

**Gaza Sustainable Water Supply Program**

**Terms of Reference**

**for the**

**Associated Works for Gaza Desalination Project**

**Project Implementation Consultant**

**Final**

**April, 2014**

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**List of Acronyms**

CMWU	Coastal Municipalities Water Utility
COGAT	Coordinator of Government Activities in the Territories
ESIA	Environmental and Social Impact Assessment
GWD	Gaza Water Department
NRW	Non-revenue Water
PIC	Project implementation Consultant
PCU	Project Coordination Unit
PWA	Palestinian Water Authority
SC	Steering Committee
STLV	Short Term Low Volume Desalination
SWRO	Sea Water Reverse Osmosis

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## 1 INTRODUCTION

### 1.1. Contract Specifics

#### 1.1.1. Project Name

Gaza Sustainable Water Supply Program: Associated Works for Gaza Desalination Project

#### 1.1.2. Beneficiary, Project Owner, Executing Agency, Contracting Authority

The beneficiary country is Palestine.

The Project Owner and Executing Agency is the Palestinian Water Authority (PWA) (hereinafter also called "Client")

The Project Beneficiary is the Coastal Municipalities Water Utility (CMWU).

The Contracting Authority is the Palestinian Water authority (PWA)

The funding agency is the World Bank through Multi Donor Trust Fund (MDTF)

#### 1.1.3. Source of Funds and Eligibility

This assignment is financed by the World Bank. World Bank eligibility criteria for Consultants apply.

### 1.2. Background

#### 1.2.1. General

In the absence of other significant water resources in the Gaza Strip 95% of all consumption is based on groundwater resources, the remainder being imports from Israel. The aquifer has been exploited three times over its natural recharge capacity for several years, leading to sea water intrusion. 93.5% of the water produced in Gaza does not comply with WHO/EU drinking water standards due to high nitrate from human and agricultural pollution or chloride concentrations. The 1.7 million people living in the Gaza Strip are thereby exposed to an unacceptable high health risk.

Population is expected to continue growing at a high rate of 3.5% per year and the domestic water demand is projected to grow from 91 million cubic meter per year (MCM) to 199 MCM by the year 2035. The challenging situation has been extensively studied and a good master plan been prepared. [CAMP II, January 2002] The strategy developed is to (a) recycle treated wastewater by injecting it to the aquifer to cover parts of the irrigation demand, (b) to increase imports from Israel to 4 times the current amount and (c) to fill the remaining gap by seawater desalination. The desalination supply was determined at 55 MCM in 20017 increasing to 130 MCM by 2035.

Three short term low volume desalination (STLV) plant projects are already under construction for short term mitigation of the existing deficit, but they provide less than proposed in the master plan. The master plan proposes in addition a 55 MCM/year regional desalination plant for Phase I with an expansion in a later phase, depending on the demand. The PWA has been assigned a 80,000 m<sup>2</sup> plot of land (in addition to 1,000 m<sup>2</sup> for the beach wells of the STLV Desalination plants) which is of sufficient size to accommodate the proposed 55 MCM plant including a possible later doubling of the capacity and also its own power plant. It is planned that PWA constructs with support from the EU with UNICEF being the Implementation Agency a STLV desalination plant of 2.2 MCM at 6,000 m<sup>2</sup> on a portion of the 80,000 m<sup>2</sup> plot.

Blending of the desalinated water with groundwater to achieve a water quality in compliance with WHO and Palestinian standards, transmission of this water to all regions of the Gaza Strip and distribution and efficient use of this water will be necessary to make the desalination project sustainable. This ToR addresses these aspects and the Client wishes to hire a **Project Implementation Consultant (PIC)** to carry out this Water Transmission, Blending, and Distribution in addition to improvements of NRW, as well as provide options for the Power Supply for Gaza Desalination Associated Works

The design and construction of the 55 MCM/year desalination plant will be a project going on in parallel. A Project Implementation Consultant for the Desalination Plant will be working in parallel with PIC for Water Blending, Transmission and Distribution, and both consultants will need to coordinate closely.

### **1.2.2. Gaza Sustainable Water Supply Program (GSWSP)**

GSWSP will include such components of the rolling program of interventions, identified in the *Comparative Study for Water Supply Options for Gaza*, which provide a comprehensive approach to the provision of domestic water supply. The rolling program has been discussed broadly and became a PWA strategy for additional supply of water to Gaza. The GSWSP is also referred to by other institutions within the Desalination Facility for the Gaza Strip project which is the name give the several interrelated projects at the time it was labelled by the 43 Member States of the Union for the Mediterranean Secretariat. The GSWSP project has greater emphasis on the Associated Works to the desalination plant.

Consultants financed by the European Investment Bank (EIB) have prepared a Project Information Memorandum (PIM) that provides an overall strategy for the main elements of the envisaged Gaza Sustainable Water Supply Program (Desalination Facility for the Gaza Strip project). In summary, the PIM proposes four main areas of activity:

- a. Construction and operation of the regional desalination facility, which comprises the construction of a seawater reverse osmosis treatment plant of 55 million cubic meters capacity, as per the water master plan for Gaza;
- b. The Associated Works to the desalination plant project include:
  1. Construction of a north-south water carrier including storage reservoirs for transport of desalinated water and for blending it with water from other sources;
  2. A non-revenue water reduction project, to reduce NRW to about 20% and to increase revenue collection efficiency from the current 38% to 80%; recently, the CMWU through the WSSIP funded by the World Bank will conduct a tariff study in Gaza, which will highlight the major relevant policy elements that the PWA will adopt and start implementing; and
  3. Construction of a dedicated gas-fired power plant of about 35 MW capacity as the primary source of power for the desalination plant (this is considered an optional project at this stage, as power for the desalination plant may also be provided from several other sources being explored by the Palestine Energy Authority). This alternative is one of the options for power supply to GSWSP.

The PIM also envisages two consultancies to implement the interrelated projects managing the infrastructure components and building institutional capacity. The first consultancy supports the design and construction of the desalination plant through a contract funded by the EU which has already been signed between EIB and the consultant. The second PIC is the purpose of this TOR will be assigned to undertake technical preparation for the Associated Works.

