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Hydrogeological Conditions and Hydrogeochemical Indicators of Groundwater in The Akhangaran Deposit

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Annotation: Currently, the natural environment of the Akhangaran river valley is experiencing a high technogenic impact. At the same time, fresh groundwaters of the Quaternary hydrogeological complex, which are the main source of household and drinking water supply in the region, are experiencing the greatest negative impact.There is a change in hydrogeological conditions, transformation of groundwater and the formation of technogenic ecological and hydrogeological systems under the influence of technogenesis.

Keywords: Hydrogeology, technogenic impact, aquifer, pollution, technogenic factor.

Introduction. Modern scientific and technological progress around the world is directly related to the global use of natural resources, including fresh groundwater. Hydrogeochemical technogenic processes occupy a special place in the general conditions of the formation of technogenesis. Firstly, under the influence of these processes, as a rule, pollution of groundwater and rocks (geological environment) occurs, and thus, by their essence, they determine the content of one of the main directions of the general problem – the protection of the geological environment from pollution. Secondly, hydrogeochemical processes are formed: under a variety of man–made loads on the environment - during the operation of a complex of drainage or irrigation facilities, as well as individual irrigation and drainage facilities (water intakes, tailings, etc.).

In the upper part of the lithosphere, in the zone of distribution of fresh groundwater, under the negative influence of hydrogeochemical processes, their drinking quality deteriorates, including at existing water intakes. Pollution of fresh groundwater in general can be understood as any deterioration of their physical, chemical and biological quality, i.e. chemical, thermal, radioactive and bacteriological pollution should be distinguished.

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Depending on the purpose of groundwater, various criteria can be adopted to assess the deterioration of their quality. For example, for industrial groundwater, the criterion of technogenic deterioration of their quality can be conditioned requirements that limit the conditions for using these waters to extract the useful components contained in them. The deterioration of the quality of industrial groundwater can, for example, occur under the influence of their dilution during the operational contour or intra-contour flooding of oil fields. In this regard, hydrogeological studies aimed at assessing and protecting fresh groundwater resources, protecting the hydrosphere from man-made pollution are relevant.

As an example, the fresh groundwater of the Akhangaran river valley is selected. Here, man-made objects affecting the hydrodynamic state of groundwater are diverse, which affects the quantitative and qualitative indicators of water resources.

Materials and methods. The research area is part of the Tashkent region and is bordered on the north and northeast by the western spurs of the Chatkala-Kuramin ridge, the southwest of the Syrdarya River, and the northwest by the valley of the Chirchik River. According to the hydrogeological zoning, it is completely included in the Pritashkent artesian basin and is 1023 km2. The main waterway is the Akhangaran River, which is formed in high-altitude conditions due to snow-eating.

Geologically, the mountain frame of the valley is composed mainly of Paleozoic rocks, the valley part is composed of Mesozoic and Cenozoic rocks. Within the valley of the Akhangaran river, it is noted that the thickness of the aquifer is from 20-22.0 m, in the sides up to 30-35 m, in the central part of 20-35 m in places increases to 100 m.

The object of observation is the hydrogeological area and areas of the fresh groundwater deposits of the Akhangaran River valley: aquifers, hydrogeological processes of ground and sub-pressure groundwater. Underground waters find numerous practical applications here: they are widely used for drinking water supply, industrial and technical needs and for irrigation of land [2]. The irrigation and collector-drainage network is also widely developed in the region, as a result, part of the filtration water is drained by the CDU. In this regard, there is a need to typify the manifestations of the impact of man-made objects on the hydrodynamic state of groundwater and the consequences of their influence on the ecological and hydrogeological situation of the studied territory.

The main methodological approach was to consider the relationship between the current technogenic situation and the natural environment through a comprehensive assessment of various features that determine the features and nature of the geological environment. To assess the current technogenic impact on groundwater, the typification of technogenic objects was carried out.

Analysis and results. Taking into account the conditions of the area and the peculiarities of the impact on the hydrochemical state of groundwater, man-made objects can be divided into agricultural lands, irrigation systems, systematic reclamation drainage systems, reservoirs and large hydraulic nodes, large irrigation channels, groundwater intakes, large reservoirs. Local objects of control are all group water intakes, large industrial enterprises, oil and gas bases, shirkat and farms, livestock complexes, landfills for waste disposal, health facilities, warehouses of pesticides and mineral fertilizers, gas stations, car washes, etc.[2]

Agricultural objects. There are three agricultural facilities operating within the study area, the spatial placement of which coincides with the area of irrigation systems. In the process of applying

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fertilizers necessary for the development of agricultural crops, a certain part of them in dissolved form, together with moisture, enters the groundwater through the aeration zone and causes a change in the qualitative state of groundwater. As a result, there is contamination of the groundwater of the site under consideration due to nitrogenous, complex fertilizers and pesticides. These objects are local in terms of the level of impact on the hydrochemical state of groundwater, and areal in terms of the area of impact.

Industrial objects of animal husbandry and agricultural products. These technogenic objects are also developed within the Akhangaran river basin and are determining the hydrogeochemical state of groundwater. Their impact occurs in conditions of inevitable losses of waste from livestock complexes and processing of agricultural products in their storage areas. As a result of this process, chemical and bacteriological contamination of groundwater is manifested. An example of such objects can be called the livestock complex of AGMK, the feedstock base of JSC "Uzmyasomoloko", poultry farms, etc. Such technogenic objects are local in terms of the level of impact on the hydrogeochemical state of groundwater, and areal in terms of the area of impact.

