Review

The Role of Hydrogeological Investigation in Geotechnical Engineering

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Geotechnical engineering investigation should be carried out with the perspective purpose of understanding the knowledge of the ground conditions through fundamental planning and construction of infrastructural objects like excavation pit, various foundation, land reclamation, and beach nourishment, and so on. During the processing, hydrogeology takes an essential part in geotechnical engineering investigation by analyzing the recharging status of how water gets into the ground, how water flows in the subsurface through aquifers, and how groundwater interacts with the surrounding soil and rock. This review mainly analyzes the hydrogeological problems in geotechnical engineering investigation, and puts forward corresponding measures and suggestions for hydrogeology in combination with the work.

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IN the process of geotechnical engineering investigation, strengthening the investigation of hydrogeology-related issues can ensure the safety and stability of engineering construction to a certain extent, and avoid the emergence of geotechnical engineering hydrogeology hazards induced by human factors (1). It is extremely important to investigate the hydrogeology issues in geotechnical engineering investigation.

The Importance of Hydrogeology in Geotechnical Engineering Investigation

In the geotechnical engineering investigation, the hydrogeological investigation directly affects the smoothness of the overall project. For example, the groundwater level and acid-base strength in hydrogeology will affect the construction height, durability and stability of buildings. At the same time, a comprehensive, in-depth and accurate geotechnical engineering hydrogeological investigation in the early stage of construction can help designers and construction parties understand the hydrogeology conditions of the project in an all-round way, and make the design and construction plan more scientific. While reducing resource waste and financial loss, it also reduces geotechnical engineering disasters and natural disasters caused by hydrogeology problems (2).

In addition, when encountering hydrogeology conditions that are conducive to construction, it can reduce the probability of construction engineering disasters to a certain extent; otherwise it will bring unnecessary geotechnical engineering disasters. Especially in areas where hydrogeology conditions are more complicated, construction is carried out before the investigation of the nature of geotechnical engineering hydrogeology is complete, which will increase the probability of natural disasters and accidents, and even lead to serious safety accidents. Due to the continuous drop or continuous rise of the groundwater level, geotechnical engineering accidents such as ground subsidence and cracking, collapse of foundation pits, tilting and settlement of buildings will occur (3). Therefore, it is of great significance to do a good job in the investigation and evaluation of hydrogeology.

Hydrogeology Issues in Geotechnical Engineering Investigation

Harm Caused by Changes in Groundwater Level

There are many reasons for the rise of groundwater levels. It is mainly affected by the structural characteristics and permeability of the aquifer, precipitation, temperature and other factors, and its rise is generally the result of the combined effect of several factors. Rising groundwater levels will have a serious impact on geotechnical engineering. If soil swamping and salinization corrode the building structure, it will cause slopes, rock and soil mass to slip; and for some special rock masses, it will greatly reduce their strength, resulting in loess collapsibility, high liquid limit soil expansion, sand liquefaction and other bad geology phenomena. This will have a great impact on the construction of the project, and there will also be many hidden safety hazards in the completed buildings. The drop in groundwater level is generally caused by some human factors, such as the large-scale use of groundwater in a certain area, the drainage of groundwater by mining activities, the construction of dams and reservoirs upstream of the river, etc., resulting in the cutoff of the source of groundwater supply (4).

Generally, a large decrease in the groundwater level will reduce the pore water pressure, increase the effective stress, and increase the amount of compression deformation of the soil, resulting in surface settlement. The rapid decline of groundwater is likely to produce greater seepage forces and increase the unstable slope of the soil the sliding force caused the slope to collapse and damage, causing serious damage to existing buildings. At the same time, the balance of groundwater will be destroyed, the hydrodynamic balance conditions will change, the physical and mechanical properties of the rock and soil will change, and the bearing capacity will decrease, which will eventually have a huge negative impact on the quality of the project (5).

Harm Caused by Groundwater Pressure

Natural groundwater exists in many stratums, but under normal circumstances, the pressure of groundwater is relatively small, and the harmful effects on geology are basically negligible. However, human activities on the ground have a greater impact on the water pressure below. Especially in the process of large-scale engineering construction on the ground, the inability of mechanics to achieve an effective balance leads to a sudden increase in the pressure of the groundwater level, a relatively serious situation of sand influx, and greater damage to the construction projects on the ground (6).

Layered Measurement of the Specific Water Level Value of the Aquifer

From what has been said above, the nature of rock and soil and engineering characteristics are severely affected by groundwater. As far as the specific calculation of various parameters of hydrogeology is concerned, it is quite difficult. The main reason for this phenomenon is not only the relative lack of scientific calculation basis, but also the change of hydrogeology parameters caused by the development of the project. Therefore, it is necessary to continuously realize data collation through specific investigation work. Therefore, when carrying out investigation operations, relevant staff needs to use specific requirements as the basic basis to make a correct distinction between upper stagnant water and diving (7). Accurate identification and scientific evaluation of groundwater types can be carried out on the conditions of pore water, rock fissure water, and upper stagnant water, so as to achieve a comprehensive understanding and grasp of the specific impact of different types of groundwater on the project.

Improvement Measures for Hydrogeology in Geotechnical Engineering Investigation

Design and Preparation Work before Construction

The general investigation work plan mainly includes four stages of investigation planning, feasibility analysis, preliminary design plan and technical support. In order to save programs, the work content of these four parts can be reduced to two different aspects. The content of the first part is planning survey and feasibility study. The main thing is to choose to provide true and accurate construction data according to the entire construction target during the survey. It requires survey personnel to collect relatively complete hydrogeology data in the area. The main content of the feasibility study is to be able to conduct survey work on the basis of the research plan. The main purpose of this part is to detect the rationality of the construction plan of the construction project. The content of the second part is the investigation of the design plan. The main content of this part is to detect local hydrological conditions, discover and troubleshoot geology problems during construction, detect changes in groundwater level, accurately predict rock mass changes, and give scientific advice on geology engineering quality issues (8).