### **1.2.3. Water Transmission, Blending, and Distribution**

A study has been performed by the local consultant TECC as part of the *Comparative Study for Water Supply Options for Gaza* which identified the needs for additional reservoirs, transmission and distribution lines. It includes a water demand forecast until 2035 and a hydraulic analysis for the necessary water conveyance and distribution system. It concludes that the construction of a north-south main carrier is required, along with a reinforcement and extension of the existing distribution systems.

The study further considered the necessary blending of desalinated water with groundwater from wells containing nitrate and chloride concentrations in excess of international standards. The blending shall be achieved through the construction of reservoirs. For an interim period, the study accepts a chloride concentration of 400 mg/l and ultimately only 250 mg/l, the latter is also the WHO limit.

#### **1.2.4. Service Providers, Non-Revenue Water and Collection Efficiency**

Overall, non-revenue water (NRW) in Gaza is thought to be about 50%, with the majority considered to be from unregistered connections. About 70 to 80% of the distribution system has been replaced in the past 20 years and local professionals report that physical losses should be low to moderate. For example, the CMWU has 1,700 km network (DN 100 and bigger) of which 70% was replaced in the past 15 years. Gaza city has 500 km network (DN 100 and bigger) of which 80% has been replaced since 1996. However, a lack of reliable metering means that the 50% NRW figure is just an estimate.

The water sector reform plan foresees that the **Coastal Municipalities Water Utility (CMWU)** be the sole water distribution service utility in the Gaza Strip. However, the establishment of the CMWU is not fully completed. CMWU covers currently only 70% of the population in the Gaza Strip, i.e. 23 of the 25 municipalities with respect to technical services. Of these, CMWU provides billing and collection services to 15 municipalities, representing 50% of the population. Still more effort is needed to expand the administrative responsibilities of CMWU to many of the Municipal Water Departments.

Municipalities, such as Gaza City and Northern area municipalities, representing 30% of the population in Gaza, are not part of CMWU.

Where the CMWU performs billing and collection, the revenue collection efficiency is about 57%. Other CMWU municipalities bill and collect directly. Gaza City has a revenue collection efficiency of about 20%. In all cases, public institutions are metered but currently mostly do not pay.

#### **1.2.5. Institutions**

The **Palestinian Water Authority (the PWA)** shall be the Project Owner and Executing Agency (the Client).

The Palestinian Water Authority will form a technical team to work with the PIC on the supervision of design and construction works, this team will be coordinated with the G-PCU.

The Coastal Municipalities Water Utility (CMWU) shall be a partner with PWA through allocating the needed technical staff with PWA teams to work with the PIC on the supervision of design and construction works, and in order to obtain training from the start of the project. As a temporary arrangement CMWU will be the operator of the bulk water supply system till the establishment of the National water company.



**Good coordination with Israeli authorities** is essential for the implementation of the project. Direct coordination links between PWA, the Israeli authorities and the PIC need to be established. Examples of these authorities are the Ministry for Electricity and Water and the Coordinator of Government Activities in the Territories (COGAT). COGAT is a unit in the Israeli Ministry of Defence that engages in coordinating civilian issues between the Government of Israel, the Israel Defence Forces, international organizations, diplomats and the Palestinian Authorities.

## 2 OBJECTIVES OF THE ASSIGNMENT

The objective of the assignment is to provide the consultancy services required to implement the Associated Works to the Regional Desalination Plant in the Gaza Strip aiming to improve the water supply situation through efficient use of desalinated water and precious groundwater while ensuring technical as well as financial sustainability of its operation.

The specific objectives of this project are:

- To blend the desalinated water with groundwater by construction of storage and blending reservoirs in such way that the resulting overall water quality in all of Gaza complies with WHO and Palestinian drinking water standards;
- To design and construct a transmission system i.e. the north – south carrier and the necessary distribution system with sufficient hydraulic capacity to transport this water to the end consumers, ensuring a quality service level;
- To put operation and maintenance of the new system on a sustainable track, by determining the costs of operation and maintenance in order to estimate a transparent subsidy regime for the initial years of operation;
- Provide technical assistance to the CMWU and Municipal Water Departments (Gaza and Northern Gaza Municipalities) in technical and commercial operation of their existing and the newly constructed facilities;
- To develop a NRW reduction plan and an Energy management plan.
- To coordinate with CMWU's separate efforts reduce non-revenue water; and
- To coordinate with CMWU's separate efforts to quantify the socio-economic impacts of utility bills on Gaza households.
- To plan, design and build the power supply system needed to operate it's the Associated Works based on the feasible alternative to be investigated under this TOR.

## 3 SCOPE OF SERVICES

The PIC shall be responsible for finalizing the design, tendering and supervision of the construction of the Gaza desalination Associated Works including but not limited to transmission mains (primary); pumping stations; reservoirs and post

chlorination facilities where required; distribution systems (secondary feeds), and bulk wholesale metering, supervisory control and data acquisition system, improvement of NRW and the Energy supply for the Associated Works. The system shall take in consideration the planned needs of water supply until 2035 as indicated in the *Comparative Study for Water Supply Options for Gaza*, including consequences of the expansion of desalination plant from 55 MCM/y first phase capacity to an eventual 110 MCM/y capacity.

The consultant shall be responsible for all topographical survey and geotechnical studies under this assignment.

The PIC will perform these tasks in close cooperation with the Client and will be responsible for actively managing the process on behalf of the Client. As previously noted, intensive cooperation will also be required with other consultants involved in the development of the desalination plant.

The services under this ToR are grouped into services 3.1 to 3.16. Technical and financial proposals are expected to cover the full scope of services (3.1-3.16), and would subsequently be evaluated for the full scope of the services. The contract for services 3.1 to 3.15 will be firmly awarded, while for service 3.16 (construction supervision), the Client reserves the right to award these services at a later date, or not at all. The Request for proposals [RFP] to be issued to short listed firms will have details on this. The services are summarized as follows:

### **3.1 Review of existing studies, reports, design criteria and designs related to the development of the Gaza north-south carrier network including the associated blending facilities:**

A Kick-off meeting shall be organised by the PIC together with Client at which all project stakeholders shall be invited. The PIC shall present the scope of the services to be performed and the role of the different stakeholders in the project shall be discussed and agreed.

Information Gathering: Detailed design for parts of the Gaza north-south main carrier has been developed back in 2003. The initial studies were done as part of the USAID financed desalination project in 2002/2003 (CAMP and CAMP II). TECC has updated the design in their report. In addition a water supply Master Plan funded by Finland had been developed for Gaza Strip back in 2006. A hydraulic model has also been developed. These documents are available with PWA/CMWU.

