FIRST ADDENDUM

Environment Impact Assessment to Guraidhoo Harbour Construction Project, Kaafu Atoll, Maldives

PROPONENT

MINISTRY OF HOUSING AND INFRASTRUCTURE

Prepared By:

Firdous Hussain: EIA P21/ 2016

Maldives Transport and Contracting Company Plc

14 June 2016

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LIST OF ABBREVIATIONS

DGPS	Differential Global Positioning System
EIA	Environment Impact Assessment
EPA	Environment Protection Agency
GDP	Gross Domestic product
K.	Kaafu (Atoll)
MEE	Ministry of Environment and Energy
MHI	Ministry of Housing and Infrastructure
mg/l	milligrams per litre
MTCC	Maldives Transport and Contracting Company Plc
NBSAP	National Biodiversity Strategy and Action Plan
NEAP	National Environment Action Plan
NSSD	National Strategy for Sustainable Development
NTU	Natural Turbidity Units
Ppt	parts per thousand
ToR	Terms of reference
TDS	Total Dissolved Solids

CONSULTANT'S DECLERATION

I certify that the statements made in this Environmental Impact Assessment report for the 1st Addendum to K.Guraidhoo harbour construction project are true, complete and correct to the best of my knowledge and it is in accordance with EIA Regulation 2012.

Firdous Hussain

Consultant Registration No: EIA P21/2016

PROPONENT'S DECLERATION

Proponents Declaration

Re: First Addendum to the EIA for the proposed Harbour construction project in K.Guraidhoo

This is in reference to the First Addendum to the EIA for the proposed harbour construction project in K.Guraidhoo Maldives.

As the proponent of the proposed project we guarantee that we have read the report and to the best of our knowledge, all information relevant to this project in terms of project description, project construction works and operational aspects provided here are accurate and complete.

Signature:

Name: Mohamed Azim

Designation: Director General

On behalf of: Ministry of Housing and Infrastructure

Date: 18 June 2017

NON-TECHNICAL SUMMARY

This is the first Addendum to the EIA for the harbour project being undertaken in Guraidhoo, Kaafu Atoll. The project is proposed by Ministry of Housing and Infrastructure.

An environmental assessment was undertaken for this project in March 2014. According to the EIA, justification for the project is to provide safe and secure harbouring facilities to the vessels, especially the larger ones. The island only had a natural harbour with some jetties without a breakwater for providing protection during the rough weather conditions. As a result government proposed a harbour construction project in K.Guraidhoo.

K.Guraidho Harbour Construction project was initially begun under the project, "Design and Build of Harbours in 10 Islands" in 2014. The agreement was signed on 9th February 2014 and harbour construction work begun in 25th February 2014. Project work lasted till 30th October 2014 during which period, Quay wall construction and dredging was completed.

However, due to quota restrictions and other reasons, during the years 2013 and 2014, Maldives has undergone a difficult time in sourcing rock boulders for construction projects in the country. As a result, K.Guraidhoo harbor construction site was temporarily demobilized on 30th October 2014 for using the machineries to speed up other projects of the contractor.

On 21st April 2016, the project site was mobilized for the second time to complete the remaining works together with other additional works agreed under, "Construction of K.Guraidhoo harbor Phase II" whose value is MVR12.7 million. Major design change was brought to the breakwater component of the project.

This addendum addresses the modifications to the breakwater component. Length, shape and location of the breakwater in Phase II has been changed compared to the initial concept. New length of the break water is 340m compared to the 194m in the initial concept. Out of 340m, 62m will be constructed on south side of the harbour adjoining the Quay Wall. Under the current design, the breakwater will run over the natural channel on west of the main Quay Wall which will be reclaimed or filled to around -0.8m which is about 0.2m shallower than the existing depth of the shallow areas on both sides. Minor dredging is involved to source the fill material. Changes incorporated to the breakwater design is complimented by the island community. According to the initial harbour construction EIA, island community expressed dissatisfaction over the initial breakwater design as it did not cover the western side which is the predominant wave direction during the southwest monsoon.

Proposed changes to the breakwater is a better alternative compared to the initial concept. It protects a larger area, specially the western side as mentioned earlier. The natural lagoon will be better enclosed to function more like a harbour, providing a safer habouring area. This design has also been identified in the 2014 EIA as an alternative.

Environmental impacts of the proposed change were assessed for both construction and operation stage of the project. Most of the identified impacts are positive as they will improve the socio-economic situation of the island. As in all construction projects of this nature and explained in K.Guraidhoo harbour construction EIA, the main negative environmental impact of the project is identified to be the movement and settlement of sediment on the reef during the dredging to source the fill material for the channel. However, sedimentation due to the project is considered negligible as a volume required is less which is around 2000cbm. Additionally, the 62m breakwater on the southern side may enhance beach erosion as it will obstruct the longshore current around the island. But the effect of this breakwater on the shore might be difficult to identify as the area used to have Jetties previously.

The most effective impact mitigation measure for the addendum would be to borrow sand from the first location proposed as the borrow area. This area is far from the reef, closer to the project area and once the work begins, will be enclosed by breakwater bed which will act as a bund wall in restricting and limiting the sediment flow.

As outlined in 2014 harbour construction EIA, environment monitoring for sea water quality and shoreline changes should be carried out. Shoreline changes are to be monitored for a longer period of about 2 years after the project completion to identify any possible adverse effect due to the project.

In an environmental and technical point of view, the proposed change to the breakwater of K.Guradhoo habour is justified and favoured by the island community.

ސާދާ ޚުލާސާ

މި ރިޕޯޓަކީ ލ.ގުރައިދޫ ބަނދަރު ހެދުމުގެ މަޝްރޫޢަށް ގެންނަން ހުށަހަޅާފައިވާ ބަދަލުތަކުގެ ސަބަބުން ތިމާވެށްޓަށް ކުރާ އަސަރު ބަޔާންކުރުމަށް ތައްޔާރުކުރެވިފައިވާ ރިޕޯޓެކެވެ. މިމަޝްރޫޢުގެ އިދާރާއަކީ މިނިސްޓްރީ އޮފް ހައުސިންގ އެންޑް އިންފްރާސްޓްރަކްޗަރއެވެ.

ލ.ގުރައިދޫ ބަނދަރުގެ މަޝްރޫޢު ކުރިއަށް ގެންދިއުމަށް ހޯދައި 2014 ވަނަ އަހަރު މާރިޗް މަހު ވަނީ މިމަޝްރޫޢުގެ ސަބަބުން ތިމާވެށްޓަށް ކުރާ އަސަރު ދެނެގަތުމުގެ ރިޕޯޓް އެކުލަވާލުމަށެވެ. މިރިޕޯޓުގައި ވާގޮތުން ގުރައިދޫއަށް ބަނދަރެއް ހެދުމަކީ، ނަމަވެސް ޓެކްނިކަލް ގޮތުން އެތަކެއް ފެހިގައި (ހުޅަނގުފާރާތުގައި) ބޮޑުވިލެއް ފެނުމާ ރަނގަޅެވެ. ކުރީގެ ފާލަމްތަކުގެ އިތުރުގައި އަރައިފަތުމުން ބޮޑުން ކުރެވޭ މިސަރަހައްދުގައެވެ. ނަމަވެސް ޑްރެޖްކުރުމާ ދުޅަސްވުމަށް، ހާއްސަ ހުޅަނގު ދުވަސްވަރުގައި މިސަރަހައްދުގެ ބޯސްޓަރުގެ ސަބަބުން ދިރުވާޔާ ސަރަހައްދުގައި ވަނީ ގުރައިދޫގައި ބަނދަރު ހެދުމުގެ މަޝްރޫޢު ފަށާފައެވެ.

ގުރައިދޫ ބަނދަރު ހެދުމުގެ އެއްބަސްވުމަކީ ސަރުކާރާއި އެމް.ޓީ.ސީ.ސީ އާއި ދެމެދު ސޮއިކުރެވިފައި ވަނީ 09 ފެބްރުއަރީ 2014 ގައެވެ. އަދި މަޝްރޫޢުގެ މަސައްކަތް ފެށިފައިވަނީ 25 ފެބްރުއަރީ 2014 ގައެވެ. ނަމަވެސް 2013 އަދި 2014 ވަނަ އަހަރު ހާލަތަށް ކުރިމަތިވި ބޮޑުވަރު ފިނޑާއި ދިމާ ކުރި ވައިގެބާރުން ބަނދަރު މަޝްރޫޢުގެ އަމަލީ މަސައްކަތް ދެލަސްވެގެން 30 އޮކްޓޫބަރު 2014 ގައި މަސައްކަތްތަކަށް ބޭނުން ކުރާ މެޝިނަރީތައް ވަނީ ރަށުން ބާލާފައެވެ. މަސައްކަތް ދެލަސްވެގެންދިޔައިރު ބަނދަރުގެ އެއްގަމު ތޮށިލެއްވާ އަދި އެއްގަމުތޮށީގެ ބޮޑުބައެއްގެ ކޮނުމުގެ މަސައްކަތް ވަނީ ނިމިފައެވެ.

ގުރައިދޫ ބަނދަރު މަޝްރޫޢުގެ ސްކޯޕަށް ގެނައި ބައެއް ބަދަލުތަކާއިއެކު 21 އޭޕްރިލް 2016 ގައި ދެވަނަ ފަހަރަށް ބޮލުބައްދާފައި، ލ.ގުރައިދޫ ބަނދަރު ހެދުމުގެ ދެވަނަ ފިޔަވަހީގެ ނަމުގައި އަލުންވެސް މަސައްކަތް ފެށިފައެވެ. ދެވަނަ ފިޔަވަހީގައި ހިމެނިފައިވާ މަސައްކަތްތަކުގެ އަގަކީ ގާތްގަނޑަކަށް 12.7 މިލިއަން ދިވެހިރުފިޔާ އެވެ. މަސައްކަތުގެ ސްކޯޕަށް ގެނެވުނު މައިގަނޑު ބަދަލަކީ ބޭރުބޮޑުގެ ޖެޓީއިން ބަދަލުކުރުމެވެ.

މި ރިޕޯޓުގައި އަލިއަޅުވާލެވިފައިވަނީ ބޭރުބޯޓުން މިގޮތުން ބަދަލުކުރާތީވެ. މިގޮތުން ބަދަލުކުރާއިރު ބޭރުގެ ބޮޑުތަނުގެ ބޭރުގައި ހުރި ރިޕޯޓުގައި ފާހަގަކުރި ސަރަހައްދު ވަނީ ބަދަލުވެފައެވެ. މިގޮތުން ކުރީ ރިޕޯޓުގައި ފާހަގަކުރެވިފައިވާ 194 މިޓަރުގެ ބަދަލުގައި ދެވަނަ ފިޔަވަހީގެ ދެކުނުން 340 މިޓަރު ދިގުމިނުގެ ބޭރުގެ ބަދަލު ބޮޑުގައި ލާފައެވެ. މި 340 މިޓަރުގެ ތެރެއިން 62 މިޓަރު ބޭރުލުވައި ބަނދަރުގެ ދޮރުން ދުރުގައި އެއްގަމުބޭރުން ގެލިގެން ދާނެއެވެ. ބޭރުބޮޑުން ބާލާ ބަނދަރުގެ ހުޅަނގުން ބޮޑުބަން ޓެކްނިކަލް ގޮތުން އެހެރިހިފައިވާ 16 މިޓަރު ފުޅާ އަދި 4 މިޓަރު ފުން ނަހަރެއް ކޮނުމުން ނަގާވެލި އަލުން ބޭނުންކުރެވޭނެއެވެ.

ވެހިއަޑީ ނެތިގެއްލޭނީ ދެއަރިމަތީގައި ވާރޭވެހުން ކުޑަވުމުން 0.2 މީޓަރ ތިރިވާނެއެވެ. މިގޮތުން ބިންތަކުގެ އުސްމިނުގައިވެސް ފުރިގެން ނެތިގެއްސާކަން ބިންތަކުގެ ދެކުނުފަރާތުގައިވާ ތިމާވެށްޓަށް ބުރަދާނުގެ ދަތުރުވެ. މިގޮތުން ބޮޑުވުމުން ފެނުގެން ބިންތަކުގެ ހަރަކާތްތެރިކަމާއި ވަރަށް ބޮޑުމަށް ނިވާވެ، ހަރަކާތްތެރިވުމުގެ ބިރުވެރިކަން ގެއްލުވެރިކަން ފިޔަވާނެއެވެ. މިބަދަލުތައް 2014 ވަނައަހަރު ބިންދަށު މަސައްކަތް ފެށުމަށް ހުރިހާ ފުރަތަމަ ތިމާވެށީގެ ދަރާސާގައި ގެންނަން ފެންނަކަމަށް ފާހަގަކޮށްފައިވާ އަދި ގުޅިގެން ރައްޔިތުންނަށް ބޭނުންވާގޮތަށް އެދެވުނު މިޚިޔާލްތަކެވެ.

