

## **INFLUENCE OF DIFFERENT BIOCHAR CONCENTRATIONS ON WATER PERMISSIBILITY OF SANDY SOIL**

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In the course of the studies carried out, the influence of various concentrations of biochar (2%, 5%, 10%) obtained from sewage sludge at 500 ° C on the permeability of alluvial sod sandy soil was determined. After the addition of biochar to the soil, the permeability of the soil decreased from excessively high to the best. Water permeability consistently decreased with increasing biochar concentration.

**Keywords:** water permeability, biochar, soil, sewage sludge, pyrolysis products.

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## **ASSESSMENT OF THE PROTECTION OF GROUNDWATER IN THE CITY OF GATCHINA USING THE DRASTIC AND SINTACS METHODS**

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People are increasingly spreading their influence in the natural environment. This article evaluates the protection of the underground waters of the city of Gatchina from human influence using two methods. DRASTIC and SINTACS techniques were used. These methods were also compared and the advantages and disadvantages of each of them were described.

**Keywords:** groundwater, Gatchina, DRASTIC, SINTACS.

Currently, the global problem of environmental pollution and, as a result, groundwater is getting worse. Increasing the use of groundwater as a resource, use of vehicles, the use of fertilizers in agriculture, the growth of industrial production – all this leads to increased concentrations of pollutants in groundwater, and, consequently, to the deterioration of their quality.

The protection of groundwater from pollution is understood as the overlap of the aquifer with sediments (primarily weakly permeable) that prevent the penetration of pollutants from the Earth's surface. The overall assessment of the degree of protection of groundwaters is based on taking into account the so-called protection factors, which are understood as natural barriers that make it difficult for pollutants to enter the groundwaters.

We considered the protection of underground waters of the city of Gatchina - the largest settlement of the Leningrad region. On the territory of the city, 2 wells were selected.

DRASTIC and SINTACS techniques were used. These methods are based on the following parameters:

- Depth to the aquifer;
- Effective infiltration;
- Lithology of the aquifer;
- Type of soil cover;
- The slope of the terrain;
- Lithology of the aeration zone;
- The filtration coefficient of the sediments of the aquifer.

All parameters are divided into set types. Each type is assigned a rating from 1 to 10, depending on its impact on vulnerability (10-characterizes the greatest vulnerability). The rating value of each parameter is multiplied by a weighting factor, which means a certain value that determines the existing conditions that may increase the influence of each parameter.

DRASTIC is the most common method of assessing the natural protection of groundwater, which is recommended by the American organization EPA for territories with a surface greater than 0.5 km.

Table: Assessment of the protection of underground water by the DRASTIC method.

	Holocene biogenic aquifer (bIV)	Upper-Eifel-Lower-Fran aquifer (D2ef2-D3f1)	Eiffel Aquifer (D2ef)	Ordovician aquifer (O2)
DRASTIC Index	141	149	100	108

The DRASTIC index does not show absolute values, so we can only comparatively assess the protection of groundwater in different aquifers. The most exploited aquifer (Ordovician) is quite protected from external anthropogenic influences. In general, higher-lying aquifers are more susceptible to surface contamination.

Table: Assessment of groundwater protection by the SINTACS method.

	Holocene biogenic aquifer (bIV)	Upper-Eifel-Lower-Fran aquifer (D2ef2-D3f1)	Eiffel Aquifer (D2ef)	Ordovician aquifer (O2)
SINTACS Index	134	173	149	164
The normalized value	54	72	61,5	70

When calculating the SINTACS index, the value of the weight of factors was used in relation to karst, as the most dangerous factor. The obtained normalized values of the index (can vary from 0 to 100) allow us to assess the protection of waters for each horizon. The table shows that the risk of pollutants entering the groundwater from the surface is quite high.

The Ordovician subterranean horizon is protected by the SINTACS method by the same medium. The DRASTIC technique gives only relative results. But

still, the results suggest that a person is able to influence the composition of groundwater. This poses a certain danger, since a large number of enterprises are located in Gatchina.

It is also worth noting that the methods for assessing security have a number of disadvantages.

The whole process of selecting scores and classes is quite subjective, and this is one of the drawbacks of the DRASTIC method. The DRASTIC method does not distinguish the factors that affect the vulnerability of groundwater to pollution for non-pressure and pressure aquifers, which are different. The influence of the soil is considered almost twice, as a factor of the structure of the soil and as one of the components of the factor "influence of the aeration zone".

SINTACS is based on the seven DRASTIC factors and has been used to study hydrogeological conditions in Italy. The biggest difference between SINTACS and DRASTIC is the assessment of landscape disturbance as a factor affecting the vulnerability of groundwater. Its advantage is that the SINTACS method allows us to consider faults in rocks and the influence of karst processes on the distribution of pollutants in the aquifer. This method also presents a larger range of classes.

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## **ОЦЕНКА ЗАЩИЩЕННОСТИ ПОДЗЕМНЫХ ВОД ГОРОДА ГАТЧИНЫ МЕТОДАМИ ДРАСТИК И СИНТАКС**

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г. Санкт-Петербург, Россия*

Люди все больше распространяют свое влияние в природной среде. В данной статье дана оценка защищенности подземных вод города Гатчины от антропогенного воздействия с использованием двух методов. Использовались радикальные и синтактические методы. Эти методы также были сопоставлены и описаны преимущества и недостатки каждого из них.

**Ключевые слова:** подземные воды, Гатчина, драстик, синтаки.