

TOR for preparation of

**Detailed engineering design for the water infrastructure for priority investment projects
for Bulk Water System in the West Bank**

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1. BACKGROUND

1.1. Beneficiary / Authority

Water is fundamental for life and all aspects of socio-economic development, and thus development of self-sufficient, efficient and sustainable water services are fundamental for life and all aspects of socio-economic development and achieving water security is considered a cornerstone for the Palestinian Authority, but the improvement in water sector still heavily impacted by the deterioration of the – already dire – political and economic situation.

Palestinian Water Authority presented the plans for development of water and wastewater sector in national water and wastewater strategy for Palestine “ toward building state from water perspectives endorsed in July 2013, and the water sector development plan 2018-2023 and PWA executive plan 2020-2022

The Palestinian Liberation Organization (PLO) for the benefit of the Palestinian Authority has received financing from the World Bank toward the cost of the Water Security Development - Gaza Central Desalination Program: Associated Works Project Phase I (AWP-Phase 1) (P168739), and intends to apply part of the proceeds for consulting services towards developing a detailed engineering design for the water infrastructure for priority investment projects for Bulk Water System in the West Bank

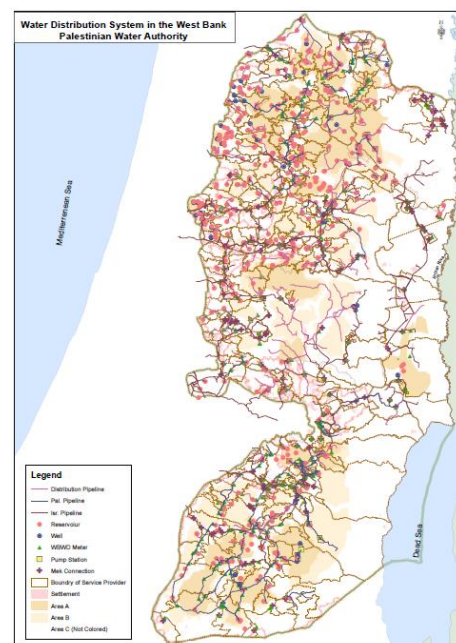
1.2. Bulk Water Supply in West Bank

The current water supply to the West Bank mainly comes from groundwater and springs (60 %) and the water purchased from Israel (40 %). As of today, the distribution of bulk water to Palestinian communities cannot be satisfactorily controlled by the Palestinians themselves due to the entangled Palestinian and Israeli water networks within the West Bank

In the West Bank, bulk water provision is the responsibility of the West Bank Water Department (WBWD). It manages wells and purchases water from Israel, and distributes and sells bulk water to service providers.

The WBWD purchases water from the Israeli side (Mekorot) through 175 connection points (for a water quantity of around 73 MCM/year) which adds to the water abstracted from 10 wells owned by the PWA and few private wells. The amount of water abstracted and purchased from private wells is around 55 MCM/year.

Currently, the WBWD is distributing water through 600 km of pipelines with diameters ranging from 2" to 36" supplying



water to 199 service providers (in additional to individual connection) through 500 water meters which represents (87%) of the total service providers.

1.3. The Project's Summary

Under the AWP project, the Palestinian Water Authority has requested the World Bank to prepare the detailed engineering design for the Water Supply and Sanitation infrastructure priority projects to be ready for investments once available. The current assignment will focus on water infrastructure projects as presented in the table below:

Name of priority Water Projects	Communities served by the project	Project Components
As Samua Connection Water System	<p>Beit A'mra, Khallet al Maiyya, Yatta, Al Karmil, Sosya, As Samu', Ar Ramadin, Ar Rihya, Dura, Adh Dhahiriya, Imneizil, At Tuwani, Al Ka'abneh –Om Adaraj, Masafir Yatta, Deir Samit, El Kaum, Beit A'wwa</p> <p>Based on the PCBS 2022, it is estimated that a total population of more than 240 thousand inhabitants will benefit from this project</p>	<p>1. Main transmission pipelines:</p> <ul style="list-style-type: none"> ✓ From Meckorot new connection to Adh Dhairiya interconnection (2 Km) ✓ From Adh Dahiriyeh Interconnection to New Adh Dhairiya Reservoir (1.6 Km), ✓ From Adh Dhahiriya Interconnection to Yatta Interconnection (3.7 km) ✓ From Al Samou Interconnection to Old Samou Reservoir (1 km) <p>2. Additional storage Reservoirs:</p> <ul style="list-style-type: none"> ✓ (4,000 m3) at Al Samou New Connection (total = 5,000 m3) ✓ Dhahiriya new reservoir (2,000 m3) <p>3. Design of Pump Station at Al Samu' New Connection</p>
Ras Al Taweel Regional Water Reservoir Project	<p>Ras Al Taweel, Ash Shuyukh, Al Duwwara, Al Odisi and the eastern parts (higher parts) of Sa'ir in Hebron Governorate. It is estimated that more than 30 thousand inhabitants will benefit from the construction of the new water reservoir and the distribution pipelines.</p>	<ol style="list-style-type: none"> 1. 3,000 m3 regional water Reservoir. 2. Main transmission pipeline to connect the new water reservoir to Halhoul water system near Bani Na'im connection point (1.5 km) 3. Distribution pipelines from the water reservoir location to serve the targeted localities, of about 1.0 km. 4. All required water chambers and flow monitoring chambers. 5. Extending of Ash Shuyukh supply pipeline from Mekorote connection point to the new regional

		<p>water reservoir location (12" Dia.) of about 1.5 km length.</p> <ol style="list-style-type: none"> 6. Internal distribution pipeline (1.5km) to connect between the new bulk system and the existing system in Sa'ir, to serve the high areas (Beit Anon and Ras Al Aroud) 7. Check and verify the main distribution systems inside the local communities 8. SCADA system at the water reservoir and flow monitoring chambers
Improvement of Za'tra Bulk Water Supply System	Za'tara and parts of Beit Ta'mir and Ras Al Wad in Bethlehem Governorate, estimated total population of more than 10 thousand inhabitants	<ol style="list-style-type: none"> 1. 2,000 cubic meters regional water reservoir 2. Transmission pipeline from the flow meter location to the new reservoir about (1.5km) 3. Distribution pipeline from the reservoir location to the network connection point (600 meters) 4. All the required water chambers 5. SCADA system at the regional reservoir 6. Check the existing water network at Za'tara by conducting hydraulic analysis to ensure safe and efficient operation
Beit Jala New Connection Water System	Al 'Ubeidiya, Al Khas, Al Manshiya, Al Ma'sara, Khallet an Nu'man, Ash Shawawra, Bethlehem Water Authority, Dar Salah, Umm Salamuna, Hindaza and Bureida'a, Jannatah, Jurat ash Sham'a, Khallet al Haddad, Marah Ma'alla, Beit Ta'mir, Khallet Sakariya, Wad An Nis, Wadi Rahhal, Za'ttara, with total population of more than 162 thousand inhabitants	<ol style="list-style-type: none"> 1. Main transmission pipeline from Beit Jala New Connection to Al Dheisheh reservoir around (8km, Dia 700mm – 1 m, consultant to verify diameters). 2. Distribution pipeline from Ad Duheisha reservoir, to East & South Bethlehem Area. Around (5 km, Dia. 500 mm – 700mm). 3. Regional Water Reservoir at Hindaza area & Umm Salamuna 4. Distribution pipeline from the new reservoirs to Bethlehem south and east villages around (20 km) 5. Required water chambers 6. SCADA system for the new bulk water supply system
Reef Dura Main Pipeline Water Project	Tawas, Sikka, Al Majd, Deir al A'sal at Tahta, Deir al A'sal al Fauqa, Iskeik, Beit ar Rush at Tahta, Beit ar Rush al Fauqa, Al Burj and Al Bira, with total	<ol style="list-style-type: none"> 1. Replacement of the existing 6" water pipeline with new 8" main pipeline of about (7 km) 2. A new 10" Dia., pipeline of about (7.5 km), to interconnect PWA wells system (near Adh Dhahiriya) with (Al Birah reservoir).

	population of more than 13 thousand inhabitants	<ol style="list-style-type: none"> 3. Installation of 8 service chambers to serve the benefitted communities 4. Construction of 2 Flow Monitoring Chambers. 5. Installation of distribution pipeline from Reef Dura pipeline to Deir al A'sal at Tahta existing reservoir.
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The Associated Works Phase I Project is a part of a coordinated international effort to address chronic poor water quality in Gaza and the significant increase in domestic demand expected in the medium term, which is projected to reach around 145 MCM a year by 2030. The project will also contribute towards enhancing soundness of the sector institutional set up. The proposed operation includes institutional strengthening activities including supporting the developing the priority investment plans needed for water and wastewater infrastructure in the West Bank.

