

# Health Consultation

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*SITE-RELATED CONTAMINATION AT THREE NEARBY RESIDENCES*

NORTH BRUNSWICK TOWNSHIP HIGH SCHOOL SITE

NORTH BRUNSWICK, MIDDLESEX COUNTY, NEW JERSEY

EPA FACILITY ID: NJD103805370

AUGUST 11, 2005

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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HEALTH CONSULTATION

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NORTH BRUNSWICK TOWNSHIP HIGH SCHOOL SITE

NORTH BRUNSWICK, MIDDLESEX COUNTY, NEW JERSEY

EPA FACILITY ID: NJD103805370

Prepared by:  
New Jersey Department of Health and Senior Services  
Public Health Protection and Emergency Preparedness  
Under a Cooperative Agreement with the  
Agency for Toxic Substances and Disease Registry

## Summary

During a July 2003 excavation for a major renovation/expansion project at the North Brunswick Township High School, North Brunswick, Middlesex County, New Jersey, debris and fill material, including hazardous waste, were discovered in the soil. Construction activities at the school were suspended and the New Jersey Department of Environmental Protection was notified. An engineering services firm hired on behalf of the North Brunswick Township Board of Education, and the Township of North Brunswick initiated a Site Remedial Investigation of the site in the autumn of 2003. Findings of the investigation indicated site-related contamination (i.e., arsenic) in the surface soil of three nearby residential properties above state Residential Direct Contact Soil Cleanup Criteria. Arsenic contamination was also detected in the interior dust of one of the three residences. Residents were advised to refrain from any activities which may disturb exterior soil (e.g., gardening, landscaping).

At each of the three residences with site-related soil contamination, water samples from basement sumps were collected and analyzed for volatile organic compounds, selected metals, and polycyclic aromatic hydrocarbons. Indoor air samples were collected and analyzed for volatile organic compounds, and dust wipe samples were collected from indoor surfaces throughout the residences for metals analysis. Trichloroethylene was detected in the sumps of two residences, and one residence had indoor air trichloroethylene concentrations above the U.S. Environmental Protection Agency Risk-Based Concentration. A number of other volatile organic compounds were also detected in the indoor air of the residences; some of these volatile organic compounds may be constituents of products commonly stored in homes such as fuels, solvents, cleaners, and paints. Arsenic contaminated dust was detected in one of the residences tested.

At the July 2004 request of affected residents, township officials, and the New Jersey Department of Environmental Protection, the New Jersey Department of Health and Senior Services, through a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry, completed evaluations of potential health risks associated with site-related contamination detected at the three residences. The evaluations were enclosed with February 2005 correspondence to residents which summarized conclusions and recommendations specific to the individual households. It was determined that past exposures to residents had posed a **Public Health Hazard** because remediation was necessary to prevent further exposures which could lead to potential adverse health effects. In the autumn of 2004, contaminated soil at all three residences was removed and the soil exposure pathway appears to have been eliminated. Trichloroethylene was detected in the sump of two of the three residences, and indoor air samples for volatile organic compounds (including trichloroethylene) were collected at one of the three residences. Following sump remediation activities at all three residences, indoor air sampling was conducted; results indicated that trichloroethylene concentrations at all three residences were below the practical quantitation limit. Although exposures appear to have been partially interrupted, there is a potential health risk associated with future trichloroethylene exposures constituting an **Indeterminate Public Health Hazard**.

Arsenic detected in the dust of one household has not been remediated to date, and exposures may present a health concern for children. Since no children currently reside in this household, there is *No Apparent Public Health Hazard* at the present time at this residence for arsenic.

In response to cancer cluster concerns expressed by the community in May and September of 2004, the New Jersey Department of Health and Senior Services, Cancer Epidemiology Program reviewed cancer incidence data from 1979 through 2001 for North Brunswick Township and Middlesex County. No unusual number or distribution of cancer types were determined for the township or county.

Recommendations include: 1) the remediation of arsenic contaminated household dust and the collection of additional dust data to ensure that arsenic levels have been successfully reduced; 2) the characterization and delineation of the contaminated groundwater plume at the site; 3) the collection of groundwater and soil gas sampling at the three residences for use in the evaluation of the vapor intrusion pathway; and 4) the collection of additional indoor air samples at all three residences so that current and future health risks may be better understood and evaluated.

Since February 2005, additional environmental sampling and remedial actions have been conducted at the residences and will be discussed in a Public Health Assessment being prepared for the site.

## **Statement of Issues**

In the summer of 2004, private citizens, township officials, and the New Jersey Department of Environmental Protection (NJDEP) requested assistance from the New Jersey Department of Health and Senior Services (NJDHSS) in the interpretation and public health evaluation of site-related metal and volatile organic compound (VOC) contamination detected at three residences during an investigation of the North Brunswick Township High School site, Raider Road, North Brunswick, Middlesex County.

Through a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), the NJDHSS reviewed environmental data available for each residence and evaluated public health implications; findings were provided confidentially to each residence in February 2005 (see Appendix A for details of the evaluations). The purpose of this health consultation was to summarize and present the results of the evaluations for public availability and to provide clarification where additional information was provided to the NJDHSS.