Tailings dumps, sludge storage facilities of mining and energy industrial enterprises. Similar technogenic objects are mainly developed in the adjacent territories of the cities of Angren, Nurabad, Almalyk. These are ash and slag accumulators of Angrenskaya and Novo-Angrenskaya GRES, hydraulic settling tanks of Uzbekkumir JSC, sludge accumulators of AGMK, etc. These man-made objects are one of the main determinants of the hydrogeochemical state of the groundwater of the Akhangaran River valley. According to the level of impact on the state of groundwater, these objects belong to local, and according to the area of impact to areal.

Under the influence of the described objects, there is mainly a linear change in the hydrogeochemical state of groundwater under the conditions of inevitable infiltration losses of the liquid phase of industrial effluents of enterprises. This process causes chemical contamination of groundwater and deterioration of the ecological and hydrogeological situation of the territories.

Landfill or storage of solid waste from industrial enterprises. These technogenic objects are also concentrated mainly within the Angren-Almalyk-Akhangaran industrial region. These are dumps of waste rocks of the coal mine of Uzbekkumir JSC, AGMK JSC, slagotvalyaNgrenskaya GRES, AGMK, waste dump of Akhangarantsement JSC and Almalyksky Ammophos JSC, etc. The impact of objects on the hydrogeochemical state of groundwater occurs under conditions of oxidation of poor ore mineralization or waste after primary treatment of used raw materials or radiation substances. As a result of such processes, chemical contamination of groundwater is manifested. According to the level of impact on the hydrogeological state of groundwater, these objects belong to local, and according to the area of impact - to areal.

Storage devices for storing petroleum products (oil depots, gas stations). These objects, first of all, should include the Angren oil Terminal and numerous gas station capacities within the cities of Angren, Nurabad, Akhangaran, Almalyk, Pskent, Buka, Bekabad, etc. The impact of similar man-made objects on the hydrogeochemical state of groundwater occurs under conditions of migration, dispersion of petroleum products. In such conditions, the deterioration of groundwater quality is manifested due to dissolved or suspended (emulsified) petroleum substances. According to the level of impact on the hydrochemical state of groundwater, these objects belong to local, and according to the area of impact – to areal. As technogenic objects with a negative impact on the natural environment, it is possible to distinguish local leaks of industrial effluents directly from industrial

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sites of various-scale industries, as well as leakage of municipal wastewater with concentrated population living in cities or urban-type settlements.

The change in the existing hydrochemical state of groundwater in the conditions of leakage of industrial and municipal wastewater and their direct penetration to the groundwater mirror is manifested in the contamination of the qualitative composition of groundwater. According to the level of impact on the state of groundwater, these objects belong to local, and according to the area of impact - to areal.

Mining, chemical, energy, metallurgical industries, as well as industries related to the processing of raw cotton have been intensively developed within the Akhangaran River valley over the past decades. All this has led to the accumulation of significant amounts of waste, which are exported to landfills that occupy significant areas.

Conclusions. The peculiarities of the hydrogeological conditions of the leveled regime and changes in the hydrochemical parameters of the groundwater of the Akhangaran deposit include:

1. The most abundant and the main source of the economic and drinking water supply of the district is an aquifer confined to well-permeable alluvial upper quaternary and modern deposits.

2. Changes in hydrodynamic and hydrochemical parameters of underground waters of the deposit sites change as follows:

The Angren site is a decline in average annual levels from 0.57 m (lower terraces) to 0.25 m (upper terraces) everywhere.

Nurabad-Akhangaran site average annual levels decline within the upper terraces – 0.05 m, rise in the low – 0.18 m. Compared to 2006, the rise of the average annual level within the upper terraces is (+1.31 m), in the lower terraces – (+1.77 m).

The Kandyr-Telyau site characterizes the natural regime of groundwater, where there are no group water intakes. The depth of the groundwater level within the low terraces varies from 1.52-3.79 m to 11.13-14.6 m, and within the upper terraces from 28.02-30.8 m to 35.1-39.95 m.

☐Telyau-Karakhtai section average annual level rise-(0.82 m) within the low terraces within the upper terrace, a decline of 0.21 m

. ☐Sartamgalinsky section: widespread decline in the average annual level from 1.01 m (riverine zone) to 0.08 m (low terraces).

☐Tashsko-Almalyksky site: also widespread decline in average annual levels from – 0.53 m (low terraces) to -0.56 m (upper terrace).

Saganak site - the rise of the average annual level by 0.08 m and within the upper terraces, and in the low ones it drops by (-0.73 m).

☐In the sections of the Gejigen and Akhangaran branches proper, the decline in average annual levels and, respectively, is 0.4 m and 0.19 m. As a result of monitoring studies, it was found that under the influence of the depression funnel of the group water intakes of the Almalyk complex, in the central strip of the valley of the Akhangaran river, the lowest positions of the average annual levels (18.08-19.57 m sq.GC-18/2) are noted from the Almalyk hydro-solution to the Almalyksai gate.

At the Kerauchinsky hydraulic solution, the magnitude of the rise in average annual groundwater levels due to infiltration losses from industrial sites, compared with the eastern part of the Saganak site, if in the previous period it was 9.63m, now it is 10.27m

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. 3. Groundwater pollution in the left side of the Angren site is associated with the discharge of mine waters from the adit horizons of the Semgran mine into the sai and from the tunnel horizons of the Semgran mine to the sai of the same name.

4. Pollution of underground waters of the "Tashkent" drinking water intake is mainly due to the inflow of polluted groundwater flowing through the alluvial-proluvial deposits of the ancient Nakpaisai floodplain, which is covered with the dumps of the Kurgashin and Kalmakyr quarries.

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