



**Ministry of Environment and Energy
Republic of Maldives**

TERMS OF REFERENCE

Design of Sewerage facilities in S.Feydhoo, S.Hulhumeedhoo, S.Maradhoofeydhoo, and S.Maradhoo , Maldives

1 Introduction

The Government of the Republic of Maldives has allocated funds for the development of Sewerage facilities in the Islands S.Feydhoo, S.Hulhumeedhoo, S.Maradhoofeydhoo, and S.Maradhoo, and intends to apply part of the proceeds for the following services: Design of Sewerage facilities in S.Feydhoo, S.Hulhumeedhoo, S.Maradhoofeydhoo, and S.Maradhoo, Maldives.

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.

2.1.1 S. Feydhoo

The island of Feydhoo is situated in the Addu Atoll. The island has an area of 73 hectare. The island has a population of 5263 people with a density of more than 72 people per hectare.



2.1.2 S.Maradhoo

The island of Maradhoo is situated in the Addu Atoll. The island has an area of 68 hectare. The island has a population of 3510 people with a density of more than 52 people per hectare.



2.1.3 S.Maradhoofeydhoo

The island of Maradhoofeydhoo is situated in the Addu Atoll. The island has an area of 29 hectare. The island has a population of more than 1749 people with a density of more than 50 people per hectare.



2.1.4 S.Hulhumeedhoo

The island of S.Hulhumeedhoo is situated in the Addu Atoll. The island has an area of 300 hectare. The island has a population of more than 6490 people with a density of more than 22 people per hectare.



3 Scope of Works

Phase IA: 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:

- Performing marine investigations for the siting of the sea outfall structures so that the final location is acceptable in environmental terms.
- Performing topographic surveys of the collection zones in order to define the programme of works related to network construction.
- Carrying out the topographic surveys of the sites of the future facilities.
- Carrying out the geotechnical investigations permitting detailed design of the facilities.
- Defining the construction methods to be used island by 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 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 appraisal of all solutions to the satisfaction of EPA, including but not necessarily limited to the following tasks:

- Discussions in association with MEE and EPA to confirm the scope of the environmental issues and studies for this package.

- Environmental studies (desk and new field investigations and community consultation as required) to identify anticipated environmental impacts of the project.
- identification of potential mitigation measures and discussion of these with MEE,
- finalization of recommended mitigation measures required during design, construction and operation of the project,
- developing cost estimates of the mitigation measures
- preparing a project-specific Environment Management Plan / mitigation management action

This task will lead to a specific report to be submitted to MEE.

The other phases of this consultancy shall account for the recommended mitigation.

Without prejudging the full scope of issues, the EIA for this project shall address at least the following issues:

- effects of construction on terrestrial and marine environment;
- effects of water treatment plant sludge management;
- effects of land disturbance associated with any earthworks, pipelines, landslip protection.

To prepare the work, the Consultants will use the EPA EIA guidelines. The analysis of the environmental aspects of the various solutions will be integrated in the technical and economic comparison so that MEE is able to select works programmes that are suitable for each island.

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

Phase IC: Preliminary Design

The consultant will prepare preliminary design and submit to MEE for approval. The report shall address the following, but not limited to:

- evaluation and comparison of different proposed options for wastewater disposal and treatment for each island taking into consideration the following aspects:
 - treatment efficiency
 - durability
 - capital costs
 - operation and maintenance Costs
 - required land area
 - expertise required for Operation and Maintenance/Ease of Operation and maintenance
 - sludge management and
 - environmental and social aspects

Phase II: Detailed Design

The second stage will concern 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 will contain three parts:

Part 1 (Main report) will include:

- basic data and interpretation of these data regarding the detailed design;
- general justification and description of the proposed rehabilitated or new structures;
- Identification of different construction lots (civil works, electromechanical works etc.);
- works schedule (indication of the timing of each task, links with other tasks, key dates, contractual dates), introduction to nature and quality of materials quality and construction methods (including for maintaining the water production service)

Part 2 (Bill of Quantities and Cost Estimate) 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. Finally, cost estimation 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.

Bill of Quantities will be established separately for each island.

Part 3 (Technical Report) will include:

A drawings section that will include a first sub-section related to the existing structures ('reference drawings') and a second sub-section related to rehabilitated or new structures (including general layouts, civil structures and electromechanical equipment's).

- A calculation notes section including hydraulic and structural calculations notes.

Outputs of Phase II:

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

- the Main Report;
- the Bill of Quantities and Cost Estimate;

the Technical Report (inc. drawings and calculations)

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.

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

4 Project Team

A total of 8 staff will be required and situated in the locations specified below;

#	Post	No
1	Project Manager (Team leader)	1
2	Sewerage / Water / Civil engineer	1
3	Electro-Mechanical Engineer	1
4	EIA Specialist	1
5	Surveyor	4

4.1 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.

4.2 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 05 years' 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 05 years' 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 05 years' 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 05 years' experience in conducting land surveys

5 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.

6 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.

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

7 Remuneration

Remuneration will be in accordance with the schedule specified below;

DESCRIPTION	ALLOCATION	REQUIREMENT
Advance Payment	10%	Advance Payment Bank Guarantee - submitted within 30 days of receiving the Letter of Acceptance (10% 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 20% 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 Final Report following Issuance of Performance Certificate to the Contractor

8 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

9 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.

10 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.

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 investigations	■	■																						
EIA studies																								
Preliminary design			■	■																				
Detail design				■	■																			
Tendering																								
Evaluation and Award					■	■																		
Contract signing						■																		
Construction supervision							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■