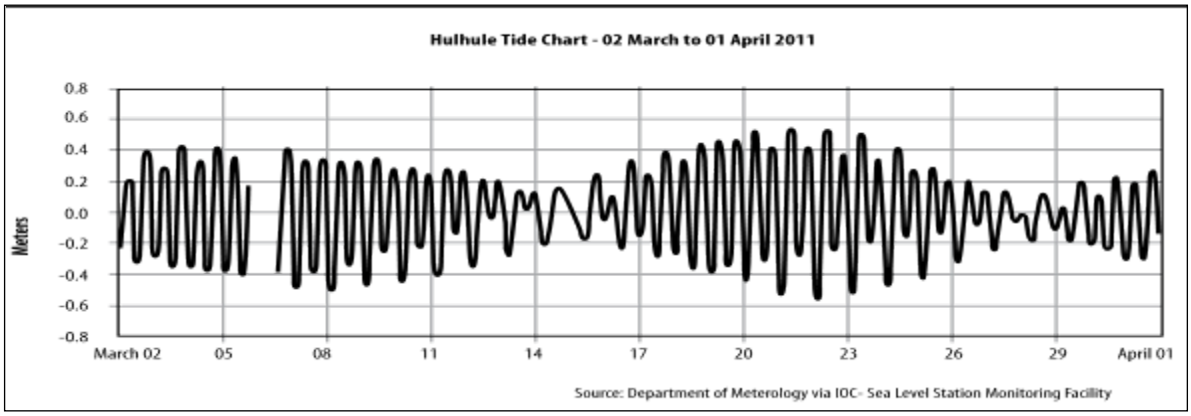


Figure 4.8: Predicted tides for March 2011, based on data supplied by Department of Meteorology, Maldives

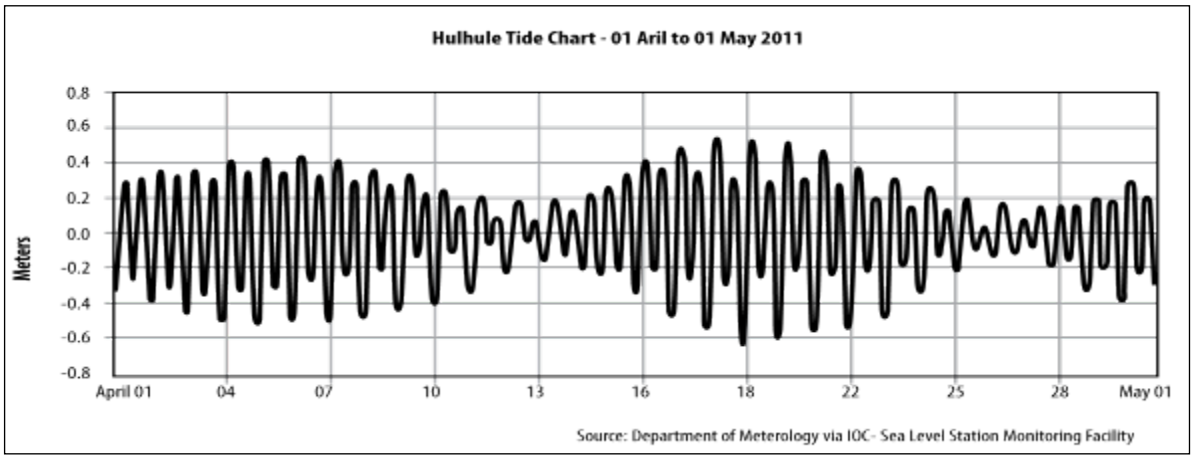


Figure 4.9: Predicted tides for April 2011, based on data supplied by Department of Meteorology, Maldives

4.2.3.2 Waves

There are two major types of waves observed along the islands of Maldives. The first type is wave generated by local monsoon wind with a period of 3-8 seconds and the second type is swells generated by distance storms with a period of 14-20 seconds [Kench et. al (2006), DHI (1999), Binnie Black & Veatch (2000), Lanka Hydraulics (1988a & 1998b)]. The local monsoon predominantly generates wind waves, which are typically strongest during April-July in the southwest monsoon period. Wave data for Male and Hulhulé' between June 1988 and January 1990 (Lanka Hydraulics 1988a & 1998b) shows that the maximum significant wave height (Hs) recorded for June was 1.23 m with a mean period (Tm) of 7.53s. The maximum recorded Hs for July was 1.51 m with a Tm of 7.74s. The mean wave periods were 5.0 – 9.0s and the peak wave periods were within 8.0 – 13.0s.

Maldives experiences occasional flooding caused by long distance swell waves that are generated by South Indian Ocean storms (Goda 1988). The swell waves of height 3 meters that flooded Male' and Hulhulé in 1987 are said to have originated from a low pressure system off west coast of Australia (refer the next section for more detail). In addition, Maldives has recently been subject to an earthquake-generated tsunami reaching heights of 4.0m on land (UNEP, 2005). Historical wave data from Indian Ocean countries show that tsunamis have occurred in more than 1 occasion, most notable has been the 1883 tsunami resulting from the volcanic explosion of Karakatoa (Choi et al., 2003).

Ithaafushi is located just inside the western rim of South Male' Atoll. It is exposed to wind waves during both seasons (see figure 4.10). The peak periods of SW and NE monsoon will create moderately rough conditions outside the lagoon. SW monsoon waves are expected to be particularly strong around the reef.

Due to its proximity to the western rim and due to its location in front of a an atoll pass, the effects of waves during the SW monsoon (May to November) is much more prominent. In particular the western half of Ithaafushi Reef receives strong wave energy due to swells refracting through the reef pass. The physiographic conditions on the western rim of the Ithaafushi Reef show evidence of this prevailing wave condition.

The presence of patch reefs within the Atoll lagoon provides cover from strong wave activities on some section of the reef. In particular, the southern side of the reef receives very limited wave activity.

The east west orientation of the island, the 'hook shaped' reef and the lack of wave activity on the south creates calm condition on the south. This area could be considered a protected 'natural harbour'.

The proposed borrow site is predominantly exposed to strong SW monsoon wind waves (See Figure 4.11). Wind waves may penetrate the reef passes and reach the project site. However, waves in excess of 1 m are unlikely in the proposed borrow site.

4.2.3.3 Swell Waves and Storm Surges

Waves studies around Maldives have identified the presence of swell waves approaching predominantly from a southwest to a southerly direction Kench et. al (2006), Young (1999), DHI(1999), Binnie Black & Veatch (2000) and Naseer (2003).

Being located close to the western rim of atoll and in front of a reef pass, the island is exposed to Indian Ocean swells approaching from the SW. Waves will refract and penetrate the atoll reef pass and reach the western reef rim of Ithaafushi. These waves will further propagate along the length of the northern reef rim and a section of the southern rim. The presence of a smaller reef west of Ithaafushi and in front of the reef pass, further alters wave refraction patterns in the area.

It is also possible for swell waves approaching from the west to affect the proposed borrow site. However, the area is largely protected from the predominant SW swell waves.

Waves generated from abnormal events could also travel against the predominant swell propagation patterns (Goda, 1998), causing flooding on the eastern and southern islands of Maldives (UNDP, 2009).

As noted in the previous section, Ithaafushi is located in a moderate risk cyclonic hazard zone. It has the potential for a 1.8 m storm tide in a 500 year return period (UNDP, 2006).

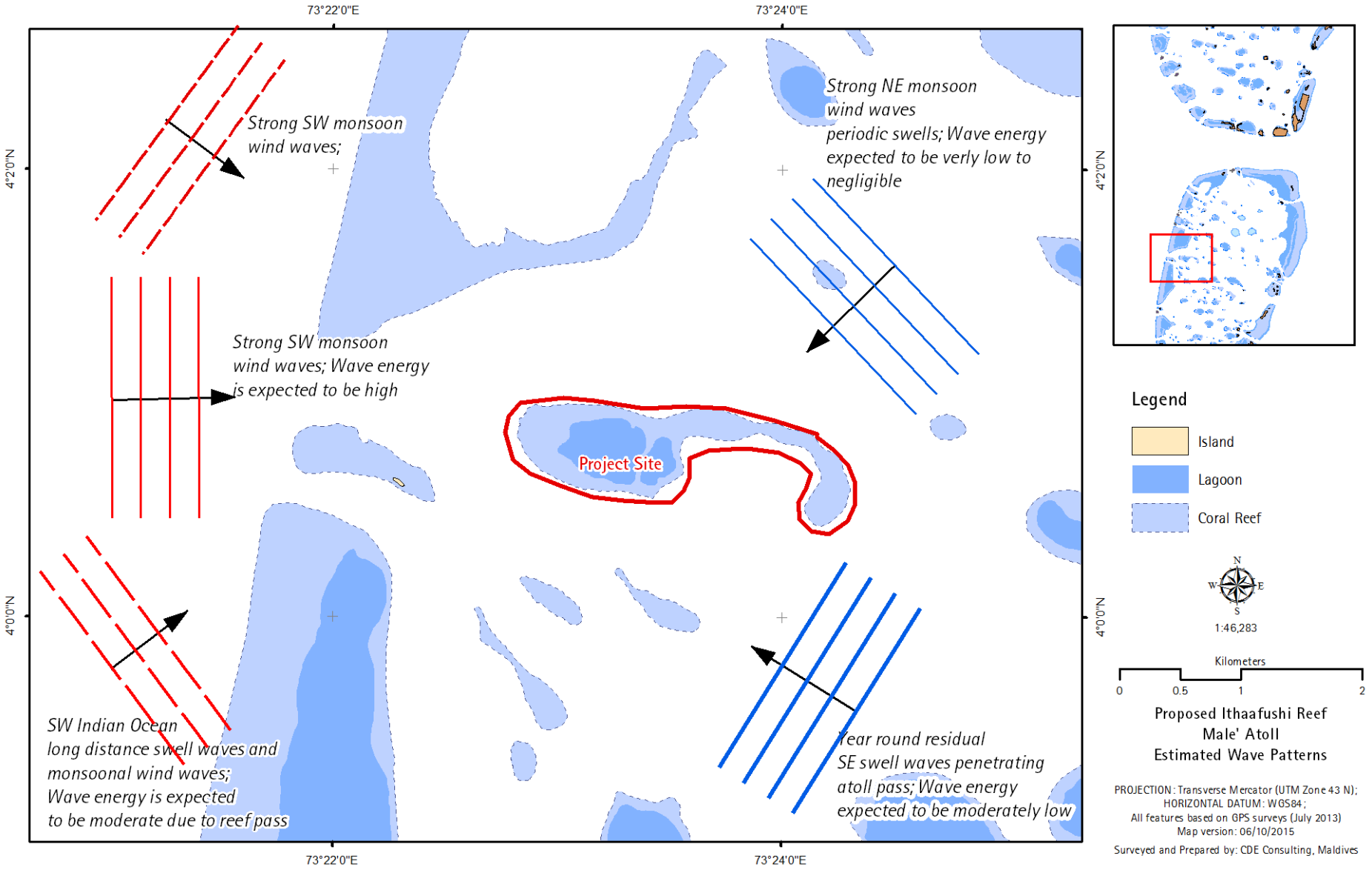


Figure 4.10: Estimated wave patterns around Ithaafushi

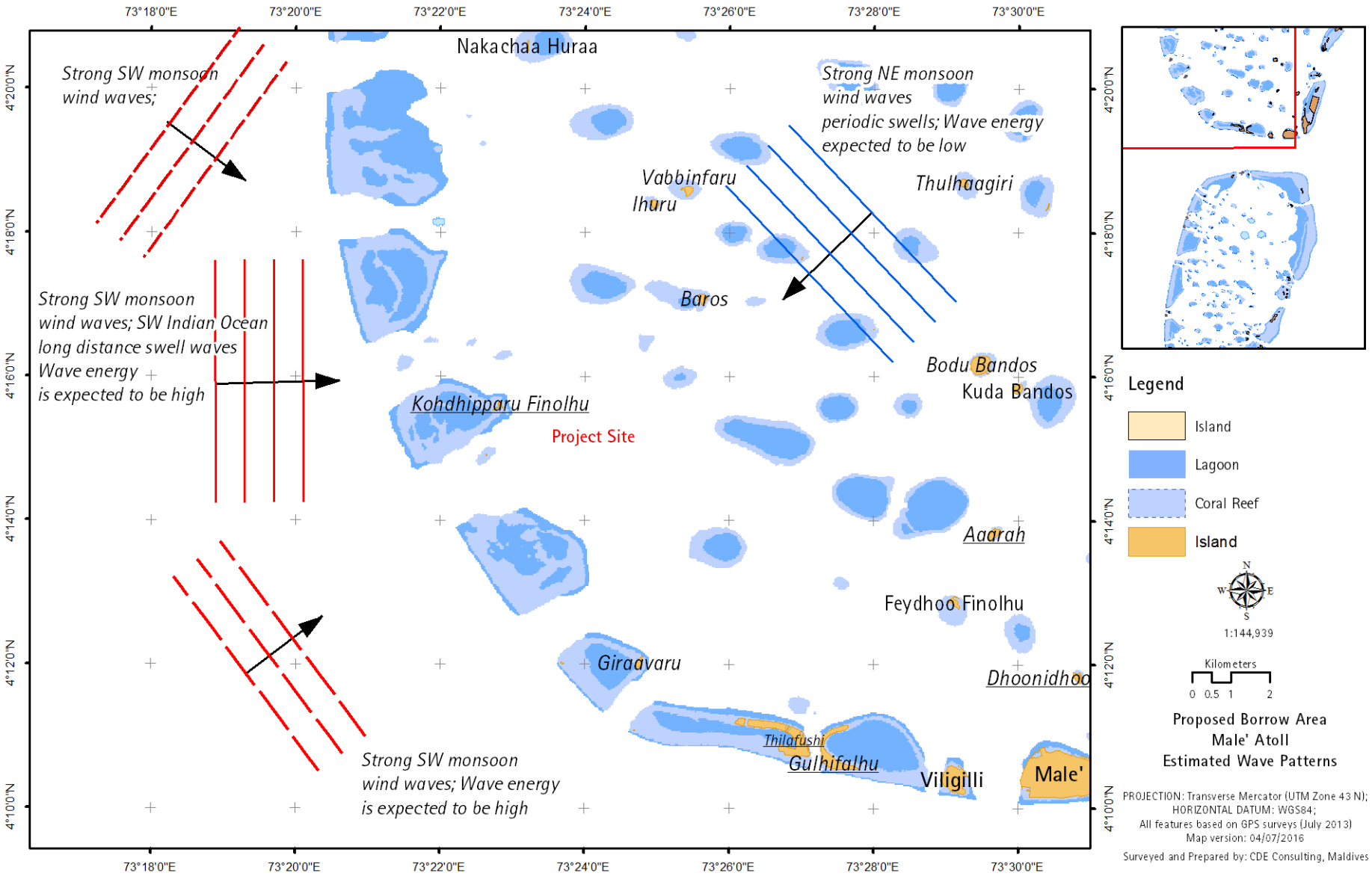


Figure 4.11: Estimated wave patterns around borrow site

4.2.3.4 Currents

Currents that affect the reef system of Ithaafushi Reef can be caused by tidal currents, wind-induced currents and wave-induced currents. It is presumed that generally current flow through the country is defined by the two-monsoon season winds. Westward flowing currents are dominant from January to March with the change in current flow pattern taking place in April and December (Kench et. al, 2006). In April the westward currents become weak while the eastward currents start to take over. In December the eastward currents are weak with the westward currents becoming more prominent. Hence, currents within the site are very likely to be heavily influenced by the monsoons.

In addition, wave driven currents also appear to play an important role on the reef system, particularly since there is a year round presence of swell waves. The estimated patterns in current flow during NE monsoon transition and SW monsoon are presented in Figure 4.12.

In-situ current assessment was undertaken on the project site during April and May, representing the SW monsoon conditions. Observations were undertaken using drogue method over 2 days, measuring only during flood tide. Measurements were undertaken as a grid to determine the various patterns off the reef, on reef flat and deep lagoon.

The current flow patterns during August were observed to be generally eastward flowing during flood tide. Current speeds generally increased during ebb. The speeds were on average around 0.27 m /s outside the shallow reef and around 0.16 m/s within the shallow lagoon. The effects of wave driven currents were observed only on the western half of the reef.

Current flow at the borrow sites were measured at six locations. All site had constant flow between 0.31 and 0.33 m/s during ebb. The flow direction was ENE.

These measurements should be viewed with caution as it represents only a snap shot of the current pattern. Long-term measurements are required to establish a proper picture.

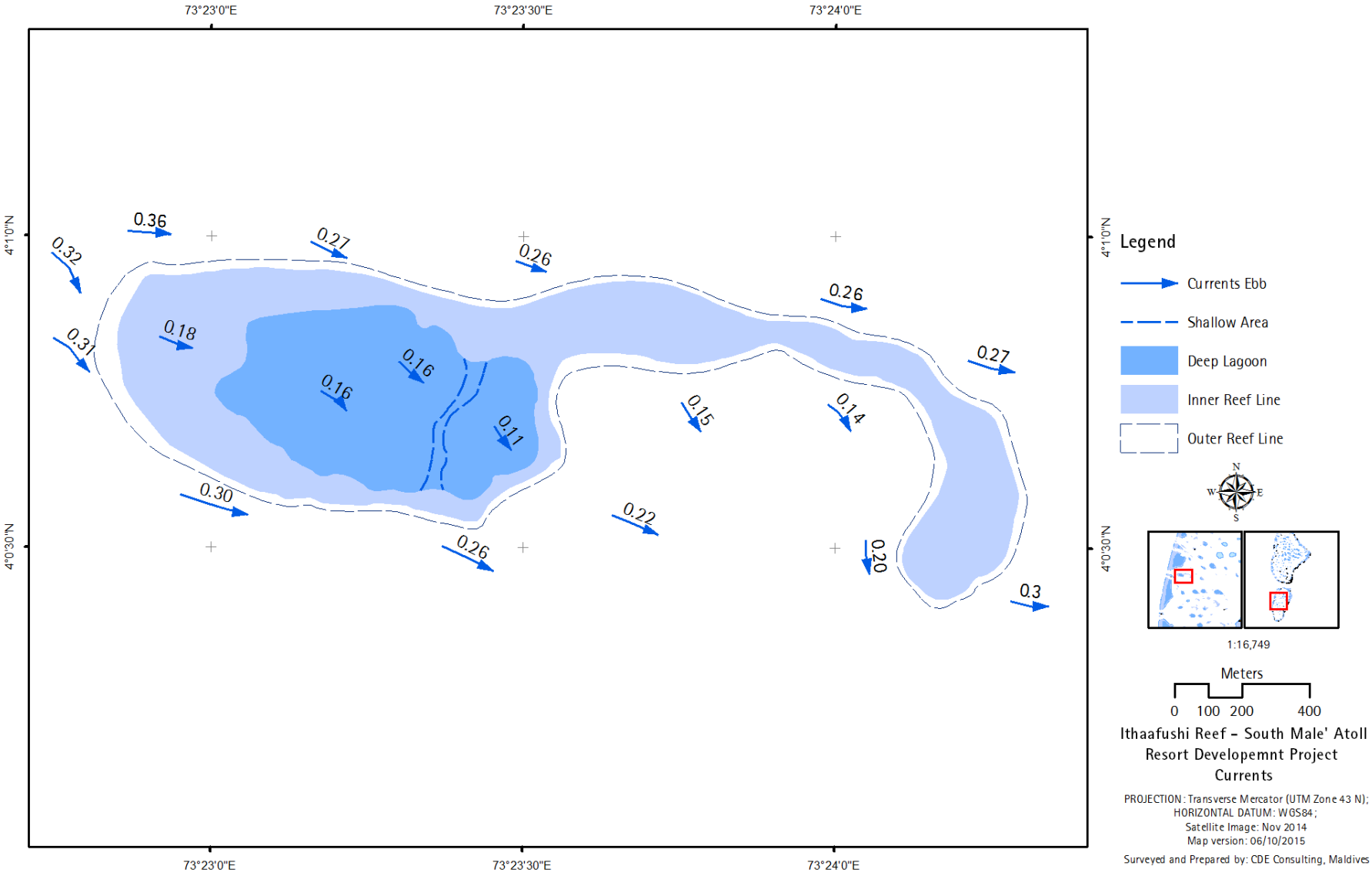


Figure 4.12 Observed current flow patterns on Ithaafushi reef

4.2.4 Marine water quality assessment

The primary objective of the lagoon water quality sampling was to determine the baseline conditions of the marine water in around the borrow sites and Ithaafushi. Water samples were collected in 500ml PET bottles from three locations. All water quality tests were done at the MWSC laboratory

The following table shows (see Table 4.5) the test results of the marine water samples collected on 23 September 2015 around Ithaafushi Reef. Laboratory results are attached in Appendix H.

Table 4.5: Marine water quality assessment results from MWSC laboratory from Ithaafushi

Parameter	**Optimal Range (EPA)**	**Results**		
		SW1	**SW2**	**SW3**
Physical appearance		Clear	Clear	Clear
pH	8.0 – 8.3	8.21	8.24	8.24
Salinity ($^{o}/_{oo}$)		35.1	35.3	35.1
Temperature	18 - 32	21.3	21.4	21.5
Nitrate (mg/L)	<5	0.2	0.3	0.3
Phosphate (mg/L)	0.005 – 0.020	<0.05 (LoQ 0.05mg/L)	<0.05 (LoQ 0.05mg/L)	<0.05 (LoQ 0.05mg/L)
Total Suspended Solids (TSS) (mg/l)	-	<5 (LoQ 5mg/L)	<5 (LoQ 5mg/L)	<5 (LoQ 5mg/L)
Biological Oxygen Demand (BOD)-(mg/l)	<2	1	1	1

All of the parameters (See Table 4.5 above) tested appear to be within acceptable ranges at all sites. The water was found to be slightly basic with a pH range of 8.21 to 8.24 and the pH level is within the recommended optimal range by EPA. Salinity, nitrates, phosphate, Total Suspended Solids and temperature and BOD of the samples is also well within the acceptable range. This denotes that the quality of the marine water around the proposed project site is in good condition.

The following table shows (see Table 4.6) the test results of the marine water samples collected on 9 June 2016 around the borrow areas. Laboratory results are attached in Appendix H.

Table 4.6: Marine water quality assessment results from MWSC laboratory for borrow areas

Parameter	Optimal Range (EPA)	Baros Thila (SW1)	Kohdhipparu Reef (SW2)	Kohdhipparu Finolhu (SW3)	Kuda Haa (SW4)
pH	8.0 – 8.3	8.08	8.12	8.13	8.09
Nitrate (mg/L)	<5	3.3	3.4	3.2	3.2
Phosphate (mg/L)	0.005 – 0.020	0.16	0.09	0.10	0.13
Turbidity (NTU)	3 - 5	0.192	< 0.1	0.356	<0.1
Total Suspended Solids (mg/l)	-	<5	<5	<5	<5
Biological Oxygen Demand (BOD)-(mg/l)	<2	1	2	1	2

Marine water quality was evaluated by taking samples from four locations. Biological Oxygen Demand of all the water samples varied between 1 to 2 mg/l, which is at acceptable level as proposed by EPA (<2 mg/L). The levels phosphate appears to be slightly higher than the acceptable levels 0.020 mg/l. As phosphorous is the limiting factor for algal growth in the marine environment, excess phosphorous coupled with higher levels of nitrate can contribute to eutrophication and slower reef growth. Turbidity and Total Suspended Solid level of all samples were within the optimal range. Overall the results indicate these sites are in good condition in terms of water quality.

4.2.5 Borrow area sediment quality

Six vibro-core samples were collected from the proposed borrow sites. The proposed borrow site contains limited fines and 80-90% moderate sized material. The average material size is at 0.650 mm (650 mu). The material is suitable for reclamation in Ithaafushi reef. The results of the assessment are presented in the Figure 4.14.

According to the contractor's survey report, "at several locations in the proposed area, a 0.5 to 2.5 meter thick sediment deposit was found on what appears to be bedrock" (See Figures 4.15). "Vibrocores confirmed that the investigated areas contained sediments consisting of fine to medium and occasionally coarse sand. The deeper areas which are clearly visible on the multibeam survey contain silt and organic clays and were hence omitted as potential borrow area. The multibeam did also reveal several areas with rock outcrops".

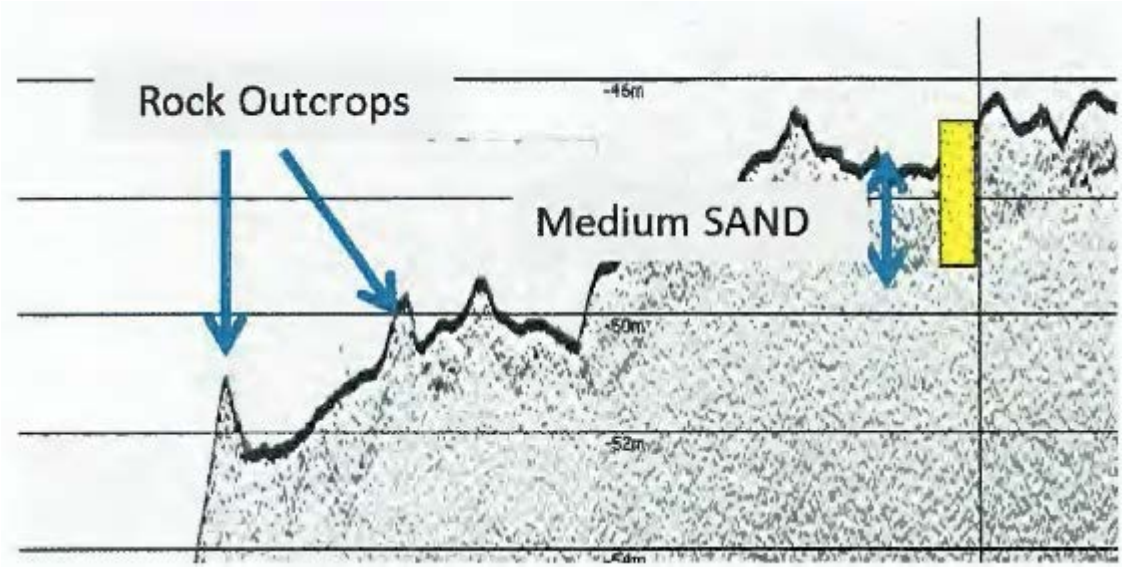
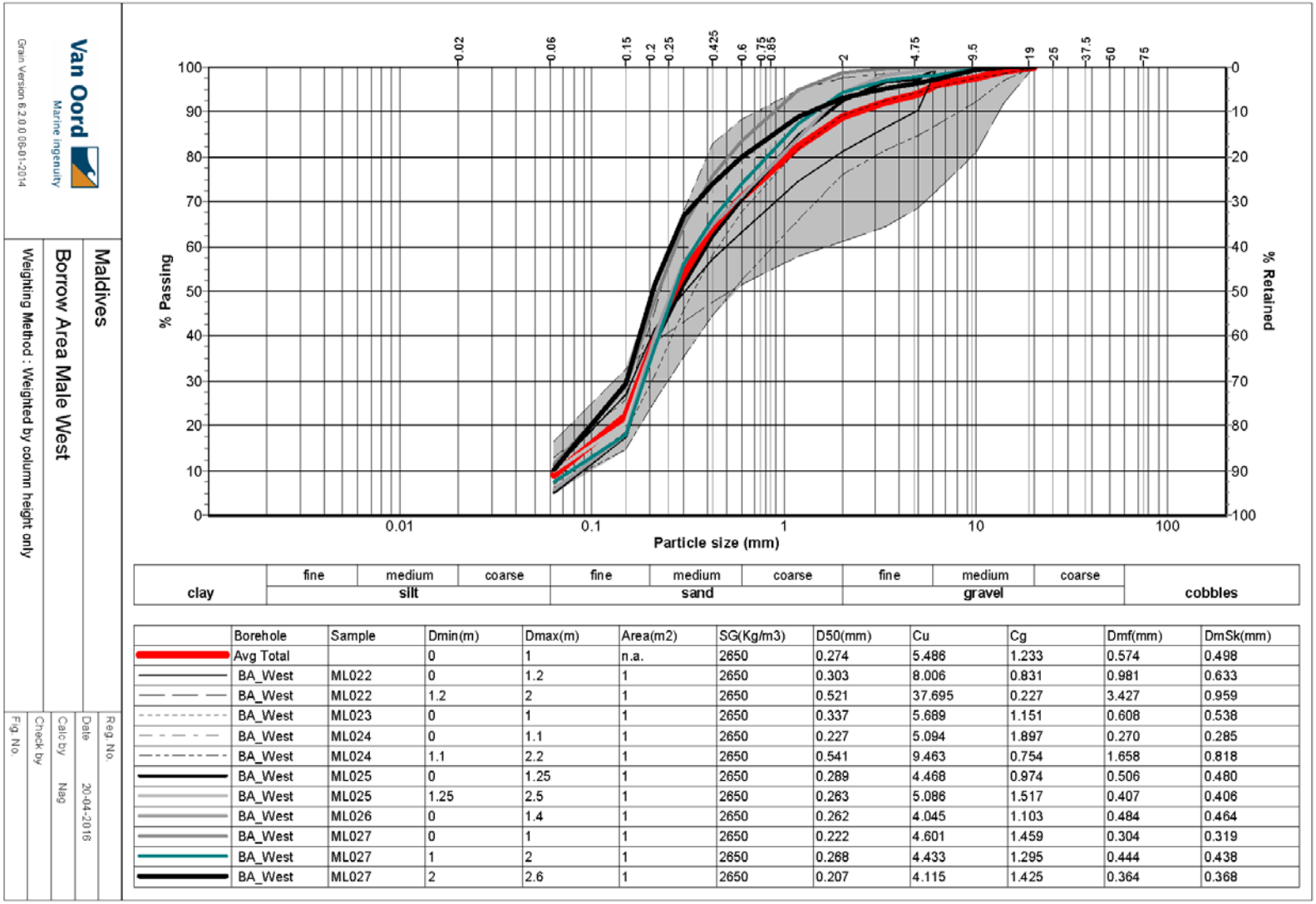


Figure 4.14: PES profiles show a 2.6 meters thick sediment layer



Borehole	Sample	Dmin(m)	Dmax(m)	Area(m2)	SG(Kg/m3)	D50(mm)	Cu	Cg	Dmf(mm)	DmSk(mm)
Avg Total		0	1	n.a.	2650	0.274	5.486	1.233	0.574	0.498
BA_West	ML022	0	1.2	1	2650	0.303	8.006	0.831	0.981	0.633
BA_West	ML022	1.2	2	1	2650	0.521	37.695	0.227	3.427	0.959
BA_West	ML023	0	1	1	2650	0.337	5.689	1.151	0.608	0.538
BA_West	ML024	0	1.1	1	2650	0.227	5.094	1.897	0.270	0.285
BA_West	ML024	1.1	2.2	1	2650	0.541	9.463	0.754	1.658	0.818
BA_West	ML025	0	1.25	1	2650	0.289	4.468	0.974	0.506	0.480
BA_West	ML025	1.25	2.5	1	2650	0.263	5.086	1.517	0.407	0.406
BA_West	ML026	0	1.4	1	2650	0.262	4.045	1.103	0.484	0.464
BA_West	ML027	0	1	1	2650	0.222	4.601	1.459	0.304	0.319
BA_West	ML027	1	2	1	2650	0.268	4.433	1.295	0.444	0.438
BA_West	ML027	2	2.6	1	2650	0.207	4.115	1.425	0.364	0.368

Figure 4.15: Sediment quality assessment for the proposed borrow site

4.2.6 Bathymetry

A detailed bathymetric survey of the proposed borrow sites was undertaken by the contractor in February 2016. Survey results have been summarised in bathy charts Appendix H. A false colour image of the bathymetry is provided in Figure 4.16 below.

