Addendum to the

ENVIRONMENTAL IMPACT ASSESSMENT

For the Proposed Coastal Protection in Alidhoo, Haa Alifu Atoll, Maldives

Proposed by

Tranquillity Pvt. Ltd.

Signature:

Prepared by

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For Water Solutions Pvt. Ltd., Maldives

May 2010

Non Technical summary

This is an addendum to the EIA submitted in April 2008 for the proposed coastal protection of Alidhoo resort in Haa Alif Atoll. This Addendum highlights the maintenance component to the initial project that was proposed in the EIA report. In principle, the addendum addresses maintenance component only.

These include, deepening the existing mooring area and repairing part of the vertical emerged breakwater which has been damaged by bad weather. The breakwater repair will not modify the breakwater and it is intended to restore the breakwater to its original design.

The proposed maintenance work will not increase the foot print on the marine environment.

The proposed deepening of the existing mooring area which is located on north eastern side of the island will aim to restore the depths initially proposed for the mooring area. The mooring area has become very shallow, causing difficulty for the boats to access during low tide. The project is proposed to deepen the existing mooring area to a depth of 3 meters at low tide, only in areas where filling has taken place. Since fine sand and few coral rubble is the main benthic substrate found in the mooring area, the deepening operations with a sand pump is not expected to have a significant impact on the marine environment. Approximately 450 cubic meters of sand will be dredged from the mooring basin.

The maintenance work proposed is aimed at restoring the original project to meet its original objectives and to ensure that the resort operation is not affected. Hence, this addendum highlights these issues which need to be undertaken.

The proposed maintenance work appears justified from an environmental point of view as there are no additional moderate to major impacts on the environment due to the proposed works. Through this EIA addendum, the proponent proposes to undertake the maintenance work and also a permit to undertake annual deepening of the mooring area.

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1 Introduction

This report is an addendum to the Environmental Impact Assessment which was prepared by Water Solutions Pvt. Ltd in April 2008 for the proposed coastal protection in Alidhoo, Haa Alif atoll.

The content of the report is based on the data presented in the initial EIA report and also using the long term monitoring following the project (attached as an annex). Since the completion of the project, monitoring data has been collected on a regular basis starting from November 2008. Although the EIA was completed in mid 2008, data for Alidhoo has been collected since September 2007.

Descriptions of the maintenance work, the existing environmental conditions and the positive and negative environmental impacts have been included. Furthermore, mitigation measures and monitoring options have also been presented where appropriate. The methodology for data collection and analysis given in the initial EIA report were followed.

This document has been produced in accordance with the 2007 Environmental Impact Assessment guidelines from the Ministry of Housing, Transport, and Environment and the guidance issued by the Ministry of Tourism, and other agencies. This document shall be read along with the *Environmental Impact Assessment for the Proposed Coastal protection of Alidhoo, Haa Alif Atoll, Maldives, April 2008,* as this document is an addendum to the report.

1.1 EIA Addendum Implementation

This EIA Addendum has been prepared by a local environmental consulting firm, Water Solutions. Water Solutions have been chosen by the proponent as the environmental consultants for this project. The team members were:

- Ahmed Jameel, Environmental Engineer (EIA Registration No: EIA 07/07)
- Abdul Aleem, Environmental Consultant (EIA Registration No: EIA 09/07)
- Mohamed Riyaz, Assistant Surveyor

1.2 Structure of the Report

The report has been structured to meet the requirements of the EIA regulations 2007 issued by the Ministry of Environment, Energy and Water.

The major findings of this report are based on qualitative and quantitative assessments undertaken during the project monitoring period, which is from the period November 2008 to April 2010. The impact assessment methodology has been restricted to field data collected, consultations, data from the monitoring report and experience and professional judgment available through long term data.

