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DETERMINATION OF MORPHOMETRIC INDICATORS OF THE SOUTH SURKHAN WATER RESERVOIR

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ANNOTATION
The article develops and calculates the method of calculation, taking into account the change in the useful volume of the reservoir under the influence of turbid sediments, the hydrological regime of turbid sediments entering the reservoir. Field research was conducted at the South Surkhan Reservoir. Based on the data collected in the field studies, a map of the reservoir bowl was constructed and morphometric parameters were evaluated, taking into account the formation of turbid sediments in the reservoir. When the normative stagnant water level of the reservoir is 415 meters, the projected water surface area is 65 km2, with a total volume of 800 mln. m3, and according to the results of field research, the total volume of the reservoir at the normative stagnation water level is 491.2 mln. m3, the water surface was 72.45 km2. The full volume of the reservoir decreased by 38.6% compared to the projected volume during operation, and the water surface area increased by 7.45 km2. The results of the study allow us to assess the change in the useful volume of the reservoir under the influence of turbid sediments, which can be used in the development of hydraulic and mechanical cleaning measures in the reservoir.
KEYWORDS: *reservoir, water level, projected water capacity, useful volume, useless volume, fuzzy streams, water surface area.*

INTRODUCTION AND ANALYSIS OF THE CURRENT STATE OF THE PROBLEM

One of the most important issues in the world is the regulation of river flow through reservoirs, the integrated use of water resources. Particular attention is paid to the reliable and efficient use of existing reservoirs, scientific substantiation of the most optimal operating modes, uniform supply of water to consumers during the growing season, development of improved methods to increase useful volume lost during operation [1; 2; 3].

The long-term efficient operation of reservoirs, the calculated accuracy of the components of the water balance depends on the amount of turbid sediments formed in their basins [1; 2; 4]. One of the most important problems today is to determine the change in the useful volume of the reservoir in operation, the formation and volume of turbid sediments deposited on the bottom of the reservoir. Extensive research on the creation of new methods of hydrological calculations, which allow to build reservoirs, increase the efficiency and service life of facilities and ensure their reliable operation, effective replenishment and discharge, identify and improve the factors affecting the efficient use of water resources. is important to carry [1; 4; 5].

The main purpose of this study is to assess the changes in the useful volume of the South Surkhan Reservoir under the influence of sediments on the basis of field observations using modern measuring instruments, to determine the morphometric parameters of the reservoir and to determine changes in the useful volume of reservoirs.

The study was conducted on the example of the South Surkhan Reservoir, which is currently operating as an object of study. The reservoir is located in Surkhandarya region and serves for seasonal adjustment of the Surkhandarya River for irrigation. When the reservoir is established, it will provide water to 122,000 hectares of new irrigated land. Currently, the reservoir supplies water to more than 154,000 hectares of irrigated land in Kumkurgan, Jarkurgan, Qizirik, Boysun, Sherabad, Angor, Muzrabad and Termez districts of Surkhandarya region (Figure 1).

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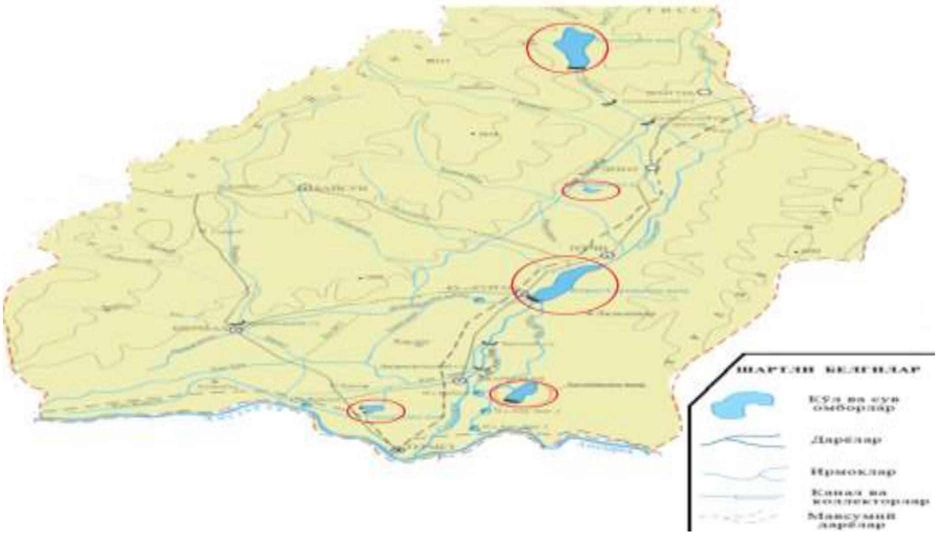

