TERMS OF REFERENCE

1.1 INTRODUCTION

The Government of the Republic of Maldives has received financing from the OPEC Fund for International Development (OFID), and intends to apply part of the proceeds for the following services: **Design and Supervision works for provision of water supply facilities in 04 (Four) Islands and sewerage facilities in 05 (Five) Islands.**

1.2 BACKGROUND

The Maldives consist of 1190 low-lying coral islands spread over an area of 90,000km2 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

ISLAND	SEWERAGE SYSTEM	WATER SUPPLY
B. Thulhaadhoo	✓	✓
N. Velidhoo	✓	✓
R. Hulhudhuhfaaru	✓	✓
Ga. Kolamaafushi	✓	✓
Gdh. Gahdhoo	✓	×

1.3 SCOPE OF WORKS

Phase IA: Data collection – Complementary Diagnosis

- Identifying suitable locations for the integrated water supply and sewerage facilities in collaboration with the respective island councils and relevant stakeholders.
- Collecting data of the current status of the roof catchment area, water storage capacity of both private and community buildings.
- Assess water needs, available resources, health risks and the capacity of existing systems
- Investigate current water supply and sewerage infrastructure and assess asset condition and capacity.
- Performing investigations for the siting of bore hole for raw water intake and for brine discharge
- Performing marine investigations for the siting of the sea outfall structures so that the final location is acceptable in environmental terms.
- Carrying topographic and other necessary survey required for the design of Water Supply and Sewerage facilities and collection zones in order to define the programme of works related to network construction for the respective island
- Carrying out the geotechnical investigations permitting detailed design of the facilities.
- Defining the construction methods to be used for the respective island, depending on transport and access.

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.

Outputs of Phase 1

Report I will include at least :

a. List of data collected and summary of relevant items enabling the solutions for;

   i. the collection, storage, treatment and supply of an integrated fresh water system including a Reverse Osmosis plant and rainwater harvesting schemes; and

   ii. the collection and treatment of waste water to be refined for each island

b. Description of measurements / investigations / analysis carried out in order to define the technical solutions and compare them

c. Technical and economic comparison of solutions technically based at feasibility level;

d. Topographic and geotechnical limiting factors affecting the construction of the planned facilities.

Phase IB: Environmental Impact Assessment (EIA)

The consultants shall undertake an environmental impact assessment according to the EIA regulations enforced by the Environmental Protection Agency (EPA), Maldives which will be availbale in the following link

http://epa.gov.mv/index.php?option=com_content&view=category&id=10&Itemid=20

Output of Phase IB :Report on Environmental Impact Appraisal (EIA) acceptable to EPA

Phase IC: Preliminary Design

The consultant will prepare preliminary designs based on Conventional Gravity System (CGS) with Waste Water Treatment Plant (WWTP) and Water supply system.

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

The Preliminary design report to be submitted by the proponent for water and sewerage projects may contain the following:-

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 proposed systems (Water /Sewerage)
   a) A brief description of the proposed system in the form of a flow chart
   b) A brief description on the type of treatment (if any).
   c) For water Supply projects, water storage capacity and the method of Post-treatment, water intake and Brine out fall location and brine outfall length should be mentioned in the report.
4. Land Allocation
   a) Land requirement for administrative building, Pumping stations, Treatment plant including sludge management (if any) should be identified and reported in drawings.
   b) Special/protected areas declared under the council or any written law should be identified (if any).
5. Technology
   - For the type of technology proposed, the region of the technology should be mentioned in the report. For ease of availability of spare parts, it is proposed to use the technology from the Asia region.

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

Phase II: Detailed Design

The second stage will be the preparation of detailed design of the selected solution for each island

The Consultants will take into account the Environmental Impact Study in his detailed design and will plan for the implementation of the mitigation measures as stated in the EIA and recommended by EPA.

The Detailed Design Report should be prepared according to the "Content of Detail Design Report for Water and sewerage Systems" prepared by EPA in Annex G.

Outputs of Phase II:

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

- Detail Design Report (with Detail Design Drawings as an annexure)
- Bill of Quantities
- Electrical Components

Final version of the Detailed Design will support preparation of the Tender Documents for the selection of contractors.

Phase III: Tender Documents & Selection of Contractors

Tender Documents

The Consultants will identify with MEE how many contractors are needed for works construction and will prepare tender documents accordingly including:

Volume 1: Tender and Administrative Documents

Volume 2: Technical Specifications and Schedules

Volume 3: Drawings and Layouts

Volume 1 will include at least the following:

- **Invitation to Tender;**
- **Description of the Works and Quantities;**

- **Instructions to Bidders;**
- **Conditions of Contract, Form of Tender (and Appendix);**
- **Bill of Quantities and Schedules;**
- **Form of Contract Agreement, Form of Tender Security, Form of Performance Security, Form of Guarantee for advance payment**

Conditions of Contract will be incorporated as the final legal agreement to be drawn up between the Contractor and the Client. The Conditions of Contract would be drawn up in close co-operation with the Client and would incorporate such special clauses as may be required.

