Health Consultation

Indoor and Outdoor Air Data Evaluation of Chillum Perc Site

CHILLUM PERC SITE
(A/K/A CHILLUM PERCHLOROETHYLENE)

CHILLUM, PRINCE GEORGE COUNTY, MARYLAND

EPA FACILITY ID: MDN00305887

DECEMBER 29, 2008

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared By:

U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

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Summary and Statement of Issues

The U.S. Environmental Protection Agency (EPA) Region III asked the Agency for Toxic Substances and Disease Registry (ATSDR) to review air data collected under the auspices of the District of Columbia Department of Health (DCDOH) during June to September 2006 and February 2007 at the Chillum, Maryland perc (perchloroethylene or perc) site.

The Chillum perc site consists of a mixed gasoline and perc contaminated groundwater plume near the intersection of Riggs Road and Eastern Avenue in Chillum, Maryland. The contaminated groundwater underlies a neighboring residential community in Washington, DC. Since 1990, numerous environmental investigation, remediation, and assessment activities have been conducted at the site. Residents in the area are served by a public water supply unaffected by the contamination at this site. Vapor intrusion (the migration of volatile organic chemicals from the groundwater and soil contamination through the pore spaces of soil into buildings above) is the primary exposure pathway of concern for the site. In 2004, ATSDR released two health consultations that reviewed soil gas, indoor air, and other environmental data to address this issue.

This is the third ATSDR health consultation for the site to evaluate the public health implications via the vapor intrusion pathway. Based on air sampling data collected during summer 2006 and winter 2007, ATSDR concludes that all indoor and outdoor air volatile organic compound (VOC) concentrations detected at the site are at levels not expected to cause adverse, cancer or non-cancer health effects for acute, intermediate, or chronic exposures. ATSDR categorizes this site as No Apparent Public Health Hazard for exposures to reported VOC levels. This means human exposure to contaminated indoor air could be occurring, could have occurred in the past, or could occur in the future at the reported VOC levels, but such exposure is not expected to cause any adverse health effects. On April 9, 2008, ATSDR released this heath consultation for public comment. Community members and District of Columbia Department of Health (DCDOH)/District of Columbia Department of Environment (DCDOE) provided comments during the public comment period. In response to these comments, ATSDR incorporated additional chemical specific information and analyses into this final document. As a result of community requests, ATSDR included a review of available cancer information for the District of Columbia as a whole, and asthma data for the Ward and zip code that include the site area. The responses to all of the submitted public comments are shown in Appendix A. The specific comments ATSDR received from the DCDOH/DCDOE are included as Appendix B, while all other public comments are summarized without identifying the individual authors.

To date, ATSDR has reviewed results from approximately 258 soil vapor samples, 178 indoor air samples, and 37 outdoor air samples for this site. Overall, all detected VOCs are in the low part per billion (ppb) range and do not appear to have significant differences among the sampling data sets from 2003, 2006, and 2007. Taken together, these data sets represent a thorough evaluation of environmental conditions relevant for public health exposures at this site. All of the data sets reviewed to date support ATSDR's overall conclusion that all indoor and outdoor air VOC concentrations detected at the site during the vapor intrusion investigations from 2003 though 2007 are unlikely to cause adverse, cancer or non-cancer health effects for acute, intermediate, or chronic exposures.

Background

The Chillum Perc site is located near the intersection of Riggs Road and Eastern Avenue in Chillum, Maryland. A contaminated groundwater plume, consisting of gasoline and perchloroethylene (perc), underlies portions of the Lamond-Riggs Park community in Washington, D.C. The gasoline plume is a result of a gasoline release at a service station in Chillum, MD; the source(s) of the perc contamination have not been definitively identified. Since 1990, numerous environmental investigation, remediation, and assessment activities have been conducted at the site. In March 2003, EPA Region III asked ATSDR to review soil vapor and preliminary indoor air sampling data. In January 2004, ATSDR released a health consultation that categorized the Chillum Perc site as an Indeterminate Public Health Hazard because of limited indoor air data. The major findings of the January 2004 health consultation included:

1. The perc soil vapor concentrations ranged from nondetect to 4,600 microgram per cubic liter ($\mu g/m^3$) or 678 part per billion (ppb). The average concentrations for shallow-soil vapor samples and deep-soil vapor samples were 313 $\mu g/m^3$ (46 ppb) and 457 $\mu g/m^3$ (67 ppb), respectively.
2. Benzene soil vapor concentrations ranged from non-detect to 160 (50 ppb). The average concentrations for shallow- and deep-soil vapor samples were 21 $\mu g/m^3$ (7 ppb) and 53 $\mu g/m^3$ (17 ppb), respectively.
3. Methyl tertiary butyl ether (MTBE) soil vapor concentrations ranged from non-detect to 3,788 $\mu g/m^3$ (1,050 ppb). The average concentrations for shallow and deep soil vapor samples were 37 $\mu g/m^3$ (10 ppb) and 148 $\mu g/m^3$ (41 ppb), respectively.
4. Six volatile organic compounds (VOCs) were detected at very low levels and below their respective comparison values (CVs) in the indoor air samples.

ATSDR recommended taking additional indoor air samples in the community to verify the indoor air contamination at the point of exposure [ATSDR 2004a].

From July 2003 through September 2003, EPA collected additional indoor air, soil vapor, drinking water, and groundwater samples around the Chillum Perc site. ATSDR reviewed the additional environmental data and released a second health consultation in November 2004 with the following conclusions [ATSDR 2004b]:

1. All indoor air VOC concentrations detected at the site related to groundwater plume vapor intrusion investigations are at levels unlikely to cause adverse, noncancer health effects for acute, intermediate, or chronic exposures.
2. Conservative cancer risk assessment indicates that residents who have a continuous lifetime exposure to the highest levels of chemicals (most of them are not related to the gasoline or perc plumes) observed at this site may have a slight increase in the risk for developing cancer. Nevertheless, because very conservative assumptions were used for risk evaluation and because of the small population of the community (i.e., about 500 houses, 1,200 people), any increase in the number of cancer cases in the community is unlikely.
3. There was no substantial correlation between soil vapor and indoor air concentration of

perc. The limited available data indicated soil vapor intrusion is either not occurring, or occurring at de minimus rate that poses no adverse health effect in the community.

4. No site-related contaminants were detected in residential drinking water samples. All detected VOCs in drinking water are trihalomethanes (THMs). The total THM concentrations in the drinking water samples are below the maximum contamination level (MCL); therefore, exposures are not expected to result in adverse health effects in the community.

ATSDR's Region III office has been addressing many of the requests that have come from EPA and participated in numerous public meetings on this site from 2003 to present. From May 2005 through May 2007, ATSDR Region III completed three ATSDR Record of Activity (AROA) health consultations individually evaluating approximately ten indoor and outdoor air samples collected at residential properties; the conclusions from these individual reviews were that exposure to reported levels of chemicals in those air samples is not expected to cause adverse health effects in children and/or adults. In August 2005, at the request of EPA Region III, ATSDR Region III completed an AROA that reviewed the EPA proposed site-specific remediation standards for five VOCs and concluded that the proposed clean-up levels are health protective and below levels known to result in adverse health effects. In November 2007, the ATSDR Region III office reviewed data (five indoor air samples) for one residence and concluded that daily exposure to chemical concentrations detected (individually or in combination) would not result in adverse effects in children or adults. In addition, the regional office has responded to community concerns about children and asthma in the site area and provided health information to interested new home buyers in the community.

In this health consultation, ATSDR evaluates the summer 2006 indoor and outdoor air data collected by Building Sciences and Engineering Associates (BSEA) and air data collected in winter 2007 by the District of Columbia Department of Health (DC DOH). This additional sampling was initiated by the DC DOH to address community concerns. Specifically, some community members were concerned about the reliability of previous tests and desired additional residential sampling. ATSDR also incorporated into this health consultation results from a June 2007 EPA follow-up sampling event at a residence.

Discussion

The mission of ATSDR is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and disease related to toxic substances.

ATSDR provides site-specific public health recommendations on the basis of available toxicologic literature, levels of environmental contaminants detected at a site compared to health comparison values, an evaluation of potential exposure pathways, and the characteristics of the exposed population. Whether a person will be harmed by exposure to hazardous substances depends upon several factors, including the type and amount of the contaminant, the manner in which the person was exposed, the duration of the exposure, the amount of the contaminant absorbed by the body, genetic factors, and individual lifestyle factors.

ATSDR's approach to evaluating a potential health concern has two components. The first component involves a screening process that could indicate the need for further analysis of selected contaminants. The second component involves a weight-of-evidence approach that integrates the estimate of likely exposure with information about the toxicology and epidemiology of the substances of interest.

Screening is a process of comparing appropriate environmental concentrations and doses to comparison values. These comparison values (CVs) include but are not limited to

- ATSDR's Environmental Media Evaluation Guides (EMEGs),
- ATSDR's Reference Dose Media Evaluation Guides (RMEGs),
- ATSDR's Minimum Risk Levels (MRLs),
- ATSDR's Cancer Risk Evaluation Guidelines (CREGs),
- ATSDR's Division of Health Assessment and Consultation (DHAC) Site-specific Provisional Guideline for benzene,
- EPA's Maximum Contaminant Levels (MCLs),
- EPA's Reference Doses (RfDs),
- EPA's Risk-Based Concentrations (RBCs), and
- EPA's Preliminary Remediation Goals (PRGs).

When determining which environmental guideline value to use, ATSDR staff followed the agency's general hierarchy and used professional judgment to select those CVs that best apply to the site conditions [ATSDR 2005]. For example, some of the CVs and health guidelines used by ATSDR scientists include CREGs, EMEGs, and MRLs. If an ATSDR CV is not available for a particular chemical, ATSDR sometimes screens environmental data with CVs developed by other sources, including EPA's RfDs and EPA's Region III RBCs. These CVs and health guidelines, as well as all other health-based screening criteria, represent conservatively derived levels for screening and assessing the likelihood of adverse effects; they are not thresholds of toxicity. Although concentrations at or below a CV may be considered safe, concentrations above a CV will not necessarily be harmful. To ensure that they will protect even the most sensitive populations (such as children or the elderly), CVs are intentionally designed to be much lower, usually by two or three orders of magnitude, than the corresponding no-observed-adverse-effect-levels (NOAELs) or lowest-observed-adverse-effect-levels (LOAELs) on which the CVs were based. When a level is above a comparison value, it does not mean that health effects could be expected—it does, however, represent a point at which further evaluation is warranted.

After identifying potential chemicals of concern through the screening process, ATSDR evaluates a number of parameters depending on the contaminant and site-specific exposure conditions. Such parameters can include biological plausibility, mechanisms of action, cumulative interactions, health outcome data, strength of epidemiological and animal studies, and toxicological and pharmacological characteristics.

ATSDR used the above approaches to determine if exposure to contamination at the Chillum Perc site posed a public health hazard.

For this health consultation, ATSDR grouped the 2006-2007 environmental data into two categories: (1) BSEA data, including the EPA re-sampled home; and (2) DC DOH data. Data evaluation and public health implications are discussed in the following sections.

BSEA Riggs Park Air Quality Study: Air Samples in Summer 2006

In April 2006, DOH contracted with BSEA to initiate the Riggs Park Air Quality Study. The main purpose of this study was to establish a community-trusted data set on indoor and outdoor chemical concentrations for site related chemicals. A total of six VOCs were selected for laboratory analysis using EPA method TO-15. The VOCs selected were MTBE, benzene, toluene, ethylbenzene, xylene, and perc. Electronic data for the selected VOCs were provided to ATSDR for this review. The air sampling started in June 2006 and completed in September 2006. Samples were collected for 97 homes during that 8-week period.

All indoor air samples were collected in Summa canisters for 24 hours. Summa canisters were placed in the basement of each residence. Some level of pre-screening and removal of VOC sources (e.g., consumer products) from the homes was performed [BSEA 2006]. Table 1 is a summary of the indoor air sampling results. To obtain a comparison set of data for evaluating the indoor air data, BSEA also sampled the ambient outdoor air during each sampling week. BSEA collected 22 outdoor air samples at locations that were representative of the locations of homes being sampled. Table 2 provides a summary of the outdoor air sampling results.

BSEA reported sampling results to the DOH and each resident who participated in the program. BSEA provided each participant with an Individual Home Test Report that contained the air sampling results, the source attribution analysis, limitations of the study, and health effects summaries. BSEA also finished a final program report that summarized program objectives, program deliverables, community relation plan, test plan, data management, source attribution analysis, full analytical report, and recommendations [BSEA 2006].

DOH Air Samples in Winter 2007

In winter 2007, DOH collected an additional 12 indoor air and 2 outdoor air samples based on recommendations made in the BSEA Riggs Park Air Quality Study Final Report. Air samples were collected with Summa canisters during a period of 24 hours. Table 3 provides a summary of the indoor and outdoor air sampling results for that event [DOH 2007].

The following text outlines ATSDR's public health evaluation for the six chemicals tested during the two sampling events.

Perc

Perc is also known by other names, including PCE, perchloroethylene, tetrachloroethene, perclene, and perchlor. Perc is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Perc is a chemical used for dry cleaning of fabrics and for metal-degreasing. When found in high concentrations in closed and poorly ventilated areas, perc can cause dizziness, headache, sleepiness, confusion, nausea, and other adverse effects. The health effects of breathing air with low levels of perc are not known. Animal studies (using much greater amounts than those to which most people are exposed), show that perc can cause liver and kidney damage. The relevance of these animal studies to people is unclear [ATSDR 1997a].

In the BSEA sampling event, perc was detected in indoor air with a maximum concentration of 5.55 ppb. In the DOH sampling events, perc was detected with a maximum concentration of 0.76 ppb. ATSDR's chronic EMEG/MRL for perc is 40 ppb (300 µg/m^3) and the ATSDR acute EMEG/MRL for perc is 200 ppb (1,000 µg/ m^3). As previously stated, these EMEGs/MRLs represent the concentration of perc in air that is unlikely to be associated with any appreciable risk of adverse, non-cancer effects for short-term (acute, as defined by ATSDR constitutes exposures less than two weeks duration) or long-term (chronic, more than one year) exposure. The maximum detected site-specific concentration of perc in indoor air (5.5 ppb) was more than 7 times lower than ATSDR's chronic EMEG/MRL. ATSDR therefore considers that exposures to the levels of perc detected in indoor air are unlikely to result in harmful noncancer health effects.

US Department of Health and Human Services (DHHS) has determined that perc may reasonably be anticipated to be a human carcinogen. High-dose (100,000 to 200,000 ppb) animal studies show that long-term exposure to perc causes liver cancer in mice and monocellular leukemia and kidney cancers in rats [ATSDR 1997a]. However, humans may respond to perc differently than mice and rats. Epidemiological studies of workers exposed to perc have not provided conclusive and clear evidence that perc cause cancer in exposed workers. Given presently available information, ATSDR considers that exposures to perc in indoor air from the tested residences are not expected to result in cancer effects.

