Terms of Reference

For the drilling of seawater boreholes to be used for the feeding of the existing seawater desalination units in Folegandros Island as well as for the rejection of the produced brine

In the framework of
the "ZERO DROP" project

Funded by The Coca-Cola Foundation

1. Background and context

1.1. The ZERO DROP Project

The small arid islands of the Aegean Sea in Greece are under significant water stress, particularly in summer months, when seasonal tourism spikes water demand, jeopardizing local water and, consequently economic, security. Water resources abstraction is mostly accompanied by pumping and high energy costs, as well as significant environmental threats by groundwater depletion and desalination. Climate change impacts are also expected to aggravate the situation.

At the same time, tourism is becoming a key economic activity, accounting for 20% of national GDP and more than 80% of local economy. However, tourism is a water thirsty activity. With an average daily domestic consumption calculated in the country at almost 200 litres, the daily consumption of a tourist is estimated between 350-1.000 litres, depending on the lodging class and facilities.

In order to meet the water demand of locals and tourists, authorities engage usually in top-down solutions to increase water supply, often with high environmental impact, like desalination, overlooking sustainable management options like water efficiency measures, including loss reduction, rainwater harvesting, reuse, etc. and behavioral change towards water conservation. Global, as well as European, best practices point to water efficiency measures as significant contributors to sustainable tourism and development.

In this regard, GWP-Med developed the "ZERO DROP" concept and methodology, aiming to:

- Increase water efficiency, decrease losses and utilize every drop for local water security and climate change adaptation by deploying and showcasing appropriate solutions, from mainstream to innovative.
- Create awareness for users, tourists and citizens, on the value of water as key factor towards sustainability.
- Improve management of water resources through partnerships via increasing capacities, advancing advocacy, dialogue and knowledge sharing, with youth and gender engagement.

"ZERO DROP" is a 2-year project that will adopt one small Greek island to address water challenges in an integrated manner, as well as engage in activities beyond the project island to showcase

good practices and solutions. It will target, as priority, an island with water scarcity, which is a touristic destination and, preferably, has women mayor, and will apply an integrated approach to improve water efficiency in the tourism sector, one of the key economic and heavily water-reliant sectors, and to spread the message across various audiences and stakeholders.

The ZERO DROP approach includes:

i. Technical solutions,
ii. Educational activities,
iii. Youth engagement and gender mainstreaming,
iv. Capacity building & training,
v. Awareness raising,
vi. Advocacy

The "ZERO DROP Island" will aspire to constitute a powerful model for sustainable use of water resources in the tourism sector, adding value to the destination and reaching out to mindful tourists, setting a paradigm for blue and sustainable economy to locals, visitors and beyond.

1.2. The Island of Folegandros

The ZERO DROP project selected the Island of Folegandros for its operations as it matches the set criteria:

- Lack of water
- Woman Mayor
- Touristic destination

Folegandros Island is one of the most picturesque islands of the Cyclades Islands chain. Its wild natural landscape and peaceful atmosphere make this island a great destination. It boasts traditional Cycladic architecture. That means that its villages are made up of tiny, whitewashed houses, narrow alleys, and colorful windows.

The island of Folegandros has a population of 780 inhabitants (Census 2011) and has developed intensive touristic activities that provide the main revenue of the local economy. Specifically, the island has a hotel / rooms to let capacity of 3.000 beds and receives more than 45.000 per year. The touristic facilities operate with 100% capacity for 60 days or with 70 – 72% capacity for 120 days.

