

Off-Post Contamination a Serious Concern at Ft. Gillem, Georgia

By Lenny Siegel
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Known by various names since its creation in 1842, Ft. Gillem, Georgia was a center for the “procurement, storage, distribution, maintenance, and disposal of military equipment and supplies.” It sits in Clayton County, just east of Atlanta’s busy airport. As a result of the 2005 base closure round, most of Ft. Gillem was shuttered in 2011. The city of Forest Park’s Urban Redevelopment Agency is slated to receive 1169 acres. The remaining 257 acres, the Ft. Gillem Enclave, remains an active Army installation under the control of Ft. Gordon, in Augusta, Georgia.

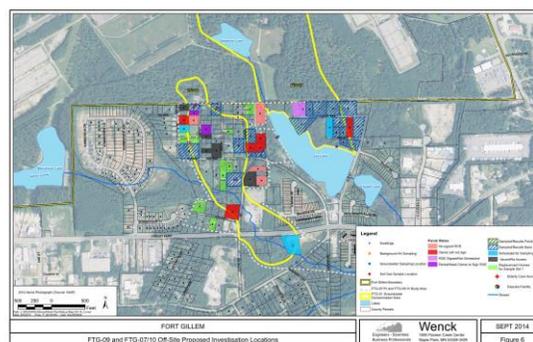
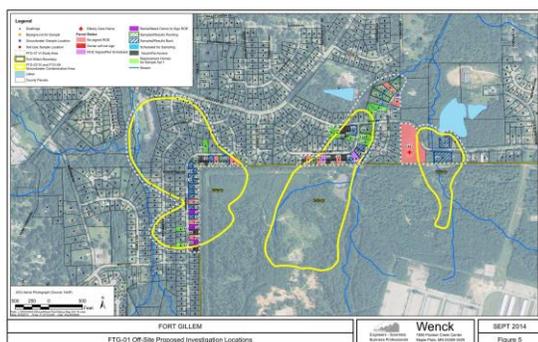
The Redevelopment Agency plans to bring in nearly 3,000 jobs by establishing commercial distribution operations, to take advantage to the Norfolk Suffolk rail lines, an office park, and a manufacturing center. It considers the Army responsible for addressing the contamination it is leaving behind but it has entered the property into the Georgia Voluntary Brownfields Program. Approximately four hundred acres were not included in the initial land transfer in 2014 due to environmental contamination.



**Home on Ft. Gillem boundary
with what appears to be a treatment facility beyond fence line**

Ft. Gillem has several active contamination sites, including landfills and other burial sites. Those sites are the sources of three groundwater plumes emanating from the northern boundary of the closure property; two plumes coming from the southern edge; and two more flowing from the Enclave. In addition, there are numerous streams, springs, and at least one major lake impacted by subsurface contamination from the former fort. The contaminants of concern include solvents such as trichloroethylene (TCE), perchloroethylene (PCE), and 1,1,2,2 tetrachloroethane (TeCA) as well as petroleum hydrocarbons such as trimethylbenzene. Most of the TeCA appears to have been released as the result of the 1946 decontamination of a leaking German mustard agent bomb buried briefly at Ft. Gillem after it was found leaking in a rail car transiting Atlanta.

Since at least as early as 1979, the Army has been investigating soil, sediment, surface water, and groundwater contamination on the northern side of the base. By 1992 it discovered groundwater contamination beyond the fence line. In 1994 it provided connections to the municipal water supply for homes with impacted production wells. The Army discovered off-site contamination at the southern boundary several years later, and in 2009 it began groundwater treatment on both sides of the installation.