A data room shall be established at PWA-Gaza office to exhibit available related studies and reports and the consultants will have the chance to look at such documents.

All available documents will be made available to the PIC.

The existing information, documentation and reports shall be reviewed by the PIC and verified if such information can be used for the development of the project. The information shall be compiled and it shall be identified whether additional data is to be collected.

**Definition of design criteria:** drinking water quality and quantity criteria shall be agreed at the beginning of the project with the Client, as far as applicable for this project. These include water quality parameters to be complied with, possible deviation during construction and initial operation phase; per-capita consumption figures; hourly and daily demand peak factors for each served locality; technical and hydraulic design specifications for the design, construction and operation of pipelines, pump stations, storage reservoirs and control elements; requirements for blending of desalination water with groundwater; production limitations from wells, with respect to maximum pumping hours per day, maximum salinity, nitrate and other pollutants; assessment of power supply capacity, configuration and provision of standby generators; and disinfection and post chlorination criteria;

The **water demand calculation** in the TECC report shall be reviewed for plausibility, applying a design horizon of 2035. If any deviations are observed, the subject shall be discussed with the Client and the Desalination Consultant and a most likely scenario for the water demand forecast shall be agreed.

**Water transmission and demand allocation:** The PIC will review the spatial demand distribution for the various locations to be fed from the Gaza north-south carrier. Also demand nodes for domestic, commercial and industry consumptions will be designated. In case major agricultural water consumers currently use domestic water supply, their need will be identified and treated based on their norms of water demands.

The PIC will coordinate with the CMWU, municipalities and PWA to obtain maps of existing transmission and distribution systems. The PIC will perform plausibility check and conduct random site visits to confirm crucial pipeline segments and demand nodes.

### **3.2 Hydraulic Modelling and preliminary conceptual design of the carrier network:**

A hydraulic model has been developed for major parts of Gaza distribution system. The consultant will review and update the entire carrier network hydraulic model to meet the demand through the year 2035. For this purpose, the PIC agree with PWA and the CMWU on the service standards; and collect/verify all required data including the demand node and their hourly demand, nodes elevation and connecting pipes length. In addition, the PIC will incorporate the needed pumping

stations and hydraulic regulating elements as well as storage and blending reservoirs. The location of the system active (like pumps and control devices) and passive elements (like reservoirs) will be confirmed in close cooperation with the PWA and the CMWU.

The hourly and daily demand at the various demand nodes as well as the demand peak factors will be determined based on the demand projection to supply the various localities served by the carrier. PIC will develop scenarios for low, medium and high demand projections and desalination capacities of 55 and 110 MCM.

As the water sources will be the main desalination plant, some smaller RO plants (both sea and brackish), and water wells of different locations and water quality, the model will determine the amount of water to be supplied from each source and thus will generate and operation mode of all resources to satisfy the total demands. The blended water quality should be maintained with the service standards agreed by the PWA and the CMWU.

The model will demonstrate the optimal network configuration and sizing so that the demand centres will be served at minimum total cost (capital + operational costs). As the prime interest of the PWA and the CMWU is to minimize the operation cost, alternative models will be generated illustrating a reduced operation cost within an acceptable range of increased capital investment trade-offs. The model would also identify the need, capacity and location of chlorination stations.

The modelling scenarios, data and results will be documented in one report named "Hydraulic Model of Gaza North-South Carrier System" The report structure and outline is expected to be clear, logical and comprehensive. One section of the report will be dedicated to the energy utilization and the efficient pump scheduling.

### **3.3 North-South Carrier Detailed Design:**

Based on the hydraulic modelling output, the PIC will proceed to develop the carrier detailed design. Previous design concluded that the main carrier is expected to stretch along 42.5 km and is expected to have segments of 200 to 1400 mm diameter. Included are approximately 5 booster stations on the Carrier. This information is for guidance only and the PIC design will be the final one. The detailed design will cover the design of the pipes (Primary and secondary mains); Design of the pumping stations, design of regulating elements, design of bulk meters, design of storage and/or blending reservoirs and design of disinfection stations. All designs are expected to meet the industry good practice and/or any specific standards requested by the PWA and the CMWU. Drawing of detailed designs and bill of quantities will be prepared and ready to be incorporated in the construction bidding document(s).

### **3.4 Other secondary mains replacement and detailed design:**

This would include detailed design for the replacement of about 21 km of existing asbestos cement pipes (diameters 100 to 400 mm), replacement or expansion of distribution PVC pipes (diameters 200 to 450 mm), and design of about 12 pumping stations. All designs are expected to meet the industry good practice and/or any specific standards requested by the PWA and the CMWU. Drawing of detailed designs and bill of quantities will be prepared and ready to be incorporated in the construction bidding document(s).

### **3.5 Reservoirs Detailed Design:**

This would include design of ground water tanks for a total capacity of 200,000 m<sup>3</sup>, the tank sizes are expected to range from 2000 m<sup>3</sup> to 5,000 m<sup>3</sup>. The PIC will confirm the size and location of these reservoirs based on the overall distribution network optimization. In addition, the PIC will develop the detailed design of each reservoir and the associated disinfection control and pumping facilities. All geotechnical investigation will be managed by the PIC.

All designs are expected to meet the industry good practice and/or any specific standards requested by the PWA and the CMWU. Drawing of detailed designs and bill of quantities will be prepared and ready to be incorporated in the construction bidding document(s).

### **3.6 Non-Revenue-Water Reduction Plan:**

The consultant will carry out due diligence to gather the distribution system data, maps and modelling necessary to perform the NRW plan. The consultant will collect and review all available maps, modelling, and reduction of unaccounted water plan prepared in 2006, meters replacement and pipes repair prepared in 1996. The PIC shall, in close liaison with the PWA, CMWU and other stakeholders, assess the existing situation, define the gaps, prepare a detail plan to improve the existing NRW Management program in order to cope with the existing and future operation of bulk and water supply networks. The PIC will define the gaps and prepare a detailed plan, with estimated costs, to design and install the required measures so that all bulk and water supply networks can be monitored to assess NRW. The PIC shall pay special attention to ensure that short and long-term proposed infrastructure projects are incorporated into these plans. The consultant shall support PWA in developing performance service contract which can be implemented by private Sector and/or CMWU. The following sub-tasks will be carried out.

