Solidification of MGP Purifier Waste above East River Sediments

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Background/Objectives. Purifier waste is iron oxide-impregnated wood chips used to scrub hydrogen sulfide and other impurities from manufactured gas and is commonly encountered at former MGP sites. Purifier waste can contain percent-level concentrations of sulfur and iron-complexed cyanides such as Prussian blue. To avoid spontaneous combustion of spent purifier waste, MGP operators sometimes placed it atop sediments in low-lying inundated areas along the edges of water bodies. The typical remedy for small quantities of purifier waste is to excavate and landfill it. But excavation and disposal was not feasible at a site adjacent to the East River in New York City where more than 100,000 cubic yards of purifier waste are present above historic river sediments across more than 10 acres of land slated for redevelopment. Instead, this project team designed the first large-scale in situ solidification remedy for purifier waste.

Approach/Activities. Using test pits and 3-inch diameter soil coring methods, the team collected purifier waste samples spanning the approximately 15 vertical feet of fill overlying river sediments at this site. The waste was analyzed for physical properties such as moisture, grain size, and organic content, and for chemical properties such as pH and cyanide content. After early ISS mix design failures, alkali demand was quantified by titration of the acidic waste with slaked lime. Quarry pond silt was substituted for bentonite to satisfy demand for inorganic fines. Underlying organic sediments were incorporated into the mix designs to mimic field-scale ISS installation conditions. Strength and permeability measurements were used to evaluate the prospective ISS mix designs. Leaching performance of the solidified waste was measured with the 1315 LEAF method.

Results/Lessons Learned. This treatability study showed how the unique physical and chemical attributes of purifier waste pose steep challenges to solidification. Physical challenges included moisture and organic contents exceeding 50 percent, and a coarse particle size with a low fraction of inorganic fine-grained material. Chemical challenges included an acidic waste capable of consuming large doses of cement to neutralize the pH. But the key challenge for ISS of purifier waste proved to be iron-complexed cyanides which, when exposed to the caustic pH of curing cement, are liberated as highly soluble ferrocyanide ions.

This presentation describes how the team overcame these challenges to produce a novel ISS remedy for purifier waste that includes the underlying river sediments and protects groundwater and surface water from ferrocyanide solubilized by the ISS reagent chemistry.