# LETTER HEALTH CONSULTATION

BANK AVENUE LANDFILL SITE
(Evaluation of Ohio EPA January/February 2012 Data)

ST. BERNARD, HAMILTON COUNTY, OHIO

APRIL 9, 2012

**Prepared by:**

**Ohio Department of Health**
**Health Assessment Section**

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April 9, 2012

Charles C. Mellon
Site Coordinator
Ohio Environmental Protection Agency
Division of Environmental Response and Revitalization
Southwest District Office
401 East Fifth St.
Dayton, OH 45402

Dear Chuck:

At your request, the Health Assessment Section (HAS) at the Ohio Department of Health evaluated the results for the latest round of indoor air and sub-slab soil gas sampling conducted by the Ohio EPA's Southwest District Office of Bank Avenue homes in St. Bernard, Ohio in January and February 2012.

**Background and Statement of Issues**

The Bank Avenue Landfill site is a closed landfill, now a city park, located east of Interstate 75 and south of Bank Avenue in St. Bernard, Hamilton County, Ohio. Seven properties located on the south and southwest sides of Bank Avenue in the Bank Avenue Subdivision abut the property line with the former landfill and have been extensively tested for the presence of landfill gases, including volatile organic compounds (VOCs) and methane. In previous reports, ODH found that VOCs and methane in and directly under these homes were not at levels expected to harm people's health (HAS 2010, HAS 2012a). However, ODH did express concern about potential health threats in the future due to explosive levels of methane recently discovered in soil borings drilled into the residents' yards by the Ohio EPA in 2011 (HAS 2012a).

In January and February 2012, Ohio EPA conducted a second round of testing of sub-slab and crawl spaces of the seven homes. In addition, this round of testing included the sampling of the indoor air of living spaces inside these homes.

**Data Evaluation**

The Health Assessment Section (HAS) at the Ohio Department of Health evaluated the results of samples collected in January and February 2012 by the Ohio EPA at several Bank Avenue homes in St. Bernard, Ohio. HAS compared the results for VOCs detected in the indoor air and sub-slab soil gas to health-based comparison values from ATSDR, along with health and environmental guidelines from the U.S. EPA. These values are derived for an exposure scenario that represents continuous, 24-hour a day exposures over a long (chronic) period of time and are



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set far below levels that might actually cause adverse health effects in most people, including sensitive populations. Concentrations detected at or below the relevant screening value are not considered to be of public health concern.

Sample results for methane were compared to 10 percent of the lower explosive limit (LEL) for sub-slab soil gas and 1 percent of the LEL for indoor air sample results per U.S. EPA Region 5 vapor intrusion guidance (U.S. EPA 2010).

***Sub-slab Sampling 2012***

VOCs

The sampling results for the chemicals detected in the sub-slab soil gas in Bank Avenue homes sampled by the Ohio EPA in January and February 2012 are summarized in Table 1. None of the sampling results exceeded their respective health-based comparison values. Chloroform was detected in only one home in this round of sampling and at a lower concentration than the levels detected during the October 2011 sampling event. All of the sub-slab soil gas samples had detections of acetone; however, acetone is commonly used in the laboratory to clean glassware and is likely a laboratory-derived contaminant. The sampling results are consistent with previous sub-slab soil gas sampling collected from under homes along Bank Avenue adjacent to the old dump site. No site-related VOCs were detected at levels exceeding health-based screening comparison values.

Methane

Methane gas is explosive between its lower explosive limit (LEL) of 5 percent methane by volume in air and its upper explosive limit (UEL) of 15 percent by volume in air. At these levels, there is a ratio of methane to oxygen in air that allows for combustion to occur and an explosion hazard to exist if an ignition source is present in a confined indoor space. In October 2011, explosive levels of methane were discovered in subsurface soils under the residents' properties. The results for methane under resident's homes in the sub-slab soil gas are included in Table 1. A level representing 10 percent of the LEL, 0.5 percent methane by volume, was used as a screening value. Methane was detected in the sub-slab soil gas under one home at 0.0076 percent, which is about 66 times below the screening value and 660 times below the LEL itself. Methane was detected in the sub-slab soil gas in only this one sample result.

