Geotechnical and architectural studies of the territory in the water protection zone of the Temernik River at the pre-design analysis stage

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Abstract. The article describes the application of an integrated systematic approach to the organization of surveys at the architectural spatial environment pre-design studies stage in the water protection zone of the Temernik River. The authors propose to use the geological portal "Geobaza" when conducting engineering surveys on the territory to increase the economic feasibility of the developed architectural project and reduce the time for the pre-project engineering studies’ execution.

Introduction
At present, especially in the economic crisis context, detailed and accurate engineering surveys of the territory are a rather costly research type, and it is sometimes difficult to perform in the conditions of difficult terrain and other geological features of the site. The study, to which the article is devoted, is intended to open up the possibility of quickly obtaining a fairly complete and reliable amount of information about the results of previously conducted surveys from an interactive map - the geological portal "Geobaza", developed by the General Director of LLC "Geoelement", Tryukhan V.A. jointly with the researchers from the Institute of Geosciences of the Southern Federal University.

Purpose of the study: Identification of factors, parameters and principles of creating a developing architectural spatial environment in the water protection zone of the Temernik River in Rostov-on-Don on the basis of a comprehensive survey using the geological portal "Geobaza", as well as on the basis of the results of the surveys to determine the architectural environment nature (a possible layout and development scheme territory).

Research object is the riverside area of the Temernik River.

Research subject is the environment of the land plot intended by the owner for the multifunctional residential complex construction.

Problem: lack of reliable forecasts of the negative processes development in the water protection zone and on the water body, as well as the results of monitoring the state of the bottom and banks, changes in morphometric features, the state and mode of the water protection zones use of the Temernik River in the city of Rostov-on-Don.
Research hypothesis: The ability to determine the development nature and the functional purpose of buildings based on the analysis of a comprehensive area study:
- engineering and geodetic surveys;
- environmental engineering surveys;
- geotechnical survey;
- engineering and hydrogeological surveys;
- experimental filtration studies in the water protection zone of the Temernik River;
- architectural pre-design analysis.

Methods of work and survey results
In accordance with clause 4 [1], the customer and the contractor determined the scope of work carried out in the course of engineering surveys of both basic and special types, their volume and method of implementation, taking into account the specifics of the relevant territory and the land plots located on them. According to clauses 1 and 5 of article 47 [2], in accordance with the design assignment and the survey execution programs, engineering surveys were performed to prepare the pre-design documentation for the capital construction object: engineering and geodetic surveys; environmental engineering; geological engineering; engineering and hydrological field and office work. In accordance with clause 4 of article 3 [3], during the construction of individual architectural objects, determined by the approved urban planning documentation, the architectural and planning assignment should be developed on the basis of mandatory pre-design studies.

According to [4], the implementation of the entire above-mentioned complex of works in close interaction of executive authorities, municipalities, scientific and educational institutions should lead to a significant improvement of the Temernik river basin, the creation of the necessary engineering and organizational prerequisites for the continuous ecological park formation in the riverside zone of the Temernik river on territories of the city of Rostov-on-Don, Aksaysky and Myasnikovsky districts of Rostov region.

In accordance with the current Land Use and Development Rules for the city of Rostov-on-Don [5], the projected territory is located in the following urban planning zone: MF-2/5/5 - a zone of multifunctional development along the Temernik River of the second type. The urban planning regulations of this territorial zone were developed to ensure the legal conditions for the formation, development and maintenance of the territories intended for the placement of multifunctional buildings with a high degree of landscaping, by reforming (transforming) the territory along the Temernik River.

Specialists of DonGeo LLC and Architectural and Construction Atelier LLC took part in the field and laboratory work with the involvement of students of the Southern Federal University (Academy of Architecture and Arts, Department of Structural Mechanics and Structures, Institute of Earth Sciences, Department of Engineering Geology) under an agreement of mutual participation.

Engineering and geodetic surveys
In order to establish on the ground points of the state geodetic network (SGN) on the territory of the urban district of the city Rostov-on-Don, as well as to determine the optimal schemes of geodetic networks, a reconnaissance of the area was carried out. And a request was submitted to the Office of the Federal Service for State Registration, Cadaster and Cartography in the Rostov Region to provide the coordinates and heights of geodetic points in the study area. During the reconnaissance survey of the survey area, the sites for laying points for satellite measurements were outlined and established, and in particular, the difficult places requiring more detailed survey were identified. The creation of the geodetic reference network was carried out on the technical assignment basis. The maximum errors in the survey justification position according to the adjustment sheet of the geodetic satellite network are in the plan - 0.020, in height - 0.029.

