

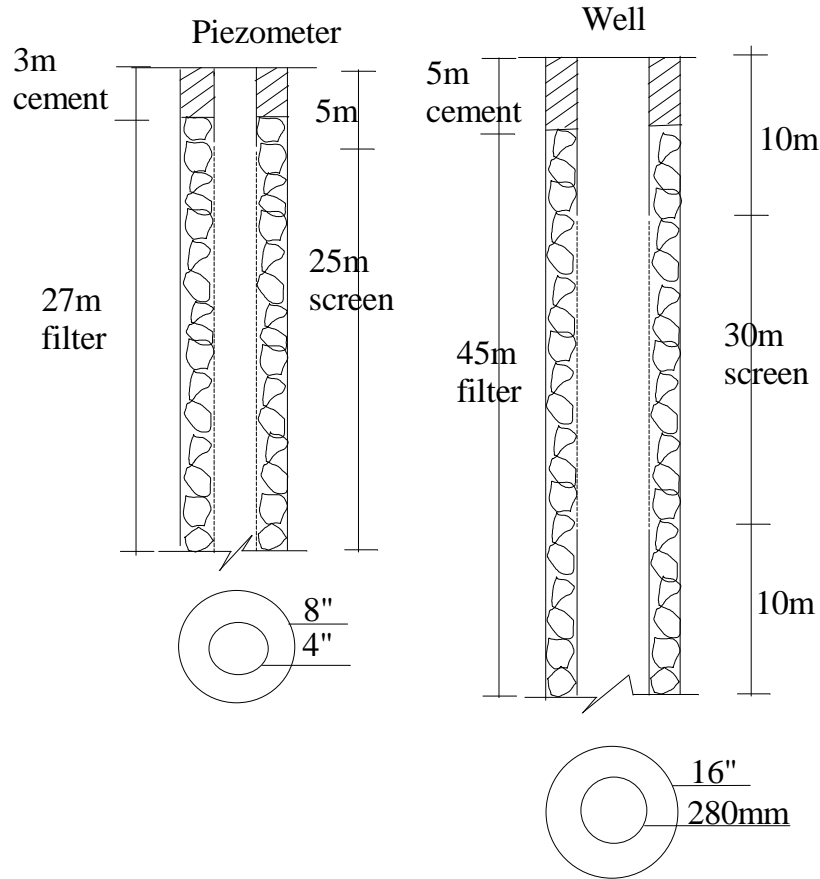
**Technical specifications
for drilling and construction of 1 production well and 5 piezometers
in Nubaria-West Delta**

1.Introduction:

In the context of development and relying on groundwater as a strategic resource of water, thus, the protection of this resource is essential. Different Hydrogeological conditions of groundwater aquifers in Egypt require to carefully monitoring the Groundwater.

2. The goal of the process:

The target of these specifications is to drill and construct of 1 production well with depth ± 50 meters with taking representative soil samples of the lithological cross section from the well borehole with [core samples] method and 5 piezometers with depths ± 30 meters each in Nubaria region - West Delta.



Dimensions of the well and the piezometers

Drilling	Well Depth (m)	Diameter (inches)	Screen depth under the ground surface (m)		Pipe type
			Start	End	
One well	50	12	0	10	Solid
			10	40	screen
			40	50	Solid (pump house)
Five piezometers	30	4	0	5	Solid
			5	30	screen

3. Duration of the process:

The Contractor shall implement all the items presented in this requirements and technical specifications sheets contained in a period of two months from the date of the award confirmation.

A production well and 5 piezometers are to be constructed in the new villages behind the city of Nubaria and the contractor shall inspect the implementation sites (Figures 1 and 2)



Table (1) Location of the well and the piezometer

Element	Location					
	Longitude (East)			Latitude (North)		
	°	'	"	°	'	"
Well W (depth of 50m)	29	51	14.8	30	40	14.9
Piezometer P1 (depth 30m)	29	51	15.17	30	40	14.98
Piezometer P2 (depth 30m)	29	51	14.26	30	40	14.76
Piezometer P3 (depth 30m)	29	50	35.5	30	40	10.3
Piezometer P4 (depth 30m)	29	50	53.62	30	39	42.33
Piezometer P4 (depth 30m)	29	51	9.85	30	40	16.06

Table (2) distance between the piezometer and the well

The piezometer	P1	P2	P3	P4	P5
The distance from the well (m)	10	15	1000	1150	136

5. Drilling method

The production well is drilled with appropriate technical drilling methods and suitable diameter to a depth of ± 50 m. Representative soil samples should be taken of the entire lithological cross section of the borehole by [continuous undisturbed coring] method. The core sample length should be one meter. They are taken every one meter along the drilling. They will be kept in 1.0m boxes. Every core sample should include full Technical Report. Enlargement of the drilling cross section should be done manually to a radius not less than 16 inches until the required depth of the well for the pipes to be installed, and according to the supervising engineer.

