

**Project: OSRO/GAZ/403/NET**

**Rehabilitation of seven groundwater wells in Nablus and Jericho Districts**

**Enhancing the resilience of farmers’ livelihoods in area C, through improved water -availability and management**

**Needs Assessment Report and Draft Design Report**

**Date: 6-1-2015-A**

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The Food and Agriculture Organization of the United Nations (FAO) is an intergovernmental Organization with more than 192 [member countries](http://www.fao.org/unfao/govbodies/membernations3_en.htm). Since its inception, FAO has worked to alleviate poverty and hunger by promoting agricultural development, improved nutrition and the pursuit of [food security](http://www.fao.org/spfs/) - defined as the access of all people at all times to the food they need for an active and healthy life. (Further and more detailed information on FAO can be found on the internet site: [http://www.fao.org)](http://www.cern.ch)/).

On June 2014, the representative of the Kingdom of the Netherlands to the Palestinian Authority signed an agreement for the execution of the project “Enhancing the resilience of farmers’ livelihoods in area C of Jenin, Nablus, Tubas and Jericho Governorates, through improved water availability and management”. The project aims to improve the food security and livelihoods of vulnerable female and male farmers in Area C of the West Bank through improved water availability and management for agricultural purposes. One major project intervention is the restoration of the efficiency of the underground water wells:

FAO had signed the project agreement ……………., and which is funded by Kingdom of the Netherlands. This project aims at enhancing the resilience of farmers’ livelihoods in area C, through improved water availability and management. The project intends to rehabilitate the following 6 wells in Nablus, and Jericho Governorates as shown in the table below:

**List of Wells Which I visited in Jordan Valley: General conditions and Contact information**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **#** | **WELL ID** | **NAME** | **LOCATION** | | **Contact Name** | **Mobile** | **Comment** |
| **GOVERNORATE** | **SITE** |
| **1** | **19-17/007** | **FATHALLA MASRI** | **JERICHO** | **AL-JIFTLIK** | **Najeh Abu Siri** | **0599-700100** | **Nearly Dry !! and the substitute well also dry**  **Existing < 5 m3/hr** |
| **2** | **19-17/043** | **ABDELGADER ABDELJALEEL** | **NABLUS** | **FRUSH BIET DAJAN** | **Tawfeeq** | **0598930675** | **Abandon Well (Dry after Israeli drilled deep wells close to it since 1985** |
| **3** | **19-16/003** | **AHMAD HASHEM AL ZGHAYYER** | **JERICHO** | **AL-JIFTLIK** | **Basher Hashim** | **0592-703030** | **Deteriorated well conditions and high priority (Work on Diesel below road 90). Needs rehabilitation and irrigation networks** |
| **4** | **18-18/011A** | **MARWAN AND AMEEN AL MASRI** | **NABLUS** | **AN-NASARIYEH** | **Jameel** | **0599-889908** | **Deteriorated conditions: Needs rehabilitation and booster pump and pipes to elevate water to existing earth pool located at higher elevation** |
| **5** | **19-17/009** | **RAFIQ QAMHAWI** | **JERICHO** | **AL-JIFTLIK** | **Ali Badarneh** | **0599-798242** | **Deteriorated well conditions: Needs total & urgent rehabilitation and irrigation networks** |
| **6** | **18-18/027** | **AQEEL FARES (NADER ABDELHADI)** | **NABLUS** | **NASSARIYEH** | **Aqeel al-fares** | **0599-57965318** | **Newly set on operation: projects established in the area will get water from it. Needs rehabilitation and networks** |
| **7** | **20-17/016** | **MARJ NAAJA C7 SULIMAN SALEH** | **JERICHO** | **MARJ NA’JEH** | **Hassan Jermi** | **0598321816** | **Newly drilled but not developed. PHG/GVC will construct new reservoirs and irrigation networks in the area.** |
| **8** | **19-17/024** | **BASEL KAN’AN** | **JERICHO** | **AL-JIFTLIK** | **Fares** | **0599-797593** | **Deteriorated well conditions: water level drops drastically in the area. Needs rehabilitation and networks** |
| **9** | **18-18/030** | **QASEM ABDULHADI** | **NABLUS** | **AQRABANIYA** | **Waheeb** | **0598020583** | **Newly drilled: needs new pumps equipments and irrigation networks** |

**Introduction:**

The access of Palestinians to groundwater is severely restricted. In1967, Military Order (MO) 92 was introduced by the Israeli Military Forces, under which the authority overall oPt water resources was transferred to its military commander. MO 158 forbade the unlicensed construction of new water infrastructures. For this reason a license has to be obtained from the military commander to setup, assemble or possess and/or operate any water installation. This also encompasses the rehabilitation of infrastructure including groundwater wells.