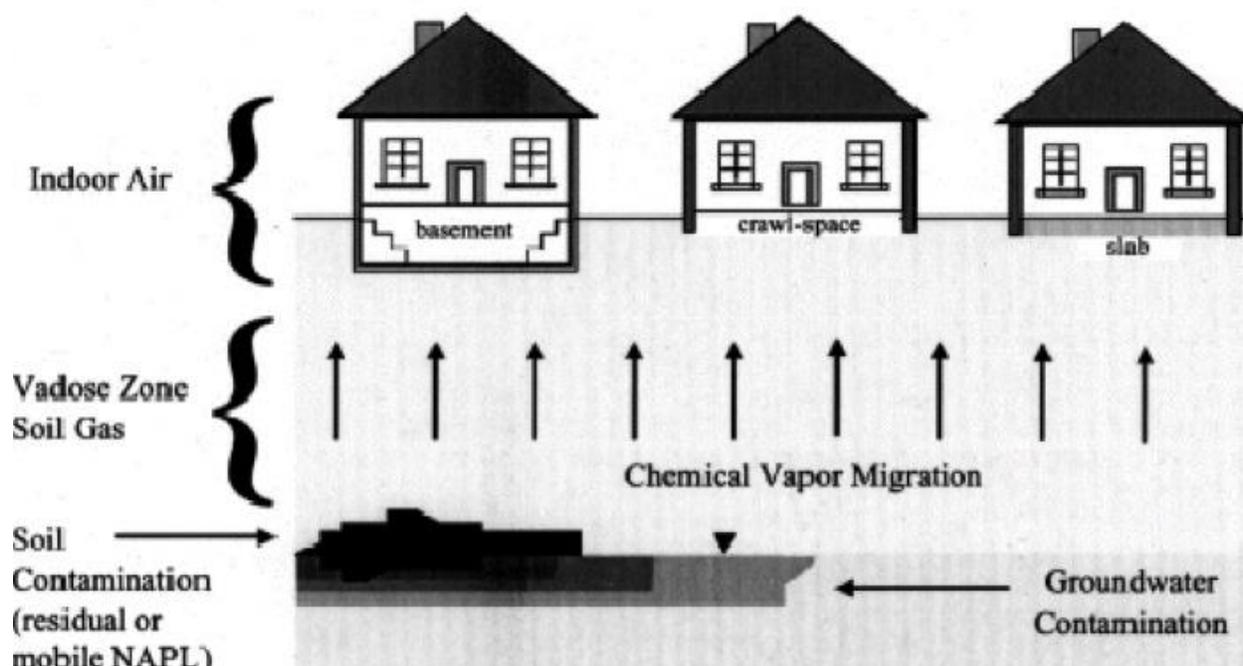
Maps showing sampling plans for northern (on left) and southern plumes

Vapor Intrusion

However, despite the documentation of volatile organic compounds in off-site groundwater and soil gas, the Army did not undertake a vapor intrusion investigation even as both civilian and military facilities across the country recognized the significance of this direct pathway, in which toxic volatile compounds migrate from the subsurface into overlying buildings.

It wasn't that the Army was unaware of the threat. In 2003, the Army asked the federal Agency for Toxic Substances and Disease Registry (ATSDR) to review the draft scope of work for its investigation at one of the southern boundary plumes, "FTG-09." In January, 2004 an ATSDR toxicologist wrote:

ATSDR is in support of field evaluations designed to determine if persons near the groundwater plume have a vapor intrusion problem. The last round of groundwater sampling conducted in October 2003 indicates significant concentrations of volatile organics that could result in vapor intrusion and subsequent exposure to people in residential properties near the site, given their close proximity to FTG-09 and the shallow depth to groundwater.



Vapor intrusion can occur in buildings with basements, crawlspaces, or slabs on grade

Only in 2013, under pressure from state environmental regulators and U.S. EPA, did the Army contract for a vapor intrusion study, releasing its Final Vapor Intrusion Study Work Plan in June, 2014. The work plan itself is a robust document. The Army agreed to start indoor air testing at as many as 92 homes, if authorized by their owners, in the summer of 2014. It would re-test those homes in the winter (January, 2015), and the Army would sample a second set of homes at the same time. It would re-test Set 2 in the summer of 2015. In addition, it would sample soil gas at two depths, subslab, or crawlspace vapors and nearby outdoor (ambient) air.

