Maldives Airports Company Limited

Fourth Addendum

for the Environmental Impact Assessment Report for the Reclamation and Expansion at Ibrahim Nasir International Airport

Report Prepared by LaMer Pvt Ltd:

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Proponents Name:
Maldives Airports Company Limited

Signature:

October 2016

Land and Marine Environmental Resources Group Pvt Ltd, Maldives

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Consultants Declaration

I certify that to the best of my knowledge the statements made in this 4th Addendum of the Environmental Impact Assessment Report for Environmental Impact Assessment for the Reclamation and Expansion at Ibrahim Nasir International Airport, Hulhulhé, North Male', are true, complete and correct.

Name: Hussein Zahir

Consultant Registration Number: 04-07

Signature:

Company Name: Land and Marine Environmental Resource Group Pvt Ltd

Date: 20th October 2016

Proponents Declaration

Re: 4th Environmental Impact Assessment for the Reclamation and Expansion at Ibrahim Nasir International Airport, Hulhulhé, North Male'

As the proponent of the proposed project WE guarantee that WE have read the report and to the best of our knowledge all non-technical information provided here are accurate and complete. Also we hereby confirm our commitment to finance and implement all mitigation measures and the monitoring program as specified in the report.

Signature:

Name: Lionel MAVGIS

Designation: MACL CDO

On behalf of: **Maldives Airports Company Limited**

Date: 20th October 2016

Details of consultants participate in preparation of EIA report

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1 Non-technical Summary

1.1 Background

The non-technical summary outlines the findings of the Addendum 4 to the Environmental lmpact Assessment for Reclamation and Expansion at lbrahim Nasir lnternational Airport (INIA), Hulhulhe, Kaafu Atoll, which involves construction of a temporary water production facility at the Hulhule for the period of the construction works of the INIA expansion project, The proponent and contractor of this project is Male' Airports Company Limited (MACL), main contractor is Chinese Beijing Urban Construction Group (BUCG) and subcontractor for RO plant, borehole and storage tank construction is Static Company Pvt Ltd.

1.2 Project Detail

The proposed project involves construction of a temporary water production facility at Ibrahim Nasir International Airport under the Reclamation and Expansion at lbrahim Nasir lnternational Airport (INIA) project. The water production facility will include RO plant house (housing two RO plants of 250ton/day, two boreholes, settlement tanks, 2 water storage tanks of capacity 500tons each, brine discharge line and also pipeline connecting temporary facility to existing MACL water grid near the project temporary site). This temporary facility will be located at the south eastern side of Hulhule. The diameter of the boreholes is 8 inch while the depth is 40m. Water extracted through the borehole will be used as feed water for the 2 RO plants (250ton/day).

1.3 Key impacts, mitigation measures and alternatives

1.3.1 Key impacts

Impacts on the environment from various activities of the water production facility, mainly the borehole construction component and its operation have been identified through interviews with the proponent, field data collection and surveys as well as based on past experience in similar development projects.

Possible impacts arising from the project have been analysed with the aid of a Leopold Matrix. In any development project major direct impacts to the environment (either short-term or long-term) occur mainly during the construction phase. Potential direct or indirect impacts on the environment (on land and reef system) from the proposed works are limited to a relatively small number of activities, which include:

- Groundwater contamination/salinisation due to extraction of groundwater during and after drilling to clear out the chemicals used during the drilling process as a

hardening agent for the walls of the borehole. This is foreseen to be minor to insignificant due to moderate extraction rates.

- Groundwater contamination due to leakage of drill slurry from the slurry collection pits
- Extraction of groundwater during operation phase which is foreseen to be insignificant due to moderate drilling rates.

1.3.2 Mitigation measures

The severity of impacts is predicted by reviewing the design plans and construction methodologies. Mitigation measures are formulated in light of the information revealed by the project engineers.

Mitigation measures are discussed for the construction stage of the project. During the construction stage it is important to take measures to minimize impacts on the degradation of groundwater quality. Method of drilling also has to be taken into account to minimise impact. A method that has the least impact on terrestrial or marine environment has to be utilized.

1.3.3 Alternatives

Considering the alternatives for the project (alternative to setting up a temporary water production system) analysis of alternatives shows that the proposed methods and locations are the most feasible for the project. No project scenario was also considered as an alternative. However, given that the benefits greatly outweigh the negative impacts, this was not seen to be a feasible option.

2 Introduction

This fourth Addendum to the EIA report for the reclamation and expansion at Ibrahim Nasir International Airport is formulated to address the proposed temporary constructions, which are required to cater the need for water during the construction phase of the project. These include construction of a temporary water production facility with the construction of two boreholes as feed water sources for the proposed water facility.

The proponent of the proposed project is Maldives Airports Company Limited. The estimated cost of the proposed project is USD 950,000· Static Company Pvt Ltd will undertake the construction works of the proposed works.

2.1 Purpose of the report and need for the EIA

This document presents the findings of the fourth Addendum to the Environmental Impact Assessment (EIA) for Reclamation and Expansion at Ibrahim Nasir International Airport, North Male' which is to construct a water production facility with two boreholes. Developers of such development projects are required to carry out EIA studies under the Environmental Act of Maldives. The developer is required to obtain approval of the Environmental Protection Agency (EPA), prior to the implementation of any development activities on the island.

Land and Marine Environmental Resources Group Pvt Ltd have been engaged by subcontractor for the construction of water production facility, Static Pvt Ltd to prepare the this addendum to the EIA. This addendum is prepared in accordance with Environmental Impact Assessment Regulation of the Environment Protection Agency.

As per the EIA regulation, an EIA application form, project brief and draft TOR for the project was submitted to the Environmental Protection Agency (EPA). The scoping meeting was held at the Ministry on the 24th August 2016 with the project proponent, consultant and officials from EPA. Based on the discussions at the meeting, a ToR was finalized and approved by EPA on the 30th August 2016 (see Appendix 2).

3 Project Setting

The project conforms to the requirements of the Environmental Protection and Preservation Act of the Maldives, Law no. 4/93. The EIA has been undertaken in accordance with the EIA Regulations 2012 of Maldives by a registered consultant. Furthermore, it adheres to the principles underlined in the regulations, action plans, programs and policies of the following Ministries of the Government of Maldives.

- Ministry of Environment and Energy

These are discussed in detail in Table 1.

Table 1. Legislation pertaining to the project

Legislation	How does current project conform to legislation
Environmental Protection and Preservation Act (Law 4/93)	EIA undertaken as stipulated in the Act, which states that any developmental project, which has a potential impact on the environment, should have an EIA done prior to commencement of the project. List of such projects are given in the EIA Regulations 2012
Desalination Plant Regulation	The Desalination Plant Regulation specifies that all water generating facilities have to be registered at EPA prior to operation. Water Department of EPA grants license for operating desalination or water production facilities, which has to be renewed every five years. ➢ However plants constructed for temporary period need not be registered. Hence no registration is required for the proposed project, as the system will be decommissioned after the completion of the project in 3 years.
Borehole drilling – guidelines and technical specification	The Environmental Protection Agency has a set of draft guidelines and technical specifications for borehole drilling. The scope of the guidelines addresses drilling boreholes and installation of electric pumps for source water extraction for various water supply development projects including reverse osmosis desalination. The guideline addresses the

	following issues: ➢ Drilling site and its environmental protection; drilling site should be at a location designated by the client in consultation with EPA and the Environmental Consultant. ➢ Equipment and materials and drilling fluids and drilling method ➢ Design and depth of borehole; boreholes should be dug to a minimum depth of 30 m even if the electrical conductivity/salinity has reached 50-60mS/cm prior to reaching a depth of 30 m. If electrical conductivity/salinity at 30 m is less than 50-60mS/cm drilling should be continued until electrical conductivity/salinity has reached 50-60mS/cm ➢ Yield estimates during drilling ➢ Pumping tests ➢ Recording and reporting of daily activities during the drilling process which must be provided to EPA at the end of the project ➢ Water sampling and quality testing with parameters to be tested identified including electrical conductivity and salinity of discharge water ➢ Code of conduct during the project and supervision by a qualified and experienced engineer ➢ All drilling projects have to submit an EIA report prior to its commencement The project will conform to the technical specifications and guidelines as per the EPA guideline and all necessary testing and reporting will be carried out as specified in the guidelines
Dewatering Regulation (2013/R-1697) – 31st January 2014	The Dewatering Regulation has been formulated to introduce measures so as to minimize impact on the environment and ecosystem due to dewatering work which may be carried out as part of construction works or during other works. Any development which requires dewatering as part of the project, can only implement the dewatering phase after obtaining the required approval from the

	Environmental Protection Agency, which is the implementing agency for the regulation. The regulation does not apply to dewatering which may be required for the installation/cleaning of a groundwater well for personal use or use of groundwater for agricultural purposes. Prior to carrying out dewatering the proponent of such projects have to submit an application form to EPA with required documents, which are detailed in the regulation, and application form. It is also the responsibility of the proponent to inform the relevant councils, if there are residential areas or agricultural lands within 100m radius of the site where dewatering will be carried out. The regulation further details what should be done with the water extracted during dewatering, and what actions should be taken should dewatering impact users within 30m radius of the site. The regulation further specifies fines, which will be applicable, if the regulation is not followed. The proposed project will conform to the regulation, by first submitting an application form to carry out dewatering within the project site. The proponent will also carry out all the additional measures necessary to obtain the approval for EPA and to abide by the regulation.

4 Project Description

4.1 Project Proponent

The project proponent of the proposed development project at Ibrahim Nasir International Airport (INIA) is Maldives Airports Company Limited (MACL). The contractor for the Reclamation and Expansion project is Chinese Beijing Urban Construction Group (BUCG) and subcontractor for RO plant, borehole and storage tank construction is Static Company Pvt Ltd.

4.2 The Project

The proposed project involves construction of a temporary water production facility to cater the need of water (for work camp, batching plants) during the construction phase of the airport expansion project. This system includes construction of a RO plant house with two RO plants with capacity of 250 ton/day; construction of two boreholes of diameter 8 inches (inner diameter) while the depth would be 40m and setting up of two storage tanks with capacity of 500m^3 each. Water extracted through the boreholes will be used as feed water for the two RO plants. Total capacity of the facility would be 500ton/day. Location of the settlement tank; boreholes for feed water and brine discharge pipelines are shown in Figure 1 and the site plan is in Appendix 3. Boreholes will be located at the south eastern side of the INIA plot within close proximity to the water facility. Brine discharge will be through a pipeline run across the paved road on the eastern side and pipe end off of revetment structure.

4.3 Need for the Project

Although INIA have a water production facility that caters for the current needs, the additional load required for the construction and for the labor force during the time of INIA expansion project would not be met by the existing system. Hence a temporary system is proposed for this particular project that would be decommissioned once the whole project is completed within 3 years. The details of the production and consumption rates from the existing water facility are explained in Table 2.

Table 2. Production and consumption rates from the existing water facility at the INIA

Production capacity:	820ton/day
Daily consumption rate	720ton/day
Projected increase in demand during the construction phase of the INIA expansion	300ton/day 400ton/day during peak hours

As it can be seen from the table 2 above, the existing system yields 820ton of water every day. This volume is just sufficient for the current consumption demand which 720ton/day is according the Project Department of MACL. It is expected that the consumption would increase by 56% during the construction period that would last for 3 years. This increase would demand up to 1,220ton/day, exceeding the current yielding capacity. Hence a temporary water production facility is necessary to cater for the additional demand that would arise during the construction and reclamation works for the INIA expansion project.

4.4 Location and Extent of Site Boundaries

The Ibrahim Nasir International Airport is located on the Hulhule' Island situated in the south eastern side of North Male' Atoll. The water plant and associated facilities are located at the eastern side of the island, close to the shoreline. The location of RO plant and proposed borehole is provided in Figure 1and Figure 2 (refer Appendix 3 for site plan). The drill mud and slurry generated during the drilling works will be collected at two ground pits within the compound and re-injected during drilling works (since drill slurry will contain bentonite mud) remaining water will be pumped via the brine discharge line off of the revetment structure.

4.5 Construction phase and schedule for implementation

The construction of the temporary water production facility at INIA is estimated to last 18 weeks including surveying and EIA preparation work. This would involve all the physical work of the construction of all components of the water production facility. Schedule for implementation is shown in Table 3 below and a detailed schedule is provided in Appendix 4

Table 3: Schedule for implementation of borehole drilling work

Project Component	Weeks																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Preliminary work, surveying																		
EIA report preparation																		
Procurement																		
Construction of the boreholes, RO plants, RO plant house & networking																		
Testing																		
Operation of boreholes																		
Demobilization																		

4.6 Decommissioning of the water production facility

The proposed temporary water production facility will be decommissioned after 3 years, once the construction of the INIA expansion project is complete. During the decommissioning, the prefab materials that will be used to construct the RO house, the tank materials and equipment that could be reused will be shipped out, re-exported (for other projects of BUCG). Any material or equipment including the scrap metals that can be auctioned will be sold and all the construction debris after the demolition will be disposed at the waste management center at K. Thilafushi. Demolition of RO building and storage tank foundations will be done using an excavator.

The boreholes will be plugged using sand and cement mixture through pumping mixture into the borehole.

4.7 Major Inputs and Outputs

4.7.1 Inputs

4.7.1.1 Mobilization and material unloading

Construction material and machinery will be brought to the site during the 1st week of the project, together with the drilling team. Materials brought to site will be unloaded at the existing harbor facility on the island and transferred to the project site. The list of machinery and equipment that will be used is attached in Appendix 5.

4.7.1.2 Workforce

Total workforce for the project is 14, which include 12 workers, 1 site supervisor and 1 site engineer. Accommodation of the workforce will be arranged at the existing project site (existing temporary accommodation facility) built for the INIA expansion project.

4.7.1.3 Site Clearance

No site clearance is required, as the site is vacant with no vegetation or buildings.

4.7.1.4 Borehole Drilling and Construction methods

Borehole Drilling

Drilling of the borehole will use Rotary mud drilling method, using a hydraulic rotary rig. Bentonite will be used as a drilling fluid. Bentonite is an insoluble, inert and non-toxic material, which is commonly used in drilling work. It helps to seal the borehole and exerts a positive hydrostatic pressure against the borehole walls, preventing the inflow of groundwater into the borehole. The borehole will be drilled to a depth of 40m, which is deeper than the minimum depth of borehole as per guideline (The Borehole Construction guidelines set by EPA which states that boreholes should have a minimum depth of 30m and electrical conductivity/salinity of 50-60mS/cm). Once the borehole drilling is completed, air compressor will be used for pumping air into the boreholes for flushing drill fluid and cleaning the borehole. Appendix 4 shows a more detailed work methodology as provided by the Client.

