ENVIRONMENTAL MANAGEMENT PLAN

For the construction of an access jetty in Hibalhidhoo Island, Baa Atoll, Maldives

Proposed by

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For Water Solutions Pvt. Ltd., Maldives

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2 Introduction

This project involves construction of an access jetty in Hibalhidhoo island, Baa Atoll, Maldives. Hibalhidhoo island is an uninhabited island located on the eastern rim of the Atoll. The island has been leased for agricultural purpose. In order to expand the commercial activities in the island, the proponent proposes to construct an access jetty on the western side of the island, along an existing narrow channel.

The project is expected to bring an end to current difficulties faced while loading and unloading goods and people to the island. The construction of the jetty will bring several economic benefits to the proponent. At present, further development activities on the island cannot be undertaken due to this. The developer is also unable to undertake further development activities without construction of a jetty.

2.1 Purpose

The purpose of this Environmental Management Plan (EMP) is to describe the means by which the proponent will manage and control the works associated with the construction and development of the jetty. The EMP seeks to consistently achieve required outcomes and to enable the achievement of the environmental requirements, objectives, and targets as outlined in the EIA regulation of 2012.

2.2 EMP scope

This EMP has been developed within the framework outlined in the EIA regulations 2012. This EMP establishes the environmental management controls to be followed by the developer, its employees, subcontractors and sub consultants in carrying out the construction and development of the jetty.

2.3 Location

Project takes place in the island of Hibalhidhoo in Baa Atoll. The jetty will be constructed on the western side of the island. Refer to the map attached

2.4 Project proponent

The proponent of the project is Ms. Nihan Shareef, Biznas Maldives Pvt.Ltd, M.Boaddoo, Male', Maldives.

2.5 Project Description

The project involves construction and development of an access jetty in the island of Hibalhidhoo. The key elements of the project are outlined below.

- Jetty will be constructed on concrete columns with a concrete foundation base.
- The total length of jetty will be approximately 400 feet long.
- The width of the jetty will be approximately 5 feet.
- Construction of the jetty columns will be done in the island. First, the foundation cast and the columns will be made on land and then positioned in the lagoon using manual labour. Following this, wooden decking will be fixed. Afterwards, electrical lines will be laid.
- Construction will not use heavy machinery due to the small scale of the project.

The proponent will contract the project to a contractor and the construction of the jetty will be undertaken by them within the given time frame. A suitable contractor will be appointed for this project based on their experience.

The Project will employ about 5 construction workers and the proponent will maintain a project manager manage the contractors. The proponent already has a two labourers and one manager based in the island.

The detail design of the jetty are attached with the report.

2.5.1 Construction strategy

The jetty will be constructed in the planned time period to reduce cost and also reduce the environmental damage. This project has both land based and water based construction activities. Construction and pre-casting of the footing and the reinforced concrete columns will be done on land. All the reinforced concrete columns will have a reinforced concrete pad as a base.

Once the columns are completed, they will be moved to the lagoon and placed at the required location.

2.5.2 Works methods for land based activities

General construction methods will be used to construct columns. It is intended to use typical concrete foundations and columns in the construction of these on land. This methodology involves the use of reinforced concrete to create a foundation joint by horizontally running beams. Together, the beams and the concrete base create a solid foundation on which columns will be supported. Imported aggregate will be used as well as river sand will also be imported sources. These columns will be constructed on land before moving them to the lagoon.

2.5.3 Work methods in the water

Construction of the jetty will take place in the lagoon. Concrete columns with the foundation will initially be towed manually using floats where labourers will move them to the required position in the lagoon. These will then be place in the lagoon bed. Following this, timber decking, will be fixed. Afterwards, electrical lines will be laid. No excavators will be used for this project as it is costly. Hence, this method is more environmentally friendly as sedimentation of the lagoon will be much less compared to when an excavator is used in the lagoon.

2.5.4 Machinery and equipment

No heavy machinery will be used in this project. Manual labour will be used to cast the columns. Placing the columns will also use floats and manual labour to keep the cost minimum.

2.5.5 Project schedule

Construction of the jetty will take place in the island within a time frame of three months. Below is a tentative construction schedule.