Typically the Conditions of Contract will be based on the following:

- For Civil Engineering works: FIDIC 4th Edition, parts I and II for works of Civil Engineering Construction.
- For pumping stations: FIDIC 3rd Edition, part I and II, for Electrical and Mechanical works.

The **Bill of Quantities and Schedules** will be prepared for all the tender packages as a basis for tendering and for payment under the Contract. Civil Engineering Standard method of measurement shall be recommended wherever possible.

Volume 2 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.

Volume 3 will be based on part 3 of the detailed design. 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.

Selection of Contractors

The Consultants will assist the MEE (acting as the "Employer" in FIDIC terminology) in the selection of the Contractors. This assistance will be effective during the three principal stages of the Contract Procurement process. These stages are:

a) *The site visit and the pre-bid meeting*

The site visit for Contractors shall be organized not later than two to three weeks after the invitation to tender is issued, in order to speed up the tendering process, and to involve rapidly the Contractors interested in the preparation of tenders.

A pre-bid meeting shall be organized immediately after or before the site visit. Questions raised by the bidders could be then answered either immediately or later through additional documentation. The Consultants will assist in the preparation of pre-bid meeting and in the preparation of replies to questions.

b) *The evaluation of tenders:*

The evaluation of bids will be based on the tender documents and on predetermined criteria and will be conducted jointly by the MEE's Engineer (acting as Engineer in FIDIC terminology) and the Consultants (acting as "Engineer's Representative" in FIDIC terminology). After verification of conformity of the Bids to the tender documents, these Bids will be the subject to a technical and economic analysis, enabling them to be evaluated and ranked.

The Consultants will then compile all findings of the analysis in an evaluation report

c) The award of contracts

The objective is to assist the MEE in the award of the contracts, preparation of confirmed copies of contracts and determination of contracts' effective dates.

Outputs of Phase III:

Report III including the tender documents including:

- Volume 1: Administrative and tender documents;
- Volume 2: Technical specifications and schedule;
- Volume 3: Drawings and layouts

The evaluation report for selection of contractors Appropriate Contractors have been selected

Phase IV: Works Design, Coordination and Supervision

Construction Design

The purpose of this task is to finalize without any ambiguity the permanent works to be executed. The Consultant will prepare the Construction Design on the basis of the Detailed Design and tender documents, his own experience and international standards and practice. The Consultant will prepare construction drawings as the Contractual Documents which define the works to be carried out by the Contractor. They will include:

- **Construction drawings** for structural works: they will include the foundation drawings for permanent works.
- **Layout drawings** related to the electromechanical equipment to be incorporated into the structures: they will be the basis of the coordination of all equipment components up to their location and the design of circuits such as cables and pipes.

When the Contractor may propose a construction solution (or transfer documents from suppliers for equipment), the Consultant will examine and verify the related drawings and calculation notes, giving particular attention to the compliance with Specifications and design criteria. All responses to official exchanges between the Consultant and the Contractors should be issued within one week within reception of the documents.

Construction Supervision

The construction supervision phase of the project will be carried out during project implementation. Expected duration of the phase is 24 months.

The Consultants will implement Construction Supervision including:

a. **Coordination of works:** the Consultant will organize and direct execution of the works, by defining compliance with programmes and relations between stakeholders (MEE, Engineer, Contractors, Suppliers and third parties). Coordination will be ensured mainly by holding regular site meetings and general monthly meetings, with managers of the Contractors and Manufacturers, the MEE and the Engineer.

b. **Supervision of field surveys**: the Consultants will supervise the Contractors who should carry out field surveys such as topographic, hydro-geological and geological surveys. The Consultants will prepare technical reports on all measurements made by the Contractor and will submit them to the Engineer.

c. **Identifying Special Studies:** in case the Consultants during progress of work come to the conclusion that special studies would be required to assist the Project Management Unit (PMU) in specific problems unforeseeable before conclusion of consulting contract, he will

inform the Engineer immediately and early enough to allow the Employer to arrange for such expertise.

d. A **Quality Control and Quality Assurance Plan** will be developed by the Consultants to ensure that the structures are built and equipment installed in conformity with the Contractual Specifications, approved drawings, standards, good engineering practice and State-of-the-Art.