Drill slurry will be disposed into two mud pits of size 1m x 0.5m x 0.5m constructed within the plot. Canvas lining will be laid to avoid leakage of fluids to ground.

RO plant house

The RO plant house will be of prefabricated segments, the building will be prefabricated in China and brought to site for assembling. The foundation of RO plant building will be caste initially prior to assembling prefabricated units. Settlement tanks will be caste using concrete. Concrete works will be done using mobile concrete production vehicles already present at site.

Storage tanks

The two storage tanks will be built using Glass Reinforced Plastic (DRP) material, which is a modular design. Initially the foundation of the tanks will be caste in-situ using concrete. Concrete works will be done using mobile concrete production vehicles already present at site. Afterwards the modular segments will be assembled.

Pipeline network and brine discharge line

The water network pipeline connecting the labor camp and batching plants will be laid at existing paths/roads of Hulhule. The pipelines will be laid using mini excavator. The network will be connected to existing grid of INIA which connects the labor camps and batching plants.

The brine discharge pipeline will be constructed using 6inch PVC pipe, the pipeline will be buried under ground and run across the main road (on the eastern side) and over the revetment structure. The pipe end will be located at the bottom of revetment structure (footing). A summary of the inputs and outputs of the project is presented in Table 4.

Table 4. Inputs and outputs of the water production facility

	Details	Source/Type	How to obtain resources
Inputs	14 workers (1 Site Supervisor, 1 Site Engineer, 12 Workers)	Contract workers	Local contract workers
	Construction material	**Concrete works**: Concrete machine, sand, cement etc	Locally obtained
		Electrical: Electric Drill, cutoff machine, circular saw, electrical planner, grinder, bar bender, vibrator, halagon light	Locally obtained

		Finishing: roofing sheets, timbre etc	
Outputs	Fresh Water	One RO plant house Two RO plants of 250ton/day each with 2 boreholes (8" diameter, 30m depth). Seawater extracted through boreholes using pumps at an average rate of 250m^3 to 300m^3 per hour Two water storage tanks (GRP Tanks) of 500m^3 capacity each, hence a total capacity of 1000m^3	Purchase locally, if available, otherwise imported
	Drill Slurry	Water extracted during the drilling process, which is also mixed with Bentonite, used as absorption agent (hardens walls of borehole).	Drill slurry collected using 2 mud pits of dimensions 1m x 0.5m x 0.5m, this slurry will be re-injected to drill hole.

4.7.2 Outputs

The key output of the project is the RO plant facility. This facility would result in the following outputs.

4.7.2.1 Borehole

Two boreholes of 8-inch diameter and 40 m depth, which has 8" PVC casing (see Figure 3 for borehole locations and Appendix 6 for borehole design). The area around the PVC casing will be bentonite packed (ground level to -2m). Gravel packed zone will be up to 20 m from the bottom of the hole.

4.7.2.2 RO plant house and RO plants

The RO plant house consists of the plat room, water boosting systems and the settlement tank. RO plant house will be built with imported pre-fabricated materials. Two RO plants of capacity 250ton/day will be constructed with a total capacity of 500ton/day. For the detail drawing of the plant house, see Appendix 3.

4.7.2.3 Water Tanks

Water produced from the RO plant will be stored in the two tanks located at close proximity to the RO plants. Each tank will hold 500m^3 of water.

4.7.2.4 Extraction rate

Seawater will be extracted through the boreholes at a rate of 250m^3 to 300m^3 per hour using GROUND FORCE pumps. The maximum extraction rate of the pump is 300m^3 per hour. The RO plants will desalinate the extracted water.

4.7.2.5 Drill Slurry

At the completion of the borehole construction, the water extracted initially, which is mixed with Bentonite, will be re-injected into two mud pits constructed within the plot. Bentonite is a naturally occurring, non-toxic compound in the form of clay and hence the discharge of this is not foreseen to cause any environmental impacts. Once the Bentonite has been removed, water will then be extracted for 12 more hours to clean the well and this water will be discharged to the lagoon. The proposed brine outfall will be used for flushing and testing of well. Detailed methodology for the drill slurry disposal is explained in the methodology provided in Appendix 4.

Figure 3 Locations of boreholes (B1, B2), drill slurry collection pits and flushed water disposal site

4.8 Risks associated with the project

No major or significant risks are foreseen to be associated with this project (both during the construction and operation phase) as the project design and set up is seen to have minimal or negligible impact on the environment. The duration of drilling works would be completed within 14 days; therefore duration of impact will be short.

5 Methodology

Data collection and compilation of this report are based on:

- Consultation and discussion with the proponent with regard to design and work methodology that would be used to implement the proposed activities of the project,
- Examination of the existing environment to identify significant environmental components that are likely to be affected,
- Consultation with major stakeholders to exchange information on the project and to follow the EIA procedures required for the report, and
- Evaluation of available and relevant literature on environmental impacts associated with similar projects.

Information on existing environment was collected during the field visit to the project site on the 5th September 2016.

5.1 Water quality analysis

In order to assess the quality of water, sample was taken from the general site where the borehole flushing line is located and at near the proposed RO plant house (Figure 4). Water samples were tested in-situ using Hanna HI 93703 portable turbidity meter and Hanna HI9828 multiprobe water test meter for pH, Salinity, Conductivity, Turbidity, TDS and dissolved oxygen. Prior to testing, turbidity meter was calibrated using two part calibration method using 0 FTU and 10FTU solution. The standard unit FTU is equivalent to NTU as a unit of turbidity. The Hanna HI9828 probe was also calibrated prior to testing using quick calibration solution (HI9828-25 solution) for DO, ORP, Conductivity and pH.

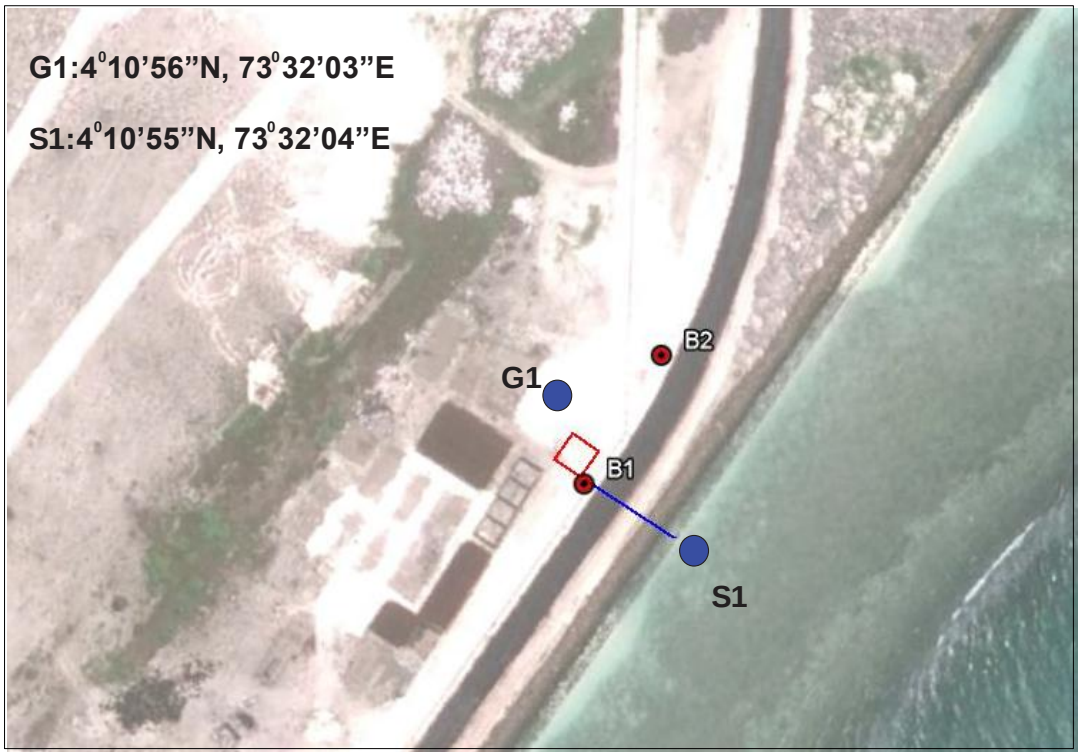

Figure 4 Water sampling locations (G1: groundwater sample, S1: seawater sample)

6 Existing environment

6.1 Geographic location and general setting of INIA, Hulhule'

The general setting and geographic location of INIA has been discussed in the EIA report for Reclamation and Expansion of INIA (Water Solutions Pvt Ltd, 2014) and will not be reiterated here. Existing environment discussed in the Addendum is as per requirement of the TOR for the current project.

The Ibrahim Nasir International Airport is located on the Hulhulé Island which is formed on a large reef in the south eastern side of North Malé Atoll. The land for proposed water production facility is located at the south eastern side of the island (see Figure 1 for project location). The boreholes will also be located at the eastern side of the proposed RO plant building.

6.2 Physical environment

The eastern side of Hulhule is modified over the years with major reclamation works and shore protection works. Part of the reclamation was undertaken by dredging on the eastern side back reef area. The proposed brine discharge line is located just off of the footing of revetment structure. The lagoon substrate at the area is mostly sand and rubble.

Surface currents at the project area is thought to flow northwards due to swell wave received at the reef and location of large borrow pit which is deeper than lagoon area near the project area.

6.3 Terrestrial Environment

The proposed water production facility is to be located at empty land at Hulhule void of vegetation (recently reclaimed land) (see Figure 1). No vegetation clearance will be required for setting up the facility and construction of boreholes.

6.3.1 Ground water quality

The ground water was tested using Hanna Multi probe meter (HI9828). A list of parameters tested and their values are given in Table 5.

Table 5 Results of the parameters tested to assess groundwater quality at the proposed borehole construction site

Reading	Temp°C	pH	DO (mg/l)	E.C (µS/cm)	TDS g/l	Salinity (PPT)
1	28.37	7.74	2.40	941	0.47	0.46
2	28.37	7.74	2.40	941	0.47	0.46
3	28.37	7.74	2.40	941	0.47	0.46
4	28.37	7.74	2.40	941	0.47	0.46
5	28.37	7.74	2.40	941	0.47	0.46
6	28.38	7.74	2.40	941	0.47	0.46
7	28.38	7.74	2.40	941	0.47	0.46
8	28.38	7.74	2.42	941	0.47	0.46
9	28.38	7.74	2.42	945	0.48	0.47
10	28.38	7.74	2.42	945	0.48	0.47
Average	**28.38**	**7.74**	**2.41**	**942**	**0.47**	**0.46**

All parameters for groundwater quality at the site were observed to be within the normal range.

6.4 Marine Environment

The brine discharge location consists mainly of sand and rubble hence no detail survey was carried out to study the area. Sea water quality was tested to establish the baseline condition of the receiving water.

6.4.1 Sea water quality

The baseline survey carried out to study the seawater quality in 2010 showed that water quality is uniform at all the sites observed. Refer the EIA for the Reclamation and Expansion at INIA (Water Solutions 2014) for the baseline results. Further, for the purpose of this project seawater testing was done in-situ at the proposed brine discharge area (south eastern side of Hulhule' Island) using Hanna multi-probe water test meter HI9828 and Hanna Turbidity meter HI93703. The Table 6 below shows results of the water test.

Table 6 Results of the parameters tested to assess seawater quality at the proposed brine disposal location (FTU is equivalent to NTU)

Reading	Temp°C	pH	DO (mg/l)	E.C (µS/cm)	TDS g/l	Salinity (PPT)	Turbidity (FTU)
1	28.13	7.14	5.23	52890	26.44	34.27	0.15
2	28.13	7.14	5.23	52890	26.44	34.27	
3	28.13	7.14	5.23	52890	26.44	34.27	
4	28.14	7.14	5.23	52890	26.44	34.27	
5	28.14	7.14	5.23	52890	26.44	34.27	
6	28.14	7.14	5.23	52890	26.44	34.27	
7	28.14	7.14	5.23	52890	26.44	34.27	
8	28.14	7.14	5.24	52900	26.45	34.29	
9	28.14	7.15	5.24	52900	26.45	34.29	
10	28.14	7.15	5.24	52900	26.45	34.29	
Average	**28.14**	**7.14**	**5.23**	**52893**	**26.44**	**34.28**	

It can be observed that, the current values are almost the same as the baseline values and all parameters were observed to be within the normal range.

7 Stakeholder consultation

As per the ToR, consultation was done with contractor of the project to identify decommissioning details of temporary water production facility. Meeting was held at BUCG temporary site at Hulhule on 5th September 2016 at 11:30.

The site manager, engineers and personnel from subcontractor, Static Company Pvt Ltd was present at the meeting. The EIA consultants briefed the requirements as per the TOR regarding decommissioning works.

The personnel from BUCG informed that most of temporary accommodation facility units and RO plant building prefabricated units will be unusable by end of project construction stage due to rusting. These materials will be sold as scrap material. The foundation of the RO plant building will be demolished using excavator and construction debris disposed at Thilafushi or government approved site.

The modular units of GRP tanks will be disassembled and shipped out of country or to other project sites within Maldives. The foundation of the tank will be demolished using excavator and construction debris disposed at Thilafushi or government approved site.

The RO plants and other equipment that can be reused will be shipped out of country (for use in other projects) or to other project sites within Maldives.

The boreholes will be plugged using sand-cement mixture pumped in to the borehole. The borehole PVC casing will be removed prior to plugging the borehole.

Table below provides list of people met

Table 7 Contact numbers/email address of people met

Name	Office	Contact number/email
Aishath Abdul Rahman	Engineer / (Expansion Projects) Maldives Airports Company Ltd	3315366
Hussain Mohamed	Project Manager/ Static Company limited	3310313
Dave Cui	Site Manager/ BUCG	cuibowen@bucg.cc

8 Environmental Impacts

8.1 Impact Identification

Various methods are available to categorize impacts and identify the magnitude and significance of the impact, such as checklists, matrices, expert opinion, modeling etc. Impacts on the environment from various activities of the resort construction work (constructional impacts) and operation of the resort (operational impacts) have been identified through interviews with the project management team, field data collection surveys and based on past experience in similar development projects. Data collected during field surveys can be used to predict outcomes of various operational and construction activities on the various related environmental components. This data can also be used as a baseline for future monitoring of the environment.