#### **3.6.1 NRW reduction management plan**

Prepare a plan to improve NRW management & approach to NRW reduction

Liaising closely with the Coastal Water Municipalities Utility (CMWU) and other municipal water service providers the consultant shall:

- a. Collect and review the existing reduction of un-accounted water (2006) plan, meters replacement, pipe replacement plan and leakage control procedure (1996).
- b. Detail the existing processes for management, monitoring and reporting of NRW.
- c. Assess the quality of the existing processes, the regularity of reporting and quality assurance methods and the ongoing implementation of existing processes for the management and reduction of NRW. Give details of the roles and responsibilities of those who manage and monitor NRW in Gaza
- d. Assess and detail the sufficiency of the CMWUs team dedicated to NRW and their ability to manage, monitor and report NRW.
- e. Give details of the teams on the ground in the Gaza Strip who are actively engaged in NRW reduction, include an assessment of previous and on-going training, equipment available and sufficiency of the teams to carry out their tasks.
- f. Investigate and detail of any previous and on-going non-capital intensive non-revenue water reduction programs including programs being implemented on the ground by teams on behalf of the CMWU and municipal water departments operating who are not a part of the CMWU. Include details of the on-going operational cost of these programs and the success of these programs. Include details of the capital costs of these programs and the measure of success of these programs.
- g. Investigate and detail of any previous and ongoing capital intensive non-revenue water reduction programs including programs including rehabilitation, mains replacement and other capital programs. Include details of the capital costs of these programs and the measure of success of these programs.
- h. Propose a plan for improved processes to manage, monitor and report NRW. Including the proposed make-up of the management team within the CMWU, including any training or mentoring requirements to implement the process.
- i. Propose a detailed plan for improved processes and tasks for the implementation of NRW investigations and reduction programs for operational teams on the ground directly linked to the proposed management, monitoring

and reporting processes above including any training or monitoring requirements to implement the process.

**3.6.2 Prepare a plan to design & implement measures so that existing & proposed bulk water system flows can be monitored**

The consultant shall, in close liaison with the PWA, CMWU and other stakeholders, collect, collate, review the previous district meters plan and present base data regarding existing and proposed bulk metering and bulk water system configuration in sufficient detail so that the system operation can be understood and present the information on plans and in tables, including the requirements for additional, calibration of existing meters and replacement bulk metering and design of system re-configuration required to monitor flows to and from each bulk water system. The consultant shall pay special attention to ensure that short and long-term proposed infrastructure projects are incorporated into these plans. Steps to meet the objectives include:

- a. Prepare and agree with PWA an alpha numeric identification system for water resource assets, wells transmission mains, reservoirs and pump stations including identification by groups of resources and assets serving unique areas/supply zones.
- b. Prepare schematic diagram showing the resource and bulk system operation including existing and proposed transmission assets (mains, pump stations and reservoirs) including unique identification number and the boundaries between bulk water systems detailing where system reconfiguration may be required.
- c. Prepare a map in Arc GiS showing the location of sources which are used to supply domestic networks, including wells, sea water desalination plants SWRO and imported water from Mekorot, each source should be given a unique identification number.
- d. Prepare tables identifying the location of sources, (wells, SWRO and imports) by co-ordinate and unique identification number, type of source, identifying if the source is metered, if the meter is read and the flow recorded.
- e. Prepare a map in Arc GiS showing the existing and proposed bulk supply mains, other transmission assets including pumping stations and reservoirs identifying the point at which the bulk supply enters a networked distribution system. The map should include the location of all bulk meters which should be given a unique identification number.
- f. Prepare tables identifying the location of bulk meters by co-ordinate and unique identification number identifying if the meter is read and the flow recorded.
- g. Prepare tables identifying bulk transmission assets, mains, pumping stations and reservoirs by co-ordinate and unique identification number identifying if the asset is

metered on either the inlet the outlet or both and if the meters are read and the flow recorded.

- h. Prepare a detailed plan identifying where additional meters are required, existing meters require calibration or need to be replaced, using unique identification numbers to relate the task to the GIS map.

### **3.6.3 Plan to design and implement network flow monitoring and detailed design of three monitoring areas**

Prepare a plan to design & implement measures to install DMAs & the required infrastructure to monitor flows to & from supply zones, the proposed areas are: Tel El Sultan at Rafah City, East Of Khanyounis City and Western Naser area in Gaza City.

The consultant shall, in close liaison with the PWA, CMWU and other stakeholders, collect, collate and present high level base data regarding existing unique water supply systems, i.e. large service which can be defined as being separate and disconnected from other systems. The consultant shall pay special attention to ensure that short and long-term proposed infrastructure projects are incorporated into these plans. Steps to meet the objectives include:

- i. Prepare and agree an alpha numeric identification system for hydraulically separate large service areas and sub-zones/district metered areas within each of those service areas.
- ii. Prepare a map in Arc GiS clearly identifying, by name and unique identification number, all hydraulically separate large service areas (e.g. which would normally contain several DMA's) identifying those which have sufficient bulk metering to measure flows into the system and those where additional bulk metering is required.
- iii. On the same GIS map, and clearly identify, and giving a unique identification number, existing sub-zones/district metered areas clearly identifying those existing subzones/DMAS which have integrity including:
  - a. Sufficient metering to monitor flows in and out of the sub-zone and the necessary valves (closed) to ensure hydraulic separation from adjacent DMAs and supply networks
  - b. Identification of those zones which have been tested to ensure that that they have integrity
- iv. On the same GIS map, and clearly identify, and give a unique identification number, those sub-zones/district metered areas which have been designed but have not been implemented i.e. require and/or:
  - a. Network reconfiguration
  - b. Installation of new and testing of existing zone valves



