ANNEX 1 – TECHNICAL SPECIFICATIONS

The following material derived from a technical study that was conducted by an awarded expert at the Water Treatment Plant of Schimatari. The awarded contractor will have access to that study.
Additionally, the awarded contractor will have access to the variation (from the original study) suggested and accepted by the Technical Service of the Municipality of Tanagra.

1. Water Treatment Plant of Schimatari

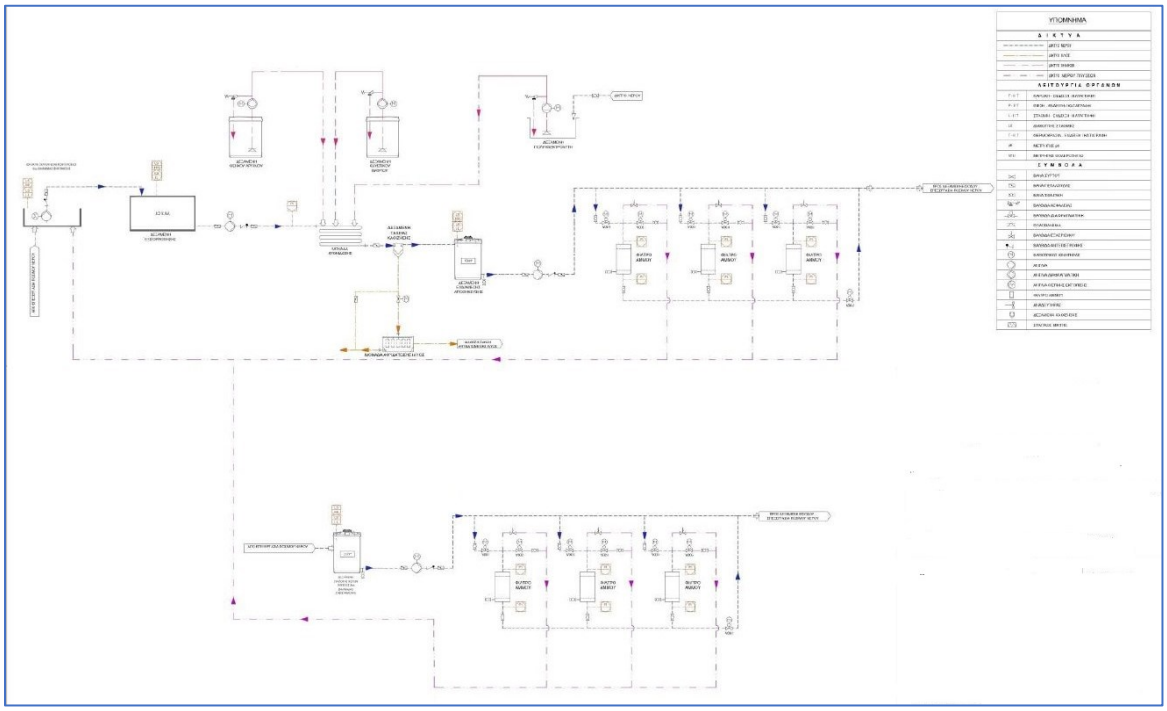
No of filters	
Filters with 2,5m diameter:	4
Filters with 1,8m diameter:	3
Flow per filter (m^3/h)	
Filters with 2,5m diameter:	100.00 m^3/h
Filters with 1,8m diameter:	50.00 m^3/h
Backwash water per filter (m^3) per washing cycle	Washing Cycle Duration: BW1: 12m, BW2: 12m, CR: 5m
Filters with 2,5m diameter:	79.50 m^3
Filters with 1,8m diameter:	41.30 m^3
Total backwash water (m^3) of all the filters:	441.90 m^3
Filters with 2,5m diameter:	318.00 m^3
Filters with 1,8m diameter:	123.90 m^3
No of backwash per 24 hours:	2
Total backwash water (m^3/24h):	883.80 m^3
Filters with 2,5m diameter:	636.00 m^3
Filters with 1,8m diameter:	247.80 m^3
Annual volume of backwash water (m^3):	322.587.00 m^3
Backwash water to be treated (m^3/h)	36.83 m^3/h
Turbidity of backwash water (NTU)	308 NTU
Total Suspended Solids of backwash water (mg/l)	286.00 mg/l
Weight of dry mud (kg/d)	0.253 kg/d

It is noted that the filters at the Water Treatment Plant of Schimatari perform both the rinsing and the backwash phases. Both volumes are included in the "backwash" term used above.

