

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ



Ministry of National Planning and Infrastructure  
Male', Republic of Maldives.

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މާލެ، ރިޕްލިކް އޮފް މާލްދިވެހިރާއްޖެ

## TERMS OF REFERENCE

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### *Consultancy Services for Survey, Design & EIA works of Water Supply and Sewerage Facilities in 02 Islands and Water Supply Facilities in 04 Islands, Maldives – Package 3*

#### 1.1 INTRODUCTION

Ministry of National Planning and Infrastructure (MNPI) on behalf of the Government of Maldives is seeking the assistance of a qualified and competent consulting firm for developing survey, design and EIA works of **Water Supply and Sewerage Facilities in the Islands Lh.Olhuvelifushi and R. Fainu and Water Supply Facilities in B. Kamadhoo, B. Maalhos, R. Innamaadhoo and K. Himmafushi**, Maldives. The services include preparation of Preliminary Designs, EIA, Detailed Design, Technical Specifications and Bill of Quantities (BoQ) of the water supply and sewerage facilities.

#### 1.2 BACKGROUND

The Maldives consist of 1190 low-lying coral islands spread over an area of 90,000km<sup>2</sup> in the Indian Ocean. Nearly 200 islands are inhabited, around 90 islands are resorts, and the rest are uninhabited. There are 26 geographical atolls which are grouped into 20 administrative atolls.

A large part of the population in the Republic of Maldives lacks the access to safe drinking water and improved sanitation facilities. Rainwater is the main source of potable water in the inhabited islands but it is available only during rainy months of the year. This causes the island population to rely on groundwater for drinking and cooking during dry period, mainly through domestic wells.

Wastewater disposal systems in most of the islands are developed within the plot known as onsite disposal systems (septic tank and soak pits), with rare cases of offsite disposals (near shore outfalls). In densely populated island environments, the construction, operation and maintenance of these systems is complex, mainly due to the short distance between domestic wells and septic tanks/soak pits, and often suffer from poor performance due to various reasons which include the absence of or limited desludging. Some small bore sewer systems (SBSS) have been introduced, but they often malfunction, and usually convey raw sewage directly into the near shore lagoon.

Sanitation facilities are poorly designed and constructed, which results in the contamination of groundwater and lagoon with the sewage effluent.

The island communities have therefore been facing the problem of groundwater contamination due to improper sanitation and over-extraction of groundwater. For a number of years, population and development pressures have led to increasing groundwater extraction, resulting in the depletion of the freshwater lens in many densely populated islands, which in turn has led saline intrusion into the groundwater aquifer. Groundwater resources have also been at risk of bacterial contamination caused by effluent leakage and pollution migration from poorly constructed and maintained septic tanks.

### 1.2.1 Focus Islands

PACKAGE	ISLAND	Land Area (Ha)	Population (Census 2014)	SEWERAGE SYSTEM	WATER SUPPLY
Package 3	1. Lh. Olhuvelifushi	24.87 ha	521	✓	✓
	2. R. Fainu	58.76 ha	318	✓	✓
	3. B. Kamadhoo	20.32 ha	495	-	✓
	4. B. Maalhos	25.22 ha	484	-	✓
	5. R. Innamaadhoo	34.16 ha	577	-	✓
	6. K. Himmafushi	42.60 ha	1725	-	✓

## 1.3 SCOPE OF WORKS

### Phase A1: Data collection – Complementary Diagnosis

First of all, it is necessary to carry out investigations to adjust the works program on the different islands. This means:

- Establishment of Permanent Survey Marks (PSM) as per Maldives Land Survey Authority (MLSA) Guidelines, and registering the PSMs with MLSA.
- Performing topographic surveys of the island. The survey should include plot level maps with, public buildings, significant trees, electrical distribution boxes and any vegetation areas clearly marked. The survey should be aligned to any existing land use plans indicating any plots given for future development. Elevation of roads are to be taken at every 10m interval from center of the road. General indication of road levels and household levels (inside the plot) should be provided in the map. Details of ground levels at proposed facilities (Desalinated Water Storage and Rainwater Catchment Storage) for primary and secondary locations should be taken.

