

(A) Comprehensive Remedial Design Approach to a Multicontaminant Multireceptor Site

David Winslow, Bhuvnesh Parekh and Morgan McBride, GZA GeoEnvironmental Inc.

From approximately 1964 to 2008, operations at the former Safeguard Chemical Facility (located in Elizabeth, New Jersey) included the manufacturing, filling (of aerosol containers), and distribution of aerosol products. During this time, household and industrial cleaners, polishes, deodorizers, insecticides, disinfectants, lubricants, and adhesives were produced at the Site. The bulk chemicals consisted of pesticides, solvents, and propellants, which were stored at the Site in aboveground storage tanks (ASTs). There was an ongoing series of remedial investigations (RIs) and remedial actions (RAs) beginning in 1994, which identified chlorinated volatile organic compound (cVOCs) and pesticides as the primary contaminants of concern (COCs) in subsurface soil, groundwater, surface water, and sediments. To address upland contamination and protect sensitive receptors, GZA proposed a treatment train approach consisting of DNAPL removal using large diameter casings and drilling, and in-situ injections at the hotspots to reduce contaminant levels in the source zone followed by monitored natural attenuation (MNA).

Prior to initiation of the remedial efforts, several data gaps and design elements needed to be completed including:

- Complete the delineation of VOC, pesticide, and PCB contamination in subsurface soil; Design an approach to address DNAPL-saturated soils approximately 16-feet beneath the water table;
- Perform treatability and bench scale studies to design full-scale groundwater injections;
- Identify potential offsite sources of contamination;
- Design an environmentally sustainable RA that utilizes a diverse range of remedial technologies.

To achieve project objective, several rounds of soil and groundwater delineation were conducted because the contamination was found to be more widespread than previously reported. To complete the delineation, we utilized additional tools to establish site specific standards including SESOIL, SPLP analysis and compliance averaging to develop site specific standards, which reduced the need for further delineation.

During delineation and treatability testing we found an isolated zone of DNAPL at the property boundary with the Great Ditch. To address the DNAPL in a cost-effective manner, we designed a remedial approach that limited the need for support of excavation (SOE) and sloping of excavation side walls. The approach utilized the installation of larger diameter casing and a larger diameter auger in an overlapping pattern across the DNAPL zone. Once the

casing was installed, DNAPL impacted soils were removed with the auger and the casing was backfilled with sand and amendments prior to removal of the casing. Although this method required increased management of waste, we avoided the need for SOE and dewatering thereby reducing the costs.

Our treatability study identified a combination of Fenton's reagent and sodium persulfate as an effective treatment, where the hydrogen peroxide mobilized the adsorbed contamination, and the sodium persulfate oxidized the desorbed fraction. Two injection events were conducted in the dissolved hot spot areas. Following the first injection, mobilization of adsorbed contamination resulted in increases of dissolved fractions. The second injection event resulted in an overall mass reduction of dissolved cVOCs of 30%.

David Winslow

Dr. Winslow has been with GZA since 2004 and is a Principal and Senior Vice President. He presently manages the Northern New Jersey district office and provides senior management of environmental investigation and remediation projects.

Dr. Winslow has provided clients with environmental and geological consulting services since 1995. He received his B.S. in Geology from Binghamton University; his M.S. in Geologic Sciences from Virginia Tech; and his Ph.D. in Geological Sciences from Lehigh University. He is a professional geologist licensed in New Hampshire.

His practice areas include supporting Brownfield Redevelopment Projects, soil and groundwater remediation, soil and groundwater investigations and environmental due diligence. Dr. Winslow has conducted, managed and implemented site investigation and remedial activities for the transportation, infrastructure, energy, institutional and real estate client sectors including client work at the major regional infrastructure projects, manufactured gas plant sites, nuclear power plants, hazardous waste sites, retail petroleum sites, former petroleum terminals, and Brownfield redevelopment sites.

Dr. Winslow is a member of the Urban Land Institute, National Association of Industrial Office Parks, Chemical Council of New Jersey and Association of Civil Engineering Companies. Dr. Winslow has presented technical papers on fractured bedrock hydrogeology, remediation and geology at various scientific meetings.