

The aim of the model was to forecast the groundwater mercury pollution distribution aureole and to discuss the mathematical simulations of the estimated quantity of mercury entering the river Irtysh and the aquifer wells in the village of Pavlodarskoe.

During the years of 1975-1993, the industrial chemical plant activity, which consisted of caustic soda and chlorine production resulting from electrolysis of mercury at the cathode, has been the primary source of mercury pollution in groundwater at the site. The mercury polluted groundwater was situated on the right shore of the river Irtysh and was located five kilometers from the chemical plant. Approximately 1,000 tons of mercury has been collected over the years as a result of numerous spills at this chemical plant.

Groundwater aquifers at depths up to 20 meters were located within the boundaries of the area to be investigated. The groundwater aquifers were represented by sand, layers of clay, sandy loams, and loams.

A mathematical model was developed for the groundwater mercury pollution process study.

This regional hydrodynamic model was used to forecast mercury pollution aureole distribution in the plan. The solution to the three-dimensional mercury transfer problem was resolved on a local model by reproducing the lithological structure and evaluating the mercury sorption processes in the plan.

Groundwater mercury pollution aureole distribution was forecast for the next 30 years (2007-2037) using the local model. The entry of mercury into the aquifer was localized during the planned prognostic task solution.

At the end of the prognostic task period, the area of the groundwater mercury pollution aureole in the sandy deposits would be considerably lower. The aureole would be transferred approximately 200 meters in the north-north-western direction. Entry of the mercury polluted waters into the drainage channel (located in the northern part of the region) is possible.

Based on the results of the mathematical simulations, the mercury transfer moved in the horizontal direction into the sandy layer between the clay layers and also in the vertical direction. The mercury was also able to enter the aeration zone prior to moving through the vegetation and the superficial waters.

In this study, the territory investigated was where large quantities of mercury were deposited. There is a high probability that the hydrogeological conditions of this area will change over time. Therefore it is necessary to continue to observe the groundwater quality near this chemical plant.