The depths in the lagoon bottom area in consideration varies between -40 and -50 m. The larger deposits on Site B have depths between -42 and -47 m. Site A contains depth between -45 and -50 m.

The proposed harbour area has a depth of -1.3 m MSL. The bathymetry survey of Ithaafushi Reef was presented in Appendix H of the original EIA.

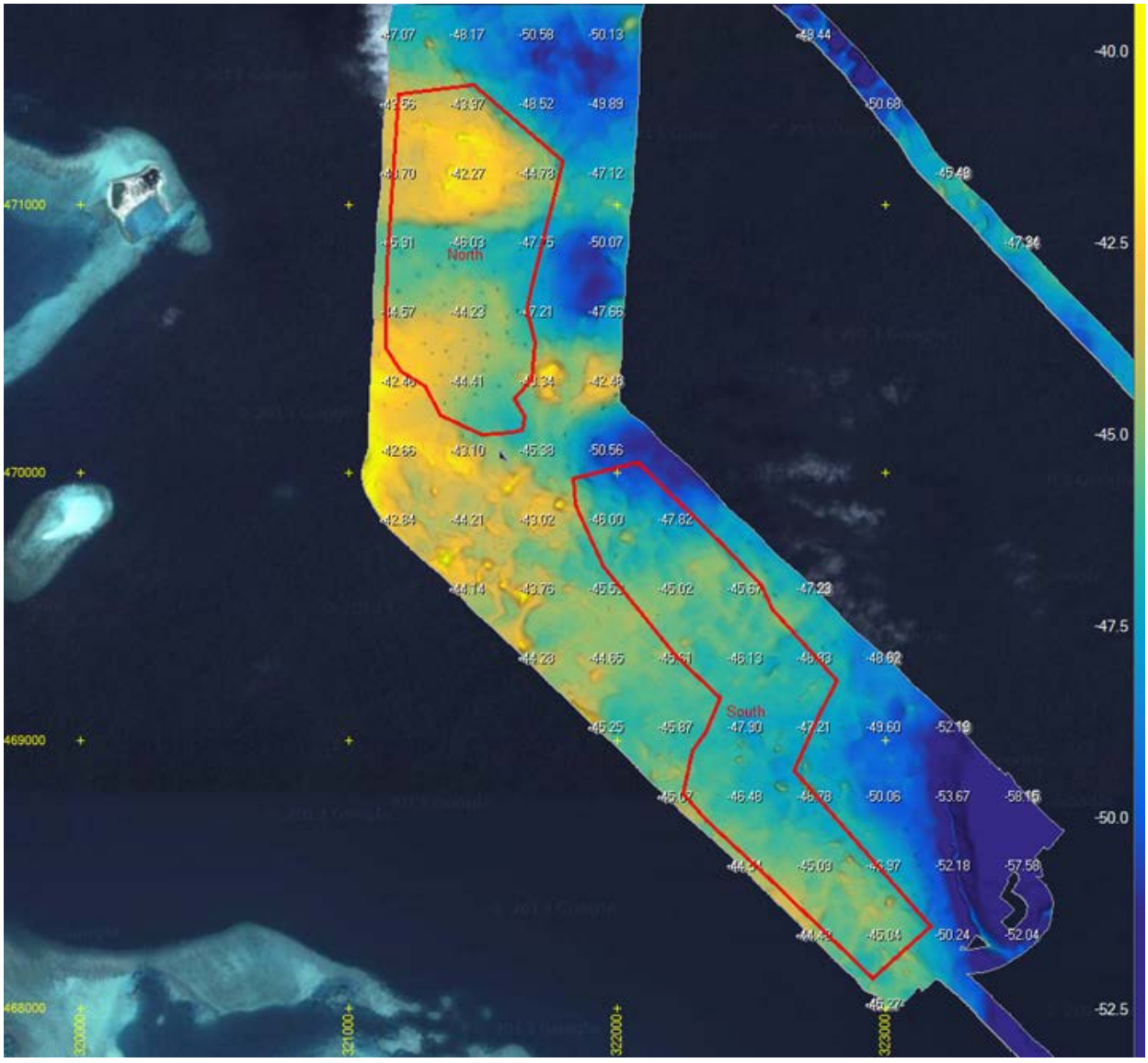


Figure 4.16: Colourised image of the bathymetry in proposed borrow area

4.3 Biological Environment

4.3.1 Marine Environment

The aim of this assessment is to establish the baseline condition of the reefs in close proximity to the proposed dredge site. Marine assessments were carried out from 9th June 2015, the sea was calm and the sky was partially cloudy during the survey. The main objectives of this assessment were:

1. to determine the general status of the reefs in the vicinity
2. to assess the condition of the marine environment which will be directly impacted by the project
3. to determine the fish species abundance and composition of the surveyed reef systems

As noted in Chapter 1, this study covered selected nearby resorts and reefs.

4.3.1.1 Marine Protected Areas and Environmentally Sensitive Sites

The nearest Marine Protected Area (MPA) to the proposed dredging site is *Giraavaru Kuda Haa* (~ 2 km south). Special features of this site as listed by the Environmental Protected Agency are the occurrence of excellent coral life and abundance fish[1].

The nearest Environmentally Sensitive Areas (ESAs) to the proposed dredging site are (1) *Kohdhipparu Finolhu* (~ 2 km to the west), (2) *Okobe Thila* (~ 13 km to the east) and *Maagiri Thila* (~ 15 km to the east).

If dredging works are to be carried out in this area, strict measures will be required to mitigate any direct or indirect adverse impact on the MPAs and ESAs in close proximity. Special attention must be given to ensure no dredging works are undertaken on or within a 500 m buffer zone of the MPA.

4.3.1.2 Photo Quadrat Survey and Fish Census

Transect 1 – Kohdhipparu Finolhu

This transect was deployed at 1.8 m depth, along the north eastern side of *Kohdhipparu Finolhu* reef. The top reef at this site is mainly made up of rocky bottom (67% ± 6.72 SE). Live coral made about 13% ± 5.54 SE of the survey area, and were mainly made up of massive and short-

[1] *Environmental Protection Agency. (n.d.). Retrieved from http://www.epa.gov.mv/index.php?option=com_content&view=article&id=40:kudahaa&catid=5:view-al-lareas&Itemid=25*

thick branched type corals. Approximately 3% ± 2 SE of the survey area was made up of bleached corals, possibly due to heat stress.

A total 31 fish species belonging to 10 fish families were recorded during the fish census at this site. Highest number of fish species were recorded from families *Pomacentridae* (6 species), and *Labridae* (6 species). Members of these families are known to feed predominantly on zooplanktons and small invertebrates. Summary of fish census survey is provided in Table 4.7.

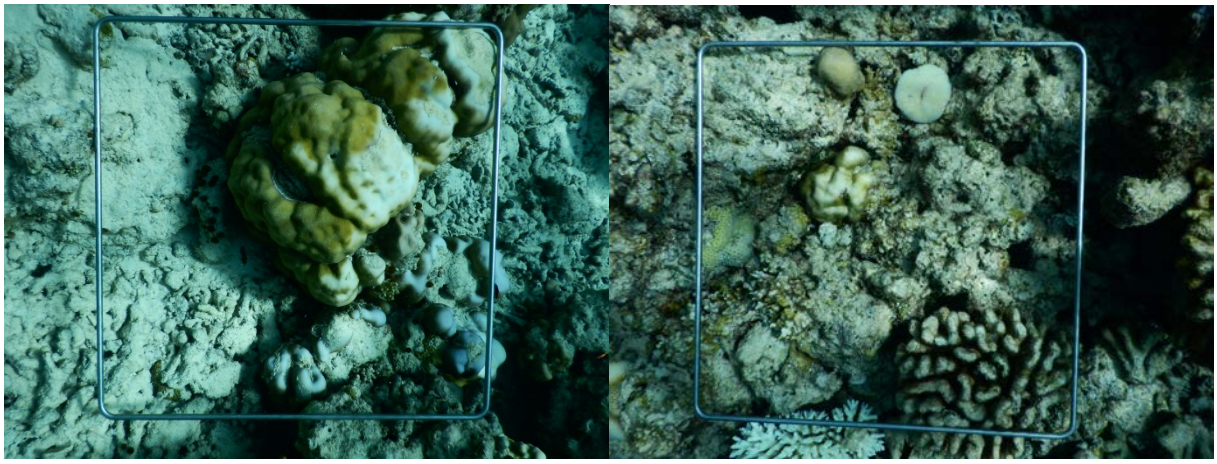


Figure 4.17: Select images showing benthic substrate cover along Kohdhipparu Finolhu (Transect 1)

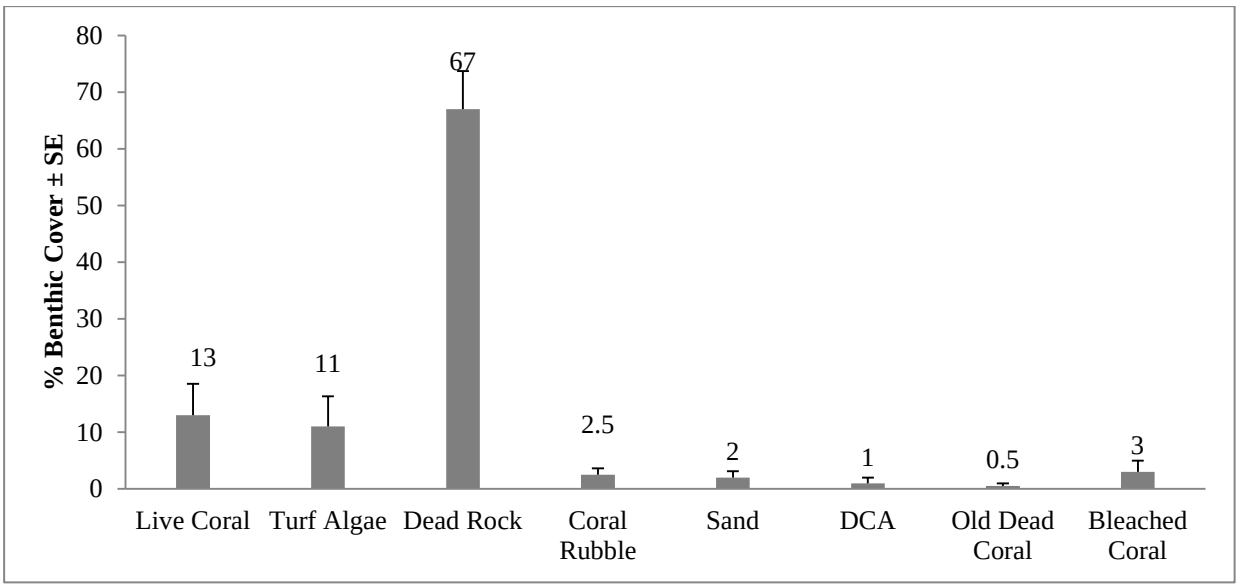


Figure 4.18: Benthic substrate composition along transect 1 (Kohdhipparu Finolhu)

Transect 2 – Kohdhipparu Reef

This transect was deployed at 2 m depth, along the reef edge to the eastern side of *Kohdhipparu* island. Rock, Rubble and Sand was the dominant substrate cover at this site (~82%). Live coral was very low (1.5% ± 1.07 SE).

A total 35 fish species belonging to 11 fish families were recorded during the fish census at this site. Highest numbers of fishes were recorded from family *Pomacentridae* which is known to feed predominantly on zooplanktons.

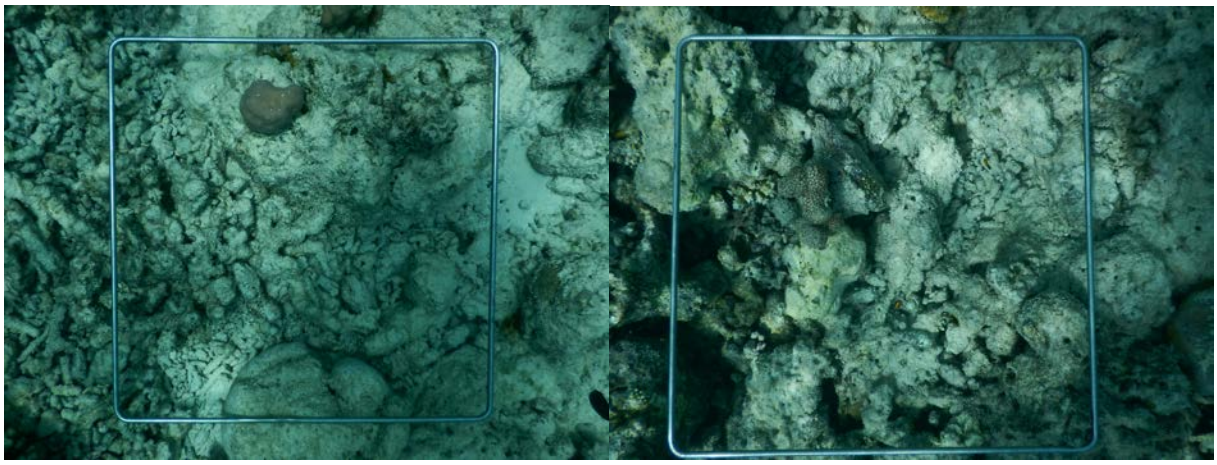


Figure 4.19: Select images showing benthic substrate cover along transect 2

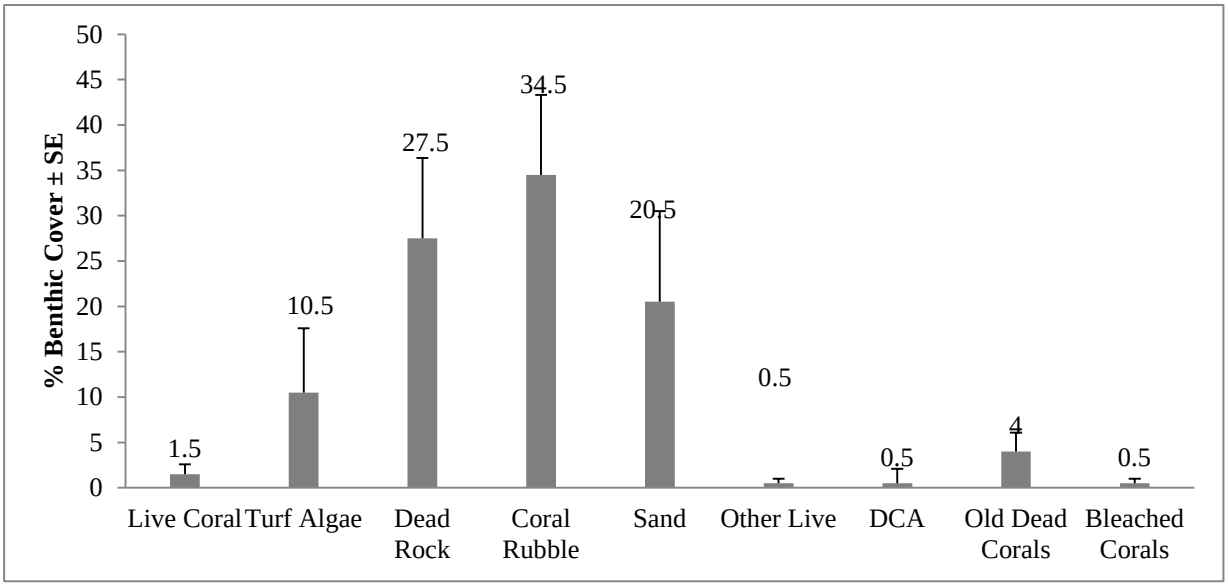


Figure 4.20: Benthic substrate composition along transect 2 (Kohdhipparu Reef)

Transect 3 – Baros Thila

This transect was deployed at 2 m depth, along the reef edge on the west side reef. Analysis of the photos shows that the dominant benthic substrate at this site is coral (34.5%), followed by dead corals with algae (32.5%). Approximately 7.5% of the corals observed along the transect line were either partially or completely bleached.

A total of 39 fish species 11 fish families were recorded during the fish census. Highest number of fishes were recorded from families *Labridae* (7 species) and *Pomacentridae* (6 species). This species is known to predominantly feed on planktons and zooplanktons.

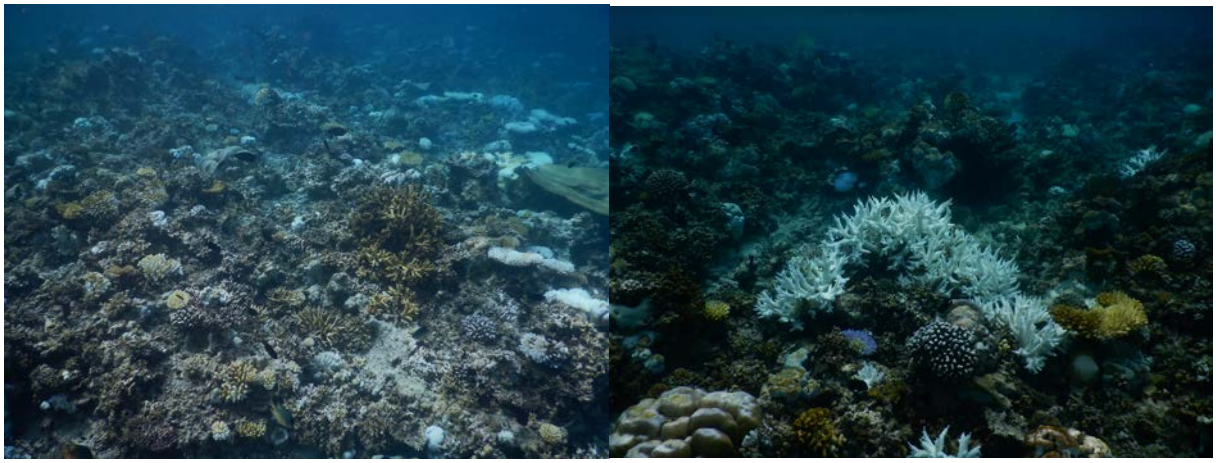


Figure 4.21: Select images showing benthic composition along transect 3 (Baros Thila)

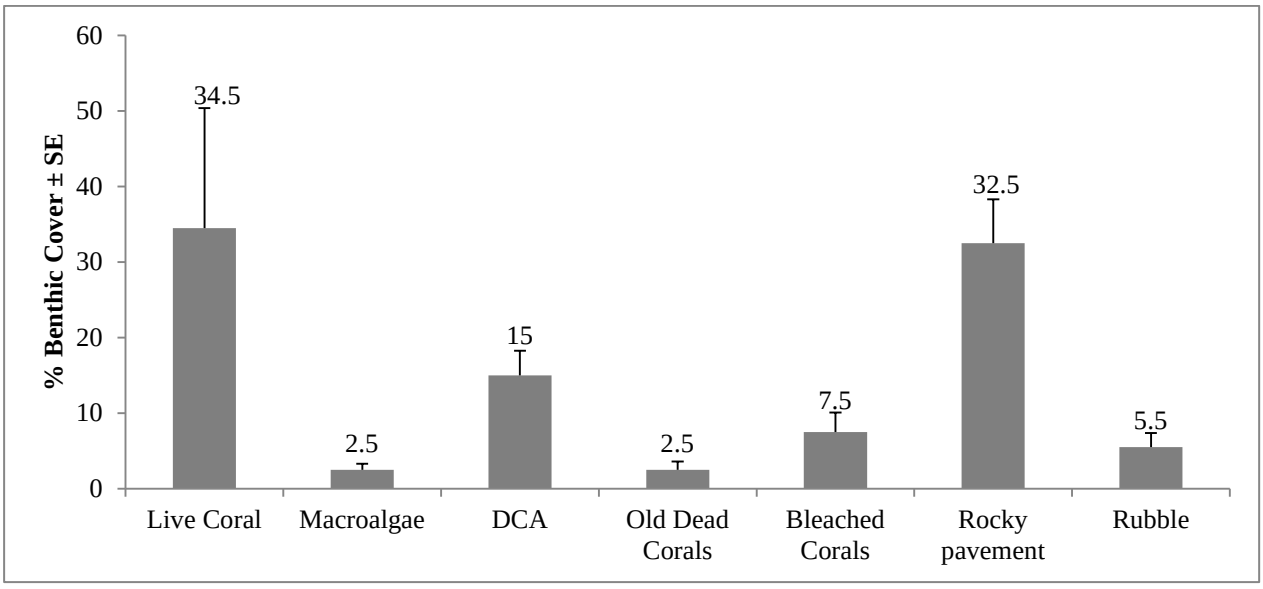


Figure 4.22: Benthic substrate composition along transect carried out at Transect 3 (Baros Thila)

4.3.1.3 Visual Snorkelling Survey

Visual snorkelling survey was carried out at Kuda Haa.

Kuda Haa

Kuda Haa is located to the north of *Giraavaru* (GPS position as provided by EPA: 4° 13'N, 73° 24.5'E). This Thila provides for a wide variety of marine flora and fauna, and high abundance of fishes and coral life were observed during the visual snorkelling survey.

The most dominant fish species belonged to families *Acanthuridae* (Surgeonfishes), *Lutjanidae* (Snappers) and *Serranidae* (Basslets). Shallowest part of the thila can be reached at about 7 m depth.

Figure 4.23: Top View of Kuda Haa

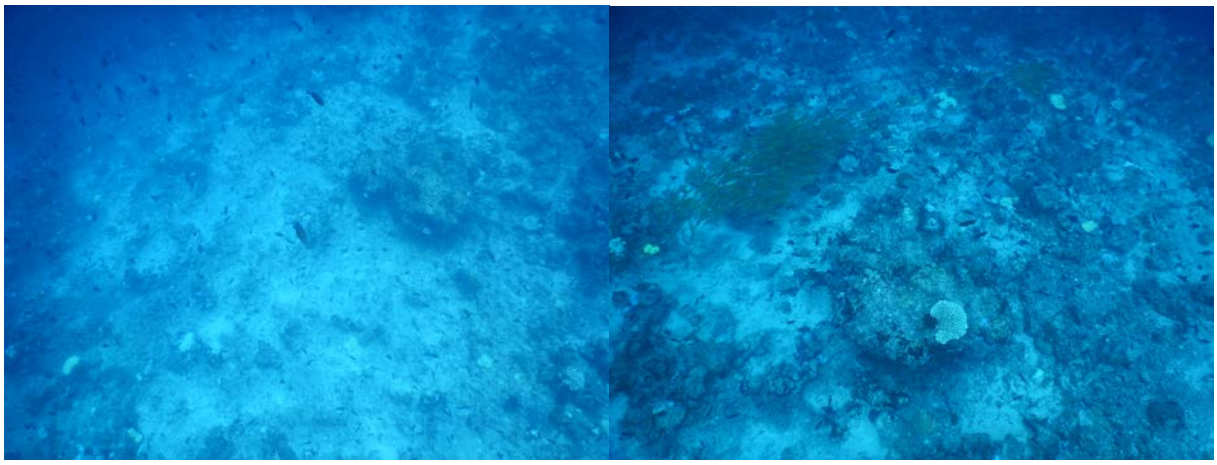


Table 4.7: Fish census results

Family	Species	Common Name	Kohdhipa ru Finolhu (T1)	Kohdhip paru Reef (T2)	Baros Thila (T3)
Aulostomidae	*Aulostomus chinensis*	Trumpetfish	0	2	2
Serranidae (Groupers)	*Cephalopholis argus*	Peacock Rock Cod	2	0	2
Serranidae (Groupers)	*Anyperodon leucogrammicus*	White-lined Grouper	0	0	2
Lethrinidae	*Monotaxis grandoculis*	Large-eye Bream	0	3	0
Nemipteridae	*Scolopsis bilineata*	Monacle Bream	2	2	3
Lutjanidae	*Lutjanus gibbus*	Humpback Snapper	0	0	3
Lutjanidae	*Lutjanus bohar*	Red Bass (Red Snapper)	0	3	0
Caesionidae	*Pterocaesio tile*	Blue Dash Fusilier	0	0	6
Chaetodontidae	*Hemitaurichthys zoster*	Black Pyramid Butterflyfish	2	3	3
Chaetodontidae	*Chaetodon trifasciatus*	Pinstriped Butterflyfish	2	2	2

Family	Species	Common Name	Kohdhipa ru Finolhu (T1)	Kohdhip paru Reef (T2)	Baros Thila (T3)
Chaetodontidae	*Chaetodon trifascialis*	Chevroned Butterflyfish	2	2	2
Chaetodontidae	*Chaetodon kleinii*	Brown Butterflyfish	2	0	2
Chaetodontidae	*Chaetodon guttatissimus*	Spotted Butterflyfish	2	0	2
Chaetodontidae	*Chaetodon falcula*	Double-saddle Butterflyfish	0	0	2
Chaetodontidae	*Chaetodon meyeri*	Meyer's Butterflyfish	0	2	2
Chaetodontidae	*Chaetodon collare*	Head-band Butterflyfish	0	2	3
Chaetodontidae	*Chaetodon triangulum*	Triangular Butterflyfish	0	2	0
Chaetodontidae	*Forcipiger flavissimus*	Long-nose Butterflyfish	3	2	2
Pomacanthidae	*Pomacanthus imperator*	Emperor Angelfish	2	0	0
Pomacentridae	*Amphiprion nigripes*	Maldivian Anemonefish	2	0	0
Pomacentridae	*Dascyllus aruanus*	Humbug Damsel	0	3	0
Pomacentridae	*Dascyllus trimaculatus*	Three-spot Humbug	2	3	3
Pomacentridae	*Chromis virdis*	Green Puller	0	5	5
Pomacentridae	*Chromis dimidiata*	Two-tone Puller	0	0	2
Pomacentridae	*Chromis weberi*	Weber's Puller	3	3	3
Pomacentridae	*Pomacentrus caeruleus*	Blue-yellow Damsel	2	3	3
Pomacentridae	*Pomacentrus philippinus*	Philipine Damsel	3	3	3
Pomacentridae	*Abudefduf vaigiensis*	Sergeant Major	0	4	3
Pomacentridae	*Plectroglyphidodon lacrymatus*	Jewel Damsel	0	0	3
Pomacentridae	*Stegastes nigricans*	Dusky Gregory	3	0	4
Labridae	*Halichoeres hortulanus*	Checkerboard Wrasse	2	0	0
Labridae	*Labroides dimidiatus*	Blue-streak Cleaner Wrasse	2	0	0
Labridae	*Thalassoma amblycephalum*	Two-tone Wrasse	3	0	0
Labridae	*Thalassoma hardwicke*	Six-bar Wrasse	2	3	2
Labridae	*Thalassoma janseni*	Jansen's Wrasse	0	0	0
Labridae	*Thalassoma lunare*	Moon Wrasse	2	2	2
Labridae	*Epibulus insidiator*	Sling-jaw Wrasse	0	0	2
Labridae	*Hemigymnus fasciatus*	Banded Thicklip Wrasse	2	2	2
Scaridae	*Cetoscarus bicolor*	Two-colour Parrotfish	3	3	3
Scaridae	*Scarus strongylocephalus*	Sheephead Parrotfish	0	0	2
Scaridae	*Scarus sordidus*	Shabby Parrotfish	3	3	3
Scaridae	*Scarus scaber*	Five-saddle Parrotfish	0	2	0
Scaridae	*Scarus rubroviolaceus*	Ember Parrotfish	0	0	2

Family	Species	Common Name	Kohdhipparu Finolhu (T1)	Kohdhipparu Reef (T2)	Baros Thila (T3)
Zanclidae	*Zanclus cornutus*	Moorish Idol	2	0	2
Acanthuridae	*Acanthurus leucosternon*	Powder-blue Surgeonfish	2	2	4
Acanthuridae	*Acanthurus nigricauda*	Eye-line Surgeonfish	0	2	0
Acanthuridae	*Acanthurus blochii*	Bloch's Surgeonfish	2	3	0
Acanthuridae	*Ctenochaetus striatus*	Fine-lined Bristletooth	3	2	3
Acanthuridae	*Zebrasoma desjardinii*	Sailfin Surgeonfish	0	0	2
Acanthuridae	*Zebrasoma scopas*	Brown Tang	0	2	3
Acanthuridae	*Naso lituratus*	Orange-spine Unicornfish	2	3	0
Acanthuridae	*Naso hexacanthus*	Sleek Unicornfish	0	0	3
Acanthuridae	*Acanthurus nigrofuscus*	Dusky Surgeonfish	2	0	0
Siganidae	*Siganus corallinus*	Coral Rabbitfish	0	2	0
Balistidae	*Balistoides viridescens*	Titan Triggerfish	0	2	0
Balistidae	*Melichthys indicus*	Indian Triggerfish	2	2	0
Balistidae	*Pseudobalistes flavimarginatus*	Yellow-margin Triggerfish	2	2	0

4.3.2 Socio-economic Environment

The proposed site is in the vicinity of a number of resorts. The islands with in a 10 km radius of the site are listed in the table below.

Island	Island Use	Distance to nearest borrow site
Kohdhipparu Island	Resort (under construction)	0.9 km
Centara Rasfushi Resort and Spa	Resort (in operation)	3.6 km
Baros Holiday Island	Resort (in operation)	4.4 km
Angsana Resort and Spa Maldives Ihuru	Resort (in operation)	5.5 km
Bayan Tree Maldives Vabbinfaru	Resort (in operation)	6.3 km
Nakachchaa Huraa	Reef leased for reclamation	
Uthuru Thilafalhu	MNDF Island	1.6 km
Thilafushi	Industrial Island	6.4 km
Gulhifalhu	Industrial Island	7.9 km
Bandos Island Resort	Resort (in operation)	10 km
Aarah	Presidential retreat	10 km
Feydhoo Finolhu	Recreational Island	9.5 km

Among these, Kohdhippar Island is the closest but it's a resort under construction. The island itself is planning to undertaken reclamation in the near future, according to its owner. The next nearest resorts that are likely to be affected are Centara Rasfushi (Giraavaru) and Baros Holiday Resort (Baros). These islands are within the distance which they may be affected visually. In particular, Giraavaru may be affected due to the constant vessel movements.

The remaining resorts are likely to be less affected visually but are in range to be affected due to temporary turbidity.

The proposed borrow site foot print is not heavily used for marine traffic.

5 IMPACT IDENTIFICATION

Potential adverse and beneficial impacts of the proposed dredging activities are identified and evaluated in this section. Please refer to the original EIA for a complete impact identification and evaluation of the land reclamation and resort development in Ithaafushi reef.