Project Components comprises Component (1) Improved Supply of Bulk Water to the southern and middle governorates of Gaza. This component includes four packages to implement an integrated system of water carriers and reservoirs to convey and blend water from three different sources to achieve the desired salinity. Component (2) Capacity Building and Performance Improvement of Selected Institutions. **This component will support to prepare priority bulk water investments in the West Bank. Priority investment planning for bulk water supply in the West Bank will include updating the water sector policy and strategy; preparing an integrated bulk water master plan for the West Bank, identifying and prioritize investments to set up a bulk water supply and conveyance system for the West Bank; and preparing detailed designs the identified priority investments related to distribution of water, and Component (3) Project Management and Implementation Support.**

The aim of this project is to develop integrated systems for water supply at different regions in the West Bank, with the overall objective to satisfy basic needs in drinking water supply for the population of selected areas in Palestine and to secure improved public health and environmental conditions.

The specific local problems, to be addressed by the Consultant, are principally those associated with the current absence of water supply in the Project area. In particular, the specific objectives are:

- To provide the quantity of drinking water supply.
- To enhance financial sustainability and self-financing capacity for future capacity expansion.
- To determine the optimal procurement method to achieve the three objectives listed above, taking into account potential options for private sector participation in the construction, operation, and maintenance of the water system.

1.4. Project Area Existing Conditions

The Project area is West Bank

1. As Samua' Connection Water System

As Samu' is located 22 km south of Hebron City in Hebron Governorate along the Green Line. It is bordered by Yatta Town to the east, Yatta Town and Ar Rihya to the north, Adh Dhahiriya to the west and the Green Line to the south. As Samu' town sits at an elevation of 705 m above sea level.

PWA supplies water to Hebron Governorate through various sources points, which include PWA wells in (Bethlehem, Bani Naim, and Al Reheya) in addition to water purchased from Mekorot points all across the Governorate.

The water is conveyed in the governorate through main trunk lines and regional reservoirs to the various service providers. Today, the Palestinian Water Authority (PWA) is purchasing water from Mekorot to supply Hebron Governorate through 14 connection points, while PWA would like to develop its own bulk water supply system by minimizing the number of connection points from Mekorot and improving the quantities of water produced through PWA-owned wells.

A new connection point with additional quantities to meet the increasing demand of the area from Mekorot water system is defined for the South Hebron Communities through As Samou' new connection point.

The new As Samou' connection will be able to provide about 25 Mm³/year by 2040 to the South of Hebron Governorate, which will account for 60% of the 2045 South Cluster Water Demand. Thus, additional sources of water will have to be defined to cover for the deficit observed in South Hebron through either, additional wells in the Southern Area or via other Mekorot connections.

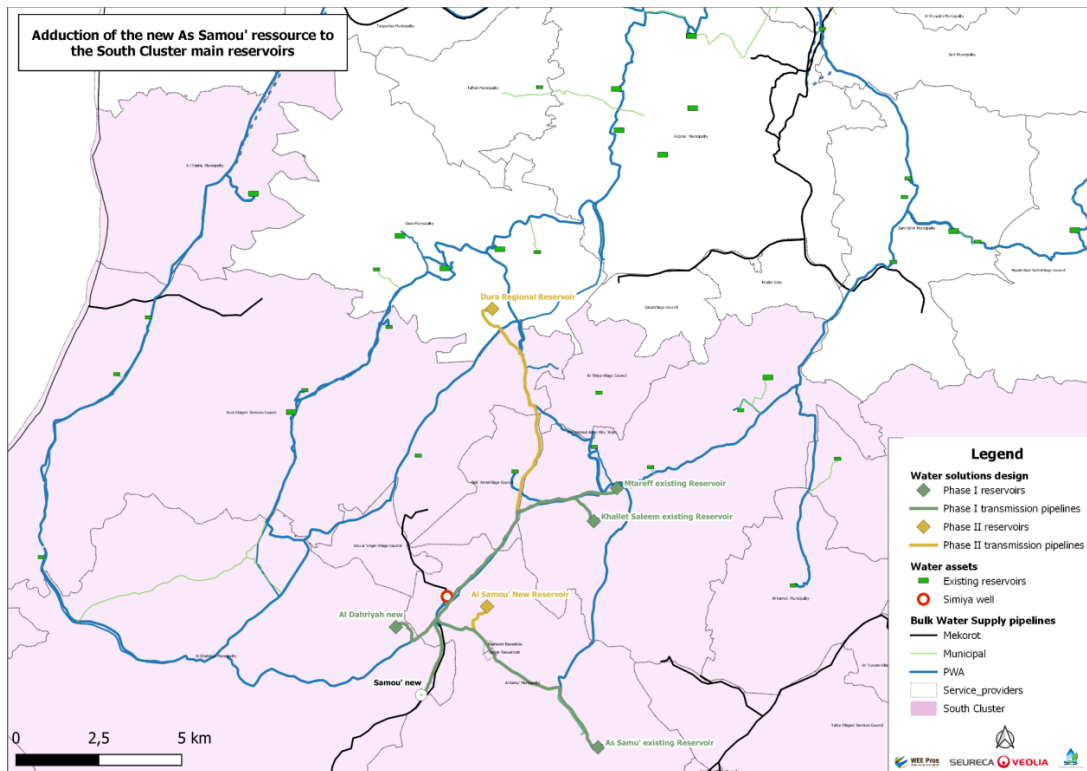
The use of these new quantities will be phased:

- Phase 1 - horizon 2030: transmission of 51,363 m³/d to the following reservoirs:
 - Adh Dhahiriya new reservoir: To supply 50% of Adh Dhahiriya demand
 - As Samu' existing reservoir: To supply As Samu' demand
 - Yatta existing reservoirs (Khalet Saleem and Mtareff): To supply the demands of Yatta, Al Karmel, Khallet al Maiyya and Beit Amra

- Phase 2 - horizon 2045: Transmission of the 70,000 m³/day to the following reservoirs:
 - Adh Dhahiriya new reservoir: To supply 50% of Adh Dhahiriya demand
 - As Samu' existing reservoir: To supply part of As Samu' demand
 - As Samu'' new reservoir: To supply part of As Samu' demand
 - Yatta existing reservoirs (Khalet Saleem and Mtareff): To supply the demands of Yatta, Al Karmel, Khallet al Maiyya and Beit Amra

- Dura New reservoir: To supply the demand of the rest of the South Cluster

The following figure is shows the two Phases (infrastructures and assets development).