2 Project Description

2.1 Project Proponent

This project is proposed by Tranquility Pvt. Ltd for the maintenance of the mooring area and to undertake repair works to the damaged vertical breakwater in Alidhoo. Alidhoo is operated by John Keells Maldivian Resorts (JKMR) under a management contract with Tranquility. JKMR has been incorporated in the Maldives in 2005 with the objective of operating resorts in the Maldives. JKMR currently operates 4 resorts namely Chaaya Island Dhonveli, Chaaya Lagoon Hakuraa, Chaayaa Reef Ellaidhoo and Cinnamon Island Alidhoo. Of these Alidhoo is targeted to the high-end tourist market as branded. JKMR attracts a wide range of tourists from different parts of the world and has an excellent Corporate Social Responsibility programme. JKMR follows good practice in environmental management and gives priority to environmental protection and preservation.

2.2 Proposed maintenance work and Justification

The addendum is submitted to obtain the permits necessary to undertake the maintenance work proposed to the initial *Environmental Impact Assessment for the Proposed coastal protection in Alidhoo, Haa Alif Atoll, Maldives (April 2008).* The proposed maintenance work includes the following:

1. Maintenance dredging of the mooring area. This component is required as a large part of the mooring area in Alidhoo has filled up resulting in difficulty of safe boat maneuvering. It is also creating a hazard for boats, especially during low tide.

2. Repair of the emerged vertical breakwater which has been damaged due to bad weather. A total of 15 meters of the breakwater will be repaired using geo-textile bags filled with sand. Sand will be obtained from dredging of the mooring area.

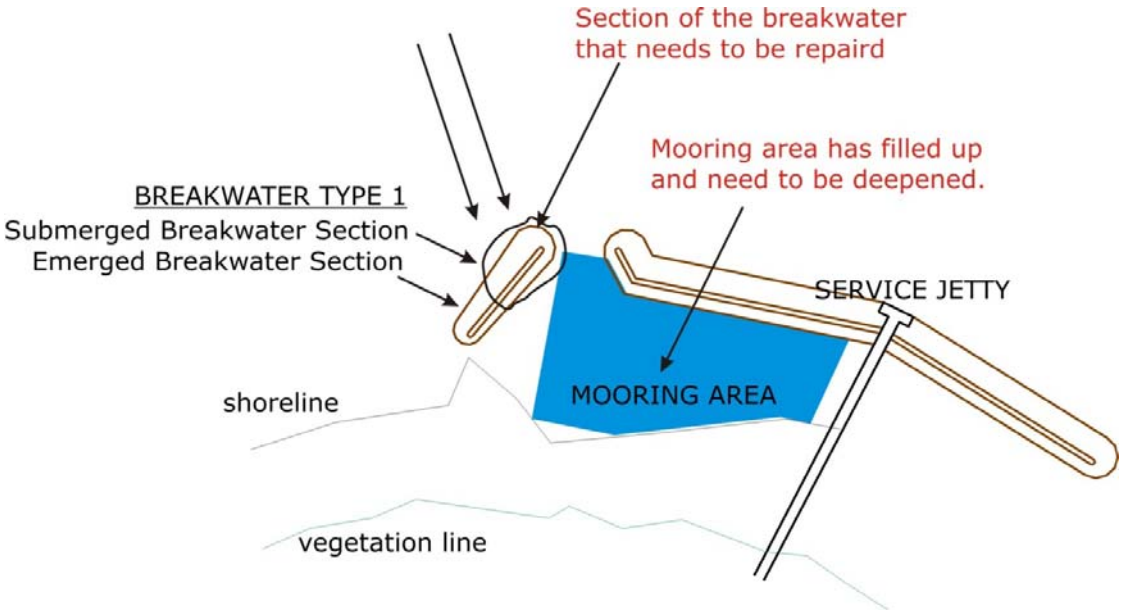
The project takes place in the island of Alidhoo, located in Haa Alif atoll. At present, Alidhoo island resort is fully operational. The maintenance component of the project will not affect the resort operation in a significant way but few rooms close to the mooring area will be closed to avoid guest distraction during the works. The following section outlines in detail the maintenance work proposed.

