FIRST ADDENDUM TO THE EIA

For the Expansion of Maadhoofinolhu, South Male' Atoll, Maldives

Photo: Water Solutions Pvt.Ltd

Proposed by: D.C.P Private Limited

Prepared by: Ahmed Jameel (EIA P07/2007), Abdul Aleem (EIA P03/2019)

For Water Solutions Pvt. Ltd., Maldives

14 October 2018

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2 Table of figures and tables

3 Declaration of the consultants

This EIA addednum has been prepared according to the EIA Regulations 2012 (With subsequent revisions), issued by the Ministry of Housing and Environment. The EIA addendum was carried out by a multidisciplinary consulting team representing Water Solutions Private Ltd. In preparing this report, no data has been manipulated. All data has been collected by field visits and through internationally accepted scientific methods.

I as the lead consultant certify that the statements in this report are true, complete and correct.

Name: Abdul Aleem (EIA P03/2019)

Signature:

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4 Proponents commitment

D.P.C. Pvt Ltd

Date: *Thursday, 10th October 2019*
Ref: *OZEN/10102019/161*

Mr. Ibrahim Naeem,
Director General
Environmental Protection Agency
Ministry of Environment and Energy,
3rd Floor, Green Building, Male' Maldives

Re: OZEN BY ATMOSPHERE AT MAADHOO ISLAND

Declaration and Commitment to Undertake

First EIA Addendum to the Proposed Expansion Project

Dear Sir,

As the proponent, we confirm that we have read the report and to the best our knowledge, all non-technical information provided in the report are complete and accurate.

We would like to confirm our commitment to implement all mitigation and monitoring during construction stage as well as post construction mitigation and monitoring program as specified in the report.

Yours sincerely

C-0705/2013

Abdul Latheef Mohamed
(Director)

CC: *MTR Holdings Pvt. Ltd.*

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5 Non-Technical Summary

This report addresses the environmental concerns of the proposed change in the dredging methodology in the project, "Expansion of Maadhoofinolhu Island in South Male' Atoll. The EIA of the project was submitted on 15th November 2018 to Ministry of Tourism (MOT) and the EIA approval was issued on 17th December 2018 from Ministry of Tourism (MOT), (Reference: 88-DS/PRIV/2018/2589). Presently the project is planned to start but changes to the borrow location and methodology has been proposed by the proponent to expedite the work and complete on time. Hence, it has been proposed to use a Trailer Suction Hopper Dredger (TSHD) and the locations for sand borrow areas have been changed. This report will identify the potential impacts (both positive and negative) of this proposed changes.

The initial proposal had the borrow site within the reef of Maadhoofinolhu to obtain the fill material. However, due to operational and practical difficulties, dredging (using excavators and cutter suction dredger) is logistically and practically difficult due to the sites close proximity to the presently operational resort in Maadhoofinolhu operated under the brand OZEN Maaadhoo. In addition, the area's high exposure to strong currents and waves throughout most part of the proposed dredging period will cause major disruption and increase the duration of environmental impacts. The site, being close to two protected areas is also one reason why this change in methodology had to be brought. Use of a TSHD has multiple advantages, both in terms of environment and operational activities and hence, for this reason it has been decided to change the methodology and borrow site for the project.

The proponent therefore proposes to change the borrow location to two selected potential sites in south Male' atoll where surveys have been undertaken to assess the availability of adequate sand. Out of these two sites, location 3 has been studied in detail using sub-bottom profiling.

The key aims of the report are;

- Describe in detail the proposed amendment/project;
- Identify the need and justification for the proposed changes;
- Describe the biophysical status of the existing environmental condition of the additional surveyed areas based on the findings undertaken during the surveys;
- Assess, identify and predict potential environmental impacts of the proposed change of methodology;
- Evaluate the significance and magnitude of impacts that will be generated; and identify and predict ways in which these environmental impacts can be mitigated.
- Develop a mechanism to monitor and understand the long-term effects and changes;
- Provide legal protection with regards to the proposed development activities; and

Compared to the previously proposed method of dredging, the present location and dredging methods will have different environmental impacts. While this method is fast and reduces significant impacts on the existing house reef, there will be a number of other impacts associated with the change in location and methodology. This includes spreading of the sediments around the dredger to a larger area of south-Male' Atoll and the potential for high unpredictability of sediment plume and the extent it travels due to multiple uncertain factors. Nevertheless, the biggest advantage of this method is that it reduces the dredging period and limits the time during which maximum level of sedimentation will occur. The idea of using a hopper dredger is to limit the dredging period so that most critical environmental impacts can be contained within a short time period.

As identified in the EIA process, during dredging, there will be sedimentation in the area. The proposed methodology would have a lot of negative environmental impacts. However, balancing these negative impacts and the socioeconomic benefits gained is something that is very difficult to measure. As a result, a comprehensive monitoring component has been suggested which takes in to consideration, the most important elements that require monitoring, most importantly a mechanism and means to measure and value the social benefit of the project. This monitoring component will be adhered and will allow the assessment of long term changes, despite the potential negative impacts. The most significant impacts of this change is expected to occur for the coral reefs and the diving and snorkelling activities that takes place in the region. Dispersion of levels of sediments will disrupt diving and snorkelling activities as this can reduce visibility significantly. These are high risk factors that kills corals, especially corals in the top reef.

Due to the change in the borrow location, the negative impacts predicted for the proposed changes and mitigation measures have been identified in the report. Environmental impacts were assessed for both the construction and operation phase of the project. The main constructional impact is the direct destruction of the lagoon and the bottom substrate. In terms of sedimentation, the impacts will be high in the region. The socio-economic impacts of the project are expected to be positive as completing the project early would save cost and bring a variety of direct and indirect positive impacts.

As the initial EIA report (Jameel, 2018) outlines a comprehensive monitoring protocol to capture the areas of concern in the present project itself, this monitoring report will be followed. For the project components that are changing, stakeholder consultations were undertaken with the relevant parties as outlined in the TOR ad a targeted monitoring additional components have been outlined in this report.

6 Introduction

This addendum to EIA report has been prepared in order to establish further impacts that may be associated with the proposed change to the initially proposed method of dredging to undertake the proposed reclamation of three (islands) as part of the expansion of Maadhoo Island in south Male' Atoll, Maldives. The findings of this report is based on the EIA for the Proposed Extension of Maadhoo Island submitted on 15th November 2018 to Ministry of Tourism (MOT). The EIA approval was issued on 17th December 2018 from Ministry of Tourism (MOT), (Reference: 88-DS/PRIV/2018/2589) (Jameel, 2018).

According to the initial concept (Jameel, 2018), dredging will be undertaken by dredging an area of the lagoon by using excavators and sand pumps. As per this initial method, the work would take up to six months to a year to complete. Nevertheless, due to the scale and sensitivity of the project, the proponent has decided to use a TSHD

Hence, under this addendum, it is proposed to change the sand borrow location and methodology as the client has decided to hire the contractor-MTCC to complete the dredging with the use of a TSHD for the project. TSHD is capable of dredging from deep sea, as deep as 50 metres. The initially approved area for dredging is not included in this addendum as it is not suitable for the TSHD. Hence, potential deep sea areas within south Male' Atoll have been surveyed to explore the possibility of borrowing sand from these locations and to verify the availability of fill material that would be appropriate and adequate.

This report is an addendum to the original EIA (Jameel, 2018) and encompass the additional changes that is being proposed. Thus the report should be read in conjunction with the original EIA report. Reference to this EIA has been made in situations where it is relevant.

6.1 Project proponent

The Proponent is the same as that given in the EIA report (Jameel, 2018), i.e. D.C.P Private Limited.

6.2 Project Location and Study Area

The details of the project location is outlined under section 8.3 of the initial EIA (Jameel, 2018). As the borrow area has been changed, additional studies were undertaken within south Male' region for selecting suitable sand borrow areas for the TSHD. The following figure illustrates the additional areas studied as part of EIA Addendum and as a result, the project boundary and impact area has been changed, which is discussed in the following section. Two locations, Location 3 and Location 4 have been considered to borrow sand and studies and surveys were done in these areas. In addition, two other areas were physically inspected to assess the condition and availability of borrow material.

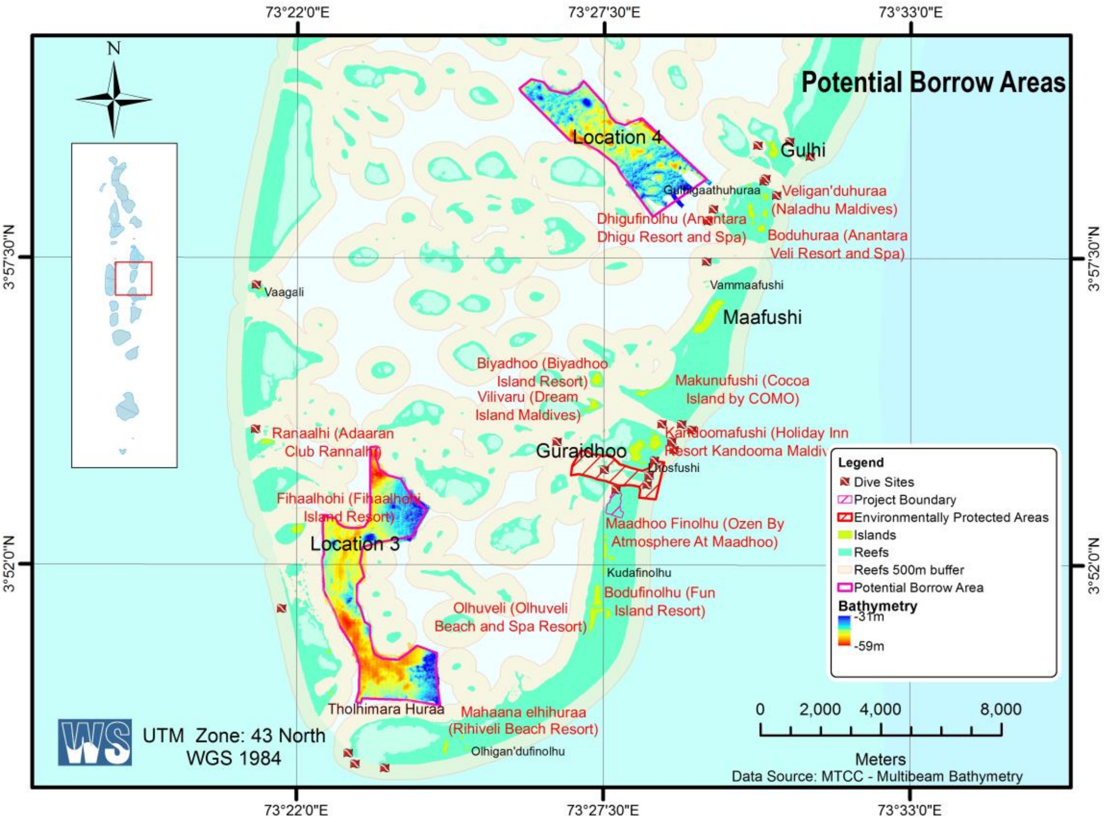


Figure 1: Locations surveyed for potential borrow sites for the project.

6.3 The revised project boundary and impact zones

The revised project boundary encompasses a large area of south Male' atoll as two (2) key locations or regions have been studied and surveyed as potential borrow areas. These areas along with their surrounding reefs are now considered part of the study area. The impact zones are the nearby reefs due to the potential of high sediment dispersion during dredging.

The revised project boundary and impact zones are outlined in the above figure. It encloses the entire construction area together with the expected possible impact buffer zones. Considering the main material in the borrow sites (mainly sand) sediment and silt generated during dredging is expected to spread eastward due to the predominant wind direction in south-west monsoon is from west to east. The project is planned to be commenced as soon as the EIA addendum report is approved which will be during the southwest monsoon, where the winds will be predominantly between SW to NW.

6.3.1 Location 3 and 4

Location 3 lies on the south-west side of south Male' Atoll (refer to the above figure). Location 4 lies on the inner lagoon, west of Gulhi island in south Male' Atoll (refer to the above figure). Details of the types of surveys done in these two locatiosn are outlined later in the report.

7 Project Description

7.1 Need and Justification for the proposed changes

There are 2 main reasons for the proposed change in dredging method, equipment and methodology.

The most significant reason is the that it will reduce the time taken for dredging, thus saving financially as well as reducing the environmental impact duration. Unlike a cutter-suction dredger, a hopper dredger can execute a given project in a very short time. This factor thus becomes very attractive as it reduces the overall cost, resulting from project delays. Apart from the cost, the short duration reduces the potential for cumulative impacts to occur over time. Thus, the duration of significant negative impacts is reduced greatly. The reclamation land is available for further development at a fraction of the time it would normally take a cutter suction dredger to work.

Initially it was planned to undertake dredging using a Cutter Suction Dredger (CSD) whose average pumping rate varies between 300-400cbm/hr which is roughly equivalent to 1400cbm for every 4 hours. The proposed TSHD to be used in this project can discharge around 3000cbm of sand every 4 hours given that the proposed sand borrow sites yield enough quantity of suitable material.

The second reason is that deep sea dredging is less destructive to the marine environment than dredging form the shallow lagoons and reef. Dredging using a CSD destroys the critical top layers of coral reefs which takes a very long time to recover, often destroying large areas of coral growth which takes years to grow. Deep sea dredging is usually undertaken in areas deeper than 30m where coral growth is minimum or absent. Unlike CSD, cutting depth by a TSHD will be less which helps the area to regain back its original state in a less time period. Hence, they are less environmentally damaging, meaning that the sand is borrowed in pre-surveyed sand pockets in the deep Atoll lagoon. These pockets of sand constitute fine sand and no coral. Like a vacumm cleaner, sand is sucked in to the dredger and transported to the filling site. This process does not physically damage coral reefs and is considered to be a very attractive option. Unlike a cutter suction dredger, it physically destroys an area of the lagoon and changes the geography of the entire reef.

7.2 Brief overview of the project

The following table outlines a brief overview of the project components.

Table 1: Summary of the project component

Project components	**Details**
Dredging	It is proposed to borrow sand from within the lagoon of South Male' Atoll. A Trailer Suction Hopper Dredge (TSHD) will be used for dredging. The TSHD will go through cycles of four to six consecutive operations: Dredging in the Atoll lagoon. Sailing full to the disposal, project site. Placement of dredge material at the disposal site by pumping directly to the land reclamation area. Sailing empty to resume the cycle. The dredging operation will continue 24 hours a day and 7 days a week as weather permits. Dredge operators will maintain a log of the dredge path, volumes dredged and other activity logs. A total of 130,000 CBM of sand will be dredged.
Reclamation of islands to 2 m above mean sea level	Reclamation will be undertaken by filling the proposed reclamation area with dredged materials obtained from the borrow area. The TSHD will pump the material direct to the site.
Coastal protection	Revetments as coastal protection will be constructed along the newly created shoreline. Details of the coastal protection has been provided in detail in the initial EIA (Jameel, 2018).

7.3 Work methodology

7.3.1 Site mobilization and demobilization

Mobilization of the land team has already begun and some of the machineries (excavator, dump trucks, wheel loader, bull dozers) and equipment will be loaded to a flat top barge to and mobilized to the site as approval for mobilization has already been obtained through the initial EIA. All the machineries and equipment's will be mobilized to the designated site on a floating barge as land is yet to be created. The very initial works that will be undertaken includes the creation of bund walls to mark the perimeter of the proposed reclamation islets. This will be the first phase of preparation and one of the most significant mitigation measures to contain sedimentation. The dredge team (TSHD and crew) will directly sail from K.Thilafushi as the dredger itself is self-propelling. Dredger will anchor near the island in deep sea, in a similar manner to other ships of similar size when it is idle. Dredger pipeline will be moved by either a flat top barge or a landing craft to the project site separately.