The objective of the assignment is to prepare a final detailed design for As Samou' new connection water system. The conceptual designs for the water system have already been realized through the Hebron Governorate - Water and Wastewater Master Plan

2. Ras Al Taweel Regional Water Reservoir Project

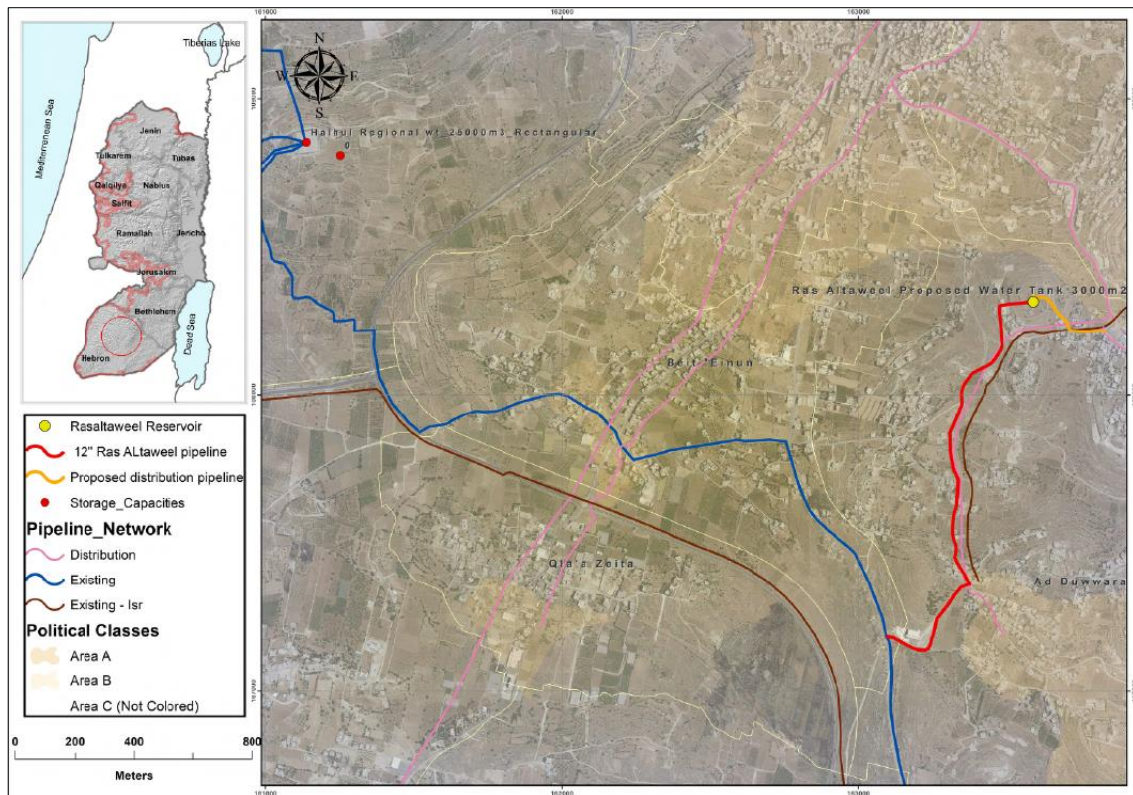
Ras Al Taweel is located to the South West of Sa'ir, it is in a mountainous area at an elevation of more than 900 m above sea level. The mean annual rainfall in the Area is 400 mm, the average annual temperature is 16° C, and the average annual humidity is 61% (ARIJ GIS).

In its efforts and vision to achieve improved bulk water system at the Southern area, the WBWD intends to construct a 3,000 m³ Regional Water Reservoir and transmission pipeline to connect the new water reservoir with Halhoul reservoir system at future connection near Bani Na'im.

The aim of the project is to construct a new bulk water existing supply and distribution system at Ras Al Taweel and the benefitted localities to improve bulk water supply system and to accommodate water quantities. The connection of the new reservoir will enhance management of the system and assist WBWD in equitable and fair distribution of available water quantities. The project will enable WBWD to allocate sufficient quantities of water to the served communities who are suffering from water shortage especially in summer and fall

seasons. The new water system will assist also in the reduction of the NRW and illegal connections.

The following figure is showing project layout and components.



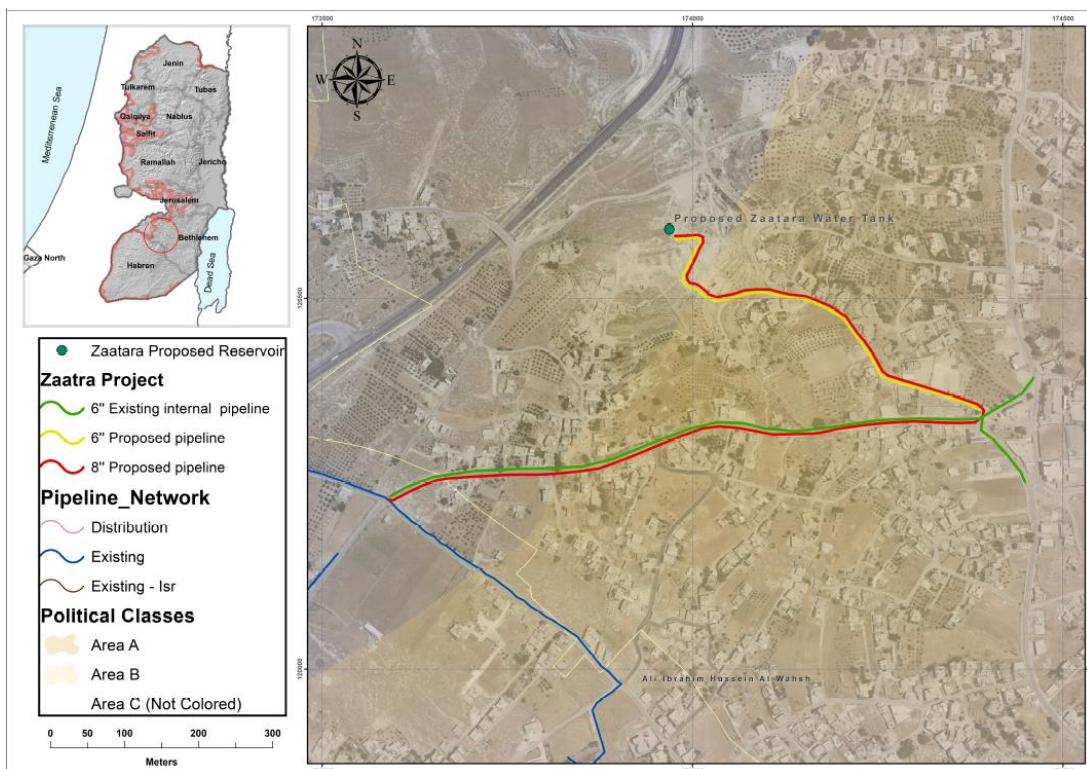
3. Improvement of Za'tara Bulk Water Supply System

Za'tara is located in Bethlehem Governorate 6km (horizontal distance) south-east of Bethlehem City. Za'tara is bordered by open spaces and nature reserves to the east, Ash Shawawra village to the north, Beit Ta'mir village and bypass road no. 356 to the west, and Jubbet adh Dhib village to the south. Za'tara is located at an altitude of 577m above sea level with a mean annual rainfall of 324mm. The average annual temperature is 18o C, and the average annual humidity is about 60 percent (ARIJ, 2009).

WBWD strategy is to improve planning, management and distribution of the limited water resources. In its efforts and vision to achieve this goal, WBWD intends to construct a 2,000 cubic meter regional reservoir and transmission pipelines at Za'tara / Bethlehem, to accommodate bulk water quantities, which will assist WBWD in the equitable and fair distribution of available water quantities. The project will enable WBWD to allocate sufficient quantities of water to the served communities in addition to the reduction of the NRW and illegal connections to the existing system.

It is worth to be mentioned that the current water distribution system is directly connected to the PWA / WBWD supply system in Janata, with no storage reservoirs which makes it difficult to assure the fair and equitable distribution of the water supply. The PWA system that supplies Za'tara extend from Jannata to main connection point of Za'tara, which supplies part of Jannata, part of Beit Ta'mir and Za'tara. It serves total population of about 15 thousand inhabitants. The existing pipeline is 4" pipeline with total length of 3.5 km. The required land for reservoir construction is available and owned by Za'tara Municipality – 850 square meters at the highest area in Za'tara.

The following figure is showing project layout components.