	Weeks											
	1	2	3	4	5	6	7	8	9	10	11	12
Preparation of EMP	x											
Approval of EMP		x	x									
Jetty design finalization	x											
Mobilization			x	x								
Pre-casting the columns				x	x	x	x					
Placing the columns in the lagoon						x	x	x	x	x		
Decking fixing								x	x	x	x	
Demobilization												x

Table 1:Tentative project schedule

3 Description of the Environment

3.1 Physical Environment

Maldives is in the Monsoonal Belt in the North Indian Ocean, therefore climate in the Maldives is dominated by two monsoons, the Southwest monsoon (SW) from May to September and the Northeast monsoon (NE) from December to February. These monsoons are relatively mild due to the country's location on the equator. The North-East monsoon is characterised by gentle and dry winds while in the south-west monsoon heavier rains and showers occur. The winds usually get stronger in the south west monsoon especially during June and July. The period between March to April is the transition period from the NE monsoon to SW monsoon known locally as the *Hulhangu Halha*, while the transition period from SW monsoon to NE monsoon known as *Iruvai Halha* is from October to November.

Storms and gales are infrequent in the Maldives and cyclones do not reach as far south as the Maldivian archipelago. Storms and line swells can occur, typically in the period May to July; gusts up to 50 – 60kts have been recorded during these storms (Binnie Black and Veatch, 1999). Generally the northern atolls of Maldives feel the effects of the storms much strongly than the southern atolls of the country.

The relative humidity generally ranges between 75 to 80%. Maldives experiences a tropical climate with mean annual temperature of 30.8°C, daytime highest reach 32 °C but night time lows rarely drop below 25.5°C(Ministry of Home Affairs Housing and Environment, 2004). In contrast to the effects of storms the annual rainfall increases from north to the south of the archipelago. This indicates that the south is wetter than the north. The wettest months are May, July, September and December and the driest are January to April. Open water evaporation rates are in the range of 6mm per day and transpiration from plants is also high (Ministry of Home Affairs Housing and Environment, 2004).There is considerable variation of climate between northern and southern atolls.

The following table provides a summary of key meteorological findings for Maldives. General studies on climatic conditions of Maldives were taken into account during study as local level time-series data are limited for longer periods at the nearest meteorological station.

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

Table 2: Key meteorological information

3.2 Monsoons

Monsoons of Indian Ocean govern the climatology of the Maldives. Monsoon wind reversal plays a significant role in weather patterns. Two monsoon seasons are observed: the Northeast (*Iruvai*) and the Southwest (*Hulhangu*) monsoon. Monsoons can be best characterized by wind and rainfall patterns. The southwest monsoon is the rainy season which lasts from May to September and the northeast monsoon is the dry season that occurs from December to February. The transition period of southwest monsoon occurs between March and April while that of northeast monsoon occurs from October to November.

3.3 Rainfall

Annual average rainfall in Maldives is about 1900mm. There is a marked variation in rainfall across Maldives with an increasing trend towards south. The annual average rainfall in north is 1977mm and for south is 2470mm.

The southwest monsoon is known as the wet season with monthly average rainfall ranging from 125-250mm. The northeast monsoon is known as the dry season with average monthly rainfall of 50-75mm.

Long term data for Hanimaadhoo area is not available. Medium term records indicate an average annual rainfall of 2500mm. The intensity of rainfall is a concern in the Maldives since intensity is high with low frequency. However, excessive rainfall is not a concern for Hibalhidhoo since the island does not cup towards the middle but rather diverts the runoff towards the shore.

3.4 Temperature

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

3.5 Wind

Wind has been shown to be an important indirect process affecting formation development and seasonal dynamics of the islands in the Maldives. Winds often help to regenerate waves that have been weakened by travelling across the reef and they also cause locally generated waves in lagoons. Therefore winds are important here, as being the dominant influence on the sediment transportation process (waves and currents). With the reversal of winds in the Maldives, NE monsoon period from December to March and a SW monsoon from April to November, over the year, the accompanying wave and current processes respond accordingly too. These aspects have ramification on the seasonal sediment movement pattern on the islands and also the delivery/removal of sediments from the reef platform/island.