7.3.2 Bund wall construction

As the very first step, a setting-out survey will be conducted to mark the boundary of the reclamation area by means of GI pipes or iron bars. A fence will also be marked and erected to conceal the work site from the existing resort on the south side. This fence will be covered using camouflage netting to reduce the visible impact on the existing resort which will be operational during the project. The following figure illustrates the location of the fence.

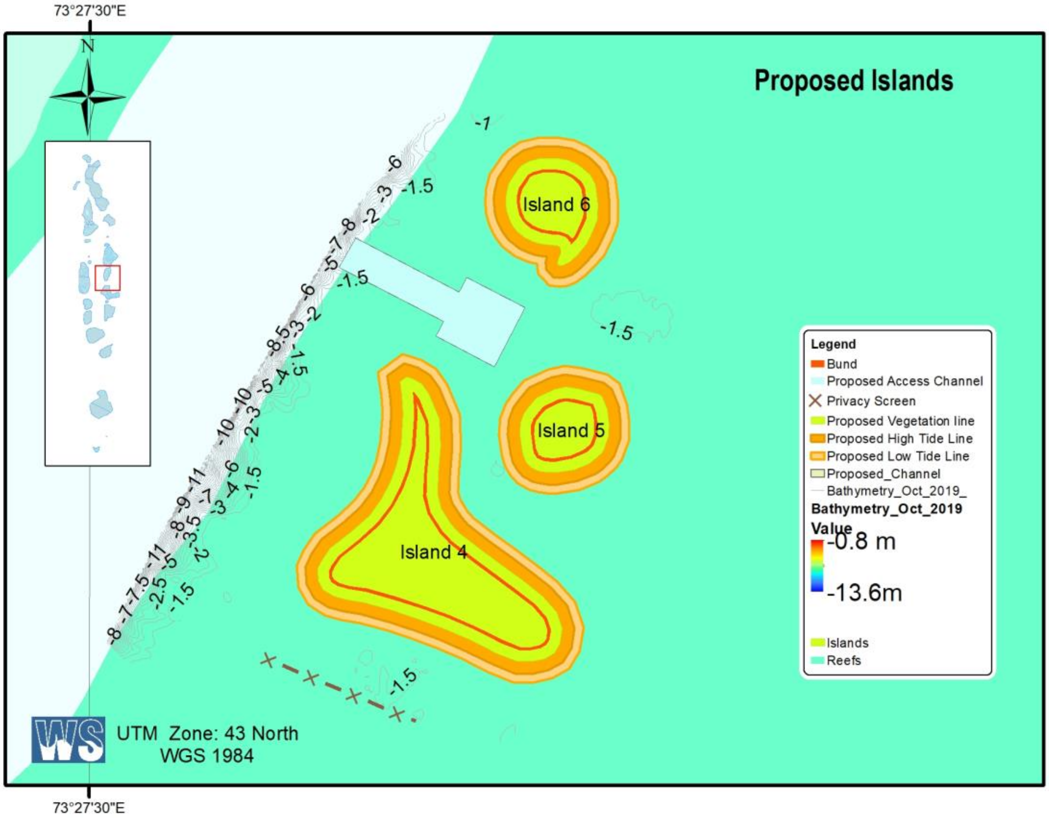


Figure 2: Location of the fence

Following the setting out survey, a bund wall construction will be undertaken using high neck excavators along the marked line. Bund wall will be constructed with sand excavated from the adjacent lagoon. Construction of the sand bund will start from anyone point where the reclamation line joins the island. At such a point, excavator will begin excavation within the reclamation area and dumping the material ahead along the setout boundary line, thereby making a sand bund. A bund wall height of about +1.0m or a suitable height to keep the pumped material inside will be maintained. Excavator will move on making the bund wall until it reaches the end, where it meets the island again, hence enclosing the proposed reclamation area. At least one overflow gate will be made for each pumping station. The gate will be made using dredger pipes of about 0.6m in diameter. Four to six such pipes will be laid across the bund wall closer to its top side by the excavator. The overflow gate will keep the sediments within the bund wall without letting them overflow to the surrounding. Instead, it will allow the movement of excess water through them in smaller controlled quantities while the sediments will keep on settling within the contained area.

The following diagramme illustrates an example of an overflow gate across a bund wall.

Figure 3: Overflow gates across a bund wall (Firdhous, 2018)

Once the bund wall is created, filling will be the next phase. Filling will be taken by disposing dredged sand to this area and compacting. Creating the perimeter bund wall is important to control sedimentation and prevention of silts from dispersing in to the lagoon and ultimately in to the reef. Sand bund walls have been proved effective in controlling sediments in a number of reclamation projects undertaken in Maldives. If properly bunded, sediment control can be reduced significantly. The following figure illustrates the effectiveness of sand bunds. This photo illustrates how sand bunds prevent sedimentation of the reef during the reclamation of Dharavandhoo island in Baa Atoll. The yellow line indicates the areas where sand bund was created, thus preventing sediment escaping to the reef slope and to the atoll lagoon. The red circled area shows sediment escaping as there is no sand bund in this area. Hence, it is proposed to create a similar bund like this during the reclamation of new islands in Maadhoo.

Figure 4: Illustration of how sand bund walls can control sedimentation (Photo: Water Solutions Pvt.Ltd)

The minimum width of the sand bund should be not less than 2.5 meters at the base. The most important factor in the sand bund is the height as the sand bund should be higher than the water level during the highest tide. An ideal height would be at least 1 meter high from the mean sea level as otherwise the bund will be overtopped during high tide. Therefore, a complete tide chart for at least a month should be obtained as reference for the contractor to work.

The goal of the sand bund is to prevent sediment plume from escaping and hence, the contractor should ensure that this does not happen. The map above illustrates a schematic of how sand bunds will be made.

7.3.3 Silt curtains

A silt curtain is a protective barrier, mostly used in marine environments to control the movement and spread of suspended sediments. As in the case of sand bunds, silt curtain confines the sediments within a specific area. Silt curtain consists of 3 major parts which are outlined below;

- The top float,
- The protective barrier which is a geotextile layer and the
- Bottom weights which anchor the curtains.

To install the curtain, weights of suitable sizes are made which are usually concrete blocks. Depending on the size of these blocks, they will either be placed along the proposed line (few meters behind the setout reclamation line) manually or with the help of a small crane in a barge. The bottom line of the curtain will be fixed to the placed anchor blocks by means of chains or threads. The following diagramme illustrates a silt curtain in use.

Figure 5: Silt curtain example (Firdhous, 2018)

7.4 Borrow Materials for reclamation

It is estimated that 130,000 cubic metres of borrow materials would be needed to reclaim the islands. Refer to the initial EIA for details of the islands, their sizes and other details (Jameel, 2018). To speed up the reclamation project, it has been proposed to undertake the project using a TSHD. At this stage the contractor for this project, MTCC has provided two potential locations where sand could be borrowed from. It is recommended that no dredging shall be carried by the hopper dredger within 500 meters around any reef.

7.4.1 Location 3

Location 3 lies on the south-west side of south Male' Atoll (refer to the following figure). The following surveys and investigations were undertaken from this site.

- Geo-technical investigations.
- Underwater dive survey to assess the sediment quality and bottom composition.
- Multibeam bathymetric survey.

7.4.2 Location 4

Location 4 lies on the inner lagoon, west of Gulhi island in south Male' Atoll (refer to the following figure). The following surveys and investigations were undertaken from this site.

- Underwater dive survey to assess the sediment quality and bottom composition.
- Multibeam bathymetric survey.

Refer to the following figure for details of these locations.

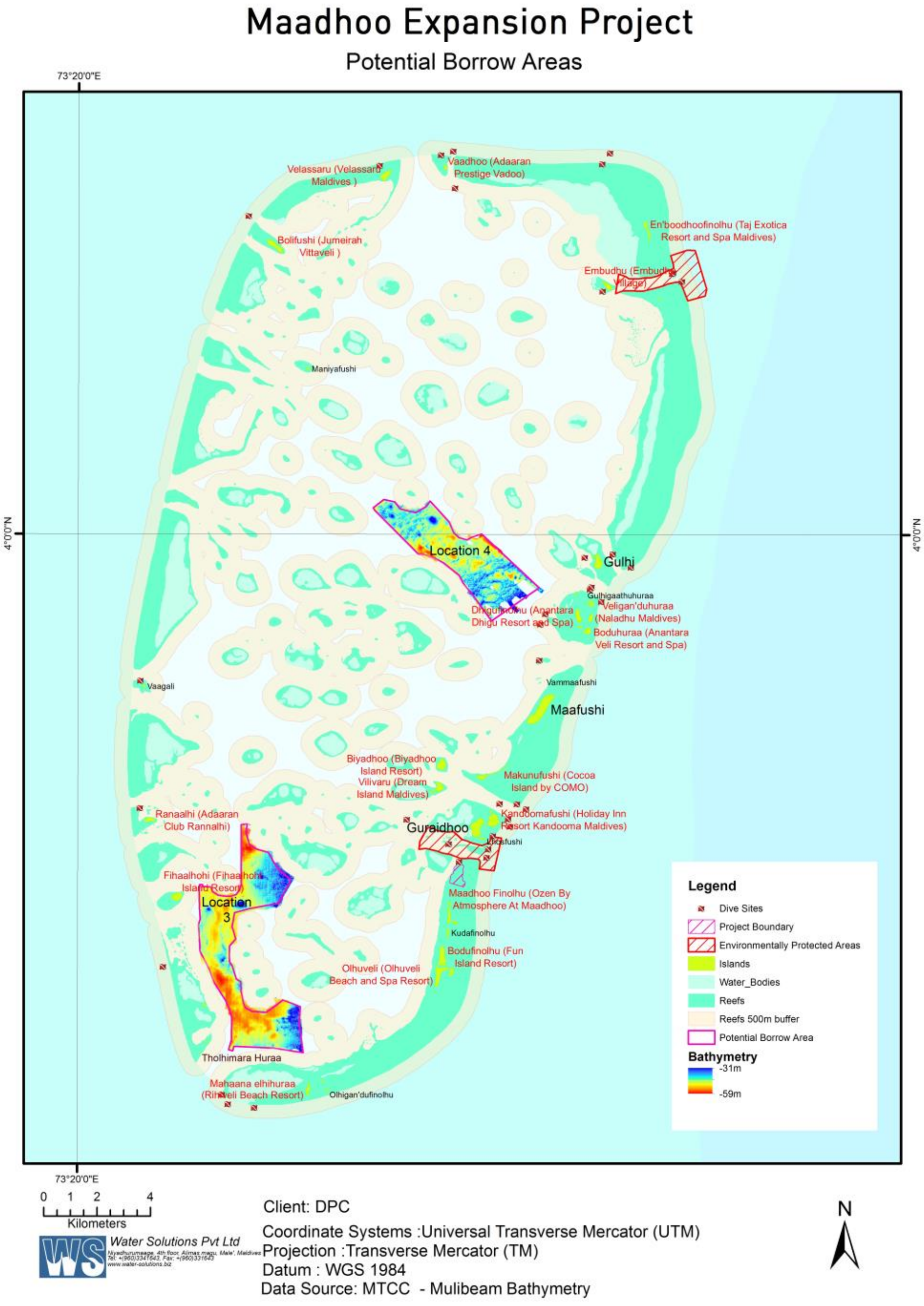


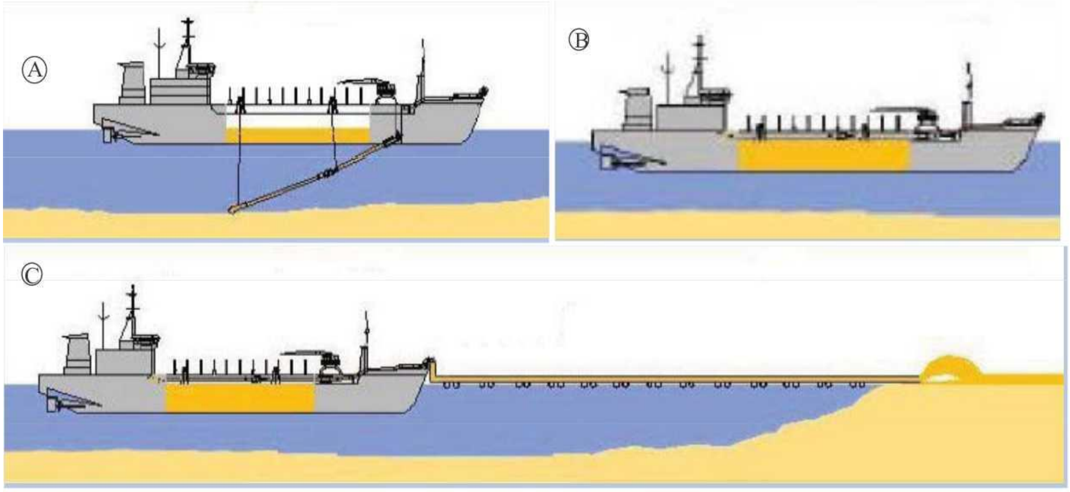
Figure 6: Proposed locations to borrow materials for reclamation

7.5 Dredging methods to borrow reclamation materials

The materials will be borrowed using a trailing suction hopper dredger (TSHD). Trailing suction hopper dredger is a normal sea-going ship equipped with one or two suction pipes. At the end of each suction pipe is a drag head, which can be lowered onto the seabed while the TSHD navigates at a reduced speed. The material loosened by the drag head, together with some transport water, is sucked into the suction pipe by means of a centrifugal pump, and subsequently placed in the hopper of the dredger.

7.6 Transportation of fill material to reclamation site

The TSHD will transport the sediments from the borrow area to the project site. The following figure provides a typical scenario where the TSHD will dredge the material from the borrow site and transport it to the reclamation site.



A - Dredge sand from borrow area, B - Transportation of sand to reclamation area , C - Pumping sand to the reclamation site

(source: Ministry of Housing and Environment, 2010)

Figure 7: Methodology for the implementation of the reclamation component of the project

7.7 Coastal Protection of the Reclaimed Land

After reclamation, coastal protection will be undertaken in order to prevent erosion of the shoreline and to prevent land loss in the short to long term. Details of the coastal protection is outlined in the initial EIA (Jameel, 2018).

7.8 Proposed area for the reclamation

The proposed area for the reclamation lies on the north of the existing island of Maadhoo. Refer to the initial EIA report for details (Jameel, 2018).

7.9 Quantity, quality and characteristics of fill material

The sediment will be sourced from the inner lagoon of South Male' Atoll outlined in Figure 1. A total of 130,000.00 cubic meters of sediment will be obtained from the borrow site using the hopper dredger. Refer to the attached concept plan. The sediment quality is expected to be similar to the existing sediment at the sea bed of the lagoon (refer to the existing environment section for more details of the sub bottom profile survey).

7.9.1 Method and equipment's used for dredging, including description and operational control

The project will be implemented through a carefully managed plan. Reclamation will be initiated as soon as the EIA addendum is approved. Dredging will be undertaken using TSHD. The dredger will be mobilized to the borrow site. The filling area will be adequately bunded before filling. Hence, the filling areas will highly prevent sediment spilling in to the lagoon and the reef during the filling process.