Possible impacts arising from the construction and operation works are categorized into reversible and permanent (irreversible) impacts. The impacts identified are also described according to their location, extent (magnitude) and characteristics. Reversible and irreversible impacts are further categorized by intensity of impacts (negligible, minor, moderate and major) for identifying best possible remedial (mitigation measures) action to be taken. Below are the impact categories (Table 8).

Table 8. Impact prediction categorized

Impact category	Description	Reversible/ irreversible	Cumulative impacts
Negligible	The impact has no significant risk to environment either short term or long term	Reversible	No
Minor	The impact is short term and cause very limited risk to the environment	Reversible	No
Moderate	Impacts give rise to some concern, may cause long term environmental problems but are likely short term and acceptable	Reversible	May or may not
Major	Impact is long term, large scale environmental risk	Reversible and Irreversible	Yes, mitigation measures has to be addressed

The concept of the Leopold Matrix (Leopold et. al., 1971) has been used to classify the magnitude and importance of possible impacts which may arise during the constructional and post constructional stage of the proposed project. This is one of the best known matrix methodology used for identifying the impact of a project on the environment. It is a two dimensional matrix which cross references between the activities which are foreseen to have potential impacts on the environment and the existing conditions (environmental and social) which could be affected.

The matrix has the actions which may cause an impact on the horizontal axis and the environmental conditions which may be impacted on the vertical axis. While the original Leopold matrix lists 100 such actions and 88 environmental conditions, not all are applicable to all projects. Hence the matrix used in the current assessment is a modified matrix customized to this project.

Each action which is evaluated is done so in terms of magnitude of impact on the environmental condition and significance of this impact. In addition to this probability of impact as well as duration of impact is also assessed and shown separately. All probable and significant actions, their magnitude of impact and duration of impact are further described in the text.

This version of the Leopold Matrix has been adopted from Josimovic et. al (2014) and the EIA adopts the grading scales used in the paper referred. Listing of these grading scales are shown in Table 9 below.

Table 9. Grading scales for the four impact evaluation criteria

Evaluation criteria	Designation	Scale
Impact Probability	M	Impact is possible (probability <50%)
	V	Impact is probable (probability >50%)
	I	Impact is certain (probability = 100%)
Impact Magnitude	0	no observable effect
	1	low effect
	2	tolerable effect
	3	medium high effect
	4	high effect
	5	very high effect
Impact significance	P	limited impact on project site (immediate site)
	I	Impact of importance at Island level
	A	Impact of importance at Atoll level
	N	Impact of national character
	M	Impact of cross-border character
Impact duration	P	Occasional/temporary
	D	Long term/permanent

The proposed project involves construction of a temporary water production facility. Most impacts for the project are envisaged for the construction phase of the project, while the operational phase is also envisaged to have some impacts on the environment. The severity of impacts is predicted by reviewing the design plans and construction/drilling methodologies.

Mitigation measures are formulated in light of the information revealed by the project engineers (drilling method and equipment or machinery used).

8.2 Limitation or uncertainty of impact prediction

Uncertainty of impact prediction are mainly due to the lack of long term data, inherent complexity of ecosystem and lack of coordinated monitoring programs with consistent methodologies which can be used to predict outcomes or reliability of predictions of previous projects.

The impacts are predicted by reviewing the survey data collected during the field visits and information revealed by the designers and engineers. The data collected during the field visit is limited in terms of number of days to a week or few more, which limits the overall understanding of even the short term environmental conditions.

The time limitation of EIA field data collection and report preparation is also a hindrance to properly understanding the environmental factors dictating the conditions of the habitat.

8.3 Construction Impacts

In any development project major direct impacts to the environment (either short term or long term) occur mainly during the construction phase. Potential direct or indirect impacts on the environment (on land and reef system) from the proposed works include:

- Groundwater contamination due to drilling activities

8.3.1 Terrestrial Impacts: Minor

Groundwater will be extracted during drilling as well as after completion of the drilling works to clear out the chemicals used (Bentonite) during the drilling process to harden the walls of the borehole. Extraction of groundwater during and after completion of drilling of the borehole has the potential to impact the groundwater quality by increasing its salinity. However the impact is foreseen to be minor to insignificant as the extraction rate is moderate. The water extracted during dewatering process will be re-injected to drilling hole and water extracted during flushing and testing of the well will be discharged to the nearest shore area via the existing brine outfall.

Groundwater may be contaminated due to possible leakage of the drill slurry through the collection pits. This can be avoided by ensuring proper sealing of the collection pit walls. Hence the impact is expected to be minor.

As far as impact to the vegetation and fauna are concerned, the proposed location is a cleared area and no tree or plant near the area will be removed. Hence the impact is negligible.

8.4 Operational Impacts: Negligible

No significant negative impacts are envisaged during the operation phase of this project. The only potential impact foreseen is an impact on groundwater due to continued extraction or leakage of drill slurry. However the extraction rate is not foreseen to be high enough to impact ground water and drill slurry will be collected in caution with proper sealing of the pits. Furthermore the depth of borehole is 40m; therefore impact due to extraction is envisaged to be negligible.

8.5 Impact Analysis

An analysis of the impacts due to the project was done using the Leopold matrix. Impacts are assessed according to probability of impact, significance of impact, magnitude of impact and duration of impact. Tables 10 to 13 gives the assessment for the impacts, and these are further discussed above with their scoring.

As evident from Tables below, the project limited number of activities which have the potential to have an impact on the environment. These minimal impacts are envisaged to be limited to the project site, though due to nature of impact, most are temporary impacts.

Table 10. Assessment of Probability of impact from project activities

	Envisaged Impact factors	Construction phase			Operational phase
		Water extraction	Disposal of drill slurry	Operation of heavy machinery (Drill rig)	Water Extraction
Physical component	**Sea Water**	M	V	M	M
	Ground water	V	M	M	V
Biological component	**Ecosystems quality**	M	M	M	M

Table 11. Assessment of magnitude of impact due to project activities

	Envisaged Impact factors	Construction phase			Operational phase
		Water extraction	Disposal of drill slurry	Operation of heavy machinery (Drill rig)	Water Extraction
Physical component	**Sea Water**	0	1	0	0
	Ground water	2	0	1	2
Biological component	**Ecosystems quality**	0	0	0	0

Table 12. Assessment of significance of impact from project activities

	Envisaged Impact factors	Construction phase			Operational phase
		Water extraction	Disposal of drill slurry	Operation of heavy machinery (Drill rig)	Water Extraction
Physical component	**Sea Water**		P		
	Ground water	P		P	P
Biological component	**Ecosystems quality**				

Table 13. Assessment of duration of impact due to project activities

	Envisaged Impact factors	Construction phase			Operational phase
		Water extraction	Disposal of drill slurry	Operation of heavy machinery (Drill rig)	Water Extraction
Physical component	**Sea Water**		P		
	Ground water	P		P	P
Biological component	**Ecosystems quality**				

9 Alternatives

Alternatives are proposed for the following components of the proposed water production facility;

- Source water from elsewhere
- Feedwater source
- No project

9.1 Considered alternatives

9.1.1 Sourcing water from elsewhere

- **Proposed Source:** Temporary construction of water production facility to cater the water needs for the construction phase of the whole project
- **Alternative:** Purchasing water from the existing water production facility at MACL and to supplement them with water transported from Male'.

9.1.2 Feedwater source

- **Proposed Source:** Two boreholes near the RO plant house
- **Alternative:** Seawater pipeline from eastern side reef

9.2 Selected alternatives

9.2.1 Source water from Male' (MWSC)

The proposed source of water is through constructing a temporary water production facility with two boreholes and two water tanks while the alternative is to purchase water from the existing water production facility at MACL and supplement them with water transported from Male'.

But the cost that would incur in arranging such logistics and purchasing water would be higher than building a temporary facility. Hence this option is considered not feasible and construction of the facility is selected.

9.2.1 Feedwater source

The reason for selecting boreholes instead of seawater intake pipeline is due to possible damage to pipeline from environmental factors (swell waves received eastern side breaking at

the reef). Also two wastewater disposal pipelines of airport facility is located at this area (approximately 300m) hence it was decided that seawater pipeline is not feasible.

9.2.2 The no-project scenario

If considering the no-project scenario, none of the foreseen environmental impacts, which may arise due to the project, will be encountered. However, if no project, given the existing supply and demand, the additional demand of water for the construction works and the workers will not be met and it will not be feasible to source water from elsewhere. Hence, given that the environmental impacts due to the proposed project are minor to insignificant, and the benefits outweigh the negative impacts, the no-project scenario is not considered feasible.

10 Mitigation Plan

There are a number of actions that can be taken to minimize or avoid impacts altogether. Those that are explored below emerged out from the discussions and consultations during this EIA and from the past experience of the consultant. Mitigation measures are selected to reduce or eliminate the severity of any predicted adverse environmental effects and improve the overall environmental performance and acceptability of the project.

Mitigation measures are discussed for the construction stage of the project (Table 14). During the construction stage it is important to take measures to minimise impact on groundwater, terrestrial and marine habitats.

Table 14 Possible environmental impacts and mitigation measures for the temporary water facility construction work at INIA

Phase	Possible Impacts	Mitigation Measures	Location	Time Frame	Mitigation Costs	Institutional Responsibility
CONSTRUCTION – temporary impacts	Drilling and extraction of groundwater - contamination of groundwater	Monitor groundwater parameters during extraction as per borehole drilling guidelines Attain dewatering permit prior to initiation of borehole drilling works	Borehole drilling location	During construction phase	Covered by the project proponent (cost details provided in the monitoring program)	Contractor, Proponent
	Impact on ground water lens (Volume of ground water)	As per the regulation, if electrical conductivity/salinity at 30 m is less than 50-60mS/cm drilling should be continued until electrical conductivity/salinity has reached 50-60mS/cm	Borehole drilling location	During construction phase	Covered by the project proponent (cost details provided in the monitoring program)	Contractor, Proponent

	Contamination of groundwater due to possible leakage of drill slurry from the collection pits into the ground	Proper sealing of the collection pits using the proposed materials (canvas) Site engineer shall check the condition of the sealing every hour	Collection pit location area	During construction phase	n/a	Contractor, Proponent's Site Engineer

11 Monitoring Program

Monitoring is the systematic collection of information over a long period of time. It involves the measuring and recording of environmental variables associated with the development impacts. Monitoring is needed to;

- Compare predicted and actual impacts
- Test the efficiency of mitigation measures
- Obtain information about responses of receptors to impacts
- Enforce conditions and standards associated with approvals
- Prevent environmental problems resulting from inaccurate predictions
- Minimize errors in future assessments and impact predictions
- Make future assessments more efficient
- Provide ongoing management information
- Improve EIA and monitoring process

Impact and mitigation monitoring is carried out to compare predicted and actual impacts occurring from project activities to determine the efficiency of the mitigation measures. This type of monitoring is targeted at assessing human impacts on the natural environment. Impact monitoring is supported by an expectation that at some level anthropogenic impacts become unacceptable and action will be taken to either prevent further impacts or re-mediate affected systems. Mitigation monitoring aims to compare predicted and actual (residual) impacts so that effectiveness of mitigation measures can be determined.

Monitoring works during the construction phase will be carried out according to the details given in Table 15. Cost for the monitoring (data collection) activities will be covered by the proponent (commitment to carrying out and financing the mitigation and monitoring work is given at the beginning of the report).

Monitoring during borehole construction shall be done in accordance to the borehole drilling guideline (Borehole drilling, technical specification and guideline, EPA Sept 2011).

Table 15 Monitoring programme for construction phase of the project

Monitoring parameter	Methodology	Sampling frequency	Estimated cost for monitoring
Water sample monitoring at every 5 m interval during drilling (electrical conductivity and salinity) in accordance to the borehole drilling guide of EPA Sept 2011	Sample collected sent for testing or in-situ tested using portable water quality meter	During drilling process	If testing done from lab MRF 4,000.00
At completion of drilling, water samples will be collected and tested for pH, conductivity, Total dissolved solids, Chloride, Calcium and Magnesium hardness, Boron, Phosphate, Sulphate, Iron, Fluoride, Ammonia and Lead. Samples should also be tested for microbiological tests (Total and Feacal coliform)	Water samples collected and sent to certified laboratory for testing	Once (after completion of drilling)	MRF 10,800.00
Possible leakage of slurry from collection pits	Check the condition of the sealing hourly	During the drilling operation	n/a

Daily log sheets have to be maintained throughout the drilling process. The monitoring report has to be prepared after completion of drilling works and completion of borehole construction. The monitoring report for borehole construction shall be as follows (adopted from Borehole Drilling Guideline; EPA Sept 2011)

a) Name of the Island
b) Date of drilling
c) Reference number of borehole
d) GPS Co-ordinates of borehole (latitude / longitude)
e) Method of drilling
f) Diameter of borehole and depth
g) Description of strata drilled
h) Vertical water quality profile at 5 m intervals (E. Conductivity/Salinity)
i) Depth at which seawater is reached

j) Records of components and quantities used or added to the drilling fluid or air.
k) Water level at the start of each working day
l) Problems encountered during drilling
m) Details of installations in the borehole (if any)
n) Depth, size and description of well casing
o) Depth, size and description of well screens
p) Aquifer depth after completion of well
q) Borehole design and installation details (as built drawings)
r) Condition of the collection pit seal

12 Conclusion

The environmental impacts associated with the proposed project are considered minor to insignificant. This conclusion is based on the evaluation of various components of the proposed project, implementation methods discussed, findings of the existing environment and environmental components that are likely to be affected. The only environmental component which will be affected is impact to ground water. Since the duration of the impacts is short, the magnitude of impact is envisaged to be minor.

Therefore, with due consideration to the environmental components identified above and the extent of the project activities and their likely and predicted impacts identified, the consultant concludes that the project components and designs are feasible and appropriate mitigation measures have been considered to correct and minimize unfavorable environmental changes.

13 Acknowledgements

The consultant acknowledges the contribution provided by the team members in this report for the valuable contribution to the report and at the field. The consultant also acknowledges the assistance provided by Maldives Airports Company Limited (MACL) and Static company private limited.