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- c. Installation of new district meters (import and export)
  - v. On the same GIS map clearly identify:
    - a. Those large service areas where it is unclear if they are hydraulically separate from other large service areas
    - b. Where sub-zones/DMA's do not exist and have not been designed
    - c. Where network records and configuration details are either not available, or are available and have not been checked are incomplete or records have not been digitized and are available in electronic format.
  - vi. On the same GIS map clearly identify:
    - a. Areas where there is no customer metering
    - b. The date of installation of existing customer metering
  - vii. Tabulation of the information included in Items 3.6.1-3.6.3 using unique identification to relate the information to the GIS maps
  - viii. Prepare a detailed work plan, using the identification system to relate task to the GIS map which includes:
    - a. Installation of additional bulk metering requirements for hydraulically separate large service areas (e.g. which would normally contain several DMA's) including:
    - b. Testing the integrity of existing sub-zones/DMA's
    - c. Works required to install and test the integrity of those sub-zones sub-zones/district metered areas which have been designed but have not been implemented
    - d. Work required to bring network records up-to-date and understand network configuration so that sub-zones/DMA's can be designed
    - e. Works required to design sub-zones/DMA's and an estimation of the works required to install and test the integrity of the sub-zones where no design work or investigation has been carried out
    - f. Installation of new or replacement of existing customer meters
    - g. Plans for items Viii a-f above should include:
      - Design, preparation of tender documents, tendering and the procurement
      - Calibration of existing bulk meters
      - Installation of the bulk meters
      - Design/preparation of tender documents, and installation of works
      - Estimated costs separated by Design/preparation of tender documents, and implementation

- Clear identification of on-going projects, or those where funds are committed and by whom or where projects where no funds are committed.
  - Provide mass balance flow tests .
  - Collect billing data and average daily billed volume. Review billing system , determine deficiencies.
  - Prepare base analysis and classification of the NRW by type and extend.
  - Calculate water losses performance indicators.
- ix. Complete the detailed design, including associated field work and investigations, & procurement documents, including all associated infrastructure, network configuration requirements, zone valves and metering requirements for a single supply zone monitoring area to be agreed with the CMWU.

#### **3.6.4 NRW Management Strategy**

Based on PWA NRW Management strategy, the consultant shall prepare

1. A comprehensive implementation plan
2. Prepare realistic NRW reduction forecast.
3. Prepare cost estimate for both capital investments as well as operating cost.

#### **3.7 Develop an Investment Plan:**

The existing investment plans are based on old information and cost estimate and will have to be updated. For example, some investments may not be required, or not required to the extent stated, while others not shown above will need to be included. Some activities are on-going with the support of different IFIs and donors, but most of the identified improvements have not been implemented yet. It will be the responsibility of the PIC to analyse the up-to-date situation regarding on-going activities and projects firmly planned in order to avoid gaps and overlaps. The updated investment plan will be discussed with the PWA, the CMWU and expected to be presented for all stakeholders in a workshop organized by the PIC in coordination with PWA.

#### **3.8 Develop a Financial and Cost modelling Operation Plan:**

The PIC will prepare a detailed estimated summary of the annual costs required to operate the entire system. This estimate will be used to help determine the feasible tariff and the subsidy levels that may results from adopting lower tariffs to operate and maintain the system during the initial years of operation. The plan will also suggest the tariff trajectory to ensure cost recovery after the transitional period. The PIC will prepare the plan report and present it to the PWA for final approval. The cost analysis and tariff trajectories will be developed and made available to PWA and CMWU a spread sheet file (Microsoft excel format) with all formulae being

unlocked for future development and updates by the PWA and/or CMWU. The PIC shall make use of the financial analysis to be conducted by the desalination component PIC.

### **3.9 Develop a Preliminary Environmental and Social Impact Assessment and a Public Awareness Improvement Program:**

A preliminary ESIA shall be performed by the PIC to highlight environmental and social issues in the context of this ToR and the associated construction. The preliminary ESIA report prepared by the PIC will be used to coordinate with the independent ESIA consultant to be hired by the Client.

The PIC will also attend all the public consultations organized by the independent ESIA consultant.

The PIC will assess the image of the water utility in Gaza and with its consumers. The PIC shall also identify main shortcomings and develop a Public Awareness Improvement Program, which may include (for example only): information campaigns with folders, or via local TV or local newspaper; information campaign in local schools; information day with public access to facilities etc.

### **3.10 Energy Supply**

The consultant shall identify the energy needed for the associated works components and study the energy alternatives including connection to the electrical grid , standalone generators and renewable energy and their analysis from technical, economic, political and financial aspects. The PIC shall coordinate with EIB contracted PIC who is assessing the power source for the central regional desalination project. The consultant shall recommend the most suitable energy source and prepare:

1. Design criteria for the selected approach.
2. Comparison and selection of the feasible option.

### **3.11 Energy Management Plan**

The Consultant shall review the Energy Management Plan that prepare in 2006 and update, modify the Energy management plan to achieve energy utilization optimization. The consultant shall perform standard operation procedure for the associated works components related to energy.

### **3.12 Tendering, Project Management and Coordination:**

Based on the detailed design and the agreement with the Client on contract packaging, the PIC will prepare the Tender Documents. The bidding documents shall comply with requirements of the financing organisation and Palestinian legislation.

The Tender Documents need to address the particular working conditions in the Gaza strip and the administrative requirements necessary in coordination with the Israeli authorities.

The PIC shall perform on behalf of the Client the complete tendering process, including pre-qualification, bidding, response and clarifications to bidders, organising and conducting pre-bid meetings, bid evaluation, contract negotiations and compilation of the contracts.

### **3.13 Project Management:**

The PIC is responsible for managing the process of successfully implementing all components of these ToR to a high professional standard and within the given time schedule.

The PIC needs to provide sufficient capacity and a qualified team leader to manage the process on behalf of the Client.

### **3.14 Project Coordination:**

Successful project implementation will require comprehensive coordination with other planned or on-going projects in the sector, which includes the following:

- On-going technical assistance to the Coastal Municipalities Water Utility (CMWU).
- Construction of the 55 MCM/year SWRO plant.
- Construction of Short Term Low Volume (STLV) desalination plants, which are realised to improve the difficult water supply situation within the short term. Most projects include a component for improvement of storage capacity and distribution.
- Power supply projects which could be construction of additional overhead lines for power imports from Egypt and Israel, or possibly the construction of a dedicated power plant next to the proposed 55 MCM SWRO plant.
- Construction of wastewater treatment plants, partially with groundwater infiltration of the treated wastewater and water recovery facilities.
- The independent Environment and Social Impact Assessment Study.
- Coordination with the Project Coordination Unit (PCU).
- Good coordination with Israeli authorities will be required for the successful implementation of the project. Direct coordination links between the Client, the Israeli Authorities and the PIC need to be established. Valuable experience on the procedures for initiating, managing and running such a project has been gained by the North Gaza Wastewater Treatment Plant PMU. The PIC is encouraged to make use of this experience.