2. Treatment Process of Backwash Water at the Water Treatment Plant of Schimatari

Treatment Stages:

Those are presented in the attached PID:



Works included:

- Construction of a shaft to collect the backwash water
- Installation of a control / electrical panel
- Hydraulic and electrical connection of the equipment (including piping, fittings, cables, etc.).
- Concrete base for the equipment (if needed)
- Protection of the electromechanical equipment from the outdoors weather conditions.

3. Technical Specifications of Equipment

Treatment of the washing water of the 1st stage of the existing filters

3.1. Collection Shaft

A shaft of max 10 m^3 will be constructed on the backwash water drainpipe to collect the backwash water and forward it to a Balancing Tank (3.3). Specifically, the construction will expand the existing shaft to serve the filter backwash water collection. The shaft will also collect the filter backwash water from the filters which will be installed as components of the system requested at the present assignment.

3.2. Shaft Pump

A surface pump will be installed next to the shaft with all the necessary hydraulic connections in order to forward the collected water from the shaft to a backwash water Collection Tank (3.3). The pump will have an approximate flow of 180 m3/h at 14 m and will be at least 11kW.

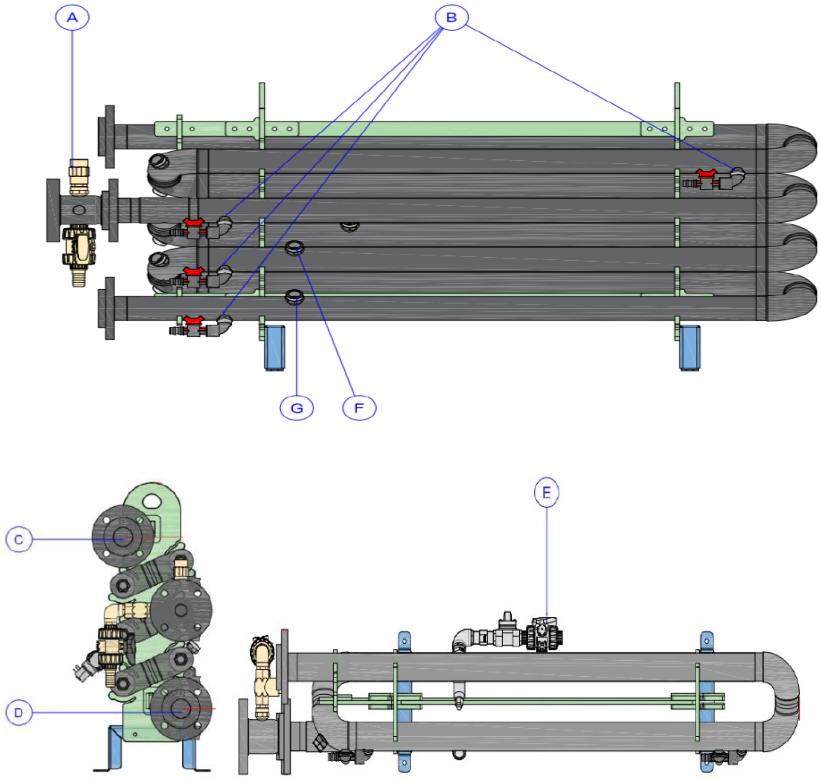
3.3. Collection / Balancing Tank

The filter backwash water will be forwarded from the Collection Shaft (3.1) to a Collection / Balancing Tank with a volume of at least 40 m^3. The tank will be installed outdoors on a suitable base made of concrete (if necessary) and will be made out of LLDPE.

3.4. Booster Pump to Flocculator

A booster pump of approximate flow of 35 m^3/h at 13 m and it will be at least 2,2 kW. The pump will be installed on the outlet of the Collection / Balancing Tank (3.3) to forward the collected water through the Pipe Flocculator, towards the Sedimentation Tank.

3.5. Pipe Flocculator



Point	Description	Size
A	Insert point for polymer	¾"
B	Sampling point	½"
C	Effluent after the addition of chemicals	DN 150
D	Influent to be treated	DN 100
E	Cleaning point KIT pH	-
F	Insert point for pH related chemicals	¾"
G	Insert point for coagulant	¾"

3.6. Dosing Pumps

3.6.1. Dosing pump for coagulant
A minimum flow of 3 l/h is required. The offered dosing pump must be of 0 – 10 l/h at 4 bar. The dosing tank will be accompanied by a tank of 500lt volume for chemicals.