***Indoor Air Sampling 2012***

VOCs

The sampling results for the chemicals detected in the indoor air and crawl spaces of Bank Avenue homes sampled by the Ohio EPA in January and February 2012 are summarized in Table 2. The VOC levels detected in the indoor air or crawl spaces of these homes are below levels of health concern. One home showed the presence of tetrachloroethylene (PCE) in the indoor air of the living area at a concentration of 6.4 ppb, which is slightly above the U.S. EPA's reference concentration (RfC) of 6 ppb (Table 2). The PCE level in the indoor air in the basement bedroom was less (1.7 ppb). The PCE concentration (6.4 ppb) in the indoor air living area was higher than levels detected in the subsurface vapor (4.4 and 2.9 ppb) under the house, indicating another possible source of PCE in the indoor air other than the soil vapor intrusion pathway. Although just above the screening value of 6 ppb, this concentration of PCE is not expected to cause adverse health effects—slightly exceeding a comparison value does not mean

that the contaminant represents a public health threat. Many VOCs, such as toluene, xylene, benzene, ethylbenzene, methylene chloride, chloroform, and PCE are commonly detected in the indoor air of North American residences not affected by vapor intrusion (U.S. EPA 2011). Many of the chemicals detected in Bank Avenue homes are in the low, single-digit ppb range, and are at levels similar to these background residential levels. For example, toluene is the chemical found most often in the indoor air in residences not affected by vapor intrusion. It has been detected in homes across the country at median concentrations ranging from 1.3–6.4 ppb (U.S. EPA 2011). Many of the indoor air samples and the background ambient (outdoor) air samples have detections of acetone—this is most likely a laboratory artifact resulting from acetone's common use in the laboratory to clean glassware. In addition to the chemicals listed in Table 2, one or more compounds, including tetrahydrofuran (THF), propene, ethyl acetate, chloromethane, and heptane, were detected in the indoor air of one or two of the homes tested, but they were detected below levels of health concern or no screening values were available for comparison due to the low or non-toxic nature of the chemical.

Methane

The sampling results for methane in the indoor air are summarized in Table 2. A level representing 1 percent of the LEL or 0.05 percent methane by volume was used as a screening value (U.S EPA 2010). Methane was detected in the indoor air in 5 out of 13 samples (3 out of 7 homes) at levels far below the indoor air screening value. The highest level of methane detected was 11 parts per million (ppm) or 0.0011 percent. Although higher than the average atmospheric concentration of 1.8 ppm (0.00018 percent), it is 45 times below the screening value and 4,500 times below the LEL. However, methane was detected in only 1 sub-slab soil gas sample, indicating other possible sources. At this time, methane was not detected at a level of public health concern in the indoor air of Bank Avenue homes.

## Conclusions

1. HAS concludes that the low levels of volatile organic compounds (VOCs) detected under and in Bank Avenue homes sampled by the Ohio EPA in January and February 2012 are below levels of health concern and not expected to harm people's health.

2. At this time, methane was not detected at a level of public health concern in either the sub-slab soil gas under the homes or in the indoor air of these homes. However, a health threat potentially exists in the future due to the close proximity of the residences to explosive levels of methane detected previously in subsurface soils under these residents' back yards.

## Recommendations

HAS recommends that the city continue to seek solutions that will reduce or eliminate methane levels under the residential properties adjacent to the landfill and regularly inspect and maintain combustible gas alarm systems in these homes.

If you have further questions about this report, please contact me at (614) 752-8335.

Sincerely,

John Kollman
Environmental Specialist
Ohio Department of Health
Bureau of Environmental Health

**References**

HAS (Health Assessment Section). 2010. Health Consultation. Bank Avenue Landfill Site. Methane & Vapor Intrusion Concerns. St. Bernard, Hamiltion County, Ohio. Prepared by the Ohio Department of Health. June 23.

HAS. 2012a. Health Consultation 2. Bank Avenue Landfill Site. Methane Gas & Vapor Intrusion Concerns. St. Bernard, Hamiltion County, Ohio. Prepared by the Ohio Department of Health. February 7.