Significant impacts are identified and evaluated in two stages. The first stage identifies the environmental and socio-economic components that may be impacted from key project changes. The second stage determines the significance of impacts of each component. The following sections provide details of the evaluation of impacts.

5.1 Boundaries of Affected Areas

The estimated boundaries of affected areas are summarised in Figure 5.1 below. These boundaries are based physical conditions and work methods proposed in the project without any mitigation measures. The extents shown are not absolute and should be treated as the best-guess scenario based on past projects.

The project site is planned to be used as a borrow site for dredging 200,000 cbm of sand from the proposed borrow site and alternative site. This will have cumulative impacts on the borrow site and its surroundings.

The works being undertaken in the neighbouring Kohdhipparu Island under a planned reclamation project, if continued at the same time as this project, will involve cumulative impacts (See Section 6.4).

The recently completed dredging works to reclaim Hulhumale' Island involved effects on a large foot print. Starting the proposed works within 6 months of that project completion will involve cumulative impacts in the region.

It has to be noted that these extents do not represent figures derived from sediment dispersal modelling. It is based purely on past experience from similar project including Th. Vilufushi Reclamation project and Gulhifalhu Reclamation Project. Additional information from Hulhumale' dredging project was also used.

5.2 Impact Identification and Evaluation

Environmental and socio-economic aspects that may be impacted by the project are identified in the impact matrices in Table 5.1. Only construction stage impacts are assessed in this report. Operation stage impacts are addressed in the original EIA report. Assessments of the impacts are conducted based on the following criteria.

1. **Magnitude**: Refers to the quantum of change that will be experienced as a consequence of the impact. It is defined by the severity of each potential impact based on impact reversibility, irreversibility and potential rate of recovery. Impacts of high magnitude are those that cannot be mitigated substantially or involve substantial residual impacts.

2. **Nature**: Where the activity or component has direct, indirect or cumulative impacts from multiple projects or activities.

3. **Duration:** Refers to the temporal scale (i.e. duration, frequency) of the impact. It does not take into account the duration of the impact's effects.

4. **Distribution:** Refers to the spatial scale of the area impacted. An impact can be site specific or limited to the project area; locally occurring within the immediate vicinity of the project locality; atoll level; or at a national level.

5. **Significance:** Refers to the importance of the impact's consequence or implications (ecological social, economic). An impact of small magnitude could have a very high significance and vice-versa (e.g. siltation of a small reef area with rare coral species has low magnitude but very high significance). Once an impact has been identified it needs to be evaluated using set of criteria. The key criterion considered in this study are:

    a. The degree of reversibility of an impact (i.e. duration of its effects) is considered part of its significance.

    b. Threats to sensitive eco-systems. For example, those leading to loss of key habitats and extinction of species, or those affecting Protected Areas.

    c. Threats to key resources leading to depletion of resources or loss of livelihood associated with those resources.

    d. Geographic extent of impact. For example, national or trans-boundary impacts

    e. Duration and timing of the impact

    f. Likelihood or probability of the impact occurrence

    g. Reversibility

    h. Resource use conflicts

    i. Public views and complaints

    j. Cumulative impacts on an area due to multiple projects

    k. Uncertainty in impact predictions

    l. Cost of mitigation.

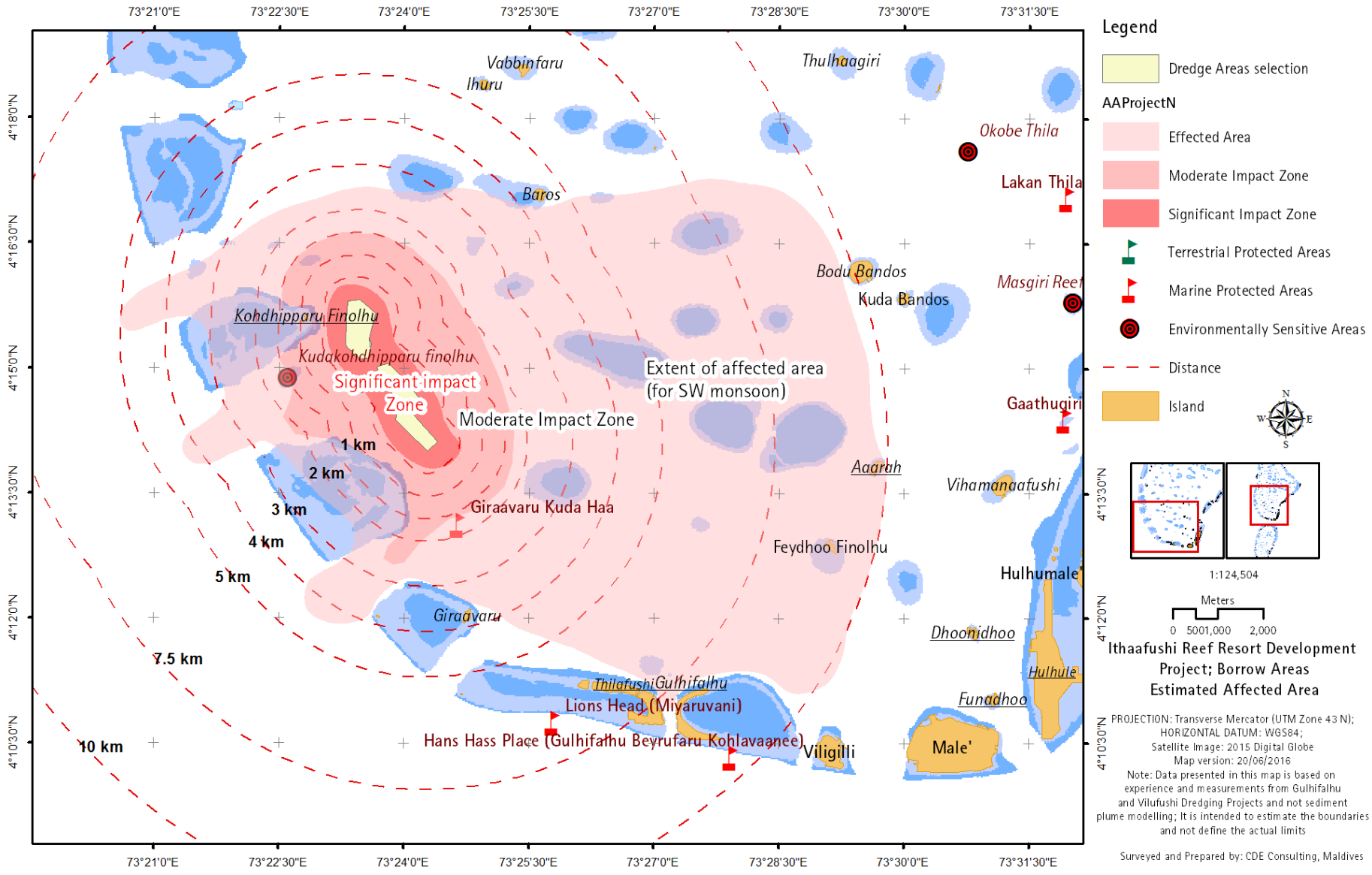


Figure 5.1: Estimated Affected Area – SW monsoon

Table 5.1: Impact Identification Matrix for Dredging and Reclamation phase

Activity / Potential Impact	Direction		Nature			Duration		Distribution			Magnitude			Significance		
	Pos	Neg	Dir	In Dir	Cumu	Long	Short	Site	Local	Nat	High	Mod	Low	High	Mod	Low
1. Site preparation and construction																
Physical Impacts																
Visual aesthetics		X		X	X		X	X				X				X
Air Quality		X		X			X	X					X			X
Noise levels		X	X				X	X				X			X	
Marine water turbidity (dredging, reclamation, over water construction)		X	X		X		X	X				X		X		
Marine water pollution (dredging, reclamation, over water construction; waste water; brine discharge)		X		X			X	X					X			X
Sedimentation (dredging, reclamation and over water construction)		X	X				X	X				X			X	
Hydrodynamics (dredging, reclamation and over water construction)	X	X	X		X	X		X					X			X
Biological Impacts																
Impacts on coral communities																
Indirect (smothering from sedimentation, turbidity)		X		X			X	X				X			X	
Invertebrate displacement		X	X				X	X					X			X
Impact of avian fauna (noise levels and worker actions)		X		X			X	X				X				X
Fish and marine life depletion (due to fishing and extraction by workers)		X	X				X	X					X		X	
2. Construction workers																
Waste management		X	X				X		X			X			X	
Waste water management		X	X				X	X					X			X
Water and energy production		X		X			X	X	X				X			X
Worker safety		X	X				X	X				X			X	

Activity / Potential Impact	Direction		Nature			Duration		Distribution			Magnitude			Significance		
	Pos	Neg	Dir	In Dir	Cumu	Long	Short	Site	Local	Nat	High	Mod	Low	High	Mod	Low
3. Socio-economic impacts																
Impact on fishing activities		X		X			X		X				X			X
Impact on nearby resorts (dredging)		X	X				X		X	X		X		X		
Demand on resources and services (e.g Thilafushi, ports)	X		X	X			X			X			X		X	

X (no impact), - (negative impact), + (positive impact)

6 SIGNIFICANT IMPACTS AND MITIGATION MEASURES

6.1 Impacts on Natural Environment during Construction

6.1.1 Marine Biodiversity

All biota (e.g. sessile marine organisms) associated with the seabed within these footprints will be lost, either due to physical removal during dredging or burial during reclamation works. In addition to direct physical damage and loss of marine life, both dredging and reclamation works have numerous adverse affects on the marine environment and ecosystems(Rogers, 1990). Given the large scale of proposed dredging and reclamation works, significant increase in turbidity, TSS and sedimentation on lagoon, reef and surrounding areas near the dredge site is anticipated.

Corals -with the exception of azooxanthellae corals- relies on symbiotic algae zooxanthellae to produce their energy requirements via photosynthesis. Elevated levels of turbidity and TSS reduce ambient light reaching the corals, decreasing the overall photosynthetic activity of zooxanthellae(Richmond, 1993). Prolonged periods of reduced photosynthetic activities may lead to malnourishment and starvation coral colonies. In addition, an increased level of suspended solid in water column is reported to reduce the survival rate of coral larvae(Gilmour, 1999).

Increased sedimentation and settlement of sediments on corals also prevents ambient light from reaching zooxanthellae, and reduces the overall photosynthetic productivity. Sedimentation also triggers corals to expend more energy to clear sediment (e.g. by production and shedding off mucus sheets). Energy if otherwise, coral's would utilize to grow, reproduce and carryout other metabolic activities(Riegl and Branch, 1995). Furthermore, increased sedimentation impedes successful coral reproduction, by preventing coral larvae settlement, and survival rates of recruit and juvenile corals(Fabricius, 2005).

A significant relationship exists between the coral morphology and their sensitivity to turbidity and sedimentation. The most sensitive coral types to Turbidity are Soft Corals, Gorgonians and Massive Corals, both falling into intermediate to sensitive range on sensitivity gradient. Turbidity level between 20 – 40 mg/L (14 – 16 NTU) is observed to have sub lethal effects (e.g. reduced growth, and increased mucus production bleaching, tissue damage) on these types of corals. Even for tolerant coral types, sub lethal effects are observed when turbidity levels raises to 40 – 100 mg/L (28 – 30 NTU). Above 100 mg/L most coral species shows mass mortality(Erftemeijer et al., 2012).

Plate, tabular, columnar and digitate type corals are observed to be the most sensitive to sedimentation. Sub lethal effects such as bleaching and tissue damage is observed on plate and tabular type corals when exposed to sedimentation rates of 10 – 50 mg L^{-1} day^{-1}, while the same effects are only observed on massive type corals only when exposed to 50 – 200 mg L^{-1} day^{-1}. Most coral species shows mass mortality when exposed to sedimentation greater than 200 mg L^{-1} day^{-1} (Erftemeijer et al., 2012).

In addition to exposure to sedimentation, duration of exposure also plays a key role in determining the response of corals. Experiment on the impact of short-term sediment burial of corals by Wesseling et al.(1999), showed no discernable effect on *Porites* species after treatment with sediment for 6 hours, but slight discolorations were recorded on *Porities* colonies for 20 hours, and bleaching was observed when burial period extended for 68 hours. Burial period also is key determinant whether the corals recover or not, from the same study it was observed that *Porites* colonies that were buried for 20 hours recovered to normal levels within 3 weeks, but those buried for 68 hours left large white patches.

Soft corals, and gorgonians, which are most sensitive to turbidity and sedimentation impacts, are reported to occur in the caves at *Kuda Haa* MPA. As dredging is proposed to undertaken in close proximity to a number of reefs and especially a marine protected area, stringent sediment control measures will be required to minimize turbidity and sedimentation impacts on the corals.

As mentioned earlier, increased levels of turbidity and sedimentation inhibits corals ability to successfully reproduce. Hence, it is important to ensure that dredging and reclamation works do not coincide with mass coral spawning events. However it should be highlighted the difficulty in predicting the exact day and time of spawning events. Mass coral spawning events in the Maldives are usually reported to occur between March and May; and always occurs during night- time often around full moon days. It is important to keep watch for indication of coral spawning, and cease dredging and reclamation works, or take stricter sediment control measures during mass spawning events.

Furthermore, it is also important to avoid large-scale dredging and reclamation works during periods of mass stress on coral reefs (e.g. periods of high sea surface temperatures that leads to mass coral bleaching). As any additional stress on corals during such periods diminish their ability to recover. Stricter sediment control measures should be taken, if dredging and reclamation works are to be undertaken during periods of mass stress on corals.

Fishes, sea turtles and other marine life associated with reefs are also likely to be adversely affected by dredging and reclamation works. Study on the affects of suspended solids on a planktivores juvenile Damselfish species demonstrated that with prolonged exposure to high-suspended sediment levels, fishes took significantly longer to find food, and consumed less food,

which subsequently declined their growth and physiological condition, and increased their mortality rate(Wenger et al., 2012). In addition gills of fishes may be clogged by sediment particles and sediment deposition may cover and suffocate eggs and larvae of benthic spawning fishes. Prolonged exposure to high sediment levels can lead to a decrease in fish immunity against parasites and diseases. As fishes can readily disperse they are likely to relocate to nearby reefs if high sediment conditions persist. Strict sediment control measures, and ensuring that dredging and reclamation works are completed within the shortest time period is key to minimize adverse impacts on marine life.

Similarly, increased suspended solids in the water column during dredging and reclamation may impede foraging behaviour of sea turtles due to reduced visibility, and deter them away from the reef. Furthermore, risk of physical damage to turtles exists due to movement of vessels and dredging, and reclamation. Dredging also runs the risk of entrainment of fishes and even as turtles (Reine, Kevin J; Clarke, Douglas G.; Engler, 1998).

Sedimentation is also likely to cause major shifts in invertebrate populations as sediment is deposited at the crevices/crannies blocking their habitat. This favors domination of invertebrate populations that are more tolerant of the condition. The overall population diversity, size and quality of reef ecosystem are likely to decline if high sedimentation rates persist for prolonged periods due to the proposed activities.

Large-scale disturbance to the seabed may re-suspend nutrients in the water column. Elevated levels of nutrients may reduce fertilization success and settlement rates.

6.1.2 Ambient Noise Level, Air Quality and Greenhouse Gas Emissions

During the mobilisation of equipment and operation of heavy machinery, particularly the THSD dredger, it is anticipated that significant noise will be generated. Noise vibrations may alter species behaviour. In addition, dust and emissions, including greenhouse gases, from vehicle and machinery exhausts will degrade the air quality. However, these adverse impacts will be short term. With proper mitigation measures, it is unlikely that noise and air pollution impacts will cause long term effects such as human health risks leading to increased public and private health costs. While emitted greenhouse gases can persist in the atmosphere in the long term, the level of emission is expected to be negligible.

6.1.3 Marine Water Quality

Construction activities will involve significant adverse impacts on the marine water quality. The most significant will be the turbidity and sedimentation impacts from the dredging and reclamation activities. Turbidity higher than certain threshold levels for longer periods of time

will have significant impacts on marine life (see next section). Marine water quality degradation is expected within a 5 km radius of the proposed dredging site and within a 3 km radius around the reclamation site. However, these effects will be largely limited to one month. The proposed work period falling into the SW monsoon will force most sediments move east towards the atoll lagoon rather than out to deep sea.

Suspended sediments are carried by water and/or accumulate in a loose unconsolidated form on the reef bottom. While large particles settle on the bottom of the water body, sediment particles less than 0.063 mm in size (mostly clay and silt) will remain suspended in the water column. Suspended sediment will be easily dispersed thereby causing sedimentation on the reef.

Construction activities require the use of chemical substances such as fuel, oil and paints. Accidental spillage of such substances, particularly during transportation or offloading, and the construction of overwater structures, can lead to marine water contamination. The spillage of construction material during construction of the overwater villas is a particular concern, given the probable longer length of construction period.

The prefabrication onshore would reduce any possibility of spilling of cement and concrete into the water column during construction of overwater structures and harbour quaywall. However, there would be some degree of disturbance to the water column due to equipment mobilization and placement of prefabricated columns and quaywall sections, particularly due to excavator operations. Sediment dispersal will occur at a moderate scale. The marine environment is likely to be moderately affected. Dredging and reclamation will also involve disturbances to bottom sediments, generating sediment plumes.

Furthermore, significant quantities of waste will be generated from all construction related activities where any mishandling of solid (non-biodegradable) waste and hazardous waste will also contaminate the marine water. Therefore, special care should be taken when handling oil, solid waste and hazardous waste to entirely avoid any accidental spills and leakage.

Since majority of the workforce will be housed in dredge vessel, barges or other vessels, marine water contamination through wastewater disposal is expected which will raise the nutrient content in the marine water. In addition, dredging exposes anaerobic layers of sediment, which also elevate the nutrient content in marine water. Increase in quantity of nutrients such as phosphorous and nitrates in marine water increase the rate of growth of aquatic plants and cause Biological Oxygen Demand (BOD) to increase. When BOD levels increase, the water body is deprived of Dissolved Oxygen (DO) and with less oxygen available fish and other aquatic organisms may not thrive.

6.1.4 Changes in Hydrodynamics

During dredging and reclamation works and shore protection works there is a high likelihood of abrupt changes to coastal hydrodynamics at the reclamation site. This aspect has been explored in more detail in the original EIA. The enlarged islands and the proposed shore protection measures will alter the hydrodynamics in the near shore waters. No hydrodynamic effects are anticipated in the borrow areas due to the depths involved.

6.1.5 Impact on unique habitats

Kuda Haa (4° 13'N, 73° 24.5'E) is a marine protected area, located about 800 m south of proposed dredge site. This site was declared as a MPA on 1st October 1995. This site is famous of its abundance of fishes and coral life. Given the close proximity to the proposed dredge site, sediment plumes generated by dredging is expected to reach Kuda Haa, and increase the level turbidity, suspended solids and sedimentation on this thila. The key to minimize these impacts is to take strict sediment control measures, during dredging. Close monitoring of the Kuda Haa for sedimentation is required to ensure effectiveness of sediment control measures.

6.1.6 Impact on visual amenity

The proposed project will affect the amenity value of this area to some extent due to the presence of dredge ship and associated activities and also by developing a natural reef and a lagoon area. It is considered that any adverse effects of the proposed development on natural character and visual amenity of the area are likely to be moderate. Resorts that will be impacted include, Centara Rasfushi Resort & Spa and Baros.

There may also be visual effects on the diving activities within the vicinity of the borrow site.

6.2 Impacts on the Socio-economic Environment

This section looks into potential impacts on nearby resorts and tourism from the proposed dredging component of the project.

6.2.1 Impacts on Nearby Resorts

Dredging activity of the proposed project is likely to cause significant visual, sedimentation and turbidity related impacts on the operation of nearby resorts including, Centara Rasfushi Resort & Spa and Baros Maldives. The most significant impacts from dredging are potential impacts on the marine biodiversity and visibility around the house reefs of nearby resorts and dive spots in the region. The area proposed for dredging has a number of notable dive spots in the vicinity including a Marine Protected Area *Giraavaru Kuda Haa* located approximately 2 km from the

dredge site. Notable dive sites in the region include *House Reef* of *Baros Maldives, Giraavaru caves, Black Coral* to the north of Baros Maldives which are renowned for its exceptional coral life and rich marine biodiversity. These dive spots are the prime selling product for the tourists visiting the resorts. Hence, loss of biodiversity and low visibility at these dives sites will impact the revenue of the resort. In addition, this will also pose an impact on Guesthouse and Safari Yacht operators who utilise the dive spots as a source of income and as a prime seller for their clients.

Operation of the dredge vessel will also be an eyesore for the guests in the nearby resorts. The aesthetic impact caused during dredging will also have an impact on the outlook of the resorts in the wider market.

Sedimentation, turbidity and aesthetic impact will be short term as the impacts will begin to subside once the dredging activities are over.

6.3 Impacts on the Natural and socio-economic environment during Operational Phase

Impacts during the operations for the resort are expected to be the same as those described in the original phase. The following changes can be noted:

1. The impact foot print or the spatial extent of the project impacts is now much larger
2. The time frame for significant impacts from dredging has been reduced from six months to one month due to the use of THSD. Thus, the overall temporal extent of impacts have reduced.
3. The extensive damage to house reef anticipated due to the CSD operation has been eliminated.

6.4 Cumulative Impacts

Majority of the impacts from the project within the project direct foot print and in the vicinity are explicitly due to this project. However, there are a some pre-existing impacts and an ongoing dredging and reclamation project which are likely have cumulative impacts on the project. These aspects are described below.

6.4.1 Coral bleaching

There is an ongoing coral bleaching event in since February 2016. The extreme heat is expected to subside around June and July but reducing the stress on corals related to the heat may take until October. Bleached coral recovery is expected to take much longer. Large areas of the Ithaafushi reef have previously been affected by bleaching. As noted before turbidity and

sedimentation will cause substantial stress on coral which are already severely stressed. The cumulative impact of turbidity and sedimentation may be unbearable for corals in locations with poor current flow particularly on the western rim. Cumulative damage to these areas may take much longer to recover.

Similarly, reefs within the vicinity of the borrow site can be affected as there are signs that these reefs have also been affected.

However, as noted before, the works are expected to be completed in a very short time frame which will reduce the duration in which the reefs are exposed to turbidity. Moreover, the reef areas are located at a distance from the actual borrow area foot print which may help to reduce the extend of turbidity and particularly sedimentation.

6.4.2 Recent dredging for South West Male' reclamation

The proposed borrow site has been used for dredging sand to reclaim the SW Male' area. These works were undertaken around the end of June. There will be cumulative impacts in the form of turbidity and sedimentation in the vicinity. The break in dredging which occurs after 4th June will allow turbidity to reduce and the area to largely clear. The restart of the dredging is expected to return the turbid conditions for a further 2-3 weeks.

6.4.3 Other planned reclamation project in Male' Atoll

As per the records of MoT a number of lagoons in North and South Male' Atoll has either been leased or is being considered for resort development with land reclamation. The amplitude of the impacts associated with dredging will be magnified substantially in the region. If these projects are implemented concurrently (which is highly likely), the overall impacts on marine environment of Male' Atoll will be very significant. If they are undertaken sequentially, the marine life at cumulative impacts zones maybe stressed for years.

Other substantial cumulative impacts from such projects include:

1. Substantial hydrodynamic changes in North Male' Atoll and impacts on atoll flushing. Certain channels may increase in water flow speed while some atoll lagoon faroes may be deprived of strong current flow.
2. The loss of many reefs will also have a cumulative impact on bait fishermen, whose site may be lost permanently due to development or affected by turbidity and sedimentation.

The loss of all these reefs will also have cumulative impacts on avian fauna habitats. Loss of roosting areas over time may drive them away from the atoll.

6.5 Mitigation Measures for Significant Adverse Impacts

6.5.1 Air and Noise Pollution

Project activities that can lead to air and noise pollution are operation of equipment and machinery, including dredger, electricity generators and desalination plants, both during construction and operations.

Mitigation Measures

- Properly tune and maintain all vehicles and machinery
- Keep ground/ soil damp to minimize dust/ topsoil erosion by wind
- Conduct construction activities during daytime to minimize nuisance to humans and fauna
- Insulate power generator and desalination plant house with appropriate material
- Monitor all occupational areas to ensure noise levels do not exceed WHO standards

The main cost would be for insulation of the power house and desalination plant house. This would cost about USD 10,000.

6.5.2 Increased Turbidity and Sedimentation

Mitigation Measures

- It is absolutely essential to use bund walls to control sediment dispersal during dredging and reclamation. The proposed reclamation site should be bunded as shown in Figure 2.6. Design for the bund wall is presented below in Figure 6.2. The bunds can be constructed using an excavator mounted on a sand bed. Excavation for bed preparation should be undertaken from inside the proposed island boundary. The bund can be constructed in full or in sections as required. Optional uses of sand filled jumbo bags have been proposed in the design if the works are to be carried out in the SW monsoon and to retain as much sand as possible. An alternative would be to use geo-tubes filled with sand.
- The impacts from dredging the borrow area is most difficult to control. The use of silt will not be viable at -50 m depth. The most important mitigation measure it to use “green valves” in the THSD to minimise impacts from the water over flow during loading into the hopper.
- Complete works in shortest time period possible; contingencies should be made available for the possibility of dredge failure as has been witnessed in some other reclamation projects in the Maldives.
- Ensure equipment is in good working condition before commencement of work.

- Ensure the sand borrow site has limited fines content.
- Ensure that the Environmental Valve is in good working condition to reduce air entrainment, and concentrate the overflow-outflow. This will help reduce the extent and content of turbidity plumes generated.
- Keep overflow in the highest position to give dredge sediment longest time to settle in hold.
- Avoid unnecessary flushing of suction pipes.
- Relocation of live corals along the affected footprint to locations of similar conditions (depth, temperature etc.), as stated in the original EIA report.
- Avoid dredging and reclamation works during coral spawning periods.
- Avoid dredging and reclamation works during mass coral bleaching/stress periods.
- Close monitoring of *Kuda Haa* Marine Protected Area to ensure measures taken to reduce impact of suspended solids, turbidity and sedimentation are effective.
- Dredging and reclamation works should be carried out within the set-boundary

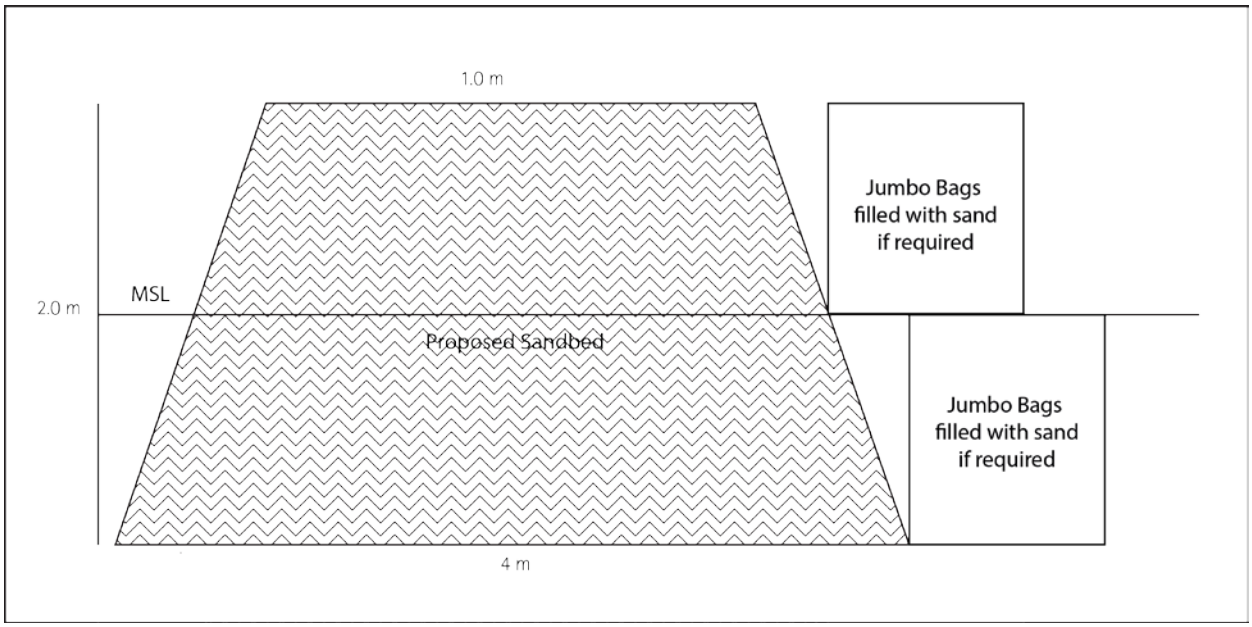


Figure 6.2: Suggested bund design

The cost of laying the proposed bund wall around the island is about USD 75,000. All vessel related measures are in-built on the proposed vessels.

6.5.3 Resource Conflicts

Conflicts over resources can occur due to:

- Loss of bait fishing and reef fishing areas in the lagoon and reef
- Loss of access to dive sites in the vicinity during dredging
- Requirement to preserve reef ecosystem as a tourism product

Mitigation Measures

1. Inform all nearby resorts, particularly Centara and Baros, about of the project work plan to help them prepare for the construction stage.

6.5.4 Social Conflicts

Social conflicts may arise due to the:

- Complaints from nearby resorts resort due to noise, and aesthetic impacts
- Complaints from nearby resorts resort due reduced visibility and high turbidity around their house reefs
- Complaints from divers due to poor underwater visibility and impacts on the major dive sites in the vicinity.

Mitigation Measures

1. Inform and consult all stakeholders at all stages of the project

7 ALTERNATIVES

7.1 "No-Project" Alternative

The No Project option assumes that the proposed changes to the project will not be made and the project will follow the originally approved concept master plan.

The comparison of benefits of each alternative is provided in Table 7.1 below.

Table 7.1: Summary of no project alternative

Options	Advantages	Disadvantages
No changes to dredging technology	• Environmental problems related to dredging in another area can be avoided, particularly damage to marine life. • Complaints from nearby resorts and divers in North Male' atoll can be avoided • Risks associated with impacts on the Marine protected areas, sensitive area and dive site can be avoided. • Project impact footprint is kept to a minimum	• The site is being approved for sourcing sand for a government project, so it's hard to justify to the proponent that the site cannot be used for a particular project • Project takes 6 months longer to complete increasing the temporal impacts • Substantial damage to Ithaafushi house reef due to the use of cutter-suction dredger. • Poor quality sand from CSD • Possibly not enough material for dredging using CSD
No changes to shore protection measures	No advantages	• Reduced costs • Increased island stability • Improved aesthetics
No changes to master plan	• The impacts associated with larger foot print (due to larger island) can be avoided. • Sand volume can be reduced • Lower cost	• The current design does not meet operators requirements. • The smaller islands are more unstable.

The proposed changes have been proposed out of necessity. The changes to the master plan and increase is size is a necessity for the new operator as the number of beach villas need to be increased and villa size needs to be increased. As noted in the original EIA, the use of THSD has always been on the agenda for this project. The proponent wishes to move forward with this option as soon as it became available. The most significant environmental advantage from using a THSD over a CSD is the limited impact on the house reef and reduced temporal impacts.

