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THE WATER SUPPLY SYSTEM OF AYGEHOVIT COMMUNITY

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The source of the water supply system of Aygehovit community is the aquifer situated about 9 km east to the settlement. The outlet carries seasonal weak changes. According to the measurements in spring 2017, the results are about 2 liters/s. The community's daily regulating 2 reservoirs (DRBs) are envisaged to be implemented in 2 turns. The first-turn reservoir will satisfy the water demand of the consumers of the community and the second, prospective basin is calculated to cover fire and emergency water intake. These reservoirs will be located near the north-eastern slopes of about 565m height near the community. Water will be distributed among consumers through a deadlock polyethylene pipeline. In order to calculate the amount of water consumed by the population, installation of water meters is envisaged with their polymeric-type wells.

Key words: water, spring, water line, outlet, water regulatory reservoir, distribution system

Introduction

In the 20th century the world population has enlarged four times and the amount of freshwater taken from the natural environment increased for eight times and the amount of extracted water will have increased by 40% till 2025 [1, 2].

The problem of water supply in small settlements with the increase of water shortage is of great importance. Water balance has been made for the territory of Ashtarak town for the first time and predictions on the changes in water supply sources are based on the global climate change [3,4].

The territory of Aygehovit community of Kashatagh administrative district is located on the left bank of Aghavno River between the altitudes of 500-540 m above the sea level.

The climate of the study area is temperate and relatively dry all year round. Since the measurements of the climatic parameters have not been performed in the area and there are no exact data available, their values are presented according to the analogous location. Specifically:

The average annual air temperature is 13, the absolute minimum is -17^{0}C, the absolute maximum is 43^{0}C. The average annual temperature on the soil surface is 16 ^{0}C. In the studied area the maximum depth of soil cooling is 37 cm. During the year the winds blowing to the north-east dominate with annual average speed of 1.2m/s and winds of at more than 15m/s are registered for not more than 3 days. Annual precipitation is 400-450 mm, 136 mm per day maximum. The heaviest precipitations are observed in May with average monthly and maximum daily precipitation of 102 mm and 78 mm respectively. The amount of precipitation in the form of snow is 54 mm. The soil is light clay partly cultivated, partly sterile.

It will be necessary to carry out complex measures in the direction of ensuring the quality of the service, the security and technical calculations of water supply system, pipelines, springs, the maintenance of the main road reconstruction, its uninterrupted operation, the replacement of internal worn-out networks in Artsakh.

In the sphere of water supply and water remove the following tasks are actual:

- The investment of the newest cleaning technologies and materials with the purpose of satisfaction of more strict sanitary reqyuirements towards the water quality **[**5**]**,

- Application of effective schemes in water supply nets and the usage of automated control systems in them **[**6**]**,
- In the difficult conditions of landcape and seismic danger the study of the proposal of efficient project solutions and the presence of appropriate normative documents for realising safe expoitation **[**7**]**.

The waters of mountain springs are rarely polluted with technical effects. They are mostly clean and qualitative and meet the requirements for drinking water. The water supply systems fed by them are profitable.

When groundwater quality does not comply with standards [8, 9], cleaning measures should be provided.

When using surface water flows for water supply, serious problems with water purification occur during spring and autumn floods when alluvial sediments and pollutants are increasing in the current. This problem is especially important in mountainous and foothill settlements [8, 10].

In terms of water quality it is important to determine the water pollution index by hydro chemical and hydro biological indicators. Based on the results of the work, the waters are usually divided into seven categories according to their pollution index: very clean, clean, moderately polluted, polluted, dirty, very dirty and extremely dirty [11, 12, 13, 14].

Conflict results

The practice of exploitation of gravity pressure systems in mountainous regions shows that their design stage the peculiarities of a number of hydraulic regimes are not taken into account as a result of which the water pipe can not be operated with calculated outlets and serious difficulties occur in the water supply. Aygehovit community, although not having much population, is mostly placed in a fairly large area. It stretches along the ground road to the south with more than 2.5 km.

Water consumers are about 160 people living in the community who are included in 45 individual farms. The community has school with about 25 pupils and a club. There are 100 heads of cattle and over 600 livestock in individual farms.

Research results

The study and localization of water quality policies and water quality guidelines set by the water quality standards, water use areas, water quality standards, water pollution control, wastewater treatment standards, drinking water directives and other relevant documents have an important importance and need to be taken into account in building or rebuilding new water supply systems.

Relief conditions in Aygehovit community enable the water supply design network to be implemented in one zone as the difference between the maximum and minimal points of the area constructed by one and rarely two-storied private houses is 40m.

Depending on the number of the floors of the private houses 10-12m free pressures are foreseen nearby.