It will be the responsibility of the PIC to organise regular coordination meetings with the project stakeholders.

### **3.15 Support to PWA:**

Provide support and advice to the PWA on other issues related to the project, e.g. in groundwater monitoring, health monitoring etc. as deemed needed

### **3.16 Construction Supervision:**

The PIC will perform overall as well as on-site construction supervision for the works contracts. This comprises Contractors compliance with local requirements and contractual obligations, quality control, time control and checking and approval of payments. This includes:

- Detail Design review
- Factory Acceptance Tests
- Site supervision (owner's engineer services)

The PIC will assist the Client in liaising with the Israeli Authorities for the smooth implementing of the works contract.

On behalf of the Client, the PIC will supervise and monitor all plant performance tests and the final commissioning

## **4 DELIVERABLES, REPORTING**

All reports shall be prepared in English language.

All reports shall be submitted electronically in word and pdf formats, all drawings shall be submitted electronically in AutoCAD and pdf formats. In addition, 3 hard copies of all reports shall be submitted, one to the financing institution and 2 to the Client.

All reports shall be submitted in draft version. The PIC shall reserve up to 3 weeks for receiving comments on the draft reports and incorporate these comments into the final report if they are justified. The PIC shall issue the final report 3 weeks after issue of the draft report independent of comments received or not.

### **4.1 Reports: Design and Tender Phase (Services 3.1-3.15)**

#### **4.1.1 Inception Report**

This report shall include a short summary of the key documents studied, any contradictions found with a proposal how to solve such issues, describe the conditions at site and any deviations from the pre-project stage, PIC's logistical

arrangements and office establishment, deployment of the PIC team, contacts established with the project stakeholders and a detailed work programme.

The draft report shall be submitted 1 month after commencement of the assignment.

#### **4.1.2 Engineering Concept Report**

This short report will contain the design criteria to be applied in the project in order to achieve acceptable water quality through mixing and delivery.

A draft of this report shall be submitted two months after commencement of the assignment.

#### **4.1.3 Hydraulic Analysis Report**

This report will include the review of the water demand projection, water demand allocation, and hydraulic analysis. The report will present separately the required improvements for the scenario with: 1) the 55 MCM/year desalination plant; and 2) the 110 MCM/year plant with demand situation in 2035.

A draft of this report shall be submitted three months commencement of the assignment.

#### **4.1.4 Asset Inventory Report and Associated Maps**

This report will include the identification and numbering of all CMWU and Municipal departments fixed assets, with associated interactive maps. Assets inventory and GIS are available for about 60% of Gaza water systems. The PIC shall revise what is available and complete the Asset Inventory Report.

A draft of this report shall be submitted five months after commencement of the assignment.

#### **4.1.5 Design Reports and Contract Packaging**

Reports for the detailed design of pipelines, reservoirs and post-chlorination facilities shall be prepared in separate volumes, corresponding to the proposed contract packaging. The reports shall include as annexes calculations and results of all survey works performed. The Report shall include construction plan for the associated works components, the plan shall consider the time horizon of construction period of three years.

A draft of this report shall be submitted eight months after the commencement of the assignment.

#### **4.1.6 Non-Revenue-Water Reports and Maps**

Reports for activities detailed in task 3.6 and its sub-tasks. The PIC shall also submit all the Arc GIS maps in both soft and hard copies.

Draft reports and maps shall be submitted 8 months after the commencement of the assignment.

#### **4.1.7 ESIA Report**

A preliminary ESIA report shall be prepared for the purpose of identifying environmental and social issues to be coordinated with the independent ESIA consultant.

A draft of this report shall also be submitted eight months after the commencement of the assignment.

#### **4.1.8 System Operating Cost Report**

This report will provide an estimate of the annual operating costs to run the CMWU bulk and distribution system. It will include estimates for labour, employee benefits, energy, chemicals, maintenance, transportation and all other costs normally related to system operations. It will provide the costs in sufficient detail to easily permit review and comment. Costs not to be included are: depreciation, debt service, taxes and new infrastructure investments exceeding US\$1 million.

A draft of this report shall be submitted nine months after the commencement of the assignment.

#### **4.1.9 Tender Documents**

The consultant shall provide tender documents for the implementation of the associated works components. The tender documents shall be prepared in compliance with financier and Palestinian legislation, according to work packages to be agreed with the Client. The Tender Documents need to address the particular working conditions in the Gaza strip and the administrative requirements necessary in coordination with the Israeli authorities.

Draft Tender documents are to be submitted 10 months after the commencement of the assignment. Moreover, the consultant will submit a report that covers preparation of tender documents, the prequalification of contractors and the evaluation of tenders. The report will be submitted after the bids evaluation which is expected to be ready 16 months after the commencement of the assignment.

**4.1.10 Public Awareness Improvement Report**

This report will outline the current image of the CMWU and provide specific recommendations on how the utility can improve its image with its customers. Key performance indicators will be designed for each recommendation to track progress and/or results.

A draft of this report shall be submitted 12 months after the commencement of the assignment.

**4.1.11 Energy supply report**

This report shall outline the energy alternatives and their analysis from technical, economic, political and financial aspects, the design criteria for the selected approach/s. An Energy management Plan of the Associated Works shall be included. A draft of this report shall be submitted 12 months after the commencement of the assignment.

**4.1.12 Energy Management Plan report**

This report should include the Energy management plan and the standard operation procedure for the associated works components related to energy optimization. A draft of this report shall be submitted 12 months after the commencement of the assignment.

**4.2 Reports: Construction Supervision Phase (Service 3.16)****4.2.1 Construction Progress Reports**

This information will be included in the regular reports such as monthly, quarterly and annual reports, described further below.

**4.2.2 Commissioning Reports**

The PIC shall prepare a commissioning report, for all facilities completed, presenting in detail the results of the performance tests. It will also include a list of deficiencies (snag list) to be corrected by the contractor in a reasonable time period specified by the PIC.

**4.2.3 Construction Completion Report**

The PIC shall prepare this report 2 months before the end of the defects liability period of each works contract. The report shall describe the defects remedied by the contractor and recommendations in case of remaining defects, not rectified by the contractor in due time.