The two monsoon seasons have a dominant influence on winds experienced across Maldives. These monsoons are relatively mild due to the country's location close to the equator and strong winds and gales are infrequent. However, storms and line squalls can occur, usually in the period May to July; gusts of up to 60 knots have been recorded at Male' during such storms.

Wind was uniform in speed and direction over the past twenty-plus monsoon seasons in the Maldives (Naseer, 2003). Wind speed is usually higher in central region of Maldives during both monsoons, with a maximum wind speed recorded at 18 m.s-1 for the period 1975 to 2001. Maximum wind speed recorded in the south was 17.5 m.s-1 during the period 1978 to 2001. Mean wind speed was highest during the months January and June in the central region, while wind speed was in general lower and more uniform throughout the year in the southern region. Wind analysis indicated that the monsoon was considerably weaker in the south (Naseer, 2003). During the peak months of the SW monsoon, southern regions have a weak wind blowing from the south and south-eastern sectors.

Table below summarises the wind conditions at Malé throughout the year. Medium term meteorological data from Malé International Airport weather station was used in this analysis.

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

Table 3: Summary of general wind conditions in Malé

Wind speed (m/s)	Wind Direction							
	NE	E	SE	S	SW	W	NW	N
1	0.94	0.95	0.96	1.19	1.02	0.97	0.82	0.78
2	2.02	1.95	2.13	1.91	1.81	1.92	1.57	1.46
3	2.30	2.79	2.98	2.74	2.74	2.99	2.31	2.12
4	2.04	2.26	2.75	2.91	2.86	2.90	2.15	1.91
5	1.45	1.97	2.30	2.21	2.98	2.49	1.51	1.27
6	0.54	0.99	1.42	0.94	1.79	2.36	1.02	0.80
7	0.10	0.32	0.74	0.28	0.91	2.04	0.43	1.10
8	0.05	0.06	0.26	0.11	0.52	1.39	0.19	0.04
9	0.01	0.01	0.16	0.01	0.19	0.94	0.10	0
10	0	0	0.05	0	0.04	0.75	0.04	0
11	0	0	0	0	0	0.46	0.01	0
12	0	0	0	0	0	0.07	0.01	0
13	0	0	0	0	0	0.02	0	0

Table 4: Scatter diagram for Malé. Wind speed versus wind direction (%). All Year (1999)- (adapted from DHI, 1999)

3.6 Waves

Wave energy is important for sediment movements and settlement, and it is also a crucial factor controlling coral growth and reef development. Waves have been attributed to the diversity and the abundance of coral and algal species. These aspects have implications for the type and perhaps the supply of sediment s into the island.

Studies by Lanka Hydraulics on Malé reef indicated that two major types of waves on Maldives coasts: wave generated by local monsoon wind and swells generated by distance storms. The local monsoon predominantly generates wind waves which are typically strongest during April-July in the south-west monsoon period. During this season, swells generated north of the equator with heights of 2-3 m with periods of 18-20 seconds have been reported in the region. Local wave periods are generally in the range 2-4 seconds and are easily distinguished from the swell waves.

Distant cyclones and low pressure systems originating from the intense South Indian Ocean storms are reported to generate long distance swells that occasionally cause flooding in Maldives (Goda, 1988). The swell waves that reached Malé and Hulhule in 1987, thought to have originated from a low pressure system of west coast of Australia, had significant wave heights in the order of 3 metres.

Hibalhidhoo is exposed to high waves generated by swells combined with short-wind-generated waves travelling across the vast span of lagoon on the eastern side and surf and short wind-generated waves from the atoll lagoon on the eastern side especially during the north-west monsoon. Waves breaking on the eastern side are stronger. General wave conditions in Malé is summarised in the following table (adapted from DHI, 1999).

Season	Total	Long Period	Short Period
NE - Monsoon	Predominantly from E-S. High Waves from W	From S-SW	Mainly E-NE. High waves from E
Transition Period 1	Mainly from SE-E	From S-SW	Mainly from NE-SE
SW - Monsoon	From SE-SW. Mainly from S. High Waves also from W	From S-SW	Mainly from SE-S. High waves from E
Transition Period 2	As SW monsoon	From S-SW	From SE-W. Higher waves from E

Table 5: Summary of wave condition in Hibalhidhoo

3.7 Tides

Tides affect wave conditions, wave-generated and other reef-top currents. Tide levels are believed to be significant in controlling amount of wave energy reaching an island, as no wave energy crosses the edge of the reef at low tide under normal conditions. In the Maldives, where the tidal range is small (1m), tides may have significantly important influence on the formation, development, and sediment movement process around the island. Tides also may play an important role in lagoon flushing, water circulation within the reef and water residence time within an enclosed reef highly depends on tidal fluctuations.

