

Hydraulic Barrier and Physical Barrier Construction for River Protection

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Background/Objectives. The subject industrial site has been operational since the 1970s and, due to organic products handling, a groundwater contamination has occurred. At the downstream boundary of the industrial site, there is a hydraulic containment system, comprised of 10 pumping wells that operate since 2000, with the main objectives of containing the groundwater migration and ensuring the protection of the river located downstream from the site. The aquifer is featured by an alluvium layer composed of sandy clay to clayey sand over a layer of weathered soil. In January 2010, after a flooding event, the presence of organic product downstream from the existing containment system was observed. It was concluded that the product migration had occurred through former pipelines, channels and utilities located along the street between the industrial site and the river. After the identification of the sources, the former pipelines and utilities were removed and/or sealed with concrete and the contaminated soil was removed, classified and treated in a proper off-site location.

Approach/Activities. As a remedial and containment action, it was decided to implement a hydraulic barrier and a physical barrier, with the following objectives: 1) avoid the migration of the chemicals of concern and promote the river protection; 2) remove mass of the chemicals of concern; 3) progressive recovery of the groundwater quality and; 4) minimize the pumping flow rate, avoiding the unnecessary pumping of water from the nearby river. The physical barrier consisted in the execution of 315 columns of soil cement with diameter varying from Ø 80 cm to Ø 100 cm with an overlapping of 20 cm and a linear extension of 191.5 m, and the depth of columns varied from 12.0 mbgs to 24.6 mbgs, corresponding to the section from the top of the soil layer (alluvium and weathered soil) to the bedrock, with an inlay of 40 cm in the bedrock. The total amount of cement consumed was 1,327.40 tons. The hydraulic barrier (DHD-01) which corresponds to a drain with 6" diameter that discharges into a shaft (CB-01), was installed with a total length of 154.0 m.

Results/Lessons Learned. Monitoring data indicate that the hydraulic barrier is operating according to the premises established during the design phase and that the physical barrier is acting efficiently for the groundwater hydraulic containment. The next steps of the project include the continuity of the hydraulic and hydrochemical monitoring as well as the mathematical simulations updating, in order to achieve optimal operational conditions.