Benzene

Benzene is a colorless and highly flammable gas that evaporates into air quickly. It is a component of crude oil, gasoline, and cigarette smoke. Benzene has been identified in indoor and outdoor samples of both rural and urban environments. Levels in urban areas are generally higher than those in rural areas. Average levels in both indoor and outdoor air tend to be higher in winter and lower in summer. The background levels of benzene in air range from 2.8 to 20 ppb [ATSDR 2007a]. The major sources of benzene exposure to U.S. residents are tobacco smoke (45%), automobile exhaust and industry (20%), and other home sources (16%). Home sources include paints and gasoline stored in the home (e.g., in basements or attached garages) [Wallace 1995, Ott 1998].

In the BSEA sampling event, benzene was detected in indoor air with a maximum concentration of 8.1 ppb. This home was re-sampled by EPA in June 2007. EPA pre-screened the home and discovered chemicals stored in an attached enclosure. After removing the stored chemicals from the home the maximum detected benzene concentration was 0.98 ppb (3.10 µg/m^3). In the BSEA sampling event, three other samples had benzene levels slightly above 3 ppb (10 µg/m^3). In the DOH sampling events, benzene was detected at a maximum concentration of 2.07 ppb. The maximum outdoor air benzene concentration for the BSEA and DOH sampling events was 0.36 ppb. Although nationwide background levels, like those in the Chillum area, can often exceed ATSDR's CVs for benzene, i.e., chronic EMEG/MRL of 3 ppb (10 µg/m3) and CREG of 0.04 ppb* (0.1 µg/m^3), no adverse health effects, including cancer, would be expected (see the following paragraphs for a more detailed explanation regarding this conclusion). EPA Region III

* In the public comment release version of this health consultation dated April 9, 2008, the benzene CREG value was listed as 0.03 ppb. The updated value is 0.04 ppb after correction of an internal calculation /rounding error.

office has proposed a site-specific remediation standard for benzene of 2.5 ppb (8 µg/m^3) and ATSDR supported this as a health protective remediation level. The site-specific remediation standard includes consideration of concentrations of benzene measured in homes that are not believed to be subject to influences of the gasoline plume. The following text is a weight-of-evidence approach that integrates the estimate of likely exposure with information about the toxicology and epidemiology of benzene exposure.

ATSDR evaluates both cancer and non-cancer health effects for benzene. Benzene is a known human carcinogen and is leukemogenic. Occupational-level benzene exposures have been specifically linked to acute myelocytic leukemia. The lowest human effect levels reported in ATSDR's Toxicological Profile for Benzene [ATSDR 2007a] are 300 ppb (960 µg/m^3) for leukemia [Ott et al. 1978] and 570 ppb (1,838 µg/m3) for reduced white blood cell and platelet counts [Lan et al. 2004]. These values (570 ppb and 300 ppb) represent the lowest measured concentrations in a range of workplace measurements from the two studies (300–35,000 ppb and 570–28,000 ppb, respectively). Use of the lowest measured concentration as an indicator of exposure in the facilities is conservative and underestimates actual exposures.

In some epidemiological and toxicological studies, estimates of benzene exposure were converted to ppm-years, i.e., average benzene levels in parts per million (ppm) multiplied by exposure duration in years, to compare with reported occupational health effects on an equivalent basis. For example, a worker exposed to 2 ppm for 20 years and another one exposed to 20 ppm for 2 years both received the same cumulative exposure (i.e., 40 ppm-years). Epidemiologic data have suggested that there are thresholds for leukemia. Available studies indicate no detectable excess of leukemia below cumulative exposures of 40 ppm-years [Rinsky et al 1987]. This would be numerically, if not biologically, equivalent to about 190 ppb, 24 hours a day, over a 70-year lifetime. However, this apparent threshold is most likely an underestimate because it is based on underestimated exposures and the inclusion of all leukemia, not just AML.

ATSDR's current chronic EMEG/MRL for benzene is 3 ppb, the concentration of benzene in air that is unlikely to be associated with any appreciable risk of adverse, non-cancer effects for more than one year of continuous exposure. For cancer effects, ATSDR has derived a benzene CREG of 0.04 ppb based primarily on studies of U.S. workers exposed to high levels of benzene (up to hundreds of ppm or hundreds of thousands of ppb) during rubber manufacturing. It is based on an EPA-estimated cancer slope factor which is in turn based on the assumption of a linear dose-response relationship; that is, the proportion of effects seen at high doses range will be the same at the low-dose range where the effects are unmeasurable. In 1999, ATSDR's Division of Health Assessment and Consultation proposed a health screening guideline (cancer and non-cancer) of 10 ppb for chronic inhalation exposure to benzene [ATSDR 1999]. The guideline was used for screening purposes and by design implied that if no maximum values of benzene exceed 10 ppb in air, then benzene exposure is classified as "no apparent public health hazard". This guideline was based on information from toxicological literature reviews, experimental findings, reevaluation of occupational cohorts related to benzene, and professional judgment by the ATSDR toxicologists. For the reasons discussed in this section, the estimated benzene exposures in the Chillum area would not produce any adverse health effects of either a cancerous or non-cancerous nature.

Toluene

Toluene is a clear, colorless liquid with a distinctive smell. Toluene occurs naturally in crude oil and in the tolu balsam tree (Myroxylon balsamum). Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes. Exposure to high concentrations of toluene can cause headaches, confusion, and memory loss [ATSDR 2000].

In the BSEA sampling event, toluene was detected in indoor air with a maximum concentration of 39.85 ppb. EPA resampled the property where the maximum value was detected in June 2007 after discovery of chemicals stored in an attached enclosure. Although maximum levels of other VOCs detected at the property were much lower than levels found at the BSEA sampling event, the maximum detected toluene concentration for the property was 47.78 ppb (180 µg/m^3). In the DOH sampling events, toluene was detected in 11 of the 12 homes tested with a maximum concentration of 8.33 ppb. The ATSDR chronic EMEG is 80 ppb, the concentration of toluene in air that is unlikely to be associated with any appreciable risk of adverse, non-cancer effects for more than one year of exposure. The chronic EMEG is based on an occupational study with a LOAEL of 35 ppm (35,000 ppb) and includes a safety factor of 100. The LOAEL (35,000 ppb) is many orders of magnitude higher than the maximum toluene concentration detected in indoor air of Chillum area homes (47.48 ppb). EPA Region III office has proposed a site-specific remediation standard for toluene of 1,327 ppb (5,000 µg/m3). ATSDR considers that exposures to the levels of toluene detected in air from the tested residences are unlikely to result in harmful noncancer health effects.

In regard to cancer effects, studies in workers and in animals exposed to toluene indicate that toluene does not cause cancer. The International Agency for Research on Cancer (IARC), EPA, and the Department of Health and Human Services (DHHS) have not classified toluene as a carcinogen [ATSDR 2000]. Given presently available information, ATSDR considers that exposures to toluene in air from the tested residences are unlikely to result in harmful cancer health effects.

Ethylbenzene

Ethylbenzene is a colorless liquid that smells like gasoline. It is used in industry and in consumer products. For example, ethylbenzene is used in gasoline, paints and inks, pesticides, carpet glues, and tobacco products. Exposure to high levels (1,000 to 10,000 ppm) of ethylbenzene in air for short periods can cause eye and throat irritation in humans. Exposure to higher levels can result in dizziness. Irreversible damage to the inner ear and hearing has been observed in animals exposed to high concentrations (200 to 400 ppm) of ethylbenzene for several days to weeks [ATSDR 2007b].

In the BSEA sampling event, ethylbenzene was detected in indoor air with a maximum concentration of 17.8 ppb. In the DOH sampling event, ethylbenzene was detected with a maximum concentration of 1.22 ppb. The maximum outdoor air ethylbenzene concentration for the BSEA and DOH sampling events was 2.05 ppb. ATSDR's intermediate EMEG/MRL for ethylbenzene is 700 ppb (3,000 µg/m3), the concentration of ethylbenzene in air that is unlikely

to be associated with any appreciable risk of adverse, non-cancer effects for an exposure duration of 15 to 364 days. EPA region III office has proposed a site-specific remediation standard for ethylbenzene of 230 ppb (1,000 µg/m3). The levels of ethylbenzene found in all air samples were below the CVs. ATSDR therefore considers that exposures to the levels of ethylbenzene detected in indoor air are unlikely to result in harmful noncancer health effects.

There is one human study regarding cancer effects of ethylbenzene exposure in humans. However, no clear conclusions can be drawn from this study due to the lack of measured ethylbenzene concentrations [Bardodej and Cirek 1988]. The International Agency for Research on Cancer (IARC) has determined that long-term exposure to ethylbenzene may possibly cause cancer in humans (Group 2B carcinogen–possibly carcinogenic to humans). This is based on a National Toxicology Program (NTP) sponsored bioassay in male and female rats. In the study, mice were exposed to 0, 75, 250, or 750 ppm ethylbenzene for up to 2 years [NTP 1999]. The study found evidence of carcinogenic activities in kidney, liver and lung tissues of tested rats. However, in the most recent carcinogenicity assessment by the EPA conducted in 1991, ethylbenzene was classified as Group D (not classifiable as to human carcinogenicity) due to the lack of animal bioassays and human studies [ATSDR 2007b]. Given presently available information, ATSDR considers that exposures to ethylbenzene in indoor air from the tested residences are unlikely to result in harmful cancer health effects.

Xylene

Xylene is a synthetic chemical with three isomers (*meta*-xylene, *ortho*-xylene, and *para*-xylene). Xylene also occurs naturally in petroleum and coal tar and is formed during forest fires. It is a colorless, flammable liquid with a sweet odor. Xylene is widely used as a cleaning agent, a thinner for paint, and in varnishes. Xylene can be found in small amounts in airplane fuel and gasoline.

Scientists have found that the three forms of xylene have very similar effects on health. No health effects have been noted at the background levels that people are exposed to on a daily basis. Short-term exposure of people to high levels (50 ppm to 10,000 ppm) of xylene can cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; impaired function of the lungs; delayed response to a visual stimulus; impaired memory; stomach discomfort; and possible changes in the liver and kidneys. Both short- and long-term exposure to high concentrations of xylene can also cause a number of effects on the nervous system, such as headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Most of the information on health effects in humans exposed for long periods of time is from studies of workers employed in industries that make or use xylene. Those workers were exposed to levels of xylene in air far greater than the levels normally encountered by the general population. Many of the effects seen after their exposure to xylene could have been caused by exposure to other chemicals that were in the air with xylene [ATSDR 2007c].

In the BSEA sampling event, xylene was detected in indoor air with a maximum concentration of 60.79 ppb. In the DOH sampling event, xylene was detected with a maximum concentration of 4.29 ppb. The maximum outdoor air xylene concentration for the BSEA and DOH sampling events was 5.9 ppb. EPA Region III office has proposed a site-specific remediation standard for

xylene of 23 ppb (100 µg/m3). ATSDR's chronic EMEG/MRL for xylene is 50 ppb (200 µg/m3), the concentration of xylene in air that is unlikely to be associated with any appreciable risk of adverse, non-cancer effects for more than one year of exposure. ATSDR's chronic EMEG/MRL for xylene is based on an occupational study which examined 175 workers (107 men, 68 women) who were exposed for an average of 7 years to mixed xylenes during the manufacture of boots or rubber-coated wires. A LOAEL of 14 ppm (14,000 ppb) for subjective respiratory and neurological effects in workers exposed to mixed xylenes was reported [Uchida et al. 1993]. The chronic EMEG is based on the observed effects and includes a safety factor of 300. The LOAEL (14,000 ppb) is more than 230 times higher than the maximum concentration of xylene detected in indoor air of Chillum area homes (60.8 ppb). ATSDR therefore considers that exposures to the levels of xylene detected in indoor air are unlikely to result in harmful noncancer health effects. Although the xylene levels found in the Chillum area indoor air samples are not of health concern, ATSDR considers reducing or minimizing xylene exposures to the EPA remediation standard a prudent public health measure, and therefore supports the implementation of vapor mitigation systems in these homes as a precautionary measure.

Both the International Agency for Research on Cancer (IARC) and EPA have found that there is insufficient information to determine whether or not xylene is carcinogenic and consider xylene not classifiable as to its human carcinogenicity [ATSDR 2007c]. Given presently available information, ATSDR considers that exposures to xylene in indoor air from the tested residences are unlikely to result in harmful cancer health effects.

MTBE

MTBE is the common name for a synthetic chemical called methyl tert-butyl ether, a flammable liquid made from combinations of chemicals like isobutylene and methanol. It has a distinctive odor that most people find disagreeable. Most people are exposed to MTBE from automobile exhaust while driving or adding gasoline to automobile tanks. Some people have reported symptoms such as headaches, nausea, dizziness, and irritation of the nose or throat [ATSDR 1996].

MTBE was detected in the BSEA and the DOH sampling events with maximum concentrations of 17.07 ppb and 9.58 ppb, respectively. EPA Region III has proposed a site-specific remediation standard for MTBE of 4.7 ppb (17 µg/m3). ATSDR has established a chronic EMEG/MRL of 700 ppb (2, 000 µg/m3) for long-term MTBE exposures. Although some samples have MTBE levels above the EPA remediation standard, MTBE levels in Chillum air are orders of magnitude below the chronic EMEG/MRL. ATSDR therefore considers that exposures to the levels of MTBE detected in indoor air are unlikely to result in harmful noncancer health effects. Although the MTBE levels found in the Chillum area indoor air samples are not of health concern, ATSDR considers reducing or minimizing MTBE exposures to the EPA remediation standard a prudent public health measure, and therefore supports the implementation of vapor mitigation systems in these homes as a precautionary measure.

There is no evidence that MTBE causes cancer in humans. One study with rats found that breathing high levels of MTBE for long periods may cause kidney cancer. Another study with mice found that breathing high levels of MTBE for long periods may cause liver cancer. The Department of Health and Human Services (DHSS), the International Agency for Research on Cancer (IARC), and the EPA have not classified MTBE for its ability to cause cancer [ATSDR

1996]. Given presently available information, ATSDR considers that exposures to MTBE in indoor air from the tested residences are unlikely to result in harmful cancer health effects.

Evaluating Inhalation Exposures to the Mixture of Multiple Chemicals

The health impact of exposure to chemical mixtures is of particular concern at this site. ATSDR followed existing ATSDR protocols for evaluating exposures to multiple chemicals of concern for inhalation exposures at this site (for example, using the hazard index approach for noncancer effects of chemical mixtures) [ATSDR 2004c, ATSDR 2004d].

For noncancer effects, although the inhalation hazard index exceeds unity for maximum contaminant levels found at the site, levels of individual contaminants detected at this site are present at levels that are below those that might be expected to result in adverse health effects. Therefore, ATSDR has concluded that the combined effect of the contaminants detected at the site is not likely to result in adverse health effects. This conclusion is based on studies that suggest that a mixture produces no adverse noncancer health effects in dosed animals when the components of that mixture are present at levels below their respective no-observed-adverse-effect levels (NOAELs). NOAELs are concentrations estimated to produce no adverse effects in animals treated separately with the individual chemicals [Wade et al. 2002, Feron et al. 1993, Jonker et al. 1990, Jonker et al. 1993a, Jonker et al. 1993b, Groten et al. 1991].

