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Research Article

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Methods of Well Construction Complication, Design and Developing for Sixteen Observation and Test Wells at the Eight Locations of Zarange District, Nimroz, Afghanistan

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INFORMATION

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ABSTRACT

This research has been conducted for construction, design, developing and observation of sixteen wells in center Zarange of Nemroz Province. For drilling of these well we used cable tool ridge "drilling Rotary by mud". The aquifers of Nimroz are located prolonging of rivers and its tributries. Most of the aquifers have been made with different sizes of sediments (sands and gravels). Near to slop and mountains, generally we can find big size and far from sources at the plain areas smaller sizes of clay, silt and sands. In this research we found different formations of stratigraphy in well profile is consisting different layers like sand, boulder, silty clay, gravel, sand, clay with gravel, clay, clay with gravel and clay silt with gravel. Generally, the aquifers belong to bigger sizes of sands and gravel, we used PVC of blank pipe and for filtering water used filter and gravel pack. This research is therefore essential to study the different layers in well profile of groundwater aquifers, with no or scarce previous research's in this section of well design. The challenges that we faced during this research are; absence of research in this area and lack of geological equipment.

1. Introduction

Generally, the drilling process does not have clear date, but we can find in some places tunnels and crystals of deep wells, at the first drillings seen in China, ancient Egypt. Too many decades' hand drilling, as well as for excavation tunnels, train roads and well drillings used bomb blasts, at that time, there was not any electric equipment for drilling (Abdullah et al., 2008). The methods of hand drilling used for soft and unconsolidated rocks. After some decades according to usage for drinking water, in some countries used cabal tool ridge drillings (Dobrin and Savit, 1988).

In developments of human, only source for relative drilling energy used, and after usage of burned machine, electric and different type of cooking (petroleum and gases) and development of drillings now we using different types of drills by having different speeds, the following are some developments of different types of drills. After geophysical studies and selection relative location of groundwater in the ground layers, the drilling of drills has been starting. Generally, there are two types of drillings, one is percation ridge and the second type is cabal tool ridges (Barker, 1989).

With the observation of Zarange City's wells, two of them were very deep, in these wells by having diameters 14 inches and having UPVC filters and casing, for backfilling at around blank pipe and filter we used natural alluvial and rounded gravel pack. The second well at that area was 40 m distance far from first well, this well was drilled by 6 inches' drill, the diameter of blank pipe and filter was 2 inches from UPVC type, as well as, around the filter and blank filling by alluvial rounded gravel pack (American Society for Testing and Materials (ASTM, 2003).

The hydrogeology of Nimroz Sedimentary Basin belongs to the diverse aquifers which are located prolonging mountains range in longitudinal valley. The thickness and depth of aquifers is related to the slope and distance from mountain range, generally near to mountain and slope areas, there are gravels and angular materials but far from mountains are

rounded and fine materials like bolder, cobble, pebble, granule, sands and silts. For drinking water, both shallow wells and deep wells are used in Nimroz Province, but in some places spring's water is used for drinking, in the fracture zones, pipe scam has been installed for gravity pumping system and distributed water among villages (Rasouli and Safi, 2021), besides, residents of that area benefit from surface steams for drinking as well.

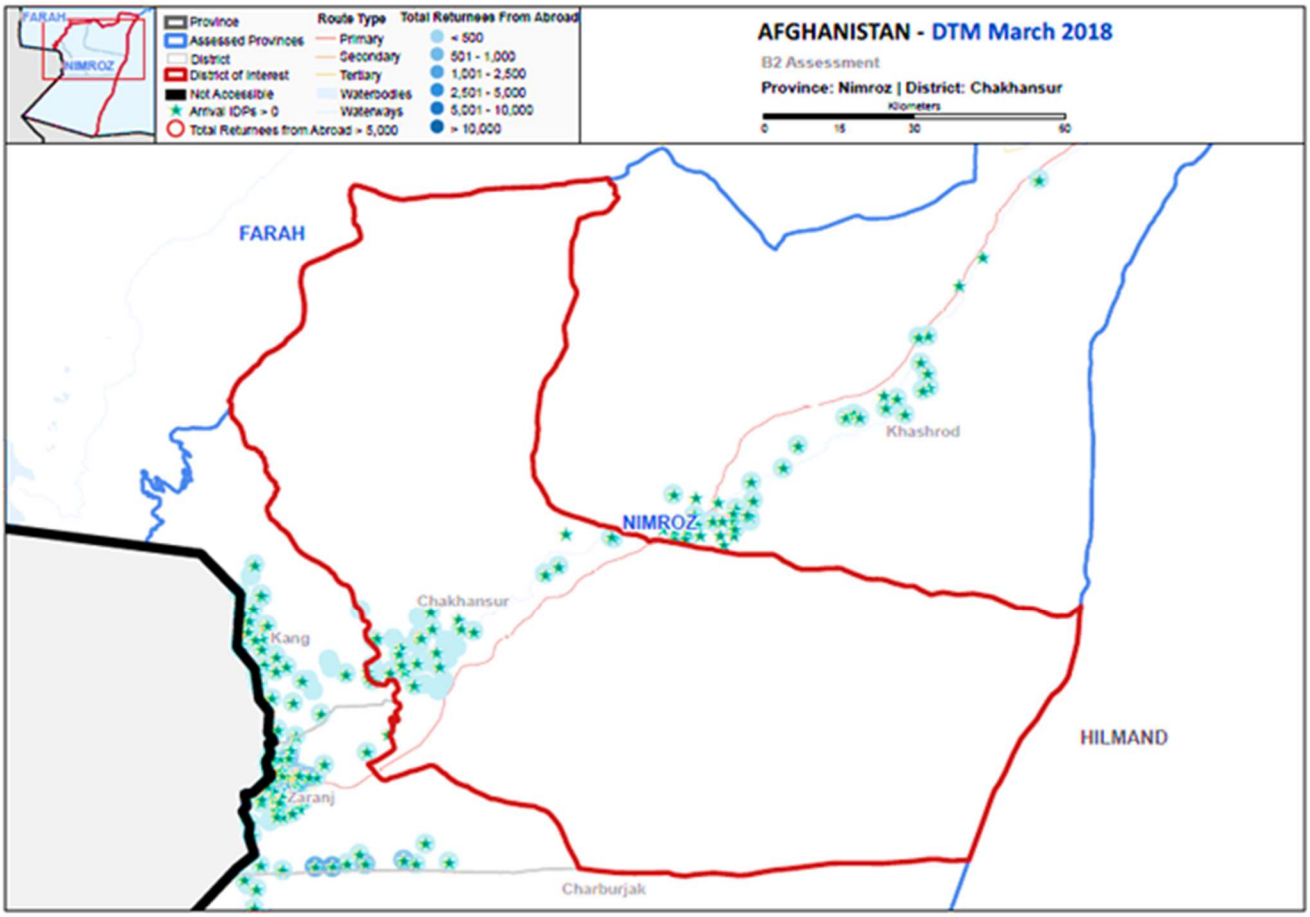

Fig. 1. Location map of Nimroz Province

Generally, in Nimroz Basin all irrigation land and living villages belong to Younger sediments those are transported from different parts of mountains ranges. Their depth and composition are different according to the locations, for example the upper and steep areas of this basin are not very thick and they belong to the Quaternary period and generally consistence conglomerate, but the lower basin consisting of young tertiary sediments and generally consisting of different clays, silt, sand and gravels (Bernard, 2003).

1.2. Historical developments of drilling tools

Between 1830-1840 came up the system of cabal drilling and it was being worked by gas energy, from 1850-1860 used the developed system of diamond by having diamond naps (Rasouli, 2020a). The percation ridge was firstly used at the tunnel of Alpine in United State of America. Between, 1870-1880 used the system of diamond Naples in America by Ingrasel cooperation and it is drilling by getting sampling to 2200 feet's diameter and 670m depth.

In 1890-1900 percation ridge made in USA that could work by spreading air energy. For first time, from 1920-1940 Germany made the Tangestan carbon Naples and it's used for percation cable tool ridges. Between 1970-2007 in Russia and USA the cable tool ridge used for oil and gas drillings, at the result they drilled at the 10000 m and 30000 feet's drills. Follow this in Germany at the depth of 1300 m drilled.

At the first time in China used percation ridge for drinking waters, and at the first time at 1859 in USA for petroleum reservoir well drilled at the 21 m depth (Musa et al., 2015). At the first time by hanging Naples and cables and three woods were used for three foots of drilling and by human force up and down this drilling, but after some developed machines and electrics come up.

2. Geographical Location

The Nimroz Province is located at the southwest side of Afghanistan, and its located 29° 36', 60° 48' east latitude, and 29° 22', 31° 49' north longitude (Rasouli, 2020b). In all districts of Nimroz the climate is arid and the average annual precipitation is 70-80 mm and in winter there is no any snowfall, because the lower precipitation and high temperature at duration one year. The land of this province has some deserts such as Margo, Bakwa, Khashoroud and Sistan (Rasouli et al., 2020) (Fig.1).

2.1. Surface water

The Helmend River Basin one the bigger rivers of Afghanistan, which is located between Farah and Nimroz Provices, consistS source of some rivers such as Helmand, Khashrod, Farah Road, Adraskan roud. After many years' drought there is no any duration due to one-year runoff in these rivers (Rasouli, 2021). The main source of these rivers is snow covered areas and glaciers areas of high mountains those are located the surrounding of Nimroz Province (Rasouli, 2019). The main source of surface water in Nimroz Province is Hamon Helmand (Rasouli et al., 2021), Hamon Pozak and Gozara are very important for surface water (Rasouli et al., 2015) (Table 1).

3. Methods of Drilling

In this research we selected the 16 points for investigation and observation of wells. In this research we used by rotary mud drilling and collected samples from stratigraphy of Nimroz deep wells and use lowering pipes and filtered according to aquifer and equipage.

Table 1. The main surface water resource of Nimroz Province

S/N	River	Source	End of river	River length (km)
1	Helmand	Onaiy Mountains	Hamon Helmand	1400
2	Farah Roud	Sayaboback	Hamon Sabari	560
3	Adraskan Roud	West side of Sayako	Hamon Sabari	400
4	Khash Roud	Sayako	Hamon Ashkasheem	600

Table 2. The main specifications of wells

Well location	Depth of well (m)	Drilling depth (m)	Drilling method	Starting date	Ending date
Joynaw School Well	70.70	74.00	Rotary	13.07.2020	25.08.2020
Janat Gul Land/Joynaw	71.10	74.00	Rotary	17.07.2020	12.08.2020
Around Famal Garden	71.70	75.00	Rotary	23.07.2020	05.08.2020
Haji Mohammad Village	71.40	76.00	Rotary	25.06.2020	21.08.2020
Haji Abdul Qadir Village	71.70	75.00	Rotary	25.06.2020	18.08.2020
Sayaduk Villige	71.00	76.00	Rotary	25.06.2020	27.08.2020
Saya Chashman School	70.80	74.00	Rotary	30.06.2020	15.08.2020
Water Supply and Conalizasion Office of Zarange	144.00	157.00	Rotary	05.07.2020	05.08.2020

The gravel pack was natural and artificial, for design and construction of well we used high quality materials, we held training and capacity building program for personnel for completion of well construction, and for future reconstruction of well, continues monitoring and evaluation of labara during well drilling, separated aquifers layers from contamination layers.

3.1. Rotary drilling

The observed wells of Zarang drilled by rotary drilling, now the device of rotary is very common and we can use hard and soft ground but is better to use for soft ground. In this method we used diamond Naples. It's join with the cylindrical metal, by motor its circulation and for staying cooling we used fluid injection to avoid from temperature.

The circulation of clay not only for staying cooling but it's also use for concrete the well walls and by circulation water we can exit some clay, silt and sands from well. In Zarang research project, we used two types of drilling: one is investigation wells and another are observation wells.

3.1.1. Investigative wells

The inventory well are those kinds of wells we drill for stratigraphy, quantity of waters, quality of waters, and Ground Water Level (GWL). Diameter of this wells according to the lithology of area, for this we can use dissimilar geophysical methods and the diameter of these wells are 12 – 18 inches. The depth of these wells by the results of geophysical surveys are different.

3.1.2. Observative wells

Those kinds of wells drilling around of investigation wells called observation wells, from that we can find the Static Water Level (SWL) of investigation wells. Sometime these types of wells are called peisometric.

Generally, the peisometric wells are used for fluctuation of groundwater surface, mapping, calculation groundwater volume, discharge and recharge from neighboring layers. The diameter of this kind of wells because of lower cost chosen smaller (6-10 inches), these kind of wells must drill on the aquifer layers and having permanent hydraulic conductivity.

Table 3. The stratigraphy of Joynaw School

S #	Depth (m)	Formation	Thickness (m)
1	00 – 04	Clay	04
2	04 – 10	Sand-Clay	06
3	10 – 14	Gravel-Sand with Clay	04
4	14 – 32	Silt Clay	18
5	32 – 34	Clay	02
6	34 – 72	Clay with minor Silt	38

4. Results and Discussion

In this research we drilled depth well for drinking water at Nimroz, Afghanistan. The total depth of this well was different, SWL are according to the locations, the lithology of layers consisting of sand, boulder, gravel, silty sand, sand, gravel, loam, clay with gravel, clay, clay with gravel and clay, silt with gravel (Figs. 2-49).

