

## Using Tracer Gases (Sulfur Hexafluoride and Helium) to Assess Radius of Influence of Biosparge Pilot Systems

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**Background/Objectives.** A beach, located downgradient of a former diesel release, exhibits intermittent aesthetic impacts including iron staining and biogenic sheen. An extensive characterization of the area indicated NAPL was not present within 75 feet from the shoreline, however high dissolved iron in the groundwater combined with anaerobic groundwater present downgradient from the NAPL extent was suspected of causing the discoloration of sand and episodic appearance of biogenic sheen. In an effort to address iron staining and biogenic sheen production a bio-sparge system was installed and operated as part of a pilot study to evaluate its effectiveness as a long-term remediation management option. Concerns for the pilot system included the generation of vapors as well as defining metrics for success during short term test. To address these concerns SF<sub>6</sub> and helium were implemented as tracer gases which allowed the characterization of the overall distribution of air injected to be determined without long term operation of the pilot study.

**Approach/Activities.** Sulfur hexafluoride (SF<sub>6</sub>) and helium were injected discretely (for less than 4 hours at a time) into air sparge wells on two separate phases of the pilot testing which operated during the day for approximately 10 days. The first injection of SF<sub>6</sub> was applied to the two air sparge wells with the deepest screened interval for a period of two hours. Groundwater samples were collected at 19 locations prior to the injection of SF<sub>6</sub>, directly following the injection, and two days after injection. The second round of SF<sub>6</sub> was applied to all four air sparge wells for a duration of three hours. Following the second SF<sub>6</sub> application the air sparge groundwater samples were collected at 19 locations directly following the application of SF<sub>6</sub>, one day after the application, and 21 days after the application. The injection of SF<sub>6</sub> was used to measure the radius of influence of the sparge wells.

Helium was also injected intermittently during the test to determine the immediate radius of during the pilot test and confirm potential vapor generation extent.

**Results/Lessons Learned.** Short term detections of helium in various monitoring points indicated the radius of influence of sparge wells was less than 5 meters and occurred discretely around the sparge points. The analytical results of groundwater samples collected following the application of SF<sub>6</sub> (which persists in groundwater allows the likely radius of influence which would become aerobic over time with the long-term operation of the biosparge system) exhibited detections of SF<sub>6</sub> over 50 meters away from the injection location. The average distance away from the injection point where SF was detected was 20 meters. The final results of this tracer study will be useful when determining the final placement and spacing of permanent air sparge locations.