e. A **Plan for Project Cost Control** will be developed on the basis of the field survey control and quantity survey required for determination of actual quantities of work accomplished by the Contractor(s) and Supplier(s) under direct guidance of the Project Manager and Director, the Consultant will approve or reject the quantities of materials delivered, equipment erected, and works performed by the Contractor(s) and Manufacturer(s).

f. **Plan for Project Progress Control**: using the same basic data as those established for project cost control, a progress chart will be maintained and updated in the Consultant(s) office. The work progress will be followed by the Consultant especially during the weekly works meetings on sites. A monthly report of weekly meetings will be established by the Consultant.

g. **Representing the Engineer**: the Consultants shall be the Engineer's representative on site and shall perform all duties delegated by the Engineer in writing in accordance with FIDIC. The Engineer for the project will be appointed by the MEE in writing.

h. **General Reporting** to Government & OFID. The Consultants will assist the MEE in supplying information related to the design and works progress to Government and OFID.

Works commissioning

The Consultants will implement Works commissioning including:

i. Supervising the acceptance tests and preparing the **Completion Certificate** and the **Temporary Acceptance Certificate**.

j. Preparing the C**ompletion Report** which will be based on the record maintained during construction design and work supervision phases. It will include the environmental completion report which will be submitted to MEE for compliance with initial recommendations.

k. **Implement Shop Inspection of Electromechanical Equipment**: the Consultants will check the manufacturing of equipment and will attend tests of main items for acceptance as and when necessary. These tests concern mechanical tests and chemical analyses, routing tests and standard tests, dimensional checks and Non-destructive tests.

l. **Prepare 'As-Built Drawings'.** The Consultants will prepare 'As-Built Drawings' during construction of works. On completion of the Project, the Consultants will submit to the Employer two (2) complete sets of all detailed drawings and computations in accordance with revisions made during the construction.

m. **Prepare Operation and Maintenance Manuals**: Based on the information and booklets received from the Contractors, Manufacturers, Suppliers and his own experience, the Consultants will prepare the Operation and Maintenance Manuals. He will complete the Manuals with the O&M recommendations identified in Phase I.

Outputs of Phase IV:

- Construction drawings are issued as per the Construction Schedule.
- Contractors and Suppliers are properly supervised and coordinated.
- Quality Control and Quality Assurance Plans are issued.
- Various authorizations and instructions to the Contractor(s) and/or Manufacturer(s) being issued regularly.
- Plan for Project Cost Control update delivered monthly
- Plan for Project Progress Control update delivered monthly
- Works are temporarily commissioned, 'As Built Drawings' delivered and Operation & Maintenance Manuals issued.

Phase V: Capacity Building and Performance Control over Defect Liability Period

Capacity Building

The Consultant will provide on-the job training to the counterpart staff on all aspects of the work carried out. Selected counterpart staff from each island will be attached to the Consultant's team for on-the-job-training in surveying, detailed design and construction supervision. During construction stage the contractor will provide on-the-job training to the selected counterpart staff from the beginning of construction works.

After commissioning, the Consultant will organize a formal two weeks training for the operation and maintenance of the works rehabilitated or newly installed, followed by two weeks of practical exercises on sites.

Defect Liability of Contractors

The Consultant will carry out quarterly inspections during the one year defects liability period and instruct accordingly the contractors with regard to outstanding works and defects. After this period and satisfactory inspections, the Final Acceptance Certificate will be issued.

Defect Liability of the Consultants

The Engineer will be in charge of validating the result of the work of the Consultants against the targeted objectives. Any additional consultancy needed for corrective actions that may occur for reaching the objectives will be under the responsibility of the Consultant (unless these measures could not be identified at the detailed design stage or are not under the responsibility of the Consultants).

Outputs of Phase V:

- Key MEE staff are trained on the job and formerly;
- Defect liability of contractors has been controlled.

1.3.1 General Requirements

Coordination of works

The Consultant will monitor and report on the progress of the works liaising with MEE and the Contractors. Coordination will be ensured by holding regular site meetings and general monthly meetings, with managers of the Contractors and the MEE.

The Consultant shall establish a field office at each location for the adequate operation and management of the tasks specified.

The Consultants will supervise the Contractors throughout the design phase and completion of preliminary field surveys. The Consultants will prepare technical reports on all designs made by the Contractor and will submit them to the MEE.

Quality Control and Quality Assurance monitoring will be carried out by the Consultant to ensure that the structures are built and equipment installed in conformity with the Contractual Specifications, approved drawings, standards and good engineering practice.

A Plan for Project Cost Control will be developed on the basis of the field survey control and quantity survey required for determination of actual quantities of work accomplished by the

Contractor. The Consultant will approve or reject the quantities of materials delivered, equipment erected, and works performed by the Contractor.