3.8 Existing marine environment at the proposed location

In order to assess the existing marine environment of the project site, a marine environment survey was undertaken. The marine environmental survey at Hibalhidhoo was focused on the proposed area for jetty construction.

3.8.1 Methodology of marine surveys

The methodologies used for the assessment as a Line intercept transects or LIT of 50 meters. In addition, photos were also taken from this location to support and assess the marine environment. Fish counts were not undertaken, but qualitatively assessed.

3.8.2 Coral reef at the proposed site

The jetty is located on the western side of the island. The lagoon does not have extensive corals in this area. A small narrow channel has already been cleared along this area. According to the caretakers, this channel has been cleared several years ago. The overall health of the reef on this side is very poor. There is no real coral reef on the western side, but large expanse of sandy and rubble filled reef slope is seen on the western side. Towards the inner lagoon, there is a small patch of live corals that will be impacted during the construction of the jetty, but this is not considered to be significant.

An LIT survey was undertaken from the proposed jetty construction area as illustrated on the map. The following graph illustrates the percentage of live coral cover recorded at this site. The conclusion from this LIT survey does not indicate any threat, let alone significant, to occur as a result of the construction of the jetty.

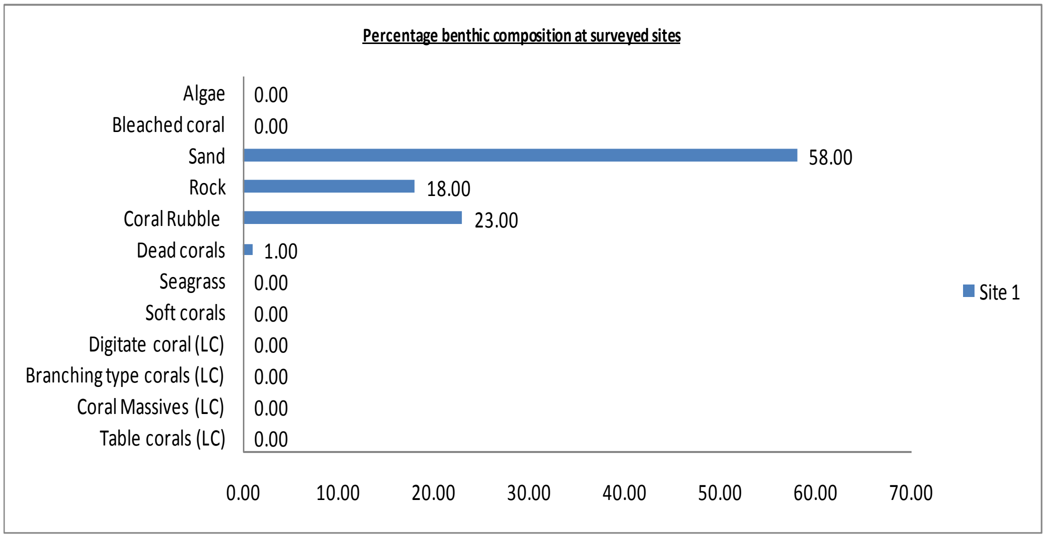

Figure 1: Results of the 20 meter LIT survey at the proposed location.

In terms of live coral cover, the proposed location for the jetty does not have any. However, a small patch of live corals are present in the lagoon, which was away from the surveyed site.

4 Scope and Priorities

The focus of the Environmental Management Plan is the immediately boundary of the project, which is the western side of the island where the jetty will be constructed. Recognising the management of a range of other properties in close proximately to the project site which may give rise to significant environmental impacts, the EMP includes a number of priority strategies and actions relating to some of these issues. The scope of the EMP includes the following functional areas:

Pre-construction phase of the development – in this stage of the project, emphasis would be to minimise the impacts related to location and design of the project to the environment. It will also look at storage of materials for construction and how they impact the environment.

