In case of sources P-I1 and P-I3 it is the earliest of the distinguished saturation stage with Ca-montmorillonite (Fig. c).

Source P-I2 and well GK1 are in near-equilibrium state with calcite, the so-called transition zone. Finally, the water from wells G1, M1, and GK5 reached the calcite saturation stage (Fig. c, g).

The study of the equilibrium underground water showed that water is saturated with montmorillonite, some reach the calcite and albite saturation stage. The composition of underground water is characterized like colorful. Underground water in this territory is neutral, slightly alkaline and alkaline. According to salinity water varies from fresh to salt water, the temperature from cold water to very hot.

Variety of chemical composition groundwater occurs due to it confinedness to the territory of modern volcanism. High temperatures, the interaction of depth gases with water of infiltration affect the formation of water chemical composition. The considerable amount of chlorine and sodium ions is associated with nearby location of the sea area and the genetic link with marine sediments is quite probable [5].

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PATTERNS OF MERCURY DISTRIBUTION IN BOTTOM SEDIMENTS VERTICAL PROFILES PONDS (TOMSK AREA)

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Mercury, being harmful environmental pollutant, is particularly harmful when entering water as a result of the activity of microorganisms inhabiting the bottom and the formation of water-soluble toxic organic compounds. They, in turn, are adsorbed on suspended particles and accumulate in sediments. Typical content of mercury in sediments is of 3-4 orders higher than that in water [1]. Thus, the bottom sediments (BS) are an informative part of aquatic systems from the viewpoint of assessing their sustainable pollution. Research in the vertical distribution of this element in the thickness of sediments allow defining the most intensive periods of mercury releases into the environment, which may be associated with natural conditions and with increased levels of anthropogenic stress in the study area.

Three low flow lakes of different mercury intake and accumulation were selected for the research. They are located in the south of the Tomsk Region and characterized by different remoteness from the main sources of the city anthropogenic impact, presented by enterprise of the nuclear fuel cycle, petrochemical, electronic and other types of industry [2].

Chernoe Lake is located to the north-east of the city on the River Pesochka and characterized by a high level of anthropogenic stress due to its location in the zone of Tomsk - Seversk industrial impact.

The lake in Timiryazevskoe settlement is located in the floodplain of the Tom River, about 3 km from Tomsk, its origin being oxbow.

Lake Um is located in the south-west of the city, at the distance 40 km, therefore, it is considered as a background body in the undertaken studies, because of minimal impact from the industry.

As an analytical method the atomic absorption method was used based on the software RA915P. Determination of mercury in sediments was performed by the mercury gas analyzer RA 915+ and prefix Piro - 915+. The method is based on the reduction of the combined mercury to the atomic state by pyrolysis and subsequent transfer of air from the atomizer to the analytical cell. Humus-podzolic sandy soils UDPS-3 type was used as a standard, certificate №3095 [3]. Testing was carried out to the depth of 36 cm at the intervals of 1 to 10 cm.

The pattern of mercury vertical distribution in sediment cores of low flow lakes are well reflected in the diagrams (Fig. 1. 2, 3), based on the data of the analysis, taking into account the depth of the sediments and the corresponding mercury concentration.

Mercury distribution in Lake Um corresponds to the regional background and is uniform throughout the section; local pronounced anomalies are not observed in the vertical profile. The gradual change in the composition of sediments over time is due to the natural factors.

In contrast to Lake Um, lake located in the Timiryazevskoe settlement is characterized by poorly-defined anomalies in the upper part of the sediment cores. The reason for these anomalies can be of both natural and anthropogenic character, and is associated with a periodic and irregular intake of pollutants into the lake, for example, as a result of flooding or other vertical oscillations of the water level in the lake.

Lake Chernoe has contrasting anomalies of mercury distribution in the upper part of the section, the formation of which can be explained by its location in the zone of Tomsk - Seversk industry impact, and, consequently, a high level of anthropogenic influence. The accumulation of mercury in the upper part of the sediment core starts with 10 cm depth. By the dating methods using isotope ^{210}Pb the age of the sediments was compared with technogenic events that took place in the vicinity of the lake. This depth corresponds to 1955, so the sharp change in geochemical environment may be associated with the construction of the SCC in 1951, as well as the launch of the first nuclear reactor I-1 in 1955 [2].