We had carried out engineering and geological studies for Aygehovit community water supply system design and construction in June 2017.

The geological clippings of the survayed area include the lower and upper chalk stones, which are represented by sandstones, limestones and grenades. These rocks are located in the study area on a small section of the main water pipe while in the remaining areas they are covered with aluvial and deluvial sediments of the fourth age which are represented by sandstones, cobblestones and glaciers. The survay area is considered to be dry from the

hydrogeological point of view. Most of the atmospheric precipitations are absorbed into the grounds of deluvial origin and they finish near Aghavno River or feed the groundwater horizon. Groundwater levels reach 50-60m in the Aghavno Valley. Physico-mechanical phenomena have not been observed in the study area.

Based on field and archive studies, four layers of soil are separated into the study area.

- Sandy clay with crushed mixtures up to 25%, capacity 0.5-1.0 m.
- Crumbs, sandstone filling up to 25%, capacity 1.0-1.5 m.
- Limestone strongly impacted by sandstones, with a capacity of 0.5 m.
- Limestone powder, capacity more than 5 m.

Summarizing the results of the survey, we can say that geological conditions of the area are sufficient for construction. Ground water level is in huge depth. Physico-geological properties are expressed by the wind beaten main rocks. The area surveyed in terms of seismic zones is included in the 2nd zone. The score is IX according to UN-64 scale.

Aygehovit community water supply system is offered from 2 main joints: external and distribution water supply systems, including daily routing basin (DRB). This system will get water from an existing artesian source having 972 m absolute score. From the head site it is envisaged to arrange the spring water intake with 3 water intake cabins and deliver it to the catchment basin with wet and dry cabins by collector which is secured by joints corresponding to the norms.

From the head of the water line it is foreseen to realise the intake for watering the animals with 3/4 CB pipe on which a lock is installed.

Water will be drilled from the water intake basin with polyethylene pipes of 1 MPa pressure resistance of 63 mm in the downstream and upstream and 75 mm in diameter which reaches DRB having 558 mm absolute point. The total length of the water supply outlet is 9.1km from the catch basin. It has 4 hubs, 7 emptying and 6 air pumps fitted with appropriate nodes.

The water will be out with pipes of 13m average length from each emptying wells to the adjacent natural ponds.

Water users are about 160 people in the community included in 44 individual housings. The community has a school with around 25 pupils. The distribution net has been designed with polyethylene PE810 type pipes resisting 1 MPa pressure. Steel pipes have been used in several joints the total length of which has relatively small percentage compared to the net.

The network is mainly designed with de = 63, 90, 110, 125, 140, 160 mm diameter pipes. Their total length is about 4.9 km. This size does not include pipes with total length of 900 m (average 20m per tube for each consumer) for home connectors. However, their deployment volumes have been taken into account (Fig. 1).

The sewage depth of water lines and outlets exced the calculated depth of penetration of negative temperatures in the soil in order to avoid the heat deformations of the pipelines, especially its undesirable effects (due to lack of data, the depth of analogous freezing in the given area was approximated by 37 cm).

The water supply net is furnished with four water supply and water disposal wells (See general layout - section 2, page 2). The network or its separate branches, if necessary, can not only be completely disconnected through the valves located in them but they also regulate the flow of water to the consumers.

The network has 2 fire protection taps installed in the corresponding wells.