4. Beit Jala New Connection Water System

Beit Jala is located in Bethlehem Governorate / West Bank. Beit Jala is located 10 km south of Jerusalem, on the western side of the Hebron road, opposite Bethlehem, at 825 meters altitude.

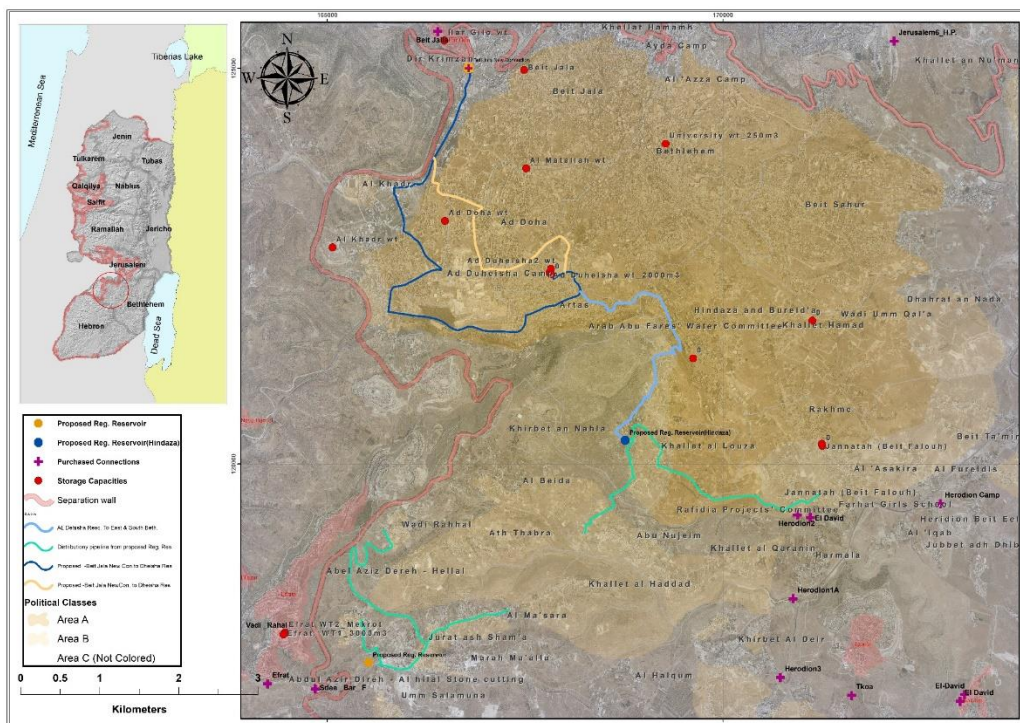
The water service is provided through both the PWA and WBWD at the bulk level, and the Service Providers at customer level. The former is responsible for the resource's development, securing and supply to the service providers and the latter is responsible for distributing the allocated water to the customers of its area of service. Today, the water provision is not equitable between the service providers and a huge difference in the water allocation can be

observed in most of West Bank governorates. This is mainly due to the rigidity of the existing supply system which gives very little control to PWA over the allocation of water.

The project will support improving the water services to the customers including the bulk water system and distribution system through increase of the water sources produced and purchased, securitization of the supply and the distribution through a better management of the sources storage, diversification, and clustering of the demand, and development of the water infrastructure and assets

The new Beit Jala water connection point will be able to provide around 40 Mm³/year by 2040 to Bethlehem Governorate, which will account around 55% of the 2045 Bethlehem Governorate Demand.

The map below is showing Beit Jala connection point system



5. Reef Dura Main Pipeline Water Project

Dura is located 6 km to the west of Hebron city in southern part of the West Bank. Dura is bordered by Yatta Town and Hebron city to the east, Taffuh and Idhna Towns to the north, As Samu' and Adh Dhahiriya Towns to the south and 1948 Armistice Line to the west. Dura town is located on a mountainous area west of Hebron city at an elevation of 839 m above sea level, with a mean rainfall 436 mm, an average annual temperature of 16 °C, and average annual humidity at 61% (ARIJ).

Reef Dura Main Pipeline Water Project is a direct continuation of Tarqumiya - Deir Samit Pipeline Project funded by USAID (completed in 2010). The existing 6" pipeline was

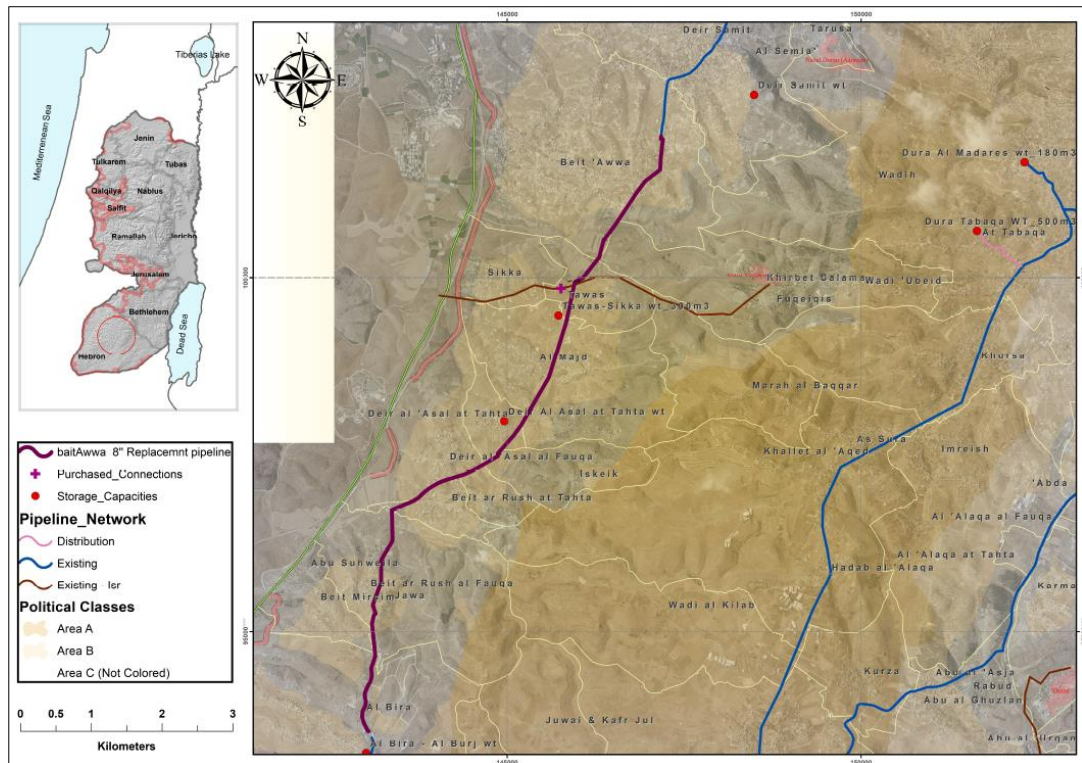
replaced by a new 12" ductile iron pipeline where pipeline installation was ended at Beit Awwa.

At later stages, other two phases were implemented through the UNICEF and ACF where the scope of work included replacement of about 2.5 km of the existing (6" pipeline) by a new 8" steel pipeline.

The remaining segment of the existing 6" pipeline is deteriorated with many illegal connections executed by the local residents as it passes through or adjacent to their own lands. The illegal connections have significantly reduces the water pressure and quantities in the main pipeline which affects the water service to the communities located at higher areas of the service zones. The percentage of water losses reaches up to 40% (due to illegal connections and leakage). Accordingly WBWD decided to continue replacement of the existing 6" water pipe, to reduce the NRW and improve service provided to the served communities.

The aim of the project is to replace the existing 6" deteriorated pipeline with a 8" pipeline to allow improved service and supply adequate water quantities to the served communities. The second part of the pipeline which connects between PWA well system and Al Bira reservoir is also planned to be replaced from 6" to a 10" pipeline of about (7.5 km) length. The replacement will enable PWA to allocate sufficient quantities of water to the served communities, reducing the NRW and illegal connections, and other communities could be served from the proposed system such as Al Ramadin and Adh Dhahiriya especially, from the second part of the pipeline.