These military orders established a permit system to prevent Palestinians from rehabilitating or digging new groundwater wells and limited the quantity of water pumped from these sources by fixing pumping quotas. Moreover, the contamination of wells due to the lack of sewage treatment systems added to the insufficient number of available wells and further undermines the access to sufficient water resources, especially with regards to domestic water use.

**General status of the wells visited**

This needs assessment target 9-groundwater wells that supply around 2400 dunums. All the targeted wells supplies water for agricultural purposes. The abovementioned wells were drilled prior to the 1967 Occupation. Since the Occupation, Israel prohibited any further well drilling for Palestinian use in this area and other areas that lie over the Eastern Aquifer Basin. This aquifer is known as the second major aquifer in term of water quantity; but of low quality especially in, Aljeftlik, Marj Na’jeh and Al-Zbiedat area. Most of these wells is relatively saline (particularly 20-17/011, 19-17/016, 19-16/003, 19-17/009, 19-17/024) and TDS exceeds 2000 mg/l. The other wells located in Al-Nassariya area as 18-18/011A, 18-18/027, and 18-18/030 have good water quality as potable water.

Since the 1967, Palestinians had been obliged to sustain themselves with the same water quantity/quality (quota) and regardless of the increase in population and its associated water needs. Therefore, most of wells in these two clusters area are suffering continuous drop in static water level and decrease in wells’ pumping capacity. This problem is escalating and lead to the damage and closure of two wells ivestigated in this study. The well 19-17/007 was totally dry now; and the owners tried to drill a substitute well and paid a lot of money; but it was also dry as well. Hundreds of dunums end as bare soil and tenths of workers and farmers lost their income. The scene in this well is hard to clarify in this technical report. Many others in wells in Al-Jeftlik area are going in the same way and destiny as this well. The water level is shrinking with time and the productivity is going as well. The well 19-17/024 was one of the good wells in the Al-Jeftlik area; it had a capacity around 80 m3/hr. Today, we noticed air pockets with pumping water at less than 40 m3/hr The whole area above road 90 is slowly drying; and year after another new wells will be added to the dry list. The advice here is beyond the scope of this study; but the farmers must be very careful to plant long terms investments and adapt to flexible cultivation as vegetable and cash crops. The palm trees in the area are good solution for water and soil salinity however, the water availability is at high risk for the seen future.

The situation is not better in Al-Nassariya area, but even it is worse in its genera situation. There is a huge over pumping going on the upstream area of Wadi Al-Fari’a and this result in drop of water level and springs dry along the Wadi. The wells capacity was decreased sharply and changes rapidly with upstream pumping activities. This means that the aquifer storage was depleted and water availability seasonally affected. This creates big risk for future development and planning. The whole area and water system are fragile to any drought year that hits the area. Therefore, we advise to set-up yearly plan of irrigation and no large cultivation before the rain season quantities are visible. For example, the wells 18-18/027 and 18-18/030 were dry few months ago. The owners of the two wells and the farmers have to drill substitute wells or deep and clean them to reach the new water level in the area. After all, the wells’ capacity is much less than the historical quantities and water level is 20 meters lower

The water situation in Froush Beit Dajan (Middle area between Wadi Al-Fari’a and Al-Jeftlik) is deteriorating and even worse. The well 19-17/043 had been closed since 1985. This has had happened after the Israeli drilled three deep wells in the area.