މިމަޝްރޫޢުގެ އަމާޒަކީ މަސައްކަތް ހިންގުމުގެ ގޮތުގައި އަދި ބިންދަށު ބޭނުން ކުރުމުގެ ތަފާސްހިސާބު ކުރުން އަސާސީވެގެން ދިރާސާ ކުރެވުނު އަސާސީވެސް ރާއްޖޭގެ ބިންދަށު ބޭނުންކުރުމަށް ރައްޔިތުންގެ ބޭނުންތަކަށް ފެންނަގަނޑުގެ ތަފާތު ބަދަލުތަކުގެ މިންވަރުގައި ބެލެނިވެ ވާނެއެވެ. މިގޮތުން މިފަދައިހިނގުން މަސައްކަތްބަލާއިރު އެހެންބޭނުން މިމަޝްރޫޢުގެ ސަރަހައްދު ދެނެގަތުމުގެ ބިންދަށުވެސް ދެކިގެން ނިކުތީ ފަރުމާ ގެނެސް ސަރަހައްދުތަކުގެ ދަރަނިބަދަލުވާ ކަންތައް ފާހަގަކުރެވުނު ސިފަތަކަށް އުސްމިން ރައްޔިތުންގެ ހިތްވަރު ކުރުމަށް. މިގޮތުން، ކަންތައް ނަގާފައިވާ ޑޭޓާ (2000 ވަނައަހަރު) ކަނޑަށްވާނީ މިންވަރު އަސާސީ މިންވަރުފަސް ވަރަށް ކުޑަވާނެއެވެ. އަދި ރަށްރަށް ގިނަވެ ދިރިއުޅުމުގެ ސަރަހައްދު ރަނގަޅަށް ދެއްކުމާ އެކުލަވާލެވުނު ރަށްރަށްގެ ތަފާސްހިސާބު ކުރުމަށް ބުރިމަތިވެ އެކަށީގެންވާނެއެވެ. ނަމަވެސް، ރަށްރަށް ބަރަބަރު ގޮތުގައި ބިންދަށުގެ މިސަރަހައްދުގައި ފެނުގެ އޮޅުމާއި ހުރުމަށް ހަމައެކަށި ބިންދަށު މަޝްރޫޢުގެ ސަރަހައްދު ދިރާސާ ރަށްރަށްގެ މަސްވެރި ދަށްވެފައިވާ އަސާސީ ދެނެގަތުމަށް ބޭނުންވެއެވެ. މިކަންކަން ދިރާސާކުރުމުގެ ތެރޭގައި، ބިންދަށު މަޝްރޫޢުގެ ސަރަހައްދު ރަށްރަށްގެ ކަމަށް ފާހަގަކުރެވޭ ޢިލްމީ އަދި ސާއިންސީ ފެއްޓި ބޭނުމަށް ފެނުނު މިމަޝްރޫޢުގެ ކުރިއަށް ގެންދިއުން މުހިންމު މަޝްރޫޢުގެ ފެންނަނެވެ.

މަޝްރޫޢުގެ ސަރަހައްދު ކުރިމަތިވާ ނުރައްކާ އަސާސީވުމާއި ކުރެވުނު މަޝްރޫޢުގެ ކުރުފެނަށް ކަނޑަތުގެ ބޮޑުގައި ދިރިއުޅުމަށް ހަރަކާތްތެރިވާ ސަރަހައްދުގެ ރަށްރަށްގެ ބޮޑެތި ސަރަހައްދުން ދިރިއުޅުން ހިފެހެއްޓެވެ. މިސަރަހައްދު ގުޅިގެން ފެތުރިގެން ސަރަހައްދުގެ ބިންދަށު ވަށައިގެންވާ އަދި މަސައްކަތް ފުރިހަމަކުރުމަށް ބޭނުންވާ (ހިމެނޭ ފެނުގެ މަސައްކަތް ރައްޔިތުން ބޭނުންކުރާ ބިރުވެރިކަން އާބާދީގެ ފަރާތުން) ދަތިކަމާއި ސަރަހައްދުގެ ބަދަލުކުރުމަށް ވާނީ ކުރުމުގެ ބޭނުންގައި އެދެވުނު ބޮޑުތަކަށް ހިފެހެއްޓުން އަސާސީވެފައިވާނެއެވެ. ހަމަހަމަކަން، ފެހިއަޑީގެ ހިއްސާކުރުމާއި މިސަރަހައްދު ކުރިއަށް މަސައްކަތް އަސާސީކަން، ދިރިމަޝްރޫޢުގެ ސަރަހައްދު ކުރިއަށް ގެންދިއުމަށް ބޭނުންކުރެވޭނެއެވެ.

2014 ވަނައަހަރު ހުށަހެޅުމާ މިމަޝްރޫޢުގެ ފުރަތަމަ ތިމާވެށީގެ ދިރާސާ ރިޕޯޓްގައިވެސް ފާހަގަކޮށްފައިވާ ގޮތަށް މަޝްރޫޢުގެ އަމާޒު މަސައްކަތް ކުރިއަށްގެންދިއުމާއި އަދި މަސައްކަތްތަކަށް ބިންދަށުކުރަން ފުރުޞަތު ހޯދުމުގެއިތުރުން ވެއްޓަށް އެންމެ ދުވަ

ބަދަލުވެއް ދިރާސާކޮށް ބަލަންޖެހެއެވެ. މިގޮތުން ފެނުގެ ކޮލިޓީއާއި ރަހުގެ ގޯސްޖެހުމަށް އަސަރުކުރާ ބަދަލުވެއް ދިރާސާކޮށް ބަލަމުން ގެންދަންވާނެއެވެ. ގޯސްޖެހުނުން އަސަރުކުރާ ބަދަލުވެއް މަޝްރޫއުގެ އުމުރު މަސައްކަތް ނިމި އިތުރު 2 އަހަރު ދުވަހަށް ދިރާސާކުރަމުން ގެންދަންވާނެއެވެ.

ގުޅިދޫ ބަނދަރުގެ ބޭރުބޮޑުބަން ގެންނަން ހުށަހެޅިފައި މިވާ ބަދަލުތަކާ މިކަމުގެ ސަބަބުން ބީޗްބަތްބަން ކުރާ ނުރައްވާ އަސަރު ކުރޭ އެދި ރަށުގެ ރައްޔިތުންނަށް އާކޮށްދެވިދާ ވަރަށްބޮޑު ބަދަލު ބީޗާއި ގެންނާނީވެ މިބަދަލު ބީޗަކީ ގެންއުން ރަށުގައި މިހެން ބަދަލުވަމުން ކަމުގައި ދަށްނުވާވެ.

1 INTRODUCTION

1.1 Introduction

This is the first Addendum to Environmental Impact Assessment (EIA) report of harbour in Guraidhoo, South Male Atoll. It has been prepared to fulfil the requirements of the Environmental Protection and Preservation Act of the Maldives (Law No. 4/93) to assess the impacts of proposed change is breakwater design. This report will identify the potential impacts (both positive and negative) of the proposed changes to harbour construction in Guraidhoo.

1.2 Structure of the Report

The report is structured in such a way that it meets the requirements of the EIA regulation 2012 and the amendments followed. The report begins with the non-technical summary followed by project setting, regulatory consideration and project introduction. Report will look at the justifications for undertaking the proposed changes. Alternatives to proposed components or activities in terms of location, design and environmental considerations would be suggested. A mitigation plan and monitoring programme during and after the works would also be included. Monitoring would ensure that the proposed activities are undertaken with caution and appropriative care to protect and preserve the built environment of the areas in proximity to the site or those areas and environmental aspects affected by the development.

The findings of this report are based on the March 2017 EIA, qualitative and quantitative assessments undertaken during site visits in May and June 2017 as well as professional judgment. The impact assessment methodology has been restricted to field data collected, professional judgement and experience of similar settings and projects across the Maldives and elsewhere. Long term data relevant to this report on specific aspects such as meteorology and climate were gathered from secondary sources and published reports on the Maldives.

1.3 Scope of the report

The main scope of this report as per the approved ToR is to broadly assess, identify, predict and document potential environmental impacts from the proposed construction of breakwater in K.Guraidhoo harbour according to the new design in relation to the harbour EIA (Zahid, 2014). New design involves construction of breakwater around the naturally deep area used as a harbour on southwest side of the island. Importance is given to document the project proposal in detail, identify the main environmental impacts that are associated with the proposed development and address the legal requirements that need to be taken into consideration while implementing this project. This document also addresses the existing environmental condition of the island and

foresees the ways in which potential environmental impacts will be managed, mitigated and reduced.

The key aims of the report are:

- Describe in detail the proposed amendment/project;
- Identify the need and justification for the proposed development;
- Describe the biophysical status of the existing environmental condition of the island based on the findings undertaken during the site visits;
- Assess, identify and predict potential environmental impacts of the proposed development;
- Evaluate the significance and magnitude of impacts that will be generated; and identify and predict ways in which these environmental impacts will be prevented and removed through appropriate environmental management and mitigation measures;
- Develop a mechanism to closely monitor and understand the long-term effects and changes of the proposed development on the environment with respect to the available baseline information collected from field assessments and site visits;
- Provide legal protection with regards to the proposed development activities; and
- Review the predictions and assessments made on environmental impacts that are associated with the proposed development activities.

1.4 Tasks already undertaken

Apart from the main breakwater on the west side, other components of the harbour construction project has been completed under March 2014 EIA. Completed tasks include;

- Quay-wall installation and concreting,
- Construction of 62m breakwater on the south side,
- Transportation of around 11,550 Ton rock boulders to the site for breakwater construction,
- Construction of about 70% of rock boulder bed for the main breakwater,
- Laying 70% of pavement blocks, part of the area is left unpaved to allow machinery movement.

1.5 EIA Implementation and Methodologies

This study was based mainly on data collected during field investigation trips on 25th May and 6th June 2017 by a team from MTCC and published literature on similar settings and projects. The addendum report was compiled by Firdous, who is a registered EIA consultant who has

involved in numerous dredging and reclamation projects in the Maldives, including harbour construction, reclamation and channel maintenance dredging projects. He was assisted by the trained marine and topographic surveyors in MTCC to carry out the mapping, topographic data collection and baseline surveys.

Established and widely accepted data collection and analyzing methods have been applied in this EIA study. Field studies have been undertaken using methods generally employed for EIA studies in the Maldives. The field assessment methodologies are briefly described in Section 7 of this report.

The methods used to identify, predict and assess impacts are based on matrices that have been established by the Consultants over a long period. In the matrix, the consultants assign a likert-scale number to represent the magnitude, significance, duration and spatial extent of the potential impact for each project activity against the key environmental and socio-economic components that the specific project activity may have an impact on. The product of the magnitude, significance, duration and spatial extent for each activity and component is summed up to measure the exact nature of the impacts by each activity and the overall impact of the proposed project is the sum of all activities.

1.6 Terms of Reference (ToR)

According to regulations of Ministry of Environment and Energy, an EIA addendum application form and project brief was submitted to EPA stating the nature and need for the project. Following the application EPA decided to hold a scoping meeting. It was held in EPA on the 15th May 2017 with the project proponent, consultant and EPA officials. Based on the discussions at the meeting, a ToR was finalized and approved by EPA on 22nd May 2017. Based on the approved ToR, field visits are conducted for data collection and report compilation begun. Approved ToR is included as Appendix 1.

2 PROJECT SETTING

This section outlines and summarizes key policies, applicable laws, regulations and regulatory bodies regarding environmental protection in the Maldives. The project meets the requirements of the Environmental Protection and Preservation Act of the Maldives, Law no. 4/93. The EIA addendum has been undertaken in accordance with the EIA Regulation 2012 of the Maldives by a registered consultant. Additionally, it adheres to the principles outlined in the regulations, action plans, programs and policies of both international and national related to the project.

The following table outlines the major environmental laws, guidelines, regulations and action plans relevant to the project.

Legislation	Relationship to the project
Environment Protection and Preservation Act (Law 4/93)	Clause 5a states that an impact assessment study shall be submitted to the Ministry of Environment, Energy and Water before implementing any development project that may have a potentially detrimental impact on the environment. Therefore, Clause 5 is of specific relevance to this EIA. The *EIA Regulations,* which came into force in May 2012 has been developed by the powers vested by the above umbrella law. This EIA has also been prepared as per this regulation.
EIA Regulation 2012	The Ministry of Environment has issued EIA regulation on May 2012, which guides the process of undertaking the Environmental Impact Assessment in the Maldives - This guideline also provides a comprehensive outline of the EIA process, including the roles and responsibilities of the consultants and the proponents. This regulation outlines every step of the EIA process beginning from application to undertake an EIA, details on the contents, minimum requirements for consultants undertaking the EIA, format of the EIA/IEE report and many more. The Ministry of Environment has issued 4 amendments to this regulation over the past years which were also followed.
Waste Management Regulations (R-58/2013)	The Ministry of Environment has developed national waste management regulation. The key elements of the regulations include: ensure safe disposal of solid waste and encourage recycling and reduction in waste generated, develop guidelines on waste management and disposal and advocate enforcing these guidelines through inter-sectoral collaboration and ensure safe disposal of

	chemical, industrial and hazardous waste. Waste management for the proposed project during the construction and operation phase will be in line with this regulation. The waste generated from the project site would be taken to the Thilafushi for processing and disposal. This project meets the requirements of this regulations.
National Biodiversity Strategy and Action Plan (NBSAP)	The objective of NBSAP was to *"achieve biodiversity conservation and sustainable utilization of biological resources in the Maldives"* by integration of biodiversity conservation into all areas of national planning, policy development and administration (MHAHE, 2002). To achieve this objective, one of the first actions listed is "formulation and adoption of suitable development planning procedures, land use plans and strengthening of the EIA process". The current project conforms to this policy, by carrying out the EIA prior to commencement of the project, to minimize impact on the environment and to incorporate ways of environmental monitoring and management during the project works.
Regulation on dredging and reclamation (R-15/2013)	The Regulation on dredging and reclamation was published in the gazette on the 2nd of April 2013 and came into effect on the day itself. The regulation was implemented to minimize the impacts on the environment due to dredging and reclamation works carried out as part of a project. The implementing agency for the regulation is the Environmental Protection Agency. In addition to listing the circumstances where dredging and reclamation can be undertaken on inhabited islands, the regulation also details the procedure to be followed prior to the commencement of dredging works. Dredging can be undertaken on an inhabited island, to improve the social and economic condition of the island. Prior to the commencement of dredging work, an application must be submitted to EPA, with required documents, requesting for a dredging permit. Once the permit is obtained, an Environmental Impact Assessment of the work has to be carried out and report submitted to EPA, based on which EPA will provide a decision note which states whether the project can be carried out or not. As per

	the regulation, the proponent applied for a dredging permit in addition to carrying out the Environmental Impact Assessment.
Regulation on Coral, Sand and Aggregate mining	This regulation addresses 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 the house reef and the atoll rim has been banned through a directive from the President's Office dated 26th September 1990. Under Article 7 (c) of the Regulation on Sand and Coral Mining issued by the Ministry of Fisheries, Agriculture and Marine Resources (MOFAMR) on the 13 th of March 2000, it is an offence to mine sand or coral from the beach, lagoon or reef of any inhabited island. No corals or sand would be mined for the implementation of this project.
The Maldives Climate Change Strategy Framework	The Maldives Climate Change Strategy Framework is the main policy instrument of the Government of Maldives addressing climate change. The climate policy framework recognizes climate change as a central player in the sustainable development. The framework is expected to be instrumental in guiding the efforts to combat climate and to achieve the sustainable development of the Maldives. The policy framework provides a platform to streamline the existing climate change adaptation strategies that had been outlined in various policy documents. The implementation of the Maldives Climate Change Policy Framework is seen as a major step towards adapting to the current and future effects of climate change.