The following schematic diagram and figure illustrates the scope and project components.



2. OBJECTIVES OF THE CONSULTANCY

The objective of this consultancy service is to prepare the detailed engineering design, tender documents and the ESMFs for the following projects:

1. As Samua' Connection Water System
2. Ras Al Taweel Regional Water Reservoir Project
3. Improvement of Za'tara Bulk Water Supply System
4. Beit Jala New Connection Water System
5. Reef Dura Main Pipeline Water Project

3. SCOPE OF SERVICES

The scope of services of this contract is to prepare the Detailed Engineering Design, Construction Drawings, Bill of quantities, and Technical Specification for Bulk Water System in priority clusters in the West Bank and determine the optimal procurement approach for the construction, operation, and maintenance of the systems.

3.1. Detailed Engineering Design and Tender Documents

The scope of work is to prepare a detailed design that meets standards of performance, durability and functionality, which are required for long-term operation.

The detailed engineering design shall be based on basic data from the previous studies and /or information provided by PWA, plus additional data to be developed for this purpose. The design shall be carried out and incorporate, but not necessarily limited to the following:

- a. Review and finalize all the information contained in all available studies and preliminary design including the design and planning criteria/ parameters.
- b. Based on the above, prepare and present different technical options to determine "least cost" solutions for the different sub-projects, including "alternative technologies", sites of structures, construction and pipe materials, dimensions, etc.
- c. Carrying out any necessary topographic surveys, mapping and geotechnical foundation and soil investigations at the sites of the major structures and pipelines, water analyses. The detailed engineering designs shall include hydraulic and surge analysis and sanitary engineering, functional and hydraulic design, including sizing and dimensions, of subprojects using computer special software.
- d. Calculation of electrical power requirements of the whole project facilities, including reserve, of the various units outside and inside the different buildings. Design of the electrical substation and stand-by generator plant as well. Detailed design, sizing and specification of all System Control and Data Acquisition SCADA system.
- e. Preparation of typical designs for special appurtenance such as valve chambers manholes, junction pits, house connections, pipe installations.
- f. Compilation of current unit rates and prices and preparation of up-to-date cost estimates of the program of investments.

In general, the Consultant shall:

1. Prepare the detailed engineering design of the approved preferred options which also include.
 - ✓ Detailed design of the whole approved water supply distribution system
 - ✓ Detailed design of all processes in the water system
2. Prepare a longitudinal topographic (profile) survey for all piping routes scale 1/1000 horizontally and 1/100 vertically, together with a suitable scale plan for those routes.
3. Prepare an area topographic survey, scale 1/100 for every site of storage reservoir(s), pumping station, building and other facilities.
4. Prepare detailed hydraulic calculations and gradient lines for pipes, pumping stations, reservoirs, etc. showing all flows, velocities, heads, and static and friction losses.
5. Prepare an architectural and structural detailed design for all pumping stations houses, reservoirs, buildings, etc., as well as for other disciplines: (mechanical, electrical, instrument, fencing, roads, heating/ cooling, etc.).
6. Drawings should be prepared according to a generally accepted standard.

7. Carrying out topographical surveys and soil investigations as required for the detailed design.
8. Preparation of a detailed design report for all sub-projects the report should include but not be limited to the followings:
 - ✓ background data and calculation.
 - ✓ hydraulic calculations for the water pipes.
 - ✓ design calculations for pumping stations and reservoirs; and
 - ✓ structural design.as well as the design of Mechanical equipment, and as well for other related disciplines (electrical, instrument, laboratory, heating/cooling, roads, gardening, fencing, etc. Special attention shall be given to the pipeline materials.
9. Preparation of documentation and drawings needed for land expropriation in accordance to local regulations.
10. Preparation of cost estimates.
11. Preparation of market analysis to determine the number of water customers/users, and their willingness to pay, in order to understand the potential revenue base for the water system; and
12. Preparation of financial analysis to assess the viability of private sector participation options for the construction, operation, and maintenance of the water system, including packaging of the proposed water infrastructure into smaller sub-projects to allow for participation of local contractors, either independently or via a joint venture with international contractors/operators.

Packages to be considered:

As Samua' Connection Water System:

Design of the infrastructures: The proposed infrastructures will include, installation of transmission pipelines, storage reservoirs / reservoirs and pumping stations with all the required equipment and systems needed for an efficient and sustainable operation of the system.

Transmission Main Pipelines - The following table is showing Design Flows - for Transmission Main Pipelines to be revised by the Consultant

Transmission Main	Designation	Communities Supplied	Length (km)	Flow (m3/day)
1	From Mekorot New Connection to Adh Dhahiriya Interconnection	South Cluster	2	51,364
2	From Adh Dhahiriya Interconnection to New Adh Dhahiriya Reservoir	Dhahriya	1.6	7,281
3	From Adh Dhahiriya Interconnection to Yatta Interconnection	South Cluster except Dhahriya	3.7	33,870

4	From Al Samou Interconnection to Old Samou Reservoir	Al Samou	1	10,213
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Note: Design criteria is available and detailed in the Conceptual design document prepared for the Southern Area Master Plan. However, it is the consultant responsibility to revise and update the design.

Design of Reservoirs :

The new storage to be considered are:

1. Additional storage (4,000 m³) at Al Samou New Connection (total = 5,000 m³)
2. Dhahriya new reservoir (2,000 m³).

Below table from Southern Area Master Plan, is showing the following

1. The volume of the reservoirs (existing and new);
2. The calculation of the storage security (in hours);
3. The calculation of the storage deficit (in m³).

Ref.#	Communities Supplied	Existing and Planned Reservoirs				Phase 1 (2030)			
		Name (Existing / New)	Elevation	Volume (m ³) / existing	Cumulated Volume (m ³) / 2030	Flow (m ³ /day)	Storage Security (h)	Required Security (h)	Storage Deficit (m ³)
1	South Cluster	new connection Reservoir / New	670	1000	5000	51,364	1.9	3	-2,700
2	Dhahriya	Dhahriya / New	700		2000	7,281	5.5	10	-1,600
3	South Cluster except Dhahriya					33,870			
4	Al Samou	Al Samou / existing	770	2000	2000	10,213	3.9	10	-3,100
5	Al Samou	Al Samou / New	730			0			
6	Yatta, Al Karmel, Khalet Saleem, Al Mayya, Beit Amra					33,870			
7	Yatta, Al Karmel, Khalet Saleem, Al Mayya, Beit Amra	Khalet Saleem / Existing	810	5000	5000	16,935	5.9	10	-3,500
8	Yatta, Al Karmel, Khalet Saleem, Al Mayya, Beit Amra	Matarref / Existing	830	2000	2000	16,935	2.4	10	-6,500
9	Rest of South Cluster	Dura / New	865		0	0			

General Notes:

- ✓ The reservoirs will be ground reservoirs with a concrete structure. The reservoirs will be preferably circular (to avoid dead zones) and modular (to facilitate maintenance and provide operational flexibility). The reservoirs will be adequately ventilated and equipped with overflow and drainage systems.
- ✓ The reservoir inlets will be fitted with a water meter (electromagnetic type full bore flow), an isolation gate valve and an altitude valve. The reservoir will be equipped with a level sensor (pressure transducer 0-1 bar or ultrasonic level sensor) and a backup mechanical float.
- ✓ The reservoir outlets will also be fitted with a water meter (electromagnetic type full bore flow), an isolation gate valve and a non-return valve. Additionally, the outlet of the New Dura Regional Reservoir will be equipped with an over speed valve to avoid the reservoir emptying in the event of a burst on the gravity discharge main

Design of Pump Station at Al Samu' New Connection

The pump station at Al Samou' new connection will suction water from the Mekorot Buffer Reservoir (5,000 m³ _ currently 1,000 m³) and discharge to the reservoirs at As Samu', Adh Dhahiriya, Mtareff & Khallet Saleem via transmission mains.

