The problems of conventional drinking water treatment processes include lower purification efficiency and larger footprint than membrane technology. An alternative approach is to use membrane filtration technology when building new facilities and upgrading existing treatment facilities. This technology is receiving more and more acceptance in modern water and wastewater treatment practices. Depending on the pore size of the membrane, it can remove various contaminants such as heavy metals, pharmaceutical compounds, viruses, bacteria, etc. in water and wastewater to produce highly pure water. However, one of the main barriers to the technology is membrane fouling, which means the membranes become dirty and get clogged overtime by organic substances and particulates on the membrane surface and/or pores. As a result, the productivity of the membranes declines significantly with filtration time.

To reduce membrane fouling, one efficient approach is pretreatment of feed water. In other words, organic substances and particulates in raw water are removed as much as possible before reaching the membrane. Recent studies have shown that riverbank filtration (RBF) systems are capable of improving taste and smell of water while removing harmful pollutants and microorganisms from the water that can pass through conventional water treatment processes. RBF facilities are located underground near surface water sources which can drastically reduce the amount of ground required as compared to conventional water treatment facilities. The implementation of riverbank filtration systems can further reduce the expenses of water treatment and the construction of new facilities.

The goal of this project is to design an innovative RBF system proceeded by a membrane filtration system to minimize fouling, extend membrane life, and reduce the cost of expensive methods used in conventional water treatment processes. The productivity and purification efficiency of the RBF and the membrane filtration systems will be evaluated by building and testing bench models of the designs. Testing of the influent and effluent water after each stage will be done in lab to evaluate if the system meets primary safe drinking water standards set forth in the Safe Drinking Water Act.