3 PROJECT DESCRIPTION

3.1 General context of the study

The aim of this study is to explain in detail the changes brought to the rock boulder breakwater design of K.Guraidhoo harbour construction project under phase II. Compared to the breakwater concept in harbour construction project EIA done in March 2014 (Zahid, 2014), a tremendous change has been brought to the design under Guraidhoo harbour construction project phase II initiated on 21st April 2016.

Length, shape and location of the breakwater in Phase II has been changed compared to the initial concept. Breakwater will be constructed by laying rock boulders of about 800 – 1200 kg weight. New length of the break water is 340m compared to the 194m in the initial concept. Out of 340m, 62m has already been completed under the initial harbour project EIA which is on south side of the harbour adjoining the Quay Wall. Remaining 278m will run over the natural channel on west of the main Quay Wall which will be reclaimed or filled to around -0.8m which is about 0.2m shallower than the existing depth of the shallow areas on both sides. Deepest part of the cannel is around 4.0m. Minor dredging is involved to source the fill material of the channel.

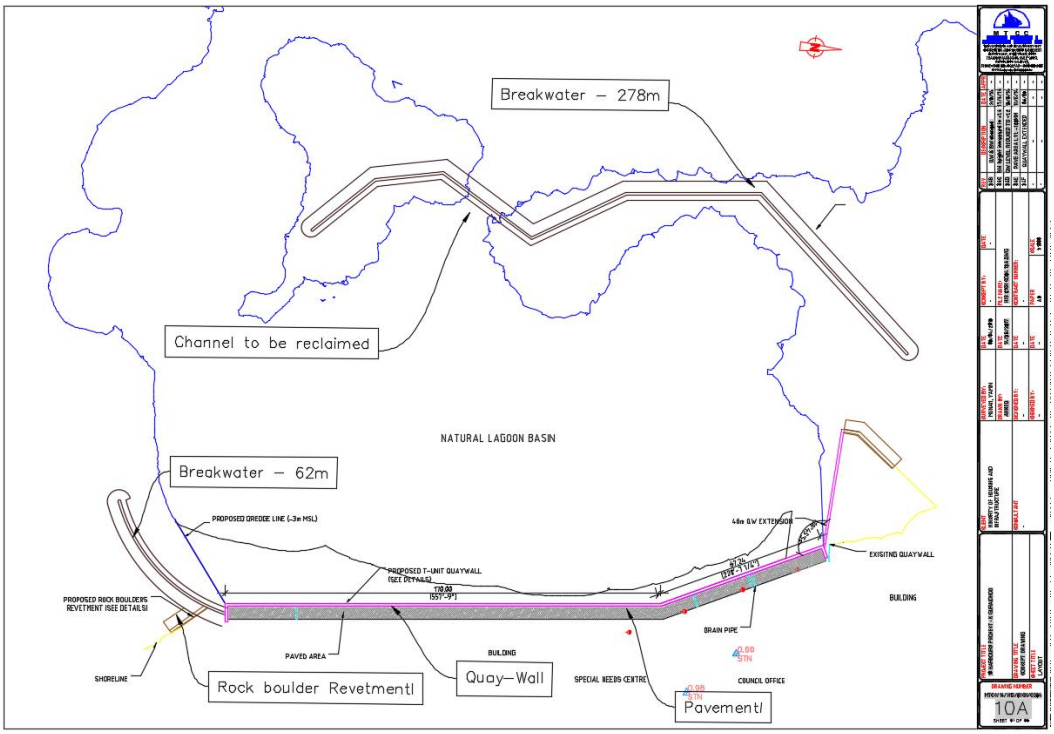


Figure 3.1: Breakwater concept under harbour project phase II

3.2 The Proponent

The project proponent is the Ministry of Housing and Infrastructure (MHI). MHI is the

government agency responsible for the development and regulation of the housing as well as the construction sector of the country. It is also the agency which oversees the development of housing and public infrastructure of the country including harbours and land reclamation projects.

3.3 Project Location and Study Area

Project location has already been discussed in harbour EIA in March 2014. Breakwater location is changed within the existing project area. The areas previously studied for the harbour project EIA can be considered relevant for the purpose of the proposed breakwater change. However additional surveys have been undertaken from the project area for this report.

Figure 3.2: Location of K.Guraidhoo (MPND, 2014)

3.4 Project Boundary

Project boundary is outlined in the below given figure. It encloses the entire harbour

construction area together with impact buffer zone.

Figure 3.3: Project Boundary

3.5 Project Components

Components of the harbour project includes site mobilization, material transport minor dredging, Quay-wall installation, breakwater construction, revetment construction, pavement arrangement, installation of navigational lights and site demobilization. Majority of these components has already taken place under harbour project phase I. Further discussions are ongoing regarding harbour light installation which has not yet been agreed as a part of the harbour project.

3.5.1 Site mobilization and demobilization

K.Guraidho Harbour site was first mobilized on 25th February 2014. Project work lasted till 30th October 2014 during which period during which period many project components were completed.

However, due to difficulties in sourcing rock boulders, site was temporarily demobilized on 30th October 2014 for using the machineries to speed up other projects of the contractor.

On 21st April 2016, the project site was mobilized for the second time to complete the remaining works together with other additional works agreed under, "Construction of K.Guraidhoo harbor Phase II".

3.5.2 Material Transport

All the major materials needed for the project including sand, cement, aggregate, iron bars, quay-wall units, rock boulders for breakwater and revetment have been taken to the site. Sand, cement, aggregate and iron bars were transported via local cargo vessels whereas rock boulders were sourced from overseas by towed barges. Quay-wall units were carried by MTCC barges from company's precast yard in Thilafushi.

3.5.3 Quay-wall Installation

Quay-wall installation and concreting the top of the concrete units have been completed under harbour project phase I.

3.5.4 Breakwater construction

Since a design change has been proposed for this component under phase II, main breakwater construction (278m) is on hold until a decision statement has been released for this report. However, the breakwater segment (62m) on the south side, adjoining the quay-wall end has been constructed under harbour project phase I. Additionally, a major part of the main breakwater bed is also completed. Breakwater height is +1.6m relative to MSL with 1.0m wide crest.

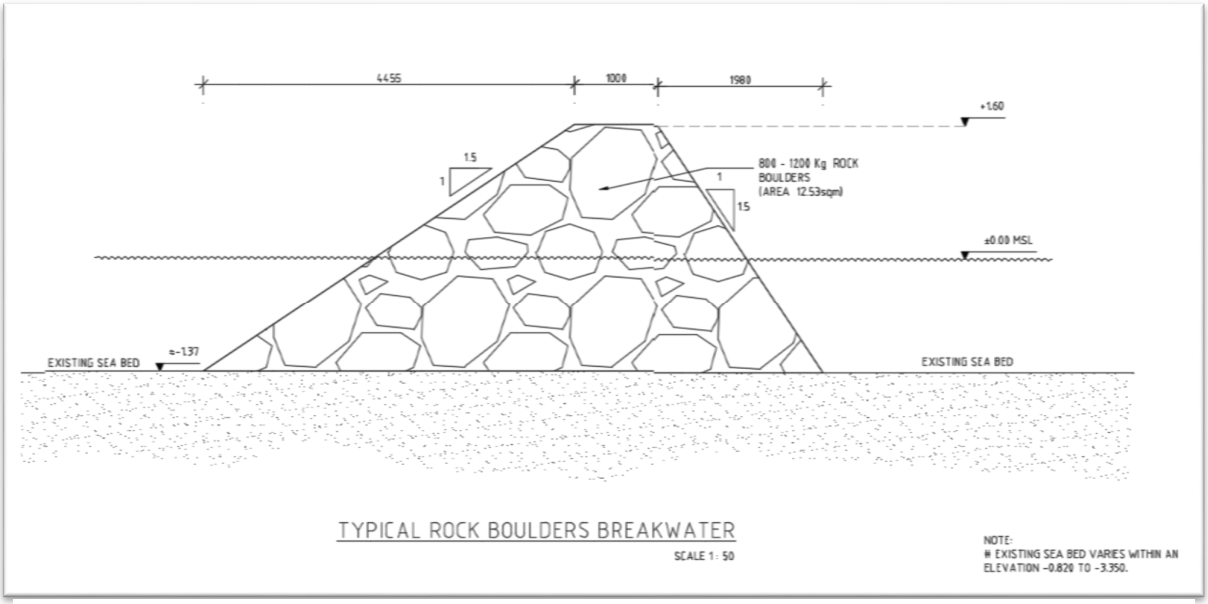


Figure 3.4: Breakwater section

Figure 3.5: Aerial image of Guraidhoo existing harbour area (Courtesy to MTCC Survey Team)

3.5.5 Revetment

No revetment work has been undertaken yet.

3.5.6 Dredging and reclamation

Dredging besides quay-wall units to obtain a suitable depth (-3.0m) for vessels have been completed.

However, dredging to source fill material of the channel is to be under taken under phase II. An area of about 20m x 28m is to be reclaimed to a depth of about -0.8m for breakwater construction. This area is a natural channel which is 3.0-4.0m deep, requiring about 2,000cbm of sand to fill to the required level.

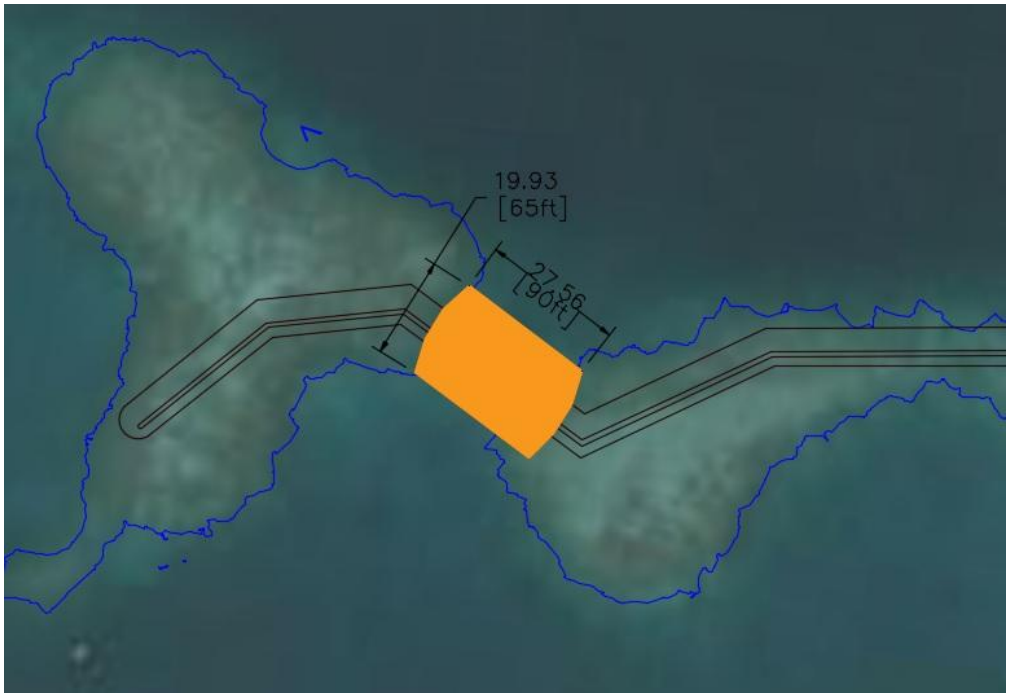


Figure 3.6: Fill area

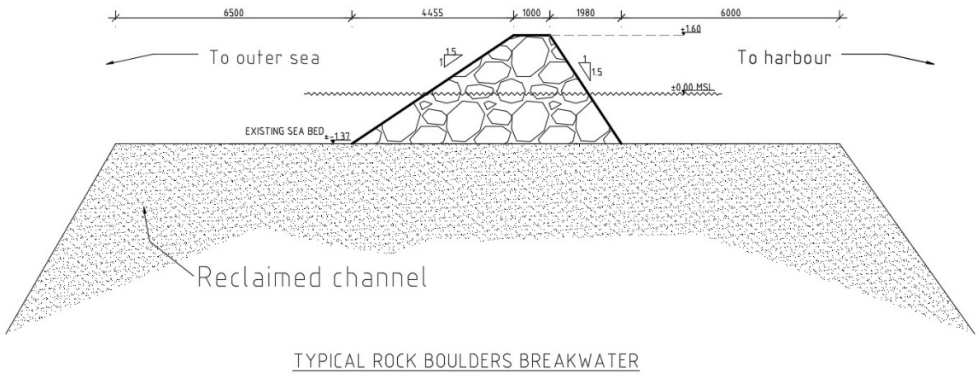


Figure 3.7: Cross Section of the breakwater over the fill area

3.5.7 Pavement arrangement

About 70% of pavement work is completed. The remaining area will be paved after the project completion as space must be allocated for heavy vehicle movement during the construction stage.

3.5.8 Navigational Lights

Navigational lights will be installed after the construction of main breakwater.

3.6 Project Justification

According to the harbour EIA 2014, justification for the project is to provide safe and secure harbouring facilities to the vessels, especially the larger ones. The island only had a natural harbour with some jetties without a breakwater for providing protection during the rough weather conditions. As a result government proposed a harbour construction project in K.Guraidhoo.

