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In Situ Chemical Reduction of CVOC and Chromium Facilitated Redevelopment of an Industrial Property

Jim Mueller (FMC Environmental Solutions, Freeport Illinois)
Doug Gray, Mike McKim and Taki Shinkawa (URS Corporation, Cleveland, Ohio, USA)
Elizabeth Bishop and Wade Meese (Innovative Environmental Technology, Inc., Pipersville, Pennsylvania, USA)

Overview. Safe implementation of efficient and cost-effective remedial solutions in the clean-up of impacted properties is paramount in returning brownfields and other impacted properties to viable use in the face of the recent real estate market declines. As part of the overall project area remediation effort, sustainable and innovative *in situ* remedial technologies were evaluated for use per proposed site redevelopment plans for the portion of the site formerly utilized for plating operations. The successful design, implementation of the *in situ* remedy and performance monitoring of the targeted treatment area resulted in the attainment of required clean-up standards and no further action within nine months of the remedy implementation.

Background/Objectives. Historical site use of the project area included: a manufactured gas plant (*circa*. 1850), trucking terminal, & plating operations. The soil and groundwater in the former plating area of the Site was impacted by chlorinated organics as well as hot spot areas of elevated chromium. As part of the overall remedial efforts, Voluntary Action Program (VAP) and Bureau of Underground Storage Tank Regulation (BUSTR) standards needed to be attained within the treatment area at the property.

Approach/Activities. The selected remedial technology, implemented within the treatment area, was *in situ* chemical reduction (ISCR) along with an associated post-ISCR performance monitoring program. A combination of organic hydrogen donors, oxygen scavengers and iron was used to reduce CVOC concentrations and precipitate chromium by stimulating biological activity capable of reductive dechlorination. The primary constituents of concern were trichloroethene (TCE), cis-1,2-dichloroethene (cis-DCE), vinyl chloride (VC) and chromium (Cr). Within the treatment area, TCE, cis-DCE and VC exceeded Aquatic Life Criteria (OMZA) for the Cuyahoga River; chromium exceedances were limited to isolated areas within the overall treatment zone. Noted groundwater impacts were observed in pre-ISCR samples ranging from ~ 8 to 15 feet below ground surface (ft-bgs). The overall treatment area was ~7,000 ft^2, divided into two separate areas of ~ 3,000 and ~4,000 ft^2 (i.e., Areas A and B, respectively). The application of the ISCR amendment was completed using direct push injection techniques with a total of 70 injection locations.

Results/Lessons Learned. Over an approximate 12 month post-ISCR performance monitoring period, reducing subsurface geochemical conditions were achieved and maintained, CVOCs concentrations were reduced >90%, with some transient progression from parent compound through daughter products to end products such as ethene. At the end of the performance monitoring period all CVOC concentrations and Cr were below the required criteria and the site was positioned for no further action. Remedial goals were obtained in a cost effective and sustainable approach; as compared to other evaluated alternatives, significant cost savings were realized.

Proposed Session: 8a Strategies for Complex Sites

Platform Requested

Corresponding Author:

Jim Mueller FMC
2871 W. Forest Rd, Suite 2
Freeport, IL 61032
Phone: (815) 235-3503

Co-Authors:

Doug Gray, Mike McKim and Taki Shinkawa
URS Corporation,
1375 Euclid Avenue, Suite 600
Cleveland, Ohio, USA 44115
Phone: 216.622.2283
E-mail: doug.gray@urs.com

Elizabeth Bishop and Wade Meese
Innovative Environmental Technology, Inc.
6151 Kellers Church Road
Pipersville, Pennsylvania, USA 18947
Phone: (888) 721-8283
E-mail: elizabethbishop@iet-inc.net