

INITIAL ENVIRONMENTAL EXAMINATION (IEE)

For Beach Nourishment

Soneva Gili Resort and Spa, North Malé Atoll

Proponent: Soneva Gili Resort and Spa



September 2010

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Non Technical Summary

This report addresses the environmental concerns of the proposed beach nourishment in Soneva Gili Resort and Spa. The primary objective of the project is to recover eroded beach by pumping sand from already excavated areas nearshore. The project encompasses sand pumping using a six or 8 inch sand pump mounted on a barge. The borrow sites for the proposed beach nourishment will be in the western side lagoon.

The beach on the eastern side is severely eroded. The beach on Soneva Gili has been maintained through regular beach nourishment. However, this activity has been stopped by the Tourism Ministry recently as beach nourishment is an activity that requires environmental clearance as per the EIA Regulations of the Maldives. Due to the importance attached with beach as beach is one of the main elements of the tourism product of the Maldives, the Environmental Protection Agency has decided to allow temporary clearance for beach nourishment followed by a detailed assessment of shore protection measures.

This Initial Environmental Examination (IEE) has been carried out in order to get temporary clearance for a one-time nourishment of the beaches of Soneva Gili. A detailed environmental assessment will be undertaken as soon as possible to ensure compliance as well as to manage the island beaches in a manner in which it has the least impact on the physical and biological environment of the island and requires least interventions.

Sand pumping from nearshore locations has the potential to aggravate erosion as the borrow pits can become sediment sinks over a considerable period of time. If borrow areas are too close to the shore, the impact on the island shoreline and the erosion of the nourished beaches would be quite rapid. Therefore, it is recommended to keep the borrow areas as far as possible from the beach.

The other possible impact would be the growth hindered patch corals within the lagoon. However, there are no coral patches within the lagoon which may be affected by the proposed beach nourishment activity. Given that biological resources are not directly affected, aesthetic concerns are of importance in the proposed project. Therefore, in order to maintain the aesthetic value of the beach and enhance the socio-economic benefits of the proposed project, it is important that immediate beach nourishment is undertaken. At the same time, it is necessary to ensure that all environmental concerns of future shore protection or beach enhancement activities are clearly established so as to minimize environmental impacts of such activities.

1 Introduction

1.1 Introduction

This Initial Environmental Examination (IEE) or the preliminary study report has been prepared in order to meet the requirements of Clause 5 of the Environmental Protection and Preservation Act of the Maldives to assess the environmental impacts of proposed beach nourishment at Soneva Gili Resort and Spa. This IEE report will look at the magnitude of the project, screening of the potential environmental impacts and mitigation measures of the proposed beach nourishment. The report will also look at the justifications for undertaking the proposed project components.

Beach nourishment is a common practice in many resorts across Maldives where erosion is severe and coastal settlements are at risk. It is an expensive and continuous process in which sand is pumped from the lagoon directly to the beach or sand pumped into barge is transported to the desired location. It is an important activity in many resorts across Maldives in the sense that, without it, it may be a challenging and difficult task for the resort operators to maintain beach. The key purpose of the activity is to maintain the environmental value of the beach.

1.2 The purpose of the IEE

The key purpose of the study is to address the environmental concerns on making a decision on the proposed beach nourishment in Soneva Gili Resort, Malé Atoll. Further it will allow to:

- Provide information on the general environmental setting of the activity area
- Screen potential impacts to environment and the characteristics of these impacts
- Assist making decisions on mitigating measures and alternative options to the proposed activity
- Promote informed and environmentally sound decision making and monitoring

1.3 Scoping

In the scoping meeting held at EPA on 19 September 2010 it has been suggested to carry out a Preliminary Study or Initial Environmental Examination (IEE) for a temporary beach nourishment approval. A detailed EIA was required to be carried out to continue the proposed beach nourishment in Soneva Gili or to undertake any further coastal protection measures.