CVs of team members are given below.

Curriculum Vitae

Position	Environmental Consultant
Name	Hussein Zahir
Date of Birth	10 February 1966
Nationality	Maldivian
Education	**Masters of Philosophy (MPhil)** in Coral Reef Ecology, University of Newcastle upon Tyne. Newcastle Upon Tyne, United Kingdom 2007 **Marine Biology B.Sc. (Hon),** University of Newcastle Upon Tyne. Newcastle Upon Tyne, United Kingdom, 1993-1996
Membership of Professional Associations	International Coral Reef Society (ICRS), Member Society for Conservation Biology (CSB), Member Baa atoll Biosphere Reserve Advisory Council, Member Registered EIA Consultant (04/07) EPA Maldives
Other Training	1990. Department of Marine Sciences. Chulalongkorn University, Bangkok, Thailand ***Workshop on Taxonomy of Soft Bottom Invertebrates (ASEAN-Australian Coastal Living Resources Project)*** 1991. Mc Master University, Hamilton, Ontario. Canada ***Training on Boring Sponges of Coral reefs in Maldives*** Turtle Specialist Group, Convention on the Conservation of Migratory Species of Wild Animal (CMS) and government of India, Bhubaneswar, India ***Workshop and Strategic Planning Session for the Conservation of Sea Turtles of the Northern Indian Ocean*** 1999. United Nations Environment Program. Environment for South Asia and Pacific, organized by SACEP and Ministry of Home Affairs, Housing and Environment ***National Training for State of the Environment and Data Collection and Reporting*** 1988. Marine Science Institute, University of Philippines ***Training Course on Coral Taxonomy***
Countries of Work Experience	Maldives

Languages

Name	SPEAKS	READS	WRITES
Dhivehi	MT	MT	MT

	English	Good	Good	Good

Employment Record

Government/Civil Service

From October 2011 to December 2014
Employer: Ministry of Housing and Environment, Male', Maldives.
Position: Coral Coordinator, CCTF Wetland Conservation and Coral Reef Monitoring (WCCRM) project funded by Climate Change Trust Fund (CCTF) administered by World Bank

From Nov 2007 to Dec 2010 (retired)
Employer: Marine Research Centre, Ministry of Fisheries Agriculture and Marine Resources, Male', Maldives.
Position: Senior Reef Ecologist/Assistant Director General

From Feb 2006 to October 2007
Employer: Marine Research Centre, Ministry of Fisheries Agriculture and Marine Resources, Male', Maldives.
Position: Reef biologist

From July 2001 to January 2006
Employer: Marine Research Centre, Ministry of Fisheries Agriculture and Marine Resources, Male', Maldives.
Position: Senior Research Officer

From July 1996 to July 2001
Employer: Marine Research Centre, Ministry of Fisheries Agriculture and Marine Resources, Male', Maldives.
Position: Research Officer

From 1988 to 1992
Employer: Marine Research Centre, Ministry of Fisheries Agriculture and Marine Resources, Male', Maldives.
Position: Biological Aid

From: 1986 to 1988
Employer: Marine Research Centre, Ministry of Fisheries Agriculture and Marine Resources, Male', Maldives.
Position: Trainee

From: June 2000 to Present
Employer: Land and Marine Environmental Resource Group of Pvt Ltd.
Position: Marine Biologist/ Environmental Consultant/Director

Detailed Tasks Assigned

Coral Reef Research and Management related projects

Name of assignment or project: *Maldives Environmental Management Project; sub component: Strengthening coral reef monitoring in the Maldives*

Year: 2008-2010
Location: Maldives
Client: Marine Research Centre, Ministry of Fisheries, Agriculture and Marine Resources
Positions held: National Coordinator/focal point
This project is a World Bank financed environmental education and management capacity building project among multi stakeholders in the country. The duration of the project is 2008-1013.

Responsibilities: Including Implementation and management of the program relevant to MRC. Specific target and output of the project include strengthening of existing coral reef monitoring program in the country with special focus on monitoring coral reef ecosystem health in the context of climate change impacts

Name of assignment or project: **Global Coral Reef Monitoring Network**

Year: 1997-2003
Location: Maldives
Client: Marine Research Centre, Ministry of Fisheries, Agriculture and Marine Resources
Main project features: Establishing and monitoring of coral reefs to assess the recovery processes after the 1998 bleaching and to monitor the temporal changes to the reef system.

Positions held: National Coordinator
Responsibilities: Responsibilities include implementation and management of the program activities in the country through the GCRMN Regional Node for South Asia Region in Sri Lanka. Responsibilities also include coordination and implementation of socioeconomic monitoring at designated pilot sites to assess the livelihood and their dependence on coral reef resources. Coordinating the establishment of the national coral reef database to share information at national, regional and global level is also part of the program of activities.

Name of assignment or project: *Coral Reef Degradation in the Indian Ocean (CORDIO) Program*

Location: Maldives
Client: Marine Research Centre, Ministry of Fisheries, Agriculture and Marine Resources.
Main project features: Bio-physical assessment of reef, ecological factors influencing coral reef recovery such as bio erosion, coral reproduction and larval recruitment has been the main focus of the studies.
Positions held: National Coordinator

Activities performed: implementation and management of the identified projects/studies funded by CORDIO. Currently involve biophysical studies designed to understand the reef

recovery processes after a severe disturbance in coral reefs.

Name of assignment or project: *Assessment of Damage to Coral reefs after the Asian Tsunami, 2004*

Location: Maldives
Client: Marine Research Centre, Ministry of Fisheries, Agriculture and Marine Resources.
Main project features: Biophysical assessment of reef, physical alteration to the reef environment due to tsunami and recommendations on restoration and management efforts.
Positions held: National Coordinator.
Activities performed: implementation and management of the identified projects/studies funded by CORDIO. Currently involve biophysical studies designed to understand the reef recovery processes after a severe disturbance in coral reefs.

Environmental Impact Assessments Reports and other studies

The following are a selected list of the projects I have been involved either as an environmental consultant of environmental specialist over 8 years as a locally registered environmental consultant. Dominant work experience is in Maldives with involvement in overseas projects such as Seychelles and Tokelau, all small island sates.

Name of assignment or project: *Hulhumale Second Phase Reclamation project EIA; addendum 1, 2 and 3.*

Year: 2015
Location: Hulhumale, Maldives
Client: Hulhumale Development Cooperation
Project features: *Additional information relevant to reclamation*
Positions held: EIA consultant
Responsibilities: lead consultant

Name of assignment or project: *Development of Training material for project staff on mainstreaming and increasing awareness on climate change adaptation and mitigation measures in tourism operation*

Year: 2015
Location: Maldives
Client: Ministry of Tourism, Maldives
Project features: *Mainstreaming and increasing awareness on climate change adaptation and mitigation measures in tourism operation*
Positions held: lead consultant
Responsibilities: Material development and presentation

Name of assignment or project: *Toolkit and training material for*

increasing awareness on climate change adaptation and mitigation material for tourism dependent community

Year: 2015
Location: Maldives
Client: Ministry of Tourism, Maldives
Project features: *Developing toolkit and training material for increasing awareness on climate change adaptation and mitigation*
Positions held: lead consultant
Responsibilities: Material development and presentation
Name of assignment or project: *Development of water supply and a sewerage system at Fuvahmulah*

Year: 2015
Location: Fuvahmulah, Gnaviyani atoll. Maldives
Client: Ministry of Environment and Energy, Maldives
Project features: setting upa water supply and a sewerage facility
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *Establishment of a tuna cold storage facility at Hulhumeedhoo, Addu City*

Year: 2015
Location: Hulhumeedhoo, Addu City Maldives
Client: Maldives Industrial Fisheries Company (MIFCO), Maldives
Project features: setting up a fish storage facility
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *Beach Nourishment and Coastal Protection works at Vela private Island*

Year: 2015
Location: N. Fushivelavaru
Client: Gladonia Maldives Pvt Ltd
Project features: Beach Nourishment and Coastal protection
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *Beach Nourishment and Coastal Protection works at a private land at Praslin, Seychelles.*

Year: 2014
Location: Praslin, Seychelles
Client: Ahmed Didi

Project features: Beach Nourishment and Coastal protection at Praslin, Seychelles
Positions held: Environmental Specialist
Responsibilities: Surveys and data collection and analysis of data related to the project and preparation of the report submitted to the client

Name of assignment or project: *1500 Housing Unit construction Project Maldives*

Year: 2014
Location: Huvahmulah, Gadhdhoo, Hoadedhdhoo, Hithadhoo, Holhudhoo, Madaveli, Thinadhoo, Maldives
Client: Ministry of Housing and Infrastructutre
Project features: construction of Housing Units at the specified Islands
Positions held: EIA Cnsusultant
Responsibilities: Surveys and data collection and analysis of data related to the project and preparation of the EIA report

Name of assignment or project: *EIA report for Borehole construction at K. Dhoonidhoo*

Year: 2013
Location: K. Dhoonidhoo
Client: Maldives Police Service, Maldives
Project features: Construction of a 8 inch borehole at northern side of the island as RO plant feed water
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for Coastal modification at Robinson Club Maldives*

Year: 2013
Location: Ga. Funamaudua
Client: Robinson Club Maldives, Maldives
Project features: Coastal modification at the NW side of the island, construction of geo-bag revetment and harbor basin maintenance dredging works
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for construction of gravity type waste water collection system a ADh Omadhoo*

Year: 2013
Location: ADh Omadhoo

Client: ADh Omadhoo Island Council Office
Project features: construction of gravity type waste water collection system and sea outfall pumping system
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for upgrading of Maldive Gas Pvt Ltd Gas jetty*

Year: 2013
Location: Thilafushi
Client: Maldive Gas Pvt Ltd
Project features: Reconstruction of existing gas jetty head and expansion of jetty head
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for Borehole construction at K. Gulhi*

Year: 2013
Location: K. Gulhi
Client: STELCO, Maldives
Project features: Construction of a 8 inch borehole at Powerhouse premise for sourcing feed water for Distillation unit
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for Resort development at GDh Havvoda*

Year: 2013
Location: GDh Havvoda
Client: Crystal Plaza Pvt Ltd, Maldives
Project features: Construction of a resort hotel and all the related amenities
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for Coastal protection, coastal modification, beach nourishment, coral nursery setup and entrance channel maintenance dredging work*

Year: 2013

Location: Gili Lankanfushi
Client: Gililankanfushi, Maldives
Project features: Coastal protection, coastal modification, beach nourishment, coral nursery setup and entrance channel maintenance dredging work
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for Harbor development project at Dh.Maaenboodhoo*

Year: 2013
Location: Dh Maaenboodhoo
Client: Ministry of Housing and Infrastructure, Maldives
Project features: Development of harbor facility (dredging of harbor basin, construction of wharfs and breakwater
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *1st Addendum for restoration of AA Mathiveri Harbor under Tsunami restoration program*

Year: 2013
Location: AA Mathiveri
Client: Ministry of Housing and Infrastructure, Maldives
Project features: Updraging of AA Mathiveri harbor facility, including reconstruction of wharf, construction of breakwater and expansion of harbor basin
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Maritime Transport Master Plan (MTMP)
Year: 2012
Location: Maldives
Client: Ministry of Transport and Communication
Project features: Development of maritime transport strategies including development of various infrastructures
Positions held: Environmental specialist (local)
Responsibilities: advice and prepare environmental component of the master plan with identification of various impacts and their significance from various projects outlined in the Master Plan.

Name of assignment or project: *EIA report for Resort development at R. Kudakurathu*

Year: 2012

Location: R. Kudakurathu
Client: Kudakurathu Island Pvt Ltd, Maldives
Project features: Construction of a resort hotel and all the related amenities
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for Resort development at Vadinolhu*

Year: 2012
Location: L.Vadinolhu
Client: Muiri Pvt Ltd, Maldives
Project features: Construction of a resort hotel and all the related amenities
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for Development of Domestic Airport Facility*

Year: 2012
Location: Th. Thimarafushi
Client: Maldives Airports Company Limited, Maldives
Project features: Construction of runway apron
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for Resort development at R. Furaveri*

Year: 2012
Location: R. Furaveri
Client: Ahmed Ibrahim Didi, M. Niyaz Villa, Maldives
Project features: Construction of a resort hotel and all the related amenities
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for Wharf reconstruction and upgrading of existing berthing facility and slipway*

Year: 2012
Location: Thilafushi

Client: Fuel Supply Maldives Pvt Ltd
Project features: Reconstruction of wharf and upgrading of existing berthing facility and slipway
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for Flood mitigation and reclamation work at Fareshmaathoda*

Year: 2012
Location: GDh Fareshmaathoda
Client: United Nations Office for Project Services (UNOPS)
Project features: Construction of breakwater and reclamation of land
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for Resort development at B. Kanifinolhu*

Year: 2012
Location: B. Kanifinolhu
Client: Coastline Hotels and Resorts Pvt Ltd, Maldives
Project features: Construction of a resort hotel and all the related amenities
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for Sand filled deck construction at Bandos Island Resort and Spa*

Year: 2012
Location: K. Bandos Island Resort and Spa
Client: Bandos Island Resort and Spa, Maldives
Project features: Construction of a sand deck at the southern side of Bandos
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for Borehole construction at Cyprea Mrine Food Fish Factory*
Year: 2012
Location: K. Himafushi
Client: Cyprea Marine Food Pvt Ltd, Maldives

Project features: Construction of a 8 inch borehole at factory premise
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *Environmental and Social Impact Assessment for the proposed North Regional Waste management Facility at Vandhoo, Raa atoll, Maldives*

Year: 2012
Location: Vandhoo, Maldives
Client: Ministry of Environment and Energy, Maldives
Project features: Design and construction of a waste management facility including a modern incinerator, waste collection and transport system to dispose majority of the waste from all inhabited island and resorts in Ra, Baa, Noonu and Lhaviyani.
Positions held: Deputy Team Leader/EIA Consultant, for the main contractor, NIRAS, Denmark
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *Environmental Impact Assessment for the proposed water supply and sewerage disposal system at Gaafaru, Maldives*

Year: 2012
Location: Gaafaru, Maldives
Client: Sim Mohamed Ibrahim, Maldives
Project features: Design and construction of sewerage disposal and water supply system
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *Environmental Impact Assessment for the proposed water supply and sewerage disposal system at Holhudhoo, Maldives*

Year: 2012
Location: Holhudhoo, Maldives
Client: Muni Enterprises Pvt Ltd, Maldives
Project features: Design and construction of sewerage disposal and water supply system
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *Environmental Impact Assessment for the resort development at Finolhus, Maldives*

Year: 2011
Location: Finolhus, Maldives
Client: Coastline Hotels and Resorts Pvt Ltd, Maldives
Project features: Construction of a resort hotels and all the related amenities
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for resort development at K. Kudavilligili, Maldives*

Year: 2011
Location: Kudavilingili, Maldives
Client: Yacht Tours Pvt Ltd, Maldives
Project features: Construction of resort hotels and all the related amenities. In addition a large reclamation of the shoreline as additional land as part of the resort development is also part of the project.
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for development of city hotel, hospitility institute and resort development at Gasfinolhu and Bodufinolhu, L. Atoll*

Year: 2011
Location: Laam Gan, Bodufinolhu and Gasfinolhu, Maldives
Client: Premier Equities Pvt Ltd, Maldives
Project features: Construction of a resort hotel and required amenities including a training hotel for hospitality industry
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and features of the resort and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *EIA report for Dhiraagu domestic submarine cable network (DDSN*

Year: 2010
Location: 6 Location in the Maldives
Client: Dhiraagu Pvt Ltd, Maldives
Project features: Deployment of submarine cables to the strategic location in the Maldives
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the cable layout and baseline environmental

condition and preparation of the EIA report.