For cancer effects, animal studies suggest that some carcinogens exhibit thresholds in the laboratory, as do noncarcinogens [SOT 1981, Williams and Weisbuirger 1991, Cunningham et al. 1994]. In addition, the ATSDR Interaction Profile for Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) recommended that the possible hematotoxic and carcinogenic hazard from exposures to BTEX should be evaluated on the basis of benzene alone. In-depth evaluation of benzene exposures is presented above in this document; ATSDR concluded that the estimated benzene exposures would not produce any adverse health effects (cancer and/or non-cancer). All measured levels of contaminants in the indoor air samples in the Chillum area are below respective NOAELs and all known adverse effect levels published in ATSDR's toxicological profiles. Therefore, ATSDR considers that the combined effect of all of these contaminants is not expected to be of public health concern.

Because relatively few chemical mixtures studies have assessed toxic interactions in low dose ranges and because several carcinogenic chemicals exhibited significant spatial trends, ATSDR recognizes there are uncertainties in evaluating the cumulative effects of chemical mixtures. ATSDR considers it a prudent public health measure to reduce or eliminate releases of chemicals into residential homes wherever possible.

Comparison of Indoor Air Samples among Different Sampling Events in Chillum Perc Site

To date, ATSDR has reviewed approximately 250 soil vapor samples, 169 indoor air samples, and 29 outdoor air samples for the site. In July 2003, approximately 50 indoor air samples were collected and analyzed for 69 VOCs. In June to July 2006, 97 indoor air samples were collected and analyzed for 6 VOCs. In February 2007, 12 indoor air samples were collected and analyzed for 6 VOCs. Table 4 is a summary of the maximum, average, and median concentrations for the

three sampling events summarized by year (2003, 2006 and 2007). In addition, ATSDR also reviewed sampling results from the residence (06/T02) where some of the highest VOC concentrations were found previously. Those samples were collected in June 2007 per EPA request and included 9 indoor air samples, 3 outdoor air samples, and 8 soil vapor samples.

Further analysis of all data above indicated the following generalizations:

- In the 2003 samples, the *median* and *mean* concentrations for all VOCs are higher than the median and mean concentrations of the other two sampling events with the exception of toluene.
- In the 2006 samples, the *maximum* concentrations for all VOCs are higher than the maximums of the other 2 sampling events with the exception of perc.
- Analytical results are available for five locations for both the 2006 and 2007 sampling events. The maximum benzene concentrations in 2007 samples were lower than their respective 2006 samples. Table 5 is a comparison of the 2006 and 2007 maximum benzene data at 6 different homes.
- It should be noted that a variety of sources of VOCs may contribute to the indoor air quality in addition to the soil vapor source. For example, one residence (06/T02) was found to have some of the highest VOC concentrations in the summer 2006 sampling event, while a subsequent test in the summer 2007 revealed much lower VOC concentrations after the removal of old containers with chemicals from the attached shed.

Overall, all detected VOCs in the indoor and outdoor air at this site are in the low ppb range and do not appear to have significant differences among the sampling data sets from 2003, 2006, and 2007. Taken together, these data sets represent a thorough evaluation of environmental conditions relevant for public health exposures at this site. All of the data sets reviewed to date support ATSDR's overall conclusion that all indoor and outdoor air VOC concentrations detected at the site from 2003 through 2007 are at levels unlikely to cause adverse, cancer or noncancer health effects for acute, intermediate, and chronic exposures.

Past exposures from site-related contaminants are a significant concern in this community. Unfortunately, it is not feasible for ATSDR to comment on potential exposures in the community prior to 2004, because (1) air monitoring data are not available prior to that time period, (2) groundwater conditions may be changed due to remediation, and (3) the methods used to predict past exposures would be limited by the lack of data.

Child Health and Sensitive Population Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Some substances have been shown to cause greater harm in particular populations or when exposure occurs at a particular point in life. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; they breathe dust, soil dust, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are

high enough during critical growth stages, the developing body systems of children can sustain permanent damage. It should be noted that sensitive populations are considered when MRLs and other health-based comparison values are developed. An uncertainty factor of 10 is generally incorporated into all MRLs to help ensure sensitive populations (e.g., children, elderly, those with pre-existing illnesses) are amply protected [ATSDR, 2005]. ATSDR has considered these factors in the development of conclusions and recommendations for this site.

Summary of DC Cancer and Asthma Data

The community has voiced many health concerns, especially related to cancer and asthma rates in this area. ATSDR reviewed available information gathered from existing databases and medical literature. The following is a summary of ATSDR's review of DC cancer and asthma data.

Cancer

Cancer is the general name for a group of more than 100 diseases in which cells in a part of the body begin to grow out of control. There are many different individual kinds of cancers and each of these different types of cancers has its own risk factors [ACS, 2008]. Considering all cancers together as a group, cancer is a common diagnosis.

The District of Columbia tracks cancer cases in the District via the DC Cancer Registry. The DC Cancer Registry requires the reporting of cancer diagnosis and/or treatment to the Director of the Health Department. In order to capture additional occurrences of cancer among DC residents, the Department of Health has also entered into reciprocal exchange agreements with its neighboring States for cancer records on residents seeking cancer care in out-of-State health care facilities. Since 1997, the District's cancer data have been closely reviewed by the North American Association of Central Cancer Registries. Similar to the U.S., cancer is the second leading cause of death among District residents. Based on 2005 data available from Centers for Disease Control and Prevention (CDC), approximately 21 percent of all deaths in the District are due to cancer, as compared to 22.8 percent of all deaths nationwide being due to cancer [CDC, 2008a]. This means that roughly one in every five deaths of District residents to be from cancer. Because not all cancers are fatal, the actual occurrence or "incidence" of cancer diagnoses among District residents is more common than deaths from cancer.

The table below was developed from the National Cancer Institute's State Cancer Profiles, and it summarizes mortality rates for select cancers in the District from 1994 to 2005 and compares them to overall U.S. rates [NCI, 2008]. Trends for cancer rates in the District appear to be similar to U.S. rates, with the exception of prostate cancer in males, which has a higher death rate in the District relative to the U.S. as a whole (this increased District rate appears to be trending downward).

Death Rate/Trend Comparison by State/County, death years through 2005
District of Columbia versus United States

All Races, Both Sexes

	Above US Rate	Similar to US Rate	Below US Rate
Rising Trend	Priority 1: rising ↑ and above ↑ [none]	Priority 2: rising ↑ and similar = [none]	Priority 3: rising ↑ and below ↓ [none]
Stable Trend	Priority 4: stable → and above ↑ [none]	Priority 6: stable → and similar = Leukemia (Males) Liver & Bile Duct (Males) Non-Hodgkin Lymphoma (Males) Ovary (Females) Pancreas (Females) Pancreas (Males) Uterus (Females)	Priority 7: stable → and below ↓ [none]
Falling Trend	Priority 5: falling ↓ and above ↑ Prostate (Males)	Priority 8: falling ↓ and similar = Breast (Females) Colon & Rectum (Females) Colon & Rectum (Males) Esophagus (Males) Leukemia (Females) Lung & Bronchus (Females) Lung & Bronchus (Males) Stomach (Males)	Priority 9: falling ↓ and below ↓ [none]

Created by statecancerprofiles.cancer.gov on 11/18/2008 1:39 pm.

Trend[2]
- Rising ↑ when 95% confidence interval of annual percent change is above 0.
- Stable → when 95% confidence interval of annual percent change includes 0.
- Falling ↓ when 95% confidence interval of annual percent change is below 0.

Rate Comparison
- Above ↑ when 95% confident the rate is above and Rate Ratio[3] > 1.10
- Similar = when unable to conclude above or below with confidence.
- Below ↓ when 95% confident the rate is below and Rate Ratio[3] < 0.90

[1] Priority indices were created by ordering from rates that are rising and above the comparison rate to rates that are falling and below the comparison rate.
[2] Recent trend in death rates were calculated using the Joinpoint Regression Program and are expressed as the annual percent change over the recent trend period. Recent trend period is the period since last change in trend as determined by Joinpoint.
[3] Rate ratio is the county rate divided by the US rate.

Source: Death data provided by the National Vital Statistics System public use data file. Death rates calculated by the National Cancer Institute using SEER*Stat. Death rates are age-adjusted to the 2000 US standard population (19 age groups: <1, 1–4, 5–9, … , 80–84, 85+). Population counts for

denominators are based on Census populations as modified by NCI.

Note: When the population size for a denominator is small, the rates may be unstable. A rate is unstable when a small change in the numerator (e.g., only one or two additional cases) has a dramatic effect on the calculated rate. Suppression is used to avoid misinterpretation when rates are unstable.

State Cancer Registries may provide more current or more local data. Data presented on the State Cancer Profiles Web Site may differ from statistics reported by the State Cancer Registries (for more information).

Data for the following has been suppressed to ensure confidentiality and stability of rate and trend estimates:
Childhood (Ages <15, All Sites) (Females), Childhood (Ages <15, All Sites) (Males), Childhood (Ages <20, All Sites) (Females), Childhood (Ages <20, All Sites) (Males), Melanoma of the Skin (Males), Thyroid (Females), Thyroid (Males)

Data for the following has been suppressed to ensure confidentiality and stability of rate estimates:
Bladder (Females), Bladder (Males), Brain & ONS (Females), Brain & ONS (Males), Cervix (Females), Esophagus (Females), Kidney & Renal Pelvis (Females), Kidney & Renal Pelvis (Males), Liver & Bile Duct (Females), Melanoma of the Skin (Females), Non-Hodgkin Lymphoma (Females), Oral Cavity & Pharynx (Females), Oral Cavity & Pharynx (Males), Stomach (Females)

A 2003 report is the most recent detailed information publicly available from the DC cancer registry at the Ward level [DOH 2008a]. Note the following detailed information summarized from this report represents information on cancer cases for a single year. According to this report, the 2003 age-adjusted incidence rate of all cancers in District residents is 514.8 new cases per 100,000 people. The table below is the age adjusted incidence rate for all cancers of the eight wards in the District. Based on the overlapping confidence intervals, rates in Ward 4 are similar to other wards in 2003.

District of Columbia Cancer Registry
2003 Cancer Annual Report

Age Adjusted Incidence Rate By Ward and Sex, District of Columbia, 2003

All Sites

	Male and female				Male				Female			
	Rate	Lower CI	Upper CI	Count	Rate	Lower CI	Upper CI	Count	Rate	Lower CI	Upper CI	Count
Ward 1	510.5	450	577.8	270	583.9	492.4	689.6	150	438.4	361.4	529.2	120
Ward 2	471	414.1	540	256	517.9	430.9	632.7	126	430.6	357.9	527.1	130
Ward 3	498.9	449.5	555.7	393	507.5	430.4	604	164	492.8	429.8	569	229
Ward 4	515.1	468.7	566.2	459	602.8	527.5	688.8	235	447.7	390.5	513.2	224
Ward 5	504.9	457.5	557.1	429	528.7	460.1	607.3	219	482.2	418	556	210
Ward 6	557.4	501.6	619.5	369	617.1	529.7	719.1	180	509.4	438.9	591.5	189
Ward 7	508.6	458.1	563.6	372	552.7	476.6	638.6	189	470.5	404.6	544.9	183
Ward 8	463.3	402.5	531.5	223	548.9	446.2	670.1	106	404.1	331.8	489	117
Unk	~	~	~	47	~	~	~	18	~	~	~	29

Rates are per 100,000 and age-adjusted to the 2000 U.S. (19 age groups) standard; Confidence intervals are 95% for rates.
~ Statistic could not be calculated.

Because of the community concerns about benzene exposures at this site, ATSDR specifically reviewed the cancer information reported for Ward 4 for leukemia. The 2003 incidence rate for leukemia in Ward 4 was 5.3 per 100,000 people, based on reporting to the cancer registry of 5 cases of leukemia from this ward. The table below shows the leukemia incidence reported across all of the District wards in 2003.

Leukemia

	Male and female				Male				Female			
	Rate	Lower CI	Upper CI	Count	Rate	Lower CI	Upper CI	Count	Rate	Lower CI	Upper CI	Count
Ward 1	2.3	0.2	13.4	2	3	0.1	25.2	1	1.7	0	22.6	1
Ward 2	8.7	2.7	34.7	5	14.5	3.7	70.1	4	3.7	0.1	51.3	1
Ward 3	10.4	2.9	30.4	6	16.2	2.1	64.3	3	6.3	1.3	33.7	3
Ward 4	5.3	1.7	15.1	5	9.8	2.7	31.8	4	1.8	0	16.9	1
Ward 5	3.7	0.7	13.6	3	2.1	0.1	19.8	1	5.2	0.6	24.2	2
Ward 6	9.6	3.7	23.8	7	14.9	4.6	44.8	5	5.3	0.6	27.6	2
Ward 7	12.1	5.5	23.8	9	14.8	4.8	36.5	5	9.8	2.7	27	4
Ward 8	14.6	5.2	33.2	6	25.3	6.7	67	4	7.2	0.7	30.1	2
Unk	~	~	~	6	~	~	~	3	~	~	~	3

Rates are per 100,000 and age-adjusted to the 2000 U.S. (19 age groups) standard; Confidence intervals are 95% for rates.
~ Statistic could not be calculated.

This information was provided for descriptive purposes only to address community questions about the cancer rates in this community. There are limitations in any review of cancer registry data. For example, when the number of cases used to compute rates is small, these rates tend to have poor reliability. In general, case counts less than 15 are too few to calculate a stable age adjusted rate. Other limitations affecting all cancer registry data reviews include the fact that residents may move away and/or be diagnosed outside a reciprocal reporting state, valid registry information may only be available for limited time periods (i.e., high quality data from the District's registry is available from 1997), and there are significant reporting delays in the system (i.e., the most recent summary data at the Ward level publicly available from DC is from 2003).

Cancer in the District is of very high concern to residents and the health professional community serving the district, consistent with the community concerns that we have heard from this site area. In 2001, the DC DOH created the DC Cancer Control Coalition to serve as a partner in addressing comprehensive cancer control and prevention in the District. The DC Cancer Coalition is a broad partnership of more than 50 District public and private institutions, organizations, and advocates. The Coalition developed a comprehensive, coordinated plan with specific strategies to have an impact on cancer in the District, and this plan was released in 2006 [DOH 2006a]. As described in the Coalition's report, a citywide effort is now needed to promote effective prevention and cancer control programs and practices, and this effort needs to engage all District citizens in addition to the health community.

Asthma

Asthma is an inflammatory airway disease caused by a complex interaction between host susceptibility (genetics) and diverse environmental factors. Environmental exposures to allergens, air pollutants, environmental tobacco smoke (including secondhand smoke), workplace exposures, and other factors (such as physical exercise, some medicines, changes in weather, and some foods and food additives) can exacerbate asthma. Over the past decade, the prevalence of asthma in children and adults has increased in the United States, especially for children living in urban areas and children living in poverty [ATSDR 2007d]. The National Capital Asthma Coalition reported that more than one in ten children (11.8%) in the metropolitan Washington D.C. area has asthma compared with 8.8% of children nationally [NCAC, 2007]. It should be noted that this area is classified by EPA as a non-attainment area for particulate matter and nitrogen oxides which could contribute to the incidence of asthma [EPA, 2008]. ATSDR reviewed the following available asthma information related to the site:

1. Behavioral Risk Factor Surveillance System (BRFSS) data including the Asthma Statistical Report [DOH 2003], the 2003 and 2004 Annual Reports [DO, 2006b], data provided by DC DOH [DOH 2008] and the BRFSS prevalence and trends data [CDC 2008b].