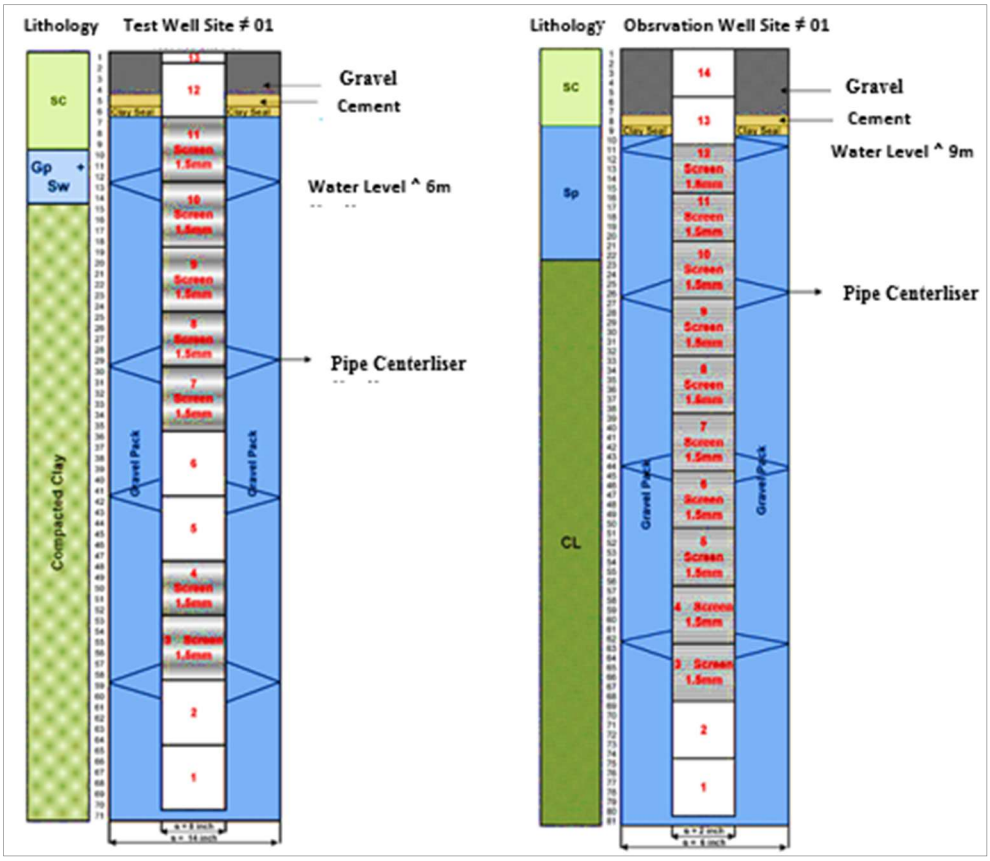

Fig. 2. Test Well and observation well in Joynaw School belong to Nimroz Province

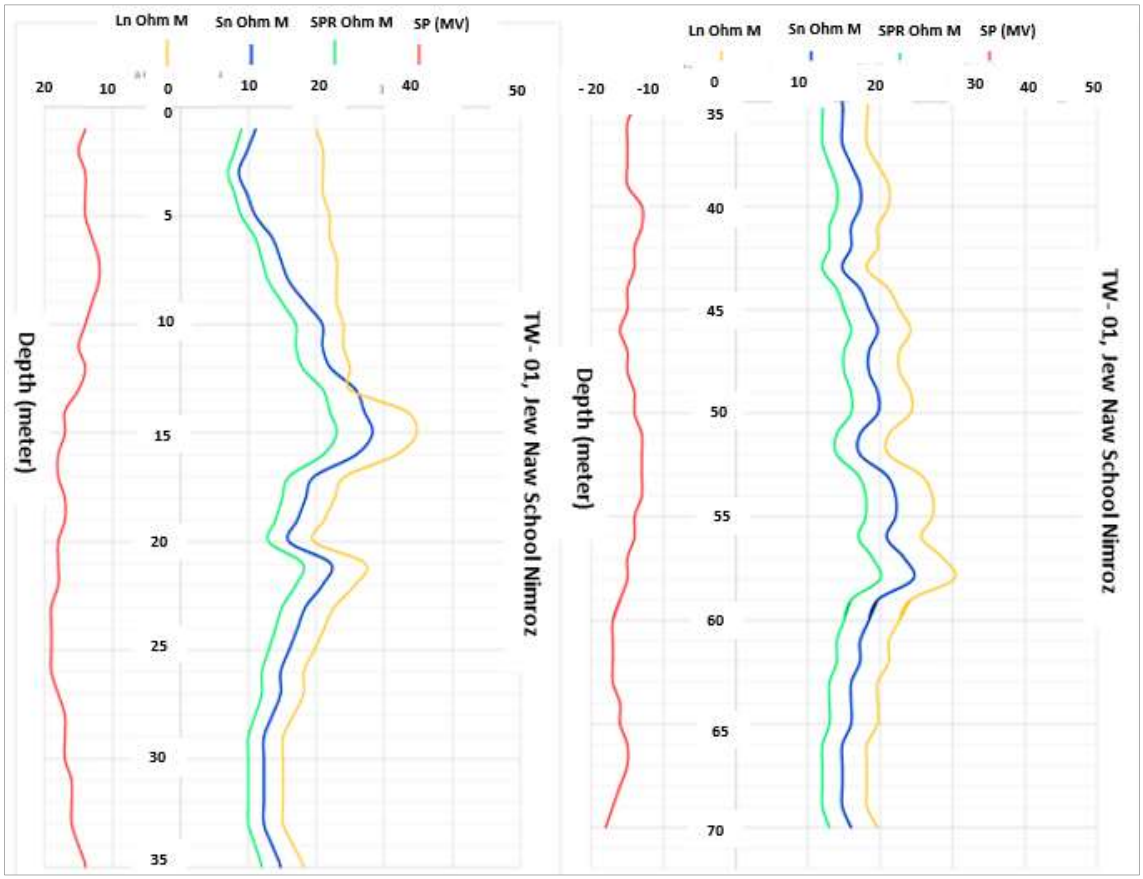

Fig. 3. Electrical Borehole LOG Design at TW # 01, JOY NAW SCHOOL NIMROZ, Afghanistan, for MS RECOL Construction Co.

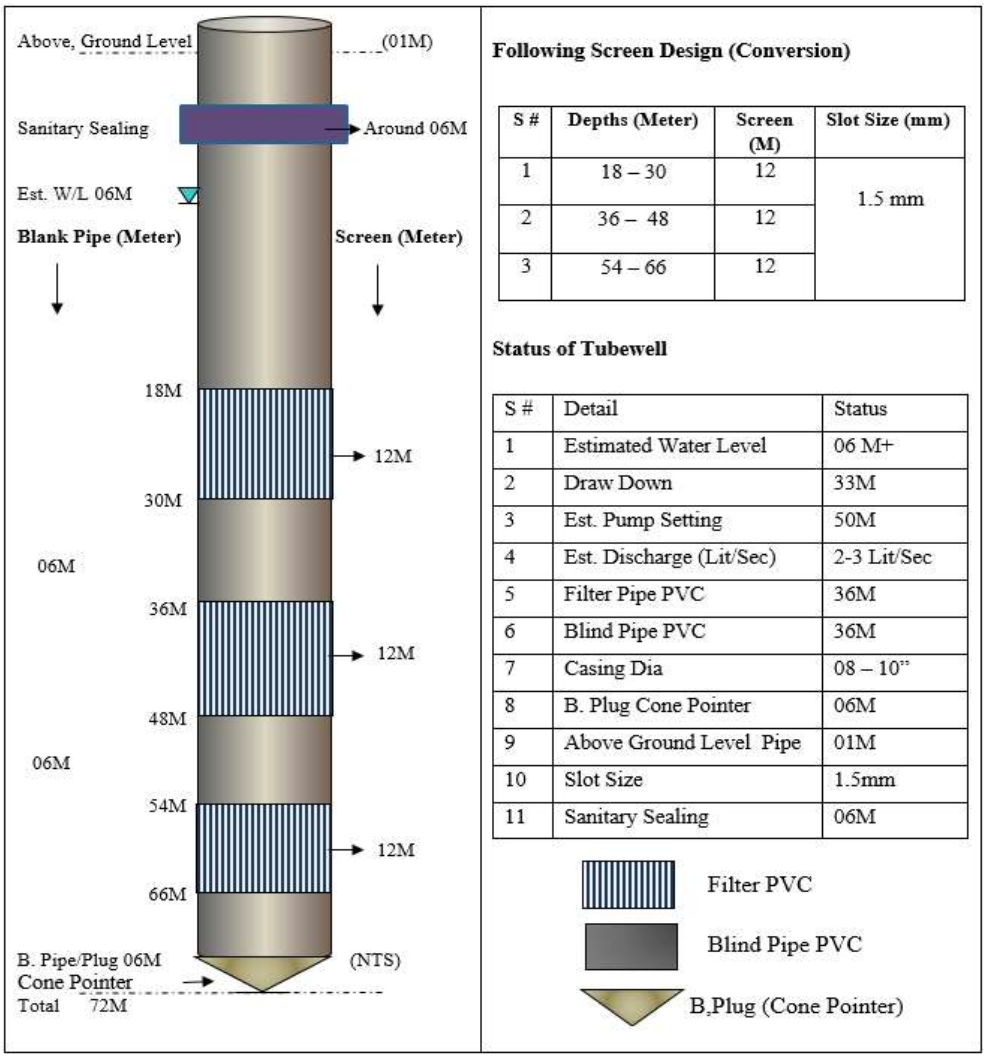

Fig. 4. Well design in Joynaw School belong to Nimroz Province

One part of this research is step drawdown or step test, when we complete the well construction in this case for well capacity we done the step drawdown or step test. In this case we found the main well capacity it was 1.5 L/minute and the water good from point of view quantity. For well sampling from different layers of well stratigraphy. The layers that have aquifer, filter is installed there, for non-aquifer we use blank pipe.

Table 4. The stratigraphy of Janat Gul Land/Joynaw

S #	Depth (m)	Formation	Thickness (m)
1	00 – 03	Clay with Minor Sand	03
2	03 – 10	Sand	07
3	10 – 15	Gravel – Sand	05
4	15 – 29	Clay with Fine Sand	14
5	29 – 74	Clay	45

In this research we used sample box from that we can find which depth which kind of materials consist. For separation of different sizes used sieving analysis method, in these sieved different sizes separated from one another is consisting of gravels, sands, silts and the rest is clay.

For gravel pack and well construction we must use those gravels and sands that do not have dust. Generally, in this research we used natural and artificial gravel packs, the natural gravel pack belongs to those gravel that is transported by streams or surface water, but the artificial gravel pack is belonging to machine and crush that is made by human force. Generally, the gravel pack used to avoid from fine material and turbidity that are located between layers to the well, the main characteristics of gravel pack is that it must not be soluble gravel and do not react with water. In well construction the gravel pack using back side of filters to avoid from fine material like sand, silt and clay.

The coefficient of homogeny for natural gravel pack is 3 ($\frac{D10}{D60} > 3$), D10 consisting of 0.25 mm. For artificial gravel pack we used to avoid the transitivity of fine they are located between groundwater and coefficient of homogeny for artificial gravel pack is 3 ($\frac{D10}{D60} > 3$), D10 consisting of 0.25 mm. In some wells of this research, restore aquifer, following damage due to drilling reduce head loss by increasing permeability, increase well efficiencyr ,educe drawdown and cost of extracting groundwater, restore/rehabilitate well due to gradual clogging and befouling.

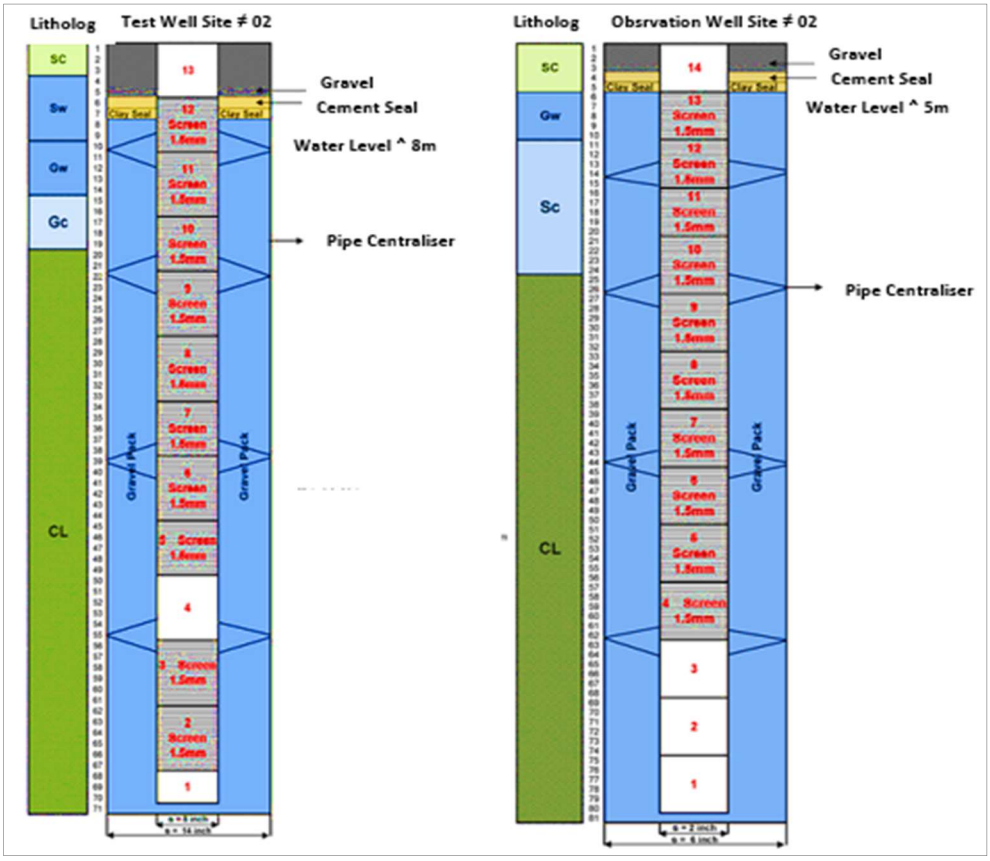

Fig. 5. Test well and observation well in Janat Gul Land/Joynaw belong to Nimroz Province

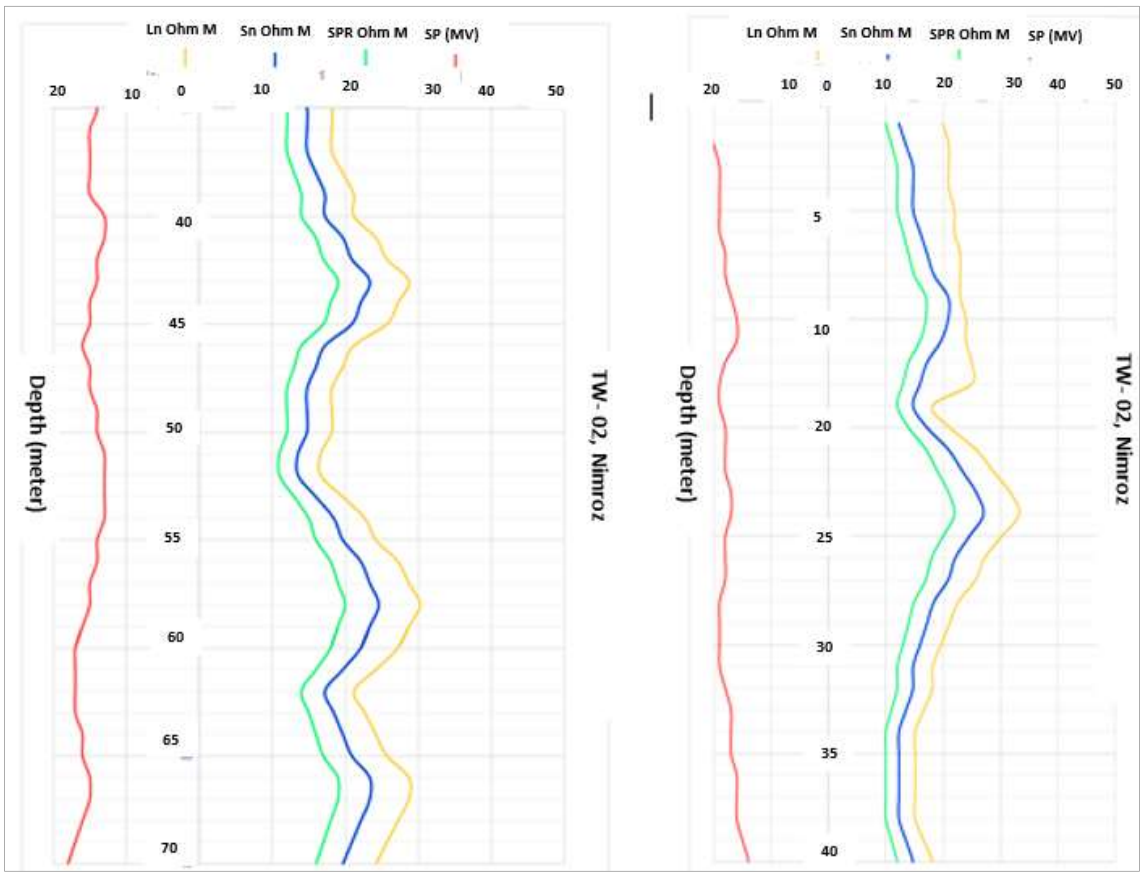

Fig. 6. Electrical Borehole LOG Design at TW # 02 (LAND OF JANAT GUL) NIMROZ, Afghanistan, for NWARA MS RECOL Construction Co.