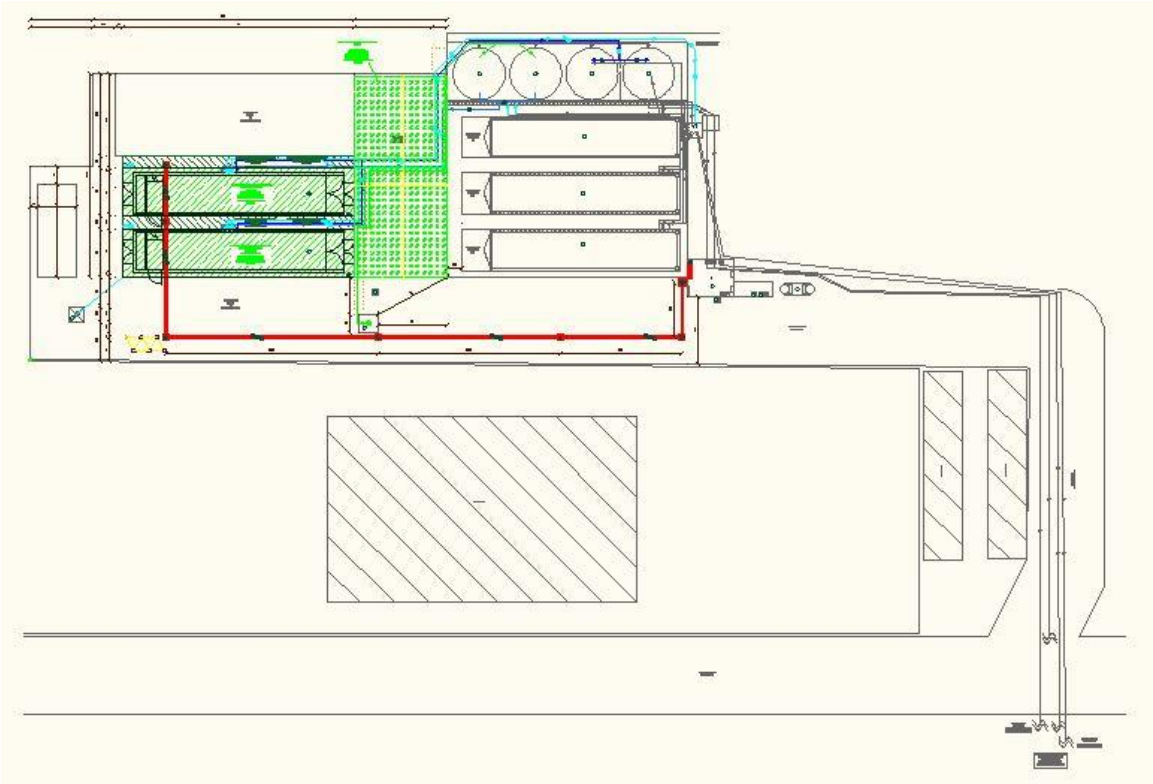
Water is essential for the maintenance and further growth of the tourism sector of the island. Generally, Folegandros Island continues to lack the necessary water quantity and quality to meet its needs. Efforts have been made in the past for both increasing water supply and reducing water demand.

Hoteliers highlighted the need for a broad awareness campaign targeting tourists, to make them aware of the island's struggle with water scarcity and to encourage them to save water in their lodgings. (It was mentioned that 'the sight of swimming pools in many facilities is giving the wrong impression of an abundance of water').

1.3. The Seawater Desalination Units in Folegandros Island

One of the major efforts of Folegandros Municipality towards meeting the needs of the various economic activities (with tourism being the most significant one) on the island, was the installation of seawater desalination units. Specifically, the island has five (5) installed units. Three (3) of those have the capacity to produce up to 300 m^3 of drinkable water per day while the other two (2), the newest ones (installed in 2020) have the capacity to produce up to 350 m^3 of drinkable water per day. Thus, the island's maximum capacity is 1.600 m^3 of drinkable water per day.

The units have been installed in the area of Karavostasi and their general allocation is pictured as follows:



The units were designed to operate under the typical composition of seawater in Aegean which is presented in the table below.

Parameter	**Value**	**Unit**
pH	7,30	-
Electrical Conductivity	59.700,00	µS/cm
Total Dissolved Solids	42.500,00	mg/l
Carbonates (CO_3^-)	56,00	mg/l
Bicarbonates (HCO_3^-)	159,00	mg/l

Chlorine (Cl^-)	24.510,00	mg/l
Nitrates (NO_3^-)	< 5,00	mg/l
Nitrites (NO_2^-)	< 0,05	mg/l
Ammonia (NH_4^+)	< 0,20	mg/l
Sulfates (SO_4^-)	2.800,00	mg/l
Silicates (SiO_2)	< 1,00	mg/l
Calcium (Ca^{++})	380,00	mg/l
Magnesium (Mg^+)	1.500,00	mg/l
Potassium (K^+)	55,00	mg/l
Sodium (Na^+)	12.900,00	mg/l
Iron (Fe^{++})	< 0,04	mg/l
Copper (Cu^{++})	0,10	mg/l
Manganese (Mn^{++})	< 0,04	mg/l
Zink (Zn^{--})	0,04	mg/l
Chromium (Cr^{+++})	0,11	mg/l

The installation also includes four (4) plastic 20 m^3 tanks. Two (2) of those are being used to collect the raw seawater and forward it to the units for treatment while the other two (2) are being used to collect the treated water and forward it to the distribution network.

Currently, the units are being fed with seawater from two (2) seawater boreholes. Those have a total capacity of much less than 100 m^3 of seawater per hour. This means that the island is provided with a maximum production of 600 - 700 m^3 of drinkable water per day (depending on which unit operates each time). Indicatively, each unit requires 40 – 50 m^3 of seawater per hour in order to produce up to 15 m^3 of drinkable water per hour. The remaining water is being rejected (brine).