The DC Asthma Statistical Report utilized three major data sets to determine the prevalence of asthma: the Behavioral Risk Factor Surveillance System (BRFSS), which only evaluates persons 18 and older; Inpatient Hospital Discharge Data; and the DC Mortality files. Based on the BRFSS data, for the three (3) year period, 1999 -2001, the highest prevalence of current adult asthma by gender, race, age group, and ward are female (9.5%), black non-Hispanics (8.1%), 18-24 year age group (10.5%), and Ward 8 (13.1%), respectively. The Chillum site is a small area located inside Ward 4, which had a prevalence of 7.3 % from 1999- 2001.

The DC Asthma Statistical Report also reported the asthma hospital discharge data for 2001. The asthma inpatient admission rate for zip code 20011 (the Chillum site is a small area in this zip code) was.13.2 to 16.4 per 10,000 people. The highest rate range for the same year was 19.3 to 35.5 per 10,000 people.

In 2004, data from the BRFSS annual report included the prevalence of asthma by ward. The following is the summary table:

2004 Asthma Prevalence by Ward

Ward	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Ward 8
Percentage	6.7%	12.2%	8.2%	6.4%	8.8%	8.6%	13%	8.4%

The available asthma prevalence for zip code 20011 and the DC area are summarized below [DOH 2008b, CDC 2008b]:

Year	2001	2002	2003	2004	2005	2006	2007
Zip Code 20011	9.2%	10.9%	8.5%	8.3%	4.9%	13.2%	Not available
Washington, DC	7.4%	9.1%	7.8%	9.2%	9.2%	10.0%	9.4%
Nationwide	7.3%	7.6%	7.6%	8.3%	8.0%	8.4%	8.3%

2. Pediatric patient asthma-related emergency department visits and admissions in Washington, DC, from 2001–2004, and associations with air quality, socio-economic status and age group [Babin et al 2007].

This is a pilot study to quantify short-term associations between daily pediatric emergency department (ED) visits and admissions with air quality (ozone and particulate concentrations), socio-economic status and age group. This study concluded that

- significant associations were found between ozone concentrations and asthma-related ED visits, especially for 5-12 years olds;
- the rates of both asthma-related ED visits and admissions increased logarithmically with the percentage of children living below the US poverty level within a zip code;
- Figure 1 depicts asthma-related ED visit rates by zip code for FY 2001-2003. Ward 4 is in zip code 20011, which has ED visit rates from 0.12 to 0.1599.

- limitations of this study include limited resolution of population data (zip code-level), relatively short time intervals (36 months), and limited resolution of spatial analysis of environmental effects (three air monitoring stations).

3. Medicaid patient asthma-related acute care visit and their associations with ozone and particulates in Washington, DC, from 1994-2005 [Babin et al 2008].

One objective of this study was to quantify associations between Medicaid patient asthma-related acute care visits and air quality (ozone and particulate concentrations). Data used in this study include daily counts for asthma-related acute care visits of DC Medicaid patients, daily ozone concentrations, daily PM 10 (particulates with aerodynamic diameters of 10 micrometer or less) concentrations, daily PM 2.5 (particulates with aerodynamic diameters of 2.5 micrometer or less) concentrations, and daily pollen and mold counts from October 1994 through November 2005. This study concluded

- the daily ozone and particulate concentrations were similar at different test locations around the DC area;
- the association between Medicaid patient asthma-related acute care visits and PM 10 was not significant; this lack of association may be due to the maximum daily PM 10 concentrations among the measurement sites remaining at relatively low risk levels during the study period (e.g., there were no days in which PM 10 levels exceeded US EPA Code Yellow);
- for the all-age and 5- to 12-year-old groups, the association between Medicaid patient asthma-related acute care visits and ozone concentrations was significant in the spring and summer seasons;
- three age groups (all-age, 5- to 12-year-old, and 21- to 49-year-old) were found to have significant association between Medicaid patient asthma-related acute care visits and PM2.5 concentrations;
- Figures 2 and 3 depict asthma-related Medicaid patient acute care visit rates and Medicaid enrollees by ward. These figures indicated that acute care visit rates ranged from 40 to 49.99 per 1,000 Medicaid enrollees in Ward 4.
- Authors cautioned that the findings should not be generalized to represent the entire population because of several limitations of this study. For example, the study included only Medicaid patients, which represents a special population with potentially unique characteristics.

The above information was provided for descriptive purposes only to address community questions about the asthma rates in this community. There are limited asthma data available for the ward and zip code level and no information is available for the smaller geographic areas like a neighborhood. Although asthma rates appear to be elevated in this zip code relative to the District as a whole in certain years, ATSDR does not have sufficient information such as confidence intervals and P values of the data to test for any statistical significant differences between wards and zip codes. The available asthma data do not help ATSDR differentiate asthma rates specifically in the Lamond Riggs neighborhood and cannot establish any links between asthma and exposures to the VOCs found in the groundwater and soils at this site.

Conclusions

1. All indoor and outdoor air VOC concentrations detected at the site in the vapor intrusion investigations are at levels unlikely to cause adverse, cancer or noncancer health effects for acute, intermediate, and chronic exposures.

2. The maximum benzene and xylene concentrations exceeded their respective CVs, and some of the highest MTBE concentrations exceeded EPA's site-specific remediation standard for this chemical. However, ATSDR concludes that all of these concentrations in the sampling results at this site since 2002 are at levels below those known to cause adverse cancer or non-cancer health effects in people. Although the maximum benzene, MTBE, and xylene levels found in the Chillum area indoor air samples are at levels unlikely to cause adverse health effects, ATSDR considers reducing or minimizing exposures to these chemicals to the EPA remediation standards a prudent public health measure, and therefore supports the implementation of vapor mitigation systems in these homes as a precautionary measure.

3. ATSDR has concluded that the combined effect of the contaminants detected at the site is also not likely to result in adverse health effects (see mixture section on page 10 for a more detailed discussion). ATSDR recognizes there are uncertainties in evaluating the cumulative effects of chemical mixtures. As stated in the prior conclusion, ATSDR considers it a prudent public health measure to reduce or eliminate releases of chemicals into residential homes wherever possible.

4. ATSDR categorizes this site as No Apparent Public Health Hazard. This means human exposure to VOCs in indoor and outdoor air could be occurring, could have occurred in the past, or could occur in the future, but such exposure is not expected to cause any adverse health effects at the levels detected.

5. Past exposures from site-related contaminants are a significant concern in this community. Unfortunately, it is not feasible for ATSDR to comment on potential exposures in the community prior to 2004, because (1) air monitoring data are not available prior to that time period, (2) groundwater conditions may be changed due to remediation, and (3) the methods used to predict past exposures would be limited by the lack of data.

6. Asthma rates appear to be elevated in zip code 20011 relative to the District as a whole four of six years from 2001 to 2006 based on limited asthma information. ATSDR does not have sufficient information to test for any statistical significant differences between wards and zip codes and the district. ATSDR cannot differentiate asthma rates specifically in the Lamond Riggs neighborhood. Thus ATSDR cannot fully explore the relationship between asthma and exposures to the VOCs found in the groundwater and soils at this site.

7. Death rates of several common cancers in the District appear to be similar to U.S. rates, with the exception of prostate cancer in males, which has a higher death rate in the

District relative to the U.S. as a whole. This increased rate appears to be trending downward over time in the District. Death rates for all other cancers appear to be stable or are declining.

8. The 2003 age-adjusted incidence rate of all cancers in District residents is 514.8 new cases per 100,000 people. The most recent information available from the DC cancer registry at the ward level indicated that Ward 4 has similar rates to other wards in 2003. The 2003 incidence rate for leukemia in Ward 4 is similar to the rates in the other district wards.

Recommendations

1. ATSDR recommends reducing or minimizing exposures to hazardous chemicals as a prudent public health measure. During the vapor intrusion investigations, elevated VOC levels were detected in one home and found to be associated to indoor storage of consumer products. As such, use of consumer products containing VOCs should be conducted following product use label instructions and storage of products in living space should be minimized (For example, store gasoline in areas away from living space).

2. Based on the on-going community concerns related to asthma, ATSDR recommends asthma health education outreach services should be provided to this community.

3. ATSDR recommends that community members contact the DC DOH cancer epidemiology section if they would like to have additional information on cancer in their community beyond the summary provided in this document.

Public Health Action Plan

Actions Taken:

1. During spring 2004, EPA collected additional indoor air, soil vapor, and ground water samples at selected residences in the community as well as at other potentially affected areas.
2. ATSDR released a site-specific fact sheet and a community health concern questionnaire in early December 2003.
3. In 2004, ATSDR released two health consultations that reviewed and evaluated all available environmental data for the site.
4. ATSDR reviewed, compiled, and presented results of the community health concern questionnaire in spring 2004 at a public meeting hosted by EPA in La Salle Elementary School.
5. ATSDR Region III office issued three AROAs per EPA requests in 2005 and 2007.
6. In 2006, BSEA conducted the Riggs Park Air Quality Study under a contract with DOH.

7. DC DOH conducted additional sampling in winter 2007.
8. In 2007, ATSDR requested from the District of Columbia Department of Health asthma prevalence information for zip code 20011 and for the District as a whole, and incorporated this information in to this health consultation document.
9. ATSDR conducted a review of cancer surveillance information for the area including this community, and the information is included in this health consultation to share with the community.

Actions Ongoing:

1. EPA or Chevron will continue to operate the existing groundwater remediation system at the site. EPA is also moving forward with its administrative order process with Chevron regarding cleanup of the gasoline spill. EPA issued its Final Decision and Response to Public Comments outlining the final remedy for the gasoline release in August 2008. EPA has also issued an Administrative Order on Consent (AOC) to Chevron, which specifies what work and the timetable upon which Chevron must perform in relation to the Chillum site. The AOC is subject to a 30-day Public Comment Period, which began August 25, 2008. After EPA completes a review of the comments and determines the need for any modifications to the agreement, the AOC will, upon acceptance by Chevron, become effective and enforceable by EPA.
2. ATSDR will work with DC DOH's asthma program to facilitate asthma health education in the community.
3. ATSDR will continue to work with stakeholders, including community members, EPA, and the District of Columbia Departments of Environment and Health to respond to public health questions and concerns.

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Attachment – Tables

Table 1— Indoor Air Data Summary, Summer 2006, Chillum Perc Site

Sample ID	PERC (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylene (ppb)	MTBE (ppb)
01/M10	1.46	0.77	4.86	0.38	1.01	0.26
01/T04	0.58	0.42	11.29	0.36	0.84	0.30
02/M09	0.71	0.59	8.71	0.25	0.39	0.12
02/T08	2.58	0.50	3.22	0.42	0.80	0.68
03/M09	0.71	0.61	3.66	0.35	0.87	0.91
06/M13	0.59	2.25	6.75	0.75	2.81	0.21
07/T02	0.68	1.38	13.07	0.70	2.31	0.16
01/M05	0.13	0.42	2.19	0.11	0.26	0.14
01/M07	0.93	0.57	22.92	1.89	4.24	0.21
01/M12	0.78	0.44	21.03	1.10	2.18	0.24
01/T01	0.91	2.26	15.68	2.67	10.57	17.07
02/M12	0.22	0.59	8.01	0.61	3.41	0.09
03/M02	0.39	0.61	7.52	0.42	1.01	0.08
03/M04	1.46	0.61	13.33	0.81	1.90	0.13
03/M10	0.18	0.36	4.38	0.98	2.60	0.09
03/T09	1.27	0.63	6.30	0.85	2.49	0.45
04/M08	0.40	1.11	9.45	1.16	3.33	0.10
04/M10	2.39	1.99	7.80	1.05	4.46	0.36
04/M11	0.07	0.03	0.04	0.04	0.19	0.08
04/M12	1.43	1.23	6.05	1.29	5.17	0.13
04/T09	0.06	0.08	0.06	0.04	0.18	1.07
05/M07	1.16	0.68	5.57	0.71	3.09	0.17
06/M04	0.45	0.70	6.28	0.87	3.39	0.08
06/M08	0.08	0.05	0.10	0.05	0.21	0.08
06/T02	2.77	8.14	39.85	8.85	32.66	12.47
06/T09	0.32	1.64	4.39	0.98	3.06	2.81
07/M03	0.13	0.38	2.69	0.42	1.47	0.10
07/M08	0.25	0.74	3.75	0.42	1.63	0.09
07/T01	0.19	0.70	3.89	0.69	2.82	0.18
07/T05	0.32	0.32	8.24	1.26	2.81	0.10
07/T10	0.30	0.66	4.32	1.31	3.34	0.87
10/S01	0.28	0.53	4.17	0.44	1.76	0.09
01/M02	2.47	0.50	19.32	0.60	1.10	0.16
01/M11	2.64	1.54	14.57	1.21	4.24	5.17
02/M03	0.06	0.12	0.50	0.04	0.18	0.07
02/M07	0.58	0.45	2.91	0.39	1.14	0.94
02/M10	1.15	0.60	7.22	0.77	2.24	0.42
02/M11	1.13	0.60	11.67	1.07	2.40	0.15
02/T01	0.23	0.86	6.47	0.77	4.40	0.92
03/M01	0.20	0.35	6.32	0.40	1.15	0.09
03/M06	0.90	0.35	7.96	0.47	1.09	0.10
03/T01	0.75	1.97	15.97	2.20	7.34	3.92
03/T04	2.70	0.62	6.27	0.87	1.96	0.32