- Performing marine investigation and bathymetry survey for the siting of the brine outfall structures in the proposed primary location and secondary location such that the final location is acceptable in environmental terms.
- Carrying out the geotechnical investigations at Water Treatment Plant facilities. Geotechnical investigation should be limited to soil test pits excavated to a depth of 1 m. Soil profile, soil condition should be provided, and recommendations for any ground improvements if necessary should be proposed
- Carrying out community consultation, stakeholder consultations (Island Council, Utility Service Providers, NGOs, Telecommunication service providers)
- Consolidate available information on existing buried utilities and provide indicative maps.
- Collection of demographic data related to the project. This should include existing population data as per both island council register and published census records, household data, etc.
- Collection of data related to power supply system of the island including the power generation capacity, transformers, available loads from distribution boxes etc.
- Collecting Data of the current status of the roof catchment area, water storage capacity of both private and community buildings.

The Consultants will collect existing data and carry out the necessary investigations to ensure that sufficient information is available to clarify uncertainty regarding the technical choices to be made. In his methodology, the consultant will precise his data acquisition methods:

- area covered by the investigations;
- duration and degree of accuracy of the measurements to be carried out;
- Members of staff in charge of interpreting the data collected.

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### **Requirements for Preliminary/Concept Design Report**

The report shall address the following, but not limited to:

1. A description of the island

It should include physical and geographical attribute of the area, Numbers of registered households and future projections, size and distribution of population, potential population growth indicators, projections etc:

2. Consultation with the Community

Description of the consultation with the island council, utility company and the community (meeting minutes shall be attached with the report);

3. Description of the existing systems,

A brief description of the existing water supply facilities (household and community level) in the island, general ground water quality, island topography and geotechnical investigations carried

4. Description of the proposed systems (Water Supply System) *as per requirement of the island.*

- A brief description of the proposed systems (minimum three) including a flow chart
- Discuss all possible options of developing an integrated water supply system in a way that each component can be constructed separately with integration of the whole system at the final stage, i.e. Community Rainwater Harvesting System, Reverse Osmosis Plant and Water Supply Network including Household Connections. The water supply network should be design in light of EPA Water Supply Guidelines. Design Consultants shall establish the overall footprint of the reverse osmosis facility and community rainwater collection and distribution system.
- Cost benefit analysis for proposed system in terms of capital cost and operational cost.
- A brief description on the type of water treatment facility proposed including land area requirement the systems. .
- Recommended IWRM system for the island.

5. Description of the proposed systems (Sewerage System) *as per requirement of the island.*

- The Gravity Sewer System should be provided with the following components

- Gravity Network/Catchment:

- Each Household should be provided with 315-400mm dia Household catch pit, which will transfer the sewage through lateral connections (110mm dia) leading to sewer mains (160mm dia). Typical Drawings are provided as attachment.
- At starting point of each sewer main section Maintenance shaft (MS) or cleanouts (CO) can be used
- The sewer main should have a minimum cover of 600mm (From ground level to the top/crown of the pipe) at all starting MS
- The minimum slope for the sewer mains is 1:250 and is preferred to be maintained between 1:250 to 1:200.
- The maximum excavation depth for the sewer main is 2.5m.

- The network should have 600mm manholes at all junctions or at maximum intervals of 60m. The last manhole or the final manhole leading up to PS/LS could be provided as 1000mm dia.
  - The gravity network should cover the entire island (if approved or draft land use plans are available) and should facilitate the immediate implementation of selected catchments for the inhabited area of the island. The additional catchments required to cover the entire island should be designed to facilitate the phasing out of the works.
- Pump Stations (PS)/Lift Stations (LS):
- The Sewer mains will discharge sewage into lift Stations (LS)
  - The PS/LS should include, sump, valve chamber, vent structures and control panel
  - PS/LS should be provided for each gravity catchment with TWO submersible pumps controlled based on the level sensors/Float switches.
  - Based on the sewage levels within the PS/ LS sump, the pumps should operate automatically to discharge the sewer into pressure network.
  - Sewage Pumped into pressure network from lift stations located at each catchment should be discharged into outfall pump station or Sewage treatment Plants.
  - If there is no STP the sewage should be directly discharge to sea via sea outfall
  - The discharge will be directly into sea away from the reef edge and into a minimum depth of 6m.
  - The sea outfall should be protected with ballast block and diffusers at the discharge point should be provided.