1.4 Methodologies

Internationally recognized and established methods have been used in this environmental examination. This IEE is based mainly on data collected during a field investigation mission on 20 September 2010 by a team from Sandcays Pvt. Ltd, discussion held with the proponent during the process of data collection and literature review.

1.5 The IEE

This IEE has been prepared by Ahmed Zahid, a registered EIA consultant who has number of years of experience in Environmental Impact Assessments and other related studies in the Maldives. The IEE is an environmental examination exercise conducted to screen the potential environmental concerns including the general environmental setting, magnitude of the project, screening of potential impacts to environment, mitigation measures for identified impacts and environmental monitoring.

2 Project Description

2.1 General context of the study

Erosion, or sand loss from the beach, arises mainly due to long-shore movement of sand out of a given area and the movement of sand to offshore areas as a result of human actions such as dredging, sand mining or through a natural process. In order to maintain beaches in its natural form beach enhancement programs are usually in place in many resorts across the Maldives including Soneva Gili. It is done through off shore sand pumping onto beach.

The beach nourishment project proposed at Soneva Gili involves pumping of sand from the lagoon in the western side of the resort and filling along the beach line on the same side. The objective of the activity is to maintain the beach through artificial remediation to keep the environmental value of the beach.

Under the Regulation on the Protection and Conservation of Environment in Tourism Industry, beach nourishment/beach enhancement programs by pumping sand is an activity which needs permission from concerned government authority. Given the size and nature of the project and the importance of beach, a decision has been made to prepare a preliminary or an initial environmental examination (IEE) report instead of the detailed environmental impact assessment (EIA) before reaching a decision on the proposed beach enhancement program on the resort.

2.2 Project Location and Study Area

The project location, as discussed earlier, is western beach line of Soneva Gili Resort and Spa, Malé Atoll as indicated in Figure 2.1



Figure 2-1: Location of proposed beach nourishment, Soneva Gili Resort and Spa

2.2.1 Borrow and Fill Areas

The borrow areas for the proposed beach nourishment in Soneva Gili will be from the lagoon on the western side of the island and sand will be pumped directly onto the beach.

2.2.2 The Project

The proposed project involves the nourishment of western beach of Soneva Gili by adding sand mined from western side lagoon. The sand will be mined using a sand pump of size 6 to 8 inches fixed on a barge. The western side beach of the island is severely eroded and the beach has been maintained by pumping sand over the past.

2.2.3 Project duration

Sand pumping is an intermittent process. Once the sand budget is met through pumping sand from sand bodies offshore, the activity will be stopped. The total duration of the project including the environmental clearance is five weeks as indicated in Table 2.1. The sand pumping, spreading and levelling will be continued for approximately three weeks.

Table 2-1: Schedule of proposed beach nourishment, Soneva Gili

Activity	W1	W2	W3	W4	W5
Conduct an Initial Environmental Examination (IEE)					
Get Decision Statement					
Mobilisation and sand pumping					
Levelling and demobilisation					

2.3 Need for the Project

The primary objective this project is to provide beach in the most important area of the resort. The western side is the face of the island and provides the first impressions that last. The economic value of the beach on this side is very high since it is the face of the island and Soneva Gili being one of the most prestigious resorts in the Maldives. Therefore, it is necessary to undertake beach nourishment on a regular basis. Beach nourishment helps to avoid the use of structural protection, which has aesthetic impacts. For these reasons, the island has been trying to maintain the beach on western side of the island, although it is an expensive process. Western side shoreline of the island is prone to severe erosion during the southwest monsoon due to wave scour, which requires periodic sand pumping to maintain the beach. The tidal surge and freak weather that prevailed in July 2010 caused much severe erosion and the beach has been almost entirely lost. Therefore, there is an immediate need to undertake beach nourishment.

2.4 The setting

The project takes place in the Maldives environment. Therefore, the extent to which the project conforms to existing plans, policies, guidelines, regulations and laws of the Maldives needs to be considered. Hence, this section will look at the context in which the project activities take place and the legal and policy aspects relevant to those activities. It is important to note that the project is of a local and regional scale and also has some bearing at a national context.

