HYDROGEOLOGICAL CONDITION AND ITS IMPACT ON THE LEVEL OF SEISMIC HAZARD IN NIZAMI DISTRICT, BAKU CITY

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Introduction. Seismicity of the construction site should be clarified during the construction of buildings, bridges and other civil and industrial facilities in the seismically active areas for the purpose of seismic safety of facilities.

Initially, the potential seismic hazard should be identified in the earthquake sources.In addition, engineer-seismological and hydrogeological conditions should be investigated in each construction site. Thus, major seismic hazard caused by strong earthquakes can change depending on the lithological composition, physical and mechanical parameters of the grounds located under the foundations of the facilities as well as hydrogeological conditions. In order to evaluate the effect of hydrogeological conditions on seismicity, the area of Nizami region, where numerous high buildings have been built in recent years and has sufficient engineer-seismological and hydrogeological data, was selected.

The formation of groundwater in the research area may occur due to infiltration of atmospheric precipitation, losses from sewerage pipelines, from irrigation systems, due to the proximity of the sea to the area during irrigation works are carried out. The level of water also depends on their nutrition regime and usage.

The water in Nizami district was very different in their pysical and chemical composition and hydrodynamic conditions. Source of these waters:

1. Climate-dependent, that is, it associated with atmospheric precipitation and evaporation (condensation) (atmospheric precipitation increases in spring and autumn and it feeds groundwater)
2. It is associated with irrigation and separate waste water (household type) (during construction and in areas with developed infrastructure, grounds are artificially irrigated and so on this results in changes in the geological environment).
3. The areas in the northwestern part of Nizami are fed by salt water of the Great Shor Lake.

There are two types of groundwater in Nizami region:

1. Pressurized groundwater (artesian water)
2. Groundwater Large thicknesses, mainly waterlogged sand and low thickness (there are clay and limestone soils)

Based on fund materials, a total of 1560 wells were drilled in construction sites (mainly in the eastern part of Nizami district). Depth of the well varies (10m, 30m, 60m and 120m). According to the research, the level of the groundwater is between 5,0 and 10,0 meters at H.Aliyev Avenue 105, 109, 111 and on 2 Kondalan Avenue intersecting with H.Aliyev Avenue. Along with groundwater in this area, pressure water horizons were found at depths of 12,0-30,0m; 38,0-50,0m; 52,0-63,0m and 79.0-92.0 m.

As can be seen from Figure1, the lithological composition of the ground in the areas where artesian water is widespread is very diverse: they arecontane sandy, hard plastic clay and shelly limestone. The thickness of this complex is more than 60 meters.

The Artezian water is located in the north-west of the region as we mentioned above. Artesian water is the confined natural underground reservoir that contains water under positive pressure (sands, fractured limestone, sandstone, karstic soils).

Mineralization of water is high due to its proximity to the Great Shor Lake. As a result of circulation in salty rocks, the water gets richer with salt.The sope level of artesian water is located below the groundwater level and artesian pool is formed. Soil can contain gypsum and various water-soluble salts.Dissolution of salts in water causes suffocation or washing away water from the

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field. As a result, there are gaps in the ground and the uneven impact of the building to the foundation resulting in the collapse of the ground.

Artesian water can rise from the ceiling of the aquifer to the surface and sometimes can form a fountain. It is likely that if construction is carried out in these areas in the future, then as a result of human activities or the weight of the buildings under construction. The underground rocks will be damaged and destroyed by pressure water, as a result, it adversely affects the seismic properties of these rocks and leads to the collapse of buildings. Even in areas where artesian water is found, it is also very dangerous to fix the underground rocks of the constructed buildings with piles. Such areas are unsuitable for construction.

