How to Remediate a Long-Term Release of Residual Petroleum Hydrocarbons to Groundwater using a Permeable Adsorption Barrier Union Pacific Railroad Colfax Yard, Colfax, CA

David John Hodson & John Skwiot – CH2M HILL
Lauren Mancuso – Union Pacific Railroad

The Colfax Railroad Yard (site), owned and operated by Union Pacific Railroad, is located in the foothills of the Sierra Nevada Mountains 50 miles northeast from Sacramento, California. The site consists of an upper deck where the railroad and railroad operations are conducted and a lower deck, which is located at a lower elevation near a seasonal stream. The lower deck is directly hydrogeologically downgradient of the upper deck. In 2002, Bunker C fuel was observed seeping from the base of the fill between the upper and lower decks. In 2012, the source of the Bunker C fuel was determined to be from a leaking 50,000 gallon sump. As an interim remedial measure, a passive oil-water separator (OWS) system consisting of an unlined pond with an overflow to a second unlined pond, and rerouted the stream to bypass the seep. In 2008, the OWS system was upgraded to include an unlined collection pond and an Aquip®water treatment system consisting of a carbon filter chamber inside a concrete vault. Operation and discharge of effluent from the Aquip®water treatment system is being conducted in accordance with an NPDES Permit.

This presentation is an overview of the construction of a permeable absorptive barrier (PAB) wall to intercept dissolved-phase diesel in groundwater before offsite migration. Using influent and effluent diesel concentrations of 100 micrograms per milliliter (mg/L) 50 mg/L, the PAB wall design consisted of a 4-foot thick dispersion zone followed by a 2-foot thick PAB wall. The PAB wall design consisted of 80 percent sand and 20 percent granulated activated carbon (GAC). Simulations of the 100-year flood event suggest that groundwater flow velocities will likely range from 6 to 16 feet per day during such an event. The maximum daily average flow through the PAB wall was 43 gallons per minute. The modeling work suggests that higher-permeability materials would be preferable to low-permeability materials for the fill and PAB wall to reduce the chance of groundwater seeps developing upgradient from the PAB wall. Under the simulated conditions, and not considering biodegradation, breakthrough of TPH-d at concen-trations above 50 µg/L is expected to occur within 50 to 75 years after wall construction, based on uniformity of PAB wall material mixing after construction and a wall thickness of 2 feet.

In January 2015, completion of the remedial action, including construction of the PAB wall was successfully completed. Approximately 3,000 tons of impacted soil was excavated to bedrock. The remedial action was completed by installing lifts of structural fill, dispersion zone, and PAB wall. Lifts of the dispersion zone and PAB wall were installed using forms fabricated in the field. Approximately 40 tons of GAC were used during construction of the PAB Wall. The completion of the project allowed for termination of the NPDES Permit. Performance of the remedial action will be evaluated as part of the groundwater monitoring program for the site.

Photo 1- Permeable Absorptive Barrier Wall Construction, Colfax, California
Photo 2- Completed Permeable Absorptive Barrier Wall, Colfax, California