### **4.3 Progress Reports (All Services)**

#### **4.3.1 Monthly Progress Sheets**

The monthly progress sheets shall not exceed 3 pages, shall be submitted within ten days of the following month and include the following information:

- Work performed
- Progress against programme
- Difficulties and delays experienced
- Proposed mitigation measures in case of difficulties and delays
- Update on measurement and financial activities
- Works planned for the upcoming reporting period.

These reports shall be submitted only electronically and as a single version (no draft version required). In case the Client or Financier comments on certain statements or developments, the PIC is obliged to take action and to respond to these in the subsequent Monthly Progress Report.

#### **4.3.2 Quarterly Progress Reports**

The PIC shall prepare quarterly reports to the Client and the Financier within 20 days of the following month. The report shall include:

- Progress of works with comparison of real progress compared to the approved work plan.
- Operational problems
- Defects reported
- Status of defects and remedial works (tracking sheets)
- A summary of works planned for the upcoming reporting period.

The report shall include pictures and special findings and reports received or produced in this period shall be attached as separate files. In case the Client or the Financiers have comments or refuse acceptance of the report, The PIC is required to improve the report accordingly.

Every Quarterly Progress Report shall be accompanied with an interim payment certificate for the past three month period.

#### **4.3.3 Annual Reports**

The PIC shall prepare Annual Progress Reports to the Client and the Financier within one month of the following year. The report shall summarize in a consolidated form the progress of works in relation to the work programme, difficulties and delays

experienced, mitigation measures taken and an update on measurement and financial activities. The report shall include pictures.

#### 4.3.4 Final Report

The PIC will prepare a final report, for approval by the Client and the Financiers. This report should summarize the previous progress reports and main achievements under the assignment, indicating lessons learnt and the scope for any future work identified, during the project.

The draft Final Report shall be submitted 2 months before the end of the assignment. This report needs to be approved by the Client and the Financiers. Comments have to be incorporated into the Final Report to the satisfaction of the Client and the Financiers.

The final report shall be accompanied by the final invoice and by an expenditure verification report.

## 5 TIME AND PAYMENT SCHEDULES

The estimated time required to carry out this TOR is as follows:

- From contract signature to award of construction contracts: 18 months; and
- Supervision of the construction through issuance of the Construction Completion and commissioning Report : 36 months

During the construction phase, the PIC will guide a process of implementation that guarantees the operationalization of the different packages in phases.

For the design and tendering phase, the consultant shall be paid according to the report deliveries as shown in the following table provided that the respective tasks are completed. Amounts specified will be paid after the Client's acceptance of the deliverable.

Sequence	Report Deliverables (see Section 4.1 for report descriptions)	Amount (expressed as percent of total contract price)
1	Contract Signature	10
2	4.1.1 through 4.1.4	20
3	4.1.5 through 4.1.7	20
4	4.1.8 & 4.1.9	25

5	4.1.10 through 4.1.12	15
6	4.3.4	10

For the construction management and supervision phase (if awarded), payments shall be effected on quarterly basis based on the actual man months and other prevailing expenses governed by the contract.

## **6 REQUIREMENTS**

### **6.1 Consultants Personnel**

The PIC will mobilize a coherent, dynamic and organized professional team of experts with experience in similar assignments to undertake this assignment. The PIC shall provide the qualifications and experience of each specialist to be assigned for the activities in the scope of services. For each specialist proposed, a Curriculum Vita shall be provided setting out the relevant experience and employment record.

If the PIC is a consortium, the arrangements should allow for the maximum flexibility in project implementation. Arrangements offering each consortium member a fixed percentage of the work to be undertaken under the contract should be avoided.

All key personnel will have a good knowledge of written and spoken English. Knowledge of local languages will be an asset. The services have to be provided primarily in Palestine, home-based work shall be accepted to a limited extent. Note that civil servants and other staff of the public administration of the beneficiary country cannot be recruited as experts.

The PIC shall indicate the manpower scheduling of the proposed staff needed during the contract and post-contract/maintenance period stages described in the TOR, including time inputs. Taking full account of the requirements as set in the ToR, the PIC may propose an alternative staffing structure if such a proposal is accompanied by the appropriate methodology section and justification and provides value for money. The PIC shall arrange for having a local consultancy company based in Gaza in his consortium or JV arrangements.

For Tasks 3.1 to 3.15, the total estimated level of effort of professional Key staff is estimated at around 73 staff- month. This is expected to be supplemented by around 116 support staff- month. For the construction supervision, under Task 3.16 the total estimated level of effort of professional Key staff is estimated at around 134 staff- month and is expected to be supplemented by around 888 support staff- month

## 6.2 Key experts

All experts play crucial role in implementing successfully the contract are referred to as key experts. The profiles of the key experts for this contract are as follows:

### 6.2.1 Design Key experts

Key expert	Qualification	Professional Experience
Project Manager	M.Sc. water supply; Engl.	15 year of project management and water supply experience
Telemetry	MSc in data transfer	10 years of designing telemetry systems in similar works.
Hydraulic Engineer	Msc in Hydraulics	10 years' of design water distribution systems and hydraulic modelling in similar works.
Structural Engineer	Msc in structure engineering	10 years of design water structures in similar works.
GIS Expert	Msc in GIS	10 years of GIS analysis in similar works.

Electromechanical	MSc in electromechanical Engineering	10years of design water pumping stations and boosters.
Construction supervision	BSc in Civil Engineering	10years of water projects construction management
Financial analysis	MSc in financial analysis or relevant discipline	10years of analysing costs of water facilities production ,distribution and operation
Water Quality	BSc in water biology and/or Chemistry	10years of analysing water quality
Public awareness and communication	MSc in communication or Social science	10years in public awareness and communication skills in water sector.
Environmental and Social	MSc in environmental engineering	10years in environmental and social studies related to water projects.
Procurement	MSc in Business Administration.	10years in procurement of Engineering construction projects.