#### 6. Land Allocation

- Land requirement for administrative building, Desalination Storage Facility and Community Rainwater Storage Facility, Desalination Treatment plant and any other facilities in the recommended systems including brine outfall should be identified and reported in design documents/drawings.
- Special/protected areas declared under the council or any written law (if any).

#### 7. Technology and other system Requirements of the Recommended system

- For the type of technology proposed, the region of the technology should be outlined ( Preference should be given for technology from the Asia region)
- Establish the electrical energy requirements of the project.
- Power requirements of the system any upgrades required based on the preliminary estimates for the proposed system
- Concept Drawings
- Overall sustainability of the system
- Spare parts and operation and maintenance requirements for the system.

## 8. Risk and Mitigation Measures

- Possible risk that could arise from the project
- Possible risk to other infrastructure of the island including any planned developments especially the road infrastructures.
- Actions to be taken by relevant stakeholders in mitigating the risks.

Note: Depending on the contractual arrangements, any additional contents requested by the client shall be included in the Preliminary design report.

### **Outputs of Phase A1**

#### **a. Part 1 of Phase A1 – Surveys and Investigations**

Report 1 will include: Topographic Survey, Bathymetry survey and Marine Investigation including Dispersion and Dilution Modelling ( for Outfall Location-Literature Based Analysis for Dispersion Factor of Marine Outfalls and Analyse Current Patters of the Area, of Brine Outfall sites for the water supply system design works and submission of Surveys/Investigation Reports

#### **b. Part 2 of Phase A1 – Preliminary/Concept Design Report**

- Report 2 will include at least but not limited to the information provided above listed requirements.

### **Phase A2: Environmental Impact Assessment (EIA)**

**This shall include carrying out of Environmental Impact Assessment** of all solution in the light of EPA Standard Guidelines, rules and regulations. The assignment includes but not necessarily limited to the following tasks;

- Undertake the application process for the EIA works of the assignment
- Undertake the scoping or screening wherever applicable for the assignment
- Undertake field data collection survey and develop the EIA report as per the approved Terms of Reference by EPA after the scoping meeting
- Submit the final EIA Report to EPA and get approval/decision statement
- Undertake submission and provide any clarifications where as necessary to the submitted EIA
- Accommodate any request by EPA for any additional information regarding the submitted EIA report.
- Conduct Environmental Monitoring and Reporting as per approved EIA Report by EPA for the Construction Phase Only
- Develop Environmental Monitoring and Reporting Formats for Post Construction Phase.

It is the responsibility of the consultancy firm to expedite the process of EIA application submission, follow up on scoping meeting, draft TOR submission, and follow up on TOR approval, obtain and address the queries made by the EIA reviewers and follow up on the EIA review and approval process.

### **Output of Phase A2**

All requisite documents/Reports and conduction of meetings/interaction with Island People etc. as recommend by EPA Guidelines

### **Phase A3: Detailed Design**

The third stage will concern detailed design of the selected solution for each island

The Detailed Design Report shall contain two parts:

**Part 1 (Detail Design, Drawings and Layouts)** All drawings will show clearly defined contract limits relating to the various divisions of works. Drawings will include general arrangement drawings, sections, elevation, typical details and typical reinforcement detailed. In addition, detailed reinforcement drawings and bar schedules will be included in the tender documents. Drawings for mechanical and electrical equipment will show main outlines and leading dimensions in sufficient details for the manufacturers to design the adequate equipment.

