

Mass Discharge Calculation for Rehabilitation of Industrial Site

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Background/Objectives. Environmental studies in the subject area, located in the state of São Paulo, Brazil, started in 2003. The studies consisted of a series of environmental investigations that enabled the detailed mapping of the site's environmental scenario and detected changes in the environmental quality of the local groundwater. Quality alterations were primarily due to the presence of perchloroethylene (PCE) in two distinct areas: downgradient of the former settling ponds (which were part of the WWTP), at the southern portion of the industrial site, near the local creek; and at the former degreasing area, at the central portion of the production area.

Approach/Activities. Considering the scenario identified, an Integrated Remediation System was implemented in the area, using several techniques: bioremediation, multiphase extraction (MPE), in situ chemical oxidation (ISCO) and hydraulic barrier. These systems removed/destroyed PCE from the primary centers of mass identified and contained its migration to the local receiving water body. The action of these systems helped reduce the concentrations of the identified pollutants to levels below the Site Specific Target Levels (SSTLs) and contributed to stabilize the local environmental conditions, until their operation was no longer necessary. The decision to discontinue the operation of the Hydraulic Barrier was based on mass discharge calculations that assessed the receiving body's capacity to assimilate a potential influx of PCE.

Results/Lessons Learned. Mass discharge calculations for PCE estimated that theoretically even if the entire existing PCE plume front were to reach the receiving water body at PCE concentrations of 500 µg/L, water body quality would not be altered to the point of changing its classification. In terms of mass, this would represent an annual release of 1.8 kg of PCE. From the practical side, it was known that the average concentration of PCE in the water captured by the hydraulic barrier was about ~315 µg/L, restricting the potential mass discharge to 1.1 kg/year of PCE, which is approximately 40% below the yearly threshold level estimated for this receptor (i.e., 1.8 kg/year). Therefore, calculations showed that the discontinuance of the hydraulic barrier – which was the last remedial system in operational in the area – would not result in unacceptable levels of impact to the surface water. Thus, with the local environmental agency acceptance, the hydraulic barrier was shut down and several rounds of surface water monitoring were carried out. As no impacts were detected (as predicted) the area was officially declared as remediated for industrial use.