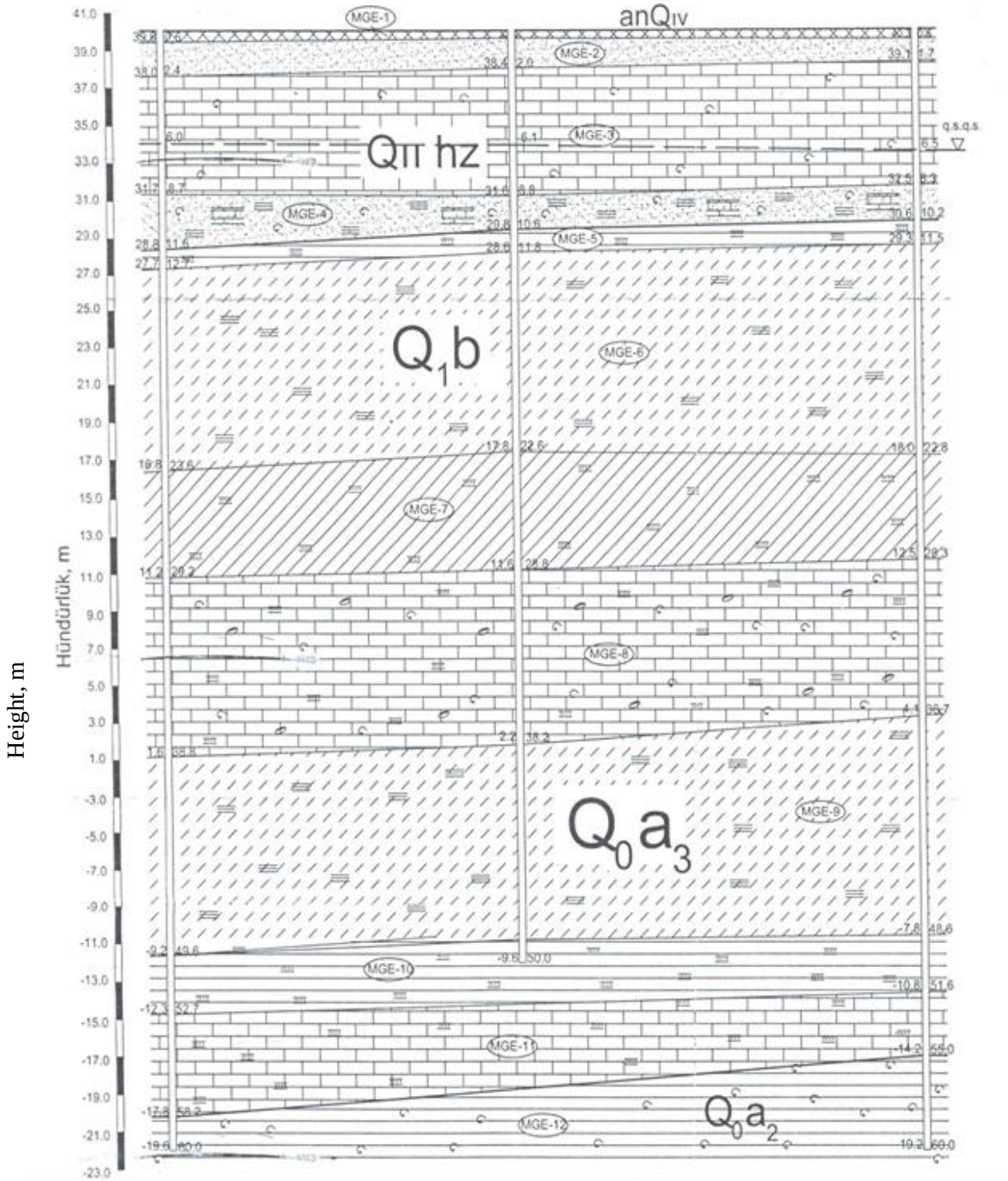

Figure 1. Example of geological-lithological section of the area where there is artesian water.