The justification of the proposed work is supported by the long term monitoring that has been undertaken in Alidhoo. Please refer to the monitoring reports attached as an annex.

2.3 Repair of the vertical breakwater

In the EIA of 2008, an emerged vertical breakwater was proposed to protect the mooring area from strong waves during south-west monsoon. The emerged breakwaters have minimal possible length and have been designed to prevent overtopping of waves and keep the mooring area or part of it calm so that tourists can embark and disembark safely during rough weather. Hence, this vertical breakwater on the west of the mooring area would prevent waves from the west during the southwest monsoon and will be placed with a wider base at the seaward end. The total amount of boulders used for the emerged breakwaters in this area is 5300 tons.

After the construction of the breakwater, 15 meters of it has been damaged by waves and need to be repaired as the damaged portion of the breakwater is now acting as a submerged breakwater (see the following figure). This is not the intended purpose and need to be repaired so that the mooring area can be used during rough weather. A total of 15 meters of the breakwater will therefore be repaired.



Therefore, it is been proposed to repair the damaged portion of the breakwaters using geotextile bags filled with sand. The geotextile bags of 2 ton and 2.5 tons will be used to repair the breakwater. The geotextile bags will be filled using sand obtained from the mooring area using a using 4-inch sand pump. They will be filled on site and transported to the breakwater area using excavators. While repairing the breakwater, some fallen boulders will be recovered and used to recreate the breakwater. The decision to repair the breakwater using geotextile bags was chosen as they are equally acceptable as boulders but there are more advantages for using them in Alidhoo. Approximately 300m^3 of sand will be required for filling geotextile bags and this sand will be obtained from the deepening works of the mooring area. It is estimated that approximately 60 to 80 geotextile bags will be required for the repair work. The following photo shows the emerged breakwater, where the repair works is required.

Figure 1: The emerged breakwater in Alidhoo

2.4 Deepening the existing channel

The existing mooring arae which was developed in 2008 has been filled up due to sediment movement around the island. Although the mooring area was designed to have minimal disruption to the sediment movement, it is totally impossible to avoid the area being filled up. Hence, regular maintenance dredging is required in order to maintain adequate depth, especially towards the shoreward side. At present, the filling up of the mooring area has reached a level where it is very difficult to manoeuvre boats in and out, especially during low tide. Based on the monitoring data, filling of the mooring area has begun soon after the project as can be seen from the following photos.

Photo taken in December 2008.

Photo taken in March 2009 showing further filling of the mooring area.

The deepening works will be carried using 4 inch sand pumps aided by excavators. Although the basin contains mostly fine sand, there are coral rubble that has been transported from other areas and the beach over the course of the past one year. These coarse and large coral rubbles will not pass through the sand pump and hence, excavators will be used to scrape them and aid the deepening works. All sand that is in excess after filling geo bags will be disposed on the north-western coastline to replenish the beach.

Photo taken in March 2010 showing the extent of filling of the mooring area.

2.5 Project Inputs and Outputs

The project has inputs in terms of human resources, and natural resources and machinery.

Table 1: Main inputs of the proposed project

Input Resource(s)	Source/Type	How to obtain resource(s)
Construction workers (9)	Maldivians	Contractor's personnel
Construction machinery	One excavator, one loader, one sand pump and barge and general construction tools.	Contractors to provide
Transport (sea)	Materials to be transported in a landing craft	Contractor
Food (during construction period)	Obtained from the resort	Resort to provide
Fuel	Diesel, Petrol, Lubricants	Resort to provide
Geotextile bag	Imported from Australia – already available	Available with the contractor
Electricity	Resort	From the resort