### 6.2.2 Construction Supervision Key experts

Key expert	Qualification	Professional Experience
Construction Director	MSc in Civil engineering	15 years in project management
Construction manager	BSc in Civil engineering	15 years in construction management of similar works
Safety engineer	BSc In Civil Engineering	10 years in providing safety procedures in similar works
Environmental Engineer	BSc in Environmental Engineering	10 years in construction of water facilities of similar works
Electromechanical engineer	BSc in electromechanical engineering	10 years in construction of electromechanical works of similar facilities.
Control engineer	BSC in Control	10 years in construction of

	Engineering	control systems and SCADA .
Procurement officer	BSc in Business administration	10 years in procurement and management of similar projects.
Legal advisor	MSc in legal studies	10 years in commercial law

Notes: "Eng." means fluent in oral and written English.

### 6.3 Other experts

The bidder shall mobilize additional other experts who will report to the Team Leader and be responsible for specialist inputs as required. The numbers of staff and inputs are to be determined by the PIC, to suit the project requirements. In its bid, the PIC will have to describe a strategy on how to best allocate these staff resources, in a time-table with information on the locations of assignment etc., for the maximum benefit of the overall assignment

In general, the PIC shall select and hire other experts as required according to the profiles identified in the Organisation & Methodology and/or these Terms of Reference.

All experts must be independent and free from conflicts of interest in the responsibilities accorded to them. Note that civil servants and other staff of the public administration of the beneficiary country cannot be recruited as experts. The selection procedures used by the PIC to select these other experts shall be transparent, and shall be based on pre-defined criteria, including professional qualifications, language skills and work experience.

CVs for all experts including the key experts need to be submitted with the proposal.

### 6.4 Backstopping and Support Staff

Backstopping and support staff must be included as required. CVs for backstopping staff shall be submitted.

### 6.5 Facilities to be provided by the Consultant

The PIC shall ensure that experts are adequately supported and equipped. In particular it shall ensure that there is sufficient administrative, secretarial and interpreting provision to enable experts to concentrate on their primary responsibilities.

The PIC will have to establish a fully equipped and serviced office in Gaza. This will serve as an administrative base for the entire project and a hub for communication

with the Client and funding agencies. The Team Leader and support staff will be based in this office.

The PIC shall further provide laptop computers with appropriate software for all key experts. This will include all supporting hardware, software and professional material needed such as printers, photocopiers, communication facilities.

The PIC shall care for local transport (vehicles including drivers if considered necessary) and running costs of the vehicles for the key staff.

The PIC shall be responsible for all office running costs including office rent and communication costs.

No equipment is to be purchased on behalf of the Client as part of this service contract.

## **6.6 Support provided by the Client**

The Project Owner will provide the PIC with all documents and reports as far as available which could be useful for performing the assignment.

The Project Owner will provide support (invitation letters, notification to relevant authorities) in obtaining visas and entry permits to the Gaza Strip.

## **7 ANNEXES**

### **7.1 Annex 1 – List of Documents**

The following is a list of available and most relevant studies.

1. Robinson, Phillips and Associates, “Updated Final Report: The Gaza Emergency Technical Assistance Programme (GETAP) on Water Supply to the Gaza Strip”, Component 1 - The Comparative Study of Options for an Additional Supply of Water for the Gaza Strip (SCO-G), July 2011.
2. Arab Center for Engineering Studies, “Site Geotechnical & Geochemical Investigation for Gaza Desalination Plant”; Beach Pumping Plant, Shoreline Investigations, Pipeline Routes; Final Report, September 2002.
3. Al-Sahel, “Rapid Quantitative Survey in West Bank & Gaza Strip to Assess the Changes in the Food Security Indicators of the Palestinian Population”; prepared for FAO, UNRWA, WFP; April 2008
4. Aqua Resources International (LLC), “Gaza Seawater Desalination Plant Feasibility Study”, A bridged Final Report, February 2003).
5. Mashharawi Bros Co. Ltd., “Bathymetric Survey Drawing (in Acad)”, July 2002.

6. Contour maps performed for the STLV project
7. Coastal Municipalities Water Utility, "CMWU Annual Report on the Water Status in the Gaza Strip", March 2011.
8. Universal Group, "Gaza Governorates water Facilities Master Planning", August, 2006
9. Palestinian Water Authority, "ESIA for STLV phase 1 to produce 6,000 m3/day to serve Rafah and Khanyounis areas", xxx.
10. Geotechnical Engineering Ltd., "Geotechnical Investigation for Proposed Gaza Desalination Plant – Proposed Project Site", August 2002.
11. Municipality of Deir Al Balah, "Land Use Designation Drawing", May 2012.
12. The European Commission, "Combined Solar Power and Desalination Plant: Techno-Economic Potential in Mediterranean Partner Countries, D2.6: Feasibility Study in Palestine" MED-CSD Project, July 2010.
13. Metcalf & Eddy Inc. - CDM International - Khatib&Alami - Palestine Hydrology Group "Integrated Aquifer Management Plan", May 2000.
14. Ministry of Environmental Affairs, "The Palestinian Environmental Assessment Policy", April 2000.
15. PWA, "Reform in the Water and Wastewater Sector – West Bank & Gaza", PPT-Presentation, July 2011.
16. Palestinian National Land Authority, "letter of land allocation and attached drawing for proposed desalination plant, April 2012.
17. Posch & Partners Consulting Engineers, "Water Supply to Gaza, Preparatory Studies for a Seawater Desalination Plant, Project Information Memorandum", May 2012.
18. PWA & CMWU, "Gaza Water Supply and Sewage System Improvement Project (GWSSIP): Annual report 2013", January 2014.
19. Technical Engineering Consulting Company (TECC), "The Domestic Water Distribution System in Gaza", Final Report, May 2011.
20. The World Bank, "Assessment of Restrictions on Palestinian Water Sector Development", Sector Note, West Bank and Gaza, April 2009.
21. UNEP, "Environmental Assessment of the Gaza Strip, following the escalation of hostilities in December 2008 – January 2009", September 2009.
22. Utah State University, "Estimation of Crop Water Requirements in Gaza Strip, Palestine – GIS Based Application", September 2011.
23. CMWU, Energy Plan June 2006.
24. CMWU - REDUCE UNACCOUNTD FOR WATER -Concept and Approach to Work,2006
25. LEKA – Technical Paper no. 1 Leakage Control Procedure
26. LYONNAISE DES EAUX - KHATIB AND ALAMI Metering Policy, 1996.
27. Master Plan models 2006.



28. Gaza N-S carrier maps 2006

## 7.2 Annex 2 - Site Map

Figure 1: Location of the Proposed Regional Desalination Plant