Given the strong benefits for the project and reduced environmental impact timeframe, it is recommend to proceed with the changes.

7.2 Alternative location for borrow site

The contractor has undertaken a sand sourcing study for the Male' region. This section summarizes the findings of the report and compares the identified options.

Figure 7.1 below shows the sailed lines for the sand sourcing survey. Five areas were surveyed and their results were compared to analyse the best practicable option.

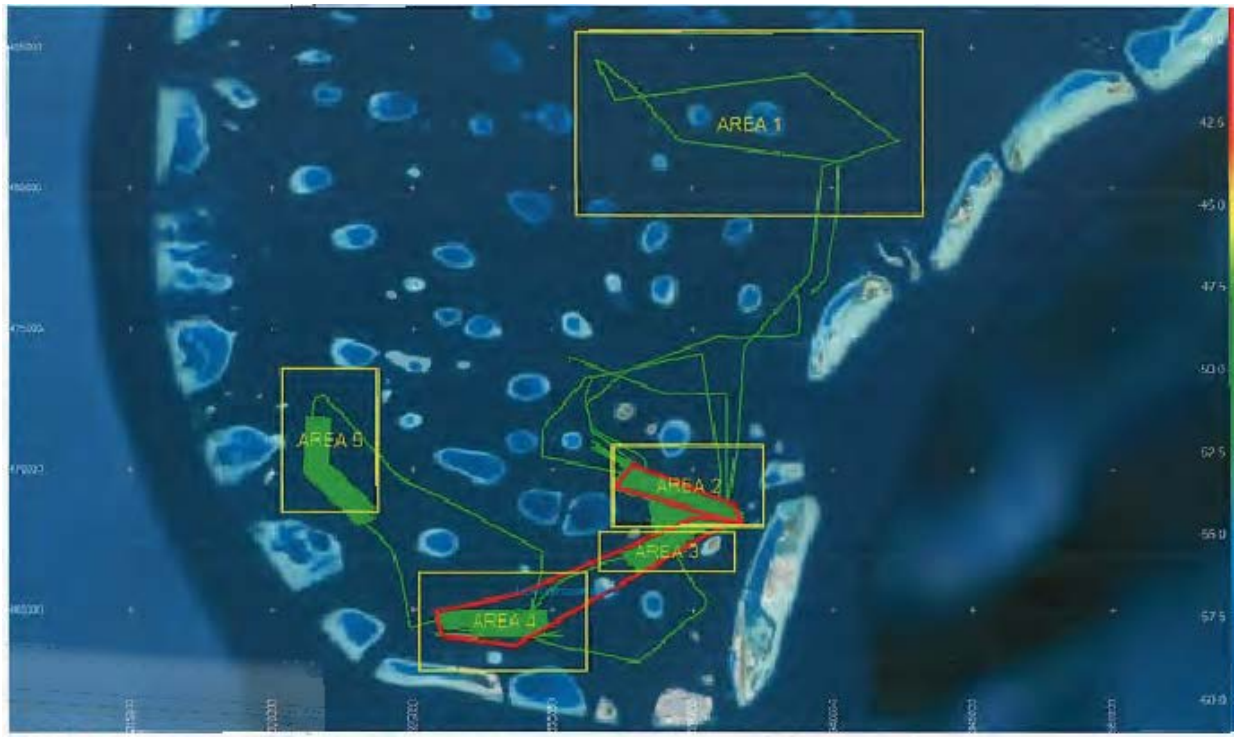


Figure 7.1: Sand survey locations to determine alternative sites

In site 1, located west of Huraa Island, the results show the presence of a thick sedimentary layer on top of what appears to be bedrock. In order to test the nature of the sediment layers, two vibrocores were deployed. Both returned unfavorable results as the sediment are fine grained and consists of silt.

In Site 2, located between Bandos Island and Kurumba Island, the result show that the area is already heavily dredged for Hulhumale' reclamation project. The surveys clearly showed the dredge marks in the area (See Figure 7.2). The PES data shows that most of the area is depleted and only small sand dunes remained after dredging. In the central part a small lump of sand remains as well as most eastern edge where some sand is still available. Unfortunately, as per the contractor, these areas are unreachable for larger hopper dredgers due to rock outcrops in the vicinity of the sand patch.

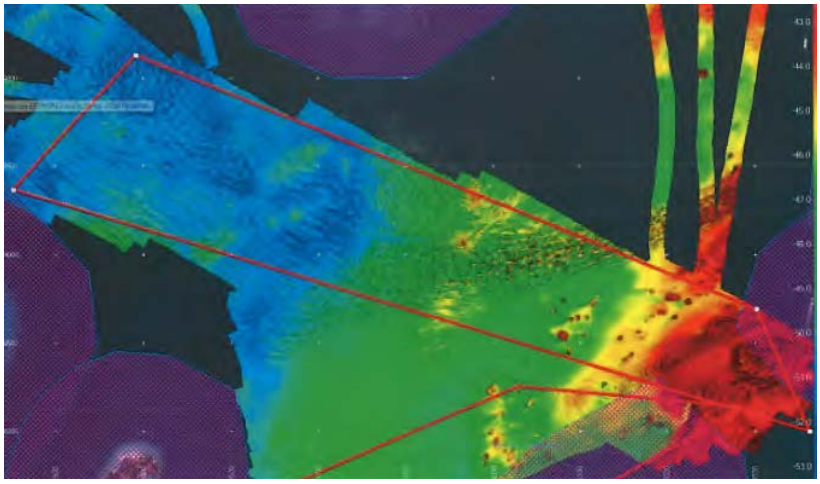


Figure 7.2: Dredge tracks used for Hulhumale' reclamation visible in site 2

Site 3 is located between Aarah and Kurumba Village Island. This site was identified for Hulhumale' reclamation project but was never used. The bathymetry from the multi beam and PES data shows a small stretch of sand on an elevated area. This was confirmed by 4 vibrocores. It was noted that this was a heavily ship traffic area particularly after the Gaadhoo Koa has been closed for the Hulhule-Male' bridge project. During the site investigation, the contractors teams were requested by the coast guard and navy to abandon the operations in the area due to the close proximity of the presidential island, Aarah.

Site 4 is located just north of Thilafushi and Gulhifalhu and this site has been dredged in the past to reclaim Gulhifalhu. Due to anchored ships located outside the designated anchorage area, some part could not be surveyed by the contractors (area just south of anchorage). Extensive dredging took place in the surveyed areas. Large part of area is depleted. The central part however still shows a sediment layer between 1 to 3 meter thickness. Six vibrocores were deployed in the area which all return very silty very fine sand. The quality of the material is not considered suitable for reclamation due to the high fine content which will result in large sediment plumes. This is likely the reason the material has not been dredged in this part of the borrow area.

Among the sites surveyed, Site 5, the proposed borrow site, is the only site with sufficient deposits of suitable quality and the least disruption to shipping traffic and nearby resort. Thus, among the sites surveyed Site 5 was preferred.

No sites were surveyed in South Male' Atoll as this area is so far untouched. Despite its proximity to Ithaafushi the contractor has not considered South Male' Atoll in their assessment. This is partially due to the maneuvering difficulties for a large ship among the dense inner lagoon reefs and lack of adequate navigation charts for South Male'. The possibility of undertaking surveys in South Male' was inquired from the contractors but it would require them to remobilize the survey vessels, which cannot be done in time for this project. The THSD vessel has a tight schedule and cannot stay back until the surveys could be complete later this year. In any case, on environmental grounds, there is no difference between dredging from North or South Male' as the environmental impacts are similar. The only major issue it the proximity to an MPA.

Given the lack of options, the short work period and the fact that it is being undertaken during SW monsoon when the currents will take the material away from the MPA, it is recommended to use the proposed borrow site with stringent adherence to THSD overflow control.

7.3 Dredging Technology Alternatives

These options were analysed in the detail in the original EIA and preference was given to a THSD if a ship was available in the Maldives.

8 ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) is an important component of the EIA process, needed to determine the accuracy of impact prediction, the adequacy of mitigation measures, and level of compliance with commitments regarding implementation of mitigation measures and monitoring of relevant environmental aspects.

The main objectives of the environmental management plan are to:

- Produce a framework for managing anticipated impacts, including practicable and achievable performance requirements and systems for monitoring, reporting and implementing corrective actions.
- Provide evidence of compliance to legislation, policies, guidelines and requirements of relevant authorities.

8.1 Environmental Management System

The environmental management framework for the proposed project is based on applicable standards and policies set out by the Ministry of Tourism of the Maldives.

- **Environmental Management Planning and establishment of key performance indicators:** The EMP specifies environmental management measures and required performance standards.
- **Monitoring and corrective action**: The implementation of EMP measures will be monitored. Any inconsistencies between the EMP and its on-site implementation will be identified and addressed through corrective actions.
- **Auditing, reviews and improvement**: The EMP will be reviewed. Improvements to the EMP will be made as necessary to achieve desired environmental outcomes.

The environmental management strategy is demonstrated in the following figure.

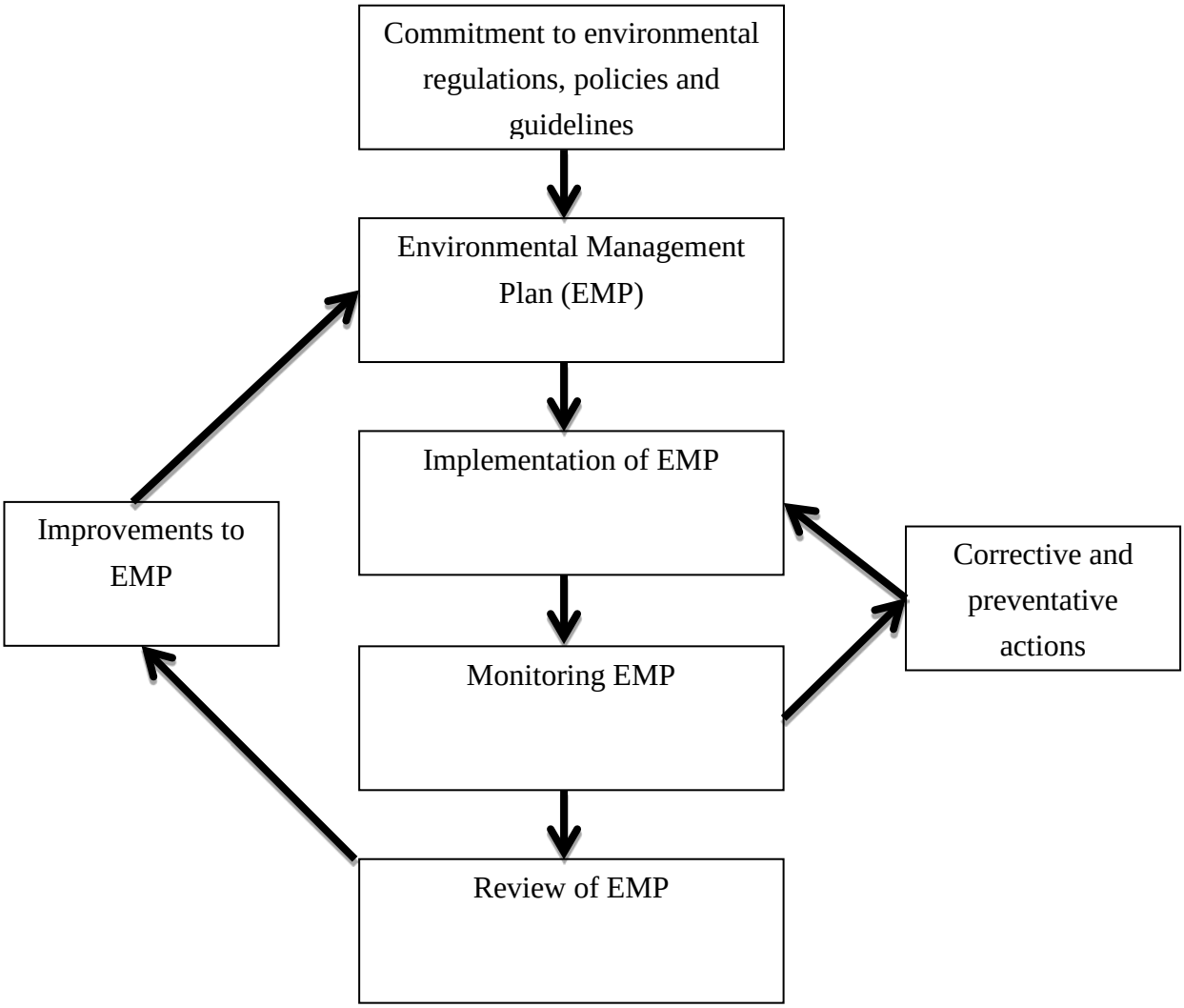


Figure 8.1: Environmental Management Strategy flow diagram

8.2 Management Structure and Responsibilities

The following parties are involved in the EMP of this project:

- Project proponent
- Environmental consultant
- Ministry of Tourism (MoT)
- Environment Protection Agency

The roles and responsibilities of the parties involved are as follows.

8.2.1 Project proponent

- Execution of all project activities

- Preparation of EMP
- Detailed designs of resort
- Monitoring of the project activities
- Submission of annual environmental monitoring reports as required by the MoT and EPA

8.2.2 Environmental Consultant

- Preparation of EMP
- Monitoring of performance of project activities according to the EMP
- Auditing the EMP to ensure desired outcomes are achieved
- Making amendments to the EMP according to the results of the audits
- Preparation of environmental monitoring report as required by the MoT (detailed in Chapter 9 of this report)

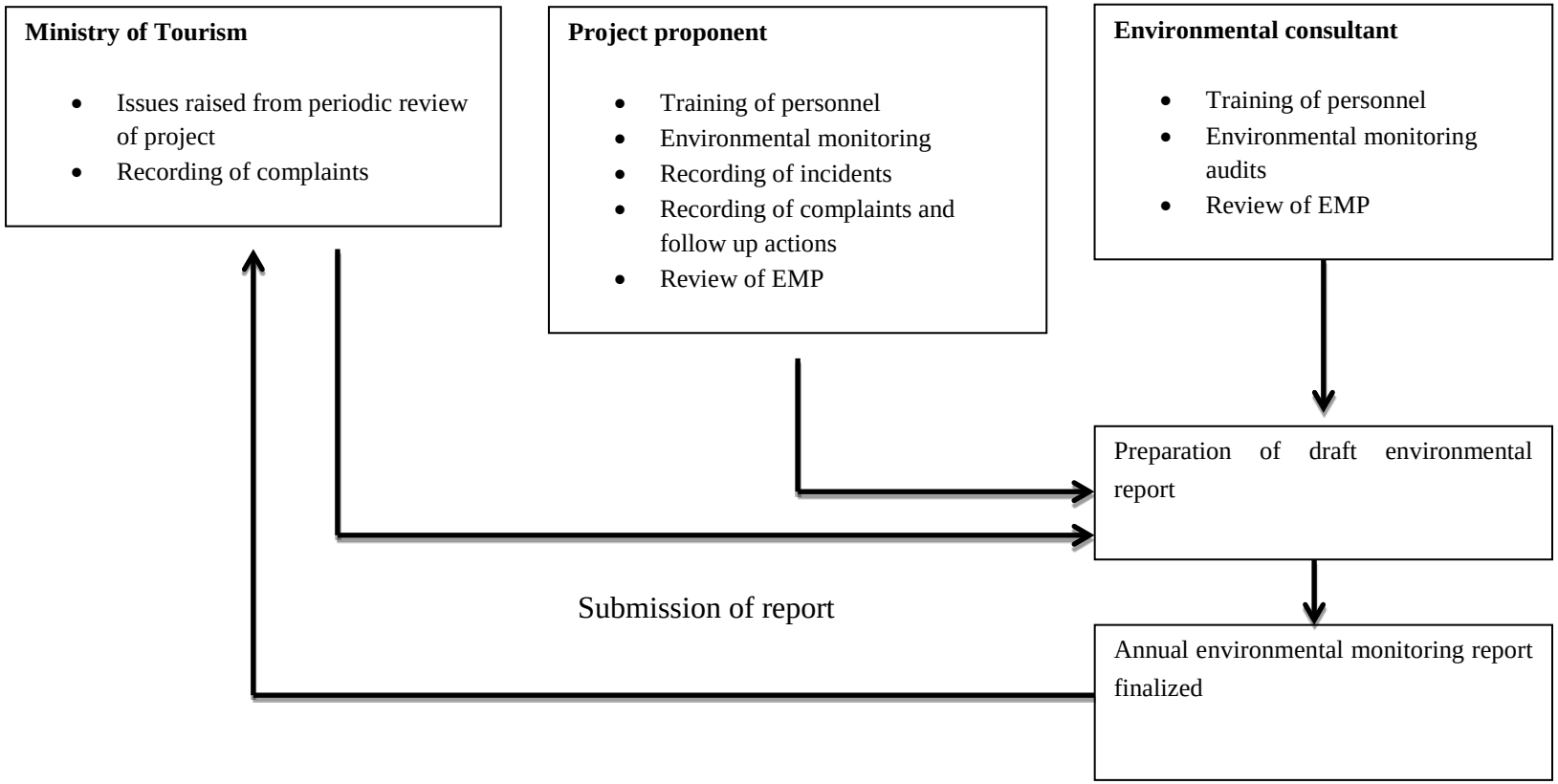
8.2.3 Ministry of Tourism

- Approval of detailed drawings
- Approval for construction
- Review environmental monitoring reports
- Intervention in the event of a breach in environmental permit conditions
- Site visit and inspection before resort opening

8.2.4 Environmental Protection Agency

- Review environmental monitoring report
- Intervention in the event of a breach in environmental permit conditions

Figure 8.2: Environmental Management Plan for construction and operation phase



The management strategies of the overall project will largely remain as proposed in the original EIA. In addition, the following section will be added to the management plan involving the THSD and dredging activities.

8.3 Environment Management Plan for THSD operations

8.3.1 Resources, roles and responsibilities

Project Manager

As the representative of Van Oord (the Contractor), the Project Manager is responsible for the environmental management on the project. The Project Manager will ensure that the project will be carried out in compliance with this EMP, including the contractual and legislative requirements. The Project Manager's tasks regarding environmental management include, but are not limited to:

- Determine and make available appropriate resources to establish, implement, maintain and improve the environmental management on the project. These resources shall be provided in a timely and efficient manner.
- Represent the Contractor during meetings with the Client and keep the Client informed in time and correctly about the environmental management on the project
- Manage the preparation of the required environmental documentation and ensure that the documents are in compliance with the contractual requirements
- Ensure that sufficient qualified and trained personnel are employed on the project site and on board of the vessels
- Promote and ensure that personnel develops environmental awareness
- Delegate environmental responsibilities to personnel

(Q)HSE Manager

Van Oord shall appoint a (Q)HSE manager who will directly report to the Project Manager who is ultimately responsible. The (Q)HSE Manager is responsible for the tasks delegated by the Project Manager which include but are not limited to:

- Induct and instruct new project personnel, subcontractors, visitors and others
- Perform random project inspections to verify continual and effective compliance to the Environmental Policy and this EMP
- Initiate incident investigation, including environmental incidents
- Organise and conduct specific environmental training

- Advise and support Project Manager and supervisory personnel on environmental issues including emergencies and incidents

Environmental Engineer

- Van Oord shall appoint an Environmental Engineer who will directly report to the Project Manager who is ultimately responsible. The Environmental Engineer is not site based during the entire project.
- Responsibilities could be delegated to the Project Manager or the (Q)HSE Manager. The Environmental Engineer is responsible for the tasks delegated by the Project Manager which include but are not limited to:
- Understand legislation and contractual requirements regarding the environment
- Identify environmental aspects related to the project
- Ensure that the significant environmental aspects of the project are being managed
- Establish, implement, maintain and improve this EMP
- Instruct relevant personnel in case of project specific environmental procedures and instructions
- Check of monitoring results of the indicators against targets
- Report the monitoring results to the Project Manager
- Review the effectiveness of the management and mitigation strategies
- If required, advise on corrective action(s) to be implemented
- Prepare environmental reporting to the Client
- Organise and conduct specific environmental training .

Environmental Monitoring Officer / Environmental Surveyor

The Environmental Monitoring Officer/Environmental Surveyor will report to the (Q)HSE manager/Chief Surveyor/Environmental Engineer and will be responsible for:

- Perform environmental monitoring as instructed by the Environmental Engineer
- Ensure proper maintenance and documented calibration of monitoring equipment
- Provide monitoring data to the Environmental Engineer/(Q)HSE Manager

Supervisory Personnel

Supervisory personnel (i.e. Superintendents, Works Managers, Chief Engineer, Chief Surveyor, etc.) are responsibility for:

- Ensure that the works are performed according to the procedures and instructions as stated in this EMP

- Instruct, supervise and correct subordinates regarding to the procedures and instructions in this EMP
- Prepare the required documentation prior to the start of particular activity
- Initiate meetings to discuss work methodologies and environmental management

Vessel Masters

Vessel masters of the marine equipment are responsible for the implementation of the environmental procedures and instructions on-board and as such primary responsibility for emergency preparedness and response on vessels. This includes:

- Initiate the required drills and emergency exercises
- Ensure that the works of the vessel are performed according to the procedures and instructions as stated in this EMP
- Instruct, supervise and correct subordinates regarding to the procedures and instructions in this EMP
- Report environmental incidents to the Project Manager

8.3.2 Competence, Training and Awareness

The personnel involved in the project will be suitably trained, and have the necessary skills to diligently perform their designated environmental responsibilities. The environmental aspects applicable to their responsibilities will be included in the Site Induction and Toolbox Talks as described in the Health and Safety Management Plan.

Certain project personnel may be allocated for a particular environmental responsibility. Specific environmental training may be required to carry out the specialist task designated to them. The following responsibilities may require specific environmental training:

- Storage location of dangerous goods
- Waste management
- Emergency preparedness and response
- Water sampling for laboratory analysis
- Water quality monitoring with YSI Multiparameter Sonde
- Marine mammal observation

A register of special training attendees will be maintained.

8.3.3 Management and Mitigation Strategies

Van Oord has set objectives and targets for each significant environmental aspect of the project to fulfil the commitments established in the Environmental Policy. The Management and Mitigation Strategies for each significant environmental aspect are developed in line with the below structure.

Aspect	**Environmental aspect of concern**
Objectives	Objectives to commit to the Environmental Policy
Targets	Measurable target for the achievement of the objective
Indicators	Objective, verifiable and reproducible indicators
Programmes	Necessary actions to be taken
Operational Control	Procedures, work instructions, physical controls, use of trained personnel or a combination of these.
Monitoring and measurement	Predictions, measurements and monitoring

Generation of waste

Aspect	**Generation of waste**
Objectives	• Waste management in accordance with the best practice and local legislation in force • Waste management as per the MARPOL 73/78 Annex V requirements
Targets	• No non-conformities regarding the management of waste • No loss of waste overboard during collection or transfer • Percentage waste recycled • Quantity of waste produced on the project
Indicators	• Number of incidents and non-conformities • Quantity of waste recycles compared the total quantity produced on project • Quantity of waste produced on the project
Programmes	• Waste management on site will be executed as per local regulations. • Waste will be segregated in order to maximise re-use and recycling methods • The production of wastes will be minimised, and wherever possible waste shall be re-used on the site where it was produced • Where waste cannot be re-used on site, every endeavour will be made

	to use it in an environmentally beneficial manner, for example by recycling • Only in a last resort, waste will be disposed of at a landfill site • Waste stored on site shall be kept safe and contained • Waste generated on board of vessels will be shipped onshore • If waste material is noted on the deck it will be immediately cleaned up • In the event that waste is lost overboard the reasonable and practicable measures will be undertaken to retrieve the waste • Waste generated will be disposed of by a local licensed firm
Operational Control	• Procedures in place, reference is made to QHSE-HSE-PU-SWP-032 Waste Management and VOMS-PR1.02-IN-02 Standing Instructions • Competence, training and awareness • Visualisation poster QHSE-HSE-PU-VPO-023 Waste segregation • Waste Management Plan
Monitoring and measurement	• Copies of waste collection notes • Copies of Waste Management Licence and Waste Carriers Licence • Register of traceable waste that have been disposed

Generation of sewage

Aspect	Generation of sewage
Objectives	• Sewage water management as per the MARPOL 73/78 Annex IV requirements • Onshore generated sewage managed according to local legislation in force
Targets	• No incidents or non-conformities regarding the disposal of sewage • No visible floating solids in, nor cause discoloration of, the surrounding water • Quality of resultant sewage discharge as per requirements
Indicators	• Number of incidents, non-conformities and complaints • Testing results of resultant sewage discharge
Programmes	Offshore: Sewage water management will be implemented as per the MARPOL 73/78 Annex IV requirements and local legislation in force, including but not limited to: • Van Oord will provide tanks that are designed or constructed to receive sewage and store it inside when the ship is less than 3 nautical miles from the nearest land and prior the disposal, with appropriate capacity, considering the ship's operation and the number of persons on board • Treated sewage will either be discharged or disposed onshore, depending on conditions and local legislation in force • Discharge of treated sewage is only undertaken outside restricted waters as per MARPOL 73/78 Annex IV requirements and local legislation in force

	• The sewage water treatment plants will be checked and maintained as per MARPOL 73/78 Annex IV requirements • If a vessel does not have a sewage treatment system it will have a suitable holding tank, waste water will then be brought back to shore for treatment by a licenced contractor Onshore: • Onshore generated sewage will be managed according to best practice and local legislation in force
Operational Control	• Procedure in place, reference is made to: VOMS-PR1.02-IN-02 Standing Instructions
Monitoring and measurement	• applicable statutory certificates regarding MARPOL 73/78 Annex IV for deployed vessels • Copies of sewage collection notes, if applicable

Storage of dangerous goods

Aspect	Storage of dangerous goods
Objectives	• Minimise the risk for contamination of the environment due to the storage of dangerous goods • Storage of dangerous goods as per best practice
Targets	• No spills of dangerous goods into the environment • No non-conformities due to improper storage of dangerous goods
Indicators	• Number of incidents and non-conformities
Programmes	• The storage of dangerous goods such as diesel, hydraulic oil, paint and other chemicals that pose potential environmental hazards are stored in a manner that minimizes the risk for contamination of the environment • Storage of liquid dangerous goods in secondary containment (drip trays) • Secondary containment capacity must be 110% of the largest container • Volume of dangerous goods stored on vessels will be limited to fit for purpose • Storage will be done according to the Material Safety Data Sheet (MSDS) • If hazardous materials are stored in a confined space, the space must be properly ventilated • A register of the dangerous goods will be kept on site (or in storage facility) • The register will include the MSDS
Operational Control	• Procedure in place. Reference is made to QHSE-HSE-PU-SWP-038 Storage of dangerous goods • Competence, training and awareness

	• Visualisation poster QHSE-HSE-PU-VPO-020 Environmental – material storage
Monitoring and measurement	• Regular documented visual inspections on the storage areas

Fuel handling

Aspect	Fuel handling
Objectives	• Fuel handling related to marine equipment as per the MARPOL 73/78 Annex I requirements • Onshore fuel handling as per local legislation in force
Targets	• bunkering of fuel to the vessels is performed appropriately and spillage is prevented • storage of fuel on site and the refuelling activities on project site, yards, workshops and marine equipment do not cause spillage into the environment • rapid response in the event of a spill to minimise impacts on the environment
Indicators	• Number of incidents and non-conformities
Programmes	Onshore: • Fuel storage tanks are preferably double-walled and are protected by a secondary containment (e.g. tank standing in bunded area) • Secondary containment must be capable of holding 110% of the capacity of the primary tank • Fuel storage tanks will be situated where they are easily accessible but where the risk of impact from passing vehicles is minimised, and as far away from surface waters or surface drains as possible • Regular training will be provided in spill response • Spill response materials will be situated at key areas close to fuel and oil storage areas, and refuelling locations • Fuel and oil will be stored away from environmental sensitive areas (and also pathways to environmentally sensitive areas) Offshore: • Storage and handling of fuel will be done as per MARPOL 73/78 Annex I requirements
Operational Control	• Procedure in place, reference is made to QHSE-HSE-PU-SWP-004 Refuelling and VOMS-PR1.02-IN-02 Standing Instructions • Competence, training and awareness • Visualisation poster QHSE-HSE-PU-VPO-021 Environmental - Oil Spillage • Emergency Response Plan in place • Oil Spill Contingency Plan in place

	• Every ship other than an oil tanker of 400 gross tonnage and above shall carry on board a Shipboard Oil Pollution Emergency Plan (SOPEP) as per MARPOL 73/78 Annex I requirements
Monitoring and measurement	• Visual inspections of fuel-dispensing equipment and surrounding waters during and after fuel transfer • applicable statutory certificates regarding MARPOL 73/78 Annex I for deployed vessels

Air emissions

Aspect	Air Pollution Emissions
Objectives	• Vessels comply with MARPOL 73/78 Annex VI requirement
Targets	• No excessive smoke • No non-conformities
Indicators	• Number of non-conformities and complaints
Programmes	• Design, maintenance and operation of vessels in compliance with MARPOL 73/78 Annex VI requirements • Local hired auxiliary equipment will be selected in compliance with the local legislation in force • Engines and equipment on board the dredge will be properly maintained and operated, and will be kept in a good working order • Maintenance of engines and/or emission control devices will be undertaken in accordance with the manufacturer's specifications
Operational Control	• Procedures in place, reference is made to: VOMS-PR1.02-IN-02 Standing Instructions and VOMS-PR3.04-TE-15 QHSE Requirements for Subcontractors
Monitoring and measurement	• applicable statutory certificates regarding MARPOL 73/78 Annex VI for deployed vessels • applicable statutory certificates regarding local hired auxiliary equipment

8.3.4 Emergency Preparedness and Response

Certain environmental aspects (e.g. fuel handling) require emergency preparedness and response in order to manage them in an acceptable manner in the unlikely event of an environmental incident. Therefore the following plans are developed.

Emergency Response Plan

An Emergency Response Plan will be made as part of the Project Plan, this will include:

- Set up of Emergency Response Team on site
- Emergency scenarios
- Emergency telephone list
- Route to hospital
- Van Oord Emergency procedure
- Oil spill flowchart

Oil Spill Contingency Plan

An Oil Spill Contingency Plan will be made as part of the Project Plan, this will include:

- Types of operations
- Basic Safety Equipment and environmental considerations
- Spill assessment
- Spill prevention
- Waste Management
- Notification

Shipboard Oil Pollution Emergency Plan

On board the marine equipment > 400 GRT, in accordance with and approved by the applicable Flag State regulations, a SOPEP plan (Shipboard Oil Pollution Emergency Plan) is available.

In the SOPEP Plan the following subject are included (but not limited to):

- The steps to control discharges
- Reporting requirements
- List of coastal state contracts
- General Arrangement Plan
- Tank Plan
- Fuel oil piping diagram

8.4 Non-Conformances and Corrective Action

All non-conformances to the environmental permit conditions, observed during monitoring will be documented.

Necessary corrective actions and preventative actions will be identified

Corrective actions will be implemented, with systematic follow-ups to ensure effectiveness of these measures.