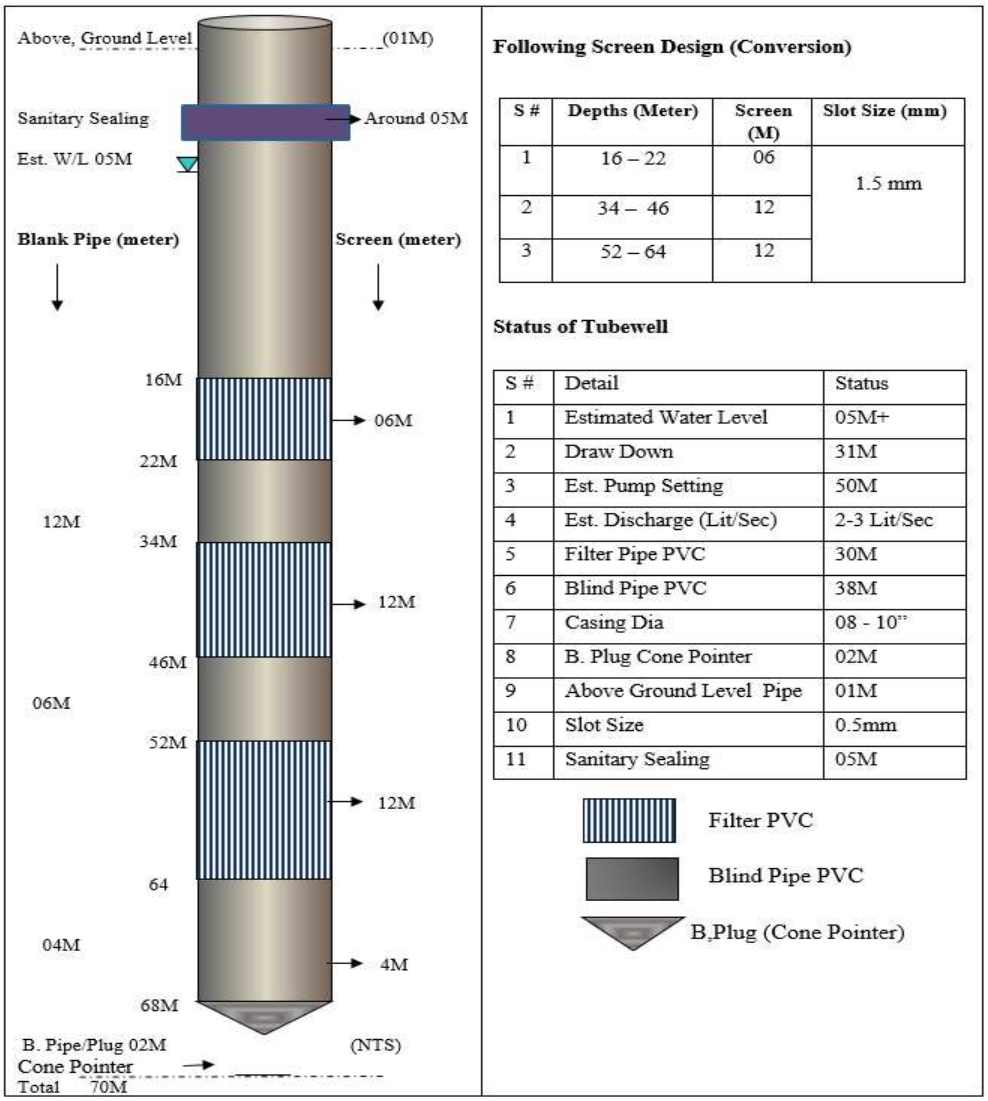

Fig. 7. Well design in Janat Gul Land/Joynaw belong to Nimroz Province

The well screen is the "heart of a well" and the filter pack acts as the "lungs" passing water to the screen, however, after drilling a borehole and installing a casing and filter pack, it is necessary to get the "heart pumping " and the lungs breathing, since the drilling fluid forms a thin layer of mud on the sand grains of the borehole wall and is forced into the pore spaces and cracks in the aquifer. This plugging effect decreases the flow of water into the well. Over pumping, the simplest but least effective development method is pumping a well at 2-3 times the designed discharge rate for a prolonged period.

Table 5. The stratigraphy of Around Famal Garden

S #	Depth (m)	Formation	Thickness (m)
1	00 – 08	Sandy – Clay	08
2	08 – 21	Sand	13
3	21 – 38	Clay	17
4	38 – 67	Sandy – Clay	29
5	67 – 82	Clayey Sand	15

This does not really agitate the soil enough to create a real filter around the screen and it tends to develop only a short section of the length of screen. The simplest but least effective development method is pumping a well at 2-3 times the designed discharge rate for a prolonged period. This does not really agitate the soil enough to create a real filter around the screen and it tends to develop only a short section of the length of scree.

Over pumping, the simplest but least effective development method is pumping a well at 2-3 times the designed discharge rate for a prolonged period. Backwashing ,this is a relatively simple method of development which requires water lifting device and a container in which water can be stored and then from which it will be allowed to flow easily back into the well. Water is pumped to the surface until the container is full; it is then rapidly dumped back into the well. Repeating this motion many times can provide some development of the surrounding water bearing formation. Surging is the most common method of well development. It involves forcefully moving water into and out of the well screen using one of the following techniques: compressed air can be injected into the well to lift the water; as it reaches the top of the casing, the air supply is shut off, allowing the aerated water column to fall (process called "raw hiding").

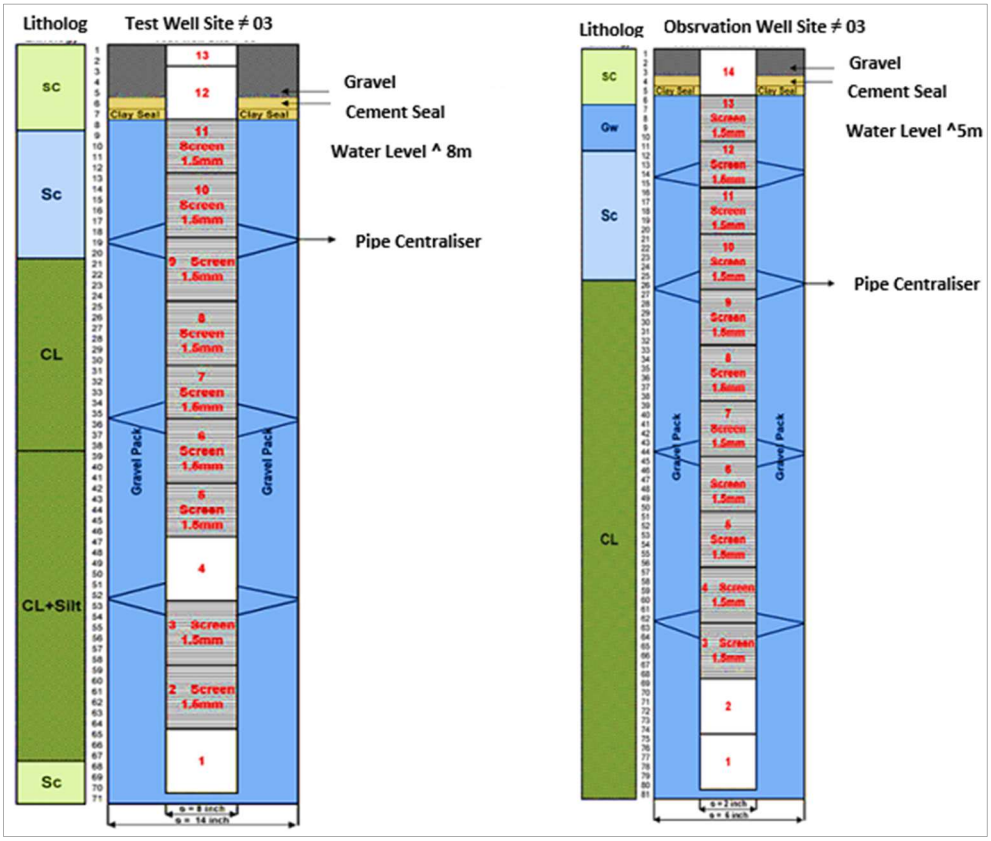

Fig. 8. Test well and observation well in Around Famal Garden belong to Nimroz Province

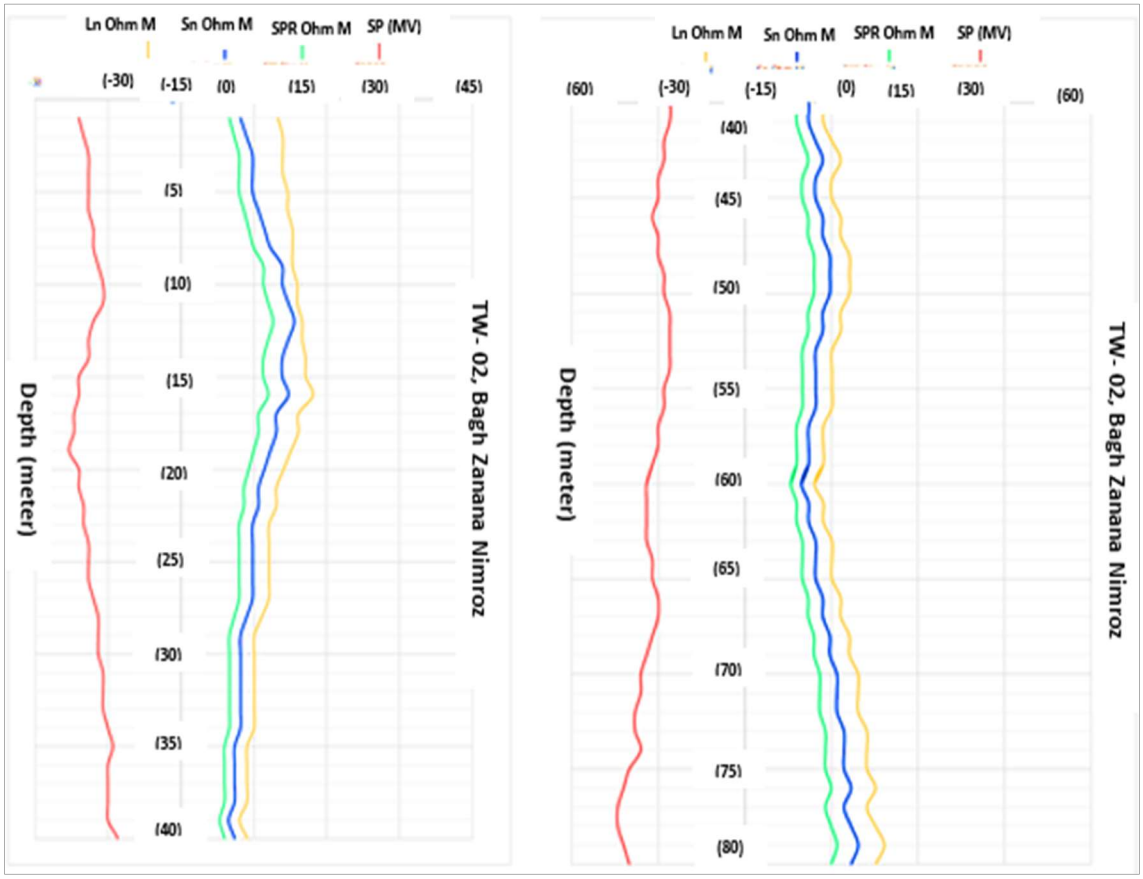

Fig. 9. Electrical Borehole LOG Design at TW#03 (BAGH ZANANA) NIMROZ, Afghanistan, for NWARA MS Rotary and Drilling Company of Latify

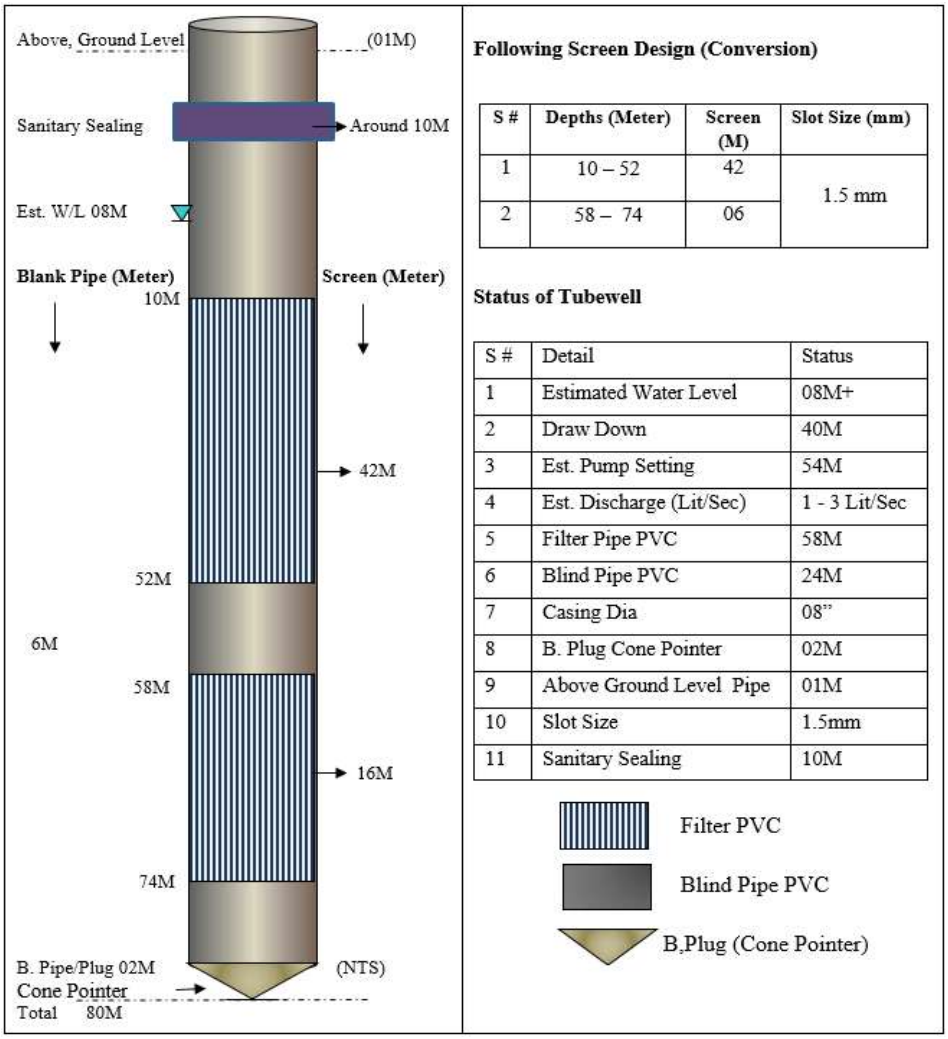

Fig. 10. well design in Around Famal Garden belong to Nimroz Province

The air supply should be periodically run without stopping to pump sediment from the well. This equipment is usually not available in remote areas and often only opens a small portion of the screen.

In this research, we used PVC type blank pipes and filters, and it's joined with one another's by different ways. Drilling method rotary by mud, screen pipe length is different, total screen pipe length according to the slot size, casing pipe length installed according to the lithology of layers.

Table 6. The stratigraphy of Haji Mohammad Village well

S #	Depth (m)	Formation	Thickness (m)
1	00 – 10	Clay with Minor Sand	10
2	10 – 22	Sand Clay	12
3	22 – 41	Clay with Minor Sand	19
4	41 – 70	Clay	29

4.1. First number well design

In this research the first number well we drilled in Joynaw School, started on 13.07.2020, the ending date is on 25.08.2020, type of drilling is Rotary, the depth of well is 74 m, and the total depth of this well is 70.70 m (Table 2).