In the harbour EIA report it was noticed that the location and the extent of breakwater in the phase I harbour concept is not good enough to provide protection to the harbour from the predominant waves of the southwest monsoon. Furthermore, during island community consultation, they have expressed dissatisfaction over the initial breakwater design as it did not cover the western side of the proposed harbour. According to the harbour EIA consultant, based on the predicted currents around the island throughout the year (current/wave patterns were predicted using drogue studies, consultations with the locals, shape of the island, sediment movement around the island and experience of the consultants) the proposed breakwater under harbour phase I may not provide enough protection for the harbor from monsoon generated waves and currents.

Referring to the above factors, the desired alternative option proposed in the harbour EIA was to construct the breakwater over the western side. In order to minimise the cost factor, at that time, it was not proposed to close the channel which is proposed to be closed under phase II. But it is evident from the surveys and island community consultations that the best option for the proposed harbour in Guraidhoo is to completely protect the western side by closing the channel (Zahid, 2014).

3.7 Work methodologies

Under this section, methodologies of the remaining works, more importantly the major work which is the main cause of this addendum will be explained.

3.7.1 Breakwater construction

Rock boulders are transported to harbour site from overseas by tug and barge. This operation has already been completed.

A setting-out survey will be conducted to mark the location of breakwater by means of GI pipes or iron bars. Afterwards, rock boulders will be carried to the breakwater location by dump trucks which will be loaded by excavators. Initially rock boulders will be laid along the breakwater line to make a bed over which dump trucks can move. Once rock boulders are unloaded, the bed will be made by the excavator. Formation of break water bed will start from the end closer to the island, and will move further away until a bed is made along the full breakwater line after which breakwater profiling will be undertaken by the excavator from the far end towards the end closer

to the island. During the construction, the design profile of the breakwater will be maintained by the supervisor who will continuously check the slop and height by using a level meter or a Total station.

3.7.2 Excavation and closing the channel

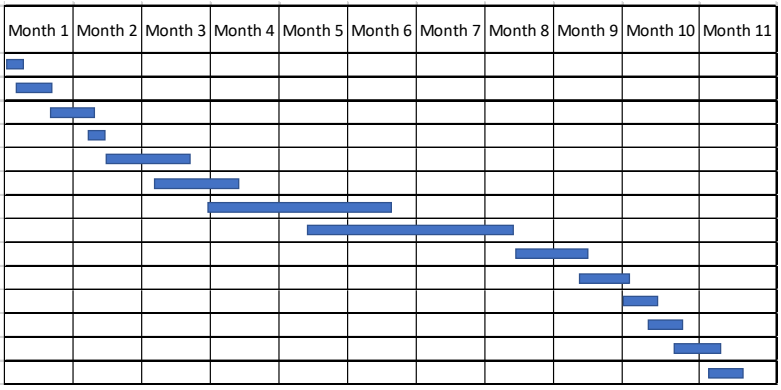
Approved sand borrow area will be marked by a setting-out survey. Excavation will be undertaken by excavators working on sand beds. Excavator will move over a sand bed to the sand borrow area and begin the excavation. The excavated fill material will be carried to the channel (fill area) by dump trucks moving over the sand and the breakwater bed. Once the required amount of sand has been dumped, excavator will level the surface before constructing the breakwater over the reclaimed area. Depending on the approved sand borrow area, the transportation bed can be made short.

3.8 Project Management

3.8.1 Project Schedule

The project schedule has been changed compared to harbour EIA since works of two stages (phase I and II) are to be completed now. Total project duration is 330 days which is about 11 months compared to 7 months duration of the harbour project. A detailed work schedule is given below.

Sno.	Description	Duration/ days
1	Preliminary works	7
2	Mobilisation	14
3	Site Setup	20
4	Survey ad Setting-out	7
5	Dredging and Excavation	49
6	Reclamation	40
7	Quay-wall Costructon	90
8	Breakwater Construction	180
9	Revetment Construction	35
10	Pavement	20
11	Installation of Harbour Street lights	15
12	Out Survey	10
13	Site Clearance	20
14	Demobilisation	13



3.8.2 Project Manpower and machineries

Project manpower and machinery lists given in harbour EIA on page 31 and 32 is sufficient (Zahid, 2014). No additional manpower or machinery will be used for the proposed change in breakwater design. According to harbour EIA, a total of 27 workers will be used by the contractor for the project. This includes both foreign and local staffs. Usually site Manager and Supervisor will be locals. Harbour EIA lists number of heavy duty machineries that will be used for the project.

3.8.3 Waste management

Waste bins will be placed within the site area which will be removed and replaced as needed. General domestic waste from the construction activities will be disposed via the waste management cycle of Guraidhoo. However, hazardous water such as grease, oil construction waste not suitable to be disposed in the island will be stockpiled in the project area which will finally be taken to Thilafushi.

3.8.4 Safety

Workers should be provided with safety shoes, helmets, overalls and other work specific safety gears to be worn during the working hours within the work site. No worker should be allowed to work without proper safety attire. Workers should be made aware of safety policies, emergency plans or evacuation policies in times of emergency. Fire extinguishers and first aid kits should be readily available within a known place in the site for health and welfare purpose.

3.8.5 Site accommodation

Site manpower will be accommodated in rented houses in the island. This will be done in consultation with the island council.

3.8.6 Fuel storage and handling

Fuel should be stored in proper solid containers with a proper mechanism of refueling the vehicles. Refueling should be carried out on a hard surface within the site. Spillage of oil and grease can occur if adequate measures are not taken.

3.8.7 Risks associated with the project

There are very few and limited risk factors associated with this project that could possibly have both financial, environmental and fatal implications given that mentioned safety attires are worn by the workers and safety measures are properly taken in handling machineries and hazardous items.

3.9 Project Inputs and Outputs

3.9.1 Project Inputs

The project has inputs in terms of machineries, human and natural resources which are summarized in the below given table.

Table 3-1: Main inputs of the proposed project

Input Resources	**How to obtain the resources**
Site workers	Contractor's manpower which include Maldivians and foreigners
Water supply	Either desalinated, rain or mineral water which is available from the island
Electricity	Available from the island
Food	Available from island also will be sourced by contractor from Male'
Machineries	Provided by contractor
Fuel and grease	Provided by contractor from Male'
Workshop and Office setup	Provided by contractor

3.9.2 Project Out puts

The main output of the project is the harbour together with the associated socio-economic benefits.

Table 3-2: Main outputs of the proposed project

Products and Waste Material	**Anticipated Quantities**	**Method of Disposal**
Waste water	200L/person/day	Through existing island sewerage system
Hazardous waste (oil and grease)	Minor amounts	Will be stockpiled in the site and taken to Thilafushi during demobilization
Air pollution	Minor amounts of Sulphur and Nitrogen oxides and dust will be released into atmosphere by vehicles	Unavoidable
Noise pollution	Localized to the houses close to the project area	Unavoidable during construction phase and project doesn't involve activities that generate very loud noise
Rock Boulder Breakwater	340 meter long	Harbour protection breakwater mainly on west side of the harbour
Excavation	2000cbm	Used as fill material of the channel
House hold waste	Minor	Disposed to island garbage

4 PROJECT ALTERNATIVES

It is a requirement of the EIA regulation to provide at least two alternatives including the no project option. If the project were to continue, it would be necessary to take technical, economic, ecological and social aspects of the project into consideration and ensure that these concerns exist within a delicate balance. Neither the economic benefits nor the social and ecological concerns can be avoided. Therefore, it is important to consider all options and ensure that the best available option(s) is/are chosen to solve the issues/problems.

4.1 No project option

Since this project already has an approved EIA (Zahid, 2014), no project option is not applicable. Nonetheless, the change proposed under the addendum can be considered to keep unchanged as the no project option.

As has been described in the "Project Justification" section of the report, the purpose of the proposed change to the breakwater is to provide the community of Guraidhoo with safe access and safety to sea vessels using the mooring area throughout the year, especially from the predominant waves of the southwest monsoon. In this regard, the breakwater design under harbour phase I does not provide enough protection from waves and currents for a period of time every year. If the proposed change can be brought within the ongoing harbour project, many costs associated with the project such as the mobilization and demobilization can be reduced. Projects of this nature will not happen in islands frequently. So, considering the technical, economic, ecological and social aspects of the project, it would be worthwhile to attend any possible alterations that would improve the quality, usage and benefit of the project.

Although there will be no additional impacts on the environment if the proposed change does not go ahead, this will eliminate an important factor that would otherwise have improved the usability of the harbour throughout the year.

4.2 Material used for Breakwater Construction

The current breakwater is proposed to be constructed by using 800-1200kg weighted rock boulders sourced from overseas. They are strong, long lasting and can withstand in harsh environments. Although costly, technical, economic and social benefits associated with this structure will be high.

4.2.1 Use of Tetra pods

Tetra pods can be locally casted like quay-wall T units. Weight and size can be varied to suite the environment. They will also be strong and long lasting.

Nevertheless, casting or manufacturing will involve additional logistics and manpower. Also skilled workers are required to install them in an interlocking format. So from a technical and economical perspective, this is not a better choice over rock boulders.

4.2.2 Use of Geo bags

Use of geo bags and geotextile tube is a much cost effective solution compared to the above two. But they cannot be strong and long lasting like rock boulders or tetra pods. So, use of geo bag or geotextile tube is not a suitable solution alternative Guraidhoo breakwater.

4.2.3 Use of Sand-cement bags

Under this method, gunny bags are filled with a dry mix of sand and cement which will finally be stacked together to erect a wall of breakwater starting from the seabed. This would be the cheapest method out of the given alternatives for breakwater material. However, this is an old method of breakwater construction which is outdated for its non-durability and frequent maintenance required.

4.3 Breakwater design

4.3.1 Breakwater without filling the channel

This will divide the main breakwater into two segments running over the shallow areas on north and south of the channel which is proposed to be filled and closed. Main advantage of this alternative would be that it does not require extra dredging to source channel fill material. This is also the desired alternative that was proposed in harbour EIA in 2014 considering the community consultation then. But during southwest monsoon when the harbour area is affected by strong waves, it will generate turbulence with the harbour as the channel is open.

Figure 4.1: Alternative breakwater design

4.3.2 Breakwater end diverted to west

This design might not have a considerable positive impact though it is expected to give more protection from wind generated waves of south west monsoon (Ramiz, 2007). Total length of the breakwater is kept unchanged.

Figure 4.2: Breakwater change proposed by Island community

4.4 Location of sand borrow area

The project proposes two possible sand borrow areas under dredging and reclamation permit. The area A is on the east of the breakwater towards the harbour thereby isolating it from the reef zones on the west (outside harbour). On the other hand, area A is very close (about 12m) to the fill area which extremely shortens the sand transportation distance and the temporary sand transportation bed needed. Also, this area has less live corals compared to the area B. This makes area A a better sand borrow area compared to B.

Proposed sand borrow area B is located on the north east of the breakwater which is outside the harbour and is more lively. This area is also far from the fill area which will require a longer sand transportation bed to be made. So, in ecological and environmental terms, this area is not suitable compared to area A.

Figure 4.3: Proposed fill and borrow areas

However, island community has preferred and suggested differently. Their preferred sand borrow locations are C, A, D and B in priority order. Their justification for the preference is that there should not be shallow areas within harbour. They are with the opinion that the inner side of the breakwater should be dredged after leaving a safety gap from the breakwater base so that breakwater also can be used to anchor vessels.

Location D is marked because if a channel can be dredged from there, the deep lagoon on north can be used as a yacht marina. Dredging two channels from north and south rim of this deep lagoon is noted in the preferred alternative option of 2014 harbour EIA.

Figure 4.4: Borrow areas preferred by Island council

But if a channel such as D is to be dredged, an area of about 120m by 25m has to be excavated. Considering the amount of dredging required for such a channel and the sand transportation distance, this might not be accommodated within the current budget of the project.

If location C is to be approved as the sand borrow area, another location should also be approved together with location C. Because to come to location C, vehicles have to cross the proposed fill area (channel) which has to be filled before dredging can be started in location C.

Apart from location C being the 1st priority for borrowing sand, island community is with the opinion that all these sand borrow locations within the harbour, east of breakwater should be dredged to around -3.0m starting from the deep lagoon which is the optimum harbour depth in most of the Maldivian harbours. But dredging to achieve -3.0m at all areas starting from the deep lagoon will not be possible by the dredging methodology employed in this project where the excavator will be on a sand bed for excavation. Contractor is with the opinion that a sand bed cannot be laid at the edge of a deep lagoon for excavation. Such an excavation can only be done by keeping the excavator over a spud barge. But usage of a spud barge is not estimated for this project.

Figure 4.5: The channel to be closed

4.5 The preferred alternative

Considering the technical, economic, ecological and social aspects of the project, the preferred alternative is the breakwater with two segments running over the shallow areas on north and south of the channel. The following points reason out and justify the preferred alternative.

- Eliminate sand borrow areas and associated impacts.
- Eliminate filling or reclamation and associated impacts.
- Provide protection again the prevailing strong waves of southwest monsoon although not to the extent with a continuous breakwater where the channel will be closed. This harsh weather condition is not experienced throughout the year.
- But the work methodology associated with a two segment breakwater might be complex without closing the channel. Transfer of rock boulders and machinery to the shallow area on the south of the channel will require a barge if the channel is not be closed. This will incur additional costs. However, the elimination or dredging and reclamation is expected to compensate this extra cost.

5 METHODOLOGY

Baseline environment of the proposed project area were studied and surveyed by using standard scientific methods. Information on the physical and biological environment was obtained in field surveys undertaken in the project site during May and June 2017. General information on the existing environment was based on available secondary data, such as climatic data from the meteorological center at K.Hulhule. Oceanographic data and information used to determine the current patterns around the island were also based on monsoonal wind patterns, wind generated waves, tidal flushing and geographic setting. The approach to data collection and compilation of the report are done by;

- Evaluation of available and relevant literature on environmental impacts associated with similar projects,
- Examination of the existing environment to identify significant environmental components that are likely to be affected and
- Consultation with major stakeholders to exchange information on the project and to follow the EIA procedures required for the report.