Name of assignment or project: *Environmental Impact Assessment for the proposed Coastal modification of Alimatha Resort*

Year: 2010
Location: Alimatha Resort, Maldives
Client: Safari Tours Pvt Ltd, Maldives
Project features: Design and construction of coastal protection structures on the eastside of the shoreline
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis of data related to the design and baseline environmental condition and preparation of the EIA report.

Name of assignment or project: *Environmental Impact Assessment Report for the constructing of Harbors at Rasdhoo and Milandhoo*

Year: 2010
Location: Maldives, Sh. Milandhoo and AA. Rasdhoo
Client: GX Associated Pvt Ltd, Maldives
Project features: Small scale harbour design and construction for the community.
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis for Environmental Impact Assessment Reporting. Preparation and submission of the Environmental Impact Assessment Report

Name of assignment or project: *Wastewater collection and disposal systems in Utheemu*

Year: 2009
Location: Ha Alif Utheemu
Client: Al Habshi of Kuwait
Project features: Design and construction of wastewater disposal system
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis for Environmental Impact Assessment Reporting. Preparation and submission of the Environmental Impact Assessment Report.

Name of assignment or project: *Environmental Impact Assessment Report for the constructing of Harbour at Kuburudhoo*

Year: 2009
Location: Adh. Kuburudhoo
Client: Maldives Contracting Company Plc.
Project features: Small scale harbour design and construction for the community
Positions held: EIA Specialist

Responsibilities: Surveys and data collection and analysis for Environmental Impact Assessment Reporting. Preparation and submission of the Environmental Impact Assessment Report.

Name of assignment or project: *Environmental Impact Assessment Report for the constructing of Harbour at Thoddu*

Year: 2009
Location: AA. Thoddoo
Client: Maldives Contracting Company Plc, Maldives
Project features: Small scale harbour design and construction for the community
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis for Environmental Impact Assessment Reporting. Preparation and submission of the Environmental Impact Assessment Report.

Name of assignment or project*: Initial Environmental Impact Assessment Report for the constructing of Harbour entrance at Eydhafushi*

Year: 2009
Location: Ba. Eydhafushi
Client: Heavy Force Pvt Ltd, Maldives
Project features: Design and Construction of harbour channel Entrance.
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis for Environmental Impact Assessment Reporting. Preparation and submission of the Environmental Impact Assessment Report.

Name of assignment or project: *Environmental Impact Assessment Report for Resort development at Naagoashi*

Year: 2009
Location: Haa Dhaal Naagoashi, Maldives
Client: GX Associates Pvt Ltd, Maldives
Project features: Design and construction of all the infrastructures related to the island resort hotel
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis for Environmental Impact Assessment Reporting. Preparation and submission of the Environmental Impact Assessment Report.

Name of assignment or project*: Environmental Impact Assessment Report for Resort development at Vakkaru*

Year: 2009
Location: Baa Vakkaru Maldives
Client: GX Associates Pvt Ltd, Maldives
Project features: Design and construction of all the infrastructures related to the island resort hotel
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis for

Environmental Impact Assessment Reporting. Preparation and submission of the Environmental Impact Assessment Report.

Name of assignment or project: *Environmental Impact Assessment Report for the constructing of Harbours at Maafushi*

Year: 2009
Location: Kaaf. Maafushi
Client: GX Associated Pvt Ltd, Maldives
Project features: Small scale harbour design and construction for the community
Positions held: EIA Specialist
Responsibilities: Surveys and data collection and analysis for Environmental Impact Assessment Reporting. Preparation and submission of the Environmental Impact Assessment Report.

Name of assignment or project: *Environmental Impact assessment for Reethi Rah Resort Redevelopment*

Year: 2005
Location: Reethi Rah Resort, Maldives
Client: Kersner International, Hotel Group
Project features: The EIA report involves collection and assessment of baseline and secondary environmental data on marine and terrestrial environment of the project site. This is one of the largest reclamation projects for resort development and assessment of impact of dredging and reclamation on the coastal marine habitats was a major component of this study
Position Held: Marine Biologist

Name of assignment or project*: Marine Biodiversity assessment, Faafu atoll, Maldives*

Year: 2003
Location: Maldives, Faafu atoll
Client: Asian Development Bank
Project features: Marine Biodiversity Assessment, Faafu atoll, Maldives. ADB regional technical assistance for coastal and marine resource management and poverty reduction in South Asia (ADB RETA 5974). A project implemented by Ministry of Fisheries, Agriculture and Marine Resources.
Responsibilities: Assignment involved detailed preparation of marine biodiversity and coastal management issues with special reference to grouper fishery and resource management.
Position Held: Biodiversity/ Environmental Specialist

Name of assignment or project: *Environmental Impact Assessment Report for the development of Fish processing plant at Ha. Huvahandhoo*

Year: 2002
Location: Maldives
Client: Jausa Fishery Links, Maldives

Project features: Environmental impact assessment
Responsibilities: The EIA report involves collection and assessment of baseline and secondary environmental data both at the marine and terrestrial environment of the project site. It also involved a risk assessment and evaluation report. An environmental management plan was also developed as part of the EIA.
Position Held: Marine Biologist

Name of assignment or project: *Environmental Impact Assessment Report for Villa Hakatha at Thilafushi, Male Atoll.*

Year: 2001
Location: Malé atoll, Maldives
Client: Villa Hakatha, Maldives
Project features: The EIA report involves collection and assessment of baseline and secondary environmental data both at the marine and terrestrial environment of the project site. It also involved a risk assessment and evaluation report. An environmental management plan was also developed as part of the EIA.
Position held: Project biologist

Name of assignment or project: *Environmental Impact Assessment Study for the Resort Development at Baa. Landaagiraavaru*

Year:2000
Location: Baa. Landaagiraavaru, Maldives
Client: Club Mediterranee
Project features: The EIA study involved collection of oceanographic data, study of the beach environment, vegetation, reef quality and groundwater/seawater quality. The study examined the impacts of the development on the island and mitigation measures where appropriate. The study also forms the baseline data for future monitoring of the environmental changes due to the resort development
Position Held: Project Biologist

Name of assignment or project: *Environmental Statement for the proposed Channel dredging & associated Barrier Island at Sun Island Resort.*

Year: 2000
Location: Sun Island Resort Maldives
Client: Tekton Design Associates Pvt Ltd, Maldives
Project features: The study involved assessment of the potential environmental impacts on the coastal shoreline of the island and on to the reef environment within close proximity of the proposed project site.

Position Held: Project Biologist

Name of assignment or project*: Environmental Statement for the Proposed Redevelopment of Reethi Rah Resort*

Year: 2000
Location: K. Reethi Rah Resort, Maldives
Client: Reethi Rah Resort
Project features: The study involved assessment of the existing status of the islands environment and identification of potential environmental impact areas related to the proposed redevelopment plans. Formulation of an environmental monitoring plan that would enable the client to record the environmental changes that may be related to anthropogenic activities or natural.
Position Held: Project Biologist

Name of assignment or project: *Proposed Beach Nourishment at M. Medhufushi. An assessment of Environmental Design Parameters*

Year: 2000
Location: M. Medhufushi Maldives
Client: Vaaly Brothers Pvt Ltd, Maldives
Position Held: Project biologist
Project features: The study involved examination of the beach characteristics including the sediment properties, beach profiles. Identification of a borrow site by comparing the borrow sediment characteristics of the borrow site and the native beach sand.
Name of assignment or project: *Environmental Evaluation of Small Bore Sewer System (SBS) in Lh. Hinnavaru and K. Gulhi*

Year: 1999
Location: Lh. Hinnavaru & K. Gulhi, Maldives
Client: Maldives Water and Sanitation Authority
Project features: The study involved groundwater / seawater analysis for sewage pollution; reef surveys hydrographic / oceanographic surveys and survey of the slopes of the sewage lines.
Position Held: Project Environmental analyst

Name of assignment or project: *Assessment of Oil Contamination in Male Groundwater from Vehicle Garages and Petrol Stations*

Year: 1999
Location: Malé, Maldives
Client: Maldives Water and Sanitation Authority
Project features: The study involved groundwater analysis for oil contamination and assessment of general working conditions and practices in the Vehicle Garages and Petrol Stations in Male.
Position held: Project environmental analyst

Name of assignment or project: *Environmental Impact Statement for the Proposed Beach Protection Works at Nika Island Resort*

Year: 1999
Location: Malé, Maldives
Client: Nika Island Resort, Maldives
Project features: The project involved assessment of physical environmental conditions such as the wave, current sediment characteristics, bathymetry at the project site (Nika Island Resort). Assessment of the status of the reef at the project site and an evaluation of the possible impacts on the reef and the physical environment as a result of the proposed beach protection work.
Position Held: Project biologist

Name of assignment or project: *Environmental Monitoring of M. Medufushi Resort Development*

Year: 1999
Location: M. Medhufushi, Maldives
Client: Vally Brothers Pvt Ltd, Maldives
Project features: The monitoring programs involve periodic measurements of the beach profiles around the islands, reef quality surveys, groundwater/seawater analysis and environmental auditing
Position Held: Project biologist

Name of assignment or project: *Environmental Monitoring of R. Meedhupparu Resort Development*

Year: 1999
Location: R. Meedhupparu, Maldives
Client: Cowrie Investment Pvt Ltd, Maldives
Project features: The monitoring programs involve periodic measurements of the beach profiles around the islands, reef quality surveys, groundwater/seawater analysis and environmental auditing
Position Held: Project biologist

Name of assignment or project: *Environmental Impact Assessment for F. Filitheyo Resort Development*

Location: F. Filitheyo, Maldives
Year: 1998
Client: AAA & Trading Company, Maldives
Project Features: The EIA studies involved collection of oceanographic data, study of the beach environment, vegetation, reef quality and groundwater/seawater quality. These studies examined the impacts of the development on the island and mitigation measures where appropriate. The studies also forms the baseline data for future monitoring of the environmental changes due to the resort development.
Position Held: Project biologist.

Name of assignment or project: *Environmental Impact Assessment for Lh Madhiriguraidhoo Resort Development*

Year: 1997
Location: Lh. Madhiriguraidhoo, Maldives
Client: Guardian Agency Pvt Ltd, Maldives.
Project features: The EIA studies involved collection of oceanographic data, study of the beach environment, vegetation, reef quality and groundwater/seawater quality. These studies examined the impacts of the development on the island and mitigation measures where appropriate. The studies also form the baseline data for future monitoring of the environmental changes due to the resort development.
Position Held: Marine biologist

Certification

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes qualifications, my experience, and me. I understand that any willful misstatement described herein may lead to my disqualification or dismissal, if engaged.

Hussein Zahir Date: 17 February 2016

Night Queen
Hithadhoo, Addu City
Contact Number: + (960) 778 2143
Email: hussein.zahir@lamer.com.mv

CURRICULUM VITAE

1.	**PROPOSED POSITION:**	Support Consultant
2.	**FIRM:**	LaMER Pvt.Ltd
3.	**NAME:**	Aishath Abdulla
4.	**DATE OF BIRTH:**	10th September 1986
5.	**NATIONALITY:**	Maldivian
6.	**PERSONAL ADDRESS:**	H.Regalge, MajeedheeMagu Male' Rep. of Maldives
7.	**EDUCATION:**	2012 M. Environment, Australia 2010 BA (Hons) in Urban and Regional Planning, Malaysia
8.	**OTHER TRAINING:**	
9.	**LANGUAGE AND DEGREE OF PROFICIENCY:**	English – Fluent Dhivehi – Mother tongue
10.	**MEMBERSHIP OF PROFESSIONAL SOCIETIES:**	
11.	**COUNTRIES OF WORK EXPERIENCE:**	Maldives, Malaysia
12.	**EMPLOYMENT RECORD:**	

February 2013- Present	Urban Planner LAMER Group Pte Ltd Male' Maldives
November 2010 – January 2011	Urban Planner/ Acting business development Manager Riyan Pte.Ltd Male' Maldives
May 2009 - July 2009	Trainee ANZ PLANNERS SDN. BHD Selangor Malaysia
August 2005 - October 2005	Surveyor Ministry of Fisheries and Agriculture Male' Maldives

	December 2003	Surveyor Ministry of Planning and National Development Male' Maldives
	May 2003-August 2003	Volunteer UNICEF Male' Maldives

13 DETAILED TASKS ASSIGNED:

WORK UNDERTAKEN THAT BEST ILLUSTRATES CAPABILITY TO HANDLE THE TASKS ASSIGNED:

Preparation of AA. Feridhoo Land use plan
Year : Ongoing
Client: Feridhoo Island Council
Position Held: Planner
Duties Rendered: Community Consultations, land use planning and reporting

Preparation of K. Himmafushi Land use plan
Year : Ongoing
Client: Himmafushi Island Council
Position Held: Planner
Duties Rendered: Community Consultations, land use planning and reporting