Based on the conceptual design _ The characteristics of the pump station are as follows:

1. Design Flow = 51,364 m³/d;
2. Design Head = 190 m;
3. Power = 2,279 kW

The configuration of the pump station will be dry well/wet well and will be equipped with Variable Frequency Drive (VFD) centrifugal pumps (operation and standby). The pump station will also comprise of the following equipment:

1. Electrical transformer and backup generator (+ diesel reservoir with 24h autonomy);
2. MV/LV switchgear and controls;
3. Motor control center and pump control cubicles;
4. Isolation gate valves, non-return valves, air relief valves, butterfly valves, sampling points;
5. Electromagnetic full bore flow water meters with data logging capability;
6. Pressure transducers and loggers;
7. PLC for automation (SCADA ready);
8. Overhead monorail with pulley and hoist;
9. Anti-water hammer vessels (size to be determined at Detailed Design stage);
10. Spare parts on site and in regional stores.
11. VFD pumps at As Samu' new connection are regulated according to the water level in the New Regional Reservoir (via SCADA).

Design of Transmission Mains

The design elements of the transmission mains are reported in the following tables:

Transmission Main	Designation	Communities Supplied	Length (km)	DN (mm)
1	From Mekorot New Connection to Adh Dhahiriya Interconnection	South Cluster	2	1000
2	From Adh Dhahiriya Interconnection to New Adh Dhahiriya Reservoir	Dhahriya	1.5	400
3	From Adh Dhahiriya Interconnection to Yatta Interconnection	South Cluster except Adh Dhahiriya	3.7	1000
4	From Al Samu' Interconnection to old Samu' Reservoir	As Samu'	1	450

General Notes:

1. Transmission pipelines are designed for the horizon 2045. At horizon 2030, design calculations

are carried out to verify compliance with the design criteria requirements;

2. Pipeline diameters to be verified by the designer,
3. Flows to the different reservoirs will be regulated by flow control valves situated near the trunk main offtakes (interconnection points). This is required as the reservoirs are at different elevations.

Ras Al Taweel Regional Water Reservoir Project

The detailed design of Ras Al Taweel Regional Water Reservoir Project shall include the following main components and activities:

1. Construction of 3,000 cubic meters regional water reservoir with all required equipment, flow monitoring system and valve chambers.
2. Supply and installation of transmission pipeline to connect the new water reservoir to Halhoul water system near Bani Na'im connection point, of about 1.5 Km
3. Supply and installation of distribution pipelines from the water reservoir location to serve the targeted localities, of about 1.0 km.
4. Construction and Installation of all required water chambers based on the design requirements.
5. Extending of Ash Shuyukh supply pipeline from Mekorote connection point to the new regional water reservoir location (12" Dia.) 1.5 km. Consultant shall verify proposed diameters
6. Construct internal distribution pipeline of about 1500 meters to connect between the new bulk system and the existing system in Sa'ir town to serve the high areas (Beit Anon and Ras Al Aroud)
7. Check and verify the main distribution systems inside the local communities benefited from the new system by conducting hydraulic analysis to ensure safe and efficient operation and system ability to accommodate new supply system (Reservoir)
8. Installation of SCADA system at the water reservoir and flow monitoring chambers which will be connected to WBWD system in the Southern area and Ramallah

Improvement of Za'tara Bulk Water Supply System

The detailed design of Za'tara Bulk Water Supply System shall include the following main components and activities:

1. Construction of 2,000 cubic meters regional water reservoir with all required equipment, flow monitoring system and valve chambers.
2. Supply and installation of transmission pipeline from the flow meter location to the new

reservoir about 1.5 KM

3. Supply and installation of distribution pipeline from the reservoir location to the network connection point, of about 600 meters
4. Construction and Installation of all the required water chambers based on the design requirements.
5. Construct internal distribution pipeline
6. Installation of SCADA system at the regional reservoir which will be connected to WBWD system in the Southern area and Ramallah
7. Check the existing water network at Za'tara by conducting hydraulic analysis to ensure safe and efficient operation and system ability to accommodate new supply system (Reservoir), the hydraulic analysis should include the main transmission pipeline that extend from Jannata to Za'tara with total length about 3.5 km.

Beit Jala New Connection Water System

The detailed design of Beit Jala New Connection Water System shall include the following main components and activities:

1. Supply and installation of main supply pipeline from Beit Jala New Connection to Al Dheisheh reservoir. Around 8km (Dia 700mm – 1 m, diameter to be verified by the consultant).
2. Supply and installation of distribution pipeline from Ad Duheisha reservoir, to East & South Bethlehem Area. Around 5 km (500 mm – 700mm, diameter to be verified by the consultant).
3. Construction of Regional Water Reservoir at Hindaza area & Umm Salamuna. Capacity of reservoir to be defined by the Consultant upon communities needs and water availability.
4. Supply and installation of distribution pipeline from the new reservoirs to Bethlehem south and east villages (20 km)
5. Construction and installation of all the required water chambers based on the design requirements
6. Installation of SCADA system for the new bulk water supply system which will be connected to WBWD system in the Southern area and Ramallah

Reef Dura Main Pipeline Water Project

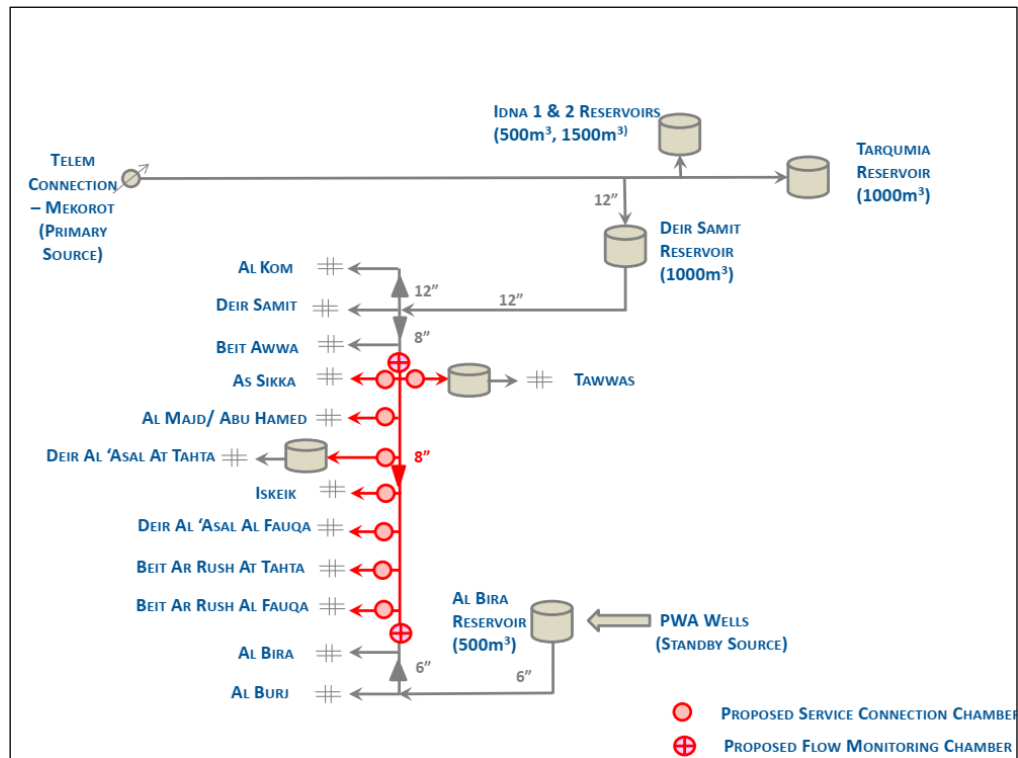
The detailed design of Reef Dura Main Pipeline Water Project shall include the following main components and activities:

1. Replacement of the existing 6" water pipeline with new 8" main pipeline. Estimated

pipeline length is 7 km to meet future demand.