3.6.2. Dosing pump for sodium hydroxide
A minimum flow of 3 l/h is required. The offered dosing pump must be of 0 – 10 l/h at 4 bar. The dosing tank will be accompanied by a tank of 500lt volume for chemicals.

3.6.3. Dosing pump for polymer
A minimum flow of 7 l/h is required. The offered dosing pump must be of 0 – 20 l/h at 2 bar. The dosing tank will be accompanied by a tank of 500lt volume for chemicals.

For the startup of the system, the contractor will offer the necessary quantity of at least 25lt of coagulant, 25lt sodium of hydroxide and 100lt of polymer.

3.7. Sedimentation Tank – Lamella Type

Indicative Technical Specifications	**Size**
Length (m)	4,50
Width (m)	3,50
Height (m)	2,23
Surface (m^2)	54,60
In / Out (water)	DN 150 / DN 200
In / Out (mud)	DN 80

The sedimentation unit will be made of Stainless Steel 304 or Glass Reinforced Plastic (GRP) with a layer of suitable resin or synthetic materials, with a plastic layer on the points of contact with the water, or Polypropylene (PP) or Polyethylene (PE). The inclined plates, will be made of plastic of adequate stiffness in order to remain in parallel formation and to avoid deformation during operation. The plates will be removable for maintenance reasons.

The applicant may suggest more than one (1) smaller tank but with a total surface equal to or higher than 54.60 m^2.

3.8. Drying Unit for the Rejected Mud from the Sedimentation Tank

The removal of the sedimented mud will be made with a suitable electrovalve which will be installed at the point of mud rejection on the Sedimentation Tank (3.7). The electrovalve will be

controlled in a way that will allow the mud to move to the mud towards a mud thickening unit with bag filters. The unit will be of double layout with three bag filters in each side.
The surface of the bag filters for the thickening of the mud will be approximately 16,00 m^2/day.
The water drained through the bag filters will return to the Collection Shaft (3.1).

3.9. Intermediate Tank Before the Sand Filter

A plastic tank of 10 m^3 will be installed before the Pressure Filters (3.11) and after the Sedimentation Tank to stabilize the flow of water to the Pressure Filters. It will be placed on a suitable base made of concrete (if necessary) and will be made out of LLDPE.

3.10. Booster Pump to Pressure Filters

A pump will be installed next to the intermediate tank with all the necessary hydraulic connections in order to forward the collected water from the tank to the filter system (3.11). The pump will have an approximate flow of 35 m3/h at 20 m and will be at least 3kW.

3.11. Automatic Pressure Filter System

Technical Specifications	
Number of filters	3
Flow (m^3/h) per filter	12,27 m^3/h
Velocity (m/h) per filter	13,73 m/h
Filter diameter (inches)	42” (1085mm)
Material of filter	Glass Reinforced Plastic
Shape	Vertical, cylindrical, with hemispherical edges
Cylindrical height (mm)	1.185 mm
Maximum pressure of operation (bar)	5
Test pressure	60% more than the maximum operation pressure
Pressure drop	Less than 1 bar
Backwash flow (m^3/h)	25 m^3/h (for 10 minutes)
Diaphragm valves	7 (for all the system of the 3 filters)
Filtering media	
Substrate	
Layer 1	Silica Gravel 10 – 15 mm
Layer 2	Silica Gravel 6 – 10 mm
Layer 3	Silica Gravel 2 – 5 mm
Total height of substrate	450 mm

Filtering Layer 1	Silica Sand 0,5 – 1 mm 380 mm height
Filtering Layer 2	Anthracite 0,8 – 1,6 mm 430 mm height

The three (3) Pressure Filters will be connected in parallel arrangement.
The backwash water of the filters will be directed back to the Collection Shaft (3.1) while the filtered water is forwarded to the Raw Water Tank of the Water Treatment Plant.