Equally important, the Army promised to install and operate mitigation systems in buildings where vapor intrusion brought indoor air contamination above action levels based upon EPA toxicity assessments. It agreed to initiate mitigation within 21 days of receiving such sampling results and to notify property owners within 72 hours. The most common form of mitigation is called active depressurization technologies (ADT) or substructure mitigation, in which piping and fans are used to create a vacuum within the crawlspace or below the slab of a building. As a result, any vapor flow is downward, protecting building occupants from volatile compounds in the subsurface. This method, developed to protect against radon intrusion decades ago, is a highly protective strategy for managing risk if it is implemented properly and continued for the life of the contamination.

Results but No Mitigation

The initial results, made available on August 4, 2014, showed that 26 of 29 homes had contamination (mostly trimethylbenzene) levels high enough to require mitigation. But a month passed and the Army did nothing to initiate mitigation, and it failed to pass along the results to

residents. It claimed that the indoor air contamination derived from indoor or outdoor sources, not the subsurface. This is plausible. In fact, there were a few homes where an indoor or crawlspace source was identified. But the *prima facie* evidence suggested vapor intrusion for most of the homes with exceedances. U.S. EPA later wrote:

The sampling data presents the classic pattern of vapor intrusion from a subsurface source with the same contaminants that are known to have been released by past Army disposal activities. These sampling data demonstrate that the levels present inside the homes are above the levels that the Army itself agreed, in its 2014 Superfund response plan, would require prompt action.

In the face of Army inaction, Georgia's Governor Nathan Deal wrote the Army on September 4, 2014 "I expect the Army to honor its previous commitment to install mitigation systems in all Tier II homes or buildings within 21 days of receiving sampling results..." Two weeks later EPA Assistant Administrator (for the Office of Solid Waste and Emergency Response) Mathy Stanislaus backed the state, noting that at least 22 homes required mitigation, and that the Army had "notified only six households of the analytical results even though the data is available for 37 homes." Later, in January, 2015 the *Atlanta Journal-Constitution* reported, "At least 52 homes recorded high enough levels of toxic fumes to require mitigation under the agreement between the Army and state environmental officials ..."



Ft. Gillem active Army enclave

As the results continued to trickle in, the Army defended its position. Deputy Assistant Secretary of the Army Hershell "Hew" Wolfe wrote the Governor, stating:

Where appropriate, the Army would install a mitigation system in buildings to address vapor coming from a groundwater plume. However, this type of system will not protect residents whose indoor air quality issues are caused by sources located inside the homes or attributed to regional air quality.

Except for a few homes where indoor sources have been identified, the Army did not present conclusive evidence to back its assertion that little of the indoor contamination is coming from the subsurface, but it hired a new consultant better able to ask that question. In the fall and winter (January 2015) the new consultant conducted additional tests designed to help determine the sources of contamination.

Frustrated by the Army's inaction, EPA—with support from the Georgia Environmental Protection Division (EPD)—issued a Section 7003 Unilateral Administrative Order (UAO) under the Resource Conservation and Recovery Act (RCRA) on September 24, 2014. The order requires, among other actions, that the Army initiate mitigation measures within seven days of the order's effective date.

In December, with the threat of the EPA order hanging over it, the Army agreed to interim mitigation of 16 homes and the possible interim mitigation of four more homes after sampling with a real-time sensing device. In this case, interim mitigation refers to the placement of two carbon air filtration systems in each home where the owners grant permission. The advantage, from the Army's perspective, is that the filters can be removed if additional study proves that the chemicals measured in indoor air come primarily from indoor or outdoor sources.

In theory, indoor air filters can cleanse the air, but they are unusual and, in my opinion, unproven for addressing vapor intrusion. The one site where I've reviewed their use is the Old Navy Mill in Dracut, Massachusetts, where there was a youth indoor baseball practice facility. (See <http://www.cpeo.org/pubs/DracutVI.pdf>.) In Dracut the filters appeared ineffective or even counterproductive.