The targeted wells are suffering from different malfunctions that highly affecting them and consequently the vulnerable inhabitants who are depending on these wells for their basic needs of their life. These factors can be summarized in the following points:

1. Some of the targeted wells have very old equipment that technically expired many years ago (as the wells 19-16/003 and 19-17/009). The other wells have been rehabilitated partially few years ago. This causes (a) low efficiency of the wells “i.e. more operating costs and less supplied water” that will forced the farmers or even the well owners to abandon part of their land as they can’t afford the high cost of the supplied water, (b) increase the potential of water interruptions that will highly effected the cultivated lands and their productivity, (c) increase the maintenance costs which will increase the debts on the wells’ owners.
2. All of the targeted wells have very old irrigation water networks. This makes high percentages of water losses and less pressure in the network. There is also tremendous lack for effective water irrigation schemes and control fittings.
3. All of the wells use direct pumping to irrigate the farms except well 18-18/027 uses distributions earth reservoir. This is however, an old traditional and non effective irrigation system.
4. The management of the wells is not sufficient and the agricultural cooperatives are weak. The wells lack for service room or operator’s room and maintenance tools.
5. The well 19-16/003 is located below road 90; this is however, limits the operation hours during the day hours only. Moreover, this well relies on diesel power for pumping the water, and as the prices of diesel have been rising up sharply; the cost of the pumping water has been increased (cost per hour is 100 NIS) and this highly affected the wells owners and the beneficiaries mainly those beneficiaries who are totally dependent on agricultural activities to earn their living.
6. In Al-Jeftlik area, the water is brackish (sodium chlorides and gypsum halite). The sodium hazard limits the types of cultivation to slat tolerant crops only. TDS ranges between 1500-5000 mg/l; and for such high concentration soil salinity exhibits low yield of most crops. Therefore, farmers used to mix saline water with some fresh water from local wells or through rain water harvesting during the flood.
7. Electricity supply is a major problem for most of wells in Al-Jeftlik area. Voltage drops below 300 V at three phase submersible pumps and causes high amperage and loss of motors frequently.

**Performance of the Targeted Wells**

1) Well 18-18/027: The targeted well is suffering from various technical problems that affect; (1) the abstraction rate of the pumps such as the case of Well No. 18-18/027 is not stable and ranges between 30-70 m3/hr due to limited aquifer capacity or well efficiency. In this case it is clear that the well is not properly drilled and the multi casing (3-casings 12”, 10, 8”) makes the well runs at low capacity. We expect this refers to well collapse over times and closure of screen slot with time. The aquifer recovery is good and depth water column exceed 30 meters above the turbine. It is recommended not exceed 70m3/hr and to drill a substitute well close to the existing well. Or to remove the existing (if possible and replace it by 12” size and properly slotted).

2) Well 19-17/043 is not working, since 1985. I asked why? The answer because it is dry. No framer is interested to buy water from Israeli sources. Because it is relatively expensive water; and water is not available all the time. We see the Israeli offer is not convincing because the well is not working, moreover; the Israeli drilled deep wells with and installed big turbine means. Rehabilitation is enough for this case; but replacement of the well and install new equipment

3) The well 19-17/009 is using t submersible pump and plastic pumping pipe; the owner is using earth pool to redistribute water to the farms. This is however not suitable design and needs new equipments and cleaning the well. The riser pipes were removed few weeks ago and put close to the well. These pipes are very old and needs total replacement.

4) The well 19-17/024 is not a promising well with deteriorating productivity as 30-40 m3/hr however; it suffers very poor electric power source. They pull electricity from 1.5 km away and this creates huge drop in voltage as less than 300 volt during operation. This cause extra heating and quick damage to electric motors coil. In that area electricity is a treasure and we do best design to keep the well working on electricity and minimize the voltage drop impacts.

5) The well 19-16/003 is working on diesel engine in bad conditions and very old equipments. It requires total replacement and cleaning. It has good yield but very shallow water columns of few meters above turbine. We suggest cleaning the well sediments and increase water pumping.

6) The well 19-17/009 is drilled recently as a substitute well for an old existing well in the same site. The yield of the well is low because it was not developed after drilling. Therefore, we suggest adding acid inside the well as described in the technical specification sheet.