The piezometers should be drilled manually to a diameter of at least 8 inches and to depth of ± 30 m. the final depth of each piezometer should be determined according to the Static depth of groundwater and according to the supervising engineer. Soil sample should be taken every one meter or where the soil change with depth. Samples should be kept in wooden boxes with it complete identification.

6. Blank casing supplies for the wells:

6.1. Supply and install the blank casting for the production well:

Supply and install the P.V.C. blank casting for the production well with the proposed approved design depth from the bidding and supervision reference. The pipes should be of: exterior diameter of 280 mm, 11.9 mm thickness and 10 bars from the finest quality. The contractor shall supply a sample of the used pipes for accreditation prior to supplying the pipes to the field. The pipes should be linked together by male and female socket.

6.2. Blank casting supplies for the piezometers:

Supply and install the P.V.C. blank casting for the piezometers well with the proposed approved design depth. The pipes should be of exterior diameter of 110 mm, 5.3 mm thickness and 10 bars from the finest quality. The pipes should be linked together by male and female socket or by an appropriate method approved from the bidding and supervision reference.

7. Screen pipes supplies for the wells:

7.1. Screen pipes supplies for the production well:

Supply, prepare and install of the P.V.C. screen pipes for the production well with the proposed approved design depth from the bidding and supervision reference. The pipes should be of: exterior diameter of 280 mm, 11.9 mm thickness and 10 Pa from the finest quality. The openings in the screen pipes should be made as not to exceed 1mm wide. The screen pipes should be linked together and with the blank casting pipes by male and female socket. A cover of the screens should be made from plastic wire screens and according to the supervising engineer.

7.2. Screen pipes supplies for the piezometer wells:

Supply, prepare and install of the P.V.C. screen pipes for the piezometer wells with the proposed approved design depth from the bidding and supervision reference. The pipes should be of exterior diameter of 110 mm, 5.3 mm thickness and 10 bars from the finest quality. The screen pipes should be linked together and with the blank casting pipes by male and female socket or by an appropriate method approved from the bidding and supervision reference.

8. Specification for completion of the production and piezometer wells:

After the completion of installing the blank casting and screen pipes to the production and piezometer wells, a gravel filter should be put around the screens and with an extra height of the screens by 5m or along the whole depth of the production well and piezometers and according to the supervising engineer. The gravel back should be of a fine quality that are used in water filters and of graded gravel of diameters of 3-5 mm, on condition that, the contractor should supply a sample from the gravel for accreditation prior of supply.

9. Development and Disinfecting of the wells:

The production well and piezometer should be developed and disinfected by an appropriate technical method and until the out water is visibly clean.

10. Concrete head blocks:

Cast and supply concrete blocks for the well and the piezometer wells with the following ratio: 300 kg cement: 0.8 m³ sand: 0.4 m³ gravel. The dimensions of the concrete blocks should be 0.75×0.75×0.75 m and should be casted 0.25 m below the ground surface.

11. Steel boxes:

11.1. Production well:

Cast and supply a 10 inch pipe, of gallivanted steel or epoxy coated layer with a minimum thickness of 6 mm, to a length of 1 m to be fixed as a well head with a flanges adaptor to be used as a base for the pump that will be installed on the well.

11.2. Piezometer:

Cast and supply a 10 inch pipe, of galvanized steel or epoxy coated layer with a minimum thickness of 6 mm, to a length of 1 m to be fixed inside the concrete block with an appropriate technical way and with an upper end cap to be used for opening and closing the piezometer well, on condition that, the opening should not be smaller than 5 inch diameter.