4.1.1. Drilling

This drills done by rotary drilling and the depth of this well is 74 m, the stratigraphy of this is mixed on clay, sand and the lowers consist of fine gravels and sands, its thick is 9-14 m having excellent aquifer. Under 14-74 m are hard layer of having 5-10 % fine sands mixed (Table 2).

In this research for completion observation, well design we use different length of filter and blank pipes, the lignth blank pipe length is -4 No 5.8 m, - 63 mm, blank pipe short – 0 No (0m) - 63 mm, blank pipe short -0 No (1m) - mm, screen solt size 1.5 mm - long - 10 No (5.8 m) - 63 mm, pipe Centraliser 4 Nc, River Gravel 1.7 m^3, Bentinite Seal 1 m, Cement Seal 1m, Cement Seal 1 m. For completion test well, we use in this research for completion observation well design we used different length of filter and blank pipes, the lignth blank pipe length is -5 No 5.70 m, - 200 mm, blank pipe short - 1 No (2.5m) - 200 mm, blank pipe short -0 No (1m) - mm, screen solt size 1.5 mm - long - 7 No (5.7 m) - 200 mm, pipe Centraliser 4 Nc, River Gravel 5m^3, Bentinite Seal 1 m, Cement Seal 1m, Cement Seal 1m (Fig. 2). As well as Electrical Borehole LOG Design at TW # 01, JOY NAW SCHOOL NIMROZ, Afghanistan, for MS RECOL Const. Co., as we can see it according to the lithology of layers there are different fluctuations in the graph (Fig. 3).

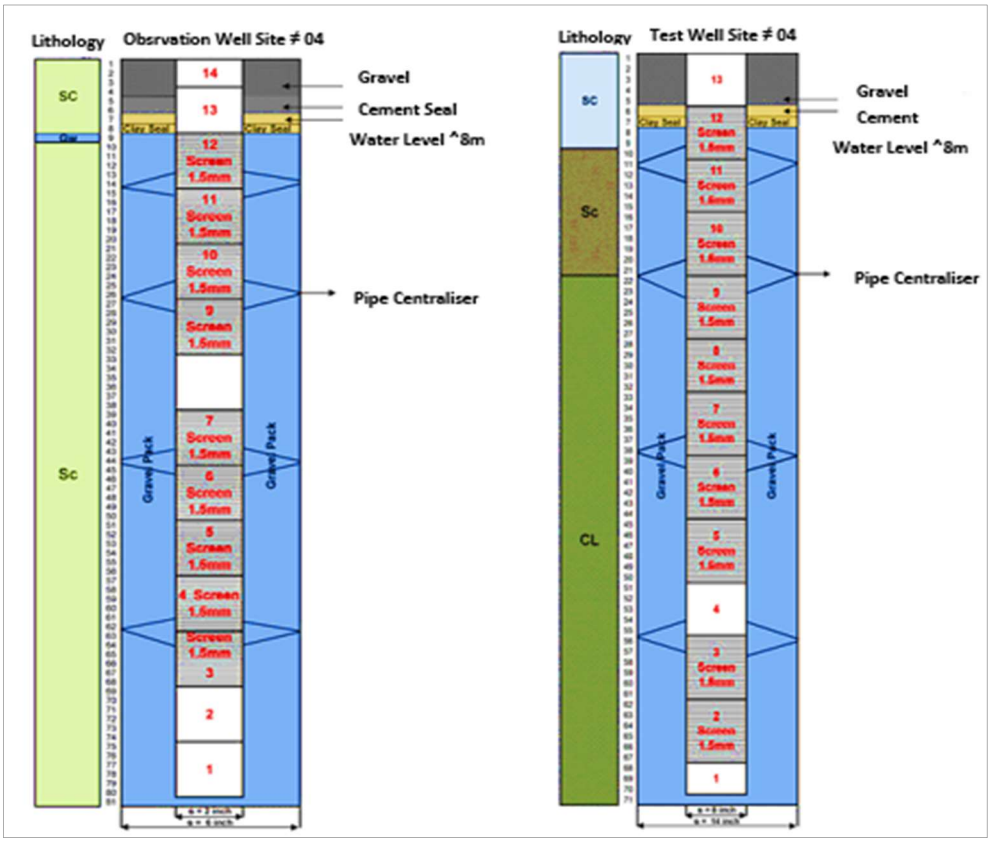

Fig. 11. Test well and observation well in Haji Mohammad Village belong to Nimroz Province

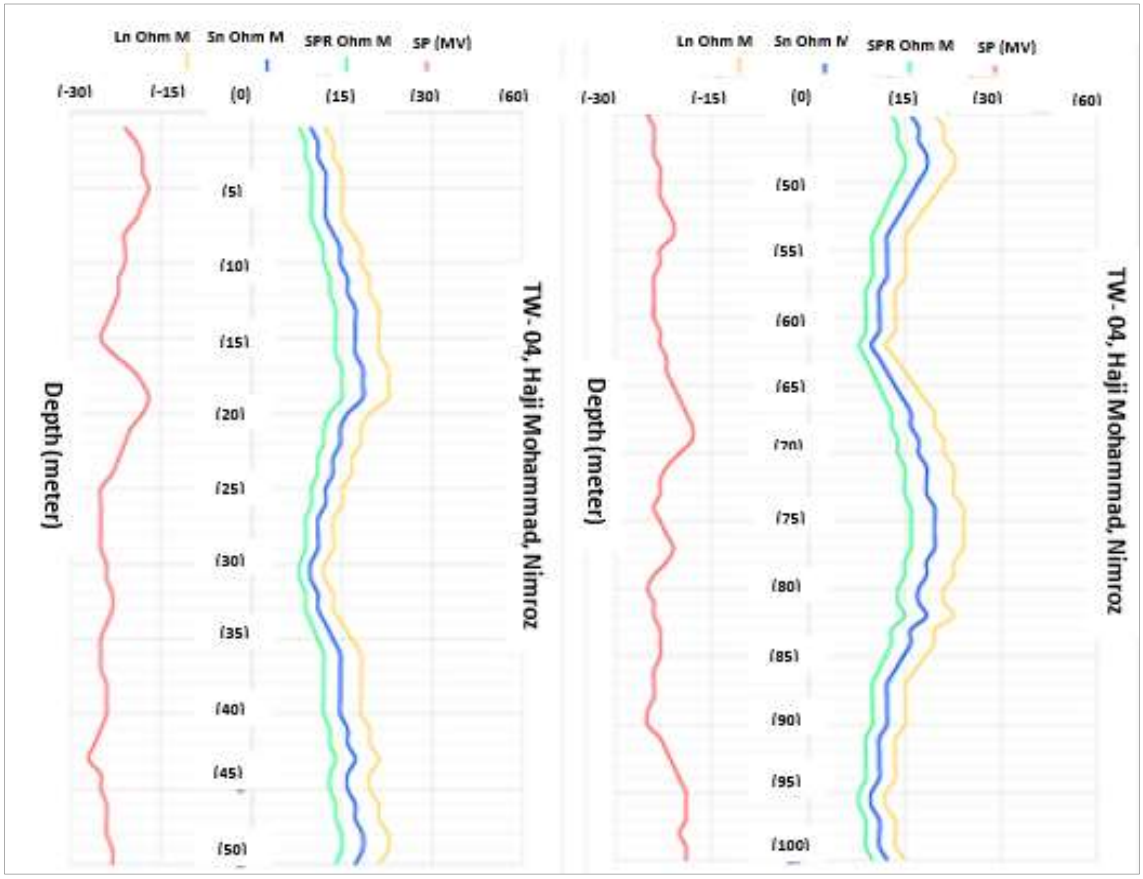

Fig. 12. Electrical Borehole Log Design at TW#03 Haji Mohammad Village, Nimroz, Afghanistan, for NWARA MS Rotary and Drilling Company of Latify

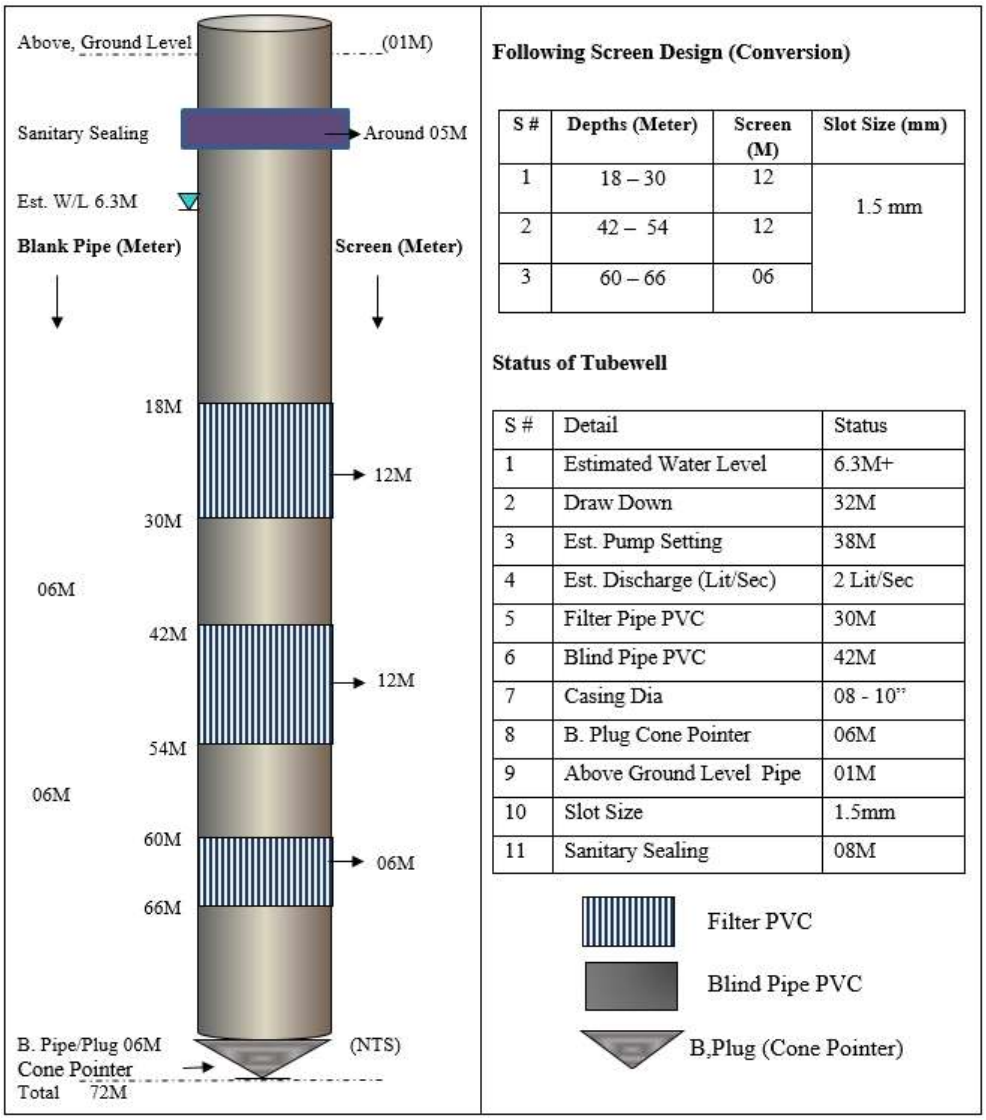

Fig. 13. well design in Haji Mohammad Village belong to Nimroz Province

If we compare the graphs there are more difference between graphs, this show lithology between layers and depth. All the wells contain in this project illustrate clearness of material. The well design of Joynaw School belongs to Nimroz Province, different types of instruments were used at the different length and wide such as Filter Pipe PVC, Blind Pipe PVC, Casing Dia, B. Plug Cone Pointer, Above Ground Level Pipe, Slot Size, and Sanitary Sealing. As we see in this research the depth of the each well is different based on the location. Further, SWL is different, and according to the aquifers we installed filter and blank pipe (Fig 4).

4.1.2. Installation of casing and filter

After complication drilling and electroil logging 8 inches UPVC in the well to 70.7m installing and the filter installing at the different locations, generally the locations are at the depth of 7-35m and lower is located at 74-58 m, depth and by sample the locations of filters are superated one another's. As well as, 4 numbers of Centerlizer at the four sparated locations at the vertically by the filter and casing installed and fluvial gravel at the back of filter filling and amount of 6 m depth and casing are installed (Fig 4).

4.1.3. Compressor test

Cleaning and development of well by compressor method of single pipe and dual pipe airlifting, this method is done in duration of 7 hours. The well development started from SWL to SWL after pump test recovered to the first SWL and all of clay and all toxic materials cleaning around the casing and filter to receive the clear waters.

Table 7. The stratigraphy of Haji Abdul Qadir Village well

S #	Depth (m)	Formation	Thickness (m)
1	00 – 07	Clay with Minor Sand	07
2	07 – 10	Poorly Graded Sand	03
3	10 – 22	Clay with fine sand	12
4	22 – 75	Clay	53

4.2. Second number well design

In this research the first number well we drilled in Joynaw School, started on 17.07.2020, and ended on 12.8.2020, type of drilling is Rotary, the depth of well is 74m, and the total depth of this well is 71.1 m (Table 2).

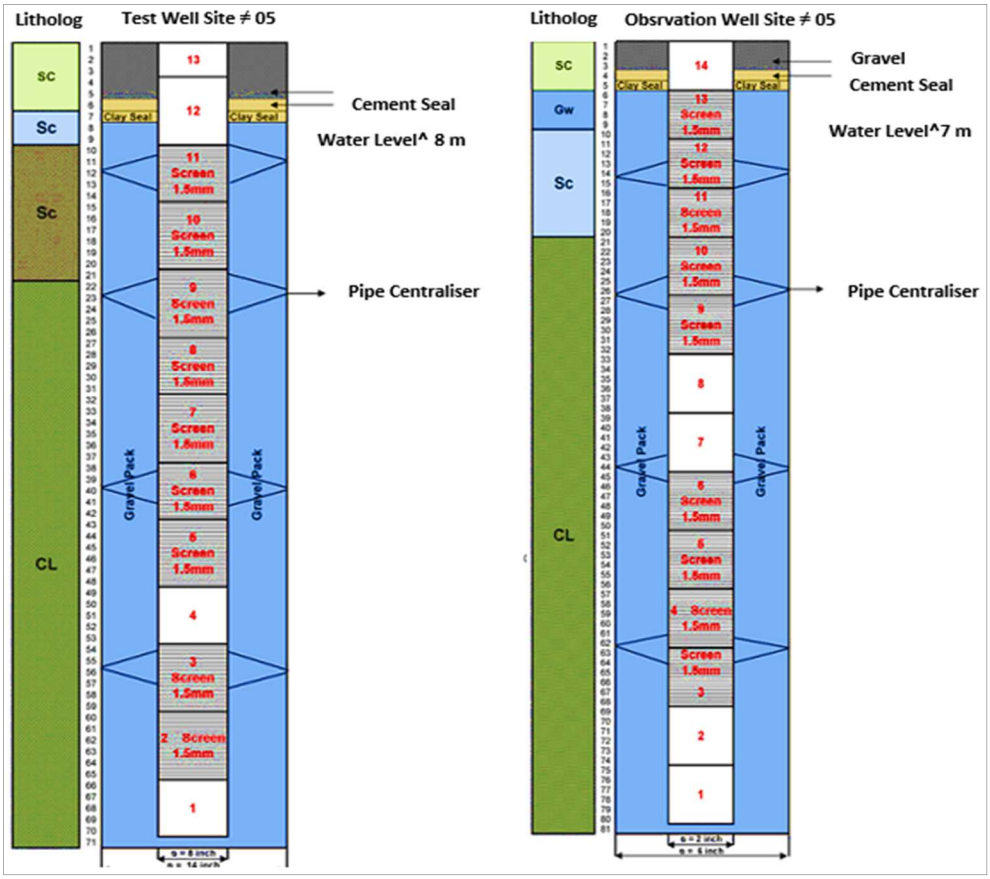

Fig. 14. Test well and observation well in Haji Abdul Qadir Village belong to Nimroz Province