7) The well 19-17/007 is nearly not working, since 2008 water level went down very quickly and eventually dried up. The owners of the well had drilled a substitute well I; but it did not work. I asked why? The answer is no water in the vicinity of the well. Rehabilitation is not enough for this case; but to abandon the well and search for groundwater within 200 meters to the south of the well.

8) The well 18-18/011A suffers from poor design and old equipments. The well is supposed to pump water at higher elevations than it does. However, this is not possible with the existing turbine design and capacity. It is not possible to operate efficiently the submersible pump at two elevations at 10-bars difference. Therefore, we suggest installing a separate booster pump to elevate water to the high lands, and rehabilitate the submersible pump as well.

9) The well 18-18/030 is newly drilled as a substitute well for a dry one in the same site. The well design is enough to install huge pump, however; the aquifer capacity is low. Therefore, the pump limits should not exceed 40 m3/hr.

***In general, there is a high risk of long term abstraction and sustainability of the water supply and availability in the whole target areas. The water level is shrinking with time and more wells will get dry in the future. The frequent interruptions were detected in all locations and mainly in the case of Well No. 18-18/027, 19-17/009, and Well No. 19-16/003. These reasons and others caused huge reduction in the abstracted water. This is not stable situation, and which makes waster availability far below the escalating demand of farmers and the big potential of lands from the upstream in Al-Nassariya and down to Froush wells and until the Al-Jeftlik area. The low performance of these wells, the bad technical situation of the equipment and the increase in the power prices (diesel in particular) and poor electric sources cause an increase the prices of the water supplied.***

**Targeted Wells, Cultivated Lands and Farmers**

All of the cultivated lands are located in Area C. These area have been seriously affected and reduced and consequently to abandon their fields due to different reasons which can be referred to the following points:

1. The restricted access to the agricultural lands in the military area due to the closure and high work risks. Many farmers have been forbidden from entering their lands beyond road 90.
2. There are a high potential for land reclamation and cultivation; but there is limited access to these wells and eventually very low opportunity to meet the escalating water demand in the area.
3. The extremely high prices of fuel and weak maintenances cause frequent -if not continuous interruptions of these wells. Water cut in agricultural water supply either due to the malfunctioning of the well or due to the incapability of wells owners to make the routine and urgent maintenances. This sometimes reduced the productivity of the cultivated land or even if it last for a long time the crops may be destroyed and died. The whole area lack for initiative to integrate the irrigation water supply system. Later no, we can propose the construction of integrated water networks and shared distribution reservoirs. One day we must work on that and let each cluster of wells do this type of water supply system. It is more efficient and reliable than the existing distribution system.
4. Salinity of the soil in the area: there is a continuous increase in the soil salinity (sodium hazard) and accumulation of salt in the root zone. The problem is doubled because of the lack for enough rain wash the salt or available access to surface water to make an artificial soil flush each year or couple of years. The salinity causes less productivity and forces the farmers to shift to salt tolerant crops as palm trees.

**The target wells are equipped with old equipment that technically expired many years ago, causing the following:**

* There is low efficiency of the wells equipments, i.e. greater operating costs and lower supply of water. Ultimately, these costs translate into higher production prices to agricultural users.
* There is greater frequency of interruptions to water supply, forcing the farmers to irrigate less than the actual crop water requirement. These interruptions greatly affect the productivity of cultivated lands. This will force the farmers to rely on other sources of water from neighbor wells. Most of time other wells are not accessible and not more expensive sources of water there by jeopardizing farmers’ livelihoods.
* There is a high maintenance and operation costs due to lack of rehabilitation, which further increase the debts acquired by well owners. From their perspective, the lack of economic viability for well owners puts the continued functioning of the well at risk, there by threatening the continued supply of water
* The low productivity for some of the target wells leads to increased pressure on, and demand from other wells when available, and reduces the potential of increasing the amount of cultivated land, there by jeopardizing the livelihoods of farmers.
* The management of the wells is not optimal due to the weak capacities of well owners and operators. This lack of skills also precludes the ability of well owners to detect and manage the mechanical problems, thereby exacerbating the poor functioning of old and outdated equipment, in turn leading to higher operation and maintenance costs and in some cases debts, consequently compromising the continued functioning of the well for economic reasons.
* Agricultural livelihoods are at risk due to the high risk of entrance to the areas situated behind the wall and to lack of stability of water supply as well; this is leading to the abandonment of land and impacting poverty levels and the welfare of farming households. In addition to the limitations to obtain permits for the rehabilitation of wells, the increasing economic vulnerability of farmers complicates their ability to pay the cost of rehabilitation**.**
* The lack of skills among well owners and operators to efficiently operate the wells impacts the quality of maintenance and the ability to execute good management measurements to cope with increasing debts.
* As these machines equipments were deteriorated we expect to have high maintenance costs of these wells; this is far beyond those normally required for a well operating under normal routine maintenance conditions. This has also increased the likelihood of the wells being interrupted due to the inability of the well owners to cover the required operation and maintenance costs.