7.9.2 Duration of dredging activity

The total duration of dredging is expected to be one (1) month and the total project duration is expected to be two years including the time allocated for coastal protection and completion of the resort.

7.9.3 Labour requirements and labour availability

This project has been contracted to MTCC who has undertaken similar reclamation projects in Maldives. Hence, the contractor will be responsible for obtaining the required labour for this project.

7.9.4 Housing of temporary labour

Housing of labour will also be the responsibility of the contractor and they will be housed and managed in a combination of accommodation options including the dredger, accommodation barge, temporary accommodation and nearby island of Guraidhoo.

7.10 Revised Schedule

The revise schedule for the project is attached as an annex.

7.11 Bathymetry

The bathymetry of the proposed borrow site is attached as an annex.

8 Existing Environment

The general existing environment condition of Maldives have been described in the initial EIA report (Jameel, 2018).

8.1 Existing marine environment

The existing environment of the proposed reclamation area has been discussed in detail in the initial EIA report, only the sand borrow areas will be discussed in this report. Additional surveys for sand borrow areas were undertaken by using geotechnical investigation (sub-bottom profiling) to assess the sea bed characteristics.

8.1.1 Existing environment at the borrow site

The existing marine environmental of the locations where filling will be undertaken (reclamation of 3 islands) have been described in the initial EIA report (Jameel, 2018). Therefore, the reader should refer to this report for further reference.

8.1.2 Marine Water Quality

Marine water was taken from the proposed borrow area and samples were tested for turbidity in situ. The measured parameters are within the optimum range. The quality of sea water is important for ecological functioning of the organisms living in the habitat and in this project, the most significant parameter is turbidity. Turbidity during the dredging period is expected to be high and for this reason, it needs to be monitored.

8.1.3 Marine Survey

As the proposed borrow location is between 40 to 50 metres deep, the condition of the biological environment cannot be surveyed using convention diving methods. Hence, the results of the geo-tech investigations will be presented in this section along with photographs taken by divers to assess the environmental condition of the proposed borrow areas. The following figure outlines the location of the proposed borrow area from which geotechnical surveys were undertaken. Geo-tech surveys were undertaken only from location 3.

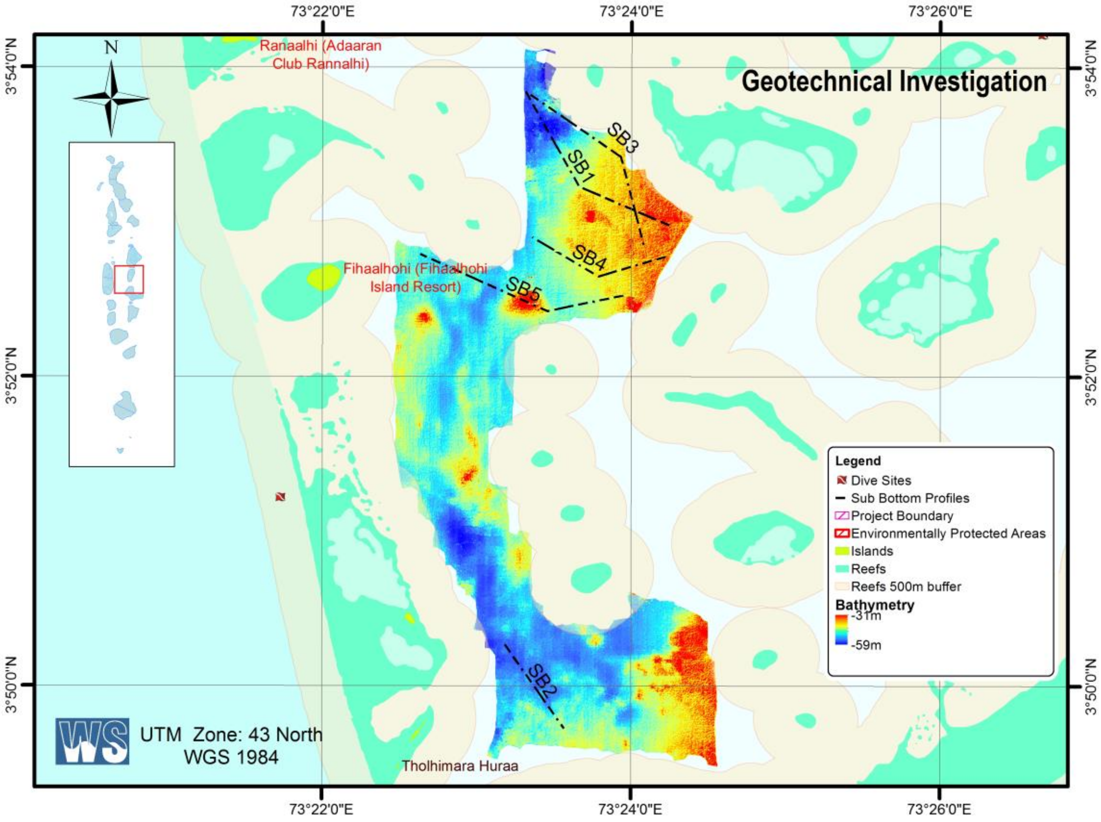


Figure 8: Location of geo-tech investigations carried out in location 3

The above figure illustrates the location of sub bottom profiling surveys and the following figures illustrates the condition of these locations.

8.1.3.1 Geo-tech investigation – Sub Bottom Profile (SBP)

The SBP gives a profile of the sub-bottom conditions of the sea floor. The horizontal axis of the profile is the route sailed by the survey vessel or the path of the source and receiver combined. The scale of the axis is given by the survey speed, he shot rate and the display rate of the recorder. The vertical axis corresponds with the water depth and the penetration depth. The scale of this axis is time. After the analysis, the final interpretation of horizontal and vertical scale are adjusted to real positions and exact depth values.

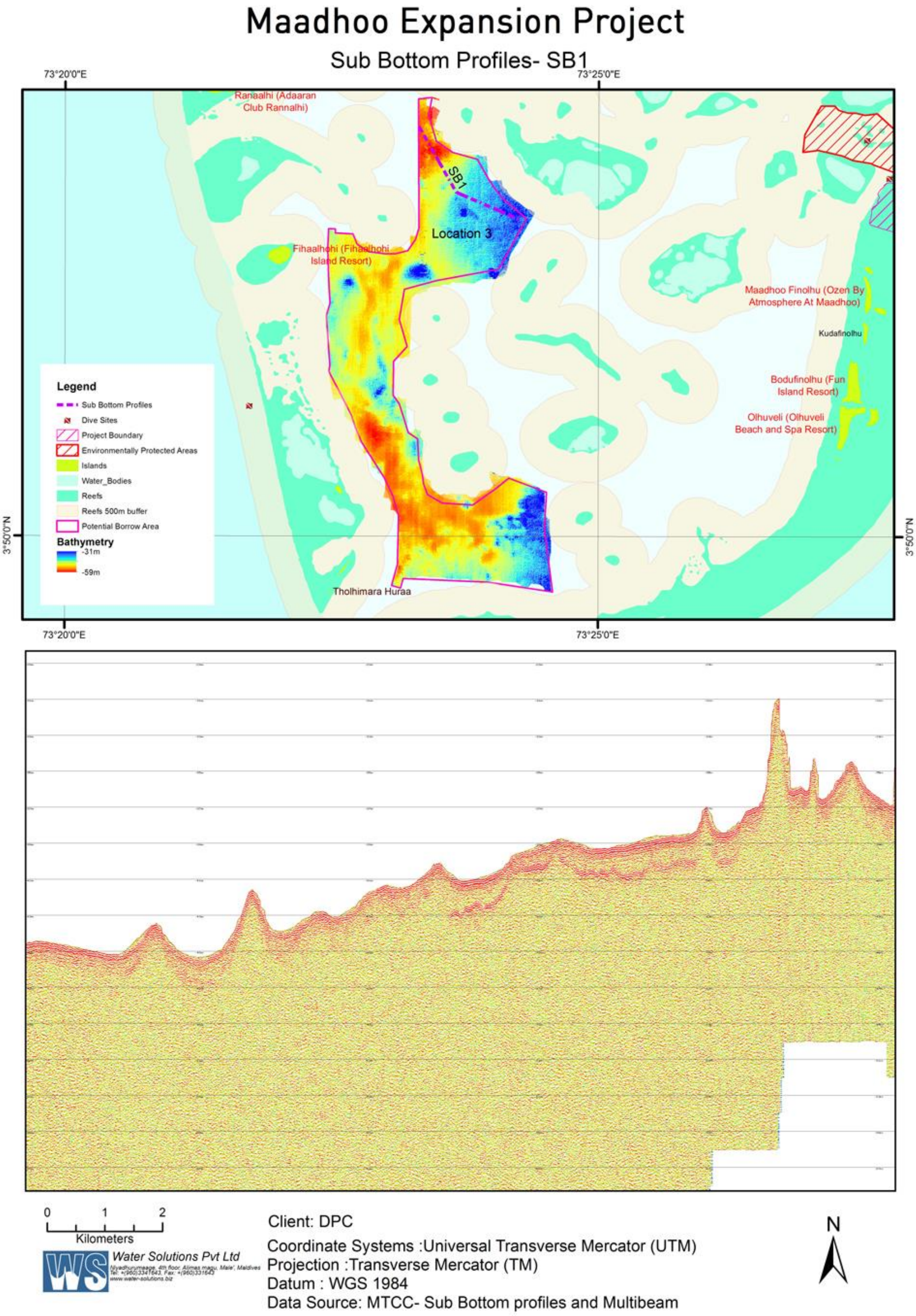


Figure 9: Location of geo-tech investigations carried out at SB1

The above figure illustrates that SB1 consists of a layer of silt / sand on the top. There is a thin layer of rocks in a small area but the majority of bottom profile indicates thick layer of sand.

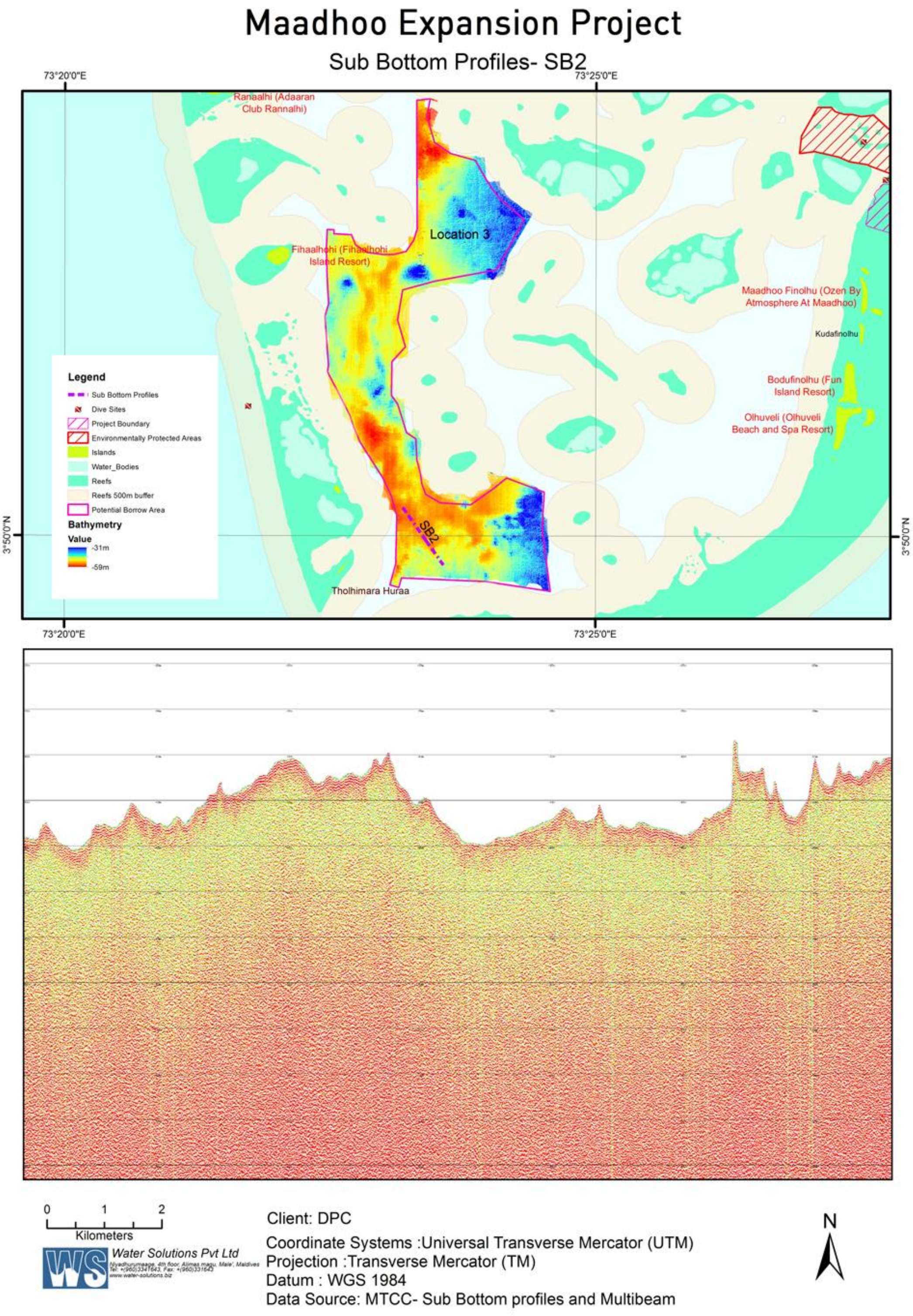


Figure 10: Location of geo-tech investigations carried out at SB 2

The above figure illustrates that SB2 consists of a layer of silt / sand on the top followed by a sandy bottom profile.