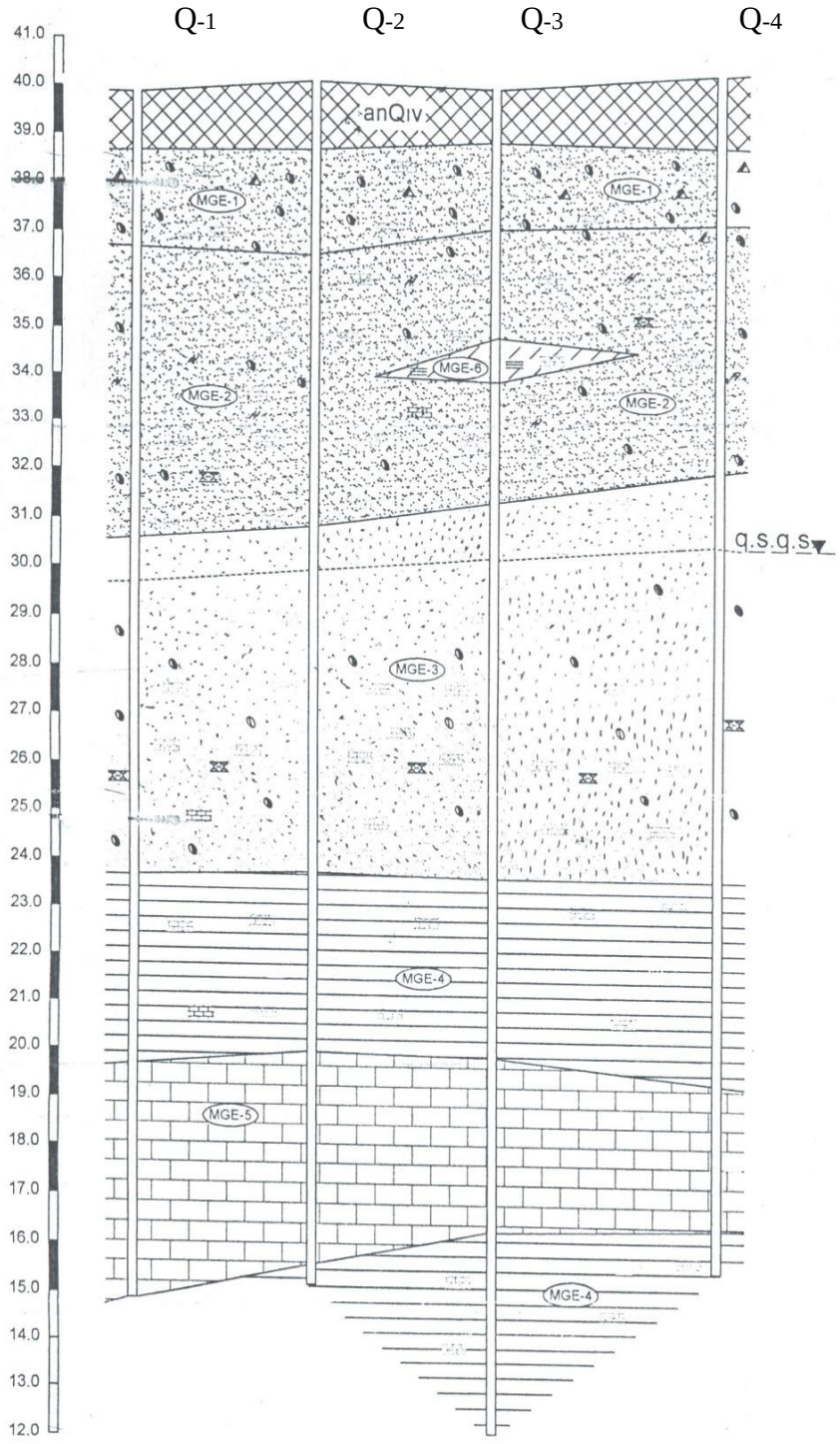

Figure 2. Example of geological-lithological section of the area with high seismicity (point)

Conventional signs:

Cost soil

Limestone

Sand plain

Q-1 Well and its number

Pebble sand

Sandy loam

q.s.q.s

Stabilization level of groundwater

Loam

MGE

Engineer-geological element

Clay

Water is almost a permanent component of rocks. Groundwater is constantly in motion, that is, the regime changes and it has a great effect on rocks, especially clay soils, due to its chemical activity and this drastically changes their properties and as a result, it leads to consolidation or thinning of the soils (thixotropy).As the composition of groundwater is variable, their impact on rocks also changes (Zaalishvili, 2014).

We encounter such conditions at construction sites located in the north-eastern part of Nizami district.

Unpressurized groundwater in this area is very diverse, widespread and unevenly distributed. Water is characterized by the level of formation, mineralization and chemical composition. The chemical composition of groundwater has a significant effect on the swelling of clays. Groundwater is mainly found in cast soil and watery sandy ground with large thickness in the areas located in blocks numbered 2402, 2566 and 2399 and moreover V.Aliyev str. 26, at the crossing of Qara Qarayev pr. and Nakhchivanski Street and at the Babek Avenue (Fig. 2).

The width (V_s) of the soils involved in geological sections is determined by the class of wave propagation, and if there are soils saturated with water or prone to liquefaction in the area, the seismicity of the construction site is rated high (Fig. 3). In these wet grounds, the velocity of seismic waves is about 300m/s or less.

The remaining areas are low seismicity (point) areas. As can be seen from the crossings, low-thickness groundwater is found in other areas. Aquifers were found at different depths for the area, but no groundwater was found at several construction sites. In most places, water has low mineralization and the mineralization of water varies in the range of 1.1-4.5 g / l.