During Construction of the development – in this stage of the project, EMP will focus on reducing the impact of site clearance (if any), access, and construction activities of project to the receiving environment. This would be the most important phase of the project cycle where EMP would play an important role to minimise and mitigate the negative impacts on the environment.

Operation phase of the development – the EMP would also highlight management options to minimise the impacts and mitigate the negative impacts on the environment during the operational phase of the project. In this phase, it would be mainly related to the use of the jetty and associated issues.

Following are some of the elements that would be addressed in the scope of the EMP.

Management systems - those systems employed in the management of the projects construction and operational activities. Includes, supervision of contractors and work methods.

Knowledge systems - those processes which build knowledge and capacity on environmental issues; principles and sustainable behaviours. Includes training; communications; creating awareness among contractors and project managers.

Materials management - those services and activities which support the avoidance, resource recovery (e.g. reuse and recycling) and environmentally responsible disposal of solid and liquid waste materials.

Planning, design and development - the planning, design and development of the associated infrastructure.

Pollution prevention - those aspects of planning and management which supports the minimisation of air and water pollution and contamination of land resulting from project activities. The most important aspect would be pollution caused by sedimentation resulting from the construction work.

Marine Environment - those aspects of management and maintenance which support conservation and enhancement of marine environment of the project site. Issues like direct and indirect damage to corals will be addressed.

5 Implementing the Environmental Management Plan

Implementation of the EMP requires that:

The detailed final design (plans and specifications) as well as construction methods incorporates all mitigation measures and are finalized before mobilization.

The contract for construction of the project includes all mitigation measures to be implemented. The mitigation measures should be sufficiently detailed out so that the contractor, in preparing his bid, will be clearly aware that he will be required to comply with these mitigation measures.

The contractors' performance is duly monitored for compliance with the EMP by competent environmental consultants. This means, implementation of the EMP during construction stage should be monitored.

On completion of construction, inspection should take place to check that the works meet all significant environmental requirements before the project is officially accepted.

The operational stage monitoring program is implemented as specified in the EMP; and there is effective reporting to show that the EMP is being properly managed.

6 Structure Plan

To assist the implementation, the Environmental Management Plan is divided into different functional areas, To facilitate efficient and effective environmental management, objectives and targets are set out, together with environmental performance indicators to monitor the project's progress towards achieving its targets.

6.1 Environmental objectives, targets and performance indicator

Environmental performance measurement provides:

- Feedback on the effectiveness of actions taken to reduce the project's ecological footprint;
- A basis for reviewing environmental objectives and targets;
- A structure for the State of the Environment Report;
- A framework for achieving continual improvement.

Environmental performance indicators must be SMART: specific, measurable, attainable, relevant and time-framed. Consistent with the international Environmental Performance Evaluation Standard ISO14031, the environmental indicators used to track progress in implementing this Plan include management performance indicators relating to organisational practices and procedures, and operational performance indicators to track the significant environmental effects of the projects activities.

The EMP sets objectives and targets for each of the functional areas. The international Environmental Management Systems Standard ISO14001:2004 defines an environmental objective as an "overall environmental goal, consistent with the environmental policy that an organization sets itself to achieve". Objectives should be quantifiable wherever possible. An Environmental target is defined in ISO14001 as a "detailed performance requirement[s], applicable to the organization or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives". The table below outlines the environmental management plan with the functional areas, impacts and mitigation measures outlined for the project.