Table 2: Major outputs of the project

Output / waste materials	Anticipated quantities/levels	Disposal/treatment (if any)
Noise	Only localised to the area in which work takes place	Unavoidable during the construction stage but will be minimized
Dredged spoil and sediment	About 450 cubic meters	$300m^3$ will be used as fill material for the geotextile bags, that will be used to repair the damaged portion of the breakwater. Remaining 150 cbm will be disposed on the north-western beach.
Improved usability of the mooring area during rough weather	Almost 100% achieved	N/A
Complete repair of breakwater	15 meters of the breakwater repaired	

2.6 Construction methodology

2.6.1 Construction strategy

The proposed maintenance work will be undertaken in the minimum possible time period in order to minimize environmental damage and nuisance to guests. Also, maximum possible number of guestrooms will be kept in operation. Only rooms and other guest facilities in the vicinity of the operations would be closed down. Work will be confined to the service jetty area.

2.6.2 Work methods for breakwater repair

The vertical emerged breakwaters will be repaired by placing sand filled geotextile bags using the excavator. Excavator will be operated from the beach to the breakwater where the bags will be placed. The exact location of the breakwaters will be fixed to the original design.

2.6.3 Work methods for deepening works

Deepening of the mooring basin will be done by using 4 inch sand pumps aided by excavators. Sand pump will be mounted on a small barge and manoeuvred inside the mooring basin. Deepening works will be concentrated on the areas where filling has taken place.

2.6.4 Management of dredged spoil and its disposal

The project will produce a combined volume of about 450 m3 of sand or dredged spoil which has to be managed in an environmentally acceptable manner. From this, 300 m3 of the dredged material will be used to fill geotextile bags to repair the breakwater. The remaining 150 cbm of the materials will be disposed on the north-western side.

2.6.5 Management of waste

Dredge spoil is the only waste that will be generated from the project. Their method of disposal is discussed elsewhere in the report. All waste oil and solid waste will enter the resorts normal waste management stream and will be disposed appropriately. The setup for waste management is already in the resort.

2.7 Project schedule

It is anticipated that the project will take maximum two months to complete. Following is a tentative schedule for the proposed project.

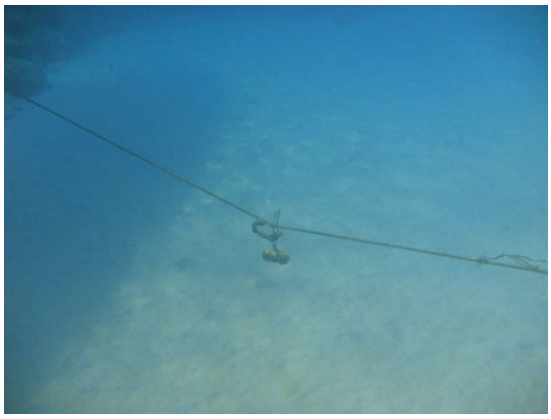
	2010			
Activity	**April**	**May**	**June**	**July**
EIA application process				
Approval of TOR				
EIA submission				
Mobilization				
Mooring area deepening works				
Repair of the breakwater				
Demobilization				

3 Existing Marine environment

For the purpose of this addendum, the existing environment of the mooring basin was studied and are described below. Since deepening work is concentrated on the mooring basin, the existing environment of the mooring area was studied using qualitative methods. Photographs were taken inside the mooring basin to understand the type of sediments and for the presence of any marine animals and species.

3.1 Existing sediments characteristics in the mooring basin

Visual inspection of the mooring basin was undertaken and photographs were taken to identify and understand the sediment types existing in the mooring basin. The following photos illustrate this. Based on the assessment, it is observed that the basin is filled with fine sand with the exception of loose coarse materials. These sediments are derived from other areas of the beach during the process of sediment cycling.