Sample ID	PERC (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylene (ppb)	MTBE (ppb)
04/T02	3.04	0.96	25.43	1.54	5.74	0.50
04/T03	1.24	0.58	4.41	0.67	1.82	0.28
05/M03	3.18	3.41	4.99	0.79	2.93	0.12
05/M05	1.34	0.71	6.96	1.36	2.92	4.14
06/M01	1.52	2.50	10.63	3.14	13.24	1.66
06/M05	0.97	1.02	4.06	0.83	2.24	0.20
06/M07	0.37	0.51	3.54	0.68	2.98	0.14
06/T01	0.27	1.88	7.56	1.47	4.80	0.08
07/M01	0.36	0.81	3.81	0.64	2.84	0.37
07/M05	0.11	1.92	1.24	0.06	0.18	0.22
08/M02	0.24	0.55	5.29	0.60	2.20	0.14
01/M09	0.32	0.83	12.62	0.55	1.46	0.33
02/M02	0.26	0.29	5.01	0.45	1.60	0.15
02/M06	0.24	0.20	5.71	0.97	2.24	0.13
02/M13	0.55	0.34	8.72	0.63	1.15	0.12
02/T03	1.21	0.24	10.72	0.38	0.78	0.26
03/M05	0.06	0.25	0.33	0.04	0.18	1.51
03/M08	0.25	0.49	12.83	1.17	2.20	0.08
04/T05	0.68	3.43	10.77	1.22	2.14	0.20
05/M08	1.18	0.84	5.57	1.31	4.63	0.59
05/T05	0.42	0.61	4.09	0.09	0.19	0.26
06/M02	0.43	3.69	10.28	2.04	8.17	12.84
01/S01	0.68	0.50	9.74	17.84	60.79	0.18
01/T03	5.55	0.63	8.94	3.87	13.54	0.22
02/M05	0.71	1.57	18.55	1.36	3.72	0.44
03/M13	0.39	0.50	3.62	0.36	0.99	0.07
04/M01	0.49	0.71	6.27	0.83	4.83	0.32
04/M13	2.90	0.94	5.61	0.67	2.51	0.23
04/T07	1.59	1.51	15.16	2.14	5.96	0.41
05/M13	0.80	0.66	3.48	0.47	1.97	0.27
05/T03	0.61	0.41	7.17	0.18	0.89	0.08
05/T08	0.41	0.44	2.81	0.54	1.57	0.13
08/M01	0.20	0.58	7.47	0.58	2.72	1.04
08/M13	0.35	0.57	6.28	0.85	5.30	0.20
10/S03	0.38	0.80	3.40	0.39	1.74	0.10
01/M01	1.81	0.68	20.47	1.35	2.75	0.44
01/M06	0.91	0.52	10.12	0.68	2.56	0.21
01/M13	0.11	0.15	3.98	0.28	1.15	0.08
02/M08	0.32	0.28	7.59	0.28	0.63	0.10
03/M07	0.32	0.27	5.10	0.49	1.84	0.19
03/M11	0.08	0.14	1.21	0.04	0.18	0.10
03/M12	0.21	0.40	4.74	0.95	3.75	0.23
03/T02	2.10	0.45	5.95	1.23	4.02	0.40
04/M03	0.55	0.51	5.10	0.76	2.75	0.15
04/M06	4.26	1.43	7.75	1.41	3.75	0.11

Sample ID	PERC (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylene (ppb)	MTBE (ppb)
04/M07	0.35	0.83	12.18	1.00	2.92	0.22
04/M09	0.61	0.31	2.14	0.14	0.37	0.21
04/T10	0.37	0.54	6.65	0.63	1.57	0.18
05/M01	1.11	0.58	4.76	0.96	5.35	0.28
05/M02	1.60	0.51	4.53	0.82	1.75	0.10
05/M04	2.02	0.35	3.21	0.48	1.84	0.44
05/M09	1.34	0.40	4.93	0.46	1.94	0.13
07/M02	0.24	0.73	5.28	1.34	5.15	0.22
10/S02	0.26	0.81	5.32	0.63	2.96	0.25
CV	40	0.04	80	700	50	700

Source: Building Sciences and Engineering Associates. 2006. Riggs Park Air Quality Study Final Program Report. Bethesda, MD

Note:

CV: comparison value.

PERC: perchloroethylene

Ppb: parts per billion

MTBE: methyl tert-butyl ether

CVs used are as follow:

Benzene: cancer risk evaluation guide (CREG).

Toluene: chronic inhalation environmental media evaluation guide (EMEG)/minimal risk level (MRL);

Xylenes: chronic inhalation environmental media evaluation guide (EMEG) / (MRL);

PERC: chronic inhalation environmental media evaluation guide (EMEG) / (MRL).

Methyl tert-butyl ether: chronic inhalation environmental media evaluation guide (EMEG) / (MRL).

Ethylbenzene: intermediate inhalation environmental media evaluation guide (EMEG) / (MRL).

Table 2—Summary of 2006 Available Outdoor Air Data Chillum Perc Site (ppb)

Sample ID	PERC	Benzene	Toluene	Ethylbenzene	Xylene	Methyl tert butyl ether
01/001	0.13	0.24	9.58	0.52	0.73	0.07
01/002	0.21	0.24	9.96	0.93	1.49	0.09
02/001	0.23	0.30	5.97	0.23	0.31	0.07
02/002	0.29	0.36	3.61	0.40	1.55	0.10
03/001	0.11	0.14	2.42	0.46	2.05	0.11
03/002	0.81	0.21	13.79	1.05	2.17	0.09
03/003	0.17	0.18	0.47	0.09	0.32	0.08
04/001	0.17	0.34	5.76	2.05	5.88	0.08
04/002	0.22	0.31	12.02	0.98	1.93	0.09
04/003	0.07	0.21	0.62	0.13	0.48	0.08
05/001	0.12	0.20	3.83	0.85	1.92	0.08
05/002	0.08	0.36	0.57	0.31	0.32	0.10
05/003	0.32	0.70	4.16	0.79	2.25	0.14
06/001	0.27	0.35	4.60	0.33	1.00	0.08
06/002	0.33	0.30	2.91	0.51	2.02	0.08
06/003	0.16	0.35	4.03	0.60	1.34	0.08
07/001	0.10	0.19	2.03	0.42	1.70	0.07
07/002	0.23	0.33	6.18	2.04	4.78	0.08
07/003	0.10	0.22	4.21	0.97	4.91	0.08
08/001	0.18	0.27	5.95	0.59	2.65	0.09
10/001	0.07	0.34	2.98	0.33	1.38	0.09
10/002	0.07	0.27	2.25	0.26	1.27	0.08
CV	**40**	**0.04**	**80**	**700**	**50**	**700**

Source: Building Sciences and Engineering Associates. 2006. Riggs Park Air Quality Study Final Program Report. Bethesda, MD

Notes:

CV: comparison value.

CVs used are as follow:

Benzene: cancer risk evaluation guide (CREG)

Toluene: chronic inhalation environmental media evaluation guide (EMEG)/minimal risk level (MRL);

Xylenes: chronic inhalation environmental media evaluation guide (EMEG) / (MRL);

PERC: chronic inhalation environmental media evaluation guide (EMEG) / (MRL);

Methyl tert-butyl ether: chronic inhalation environmental media evaluation guide (EMEG) / (MRL); and

Ethylbenzene: intermediate inhalation environmental media evaluation guide (EMEG) / (MRL).

Table 3—Summary of Indoor and Outdoor Air Sample Results, Winter 2007, Chillum Perc Site (ppb)

Sample Code	Benzene	Ethyl Benzene	MTBE	Perc	Toluene	Xylenes
1-1398	0.92	0.31	<0.108	<0.143	4.62	0.94
2-5565	1.20	0.74	2.45	0.71	3.7	2.36
3-1384	2.07	1.22	9.85	0.76	8.33	4.29
4-1360	1.26	0.35	<0.108	0.58	3.44	1.10
5-1379	0.63	<0.141	<0.108	<0.143	2.47	0.65
6-470	0.56	0.78	<0.5	<0.5	2.97	2.79
7-238	<0.5	<0.5	<0.5	<0.5	2.8	<1.00
9-1682	0.62	<0.5	<0.5	<0.5	1.5	<1.00
10-1367	0.73	0.63	2.37	<0.5	3.58	2.26
11-0235	<0.124	<0.141	<0.108	<0.143	0.71	<0.246
12-1389	0.86	<0.141	0.88	<0.143	3.38	0.49
13-495	0.80	<0.141	<0.108	<0.143	0.72	0.30
8-5566 (Outdoor)	<0.5	<0.5	<0.5	0.66	<0.5	<1.00
14-233 (Outdoor)	<0.124	<0.141	<0.108	<0.143	0.99	<0.246
CV	**0.04**	**700**	**700**	**40**	**80**	**50**

Source: Government of the District of Columbia, Department of Health. Riggs Park 2007 Winter Air Quality Sampling test Results.

Notes:

CV: comparison value.

< : less than

PERC: perchloroethylene

MTBE: methyl tert-butyl ether

CVs used are as follow:

Benzene: cancer risk evaluation guide (CREG) of 0.04 ppb;

Toluene: chronic inhalation environmental media evaluation guide (EMEG)/minimal risk level (MRL);

Xylenes: chronic inhalation environmental media evaluation guide (EMEG) / (MRL);

PERC: chronic inhalation environmental media evaluation guide (EMEG) / (MRL);

Methyl tert-butyl ether: chronic inhalation environmental media evaluation guide (EMEG) / (MRL); and

Ethylbenzene: intermediate inhalation environmental media evaluation guide (EMEG) / (MRL).

Table 4— Summary of Indoor Data, Chillum Perc Site, 2003, 2006, and 2007 (ppb)

Substance	Maximum concentration			Median concentration			Mean concentration		
	2007	*2006*	*2003*	*2007*	*2006*	*2003*	*2007*	*2006*	*2003*
benzene	2.07	8.14	4.13	0.77	0.60	1.06	0.856	0.88	1.41
ethylbenzene	1.22	17.84	6.08	0.43	0.70	4.05	0.525	1.09	4.05
mtbe	9.58	17.07	6.99	0.50	0.21	1.99	2.110	0.87	3.19
perc	0.76	5.55	6.06	0.50	0.58	2.03	0.425	0.92	3.26
toluene	8.33	39.85	12.10	3.18	6.27	4.03	3.580	7.66	5.25
xylenes	4.29	60.79	19.25	1.00	2.24	3.04	1.670	3.66	4.49

Note:

Nondetects are not included in the 2003 statistics.

The 2006 statistics are adopted from the BESA final report.

The 2007 statistics were generated from EPA collected data.

Table 5— Comparison of 2006 and 2007 Indoor Air Benzene Data from 6 Different Homes Participating in Multiple Site Sampling Rounds, Chillum Perc Site (ppb)

2007 DOH Samples	Maximum Concentration	2006 BESA samples	Maximum Concentration
3-2007 (1384)	2.07	3-2006 (06T02)	8.14
4-2007 (1360)	1.26	4-2007 (05M03)	3.14
5-2007 (1379)	0.63	5-2007 (07T02)	1.38
6-2007(470)	0.56	6-2007 (06M01)	2.5
9-2007 (1682)	0.62	9-2007 (06M13)	2.25
10-2007 (1367)	0.73	10-2007 (03T01)	1.97

Source: Building Sciences and Engineering Associates. 2006. Riggs Park Air Quality Study Final Program Report. Bethesda, MD; Government of the District of Columbia, Department of Health. Riggs Park 2007 Winter Air Quality Sampling test Results.

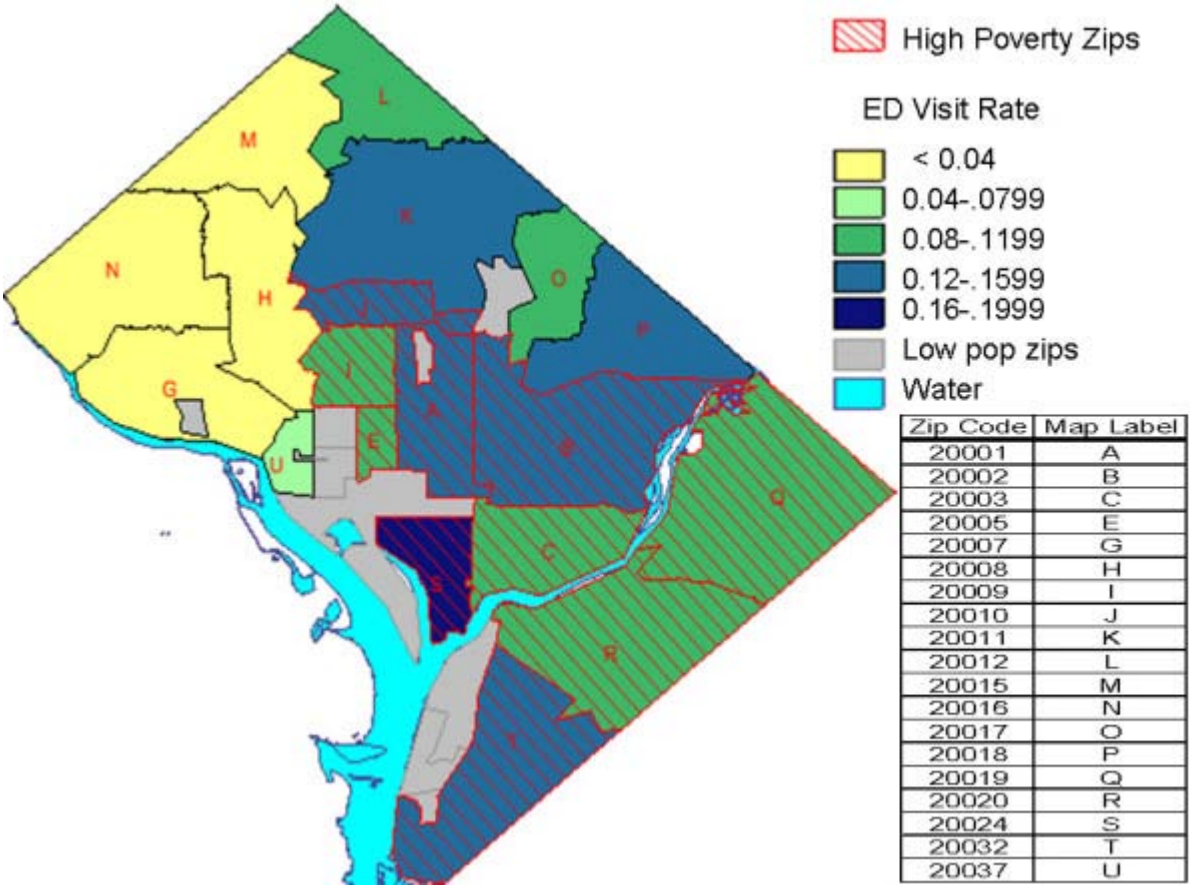
Attachment – Figures

Figures are adopted from:

[Babin et al] Babin S., Burkom H., Holtry R., et al. 2007. Pediatric patient asthma-related emergency department visits and admissions in Washington, DC, from 2001–2004, and associations with air quality, socio-economic status and age group. Environ Health. 2007;6:9.

[Babin et al] Babin S., Burkom H., Holtry R., et al. 2008. Medicaid patient asthma-related acute care visit and their associations with ozone and particulates in Washington, DC, from 1994-2005. International Journal of Environmental Health Research, 18:3, 209-221.