5.1 Bathymetry

A full bathymetry of the proposed project location was undertaken by using a singlebeam Ohmex SonarMite which was which was integrated to a Topcon GR5 DGPS. SonarMite is lowered to the sea from the side of a small speedboat after fixing it to the end of the pole. The pole is mounted to the speedboat by a mounting bracket. The integrated GPS rover will be placed at the top of the pole so that correct horizontal coordinates for the depth points are recorded. Bathymetric survey was conducted relative to Survey mark on the ground whose height has been reduced to MSL previously. So, all the depth data obtained will be recorded relative to MSL. Bathymetric maps were generated in Civil3D.

5.2 Shoreline mapping and beach profiles

Shoreline mapping and profiles of the beach were taken in GNSS RTK positioning method by using Topcon GR5 DGPS. GPS base station was set over a survey mark which has a reduced level relative to MSL.

5.3 Marine Survey

A GoPro camera with housing was used to take a series of photographs for assessing reef benthic community. Photo quadrats were taken along a 20 meter transect line. Randomly selected

20 quadrats were sampled within a 10 meter belt along the 50 meter transect line. Qualitative and Quantitative assessment was carried out at site 1, 2 and 3. Photos were analyzed using Coral Point Count with Excel Extensions software (CPCe) to assess the benthic cover.

Assessment of the selected fish community was also carried out at the same site which would also be considered as the baseline for future monitoring of the impact of the project. Fish abundance and density surveys were based on visual fish census techniques described in English, Wilkinson and Baker (1997). The 20 meter long transect line used to assess the coral and other benthic substrate was used to estimate the diversity and abundance of all coral reef fish families that are commonly associated with the reef environment of Maldives and observed in the area.

5.4 Social environment

Information on social conditions were assessed using information provided by the island council and personal observations of surveyors made during the field visit.

5.5 Currents

A purpose built drogue with a hand held GPS was made to create spaghetti diagrams of the ocean currents at the study site. Drogue tests were conducted on 3 selected locations of the project.

5.6 General meteorological conditions

Secondary sources of information were used to describe meteorological conditions such as temperature, relative humidity, rainfall and wind data of Maldives. Data provided by MEE and Maldives Meteorological Service were referred.

5.7 Water Quality analysis

Marine water quality was tested in situ at three different locations using YSI ProDSS Multiparameter Sampling Instrument. These two meters recorded Temperature, Salinity, E. Conductivity, Total Dissolved Solids, Dissolved Oxygen, pH, Turbidity and Total Suspended Solids.

Figure 5.1: Marine Survey Locations

6 EXISTING ENVIRONMENT

Since the existing environment of the island has been discussed in detail in the harbour EIA report and no additional information is deemed necessary, it is considered relevant for this report. However, additional surveys were undertaken for this report in May and June 2017.

6.1 Marine Water Quality

Marine water quality was measured from two locations on the project area. The measured parameters are within the optimum range. The quality of sea water is important for ecological functioning of the organisms living in the habitat.

Table 6-1: Water Quality Results

	Units	Site 1	Site 2	Optimum range
Physical Appearance	-	Clear	Clear	-
Temperature	ºC	27.10	26.95	18 – 32 (ANZECC, 2000)
pH	-	7.92	7.83	6.0-9.0 (ANZECC, 2000)
Salinity	‰	31.21	30.12	320-042 (GBRMPA, 2009)

Turbidity	NTU	0.454	0.158	< 5
Total Suspended Solids	mg/L	0	0	-

6.2 Marine Survey

Condition of the biological environment was surveyed at 3 different locations which are close to the proposed sand borrow and fill area. The benthic habitat and community assessment including coral cover and marine species were assessed through photo and video transects.

6.2.1 Site 1

Site 1 is the south side of the proposed fill area-the channel. Majority of the area was dominated by dead coral (43.7%); live corals made up to 25% of transect along with 27.5% rubble and 3.8% sand. Live coral colonies of *Acropora latistella,* and *Porites branneri* were the most common type of corals found at this site.

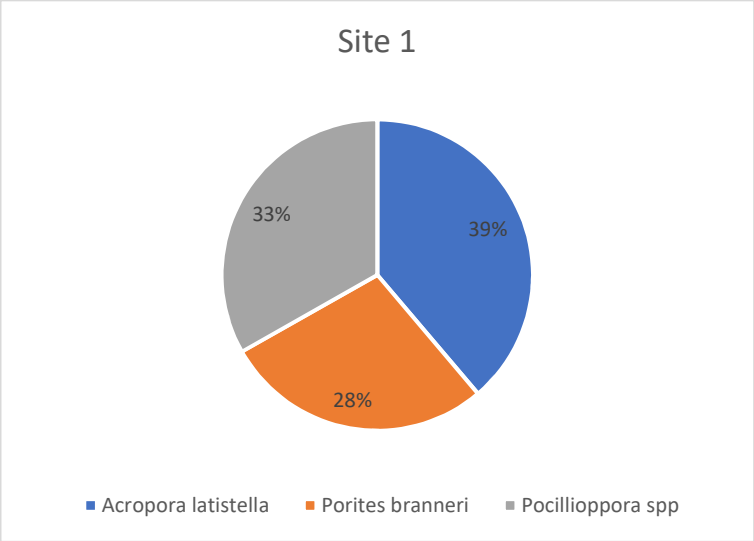


Figure 6.1: Live coral composition in Site 1

Figure 6.2: General Reef condition in Site 1

6.2.2 Site 2

Site 2 is the north side of the proposed fill area which also covers the proposed sand borrow area A. This site is composed of 48.1% rubble, 30% dead coral and 18% live coral with minor amount of sand. Majority of the live coral seen in this site is *Acropora* spp.

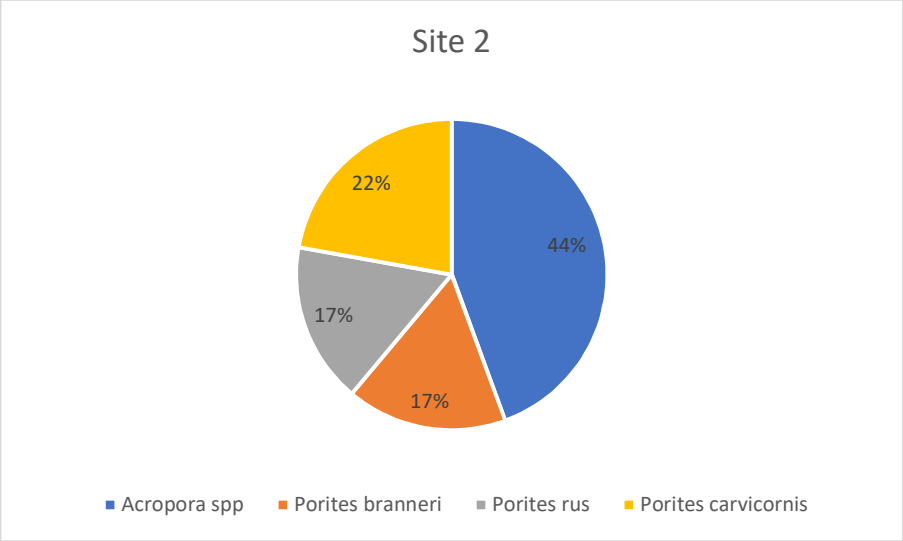


Figure 6.3: Live coral composition in Site 2

Figure 6.4: General Reef condition in Site 2

6.2.3 Site 3

Site 3 is selected from proposed sand borrow area 3 on north west of the breakwater. Compared to the other 2 site, live coral composition is much higher is this area which makes it unsuitable to be selected as a sand borrow site unless there is no other option. Sand composition of this site is 42% whereas rubble and dead coral account for 12% which leaves with 46% of live corals. Similar to the other two sites most of type of coral seen is *Acropora* spp.

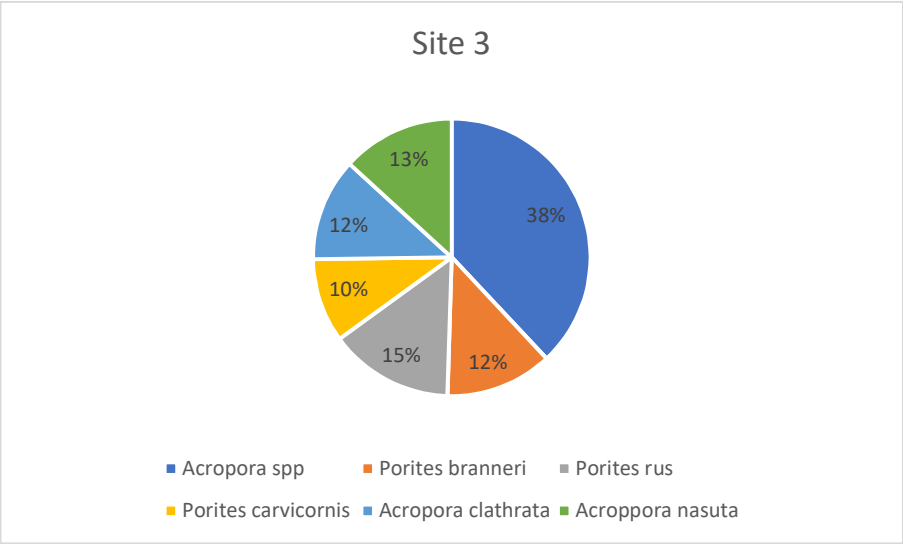


Figure 6.5: Live coral composition in Site 3

Figure 6.6: General reef condition in Site 3

6.2.4 Fish count

Reef fish survey was carried out in all 3 sites. It was noted that herbivorous fish species were dominant in general. The dominant groups of reef fish are Acanthurids, Labrids and Pomacentrids.

Table 6-2: Fish Census

Family	Common Name	Abundance		
		Site 1	Site 2	Site 3
Acanthuridae	Surgeonfish	A	A	A
Pomacentridae	Damselfish	A	C	A
Labridae	Wrasses	R	C	R
Scaridae	Parrotfish	-	R	-
Lutjanidae	Snappers	R	R	-
Chaetodontidae	Butterflyfish	C	-	R
Balistidae	Triggerfish	R	R	R
Holocentridae	Sqirrel and Soldierfish	-	-	-
Zanclidae	Moorish Idol	-	R	R
Pinguipedidae	Sandperches	-	R	-
Mullidae	Goatfish	-	R	R
Serranidae	Groupers	R	R	-

A – Abundant (during the swim , species were recorded to a degree difficult to count (>50))

C – Common (during the swim, they were spotted occasionally and throughout the survey (<50))

R – Rare (Very few observed (1 or 2))

6.3 Coastal environment

6.3.1 Shoreline

Coastal environment was studied during a survey in June 2017. Four beach profiles were taken and the shoreline (roughly MSL line) was mapped by a DGPS survey.

The island was seen to undergo severe erosion at 3 locations. According to island community, they cannot relate the erosion to the harbour project as they have experienced it way before harbour project. At various locations on the shoreline, individual members have tried to protect the shore by construction of concrete walls and dumping concrete waste as they cannot do much.

A seasonally shifting sand bank has been formed on the north-east side which according to island community was initially accumulated after the erosion from the adjoining area.

Figure 6.7: Guraidhoo Shoreline and location of severe erosion

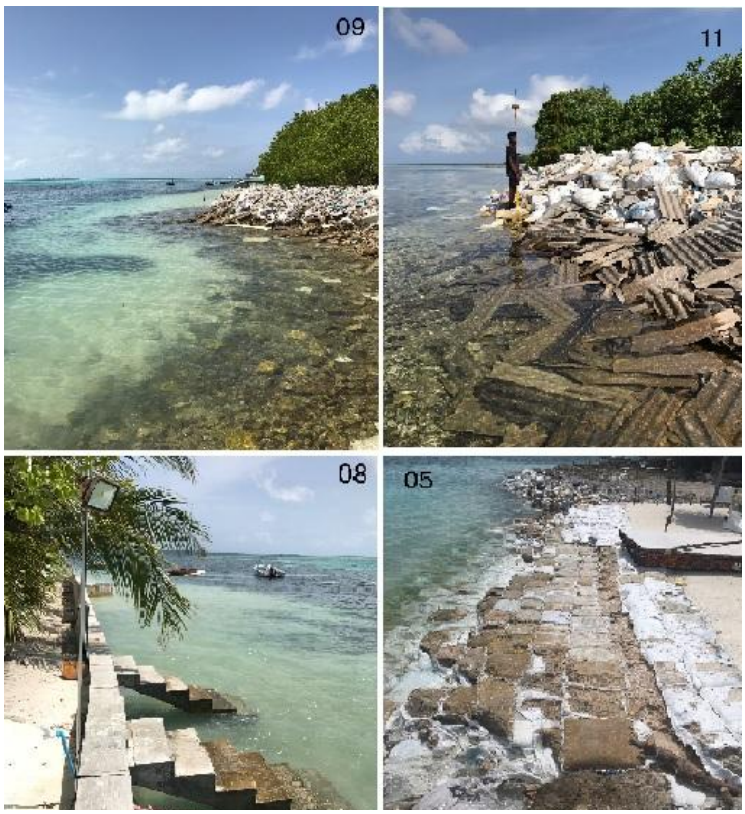


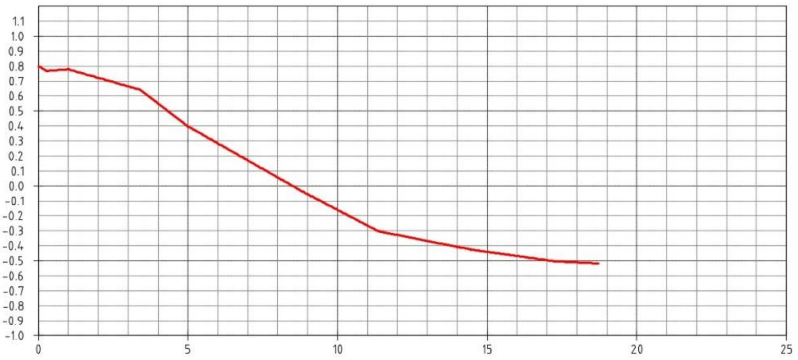
Figure 6.8: Shore protection features developed by island community

Figure 0.1: Aerial image of Guraidhoo north side (Courtesy: MTCC Survey Team)