Sediment characteristics inside the mooring basin

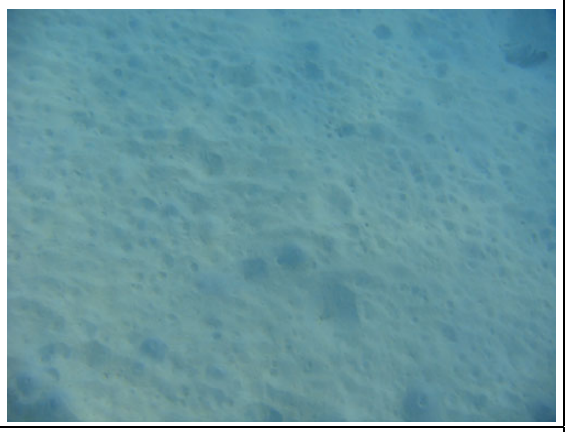


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Figure 2: The mooring basin is mostly filled with fine sand except few loose coarse rubble matter.

3.2 Existing marine life

3.2.1 Corals

No live corals are present inside the mooring basin.

3.2.2 Fish species

Fishes belonging to the grazer family were observed during the survey. Due to the lack of any live croals and due to the absence of any dead corals, these grazers were observed to be feeding on the algae that has grown on the mooring lines. Only Eye striped surgeonfish was observed which

numbered to about 20 during the 15 minutes qualitative survey. The following photo illustrates a school of surgeonfish feeding on the algae on the mooring line.

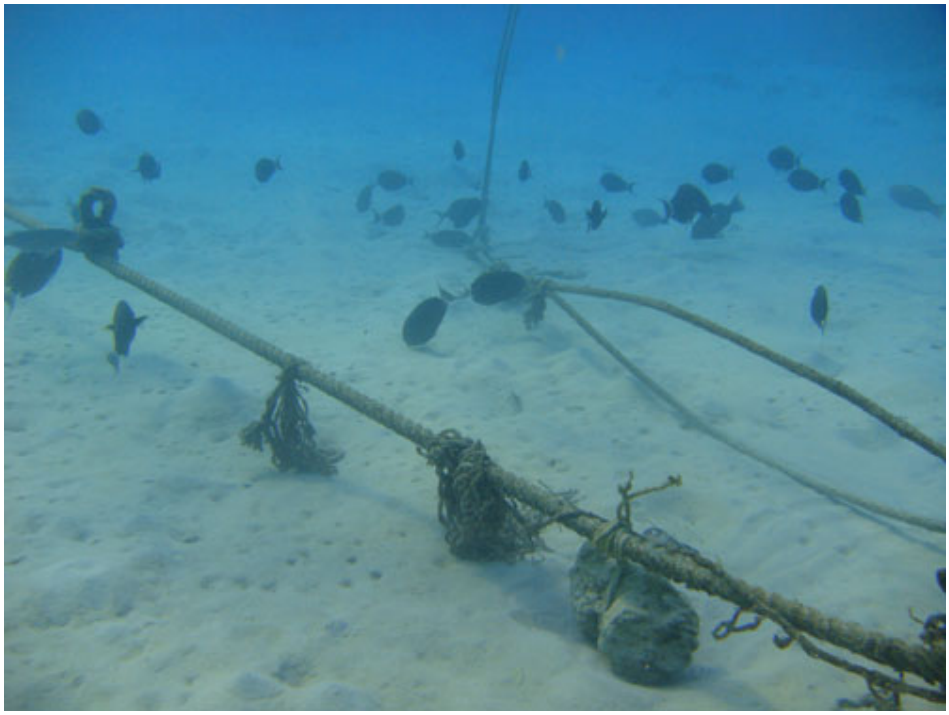

Figure 3: Grazer fish feeding on the mooring line inside the mooring basin

3.2.3 Sea water quality

The following table outlines the results of the seawater quality tests undertaken in May 2010.

Parameter	Unit	Sample
Appearance		Clear
Temperature	^{0}C	29
pH		8
Dissolved Oxygen	mg/l	6
Salinity	mg/l	34500
Turbidity	NTU	0.8
BOD_5	mg/L	9
Nitrates	mg/L	0
Phosphates	mg/L	0

3.2.4 Beach profiles

Beach profiles are continuously taken in Alidhoo as part of the monitoring ever two months. The attached monitoring reports in the annex will contain beach profiles taken all around the island including the mooring area. Refer to these monitoring reports for more details.