Figure 1. Scheme of location of water bodies in Surkhandarya region

The area where the reservoir is located is composed of clay, sandstone and sandy soil. In this oasis, gravel mixtures accumulated through the river and formed a layer of sedimentary gravel mixtures to a depth of 100 m. The width of the Surkhandarya river valley is 5 km from the dam axis, and the width of the gorge is about 400 m from the riverbed. The first part of the terrace around the river is Kayir. The width of the right bank is 150 m, 2000 m to the left bank. The reservoir basin area includes four terraces and two hydrological zones.

The first terrace is 3 meters thick of sandy soil, the lower part consists of sand and gravel.

The second terrace is formed by washouts on the left bank of the dam axis, 400 m long and 200 m wide.

The third terrace is just on the right bank. This terrace consists of various soil layers, the upper layer consists of sand, sandy and clay soils, the lower layer consists of sand and small stones, gravel. The width of the terrace is 2200 m. The western side is joined by the foothills on the right bank and the first terrace through heights of 15-18 m.

The fourth terrace is located on the left bank and consists of sand and sandy soils.

SOLUTION METHOD

Geodetic topographic surveys were conducted using iBase GNSS and i73 GNSS measuring instruments to determine changes in the useful volume of the South Surkhan Reservoir, morphometric indicators of the reservoir's characteristic water levels. Initially, the reservoir’s standard stagnation level mark (415 m) was determined by markers on the dam, and the iBase GNSS equipment was placed at a height of 415 m above the normal stagnation level in the reservoir dam. The iBase GNSS device, which receives the data, has been put into operation by connecting the database to a satellite. In determining the shape of the reservoir basin and the length of the shoreline, the values of the reservoir shoreline at the absolute height mark 415 m were determined at absolute height points every 30 m along the shoreline (Figure 2).

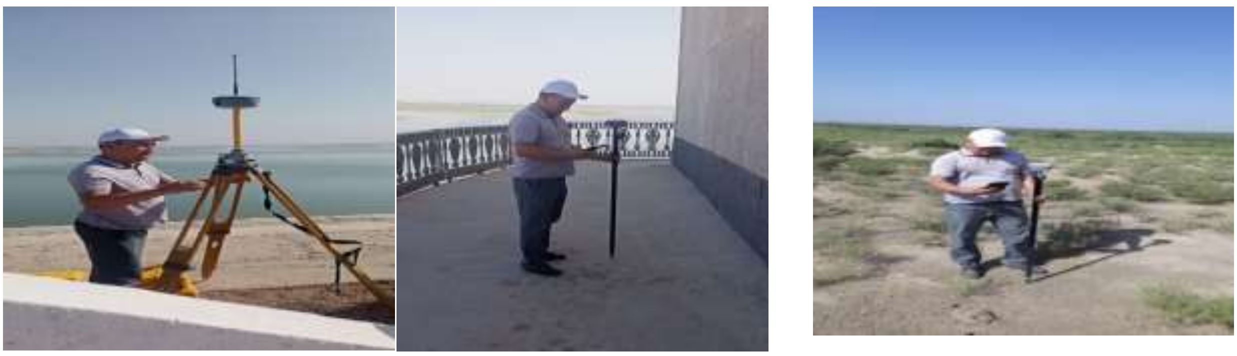

Figure 2. Processes of field research in the reservoir

In order to determine the change in the surface area of the reservoir and the volume of water in the range from 415 m to the minimum water level mark 392 m. increased and the data was transferred to the iBase GNSS device database.