The Army has provided mitigation at the Pride and Joy Learning Academy.

At one location near Ft. Gillem, however, the Army has been more responsive: the Pride and Joy Daycare Learning Academy, situated near the edge of the southern plume (FTG-09). The Army has reportedly installed both indoor air filters and a subslab depressurization system, in recognition of both the continuing presence of young children and summer TCE detections in the indoor air and subslab, even though the indoor readings were under half the agreed action level.

Trimethylbenzene

Part of the problem is that it is unusual to find vapor intrusion, at a level requiring a response, where trimethylbenzene is the principal contaminant of concern. (I lump the two primary forms [isomers] of trimethylbenzene together because they behave similarly and do not appear to have distinct toxicological consequences.) Trimethylbenzene is used as a fuel additive, a solvent, and a manufacturing feedstock. Army documents don't show it as a contaminant of concern at every plume, but it's unclear to me whether that means it did not find the compound or just didn't look.

It's conventional wisdom that petroleum hydrocarbons such as trimethylbenzene rarely pose a vapor intrusion threat because they tend to break down as they approach the oxygen-rich surface from below. But the evidence at Ft. Gillem is that it has been found in the groundwater, soil gas, and indoor air at the same locations. It may be that trimethylbenzene does not break down as readily as other petroleum hydrocarbons, particularly when it occurs in a "soup" of other, more degradable volatile organic compounds.

Thus far, no one has identified alternate sources of trimethylbenzene for most of the homes with indoor vapor exceedances for that compound.

Trichloroethylene

Trichloroethylene, on the other hand, was one of the contaminants that led to the vapor investigation in the first place. Nationally, it's probably the top contaminant at confirmed vapor intrusion sites. In August the Army found TCE in several homes. Though regulators initially reported that in the summer, 2014 sampling round it was never detected over the $2 \mu\text{g}/\text{m}^3$ (micrograms per cubic meter) health standard. I have found data that seems to show one home, above the large southern groundwater plume, at $2.9 \mu\text{g}/\text{m}^3$. If the TCE is coming from below, it's likely that there will be more exceedances during the winter round of testing. Additionally, TCE has been found at $2 \mu\text{g}/\text{m}^3$ in outside air near some of the impacted homes.

That TCE health standard, $2 \mu\text{g}/\text{m}^3$, is the threshold at which EPA believes that TCE can trigger cardiac birth defects among the offspring of women exposed for a comparatively short period of time during the first trimester of pregnancy. In a July 2, 2014 Technical Memorandum, the Army accepted that standard, agreeing to take immediate action if "sensitive residents" (women of child-bearing age) are identified. I have seen no reports on whether any women of child-bearing age reside in the home with the exceedance.

Since the sampling also found TCE in the outdoor air, it is possible that at least some of the indoor TCE might be coming through the doors and windows. EPA asked—indeed, it

ordered—that the Army investigate groundwater treatment systems and surface water sources—springs, streams, and lakes—to determine if they are releasing TCE into the air. If so, then the Army will need to capture or contain TCE by using a means other than depressurization (mitigation).

In late October, the Army's new consultant proposed additional ambient air investigations in some areas. EPA agreed:

The source of TCE in outdoor air must be located and addressed in order to address TCE in indoor air. As previously agreed and included in the path forward document, the emissions stack of the on-site treatment system is a possible source of TCE in outdoor air. In addition, there are a number of springs in the area...



2002 investigation at FTG-09

Rocket Science

In my “Vapor Intrusion 101” workshops for lay community members, I often say vapor intrusion is rocket science. But members of my own community who are real rocket scientists have trouble understanding it too. It is not only difficult for lay people to understand, but even the top scientists who study it are still discovering important new information.