8.5 Reporting

Reporting shall be undertaken to provide evidence of the ongoing implementation of the EMP and will cover any training activities, site conditions and operations, monitoring data, details of non-conformances, incidents, complaints and follow up action, results of audits and reviews. Reporting shall be undertaken by the project proponent and the Environmental Consultant.

The environmental reporting process is summarized in the figure 8.2. All non-compliances and complaints during the execution of the project are to be reported to the EPA and MoT.

9 ENVIRONMENTAL MONITORING PLAN

9.1 Introduction

This chapter will outline the monitoring plan for the proposed project. The Addendum to the original EIA submitted to MoT contains the same monitoring programme. Thus, monitoring programme can be combined but the report on dredging phase should be sent to EPA as well.

9.2 Objectives of the Monitoring Plan

The main objectives of the monitoring plan are:

1) To identify whether the predicted impacts are accurate and mitigation measures taken are effective.
2) To identify any unforeseen impacts so that appropriate mitigation measures can be taken at the earliest.
3) To identify and resolve any issues of social unrest at the earliest.
4) To eliminate or reduce environmental costs.

9.3 Monitoring during Construction Phase

Table 9.1 shows the details of the different monitoring attributes and parameters must be monitored during the construction stage.

Table 9.1: Monitoring Schedule for Dredging, Reclamation phase

Monitoring Attribute	**Objective**	**Indicator**	**Methodology**	**Locations & samples**	**Frequency**	**Reference Guideline / Standard**	**Est. Total Costs / USD**
Marine Water Quality	To monitor the condition of marine water at all dredging sites	Temperature, pH, TSS, Turbidity, Phosphate, Nitrates, Biological Oxygen Demand	Laboratory analysis Refer to procedures as specified in EPA guidelines See Annex	Baros Thila (SW1) Kohdhipparu Reef (SW2) Kohdhipparu Reef (SW3) Kuda Haa (SW4) One sample from each site at 1 m depth	Once every week Total of 3 tests (estimated during dredging period of 3 weeks)	Great Barrier Reef Marine Park, 2009 (GBRMP 2009) UNESCO/ WHO/UNE P 1996	550 per year
	To monitor the condition of marine water around reclamation site	Temperature, pH, TSS, Turbidity, Phosphate, Nitrates, Biological Oxygen Demand	Laboratory analysis Refer to procedures as specified in EPA guidelines See Annex	Three locations SW1, SW2, SW3 One sample from each site at 1 m depth	Once every week Total of 3 tests (estimated during dredging period of 3 weeks)	Great Barrier Reef Marine Park, 2009 (GBRMP 2009) UNESCO/ WHO/UNE P 1996	480 per year

Noise	To determine the impact of noise on resorts and on site	Noise complaints received outside the project site	Logs		Daily logs		-
Sedimentation	To document the sedimentation levels along reef area	Sedimentation rate	Sediment traps	Monitoring sites around dredging and reclamation area	Once during dredging and reclamation work	Max mean annual sedimentation rate of 3 mg/cm^2/day and daily maximum of 15 mg/cm^2/day	850
Contingency Marine water quality	As a contingency measure to assess the quality of marine water around project site and to assess the extent of impact of dredging to marine water.	The following parameters will be tested: Temperature, Salinity, pH, Total Suspended Solids, Nitrate, Biological Oxygen Demand, turbidity	Laboratory analysis	As required	During dredging, reclamation and shore protection phase	Great Barrier Reef Marine Park, 2009 (GBRMP 2009) UNESCO/ WHO/UNEP 1996	46 per sample

Marine Water Contamination	To assess the marine water contamination due to oil spills and leakage	Oil spills Oil leakage from machinery or vessels	Visual observation Maintenance and tuning of all machinery & vessels	All area where oil is handled	Daily	NA	Included in contractor fees

9.4 Monitoring Report

A detailed environmental monitoring report is required to be compiled and submitted to the EPA six months after the completion of the project, based on the data collected for monitoring the parameters included in the monitoring plan given in the EIA. This report may be submitted to the relevant Government agencies in order to demonstrate compliance. The report will include details of the site, strategy of data collection and analysis, quality control measures, sampling frequency and monitoring analysis and details of methodologies and protocols followed. In addition to this more frequent reporting of environmental monitoring will be communicated among the environmental consultant, project proponent, the contractors and supervisors to ensure possible negative impacts are mitigated appropriately during and after the project.

The same report submitted to MoT may also be submitted to EPA.

9.5 Cost of Monitoring

The revised cost of monitoring will be about $5,000 for the project.

9.6 Commitment to Monitoring

The proponent is fully committed to undertake the monitoring programme given in this chapter (see Appendix K).

10 STAKEHOLDER CONSULTATIONS

Stakeholder consultations were conducted for this project to provide information about the proposed project and to seek stakeholder's views on the project. During consultations, stakeholders were asked about their opinions or concerns regarding the project and their recommendations to address the key issues. The following stakeholders were consulted for this addendum;

1. Proponent
2. Centara Rasfushi Resort & Spa
3. Baros Maldives
4. Environmental Protection Agency (EPA)
5. Marine Research Centre (MRC)
6. Kohdhipparu (non-responsive)

Centara Rasfushi Resort & Spa and Baros Maldives expressed their concern over the impacts dredging will have on the dive spots and the marine biodiversity in the area. As the marine environment in the area is still recovering from impacts of past reclamation projects and the El-Nino Effect and dredging will cause further damage. The dive spots in the area are prime sellers of the resorts and impacts on these sites will reflect on their brand. Hence, Both resorts highly recommended to utilise an alternative borrow site for this project.

Environmental Protection Agency also had reservations for dredging in the area due to the presence of a Marine Protected Area in the vicinity. Both EPA and MRC recommended exploring alternative locations for dredging.

Following section will provide details of the discussions held in the each stakeholder consultation meeting.

10.1 Proponent

Date: 10 June 2016; Time: 1000 hrs; Venue: Ithaafushi Investment Pvt Ltd Office

Mr. Mohammed Ali Janah from the proponent side emphasized the importance of the changes to the master plan as it is required to bring the property to the standard required by the new operators.

They also noted that the target dredging technology for the project was always a THSD but they proceeded with the plans for a CSD as no ship was available at the time. The advantage of time,

quality of sand and lower impacts on house reef offers them a much more attractive option as a dredging technology.

10.2 Centara Rasfushi Resort & Spa

Date: 9 June 2016

Time: 1100hrs

Venue: Centara Rasfushi Resort & Spa

Participants: Ibrahim Shaan (Operations Manager), Jerome Mannez (Chief Engineer), Ahmed Shahyl (Dive Manager), Ahmed Nabeel (Marine & Logistics Manager), Ismail Hussein (Resort Manger), Prpaijit Thongma (General Manager)

Summary of Discussions

- The island reef of Centara Rasfushi Resort & Spa has been critically impacted by previous dredging and reclamation projects, especially during land reclamation project in Hulhumale' in 2015. During this time, high sedimentation around the area reduced visibility of the area causing extensive damage to the corals.
- The corals and the island reef is still recovering from this impact, hence dredging in the proximity of island reef will prolong the recovery period and will further cause sedimentation and the extent of damage on corals is hard to predict.
- As marine biodiversity around the resort is poor due to overfishing, corals are the prime selling product by the resort. Hence, it is crucial for the resort to ensure the quality of corals remain intact and avoid extensive damage.
- The area also has notable diving spots including *Kuda haa, Giraavaru Caves, Wattaru Kandu. Kuda Haa* in particular is found to be a unique spot where nurseries of juvenile fishes are often observed. In addition, the resort also uses the house reef of Baros Maldives due to its unique nature and rich biodiversity.
- During dredging period, impacts on aesthetics will have to be taken into account. Resorts guests are likely to raise complaints once the visual aesthetics are impacted and it is expected that this will have a significant impact on resort brand and standard.
- Future developments need to consider the long-term impacts it will have on the surrounding environment and the people.
- It is recommended to undertake dredging activity outside the atoll rim to avoid impacts to the resorts and unique reef systems in the vicinity.

10.3 Baros Maldives

Date: 9 June 2016

Time: 2030hrs

Venue: Baros Maldives

Participants: Musthafeez (EAM), Nina Rothe (Marine Biologist), Shuhaina (Marine Centre Supervisor), Ahmed Nasir (Dive Master), Chino (Dive Instructor), Ahmed Shuhan (Resort Manager)

Summary of Discussions

- There are numerous remarkable dive spots in the vicinity of the resort including *Black Coral, Baros House Reef* and *Papaya Reef* where a diversity of marine species is often spotted. These include turtles, whales, dolphins and string rays. In addition *Black Coral* is observed to be rich in live coral which makes it very unique.
- During the reclamation of Hulhumale', Baros also experienced bulk of the impact via sedimentation and increased turbidity. Approximately 15% – 20% of the corals were impacted.
- The biggest concern is that dredging activity will be conducted in Southwest monsoon during which the wind direction will be to the east and this will further exacerbate the impacts on *Baros House Reef*, which is one of the key selling points of the resort. This reef is also shared by other neighbouring resorts due its exceptional quality and cost of impact on this reef will not only be felt by Baros Maldives, but also by the neighbouring resorts.
- Following the El-Nino Effect, the corals in *Baros House Reef* are still under stress and further impacts following dredging will be detrimental.
- Sedimentation caused during dredging period will also spread to the neighbouring reef systems and this will cause cumulative impacts in neighbouring reef systems compromising their quality and the marine life which thrive in these reefs.
- As dolphins and humpback whales are often spotted around Baros Maldives, concern remains over the impact of noise from the dredge vessel, which will have an impact on the movement of these fishes.
- Maldives is upheld for its exclusive natural environment and it is disappointing that developments are progressing with the least consideration to the impacts it will have on

the environment. The government should be more attentive and cautious while approving projects that could compromise the authentic natural beauty of the country.

- It is highly recommended to use an alternative location for dredging, preferably in South Male' Atoll for this project. The current borrow sites have far more noteworthy dive spots and reef systems in the vicinity that needs to be protected from the primary impacts of dredging.

10.4 EPA

Date: 15 June 2016

Time: 1100hrs

Venue: EPA

Participants: Mariyam Rifga (Assistant Director), Ahmed Shan (Senior Surveyor), Rifath Naeem (SEA), Fathimath Reema (Director)

Summary of Discussions

- If sand borrow areas fall outside the boundary area allocated by Ministry of Tourism, the project must seek permit from EPA and submit a separate EIA report to approve theI proposed dredging locations for the project. This should also be cross checked with Ministry of Tourism.
- The proposed dredging vessel has also been used to reclaim Addu City recently and it has caused a lot of sedimentation around the region. Hence, EPA has reservations for dredging in the proposed borrow sites for this project, especially when there is a marine protected site within the vicinity.
- The coral and reef systems are still in the recovery process in the area following reclamation in Hulhumale', and dredging in this location will exert further stress on the reefs.
- Alternative borrow sites must be explored for this project.

10.5 MRC

Date: 16 June 2016

Time: 1100hrs

Venue: MRC

Participants: Nizam Ibrahim (Senior Research Officer)

Summary of Discussions

- As bleaching events for the past few months has significantly impacted corals, it is highly recommended to commence all dredging activities after July to avoid further stress on corals and marine life.
- It is highly recommended to explore alternative locations for dredging, preferably closer to the reclamation site.

A cautious approach must be undertaken to lessen the impacts on the marine environment throughout the construction phase of the project.

10.6 Kohdhipparu Island (onogoing resort development project)

Numerous attempts have been made to solicit the opinion of the project owners and developers but have so far been unresponsive. Contacts were made with the owner Mr. Abdulla Ahmed and a contact person (Mr. Thotho) was identified. However, he was non-responsive after numerous attempts. The project was explained briefly to the owner.

11 Conclusions

This report has evaluated the environmental impacts and potential mitigation measures to changes proposed dredging component of the Ithaafushi Resort Development project. The proposed activities include the use of THSD technology to reclaim the island.

The borrow site is in North Male' Atoll near Kohdhipparu Island. The site was chosen among five other sites because it had the right volume of sand and the least fines. No sites were surveyed in South Male' Atoll and it is not possible to resurvey South Male' in time for this project.

Apart from dredging and reclamation, which has inherent unavoidable impacts on marine life, the proposed changes are broadly designed based on environmental best practices suitable for construction of resort islands in fragile environment of Maldives. It has taken conscious decision to use stringent measures to contain turbidity.

The proposed developments are also generally in conformance to the Tourism laws and regulations. Additional approvals are required for the following before commencement of project activities. They are:

- Dredging and reclamation approval from EPA.
- Detailed drawings approval from the Ministry of Tourism
- Construction approval from Ministry of Tourism.

The proposed borrow area is in a pristine condition at the time of the survey but has been used to borrow sand to reclaim SW Male', at time of writing. There are numerous dive sites, a Marine Protected Area and a listed Sensitive Environment within a five km radius from the dredge site. The ongoing resort development project in Kohdhipparu is within 1 km of the project site. There two other resorts within a 5 km radius.

The negative impacts from the overall project are expected to remain fairly similar apart from the new dredging component. The impacts of dredging will increase and the foot print of the project has increased. However, the impacts during reclamation will be reduced and the overall timeframe of the impacts of dredging will be reduced by 6 months, which is substantial.

During dredging and reclamation there will be impacts on neighbouring reefs due to turbidity and sedimentation. There may be poor visibility in the nearby resorts. Reefs within the vicinity may experience turbidity effects and to some extent sedimentation. However, these impacts will only last for 2-3 weeks. The presence of sensitive environment within the vicinity is a concern, particularly due to the recent coral bleaching event, cumulative impacts from the recently

completed Hulhumale' reclamation project and cumulative impacts of dredging from the same site for Male' SW harbour construction project.

Given that a delay in reclamation is contractually and financially not feasible, it is recommended to deploy stringent measures to reduce the impacts of turbidity and sedimentation on reef. These include the concurrent use of containment sand bunds and multiple settlement basin at the reclamation site and. The use of "green valves" to control overflow impacts from THSD.

Alternative borrow sites were evaluated but not practical as per the contractor.

The project also needs close coordination with relevant stakeholders, particularly nearby resorts and dive schools to minimise the negative social impacts.

The impacts predicted can be minimized considerably with the proposed mitigation measures suggested in the report. Special attention need to be paid during construction stage to minimise damage to the environment especially when outside contractors are in operation. It is important that proper monitoring be undertaken during construction stage to identify any unwarranted practices and activities. Environmental monitoring and management plan will also ensure that the impacts to the environment are kept to a minimum throughout the operations stage of the resort.

The findings of this EIA are that if the Ithaafushi Reclamation project proceeds as described and in accordance with the recommendations outlined in this report, it will limit significant adverse environmental impacts. The disturbances to nearby resort activities are unavoidable buts its effects could be reduced with good coordination.

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APPENDIX A – Terms of Reference

203-EIARES/PRIV/2016/361

Terms of Reference for Environmental Impact Assessment for Borrowing Sand from North Male' Atoll for Ithaafushi Resort Reclamation

The following is the Terms of Reference (ToR) following Scoping meeting held on **4th July 2016 for undertaking <u>the EIA for the Dredging sand from North Male' Atoll, for Ithaafushi Resort Reclamation</u>. The proponent of the project is Mohamed Ali Janah, Ithaafushi Investment Pvt Ltd.**

While every attempt has been made to ensure that this TOR addresses all of the major issues associated with development 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 change in scope to the original project and, if applicable, the background information of the project/activity and the tasks already completed. Objectives of the development activities should be specific. Define the arrangements required for the environmental assessment including how work carried out under this contract is linked to other activities that are carried out or that is being carried out within the project boundary. Identify the donors and the institutional arrangements relevant to this project.

2. **Study area** – Submit a minimumA3 size scaled plan with indications of the proposed changes in scope. Specify the agreed boundaries of the study area for the environmental impact assessment highlighting the proposed development location and size. The study area should include adjacent or remote areas, such as relevant developments and nearby environmentally sensitive sites. Relevant developments in the areas must also be addressed including residential areas, all economic ventures and cultural sites

3. **Scope of work** – Identify and number tasks of the project including preparation, construction and decommissioning phases.
   Activity 1. Description of the proposed project – Provide a full description and justification of the relevant parts of the reclamation works, using maps at appropriate scales where necessary. The following should be provided (all inputs and outputs related to the proposed activities shall be justified):

The main activities of the reclamation and coastal works are:

- Dredging material from burrow area;
- Transportation to site
- Pumping it into the reclamation area;
- Construction of bunds;
- Environmental monitoring during construction activities;
- Measures to protect environmental values during construction and once the new island has been established
- Project management (include scheduling and duration of the project and life span of facilities; communication of construction details, progress, target dates, construction/operation/closure of labour camps, access to site, safety, equipment and material storage, fuel management and emergency plan in case of spills)

<u>Dredging:</u>

- Location and size of sand burrow areas (s) on a map;
- Justification for the selection of this location;
- Quantity, quality and characteristics of fill material;
- Indication of guarantees for sufficient availability of fill material;

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- Method and equipment used for dredging, including description of positioning system, depth control system and operational control procedures;
- Justification for selecting the methods and equipment;
- Duration of dredging activity;
- Labour requirements and (local) labour availability;
- Housing of temporary labour, and
- Emergency plan in case of spills (diesel, grease, oil)
- Measures to reduce Hopper Overflow

Task 2. Description of the environment – This component will be based on the existing environment that is significant due to the change in project scope. 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 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
- Bathymetry of borrow area
- Characteristics of seabed sediments to assess direct habitat destruction and turbidity impacts during construction;

Hydrography/hydrodynamics (use maps)
- Tidal ranges and tidal currents;
- Wave climate and wave induced currents at dredging and reclamation site.
- Wind induced currents;
- Sea water quality at four locations within the vicinity of the dredging site. Focus should be placed on the protected area and sensitive area and Kohdhipparu. These parameters must be measured: pH, turbidity, phosphate, nitrate, BOD and Total suspended Solids (Results from the EIA submitted to MoT may be used).
- Sea water quality baseline data from reclamation site at three locations (Results from the EIA submitted to MoT may be used).

Ecology
- Identify marine protected areas (MPAs) and sensitive sites such as breeding or nursery grounds for protected or endangered species (e.g. coral reefs, spawning fish sites, nurseries for crustaceans or specific sites for marine mammals, sharks and turtles). Include description of commercial species, species with potential to become nuisances or vector.
- Benthic and fish community monitoring around three sites within the vicinity of borrow site

Socio-economic environment
- Description of islands and facilities within proximity to borrow site.

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.

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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. Legal requirements:

- Tourism Ministry

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 due to the change in scope. Particular attention shall be given to impacts associated with the following:

Impacts on the natural environment

- Loss of marine bottom habitat, both in the borrow area resulting in (temporary) loss of bottom life, which may impact fish stocks and species diversity and density of crabs, shellfish etc.;
- Sediment dispersal in water column (turbidity at the dredging), possibly resulting in changes in visibility, smothering of coral reefs and benthic communities and affecting fish and shellfish etc.;
- Impacts of noise, vibration and disturbance;
- Impacts on unique or threatened habitats or species (coral reefs, sea turtles etc.), and
- Impacts on visual landscape.
- Impacts on the marine protected area/s at the vicinity of the borrow site

Impacts on the socio-economic environment

- Impacts on visual amenity of nearby resorts
- Impacts on the operation of nearby resorts, including diving
- Impacts on fishermen using the area in the vicinity
- Impacts on social values, norms and belief due to presence of workers of dredging company on local population.

Construction related hazards and risks

- Pollution of the natural environment
- Risk of accidents and pollution on workers and local population, and

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 but not limited to alternative borrow sites, alternative equipment/machinery for dredging and alternative containment measures. The report should highlight how the dredging and reclamation 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 with particular attention paid to sedimentation control and future changes in coastal processes. Mitigation measures to avoid or compensate habitat destruction caused by dredging will have to be considered, e.g. temporal sediment control structures, coastal protection structures to reduce erosion, coral reconstruction and MPA replacement areas. 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 (see appendix)– Identify the critical issues requiring monitoring to ensure compliance to mitigation measures and present impact management and monitoring plan for coastal modification, beach morphology, sediment movement around the island. 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, cost 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.

- Water quality, especially turbidity;
- Condition of the sensitive ecosystems and marine resources;
- Re-colonization of the benthic organisms in the borrow areas;
- Environmentally sound removal of dredging equipment

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

1. Stakeholder consultations were undertaken with the following stakeholders:
2. Centara Grand Rasfushi Resort & Spa
3. Baros Maldives
4. Kohdhipparu Island
5. Marine Research Centre (MRC)

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 its Amendments

Timeframe for submitting the EIA report – The developer must submit the completed EIA report within 2 months from the date of this Term of Reference.

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5 July 2016

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APPENDIX B – Approvals

بسم الله الرحمن الرحيم

MINISTRY OF TOURISM
REPUBLIC OF MALDIVES

Ref no: 88-DS/PRIV/2016/1511

12th June 2016

Mr. Mohamed Ali Janah
Director,
Sumaia Holdings (Maldives) Pvt Ltd,
H. Sea Side,
Boduthakurufaanu Magu',
Male',
Rep. of Maldives

Dear Mr. Janah,

Re: Conditional Approval for the proposed changes to the approved dredging and land reclamation concept for the development of tourist resorts at the plot of lagoon in Male' Atoll. (4°0'47, 62"N 73°22'57.86"E)

We refer to your application received on 09th June 2016, requesting to approve the proposed addendum to the approved EIA by our letter ref no: 88-DS/PRIV/2015/2519 dated 15th October 2015 for the development of tourist resorts at the plot of lagoon in Male' Atoll. (4°0'47, 62"N 73°22'57.86"E)

A principal approval is hereby granted to the concept plans submitted for the project, subjected to the following;

- Submission and approval of EIA study for the project
- Submission of land survey report for the registration of the land area upon completion of the proposed reclamation works
- Development shall comply with all conditions specified in the lease agreement

Please also note that this approval is based on the rules and regulations and practices of this Ministry and concerned government authorities.

Thank you

Yours sincerely,

Ahmed Salih
Permanent Secretary

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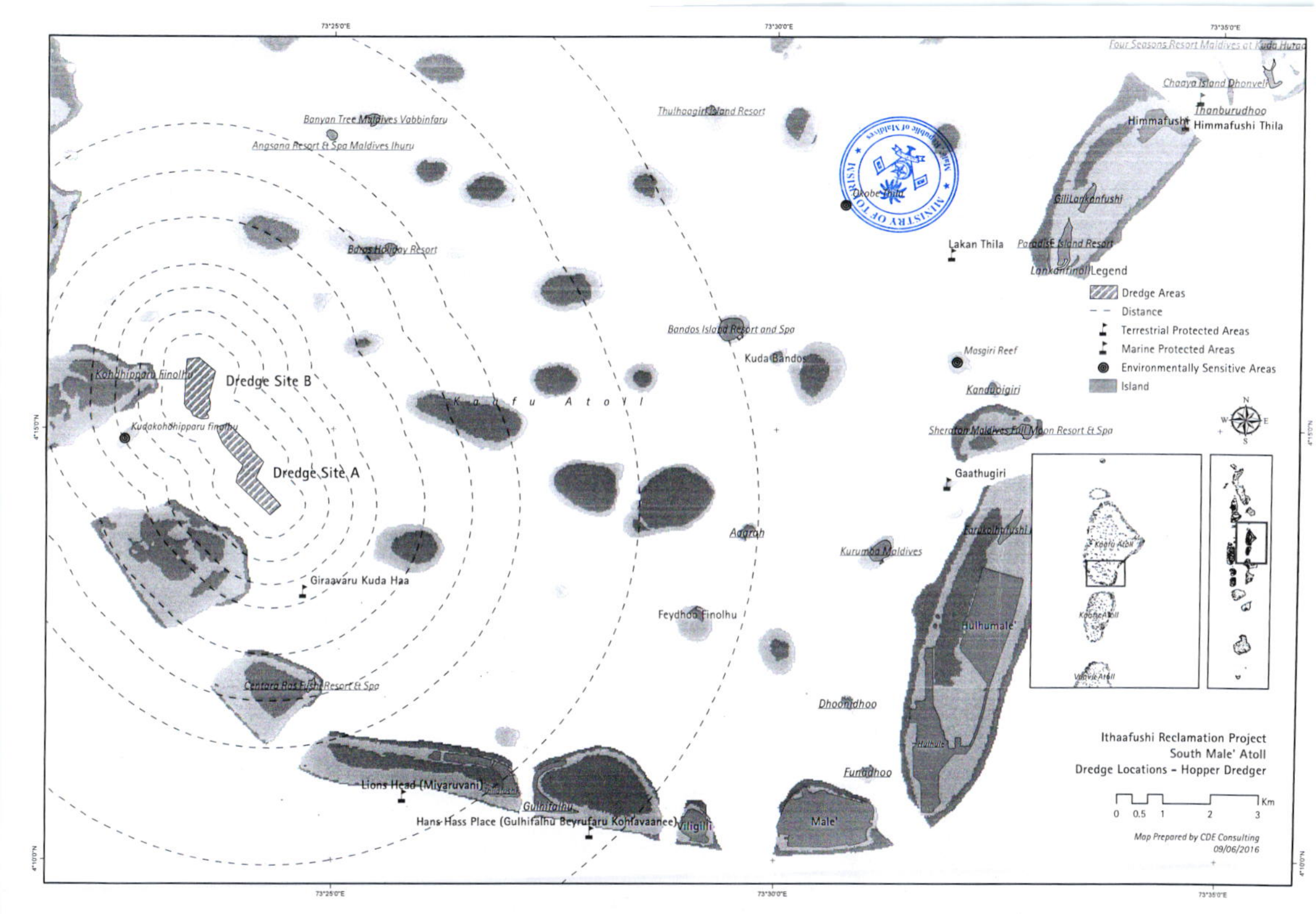
73°25'0"E
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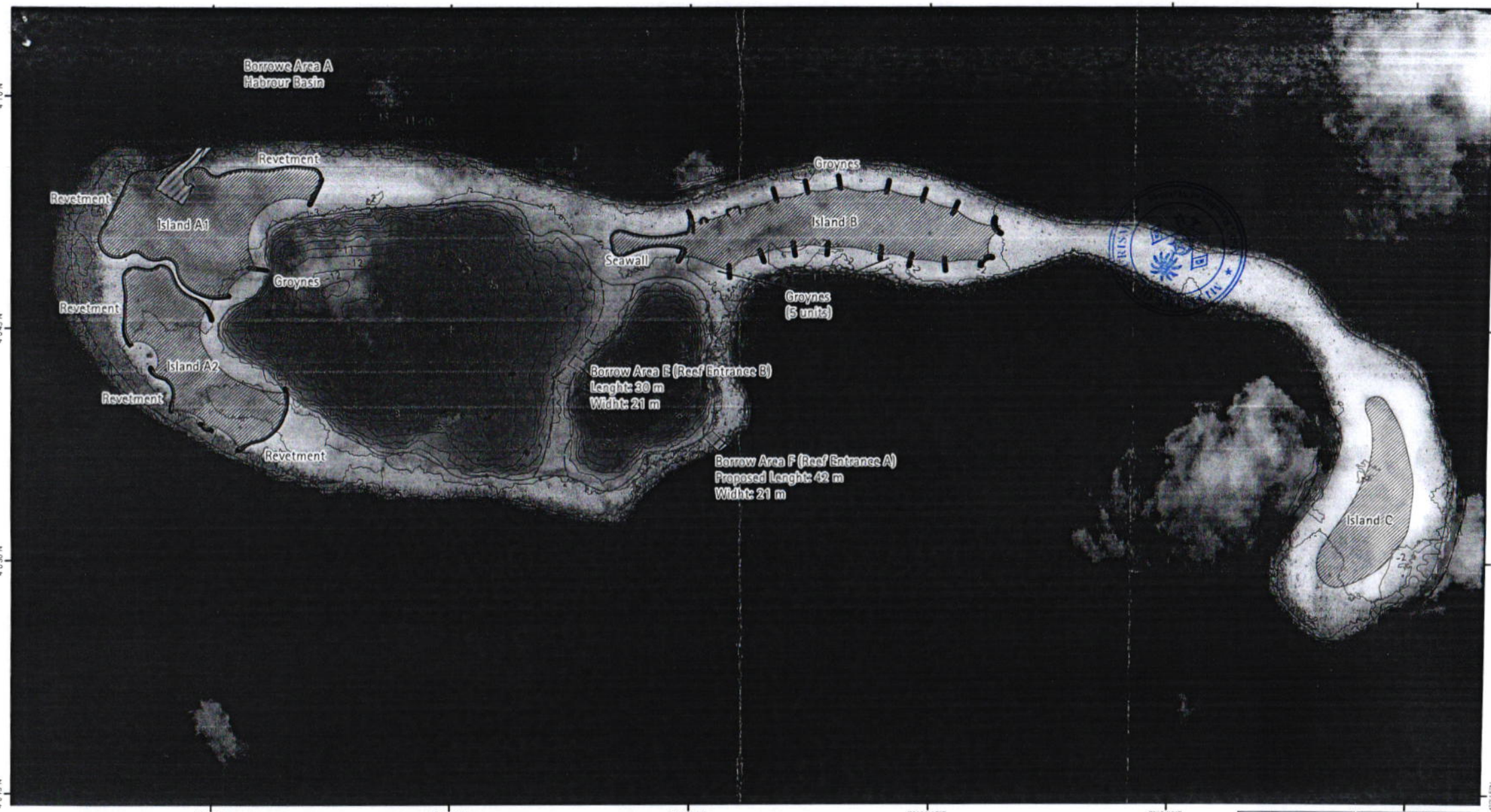
4°15'0"N
4°10'0"N
Four Seasons Resort Maldives at Kuda Huraa
Chaaya Island Dhonveli
Thanburudhoo
Himmafushi
Himmafushi Thila
Thulhaagiri Island Resort
Banyan Tree Maldives Vabbinfaru
Angsana Resort & Spa Maldives Ihuru
Okobe Thila
Gili Lankanfushi
Lakan Thila
Paradise Island Resort
Lankanfinolhu
Baros Holiday Resort
Bandos Island Resort and Spa
Kuda Bandos
Masgiri Reef
Kandoigiri
Kohuhipparu finolhu
Dredge Site B
K a a f u A t o l l
Kudakohuhipparu finolhu
Dredge Site A
Sheraton Maldives Full Moon Resort & Spa
Gaathugiri
Aagrah
Farukolhufushi
Kurumba Maldives
Giraavaru Kuda Haa
Feydhoo Finolhu
Hulhumale'
Centara Ras Fushi Resort & Spa
Dhoonidhoo
Hulhule'
Funadhoo
Lions Head (Miyaruvani)
Gulhifalhu
Hans Hass Place (Gulhifalhu Beyrufaru Kohfavaanee)
Viligili
Male'
Legend
Dredge Areas
Distance
Terrestrial Protected Areas
Marine Protected Areas
Environmentally Sensitive Areas
Island
N
S
E
W
Kaafu Atoll
Vaavu Atoll
Ithaafushi Reclamation Project
South Male' Atoll
Dredge Locations - Hopper Dredger
0 0.5 1 2 3 Km
Map Prepared by CDE Consulting
09/06/2016