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During the field survey, the water level mark in the reservoir was 401m, the reservoir water volume was 35.3 mln. m3, and the water surface area was 7.10 km2. Using the exolot device (LUCKY FF718LiC) of the water-covered part of the reservoir, the drawings of the log sections were created by determining the depths on each selected stvor (Figure 3).

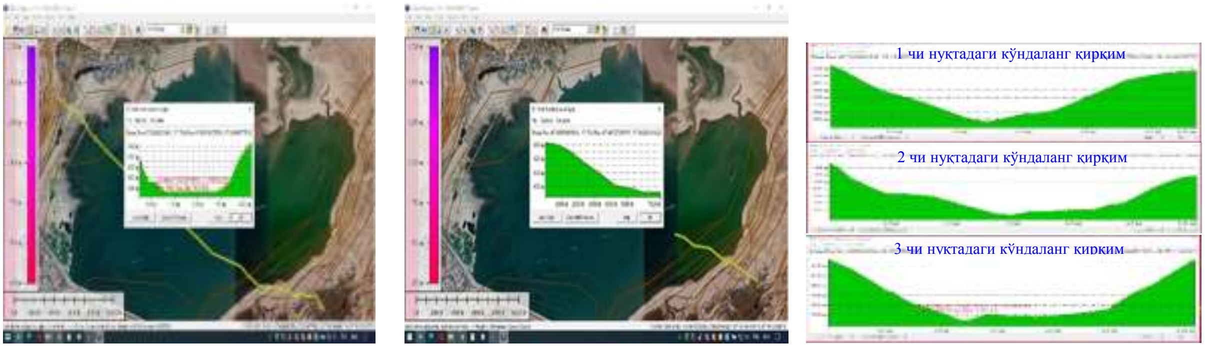

Figure 3. Log sections of the reservoir on selected storks

As part of the study, the determination of the change in the useful volume of the South Surkhan Reservoir under the influence of sediments was carried out on the basis of field observations using modern measuring instruments, and the morphometric parameters of the reservoir were determined. An electronic map of the South Surkhan Reservoir basin was developed based on the use of modern geographic information system technologies in the assessment of hydrological and hydraulic processes in the reservoir (Figure 4).

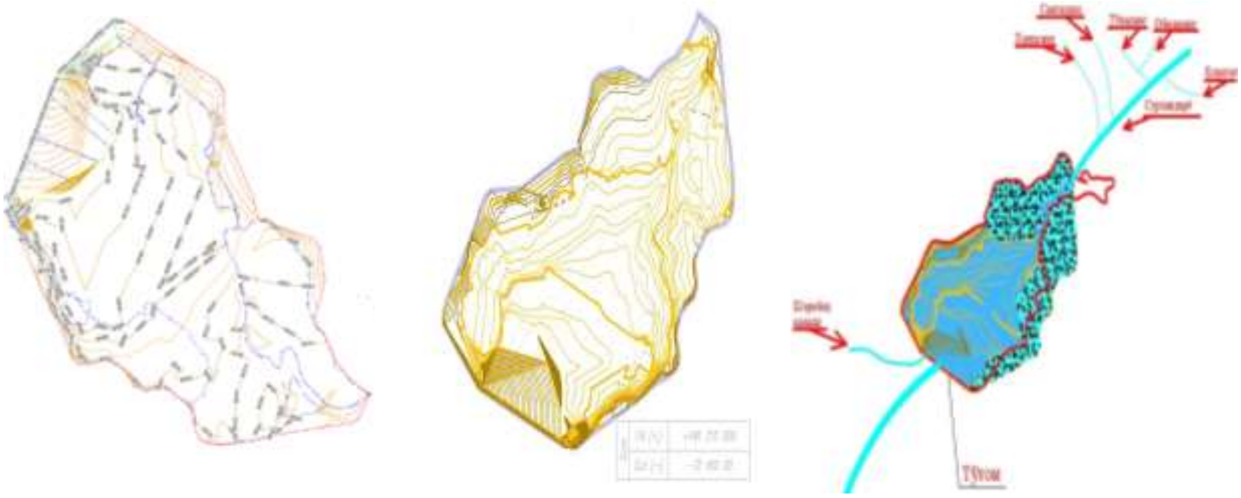

Figure 4. Electronic map of the South Surkhandarya reservoir basin

OUTCOME ANALYSIS: Based on the research, batiometric graphs were developed with the determination of morphometric parameters of the South Surkhandarya reservoir (Figures 5.6).