2.5 Applicable Policies, Laws and Regulations

The main legal instrument pertaining to environmental protection is the Environmental Protection and Preservation Act (Law No. 4/93) of the Maldives passed by the Citizen's Majlis in April 1993. This Act provides the Ministry of Housing and Environment with wide statutory powers of environmental regulation and enforcement. This umbrella law covers issues such as environmental impact assessment, Initial Environmental Examinations, protected areas management and pollution prevention. The following clauses of the Environmental Protection and Preservation Act (Law No. 4/93) are relevant to the project:

Clause 5a: 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.

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

Clause 6: The Ministry of Environment, Energy and Water has the authority to terminate any project that has an undesirable impact on the environment. A project so terminated shall not receive any compensation.

Clause 9a: The penalty for minor offences in breach of this law or any regulations made under this law, shall be a fine ranging between Rf5.00 (five Rufiyaa) and Rf500.00 (five hundred Rufiyaa), depending on the actual gravity of the offence. The fine shall be levied by the Ministry of Environment, Energy and Water or by any other government authority designated by that Ministry.

Clause 9b: Except for those offences that are stated in (a) of this clause, all major offences under this law shall carry a fine of not more than Rf100, 000,000.00 (one hundred million Rufiyaa), depending on the seriousness of the offence. The fine shall be levied by the Ministry of Environment, Energy and Water.

Clause 10: The government of the Maldives reserves the right to claim compensation for all damages that are caused by activities that are detrimental to the environment. This includes all activities mentioned in Clause No. 7 of this law as well as those activities that take place outside the projects that are identified here as environmentally damaging.

The EIA Regulations, which came into force in May 2007, has been developed by the powers vested by the above umbrella law. The EIA Regulations have been the basis for Environmental Impact Assessment and Initial Environmental Examinations in the Maldives. If anyone intends to submit a project proposal not included in Schedule D of Environmental Regulation 2007, an Environmental Screening application has to be submitted to Environmental Protection Agency. At screening if found it requires an Initial Environmental Examination the proponent shall submit further information in the form of an Initial Environmental Examination (IEE) report as indicated under Clause 8 of EIA Regulation 2007. However, beach nourishment is an activity that has been placed in Schedule D of the EIA Regulation among activities that require Environmental Impact Assessment. Therefore, this IEE is a special consideration as this case requires urgent approval. Hence this project is subjected to further studies and a detailed environmental impact assessment that would immediately follow.

Today, registered consultants are required to sign EIAs and IEEs and are reviewed by two independent reviewers and final decisions are based on the review report.

2.6 Environmental Permits required for the Project

2.6.1 EIA Decision Statement

The most important environmental permit to initiate beach nourishment in Soneva Gili would be a decision statement regarding this IEE from the Environmental Protection Agency (EPA). The Decision Statement, as it is referred to, shall govern the manner in which the project activities must be undertaken. This IEE report assists decision makers in understanding the existing environment and potential impacts of the project to environment. Therefore, the Decision Statement may only be given to the Proponent after a review of this document.

3 Methodology

The section covers methodologies used to collect data on the existing environment. The key environmental components of the project that were considered are coastal environment and marine environment. In order to study the existing environment of the island, the following data collection methodologies were used during the field visit to Soneva Gili during 20 September 2010.

3.1 General Methodologies of data collection

Conditions of the existing environment of the study area were analysed by using appropriate scientific methods. Field surveys were undertaken to get further understanding of the existing environment of the island. Field surveys were carried out during field visit to the resort on 20 September 2010 to collect baseline data. Before the trip was undertaken all existing information regarding the site was gathered.

As identified in the Scoping Meeting, the following baseline information was gathered.

- Existing shore protection measures (if any)
- Beach profiles along the western and some on the eastern side
- Long-shore currents using drogue
- Bathymetry of the western side lagoon
- Marine water quality

3.1.1 Mapping and Location identification

The entire island shoreline and survey locations (in the project boundary) were mapped using a differential GPS. Seven beach profiles P1-P7 as indicated in Figure 3-1 were taken around the island, of which four were taken on the western side and the remaining on eastern side of the island.