Ithaafushi Reef - South Male' Atoll
Proposed Reclamation and Coastal Works Site Plan

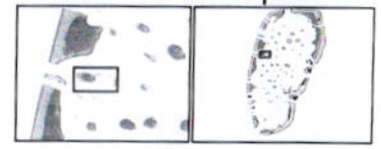
Revised Dredge Areas on reef
ReclamationArea_April2016
ShoreprotectionFeb2016
Shallow Area
Deep Lagoon
Inner Reef Line
Outer Reef Line
Contour

Land Reclamation Sites

SiteID	Area (sq m)	Elevation (m M	Volume (cbm)
Island A1	60,526	1.5	151,314
Island A2	47,509	1.5	118,773
Island B	65,082	1.5	162,706
Island C	35,668	1.5	89,170
Total	208,785		521,962

Dredge Areas Specifications

Site ID	Area (s	Dredge Depth (m MSL)	Volume (
SITE A	4,182	-4	13,225
SITE E	651	-4	1,890
SITE F	864	-4	2,312



Meters
0 100 200 400

PROJECTION: Transverse Mercator
(UTM Zone 43 N); HORIZONTAL DATUM: WGS84;
VERTICAL DATUM: Hulhule Tide Gauge
Map version: 09/06/2016
Surveyed and Prepared by: CDE Consulting, Maldives

APPENDIX C – Site Plan

73°25'0"E
73°30'0"E
73°35'0"E
4°15'0"N
4°10'0"N

Four Seasons Resort Maldives at Kuda Huraa
Chaaya Island Dhonveli
Thanburudhoo
Himmafushi
Himmafushi Thila
Thulhaagiri Island Resort
Banyan Tree Maldives Vabbinfaru
Angsana Resort & Spa Maldives Ihuru
Okobe Thila
GiliLankanfushi
Lakan Thila
Paradise Island Resort
Lankanfinolhu
Baros Holiday Resort
Bandos Island Resort and Spa
Kuda Bandos
Masgiri Reef
Kanduoigiri
Sheraton Maldives Full Moon Resort & Spa
Kohdhipparu Finolhu
Dredge Site B
K a a f u A t o l l
Kudakohdhipparu finolhu
Dredge Site A
Gaathugiri
Farukolhufushi
Aaarah
Kurumba Maldives
Giraavaru Kuda Haa
Feydhoo Finolhu
Hulhumale'
Centara Ras Fushi Resort & Spa
Dhoonidhoo
Hulhule
Funadhoo
Lions Head (Miyaruvani)
Thilafushi
Gulhifalhu
Hans Hass Place (Gulhifalhu Beyrufaru Kohlavaanee)
Viligilli
Male'

Legend
- Dredge Areas
- Distance
- Terrestrial Protected Areas
- Marine Protected Areas
- Environmentally Sensitive Areas
- Island

N
W
E
S

Kaafu Atoll
Kaafu Atoll
Vaavu Atoll

Ithaafushi Reclamation Project
South Male' Atoll
Dredge Locations - Hopper Dredger

0 0.5 1 2 3 Km

Map Prepared by CDE Consulting
09/06/2016

Ithaafushi Reef - South Male' Atoll
Proposed Reclamation and Coastal Works Site Plan

- Revised Dredge Areas on reef
- ReclamationArea_April2016
- ShoreprotectionFeb2016
- Shallow Area
- Deep Lagoon
- Inner Reef Line
- Outer Reef Line
- Contour

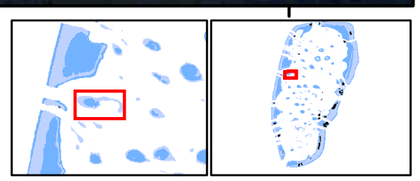
N, W, E, S

Land Reclamation Sites

SiteID	Area (sq m)	Elevation (m M	Volume (cbm)
Island A1	60,526	1.5	151,314
Island A2	47,509	1.5	118,773
Island B	65,082	1.5	162,706
Island C	35,668	1.5	89,170
Total	208,785		521,962

Dredge Areas Specifications

Site ID	Area (s	Dredge Depth (m MSL)	Volume (
SITE A	4,182	-4	13,225
SITE E	651	-4	1,890
SITE F	864	-4	2,312



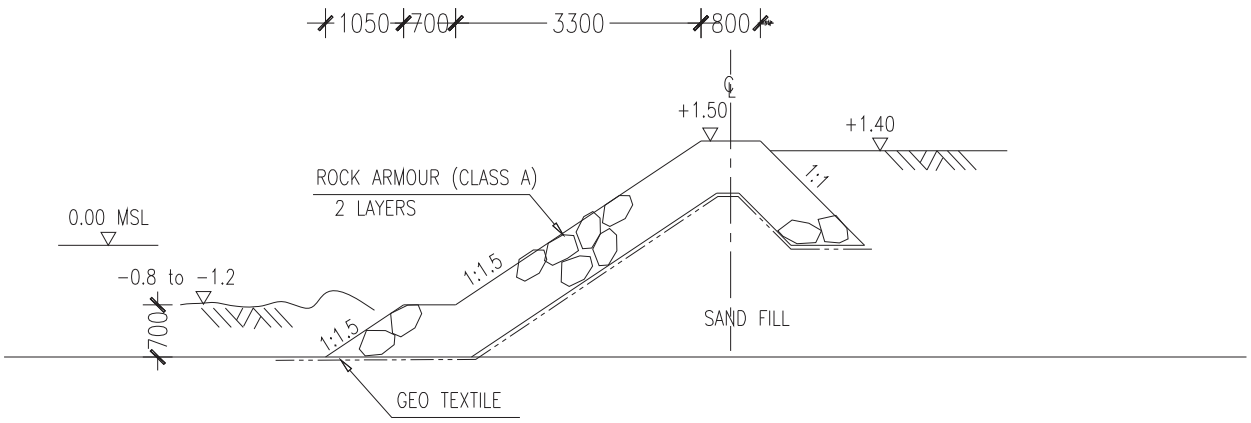
Meters

0 100 200 400

PROJECTION: Transverse Mercator
(UTM Zone 43 N); HORIZONTAL DATUM: WGS84;
VERTICAL DATUM: Hulhule Tide Gauge
Map version: 09/06/2016

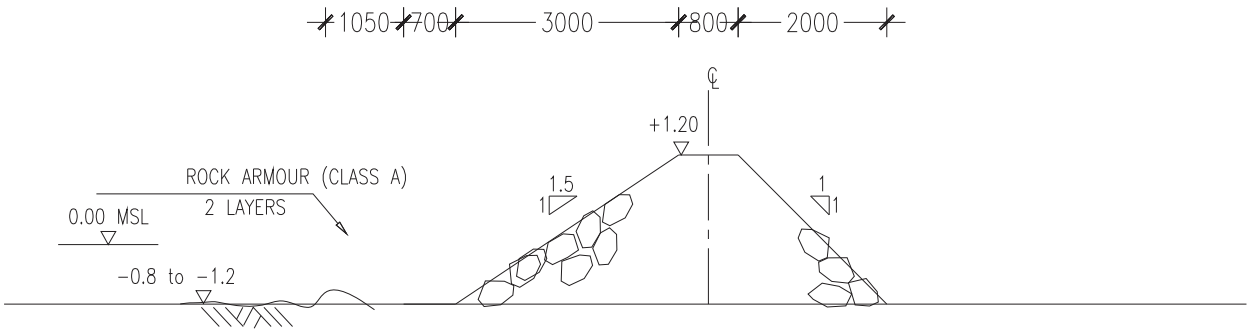
Surveyed and Prepared by: CDE Consulting, Maldives

APPENDIX D – Detailed Drawings



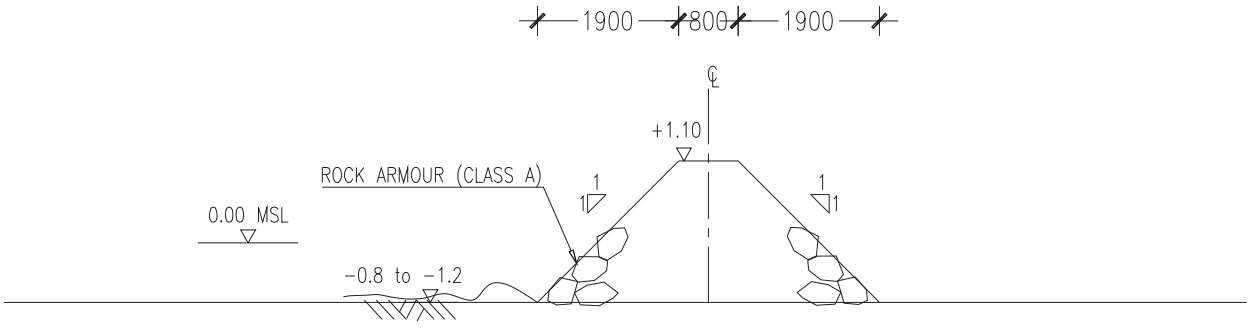
Revetment (Structure Type 1)

a



Revetment End (Structure Type 2)

b



Groyne (Structure Type 3)

c

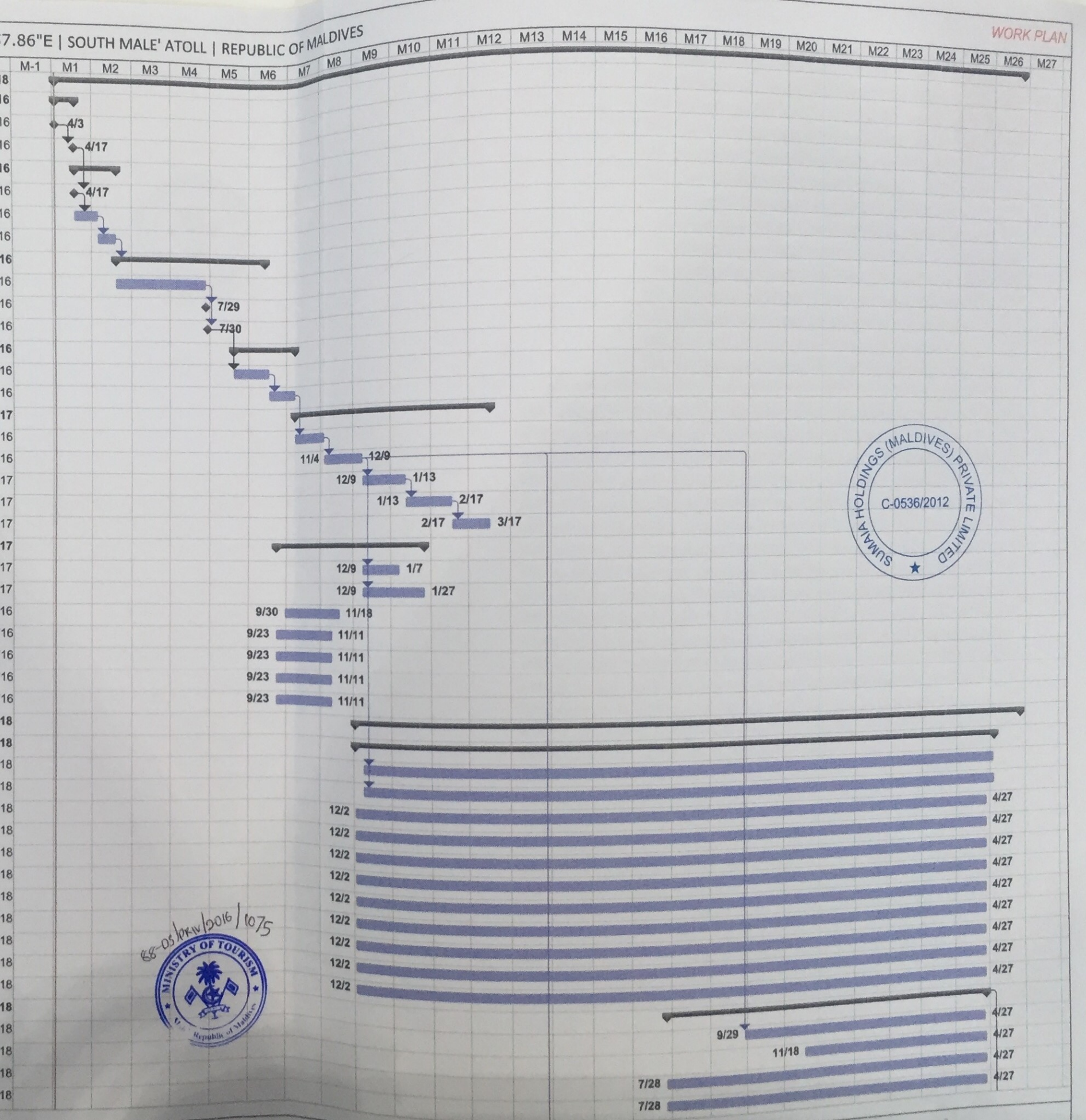
Fig 3. Coastal structure types at Ithafushi

APPENDIX E – Work Plan

MALDIVES ITHAAFUSHI RESORT | LAGOON NINE OR FALHU NINE AT 4°0'47.62"N, 73°22'57.86"E | SOUTH MALE' ATOLL | REPUBLIC OF MALDIVES

WORK PLAN

ID	Task Name	Start	Finish
1	**DEVELOPMENT OF FALHU NINE**	**Sun Apr 3, '16**	**Sun May 27, '18**
2	**Concept Revision**	**Sun Apr 3, '16**	**Sun Apr 17, '16**
3	Revised Concept Submission	Sun Apr 3, '16	Sun Apr 3, '16
4	Revised Concept Approval	Sun Apr 17, '16	Sun Apr 17, '16
5	**EIA Amendment Based on Revised Masterplan**	**Sun Apr 17, '16**	**Thu May 19, '16**
6	Application of EIA Amendment	Sun Apr 17, '16	Mon Apr 18, '16
7	Review of Amendment	Mon Apr 18, '16	Thu May 5, '16
8	Decision Note Issued	Thu May 5, '16	Thu May 19, '16
9	**Construction Drawings**	**Thu May 19, '16**	**Tue Sep 13, '16**
10	Prepare Detailed Drawings	Thu May 19, '16	Fri Jul 29, '16
11	Submit Detailed Drawings	Fri Jul 29, '16	Tue Sep 13, '16
12	Approval of Detailed drawings	Sat Jul 30, '16	Fri Aug 19, '16
13	**Pre Construction Surveys**	**Fri Aug 19, '16**	**Fri Oct 7, '16**
14	Survey of Boudary Lines	Fri Aug 19, '16	Fri Sep 16, '16
15	Setout Reclamation Areas	Fri Sep 16, '16	Fri Oct 7, '16
16	**Reclamation Works For Revised Island Shapes**	**Fri Oct 7, '16**	**Fri Mar 17, '17**
17	Setup Silt Screens	Fri Oct 7, '16	Fri Nov 4, '16
18	Dredging Works	Fri Nov 4, '16	Fri Dec 9, '16
19	Stock Piling Dredged Material	Fri Dec 9, '16	Fri Jan 13, '17
20	Spreading Material	Fri Jan 13, '17	Fri Feb 17, '17
21	Shore Protection Works	Fri Feb 17, '17	Fri Mar 17, '17
22	**Site Temporary Facilities**	**Fri Sep 23, '16**	**Fri Jan 27, '17**
23	Temporary Accommodation Setup	Fri Dec 9, '16	Sat Jan 7, '17
24	Site Office Setup	Fri Dec 9, '16	Fri Jan 27, '17
25	Set up F&B Arrangements	Fri Sep 30, '16	Fri Nov 18, '16
26	Setup Storage Areas	Fri Sep 23, '16	Fri Nov 11, '16
27	Create Access Sand Jetty	Fri Sep 23, '16	Fri Nov 11, '16
28	Identify and Mark Access Roads	Fri Sep 23, '16	Fri Nov 11, '16
29	Erect Signage Where Necessary	Fri Sep 23, '16	Fri Nov 11, '16
30	**Construction Works**	**Fri Dec 2, '16**	**Sun May 27, '18**
31	**Villas**	**Fri Dec 2, '16**	**Fri May 4, '18**
32	1- BR Beach Villa [22 Units]	Fri Dec 9, '16	Thu May 3, '18
33	2- BR Beach Villa + Sitting [10 Units]	Fri Dec 9, '16	Fri May 4, '18
34	2- BR Beach Villa + Sitting + Maid [4 Units]	Fri Dec 2, '16	Fri Apr 27, '18
35	3- BR Royal Villa - Beach	Fri Dec 2, '16	Fri Apr 27, '18
36	1- BR Over Water Villa [58 Units]	Fri Dec 2, '16	Fri Apr 27, '18
37	1- BR Boat Villa [10 Units]	Fri Dec 2, '16	Fri Apr 27, '18
38	2- BR Over Water Villa [7 Units]	Fri Dec 2, '16	Fri Apr 27, '18
39	2- BR Water Villa + Maid [4 Units]	Fri Dec 2, '16	Fri Apr 27, '18
40	2- BR Boat Villa [10 Units]	Fri Dec 2, '16	Fri Apr 27, '18
41	3- BR Royal Villa - Over Water	Fri Dec 2, '16	Fri Apr 27, '18
42	4- BR Over Water Presidential Villa	Fri Dec 2, '16	Fri Apr 27, '18
43	**Front of House**	**Fri Jul 28, '17**	**Fri Apr 27, '18**
44	Arrival Jetty	Fri Sep 29, '17	Fri Apr 27, '18
45	Arrival Jetty Pavilion	Sat Nov 18, '17	Fri Apr 27, '18
46	Reception, Lobby & Library	Fri Jul 28, '17	Fri Apr 27, '18
47	All Day Dining Restaurant	Fri Jul 28, '17	Fri Apr 27, '18



SUMAIA HOLDINGS (MALDIVES) PRIVATE LIMITED C-0536/2012

88-05/KRW/2016/1075 MINISTRY OF TOURISM Republic of Maldives

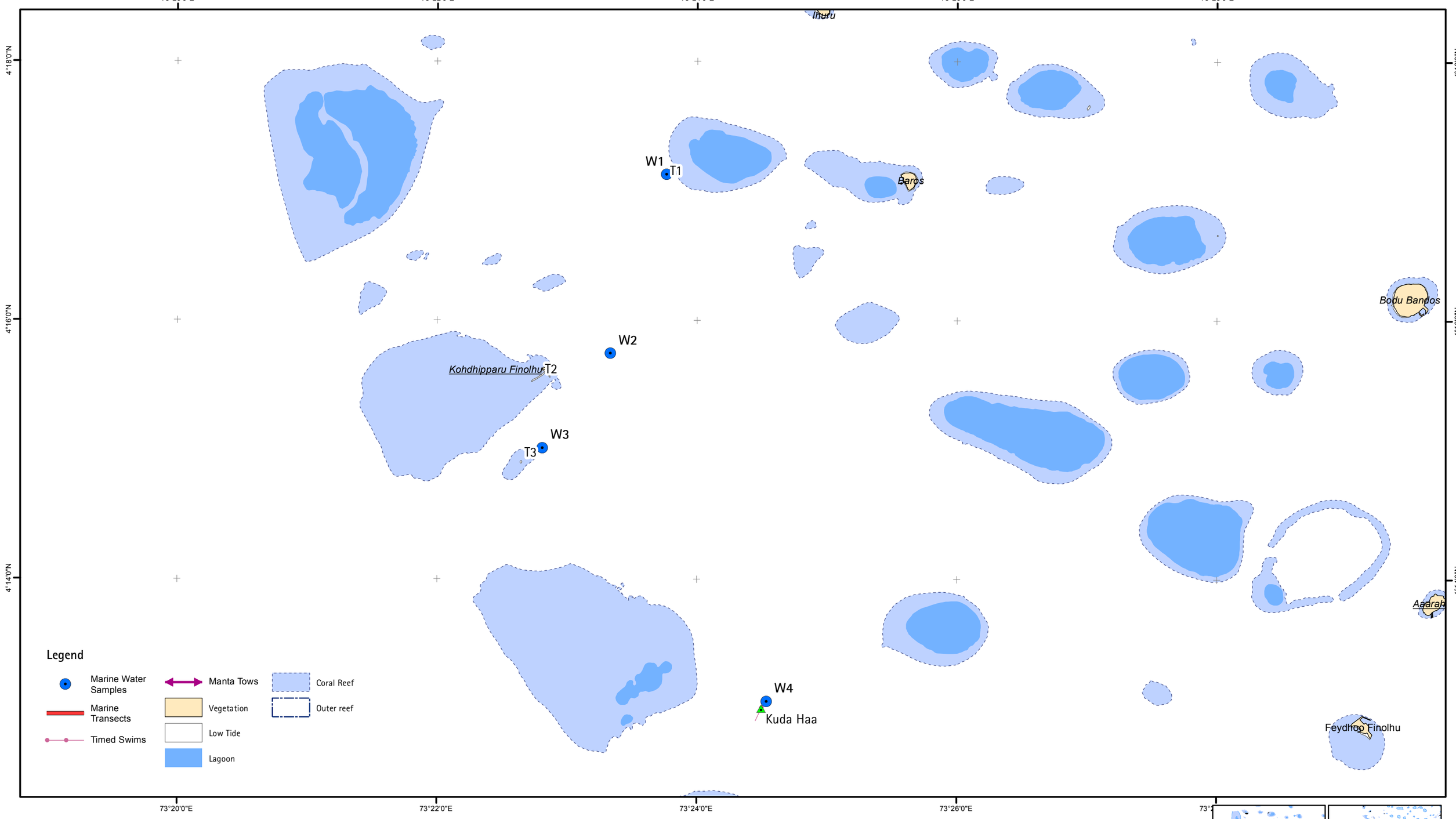
20-August-2015
Revision 1

Task | Milestone | Summary | Rolled Up Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Progress | Deadline

Preliminary Work Plan - Subject to Change

SUMAIA HOLDINGS (MALDIVES) PVT LTD

APPENDIX F – Survey Locations



Marine water

code	X	Y
W1	73.3961	4.28542
W2	73.3889	4.26237
W3	73.3802	4.25022
W4	73.409	4.21761

Transects

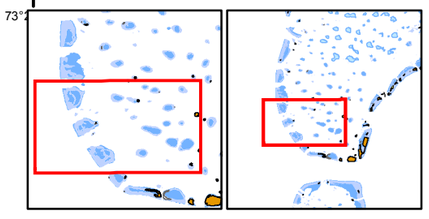
Site_ID	X_Start	Y_Start	X_Start	Y_Finish
T1	73.3972	4.28648	73.3974	4.28607
T2	73.3812	4.26095	73.3815	4.26057
T3	73.3787	4.25021	73.3789	4.24981

Ithaafushi Reef Resort Development Project
North Male' Borrow Area
Survey Locations

N W E S

Meters

0 400 800 1,600



PROJECTION: Transverse Mercator
(UTM Zone 43 N); HORIZONTAL DATUM: WGS84;
VERTICAL DATUM: Hulhule Tide Gauge
Map version: 20/06/2016

Surveyed and Prepared by: CDE Consulting, Maldives

APPENDIX G – Water Quality Results

Male' Water & Sewerage Company Pvt Ltd
Water Quality Assurance Laboratory
FEN Building 5th Floor, Machangoalhi, Ameeneemagu, Male', Maldives
Tel: +9603323209, Fax: +9603324306, Email: wqa@mwsc.com.mv

بسم الله الرحمن الرحيم

MWSC

WATER QUALITY TEST REPORT

Test Report No: 300678/2015/70

Customer Informations : ***CDE Consulting Pvt Ltd***
H.Orchidmaage 4th Floor
Ameeru Ahmed Magu
Male'
Rep.of Maldives

Date: 04/10/2015

Sample Description / Location~	Falhu 9			TEST METHOD	UNIT
	SW 1	SW 2	SW 3		
Sample Type~	Sea water				
Sampled Date~	27/9/2015				
Sample Received Date	28/9/2015				
Test Requisition Form No.	900162358				
Sample No.	819860	819861	819862		
Date of Analysis	28/9/2015 - 3/10/2015				
PARAMETER	ANALYSIS RESULT				
Physical Appearance	Clear	Clear	Clear	Visual	-
Nitrate	0.2	0.2	0.3	Method 8171 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)	mg/L
pH	8.21	8.24	8.24	Method 4500-H+ B. (adapted from Standard methods for the examintation of water and waste water, 21st edition)	-
Salinity	35.1	35.3	35.1	Method 2520 B. (adapted from Standard methods for the examintation of water and waste water, 21st edition)	‰
Phosphate	<0.05 (LoQ 0.05mg/L)	<0.05 (LoQ 0.05mg/L)	<0.05 (LoQ 0.05mg/L)	Method 8048 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)	mg/L
Temperature	21.3	21.4	21.5	Electrometry	°C
Biological Oxygen Demand	1	1	1	HACH Method 8043	mg/L
Total Suspended Solids	<5 (LoQ 5 mg/L)	<5 (LoQ 5 mg/L)	<5 (LoQ 5 mg/L)	Method 8006 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)	mg/L

Keys:
mg/L: Milligram Per Liter, **‰:** Parts Per Thousand, **°C:** Degree Celcius
LoQ: Limit of Quantification

Checked by:	Approved by:
Afnan Farooq Laboratory Executive	Mohamed Eyman Senior Technical Officer

Notes:
Sampling Authority: Sampling was not done by MWSC Laboratory
This report shall not be reproduced except in full, without written approval of MWSC
This test report is ONLY FOR THE SAMPLES TESTED.
~ Information Supplied by the customer

**********END OF THE REPORT**********

Male' Water & Sewerage Company Pvt Ltd
Water Quality Assurance Laboratory
FEN Building 5th Floor, Machangoalhi, Ameeneemagu, Male', Maldives
Tel: +9603323209, Fax: +9603324306, Email: wqa@mwsc.com.mv

بسم الله الرحمن الرحيم

MWSC

WATER QUALITY TEST REPORT

Test Report No: 300678/2016/39

Customer Informations : ***CDE Consulting Pvt Ltd***
H.Orchidmaage 4th Floor
Ameeru Ahmed Magu
Male'
Rep.of Maldives

Date: 19/06/2016

Sample Description / Location~	Baros Thila SW1	Kohdhipparu Reef SW2	Kohdhipparu Finolhu SW3	Kuda Haa SW4	TEST METHOD	UNIT
Sample Type~	Sea water					
Sampled Date~	9/6/2016					
Sample Received Date	12/6/2016					
Test Requisition Form No.	900164320					
Sample No.	824140	824141	824142	824143		
Date of Analysis	12/6/2016 - 19/6/2016					
PARAMETER	**ANALYSIS RESULT**					
Physical Appearance	Clear	Clear	Clear	Clear	Visual	-
Nitrate	3.3	3.4	3.2	3.2	Method 8171 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)	mg/L
pH	8.08	8.12	8.13	8.09	Method 4500-H+ B. (adapted from Standard methods for the examintation of water and waste water, 21st edition)	-
Phosphate	0.16	0.09	0.10	0.13	Method 8048 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)	mg/L
Biological Oxygen Demand (BOD)	1	2	1	2	HACH Method 8043	mg/L
Total Suspended Solids (TSS)	<5 (LoQ 5mg/L)	<5 (LoQ 5mg/L)	<5 (LoQ 5mg/L)	<5 (LoQ 5mg/L)	Method 8006 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)	mg/L
Turbidity	0.192	<0.1 (LoQ 0.1NTU)	0.356	<0.1 (LoQ 0.1NTU)	HACH Nephelometric Method (adapted from HACH 2100N Turbidimeter User Manual)	NTU

Keys:
mg/L: Milligram Per Liter,**NTU:** Nephelometric Turbidity Unit
LoQ: Limit of Quantification

Checked by:	Approved by:
Afnan Farooq Laboratory Executive	Mohamed Eyman Senior Technical Officer

Notes:
Sampling Authority: Sampling was not done by MWSC Laboratory
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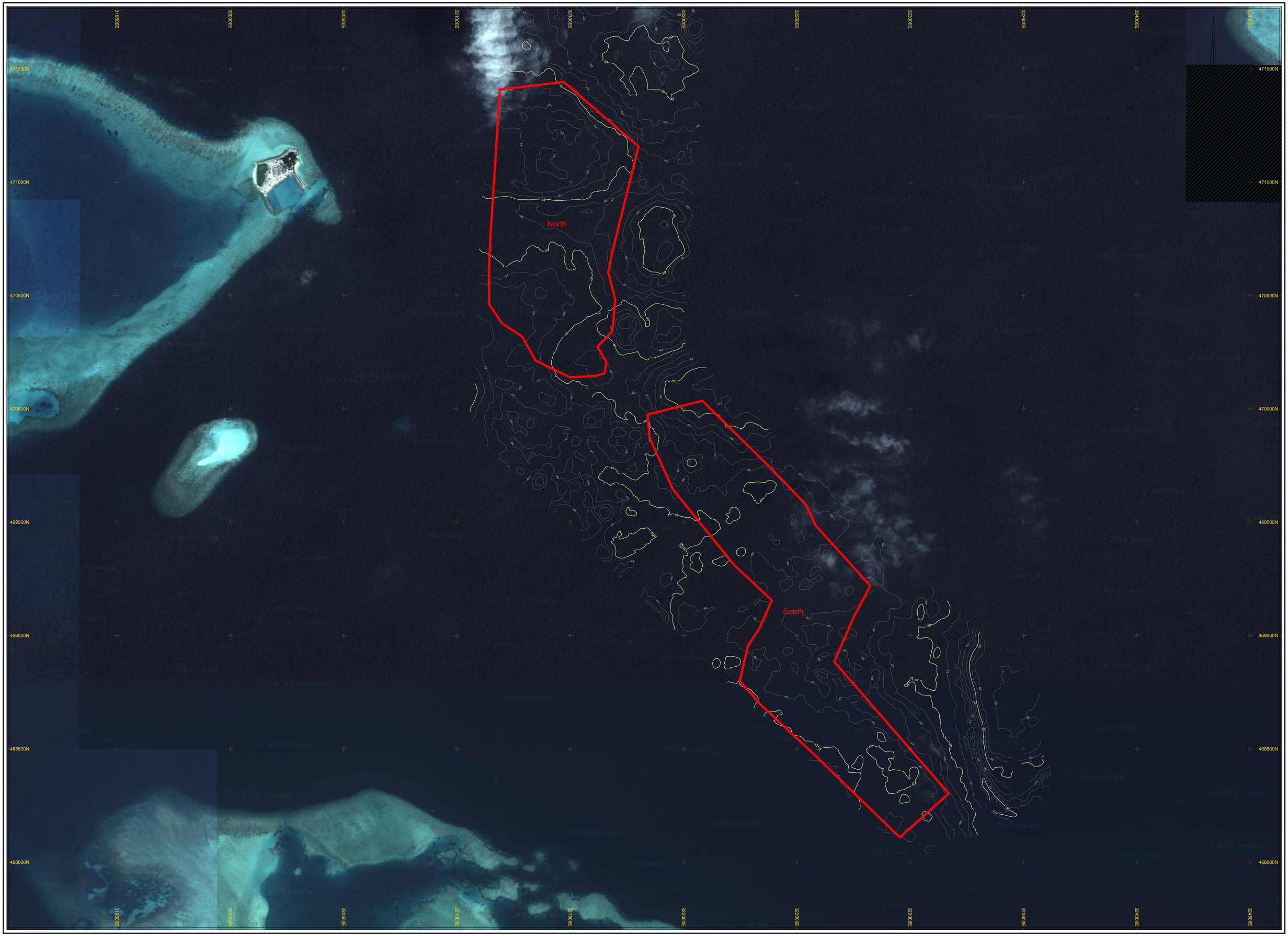
~ Information Supplied by the customer