**Basic data of the Targeted Groundwater Wells**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***No.*** | ***Well ID*** | ***X-coordinate*** | ***Y-coordinate*** | ***Elevation*** | ***Depth*** | ***Hole Diam*** | ***Avg. Static W. level*** | ***Pump***  ***pipes*** | ***Locality*** | ***Discharge Rate*** | ***Use*** | ***Quota License*** |
| ***E*** | ***N*** | ***m. a..s. l*** | ***mbgl*** | ***inch*** | ***m.b.s*** | ***Diam”/m.b.s*** | ***M3/hr*** | ***m3/yr*** |
|  | **19-17/043** | 192920 | 176760 | -179 | 119 |  |  |  | **FRUSH BIET DAJAN** |  | Agr. | 121000 |
|  |  |
|  | **20-17/011** | 201160 | 176870 | -270 | 92 |  |  |  | **MARJ NA’JEH** |  | Agr. | 194000 |
| 35 32 25 | 32 11 6 |
|  | **19-16/003** | 198460 | 169650 | -280 | 75 |  |  |  | **AL-JIFTLIK** |  | Agr. | 48000 |
|  |  |
|  | **18-18/011A** | 187040 | 183400 | -30 | 39 |  |  |  | **AN-NASARIYEH** |  | Agr. | 28000 |
|  |  |
|  | **19-17/009** | 197470 | 170230 | -264 | 91 |  |  |  | **AL-JIFTLIK** |  | Agr. | 138000 |
|  |  |
|  | **18-18/027** | 186060 | 183610 | -15 | 60 |  |  |  | **NASSARIYEH** | 70 | Agr.  300 dun | 29000 |
| 35 22 49 | 32 14 49 |
|  | **20-17/016** | 200290 | 175850 | -256 | 90 |  |  |  | **MARJ NA’JEH** |  | Agr. | 150000 |
|  |  |
|  | **19-17/024** | 196560 | 171550 | -251 | 62 |  |  |  | **AL-JIFTLIK** |  | Agr. | 150000 |
|  |  |
|  | **18-18/030** |  |  |  |  |  |  |  | AQRABANIYA |  | Agr. |  |

**Methodology and Preliminary Steps to Prepare the Needs Assessment Report**

* Meeting between the staff and the farmers, operators, and owners of the wells to introduce the staff and purpose of this assessment.
* Field visits to measure discharge, motor speed, pipe pressure at low and high values, power consumption etc..
* Another Appointment for each well between the staff and owners of the wells to identify the needs assessment and technical evaluation of the available data. This is important to see what is most priority need? How they look to future cultivation ion and main technical problems they want to solve. We tried to come together with general ideas of the expected rehabilitation and development works on the well.
* Disk study to evaluate and write the draft report for the needs assessment.
* Re evaluation of the needs assessment report by the technical team and verified through coordination with technical people who have in contact with each well conditions. This is to make sure that there is no fatal data. This includes the operators, c and c local contractors. This can take one week and will end with verified needs assessment report of each well