As can be clearly seen from the beach profiles and the shoreline changes across the mooring are, filling has started as soon as the project was complete.

4 Environmental Impacts and Mitigation

4.1 Impact Identification and Assessing Impacts

Environmental impacts of the proposed work have been examined through a number of processes. These include consultations with the stakeholders, field surveys, observations and assessment, and field experience gained from similar development projects implemented throughout the country. Potential positive and negative impacts on the environment have been considered.

Possible negative impacts on the environment have been considered in worst-case scenario to recommend mitigation measures in the best possible ways so that these impacts would be minimized and perhaps eliminated in both constructional and operational phases.

This EIA Addendum identifies and quantifies the significance of adverse impacts on the environment from the proposed additional activities of the project. Impacts on the environment were identified and described according to their location/attribute, extent (magnitude) and characteristics (such as short-term or long term, direct or indirect, reversible or irreversible) and assessed in terms of their significance according to the following categories:

Negligible – the impact is too small to be of any significance;
Minor– the impact is minor;
Minor adverse – the impact is undesirable but accepted;
Moderate adverse – the impact give rise to some concern but is likely to be tolerable in short-term (e.g. construction phase) or will require a value judgement as to its acceptability;
Major adverse – the impact is large scale giving rise to great concern; it should be considered unacceptable and requires significant change or halting of the project.
Positive – the impact is likely to bring a positive change in the sense that it is aimed at further minimizing the impacts as a result of the proposed actions.

4.2 Uncertainties in impact prediction

Environmental impact prediction involves a certain degree of uncertainty as the natural and anthropogenic impacts can vary from place to place due to even slight differences in ecological, geomorphological or social conditions in a particular place. There is also limited data and information regarding the particular site under consideration, which makes it difficult to predict impacts.

However, the level of uncertainty, in the case of Alidhoo is expected to be very low as the same work has been done in Alidhoo as well as many similar projects have been undertaken in Maldives on a much larger scale. Maintenance dredging of harbours and mooring areas are standard construction protocols for islands in Maldives and appropriate and adequate information on construction methodology are available. Therefore, there is very little uncertainty involved in this project. There is a high degree of accuracy in prediction of the impacts.

The following table outlines the major environmental impacts and their mitigation measures proposed.

Environmental Aspect	Potential Impacts to the environment	Mitigation Measures proposed
Impacts during construction stage		
Impact due to deepening the mooring area	Most of the negative impacts on the marine environment arising from the proposed project will mainly be from deepening of the basin. In this project, sand pumps aided by excavators will be used to deepen the mooring area and therefore sedimentation will be an ultimate outcome which will be unavoidable. Despite this, it has to be noted that this is only a short term effect and will only last during the excavation period. The mooring area will be deepened to a depth of 3 meters at mean sea level (MSL). The sea bottom of the mooring area currently consist of fine sand and some coral rubble. There are no live corals in the mooring area. Therefore, when deepening, no live coral damage is anticipated. Both work phase and operation phase will have direct and indirect negative impacts. Direct impacts during work phase will result from the removal of lagoon bottom areas. But this area has been previously deepened. Indirect impacts will result from release of sediment to the water column and increase in turbidity during the work phase. Lagoon bottom is an important habitat for certain organisms such as worms, mollusks, amphipod etc. which are important food sources for bottom feeders such as certain species of fishes. By removing sand from the lagoon bottom would disturb habitats of these organisms.	Following are the specific mitigation measures that will be taken to mitigate negative impacts on the marine environment that are likely to arise from the proposed project activities. • Deepening will be restricted to the mooring area only and areas where filling has taken place. • Undertaking work during low tide. • The monitoring programme specified in the EIA report will be followed and reported in order to take necessary mitigation measures. At present, Alidhoo environment is regularly monitored. • Mooring area will be deepened to the required depth of – 3.0 m at MSL. • Sedimentation and siltation resulting from the proposed work activity will be minimised and contained within the area by using appropriate techniques such as undertaking the works in low tide to reduce spreading of sediment and silt plumes to the lagoon floor, lagoon water and the coral reef. • The excavated material will be used to fill geotextile bags
Repair of the breakwater	The repair of the breakwater will have a significant positive impact on the mooring area as this was the intended purpose. The impact of this breakwater is beyond the scope of this addendum and has been identified and discussed in the EIA report of 2008. The impact of breakwater repair will therefore have very minor impacts. There will be visual impacts during the construction stage due to the use of machinery in this area. This impact will be temporary.	Following mitigation measure is proposed. • It is important to undertake work at low tide hours when repairing the breakwater. • Work to be done only within the work area. • Noise to be kept at minimum. • Workers to be properly trained and briefed about the work methodology.