The current standard method for evaluating vapor intrusion is called “multiple lines of evidence.” Typically one samples groundwater, soil gas, either subslab soil gas or crawlspace vapors (depending up whether there is a slab on grade or a crawlspace), indoor air, and ambient (outdoor) air to determine whether vapor intrusion is occurring. If substructure (groundwater, soil gas, or crawlspace) levels are low, the contamination might have an indoor source. If concentrations are high in the outdoor air, then indoor air contamination may simply be the result of outdoor air entering the building.

Both the timing and location (in three dimensions) of the sampling can significantly influence results. Thus, even if sampling is conducted properly, results are often confusing. For example, some of the Ft. Gillem sampling results show low or even non-detected levels of contamination in the groundwater in areas historically identified based upon past sampling in the same area, as part of the groundwater contamination plumes.

Evaluations often depend upon an attenuation factor, the ratio of contaminant concentrations in the indoor air to other metrics, such as contaminant concentrations in soil gas. That ratio is a function of the particular contaminants of concern, the characteristics of the soil, and the pathways into the building from the subsurface. The attenuation factor typically ranges from 1/10 to 1/10,000. Thus, indoor air concentrations caused by vapor intrusion are usually a small fraction of the subsurface vapor concentration. Furthermore, if the source of indoor air contamination is volatilization from underlying groundwater, then concentrations typically decline as they approach the surface. Petroleum hydrocarbons typically degrade as they come into contact with oxygen from the air, so their concentrations decline (attenuate) more than chlorinated compounds such as TCE.

As an example of how such evaluations occur, where soil vapor concentrations directly under a building are no higher than concentrations of the same compound indoors, that suggests that vapor intrusion is not the principal source of indoor air contamination. Or if one compound appears to attenuate less than a second compound in the same location, that suggests an indoor source for the first compound.

If an initial evaluation of the multiple lines of evidence do not make it clear where the source is (indoors, outdoor, or subsurface), then one can use “forensic” strategies such as real-time sampling, pressurizing the building before sampling, or stable isotope analysis. The Army’s new consultant is likely using one or more of these approaches.

EPA has concluded that vapor intrusion, causing indoor air contamination at levels

exceeding agreed-upon health-based standards, is occurring at many homes adjacent to Ft. Gillem because the same contaminants—two isomers of trimethylbenzene—are found in the subsurface and indoor air, but not in the outdoor air. It explained:

Using the current data set, including indoor air, outdoor air, crawlspace air, subslab, air and soil gas, it is possible to differentiate indoor air sources originating from household products from vapor intrusion of contaminants originating from the subsurface for most of the buildings in the study. Indoor air sources of contamination are readily identified by the pattern of detection (i.e., contaminants [are] found in indoor living spaces without a corresponding detection in crawlspace or subslab, and [no] presence in the subsurface), and the type of contaminant (i.e., common household product ingredients such as isopropyl alcohol, naphthalene, acetone, etc.).

The Army counters that trimethylbenzene is sometimes found in soil gas but not in the underlying shallow groundwater. It also argues that the levels of trimethylbenzene vapors in the subsurface are not sufficiently higher than those in the subsurface to prove that vapor intrusion is occurring. It points out that at some locations TCE attenuates between deep soil gas sampling locations and shallow soil gas probes in the same position, but trimethylbenzene does not. That would suggest that shallow soil gas contamination is not coming from the underlying groundwater, but instead from a surface release (such as a spill) or lateral movement (diffusion) of trimethylbenzene gas from a nearby source. To evaluate lateral diffusion, in the fall of 2014, the Army collected additional soil gas samples in the residential areas closest to the Fort boundary.

I have not seen all the data nor have I heard all the arguments between the regulators and the Army, and I have less formal expertise than the people drawing conclusions for the agencies. Furthermore, much more data should soon be available. So I am not going to opine which experts are correct. I do believe, however, that the regulators were correct to believe that vapor intrusion was a likely explanation of initial sampling results, and that the Army dismissed that interpretation without sufficient evidence. But as new data becomes available, and as the Army's new consultant conducts investigations designed to distinguish subsurface vapor intrusion from indoor-source contamination, it may turn out that the Army was right about at least some of the buildings.

