A Tale of Two Semiconductor Cities:
Why It Took So Long to Investigate Vapor Intrusion in Phoenix

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The other day I received a phone call from a TV reporter in Arizona. He asked me why it took so long for regulatory agencies to launch a vapor intrusion investigation near the Motorola 52nd Street Superfund site in Phoenix. I had visited this site a month earlier, conducting a community workshop on vapor intrusion, and I had been ready to write a report asking why such an investigation had not been undertaken. But at the meeting where I presented, officials from U.S. EPA Region 9 announced that they had launched such an investigation. The technical experts advising the study were the same people who have been supporting the vapor intrusion investigations in my community of Mountain View, California, since 2002, so the announcement came as a great relief.

But the reporter's question is still valid. Comparing Mountain View and Phoenix, this appears to be a serious instance of *environmental injustice*. Mountain View, in the heart of Silicon Valley, is a diverse but highly educated, relatively affluent, and empowered community. The population of Phoenix above the Motorola plume is predominantly Latino, lacking—on average—the education, wealth, and power of Mountain View residents.

Former Motorola plant as seen from Lindon Park Neighborhood, Phoenix, Arizona

In the early 1980s, contamination at a south San Jose, California semiconductor plant owned and operated by Fairchild Semiconductor prompted regulators to require electronics manufacturers throughout Silicon Valley to test their underground storage tanks, adjacent soil,

and groundwater. Most of the tanks had leaked, and the supposedly clean semiconductor industry turned out to be responsible for perhaps the greatest concentration of TCE plumes in the country, including a large one at the birthplace of the commercial semiconductor industry, about a mile from my house in Mountain View. Defined by the three surface streets that parallel its boundaries, it is known as the Middlefield-Ellis-Whisman (MEW) Superfund Study Area. The plume from MEW flows under Bayshore Freeway, merging with contamination from Navy and NASA sources at Moffett Field, a former Naval Air Station now primarily operated by NASA's Ames Research Center. Nearby are the former GTE military electronics plant, where an award-winning transit-oriented development was built in the 1990s, and the recently demolished Orion Park military housing area, both of which have smaller TCE plumes.

Former GTE plant, Mountain View, California

Phoenix-based Motorola Semiconductor, one of the two early major chipmakers not based in Silicon Valley, turned out to have similar problems. In 1982 it discovered that volatile organic compounds had leaked from its underground storage tanks, and the plant was first proposed for the "Superfund" National Priorities List in 1984. Its seven-mile-long plume, boosted by releases from other companies, is larger than any groundwater contamination site in Silicon Valley. Its maximum TCE level of 1,470,000 parts per billion (ppb), reported in 1983, is to my knowledge larger than any sampling result in Silicon Valley. The principal responsible party is Freescale Semiconductor, which took over the plant from Motorola, but the plant is now operated by ON Semiconductor.

State and federal regulators directed extensive cleanups in both areas, focused on protecting local groundwater. But in 2002 EPA Region 9, covering the Pacific Southwest as well as Pacific islands, joined EPA nationally in considering the risks posed by vapor intrusion, the migration of TCE and other volatile organic compounds from the subsurface into overlying

buildings. In October of that year, it sent letters to the MEW responsible parties ordering them to undertake, under EPA supervision, an evaluation of the "groundwater to indoor air pathway." In January 2003, EPA released a fact sheet describing four vapor intrusion investigations in Mountain View, inviting the public to a community meeting.

Three to four hundred people, a majority of whom were residents of the former GTE site, showed up, reinforcing EPA's decision to make Mountain View a test case for its new vapor intrusion strategy. The MEW vapor intrusion project is one of the largest and most complex in the country, involving a mix of over 130 occupied commercial buildings, 80 private residences, 14 multi-unit military housing buildings, and a planned university campus at Moffett Field. EPA did not issue a Proposed Plan until July 2009, but the responsible parties implemented mitigation as soon as evidence of vapor intrusion was found at any building.

The GTE investigation proceeded faster, largely because the TCE plumes there were weaker and localized. Despite an unusually protective detection limit, prompted by EPA's briefly proposed TCE screening level of .017 $\mu g/m^3$, only one home was found to require mitigation (depressurization). Conceivably a few other homes would have needed mitigation, but the owners did not agree to have them tested. After a few years, the focus shifted to completing the cleanup of source areas, and neighborhood interest declined.

The Motorola 52nd Street site was also on EPA's radar screen at this time. By January 2004, Region 9 had placed it among 14 Superfund sites considered "High Priority Sites for Expedited Review." And well it should have. Hundreds, maybe thousands of homes sit over the TCE plume. Recent deep, bedrock aquifer samples show TCE levels as high as 610,000 ppb near the factory's fenceline with the Lindon Park neighborhood, but concentrations in the upper, alluvial aquifer measure in the low thousands, with one sample reaching 2,800 ppb. In 2003 a new elementary school opened less than a half-mile from the plant, near some of the highest alluvial aquifer TCE concentrations, with no reported vapor intrusion assessment or response.

New elementary School above the Motorola Phoenix plume

But no action was taken. Though on EPA's Superfund list, the portion of the Motorola site nearest the plant was under the lead jurisdiction of the Arizona Department of Environmental Quality. The newsman who called me reported on the air, "Public documents show ADEQ discussed a vapor intrusion study in 2004 but never followed through. 'Folks felt that the appropriate experience was not available to do this type of study properly,' said ADEQ spokesperson Sherri Zendri."

I first learned about the oversight in oversight in Phoenix in March 2008. I was organizing a panel of representatives from vapor-intrusion-impacted communities for an EPA workshop in San Diego. An EPA Community Involvement Coordinator recommended as a presenter Mary Moore, Vice-President of the Lindon Park Neighborhood Association and manager of its EPA Technical Assistance Grant. Mary explained to the roomful of engineers and other consultants and officials that ADEQ was not moving forward with a needed vapor intrusion investigation, reporting the official ADEQ explanation that U.S. EPA had not finalized its official guidance! Mary repeated this at a similar forum in Philadelphia in January 2009. Still there was no action, but EPA officials apparently were listening and figuring out what to do.

Moore presents in San Diego, March 2008

Finally, in early February 2010, while I was in Phoenix, EPA Region 9 announced that it was taking over the investigation and moving it forward. It handed out a January 28, 2010 review of a vapor intrusion study work plan prepared for Freescale Semiconductor in August 2004! The first steps will include door-to-door outreach and soil gas sampling.

EPA deserves credit for finally taking on this investigation, which *might* surpass Endicott (NY), Pompton Lakes (NJ), Dayton (OH), and Denver (CO)—the Redfield plume—to become the community requiring the greatest number of residential mitigation systems. However, no one

will know if there is an indoor air problem in Phoenix until sampling is undertaken. Region 9 has honed its skills here in Mountain View over the past seven years, so I expect it to do an effective, conscientious job.

Why did it take so long? The superficial explanation for the delay in Arizona is that the state of Arizona does not have a vapor intrusion program, but one cannot rule out the conclusion, offered by the reporter from KPHO-TV news, that the residents of Lindon Park and other downgradient neighbors would have received more prompt protection had the demographics been different.