A progress chart will be maintained and updated in the Consultants' office. The work progress will be followed by the Consultant especially during the weekly works meetings on sites. A monthly report of weekly meetings will be established by the Consultant and forwarded to the MEE.

The Consultant shall be the Employers Representative on site and shall perform all duties delegated by the Employer in writing in accordance with *FIDIC Conditions of Contract for Plant and Design-Build, First Edition, 1999.*

The Consultants will assist the MEE in supplying information related to the design and works progress to Government and OFID.

1.4 PROJECT TEAM

A total of 18 staff will be required and situated in the locations specified below;

Post	**No**
Project Manager (Team leader)	1
Civil engineer	2
Electro-Mechanical Engineer	2
EIA Specialist	1
Surveyor	2
Senior Engineer	5 (1 for each island)
Field Engineer	5 (1 for each island)

1.5 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.

1.6 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

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 Sewerage projects. Tertiary certification will be an added advantage.

b. Civil Engineer

Bachelor's degree in Civil/Environmental Engineering with minimum 05years' experience along with Specific experiences in designing sewerage systems. Tertiary certification will be an added advantage.

c. Electro-Mechanical Engineer

Bachelor's Degree in Electrical/Mechanical Engineering with minimum 05years' experience along with specific experience in designing Electro-Mechanical components of Water/Sewerage Facilities. Tertiary certification will be an added advantage.

d. EIA Specialist

Bachelor's Degree in Environmental Engineering/Environmental Science/Environmental Management with minimum 05years' experience in conducting Environmental Impact Assessment (EIA). Experience in conducting EIA for Sewerage Systems will be given preference. Tertiary certification will be an added advantage.

e. Surveyor

Diploma in Surveying with minimum 05years' experience in conducting land surveys

f. Senior engineer

The Senior Engineer shall have a Bachelor of Engineering or higher with a minimum of 10 years' experience in Construction Site Management and specifically 3 years as a senior project manager working on Sewerage Construction projects. The Senior Engineer should also have demonstrated experience in the use of dewatering techniques for construction in areas with high water tables and an understanding of the difficulties limitations and mitigation methods required to minimise the impacts of dewatering. The Senior Engineer shall be fluent in both written and spoken English with Divehi an advantage.

g. Field Engineer

The technical field Officer shall have a Bachelor of Engineering or similar degree with a minimum of 3 years' experience in Construction Site Management with at least 1 year experience in the construction of sewerage infrastructure projects. The Field Engineer shall be fluent in both written and spoken English with Divehi an advantage.

1.7 REPORTING REQUIREMENTS

The consultants should submit a Monthly report at the end of each month in a format agreed with the MEE 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.

A final report shall be produced 30 days following the issuance of the Performance Certificate to the Contractor engaged under the Design and Consultancy Contract.

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 is 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.

During works supervision, the Contractors will provide the Consultant with necessary transportation to all sites and office space with furniture, equipment and facilities (electricity, telephone etc.) for the execution of supervision activities as well as accommodation for Consultant's personnel. These facilities will be made available by the contractor to whom the works will be awarded. Such requirements shall be detailed in the bidding documents and then reflected in the civil works contract.

1.9 REMUNERATION

Remuneration 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).
Monthly payment	As per invoice	Submission of Monthly Report
		Submission of Invoice in the specified format
*Amortization of 15% will be deducted from each monthly invoice to recoup the Advance Payment. *10% retention will be deducted from each monthly invoice for Payment at completion of the project.		

Final Payment	10%	Upon submission of the project completion report following Issuance of Performance Certificate to the Contractor

1.10 DELIVERABLES

The consultants shall submit the following reports

- Detail map showing all survey results in AutoCAD format (if not available)
- Preliminary Design Report (2 hard copies + Soft copy)
- EIA report (Hard copies + Soft copy as per EPA requirement)
- Detailed Design Report (3 hard Copies + 1 soft copy) as per Design guidelines of EPA.
- Bill of quantities and Technical specifications
- Complete bid document
- Monthly report
- Quarterly report
- Final report

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. Tender assistance should be given to Client and NTB during tender, evaluation and award stage.

The period of total engagement will be 24 months commencing upon the signing of the contract agreement with the selected Consultant for the Design and Consultancy Works. Tentative schedule showing the engagement is shown below.

ITEM	MONTHS																							
	Design stage						Construction stage																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Data collection																								
Marine investigation																								
Surveying																								
Geotechnical investogations																								
EIA studies																								
Preliminary design																								
Detail design																								
Tendering																								
Evaluation and Award																								
Contract signing																								
Construction supervision																								