**********END OF THE REPORT**********

APPENDIX H – Bathy Chart


North
South
319650E
320000E
320350E
320700E
321050E
321400E
321750E
322100E
322450E
322800E
323150E
323500E
323850E
324200E
324550E
471500N
471000N
470500N
470000N
469500N
469000N
468500N
468000N

APPENDIX I – Dredger Details

Van Oord

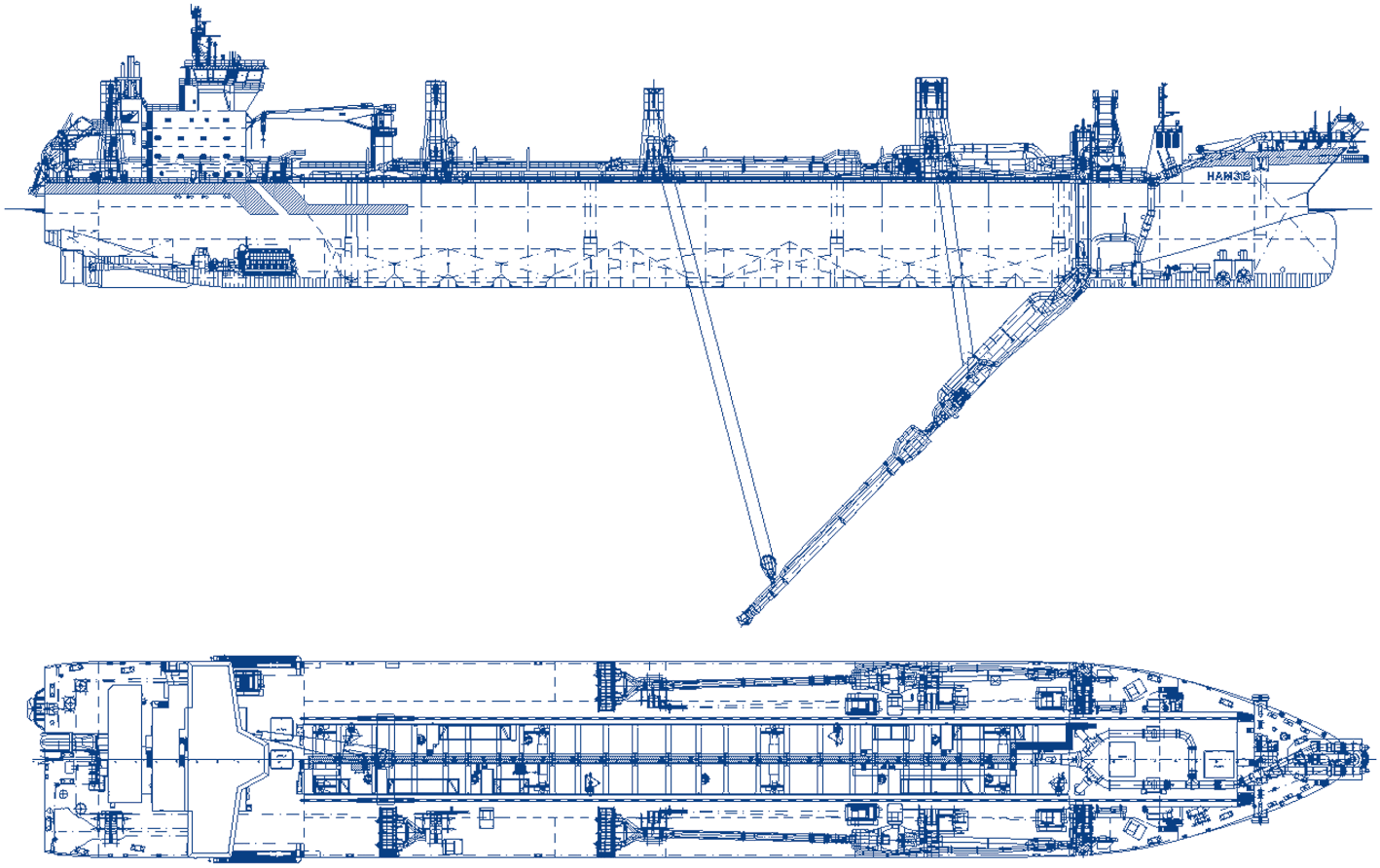
Marine ingenuity

Equipment

Trailing suction hopper dredger
HAM 318

Dredging and Marine Contractors

Van Oord
Marine ingenuity



HAM 318

Name	HAM 318	
Type	Trailing suction hopper dredger	
Classification	Bureau Veritas, I ✠ Hull ✠ Mach ✠ AUT-UMS ✠ SYS-NEQ-1, hopper dredger, unrestricted navigation, dredging within 15 miles from shore or within 20 miles from port, dredging over 15 miles from shore with H.S. ≤ 3.5 m, dredging within 8 miles from shore, dredging over 8 miles from shore with H.S. ≤ 2.0 m	
Year of construction	2001	
Year of upgrading	2008	
Dimensions	Length overall	227.20 m
	Breadth overall	32.05 m
	Moulded depth	17.12 m
	Dredging draught	13.00 m (15 miles) and 13.55 m (8 miles)
Hopper capacity	37,293 m^3	
Deadweight	61,071 tons	

Maximum dredging depth	70.0 m / 101.0 m
Suction pipes	2 x ø 1,200 mm
Discharge pipe	ø 1,100 mm
Speed loaded	15.5 kn
Propulsion	2 x 12,600 kW
Bow thrusters	2 x 1,500 kW
Bow jet	2,250 kW
Total power installed	28,636 kW
Inboard dredge pumps	2 x 2,750 kW
Submerged dredge pumps	2 x 2,500 kW
Jet pumps	2 x 2,150 kW

Contact

Van Oord
PO Box 8574
3009 AN Rotterdam
The Netherlands
T +31 88 8260000
F +31 88 8265010
E info@vanoord.com
I www.vanoord.com

August 2015

APPENDIX J – CVs of consultants

Ahmed Shaig

Phone: (+960) 77 88 758 shaig@cde.com.mv

Personal Details

Date of Birth: 19/02/1976 **Nationality:** Maldivian **Gender:** Male **Marital Status:** Married

Permanent Address: Maldives **Present Address:** M. Muleege, Orchid Magu, Male', Maldives.

Education

PhD, Environmental Science, 2009
James Cook University, Townsville, Australia

Research degree on 'Settlement Planning for Natural Hazard Resilience in Small Island States: The Population and Development Consolidation Approach'

BSc Land and Spatial Information Studies/Information Science. (double major), 1999-2001
University of Otago, Dunedin, New Zealand

Diploma in project planning, implementation, monitoring and evaluation, 1995
ILO training Centre, Turin, Italy

Employment History

Director, Environmental Services 2008 to present
CDE Consulting Supervisor: Dr. Simad Saeed
Republic of Maldives Phone: +(960) 7777445
Head of environmental wing

Assistant Under-secretary, Spatial Planning 2002-2004
Ministry of Planning and National Development Supervisor: Hon. Hamdun Hameed
Republic of Maldives Phone: +(960) 332-3919
Head of Spatial Planning Unit. Relevant Tasks include:

- Oversee environment related projects and application of environmental guidelines for planned projects.
- Plan, implement and oversee the development of a National GIS;
- Aid/facilitate/oversee urban planning, housing, land use planning, natural resource planning and environment related projects; Provide assistance in project planning (includes urban and regional planning, natural resources planning)

Project Manager, National Digital Mapping Project 2005 (8 months)
Ministry of Planning and National Development Supervisor: Hon. Hamdun Hameed
Republic of Maldives Phone: +(960) 332-3919

- Project involved aerial photography and satellite imagery of entire Maldives, ground surveying of key settlements, digital conversion of data and setting up a Mapping Unit.

Assistant Planning Officer/Planning Officer 1994-1999
Ministry of Planning and National Development Supervisor: Mr. Mohamed Hunaif
Republic of Maldives Phone +(960) 331-3040
Relevant tasks involved:

- Assisting in the National GIS Development Programme (Junior GIS developer)
- Facilitate urban planning, housing, land use planning, natural resource planning and environment related projects.

Experience in Consultancy

- *September 2002:* Member of the team appointed for environmental surveying and carrying capacity assessment of islands for tourism development in the southern atolls of Maldives for Ministry of Tourism Maldives.
- *October 2002:* Developed the Census GIS for United National Population Fund
- *December 2002:* Developed the Maldives Protected Areas Systems GIS for Maldives Home Affairs Housing and Environment.
- *February 2003*: Participated in the preparation of Royal Island and Spa Resort Annual Environmental Monitoring Report for Royal Island and Spa.
- *April 2003:* Member of the team selected for developing town plans for urban centres in Northern and Southern Regional Development Zones, looking specifically into environmental control measures, for Ministry of Planning and National Development.
- *April 2003:* Participated in the preparation of Environmental Impact Statement for Coastal Modifications on Rihiveli, South Malé Atoll, Maldives.
- *April 2003:* Participated in the surveying and preparation of Environmental Impact Statement for the proposed coastal improvements to address coastal erosion concerns on Royal Island Spa Resort, Baa Atoll, Maldives.
- *May 2003:* Participated in the bathymetry survey and preparation of Initial Environmental Examination for Deepening of Existing Entrance Channel to Service Jetty, Soneva Gili Resort and Spa, North Malé Atoll, Maldives
- *May 2003:* Participated in the preparation of Initial Environmental Examination for development of an access channel into the natural inner lagoon (*Vilu*) of Mayafushi resort, North Ari Atoll.
- *May 2003:* Participated in the preparation of Environmental Impact Assessment for Landaa Giraavaru Pvt. Ltd. for the development of a Four Season's Tourist Resort on the island of Landaa Giraavaru in Baa Atoll, Maldives.
- *June 2003:* Participated in survey and preparation of Initial Environmental Examination for the Development of a Mooring Area and Associated Beach Replenishment in, Boduhithi Club, North Malé Atoll, Maldives.
- *July 2003:* Participated in the surveying and preparation of Initial Environmental Examination for Short-term and Long-term Shore Protection Measures at Alimatha Tourist Resort, Vaavu Atoll, Maldives.
- *July 2003:* Conducted shoreline and vegetation line of Alimatha Tourist Resort, Vaavu Atoll, Maldives.
- *July 2003:* Participated in the surveying for Initial Environmental Examination for Short-term and Long-term Shore Protection Measures at Dhiggiri Tourist Resort, Vaavu Atoll, Maldives.
- *July 2003:* Participated in conducting and preparation of Fun Island Resort Annual Environmental Monitoring Report.
- *July 2003:* Participated in conducting and preparation of Sun Island Resort Annual Environmental Monitoring Report.
- *July 2003:* Participated in conducting and preparation of Holiday Island Resort Annual Environmental Monitoring Report.
- *August 2003:* Developed the Initial Environmental Examination for the construction of Sun Decks along the southern beach of Kudarah Island Resort.
- *September 2003:* Participated in surveying and preparation of Fonaddoo Environmental Impact Assessment Report for the development of fisheries complex, Fonaddoo, Maldives.
- *October 2003*: Participated in surveying and preparation of Kuda Rah Erosion Study and recommendations for shore protection and erosion prevention
- *November 2003:* Conducted vegetation and shoreline survey of Dhonveli Beach and Spa and Four Seasons Report for the Boundary Delineation between the two islands.
- *December 2003:* Contributed to the Landuse Planning Guidelines of Maldives (environmental aspects) for Ministry of Housing and Urban Development.
- *December 2003*: Contributed to the Development of a Building Code of Maldives for Ministry of Housing and Urban Development.
- *January 2004:* Co-author to the Environmental Guidelines for the Development of Resort Islands in Maldives, Ministry of Tourism.
- *February 2004:* Developed the Baa Atoll Spatial Development Plan for Ministry of Planning and National Development.

- *April-July 2004:* Participated in the preparation of the Environmental aspects of the 8 bid proposals for resort Development for various proponents.
- *November 2005:* Participated in the preparation of EIA for L.Gan Resettlement Project for Ministry of Housing.
- *December 2005:* Participated in the surveying and preparation of EIA for Gn Fuvahmulaku Tourist Hotel Development
- *November 2005:* Developed a GIS for strategic planning to select islands for tourism development for Ministry of Tourism.
- *January 2006:* Local consultant for the Strategic Environmental Assessment (SEA) of Maldives Regional Development Plan, for AGRIFOR Consult Consortium, Belgium.
- *June 2006:* Developed the Baa Atoll Resource Management GIS for Ministry of Environment and Energy.
- *August 2006:* Consultant to the Integrated Climate Change System (ICCS) project – Assessment of vulnerability of Maldives Islands and Beaches to climate change
- *September 2006:* Consultant to the ICCS project – Assessment of vulnerability of Maldives Infrastructure to climate change
- *November 2006:* Consultant to the preparation of National Adaptation Programme of Action in Maldives for Ministry of Environment.
- *December 2006*: Environmental Consultant to the United Nations Development Programme (UNDP) Project: Disaster Risk Assessment of Selected nine Safe Islands in Maldives.
- *April 2007:* Prepared the Coastal Erosion Assessment and Management Report for Ga.Meradhoo Island.
- *May 2007:* Participated in the preparation of EIA for N. Randheli Resort Development Project, I&T Management group.
- *June 2007:* Participated in the preparation of Millennium Development Goals, Maldives Country Report.
- *October 2007*: Natural Hazard Assessment consultant to the UNDP Project: Disaster Risk Assessment of Selected Safe Islands in Maldives.
- *November 2007*: Prepared the EIA for proposed coastal protection, beach replenishment and access improvement of Elaa, Thaa Atoll, for Mr Abbas Mohamed, H. Merry Rose.
- *May 2009*: Participated in the preparation of EIA for sand sourcing and beach replenishment project of Viligilli Island, Addu Atoll, for Shangri-La at Viligilli..
- *April 2009:* Participated in the preparation of EIA for N. Maafaru Airport Development Project for Noonu Hotels Pvt Ltd.
- *May 2009:* Participated in the preparation of EIA for resort development in Huvandhumaavattaru, Noonu Atoll
- *June 2009:* Prepared a status of the environment report Randheli Island, Noonu Atoll.
- *July 2009:* Prepared the Environmental EIA for harbour development in Fiyoari, Gaafu Dhaalu Atoll.
- *July 2009:* Participated in the preparation of EIA for Jetty and arrival lounge development project in Gan, Addu Atoll, for Island Aviation Services Private Limited.
- *July 2009:* Team Leader for the socio-economic risk assessment of Selected Safe Islands in Maldives.
- *August 2009:* Coastal erosion data synthesis for selected islands of Maldives, for World Bank Maldives Environmental Management Project.
- *September 2009:* Prepared the beach management plan and development control measures for Reethibeach Island Resort, Baa Atoll.
- *September 2009:* Participated in the preparation of EIA for agricultural island development in Felivaru, Noonu Atoll, for Fantasy Private Limited.
- *September 2009:* Consultant to review the safer islands programme and cost benefit study of mitigation measures in three islands in the Maldives for UNDP.
- *October 2009:* Consultant to the Maldives Environmental Management Project for waste management technical assistance for World Bank.
- *December 2009:* Environmental consultant for advising on resort development and development control measures in Randheli Island, Noonu Atoll.
- *January 2010:* Prepared the beach management plan and development control measures for Shangri-La Island Resort, Addu Atoll.
- *January 2010:* Consultant to the Atoll Ecosystem Conservation project conservation component defining conservation areas and development controls.
- *February 2010:* Prepared the environmental audit of Thunbafushi Island, Kaafu Atoll, for Champa Brothers Private Limited.

- *March 2010:* Prepared the beach management plan and development control for Herathera Island Resort, Addu Atoll.
- *March 2010:* Lead author in the preparation of EIA for power plant upgrading project in Palm Beach Island in Lhaviyani Atoll.
- *April 2010:* Lead author in the preparation of EIA for Seagrass removal and beach replenishment project in Olhuveli Island Resort and Spa, Kaafu Atoll.
- *April 2010:* Prepared an EIA addendum for resort development in Gaakoshibee Island, Shaviyani Atoll.
- *May 2010:* Consultant to undertake island environmental scoping studies in 30 islands in North Maldives to determine islands with resort development potential for GMR Group of India.
- *May 2010:* Lead author in the preparation of EIA for harbour development project in Madidhoo Island, Shaviyani Atoll.
- *June 2010:* Lead author in the preparation of EIA for deep piling project in Olhuveli Island Resort and Spa, Kaafu Atoll.
- *July 2010:* Lead author in the preparation of EIA for the development of an aquaculture site in Kanduoigiri, Kaafu Atoll.
- *July 2010:* Environmental planning consultant for Shangri-La at Viligilli Maldives, Addu Atoll.
- *July 2010:* Environmental planning consultant to the Addu Land Use Planning project (including defining development controls) in Addu Atoll Maldives for South Province Office.
- *August 2010:* Environmental Consultant for the Atoll Ecosystem Conservation Project to declare Baa Atoll as a UNESCO Biosphere reserve.
- *September 2010:* Lead author in the EIA for Seagrass removal and beach replenishment project in Herathera Island, Addu Atoll.
- *September 2010:* Lead author in the EIA for resort redevelopment in Vilamendhoo Island Resort, Ari Atoll.
- *September 2010:* Lead author in the preparation of EIA for Gulhifalhu land reclamation project in Gulhifalhu, Male' Atoll, for Capital Investment and Finance Limited, UK.
- *September 2010:* Participated in the preparation of EIA for sewerage system development project in Miladhoo, Noonu Atoll.
- *October 2010:* Consultant to undertake the coastal adaptation survey of 40 islands in Maldives for Ministry of Housing and Environment.
- *November 2010:* Environmental consultant for advising on resort development and development control measures in Maamigili Island, Raa Atoll
- *January 2011:* Lead author in the preparation of EIA for sewerage and water system development project in Hithadhoo Island, Addu City for Bi-water International Private Limited.
- *February 2011:* Lead author in the preparation of EIA for sewerage and water system development project in Maradhoo Island, Addu City for Bi-water International Private Limited.
- *March 2011:* Lead author in the preparation of EIA for sewerage and water system development project in Feydhoo Island, Addu City for Bi-water International Private Limited.
- *April 2011:* Lead author in the preparation of EIA for sewerage and water system development project in Maradhoo-Feydhoo Island, Addu City for Bi-water International Private Limited.
- *May 2012:* Coastal erosion mitigation assessment and planning for Six Senses Laamu, Laamu Atoll
- *January 2012:* Lead author in the preparation of EIA for sewerage and water system development project in Fuvahmulah Island, Addu City for Bi-water International Private Limited.
- *February 2012:* Coastal erosion mitigation assessment and planning for Fushivelavaru Island
- *March 2012:* EIA for the proposed resort redevelopment project in Conrad Rangali Island for Champa and Crown Resorts
- *March 2012:* EIA for the proposed resort redevelopment project in Gasfinolhu Island Resort, Champa and Crown Resorts
- *May 2012:* Environmental consultant for advising on resort development and development control measures in Gasfinolhu Island, Male' Atoll
- *June 2012:* Environmental consultant for advising on resort development and development control measures in Nakachchaa Huraa Island, Male' Atoll
- *April 2012:* Member of the consultant team that prepared the Tourism Opinion and Profile Survey 2011, Ministry of Tourism.
- *October 2012:* Environmental consultant to the preparation of 4th Tourism Master plan for Ministry of Tourism, Maldives.
- *November 2013:* Environmental consultant for advising on land reclamation, resort development and development control measures in Dhiffushi Island Reef, Male' Atoll.

- *January 2013:* Environmental consultant for advising on resort development and development control measures in Hankede Island, Addu Atoll
- *January 2013:* Environmental consultant for advising on resort development and development control measures in Hankede Island, Addu Atoll
  June 2013: Local Environment consultant to the WCCM project, HIDRIA and Aquatica, Spain.

Membership of Professional Bodies

- Member of Building Code Committee, Maldives
- Member of Commission on Sustainable development
- Member of the Technical Committee for Developing Spatial Plans for conducting tourism related activities in Ari Atoll.
- Member of Climate Advisory Council to the President of Maldives 2009- to present.
- Registered EIA Consultant in Maldives Environment Protection Agency roster.

Major Publications

SHAIG, A. (2001) "An Overview of Web Based Geographic Information Systems". In Proceedings: Thirteenth Annual Colloquium of the Spatial Information Research Centre. P.A. Whigham (ed). 2 - 5 Dec, Dunedin, New Zealand. University of Otago, pp.255-264.

SHAIG, A. (2006). Climate Change Vulnerability and Adaptation Assessment of the Coastal Infrastructure of Maldives. Technical Paper submitted to Maldives National Adaptation Plan of Action for Climate Change. Ministry of Environment, Energy and Water, Male', Maldives.

SHAIG, A. (2006). Climate Change Vulnerability and Adaptation Assessment of the Land and Beaches of Maldives. Technical Paper submitted to Maldives National Adaptation Plan of Action for Climate Change. Ministry of Environment, Energy and Water, Male', Maldives.

SHAIG, A. (2007) Land Study of Maldives, 2006. Ministry of Planning and National Development, Male' Maldives.

SHAIG, A. and Aslam, M (2007) Detailed Island Risk Assessment Maldives Volume I to Volume IV – Natural Hazard Assessment (Final Draft). UNDP, Male' Maldives

SHAIG, A. (2007) Detailed Island Risk Assessment Maldives Volume I to Volume IV – Environmental Vulnerability Assessment (Final Draft). UNDP, Male' Maldives.

Academic Achievements

2001 Critchlow Associates Prize in Surveying, New Zealand.
Prize awarded annually by University council for the highest standard of Achievement in Spatial Information Studies in University of Otago.
1994 Certificate for best results in General Certificate of Examinations, Advanced Level.
Science Education Centre, Male', Maldives

References

Hamdun Hameed
Member of Parliament
Male', Maldives
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minister@planning.gov.mv

Simad Saeed, Dr
Managing Director,
CDE Consulting
Male', Maldives
Tel: +960 777 7445
Email: simad@cde.com.mv

David King, Dr.
Associate Proffessor
James Cook University
Townsville, QLD,Australia, 4811
Tel: (+61) 747 81 4441 ,Fax: (+61) 747 81 5581
Email: david.king@jcu.edu.au

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Head of School, TESAG Department
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Email: peter.valentine@jcu.edu.au

Clarification

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 willful misstatement described herein may lead to my disqualification or dismissal, if engaged.

Signature Date: 15 July 2013

Mohamed Faizan

Contact Details

Address: H. Pent Land,
Lansimoo Goalhi,
20041 Male',
Maldives

Tel: +960-7501205

E-mail: Mohamed.faizan@gmail.com

Education

August 2012 – September 2014 **University of Malaya, (Malaysia)**
- Master of Technology (Environmental management),
- Dissertation title "Study on the impact of anthropogenic pressure on coral reefs around Cape Rachado, Malacca and recommendations to improve its management"

July 2006- June 2010 **International Islamic University Malaysia, (Malaysia)**
- Bachelor of Biotechnology (Honours).
- Final year thesis title "Spatio-temporal study on coastline changes along Tanjung Lumpur – Cherok Paloh Coast".

June 2002 – June 2004 **Centre for Higher Secondary School, (Maldives)**
- GCE Advanced level.

January 1997 – February 2002 **Majeediyaa School, (Maldives)**
- GCE Ordinary level.

Employment History

July 2014 – Present **CDE Consulting**
- **Environmental Consultant** at CDE Consulting. Roles and responsibilities include preparation of Environmental Impact Assessment reports, undertaking environmental baseline surveys, and conduct environmental monitoring.

June 2010 – July 2012 **CDE Consulting**
- **Environmental Consultant** at CDE Consulting. Responsibilities included undertaking environmental baseline studies for Environmental Impact Assessments, and environmental monitoring. In addition, co-ordination of field surveys.

February 2005 – April 2006 **Integrated Climate Change Strategy**
- **Project Assistant** for the Integrated Climate Change Strategy implemented by Ministry of Environment, Energy and Water (Maldives).
- Responsibilities included assisting the project manager, in preparation of financial reports, organizing workshops.
- Helped launch monthly newsletter on climate change "Nakaiy".

EIA experience

Environmental Impact Assessment (EIA)	Proponent	Date
EIA for the proposed sewerage system project at Kanditheem, Shaviyani - Marine environment assessment and report for the EIA	Male' Water and Sewerage Company Pvt Ltd	April 2014
EIA for the proposed beach replenishment project in Holiday Inn Resort Kandooma, Maldives, South Male' Atoll - Marine environment assessment and report for the EIA	Holiday Inn Resort Kandooma Maldives	April 2014
EIA report for the proposed sewerage system at Maduvvari, Raa Atoll - Undertook the baseline assessment surveys, including stakeholder consultations. Complied the EIA report.	Mr. Ibrahim Shazyl, Venture Maldives Pvt Ltd	February 2012
EIA report for the proposed installation and operation of desalination plant at Hithaadhoo, Baa Atoll - EIA report compilation.	Mr. Ismail Shafeeu, Static Company Pvt Ltd	January 2012
EIA report for the proposed Solid Waste Management facility at Thilafushi - Baseline marine assessments and EIA report compilation.	Tatva Global Renewable Energy (Maldives) Private Limited	December 2011
EIA for the development of a domestic airport on Koodoo, GA. Atoll - Undertook baseline assessments for the EIA, and prepared the existing environment chapter for the EIA.	Bonavvista (Maldives) Private Limited Singapore	October 2011
EIA prepared for the proposed harbor entrance channel dredging project in Bodufolhudhoo Island, North Ari Atoll - Undertook the baseline assessments for the EIA, and prepared the existing environment chapter of the EIA and compiled the overall EIA report.	Ministry of Housing and Environment	August 2011
EIA prepared for the proposed re-development – phase I of Gasfinolhu Island Resort, Kaafu Atoll, Maldives - Baseline marine assessments and report preparation for the EIA.	Mr. Hussain Afeef	July 2011
EIA prepared for the proposed re-construction of Shaviyani Foakaidhoo Harbour - Undertook the marine baseline assessments and, prepared the marine assessment report for the EIA.	Ministry of Housing and Environment	March 2011
EIA for the sewerage system development in N. Miladhoo - Marine environment assessments	Works Corporation Limited	September 2010

PERSONAL DETAILS

Name in Full : Ali Moosa Didi
Date of Birth : 18.06.1985
Gender : Male
Nationality : Maldivian Address:
Permanent : Saraasaruge Aage, S.Hithadhoo
Neelonfaru Magu

Present : Ma. Rose Villa SE, 4th Floor Dhevina Magu
Male'

Telephone : +960 9912001

EDUCATIONAL QUALIFICATIONS

Madharasthul Islamiya School

Certification, University of Cambridge General Certification of Education O/L

Subject English Mathematics
Business Account Commerce
Economics

Secondary School Certificate Islamic Studies
Dhivehi Language

WORK PLACE DETAILS

Commerce Development and Environment Pvt.
H. Orchidmaage, 4th Floor
Ameeru Ahmed Magu,
Male', Republic of Maldives
Telephone: + 960 3312514
Fax: + 960 3315926
E-mail: ali@cde.com.mv

EMPLOYMENT RECORD

January 2004 – December 2008 Commerce Development & Environment Pvt

Assistant Surveyor January 2009 – December 2009 Ryco Investment Pvt
HR. Officer

January 2010 – To Current Date Commerce Development & Environment Pvt Surveyor

WORK EXPERIENCE

Assistant Surveying Officer (Sep 2008 – To Current Date)
-Survey proposed areas for the new projects under the instruction of survey officer.

-Determine precise location and measurements of points, elevations, lines, areas, contours for the construction studying the morphology of the seabed mapmaking and for construction staking, defining and managing parcels data, as-built and profiling.

-Utilize recourses to the optimum level.

-Use company civil/ survey software for contouring, setting alignments, setting points construction, land division.

-Edits and troubleshoot incoming data collector files in accordance with company procedures.

Processing Survey Data's Using Topcon Tools, Surfer, Sonar XP, etc

-Reviews and utilize survey crew field notes. -Imports verified data into the appropriate CAD drawing file, using company standards point layer management and description keys.

-Prepares survey drawings and documents using company standards, prototypes, templates and blocks.

-Operate digital cameras and download photo files into database and/ or CAD drawings.

-Utilize company scanners to transfer reference maps into CAD files to facilitate utility mapping and property line.

-To perform bathymetric and topographical survey before start of the Projects

-Plotting survey data using AutoCAD 2006-2009

-Processing Survey Data's Using Topcon Tools, Surfer, Sonar XP, etc.

-Modeling accurate contours

-Advanced at ESRI ArcGIS (ArcMap, Arc Catalogue)

-GPS, wetland vegetation species identification, extensive geological identification skills

-Preparation of survey maps

-Make sure all the survey instruments are working in good condition.

AHMED HAIMAN RASHEED

PERSONAL DETAILS

Full Name:	**Haiman Rasheed, Ahmed**	NIRC:	**A297924**
Gender:	**Male**	Date of birth:	**September 24, 1993**
Place of birth:	**S.Feydhoo, Republic of Maldives**	Nationality:	**Maldivian**

Permanent Address: **Goal Corner**
S.Feydhoo 19040
Republic of Maldives

Contact Details**:** **(Mobile): +960 7684393**

Email for correspondence: **haiman@cde.com.mv**

EDUCATION

Year	Name of Education Institute	Title of Qualification	Status
2007 – 2009	**DHARUMAVANTHA SCHOOL**	**GCE / IGCSE O' Level under the curriculum of University of Cambridge**	**Graduated**

EMPLOYMENT HISTORY

Time Period	**Position Held, Employee**	**Task assigned**
February 2014 – present	Associate Consultant, CDE Consulting	- Marine surveying (Conducting inspections, surveys & examinations of reefs) - Beach surveying - Compiling Marine reports (Prepare reports on types of surveys conducted
August 2013 – February 2014	Assistant technician, Ministry of Fisheries and Agriculture	- Designing the structure of FAD (Fish Aggregating Device) - Research on the status and pelagic fishes found near FADs
January 2011 – January 2012	Research officer, CDE Consulting	- Marine surveying (Conducting inspections, surveys & examinations of reefs) - Beach surveying - Compiling Marine reports (Prepare reports on types of surveys conducted
December 2009 – June 2010	Research officer, CDE Consulting	- Marine surveying (Conducting inspections, surveys & examinations of reefs) - Beach surveying - Compiling Marine reports (Prepare reports on types of surveys conducted)

REFERENCES

Name	Address, Telephone & Fax	Email, Occupation & Business Title
Ahmed Shaig, PhD	**CDE Pvt Ltd** **4th Floor, Orchidmaage** **Ameer Ahmed Magu, Henveiru** **Male', Maldives** **(Telephone): +960 3312514** **(Fax): +960 3315926**	**Director** **CDE Pvt Ltd** **info@cde.com.mv**
Ahmed Yameen	**Ministry of fisheries and agriculture** **7th Floor, velaanaage** **Ameer Ahmed Magu, Henveiru** **Male', Maldives** **(Telephone): +960 3322625** **(Fax): +960 3326558**	**Assistant director**

Mohamed Ali

ID #:	A 094918
Nationality:	Maldivian
Languages:	English, Sinhalese, Dhivehi
Date of Birth:	13/09/1983
Telephone:	960-790-6007
Email:	mohamed.ali@cde.com.mv

Experience

Marine Environmental Specialist — June 2011- Present
CDE Consulting

Marine Environment Officer — July 2008 – May 2011
Banyan Tree Vabbinfaru

Freelance Lobster Hunter, Shark Fisherman — Jan 2007 - July 2008
Laamu Atoll

Dock Assistant — Sep 2006 - Jan 2007
Tourist Submarine Maldives

Education and Certifications

PADI Rescue Diver	June 2011
PADI Enriched Air Diver	June 2011
Emergency First Responder	May 2011

Basic Computer Science — 2001 - 2006
Singapore Informatics, Colombo Sri Lanka

Profile

I am very passionate about protecting the marine environment. After having worked as both a fisherman and a marine environment officer I am aware of the impact that human activity has on our fragile marine environment. My favorite activities are reef monitoring and planting coral gardens. With my undying passion for the underwater world and also with my vast experience diving all over the Maldives, educating people on the marine environment is my greatest mission, to ensure the preservation and protection of our most valuable treasure. Furthermore, I have got the opportunity to work besides the greatest marine experts in the world namely Prof. J.E.N. Veron,Dr. Norman Queen and Dr. Daphne G. Fautin.