Figure 1 Asthma-related ED visit rates by Zip code for FY 2001-2003



Zip Code	Map Label
20001	A
20002	B
20003	C
20005	E
20007	G
20008	H
20009	I
20010	J
20011	K
20012	L
20015	M
20016	N
20017	O
20018	P
20019	Q
20020	R
20024	S
20032	T
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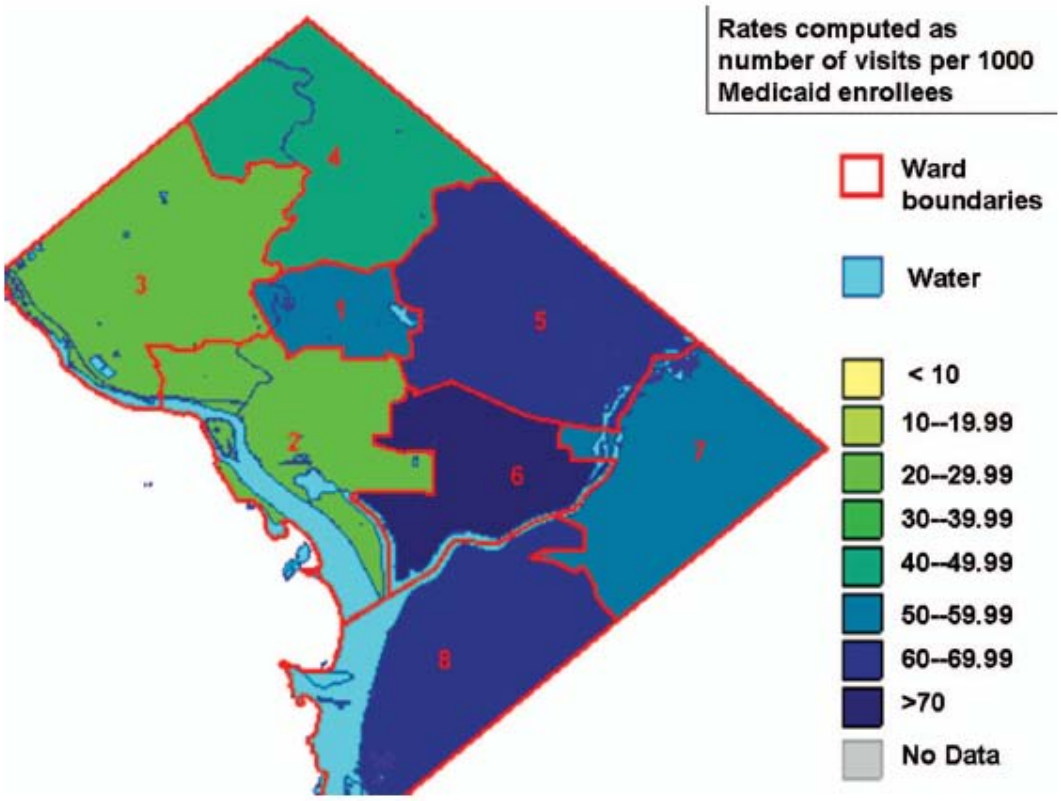

Figure 2. Map of DC showing asthma-related Medicaid patient GAC visit raters (visits divided by Medicaid enrollment of ward residents) over all the years of the study. Wards are indicated by the red boundaries and red numbers.

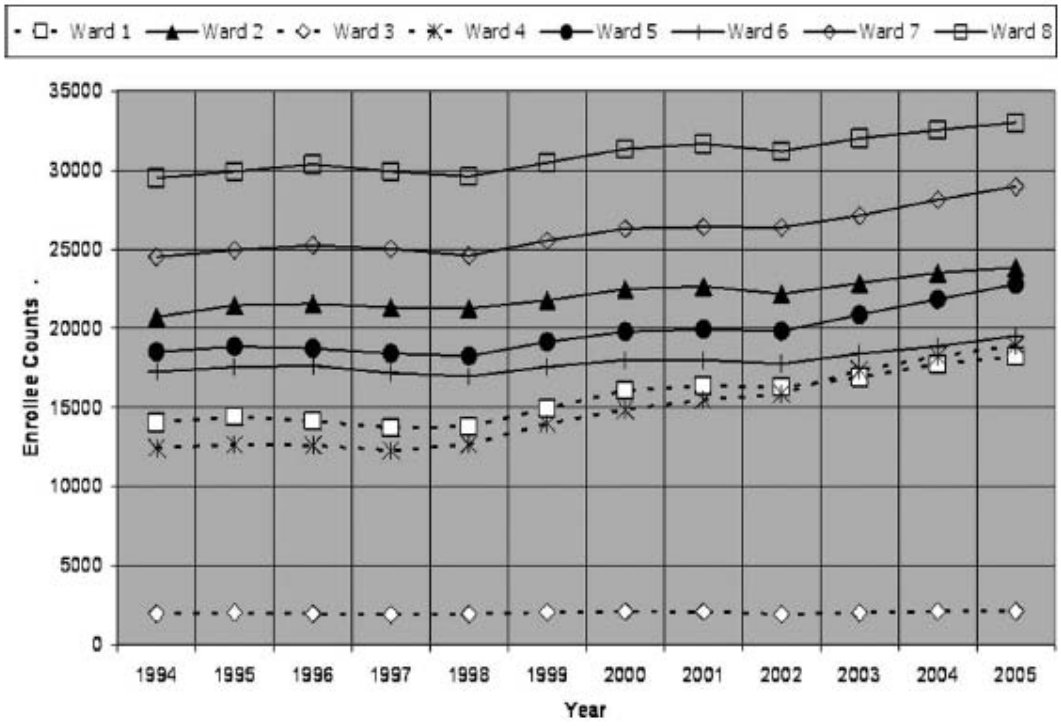

Figure 3. Annual numbers of Medicaid enrollees by year and by ward.

Appendix A - Response to public comments

After releasing the health consultation on April 12, 2008, ARSDR received comments from the public and DC DOH/DC DOE. Theses response are categorized and listed below along with agency's response, including a description of changes that were made in this health consultation report because of the comments.

Communication and Environmental Justice (EJ) issues:

1. Most of the residents in the Riggs Park community did not receive a copy of the ATSDR Health Consultation in order to be in a position to comment on it.

ATSDR announced the availability of this document via a press release, provided it to the public library repository, mailed an announcement to residents who expressed interest in receiving ATSDR information (a 250-member community mailing list), and mailed copies directly to key residents and agency representatives. EPA also advertised the availability of our document in a community factsheet, and posted it on the EPA website. We hope community members will let us know if different communication strategies would be preferred, and we would be glad to work to accommodate any such community preferences that are communicated to us.

2. Why is it the front page of the Chillum Perc HC makes no reference to the gasoline contamination in Riggs Park residential community and is this a form of discrimination against this black community? Your indoor and outdoor air data evaluation is referred to as Chillum Perc Site health Consultation. Why is this, since we are dealing with gasoline and hazardous materials that it renders. Are you going to retract this title?

ATSDR was initially requested by the EPA Superfund program to evaluate the contamination of groundwater at this site with chemicals such as tetrachloroethylene (PCE), benzene, and methyl tert-butyl ether (MTBE) in the area. As such, the Chillum Perc health consultation is titled this way and this site name appears in official ATSDR and EPA Superfund administrative database accordingly. ATSDR is, however, committed to environmental justice by identifying and addressing, as appropriate, adverse human health or environmental impacts on low income and/or minority populations. Therefore, the gasoline related chemicals have been evaluated and discussed per ATSDR health assessment guidelines. ATSDR has no plans to change or retract the title.

3. Has ATSDR and EPA Region III applied the federally mandated Environmental Justice (EJ) principles in their decision making processes when selecting CV CREGs for this health consultation? Why were CV CREGs used to evaluate vapor intrusion and indoor air in other EPA Region III HC sites, predominantly white, and not used in this, predominantly black site?

ATSDR and EPA are committed to being responsive to the Presidential Executive Order 12898 entitled "Federal Actions to Address Environmental Justice Actions in Minority and Low income Populations". Responding to that Executive Order we focused attention on the environmental and human health conditions of this minority community by providing fair and meaningful involvement of the community. ATSDR's CV CREGs are based on the best science available and are not biased against any group based on race. All sites and data packages are screened in a

step-wise scientific process regardless of race or ethnicity. The CREGs were used to screen chemicals to determine if we should conduct a more in-depth evaluation. The CREG or any ATSDR CV is NOT an effect level. If a chemical is above a CV (CREG or other) we conduct further evaluation, incorporating site-specific information into the evaluation of exposure.

4. If it is determined the mandated EJ principles and/or CV CREGs for indoor air were not properly administered in this HC will ASTDR agree to perform a public health assessment of the Riggs Park gasoline and perc residential area?

ATSDR has conducted its public health activities at this site in accordance with agency practices and principles.

ATSDR understands that community members at this site have long advocated for a health study of residents at this site. ATSDR understands that this comment regarding a "public health assessment" may in fact represent a request for a health study as opposed to the ongoing public health assessment/consultation activities that ATSDR has been engaged in since 2003 at this site. As was formally communicated to the District in a letter from CDC Administrator Dr. Julie Gerberding in June 2004, and has been discussed in numerous public forums since then, ATSDR does not believe the conditions at this site necessitate a health study in this community. Generally, we do not recommend performing health studies when there is insufficient information or when other factors exist that severely limit ATSDR's ability to provide new and useful information on the health or exposure status of the community relative to any known sources of contamination. At this site, the information available on environmental exposures does not indicate that the community has received exposures high enough to produce illnesses or diseases related to the contamination. Therefore, ATSDR does not recommend a health study in this community.

5. Have you researched the Environmental Justice and the Nimby Principle. I was concerned because it states that a site must have a soil type and geological profile insuring that hazardous material will not find is way into the aquifer. Our community is in the area and on the aquifer. HOW COME THIS HAS NOT BEEN ADDRESSED?

The NIMBY Principle (Not In My Back Yard) applies to the "siting" of faculties in or around communities. The commenter is correct that geological suitability is a fact that should appropriately be considered in the siting of facilities involving the disposal of hazardous materials. ATSDR was not involved in the "siting" process of the facilities that are the historical source (s) of the groundwater contamination in this community. We are, however, committed to the principles of Environmental Justice and the mission of the Agency to promote health and quality of life by preventing and controlling disease, injury and disability. This mission applies to everyone including and especially those populations that are disproportionately affected by threats to health and safety. Environmental sampling has shown that the groundwater aquifer is contaminated and that soil/soil gas are impacted as well. ATSDR evaluated the public health implications from exposures to chemicals in ambient and indoor air, soil gas, and drinking water. Because this community is served by a public water supply, the primary public health exposure pathway of concern at this site is the vapor intrusion pathway.

Comparison value /CREG issues:

6. The most recent ATSDR Cancer Risk Evaluation Guideline ("CREG") level for benzene was apparently not used.

ATSDR used the benzene CREG in the health consultation as stated in the document (please see Discussion section in the public comment release version, page 5 and 6) as following: "ATSDR's current chronic EMEG/MRL for benzene is 3 ppb, the concentration of benzene in air that is unlikely to be associated with any appreciable risk of adverse, non-cancer effects for more than one year of continuous exposure. For cancer effects, ATSDR has derived an benzene CREG of 0.04 ppb based primarily on studies of U.S. workers exposed to high levels of benzene (up to hundreds of ppm or hundreds of thousands of ppb) during rubber manufacturing."

Because benzene levels detected at the site exceeded the screening level for this chemical, ATSDR used a weight - of -evidence approach to further evaluate this chemical and compared the maximum benzene exposure level at the site to human studies that have shown adverse effects. It should be noted again that the CREGs or any ATSDR CV is NOT an effect level - it is a screening value. If a chemical is above a CV (CREG or other) we take further evaluations such as comparing site-specific information to information from human or animal studies that have or have not shown adverse effects. Further evaluation of benzene exposures are presented in the HC and summarized below:

1. The lowest human effect levels reported in ATSDR's Toxicological Profile for Benzene [ATSDR 2007a] are 300 ppb (960 µg/ m^3) for leukemia [Ott et al. 1978] and 570 ppb (1,838 µg / m^3) for reduced white blood cell and platelet counts [Lan et al. 2004]. These values (570 ppb and 300 ppb) represent the lowest measured concentrations in a range of workplace measurements from the two studies (300–35,000 ppb and 570–28,000 ppb, respectively). Those levels are many times higher than the maximum benzene level detected in indoor air for the site (8.1 ppb).
2. One recent study [Lan et al. 2004] was used to develop the chronic MRL in the current toxicological profile for benzene. The MRL of 3 ppb is based on (1) the LOAEL of 570 ppb for the critical effect of decreased B cell count, (2) the point of departure of 100 ppb (adjusted from the 8-hour time weighted average to a continuous exposure concentration of 30 ppb), and (3) an uncertainty factor of 10 for human variability.
3. Epidemiologic data have suggested that there are thresholds for leukemia. Available studies indicate no detectable excess of leukemia below cumulative exposures of 40 ppm-years [Rinsky et al 1987]. This would be numerically, if not biologically, equivalent to about 190 ppb, 24 hours a day, over a 70-year lifetime. However, this apparent threshold is most likely an underestimate.
4. The 1999 ATSDR's Division of Health Assessment and Consultation health screening guideline (cancer and non-cancer) of 10 ppb for chronic inhalation exposure to benzene was based on information from toxicological literature reviews, experimental findings, reevaluation of occupational cohorts related to benzene, and professional judgment by the ATSDR toxicologists. This number was based on the finding that no adverse health effects were reported in the literature at 1,000 ppb, and incorporated an uncertainty factor of 100.
Because the reasons discussed above, ATSDR concluded that the estimated benzene exposures in the Chillum area would not produce any adverse health effects of either a cancerous or non-cancerous nature.

7. Of the 258 soil vapor, 178 indoor air and the 37 outdoor air sample ATSDR reviewed, how many were evaluated using CV CREGs?

All samples are screened for cancer and non-cancer effects. If available, CREGs were used.

8. Why did CV CREGs apply to Benzene and not to MTBE as well, considering EPA Region III RBCs considers both chemicals as having carcinogen effects?

The Department of Health and Human Services (DHSS), the International Agency for Research on Cancer (IARC), and the U.S.EPA have not classified MTBE for its ability to cause cancer. Currently, ATSDR has not established a CREG for MTBE. In summary, there is no evidence that MTBE causes cancer in humans. One study with rats found that breathing high levels of MTBE for long periods may cause kidney cancer. Another study with mice found that breathing high levels of MTBE for long periods may cause liver cancer. In line with its regulatory and remediation activites, EPA Region 3 conservatively` treats MTBE as a possible carcinogen; however, other agencies are not required to conform with EPA Region 3 policies.

9. Were the Cancer Risk Evaluation Guides developed by ATSDR to aid in evaluating carcinogenic effects?

CREGs were developed as a screening value (comparison value) for chemicals ATSDR considers to be carcinogenic in humans. If a CREG is exceeded, it does not mean that cancers will result from the exposure. If the detected level of a chemical is above its respective CREG, then we need to evaluate exposures to a greater degree under more site-specific parameters.

10. If CV CREGs were used to evaluate all soil vapor and indoor air samples, as a result, how would the conclusions and recommendations differ from this HC?

If available, CREGs were used. As such, the conclusions and recommendations would not change.

11. Comparison Values (CVs) are to be used to determine what is best for the residents, why do we need a varity of guidelines to determine what is right for the site? Is there one for gasoline? What determine which CVs to use? Is it by color, race, or creed?

As stated in the health consultation, ATSDR staff followed the agency's general hierarchy and used professional judgment to select those CVs that best apply to the site conditions. For example, some of the CVs and health guidelines used by ATSDR scientists include CREGs, EMEGs, and MRLs. If an ATSDR CV is not available for a particular chemical, ATSDR sometimes screens environmental data with CVs developed by other sources, including EPA's RfDs and EPA's Region III RBCs. These CVs and health guidelines, as well as all other health-based screening criteria, represent conservatively derived levels for screening and assessing the likelihood of adverse effects; they are not thresholds of toxicity. Although concentrations at or below a CV may be considered safe, concentrations above a CV will not necessarily be harmful. There is no CV for gasoline because gasoline is a material consisting of many chemicals. However, there are CVs for many constituents of gasoline such as benzene, toluene, MTBE, xylene, etc.