Functional Area		Impacts	Proposed Mitigating Measures	Performance Indicator
Pre-construction	Impacts related to location and design	Poor sitting leading to loss of significant marine resources such as live corals.	Careful selection a suitable location for the jetty through consulting with long term caretakers of the island and experienced environmental consultants.	
		Alteration of the hydrodynamic regime around the island leading to erosion of the coastline.	Study of the local hydrodynamic and coastal process, if necessary through physically or mathematical models and integrate resultants to project engineering design including protection facilities	Bathymetry of the harbour basin Water quality of the harbour and the shoreline changes to understand the sediment movement pattern around the island.
		Difficulty in the usability of jetty due to its exposure to strong winds in both monsoons. This is a design issue which will have impats during operational stage.	Identify the most suitable location for the jetty and cross check with experienced people as well as weather data information to ensure that the location selected is most suitable.	Shoreline, shape of island and windrose data for the region.
	Impacts related to material storage.	Materials such as aggregate, precast columns (after construction) and timber should be stored inside the island away from the beach. Storage of these materials on the beach, especially for prolonged periods will impact the beach dynamics and induce erosion eventually.	All storage of materials to be done inside the island, at least 10 meters inside the beach.	Changes to the shoreline through simple mapping with a GPS. Visual inspection should also be carried out.
Construction phase of development	Impacts due to site clearance and water based activities.	Modification of the lagoon and the reef resulting in direct damage to corals, change of wave dynamics inside the harbour basin during the placement of the jetty columns.	Controlling the work boundary to the required area and define and limit an area for working in the lagoon. Using manual labour and not using machinery such as excavators to place	Sedimentation and direct and indirect damage to corals.

Functional Area		**Impacts**	**Proposed Mitigating Measures**	**Performance Indicator**
			jetty columns.	
		Suspension of sediment in water column and turbidity in the lagoon and the coral reef areas.	Use manual methods and avoid use of heavy machinery such as excavators. Undertake the construction work in the shortest possible period time. Work as much as possible during low tide hours.	Turbidity of the waters inside the lagoon.
		Noise associated with construction process.	No mitigation required as the project will generate nuisance noise.	
	Use of groundwater for construction.	Excessive use of groundwater extraction may impact the freshwater lense. Groundwater use for this project will be minimal and only for the concrete mix for the columns.	Minimize groundwater wastage by ensuring that only the required amount of groundwater is extracted	Electrical conductivity levels of the groundwater.
	Impacts due to construction the jetty (placement of columns)	Impact on the marine fauna found in the lagoon and reef areas. Important to note that the proposed jetty is to be constructed in an already cleared channel along the lagoon which does not have live corals (except for a small patch of corals towards the shore in the lagoon). The reef slope in this area is mainly sand and coral rubble without any distinct live corals.	Use of clearly visible physical markers (such as stakes and tapes) to guide workers and indicate the 'boundaries' of their work area. Working in low tide hours. Using manual labour, as planned.	Coral cover
		Suspension of sediment in water column and turbidity to detrimental levels to the coral reefs.	Working in low tide hours. Using manual labour, as planned.	Turbidity of the waters in the lagoon.
		Changes in hydrodynamic regime on the western side of the island due to construction of the jetty.	Jetty columns should be spaced adequately to allow sediment flow between the columns. No matrerials to be placed on the beach during cosntruciton period as it will	Shoreline changes.

Functional Area		**Impacts**	**Proposed Mitigating Measures**	**Performance Indicator**
			obstruct the sediment movement around the island.	
		Air pollution from fumes and dust.	No machinery will be used. Dust emission from pre-casting works is expected to be negligible in this project.	No required.
		Noise from construction machinery	No machinery will be used. Only manual labour hence, noise will not be an issue.	Not required.
		Marine pollution impacts from solid waste.	Good housekeeping sound practices of project management such as proper storage and collection of waste from construction works in one area of the island.	Amount of debris floating inside the western lagoon including empty cement / gunny bags, pieces of wood, etc.
Operation stage.	Impacts due to operation of the jetty.	Impacts from the jetty operations	Vessel operations management	Number of vessels using the jetty per month.
		Impacts from solid wastes such as garbage, litter	Adequate waste management Regular clean - up	Amount of waste generated.
		Risks from accidents and oil spill	Good mechanism to create awareness for vessel operators on proper handling of fuel, especially during loading and unloading. Ensuring that vessel operators do not dispose waste or practice other activities that will pollute the environment such as running aground the reef or trying to berth during very rough weather. Good knowledge of tides to be communicated to vessel operators to ensure that safe boat manoeuvring is undertaken in events such as neap tides.	Number of oil spills per month.