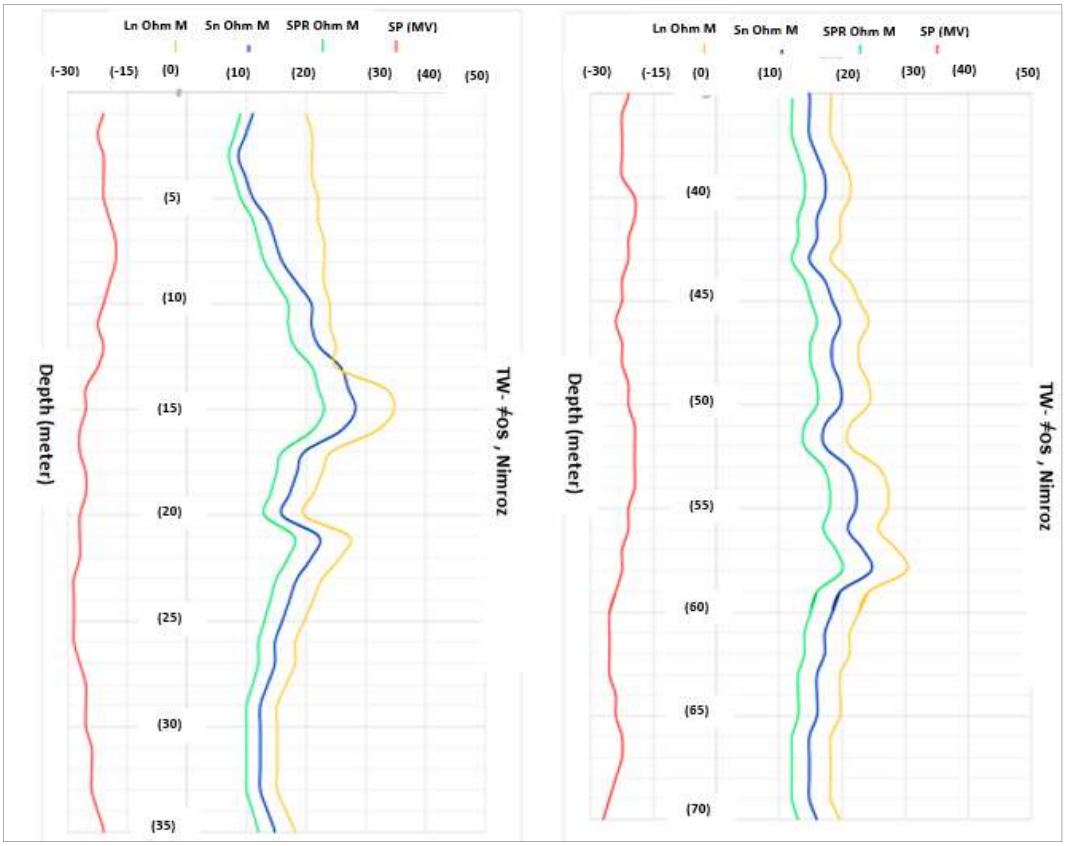

Fig. 15. Electrical Borehole LOG Design at TW #05 (Haji Abdul Qadir Village) Nimroz, Afghanistan, for NWARA MS RECOL Construction Co.

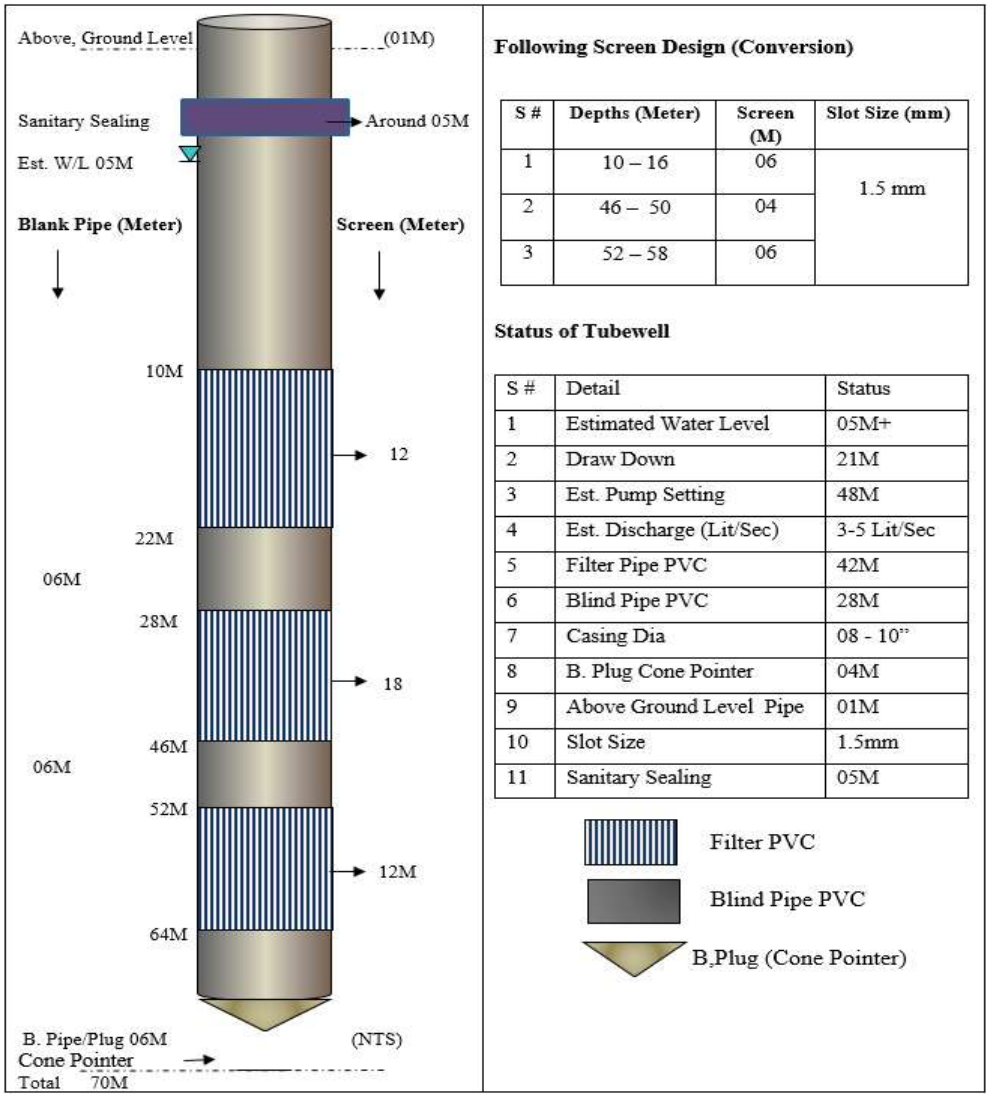

Fig. 16. well design in Haji Abdul Qadir Village belong to Nimroz Province

4.2.1. Drilling

This well drilling was done by rotary to 74m depth on the mixed layers of clay, sands and under that another layers of mixed by gravels and clay. It is located at the depth of 9-14 m. It's having exiling aquifer for water, lower this layers located clay mixed with sand and continues to 74 m. The SWL is located at the 7.37 m depth (Table 2). For completion the observation of this well's design in this research we used dissimilar length of filter and blank pipes, the length blank pipe length was -4 No 5.8 m, - 63 mm, blank pipe short - 0 No (0m) - 63 mm, blank pipe short -0 No (1m) - mm, screen solt size 1.5 mm - long - 10 No (5.8 m) - 63 mm, pipe Centraliser 4 Nc, River Gravel 1.7 m^3, Bentinite Seal 1 m, Cement Seal 1m, Cement Seal 1m. For completion of the well's test we used different length of filter and blank pipes in this research. The length blank pipe length is -2 No 5.8 m, - 200 mm, blank pipe short - 1 No (2.7m) - 200 mm, blank pipe short -0 No (1m) - mm, screen solt size 1.5 mm - long - 10 No (5.8 m) - 200 mm, pipe Centraliser 5 Nc, River Gravel 5m^3, Bentinite Seal 1 m, Cement Seal 1 m, Cement Seal 1 m (Fig. 5). As well as, Electrical Borehole LOG Design was done at TW # 01, LAND OF JANAT GUL, NIMROZ, Afghanistan, for MS RECOL Constriction Co. According to the lithology of layers we understand that there are different fluctuations in the graph. If we compare the graphs there are more differential between graphs, these show the lithology between layers and depth. Through this figure below with the help of well sampling and lithology of layers we can make it clearer (Fig. 6). Well design of Joynaw School that belongs to Nimroz Province help us to see different types of instruments at the different length and wide such as Filter Pipe PVC, Blind Pipe PVC, Casing Dia, B. Plug Cone Pointer, Above Ground Level Pipe, Slot Size, and Sanitary Sealing. Likewise, in this research the depths of wells are different in diverse locations with different Static Water, the filter pipe was installed in aquifers, but the blank pipe was installed in the non-aquifers (Fig. 7).

Table 8. The stratigraphy of Sayaduk Village well

S #	Depth (m)	Formation	Thickness (m)
1	00 – 06	Sand Clay	06
2	06 – 10	Sand	04
3	10 – 22	Sand Clay	12
4	22 – 38	Clay with Silt	16
5	38 – 75	Clay	37

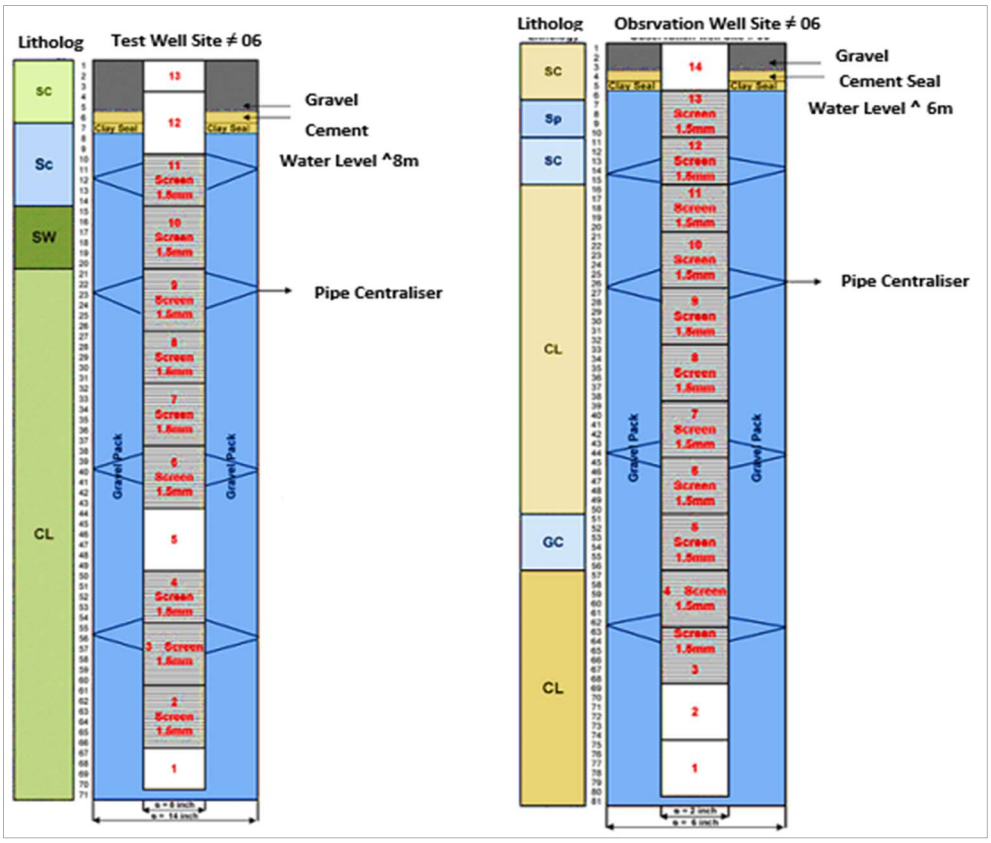

Fig. 17. Test well and observation well in Sayaduk Village belong to Nimroz Province

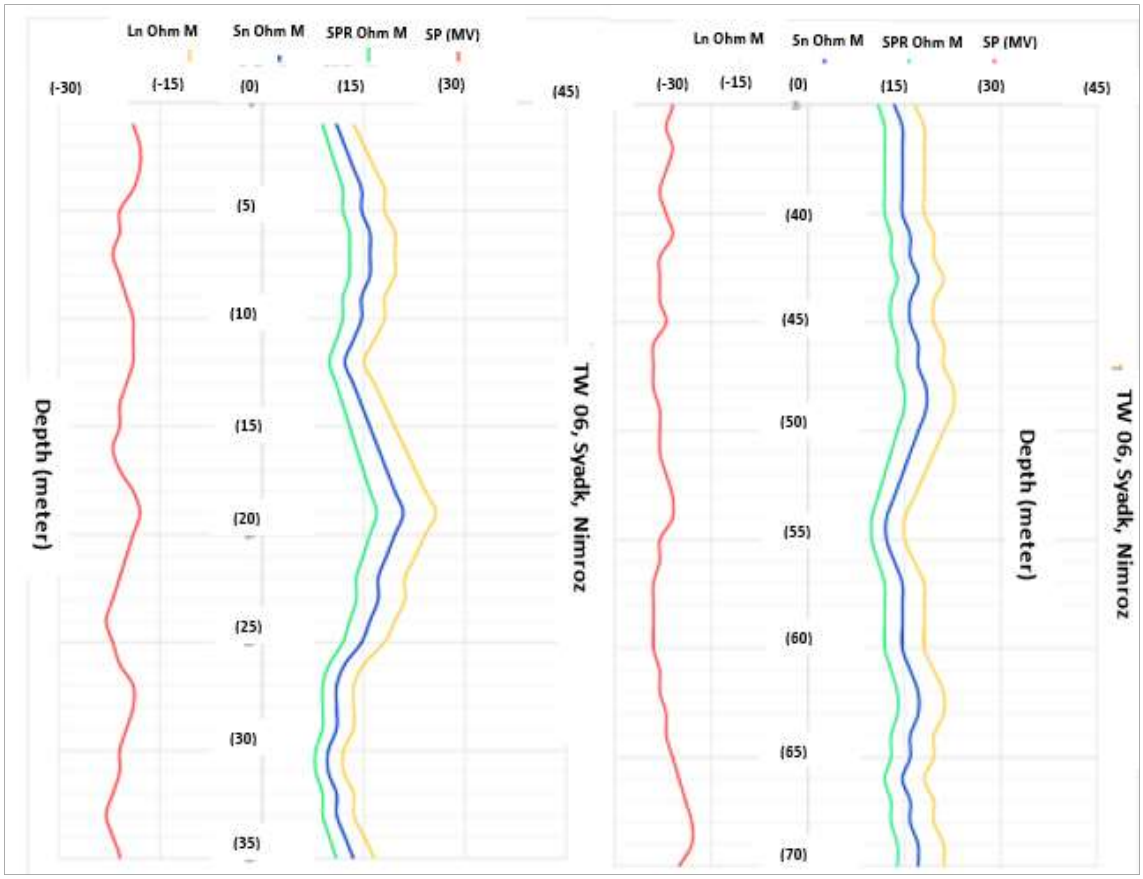

Fig. 18. Electrical Borehole LOG Design at TW # 06, Sayaduk Village, Nimroz, Afghanistan, for MS RECOL Construction Co.