Table 3: Matrix of the impacts, their significance and characterization

Impact indicator	Impact type (NEG or POS) +	Significant (H/M/L)*	Direct	Indirect	Magnitude # (N/M/MA/MoA/MaA)	Short term	Long term	Unavoidable	Reversible	Irreversible	Cumulative	Mitigation Required
Deepening the mooring area	Neg	L	X	X	N	X	X	X		X		X
Repair of the submerged breakwater	-	L	X	X	M	X		X	X			X

+ POS = positive impacts, NEG= negative impacts

* H=high, M=Moderate, L=Low

N=Negligible, M=Minor, MA=Minor Adverse; MoA= Moderate adverse; MaA=Major Adverse

5 Environmental Management and Monitoring

The monitoring programme given in the EIA report will be followed. No further monitoring needs are considered at this stage. It is also worth mentioning here that additional monitoring (not included in the EIA report) are being considered using satellite imagery and aerial photography.

5.1 Monitoring parameters

For this component, the following aspects will be monitored

- Beach profiles
- Shore lines
- Rate of filling in the mooring basin

These parameters are already monitored as part of the initial EIA (please refer to the monitoring reports) and hence will be continued. These reports are also evidence that the proponent is committed to undertake the monitoring.

5.2 Monitoring Report

A detailed monitoring report is attached as an annex which outlines the data collected over the past one and half years.

Detailed monitoring reports are attached as an annex which outlines the data collected over the past one and half years. The need for the repair works arose as a result of continuous monitoring. The monitoring programme proposed in the 2008 EIA will be followed. No further monitoring parameters are required for this maintenance component.

6 Conclusion

More than 18 months of environmental monitoring that has been undertaken in Alidhoo indicates that the mooring area has been filling and will continuously be filled. This is something that cannot be avoided and the only sustainable option would be to regularly undertake maintenance dredging on an annual basis. The repair of the breakwater though is not going to be a continuous exercise but rather a onetime operation which needs to be undertaken to meet the original project objectives.

Hence, through this EIA addendum, the proponent seeks to obtain the necessary permit to undertake the repair works and also obtain an annual permit to undertake the deepening works as the two year monitoring has clearly provided adequate qualitative and quantitative data to back the proponent's justification.

7 Declaration of the consultants

This EIA Addendum has been prepared according to the EIA Regulations 2007, issued by the Ministry of Environment, Energy and Water. The EIA was carried out by a multidisciplinary consulting team representing Water Solutions Private Ltd.

I certify that the statements in this Addendum to the Environmental Impact Assessment study are true, complete and correct, to our best of our knowledge and ability.

Name: Abdul Aleem (EIA 09/07)

Signature:

8 TOR for the Addendum

Environmental Protection Agency

Ministry of Housing, Transport and Environment

Male', Republic of Maldives

Terms of Reference for Addendum to Environmental Impact Assessment

The following is the TOR based on the scoping meeting held on 05th May 2010 for undertaking the EIA for the **proposed Maintenance deepening of the mooring area and repairing of 15 meters of breakwaters in Cinnamon Island Alidhoo , Haa Alif Atoll, Maldives.**

1. Introduction - Identify the development project to be assessed and explain the executing arrangements for the environmental assessment; this TOR is for an addendum to the EIA for the proposed coastal protection at Alidhoo, Haa Alif Atoll, Maldives that was submitted on 05th May 2008.