Final Order

On December 29, 2014 after a series of technical meetings between the regulators and the Army, EPA finalized the order. It became effective on January 5, 2015. Cynthia Giles, EPA Assistant Administrator for the Office of Enforcement and Compliance Assurance, wrote, "the Army's actions to date under [its own July 2014 response plan] have not been sufficient or timely enough to protect residents who are still exposed to dangerous levels of vapors." She explained, "While the Army has recently indicated it would install temporary air filters in a limited number of the affected homes, this very limited response is not sufficient to address the immediate health concerns."

EPA also addressed the outdoor air investigation:

The Army's letter states that the UAO "establishes requirements for investigating or

responding to elevated ambient air levels that are unrealistic or inappropriate.” The Army also claims that CERCLA and EPA guidance use ambient air data only to evaluate background conditions. Finally, the Army takes issue with EPA's view that “springs, ditches, creeks, streams and lakes will cause ambient air concentrations to exceed risk based levels.” EPA disagrees on all counts.... Army statements during the [October 31] conference and in written material suggest potential community-wide air quality problems and an assertion that EPA expects the Army to address regional air quality matters unrelated to site sources. This is not the case.

EPA notes that TCE elevations in outside air are localized to two discrete areas, and it argues:

The Army has suggested that the Hartsfield Jackson International Airport, located seven miles west of Ft. Gillem, may have caused or contributed to trimethylbenzene, a fuel-related contaminant, in ambient air in the study area. The Army's outdoor air data set demonstrates, however, that trimethylbenzene is not present in outdoor air on a community-wide basis in the study areas.



Joy Lake, just south of Fort Gillem

On January 12, the Assistant Secretary of the Army (for Installations, Energy and Environment) Katharine Hammack responded, arguing that its activities under CERCLA (the Comprehensive Environmental Response, Compensation, and Liability Act, the Superfund law), under which it serves as the Lead Agency, satisfy its RCRA obligations. The Army questioned whether indoor air contamination resulted from the Army's past release of hazardous substances, and Hammack stated:

We have demonstrated this commitment [to CERCLA remediation] through the actions we have taken to address the vapor intrusion resulting from past Army activities that

could pose an unacceptable risk to the citizens of Forest Park, Georgia.... The Army continues to believe there is common ground between the ongoing CERCLA response and the RCRA UAO, and will continue to focus on how to modify or accelerate these ongoing CERCLA actions such that they meet the substantive requirements of CERCLA and the UAO.

Much of Hammack's letter and the accompanying memo address technical disagreements over the sources of contamination, but underlying the Ft. Gillem dispute is a decades-long contest between the Defense Department and regulatory agencies: Who has the final say in guiding cleanup decisions? Each time there is a dispute, all parties' lawyers consider how its disposition will affect the resolution of future differences.

The Army, while continuing the vapor investigation on its own terms with some concessions to the regulators, is not accepting EPA's authority. Even though, in my view, EPA clearly has the legal authority to issue such an order to another federal agency, even though government lawyers say it does not have the power to take the Army to court because they are both part of the same Executive Branch of government. This is called the Unitary Theory of the Executive. However either the State of Georgia or a non-governmental organization can go to court to enforce the EPA order, and it's my understanding that this may happen if the dispute between the regulators and the Army continues.

Community Engagement

The Ft. Gillem experience illustrates some of the challenges of engaging the public at vapor intrusion investigation sites. As far back as 2004, the same ATSDR toxicologist who warned of vapor intrusion told the Army that the public needed more information:

From my perception of the situation at Fort Gillem, there appears to be a lack of adequate public information about the off-site contamination South of Ft. Gillem. Adequately informing the public should be an important priority for the Army to undertake in fulfilling its duty to protect the public.... Given the anecdotal reports of cancer and illness in the neighborhood it is advisable for the Army to promptly hold a public meeting to inform nearby residents of current conditions, potential problems including the degree of exposure to off-site contamination and potential for health impacts, and steps the Army is taking to rectify the situation. In addition, ATSDR recommends actions appropriate to inform persons who cannot or are not likely to attend a public meeting and who may not read flyers delivered to their house.