Developing a Handbook to Enhance the Capacity of Trainers to Increase the Resilience of People with Disabilities to DRR and CCA
Year : Ongoing
Client: National Disaster Management Center
Position Held: Consultant
Duties Rendered: Review and analyze existing; provide input in relevant stakeholder consultations; Preparation of the handbook

Tool Kit and Training Materials for Increasing Awareness on Climate Change Adaptation & Mitigation Measures in Tourism Sector (Kaaf, Alif Alif, Alif Dhaal, Baa & Lhaviyani Atoll)
Year : 2015
Client: Ministry of Tourism
Position Held: Project manager
Duties Rendered: Preparation of Materials, Conducting workshops

Tool Kit and Training Materials for Increasing Awareness on Climate Change Adaptation & Mitigation Measures in Tourism Sector (For Tourism Staff)
Year : 2015
Client: Ministry of Tourism
Position Held: Project manager
Duties Rendered: Preparation of Materials, Conducting workshops

Preparation of AA. Bodufolhudhoo Land use plan
Year : 2015
Client: Bodufolhudhoo Island Council
Position Held: Planner
Duties Rendered: Community Consultations, land use planning and reporting

Formulation of Coastal Protection Regulation, ICCRRIP Project
Client: Ministry of Environment & Energy
Position Held: Project Coordinator
Duties Rendered: Consultations, Input in formulation of Regulation and reporting

Situation Analysis for the formulation of Master Plan for sustainable fisheries (MASPLAN)
Year : 2015
Client: JICA
Position Held: Consultant
Duties Rendered: Community Consultations, Analysis and reporting

Preparation of AA. Mathiveri Land use plan
Year : 2014
Client: Mathiveri Island Council
Position Held: Planner
Duties Rendered: Community Consultations, land use planning and reporting

Development of a National Framework/plan on managing IDP's (internally displaced) persons/population caused by crises, emergencies and climate change
Year : May 2014 –Dec 2014
Client: UNDP/NDMC
Position Held: Team Leader
Duties Rendered: Overall project coordination and delivery

Preparation of Disaster Management Plan for a Guest House
Year : 2014
Client: Sea Side Lodge Guesthouse Manager, Hulhumale'
Position Held: Planner
Duties Rendered: Preparation of the disaster management plan according to the guidelines set by

Perceptions and understandings of climate change and migration survey (K.Guraidhoo and R.Dhuvaafaru) carried out by a Norwegian Research Institute
Year : 2013
Client: CICERO - Center for Climate and Environmental Research – Oslo ; Norwegian Academic Institution
Position Held: Local Consultant
Duties Rendered: Assisted (CICERO to carry out the household survey, focus group discussions and the key informant interviews

Review and Update the Detailed Island Risk Assessment in the Maldives prepared for HDh. Kulhudhuffushi and GDh. Thinadhoo
Year: 2013
Client: Ministry of Environment and Energy
Position Held: Social Planner/Project Coordinator
Duties Rendered: Review all relevant documents related to DIRAM study, study the social aspects impacting the risks of the islands and overall management of the project.

Preparation of Heritage Action Plan and Preliminary Inventory
Year: 2011
Client: Department of National Heritage
Position Held: Team Leader
Duties Rendered: Proposed action plan for the protection and safeguarding of national heritage. Prepared a preliminary inventory of the existing tangible and intangible heritage of Maldives

Preparation of Atoll and Island Development Plans for AA. Atoll
Year: 2011
Client: Secretariat of AA Atoll council
Position Held: Planner/ Project Manager
Duties: Manage and prepare the development plans

Reviewing the Third Tourism Master Plan 2005-2011
Year : 2011
Client: Ministry of Tourism Arts and Culture
Position Held: Planner/Project Coordinator
Duties Rendered: Provide input in planning perspective and also over all coordination of the project inclusive of conducting a workshop to present the findings

Integration of Climate Change Risk Resilience into Land Use Planning
Location: Maldives
Year: 2011
Client: Ministry of Housing and Environment
Position Held: Planner/Project Coordinator
Duties Rendered: Provide input in planning perspective and also over all coordination of the project inclusive of conducting a workshop to present the findings

Preparation of a detailed Layout Plan for Tourism Zone (Asseyri Project)
Year :2011
Client: Ministry of Tourism Arts and Culture
Position Held: Planner/Project Coordinator
Duties Rendered: Provide input in planning perspective through preparing the layout plan and also over all coordination of the project inclusive of conducting a workshop to present the findings

Appraisal of Hithadhoo Regional Hospital Development
Location: S. Hithadhoo, Maldives
Year :2010
Client: OPEC Fund for International Development (OFID)
Position Held: Socio Assessment Specialist/Project Coordinator

Duties Rendered: Overall Coordination of the project and carry out social Impact assessment study.

Mapping study of infrastructure and resources for Youth
Location:
Year : 2010
Client: UNDP
Position Held: Assistant project coordinator
Duties Rendered: Assisting in overall coordination of the project

***Draf RancanganTempatan* DAERAH KUALA LANGAT (*Draft Local Plan* for Kuala Langat District)**
Location: Kuala Langat, Selangor, Malaysia
Year :2009
Client: JPBD (Town and country planning department, Selangor)
Position Held: Support consultant
Duties Rendered: Assisting in the planning process including the report writing, consultations, preparing layout plans and 3D sketch-up models

Reviewing the Master Plan of Badra and Sweirra, Iraq
Location: Badra and Sweirra, Iraq
Year :2009
Client: City council, Badra and Sweirra
Position Held: Support consultant
Duties Rendered: Providing consultancy on the master plan. Reviewing the EIA and preparing SIA for the master plan of Badra and Sweirra

HELIPAD Development; PRINCE COURT Hospital
Location: Ampang, Kuala Lumpur, Malaysia
Year :2009
Client:
Position Held: Support Consultant
Duties Rendered: Reviewing the guidelines for HELIPAD development, preparing proposal presentations for the development.

Professional Referees

Name: Najfa Shaheem Raazee
Position: Project Manager of ICCRRIP Project
Email Address: najfa.raazee@environment.gov.mv

Name: Ilan Celman
Position: Former project manager for Perceptions and understandings of climate change and migration survey (K.Guraidhoo and R.Dhuvaafaru)
Email Address: ilan_kelman@hotmail.com

CERTIFICATION

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes me, my qualifications, and my experience. I understand that any willful misstatement described herein may lead to my disqualification or dismissal, if engaged.

Aishath Abdulla
19 January 2015
LaMer Group Pvt Ltd
3rd Floor, Azum, Ameenee Magu
Contact Number: + (960) 7987809 Email: aishath.abdulla@lamer.com.

References

Josimovic, B., Petric, J. and Milijic, S., 2014. The use of the Leopold Matrix in carrying out the EIA for windfarms in Serbia, Energy and Environment Research, 4(1), pp 43 – 54

Leopold, L. B., Clarke, F. E., Hanshaw, B. B. and Balsley, J. R., 1971.A procedure for evaluating

Environmental Impact. Geological Survey Circular 645.U.S. Geological Survey, Washington. 30 pp

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Appendices

Appendix 1 List of abbreviations

BUCG	Beijing Urban Construction Group
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
INIA	Ibrahim Nasir International Airport
MACL	Maldives Airports Company Limited
MEE	Ministry of Environment and Energy
RO	Reverse Osmosis

Appendix 2 Terms of Reference (ToR)

بسم الله الرحمن الرحيم

No: 203-EIARES/116/2016/5

Terms of Reference for Addendum 4 to the Environmental Impact Assessment for Reclamation and Expansion at Ibrahim Nasir International Airport, Hulhulhé, Kaafu Atoll

The following is the Terms of Reference (ToR) following the Scoping meeting held on **24th August 2016** for undertaking an addendum to EIA of the proposed construction of temporary water production facility and 2 boreholes for the Reclamation and Expansion project at Ibrahim Nasir International Airport at Hulhule'. The proponent of the project is **Maldives Airports Company Limited.**

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** – Describe the purpose and justification for the proposed components and, if applicable, the background information of the project/activity and the tasks already completed. Objectives of the development activities should be specific. Define the arrangements required for the environmental assessment 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. Identify the donors and the institutional arrangements relevant to this project.

2. **Study area** – Submit a minimumA3 size scaled plan and a location plan with indications of the proposed activities. Specify the agreed boundaries of the study area for the environmental impact assessment highlighting the proposed development location and size. The study area should include adjacent or remote areas, such as relevant developments and nearby environmentally sensitive sites. Relevant developments in the areas must also be addressed including residential areas, all economic ventures and cultural sites.

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

Task 1. Description of the Proposed Project - Provide description of the project, using maps and design schematics at appropriate scales where necessary. This shall various components of the project to include all the components associated with the borehole construction and Desalination facility components (RO plant details, pipeline network and storage tanks), description of work methodology, equipment, duration and execution of the various works associated with the construction. Method and location of disposal of drilling related waste such as sediments, water shall be provided. Method and location of brine discharge pipeline installation shall be provided. Also, methodology and details of decommissioning of the temporary desalination plants and boreholes need to be provided. (All inputs and outputs related to the proposed activities shall be justified).

Task 2. Description of the Environment - Assemble, evaluate and present baseline data on the relevant environmental characteristics of the study areas, including the following:

a) Physical environment: description of the project environment in terms physical characteristic of the site. This shall include general physical description of environmental components associated location of temporary desalination facility, borehole, and disposal of drilling mud. General description of the location where the borehole construction is proposed including general ground condition, presence of vegetation and requirement for vegetation clearance (if any) shall also be

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Green Building, 3rd Floor, HandhuvareeHingun
Male', Rep. of Maldives, 20392
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Fax: [+960] 333 5953

Email: secretariat@epa.gov.mv
Website: www.epa.gov.mv

given. Reference can be made to the original EIA report where relevant and provide descriptions related to proposed activities in this addendum.

b) Biological environment: Description of the environment where the drill waste would be disposed. Assessment of water quality shall be carried out during borehole construction. Specific guidelines for test parameters are to follow borehole drilling guidelines published by EPA. Physical parameters of seawater such as salinity, Electrical Conductivity, turbidity, pH shall be tested to establish baseline condition of the receiving water where appropriate (if drill mud is disposed on lagoon).

- Seawater quality of brine discharge location including salinity, Electrical Conductivity, turbidity and pH.

Task 3. Legislative and regulatory considerations – Identify the pertinent legislation, regulations and standards, and environmental policies that are relevant and applicable to the proposed project, and identify the appropriate authority jurisdictions that will specifically apply to the project. Identify whether any additional requirements are need to be met due to the proposed changes.

- This shall include borehole-drilling guidelines, Dewatering Regulations and other relevant guidelines applicable to the project.

Task 4. Determine the Potential Impacts of the Proposed Project-"Identify impacts related to the proposed project and its components in relation to their size, scale and duration. Distinguish between significant impacts that are positive and negative, direct and indirect (= triggering), and short and long term. Identify impacts that are cumulative, unavoidable or irreversible. Identify any information gaps and evaluate their importance for decision-making.

The methods used to identify the significance of the impacts shall be outlined. One or more of the following methods must be utilized in determining impacts; checklists, matrices, overlays, networks, expert systems and professional judgment. Justification must be provided to the selected methodologies. The report should outline the uncertainties in impact prediction and also outline all positive and negative/short and long-term impacts. Identify impacts that are cumulative and unavoidable.

Task 5. Analysis of Alternatives to the Proposed Project- Describe the alternatives examined for the proposed project that would achieve the same objective including the no action alternative. This shall include alternative design options, alternative location for the borehole, brine discharge etc.

Task 6. Mitigation and Management of Negative Impacts- Identify measures to minimize significant negative impacts associated proposed activities of the project. Mitigation and management of negative impacts shall be discussed in the context of the information and discussions provided in the project description (Task 1). Any additional impacts that may arise from the proposed activities shall be separately discussed.

Task 7. Development of a Monitoring Plan- Identify areas and issues requiring monitoring to ensure compliance to mitigation measures are identified. Provide impact management and monitoring plan during and after completion of the project giving emphasis on the impacts and their mitigation measures.

Task 8. Stakeholder Consultations- Consultations need to be made with the project contractor regarding the details and justification for the proposed activities.

Presentation- The environmental impact assessment report, to be presented in digital format, will 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 environmental assessment report will be organized according to, but not necessarily limited by, the outline given in the Environmental Impact Assessment Regulations, 2012 and its Amendments

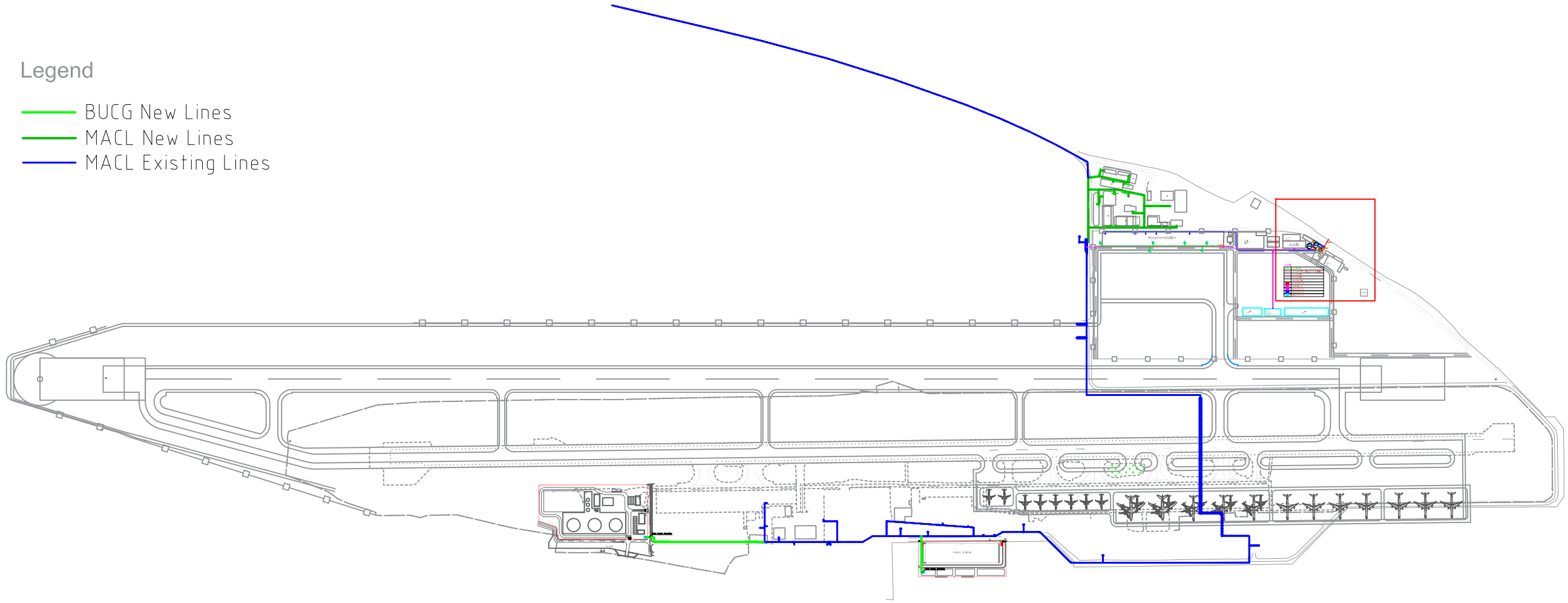
Timeframe for submitting the EIA report – The developer must submit the completed EIA report within 6 months from the date of this Term of Reference.