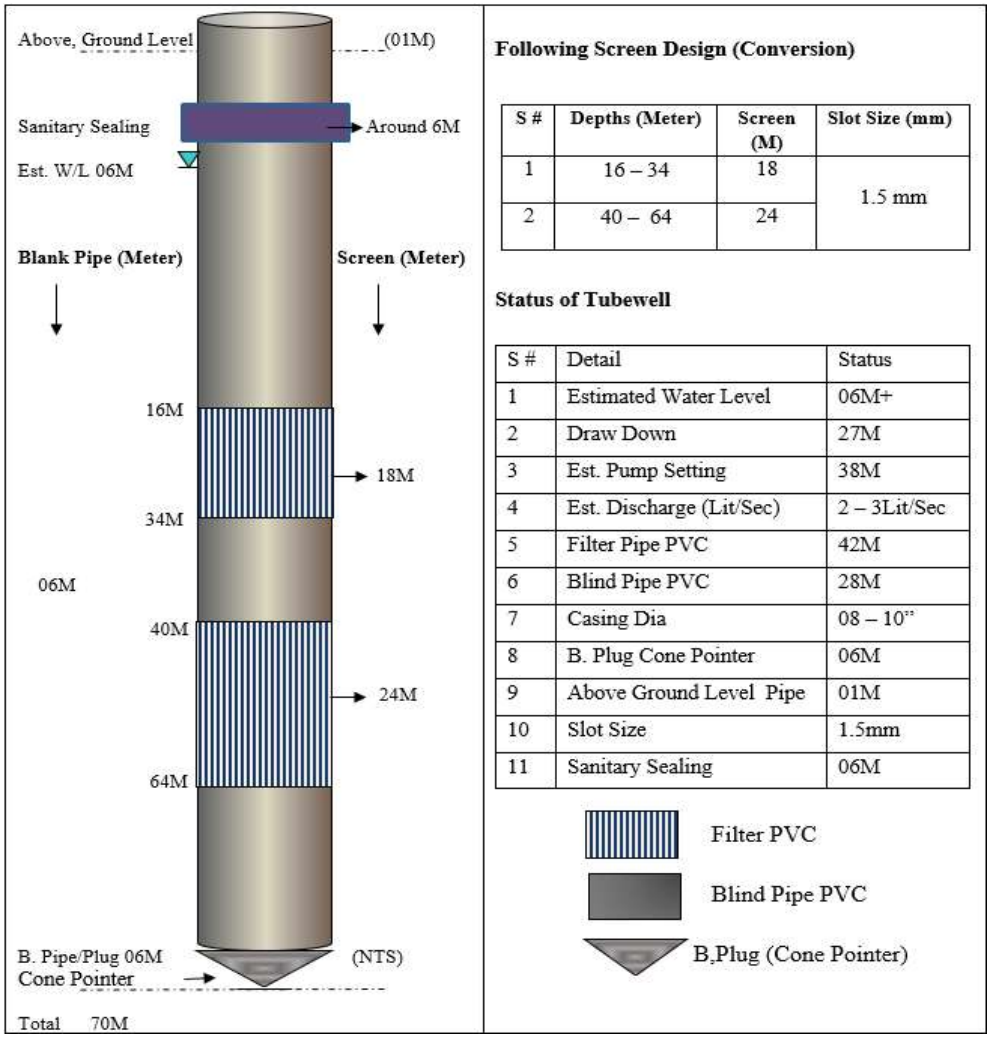

Fig. 19. Well design in Sayaduk Village belong to Nimroz Province

Table 9. The stratigraphy of Saya Chashman School well

S #	Depth (m)	Formation	Thickness (m)
1	00 – 03	Clay with Sand	03
2	03 – 07	Sand - Silt	04
3	07 – 16	Sand Clay	09
4	16 – 21	Sand	05
5	21 – 32	Sand with Minor Clay	11
6	32 – 76	Clay	44

4.2.2. Casing and filter installation

After the end of drilling and electrical logging of well casing and filter 8 inches UPVC in of well 71.1 m installed. The filter was installed at the two locations: the upper location is at the 5-49 m and the lower location is 55-67m by sample casing the filter separated from one another's. Also, 4 numbers of centerlizer at the four different locations for vertical staying of filter and casing used, besides we filled the back of filter and casing used fluvial gravel pack to the 7 m of well depth (Fig. 7).

4.2.3. Compressor working

Cleaning and development of well by compressor method (Single pipe and dual pipe airlifting) was done for 6 hours. The well development from SWL and inverse from Pumping Water Level (PWL) again recoved to the first SWL we used Stop watch. We used this to clean all dirt and clay from back of filter and blonk pipe to came and change to the clear water for drinking.

4.3. Third number area

In this research the first number well we drilled in Joynaw School started on 23.07.2020, and ended on 05.08.2020, the type of drilling was Rotary, the depth of well was 75 m and the total depth of this well was 71.7 m (Table 2).

4.3.1. Drilling

The drilling of this well was done by rotary drilling at the depth of 75m, the upper layer makes by clayey sand and its depth is 0-8m, the amount of about 60% was formed from clay. Lower of 8 m to 21 m there was sand with clay and the amount of clay is about 15%, it had excellent aquifer, and lower of is clay and its continues to the end of depth. The SWL of this well is at the 10 m depth (Table 5). In this research for the conservative design of this well we used different length of filter and blank pipes, the length blank pipe length is -3 No 5.8 m, - 63 mm, blank pipe short - 0 No (0 m) - 63 mm, blank pipe short -0 No (1 m) - mm, screen solt size 1.5 mm - long - 11 No (5.8 m) - 63 mm, pipe Centraliser 4 Nc, River Gravel 1.7 m^3, Bentinite Seal 1 m, Cement Seal 1 m.

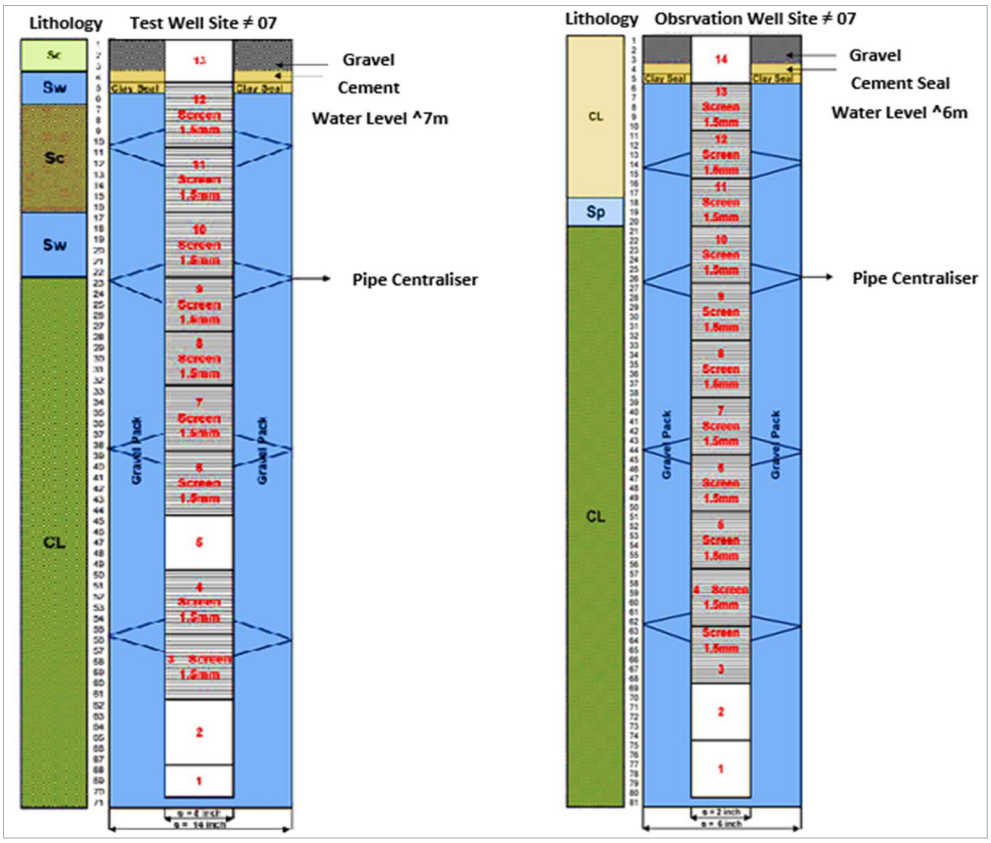

Fig. 20. Test well and observation well in Saya Chashman School belong to Nimroz Province

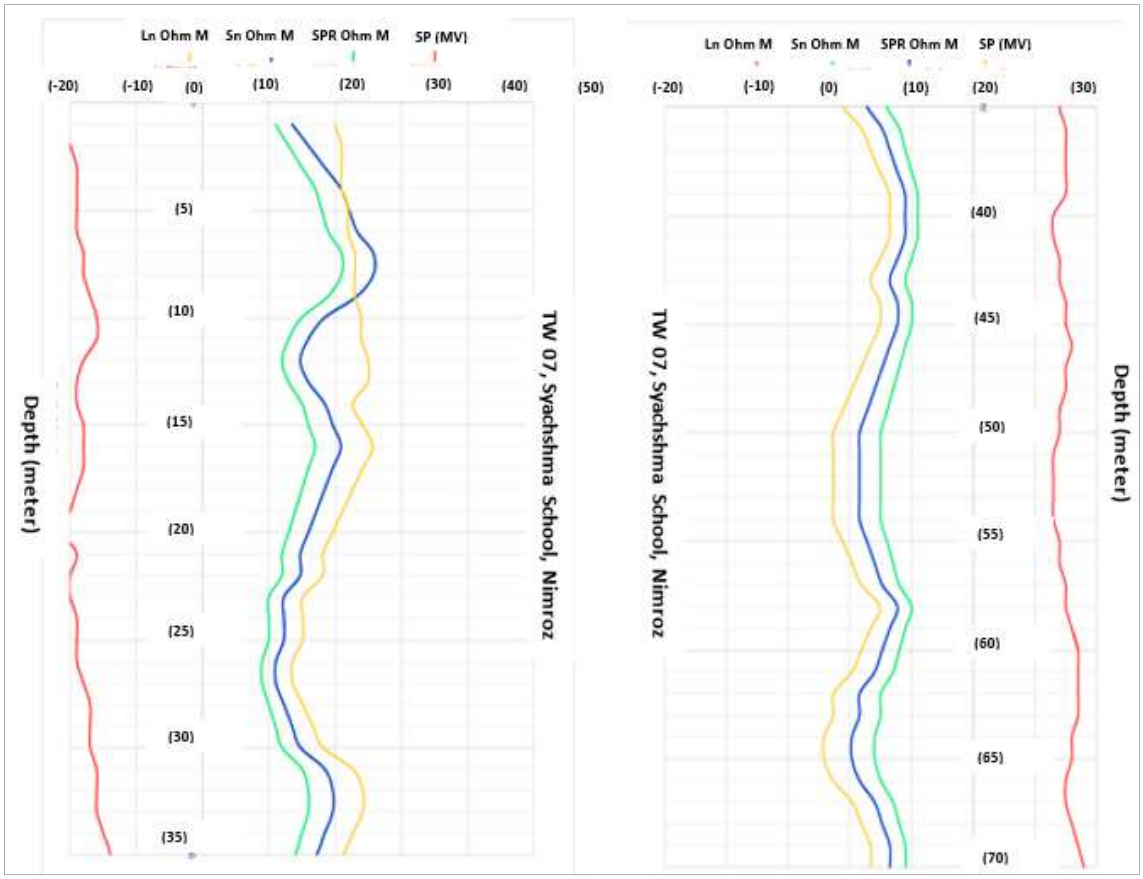

Fig. 21. Electrical Borehole LOG Design at TW # 07 (SEYACHASHMAN SCHOOL) NIMROZ, Afghanistan, for MS RECOL Const. Co.

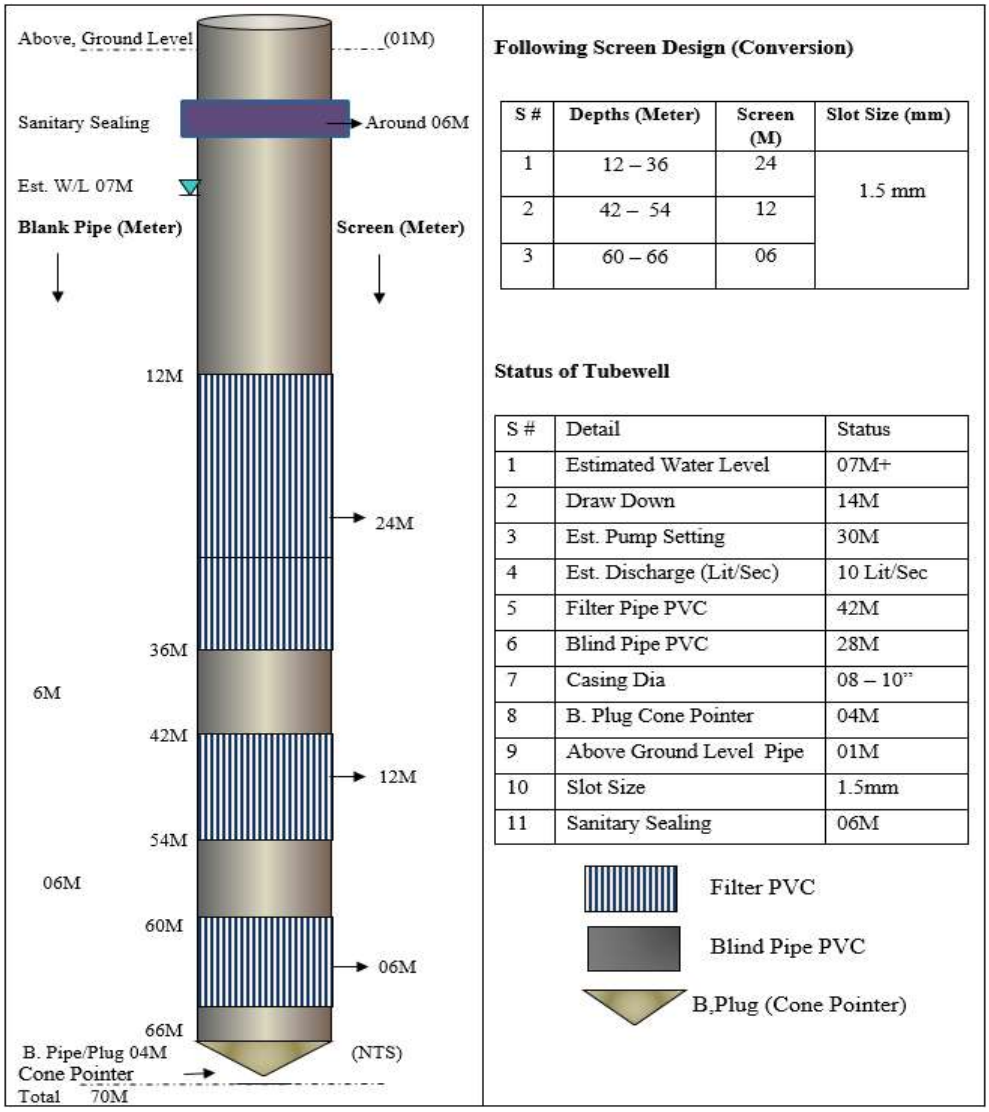

Fig. 22. Well design in Saya Chashman School belong to Nimroz Province

Table 10. The stratigraphy of office of Water Supply and Conalizasion of Zarange City well

S #	Depth (m)	Formation	Thickness (m)
1	00 – 03	Clay with Sand	03
2	03 – 07	Sand - Silt	04
3	07 – 16	Sand Clay	09
4	16 – 21	Sand	05
5	21 – 32	Sand with Minor Clay	11
6	32 – 76	Clay	44

For completion well's test in this research we used differnent lenth of filter and blank pipes, the lignth blank pipe length is -3 No 5.8 m, - 200 mm, blank pipe short - 1 No (3 m) - 200 mm, blank pipe short -0 No (1m) - mm, screen solt size 1.5 mm - long - 9 No (5.8 m) - 200 mm, pipe Centraliser 5 Nc, River Gravel m^3, Bentinite Seal 1 m, Cement Seal 1m, Cement Seal 1m (Fig. 8). Besides, Electrical Borehole LOG Design was done at TW # 01, LAND OF JANAT GUL, NIMROZ, Afghanistan, for MS RECOL Const. Co, and it is seen through the lithology of layers. Further, there are different fluctuations in the graph. If we compare the graphs there are more differntiol between graphs, these shows the lithology between layers and depth. Al well as this matter we can clear from well sampling and lithology of layers (Fig. 9).