The CV CREGs used were based on the best science available. All sites and data packages are screened the same way in a step-wise scientific process.

12. I feel that ATSDR should incorporate the District of Columbia Regulation for Evaluating Indoor and Outdoor Air Data. These regulations were set up to protect the safety and welfare of our community.

ATSDR staff followed the agency's general hierarchy and used professional judgment to select those CVs that best apply to the site conditions. The District's regulations (found at http://ddoe.dc.gov/ddoe/cwp/view,a,1209,q,495379.asp; and http://ddoe.dc.gov/ddoe/cwp/view,a,1209,q,495386.asp) are risk-based corrective action and regulations for Underground Storage Tanks. The regulations contain procedures and risk based screening levels for groundwater, surface water, and soil used by potential responsible parties to develop site- specific risk based screening levels and site-specific target levels for remediation for those environmental media. No direct comparison can be made for the indoor and outdoor air data collected in the Chillum site. ATSDR supports DCDOE and DC DOH's regulations to protect and restore the environment, and to promote and protect the health, safety and quality of life of residents.

13. I would like to know 'Why wasn't my child care facility evaluated under the Cancer Risk Evaluation Guidelines (CREGs), the same as you used to evaluate other child care facilities?

All sites and data packages are screened the same way in a step-wise scientific process. If available, CREGs were used.

Asthma and other health issues

14. After collecting data from the District of Columbia Department of Health asthma prevalence information for the Riggs Park Community, zip code 20011, ward survey and study, if it is determined that there is a larger than first considered number of children with asthma and /or respiratory health problems, is the ATSDR going to reevaluate to conclude a possible link to asthma / respiratory and this contaminated site?

As a direct result of the community's concern regarding asthma in this community, ATSDR has begun working with the CDC-funded asthma program at the DC DOH. We are interested in promoting specific asthma initiatives in this community through this program as a public health promotion measure. However, it is important to note that the considerable asthma-related research field has not established any links between asthma and exposures to the VOCs found in the groundwater and soils at this site.

To further evaluate the asthma rates in this community, ATSDR reviewed the following available asthma information related to the site: the Asthma Statistical Report (http://doh.dc.gov/doh/cwp/view,a,1374,q,601730.asp), the 2003 and 2004 Annual Reports, data provided by DC and the BRFSS prevalence and trends, Pediatric patient asthma-related emergency department visits and admissions in Washington, DC, from 2001–2004, and associations with air quality, socio-economic status and age group

(http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1845147), and Medicaid patient asthma-related acute care visit and their associations with ozone and particulates in Washington, DC, from 1994-20005 (International Journal of Environmental Health research, 2008 Jun:18(3):209-21).

Please see the summary of the information in this final document under "Summary of DC Cancer and Asthma Data". This information confirms the concern community members have raised that asthma rates appear to be elevated in this Ward and zip code relative to the District as a whole. However, the available asthma data does not help ATSDR differentiate asthma rates specifically in the Lamond Riggs neighborhood affected by the groundwater contamination; we are only able to comment on rates at the whole Ward or zip code level. Asthma rates appear to be elevated in zip code 20011 relative to the District as a whole four of six years from 2001 to 2006 based on limited asthma information. ATSDR does not have sufficient information to test for any statistical significant differences between wards and zip codes and the district.

15. ATSDR categorized this site in Riggs Park as a no apparent public health hazard. Levels are reading different year to year, month to month, day to day, at times higher than others. At some point until this gasoline contaminate is removed, the levels will, in some homes if not all, exceed the levels for human health exposures to VOC's indoor air; in fact causing adverse health effects (asthma, respiratory/breathing, etc.) If changes were noted, what would your proposed assessment health plan of action for residents be?

ATSDR recognizes that vapor intrusion varies depending upon the time of year. ATSDR evaluated sampling data taken by several agencies performed at different times of the year and concluded that the full range of the reported VOC levels in indoor air are at levels unlikely to cause adverse, cancer or non-cancer health effects for acute, intermediate, and chronic exposures. If site conditions changes, ATSDR will evaluate any additional environmental data when they are available.

16. ATSDR keeps hopping on cancer risks but these chemicals cause much more respiratory problems, skin problems, blood disorders, myelogenous leukemia, lymphocytic leukemia, hodghens lymphoma, hopkins disease, multiple meloma, mylhodysploctic syndrome, hairy cell leukemia, eye irritations, skin, nose, throat and eye irritation, dizziness, excitement, drowsiness, in-coordination, anorexia, nausea, vomiting, abdominal pain, dermatitis, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidney, brain damage, damage to fetal development, bone damage and I could go on and on. So – how has your agency tried to help our neighborhood?

ATSDR has tried to help your neighborhood with health information and technical assistance and provided our support and technical assistance to the environmental regulatory agencies' characterization and remediation efforts at this site. We have individually consulted with residents, physicians, and the involved agencies at the federal and district level since 2003.

The commenter is correct; ATSDR has focused on cancer risk evaluations at this site. We have focused on cancer risks because the contamination levels seen in the indoor air at this site are not high enough to produce any of the non-cancer health effects described in the comment above.

Cancer risk effect levels are considerably lower than non-cancer health effect levels. So, for the relatively low levels of contaminants observed in the indoor air at this site, it has been most appropriate to focus on cancer endpoints. Available data indicated that (1) death rates of several common cancers in the District appear to be similar to U.S. rates, with the exception of prostate cancer in males, which has a higher death rate in the District relative to the U.S. as a whole. This increased rate appears to be trending downward over time in the District. Death rates for all other cancers appear to be stable or are declining, and (2) the most recent information available from the DC cancer registry at the ward level indicated that Ward 4 has similar rates to other wards in 2003. The 2003 incidence rate for leukemia in Ward 4 is similar to the rates in the other district wards. Please see the detailed discussion section of this document for more information on this topic.

Select of COC / chemical mixture /sensitive population issues

17. Health threats for numerous chemicals of concern ("COCs") known to be associated with gasoline mixtures and Perc breakdown products were not considered. You talk about five chemicals out of a list of over 300 or more VOC concentrations. Why?

ATSDR evaluated all of the available chemical data provided to us from EPA and the District/BSEA. Per our standard process, we screened all of the chemical data we received, and then selected certain chemicals for further, more detailed public health evaluation if they exceeded our comparison values. At the request of District officials and/or community members, and requisite upon receipt of the electronic data sets from the District, ATSDR will perform a public health evaluation of forthcoming additional sampling information in the community (i.e., the complete BSEA and Papadopulas data sets).

18. It is not clear that the conventional ATSDR approach used to evaluate cumulative health effects associated with exposure to multiple COCs (that either target the same organ system or produce cancer) was followed.

ATSDR recognizes that the health impact of exposure to chemical mixtures is of particular concern to community members and the District. ATSDR followed existing ATSDR protocols for evaluating exposures to multiple chemicals of concern. Specifically, ATSDR incorporated the information from ATSDR's Guidance Manual for the Assessment of Joint Action of Chemical Mixtures [ATSDR 2004c] and the Interaction Profile for Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) [ATSDR 2004d]. The summary statement in the interaction profile states the following:

"No studies are available that directly characterize health hazards and dose-response relationships for exposures to "whole" mixtures of BTEX. Exposure to each of the individual chemicals can produce neurological impairment via parent chemical-induced changes in neuronal membranes. Benzene can additionally cause hematological effects, which may ultimately lead to aplastic anemia and acute myelogenous leukemia, and there is evidence that ethylbenzene is carcinogenic in other tissues. No studies were located that directly examined joint toxic actions of benzene, toluene, ethylbenzene, and xylenes on the nervous system, but additive joint neurotoxic action is plausible for environmental exposures based on predictions

from physiologically based pharmacokinetic (PBPK) modeling studies with BTEX and a ternary mixture of its components, and supporting data from neurotoxicity interaction studies of binary component mixtures.

In the absence of data on toxic or carcinogenic responses to the whole mixture, possible health hazards from exposures to BTEX are best assessed using a component-based approach that considers both the shared (neurologic) and unique (hematologic/carcinogenic) critical effects of the constituent chemicals.

A hazard index approach that assumes additive joint action and uses ATSDR Minimal Risk Levels (MRLs) and guidance values based on neurological impairment is recommended for exposure-based assessments of possible neurotoxic health hazards from the four components. The possible hematotoxic and carcinogenic hazards of BTEX exposures should be evaluated on the basis of benzene alone due to the causal relationship between the noncancer hematological effects of benzene and the development of leukemia, and the lack of a cancer risk value for ethylbenzene. It therefore is recommended that the cancer unit risk value for benzene be used to jointly assess possible hematotoxic and carcinogenic hazards from exposures to BTEX."

Since individual contaminants detected at this site are present at levels that are below those that might be expected to result in adverse health effects, ATSDR has concluded that the combined effect of the contaminants detected at the site is also not likely to result in adverse health effects. This conclusion is based on studies that suggest that a mixture produces no adverse noncancer health effects in dosed animals when the components of that mixture are present at levels below their respective no-observed-adverse-effect levels (NOAELs), which are concentrations estimated to produce no adverse effects in animals treated separately with the individual chemicals [Wade et al. 2002, Feron et al. 1993, Jonker et al. 1990, Jonker et al. 1993a, Jonker et al. 1993b, Groten et al. 1991]. Carcinogens exhibit thresholds in the laboratory, no less than do noncarcinogens [SOT 1981, Williams and Weisbuirger 1991, Cunningham et al. 1994]. It is likely that the previously stated principle regarding mixtures of noncarcinogens applies to mixtures of carcinogens as well. All measured levels of contaminants in the indoor air samples are well below all NOAELs and all known adverse effect levels published in ATSDR's toxicological profiles. Therefore, ATSDR considers that the combined effect of all of these contaminants is not likely to be of public health concern.

Because relatively few chemical mixtures studies have assessed toxic interactions in low dose ranges and because several carcinogenic chemicals exhibited significant spatial trends, ATSDR recognizes there are uncertainties in evaluating the cumulative effects of chemical mixtures. ATSDR considers it a prudent public health measure to reduce or eliminate releases of chemicals into residential homes wherever possible.

19. ATSDR did not conduct any health surveys or collect any medical information from the residents to determine if the toxicity factors are applicable and appropriate, or whether the toxicity values should be adjusted for the unique and highly sensitive population of Chillum residents.

ATSDR does consider the unique population characteristics of the community affected by an environmental contamination concern in our overall evaluation. However, we do not adjust our

"toxicity factors" or chemical-specific screening comparison values on a site specific basis. These screening values are the same for all ATSDR sites and incorporate adjustment or safety factors for sensitive populations such as the elderly and young children.

ATSDR understands that community members at this site have long advocated for a health study/ survey of residents at this site. As was formally communicated to the District in a letter from CDC Administrator Dr. Julie Gerberding in June 2004, and has been discussed in numerous public forums with community members since then, ATSDR does not believe the conditions at this site support a health study in this community. At this site, the concentrations of chemicals detected have been below concentrations that would cause health effects. It is therefore misleading to community members to collect medical information from residents when we cannot support a link to the environmental contamination and exposure information for the site. However, as always concerned residents are encouraged to discuss their unique health situations and the information from ATSDR with their health care providers. ATSDR is available to provide direct consultation with individual health care providers, as needed.

20. What about the health facts on the combination of chemicals induced into children, adults and the elderly for long durations. Do you have those results?

Please see answers to comments #18 and #19.

21. If you refer to the promulgated and published EPA subsurface Vapor Intrusion Guide dated November 2002, EPA530-D-02-004-Draft guidance for evaluating the vapor intrusion to indoor air pathways from groundwater and soil (www.epa.gov/correctiveaction/eis/vapor/complete.pdf) , this guidance provides targeted indoor air concentrations 10-4, 10-5 and 10-6 (incremental individual lifetime cancer risks) levels and hazard quotient (HQ) of 1 for non-cancer risk. For the presence of multiple contaminants at a site, Federal 40 CFR Ch. 1 page 70 section 300.430 e)(2)(I)(A) mandates the use of 10-6. Our community has multiple contaminants. Therefore, as per table 2C, Target Indoor Air Concentration to Satisfy Both the Prescribed Risk Level and the Target Hazard Index (R=10-6, HI=I). Do you agree?

The guidance being referred to is specifically to be used by environmental regulatory agencies in their risk management decisions for vapor intrusion sites. Therefore, this guidance and the target indoor air concentrations described above are not directly applicable to ATSDR's advisory public health assessment process. However, ATSDR is familiar with this guidance and it is ATSDR's understanding that this guidance has been followed at this site. For example, in ATSDR's January 2004 health consultation, ATSDR evaluated available soil vapor data and identified that perc soil vapor concentrations at 5 homes exceeded a level of 810 µg/m³ (120 ppb), and we recognized that this concentration in soil vapor represented an estimated target indoor air concentration of 81 µg/m³ (12 ppb) using the modeling approach described in the EPA guidance. Because the soil vapor data suggested that there is a potential for indoor air exposure, ATSDR recommended additional indoor air sampling and conducted exposure evaluations in our second and third health consultations on actual indoor air sampling data as opposed to modeled soil gas concentrations. From EPA's perspective, the Vapor Intrusion Guidance is not promulgated regulation. EPA informed ATSR that guidance standards are for reference use and are not regulatory standards that can be enforced.

22. Due to seasonal changes gasoline takes on a convection approach. Convection approach is the amount of heat by moving liquid or gas. Convection results form the differences in the density of a material at a different temperatures as liquids or gas rises it become less dense and lighter rising above its cooler and denser counterparts which in turn sinks, this combination of reactions that gas and liquids take in high climate temperatures in our community makes us very susceptible to the chemicals at large being induced into children adults and the elderly. Was this fact considered?

ATSDR interprets from this question that the author is asking about the importance of seasonal variation at vapor intrusion sites. ATSDR recognizes that vapor intrusion varies depending upon the time of year, in part because homes may be more closed off in colder seasons, and also because temperature differentials affect subsurface air movements This site has a data set of sampling data taken by several agencies at different times of the year. After reviewing all of the available data provided to us, we concluded that the reported VOC levels in indoor air across all of these different sampling events are at levels unlikely to cause adverse, cancer or non-cancer health effects for acute, intermediate, and chronic exposures.

23. I feel that ATSDR did not take into consideration the risk factor of how much of the substance an individual in the community was exposed to, its concentration, its form, the timing of the exposure (when and how long exposure occurred) other substances children could be exposed to, his or her individual sensitivity, which in turn can be influenced by age, sex, health status and genetic make up. Why is this?

The commenter is correct that ATSDR's public health reviews at this site are at the overall population level as opposed to an individual's level. This is by definition what a public health review is designed to accomplish. Our screening process attempts to take into account sensitive population groups such as children by applying safety factors to our comparison values. However, it is true that we are not able to account for each individual's unique genetic makeup and health status in our overall community-level public health review, and this is a limitation of our public health work. However, we can examine this concern to some extent in private consultations with individuals/families, which is something we have done for some families and their health care providers at this site.