The degree of mineralization of groundwater depends on their level. As water levels fall, their mineralization decreases and their chemical composition changes (Projected buildings..., 1998-2018).

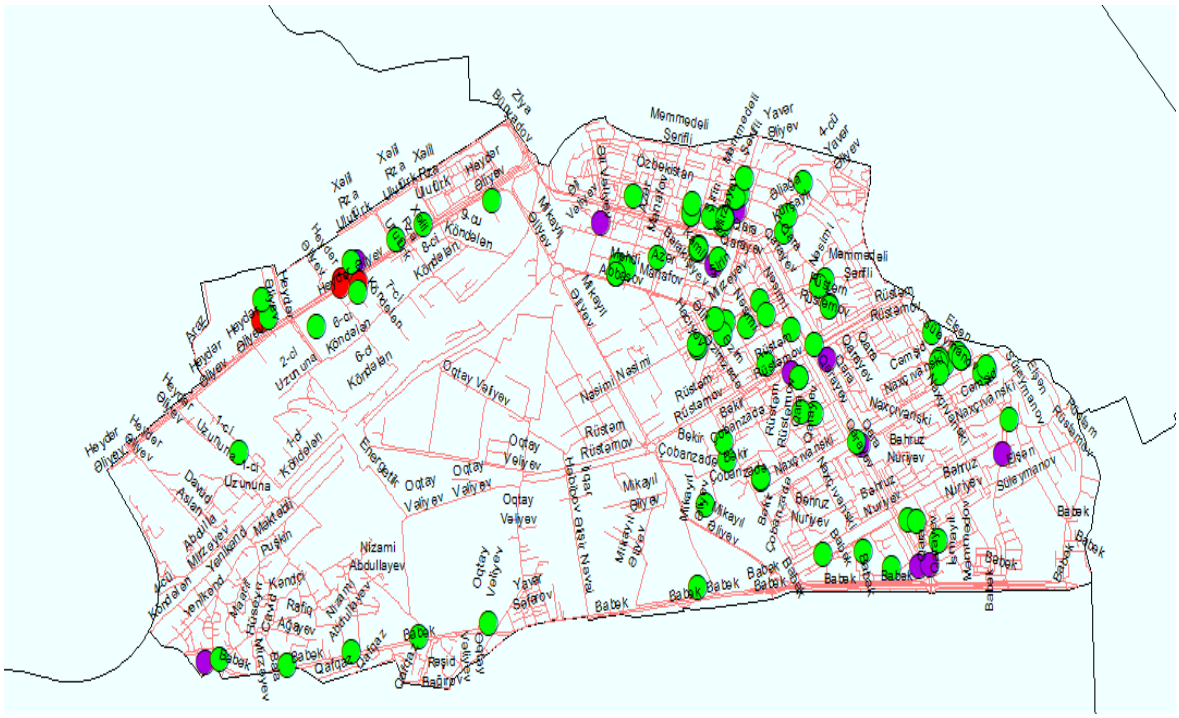

Figure 3. Map of seismic hazard assessment based on hydrogeological conditions in Nizami district

Symbols:

- areas where artesian water is available
- areas with high points
- suitable areas for construction

Conclusion:

There are 2 types of pressurized groundwater - artesian water and groundwater in Nizami district. Artesian waters are located in the northwest of the region near the Great Shor Lake. This is a very dangerous situation for the area, which can be a problem for construction sites and is considered an unfavorable area.

In the north-eastern part of Nizami district, unpressurized groundwater is found. These waters are mainly formed in moist and water-saturated sandy soils with a large thickness. The seismicity of the area is rated high.

In the rest, groundwater is found at different depths and is less thick. This part is rated lower than the above areas.

REFERENCES

1. В.Б. Заалишвили. Некоторые проблемы практической реализации сейсмического микрорайонирования, факторы, формирующие интенсивность землетрясения, Владикавказ, 2012, Геология и геофизика Юга России, № 3, 2014

2. Layihələndirilən binaların, qurğuların tikintisi üçün ayrılmış sahələrin seysmik balının dəqiqləşdirilməsi haqqında hesabatlar. AMEA nəzdində RSXM-nın fondu 1998-2018-cu illər.

3. “Seysmik rayonlarda tikinti Az DTN 2.3-1”, AR Dövlət Şəhərsalma və Arxitektura Komitəsi, Bakı – 2009.

4. Справочное руководство гидрогеологии под редакцией проф. В.М. Максимова, Том 1, 2., Ленинград “Недра”, 1979.