Thus, the island lacks the necessary infrastructure to exploit the maximum designed capacity of the installed units. Apart from water shortages, especially during the summer season, the lack of related infrastructure also causes much higher energy consumption (compared to the estimated / designed consumption) due to the frequent shutdowns and starts of the units. That also translates to much higher water costs for citizens and businesses compared to the costs generated under the smooth operation of the units.

2. Description of the Assignment

2.1. Objective

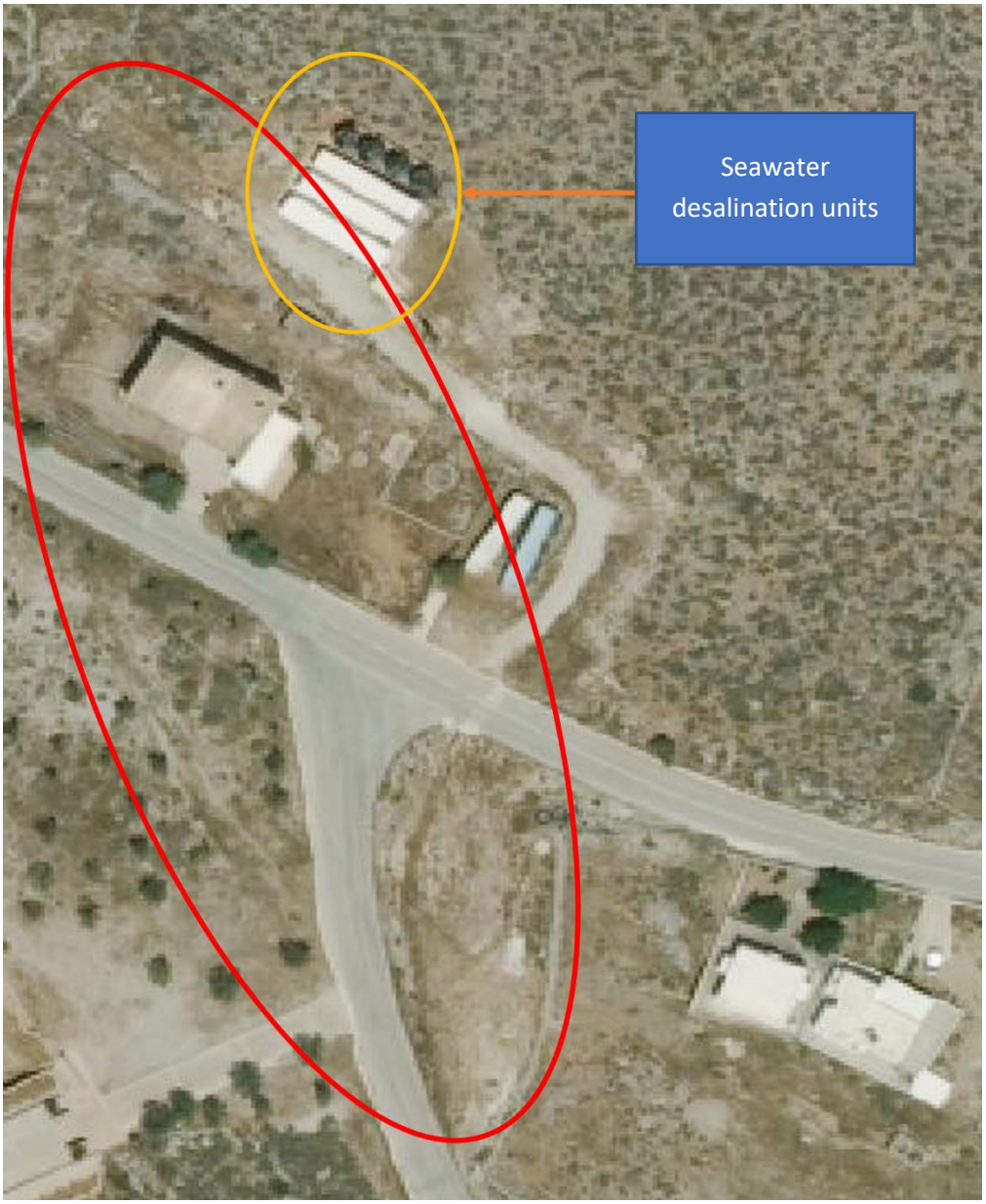
The objective of the assignment is the delivery of boreholes capable of providing a total minimum amount of 50 m^3 of seawater / hour for the feeding of the existing seawater desalination plants as well as the delivery of boreholes capable to receive a total minimum amount of 35 m^3 of rejected brine / hour from the existing seawater desalination plants and direct it to the sea.

The location of the assignment is the Greek island of Folegandros.