12. Pumping tests:

Step, continuous and recovery pumping tests should be performed after the completion of the development and disinfection process of the production well and being ready for start working, and according to the supervising engineer. The step pumping test should be performed nonstop on 4 phases. The phases discharge are 1/4, 2/4, 3/4 and 4/4 of the maximum discharge. Every phase should not less than 2 hours or until the static depth of water is stable. Afterwards, the pump should be stopped until the static groundwater head returns to its original value before starting the constant pumping test. Constant pumping test should be performed for a period of 24h nonstop and after reaching the stable water level, the pumps is stopped and water level rise is recorded till reaching the original static head (recovery test). The target of the pumping tests is to determine the hydrogeological parameters of the groundwater aquifer in the area. The groundwater levels are recorded according to the time table shown below. The pumping tests should be performed using a submerged electric pump with a minimum discharge of 100 m³/hr and head of 30m and the different discharge rates for every phase are set according to the supervising engineer.

Every 1 minute for 10 minutes

Every 2 minute for 10 minutes

Every 5 minute for 40 minutes

Every 10 minute for 120 minutes

Every 30 minute for 180 minutes

Every 60 minute till the test end

Bill of quantity

**for drilling and construction of 1 production well ± 50 m and 5 piezometers ± 30 m
Nubaria-West Delta**

1. Production well

Serial	Activity	Unit	Quantity	Rate	Total
1	Drill with appropriate techniques and with suitable diameter to ± 50 m depth and take representative lithological samples for the borehole every meter by (continuous undisturbed coring), Every core sample should include full Technical Report. They should be kept in 1.0m boxes	m length	± 50 m		
2	Enlarge the drilled cross section to a diameter not less than 16 inch, in case of the validity of converting the borehole to a production well	m length	± 50 m		
3	Supply and install the P.V.C. blank casting of: exterior diameter of 280 mm, 11.9 mm thickness and 10 bars from the finest quality and the pipes should be linked together by male and female socket.	m length	± 10 m		
4	Supply, prepare and install of the P.V.C. screen pipes of: exterior diameter of 280 mm, 11.9 mm thickness and 10 bars from the finest quality and it should be linked together by male and female socket	m length	± 30 m		
5	Supply and install the P.V.C. blank casting of: exterior diameter of 280 mm, 11.9 mm thickness and 10 bars from the finest quality and the pipes should be linked together by male and female socket.	m length	± 10 m		

6	Supply and install a gravel back, according the specification, around the screens and with an extra height of the screens by 5 m or along the whole depth of the production and this item is added on it the cement seal above the gravel filter from 5 m and according to the supervising engineer.	m length	± 45m		
7	Development and disinfection of the production well by an appropriate technical way and until the water is visibly clean	by item	1		
8	Supply and prepare a steel pipe and according to the specification of a diameter of 14 inch to be fixed as a well head with a flanges adaptor to be used as a base for the pump that will be installed on the well.	by item	1		
9	Supply and install the P.V.C. blank casting of exterior diameter of 1.25 inches inside the well casing for recording the groundwater level. This pipe should be fixed at the well top	m length	±25		
10	Prepare and operate an electrical submerged pump with a minimum discharge of 100 m ³ /hr and head of 30m to be used in the step and constant pumping test for enough time to develop and disinfect the well and make it ready prior to pumping tests	hour	30		

2. Piezometers:

Serial	Activity	Unit	Quantity	Rate	Total
1	Drill with appropriate techniques with diameter not less than 8 inch to ± 30 m depth and to take representative lithological sample for the borehole every meter when lithological changes occur.	m length	± 150 m		
2	Enlarge the drilled cross section to a diameter not less than 8 inch to install the pipes of the piezometer and according to supervisor engineer.	m length	± 150 m		
3	Supply and install the P.V.C. blank casting of: exterior diameter of 110 mm and 10 bars from the finest quality and the pipes should be linked together by male and female socket.	m length	± 25 m		
4	Supply, prepare and install of the P.V.C. screen pipes of: exterior diameter of 110 mm, 5.3 mm thickness and 10 bars from the finest quality and it should be linked together. This item include supply and install a gravel back, according the specification, around the screens and with an extra height of the screens by 2 m or along the whole depth of the piezometer wells. Above the gravel there is cementation with height 3m	m length	± 125 m		
5	Development and disinfection of all the piezometer wells by an appropriate technical way and until the water is visibly clean	by item	5		
6	Cast and supply concrete blocks for the piezometer wells with dimensions: $0.75 \times 0.75 \times 0.75$ m and according to the specification.	by item	5		



7	Cast and supply a 10 inch pipe, to be fixed inside the concrete block, with an upper end cap to be used for opening and closing the piezometer well and according to the specification.	by item	5		
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