**Data collection**:

1. **Literature review:** Arrange of secondary sources were consulted to gather information on the general context and situation of the target wells in the are a
2. **Fieldwork:** In order to establish baseline data on the conditions of the 6-groundwaterwells and the context in which they are located; several field shall be conducted in the area. It is including meetings with local committees and owners of the wells.
3. **Standardized questionnaires:** Updated technical, economic and operational information on each of the wells was gathered in meetings with well owners and operators at the well houses
4. **Participatory observation/inspection of wells:** Each of the selected wells was visited by the needs assessment team.
5. **Coordination with key stakeholders**: Once the initial field visits had been conducted and preliminary data compiled on the status of each of the 6 wells, coordination meetings were held with the representatives of the wells in order to confirm the appropriate needs assessment of the targeted wells, and in order to coordinate the proposed action with them. .
6. **Field measurements where possible** and ask the local committee to exact figures as well’s discharge per hour and through the review of preliminary data.
7. **Data analysis**: A comprehensive analysis of the data collected was carried out by the needs assessment team in order to prioritize the needs of wells in most urgent steps of rehabilitation. Thisprocessenabledtheprioritizationofthe6-wellsbasedonthe above mentioned technical evaluation.

**Proposed physical action: The stable, continuous supply of water for agricultural purposes will be secured** by re installing new mechanical and electrical equipments as the turbines, electrical motors, pumping pipes, gear heads, drilling heads and control panels (depending on the needs of the well in question) to guarantee the efficient functioning of these wells for at least 7-12 years **without** facing any electrical or mechanical failure. The maintenance of the existing pumping room includes: a-Renovation of walls, floor, ceiling and roof. b- Building new booster and service rooms. C- Installing new pipelines or replaces old ones. d- Connect existing reservoirs to water source and operation of water meter system and each where applicable s shown in the technical activities below.

**Expected Outputs:**

* **The availability of water for agricultural purposes will be increased**. The installation of new equipment and the rehabilitation of wells will enable to operate them at the optimum discharge capacity; there by increasing the amount of water available to agricultural users. All of these wells are under the Israeli license quota. The rehabilitation will effectively contribute towards increasing the amount of water pumped and at the end of the intervention.
* **The supply of water for agricultural purposes will be stabilized**. **This is conditioned by the construction of new pumps and the operation of new reservoirs.**
* **Integration of water supply for groundwater wells in the area. Farmers will feel more secure toward risk of wells interruptions.**
* In addition to the rehabilitation of wells, **the economic sustainability and optimum** functioning of the wells will be increased by improving the skills of the well operators. Therefore we suggest providing each well with computer facilities to achieve all pumping data including technical and the financial sheet for each farmer. There, we suggest carrying a comprehensive training course to cover the most important points to operate effectively the wells and to carry the routine maintenance**.** The improved capacities of owners to manage and maintain the wells will allow operators to accurately detect any technical problems if, and as soon as they occur, and to address these problems immediately, thereby minimizing the amount spent on maintenance costs. From their perspective, helping well owners to stay out of debt in this way will ensure both the stable and continuous supply of water for users (due to lack of technical failures), and the economic viability of the well.