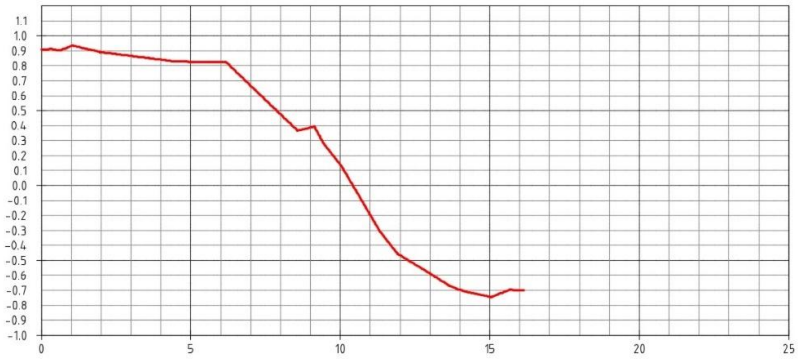
Figure 0.2: Aerial image of Guraidhoo South Side (Courtesy: MTCC Survey Team)

6.3.2 Beach Profiles

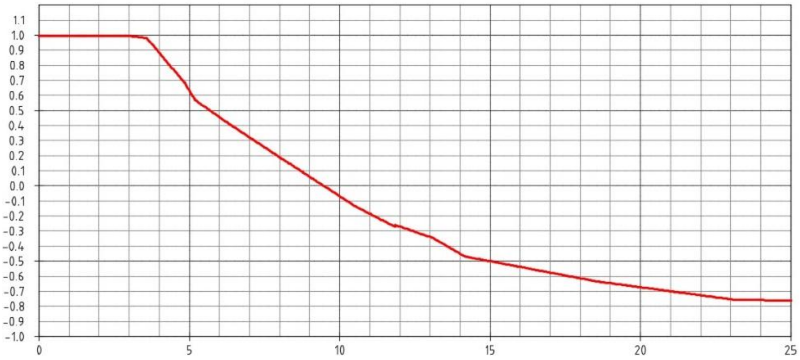
Four beach profiles were taken from the locations given in Figure 7.1 as baseline for future monitoring. Profile 2 looks unnatural as the area contains dumped concrete waste.



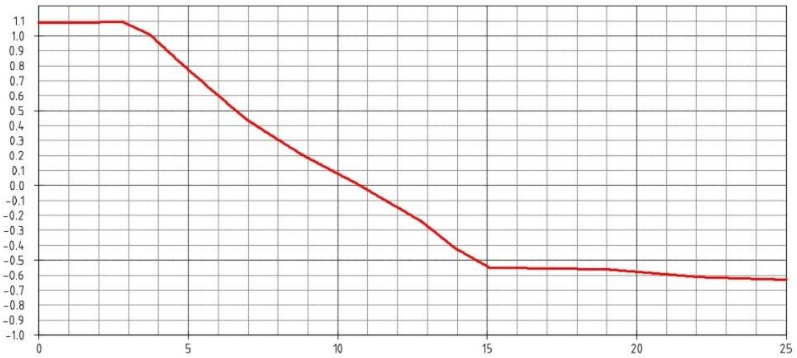
PROFILE 1



PROFILE 2



PROFILE 3

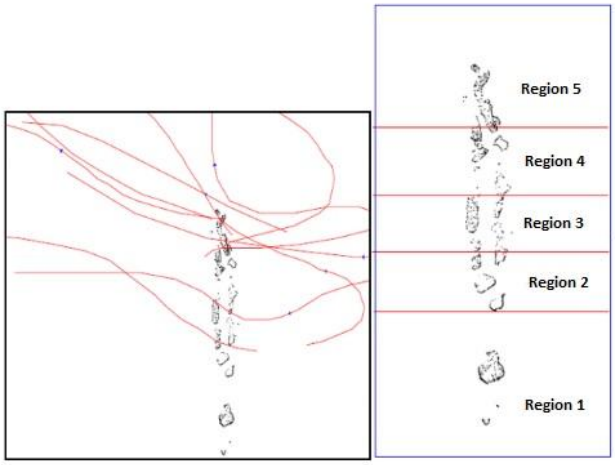


PROFILE 4

6.4 Natural Hazard Vulnerability

Natural hazard vulnerability risks related to global warming and subsequent sea level rise remains a cause for concern. However, since Maldives is located within the equatorial region of the Indian Ocean, it is generally free from cyclonic activity. There have only been a few cyclonic strength depressions that have tracked through the Maldives (UNDP, 2006). The vulnerability is further aggravated by the fact that rainfall in the region is of high intensity but short duration, which may be affected due to changes in global precipitation patterns related to climate change. However, the proposed project area has not had flooding due to rain.

In Developing a Disaster Rick Profile for Maldives by UNDP (UNDP, 2006), the natural vulnerability of the islands and atolls of the country to potential hazards have been modelled to understand the risk factors of the country. In that report, the disaster risk scenario for Maldives was described as moderate in general. Referring to Suffir-Simpson Scale, the proposed site is considered fairly safe zone when cyclonic winds and storm surges over the Maldives are concerned and also low risk when tsunamis and earthquakes are concerned (UNDP, 2007).



Hazard Zone	Probable Maximum Wind Speed (knots)	Saffir-Simpson Scale
1	0.0	0
2	55.9	0
3	69.6	1
4	84.2	2
5	96.8	3

Figure 0.3: Cyclonic hazard zones and historical storm tracts in Indian Ocean (UNDP, 2006)

7 ENVIRONMENTAL IMPACTS

7.1 Introduction

Any developmental project has impacts on the environment, which can either be positive or negative. They can also be direct or indirect and short term or long term in their existence. Identification of these impacts is important in the early stages of the project to assess whether they are reasonable, and if any mitigation measures can be made.

Different methods are available to categorize impacts and identify the magnitude and significance of the impact, such as checklists, matrices, expert opinion, modeling etc. Impacts on the environment from various activities of the project construction work (constructional impacts) and post construction (operational impacts) have been identified through interviews with the project management team, field data collection surveys and based on past experience in similar development projects.

7.2 Impact Identification

The impact identification Leopold matrix given in page 67 of the harbour EIA is sufficient for the project. But a simple purpose built matrix has been used to evaluate the overall impacts of the proposed change in the addendum. The impacts of the project have been evaluated according to the following criteria:

1. Magnitude (or severity): the amount or scale of change that will result from the impact
2. Significance: importance of the impact. Reversibility is considered part of its significance
3. Duration: the time over which the impact would be felt
4. Spatial extent: the spatial extent over which the impact would be felt.

Table 7-1: Simple impact matrix for the proposed Breakwater change

IMPACT	DIRECT/ INDIRECT/ COMMULATIVE	MAGNITUDE	SIGNIFICANCE	DURATION	SPATIAL EXTENT	PROJECT ACTIVITY
Sedimentation, Loss of fauna habitat	Direct	Minor Negative	Low	Short term	Site specific	Dredging and Reclamation
Noise and air pollution	Direct	Minor Negative	Low	Short term	Project area	Machinery and Workforce
Sedimentation, Loss of fauna habitate, Change in Hydrodynamics	Direct	Minor Negative	Low	Long term	Site specific and Island	Breakwater Construction
Protected harbour	Commulative	Positive	High	Long term	Harbour	Completed Breakwater
Change in Hydrodynamics, Possible island erosion	Commulative	Negative	Low	Long term	Island	Completed Breakwater

According to the above matrix, the proposed change in the breakwater has minor negative environmental impacts during construction which are mostly short term. But social and economic benefits associated with the project outweigh the negative environmental impact, as a result of which the total potential impact index for the project is considered to be positive despite.

7.3 Impacts during Construction Phase

7.3.1 Machinery and workforce

These impacts outlined in harbour EIA 2014 is considered applicable and no further discussion of these impacts are included in this report.

7.3.2 Dredging and Reclamation

Dredging and reclamation would cause sedimentation and sediment re-suspension which would consequential increase the turbidity of coastal marine water. This will be a direct short-term negative impact of low significance since the scope of dredging and reclamation is less. Sedimentation will stress live corals and filter feeding marine organisms greatly if exposed to high rates for prolonged periods of time. Dredging would directly destroy benthic habitats in sand borrow location. Therefore, a location with less live corals (Location A) should be selected for

dredging.

As dredging under this project will be carried out within the harbour basin of the proposed harbour, majority of the sediment suspended during dredging activity will be contained within the harbour basin which is the deep lagoon and only a small amount of sediment is estimated to move out to the reef area via the access channel. Therefore, its impact on live corals and other marine organisms will be minimal. And in terms of negative environmental impacts on the marine environment due to this proposed change are minor to negligible

7.4 Impacts under Operational phase

7.4.1 Changes in Hydrodynamics

The proposed project will not have severe impacts on the overall longshore current around the island as the structure allows ample space between it and the island. But beach monitoring should be carried out as outlined in the monitoring programme to ensure no severe erosion takes place due to the project. According to the island community, so far they have not noticed any beach erosion that could be justified to be related to the harbour project although the island under goes erosion.

7.4.2 Socio-economic impacts

Once the breakwater construction is completed as proposed in the concept, it will provide a well-protected habour for the island of k.Guraidhoo. This will facilitate the island community in number of ways such as providing a safe loading and unloading area, a safer habouring area for the vessels which will ultimately reduce the stress of fishermen and businessmen in the island.

7.5 Mitigation Measures

7.5.1 Reducing Sedimentation and its impact

As described earlier, one of the significant impacts from this project will be sedimentation. However, due to the small amount of dredging and reclamation involved and short period of time, no special mitigation measures would be needed. Natural dispersion of sediment will be sufficient. Mitigation measures proposed in the EIA report, such as workforce awareness and timing would be sufficient.

As a mitigation measure during reclamation, it is advisable that the boundary of the proposed

reclamation area is enclosed initially by the dredge material to make a bund wall. This will greatly reduce and confine the sedimentation due to reclamation. Due to longshore and onshore currents in the area, the water quality would be affected for a short duration and sediment plumes would be diluted to a great extent.

7.6 Uncertainties in impact prediction

The level of uncertainty, in the case of the proposed dredging, reclamation and breakwater construction is expected to be low due to the experience of such similar works and settings experienced in Maldives. However, it is important to consider that there are elements that require careful monitoring such as the change in hydrodynamics. Therefore, it is extremely important to carry out environment monitoring as described in the monitoring programme given in the EIA report.

8 STAKEHOLDERS CONSULTATION

Main stakeholders of the project are similar are those identified in the harbour EIA report.

8.1 Scoping Meeting

Following the EIA addendum application submission, EPA decided to hold a scoping meeting for the project. A scoping meeting was held in EPA on 15th May 2017 which was attended by all the main stakeholders. It was discussed that the breakwater design under harbour project phase II is in line with the requirements of the island community. No issue was raised in the scoping meeting.

Table 8-1: List of participants of the scoping meeting

NAME	DESIGNATION	OFFICE	CONTACT
Abdul Samad	A.Director	K.Guraidhoo Council	795 1399
Mohamed Ibrahim Jaleel	A.Director	MEE	976 8999
Firdous Hussain	Senior Engineer/ EIA Consultant	MTCC	797 3873

Ahmed Waheed	Asst. Project Officer	MHI	982 3107
Rifau Aleem	SEA	EPA	333 5949
Ibrahim Naeem	Director General	EPA	333 5949
Hashim Nabeel	Asst. Oceanographic Observer	EPA	768 7188

8.2 Island community meeting

However, in the island community meeting held in Guraidhoo Council office on 10th May 2017, number of suggestions were proposed by the island community. Major requests of the island community are;

- Guraidhoo urgently needs a vessel beaching area. It is a request of the island council and the fishermen to include a vessel beaching area under harbour phase II. Currently the vessels are beached to a nearby island like K.Gulhi where they have to pay around MVR10,000 every time they get service. According to the council, MHI agreed to include a vessel beaching area under phase II.
- To lengthen the already completed 62.0m breakwater on the south side suggesting that channel opening is too much.
- To connect the northern end of the breakwater to the quay-wall on that side by means of a jetty so that people can get on the breakwater.
- To dredge the shallow areas on the east of breakwater after leaving a safety gap from the base of the breakwater.
- To lengthen the breakwater towards southwest to possibly provide more protection.

Figure 8.1: Graphical representation of the requests of Island community

Table 8-2: Participants of Island community meeting

NAME	DESIGNATION	OFFICE	CONTACT
Ali Mohamed	Vessel Owner	Community member	
Abdul Rasheed	"	"	
Firdous Hussain	Senior Engineer/ EIA Consultant	MTCC	797 3873
Abdulla Mufeed	Vessel Owner	Community member	
Abdul Sahthaar	"	"	
Abdul Latheef	"	"	
Ibrahim Shaleez	Vice President	K.Guraidhoo Council	795 7660

Ali Shameem	Councilor	K.Guraidhoo Council	
Irufaan	Office Assistant	K. Guraidhoo Island Office	
Mohamed Sofwan	Supervisor	MTCC	792 1249

9 ENVIRONMENT MONITORING

As there are no significant changes to project site or environmental parameters the impacts will reach, no additional monitoring requirement is identified by the consultant for this component; i.e. monitoring schedule given in the initial EIA is considered appropriate and sufficient to address impacts of the proposed component.

In addition to this, in every 3 months until 1 year, the part of breakwater over the reclaimed area should be checked for level changes due to long term compaction, soil erosion and for any other reason. After 1 year it should be monitored in every 6 months until 3 years. And if no considerable level change is noticed in these surveys time, no further monitoring is required.

To observe level changes, take profiles of the breakwater and the reclaimed area from the two ends of the reclaimed part and at the middle by using either a level meter, Total station or DGP. Such a survey will cost extra USD 200 if carried out with High Tide, Low Tide and beach profile survey outlined in monitoring programme which also must be undertaken in every 3 months. But if this survey is to be considered alone, it will cost USD700 per survey.

10 CONCLUSION

As outlined and justified in the report, the main objective of the change brought to breakwater in harbour phase II is to provide protection safety to the vessels mainly during the southwest monsoon. As evident from 2014 EIA, this is the major request of the island community regarding the previous concept. Also it is evident from the initial EIA, that the west side of the harbour should be protected.