3.1.2 Marine Water Quality

Marine water quality around the island was tested by using YSI water quality logger which can measure pH, electrical conductivity ($\mu\text{S}/\text{cm}$), TDS (mg/l) and dissolved oxygen.

3.1.3 Bathymetry and Ocean Currents

Bathymetry around along the western lagoon was taken using echo sounding system mounted on a small speed boat. Drogues were done at three different locations on the western lagoon in order to assess sediment transport patterns within the zone of project.

4 Existing Environment

This section describes the environment of the project area of Soneva Gili. The key environmental category of relevance to this project considered includes physical resources in the project area. The components considered under the category include.

- The general meteorological conditions
- Topography – extent of beach erosions (e.g. beach profiles)
- Existing shore protection measures (if any)
- Long-shore currents using drogoue
- Bathymetry of the western side lagoon
- Marine water quality

4.1 General meteorological conditions

The climate of the Maldives varies slightly from North to South of the country. General meteorological conditions prevailing in the central region based on meteorological data for Hulhulé has been used to understand climatic factors affecting Soneva Gili resort.

The Maldives, in general, has a warm and humid tropical climate with average temperatures ranging between 25°C to 30°C (MHAHE, 2001) and relative humidity ranging from 73 per cent to 85 per cent. The country receives an annual average rainfall of 1,948.4mm. Table 4-1 provides a summary of key meteorological findings for Maldives.

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. These are discussed in more detail in the following subsections. 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.

Table 4-1: Key meteorological information

Parameter	Data
Average Rainfall	9.1 mm/day in May, November 1.1 mm/day in February 1900mm annual average
Maximum Rainfall	184.5 mm/day in October 1994
Average air temperature	30.0 C in November 1973 31.7 C in April
Extreme Air Temperature	34.1 C in April 1973 17.2 C in April 1978
Average wind speed	3.7 m/s in March 5.7 m/s in January, June
Maximum wind speed	W 31.9 m/s in November 1978
Average air pressure	1012 mb in December 1010 mb in April

4.1.1 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 hydrodynamics around the island (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.

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.

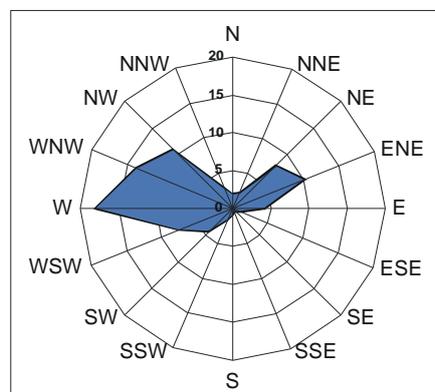


Figure 4-1: General wind rose diagram for the Maldives (source MEEW 2005).

Changes in wind directions and intensity of wind need to be taken into consideration in determining the most favourable time period of beach nourishment work. The Maldives experience strong ocean wind at speed of 6m/s to 7.5m/s at a height of 10m during June, July and August (Elliott *et al*, 2003)..

4.2 Waves

Waves are important to consider in designing beach enhancement programs as waves move shoreward from deeper water and propagate over depth anomalies resulting from removal of material from natural as well as nourished beaches. These various transformations, called wave shoaling, refraction, reflection, and diffraction, can significantly increase or decrease the transport of sand along the shoreline, resulting in localized erosion and accretion. Studies by Lanka Hydraulics (1988a & 1988b) 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 May-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.

The western side beach of Soneva Gili is subjected to severe erosion mainly due to long shore current and wave action. The beach profiles are in given in Appendix 3.

4.3 Currents

Generally current flow through the Maldives is driven by the dominating two-monsoon season winds. Westwardly flowing currents are dominated from January to March and eastwardly from May to November. The change in currents flow pattern occurs in April and December. In April the westward currents flow are weak and eastward currents flow will slowly take place. Similarly in December eastward currents flows are weak and westward currents will take over slowly. Studies on current flow within a reef flat in Male' Atoll suggests that wave over wash and tides generate currents across the reef platforms, which are also capable of transporting sediments (Binnie Black & Veatch, 2000). However, available information suggests that tidal currents are not strong due to small tidal range.