Functional Area		Impacts	Proposed Mitigating Measures	Performance Indicator
		Noise from everyday operation that will affect nearby settlements	The island is an uninhabited island. Not expected to cause any impact from this to the nearby islands.	-
		Marine pollution due to engine or bilge run-off.	Education, and enforcement of discharge regulation.	Number and area of oil sleeks found inside the lagoon.
	Impacts to the shoreline from construction of the jetty	Shoreline changes, especially the sediment movement patters will be affected depending on the type of jetty used. That is to say that the movement of longshore currents on the western side will be affected to some extent. This will bring changes to the sediment movement patterns along the shore.	Jetty to be constructed on columns with adequate spacing to allow long shore sediment transport. Undertake monitoring of the shoreline to assess the changes.	Changes to the shoreline, especially in close proximity to the jetty.

7 Environmental Monitoring

7.1 Introduction

The parameters that are most relevant for monitoring the impacts that may arise from the proposed project activities are included in the monitoring plan. These include amount of waste generated, noise level, sedimentation, damage to marine environment and changes to the long shore sediment transport mechanism. Monitoring will be carried out as part of the implementation Environmental Management Plan.

It is important that information and experience gained through the monitoring activities are fed back into the EIA evaluation and analysis system to improve the quality of future assessment studies.

7.2 Aim of monitoring

The primary aim of the monitoring is to provide information that will aid impact management, and secondarily to achieve a better understanding of cause-effect relationship and to improve impact prediction and mitigation methods.

7.3 Objectives of monitoring

The following monitoring plan is used to measure impacts that occur during the proposed project activities and determine the accuracy of impacts that are predicted and the effectiveness of mitigation measures. The objectives of the monitoring plan are to measure: waste generated, damage to marine environment, water quality in the lagoon and the changes to shoreline in to ensure that these measurements are kept within the baseline limits and predicted impacts are accurate and mitigation measures taken are effective.

7.4 Monitoring time frame

Monitoring could begin soon before civil works are completed and will be done after the construction period once in every six months. A summary monitoring report could be compiled during the construction period and a final report could be prepared at the end.

7.5 Monitoring report

A detail monitoring report could be compiled after the completion of the civil works based on the data collected for monitoring the parameters included in the monitoring plan. The report will include details of the site, data collection and analysis, quality control measures, sampling frequency and monitoring analysis and details of methodologies and protocols followed.

7.6 Impact Monitoring Plan

Monitoring Requirements	Indicators	Technique	Responsible person	Frequency
Coral reef	Damage to coals	Qualitative	Env Consultant	After construction
Coral reef	Damage to coals	Quantitative	Env Consultant	After construction by undertaking an LIT survey.
Coastal change	Shoreline change	GPS mapping	Env Consultant	After construction

Table 6: Impact monitoring plan

7.7 Cost of Environmental Management and Monitoring

The proponent has committed fully for the monitoring programme outlined in this report. The cost indicated below is for monitoring the project during the construction stage and operational stage. This amount indicated is the total cost of monitoring during the construction and operational phase.

DESCRIPTION	TOTAL (US$)
Consultants fee including report writing during the construction period and operational period.	500.00
Total (Five hundred US Dollars only)	**500.00**

Table 7: Cost of monitoring programme

8 Conclusion and recommendation

The constructing a jetty in Hibalhidhoo island is an important and urgently required project. In order to fully utilize and take the economic advantage of the island, the jetty must be constructed as without it, physical and infrastructure as well as other developments are hindered. An assessment was undertaken to identify the critical environmental aspects of this project. It appears that this project does not have any concerning environmental impacts. The most significant impacts one can expect from such a project is the damage to coral reef. Fortunately, in Hibalhidhoo, the western side of the lagoon and the reef does not pose healthy live coral areas and is one of the biggest advantage for this project. Anthropogenic damage to the proposed location has already been felt due to the existence of a narrow entrance channel. This channel has been cleared few years ago for small boats to access. During the assessment, the coral reef along this area was studied and assessed. To quantiy the results, a marine survey was undertaken at the project site. The results do not show the presence of live corals in this area. Although a small live coral patch is found further inwards the lagoon, the construction of jetty will not directly damage any corals. Indirect damage caused by sedimentation will also be very minimal as excavators or heavy machinery will not be used.

This EMP outlines the key factors that need to be looked in to during the pre-construction, construction as well as during operation stage. In our opninion, this project does not have any concerning environmental impacts and should be allowed to go ahead. The EMP will guide the developer in addressing the key issues that need to be addressed in this project.

9 Acknowledgements

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