The work was carried out using two sets of dual-frequency satellite receivers S-Max GEO - №5726550876, №572755017. The processing of data from the field satellite measurements was carried out on the basis of a field party on personal computers using the Leica Geo Office (LGO) software.
product. As a result of the work, the coordinates and heights of the reference geodetic network Rp1 and Rp2 points in the coordinate system MSK-61 and the Baltic height system were obtained.

![Image](image1.png)

**Figure 1.** Work site scheme.

The survey of underground utilities was carried out with the involvement of the operating organizations’ representatives.

![Image](image2.png)

**Figure 2.** Topographic plan M 1: 500 on 20.01.2020.

The utilities’ location was preliminarily determined by the operating organization according to the technical documentation, then by the locator to clarify the utilities’ location and the occurrence depth. The routes of underground communications were marked with the landmarks on the ground and were taken into account in the process of topographic survey.

The topographic plans with applied underground utilities were subsequently sent to the operating organizations for approval. The agreements were obtained with the seals and signatures of all responsible authorities.
In the archival funds, a topographic survey was obtained by LLC YuzhGeoKom in April 2014, with the designation of zones with special conditions for the studied area territory use.

**Figure 3.** Topographic plan M 1: 500 with special areas of territory use on April 30, 2014.

Administratively, the survey site is located in the Oktyabrsky district of the urban district, the city of Rostov-on-Don, at 2 Pyatiletki street, 29, cadastral number 61: 44: 082201: 176. The area of the land plot is 1.35 hectares, the area of the adjacent residential buildings is 0.46 hectares. The site is located on the left bank of the Temernik River. The relief of the site is complex, with contour lines falling towards the Temernik River. Absolute surface elevations vary from 11.87 to 12.14 m in the Baltic system of heights. Along the southern border of the land plot, a slope with a drop in elevations towards the land plot along the border from 20.06 to 14.5 m at the top of the slope and from 13.28 to 12.07 m at the bottom of the slope in the Baltic system of heights, slope height difference from 3.0 m to 7.0m.

The territory of the land plot is located within the following zones with special conditions of use:
- in the archaeological zone of the Temernik river gully;
- in the water protection zone of the Temernik river;
- the western part of the land plot within the boundaries of the PTL 110 kV security zone.

**Engineering and environmental surveys**

The purpose of the engineering and environmental surveys was to assess the current state and predict possible changes in environmental components under the anthropogenic load influence in order to prevent, minimize or eliminate harmful and undesirable environmental and related social, economic and other consequences.

The main tasks to be solved are as follows:

1. Assessment of the current ecological state of the natural environment individual components (atmospheric air, soil, vegetation and fauna) and geo- and ecosystems in general, their resistance to anthropogenic impacts and their ability to recover in the area of the studied object.

2. Assessment of socio-economic and medico-biological living conditions of the population in the area of engineering and environmental surveys based on stock materials.

3. Identification of soil pollution possible sources based on the current situation analysis and the territory use.
4. Assessment of physical factors of influence (noise from natural and man-made sources).

5. Development of proposals and recommendations for the environmental protection measures organization and industrial environmental control (monitoring).

At the work site, there are no hazardous natural and man-made processes affecting the relief. The vegetation is represented by tree plantations of oak, acacia and bushes, the bases are uneven, the tree trunks are inclined in different directions. The fourth part of the site surface is swampy. To drain groundwater, two drainage systems with concrete pipes and trays pass through the surface areas.

Physical factors of environmental impact - noise rarely generated by vehicles from the road passing along the site border.

Figure 1. View of the study area from North.

According to the tasks set, the following necessary works were carried out during the implementation of engineering and environmental surveys. Collection, generalization and analysis of stock materials, information about natural conditions and the modern nature of economic development on the territory of the projected facility were carried out in specially authorized state bodies in the field of environmental protection and other specialized organizations performing medico-biological, hydrometeorological, landscape, soil research. Reconnaissance (route) survey of the territory was carried out in the course of field work during the construction site study.