4.3.1 Drogue Tests

In order to study the sediment transport pattern within the lagoon system on the western side of the island, a drogue test was conducted. The drogue tests Drogue 1, Drogue 2 and Drogue 3 carried out on three different locations in the lagoon as indicated in Figure 3-1. Drogue 1 released middle of the lagoon in the western side moved towards the shore at 0.18m/s. Drogue 2 moved towards north east at 0.09m/s, and Drogue 3 on the other hand travelled in the opposite direction towards south at 0.08m/s. The movement of water body close to shore line is low compared to the middle of lagoon. This indicates that there is slow longshore movement and a possible tendency for sand accumulation at mid region of the western shore line. The drogues also indicate that erosion is mainly due to tidal and wave scour during the southwest monsoon rather than longshore currents. Sediment deposition is expected during the northeast monsoon due to longshore currents on the western side.

4.4 Existing Coastal Environment

There is extensive erosion on the western side of the island as shown in Figure 4.2. Erosion has reached slightly beyond the vegetation line of the island. There is no beach on the western side except at low tide. More photos are shown in Figure 4-3.



Figure 4-2: Beach line on the western side of Soneva Gili, September 2010

4.4.1 Marine Water Quality

Marine water quality was tested on three locations W1, W2 and W3 within the lagoon system as in Table 4-2. There are low levels of turbidity in the different sample locations. The locations are shown in Figure 3-1

Table 4-2: Marine water quality, Soneva Gili resort

	Sample locations		
	W1	W2	W3
E. Conductivity ($\mu\text{S}/\text{cm}$)	35500	35550	35540
Dissolved oxygen (mg/l)	7.13	6.84	7.05
pH	7.6	7.4	7.5
Turbidity (NTU)	0	1	1

4.4.2 Features of Coastal Environment

The coastal environment of the island and in general the project area can be described as having four major characteristics as illustrated in Figure 4-3. They are:

1. Jetty extending to deepwater at north western corner of the island
2. Damaged sand bags exposed in many areas following recent storm
3. Roots of coconut palms along the coast line are exposed at the beach scarp and berm areas
4. The width of beach on the eastern side is small as there has never been any beach nourishment on this side of the island. This side erodes during NE monsoon, however, there is little concern.
5. Overwater restaurant towards the middle of the island would affect wind-generated currents nearshore.

4.4.3 Lagoon

The lagoon around Soneva Gili is in pristine condition except the near shore lagoon where water is turbid due to wave-induced erosion. The fine sediments from past beach nourishment and reclamation activities get re-suspended in the water column due to tides, currents and waves.

Figure 4-3: Illustrated summary of site conditions

5 Screening of Environmental Impacts

This section covers potential environmental impacts due to proposed beach nourishment project in Soneva Gili.

Analysis of environmental issues within the lifecycle of the project identifies the major issues and concerns that are likely to evolve over the life of a project. For the proposed project, these issues include location of borrow areas for sand pumping, suspension of sediments during the operation and coastal protection measures. The different components of the project would impact upon the following resources or elements of the environment.

- Coral reef patches and benthic communities
- Marine water quality
- Lagoon and beaches – aesthetics

Pumping of sand from nearshore areas is the key component of the proposed beach nourishment project. However the degree of adverse environmental impact caused by the proposed type of sand pumping will be minimal. As per the project design a submersible suction pump of appropriate size will be used to pump, hence the impact of sediment re-suspension and increase of background turbidity will be minimal and insignificant at the location of the pump. However, sedimentation to a visible degree will occur at the pumped sand disposal location or where the sand is pumped to. The sediment plume will move towards the leeward areas where fines would settle paving way for resuspension during recreational activities as well as waves, tides and currents. However, this is short term given that longshore currents as well as tides and waves would subsequently remove the suspended sediments clearing the areas given that there are no structural protection measures in Soneva Gili such as breakwaters which can hinder natural sediment removal processes. However, background turbidity levels in certain areas of the island will be raised due to continuous sand pumping. Since the fine sediments move around the island with seasonal changes the leeward areas during a given season would be the most affected.