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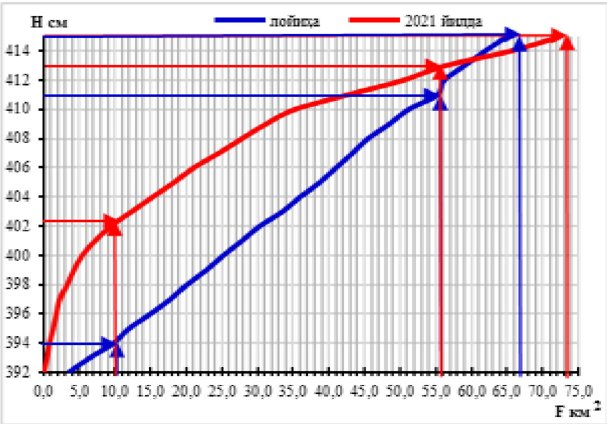

Figure 5. Reservoir water surface water level dependence graph

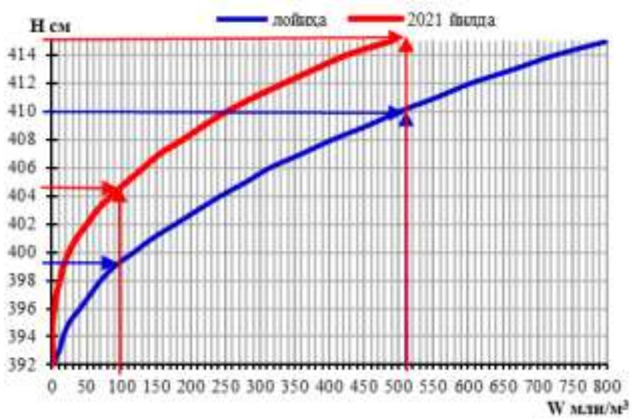

Figure 6. Graph of the dependence of the volume of the reservoir on the water level

The total length of the reservoir shoreline is 60 km, of which about 4 km are cliffs. 50% of the coastline is made up of abrasive shores. Scientific research to study the formation of the reservoir shores found that in the first phase of the reservoir filling, the one-meter-long shoreline wash ranged from 100 m3 to 225 m3, while in the second phase it ranged from 50 m3 to 450 m3. Fifteen years later, this size was 5–40 m3. Although coastal washing has been accelerated during the initial period of operation, it can be noted that in recent years this figure has declined sharply.

While the projected water surface area at the normal stagnation water level mark of 415 m was 65 km2, according to the results of research conducted in 2021, the water surface area of the reservoir at the normal stagnation water level mark was 72.45 km2. We can see that the water surface area of the South Surkhandarya Reservoir has increased by 7.45 km2 at the normal stagnation water level mark. The design volume of the reservoir at the normative stagnation water level mark is 800 mln. m3, and in 2021, 491.21 mln. m3.

CONCLUSION

According to the results of the study, the formation of turbid sediments on the basis of changes in the water level of the South Surkhandarya reservoir was determined and morphometric indicators were determined, including the useful volume at the normative stagnation water level mark of 491.21 mln. m3, which is a decrease of 38.6% compared to the design volume of the reservoir, and the surface area of the reservoir increased by 11.5% to 72.45 km2. The reason for this is that with the arrival of fuzzy streams in the reservoir, we can see that the movement of current in the formation of the coastline, the surface area has expanded due to erosion as a result of wind waves. The main reasons for the fact that the rate of filling of the reservoir with sludge is higher than specified in the project, it is clear that the project does not provide for measures to prevent the filling of the reservoir with sludge during the operation of the reservoir. The use of the results of research conducted during the operation of the reservoir will increase the accuracy of the morphometric parameters of the reservoir and the components of the water balance, provide consumers with reliable water, create opportunities for safe and efficient use of the reservoir.

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