The Army has reported that it found insufficient community interest to form a Restoration Advisory Board (RAB) in 1993, 1998, 2001, 2007, and 2009. Twenty-five people attended a public meeting in 1994, but no one showed up for a bus tour in 1997. Even after vapor intrusion became a concern, public interest seemed limited. In October 2014, when the Army organized two poster sessions in cooperation with the city of Forest Park, only a handful of people attended.

But reporters easily found that at least some of base's neighbors are very concerned. "We don't feel safe here," Chad Partin told Atlanta Public Radio in December. His wife and 4-year-old son were staying part of the week at his mother-in-law's home in Newnan. He added:

I have a four-year-old son. I'm concerned everyday of him sleeping here and what kind of things it's doing to his body. My wife has constant headaches. My dog has a growth on the side of her head. Those may not be anything attributed to this kind of this stuff, but who knows.

The radio station also reported:

The home Susan Martin-Morgan was renting tested positive for toxic vapor this past summer.... But the Army recently told Martin-Morgan its initial testing doesn't show the military is to blame for the toxic vapor within her home. Martin-Morgan doesn't think that's the case. And because she was worried for her health, she packed up all of her belongings and moved out of her home.

The Atlantic Journal-Constitution also found mistrust when it interviewed base neighbors: "The more I know about this, the more frustrated I become," said Allen McKinley, who has lived in his home near the base for 28 years. "The fact that they knew about this decades ago and this is only happening now? That bothers me."

While in the past people may have been disinterested in Army events because they didn't know about the risks to their homes and families, more recently *mistrust* appears to have kept them away. At an April 12, 2014 community meeting sponsored by non-profit Greenlaw, one resident explained, "I am frustrated that nothing has come of the interest in our community and the interviews. Officials drill holes all around [our] neighborhood, but don't share results."

On December 7, 2014, when Greenlaw, the Clayton County NAACP, local elected officials, and experienced local activists hosted a workshop, which I led, on vapor intrusion, about 80 community members showed up. While some lived in homes tested in Set 1, many lived near the vapor intrusion study area, and they wanted to know if they might be impacted.

It's easy to say the Army should have put more effort into community involvement. Indeed, it should have. But to generate genuine community interest, it takes more.

People have to know that the contamination and proposed response will affect their lives or their property. They need to know that there will be an effort to explain the situation in terms that they understand. And they should be given some hope that by becoming engaged they will be better served by the government agencies making the decisions. Without such an effort, many communities, particularly those that have historically been disempowered and/or have a low level of technical literacy may appear apathetic. However, given proper attention and support, they are usually as engaged and intelligent as those that organize themselves from the start.

Workshop sponsors, particularly the NAACP, made that clear, and they did more. NAACP volunteers directly called community members, urging them to attend. The meeting was held at a convenient time (late on a Sunday afternoon) at a storefront church. The lesson is not that the Army or the regulatory agencies try to replicate what the NAACP accomplished, but that they should work with community-based organizations such as the NAACP when they need to reach out to a community. The Army will not easily earn the respect of its neighbors, the way the NAACP does, at a site where it is responsible for several large contamination plumes.



December 7, 2014 community meeting

People at the workshop were hungry to learn about the contamination, to understand how vapor intrusion works, and whether their homes were in the area of the groundwater plumes. Workshop organizers are seeking funding for continuing community engagement activity, and they are planning to seek formation of a Restoration Advisory Board. Experience elsewhere shows that a RAB, with a small number of community members, can serve as a bridge between the agencies and the community. By meeting regularly, with official Army sponsorship, they can absorb technical information and provide input to the decision-makers. With government-funded technical assistance, the RAB can become a constructive partner with the agencies, ensuring that the vapor intrusion response and other cleanup activities at Ft. Gillem serve the impacted public.