30th August 2016

Appendix 3 Site Plan

Legend

- BUCG New Lines
- MACL New Lines
- MACL Existing Lines



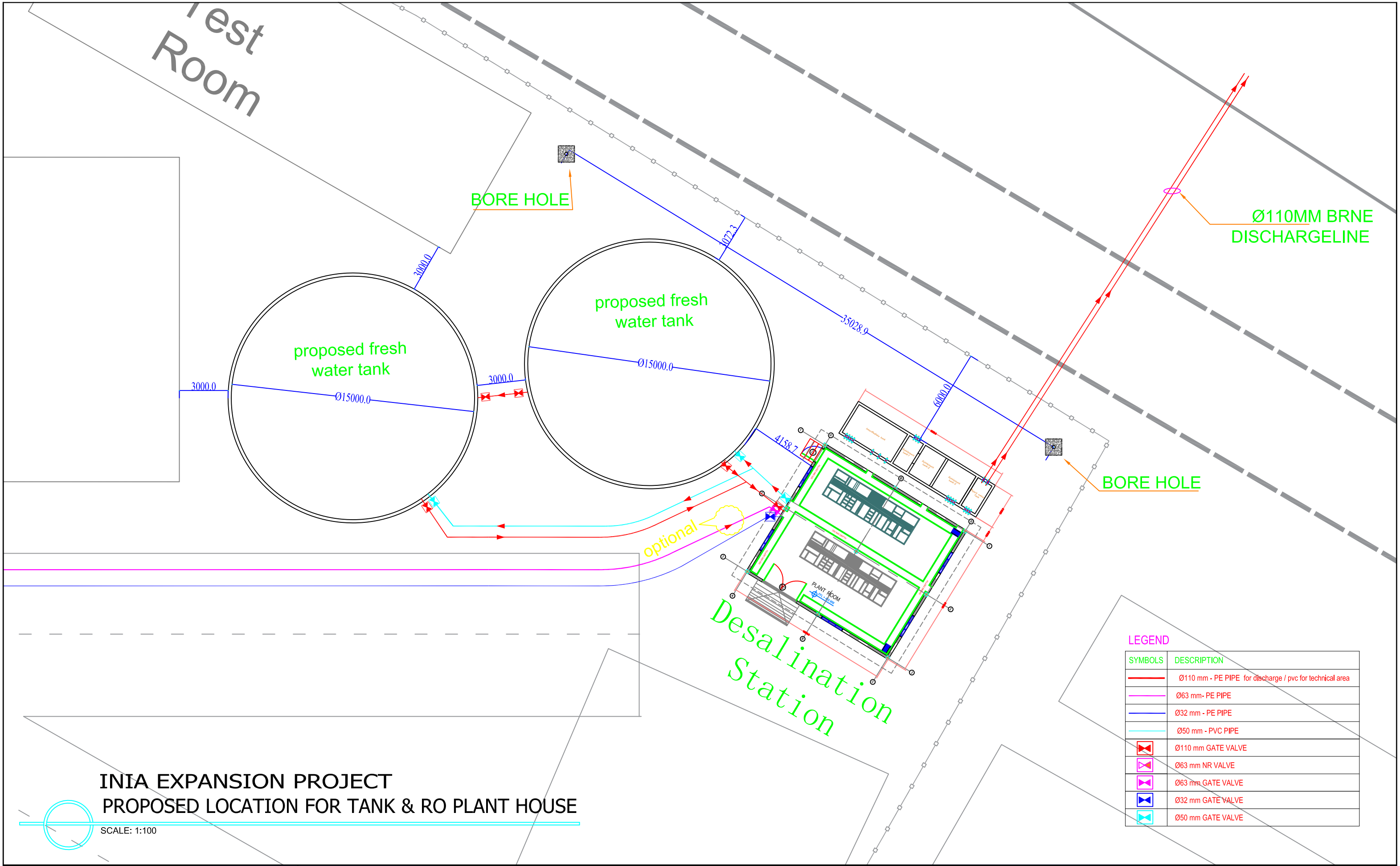
INIA EXPANSION PROJECT

PROPOSED LOCATION FOR TANK & RO PLANT HOUSE

SCALE: 1:100

Project Title	Client	Architecture	M&E Contractor	Drawing Title		
INIA EXPANSION PROJECT MALDIVES			STATIC COMPANY PRIVATE LIMITED M. HURAA, FAREEDEE MAGU, MALE 20256, REPUBLIC OF MALDIVES. TEL : +960-3310313 FAX: +960-3326405	PROPOSED RO PLANT HOUSE &TANK LOCATION INIA EXPANSION PROJECT	Prepared: Binu	Date: 19/07/2016
					Checked: HUSSAIN	Scale: N/A
					Approved:	Job No.: N/A
					File Path:	
					Dwg No.: STC-INIA-PSD-LCN-TNK- 01	Revision: R0

Rev.	Description	Date	Made By
R0	PROPOSED DESIGN	12/07/16	Binu



INIA EXPANSION PROJECT
PROPOSED LOCATION FOR TANK & RO PLANT HOUSE

SCALE: 1:100

Project Title	Client	Architecture	M&E Contractor				Drawing Title				
INIA EXPANSION PROJECT MALDIVES			STATIC COMPANY PRIVATE LIMITED M. HURAA, FAREEDEE MAGU, MALE 20256, REPUBLIC OF MALDIVES. TEL : +960-3310313 FAX: +960-3326405				PROPOSED RO PLANT HOUSE &TANK LOCATION INIA EXPANSION PROJECT	Prepared	Binu	Date	19/07/2016
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								STC-INIA-PSD-LCN-TNK- 01			R0
				R0	PROPOSED DESIGN	12/07/16	Binu				
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Appendix 4 Detailed work methodology and Project Schedule

Method Statement for Construction of Bore Hole

This procedure enumerates drilling, construction & development of bore well using hydraulic drilling rig, mud pump and compressor.

2 boreholes. 8 inch each.

METHOD OF DRILLING OF BORE HOLE :

1. Temporary Works:

Temporary light post will be fixed to illuminating working area.

The surrounding area will be barricaded to avoid unnecessary movement of workmen

2.Survey:

Land survey will be conducted to find out the exact location of the borehole as per engineering drawing.

3 Work Method

3.1 Location of the bore hole shall be worked out from the approved drawing and marked on the top of the existing ground profile. Drilling shall be carried out at these marked locations.

3.2 5m X 5m area surrounding the drilling location shall be cleaned before set up of drilling machine.

3.3 Two mud pit(1.0X0.5X0.5 M) shall be made by using shovel and spade in front of drilling location and connected each other by a drain and canvas lining shall be done to prevent fluid loss.

3.4 Drilling mud shall be prepared by mixing of bentonite with water with a proportion of 1:2 before 12 hours of starting of borehole. Thickness of the mud shall be controlled as per the strata encountered during drilling. It is better to use bentonite as less as possible to retain the natural condition of aquifer. If there is severe caving encountered during drilling through a particular stratum then 150 gm poly-anionic cellulosic polymer shall be used by mixing with 50 Kg bentonite and 100 liter water.

3.5 Drilling rig is placed on the drilling spot with proper platform and verticality alignment of the machine is done by using spirit label. During the whole drilling process this is checked frequently to maintain the verticality and alignment of borehole.

3.6 After attaching the mud pump and drilling machine with 50 mm hoses drilling shall be started with 250 mm reamer bit upto the loose formation or overburden and 200mm dia PVC casing will be placed inside hole. The depth of outer casing shall be decided as per geological strata encountered at site.

3.7 After placing of outer casing upto required depth drilling shall be continued with mud circulation, with the help of 200 mm drag & rock roller bit.

3.8 Soil samples shall be collected from return water from borehole at every 2 m interval or change of strata. Soil samples will be preserved in polythene bags marked with borehole number and depth and date of collection. Bore Log shall be prepared as per the sample received during drilling from different depth. Soil samples shall be sent to soil testing lab for grain size analysis.

3.9 After drilling is completed upto 30m depth hole shall be reamed again by using 200 mm dia reamer bit.

3.10 Flushing of borehole shall be carried out after completion and water sample shall be collected in a sterilized 1liter capacity bottle from outgoing water of borehole and sample shall be sent to chemical lab within a day for further testing as per specification. The following tests of water like pH, EC, Temperature, Taste, Odour & Colour shall be conducted at site and that report shall be submitted along with drill-log.

3.11 After reaming of the hole, 6m length(3mX2) 152 mm dia PVC screen pipe with bottom bail plug shall be placed inside the hole and threaded solid PVC casing pipe (152mm) shall be attached with the screen pipe & lowered one by one freely upto the depth of borehole. At least 50 cm of PVC casing shall be kept above the ground level of the borehole.

3.12 Daily Progress Report (DPR) shall be submitted regular basis. After completion of borehole drilling log along with stratification, ROP, casing details and water analysis at site shall be submitted. Laboratory Water & Soil Testing reports shall be provided after completion of the relevant tests.

4. METHOD OF CONSTRUCTION OF WELL:

4.1 With the help of 38 mm gravel feeding PVC pipe silica gravel shall be placed through the annular space between outer and inner PVC casings and the gravel shall make a layer surrounding inner PVC casing. Gravel feeding pipe shall be raised slowly till the gravel shall be filled upto 20 m from the bottom of the hole.

4.2 After that 3 m thick sand layer shall be placed above the gravel layer.

4.3 Outer casing shall be removed after placing the sand layer.

4.4 Bentonite clay layer of 2 m is placed over the sand layer. The bentonite clay layer shall be described as a seal between cement sand concrete layer and gravel pack.

4.3 Above bentonite clay seal, M25 grade concrete shall be placed upto the ground level i.e. 5m.Fine aggregate for use in the production of concrete shall be of river sand and for coarse aggregate shall be composed of crushed gravel of 20mm size and it shall be free from salt and other organic impurities. The mixture ratio of cement, sand & coarse aggregate is 1:2:3

4.4 DPR of construction of well shall be submitted in regular basis and after completion of well construction, diagram of the same shall be submitted.

5. METHODS OF DEVELOPMENT OF BOREWELL:

5.1 Development of bore well is essential in order to obtain an efficient and long lasting well. The purposes of well development are as follows:

a. To rectify the damage to the aquifer caused due to excavation of the borehole.

b. To increase the porosity and permeability of screened formation adjacent to the borehole.

c. To stabilize the formation/gravel pack around the screen so that the well will yield sand within permissible limits with water.

5.2 The methods of development of bore well are as follows:

a. Surging with air compressor: With the help of 12kg/sq.cm capacity compressor bore well shall be flushed. 25 mm flexible hose shall be attached with a 1m long hollow pipe and it is lowered in the hole. Now by attaching the other end of hose with compressor we release air to bore well and it will be flushed. After continuous flushing of 10 minutes air compressor shall be stopped for 5 minutes and then again flushing shall be carried out by same process for 8 hours.

b. Chemical Washing: After air flushing with compressor hole is washed with Sodium hexa-meta phosphate solution.

c. Bailing: A bailer is a 1m length, 76mm dia PVC pipe with a one way valve at the bottom. It shall be lowered into the well by tripod arrangement, till it fills with water and sediment. It shall be then pulled to the surface and emptied. This process shall be continued for 12 hours or till the sand content in water shall be negligible.

d. Back Washing: In this method with the help of a pump water lifting from bore well shall be started and frequently switch off and switch on the pump shall be carried out, so the water in the rise pipe fall back through the screen openings with pressure and clean it.

e. Over Pumping: In this method the well shall be pumped at a much larger rate continuously for an hour or until sand become negligible.

6. TESTING OF THE WELL:

6.1 By using the require capacity pump the yield shall be simply measured with the help of a 200 lit empty barrel and stopwatch. Time taken to fill up the 200 lit drum in second can be converted in cubic meter per hour. For accuracy of the reading the same procedure shall be conducted three times and then average of three stop watch reading shall be taken for calculation. Water sample shall also be collected before completion of the test for chemical and biological analysis.

6.2 Step draw down test shall be carried out with the help of required capacity pump or compressor, at least five steps of 60 minutes each. Discharge rates shall be fixed on the basis of 25%, 70%, 100%, 125% & 150% of required yield and drawdown will be measured by lowering measuring tape after every 1 hour.

6.3 Constant discharge pumping test shall be carried out with the help of required capacity submersible pump or compressor at 150% of design discharge for 12 hours .Drawdown shall be measured after every 1 hour by lowering a measuring tape.

6.4 On completion of constant discharge taste, 12 hours recovery test shall be carried out & water level should be measured for every one minute for first 1 hour and then every 5 minutes for the remaining hours.

6.5 All test reports shall be submitted in a tabular format after completion of all tests.

8. CAPPING OF BORE WELL:

8.1 After completion of yield test submersible pump is removed from the bore well and well shall be capped with threaded 10" PVC cap to protect it to fall any unwanted material inside.

