CASTAIC LAKE WATER AGENCY, SANTA CLARITA, CALIFORNIA

Treatment of Perchlorate Contaminated Groundwater from the Saugus Aquifer

HIGHLIGHTS

- Fixed- and fluidized bed bioreactor pilot testing.
- Molecular techniques to compare active perchlorate-reducing bacteria in the two bioreactors.
- Mass-balance biological drinking water treatment model.
- Conditional CA DHS acceptance for fixed-bed biological treatment of perchlorate-contaminated drinking water.

In 1997, the Castaic Lake Water Agency detected widespread perchlorate contamination of the Saugus Aquifer, the source of which is a local explosives manufacturing facility. In addition to perchlorate, the Saugus Aquifer contains nitrate and may also be impacted by TCE and explosives such as HMX and RDX. Consequently, three local wells have been shut down, resulting in a substantial reduction in usable groundwater supply.

In an effort to restore the impaired groundwater, the Agency selected Carollo to perform a preliminary design study. At the inception of the project, Carollo developed and executed a DHS-approved well water sampling protocol to generate a comprehensive raw water characterization. Data from this characterization were used as inputs to membrane, ion exchange, and biological treatment process models that Carollo developed for perchlorate removal sensitivity analyses. These models were used to screen treatment alternatives and identify appropriate processes for bench and pilot-scale testing. Following a process screening workshop conducted by Carollo, a seven-month bench- and pilot-testing program was initiated and completed using protocols developed by Carollo and approved by CA DHS. Bench-scale testing included single-pass ion exchange and pilot testing involved fixed- and fluidized-bed bioreactors. Pilot data showed that perchlorate-reducing fixed-bed biological reactors can be acclimated using organisms indigenous to the Saugus aquifer, that perchlorate can be removed to below detection using reasonable contact times and acetic acid doses, that effluent water from these processes is of high quality, and that the process is robust with respect to system upsets. Detailed process and engineering analyses indicate that fixed-bed biological processes can ensure the delivery of perchlorate-free potable water under steady state and non-steady state operating and water quality conditions.

Pilot testing at Castaic Lake Water Agency showed that fixed-bed biological filtration is an efficient, robust process for removing perchlorate and nitrate from groundwater.

In November 2004, CA DHS granted Carollo Engineers conditional acceptance for fixed-bed biological treatment of perchlorate-contaminated drinking water, thereby making it possible for the first time to consider the full-scale design and implementation of fixed-bed biological perchlorate treatment in California.

Based on the results of this pilot-scale work, Carollo submitted a comprehensive fixed-bed biological perchlorate treatment engineering report to the CA DHS' technology acceptance application program. On November 15, 2004, CA DHS granted Carollo Conditional Acceptance of Fixed-Bed Biological Treatment for the Production of Drinking Water from Perchlorate Contaminated Water, thereby making it possible for the first time to consider the full-scale design and implementation of FXB biological perchlorate treatment in California.