In well design of Joynaw School belong to Nimroz Province, we can see different types of instroments at the different length and wid such as: Filter Pipe PVC, Blind Pipe PVC, Casing Dia, B. Plug Cone Pointer, Above Ground Level Pipe, Slot Size, and Sanitary Sealing. As we as in this research the depth of the well of well are different location Static Water is different, and according to the aquifers we installed filter and blank pipe (Fig. 10).

4.3.2. Casing and filter installation

After completion of drilling and electrical logging casing and filter at the 8 inches' diameter UPVC at the well to the depth of 71.7 m installed and the filter installed at the two locations, the upper location is 7-46 m and the lower is at the 52-64 m by sample casing locations separated to one another.

More, 4 numbers of centerlizers for staying vertically casing and filter used and at the back of casing and filter fluvial gravelpack to the 7m used (Fig. 10).

4.3.3. Comprisor working

The cleaning and development of well was done by method of Single pipe and dual pipe airlifting and this was used for 6 hours. In this method drawdown started from SWL and after resieved to the PWL, in this time all dirtes and clays were cleaned from around of casing and filters and the water changes to the clear water.

4.4. Fourth number area

In this research the first number well we drilled in Joynaw School started on 25.6.2020, and ended on 21.08.2020, type of drilling was Rotary, the depth of well is 76 m, and the total depth of this well is 71.4 m (Table 8).

4.4.1. Drilling

This type of drilling was done by rotary to the 76 m depth, the upper layers of this was made from clay and sand, and the lower part consisted sand to the 14-83 m depth and lower aquifers. The SWL was 6-30 m (Table 9). For completion of the observation related design of this well in this research we used different length of filter and blank pipes, the lignth blank pipe length is -5 No 5.8 m, - 63 mm, blank pipe short – 0 No (0m) – 63 mm, blank pipe short -0 No (1m) – mm, screen solt size 1.5 mm – long – 9 No (5.8 m) – 63 mm, pipe Centraliser 4 Nc, River Gravel 1.7 m^3, Bentinite Seal 1 m, Cement Seal 1m. For completion well's test we used in this research we used different length of filter and blank pipes, the lignth blank pipe length is -2 No 5.8 m, - 200 mm, blank pipe short – 1 No (3m) – 200 mm, blank pipe short -0 No (1m) – mm, screen solt size 1.5 mm – long – 10 No (5.8 m) – 200 mm, pipe Centraliser 5 Nc, River Gravel m^3, Bentinite Seal 1 m, Cement Seal 1m, Cement Seal 1m (Fig. 11).

In addition, Electrical Borehole LOG Design was done at TW # 01, LAND OF JANAT GUL, NIMROZ, Afghanistan, for MS RECOL Construction Co. As it is seen according to the lithology of layers and there are different fluctuations in the graph. If we compare the graphs there are more differential between graphs, these shows the lithology between layers and depth. All wells related materials and information can be revealed and cleared from wells' sampling and lithology of layers (Fig. 12).

In well design of Joynaw School related to Nimroz Province, different types of instruments at the different length and wide such as: Filter Pipe PVC, Blind Pipe PVC, Casing Dia, B. Plug Cone Pointer, Above Ground Level Pipe, Slot Size, and Sanitary Sealing. As well as, in this research the depth of the wells is different in diverse locations, as well is Static Water is also different, this is according to the aquifers we installed filter and blank pipe (Fig. 13).

4.4.2. Casing and filter installation

After finishing of drilling and electrical logging and filter of well, we used 8 inches UPVC at the well to the 7.4 m installed, the filter installed at the two parts of well, the upper part is 5-50 m depth and lower is 55-67 m depth and it's separated by sample casing from the upper parts. As well as, 4 centerlizers installeled at the four different locations for staying vertically conditions of filter and casing and at the back of filter and casing fluvial gravel pack to the 51 m depth (Fig. 13).

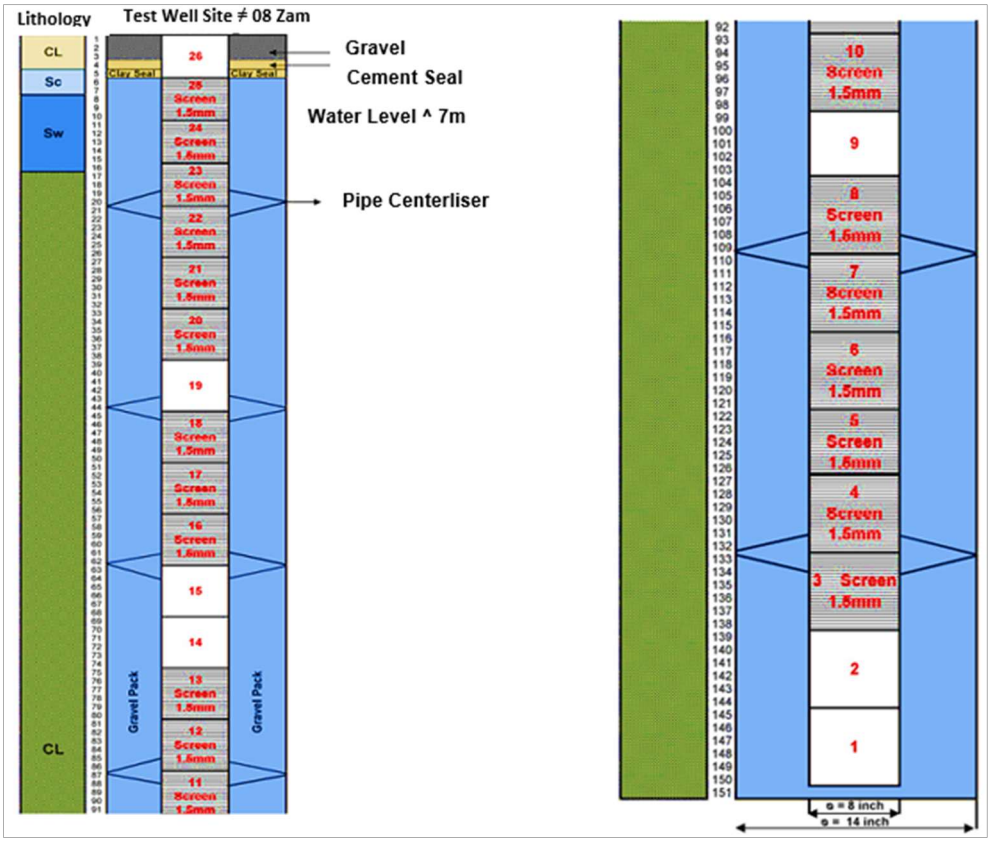

Fig. 23. Test well and observation well in office of water supply and Conalizasion of Zarange City belong to Nimroz Province

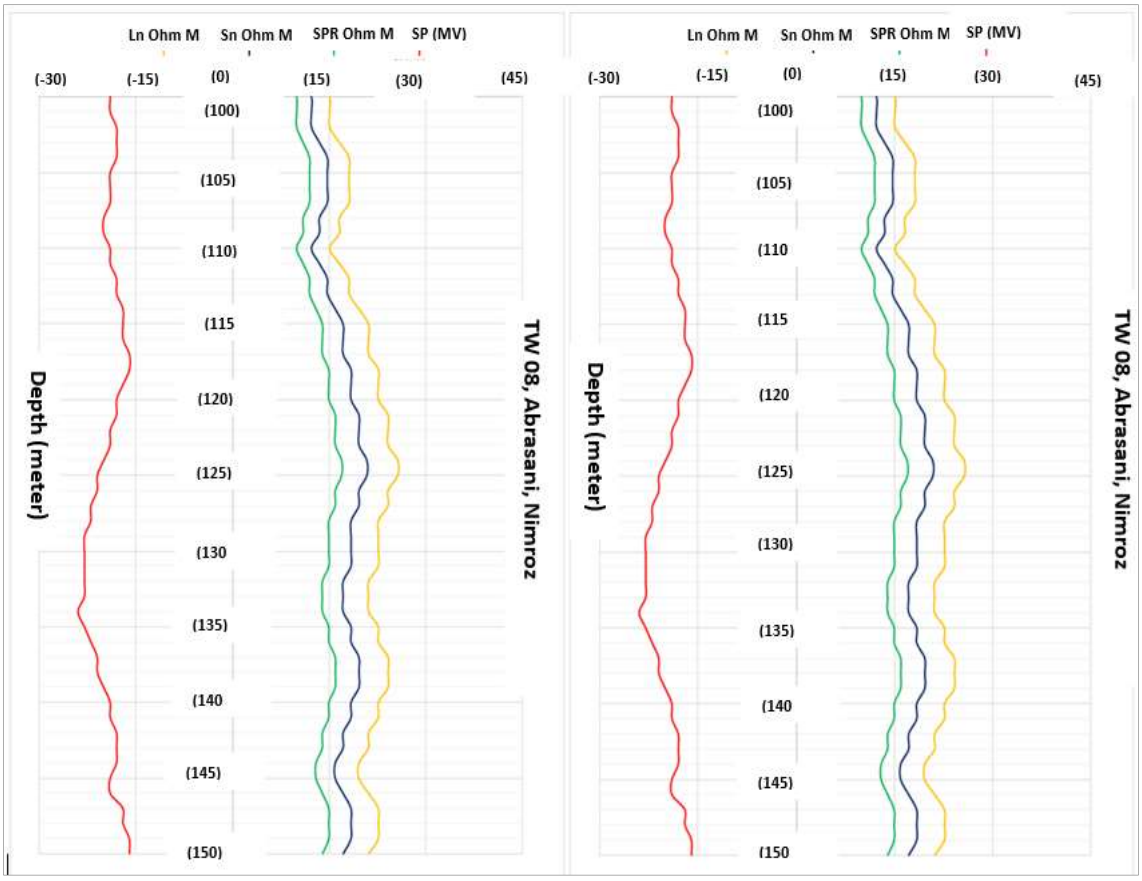

Fig. 24. Electrical Borehole LOG Design at TW # 08, ABRASANI NIMROZ, Afghanistan, for MS RECOL Const. Co.

4.4.3. Comprosure working

Well development and cleaning done by compresoure method (Single pipe and dual pipe airlifting) for 8 hours. The well development from the SWL drawdown to the PWL for cleaning all dirts and toxic materials from the back of filter and casing and well water change to the clean water.

4.5. Fifth number area

In this research the first number well we drilling in Joynaw School started on 25.6.2020, and ended on 18.8.2020, type of drilling was Rotary, the depth of well was 75m, and the total depth of this well is 71.7 m (Table 8).

4.5.1. Drilling

The well of Haji Abdul Qadir Village drilled by the rotary up to 75 m depth, the upper layer mixed from clay and sand. The second layer was consisted from sand to the 3m thick and lower of this consisted of clay and it had about 10% sand to the depth of 9-21 m. Lower from 21 m depth consist of clay, the SWL) of this well is 93.3 m (Table 11).

In this research for completion conservative design of well we used different length of filter and blank pipes, the lignth blank pipe length is -3 No 5.8 m, - 63 mm, blank pipe short - 1 No (0 m) - 63 mm, blank pipe short - 0 No (1m) - mm, screen solt size 1.5 mm - long – 9 No (5.8 m) - 63 mm, pipe Centraliser 4 Nc, River Gravel 1.7 m3, Bentinite Seal 1 m, Cement Seal 1m. For completion well's test in this research we used different length of filter and blank pipes, the lignth blank pipe length is - 2 No 5.8 m, - 200 mm, blank pipe short - 1 No (3 m) - 200 mm, blank pipe short -0 No (1m) - mm, screen solt size 1.5 mm - long - 9 No (5.8 m) - 200 mm, pipe Centraliser 5 Nc, River Gravel m^3, Bentinite Seal 1 m, Cement Seal 1m, Cement Seal 1m (Fig. 14).

As well as, Electrical Borehole LOG Design was done at TW # 01, LAND OF JANAT GUL, NIMROZ, Afghanistan, for MS RECOL Construction Co. As it is seen according to the lithology of layers and there are different fluctuations in the graph. If we compare the graphs there are more differntiol between graphs, these shows the lithology between layers and depth. All materials related to well can be cleared with sampling and lithology of layers (Fig. 15). In well design of Joynaw School belong to Nimroz Province, different types of instruments were used at the different length and wid suchas: Filter Pipe PVC, Blind Pipe PVC, Casing Dia, B. Plug Cone Pointer, Above Ground Level Pipe, Slot Size, and Sanitary Sealing. In this research the depth of the wells is different in diverse lacations as well as SWL is also different according to the aquifers we installed filter and blank pipe (Fig. 16).

4.5.2. Casing and filter installation

After completion of drilling and electrical logging we installed 8 inches UPVC casing and filter in the well to the 71.1 m, the filter located at the two locations, the first location is 9-48 m and the second lower location of filter is 53-65 m depth, and its separated by simple casing. Further, 4 number centerlizer was installed at the four different locations for vertically staying filter and casing, and we used fluvial gravel pack at the back of filter and casing to the 7m depth (Fig. 16).