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U.S. EPA. 2010. U.S. EPA Region 5. Vapor Intrusion Guidebook. A Tool for On-Scene Coordinators and Remedial Project Managers. Version October 2010.

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**Table 1. Chemicals Detected in Sub-slab Soil Gas of Bank Avenue Homes January/February 2012**

| *Chemical* | *Range of Detections (ppb)* | *Frequency of Detections* | *# Above Screening Value* | *Sub-slab Screening Value (ppb)* | *Type/Criteria* |
|---|---|---|---|---|---|
| Acetone | 2.7–11 | 9/9 | 0 | 100,000 | ATSDR/NC x 10 |
| 2-Butanone (MEK) | ND–1.3 | 3/9 | 0 | 3,400 | OSWER/NC |
| Chloroform | ND–1.3 | 1/9 | 0 | 22 | OSWER/C $10^{-4}$ |
| Ethylbenzene | ND–1.5 | 2/9 | 0 | 600 | ATSDR/NC x 10 |
| 2-Propanol | ND–2.5 | 1/9 | 0 | 30,000 | EPA RSL NC x 10 |
| Tetrachloroethylene (PCE) | ND–4.4 | 2/9 | 0 | 60 | EPA RfC x 10 |
| Toluene | ND–9.9 | 7/9 | 0 | 800 | ATSDR/NC x 10 |
| 1,1,1-Trichloroethane | ND–1.1 | 1/9 | 0 | 4,000 | OSWER/NC |
| Trichloroethylene (TCE) | ND–1.2 | 4/9 | 0 | 4 | EPA RfC x 10 |
| Trichlorofluoromethane | ND–2.3 | 1/9 | 0 | 1,200 | OSWER/NC |
| m,p-Xylene | ND–4.9 | 7/9 | 0 | 500 | ATSDR/NC x 10 |
| o-Xylene | ND–1.9 | 4/9 | 0 | 500 | ATSDR/NC x 10 |
| Methane (in percent = %) | ND–0.0076 | 1/9 | 0 | 0.5% | EPA Region 5 VIG |

Source: Ohio EPA 2012

ppb = parts per billion
CV = Comparison Value
C = cancer
NC = noncancer
ND = Not Detected
$10^{-4}$ = cancer risk of 1 in 10,000

**Table 2. Chemicals Detected in Indoor Air of Bank Avenue Homes January/February 2012**

| *Chemical of Concern* | *Range of Detections (ppb)* | *Frequency of Detections* | *# Above Screening Value* | *Indoor Air Screening Value (ppb)* | *Type/Criteria* |
|---|---|---|---|---|---|
| Acetone | ND–41 | 10/13 | 0 | 10,000 | ATSDR/NC |
| 2-Butanone (MEK) | ND–3.0 | 5/13 | 0 | 340 | OSWER/NC |
| Benzene | ND–2.0 | 4/13 | 0 | 3 | ATSDR/NC |
| Ethylbenzene | ND–1.1 | 1/13 | 0 | 60 | ATSDR/NC |
| Hexane | ND–6.0 | 7/13 | 0 | 57 | OSWER/NC |
| Methylene chloride | ND–4.3 | 4/13 | 0 | 300 | ATSDR/NC |
| 2-Propanol | ND–23 | 5/13 | 0 | 3,000 | EPA RSL/NC |
| Tetrachloroethylene (PCE) | ND–6.4 | 2/13 | 1 | 6 | EPA RfC |
| Toluene | ND–11 | 11/13 | 0 | 80 | ATSDR/NC |
| Trichlorofluoromethane | ND–1.6 | 3/13 | 0 | 120 | OSWER/ NC |
| m,p-Xylene | ND–3.4 | 5/13 | 0 | 50 | ATSDR/NC |
| o-Xylene | ND–1.4 | 1/13 | 0 | 50 | ATSDR/NC |
| Methane (in percent = %) | ND–0.0011 | 5/13 | 0 | 0.05 | EPA Region 5 |

Source: Ohio EPA 2012

ppb = parts per billion
CV = Comparison Value
C = cancer
NC = noncancer
ND = Not Detected
$10^{-4}$ = cancer risk of 1 in 10,000