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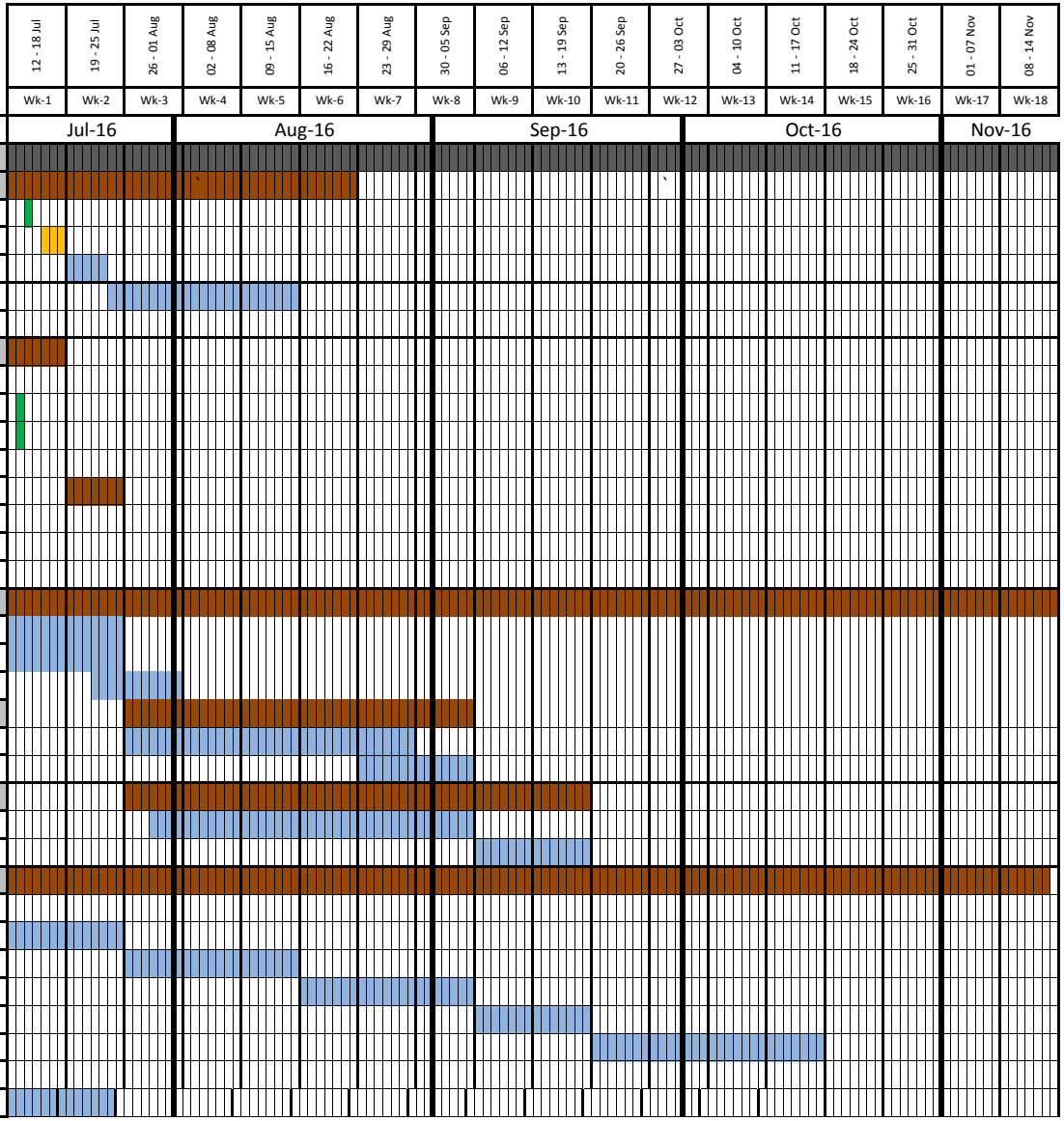
PROJECT: ***SUPPLYING, INSTALLATION, TESTING AND COMMISSIONING OF DESALINATION EQUIPMENT FOR EXPANSION & UPGRADING OF INIA PROJECT in Hulhule of Maldives***

Client: Beijing Urban Construction Group Co., Ltd
Contract No.: GJ-MDJC-QTZCHT-2016-005
Contract No.: GJ-MDJC-QTZCHT-2016-005-A1

Task Period
Task Completed
Task In Progress
Planned

Task #	Task Description	Reponsibility	# Days	Start	End
1	**Project Period**		126	12-Jul-16	15-Nov-16
2	**Prerequisite to start of work**		42	12-Jul-16	23-Aug-16
	Site Vist	Client / Static	1	14-Jul-16	14-Jul-16
	Plot Area drawings	Client	4	14-Jul-16	18-Jul-16
	Map Facilities on Plot	Static	4	19-Jul-16	23-Jul-16
	EIA Submission	Static / Client	40	12-Jul-16	21-Aug-16
	EIA Approval	**Government**			
3	**Proposed Drawings**		14	12-Jul-16	26-Jul-16
	Drawing Submissions to Client	Static	7	12-Jul-16	19-Jul-16
	a) RO Plant House		1	12-Jul-16	13-Jul-16
	b) Settlement Tank		1	12-Jul-16	13-Jul-16
	c) Bore Hole Foundation / hut		5	12-Jul-16	17-Jul-16
	Drawing Approval	Client	7	19-Jul-16	26-Jul-16
	a) RO Plant House		7	19-Jul-16	26-Jul-16
	b) Settlement Tank		7	19-Jul-16	26-Jul-16
	c) Bore Hole Foundation / hut		7	19-Jul-16	26-Jul-16
4	**Mobilization of Site Setup**				
	Staff Site Accomodation	Clinet			
	Site Office	Clinet			
	Site Store	Clinet			
5	**Settlement Tank**		42	26-Jul-16	06-Sep-16
	Constuction	Static	35	26-Jul-16	30-Aug-16
	Finishing Work	Static	14	23-Aug-16	06-Sep-16
6	**RO Plant House**		14	12-Jul-16	26-Jul-16
	Constuction	Client			
	Finishing Work	Client			
7	**RO - Plants**		125	12-Jul-16	14-Nov-16
	Ro Plant No.1 - 250 TPD	Static			
	Ordering of Materials		14	12-Jul-16	26-Jul-16
	Fabrication		21	26-Jul-16	16-Aug-16
	Asseblimg		21	16-Aug-16	06-Sep-16
	Delivary to Site		14	06-Sep-16	20-Sep-16
	Installation		28	20-Aug-16	17-Sep-16
	Ro Plant No.2 - 250 TPD	Static			
	Ordering of Materials		14	12-Jul-16	26-Jul-16



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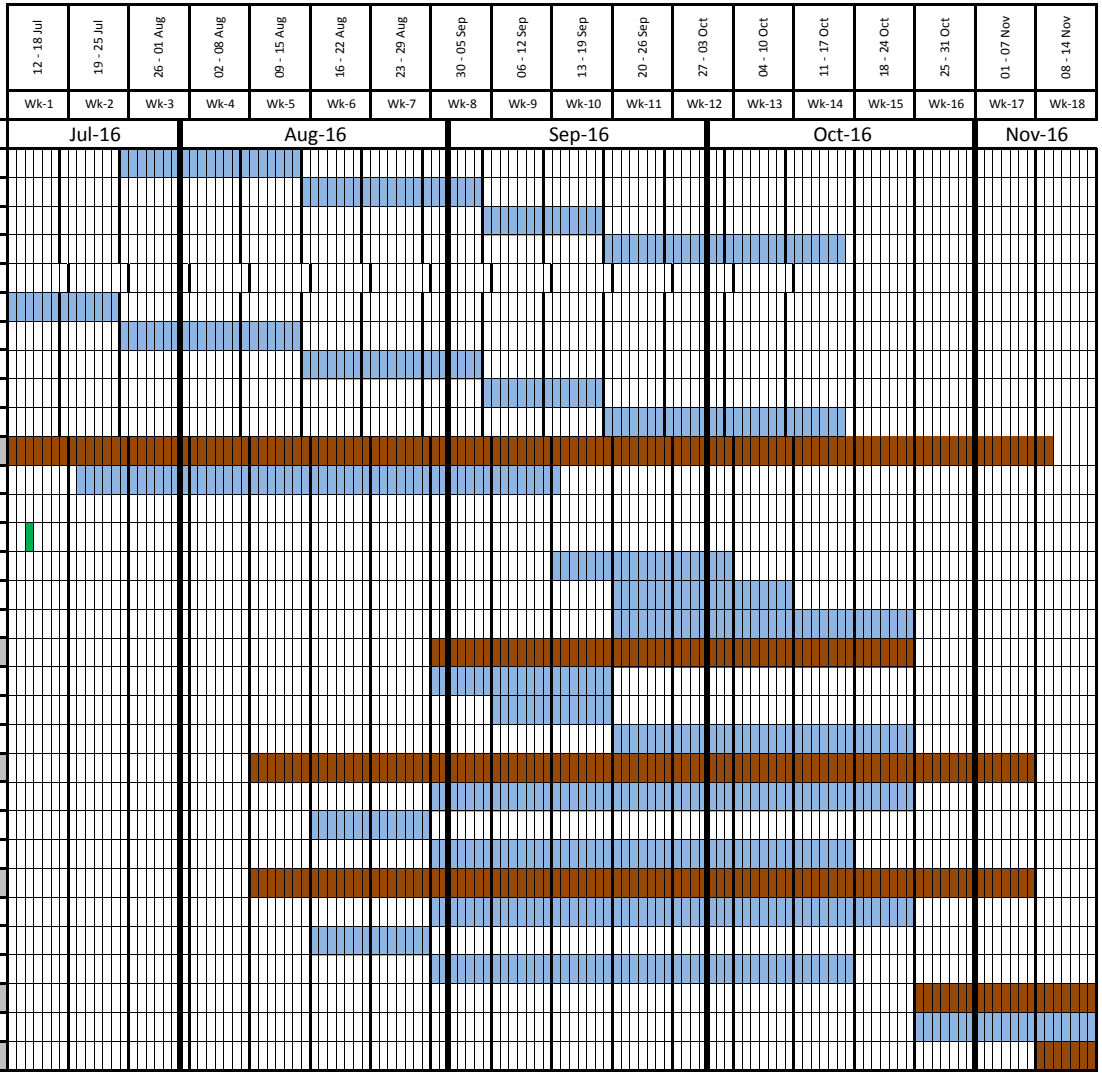
Client: Beijing Urban Construction Group Co., Ltd
Contract No.: GJ-MDJC-QTZCHT-2016-005
Contract No.: GJ-MDJC-QTZCHT-2016-005-A1

Task Period
Task Completed
Task In Progress
Planned

Task #	Task Description	Reponsibility	# Days	Start	End
	Fabrication		21	26-Jul-16	16-Aug-16
	Asseblimg		21	16-Aug-16	06-Sep-16
	Delivary to Site		14	06-Sep-16	20-Sep-16
	Installation		28	20-Aug-16	17-Sep-16
	Ro Plant No.3 - 12 TPD 2nd pass	Static			
	Ordering of Materials		14	12-Jul-16	26-Jul-16
	Fabrication		21	26-Jul-16	16-Aug-16
	Asseblimg		21	16-Aug-16	06-Sep-16
	Delivary to Site		14	06-Sep-16	20-Sep-16
	Installation		28	20-Aug-16	17-Sep-16
8	**GRP water Storage tank with Foundation- 500m3**		120	12-Jul-16	09-Nov-16
	Foundation	Static	55	20-Jul-16	13-Sep-16
	GRP Storage Tank	Static			
	Ordering		7	12-Jul-16	19-Jul-16
	Materials Shipmet - ETA - Male		7	12-Jul-16	19-Jul-16
	Delivary of Items To Site		14	12-Jul-16	26-Jul-16
	Asseblimg		28	12-Jul-16	09-Aug-16
9	**Fresh Water Pump system & 5000Lt tank**		54	30-Aug-16	23-Oct-16
	Fabrication		21	30-Aug-16	20-Sep-16
	Delivary to Site		14	06-Sep-16	20-Sep-16
	Installation of Fresh Water Booster System		35	20-Sep-16	25-Oct-16
10	**Fresh Water Networks**		91	09-Aug-16	08-Nov-16
	Excavation & Back Filling	Client	54	30-Aug-16	23-Oct-16
	Delivary of Items To Site	Static	14	16-Aug-16	30-Aug-16
	Installation of Main Pipes	Static	49	30-Aug-16	18-Oct-16
11	**Discharge Line and other ADHOC pipe lying**		91	09-Aug-16	08-Nov-16
	Excavation & Back Filling	Client	54	30-Aug-16	23-Oct-16
	Delivary of Items To Site	Static	14	16-Aug-16	30-Aug-16
	Installation of Main Pipes	Static	49	30-Aug-16	18-Oct-16
12	**Testing & Commissioning**		21	25-Oct-16	15-Nov-16
	Hand over of the Project		21	25-Oct-16	15-Nov-16
13	**Demobilization**		7	08-Nov-16	15-Nov-16



Appendix 5 Materials and Equipment List

Description	Description		Qty	Unit
Binding wire	Binding wire		130	Kilo
Blocks	Blocks		2800	Pcs
Cement	Cement		100	Bags
Galvanised Pipe 3"	3" GL Pipe	3"	5	Nos
Gutter	Gutter 8feet	8 feet	12	Nos
Hollow Section 2" x 1"	Hollow Section 2" x 1"	6mm	24	Nos
Hollow Section 3" x 2"	Hollow Section 3" x 2"	6mm	12	Nos
Nail 1-1/2"	Nail	11/2"	10	kilo
Nail 2-1/2"	Nail	2 1/2 "	6	kilo
Plywood 12mm	12 mm plywood		72	Pcs
Polythene Sheet	Polythene Sheet	350m	1	nos
Ridge Cap	Ridge Cap	8 feet	6	Nos
Roofing Sheet - Lysart	10' Sheet		36	Nos
Screw 1", Kochchey, for metal	Screw	1"	3	box
Screw 3"	Screw	3"	3	box
Screw 4"	Screw	4"	2	box
Steel Bar 10mm	Steel Bar	10mm	200	Pcs
Steel Bar 12mm	Steel Bar	12mm	2180	Pcs
Steel Bar 16mm	Steel Bar	16mm	250	Pcs
Steel Bar 6mm	Steel Bar	6mm	120	Pcs
Thaaru	Thaaru		7	Pcs
Timber 1-1/2" x 2"	Timber 11/2" x 2"		200	meter
Timber 2" x 2"	Timber 2" x 2"		1200	meter
Timber 2" x 3"	Timber 2" x 3"		350	meter

Appendix 6 Borehole Design