**Part 2 (Main report)** will include: The detail design report should be in accordance with EPA guidelines. (Design Criteria and Technical Specification for Water treatment Supply system and Conventional Gravity Sewerage System).

**Part 3 (Technical Specifications)** will include Technical Specifications and Schedules. Technical Specification will be prepared for all items to be constructed, supplied or erected. Materials and work specifications will cover all aspects of materials and equipment to be provided.

The Consultants will use local or national standards where possible. Where no suitable local or national standards exist then international standards such as BS, ASTM, ISO etc. will be used.

Where possible, the specification of materials (locally produced or imported) will be specified. Construction Schedules will be issued in details.

**Part 4 (Bill of Quantities)** will include a Bill of Quantities for each structure and then by type of works (earth, concrete, mechanical, electrical). The Consultants will here explain the unit costs as well as the percentage considered for miscellaneous and contingencies.

Bill of Quantities will be established separately for each island.

**Part 5 (Cost Estimate)** will show separate cost details for materials, transportation and logistics, machinery and equipment, labor costs including food and accommodation, and clearly indicate the tax portion and contractor's profit. The consultant shall indicate the method of

calculation of costs, and in the case of taxes and contractor's profit, if the amount is derived from the total costs, must clearly indicate the derivation in percentage.

Cost Estimate will be carried out on the basis of quantities and unit costs. The Consultants will keep this cost estimate confidential. The capital costs shall be derived from the Bill of Quantities and unit rates developed from recent tender for works in the MEE, using either unit prices or cost curves and indexed to inflation. The minor items will be estimated using historic current rates and prices prevailing in the Maldives islands.

For the mechanical and electrical equipment, cost estimates will be prepared based on recent experience of the cost of similar work and / or quotations from internationally recognized manufacturers and suppliers. The cost estimates will allow for transportation and erection on site, all out-site costs and off-site overheads.

Cost estimate must be established for each island separately.

**Outputs of Phase A3:**

Report will include the detailed design of the 'selected solution for each island including:

- Detail Design/Drawings and Layouts
- the Main Report;
- Technical Specifications and Schedules
- the Bill of Quantities;
- the Cost Estimates

**Phase A4: Construction Drawings**

Report 4 shall include preparation/submission of Construction Drawings of all Civil, Electrical/Mechanical and Instrumentation works items

**1.4 PROJECT TEAM**

The following staff members will be required for each package and should not be repeated in other packages that are applied.

<b>Post</b>	<b>No</b>
Project Manager (Team leader)	1
Civil Engineer/ Structural Engineer	1
EIA Specialist	1
Surveyor	2
Quantity Surveyor	1



## **1.5 QUALIFICATIONS OF THE DESIGN AND CONSULTANCY TEAM**

The Consultant should submit full CV's for each of the proposed staff members highlighting the criteria given below.

### ***a. Project Manager***

Minimum Bachelor's degree in Project Management or Environmental Management/Science or in a related field with minimum 10 years' experience in project management, along with specific experience in the field of Water Supply and Sewerage projects and Design Works such as buildings, resorts, water supply and sewerage works, coastal works, road projects etc. In addition should be able to monitor and check of materials and equipment's as per approval or acceptable specifications and standards. Tertiary certification will be an added advantage.

### ***b. Civil Engineer/ Structural Engineer***

Minimum Bachelor's degree in Civil/Environmental Engineering with minimum 05 years' experience along with Specific experiences in designing water supply and sewerage systems projects. In addition should be familiar with pumps and its operations under different applications. Tertiary certification will be an added advantage.

### ***c. EIA Specialist***

Minimum Bachelor's Degree in Environmental Engineering/ Environmental Science/ Environmental Management with minimum 5 years' experience in Environmental Impact Assessment (EIA) and specific experience in conducting EIA for Sewerage Systems will be given preference. Tertiary certification will be an added advantage. The consultant should hold a permanent EIA license and his/her EIA license copy shall be submitted along with a dated letter stating his/her association with the bidding party

### ***d. Quantity Surveyor***

Minimum Diploma in Surveying/ Civil Engineering with minimum 05 years' experience in conducting land surveys and experience in checking payment invoices/Variation Orders of civil/ Time Extension cases, of electrical and mechanical works of Building and other miscellaneous works specifically in the field of Water supply and sewerage works.