2. Study Area - Specify the boundaries of the study area for the assessment as well as any adjacent areas that should be considered with respect to the project.

3. Scope of Work - The following tasks will be performed:

Task 1. Description of the Proposed Project– Provide a full description of the relevant part and nature of the project, using maps at appropriate scales where necessary. This is to include: justification of the proposed project, a clearly labelled site plan and architectural drawings (giving estimated area of the island (changes in size, width and length) detailed description of how the project activities will be undertaken including work method for constructing structures, proposed methods for 'disposal' the dredged material, how wastes and emissions will be managed during the project, including a waste management plan for construction phase, a matrix of project inputs and outputs during the construction and operation phase, details of coastal modifications, a detailed project schedule and life span. Specify the boundaries of the study area for the EIA.

Task 2. Description of the Environment - Where baseline data is to be collected, careful consideration must be given to the design of the survey and sampling programme. Data collection must focus on key issues needing to be examined for the EIA. Consideration of likely monitoring requirements should be borne in mind during survey planning, so that the data collected is suitable for use as a baseline to monitoring impacts.

Assemble, evaluate and present baseline data on the relevant environmental characteristics of the study area (and disposal sites).

- *Sea water quality parameters shall specifically include: dissolved oxygen, salinity, pH, temperature, turbidity, nitrates, phosphates, BOD and COD.*
- *Description of the biota of the proposed area for the deepening(reef status, coral and fish communities)*

- *Beach profiles at atleast 4 locations.*

All survey locations shall be referenced with Geographic Positioning System (GPS) including sampling points, reef transects, vegetation transects, manta tows and soil sampling sites. All water samples shall be taken at a depth of 1m from the mean sea level or mid water depth for shallow areas. At least two benchmarks shall be used when undertaking the baseline assessments. The report should outline the detailed methodology of data collection utilized to describe the existing environment.

In addition, monitoring reports of the earlier EIA report for the coastal modification of Alidhoo (and its addendums) must be submitted as an attachment to the addendum. This information can be used to describe the existing situation of the coastal structures and to provide justification for the proposed project.

Where references are made to earlier EIA reports, please provide exact sections of the report and also provide a copy of the EIA report for coastal protection and the following addendums as an attachment to this addendum.

Task 3. Determine the Potential Impacts of the Proposed Project – The addendum should identify all the impacts and shall determine and analyze all the significant impacts for the proposed redevelopment for both construction and operational phases.

It should also describe the methods used identify the significance of the impacts outlined. The report should outline the uncertainties in impact prediction and also outline positive and negative: short and long-term impacts. Identify impacts that are cumulative and unavoidable.

Task 4. Mitigation and Management of Negative Impacts – Identify possible measures to prevent or reduce significant negative impacts to acceptable levels for both construction and operation phase with particular attention paid to use of dredged materials, constructional waste management, sediment control during construction of coastal structures including water villas, and construction methods and materials that would minimize impact on the environment. Discuss the feasibility and cost effectiveness of each mitigation measure and provide the costs of mitigation and the commitment to it.

Task 5. Environment Management Plan and Monitoring – A reasonable timeframe should be outlined for monitoring during construction and operational phase. Identify the critical issues requiring monitoring to ensure compliance to mitigation measures. Changes to the beach profile after the sand pumping activities are completed must be included. The report should also provide a detailed cost breakdown for implementing the monitoring plan. Provide commitment of the Proponent to conduct the monitoring programme.

Timeframe for submitting the EIA report – The developer must submit the completed addendum within 3 months from the date of this Term of Reference.

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10th May 2010

9 Appendices