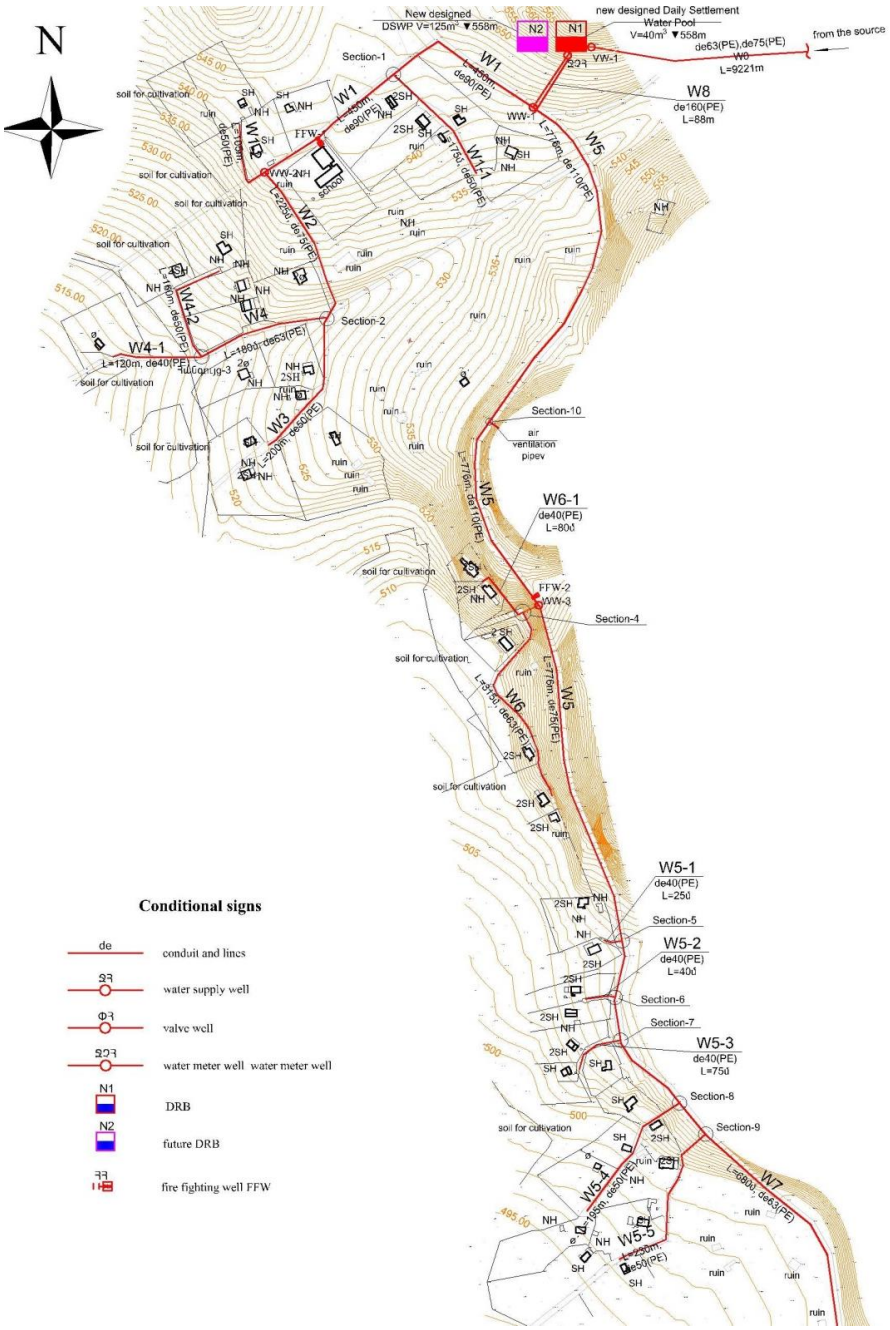

Fig. 1 The water supply system of Aygehovit community

For the calculation of the amount of water consumed by the population which is designed in the water supply net 35 water measuring standard silicat sandy wells are foreseen including 25 wells with 1 water meter, 10 wells with 2 water meters. The diameter of all water meters is 15 mm, except for the water line going to school where d = 20 mm diameter water meter is installed.

The metering devices are placed in wells at a height of about 20 cm above the floor which allows them to be protected from the effects of accidental waters gathered on the floor.

In case of necessity of transformation or prophylactic work during the operation of the water supply network, the faucets of the heads of the entrances which are supplied from the network or the particular section shall be kept open. These requirements must be ensured particularly in the implementation of exploitation and construction and during the completion of

the works as well while testing, washing, disinfection of water lines and other pipelines are being done which may cause the above-mentioned undesirable phenomenon - the creation of a vacuum in the network.

After the installation and before the operation of the pipelines, as a rule, the working pressure must be exceeded by 5% with hydraulic testing.

According to the current norms, the total volumes of regulating, fire, emergency and DRB components of the regulatory reservoir of the day were fulfilled.

It is predetermined to provide the calculated volume of the DRB with 2 separate basins. In order to solve the drinking water problem of the community quickly, the construction of one 40m^3 basin has been envisaged. Secondly, the promising DRB will be built later.

The first DRB is a reinforced concrete basin equipped with water access, overflowing, drainage and exit lines. Valve and water meter wells are designed for access and exit water lines (FF-1 and DPM) with their valves respectively for inside montaging. A ventilation system and the access hole with its own door are installed on the roof of the DRR. The sanitary zone of the basin has been blockaded by 2.5 m height fence, which has access to the source water line. Guard room is not provided.

First of all, the reservoir floor is 558 m and the height is 3.5 m which the hydraulic calculations of the deadline internal and distribution network pipes originate from.

After completion of the constructive works, the regulation and reservoir dams as well as other elements of the system will be subjected to hydraulic testing after which they should pass through the solvent of 50 mg/l calcium hypochlorite concentration (chloride) for 24 hours of disinfection.