During the soil samples' selection, the main visual signs were recorded: texture, moisture, color, structure, density, composition, neoplasms, inclusions, character of effervescence, transition character. Soil sampling was carried out for the purpose of their ecotoxicological assessment as the environment components. Geo-ecological sampling of the natural environment components was single. Taking into account the nature of the designed object, the range of controlled components was determined based on the potential contamination composition specifics. Laboratory studies of soil samples for the content of pollutants were carried out in specialized chemical-analytical centers and laboratories accredited in accordance with the established procedure: testing laboratory center FBEI "Center for Hygiene and Epidemiology in the Rostov Region", FSBU GTCAS "Rostov".

The assessment of vegetation and fauna was assessed using the stock data and directly visually at key sites of the surveyed area.

The background concentrations of pollutants were estimated based on the data presented by FSBI "North Caucasian UGMS" and climatic reference books. In addition, with the help of the multifunctional multicomponent portable gas analyzer Kometa-M, the content of the following gases in the atmospheric air was studied: oxygen, ammonia, carbon monoxide, hydrogen. The measurements were taken at the points coinciding with the places where soil samples were taken. The total number of measurements is 4. Measurements of the external gamma radiation dose rate (EGR) were carried out on a plot area of 6.7 hectares in constant listening-in mode using devices SRP-68-01, DRG-01T1, DKG-02Y "Arbitr". EGR measurements were performed over the network of profiles. A total of 30
measurements were made. Contrasting EGR abnormal values were not established. Control gamma-spectrometric determination of radionuclides was recognized as inappropriate. Taking volumetric activity (VA) measurements of radon in the selected samples included: measurement of the residual activity of radon in the measuring chamber; mixing the sample between the sampler and the measuring chamber; VA radon samples dimension in the measuring chamber.

The sound (noise) level was estimated at the border with the residential area of the projected buildings. The measurements were made at two points in accordance with GOST R 53187-2008 "Noise monitoring of urban areas".

Camera work included analysis of the current state of natural components based on processing the results of a route survey in the territory; laboratory data on soils; materials collected in the bodies for the environment protection and monitoring, the library of the Faculty of Geology and Geography. Working maps and diagrams were drawn up with digitization and preparation of cartographic material in electronic form, the correspondence of the identified parameters to the current standards was established, the natural complex value and current state were determined. The preparation of the final report on the engineering and environmental surveys results was carried out. Graphic applications are represented by a set of cards.

**Engineering and geological surveys**

According to engineering and geological conditions, the area of work belongs to the III category of complexity. The purpose of the geotechnical survey was to determine the feasibility of construction and to determine the possible construction costs. The tasks of engineering and geological surveys were: study of the geological and lithological structure and hydrogeological conditions of the construction site, the engineering and construction properties of soils, which will serve as a natural basis and environment for the designed object.

“One of the modern tools to achieve this goal is to use GIS-technologies. GIS capabilities for engineering-geological studies are significant: they allow accumulating, storing and processing large volumes of engineering-geological information, for example, forming an information resource about the composition and properties of the geological environment; allow solving the problems of typological engineering-geological zoning; architectural analysis of the design site, etc.” [10]

Consolidation of efforts of specialists from survey organizations and researchers of the Southern Federal University, namely the Department of Structural Mechanics and Structures, the Department of Engineering and Construction Disciplines of the Academy of Architecture and Arts and the Department of General and Engineering Geology of the Institute of Geosciences, in accordance with the scientific plan, allowed to test the an interactive map [10, 11] of the geotechnical characteristics of soils in the territory of Rostov-on-Don and the Rostov region (electronic archive of information on the parameters and characteristics of soils of the buildings and structures foundations), which provides information from 2008 to 2020, including for the investigated territory. The information obtained helped to trace the changes’ dynamics in the geological structure in the study area over 12 years.

Geomorphologically, the site belongs to the following geomorphological elements: the left bank slope of the Temernik River valley, its high floodplain and the first terrace above the floodplain. The relief of the study area surface has a slope in the north direction.
According to the archival materials of 2013, the geological structure of the site to a depth of 20.0 m involved Quaternary diluvial and alluvial loams, clays and sands, covered by technogenic soils, underlain by Neogene sediments, represented by clays and limestones from above. Groundwater is located at depths from 0.9 to 1.25 m (absolute marks 10.21 m - 12.15 m). Groundwater is hydraulically linked to the water level in the Temernik River. During flood periods, flooding of a low floodplain occurs, and in the areas of a high floodplain, groundwater may flow to the day surface.