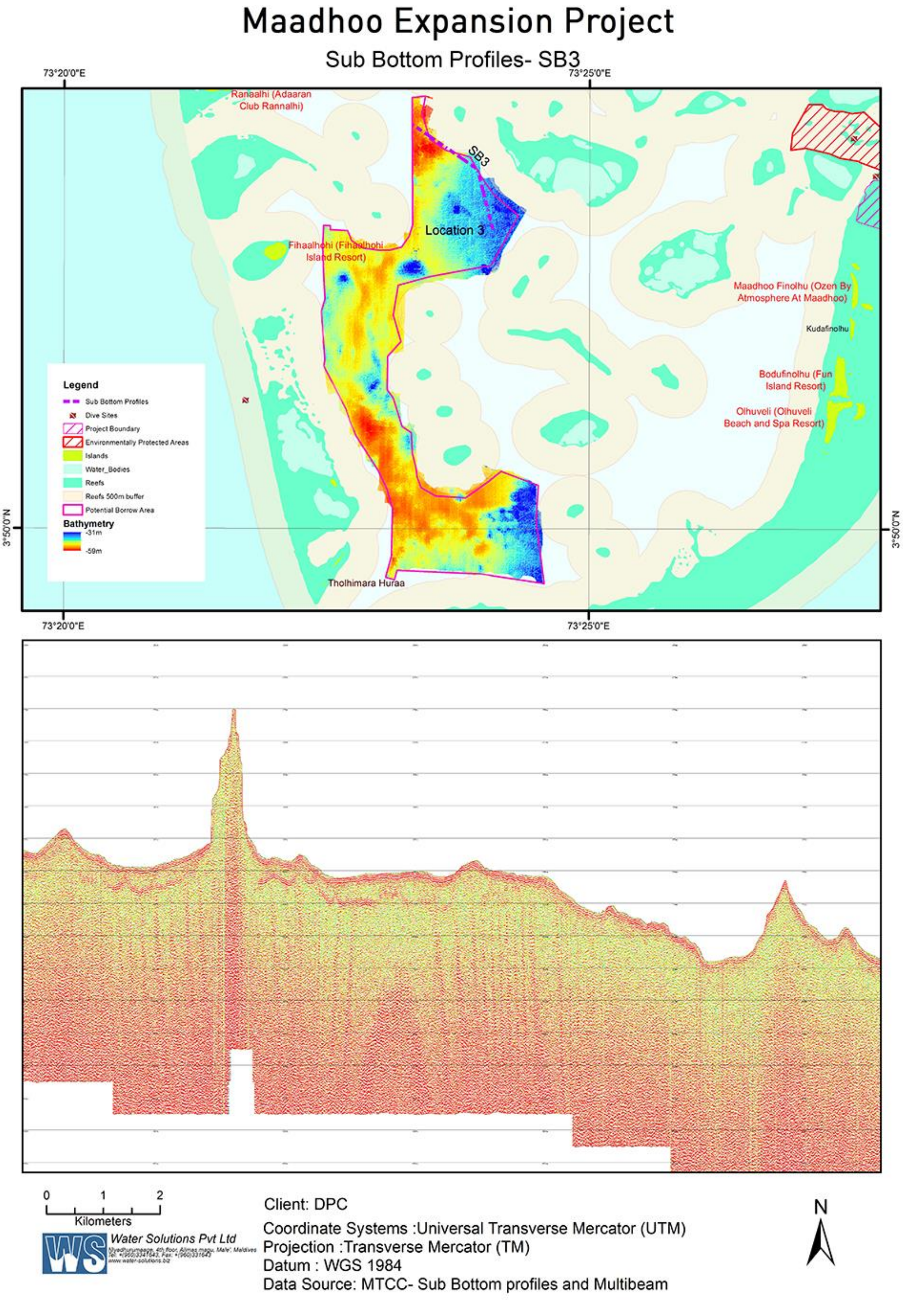


Figure 11: Location of geo-tech investigations carried out at SB3

The above figure illustrates that SB3 has a layer of silt / sand on the top. There is a thin layer of rocks in a small area but the majority of bottom profile indicates thick layer of sand. There is a rock out crop along the profile, possibly indicative of a reef formation.

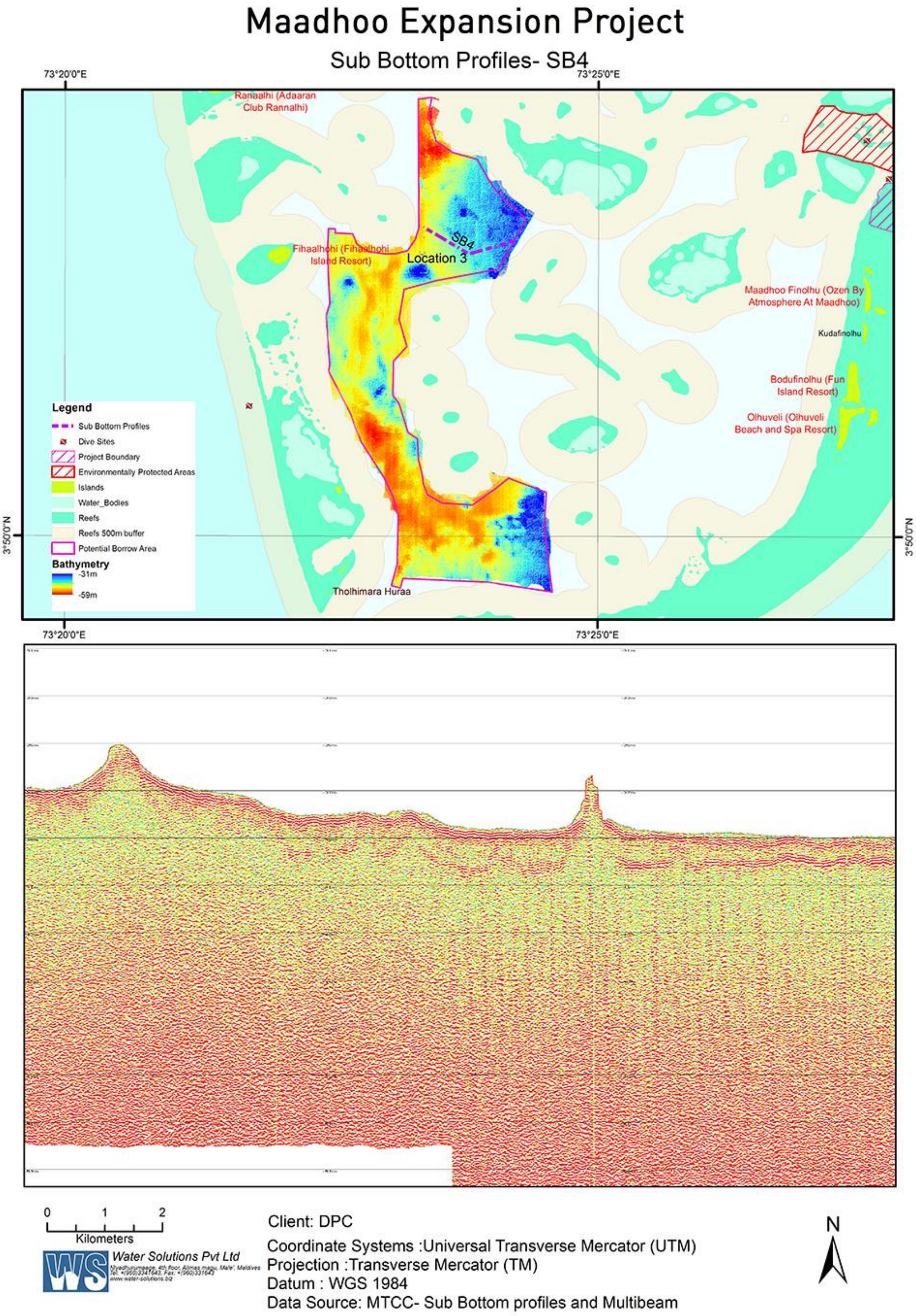


Figure 12: Location of geo-tech investigations carried out at SB4

The above figure illustrates that SB4 has a layer of silt / sand on the top. There is a thin layer of rocks along the route of sail. Majority of bottom profile indicates thick layer of sand with small outcrops of a possible reef or rock formation.

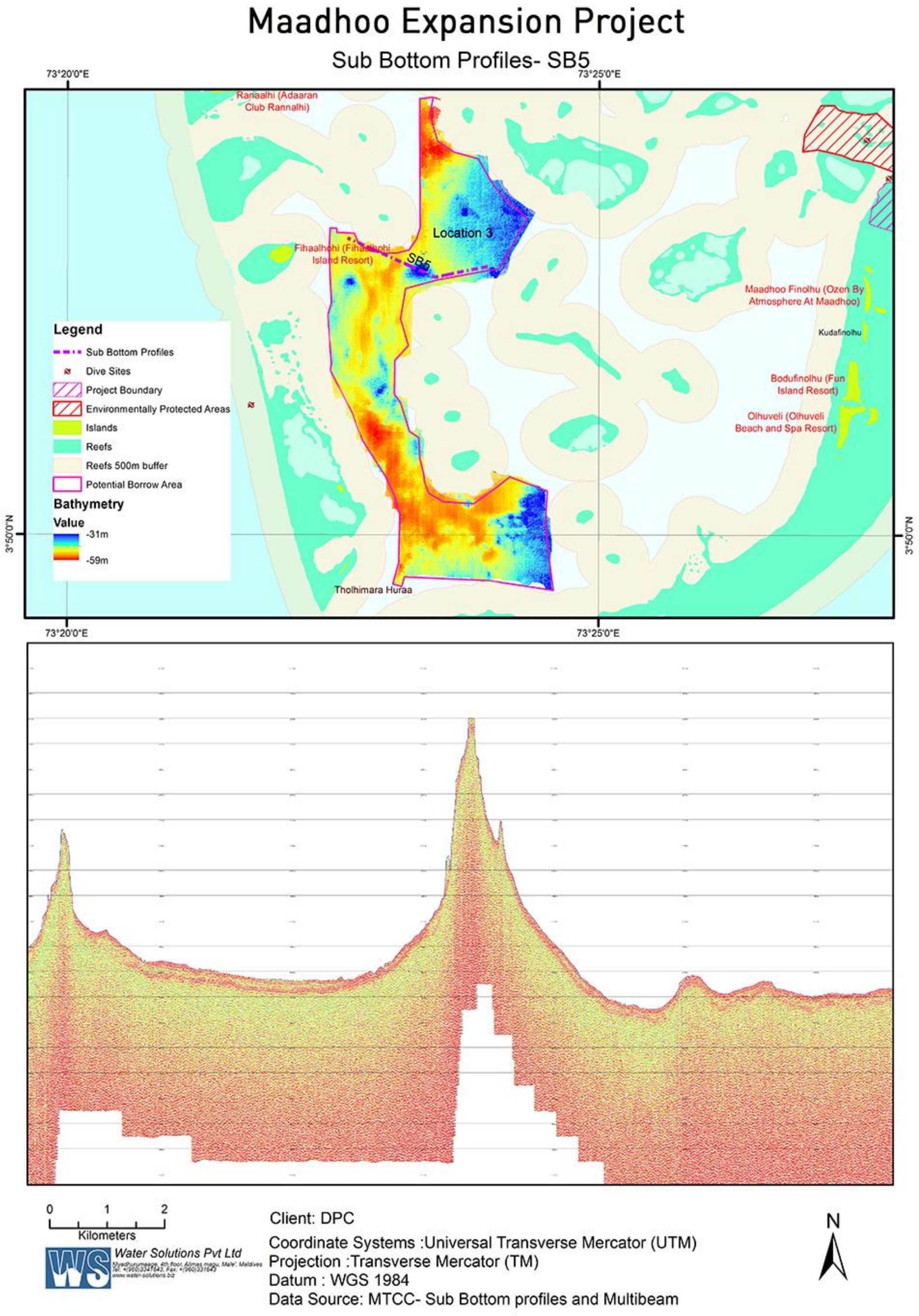


Figure 13: Location of geo-tech investigations carried out at SB 5

The above figure illustrates that SB1 has some overlaps of a coral or a reef formation but the majority of bottom profile indicates thick layer of sand.

8.1.4 Diving survey

8.1.4.1 Dive survey – location B

The following figure illustrates the location of diving survey at location B. Location B1 and B2 corresponds to location 3 where geotechnical investigation were made (marked SB1 and SB2 on the map).

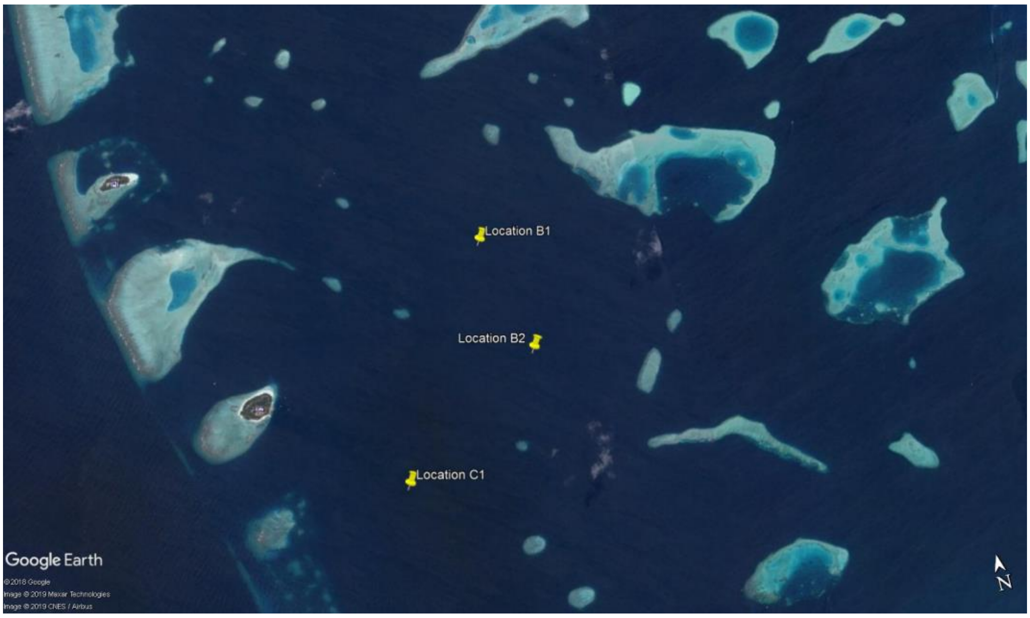
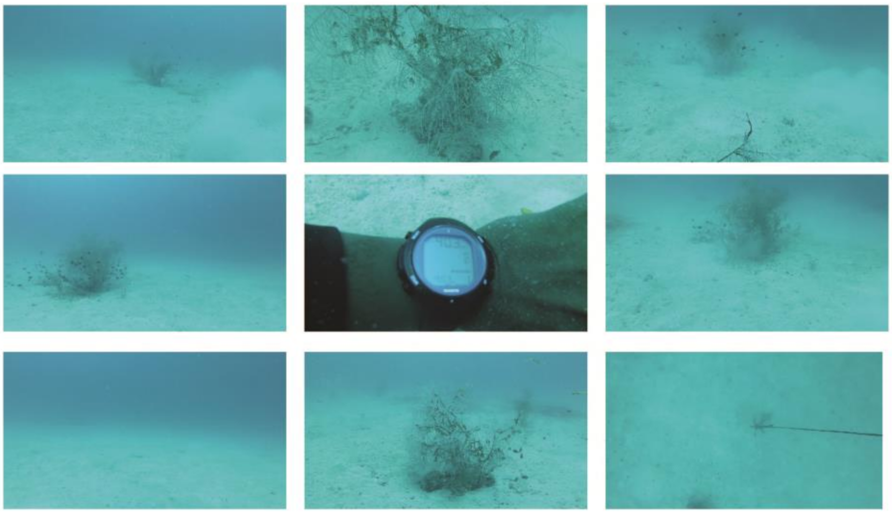


Figure 14: Location of dive survey B

The following figure illustrates the condition of the sea bed at location B1. The area consists of fine layer of silt and sand on the top with a small growth of one colony of back coral. It is likely that this growth emanates from a hard core substrate, indicating that this could potentially be where the SB1 profile indicating a sub bottom hard layer above the surface.



Photos from Location B1

Figure 15: Photos from dive survey B1

At B2, the sea bed is completely filled with sand and silt on the top with very few occasional distribution of pebbles and coarse material.