**Main activities including civil and electro mechanical activities for each of the wells:**

|  |  |  |
| --- | --- | --- |
| ***Well ID*** | **Technical Needs** | **Notes** |
| **Well 18-18/027** | **Replacement of the existing old equipments with new equipments as follow**:   * vertical turbine (70 m3/100 m), pumping pipes 60/5”, shafts 32mm, rubber joints 40, copper restrainers 40, discharge head 5”/5”, * **Replace the Old electrical vertical hollow shaft motor** with new vertical hollow shaft electric motor 75 hp at 1800 rpm with all motor cable connections. The motor has to be inverter duty as 10:1 (7-70 Hertz cycle) Speed Range Constant Torque voltage 220/380-440 Class **F** Insulation. * **Replace the old electric panel with new panel** to fit with motor and AC/DC safe operation control system including VFD and equipped with digital sensors for pressure, flow, temperature, voltage, phase failure…etc * **Replace the existing fittings at the site of the well** including: 6” control valves, 6” dressers, pressure gauges, 2” pressure release valve 2” air valve…etc and electromagnetic flow meter..etc * Chemical and biological tests | We asked the well’s representatives to prepare the main documents for this purpose. The well building motor is almost damaged. During the needs assessment we noticed that the well casing is very limited (8”) and therefore any new design or change of pumping equipments should handle this very carefully. Therefore we suggest to have short pumping pipes (half normal lengths) and this applies for the shafts as well. Because we expect to run the motor at higher speeds than normal. This is also to fit future replacements of the well equipments. |
| Well  **18-18/011A** | **No need for replacement of the existing new equipments with another new equipments, as follows**:   * Submersible turbine (80m3/100 m), discharge head 6”/6”, 1.5 pvc pipes sch80 length 150 m * Pump motor cable and connections. The motor has to be inverter duty as 10:1 (6-60 Hertz) Speed Range Constant Torque voltage 220/380-440 Class **F** Insulation. * **Replace the old electric panel** to fit with motor and AC/DC safe operation control system including VFD and equipped with digital water level sensor * **Replace the existing fittings at the site of the well** including: 6” control valves, 6” dressers, pressure gauges, 2” pressure release valve 2” air valve… and electromagnetic flow meter * Chemical and biological tests | We asked the well’s representatives to prepare the main documents for this purpose:   1. Valid license of abstraction issued by the PWA 2. Permission of work issued by the PWA in coordination with MoA |
| **Well** | **Replacement of the existing old equipments with new equipments as follow**:   * Supply and install diesel generator 110 KVA * vertical turbine (120 m3/hr at 100 m head), pumping pipes 64/6”, shafts 38mm, rubber joints, restrainers, discharge head 6”/6”, sch40 access pipes for water level * **Replace the electric** motor with new vertical hollow shaft electric motor 90 hp at 1500 rpm with all motor cable connections. The motor has to be inverter duty as10:1 (6-60 Hertz) Speed Range Constant Torque voltage220/380-440 Class F Insulation. * **Replace the old electric panel** to fit with motor and AC/DC safe operation control system including digital water level monitor and automatic flow measurement * **Partial replacement of the existing fittings at the site of the well** including: 6” valves, pressure gauges, 2” air valve and electromagnetic flow meter * Chemical and biological tests * **Building of sun and rain protection shed** | We asked the well’s representatives to prepare the main documents for this purpose:   1. Valid license of abstraction issued by the PWA 2. Permission of work issued by the PWA in coordination with MoA 3. Electric source is miserable |
|  | **Replacement of the existing old equipments with new equipments as follow**:   * vertical turbine (75 m3/100), pumping pipes 64/6”, shafts 38mm, rubber joints, copper restrainers, discharge head 6”/6”, sch40 access pipes for water level measurements. * **Replace the old motor** with new vertical hollow shaft electric motor 75 hp at 1500 rpm with all motor cable connections. The motor has to be inverter duty as 10:1 (6-60 Hertz) Speed Range Constant Torque voltage 220/380-440 Class **F** Insulation. * **Replace the old electric panel** to fit with motor and AC/DC safe operation control system including VFD and equipped with digital water level sensor * **Partially replace the existing fittings at the site of the well** including: 6” valves, pressure gauges, 2” air valve…etc and electromagnetic flow meter * Chemical and biological tests * **Building of sun and rain protection shed** | We asked the well’s representatives to prepare the main documents for this purpose:   1. Valid license of abstraction issued by the PWA 2. Permission of work issued by the PWA in coordination with MoA. 3. No civil works are allowed in this site |
|  | **Replacement of the existing old equipments with new equipments as follow**:   * Supply and install diesel generator 110 KVA * vertical turbine (120 m3/hr @ 100 m head), pumping pipes 64 m/5”, shafts 38mm, rubber joints, copper restrainers, discharge head 6”/6”, Sch40 pvc access pipes * **Replace diesel motor** with new vertical hollow shaft electric motor 90 hp at 1500 rpm with all motor cable connections. The motor has to be inverter duty as 10:1 (6-60 Hertz) Speed Range Constant Torque voltage 220/380-440 Class **F** Insulation. * **Replace the existing fittings at the site of the well** including: 6” valves, pressure gauges, 2” air valve…etc and electromagnetic flow meter * **Chemical and biological tests** * **Building of sun and rain protection shed** | We asked the well’s representatives to prepare the main documents for this purpose:   1. Valid license of abstraction issued by the PWA 2. Permission of work issued by the PWA in coordination with MoA |
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