According to the survey data of January 2020, the geological structure of the survey site is attended by diluvial deposits of the Quaternary age, overlapped from the surface by technogenic and humous soils. Diluvial loams are underlain by Quaternary alluvial clays, loams, gravel deposits and sands. Neogene sands occur down the section. When drilling wells in January 2020 the ground waters were...
discovered at depths of 0.4 m - 0.8 m (absolute marks 11.48 m - 12.10 m) in man-made loose loam. Under the prevailing hydrogeological conditions, without taking into account the amplitude of seasonal fluctuations, the structures foundations at the survey site will be periodically flooded.

**Engineering and hydrogeological surveys**

The main tasks of the research were: study of the geological section within the various geomorphological elements of the territory; clarification of the hydrogeological and engineering-geological conditions of the territory and the establishment of the ground water level position; obtaining the information about the geo-filtration parameters of soils necessary to substantiate the measures to prevent flooding and flooding phenomena and directions for subsequent hydrogeological monitoring and forecasts.

The scope of the work included: reconnaissance ecological and hydrogeological survey; manual drilling of mapping wells up to 7 meters deep in order to study the geological section and establish the groundwater leve level position; hydrogeological experimental work - single express pumping from wells.

The most important aspect of the study was the flooding and waterlogging processes in the territory. The study area is located on the first low left-bank above-floodplain terrace of the Temernik River. From the North it is bounded by a motor road, from the South by the slope of the second terrace above the floodplain. Temernik (Figures 3 and 4).

**Figure 3.** View of the western part of the slope slope the second above-floodplain Temernik terrace of the Temernik river.

**Figure 4.** To the eastern part of the second above the floodplain terrace of the river

Slope of the second terrace above the floodplain of the Temernik river, overgrown with trees, has a different steepness and is significantly disturbed by anthropogenic activity (remnants of a destroyed drainage system, soil dumps, construction and household waste). At the time of the survey, no groundwater outlets were found in the terrace body. Hazardous slope processes were not identified.

When examining the first lower terrace of the Temernik River, the phenomena of flooding its low sections, localized in the western part of the site, were established. It seems most likely that the anthropogenic impact on the relief and the drainage system disruption created the conditions for a very difficult water flow (backwater) and was the main reason for flooding, underflooding and swamping of low parts of the territory. The whole area is overgrown with weeds, bushes and reeds. Inspection of the drainage system, created to drain surface and lower the groundwater level and upper waters, indicated its unsatisfactory condition. Throughout the site, there are traces of its partial or complete destruction. Not all gutters and pipes were in working order.

**Experimental filtration studies in the water protection zone of the Temernik River**

Short-term pumping from wells is mainly performed to study the filtration characteristics of rocks with a relatively low permeability (0.01 < K < 5 m / day). The calculated coefficient value, as a rule, depends on the nature of the level rise curve in the well. This curve is plotted in coordinates $\lg S / S$ from $t$ and
the filtration coefficient is determined only by the straight-line part of the graph passing through the maximum number of experimental points (Fig. 6). Reliable results have been obtained by means of the open hole tests. In this case, the mesh does not become clogged and the filter resistance does not affect the groundwater horizon filtration parameters’ determination. The specificity of soils necessitates the elimination of random errors. For this, it was recommended to determine the filtration coefficient based on the results of the experiments carried out at several points of one site.

\[ k = \frac{\alpha (h_0 - r_0)}{h_0^2 \Delta t} r_0^2 \log \frac{S_0}{S} \]

where
- \( h_0 \) – is the depth from static level to the bottom of the well \((h_0 = h + S)\), m;
- \( r_0 \) – is well radius, m;
- \( \Delta t \) – is a calculated moment of time in days, determined from the graph in Figure 7.
- \( S_0 \) – is maximum lowering of the water level in the well from static, m;
- \( S \) – is a decrease in water level at a point in time \( \Delta t \), m.

In the production of instant pumping, on the recommendation of the author of this method K.Ya. Kozhanov, it is better to use the data obtained in the interval of \((0,2-0,8) S_0\).

According to the experiment results and the calculation results, the data given in Table 1 were obtained.