### ***e. Surveyor***

Minimum Diploma in Surveying/ Civil Engineering with minimum 05 years' experience in conducting land surveys and experience in checking payment invoices/Variation Orders of civil/ Time Extension cases, of electrical and mechanical works of Building and other miscellaneous works specifically in the field of Water supply and sewerage works.

## 1.6 SIMILAR ASSIGNMENTS

To be eligible for this assignment, the consultancy firm must demonstrate past experience in performing the services (description of similar assignments, Value of such assignments). The Firm shall have carried out a minimum of Four (4) similar assignments with a minimum contract value of MVR 1,000,000.00 each.

## 1.7 REPORTING REQUIREMENTS

The consultants should submit a Monthly report at the end of each month in a format agreed with the MNPI representative. At the end of each quarter a consolidated report summarizing the events of the months preceding shall be submitted in place of the monthly report.

Details	No. of Copies
Detail Map showing all survey results in AutoCAD format	-
Inception Report	2 hard copies + Soft copy
Preliminary Design Report as per Guidelines of MEE	2 hard copies + Soft copy
EIA report	Hard copies + Soft copy as EPA requirement
Detailed Design Report as per Design guidelines of EPA	3 hard Copies + 1 soft copy
Bill of quantities and Technical specifications	3 hard copies + 1 soft copy
Cost Estimates	1 soft copy

## 1.8 EQUIPMENT, LOGISTICS AND FACILITIES

The Consultants shall ensure that experts are adequately supported and equipped. In particular he/she shall ensure that there are sufficient administrative, computing and secretarial provision to enable experts to concentrate on their primary responsibilities. The Consultant shall meet the full costs for the supply of the teams including all travels, remuneration, insurance, emergency medical aid, facilities and all else necessary for the competent operation of the teams. The Consultants will provide their own office space for the Project team.

## 1.9 PAYMENT SCHEDULE

Payment schedule will be in accordance with the schedule specified below:

DESCRIPTION	ALLOCATION	REQUIREMENT
Advance Payment	15%	Advance Payment Bank Guarantee submitted within 30 days of receiving the Letter of Acceptance (15% of the value of the agreed Contract Price).
Phase I	20%	Upon submission of Preliminary Design Report
Phase II	40%	Upon Submission of Detailed Design, Drawings and Layout
Phase III	25%	Upon submission of the main report along with BOQ and Cost Estimates
<b>Total</b>	100%	
<p>Amortization of 15% will be deducted from each monthly invoice to recoup the advance payment</p> <p>Advance Payment will be paid upon Submission of Advance Payment Bank Guarantee</p>		

## 1.10 DELIVERABLES

The consultants shall submit the following reports

DESCRIPTION	TIME OF COMPLETION	NO. OF COPIES
Preliminary Design Report	2 months within awarding of the contract	2 hard copies + soft copy
EIA report as per EPA requirement	6 months within awarding of the contract	2 hard copies + soft copy
Detailed Design, Drawings and layouts as per Design guidelines of EPA	4 months within awarding of the contract	3 hard copies + 1 soft copy
The Main report	6 months within awarding of the contract	3 hard copies + 1 soft copy
Bill of Quantities and Technical Specifications	6 months within awarding of the contract	2 hard copies + 1 soft copy
Cost Estimates	6 months within awarding of the contract	2 hard copies + 1 soft copy

## 1.11 TECHNOLOGY TRANSFER

The Consultant shall consider the technology transfer as an important aspect of this project. The Consultant shall provide the opportunity to the staffs of the client to be involved in the working team of Consultants during the design phase of the project for their capacity development wherever possible. If requested by Clients staff, the Consultant shall brief and demonstrate the survey and design procedures.

## 1.12 DURATION OF THE ASSIGNMENT

All surveying, preparation and submission of design documents should be completed within **6 Months**.