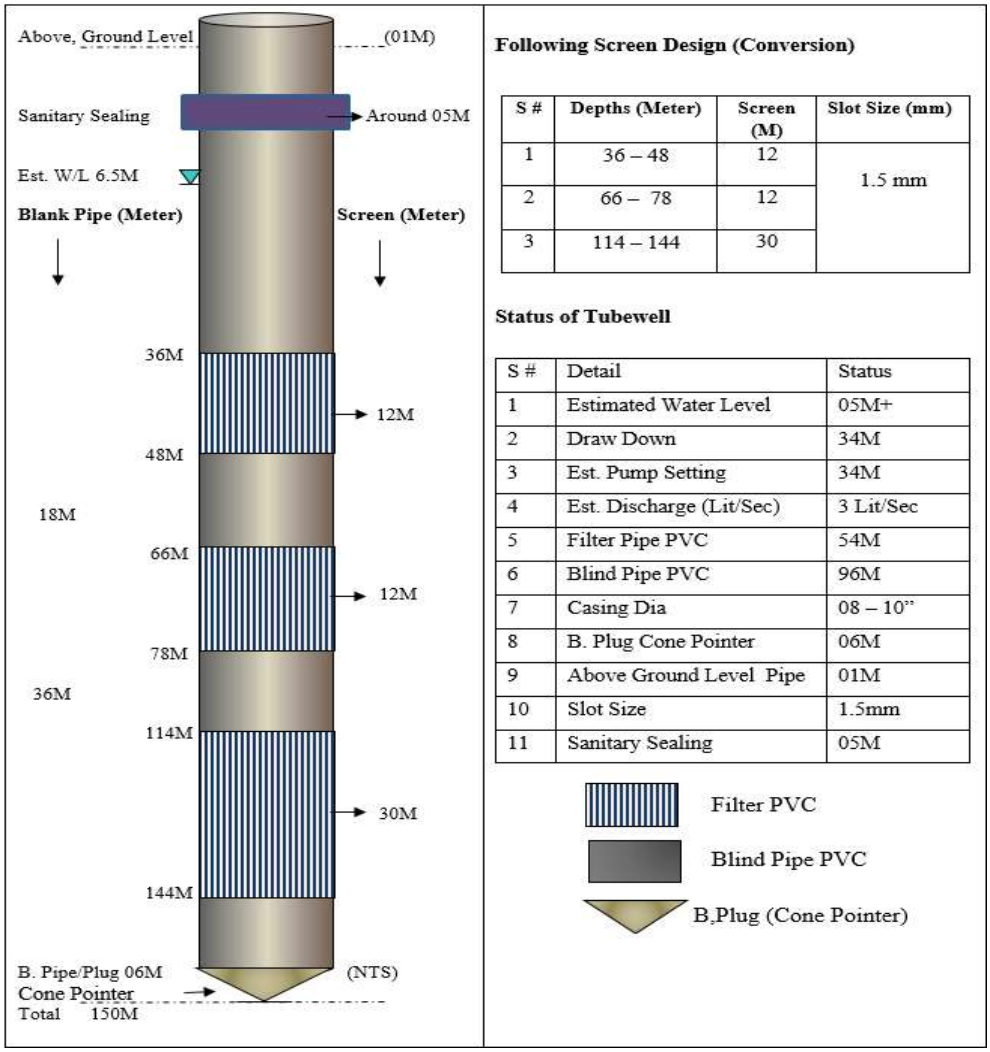

Fig. 25. Well design in office of Water Supply and Conalizasion of Zarange City belong to Nimroz Province

4.5.3. Compressor working

Well development and cleaning was done by compressor method Single pipe and dual pipe airlifting for 10 hours. The well development from the SWL drawdown to the PWL for cleaning all dirts and toxic materials from the back of filter and casing and well water change to the clean water.

4.6. Sixth number area

In this research the first number well we drilled in Joynaw School well started on 25.6.2020, and ended on 27.08.2020, type of drilling is Rotary, the depth of well is 76m, and the total depth of this well is 71 m (Table 12).

4.6.1. Drilling

The drilling was done by rotary to the 76 m depth, the upper layers of this was made from sand, and the lower part consisted of fine sand to the 6-14cm depth and lower aquifers. The lower layer from 14-20 cm mixed from sand and clay, the lower layer from 20 cm consisted of clay and its composition contained smaller amount of sand. The SWL of this well is 7.23 (Table 13). In this research for completion of the observative design of well we used different lengths of filter and blank pipes, the lignth blank pipe length is -3 No 5.8 m, - 63 mm, blank pipe short - 0 No (0 m) - 63 mm, blank pipe short -0 No (1 m) - mm, screen solt size 1.5 mm - long - 9 No (5.8 m) - 63 mm, pipe Centraliser 4 Nc, River Gravel 3.5 m3, Bentinite Seal 1 m, Cement Seal 1 m. For completion well's test in this research, we used different length of filter and blank pipes, the lignth blank pipe length is -3 No 5.8 m, - 200 mm, blank pipe short - 1 No (2.8 m) - 200 mm, blank pipe short -0 No (1m) - mm, screen solt size 1.5 mm – long - 9 No (5.8 m) - 200 mm, pipe Centraliser 5 Nc, River Gravel m^3, Bentinite Seal 1 m, Cement Seal 1m, Cement Seal 1m (Fig. 17).

Moreover, Electrical Borehole LOG Design was done at TW # 01, LAND OF JANAT GUL, NIMROZ, Afghanistan, for MS RECOL Construction Co., as it is seen according to the lithology of layers and there are different fluctuations in the graph. If we compare the graphs, there are more differntiol between graphs, these show the lithology between layers and depth. All wells' related materials can have cleared from well sampling and lithology of layers (Fig. 18).

In well design of Joynaw School related to Nimroz Province, different types of instruments were used at the different length and wide such as: Filter Pipe PVC, Blind Pipe PVC, Casing Dia, B. Plug Cone Pointer, Above Ground Level Pipe, Slot

Size, and Sanitary Sealing. As well as, in this research the depth of the wells is different in diverse locations, also, Static Water is different, and according to the aquifers we installed filter and blank pipe (Fig. 19).

4.6.2. Casing and filter installation

After finishing the drilling and electrical logging and filter of well, we used 8 inches UPVC at the well to the 70.8 m installed, the filter installed at the two places of well, the upper part is two the 9-43 m depth and lower of these at the 49-66 m depth and its separated by sample casing from the upper parts. As well as, 4 centralizers installed at the four different locations for staying vertically conditions of filter and casing and at the back of filter and casing fluvial gravel pack to the 51 m depth (Fig. 19).

4.6.3. Comprasor working

Well development and cleaning was done by compresoure method single pipe and dual pipe airlifting for 6 hours. The well development from the SWL drawdown to the PWL for cleaning all dirts and toxic materials from the back of filter and casing and well water change to the clean water.

Table 11. The result of this test according to these parameters (Date: 29.09.2020)

Location	EC (µS/cm)	pH	SWL (m)	Max. drawdown	DWL (34.34 m bgl)	T (m²/d)	Q (m²/d)	S
First	3870	7.91	9.89	37.05	34.34	10.25	345.6	1.07
Second	2460	98.7	9.05	27.39	34.34	10.25	388.8	1.07
Third	3190	7.35	9.19	26.89	36.49	4.34	164.16	5.44
Fourth	20100	7.71	5.12	35.45	41.75	78.94	216.00	2.37
Fifth	28600	7.16	4.58	29.36	33.29	22.55	319.68	1.04
Sixth	22100	7.56	6.58	42.07	49.30	43.11	86.40	7.19
Seventh	36800	6.99	4.16	18.18	13.65	81.95	864.00	3.26
Eighth	27400	7.99	6.40	18.18	13.65	81.95	864.00	3.26

4.7. Seventh number area

In this research the first number well we drilled in Joynaw School, this well started on 30.6.2020, and ended on 15.8.2020, type of drilling is Rotary, the depth of well is 74m, and the total depth of this well is 70.80 m (Table 14).

4.7.1. Drilling

This type of drilling was done by rotary to the 74 m depth, the upper layers of this was made from sand, and the lower part consisted of fine sand to the 6-16 m depth and lower aquifers. The lower layer from 16-22 m, it was mixed from sand and clay, the lower layer from 20 m consisted of clay and it was composed of smaller amount of sand. After second layer the amount of water higher because here is bigger sand. In 22 m lower to 75 m consist of sand and 85% are clay. The SWL of this well is 4.5 m (Table 15).

In this research for completion of the observative design of well we used different length of filter and blank pipes, the lignth blank pipe length is -3 No 5.8 m, - 63 mm, blank pipe short - 0 No (0m) - 63 mm, blank pipe short -0 No (1m) - mm, screen solt size 1.5 mm - long - 11 No (5.8 m) - 63 mm, pipe Centraliser 4 Nc, River Gravel 3.5 m3, Bentinite Seal 1 m, Cement Seal 1m. For completion of the well's test, in this research we used differnent lenth of filter and blank pipes, the lignth blank pipe length is -3 No 5.8 m, - 200 mm, blank pipe short – 1 No (2.8 m) - 200 mm, blank pipe short -0 No (1 m) - mm, screen solt size 1.5 mm - long - 9 No (5.8 m) - 200 mm, pipe Centraliser 5 Nc, River Gravel 6m3, Bentinite Seal 1 m, Cement Seal 1m, Cement Seal 1m (Fig. 20). As well as, Electrical Borehole LOG Design was done at TW # 01, LAND OF JANAT GUL, NIMROZ, Afghanistan, for MS RECOL Construction Co., as it is seen according to the lithology of layers and there are different fluctuations in the graph. If we compare the graphs there are more differential between graphs, these shows the lithology between layers and depth. All materials can be cleared from well sampling and lithology of layers (Fig. 21). In well design of Joynaw School related to Nimroz Province, different types of instruments were used at the different length and wide such as: Filter Pipe PVC, Blind Pipe PVC, Casing Dia, B. Plug Cone Pointer, Above Ground Level Pipe, Slot Size, and Sanitary Sealing. In this research, the depth of the wells is different in different locations and also Static Water is different, and is according to the aquifers we installed filter and blank pipe (Fig. 22).

4.7.2. Casing and filter installation

After finishing drilling and electrical logging and filter of well we used 8 inches UPVC at the well to the 71 m installed, the filter installed at the two places of well, the upper part is two the 4-44 m depth and lower of these at the 49-61 m depth and its separated by sample casing from the upper parts. As well as 4 centerlizers installed at the four different locations for staying vertically conditions of filter and casing and at the back of filter and casing fluvial gravel pack to the 49 m depth (Fig. 22).

4.7.3. Comprasor working

Well development and cleaning was done by compresoure method single pipe and dual pipe airlifting for 6 hours. The well development from the SWL drawdown to the PWL for cleaning all dirts and toxic materials from the back of filter and casing and well water change to the clean water.

4.8. Eight number area

In this research the first number, well we drilled in Joynaw School started on 05.07.2020 and ended on 05.08.2020, type of drilling is Rotary, the depth of well is 157 m and the total depth of this well is 144 m (Table 14).

4.8.1. Drilling working

This well drilling was done by rotary to 157 m depth on the mixed layers of clay, sands and under that another layers of mixed by gravels and clay the amount of clay is 80%. The thirty layer 7-16 and it consists of fine sand but it having capacity of excellent aquifer. It's having exillent aquifer for

water, lower this layers located clay mixed with sand and it continues to 74 m. The SWL of this well is located at the 6.9 m depth (Table 18). In this research for completion observative design of well we used different length of filter and blank pipes, the lignth blank pipe length is -7 No 5.8 m, - 63 mm, blank pipe short - 0 No (0m) - 63 mm, blank pipe short -0 No (1m) - mm, screen solt size 1.5 mm - long - 19 No (5.8 m) - 63 mm, pipe Centraliser 6 Nc, River Gravel 3.5 m3, Bentinite Seal 1 m, Cement Seal 1m. For completion well's test we used in this research we used different length of filter and blank pipes, the lignth blank pipe length is -3 No 5.8 m, - 200 mm, blank pipe short - 1 No (2.8m) - 200 mm, blank pipe short -0 No (1m) - mm, screen solt size 1.5 mm - long - 9 No (5.8 m) - 200 mm, pipe Centraliser 5 Nc, River Gravel 6m3, Bentinite Seal 1 m, Cement Seal 1m, Cement Seal 1m (Fig. 23). As well as, Electrical Borehole LOG Design was done at TW # 01, LAND OF JANAT GUL, NIMROZ, Afghanistan, for MS RECOL Construction Co. As it is seen according to the lithology of layers, and there are different fluctuations in the graph. If we compare the graphs there are more differential between graphs, these show the lithology between layers and depth. All materials can be cleared from well sampling and lithology of layers (Fig. 24). In well design of Joynaw School belong to Nimroz Province, different types of instruments were used at the different length and wide such as: Filter Pipe PVC, Blind Pipe PVC, Casing Dia, B. Plug Cone Pointer, Above Ground Level Pipe, Slot Size, and Sanitary Sealing. As well as, in this research the depth of wells is different form location to location, Static Water is also different according to the aquifers we installed filter and blank pipe (Fig. 25).

4.8.2. Casing and filter installation

After completion of drilling and electrical logging casing and filter at the 8 inches' diameter of UPVC at the well to the depth of 144m installed, the filter was installed at the two locations, the upper location is 5-38 m and the lower is at the 44-62 m and its third is 74-98 m, and the fourth 103-138 m depth, by sample casing locations separated to one another's. As well as, 7 number of centerlizers for staying vertically casing and filter used and at the back of casing and filter fluvial gravel pack to the 13 m used (Fig. 25).

4.8.3. Comprisor working

The method of cleaning and development for well was the single pipe and dual pipe airlifting, and this was used for 6 hours. In this method drawdown started from SWL and after resieved to the PWL, in this time all dirtes and clays cleans from around of casing and filters and the water changes to the clear water.

5. Conclusion

This research is used to select stratigraphy and prepared drinking water for health center in the Nimroz Province on Afghanistan. The hydrogeology of Nimroz Sedimentary Basin has direct relation with different aquifer located prolonging mountain range at longitudinal valley. The thickness and depth of aquifers is related to the slope and distance from mountain range. Generally, near to mountain and slope areas we can find gravels and angular materials but far from mountains at plain areas are rounded and fine materials like bolder, cobble, pebble, granule, sands and silts. For drinking water generally, the shallow wells, deep wells are used, as well as the spring water at the fracture zones and they install pipe scam from gravity pumping system and distributed water among villages. They benefit from surface streams water for drinking and irrigation. For constriction of well we used high quality materials, training and capacity building of personal for the constructions of well, and for future reconstruction of well, continues monitoring and evaluation of labors during well drilling, separated aquifers layers from contamination layers. During drilling we controlled well depth, the speed of infiltration layers, capacity of drug, the speed of rotation during drilling, the force of rotation, capacity of water pump, pressure of pump, the turbidity of mud, temperature of pump, salts of mud, and boulders in well walls and speed of mud rotation. The lithology of layers consisted of sand, boulder, gravel, silty sand, sand, gravel, loam, clay with gravel, clay, clay with gravel and clay, silt with gravel. There is prepared different tables for drilling depth according to time, in this method the progress of drilling depth recording according to time by m or cm recording. The time of recording is by second, minute and hour, and the curve drawing according to time. The curve of drilling depth is according to the time prepared tabled and we can find the speed of drilling and it's compared with one another's. From speed of drilling we can find the hardness of rocks between stratigraphy. Generally, gravel pack divided into type, one is natural gravel pack and other is artificial gravel pack, the natural gravel pack is belonging to those gravel that is transported by streams or surface water, and that is good for filtering of groundwater turbidity, but the artificial gravel pack belongs to machine and crush that is made by human force. Generally, the gravel pack using for to avoid from fine material and turbidity that are located among layers of the well, the main characteristics of gravel pack is it must not be soluble gravel and not reaction with water. In well construction the gravel pack using back side of filters to avoid from fine material like sand, silt and clay. The coefficient of homogeny for natural gravel pack is 3 ($\frac{D10}{D60} > 3$), D10 consisting of 0.25 mm. Artificial gravel pack using to avoid the transitivity of fine they are located between groundwater and coefficient of homogeny for natural gravel pack is 3 ($\frac{D10}{D60} > 3$), D10 consisting of 0.25 mm. The main characteristics of gravel pack is it must be clear from dust, it must be rounded materials, they must not be between gravel carbonates materials, it must be sorted and homogeny. In gravel pack must be more than consisting from quartz.

Conflicts of Interest

The author declares no conflicts of in interest regarding the publication of this paper.

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