**Table 1.** Experimental results

| Well No. | Well depth, m | Depth to static level to the bottom of the well, m | Well radius, \( r_0 \), m | Depth from static level to the bottom of the well \( h_0 \), m | The maximum decrease in the water level in the well from the static, \( S_0 \), m | Filtration coefficient \( k \), m/day |
|----------|---------------|-----------------------------------------------|----------------------|-----------------------------------|---------------------------------|------------------|
| 1        | 1.71          | 0.55                                         | 0.10                 | 1.15                              | 0.56                            | 0.51             |
| 2        | 7.30          | 0.70                                         | 0.075                | 6.60                              | 0.45                            | 1.09             |
| 3        | 2.00          | 0.85                                         | 0.10                 | 1.15                              | 0.37                            | 3.46             |
| 4        | 2.00          | 0.40                                         | 0.10                 | 1.60                              | 0.50                            | 3.58             |

Based on the analysis of the field and laboratory work performed, the following conclusions were drawn:
1. Underground (ground) waters at the research site are widespread. They belong to non-pressurized groundwater, have a free surface, the position of which in the research course was recorded in wells at depths of 0.4 - 0.85 m (the first above-floodplain terrace). Water-bearing rocks are Quaternary deposits of various origins: technogenic soils, alluvial loams, clays; diluvial loams. Groundwater is fed over the entire area of its distribution due to the atmospheric precipitation infiltration. The aquifer is hydraulically connected with the waters of the Temernik River, into the channel of which groundwater is unloaded. The existing dilapidated drainage system has a certain effect on the groundwater discharge. In the relief depressions, groundwater came to the surface. The established facts indicate that under the existing conditions (climate, relief, conditions of surface and underground runoff) flooding, under-flooding and waterlogging of lowered areas in the territory occur.

2. The performed experimental filtration works make it possible to classify most of the soils composing the floodplain and the valley slopes as permeable (filtration coefficients 0.5 - 3.6 m / day). This testifies to the rather powerful flows of groundwater discharging into the Temernik river bed.

Architectural pre-design analysis
At the stage of the territory development architectural concept formation, it is necessary to carry out a pre-design analysis of the site and the surrounding area, which includes a study of the configuration and topography of the site, an exposure assessment of the relief and the degree of its complexity, as well as the presence of special geological conditions in the area under consideration.

As a part of a comprehensive pre-design architectural analysis, the following issues are also considered: the need for insolation and natural illumination calculations; the presence and possibility of reducing the sanitary protection zone and other especially dangerous protection zones; possible directions for the future territory development. The main purpose of pre-design studies is to collect and study information, criteria and factors to substantiate the possibility of placing a new construction object specified by the customer, taking into account the requirements of urban planning, historical, cultural, socio-economic, sanitary-hygienic and environmental regulations and the concept of the general city plan.

In the context of the research topic, to which this article is devoted, the central subject of the pre-project architectural analysis is the geometry of the site, on which the nature and form of the designed multifunctional residential complex directly depends. The relief of the site is complex, with the fall of the contours towards the Temernik River, the southern and southwestern borders are fenced off by a slope, the steepness of which reaches 45°, slope height - 7.0 m. The task of planning the territory is specific and is determined by the temporal and spatial development of the environment in the Temernik River water protection zone. A concomitant factor is the historical nature of the area development in the 60-90s of the last century - the land plot was previously a part of the territory entirely allotted for the operation of the “Nadezhda” sanatorium, where there were no main and citywide roads and streets, as well as urban transport. When designing buildings on a site with difficult terrain, a creative, individual approach is required, taking into account a set of technical, functional and compositional requirements, “… establishing the maximum connection between architecture and relief and other natural components is the most important condition for the successful solution of urban planning problems”. [6]

Discussion
In modern conditions of constant shortage of sites for construction, the developers are forced to develop the territories that were previously considered unsuitable for urban construction. One of the parameters that have a direct impact on the future construction site development complexity degree is the site relief. Many specialists from different countries have devoted their scientific works to this problem solution. From the end of the 20th century to the present time, the international experience of using the territory located in difficult conditions has been studied. Thus, in the book "Urban Development on Slopes" under the general editorship of the candidate of architecture V.R. Krogius sets out the results of many years research by Soviet and foreign experts in this field: “… in the theory and practice of urban planning,
the concept of “complex relief” has been formed, which in general terms characterizes the totality of forms of the Earth’s surface, significantly affecting the functional, household, sanitary and hygienic, architectural and aesthetic and technical and economic characteristics of urban construction and economy and determining the use of special methods of planning, development and improvement of cities”. [6]

