Public Private Partnership Stimulating Sustainable Biodegradation of Chlorinated Compounds

Allison K. Stenger (allison.stenger@terracon.com), Michael T. Jordan (michael.jordan@terracon.com), and Casey M. Portela (casey.portela@terracon.com) (Terracon, Raleigh, NC, USA)

Background/Objectives. In 1989, the North Carolina Department of Transportation (NCDOT) and North Carolina Department of Environmental Quality (NCDEQ) entered into a Memorandum of Agreement to conduct assessments at 72 asphalt manufacturing facilities that had on-site testing laboratories. Asphalt testing included the use of trichloroethene (TCE), 1,1,1-trichloroethane (TCA) and/or carbon tetrachloride (CT). One of these testing laboratories was in Sanford, North Carolina (Site). Investigation activities conducted at the Site identified TCE in soil at a concentration of 13 milligrams per kilogram (mg/kg) and monitoring wells at concentrations up to 2,840 μg/L. Though relatively favorable biogeochemical conditions in the aquifer and detections of degradation products provide evidence for MNA, back diffusion from the clayey soil matrix may limit its effectiveness. The NCDOT required a cost-effective approach to expedite remediation at the Site as well as the remainder of the asphalt labs across the state.

Approach/Activities. While the NCDOT desires to utilize in situ remediation at the asphalt testing labs, commercial products used to stimulate bioremediation are cost prohibitive given the number of sites. NCDOT and Pepsi Bottling Ventures (PBV) created a partnership that mutually benefits them and the City of Raleigh with PBV providing the NCDOT with a free source of soluble high fructose corn syrup substrate. PBV donates its time to recover and repackage expired beverages, normally disposed of to the City of Raleigh waste water treatment plant, to donate for the NCDOT for use as Beverage Remediation Product (BRP). This reduces the waste burden on the City of Raleigh, reduces the cost of waste disposal for PBV and provides BRP to stimulate anaerobic biodegradation.

Terracon conducted a pilot test at the Sanford site in October 2017 to evaluate the efficacy of BRP injections through DPT injections to reduce TCE concentrations and estimate aquifer buffer requirements. The pilot test resulted in a decrease in oxidation-reduction potential (ORP) and increase in pH and total organic carbon (TOC). TCE concentrations in groundwater decreased by one to two orders of magnitude with comparable increases in degradation products. Based on these results, NCDOT installed a network of permanent injection wells at the site and a full-scale BRP injections occurred in August 2018.

Results/Lessons Learned. Post full-scale injection data will be used to document the concentration trends of TCE in the source area and evaluate the geochemical conditions. Data will be used to calculate a half-life of the BRP; estimating the need and frequency of recurring injections. The method of injecting the BRP will also be evaluated; comparing the injection rates and distribution of the DPT injections to the full-scale injection utilizing permanent injection wells. These determinations can be applied to gauge the overall cost savings and effectiveness of the collaborative effort using repurposed, expired beverage to not only reduce waste for PBV and impact on the municipal waste water treatment, but also lower the cost of effectively and sustainably using bioremediation substrates for legacy asphalt testing laboratory sites.