Additional features:

- The filters must rest on a base to prevent damage from moisture and also to allow easy access to the bottom of the filter.
- The filters must be accompanied by a piping system made of PVC polymer material, of high quality with particular resistance to corrosion, diameter Φ63.
- In the upper part of the filters there must be a cylindrical system of uniform distribution, while in the lower part of the filter there is a system of uniform distribution of the water perforated distributors placed radially.
- The filters will be accompanied by an air compressor which will include an electric motor and an air tank of 100lt, and the following technical specifications:
  - Flow: 175 l/min
  - Pressure: up to 8 bar
  - Power: 2.5 hp

Operation and washing control unit

The backwashing of each filter is performed with water. The water comes to the filters via pumping (the one displayed in 3.10). The filters will be equipped with diaphragm-type valves which will be controlled by pneumatic motors / actuators. Totally, the filtering system will be equipped with seven (7) diaphragm valves [two (2) on each filter and one (1) on the connecting pipe for filtered water]. The valve operation commands will be provided by an electric board of 24V. The whole filtering system will be controlled by an electric board.
The control will ensure:

- The automatic operation in all the phases of filtering, rinsing and backwashing.
- The minimization of hydraulic hammering.
- The chronometric setting of the backwashing of each filter.
- The independent setting of the duration of each stage of backwashing.
- The option of manual operation with the simple pressing of a button.

The filtering system is composed of three (3) Pressure Filters connected in parallel. Its operation includes two (2) phases:

- Normal or Filtering Operation: The water is inserted from the top of each filter vessel and the total suspended solids are removed as it moves downwards through the filtering materials. Finaly, the water exits each vessel from the bottom.
- Backwash Operation: The water is inserted from the bottom of each vessel and removes the suspended solids from the filtering media as it moves upwards. From there, it is forwarded to the drain. The backwash of each filter is performed with water (after the Sedimentation Tank). Each filtered is backwashed separately and consecutively.

All the filtering system operations are performed automatically.

Treatment of the washing water of the 2nd stage of the existing filters

In Schimatari Water Treatment plant there already exists a hydraulic configuration that collects the washing water of the 2nd stage of the four larger existing filters to a tank.

3.12. Intermediate Tank Before the Sand Filter

A plastic tank of approximately 20 to 25 m^3 already exists in the WTP of Schimatari. This tank will be used for the collection and stabilization of the flow of water coming from the backwash operation of the 2nd Stage of all the filters and not only the four larger ones.
For this reason, the drain of the 2nd stage of the three smaller vessels will be connected to the existing hydraulic configuration.

3.13. Booster Pump to Pressure Filters

A pump will be installed next to the intermediate tank with all the necessary hydraulic connections in order to forward the collected water from the tank to the filter system (3.14). The pump will have an approximate flow of 45 m3/h at 22 m and will be at least 4kW.

3.14. Automatic Pressure Filter System

Technical Specifications	
Number of filters	3
Flow (m^3/h) per filter	15 m^3/h
Velocity (m/h) per filter	12,85 m/h
Filter diameter (inches)	48” (1218mm)
Material of filter	Glass Reinforced Plastic
Shape	Vertical, cylindrical, with hemispherical edges
Cylindrical height (mm)	1.110 mm
Maximum pressure of operation (bar)	5
Test pressure	60% more than the maximum operation pressure
Pressure drop	Less than 1 bar
Backwash flow (m^3/h)	25 m^3/h (for 10 minutes)
Diaphragm valves	7 (for all the system of the 3 filters)

Filtering media	
Substrate	
Layer 1	Silica Gravel 10 – 15 mm
Layer 2	Silica Gravel 6 – 10 mm
Layer 3	Silica Gravel 2 – 5 mm
Total height of substrate	465 mm
Filtering Layer 1	Silica Sand 0,5 – 1 mm 390 mm height
Filtering Layer 2	Anthracite 0,8 – 1,6 mm 470 mm height

All other information related to the Pressure Filters are similar to the ones presented in 3.11. The main difference is that the water which will be used for the backwashing of the filters comes from the Collection tank of 3.12 and not after the Sedimentation Tank.

Operation of Filter Backwash System

The requested system should include the necessary components (including PLC) for its operation to be connected to and be synched with the existing treatment equipment at the Water Treatment plant of Schimatari.

4. Bill of Quantities

ITEM / EQUIPMENT	**QUANTITY**
Construction of a 10 m^3 (max) shaft	1 (lump sum)
Supply of a pump of 180 m^3/h at 14 m, 11 kW	1
Supply of a flow balancing tank of 45 m^3, LLDPE	1
Supply of a pump of 35 m^3/h at 13 m, 2.2 kW	1
Supply of a pipe flocculation with chemical dosing inlets	1
Supply of dosing pump for polymer (0 – 20 lt/h at 2 bar), including tank of 500 lt. for chemicals	1
Supply of dosing pump for coagulant (0 – 10 lt/h at 4 bar), including tank of 500 lt. for chemicals	1
Supply of dosing pump for sodium hydroxide (0 – 10 lt/h at 4 bar), including tank of 500 lt. for chemicals	1
Supply of Sedimentation tank(s) of a total surface of 55 m^2	1