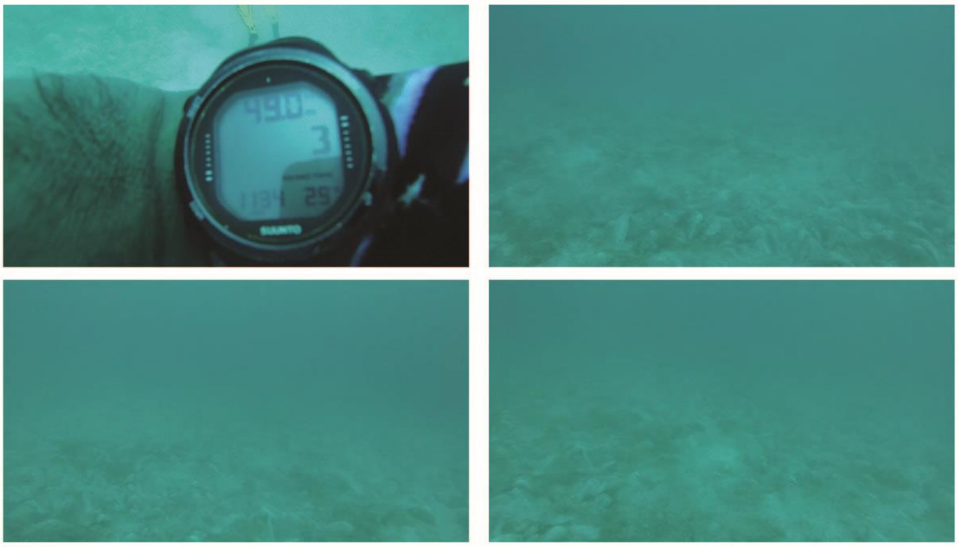
Figure 16: Photos from dive survey B2

8.1.4.2 Dive survey – location A

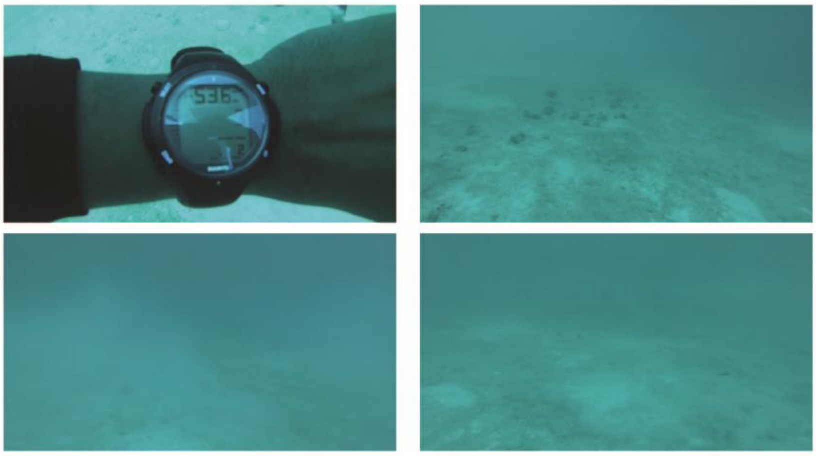
The following figure illustrates the location of diving survey at location A. No Sub bottom profiling has been undertaken in this location. However, multi beam bathymetry was performed in this location.

Figure 17: Location of dive survey A

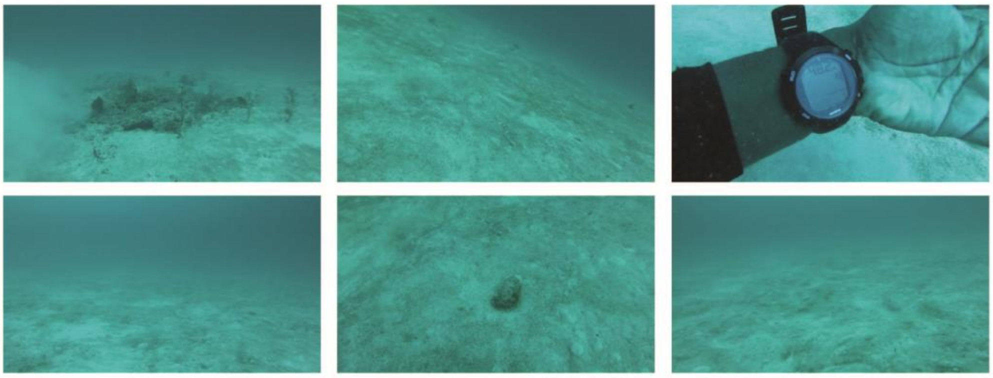
The following figures illustrates the condition of the sea bed at location A. The area consists of a fine layer of silt and sand on the top with distribution of some rubble and coarse material on the top later. The surface of the top layer indicates algal growth indicating that there is more rubble. In location A3, there is a very small patch of hard coral on the top.



Photos from Location A1



Photos from Location A2



Photos from Location A3

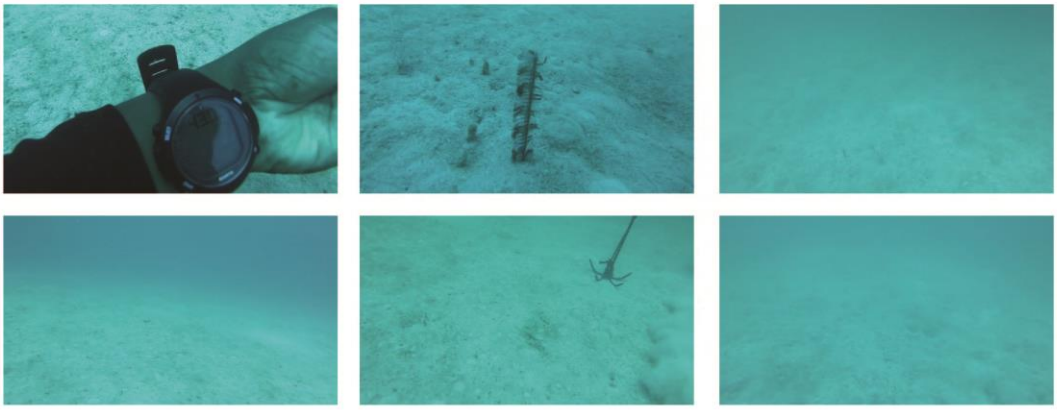
Figure 18: Photos from dive survey A

8.1.4.3 Dive survey – location C

The following figure illustrates the location of diving survey at location C. C2 and C3 represent somewhere close to the location where SB 2 survey was undertaken.

Figure 19: Location of dive survey C

The following figures illustrates the condition of the sea bed at location C1 to C3. The area consists of a fine layer of silt and sand on the top with very little distribution rubble and coarse material on the top later.



Photos from Location C1

Photos from Location C2

Photos from Location C3

Figure 20: Photos from dive survey C

8.1.4.4 Dive survey – location D

The following figure illustrates the location of diving survey at location D. Location D was surveyed from the west of Maafushi island in South Male' Atoll

Figure 21: Location of dive survey D

The following figures illustrates the condition of the sea bed at location D. The area consists of a fine layer of silt and sand on the top with very little distribution rubble and coarse material on the top later.

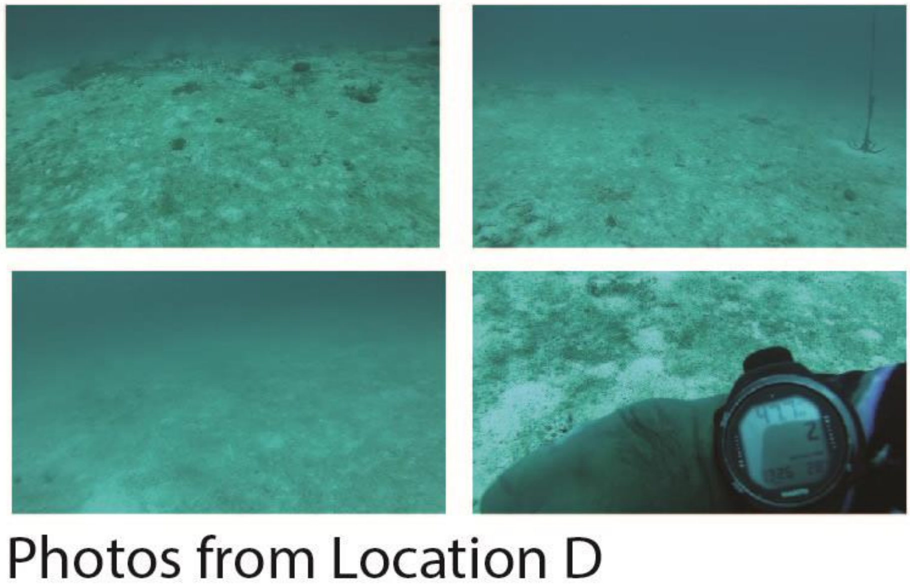


Figure 22: Photos from dive survey D

9 Environmental Impacts

The detail environmental impacts of the entire project has been outlined in the initial EIA report for the expansion of Maadhoo Island (Jameel, 2018). Therefore, only the impacts associated with this change in the dredging method will be identified.

For details of impact identification methods, please refer to the initial EIA (Jameel, 2018).

9.1 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 some sites under consideration, which makes it difficult to predict impacts.

The level of uncertainty, in the case of this project is expected to be high as this project involves activities that is likely to effect a large area. Although dredging is proposed in a specific area within the south Male' Atoll, there are a number of direct and indirect impacts that can result from dredging activities. Such projects have been undertaken in many locations throughout the Maldives but their accurate environmental impacts to the nearby reefs have not been documented well.

9.2 Impacts and mitigation measures

The following tables outlines the impacts and mitigation measures and their characterization. Reference to the matrix was derived from (Hoepner, 1999). This impacts and mitigation measures only focuses only on the changes proposed.

For a detail list of all the impacts and mitigation measures, please refer to the original EIA of Maadhoo Expansion (Jameel, 2018).

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9.3 Impacts and mitigation measures

Activity	Potential Impacts	Mitigation measures	Cost of Mitigation
Dredging from the atoll lagoon.	Sedimentation Most of the turbidity generated by a trailer suction hopper dredge is caused by the overflow of turbid water during the hopper filling operations. Overflow is used to maximise the load of sand inside the hopper. Overflow process will not be a continuous activity, since its duration will be limited to operational dredging time, which is usually less than half the total cycle time. Sedimentation is mainly caused by two processes involved in dredging. Initially, sedimentation will be caused during the dredging process where the drag head is trailed over the seabed. At times water jet pumps are used to loosen the material during dredging and it accelerates the sedimentation process. When the hopper is almost full, some of the water that has been sucked together with water will be removed from the hopper via the overflow gates. This will cause the spread of sediments over the surface water. However, overflow will discharge less sediment as most of larger material will be settled within the hopper by then.	The following mitigations measures are proposed as mitigation measures. - Complete the dredging component within the least possible duration. It is expected that dredging can be completed within two weeks. - Regular monitoring as outlined under monitoring section should be carried out. - If it is notified during monitoring that the sediment plume is spreading out of the estimated buffer zone (more than 200 metres from the dredging location), it should be closely monitored to ensure that no sever impact other than what has been mentioned in the report takes place. - Apart from the dredge location coordinates, dredger should be provided with coordinates of MPA. - In order to completely fill the hopper with sand, discharging the extra water via the overflow gates should be carried out within the borrow area. - Anchoring area of the dredger for discharging	Cost has been included in the new contract with the contractor. Contractor to follow the mitigation measures, including monitoring of the dredging plume, water quality and ensuring that sediment plumes are contained.

Activity	Potential Impacts	Mitigation measures	Cost of Mitigation
	It is estimated from past experience that under normal conditions, the sediments will be distributed to a distance of about 200m from the edge of dredge area, during dredging. However, during harsh environmental conditions of southwest monsoon where the predominant winds are from SW and NW, the wind induced current may spread the sediments further. The suspension of sediments and the effects on the coral reefs will mainly depend on the grain size distribution, the local currents and the distances to the coral reef areas. It is expected that sediment plumes will reach coral reefs located near the dredging locations to varying extent. According to a monitoring done by Van Oord during the dredging for S. Feydhoo and Gdh.Thinadhoo reclamation, turbidity levels during dredging can be kept low (Firdhous, 2018). Turbidity level near the dredging area of Thinadhoo varied between 0-3NTU. Similarly, during the dredging of Rah Falhu Huraa in North Male' Atoll in 2017, Dredging international undertook monitoring of selected reefs in north Male' Atoll and based on the monitoring data, the turbidity levels were between 0 to 3 as well.	should be properly marked. - Prior to the start of dredging, notification should be given to all stakeholders including the nearby resorts and dive operators - Develop a responsive complain lodging mechanism with proper details of contact person from the client and contractor side, for the stakeholders, especially nearby resorts, to lodge complains when necessary.	

Activity	Potential Impacts	Mitigation measures	Cost of Mitigation
	Hence with proper mitigation measures, turbidity levels can be controlled so as to prevent a major environmental issue.		
Marine water quality	Dredging and reclamation causes significant adverse impacts on marine water quality due to increased turbidity. Sediments will be transported in the water column as suspended material and bed load depending on the size of material. Fine material will be transported as suspended matter and can be transported over a long distance depending of the surface current. However, larger particles will soon settle at the bottom without being carried away for a long distance. Increased turbidity can cause stress on marine life. It can also cause major shifts in invertebrate communities as they are more tolerant on sedimentation. Nearby house reefs are therefore expected to be affected by the sedimentation to varying degrees as a result. Dredging will be undertaken during southwest monsoon.	Mitigation same as above. In addition, continuous checking of turbidity levels during dredging should be undertaken as a means to ensure that water quality levels are maintained and that it does not increase. Regular monitoring during dredging will therefore allow the contractor to manage and bring operational changes to the dredging work as and when needed.	Cost has been included in the new contract with the contractor. Contractor to follow the mitigation measures, including monitoring of the dredging plume, water quality and ensuring that sediment plumes are contained.
Impacts on diving operations in the atoll	During the dredging and operations, dive operations of the resorts nearby the proposed dredging locations and safari boat movement will be affected as their movements have to synchronize with the operation and travel routes of the dredger. This will affect where divers can dive during this period. This may limit or completely prevent divers from accessing a given site, meaning that this will become an issue that could lead to financial loss through compensation claims	The resorts nearby and all dive boats and safaris must be informed of the dredger operating hours, its routes and possible time period at least a week or few days ahead in order to inform their clients of the construction period. All dive operators and resort dive boats to avoid diving in sites that are in a 1 kilometer buffer zone	Not relevant

Activity	Potential Impacts	Mitigation measures	Cost of Mitigation
	by the dive clients.	from the dredging site. These groups could be informed through a public announcement on public media or directly contacting them.	
Impact on the coral reefs and the dive sites	Spreading of sediments from the dredging locations to the nearby coral reefs will impact the reefs and cause smothering of corals, reduce light penetration and affect the marine life. It is difficult to predict the intensity and duration as a lot depends on the currents and prevailing weather conditions. The mitigation measures proposed should therefore be followed.	Mitigation measures identified for "dredging from the atoll lagoon" shall be followed.	Not relevant

9.4 Impacts on the Environment and their mitigation measures

The following table outlines the matrix of specific impacts and their characterizations.

Table 2: Matrix of specific impacts and their characterization

Impact indicator	Impact type (NEG or POS) +	Significant (H/M/L)*	Direct	Indirect	Maginitude # (N/M/MA/MoA/MaA)	Short term	Long term	Unavoidable	Reversible	Irreversible	Cumulative	Mitigation Required
Sedimentation from dredging	Neg	H	X	x	MoA	x		x	x			X
Habitat loss	Neg	H	X	x	MA		x	x	X			
Deterioration of marine water quality.	Neg	H	x	x	MA		x		X		x	X
Impact on commercial species.	Neg	H	X	X	M	X		X	X			X
Impact on existing dive operations of resorts in the vicinity of the dredging area	Neg	H	X	X	N	X		X		X		X
Impacts on the coral reef	Neg	H		X	N		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

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10 Stakeholder Consultations

For the purpose of this project, stakeholder consultations were limited to the tose outlined in the TOR. Methodology for undertaking these discussions was through meetings.