Continuously Strengthen the Hydrogeology Technology of Investigation Personnel

Hydrogeological investigation is carried out in engineering geological investigation. This method can be used to prevent the serious impact of geology changes on the building as a whole. Continuous technological transformation can improve its ability to prevent hydrogeology disasters.

Therefore, when investigation personnel choose construction tools, they must choose according to the corresponding tool requirements. In addition, the investigation personnel must coordinate their close contact with the unit and comply with the work management requirements of the investigation agency. In addition, investigation personnel must also use interventions to improve the overall anti-hazard capability of the building (9). In addition, the investigation personnel must also carry out appropriate hydrogeology technical transformation work according to the actual problems encountered during the construction of the construction project.

Standardize the Work of Geotechnical Engineering Investigation

Strengthen the study of various geotechnical engineering investigation norms or procedures. The geotechnical engineering investigation work already has a complete system of specifications and procedures. These normative documents have made specific and feasible provisions for the purpose, tasks, and eval-

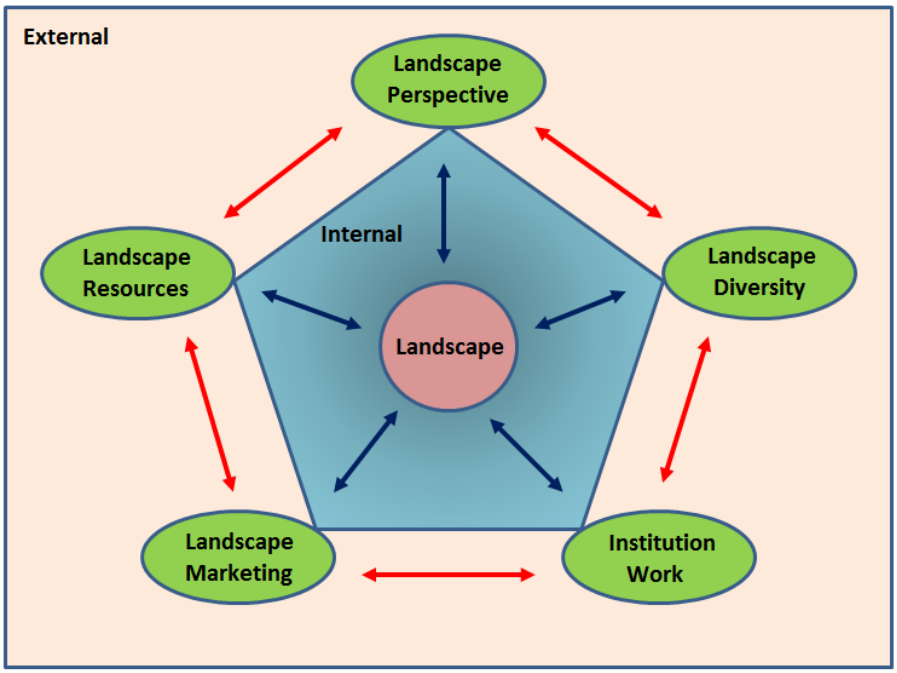

Figure 1. Sustainable Development of Landscape.

uation of the investigation work, and are the main basis for technical personnel to carry out their work. Engineering geology technicians must attach great importance to specifications and procedures. Understand and be familiar with its requirements. Through studying the specifications and regulations, the engineering geology managers and technicians can continuously enrich and improve the theoretical level and practical operation ability after absorbing the relevant provisions of the documents. Only in this way can the hydrogeological investigation work be properly handled during the investigation, the hydrogeology conditions of the construction site can be identified, accurate hydrogeology parameters can be put forward, hydrogeology evaluation can be carried out reasonably, and hydrogeology problems can be predicted, so as to provide practical standards for engineering design and construction (10).

Formulate Specific Requirements for Hydrogeological Investigation

The investigators clarify their work tasks and work goals not only to complete the work more accurately and efficiently, but also to improve their sense of responsibility, work ability, and teamwork ability. Regarding the objectives and specific tasks of the hydrogeological investigation, the specific distribution of the groundwater system should be analyzed first, and combined with the analysis results, the requirements of the investigation work that meet the actual project should be formulated, so as to give the investigation work a scientific and reasonable basis. Furthermore, all investigation staff can achieve good restraint on their own work behavior. The investigation workflow and specific operations are more standardized and reasonable, which can effectively reduce the occurrence of work errors, and has a positive effect on the improvement of the correctness of the investigation design structure.

Conclusion

In summary, geotechnical engineering hydrogeological investigation can provide detailed engineering geology data and geotechnical technical parameters for building design; provide a basis for improving the accuracy of building foundation analysis and evaluation. Therefore, in geotechnical engineering investigation operations, investigation personnel should pay more attention to geotechnical engineering hydrogeological investigation, and conduct one-by-one investigations on the adverse geological effects of the site, the physical and mechanical properties of each layer of rock and soil, the uniformity of the foundation soil, and the distribution of groundwater in order to provide sufficient reference data for project construction plan decision-making, and eventually realize a sustainable development from inside to outside of the landscape prospectively on its past to the future (**Figure 1**).

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