2. Installation of a new 10" Dia., pipeline of about 7.5 km, to interconnect PWA wells system (near Adh Dhahiriya) with Al Birah reservoir.
3. Construction and Installation of 8 service chambers to serve the benefitted communities
4. Construction and furnishing of 2 Flow Monitoring Chambers.
5. Installation of a new distribution piping from Reef Dura pipeline to Deir al A'sal at Tahta existing reservoir.

Schematic Diagram of Reef Dura Main Pipeline Water Project



Specific Activities:

As part of the preparation of detailed engineering design, specific activities required includes follows:

(a) Topographical Surveys:

The Consultant shall carry out topographic surveys of all roads, streets etc. where water pipes will be laid for main pipeline (bulk water) . The survey shall be carried out using total stations and associated computer software to produce 2-D and 3-D plan metric drawings in sheets to the standards of the PWA and to scale 1: 1000 produced digitally using compatible AutoCAD computer software.

The survey shall be made for the full width of the roads from property line to the property line and of all above ground and underground features and utilities. The features shall include but not be limited to road widths and center lines, sidewalks, walls and/or building facades,

telephone cabinets, electricity substations, poles and draw pits, and any other features present within the road widths. All features must be shown on the drawing using well-established symbols.

The survey shall include establishing survey control points referenced to fixed features and documented by reference numbers, sketches, and photographs.

All survey points shall have X, Y, Z coordinates with the points describing the roads at an average horizontal interval of 25m.

Surveys shall be prepared for all facilities included in the detailed design.

(b) Soil investigation

The soil investigation shall consist of coring and drilling test boreholes (minimum 10 boreholes, 20 m deep each at every site of each reservoir, pumping station, building or any other buildings) and along the routes of the water mains (one every 1 km) distance. The depth of holes shall not be less than 6.0m from the surface or as appropriate.

Bulk samples must be collected for laboratory testing and the stratification described. Standard Penetration Tests (SPT) or an equivalent test shall be performed. The laboratory test shall include sieve analysis of the soil samples and determination of the Atterberg limits for the material passing No.4 sieve. In addition, chemical tests for the soil and groundwater encountered and the determination of the water table level shall be carried out. Additionally, the consultant should be responsible to perform any other required soil investigations according to the requirement of the project.

(c) Drawings

These shall involve the preparation of final design drawings for each sub-project. Detailed construction drawings of water pipes, to suitable scales, plans 1: 1000 and profiles, 1: 1000 horizontal and 1: 100 vertical scale; for structural, architectural, mechanical and electrical etc plans and details, scale 1: 100 or 1 :50, 1 :25 to be used.

The drawings shall also show the exact location of all structures including reservoirs. Details of chambers, manholes and other appurtenances shall be given at suitable scales.

(d) Technical Specifications:

The Consultant shall prepare technical specifications for the implementation of the Project works in accordance with International Standards. These include but are not limited to the following:

- a. Technical specifications for all materials and work included in the civil works component.
- b. Technical specifications for all plants and equipment to be incorporated in the Project works.

- c. General obligations of the contractors.
- d. The tests and measurements to be carried out prior to, during and upon completion of the Project, test and certifications of equipment and supplies at the place of manufacture or fabrication before shipment to OT. The Technical Specifications shall specify tests and procedures in detail; and
- e. Specifications of all vehicles, plant and equipment, laboratory equipment, reagents and furniture and fittings, office equipment and furniture, workshop equipment and tools needed for an adequate operation of the system and plants, additional to any existing facilities.
- f. Any other necessary and required implementation guideline

The consultant is responsible to provide the specifications of items of work or materials included in the above-mentioned designs or anticipated.

(e) Building GIS Data Sets and Comprehensive Computer Models

- a. To prepare a GIS data set for all of the proposed designed assets (main pipes, pumps, reservoirs, etc.) for all the water supply systems in the study area.
- b. To build a compressive model for the water supply distribution system, in order to be able to use this model for future operation, maintenance, exposition and monitoring of the system.
- c. Building the computer model of the drinking water treatment plant in order to use the models for monitoring, and further improvement of the plants in the future.
- d. Providing capacity-building programs for the PWA/WBWD targeted staff to get acquainted with such software moldings and be able to expand, calibrate and validate the models.

Note: Some software suggested to do the aforementioned tasks can be: WaterGEMS, WaterCAD, Infoworks WS, Mike Urban and WEST by DHI. With confirmation from the contracting authority.

(f) Bills of Quantities and Cost estimations

This shall include the preparation of detailed Bills of Quantities for all works, as well as services envisaged for implementation and defining how quantities will be measured for payment. The Consultant shall prepare the bills of quantities in computer format using standard software. Additionally, the consultant is responsible for cost estimations, as well as the preparation of a financing plan for the period of works execution.

The Consultant shall, simultaneously, prepare confidential priced Bills of Quantities, with the accurate unit and/or lump sum rates, whichever is applicable, which in total shall equal the

cost estimate in the above paragraph. The cost estimate shall identify both local and foreign currency costs associated with the construction drawings kept for this purpose, in preparation of the as-built drawings.

Maintaining a comprehensive record of all works executed, materials, plants, and equipment supplied variations to design or field changes in construction, and Project cost changes.

The Consultant shall also prepare cost estimates for the operations of all works over their intended life cycle.

3.2. Assessment of Private Sector Participation Options

The consultant will assess private sector participation options for the construction, operation, and maintenance of the water system to determine an approach that is viable and provides optimal value for money. The Consultant shall therefore undertake the following:

- a. Baseline Market Analysis: Identify historical trends in usage and revenue of existing services in the water sector to determine the size of the potential customer base.
- b. Legal, Regulatory and Institutional Analysis: Identify any relevant legal, regulatory, and institutional bottlenecks that may negatively impact the viability of the project and/or the ability of the private sector to deliver the proposed water services. Subject to this analysis, recommend necessary changes/mechanisms to the legal, regulatory and/or institutional environment that would be needed in order to enable private sector participation in the project.
- c. Financial Analysis: Using relevant technical information and cost estimates, and taking into account baseline market analysis, develop a financial model that assesses the financial viability of the various private sector participation options during operation, and maintenance.
- d. Develop Project Structure: Based on the financial analysis undertaken, develop a proposed PPP project structure(s), including an indicative project risk allocation and payment mechanism.
- e. Market Sounding: Socialize the proposed project structure with potential bidders as a way of assessing bidder appetite and further informing the proposed project structure(s).
- f. Public Sector Comparator: Assess whether the proposed PPP project structure(s) provides better value for money than public procurement and implementation of the project.

4. PROJECT MANAGEMENT

PWA is the Implementing Agency of the Project and will be responsible for the proper implementation of this study. PWA - PMSU, headed by a Project Manager- to coordinate all Project activities, including

future tendering procedures and contract management issues. The PM will be inter alia responsible for:

- support the consultant's obtaining required permits, information, and approvals.
- Reviewing work plans.
- Reviewing and monitoring progress and giving directions.
- Taking appropriate measures for coordinating the activities.
- Reviewing and approving all reports studies and designs (Reports, studies, drawings and any other documents).
- Reviewing and approving tender documents.

Coordination: All studies and design and other activities of the Consultant shall be closely coordinated with PWA Project Coordinator.

PWA will ensure close coordination and co-operation with the local authorities for technical and general contractual and coordination matters. A detailed coordination mechanism between the PWA and the Consultant shall be discussed during the signing of the contract.