10.1 Stakeholder meeting with Guraidhoo Island (Kaafu Atoll) Council

A stakeholder meeting was held with Guraidhoo Island Council on 10th October 2019 at Water Solutions Office at 12:00 PM. Following is the summary of the discussions.

- The EIA consultant for the project, Mr. Abdul Aleem gave a brief introduction about the project, including the proposed new borrow areas and the expected start and finish dates of the project.
- According to the Council, the biggest impacts of this project will be felt on the dive sites near Guraidhoo and the borrow site. They highlighted that the most highly sites of risk will be Guraidhoo corner and Kandoomaa Thila and that these impacts should be highlighted in the report. These sites are used by the nearby resorts, safaris and guest houses operating in the region on a daily basis throughout the year and thus, this project will have the most negative impacts on these sites among other dive sites in the region.
- The council requested to clarify whether the bund wall creation for the present reclamation is been done with the approval of EPA or not. The reason for this is that even at present, there are lot of complains from the guest houses regarding the spread of sediments to Guraidhoo corner.
- The council highlighted that even during the bund wall construction, the sediments rate is quite high, more than they expected and all the dive sites in the region are affected from this.
- According to the Council, the Gulhi Island Council and resorts near Gulhi, namely Anantara Dhigu and the other 3 resorts in the lagoon needs to be consulted as the location 4 outlined as a borrow site is very close to these resorts. There are dive sites very close to the proposed borrow area, location 4 that will be impacted from this project.
- The most important dive site in location 4 is kuda giri wreck and the average daily rate of diving to this wreck is quite high. This is also not only a dive site for the resorts nearby, but a popular destination to all the safari boats passing south Male' Atoll.
- According to the Guraidhoo council, the proposed two borrow sites are not feasible for this project since a large area of south- Male' Atoll will be damaged, especially dive sites.
- Dive centers in the region who frequently dives in Guraidhoo area have already started complaining and this is a serious issue which needs to be brought to the governments attention, especially the tourism sector.
- According to the Council, all the divers from throughout the Maldives use the Guraidhoo area for diving including resorts, guesthouses and Safaris.

- The Manta point near Guraidhoo is finally experiencing Mantas after few years. The effects of high sedimentation and its spread in the region will further upset these siting's and there are fears that these sites will be totally damaged from this project.
- An alternate borrow site must be explored such as the north west side of the South Male'. The presently proposed two sites are not feasible to borrow sand for this project.
- It must be noted that even during the harbor construction of Guraidhoo, dive sites nearby were affected, and compared to this project, the harbor project was a much smaller project.

For Guraidhoo Council, the most important concern is the locations proposed for sand borrowing inside the

10.2 Stakeholder meeting with Kaafu Atoll Council

A stakeholder meeting was held with Kaafu Atoll Council on 10th October 2019 at Water Solutions Office at 12:00 PM. Following is the summary of the discussions.

- The EIA consultant for the project, Mr. Abdul Aleem gave a brief introduction about the project, including the proposed new borrow areas and the expected start and finish dates of the project.
- Previously complaints were submitted from councils about reclamation projects, however once they know it is undertaken with the approvals from, they didn't care much as there was nothing they could do.
- According to the Atoll council, the Most difficult issue for them is that they do not have technical staffs and technical information about these project. The only information they get is through the project manager or what the EIA consultant provides. Hence, the Atoll Council is in not in a situation to provide any contribution to the project whether it's a compliance issue or interventions.
- Regarding this project, so far No concerns were yet complained to Atoll council about this project, however it is very likely that as the reclamation starts there will be complains lodged.

10.3 Stakeholder meeting with Olhuveli Beach and Spa Resort

A stakeholder meeting was held with Olhuveli Beach and Spa Resort on 9th October 2019 in the resort at 3:00 PM. Following is the summary of the discussions.

- The EIA consultant for the project, Mr. Abdul Aleem gave a brief introduction about the project, including the proposed new borrow areas and the expected start and finish dates of the project and the most likely impacts to Olhuveli Resort,
- According to the management, Kandoomaa Thila is located very near to the reclamation site, direct impacts are likely to be caused to this site rather than Olhuveli resort.
- There are many other dive sites located in this area, even the resort use these areas

on a daily basis. Any damage to dive sites is a damage to this resort as well as to the tourism industry.

- Borrow area location 3 located near Rihiveli is a famous dolphin, manta and shark area aggregation and breeding ground. Sediments from borrowing will impact to these marine organisms and it is recommended to dredge away from this location.
- Before such a project is commenced or planned, it is important to know about these sites and do a proper research by the contractors, government and the project owners.
- There are few dive sites located in location 3, however recreational fishing, water sports are been practiced in these area.
- It is important to know that most repeaters visit to these areas to dive, especially to Kandoomaa Thila. Hence, it is important to use precautionary approach during reclamation to ensure that sedimentation doesn't affect these sensitive dive sites.
- Reclamation projects for the development of tourism resorts have been undertaken intensively for the last couple of years. Even during the recent Tourism Expo, President Ibrahim Solih has assured that these reclamations of lagoons and reefs will be totally brought to a halt in order to safeguard the tourism industry and our vulnerable environment.
- Government needs to declare Kandoomaa and other important dive sites as protected areas and monitor the sites more regularly.
- The resort is keen to know whether there will be any kind of monitoring that will take place during the course of reclamation of Maadhoo Finolhu.

Discussions and consultations were also done with the dive centre staff in Olhuveli beach and Spa. The following are the summary of discussions and their concerns raised.

- Rihiveili reef is a famous Dolphin and Manta breeding area famous throughout the Maldives. This site is visited by hundreds of divers and snorkelers to watch manta and dolphin and hence it is important to declare them as protected areas and ensure that such activities like dredging does not occur nearby.
- Location 3 area is used for recreational activities, especially snorkeling and water sports. Hence, it is anticipated that the project will have significant impacts on these activities.
- Reclamation needs to be totally banned in Maldives. Sediments from reclamation and dredging is one of the main reason why marine life is decreasing throughout the Maldives.
- Bodukandu Beyru is located east of the proposed reclamation area, right now it is a super healthy area but is under threat. However after this reclamation Bodukandu Beyru will totally be dead, and this is a sure thing to happen.
- Even today (09th Oct 19), the dive centre had to cancel a dive to Guraidhoo corner due to sediments resulting from the bund wall construction works from Madhoo Finolhu.
- This is happening from the first day onwards since they started creation of bund wall, by the end of this project even Guraidhoo corner will be totally gone.
- It is better to avoid location 3 and go for location 4 to borrow the sand for the reclamation as this would avoid impacts to the Rihiveli area.

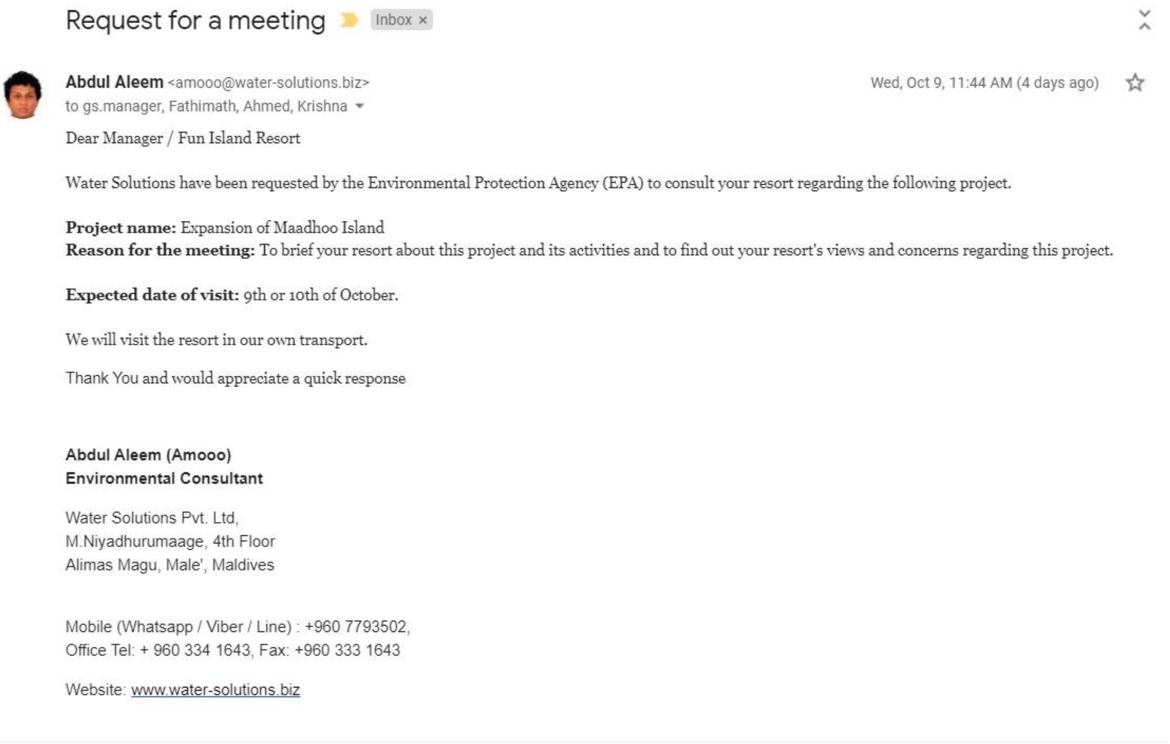
10.4 Stakeholder meeting with Kandooma Resort

A stakeholder meeting was held with the resort owner of Kandooma on 10th October 2019 in Kandooma Male' Office at 1:00 PM. Following is the summary of the discussions.

- The EIA consultant for the project, Mr. Abdul Aleem gave a brief introduction about the project, including the proposed new borrow areas and the expected start and finish dates of the project and the most likely impacts to Kandooma Resort,
- As per the owners of Kandooma, they do not have any concerns regarding the project and that the details of this have already been informed to Kandoomaa resort.
- According to the owners, the whole area around Kandooma is likely to be impacted due to this project.
- The management of Kandooma have raised concerns about this project and have requested to clarify the duration of the project, and how long the reclamation component take.

10.5 Stakeholder meeting with Fun Island resort

Despite several requests, the management of Fun island refused to meet the EIA consultants and insited n meeting with EPA instead. Official correspondence were exchanged with the resort and the following screenshots are proof of these exchange.



Request for a meeting

Abdul Aleem <amooo@water-solutions.biz>
to gs.manager, Fathimath, Ahmed, Krishna
Wed, Oct 9, 11:44 AM (4 days ago)

Dear Manager / Fun Island Resort

Water Solutions have been requested by the Environmental Protection Agency (EPA) to consult your resort regarding the following project.

Project name: Expansion of Maadhoo Island
Reason for the meeting: To brief your resort about this project and its activities and to find out your resort's views and concerns regarding this project.

Expected date of visit: 9th or 10th of October.

We will visit the resort in our own transport.

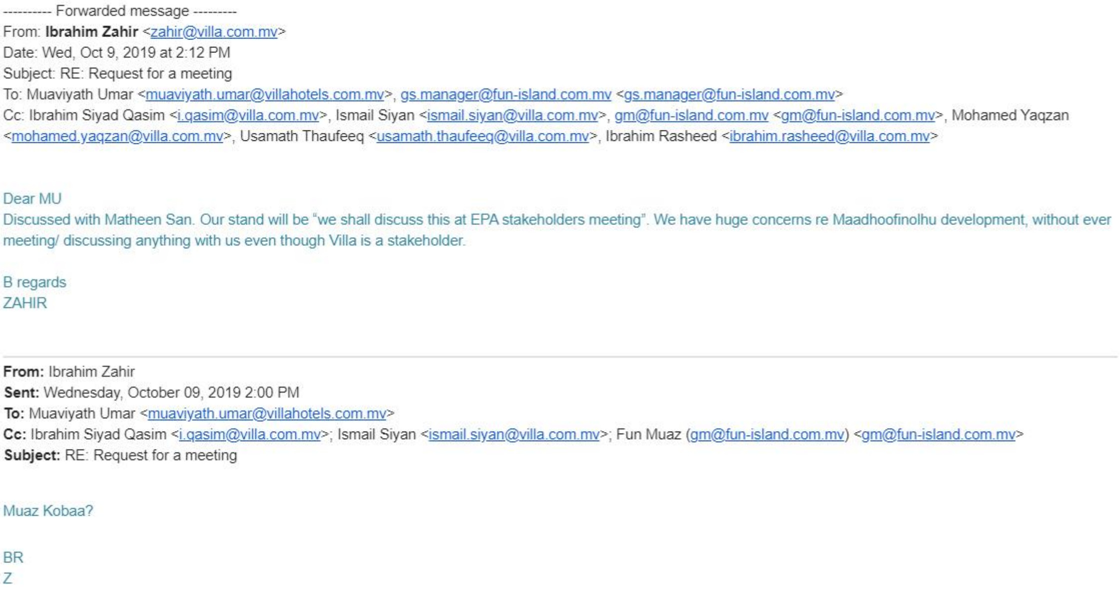
Thank You and would appreciate a quick response

Abdul Aleem (Amooo)
Environmental Consultant

Water Solutions Pvt. Ltd,
M.Niyadhurumaage, 4th Floor
Alimas Magu, Male', Maldives

Mobile (Whatsapp / Viber / Line) : +960 7793502,
Office Tel: + 960 334 1643, Fax: +960 333 1643

Website: www.water-solutions.biz



---------- Forwarded message ---------
From: **Ibrahim Zahir** <zahir@villa.com.mv>
Date: Wed, Oct 9, 2019 at 2:12 PM
Subject: RE: Request for a meeting
To: Muaviyath Umar <muaviyath.umar@villahotels.com.mv>, gs.manager@fun-island.com.mv <gs.manager@fun-island.com.mv>
Cc: Ibrahim Siyad Qasim <i.qasim@villa.com.mv>, Ismail Siyan <ismail.siyan@villa.com.mv>, gm@fun-island.com.mv <gm@fun-island.com.mv>, Mohamed Yaqzan <mohamed.yaqzan@villa.com.mv>, Usamath Thaufeeq <usamath.thaufeeq@villa.com.mv>, Ibrahim Rasheed <ibrahim.rasheed@villa.com.mv>

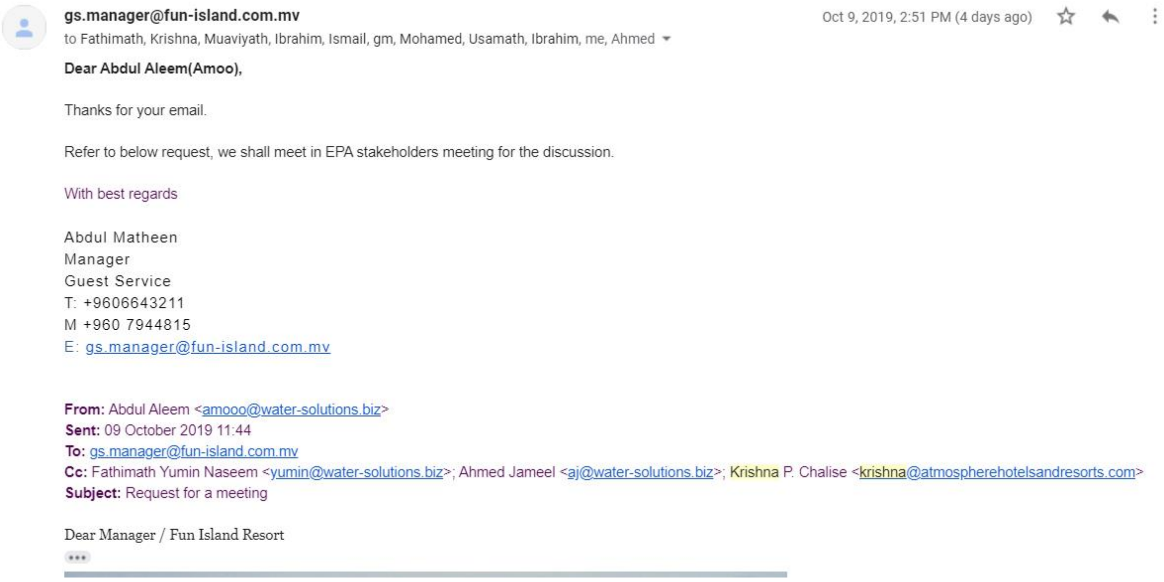
Dear MU
Discussed with Matheen San. Our stand will be "we shall discuss this at EPA stakeholders meeting". We have huge concerns re Maadhoofinolhu development, without ever meeting/ discussing anything with us even though Villa is a stakeholder.

