Accelerating Groundwater Remediation at the Moffett-MEW Regional Plume

A CPEO Fact Sheet

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The Moffett-MEW Regional Plume is one of the nation's larger, more complex groundwater remediation projects. (MEW stands for Middlefield, Ellis, and Whisman, the three surface streets that generally define plume boundaries south of the U.S. 101 freeway.) The plume is about two miles long and nearly a half-mile wide. Trichloroethylene (TCE), its breakdown products, and other contaminants are primarily found in the upper three aquifers, with only localized breakthrough identified in the deeper C aquifer that some distance away serves as a drinking water supply. When measured in 1982, maximum TCE concentrations in the shallow-most aquifer reached 1,000,000 parts per billion (ppb) south of U.S. 101 and 110,000 ppb at Moffett Field. The drinking water standard for TCE is 5 ppb. Fortunately, Mountain View has no drinking water wells in the shallow aquifers.

When groundwater contamination was discovered south of 101 in the early 1980s, the companies responsible for the pollution hauled away contaminated soil, initiated groundwater extraction and treatment, and built underground slurry walls to prevent contaminated groundwater from migrating away from several of the TCE source areas. The Navy removed soil and began treating groundwater soon after Moffett Field was added to the federal Superfund list in the late 1980s. In 1998 the regional groundwater extraction and treatment systems began operation.

South of 101 Regional Treatment System

Under U.S. EPA oversight and with continuing public input, the cleanup of the Regional Plume has in many ways served as a national model for environmental response. In general, the subsurface contamination was contained. Contamination levels dropped considerably. And public drinking water supplies were never at risk. By 2009, the average TCE concentration had fallen 90%, with the maximum down to 40,000 ppb south of 101 and 4,700 ppb at Moffett.

Despite its success, the groundwater treatment strategy has been expensive, wasteful, and un-ending. EPA concluded in its 2009 Second Five-Year Review for MEW and the Regional

Plume, "At several of the facilities, the remedy's cost efficiency and potential for achieving cleanup goals are decreasing with continued operation, due to decreasing influent VOC [volatile organica compound] concentrations and declining mass removal efficiency." Achieving cleanup objectives was expected to take decades or longer. Combined annual operation and maintenance costs exceed $3 million. Since much of this expenditure goes for electricity to run the pumps, the remedy also represents a growing level of greenhouse gas emissions. Furthermore, most extracted groundwater is discharged to wastewater systems or the San Francisco Bay without beneficial use. And in most cases the contaminants are merely entrapped on carbon filters, which are shipped elsewhere (such as the Colorado River Indian reservation) where thermal treatment may release hazardous byproducts into the environment.

1n 2009 EPA found that the remedy was not protective, because vapors from shallow groundwater contamination were being pulled into overlying buildings, a pathway known as vapor intrusion. Consequently, it initiated a process to accelerate groundwater cleanup. New technologies were evaluated not only to speed up the decrease in TCE contamination in shallow groundwater, but also to accomplish cleanup objectives more efficiently and sustainably.

Even before the 2009 finding, the Navy and the companies responsible for cleanup had initiated innovative groundwater remedies on a small scale. Injecting non-toxic chemicals into the groundwater to stimulate the breakdown of contamination by bacteria—a process known as *in situ* bioremediation—they achieved remarkable results in small areas. However, experts insisted that these technologies would be difficult, if not impossible to apply throughout a large plume covered with buildings and threaded with subsurface infrastructure.

In response, CPEO and its Community Advisory Board proposed that the introduction of new remedial technologies "be focused on addressing the problems that led us all to initiate the cleanup decades ago, those portions of the plume that pose the greatest risk to human health and the environment." Specifically, we suggested that the new technologies focus on the following:

- Areas with high mass
- Areas that continue to act as a source
- Areas that reduce the need for long-term Vapor Intrusion mitigation
- Where the detectable plume encroaches on residential areas, schools, and other sensitive uses
- To enable reasonable future use of the property.

Today the companies are using *in situ* chemical oxidation, the injection of chemicals to directly transform TCE and other toxic substances, at one of hot spots in the Evandale Avenue residential area. More significantly, they are planning to use innovative technologies at 401 National Avenue, in the heart of the MEW Groundwater Plume. On portions of this property TCE levels in shallow groundwater still exceed 1,000 parts per billion.

Developers are planning new office space on this property as well as adjacent properties to the north along National Avenue. After the existing buildings are demolished, the companies responsible for cleanup will inject substances into the ground to promote *in situ* bioremediation. They will then breach the slurry wall that for three decades has largely prevented the contaminated groundwater from spreading. In the opening they will install a permeable reactive barrier, a trench filled with zero-valent iron, to break down the TCE remaining in the

groundwater as it moves through the barrier. The new buildings will be designed to prevent vapor intrusion, for however long TCE remains in the subsurface.

401 National Avenue

This remedial strategy will accelerate the decline in TCE concentrations, without pumping any water from the ground. If successful, it will reduce the energy use and greenhouse gas emissions associated with the MEW cleanup. The risk of vapor intrusion to building occupants will be minimized. And at some point, the water will be drinkable.

Coordinating the new cleanup with construction will be challenging, but it can be done. It is CPEO's hope that the accelerated cleanup of this section of the Regional Plume will serve as a local and national model for harnessing innovative technologies to improve the cleanup of complex groundwater contamination sites where historic remedies are losing their effectiveness.

For more information on *in situ* bio remediation, *in situ* chemical oxidation, permeable reactive barriers, and groundwater extraction, see
http://www.cpeo.org/techtree/ttdescript/ensolmx.htm
http://www.cpeo.org/techtree/ttdescript/isco.htm
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