5. Studies to be provided by the Client

The following reports / documents shall be provided to the consultant to assist in preparation of the detailed design:

1. Northern West Bank Master Plan, 2015, funded by AfD and KfW
2. Water and Wastewater Master Plan for Ramallah and Al Bireh, 2018, by KfW
3. INB 4 Program funded by USIAD and implemented through Black & Vetch
4. Hebron Governorate - Water and Wastewater Master Plan
5. The Water Master Plan for the South and North-East communities of the West Bank, specifically Area C (2017-2035) prepared by Action Against Hunger and GVC. The final report – referred to as [GVC, 2017] – presents the existing situation in those areas and gives a list of recommended investment measures for the 2035 horizon.

6. LOGISTICS AND TIMING

6.1. Project Location

The project will be implemented in West Bank / Palestine

6.2 Commencement date & Period of execution

The envisaged commencement date of the Consultancy by April 2023. The period of execution of the tasks identified in this Terms of Reference is (12) months from the Commencement Date.

7. REQUIREMENTS

7.1. Qualification of the Company

General experience: having been in business for at least the past 10 years.

Specific experience: demonstrate similar services in terms of contracts size; nature of the Services (design study, Preparation Tender Documents), technical area and expertise (water project, bulk and network water system).

Availability of appropriate skills among staff and/or the ability to mobilize a diversified team of experts with appropriate knowledge and skills .

7.2. Personnel

All employees or other personnel provided by the Consultant to provide services or carry out any obligations under this contract shall be deemed, for purposes of this Contract, to be employees of the Consultant.

The Consultant shall be responsible for the professional and technical competence of its employees and will select reliable and competent individuals who will perform effectively in the implementation of this Contract, who will respect the local customs and who will conform to a high standard of moral and ethical conduct.

The Consultant should pay attention to the need to ensure the active participation of local professional skills where available, and a suitable mix of international and local staff in the Project teams.

7.2.2. Qualifications:

The required qualifications of the Consultant's staff are outlined below. In all positions mentioned, fluency in English is required. With expatriate personnel overseas experience is considered advantageous. All experts who have a crucial role in implementing the contract are referred to as "Key Experts". The profiles of the "Key Experts" for this contract shall be:

Key Experts

Project Manager: Civil Engineer with at least 15 years professional experience, management of which 10 years in water supply system projects. Holding a minimum of a master's degree, or preferably higher, in the related field of study. He/she should have worked on at least one project similar in size and scope as a project manager.

Water Supply Treatment Design Engineer: Civil Engineers with at least 15 years of professional experience, of which 7 years' specialist experience in water supply and wastewater projects. In case

of association / joint venture, the Water Supply and Wastewater/treatment Design Eng. must be a permanent employee with the Company invited on the shortlist.

Structural Engineer: Civil Engineer with at least **10 years** professional experience, of which 7 years of professional experience in structural design of water facilities including regional reservoirs.

'Network design/ Hydraulic Analysis Expert: Civil Engineers with at least 10 years of professional experience, of which 7 years of professional experience in water network analysis and hydraulic modeling.

Specification and Contracts Expert: Civil Engineer with at least 20 years' professional experience, of which 10 years' specialist experience in water supply and wastewater projects.

Non-Key experts

The Consultant shall select and hire other experts as required throughout the project phases. These profiles must indicate whether they are to be regarded as long-term/short-term, local/international and senior/junior.

The required profiles include, but are not limited to:

- Environmental Specialist
- Financial Analysis Expert
- Electro/Mechanical Engineer
- Structural Engineer
- Electrical Engineer with experience in Automation and Control and SCADA systems
- Etc.

All staff proposals shall be supported by the respective CV's and certified as accurate by the Consultant, all the forms should be organized and presented in an original format of CV used by the consultant.

7.3. Facilities to be provided by the Consultant

The Consultant 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.

7.4. Workshops

After the review of the feasibility study report and any other studies provided by the client, the Consultant shall arrange and conduct workshops to be held in the project field office or some other place as necessary. At the workshop, the review of feasibility study findings (e.g., the technical alternative options, costs, environmental impact) will be presented and discussed. The workshop may

be attended by concerned agencies, project stakeholders from the government central and field level, institutions, media, NGO's and local communities.

Other workshops to be held in the Project area attended by community representatives in order to discuss and produce a plan to coordinate efforts on community health and wellbeing of the people of the Project area.

7.5. Support by the Contracting Authority

- The Contracting Authority will make available and free of charge the pertinent data and information available as per. The Consultant may make photocopies at his own expense.
- Any data, drawings, maps, information and other items, which are necessary to complete the Project, and which need to be obtained from governmental or non-governmental agencies, shall be obtained by the Consultant at his own expense and at no cost to the Contracting Authority.
- The Contracting Authority will provide the Consultant with support as may be required.

8. REPORTS

8.1. Requirements

The Consultant shall prepare and deliver to PWA a number of reports, documents and files covering all the work performed by him in the execution of the Consultancy services. All these submissions shall be in English and shall be submitted in both hard and soft copies, and shall include all relevant data, maps, drawings, diagrams, reports and other documents as appropriate with information sources/references. These shall be submitted in the requisite number of copies to PWA, according to the schedule of submission in agreed Work plan. The official date of submission shall be the date on which the reports are received by PWA. The form of printing, type of cover and binding of the reports shall be determined by mutual agreement between PWA and the Consultant.

8.2. Submission and approval of Progress and Study Reports

The type and contents of the reports to be submitted shall be subject to revisions from time to time as services progress. The Consultant shall initially prepare reports according to the prescribed time schedules for the Project as follows:

a) Inception Report

The Consultant shall submit within 1 month after the Commencement Date an Inception Report covering detailed design phases, which should include:

- Detailed findings of the FS review and description of the approach to work and of work components, organization, and technical aspects of the Project to be covered.
- Any problems unforeseen, with recommendations for their solutions.
- Detailed work plan.
- Detailed staffing schedule and sub-division of work between the field and home office.
- Detailed schedule for the delivery of reports which could be divided for coverage of specific subject areas. and
- Detailed schedule for data, services and facilities to be provided by PWA

b) Detailed Design and Tender Documents for the Water System.

- the Consultant shall submit a Draft Detailed Design Report for the works related to subprojects within four and a half (4.5) months the Commencement Date of the contract *(Submission of the reports/reports should be on a task basis and each part be submitted separately (or in percentages of progress) before submitting the final package, this will help the PWA to review the reports and provide comments in parallel with the ongoing process of work.)*
- The Contracting Authority will provide comments to the Consultant within (2) two weeks.
- The Consultant shall provide a Final Design Report within (2) two weeks after the receipt of the Contracting Authority's comments.
- Unless further comments will be made, the Final Design Report will be approved by the Contracting Authority within (2) two weeks after its submission.
- The Consultant will provide a Draft for all detailed specifications of Tender Documents within (2) months after submission of the draft Detailed design report. *(Submission of the reports/reports should be on a task basis and each part be submitted separately (or in percentages of progress) before submitting the final package, this will help the PWA to review the reports and provide comments in parallel with the ongoing process of work.)*
- The Contracting Authority will provide comments within 3 weeks.
- The Consultant shall provide Final Tender Documents within 3 weeks of receipt of PWA comments.
- Unless further comments are made, the Final Tender Documents will be approved by PWA within two weeks after their submission.

This implies a total time period for the detailed design and tender documents of **(12) months from commencement day.**

Consultant shall submit to PWA the documents hard and soft copies for each sub-project and other materials as follows:

- Full-size tender drawing
- Technical specifications required for tender document Estimates of construction costs (Confidential)
- Implementation program and construction schedule.

c) Ad Hoc Reports,

These are special reports which are not scheduled in the Work Plan, but which may be called for in response to unforeseen circumstances which may arise during the implementation of the Services, and which may require immediate action by PWA, or third parties, on important technical findings or the future of the Project. The Consultant shall prepare such reports on his own initiative or at the request of PWA.

9. ASSIGNMENT PERIOD & LEVEL OF EFFORT

The total time period for the Consultant assignment would thus comprise 12 months in total. All reports should be submitted in an agreed number of hard copies and also soft copies. The level of effort for the assignment 30 man.month.