B regards
ZAHIR

From: Ibrahim Zahir
Sent: Wednesday, October 09, 2019 2:00 PM
To: Muaviyath Umar <muaviyath.umar@villahotels.com.mv>
Cc: Ibrahim Siyad Qasim <i.qasim@villa.com.mv>; Ismail Siyan <ismail.siyan@villa.com.mv>; Fun Muaz (gm@fun-island.com.mv) <gm@fun-island.com.mv>
Subject: RE: Request for a meeting

Muaz Kobaa?

BR
Z



gs.manager@fun-island.com.mv
to Fathimath, Krishna, Muaviyath, Ibrahim, Ismail, gm, Mohamed, Usamath, Ibrahim, me, Ahmed
Oct 9, 2019, 2:51 PM (4 days ago)

Dear Abdul Aleem(Amoo),

Thanks for your email.

Refer to below request, we shall meet in EPA stakeholders meeting for the discussion.

With best regards

Abdul Matheen
Manager
Guest Service
T: +9606643211
M +960 7944815
E: gs.manager@fun-island.com.mv

From: Abdul Aleem <amooo@water-solutions.biz>
Sent: 09 October 2019 11:44
To: gs.manager@fun-island.com.mv
Cc: Fathimath Yumin Naseem <yumin@water-solutions.biz>; Ahmed Jameel <aj@water-solutions.biz>; Krishna P. Chalise <krishna@atmospherehotelsandresorts.com>
Subject: Request for a meeting

Dear Manager / Fun Island Resort

10.6 List of participants

The detail list of participants and the attendance sheet for the meetings are attached as an annex.

11 Environmental Monitoring

A monitoring programme has been suggested in the initial EIA report (Jameel, 2018). The parameters outlined for monitoring in the EIA report will be followed. Although the dredging location has been changed, the monitoring protocol proposed in the EIA report has addressed wide scale monitoring to cover the present project change. Hence, this monitoring protocol is to be followed.

11.1 Monitoring schedule and report

The following table outlines the additional monitoring component that needs to be included to the proposed monitoring programme.

Table 3: Schedule for environmental monitoring during dredging period –(One (1) month.

Monitoring Attribute	**Indicator**	**Methodology**	**Monitoring Frequency**		**Cost during (construction phase)**	**Cost during (operational phase)**
			Construction stage	**Operational stage**		
Marine environment						
Visual water quality	Visibility of water	Through visual inspections and logs to be kept on site (to ensure that turbidity in the dredging area is kept in check).	Every other day during work.	-		
Monitoring turbidity	Turbidity (EPA Guidelines is 3 -5 NTU)	Measure turbidity with portable instruments from dredging site daily during dredging period.	Daily during dredging period.	-	$ 5,000.00	
Aerial survey (dredging location)	Aerial photo to assess the path of sediment plume and measure its spread.	Using drones, aerial photos to be taken above in the dredging location.	Twice weekly	-	$ 15,000.00	
Aerial survey (filling location)	Aerial photo to assess the path of sediment plume and measure its spread.	Using drones, aerial photos to be taken above in the fill location	Twice weekly		$ 6,000.00	

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12 Conclusion

In November 2018, an EIA was undertaken to obtain approval to undertake the expansion of Maadhoo Finolhu in South Male' Atoll. In November 2018, the EIA was approved by MOT. Since the approval of EIA, the proponent is proposing to bring some changes to the project in order to speed up the dredging works. The initial proposal had the borrow site within the reef of Maadhoofinolhu to obtain the fill material. However, due to operational and practical difficulties, dredging (using excavators and cutter suction dredger) is logistically and practically difficult due to the sites close proximity to the presently operational resort in Maadhoofinolhu operated under the brand OZEN Maaadhoo. The site, being close to two protected areas is also one reason why this change in methodology had to be brought. Use of a TSHD has multiple advantages, both in terms of environment and operational activities and hence, for this reason it has been decided to change the methodology and borrow site for the project.

The proponent therefore proposes to change the borrow location to two selected potential sites in south Male' atoll where surveys have been undertaken to assess the availability of adequate sand.

Hence, the aim of this report is to obtain the necessary approval to bring this amendment to the change in borrow area. The most critical part of this project is dredging from the atoll lagoon. While there are many environmental concerns, there are also other logistical, technical as well as social advantages associated with the change. The most significant threat to the proposed change is the impact of sedimentation to a greater area in south Male' atoll, some of which are sensitive in nature and famous dive sites. Dredging in the atoll lagoon will spread sediments to a larger area, causing reduction of water visibility in a much greater area. This will disrupt a number of activities such as recreational diving, snorkelling and other water sports. In addition, the sedimentation will cause the change in behaviour marine animals such as Manta rays, sharks, dolphin.

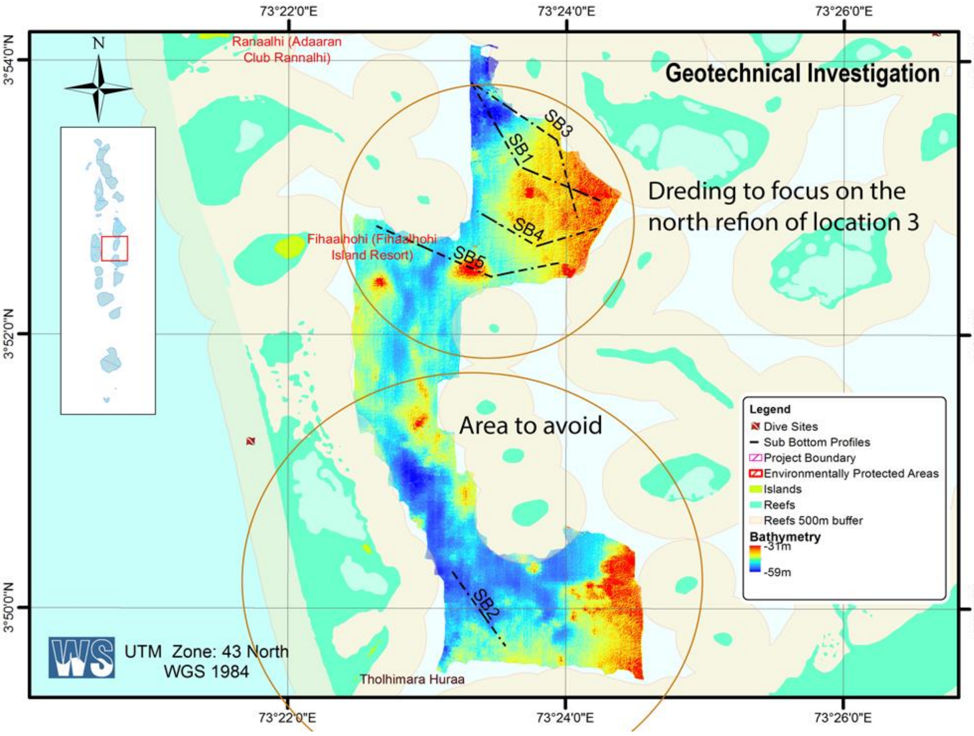
There are two major environmental concerns with regard to the proposed borrow site. Location three (3) forms a large area of south Male' atoll devoid of any reefs. However, the southern part of this stretch is close to Rihiveli reef which is a breeding area for dolphins and sharks. This reef is partly open to the open ocean and all the migratory pelagics are known to use this reef. Siting's of sharks and rays are common and the bay like reef with its inner lagoon is a documented marine sensitive area where dolphin aggregate every year. Dredging from location 3 should therefore be restricted to the north part as much as possible.

Location four (4) is a stretch on the west side of the island of Gulhi. Here also, there are a number of dive sites that are both located on the eastern rim and inside the atoll. The famous Kuda Giri Wreck is located slightly south east of the propose stretch and dredging from this location will also create sedimentation for the entire region. While these are issues to be concern, the objective of the proposed change is geared towards reduced environmental impacts and completion of the project on time and reduce the duration of negative environmental impacts of this project.

13 Recommendations

Following are some of the recommendations based on this assessment.

- It is recommended to dredge only from areas where sub-bottom profiling has been undertaken. As such, location 3 should be utilized to borrow sand.
- Within the location 3, focus should be diverted to dredge from far north as much as possible to reduce the impact of sedimentation on the reef and the surrounding areas of Rihiveli, which is a known sensitive habitat where dolphins breed. This locations are illustrated in the following diagramme.



- The contractor needs to control the sediment plume around the dredger during the dredging work. The sediment plume shall not impact inhabited islands, resorts and diving sites during the dredging activity. The dredging plume shall not be visible more than 2 km radius of the dredger. The turbidity inside 1 km radius of the dredger shall not exceed 100% of the background turbidity level. Monitoring mechanism need to be established by the contractor to monitor the turbidity level around the dredger and report to EPA as outlined in the EIA report.
- Controlling sedimentation during reclamation: The contract needs to control the sedimentation as such that it has the least impacts on the coral reef areas around the island. As such proper sand bunds must be constructed before filling.
- Environmental monitoring is essential to ensure that potential impacts are minimized and to mitigate unanticipated impacts. It is recommended that environmental monitoring to be carried by the contractor during the dredging and reclamation phase to monitor the impact of sedimentation at

the dredging location and reclamation site. The monitoring programme need to be implemented by the contractor during the implementation of the coastal protection measures. It is recommended that this activity would be carried out as per the proponent's committed for this development.

- Aerial photos and satellite photos could be used to monitor the path and spread of sedimentation plume. Hence it is recommended to take bi weekly drone photos to assess this.
- The contractor and the client need to communicate with the nearby resorts regarding timing and scheduling of dredging activities in order for the resort to prepare and inform their guest well ahead. The contractor and client also needs to inform the Ministry of Tourism about the movement of the dredger and its pathways to allow resorts and dive operations to prepare themselves.

14 Reference Books and Sources

Firdhous, H. (2018). *First EIA Addendum to the Reclamation of 15 hectares of land at Thilafushi for the development of the regional waste management facility for zone 3, Kaafu Atoll.* Male': Ministry of Environment and Energy.

Hoepner, T. (1999). A Procedure for Environmental Impact Assessment (EIA) for Seawater Desalination Plants. *Desalination*, vol.124, pp. 1-12.

Jameel, A. (2018). *EIA for the Expansion of Maadhoo Island, South Male' Atoll.* Male': Water Solutions.

Water Solutions Pvt.Ltd. (2012). *EIA of Harbour development and rehabilitation in Maavah island, Laamu Toll.* Male': Water Solutions.

Water Solutions Pvt.Ltd,. (2006). *EIA for the development of a resort in Kalhufahalafushi in Thaa Atoll.* Male': Water Solutions Pvt.Ltd.

15 Annex: Terms of reference

بسم الله الرحمن الرحيم

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Environmental Protection Agency

No: 203-EIARES/PRIV/2019/932

Terms of Reference for the First Addendum to the Environmental Impact Assessment to the Proposed Expansion of OZEN Maadhoo Finolhu, Kaafu Atoll, Maldives.

The following is the Terms of Reference (ToR) following the scoping meeting held on **07th October 2019** for undertaking the **First Addendum to the EIA for the Proposed Expansion of OZEN Maadhoo Finolhu, Kaafu Atoll.** The proponent of this project is **D.P.C Pvt Ltd.** The EIA consultant of this project is **Mr. Abdul Aleem (License No. EIA P03/2019).**

While every attempt has been made to ensure that this TOR addresses all of the major issues associated with development proposal, they are not necessarily exhaustive. They should not be interpreted as excluding from consideration matters deemed to be significant but not incorporated in them, or matters currently unforeseen, that emerge as important or significant from environmental studies, or otherwise, during the course of preparation of the EIA report.

1. **Introduction and rationale** – Provide an introduction to the addendum. Describe the purpose of the changes that had been brought to the project**.** Define the arrangements required for the undertaking the environmental study including how work carried out under this contract is linked to other activities that are carried out or that is being carried out within the project boundary.

2. **Study area** – Submit a minimum A3 size scaled plan with indications of the changes that had been made to the project.

3. **Scope of work**– Identify and number of tasks of the project including preparation, construction and decommissioning phases.

Task 1. Description of the proposed project – Provide a description and justification of the changes that had been made to the project that is covered in this addendum. Particularly the following aspects need to be covered:

1. Location of Dredging with justification.
2. Evidence of availability of required amount sand from the dredging location (geotechnical study undertaken for this purpose needs to be provided).
3. Revised schedule for the project.
4. Details of sediment containment measures that will be implemented. In addition to bunding, silt screens need to be utilized. Need to provide locations where silt screens will be installed with justification.

Task 2. Description of the environment – provide the existing environment condition of the following;

- Marine environment at the location where dredging is proposed (need to reference geotechnical study).
- Marine environment at the location where filling will take place (for this reference can be made to original EIA report).

All survey locations shall be referenced with Geographic Positioning System (GPS).

Task 3. Potential additional impacts and mitigation measures– Discuss environmental impacts associated with the proposed changes; their significance in terms of magnitude and duration. If the changes are significant, discuss the changes in the context of impact and mitigation measures already provided and provide additional mitigation measures where necessary. As dredging is undertaken using a different method in a different location through the revised concept, need to discuss the potential impacts and mitigation measures with regards to this change in concept.

Task 4. Development of monitoring plan – Discuss and provide environmental monitoring requirement for the proposed changes to the resort development project. Cost and commitment for mitigation and monitoring requirements need to be provided.

Task 5. Stakeholder Consultation – Consultation needs to be undertaken with the following parties with respect to the change in concept:

1. Guriadhoo council.
2. Kaafu Atoll council.
3. Olhuveli beach resort, Fun Island Resort and Holiday Inn at Kandooma resort.

All consultation should be undertaken in person and meeting minutes should be referenced.