Sand pumping from nearshore locations has the potential to aggravate erosion as the borrow pits can become sediment sinks over a considerable period of time. If borrow areas are too close to the shore, the impact on the island shoreline and the erosion of the nourished beaches would be quite rapid.

The other possible impact would be the growth hindered patch corals within the lagoon. However, there are no coral patches within the lagoon which may be affected by the proposed beach nourishment activity. Given that biological resources are not directly affected, aesthetic concerns are of importance in the proposed project. Therefore, in order to maintain the aesthetic value of the beach, the proposed project has socio-economic benefits of a greater magnitude.

Table 5-1: Summary of negative impacts of proposed Beach nourishment, Soneva Gili

Activity	Negative Impacts	Type of impact	Duration	Reversibility	Significance
Sand pumping	• Smothering of bottom biota	Direct	Short term	Irreversible	Minor
	• Hazardous areas within the lagoon	Direct	Long term	Reversible	Moderate
	• Sedimentation within the lagoon	Direct and cumulative	Short to Medium term	Reversible	Moderate
	• Re-suspension of fine sediments	Direct and cumulative		Reversible	Moderate
	• Poor water quality	Direct and cumulative		Reversible	Moderate
• Altered bathymetry	Direct and cumulative	Irreversible		Minor	
• Sediment deposition on discrete corals	Direct and cumulative	Irreversible	Irreversible	Negligible	
Beach nourishment	• Elevated turbidity of near shore lagoon	Indirect	Short – Medium term	Reversible	Major
Fuel consumption (e.g. sand mining)	• Global warming and climate change	Indirect	Long term	Irreversible	Moderate
	• Oil/Petrol spillage into environment	Direct	Long term	Irreversible	Moderate

Table 5-2: Summary of positive impacts of proposed Beach nourishment in Soneva Gili

Activity	Positive Impacts	Beneficiaries/Geographic Extent	Type of impact
Beach enhancement through nourishment	• Increased aesthetic value	Tourists, staff	Cumulative
	• Increased indirect revenue	Operator	Cumulative

6 Findings and Recommendations

The beach on the western side is subjected heavy erosion apparently due to combined effects of waves and tides during the southwest monsoon. Longshore currents are expected to bring in sediment to the western beaches during northeast monsoon, however, may not do so to combat the extent of erosion during southwest monsoon. Therefore, interventions such as continuous sand pumping would be necessary. The recent storm in July 2010 worsened the erosion leaving a completely eroded beach with damaged sand bags exposed along with roots of coconut palms on erosion scarps and beach berms. Continuous beach nourishment has been undertaken in the past as the preferred means of shore protection. However, this has been based on observations and experience of past erosion problems. Therefore, it is important to undertake detailed studies to assess the impacts of continuous, long term sand pumping activities in comparison with other shore protection alternatives. Therefore, EPA has recommended undertaking a detailed study and preparing an Environmental Impact Assessment report following this IEE as this IEE will establish baseline information and project details for provision of an urgent environmental clearance to undertake one-time sand pumping operation to nourish the western beaches.

It is also recommended that environmental consultant undertake appropriate supervision and monitoring during the sand pumping operation to establish the actual impacts of the sand pumping operation for inclusion in the EIA report that will follow. Monitoring shall cover the same baseline locations in this report and additional monitoring requirements as the consultants feel necessary for future planning of shore protection measures.

7 Declaration of the consultant

I certify that the information and baseline data given in this Initial Environmental Examination are true, complete and correct to the best of my knowledge and abilities.

Name: Ahmed Zahid (EIA 08/07)

Signature:

Date:

8 Sources of Information

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Appendix 1: Beach Profiles