References

N.D. Abdul Azeez Abdul Hakeem
Former Director of Conservation
Mobile: + 960 7784263
Banyan Tree Maldives

Dr. Steve Newman
Former Marine Lab Manager at Banyan Tree
steve.newman@ncl.ac.uk

Robert James
Former Marine Lab Manager at Banyan Tree

Shahdha

Sustainable Development Consultant

CDE Consulting Pvt Ltd

Phone: +960 9700169 E-Mail: shahdha@cde.com.mv

Professional Experience

Sustainable Development Consultant

CDE Consulting Private Limited, Male', Republic of Maldives. **1 March 2015- Present**

- Experience

Environmental Impact Assessments

- EIA for the proposed test drilling For Hulhule'-Male' Bridge construction project
- EIA for the proposed redevelopment of Nasandhura Palace Hotel, Male'
- EIA for the proposed Hulhule'-Male' Bridge Project
- EIA for the proposed construction of a 9-storey building at the compound of ADK Hospital, Sosun Magu, Male', Maldives
- EIA for the proposed tourist development project at Madivaru Island, Kaafu Atoll
- EIA for the proposed land reclamation and resort development project in Ithaafushi Reef, South Male' Atoll
- EIA for the proposed resort development in Bodukaashihuraa, Alifu Dhaalu Atoll, Maldives

Surveys

- Maldives Visitor Survey 2015 for the Ministry of Tourism
- Maldives Democracy Survey 2015 for International Foundation for Electoral Systems (IFES)

Environmental Monitoring Projects

- Environmental and Social Performance Annual Monitoring 2014 for Shangri-La's Vilingili Resort & Spa, Addu Atoll, Maldives

- Key Skills and Competencies

- Ability to interpret environmental laws and regulations and act accordingly
- Sound knowledge of environmental management procedures and assessment of risk
- Solid understanding of waste management, climate change, disaster prevention and mitigation, and coastal environment and processes
- Profound knowledge of sustainable development issues
- Ability to assess and analyze complex social problems
- Competent in identifying and communicating with stakeholders
- Skilled in data collection, analysis and report writing

Clinical Assistant

Indhira Gandhi Memorial Hospital, Male, Republic of Maldives **February 2010- December 2011**

Relief Teacher

HDh. Atoll School, HDh. Vaikaradhoo, Republic of Maldives **July 2009- November 2009**

Academic Qualifications

Bachelor of Environments 2012-2014

Major: Environmental Geographies, Politics and Cultures,

The University of Melbourne, Melbourne, Victoria, Australia.

Advanced Level Edexcel Examination

Higher Secondary Certificate (HSC) Examinations 2007-2009

Center for Higher Secondary Education, Male', Republic of Maldives

Cambridge GCE O-level

IGCSE Examinations

Secondary School Certificate (SSC) Examination 2004-2006

Cener for Higher Secondary Education, Male', Republic of Maldives

Achievements

- Dean's Honours Award for outstanding academic achievement in 2014 (University of Melbourne) 2014
- Australian Development Scholarship 2011
- Fourth place among the National Top 10 Achievers in the Higher Secondary School Completion Examinations 2009 2009
- Second place among the National Top 10 Achievers in the Secondary School Completion Examinations 2006
- Best All Round Student of H Dh. Atoll School 2006
- Haveeru Atolls Scholarship Award 2007-2009
- School Captain at H Dh. Atoll School.
- Student Association's Vice President in 2006 at H Dh. Atoll School 2006
- Deputy and Acting School Captain in 2005 at H Dh. Atoll School
- Student Association's President in 2005 at H Dh. Atoll School 2005

Professional Development and Memberships

- Member of the University of Melbourne Australian Awards Club 2013- 2014
- Participated in the Women's Mentoring Network at the University of Melbourne 2013
- Completed a 21 hours course on Standard First Aid at the Faculty of Health Sciences, Maldives College of Higher Education 2010
- Member of the Science Club at the Center for Higher Secondary Education 2007-2009
- School Prefect Board member at the H Dh. Atoll School 2004-2006

Computer Skills

- Experienced in using Microsoft office Word, Excel, Powerpoint and Project.

Language Skills

	Understanding	Speaking	Writing
English	Excellent	Excellent	Excellent
Dhivehi	Excellent	Excellent	Excellent

Ali Nishaman Nizar

G. Dhoores Villa, 20132
06th March 1988
(00) 960 778 5767
ali.nishaman@gmail.com

A strategic and creative thinker who has effective communication and writing skills, and is ready and willing to use my skills and knowledge to add significant value to aid in your organization's development and enhance its values.

EDUCATION

Cyprus Forestry College (2006 - 2008)

- Adv. Diploma in Forestry

Center for Higher Secondary Education (2004 - 2006)

- Edexcel - G.C.E. A'levels (Statistics, Business, Accounts)
- Cambridge - Certificate in Advanced English

Majeedhiyya School (2001 - 2003)

- Cambridge - O'levels (Mathematics, Economics, Commerce, English, Accounts)

EXPERIENCE

Terrestrial Environment Consultant – CDE Consulting, (July 13 – Present)

- Provides technical assistance to various national and international projects, specifically providing input in areas such as; wetlands, agriculture, forestry, vegetation mapping, mangroves, waste management, composting…etc.
- Working on and contributing to several Environmental Impact Assessment studies.
- In charge of sourcing/developing innovative tools and methodologies for improving teamwork and cohesion at the office.
- Lead designer for iPad based surveys and in charge of the Data Management System for surveys.

Local Consultant – Vegetation Expert – Hidria, Spain, (May 13 – Aug 13)

- Worked as a local consultant for Hidria, on developing the Wetland Management Plan for Addu Hithadhoo Eidhigali Kilhli and Gn.Fuvahmulah Bandaara & Dhandimagu Kilhi.
- Specifically on the areas of terrestrial biodiversity and vegetation mapping.

CSR Consultant – Secure Bag Maldives Pvt Ltd (Jan 12 – Jan 13)

- In charge of all activities of the company to improve its CSR image.
- In charge of handling all the activities carried out on the company owned Private Island. This includes doing various agricultural activities such as hydroponics, goat keeping, poultry, orchid farming, land-based agriculture and agro-tourism. The task involves leading staff personnel of 13 employees on the island.
- Developed a home-based CSR project to organize and reduce household waste.
- Developed a school program to increase awareness of recycling.

Agriculture Implementation Officer (AIO) – Project Implementation Unit, MOFA (Oct 10 – Jun 13)

- Worked on the "Post-Tsunami Agriculture and Fisheries Rehabilitation Programme" & the "Fisheries and Agriculture Diversification Programme"
- In charge of planning, organizing and implementing all the activities under the agriculture component of the project.
- Planning and coordinating all agriculture and cooperative related training programs.
- Focal point for forming and mobilizing agriculture cooperatives in island based communities.
- Lead instructor for conducting Enumerator Training Programs and the Team leader for conducting baseline surveys for FADIP project
- Established 5 agricultural cooperatives in the Maldives and working closely towards the formation of several additional cooperatives.

Head of Agriculture Research & Extension – Ministry of Fisheries and Agriculture (Jan 10 – Sept 10)

- Lead a team of 5 staff at the Agriculture Research and Extension Section in the Capital city and an additional 15 staff at our regional research centers in the North and South
- Devised agricultural research programs that develop and improve agriculture in a sustainable manner in the country.
- Conducted training programs, workshops and awareness session at various venues.

Marketing Manager – BCube Signage Pvt Ltd (Aug 08 – Present)

- In charge of handling all marketing and client relations for the company.
- Designed layouts and concept notes for various publications and marketing campaigns.
- Lead focal point for all communications with the company's foreign suppliers and local clients.

Agriculture Officer – Ministry of Fisheries and Agriculture (Aug 08 – Dec 09)

- Handled the "Training & Extension Unit" (Agriculture Division).
- Planned and coordinated all agriculture related training programs in the Maldives on a daily basis according to the staff availability.
- Promoted general agriculture and other related activities using modern extension methodologies.
- Conducted training programs, workshops and awareness session at various venues.

National Project Assistant – F.A.O, United Nations (Aug 06 – Oct 06)

- Worked on a Post-Tsunami forest rehabilitation project.
- Worked with international consultants on several aspects of Maldivian forestry, agriculture and especially focusing upon Maldivian Mangrove ecosystems.
- Worked closely with community members, local officials and visiting consultants in understanding local environments.
- Studied the different vegetation types in the Maldives (30 islands, mostly including wetlands).

Graphic Designer – BCube Signage Pvt Ltd (Jan 04 – Oct 06)

- Designed various logos and graphics for several clients.
- Created layouts and concept designs for several clients
- Create routine layouts for signboards.
- Design graphic advertisements ready for print, billboard and signboards.

WORKSHOPS / SHORT-TERM TRAININGS ATTENDED

- 2009,
  - Workshop on Strengthening Plant Quarantine and Inspection, Male', Maldives, 15-16 July 2009
  - "Awareness of Food Security" Workshop, Male', Maldives, 22nd October 2009
  - Workshop on Updating and Finalization of the Agriculture Development Master Plan (ADMP), Male, Maldives, 21st December 2009

- 2010,
  - Fisheries & Agriculture Diversification Programme, Financial, Procurement & M&E Training, Male', Maldives, 26-28 January 2010
  - Team Leaders Meeting, 8th Virtual University for Small States of the Commonwealth's (VUSSC) International Training and Materials Development Workshop, Singapore, 14-20 April 2010
  - Prevention, Control and Management of Forest Invasive Species in South Asia, (by APFSIN), Male', Maldives, 29th April 2010
  - 8th Virtual University for Small States of the Commonwealth's (VUSSC) International Training and Materials Development Workshop, Male', Maldives, 15-31 March 2011
  - Loan Administration Training, Hdh.Kulhudhuhfushi, Maldives, 3-8 July 2010
  - Workshop to Finalize the Draft Pesticides and Plant Protection Bill, Male', Maldives, 12-13 July 2010
  - International Workshop on Climate Change Extreme Events Adaptation Practices and Technological Solutions, New Delhi, 16-18 August 2010

- 2011,
  - FADIP "Rolling Baseline Survey" Workshop, Male, Maldives, 2-3 March 2011
  - Knowledge Sharing in Asia Workshop #3: Participatory Techniques in the Field, Godavri, Nepal, 30th March 2011 – 2nd April 2011
  - Knowledge Sharing in Asia Workshop #2: Writing to Share Knowledge Effectively, Godavri, Nepal, 3-6 April 2011
  - Consultation Workshop for Facilitators on Cooperatives and Business Development, UNDP Building, Male, Maldives, 21st April 2011
  - AFE's Workshop on "Value Chain Program Design", Chiang Mai, Thailand, 12-16 September 2011
  - Training of Trainers Workshop on Systematization, Nepal, 8-10 December 2011

- 2012,
  - Workshop on Knowledge Management, tools and techniques (as a trainer for the programme), Maldives, 29th November 2012 – 02nd December 2012
  - Partnering 4 Development Forum, UNDP, Paradise Island Resort, 2nd December 2012

- 2013,
  - Consultative Workshop on ICRAF's Capacity Development Strategy & ICRAF's South Asian Partner's Capacity Needs Assessment, BRAC (Bangladesh Rural Advancement Committee) Centre, 30-31 January 2013
  - Certificate in Co-operative Poverty Reduction, Co-operative College of Malaysia, Malaysia, 3-21 March 2013

ENVIRONMENT IMPACT ASSESSMENT WORK

- Was a member of the team, and provided contributions to both the field work and report writing of the following EIA's:
- Tourism Development Projects:
  - Adh. Bodukaashihuraa Resort Development EIA
  - B. Dhigufaruvinagandu Resort Development EIA
  - K. Madivaru Resort Development EIA
  - Lh. Fushifaru Resort Development EIA
  - N. Thanburudhuffushi Picnic Island Development EIA
  - K. Gasfinolhu Addendum EIA (Palm transplanting)
  - K. Taj Vivanta Resort Shore Protection EIA
- Agricultural Development Projects:
  - Sh. Madidhoo Agricultural Development EIA
  - Lh. Maduvarri Agricultural Development EIA
- Airport Development Projects:
  - R. Ifuru Airport Development EIA
  - N. Maafaru Airport Development EIA
- Major public/ private sector Projects:
  - Tree Top Hospital Development EIA
  - Nasandhura Palace Hotel Redevelopment EIA
  - Male-Hulhule Bridge, Borehole Drilling EIA
  - Male-Hulhule Bridge EIA
  - Addu and Fuvahmulah ESIA for Wetland Project

ACADEMIC ACHIEVEMENTS

Cyprus Forestry College (2006 - 2008)

- Highest Overall Performance: Presidential Prize (2nd prize)
- Best Academic Performance: Nature Conservation
- Best Academic Performance: Ecology
- Best Botanical Collection
- Best Fire Protection Project
- Best Forest Management Project
- Best Nursery Management Project

Center for Higher Secondary Education (2004 - 2006)

- 10^{th} place in the national Top Ten.

Majeedhiyya School (2001 - 2003)

- 8^{th} place in the national Top Ten.
- A Prefect

PROFESSIONAL ACHIEVEMENTS

- Designed and structured an online system to coordinate training programs and staff travel plans. This lead to an overall increase in the number of trainings by 400% from 2008 to 2009.
- Played active roles in the planning and organizing of key events and workshops such as;
  - Agriculture Fair 2009, Hdh.Kulhudhuhfushi
  - Farmers Day 2009, F.Nilandhoo
  - Food Security Workshop 2009, (In collaboration with Department of National Planning)
- Worked with a team from the Sultanate of Oman on a research program focusing on the local mango variety "Dhivehi Anbu". The discovery of the Maldivian mango variety having a polyembryonic seed structure was one of the key findings of the research.
- Co-director and technical advisor for the Agriculture TV program, "dhanduveriya" for a full season, featuring over 13 episodes.
- Group leader in a materials development workshop for a course titled "Diploma in Sustainable Agriculture for Small States" for the Commonwealth of Learning, collaborating with 20 other experts from different parts of the world. My work was focused on writing specifically the chapters of "Agriculture Production Systems" and the "Importance of Working Together (CBPO's)".
- Team leader for the "Fisheries and Agriculture Diversification Program" (FADiP) baseline survey on the RIM'S Impact Questionnaires and the Project Questionnaire which included over 450 households in 4 different islands.
- Introduced an iPad-based real-time data entry system in 2014, that eliminated the need for paper-based questionnaire forms, reduced survey times, improved security features and provided real-time partial analytics on the data for our clients, at CDE. This system has since been replicated in over 5 separate surveys carried out by CDE.

SKILLS

- ICT Competent (MS Applications, Corel Suite…etc)
- Flexible to travel at any time
- Able to Multi-task and work in stressful conditions
- Able to co-ordinate and work with CBPO's / Co-operatives / NGO's
- Decision Making Skills
- Logistical Planning Skills
- Good Interpersonal Skills (Community Consultation Expert, specifically on participatory approaches and conflict resolution exercises)
- Training Skills in "Agri-Business", "General Agriculture", "Hydroponics", "Agro-Forestry", "Home-gardening", "Baseline Surveys" and "Co-operatives".

MEMBERSHIPS IN PROFESSIONAL ASSOCIATIONS

- Bluepeace - an Environmental NGO
  - Advisor on environmental and agricultural issues since the year 2009.
  - Participated in several beach and reef cleanup programs.
  - A member since the year 2008.
- United Artists of Maldives - an association focusing on Maldivian Art and Artisans
  - Sits in the Steering committee of UAM as the Media Coordinator, since January 2013
  - Participated in the International Hay Festival Activities held in the Maldives in 2010.
  - A member since the year 2008.
- UN Global Compact Maldives Network - a network of local private sector parties
  - Representative for Addu Meedhoo Cooperative Society
  - Representative for CDE Consulting

REFEREES

- Dr. Ahmed Shaig,
  Director of Environment, CDE Consulting,
  shaig@cde.com.mv
  +9607788758

- Dr. Aminath Shafia,
  Former State Minister, Ministry of Fisheries and Agriculture,
  shafia@fishagri.gov.mv
  +9607792458

LANGUAGE PROFICIENCY

- Fluent in both writing and reading of Dhivehi (mother tongue)
- Fluent in both writing and reading of English

MARIYAM HANA SAEED

ADDRESS

G. Quest, Alikilegefaanu Magu
Galolhu, 20118, Malé
Republic of Maldives

CONTACTS

960 797 0022

mariyamhanas@gmail.com
hana@cde.com.mv

NATIONALITY

Maldivian

ACADEMIC QUALIFICATIONS

2014
December

Bachelor of Environments
University of Melbourne, Parkville Victoria

Recipient of Australia Awards Scholarship
Majored in Environmental Geographies, Politics and Culture

2010
June

Higher Secondary Education, Edexcel A' Level
Centre for Higher Secondary Education, Male' Maldives

Achieved Fourth Place among the National Top 10 Achievers in 2010

Maths (Mechanics)	A	Biology	B
Chemistry	A	Physics	B
Islam	A	Dhivehi	B

2007
November

Secondary Education, GCE O' Level
Aminiya School, Male' Maldives

Achieved First Place among the National Top 10 Achievers in 2007

Maths	A	Physics	A	English (IGCSE)	B
Biology	A	Computer Studies	A	English (GCE)	A
Chemistry	A	Dhivehi	A	Islam	A

LANGUAGES

English
●●●●● Fluent

Dhivehi
●●●●● Fluent

SKILLS

+ Excellent customer service skills
+ Expert knowledge in environment and development field
+ Familiar with the concept of environmental psychology
+ Knowledge on coastal landforms and processes
+ Familiar with risk assessment projects
+ Experience in communicating effectively with key decision makers and clients
+ Ability to learn quickly and understand complex work
+ Excellent organisation skills
+ Excellent computer skills

EMPLOYMENT HISTORY

March 2015 to Present

Sustainable Development Consultant | **CDE Consulting, Malé, Maldives**

Specialised Work Areas | **Renewable energy, Water, Sewerage and Housing**

Duties

+ Involved in cross-business, community and regulatory agencies
+ Contribute to development plans, policy analysis, institutional and sectoral reviews, project appraisals and designs
+ Planning and designing of strategies and programs of intervention on key social issues, major economic sectors and environmental issues
+ Conduct consultation, education and outreach programs
+ Prepare baseline, suitability analysis, due diligence, consultation, impact assessment, monitoring and evaluation and audit reports
+ Research and maintain up to date knowledge about current policies, best practices and potential future policies.

February 2011 to January 2012

Administrative Assistant | **The President's Office, Malé, Maldives**

Duties

+ Monitored the policies under governance section in the Policy Office
+ Organised meetings of Narcotics Control Council board and updated the progress of the policies and actions under the council
+ Managed all admin-oriented work in the section, updating minutes of each council meeting, updating databases, and filing
+ Led administrative work to organise the 17th SAARC Summit in November 2011 and worked in coordination with other government bodies, private agencies and key decision makers to organise meetings and circulate information

EXPERIENCE

EIA for the proposed development of a tertiary hospital

Year . 2015
Location . Hulhumalé
Client . Tree top Health Pvt Ltd
Position . Team leader
Activities Performed
Stakeholder consultations, socioeconomic impact assessment and contributed to report writing

EIA for the proposed redevelopment of Nasandhura Palace Hotel

Year . 2015
Location . Malé
Client . NPH Investments Pvt Ltd
Position . Consultant for Water and Energy
Activities Performed
Stakeholder consultations, conducted baseline surveys and contributed to report writing

EIA for the proposed construction of a 9-storey building at the compound of ADK Hospital

Year . 2015
Location . Malé
Client . ADK Hospital Pvt Ltd
Position . Consultant for Water and Energy
Activities Performed
Contributed to report writing

EIA for the proposed land reclamation and resort development project at Ithaafushi Reef

Year . 2015
Location . South Malé Atoll
Client . Sumaiyya Holdings Pvt Ltd
Position . Team Leader
Activities Performed
Designed stakeholder consultations, socioeconomic assessment and contributed to report writing

EIA for the proposed land reclamation and resort development project at Bodukaashihuraa

Year . 2015
Location . Adh. Atoll
Client . Millennium Capital Management Pvt Ltd
Position . Consultant for Water and Energy
Activities Performed
Undertook baseline surveys, Stakeholder consultations, and contributed to report writing

EIA for the channel dredging and beach replenishment activities at Canareef Resort Maldives

Year . 2015
Location . Addu City
Client . Canareef Resort Pvt Ltd
Position . Consultant for Water and Energy
Activities Performed
Contributed to report writing

EIA for the proposed resort development project at Kudadhoo Island

Year . 2015
Location . Lhaviyani Atoll
Client . Champalars Pvt Ltd
Position . Consultant for Water and Energy
Activities Performed
Contributed to report writing

EIA for the proposed land reclamation and resort development project at Madivaru Island

Year . 2015
Location . Kaafu Atoll
Client . Shuaz Investments Pvt Ltd
Position . Consultant for Water and Energy
Activities Performed
Undertook baseline surveys, Stakeholder consultations, and contributed to report writing

EIA for the proposed Hulhule' – Male' bridge project

Year . 2015
Location . Malé
Client . Ministry of Housing and Environment
Position . Consultant for Water and Energy
Activities Performed
Contributed to report writing

EIA for the proposed test drilling for Hulhule' - Male' bridge construction project

Year . 2015
Location . Malé
Client . Ministry of Housing and Environment
Position . Consultant
Activities Performed
Stakeholder consultations and contributed to report writing

EIA for the proposed harbour maintenance project at Cheval Blanc Randheli

Year . 2015
Location . Noonu Atoll
Client . Cheval Blanc Randheli Maldives
Position . Consultant
Activities Performed
Designed questionnaire for stakeholder consultations, undertook baseline surveys, socioeconomic impact assessment and contributed to report writing

EIA for the proposed resort development project at Miriandhoo island

Year . 2016
Location . Baa Atoll
Client . Miriandhoo Maldives Resorts Pvt Ltd
Position . Consultant for Water and Energy
Activities Performed
Designed questionnaire for stakeholder consultations, undertook baseline surveys, socioeconomic impact assessment and contributed to report writing

EIA for the proposed land reclamation and resort development project at Maagaa reef

Year . 2016
Location . North Ari Atoll
Client . Big Stone Investments Pvt Ltd
Position . Consultant for Water and Energy
Activities Performed
Designed questionnaire for stakeholder consultations, undertook baseline surveys, socioeconomic impact assessment and contributed to report writing

EIA for the proposed resort development project at Aluvifushi island

Year . 2016
Location . Dhaalu Atoll
Client . Ocean Islands Pvt Ltd
Position . Consultant for Water and Energy
Activities Performed
Contributed to report writing

EIA for the proposed land reclamation and resort development project at Rasdhoo Madivaru

Year . 2016
Location . North Male' Atoll
Client . Veli Madivaru Pvt Ltd
Position . Consultant for Water and Energy
Activities Performed
Socioeconomic impact assessment and contributed to report writing

EIA for the proposed Raffalhuhuraa land reclamation and resort development project at Mai Falhu Reef

Year . 2016
Location . Kaafu Atoll
Client . Mesa RF Pvt Ltd
Position . Consultant for Water and Energy
Activities Performed
Socioeconomic impact assessment and contributed to report writing

EIA for the proposed nationwide submarine cable by Ooredoo Maldives

Year . 2016
Location . Maldives
Client . Ooredoo Maldives
Position . Consultant for Water and Energy
Activities Performed
Socioeconomic impact assessment and contributed to report writing

EIA for the proposed development of plot N3-55 under 3,000 housing units project

Year . 2016
Location . Hulhumalé
Client . Sea Life Global Inc Pvt Ltd
Position . Consultant for Water and Energy
Activities Performed
Designed methodology and survey questionnaires for public consultations, stakeholder consultations, socioeconomic impact assessment and contributed to report writing

EIA for the proposed development of plot N3-56 and N3-57 under 3,000 housing units project

Year . 2016
Location . Hulhumalé
Client . Sea Life Global Inc Pvt Ltd
Position . Consultant for Water and Energy
Activities Performed
Designed methodology and survey questionnaires for public consultations, stakeholder consultations, socioeconomic impact assessment and contributed to report writing

Maldives visitor survey 2015

Year . 2015
Location . Hulhule
Client . Ministry of Tourism
Position . Team leader and Enumerator
Activities Performed
Supervised survey enumerators and conducted the survey

Maldives democracy survey 2015

Year . 2015
Location . Maldives
Client . International Foundation for Electoral Systems (IFES) and Transparency Maldives
Position . Team leader and Enumerator
Activities Performed
Supervised survey enumerators and conducted the survey

Environmental and social performance annual monitoring report of Shangri-La's Vilingili Resort & Spa 2014

Year . 2015
Location . Addu City
Client . Shangri-La's Vilingili Resorts & Spa
Position . Consultant for Water and Energy
Activities Performed
Quantifying energy production and consumption rate, water quality assessment and analysis advice and reporting.

Environmental and social performance annual monitoring report of Shangri-La's Vilingili Resort & Spa 2015

Year . 2016
Location . Addu City
Client . Shangri-La's Vilingili Resorts & Spa
Position . Consultant for Water and Energy
Activities Performed
Quantifying energy production and consumption rate, water quality assessment and analysis advice and reporting.

Environmental monitoring of Vilamendhoo Resort & Spa

Year . 2015
Location . Alifu Dhaal Atoll
Client . Vilamendhoo Resort & Spa
Position . Consultant for Water and Energy
Activities Performed
Water quality assessment, beach profiling, coastal area surveying, Energy audit

Finolhu Villas energy audit 2015

Year . 2015
Location . Kaafu Atoll
Client . Finolhu Villas
Position . Consultant for Energy
Activities Performed
Conducted an onsite comprehensive energy audit of the resort, quantified energy consumption and production patterns, data analysis and report writing.

Feasibility study for solar panel installation in F.Nilandhoo

Year . 2015
Location . Faafu Atoll
Client . F.Nilandhoo
Position . Consultant for Energy
Activities Performed
Conducted baseline surveys of potential buildings for solar panel installation, gathered baseline information about the existing power generation capacity, demand and expenditure for fuel and powerhouse maintenance, data analysis and contributed to report writing.

Understanding the risks to and vulnerability of energy sector to climate change in tourist resorts of the Maldives

Year . 2015 - 2016
Location . Maldives
Client . Tourism Adaptation Platform / UNDP
Position . Consultant for Energy
Activities Performed
Undertook baseline studies on dependency of the Maldives to fuel and its vulnerability; designed methodology and energy audit questionnaire; conducted a comprehensive energy audit in Vilamendhoo Resort & Spa, Kurumba Maldives, Bandos Island Resort,The Sun Siyam Irufushi Maldives, Embudu Village; data analysis and presentation of audit findings. Conducted workshops with engineers in each of the 5 resorts on climate change awareness and vulnerability of tourist resorts to climate change. Conducted a workshop to present the findings of the project to stakeholders.

Introducing green healing hospital concept at Adh. Atoll Hospital

Year . 2016
Location . Adh. Mahibadhoo
Client . Adh. Atoll Hospital
Position . Consultant for Energy and Water
Activities Performed
Conducted the energy and water audits of the hospital, consulted hospital engineers and utility providers of the island, conducted a feasibility assessment of the hospital roofs for solar panel installation, data analysis and presentation of findings with recommendations, conducted a workshop to present the findings of the baseline study to hospital staff and community member.

Desalination plant registration at Conrad Maldives Rangali Island

Year . 2015
Location . Alifu Dhaal Atoll
Client . Conrad Maldives Rangali Island
Position . Consultant for Water
Activities Performed
Undertook baseline studies and facilitated the registration process

Desalination plant registration at Kudarah Island Resort

Year . 2016
Location . Alifu Dhaal Atoll
Client . Kudarah Island Resort
Position . Consultant for Water
Activities Performed
Undertook baseline studies and facilitated the registration process

Desalination plant registration at Mirihi Island Resort

Year . 2015
Location . Alifu Dhaal Atoll
Client . Mirihi Island Resort
Position . Consultant for Water
Activities Performed
Undertook baseline studies and facilitated the registration process

Terminal Evaluation for the project titled increasing climate resilience through an integrated water resource management programme in Ha.Ihavandhoo, Adh.Mahibadhoo Gdh.Gadhdhoo

Year . 2015
Location . Ha. Ihavandhoo, Adh. Mahibadhoo and Gdh.Gadhdhoo
Client . UNDP
Position . National consultant
Activities Performed
Reviewed project documents, conducted stakeholder consultations, logistics management, designed survey methodology and questionnaire for consultations in coordination with the international consultant, visited the three islands and conducted council meetings and public consultations with focused groups. Contributed to report writing and presented preliminary findings to stakeholders.

APPENDIX K – Commitment Letter

بسم الله الرحمن الرحيم

ITHAAFUSHI INVESTMENTS PVT LTD

Ref: IIPL/EPA01-2016

Mr. Ibrahim Naeem,
Director General
Environment Protection Agency
3rd Floor, Green Building
Ameenee Magu,
Male', Maldives

4 July 2016

Dear Sir,

Sub: EIA prepared for the proposed dredging component of the Ithaafushi resort development project

As the proponent of the above mentioned 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.

We also hereby confirm our commitment to carry out and bear costs of environmental mitigation measures and monitoring outlined in the report.

Sincerely,

ITHAAFUSHI INVESTMENTS PRIVATE LIMITED
C-0536/2012

Mohamed Ali Janah
Director