And in an environmental perspective, this change does not involve considerable adverse impacts to the environment. Main impact will be due to the sedimentation which is also not considerable since minor dredging is involved and compared to the socio-economic impacts which will be associated with a properly functioning harbour.

Therefore, based on this report, it is recommended that the breakwater of K.Guradhoo harbour should be constructed according to the proposed changes under harbour project phase II.

11 ACKNOWLEGDEMENT

The author wish to acknowledge the work of those people who have assisted the consulting team in carrying out the necessary site surveys and creation of maps for preparation of the report. Also appreciate the work of those who participated in different meetings held regarding the EIA addendum report. Below given are the EIA team members and those who provided assistance at varies ways in various stages.

- Firdous Hussain — EIA Consultant
- MTCC Survey Team — Undertook all the surveys
    - Hamdhoon Khaleel
    - Mohamed Anas
    - Ali AKram
    - Marium Yaula
- K.Guraidhoo Island Council
    - Specially Ibrahim Shaleez — Vice President of the Council

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13 APPENDICES

13.1 Terms of Reference
13.2 EIA Decision Statement
13.3 Receipt of Atoll Council
13.4 Final Harbour Phase II concept
13.5 Bathymetry of the project area

بسم الله الرحمن الرحيم

No: 203-EIARES/138/2017/70

Terms of Reference for 1st Addendum to the Environmental Impact Assessment for the Proposed Harbour Construction in K.Guraidhoo

The following is the Terms of Reference (ToR) following the scoping meeting held on **5th May 2017** for undertaking the coastal protection for K.Guraidhoo as the **1st Addendum to the EIA for the Proposed Harbour Construction Project at Guraidho, Kaafu Atoll**. The proponent of the project is Ministry of housing and infrastructure.

1. **Introduction and rationale** – Describe the purpose of the project and, if applicable, the background of the site and the tasks already completed. Clearly identify the objectives to enable the formulation of alternatives and to furnish criteria for monitoring and evaluation. Objectives should be specific and if possible quantified. Define the arrangements required for the environmental assessment including how work carried out under this contract is linked and sequenced with other projects executed by other consultants, and how coordination between other consultants, contractors and government institutions will be carried out. List the donors and the institutions the consultant will be coordinating with and the methodologies used.

2. **Study area** – Submit an A3 size scaled plan with indications of all the proposed infrastructures. Specify the 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 including relevant developments and nearby environmentally sensitive sites (e.g. coral reef, mangroves, marine protected areas, special birds site, sensitive species nursery and feeding grounds). 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.

Task 1. Description of the proposed project – Provide a full description and justification of the relevant parts of the dredging 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 and depositing at dumping site;
- Environmental monitoring during construction activities;
- 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

labor camps, access to site, safety, equipment and material storage, fuel management and emergency plan in case of spills)

Dredging:

- Location and size of sand burrow areas (s) on a map;
- Justification for the selection of this location;
- 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;
- Dredged material usage details, e.g. for land reclamation or coastal protection works;
- Duration of dredging activity;

The EIA report should investigate possibilities for alternatives:

- Operation and positioning options;
- Alternative borrow area locations: have these been considered and if so, give arguments why these alternatives have not been selected, and
- Layout of borrow pits, large shallow pits versus small deep pits to allow quick recovery of the seabed.

Land reclamation refilling

- Design of the reclamation area, including a justification (from a social and environmental point of view) for the choice of the shape;
- Quantity, quality and characteristics of fill material;
- Indication of guarantees for sufficient availability of fill material;
- Planning and timing of sub-activities (order of the works, clearance, dredging and reclamation);
- Method and equipment of transport of fill material and hydraulic filling;
- Distance of transport;
- Location and description of any additional coastal protection structures which may be required (e.g. sea walls, break waters, groins). Specify size, number of structures, location, construction materials (rock or sand-cement bags), timing;
- Description of safety measures during the construction phases and
- Labour requirements and (local) labour availability.

The EIA should investigate possibilities for alternative:

- Design of bunds, including materials used;
- Design of additional coastal protection structures, including materials used.

Coastal structure construction including seawall and breakwaters

- Details and justification of location, number, size and materials of coastal protection structures e.g. groins, seawall or breakwaters;
- Construction methods, materials, equipment, man power, expertise and scheduling.

- Loss of marine bottom habitat, both in the borrow area as well as due to enlargement of the islands, resulting in 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 site (overflow), the reclamation areas and related to shore protection activities), 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 landscape integrity/scenery.

Impacts on the socio-economic environment

- Impacts of the dredging and reclamation works on resource users (adjacent businesses, nearby resorts and dive sites);
- Impacts of the reclamation works (diminished) access to groundwater and risks of covering up hazardous materials, and
- Level of protection against hazards like sea level rise, storm surges, etc.

Construction related hazards and risks

- Pollution of the natural environment (e.g. oil spills, discharge of untreated waste water and solid waste, including construction waste);
- Risk of accidents and pollution on workers and local population, and
- Impacts on social values, norms and belief due to presence of workers of dredging company on local population.

The methods used to identify the significance of the impacts shall be outlined. The report should outline the uncertainties in impact prediction and also outline all positive and negative/short and long-term impacts. Identify impacts that are cumulative and unavoidable. Use interaction matrices (E.g. Leopold Matrix) to assess the magnitude and significance of the impacts.

Task 5. Alternatives to proposed project – Describe alternatives including the *"no action option"* should be presented.

Determine the best practical environmental options. Alternatives examined for the proposed project that would achieve the same objective including the "no action alternative". This should include alternative location of STP and outfall pipe, technologies, materials, designs, timing, etc. environmental, social and economic factors should be taken into consideration. The report should highlight how the location was determined. All alternatives must be compared according to international standards and commonly accepted standards as much as possible. The comparison should yield the preferred alternative for implementation. Mitigation options should be specified for each component of the proposed project.

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

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:

Climate

- Temperature, rainfall, wind, waves, evaporation rates (including extreme conditions);
- Risk of hurricanes and storm surges;

Geology and geomorphology

- Bathymetry (bottom morphology) (use maps);
- (Seasonal) patterns of coastal erosion and accretion (see appendix for monitoring details), and
- 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;
- Wind induced (seasonal) currents;
- Sea water quality measuring these parameters: temperature, pH, salinity, turbidity and Total suspended solids.

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

Task 4. Potential impacts (environmental and socio-cultural) of proposed project, incl. all stages – The EIA report should identify all the impacts, direct and indirect, during and after construction, and evaluate the magnitude and significance of each. Particular attention shall be given to impacts associated with the following:

Impacts on the natural environment

- Changes in flow velocities/directions, resulting in changes in erosion/sedimentation patterns, which may impact shore zone configuration/coastal morphology;

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. Mitigation measures to avoid or compensate habitat destruction, e.g. temporal sediment control structures, coastal protection structures to reduce erosion, coral reconstruction, and temporary docking jetty 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 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. Monitoring is required in:

- Coastal erosion around the island;
- Water quality assessments (ground water and surrounding seawater quality);
- Marine ecosystems monitoring (coral reef, seagrass and fish and invertebrates communities), and

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 such as Ministry of Housing, Transport and Environment, Planning Council, Tourism Ministry, Finance Ministry, government agencies, NGOs, engineers/designers, development managers, staff and members of the general public. The EIA report should include a list of people/groups consulted, their contact details and summary of the major outcomes.

4. <u>**Deliverables and required resources**</u> – The EIA report will be concise and focus on significant environmental issues. It will be submitted in digital format to the relevant government ministry and to the EPA for review and evaluation. The EIA report will contain findings, conclusions and recommended actions supported by summaries of the data collected and citations for any references used in interpreting such data. The EIA report will be organized according to the points discussed in the final ToR document. Monitoring reports will be submitted according to deadlines stated in the EIA report in a digitalized

format to relevant institutions (EPA, MRC, Tourism Ministry, etc.). Inspections on behalf of the EPA may be performed to verify that the developer is complying with the terms agreed in the EIA report.

5. **Relevant documentation, references for consultants** – Include publicly available studies or references relevant to the current project to be used by the consultant.

6. **Timeframe for submitting the EIA report** – The developer must submit the completed EIA report within *6 months* from the date of this Terms of Reference.

22/05/2017

Environmental Protection Agency

އެންވަޔަރަންމަންޓަލް ޕްރޮޓެކްޝަން އެޖެންސީ

ދޫކުރި ތާރީޚް: 11 މާރިޗު 2014

ތިމާވެށީގެ ގޮތުން ނިންމިގޮތުގެ މިލިޔުން ހ.ގުރައިދޫ ބޮޑުދަނޑު ހުޅުމުގެ މަޝްރޫޢުގެ މަސައްކަތްކުރުމާ ގުޅޭގޮތުން ތައްޔާރުކޮށް 05 މާރިޗު 2014 ގައި މުރާޖާޢާކުރުމަށް ހުށަހަޅުއްވާފައިވާ އަދި 06 މާރިޗު 2014 ގައި އިތުރު މައުލޫމާތު ހުށަހަޅުއްވާފައިވާ ތިމާވެށްޓަށް އަސަރު ފޯރާނެ މިންވަރު ބަލާ ރިޕޯޓާއި ބެހޭގޮތުން ނިންމިގޮތް އެންގުމަށްޓަކައެވެ.

1. ތިމާވެށްޓަށް އަސަރު ފޯރާނެ މިންވަރު ބަލާ ރިޕޯޓު ހެދުމާއިބެހޭ ގަވާއިދު 2012 ގެ ދަށުން (މި ލިޔުމުގައި މީގެ ފަހުން މިނިސްޓްރީ ކަމަށް ބޭނުން ކުރެވިފައިވާ) މިގަވާއިދުގެ ތަންފީޒީ އިދާރާ، އެންވަޔަރަންމަންޓް ޕްރޮޓެކްޝަން އެޖެންސީގެ ފަރާތުން މި ތިމާވެށީގެ ގޮތުން ނިންމިގޮތުގެ ލިޔުން ދޫކުރަނީ މަތީގައި ބަޔާންކޮށްފައިވާ ތަރައްޤީގެ މަޝްރޫޢު ތިމާވެށްޓަށް އަސަރު ފޯރާނެ މިންވަރު ބަލައިލުމުގައި ބަޔާންކޮށްފައިވާ ގޮތަށް ކުރިއަށް ގެންދިއުމުގެ ޝަރުތު ދަށުންނެވެ.

2. މި ޝަރުތު މިނިސްޓްރީން ދީފައިވަނީ ތިރީގައި މިވާ ޝަރުތުތަކުގެ މަތިންނެވެ:

I. ތިމާވެށީގެ ގޮތުން ނިންމިގޮތުގެ ލިޔުން ދޫކުރި ތާރީޚުން ފެށިގެން 1 (އެކެއް) އަހަރު ދުވަހުގެ ތެރޭގައި މަޝްރޫޢުގެ އަމަލީ މަސައްކަތް ނުފެށިއްޖެ ނަމަ، ނިންމިގޮތުގެ ލިޔުމާއި އަދި މި ލިޔުމުގެ 1 ވަނަ ނަންބަރުގައި ދީފައިވާ ހުއްދަ ބާތިލުވާނެއެވެ.

II. 1 ވަނަ ނަންބަރުގައިވާ ހުއްދައިގެ ދަށުން މަޝްރޫޢުގެ އަމަލީ މަސައްކަތް ނުފެށި 1 (އެކެއް) އަހަރަށްވުރެ ފަސްވެ ގޮއްސިނަމަ ކުރިއަށް ތަފްޞީލުކޮށް ނޫނީ ކަނޑައަޅާ ތިމާވެށީގެ ކަނޑައަޅަނަ، މައުލޫމާތު އިތުރުކުރުމުގެ އިޖުރާޢާތު ނުވަތަ ހުއްޓާލުމުގެ އިޖުރާޢާތު މިނިސްޓްރީއަށް ލިޔުމުން އަންގަންވާނެއެވެ. މިގޮތަށް ހަރަކާތްތަކުގައި މައުލޫމާތު ހުށަހަޅަންވާނީ 30 (ތިރީސް) ދުވަސް ކުރިން ސަރަޙައްދު ބަލަހައްޓާ އިދާރާއަށް ގެ ފަރާތުން މިނިސްޓްރީއަށް ލިބެންވާނެއެވެ.

III. ތިރީގައި މިބަޔާން ކުރެވިފައިވާ ކަމެއް ތިމާވެށިއާ ގުޅުންހުރި ކަމެއް، މިނިސްޓްރީ ނުވަތަ ކޮންމެ ފަރާތަކުން ކުރަން ޖެހޭ ކަންތައްތަކެއް، ހިނގައިދާނަމަ ތަރައްޤީގެ މަޝްރޫޢު ކުރިއަށް ގެންދާ ބަރަކާތް އެމަސައްކަތެއް އަލުން ވަގުތު އަންގަންވާނެ ގޮތުގެ އުސޫލުން އެންގެންވާނެއެވެ.

ހ. މި ތިމާވެށީގެ ޒޯން ނިންމުމުގެ ލިޔުން ބާޠިލުކުރުން ނުވަތަ

ށ. މި ތިމާވެށީގެ ޒޯން ނިންމުމުގެ ލިޔުމު ގެ ސަރަޙައްދާއި ހަމަކުރުން

IV. މަސްއޫލު ހިންގުމާއި ގުޅުންހުރި، ރާއްޖޭގެ އަމަލުކުރަމުންދާ ގާނޫނުތަކާއި ގަވާއިދުތަކާއި އެއްގޮތަށް މަސައްކަތް ކުރަމުން ގެންދިޔުމަކީ އިދާރާގެ ޒިންމާއެކެވެ.

V. މި ތިމާވެށީގެ ޒޯން ނިންމުމުގެ ލިޔުމުގެ VIII ވަނަ ޕެރެގްރާފްގައިވާ ފެންބަރު އަންނަމުންދާ ބަދަލުތައް ދެމެހެއްޓުމާއިބެހޭ ރިޕޯޓް އިދާރާއަށް ހުށަހަޅަން ވާނެއެވެ.