The monograph "Comprehensive Assessment of the Territory in Urban Planning" under the general supervision of S.G. Sheina [12] is devoted to the GIS- systems application in the process of collecting and analyzing initial information for the economic assessment in the study area. The authors of the monograph defined an algorithm for financial assessment and formed a mathematical model for making calculations, as well as the monograph proposed ways to use the results of a comprehensive assessment in urban planning and management of the Rostov-on-Don city development. The quality of the Rostov-on-Don city territory suitability and investment attractiveness study was the subject of a scientific article by S.G. Sheina and Yu.V. Popova "Assessment of the suitability of the territories of Rostov-on-Don for the implementation of integrated development projects", [13]

In the article by Yu. V. Gorgorov, M. G. Sarkisyants, M. A. Sotnikov the principles of sustainable development of the architectural space of the Temernik River embankment in Rostov-on-Don and the issues of experimental design in the water protection zone of the linear park along the Temernik River are considered. [7]

The article by A.V. Ishchenko "Comprehensive analysis of built-up areas as a means of effective urban planning in landslide hazard zones (for example, Rostov-on-Don)” [10] analyzes the degree of environmental risk impact on landslide slopes, groundwater backwater, as well as contamination of the area. The author also proposes the construction of an electronic engineering-geological model of the Rostov-on-Don city, taking into account landslide processes, geotechnical analysis of the geological environment, detection and forecast of the vulnerable spots’ formation with the maximum probability of the landslide processes formation.

L.A. Zolotareva, O.D. Alekseeva in an article "Isomorphism of the computational model of the object and the architectural concept" consider the main points of "the concept choice and the method of constructing a model of the future object, which depend on many factors - a set of functions of the object, the construction site, the requirements of the task for the project development, surrounding buildings, the regulatory framework, etc.” [8]

In the articles of L.A. Zolotareva, N.M. Hansivaroa, V.A. Tryukhan "Expansion of the functions of the portal of geological information for joint remote use by various structural divisions of SFedU in teaching students" and "Portal of geological information as a tool for remote practical training of bachelors of the training direction 05.03.01. "Geology" the components of the natural-technical system (NTS), their interaction and dynamics are described. “One of the most important economic and social tasks of our time is to create NTS, which is capable of meeting the needs of society to the maximum extent with minimal disruption of the existing ecological balance. Optimal design and NTS control can be provided only by joint activities of designers and geological engineers, since the decomposition aspects of any NTS are geotechnical and technical aspects.

“In the context of preventing the spread of a new coronavirus infection, a new format of industrial practices is relevant. The basis for its development was the geological portal "Geobaza". It is a constantly updated electronic archive of geological information, which was created by a graduate of the Faculty of Geology and Geography (since 2013 - the Institute of Geosciences) SFedU, General Director of LLC "Geoelement" V. A. Tryukhan. Geological portal contains the following information:
1. A map of factual material showing the points of the performed engineering-geological and environmental surveys in the territories of Russian cities.
2. Brief information about the survey objects.
3. Table of physical and mechanical properties of engineering and geological elements identified within the soil strata.
4. Data on the properties of groundwater [11]
Summary
The scientific novelty of the study lies in the study of a holistic picture of pre-design engineering and architectural studies required to analyze the main factors affecting the interaction process of a building with the geological environment. Thanks to the joint work of specialists from the survey organizations and researchers of the Southern Federal University, the data obtained by means of the geological portal "Geobaza" were used for the first time. Based on the results of the interactive map use of the factual material and the experimental and filtration studies carried out in the water protection zone of the Temernik River, the possible periodic flooding of the projected building foundations was accurately predicted, which even at the stage of pre-design development indicated the need for the individual design decisions to ensure safety, waterproofing and reliability of structures in special geological conditions. The results of the comprehensive studies carried out allowed the chief architect and chief engineer of the multifunctional residential complex project to most efficiently and effectively solve the fundamental planning structure of the projected facility.

Reflection of the results obtained in the course of various studies on the available maps of the geological portal makes it possible to compile the maps of various scales from the small sites of the planned construction to such large areas as the Rostov Region and the Southern Federal District, and in the future to cover the territory of the entire Russian Federation.

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