Such measures should be periodically implemented while exploitation according to the existing norms.

DRB drainpipe has been brought to the main irrigation ditch. When cleaning a pool with a chlorine solvent, it is necessary to warn the community's residents not to use the irrigation ditch for a few hours as the polluted water may cause serious damage to crops.

For the population, the water use norm was first adopted for 150 l/ day per inhabitant and 100 l/day and 60 l/ day respectively for large and small cattle. But the community, as it was mentioned before, has not yet had a master plan by which the further promising development of community’s population would have been predicted for the next 20-25 years, so based on the normative requirement of the documents the coefficient to increase water use norms was adopted.

It is considered that unforeseen and possible unnavoidable losses from the network are taken into account.

The number of simultaneous possible fires in the community, according to seismicity of the area, is one. The total output of external and internal firefighting components, depending on the village population, is 5 l/sec. Among residential and public buildings located within the village only for the school building an internal fire of 5 l/sec is set out which is taken into account in the calculations. The diameters of the water lines coming from the two fire hydrants intended for the territory of the community were calculated by these values.

Concliusion

Aygehovit community water supply system is offered from 2 main units: water supply and distribution systems. In the headwater, the abstraction is arranged by a spring with a 3-hollowed water intake. Water will be drilled from the water intake basin with polyethylene pipes of 1 MPa pressure resistance of 63 mm in the downstream and upstream and 75 mm in

diameter which reaches DRB having 558 mm of absolute point. It is foreseen to install 4 hubs, 7 emptying and 6 air pumps fitted.

The reconstruction of the Aygehovit community water supply system will provide sufficient reliability for exploitation and efficient management indicators.

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ԱՅԳԵՀՈՎԻՏ ՀԱՄԱՅՆՔԻ ՋՐԱՄԱՏԱԿԱՐԱՐՄԱՆ ՀԱՄԱԿԱՐԳԸ

Հ.Վ. Բայունց

Շուշիի տեխնոլոգիական համալսարան

Այգեհովիտ համայնքի ջրամատակարարման համակարգի սնման աղբյուր է հանդիսանում բնակավայրից դեպի արևելք մոտ 9 կմ հեռավորության վրա գտնվող քյահրիզային աղբյուրը: Դրա ելքը, սեզոնային թույլ փոփոխություններ է կրում: Համաձայն 2017թ. գարնանը մեր կողմից

կատարված չափումների այն կազմում է շուրջ 2 լ/վ: Համայնքի օրական կարգավորիչ 2 ջրամբարները (ՕԿՋ) նախատեսվել է իրականացնել 2 հերթով: Առաջին հերթի ջրամբարով կբավարարվի համայնքի սպառողների ջրապահանջը, իսկ երկրորդ, հեռանկարային ավազանը հաշվարկված է հակահրդեհային և վթարային ջրապահանջը ծածկելու համար: Այդ ջրամբարները կտեղադրվեն համայնքին հարակից հյուսիս-արևելյան բլրալանջի՝ 565մ նիշին մոտիկ տարածքում: Ջրօգտագործողների միջև ջուրը բաշխվելու է պոլիէթիլենային խողովակաշարերից կազմված փակուղային ցանցի միջոցով: Բնակչության կողմից սպառվող ջրաքանակի հաշվառման համար առանձնատներին կից նախատեսված են տեղադրել ջրաչափեր՝ իրենց պոլիմերաավազային տեսակի հորերով:

Բանալի բառեր. ջուր, աղբյուր, ջրագիծ, ելք, օրվա կարգավորիչ ջրամբար, բաշխիչ համակարգ

СИСТЕМА ВОДОСНАБЖЕНИЯ НП АЙГЕОВИТ

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Источником системы водоснабжения населенного пункта Айгеовит является родник, находящийся примерно в 9 км к востоку от поселка. Его расход имеет сезонные слабые изменения. Согласно измерениям, проведённым весной 2017г., они составляют 2 л/ с. Строительство 2 водохранилищ дневного регулирования планируется осуществить в 2 очереди.

Резервуаром суточного регулирования первой очереди планируется удовлетворение водопотребности жителей общины, а перспективный резервуар второй очереди рассчитан на покрытие противопожарных и аварйных потребностей. Эти Резервуары будут расположены на северо-восточном склоне холма в 565-метрах от общины. Вода между водопользователями будет распределяться через тупиковую сеть, составленную из полиэтиленовых труб. Для расчета количества воды, потребляемой населением, предусматривается установить водомеры в собственных домах со своими люками полимерорезервуарного вида.

Ключевые слова: вода, родник, ватерлиния, водохранилище дневного регулирования, водохранилище, распределяющая система