The drilling coordinates (EGSA 87) and the maximum depths, according to the related permit from the Water Authority of South Aegean are listed as follows:

Boreholes	Coordinates	Maximum Depth
B1	584387 A and 4052536 B	60 meters
B2	584403 A and 4052524 B	60 meters
B3	584438 A and 4052412 B	60 meters
B4	584434 A and 4052467 B	80 meters
B5	584438 A and 4052433 B	80 meters
B6	584432 A and 4052398 B	80 meters

The area of the boreholes is highlighted in red in the following picture from the Hellenic Cadastral webpage. It is noted that only the three (3) out of the five (5) seawater desalination units are presented in the picture since the last two (2) were installed quite recently (2020).



2.2. Required Services

Responding to the above, the assignment includes the following:

Task	Quantity
Transportation of the drill (1400 mm) to the location of the drilling and back at the contractor's base of operation	1 service (for the whole project)
Drilling of 6 (max.) testing boreholes for the pumping of seawater and the rejection of brine (each one between 60 – 80 m deep), with a diameter of 8 ½", in hard rock.	Maximum total depth of 420 m
Widening of the drilled boreholes that meet the criteria described in 2.1. to a diameter of 12 ¼", in hard rock	Maximum total depth of 300 m
Installation of plastic piping of 10" and 10 atm. in the boreholes.	Maximum total depth of 240 m
Gravelling between the borehole walls and the piping.	Maximum 10 m3 of gravel

Notes:

- The boreholes must be covered to avoid accident risk for people and animals.
- In the boreholes to be placed a fencing pipeline with cementation for surface sealing and water intake protection.
- Plastic piezometric piping will be installed in the borehole at the second phase of the project.

2.3. Permit related Obligations

During the construction phase of the project, the following obligations are put into force:

- Removal of any vegetation, to be limited to the minimum degree required and exclusively for the construction needs of the project.
- All necessary measures to avoid any form of water pollution from solid waste, waste materials, mineral oils, etc. during the construction phase of the project, to be taken.
- All necessary measures (marking, fencing, etc.) to avoid accidents, to protect residents and workers from danger that may be created during the construction of the project, to be taken.
- Storage of materials, even temporary, outside the construction area is prohibited.
- After the completion of the construction, the rehabilitation of the construction area needs to be conducted.

2.4. Assignment Outputs

The outputs of the assignment are the following:

- Completed boreholes capable of providing a total minimum amount of 50 m^3 of seawater per hour for the feeding of the existing seawater desalination plants
- Completed boreholes capable to receive a total minimum amount of 35 m^3 of rejected brine per hour from the existing seawater desalination plants and direct it to the sea.
- A report listing the works performed (project logbook) upon which the final payment will be issued.

- Final report which will include the following:
  - Brief report describing the works and the adopted methods. The report should also include details such as the pace of drilling, the level of water after the construction of the boreholes, etc.
  - Topographic map presenting the location of the boreholes.
  - Lithological section on page scale A4 or A3.

Due to the complex nature of the task, the outputs will be assessed upon measurement.

2.5. Reporting line

The contractor will work under the direct supervision of / and communicate directly with Dr. Nikolaos Skondras, GWP-Med Senior Programme Officer, who is serving as Project Coordinator for Technical Solutions. When not present, the contractor will be supervised by related technical personnel assigned by the municipality of Folegandros.
The Head of Water Authority of South Aegean might be present during the construction phase. He should have direct access to the project details.

3. Duration of the Contract

The overall duration of the contract will be maximum 40 days.

4. Contract Price and Schedule of Payments

The maximum fee for this assignment is **55,000 EUR***. This amount includes all other costs, income taxes and any other amount payable or cost that may be required for the completion of the work/service, **including VAT**.

The schedule of payments is as follows:
- 30% payment in advance upon signatory
- 70% payment upon satisfactory completion of the works

*The final payment will be issued upon measuring of the total works performed.

5. Selection Criteria

5.1. Pass/Fail criteria

Successful participants must:
- Have the necessary machinery and personnel to perform the works.
  - The machines and devices that will be used, must be licensed according to the Greek Laws in force. – Copy of license to be provided with the offer.
  - The drills must be accompanied by the operator's license as well as the special license of equipment. – Copy of license to be provided with the offer.
- Have Excellent oral and written communication skills in Greek and English.

- Reside in Greece and be able travel without restrictions to the Project area.

5.2. Qualification and Experience

The required qualifications are presented below. **Failure to provide the minimum required qualifications is considered ground for disqualification**.

Work experience (Required)

- Minimum ten (10) years of experience in borehole drilling and related works.
- Minimum five (5) years of experience in borehole drilling related to seawater desalination plants.
- Minimum five (5) years of experience in borehole drilling in Greek Islands.
- Minimum five (5) assignments of similar nature and budget with the present one in the last five (5) years – list of works to be provided to assist the evaluation process.

5.3. Awarding Criterion and Evaluation Process

Award criterion is the Most Economically Advantageous offer with criterion the lowest price.