VI. ދިވެހިރާއްޖޭގެ ތިމާވެށި ރައްކާތެރިކޮށް ދެމެހެއްޓުމުގެ ޤާނޫނު (ނަންބަރު 4/93) އާއި ތިމާވެށްޓަށް އަސަރު ފޯރާނެ މިންވަރު ބެލުމުގެ ރިޕޯޓް ހެދުމާއިބެހޭ ގަވާއިދު 2012 ގެ ދަށުން ރާއްޖޭގެ ތިމާވެށްޓަށް އަނބުރާ އިޞްލާޙު ނުކުރެވޭ ފަދަ ބަދަލެއް އައުމަށް ކަމެއް ކުރާ ހާލަތުގައި ކުރިއަށްގެންދާ މަސައްކަތްތަކުގެ ބަދަލެއް ދިނުމަށް ނުވަތަ މަސައްކަތް ހުއްޓުވާ މަސްއޫލު ކުރިއަށް ގެންދިޔުމަށް ދޫކޮށްފައިވާ ހުއްދަ ބާޠިލުކުރުމުގެ ބާރު އިދާރާއަށް އޮންނާނެއެވެ.

VII. ތިމާވެށްޓަށް އަސަރު ފޯރާނެ މިންވަރު ބަޔާންކުރާ ރިޕޯޓުގައި އިޤްރާރުވެފައިވާ ފިޔަވަޅުތަކާއި ނުވަތަ މަސްއޫލު ހިނގަމުންދާ ފިޔަވަޅުތަކާއި ތިމާވެށްޓަށް ކުރާނެ އަސަރުތައް ކުޑަކުރުމަށް އަޅަންޖެހޭ ހުރިހާ ފިޔަވަޅުތައް ރިޕޯޓުގައި ބަޔާންކުރެވިފައިވާ ގޮތަށް އަޅަންވާނެއެވެ.

VIII. ތިމާވެށްޓަށް އަސަރު ފޯރާނެ މިންވަރު ބަޔާންކުރާ ރިޕޯޓްގައި ފެންބަރު އަންނަމުންދާ ބަދަލުތައް ދެމެހެއްޓުމަށް ޓަކައިވާ ޕްލޭންގައި ބަޔާން ކުރެވިފައިވާ ކަންތައްތައް ފުރިހަމަ ކުރުމަށްފަހު، ފެންބަރު އަންނަމުންދާ ބަދަލުތައް ދެމެހެއްޓުމުގެ ހުރާސް، ރިޕޯޓުގައިބަޔާންކުރެވިފައިވާ ގޮތުގެ މަތިން މި އޮގަސްޓުއަހަރު ހުށަހަޅަންވާނެއެވެ.

IX. ލިބިދޫރުގެ ތިންވަނަ ވިއްދުގައި ދެން ކުރަން ބޭނުންވާ ބަދަލު ބަލައިގަތުމާއި ވިސްނާލުމަށް ލިޔެ ހުށަހެޅުން ހުށަހަޅާ ދުވަހާއި ގުޅޭ ތަފާސް ކުރުމަށް.

ތާއީދުކުރާ ފަރާތްތަކުގެ ގުޅުން ކުރެވޭ ނަންބަރު ލިޔުން:
ނަން: ދުރާގަދ ދުނިޔެ	ހުށަހެޅި ނަންބަރ: 20203-FINHUM/138/2014/47
ގަޑި: ހޯދާ ނުކުތް	ދަށްވި ތާރީޚ: 11 ފެބްރުވަރީ 2014
ސޮއި:	ދެން ކުރަން ބޭނުންވާ ތާރީޚ: 11 ފެބްރުވަރީ 2015

<u>އީ.އައި.އޭ ރިވިއުކުރި މީހާއާބެހޭ މަޢުލޫމާތު</u>

އީ.އައި.އޭ ރިވިއުކުރީގެ ނަން: ކ. ގުޅީފަޅު ބަނދަރު މަސައްކަތްތަކުގެ އީ.އައި.އޭ އެޑެންޑަމް ރިޕޯޓް

ކޮންސަލްޓަންޓް: [illegible]

މަޤާމް: [illegible]

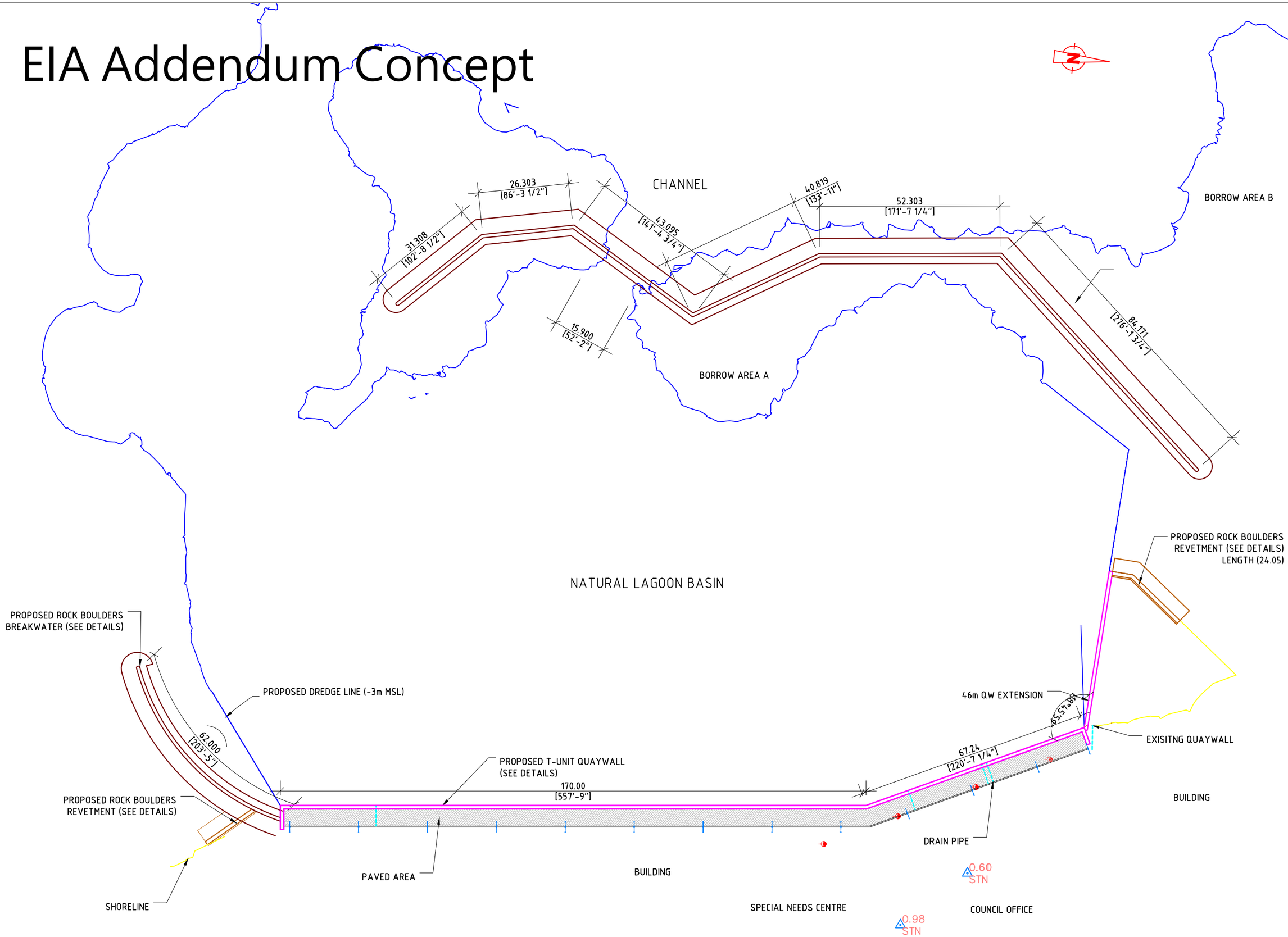
އެޑްރެސް: [illegible]

ތާރީޚް: 18.06.2017

ސޮއި: .... ސިއްކަ: ....

މޯލްޑިވްސް ޓްރާންސްޕޯޓް އެންޑް ކޮންޓްރެކްޓިންގ ކޮމްޕެނީ ޕލކ ފޯން: 3326822 އީމެއިލް: env@mtcc.com.mv

EIA Addendum Concept



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MALDIVES TRANSPORT &
CONTRACTING COMPANY PLC
SURVEY,DESIGN AND DEVELOPMENT UNIT
COSTRUCTION AND PROJECTS MANGEMENT
DEPARTMENT, MTCC TOWER, BODU
THAKURUFAANU MAGU, MALE' 20057,
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REV	DESCRIPTION	DATE	APPR
04B	QW & BW changed	9/3/14	-
04C	BW height increased to +1.4	17/4/14	-
04D	QW LEVEL REDUCED TO +1.2	15/5/14	-
04E	PAVE AREA LVL -100MM	18/5/14	-
04F	QUAYWALL EXTENDED	06/08	-
-	-	-	-
-	-	-	-

DATE 03/04/2013 — CONCEPT BY: - — DATE: -

DATE 14/03/2017 — FILE NAME: C004 10A.DWG — SCALE 1:1000

DATE - — CONTRACT NUMBER: - — PAPER A3

DATE - — SURVEYED BY: MUNAH, YAMIN — DRAWN BY: AHMED — DESIGNED BY: - — CHECKED BY: -

CLIENT: MINISRTY OF HOUSING AND INFRASTRUCTURE

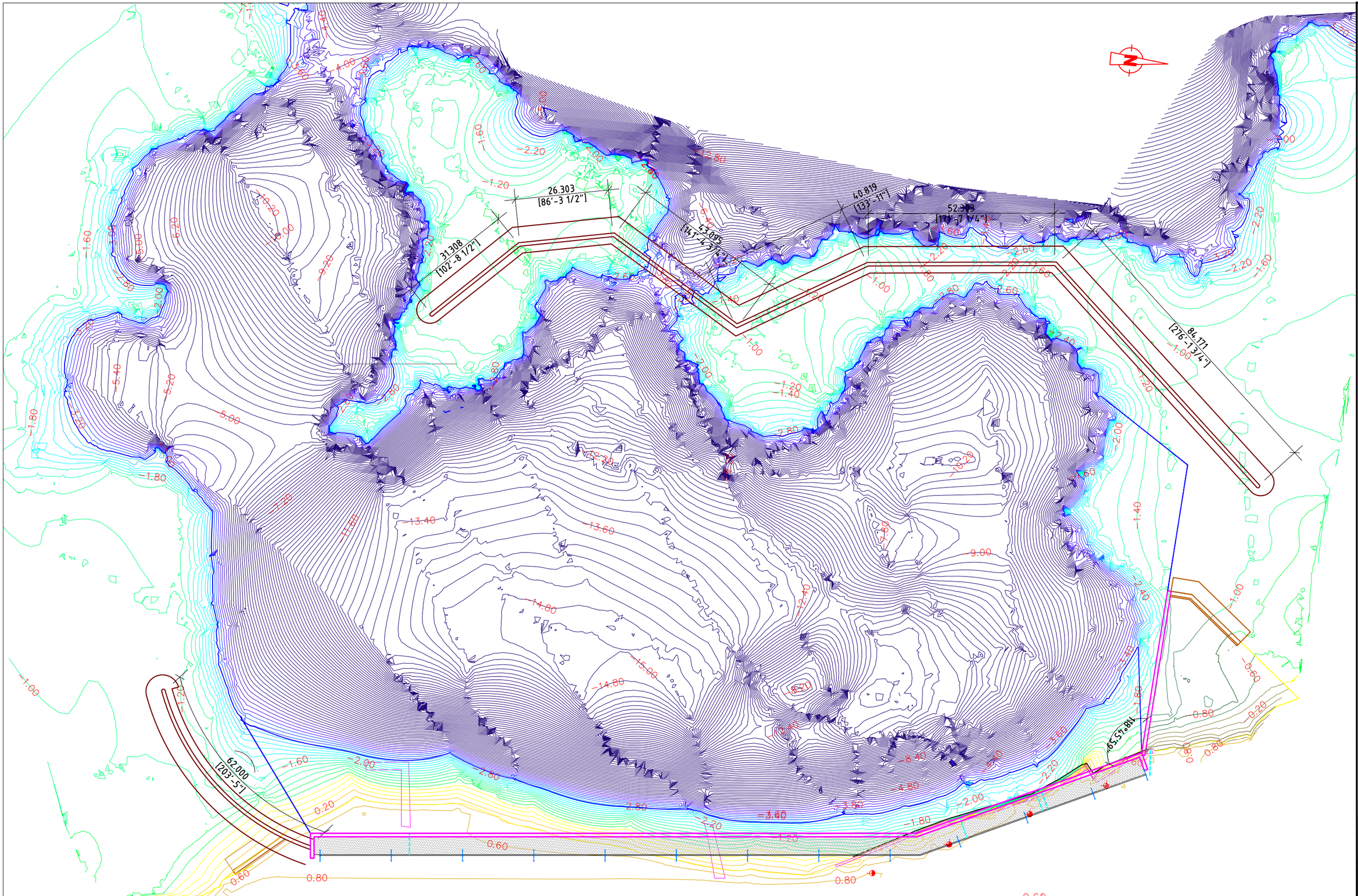
CONSULTANT: -

PROJECT TITLE: 10 HARBOURS PROJECT : K GURAIDHOO

DRAWING TITLE: CONCEPT DRAWING

SHEET TITLE: LAYOUT

DRAWING NUMBER
MTCC/14/H13/01CH/C004
10A
SHEET 01 OF 03



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CONSULTANT: -

PROJECT TITLE: 10 HARBOURS PROJECT : K GURAIDHOO

DRAWING TITLE: CONCEPT DRAWING

SHEET TITLE: LAYOUT WITH CONTOUR

DRAWING NUMBER
MTCC/14/H13/01CH/C004
10A
SHEET 02 OF 03