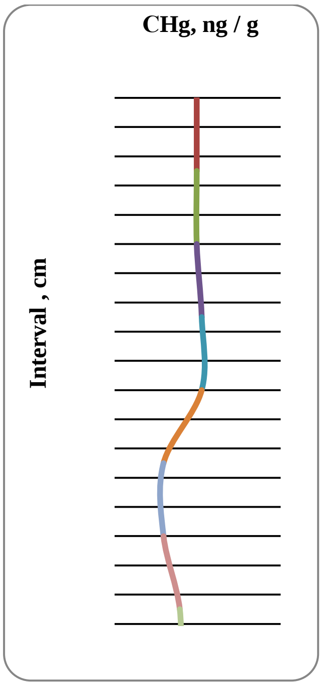

Fig. 1. Hg in BS of Lake Um

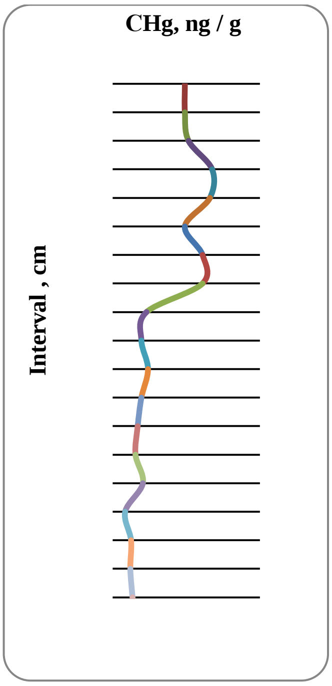

Fig. 2. Hg in BS of Lake Timiryazevskoe

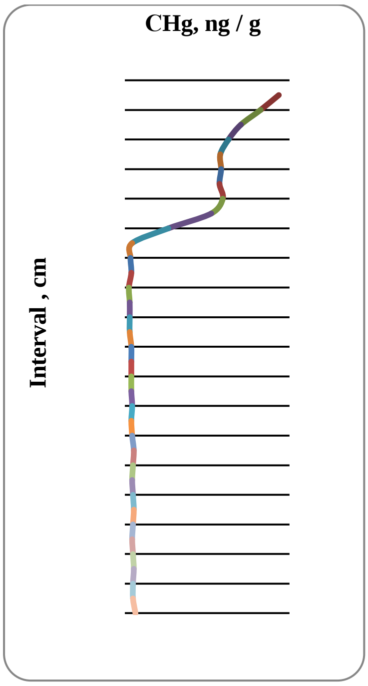

Fig. 3. Hg in BS of Lake Chernoe

To sum up, this research has shown the dependence of geochemical features of the environment on not only the natural factors but also from the anthropogenic ones. In this case, they include the intensity of impact on the objects under consideration which are located near the sources of anthropogenic pollution. Sharp changes of geochemical environment allow monitoring the dynamics of social development of the region, identifying industrial facilities that impact specifically on the environment.

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OPTIMIZATION OF DEVELOPMENT OF A SECTOR OF OIL-GAS CONDENSATE FIELD X USING AND INTEGRATED FIELD MODEL

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This individual project presents the integrated reservoir simulations which combines hydrodynamic flow models of two different formations, and results of development optimization for these formations of a sector of Field X. Field X has two separately developed formations. A decision not to apply a commingled production for formations having similar fluid saturation and close hypsometric marks has been caused by a significant difference in the physic-chemical properties of the hydrocarbon fluids and the reservoir properties. The formations are tied to a common gathering and separator node. Formation U11 has one oil bearing accumulation and 20% of oil in place of Field X, while formation U12 is identified as an oil-gas condensate reservoir with a gas cap and has 80% of oil in place of Field X. The optimal production plan for each formation is the goal of the field development. The considered formations have separate