Presentation- The Addendum to the Environmental Impact Assessment report, to be presented in digital format, to be concise and focus on significant environmental issues. It will contain the findings, conclusions and recommended actions supported by summaries of the data collected and citations f or any references used in interpreting those data. The report shall be organized according to, but not necessarily limited by, the outline given in the Environmental Impact Assessment Regulations, 2012

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

08th October 2019

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16 Annex: Bathymetry of the proposed new borrow site

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17 Annex: EIA decision statement issued in 2018 for the Initial EIA report

بسم الله الرحمن الرحيم

MINISTRY OF TOURISM
REPUBLIC OF MALDIVES

Ref no: 88-DS/PRIV/2018/2589 Monday, December 17th, 2018

Mr. Shrikant Dash
Group Director – Business Development,
D. P. C Private Limited,
H. Aage, 2nd Floor,
Boduthakurufaanu Magu,
Male',
Republic of Maldives,

Dear Mr. Shrikant Dash,

Re: Environmental Decision Statement for the Initial EIA Report – Resort Expansion Project at Maadhoo Island in South Malé Atoll.

We refer to the Environmental Impact Assessment (EIA) Report submitted on 15th November 2018 for the proposed resort expansion project at reclamation of lagoon located at Maadhoo Island in South Malé Atoll.

We are pleased to inform you that the EIA report submitted for the above mentioned project is hereby approved and the validity of this decision statement is one (1) year from the date of this letter.

Furthermore, you are required to inform the commencement date of the project and take necessary approval/permits before the commencement of any construction works. Environmental monitoring reports should be submitted to the Ministry according to the EIA report. The Environmental Decision Statement and approved EIA report are enclosed with this letter.

Thank you.

Yours sincerely,

Aishath Ali
Director General

IF/ES

بسم الله الرحمن الرحيم

MINISTRY OF TOURISM
REPUBLIC OF MALDIVES

Ref No: 88-DS/PRIV/2018/2589

ENVIRONMENTAL DECISION STATEMENT

Project Name: Expansion of Maadhoo Island, South Malé Atoll.

Document Type: Initial EIA

Date: Monday, December 17th, 2018

This Decision Statement is issued for the purpose of communicating the decision based on the Environmental Impact Assessment (EIA) for the proposed resort expansion project at Maadhoo Island, South Malé Atoll, submitted to the Ministry of Tourism on 15th November 2018 for evaluation by the proponent D.P.C Pvt. Ltd.

This Environmental Decision Statement has been issued by the Ministry of Tourism ("Ministry") pursuant to the amended Article 15 of the Maldives Tourism Act (2/99), to advice that the Ministry has decided that the proposed project can proceed.

The decision has been made by the Ministry on the following conditions;

1. In the event that the project activities has not commenced within 1 (one) year from the date of issue, this Decision Statement shall be considered null and void.
2. In the event that the project has been delayed for more than 1 (one) year due to unforeseen circumstances, the Ministry shall have the discretion to extend the duration of the Environment Decision Statement, or to terminate it. In such circumstances, the project proponent shall write to the Minister for an extension before the date of expiry clearly stating out the reasons for the delay.
3. The Minister or the Ministry's representative, may issue a cessation order requiring persons working on the proposed project to cease working until the order is withdrawn, if;
    1. This Environmental Decision Statement has been withdrawn, or;
    2. There has been a breach of conditions of this Environmental Decision Statement.
4. It is the responsibility of the project proponent to undertake all project activities in accordance with relevant laws and regulations of the Maldives and as stated in the EIA Report.

    The proposed activities of the project are:

    - Reclamation of three additional islands.
    - Dredging material from sand borrow areas and pumping it into the reclamation area.
    - Coastal protection measures.
    - Construction of overwater structures.
    - Construction of guest accommodation.
    - Environmental monitoring during construction activities.

- Measures to protect environmental values during construction and operation phase.
- Project management.
- Re-vegetation.

5. The project proponent shall inform the Ministry in writing the date of project commencement.

6. It is the responsibility of the project proponent to inform the Ministry in writing and take approval for the changes, if the proposed methodology changes (such as energy intensive drop hammer or any other energy intensive method) during construction of coastal structures and reclamation including dredging.

7. In an event that project proponent decided to implement alternatives proposed in section 12 (page 77 to 81 and in the additional information), the project proponent shall write and take separate permit from the Ministry.

8. The project proponent shall implement all mitigation measures outlined in the EIA Report page number 64 to 75 and in the additional information submitted. Failure to implement the mitigations measures may result in the suspension or revocation of the approval given in the Environment Decision Statement.

9. The project proponent shall implement the environmental monitoring programme outlined in the EIA Report page number 81 to 86 and in the additional information submitted. Monitoring reports shall be submitted to Ministry of Tourism. Failure to submit the monitoring programme may result in the suspension or revocation of the approval given in the Environment Decision Statement. All data's and methodology used in monitoring program outlined in the EIA report must comply national, international standards and commonly accepted standards as much as possible.

10. The project proponent is aware that under the Article of 15 of Maldives Tourism Act (2/99), the Ministry reserves the right to terminate any activity without compensation if found that such an activity has caused significant, irreversible environmental impacts.

The document has been authorized on behalf of the Ministry of Tourism by;

Aishath Ali
Director General

Date of Issue: December 17th, 2018
Date of Expiry: December 17th, 2019

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18 Annex: List of participants and attendance sheets during stakeholder meetings

Environmental Protection Agency
Male', Rep of Maldives

Meeting: K-Maadhoo (COZEN By Atmosphere) expansion Project
Date: 07/10/2019 (Monday)
Time: 10:00

MEETING ATTENDANCE

	Name	Designation	Office	Email	Phone No.	Signature
01	Ahmed Janeel	consultant	7785329	aj@water-solutions.mv	7785329	
02	Krishna P. Chalise	VP- Projects	DPC Pvt. Ltd ~~9983160~~	krishna@eonresorts.com	9983160	
03	Abdul Aleem	Environmental consultant	~~7793507~~ Watsuh	anoo@water-solutions	7793507.	
04	Mohamed Hamdhaan Zuhair	Assistant Director	EPA	mohamed.hamdhaan@epa.gov.mv.	7668606	
05	Aminath Fizna	Asst. Env. Officer	EPA	—	9819184	
06						
07						
08						
09						
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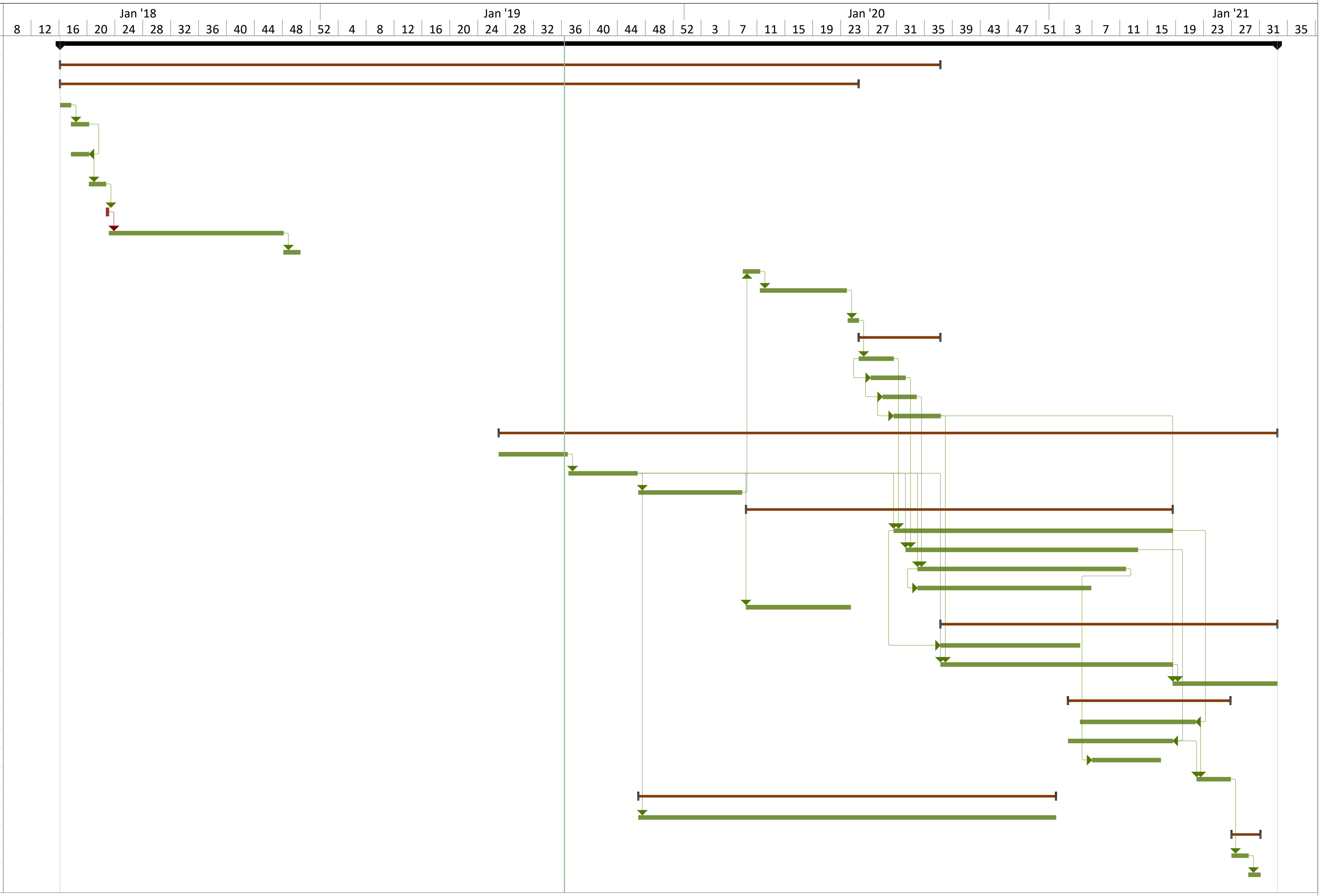
19 Annex: Project Schedule

WORK PLAN- OZEN EXPANSION PROJECT AT MAADHOO ISLAND-2019

ID	ⓘ	Task Mode	Task Name	Duration	Start	Finish
1		→	**1 OZEN EXPANSION- PROJECT WORK**	**1047 day**	**Sun 15/04/18**	**Tue 17/08/21**
2		→	**1.1 PRE-CONSTRUCTION PHASE**	**757 days**	**Sun 15/04/18**	**Sun 13/09/20**
3		→	**1.1.1 PRELIMINARY DESIGN AN**	**687 days**	**Sun 15/04/18**	**Tue 23/06/20**
4		→	1.1.1.1 Bathymetry of the Isl	10 days	Sun 15/04/18	Wed 25/04/18
5		→	1.1.1.2 Concept Design of the Proposed Development	15 days	Thu 26/04/18	Sun 13/05/18
6		→	1.1.1.3 Concept Design of Coastal modification	15 days	Thu 26/04/18	Sun 13/05/18
7		→	1.1.1.4 Submit Concept Plans to Ministry &	15 days	Mon 14/05/18	Wed 30/05/18
8		→	1.1.1.5 Apply for EIA applicat	2 days	Thu 31/05/18	Sat 02/06/18
9		→	1.1.1.6 EIA Study and Submit	150 days	Sun 03/06/18	Sat 24/11/18
10		→	1.1.1.7 EIA Approval	15 days	Sun 25/11/18	Tue 11/12/18
11		→	1.1.1.8 Island Survey and lan	15 days	Sat 29/02/20	Mon 16/03/20
12		→	1.1.1.9 Prepare & Submit Detail Drawings for approval	75 days	Tue 17/03/20	Thu 11/06/20
13		→	1.1.1.10 Receive Constructio	10 days	Sat 13/06/20	Tue 23/06/20
14		→	**1.1.2 TENDERING AND CONTRA**	**70 days**	**Wed 24/06/20**	**Sun 13/09/20**
15		→	1.1.2.1 Tendering of Guest r	30 days	Wed 24/06/20	Tue 28/07/20
16		→	1.1.2.2 Tendering of Public a	30 days	Mon 06/07/20	Sun 09/08/20
17		→	1.1.2.3 Tendering of BOH an	30 days	Sat 18/07/20	Thu 20/08/20
18		→	1.1.2.4 Tendering of MEP Inf	40 days	Wed 29/07/20	Sun 13/09/20
19		→	**1.2 CONSTRUCTION PHASE**	**670 days**	**Sat 29/06/19**	**Tue 17/08/21**
20	▦	→	1.2.1 Mobilization of the Contra	60 days	Sat 29/06/19	Thu 05/09/19
21		→	1.2.2 Reclamation works	60 days	Sat 07/09/19	Thu 14/11/19
22		→	1.2.3 Coastal Protection works	90 days	Sat 16/11/19	Thu 27/02/20
23		→	**1.2.4 Civil works**	**367 days**	**Tue 03/03/20**	**Tue 04/05/21**
24		→	1.2.4.1 Civil works- Guest Ro	240 days	Wed 29/07/20	Tue 04/05/21
25		→	1.2.4.2 Civil works - Public Ar	200 days	Mon 10/08/20	Tue 30/03/21
26		→	1.2.4.3 Civil works - Staff buil	180 days	Sat 22/08/20	Thu 18/03/21
27		→	1.2.4.4 Civil works - Heart of	150 days	Sat 22/08/20	Thu 11/02/21
28	▦	→	1.2.4.5 Civil works - Jetties	90 days	Tue 03/03/20	Mon 15/06/20
29		→	**1.2.5 MEP Infrastructure & Equ**	**290 days**	**Mon 14/09/20**	**Tue 17/08/21**
30	▦	→	1.2.5.1 Internal M & E works	120 days	Mon 14/09/20	Sun 31/01/21
31	▦	→	1.2.5.2 External reticulation	200 days	Mon 14/09/20	Tue 04/05/21
32	▦	→	1.2.5.3 Equipment Set up at	90 days	Wed 05/05/21	Tue 17/08/21
33		→	**1.2.6 Finishing works**	**140 days**	**Wed 20/01/21**	**Thu 01/07/21**
34		→	1.2.6.1 Guest rooms	100 days	Mon 01/02/21	Thu 27/05/21
35		→	1.2.6.2 Public areas	90 days	Wed 20/01/21	Tue 04/05/21
36		→	1.2.6.3 Staff Accommodatior	60 days	Sat 13/02/21	Thu 22/04/21
37		→	1.2.6.4 FF&E set up	30 days	Sat 29/05/21	Thu 01/07/21
38		→	**1.2.7 Other Works**	**360 days**	**Sat 16/11/19**	**Thu 07/01/21**
39	▦	→	1.2.7.1 Landscaping works	360 days	Sat 16/11/19	Thu 07/01/21
40		→	**1.3 POST-CONSTRUCTION PHASE**	**25 days**	**Sat 03/07/21**	**Sat 31/07/21**
41		→	1.3.1 Apply & Receive Resort op	15 days	Sat 03/07/21	Mon 19/07/21
42		→	1.3.2 Preparation and Resort Opening for guest	10 days	Tue 20/07/21	Sat 31/07/21



Task	▬	Project Summary	⊢⊣	Inactive Milestone	◇	Manual Summary Rollup	▬	Deadline	⇩
Split	┅	External Tasks	▬	Inactive Summary	⊢⊣	Manual Summary	⊢⊣	Progress	▬
Milestone	◆	External Milestone	◆	Manual Task	▬	Start-only	[	Manual Progress	▬
Summary	⊢⊣	Inactive Task	▭	Duration-only	▬	Finish-only	]		

Project: OZEN EXPANSION PROJEC
Date: 2018.10.31