Supply of drying unit of daily bag filter surface of 16 m^2	1
Supply of an intermediate plastic tank of 10 m^3	1
Supply of a pump of 35 m^3/h at 20 m, 3 kW (able to support the backwash of the filters of 42').	1
Supply of pressure filter of 42' including its filtering media	3
Supply of a pump of 45 m^3/h at 22 m, 4 kW (able to support the backwash of the filters of 48').	1
Supply of pressure filter of 48' including its filtering media	3
Coagulant for the start-up	25kg
Polymer for the start-up	100kg
Sodium hydroxide for the start-up	25kg
Control panel / electric board in synch with the existing operational system at the WTP.	1
Electrical connections	1 (lump sum)
Hydraulic connections	1 (lump sum)
Concrete slab for the placement of the equipment which is to installed outdoors.	1 (lump sum)
Shed to cover the equipment which is to installed outdoors.	1 (lump sum)

5. Drawings

P&ID drawing is provided as separate .pdf file, as Annex III

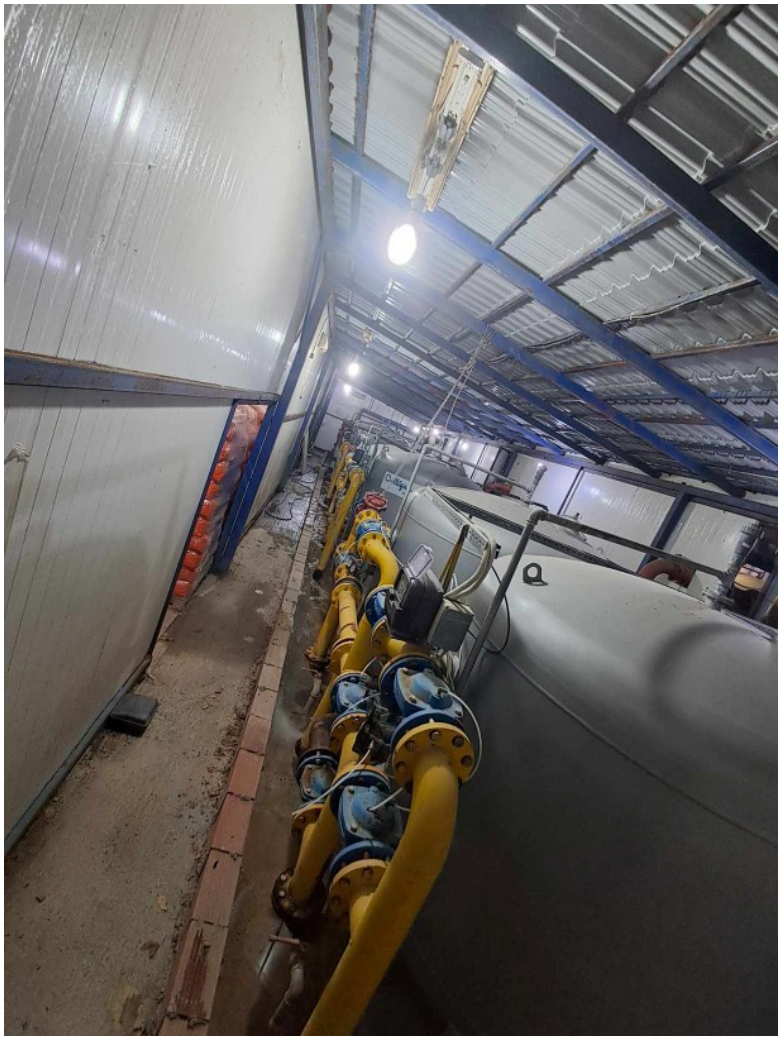
6. Phases of Work

Phase I	Preparatory works (e.g. cleaning of the area of installation, ground leveling, concrete slab, etc.)
Phase II	Supply and delivery of equipment to the location of installation
Phase III	Hydraulic and electrical connection of equipment and control / electric board
Phase IV	Testing and start-up of the system
Phase V	Operation and Maintenance Manual, including troubleshooting section
Phase VI	Training session for the employees of the Technical Service of the Municipality of Tanagra

7. Indicative Drawing of the Area of Installation

Indicative drawing is provided as separate .pdf file, as Annex III

8. Pictures of the Area of Installation

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