Sampling Issues:

24. In a letter dated September 27, 2007 stating EPA review indoor air data collected from my home, showing petroleum vapor concentrations above EPA's long-term remediation standards. Stated my home needs a vapor mitigation system. What should I think of your health consultation?

ATSDR's health consultation serves a different purpose from EPA's review and decision making for specific homes in the site area. ATSDR's job as an advisory public health agency is to make a public health call after looking at the environmental data for your home and the other homes in the community. Our conclusion is that the maximum levels seen in the indoor air of homes in your community are below levels that would actually make people sick. EPA's job as an environmental regulatory authority is to protect the public and the environment by enforcing the environmental laws and regulations under its purview. EPA has determined that certain homes in the site area meet criteria for site-related vapor intrusion and thereby warrant a vapor

mitigation system. ATSDR support EPA's actions at your home as being protective of public health. EPA has requested ATSDR to provide a health consultation on the protectiveness of the proposed Indoor Air Standards. Our review concludes that EPA's standards are protective. ATSDR supports EPA's decision to install a vapor mitigation system in your home even though the measured indoor air concentrations do not exceed levels that will make people sick. It is not uncommon for EPA to take precautionary (proactive) actions based on more conservative approach.

25. At a community meeting held September 2007, Mr. Fan (EPA Region III) said the plume is growing. What comment do you have on this statement?

ATSDR referred this comment to EPA for response.
EPA has answered this question on Page 26 of the Final Decision and Response to Comment document as follows:

The contaminated groundwater plume is not expanding. A source for increased liquid phase hydrocarbons no longer exists at the Facility. The leak from the gas station was stopped over 18 years ago. In addition, the remediation system has been working; Chevron has removed 4,800 equivalent gallons of liquid phase hydrocarbons from the groundwater. (http://www.epaosc.net/sites/abc/files/finaldecisionvolume1.pdf)

26. There was an order passed by Congress to have the air safe enough to protect the health, it was amended in 1990 to require EPA to develop more stringent and specific regulations for air emissions. HAS IT BEEN REVISED?

ATSDR referred this comment to EPA for response. EPA answered this question as follows:

In 1990, congress passed the last major amendment to the Clean Air Act and since then, there have only been minor changes to the Act. An overview of the1990 amendment can be found in the EPA web site: http://www.epa.gov/air/caa/overview.txt

27. In a news article dated 08-13-07 written by Michael Neibauer titled EPA Issues Plan for Gas Spill Cleanup, states the primary concern is the vapors that migrate vertically through soil into basements through cracks, joints and utility openings, when in fact we should also be concerned with permeability through pipes. As I stated before - WHY IS THIS? Most pipes have been here for year.

ATSDR referred this comment to EPA for response. EPA has responded to this question on Page 28 of the Final Decision and Response to Comments document as follows:

Liquid gasoline can permeate through a water line that is made of plastic, polyvinyl chloride (PVC) or high-density polyethylene (HDPE). EPA has ruled out the possibility of gasoline permeation of water line in Riggs Park because: (1) the water main in Riggs Park is made of cast iron which is resistant to gasoline permeation; (2) the water main is under pressure, so it can only leak water out, not water in; and (3) the water main is located laterally and vertically away from the smear zone, so it is not in contact with

liquid gasoline. (http://www.epaosc.net/sites/abc/files/finaldecisionvolume1.pdf)

28. Did ATSDR ever review the geoprob data done by Chevron?

Yes. In the January 12, 2004 health consultation, ATSDR reviewed 129 samples from 68 residential properties collected using direct push Geoprobe® soil equipment and post-run tubing soil vapor sampling methods. Those samples were collected during January through June 2002 and October through December 2002 by Gannett Fleming, Inc. under contract with Chevron.

29. How come ATSDR did not push to install full scale gas concentration range monitors to monitor potential hazard concentrations on a daily basis to ensure their own results?

ATSDR typically does not conduct our own air monitoring at sites. If the information we need is available from regulatory agencies, such as the U.S. EPA and the DCDOH/DCDOE, we use that data for our public health reviews.

30. How much background air data collected at McMillan Reservoir, 5 miles away from community, is included in the weight of evidence approach used for this HC? Why were McMillan Reservoir air samples, where higher traffic patterns and direct non obstructed access to higher automobile related VOC concentrations then existed in the contaminated community, excepted as background air for the HC?

The McMillan Reservoir data was used to gain a general understanding of volatile organic chemical levels from the nearest ambient air monitoring station. ATSDR used site specific ambient air samples in conjunction with the McMillan Reservoir data for background consideration. The epidemiologic and animal toxicity data for chemicals identified during the screening process were used in the toxicological implications weight-of-evidence evaluation to a greater extent.

Other Issues:

31. From ATSDR this site is categorized as no apparent public health hazard. What about a personal health hazard?

As a public health agency, ATSDR makes public health calls after reviewing available environmental data, health outcomes and community concerns at a hazardous waste site to determine whether people could be harmed from coming into contact with those substances. Public health assessments and health consultations *do not focus on individuals. Our conclusion is that the maximum levels seen in the indoor air of any home in your community are below levels that would actually make people sick. Certain individuals (such as people with underlying diseases, other physiologic factors, or non-site related exposures) in the community may have more sensitivities. ATSDR suggests that concerned individuals in the community consult with their private care professionals, and share with them their individual sampling results and the information from this Health Consultation document. ATSDR is available to provide direct consultation with individual health care providers, as needed.*

32. What is ambient air? I thought it was when sensing elements are exposed in the air. Is this a health hazard?

Ambient air is any unconfined portion of the atmosphere: open air, surrounding air, outside air, outdoor air.

33. In an article under General Environmental Health, Jan Zhu, Environmental Health Scientist for ATSDR in Atlanta, GA, states that the primary route of exposure was inhalation of potentially contaminated indoor air through vapor intrusion that is still going on today. How can this be safe?

It is not clear to ATSDR which article this comment refers to. However, in all our health consultations for this site, we stated that vapor intrusion is the primary exposure pathway of concern at this site. Whether a person will be harmed by exposure to hazardous substances depends upon several factors, including the type and amount of the contaminant, the manner in which the person was exposed, the duration of the exposure, the amount of the contaminant absorbed by the body, genetic factors, and individual lifestyle factors. For the Chillum site, exposure to contaminated indoor air could be occurring, could have occurred in the past, or could occur in the future, but ATSDR concludes that the reported VOC levels in indoor air are at levels unlikely to cause adverse, cancer or non-cancer health effects for acute, intermediate, and chronic exposures.

34. Has ATSDR ever taken into consideration air movement, air velocity and direction influences the dispersion of vapors/gas that should have been monitored everyday to form accredited results to daily exposure. How come this never happened?

ATSDR recognizes that vapor intrusion varies depending on a number of factors including the time of year. This site has a data set of sampling data taken by several agencies at different times of the year to address these variables. It is not practical or feasible to have sampling results from every single day from every residence; in standard practice, having data from discrete sampling events across several different seasons provides a good approximation of changes that could be expected as a result of temperature differentials. After reviewing all of the available data provided to us, we concluded that the reported VOC levels in indoor air across all of the available different sampling events are at levels unlikely to cause adverse, cancer or non-cancer health effects for acute, intermediate, and chronic exposures.

35. On page 1, Heading Background, bottom outline you stated there a fewer than 500 people, stated small population, when in fact there are 400 homes affected by the spill, let's say at least 3 people per home, a rough estimate is about 1200 or more being affected by contamination. What community does this statement belong?

Thank you for pointing out this typographical error. We have corrected this error in the final version of this report. ATSDR estimates that the number of homes in the affected area should be around 500 housing units, with an estimated overall affected population of 1,280. This number

represents a small population when compared to the estimated population of one million (1,000,000) usually referred to in cancer risk assessment.

36. The community and I have continue to express the need for an appropriate health evaluation but instead, you only work with data, guides, health based criteria, these are only based on assumptions. True health assessments would be of help to people to get proper help needed for their families. Why is this?

ATSDR recognizes the significant frustrations community members have experienced at this site, as they have struggled with concerns about health. As a public health agency, ATSDR cannot provide clinical care for individuals or survey every individual regarding their health status and needs. ATSDR's job is to make public health, community level recommendations after reviewing available environmental data, health outcome information at the community level, and community concerns, and to work with communities and regulatory agencies to mitigate any identified harmful exposures.

ATSDR understands that community members at this site have long advocated for a health study/ survey of residents at this site. As was formally communicated to the District in a letter from CDC Administrator Dr. Julie Gerberding in June 2004, and has been discussed in numerous public forums with community members since then, ATSDR does not believe the conditions at this site support a health study in this community. At this site, the concentrations of chemicals detected have been below concentrations that would cause health effects. It is therefore misleading to community members to collect medical information from residents when we cannot support a link to the environmental contamination and exposure information for the site. However, ATSDR has continued to encourage residents to discuss their unique health situations and the information from ATSDR with their health care providers. ATSDR is available to provide direct consultation with individual health care providers, as needed.

37. As your final conclusion, you stated that there is no apparent public health hazard, but you also state that indoor and outdoor vapor intrusion could be occurring, could have occurred in the past or could occur in the future. I feel your agency has no consideration on the families here to make such a statement.

As stated in the previous response, ATSDR recognizes the significant frustrations community members have experienced at this site, as they have struggled with concerns about health. Our goal in making our statement about the exposures at this site is to recognize and validate for the community that exposures have occurred at this site, may have occurred in the past, and may occur in the future. We feel it is important to make this recognition. However, we also feel it is important to emphasize that in reviewing all of the data available for us, none of these exposures are at levels that would cause families to experience health effects.

38. Under study methods you indicated that the study sought to determine whether or not cancer rates in the community are statistically different compared to the US rates for Black African-Americans. If industry is generally located more in African-American and poor neighborhoods, why wasn't a comparison made to white populations of similar size. I Still Would Like an Answer.

The statement about study methods that the author refers to above is not from any ATSDR document for this site, so ATSDR is not able to respond to this concern. ATSDR conducted a review of cancer surveillance information for the area including this community and the information is included in this health consultation to share with the community. Please see the DC cancer and asthma summary section for details.

39. These chemical compounds are classified as volatile organic compounds or chemicals. Why does ATSDR continue to play them down?

It is not ATSDR's intention to play down or dismiss the important concerns about exposures to the chemicals at this site.

Appendix B DC DOH/DC DOE Comments

(Response to the DC DOH/DC DOE comments is included in Appendix A. See comments # 6, 17, and 18.)

GOVERNMENT OF THE DISTRICT OF COLUMBIA

May 15, 2008

Lora Siegmann Werner, MPH
Senior Regional Representative
Agency for Toxic Substances and Disease Registry, Region 3
Department of Health and Human Services
1650 Arch Street, 3HS00
Philadelphia, PA 19103

Re: ATSDR Health Consultation, Indoor and Outdoor Air Evaluation for Chillum Perc Site, Chillum, Prince Georges County, Maryland, MDN000305887

Dear Ms. Werner:

Thank you for inviting comment from the District of Columbia on the above-captioned document, and for granting the District an additional week to submit its comment.

The District is particularly concerned about the health threats posed to District residents from indoor air potentially impacted by contaminants emanating from the Chillum Perc [loroethylene] Site ("Site"). To that end, the District has participated fully in the response activities being implemented by the U.S. Environmental Protection Agency's Region 3 Office ("EPA") regarding the Site. We are appreciative that EPA incorporated several of the District's recommendations in its May 8, 2008 Decision Document. The District is also keenly interested in working with ATSDR, and would be pleased to discuss its comments as ATSDR continues to evaluate the health of District residents.[1]

While it is apparent that ATSDR devoted considerable time and effort to the Chillum Consultation, our review of past ATSDR health assessments for similar sites with similar

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[1] As an initial matter, we note that in its evaluation of the Chillum Site, unlike the approach it takes at most sites, ATSDR did not seemingly consult the District's risk assessment or risk management strategies. In particular, we would ask that ATSDR consider the District's Risk-Based Corrective Action regulations and guidelines. These can be found at: http://ddoe.dc.gov/ddoe/cwp/view,a,1209,q,495379.asp; http://ddoe.dc.gov/ddoe/cwp/view,a,1209,q,495386.asp.

contaminants suggests that ATSDR did not employ the same scientific and technical methodology in its Chillum Consultation that it has at the other sites. Based on our comparison of the Chillum Consultation with the approaches and results used in past ATSDR investigations, we believe ATSDR potentially underestimated cancer risks and non-cancer health threats at the Chillum site for the following reasons:

- Health threats for numerous chemicals of concern ("COCs") known to be associated with gasoline mixtures and Perc breakdown products were not considered;[2]

- It was not clear that the conventional ATSDR approach used to evaluate cumulative health effects associated with exposure to multiple COCs (that either target the same organ system or produce cancer) was followed; and

- The most recent ATSDR Cancer Risk Evaluation Guideline ("CREG") level for benzene was apparently not used.

Additionally, unlike other sites ATSDR has investigated, the Chillum Site may be unique in that the majority of the residents are elderly, and some are infirm. Furthermore, according to our preliminary survey information, some residents may be suffering from existing medical conditions that may predispose them to the toxic effects of the vapors entering their homes. Although many of the toxicity values that ATSDR used to compare to site-specific data have incorporated safety factors, no (ATSDR- or USEPA-derived) toxicity value has ever been based on epidemiological or animal studies where the subjects have been very old or had a preexisting medical condition. To our knowledge, ATSDR did not conduct any health surveys or collect any medical information from the residents to determine if the toxicity factors are applicable and appropriate, or whether the toxicity values should be adjusted for the unique and highly sensitive population of Chillum residents.

We believe that if ATSDR revisits and revises its Chillum consultation to match what it has done at other similar sites, and if it considers the unique characteristics of the Chillum community, it will conclude that contaminant levels in some homes could pose a health threat.

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[2] The District acknowledges that its own 2006 study done by Building Sciences & Engineering Associates ("BSEA"), which was an air study, and studies done by EPA and Chevron, Inc. ("Chevron"), also focused only on a pre-determined subset of contaminants. However, a comprehensive health assessment demands consideration of all the contaminants in a dataset. As ATSDR traditionally employs such comprehensive approach, we are uncertain why it did not do so with regard to Chillum, and are concerned that a narrow focus may have underestimated Site risk. We believe, nevertheless, that even if ATSDR's focus remains limited to a subset of contaminants, if it evaluates those in the same manner it has done elsewhere in the country, ATSDR will conclude that the contaminant levels in some District homes could pose a health threat.

If you would like to discuss these or the attached specific comments, please contact Dr. V. Sreenivas, 202-478-9175, at the Department of Health, and Nick Kauffman, 202-535-2288, at the District Department of the Environment.

Thank you.

Sincerely,

George S. Hawkins
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District Department of the Environment
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Pierre Vigilance, MD, MPH
Acting Director
Department of Health
825 North Capitol Street, N.E., 4th Floor
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Attachment

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