Since February 2005, additional environmental sampling and remedial actions have been conducted at the residences and will be discussed in a public health assessment being prepared for the site.

## **Background**

During a July 2003 excavation for a major renovation/expansion project at the North Brunswick Township High School, North Brunswick, Middlesex County, New Jersey, difficulty was experienced in achieving soil compaction. A test pit was excavated, and visual inspection revealed fill material extending from the surface to a depth of 1.5 feet. The fill consisted of medical wastes, glass vials and bottles, and an unidentified dark brown material. Construction activities were suspended and the NJDEP was notified. On behalf of the North Brunswick Township Board of Education and the Township of North Brunswick, the engineering services firm of Powell-Harpstead, Inc., West Chester, Pennsylvania initiated a Site Remedial Investigation (SRI) of the site in the autumn of 2003. A primary purpose of the SRI was to delineate the extent of soil contamination. Areas initially investigated were the construction site itself on the school grounds, stockpiles of material that had already been excavated, athletic fields, an adjacent recreational park, and a nearby elementary school. Subsequently, site-related contamination was detected at three nearby residential properties.

## **Site Visit**

On August 11, 2004, a site visit of the three residences located in the vicinity of the North Brunswick Township High School site was conducted. Individuals present were Christa Fontecchio and Sharon Kubiak of the NJDHSS, and representatives of the NJDEP and Powell-Harpstead, Inc. The site visit commenced at 9:00 am. Weather

conditions were sunny, with temperatures in the low to mid 70s. Information collected during the site visit included the number and age of residents, years of occupancy, gardening and landscaping activities, home-gardened fruit and vegetable consumption (see Appendix B), and time spent in the basement. This information was utilized in estimating past exposures and assessing the potential for health effects.

### Past ATSDR/NJDHSS Activities

Please see Discussion, Health Outcome Data section below.

### Environmental Contamination

Environmental sampling data reviewed for this Health Consultation were provided by Powell-Harpstead, Inc. (2004) through the NJDEP.

#### Surface Soil

Results of surface (0 – 0.5 foot depth) soil samples collected from the three residences indicated arsenic contamination above NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC):

Residence	No. Samples Collected for Metals Analysis	Average Arsenic Concentration (mg/kg)*	Maximum Arsenic Concentration (mg/kg)	NJDEP RDCSCC (mg/kg)
A	13	49.9	150	20
B	6**	14.79	45.2	
C	13	16.67	46.1	

\*milligrams of contaminant per kilogram of soil

\*\*five samples were collected at a depth of 0 - 0.5 feet, one sample at a depth of 0.3 – 0.8 feet

#### Household Dust

Dust wipe samples were collected from the indoor surfaces of the three residences. Arsenic was detected in one of the three residences (A) at concentrations ranging from not detected to 53.6 micrograms of arsenic per square foot ( $\mu\text{g}/\text{ft}^2$ ) of surface tested. There is no comparison value available for arsenic in household dust. Since the main route of exposure associated with settled dust is ingestion, an exposure dose can be calculated and compared with the health guideline comparison value for the oral route of exposure.

#### Sump Water

At each of the three residences, a water sample was collected from the basement sump. Trichloroethylene (TCE) was detected in two of the three sumps (residences A and C) at concentrations ranging from 4 to 140 micrograms of TCE per liter of water

(µg/L). The presence of TCE in the sump water suggests TCE contamination of area groundwater; the NJDEP Groundwater Quality Criteria for TCE is 1 µg/L.

**Indoor Air**

On April 7 and 14, 2004, screening for VOCs was conducted at the three residences using a photoionization detector. Based on the results of this screening, indoor air samples were collected from the basement and first floor of residence A on April 15, 2004; results indicated TCE contamination:

<b>Residence</b>	<b>Basement TCE (µg/m<sup>3</sup>)*</b>	<b>First Floor TCE (µg/m<sup>3</sup>)</b>	<b>USEPA Region 3 Risk-Based Concentration (RBC)** (µg/m<sup>3</sup>)</b>	<b>NJDEP Indoor Air Guidance (µg/m<sup>3</sup>)</b>
A	12	5.4	0.016	2.68***
B	Not sampled			
C	Not sampled			

\*micrograms of TCE per cubic meter of air

\*\*RBCs are contaminant concentrations corresponding to a fixed level of risk (i.e., a Hazard Index of 1, or lifetime excess cancer risk of one in one million, whichever results in a lower concentration) in water, air, biota, and soil

\*\*\*practical quantitation limit (PQL) for TCE which is the lowest concentration that can be measured accurately

**Discussion**

**Assessment Methodology**

An exposure pathway is a series of steps starting with the release of a contaminant in environmental media and ending at the interface with the human body. A completed exposure pathway consists of five elements:

1. source of contamination;
2. environmental media and transport mechanisms;
3. point of exposure;
4. route of exposure; and
5. receptor population.

Generally, the ATSDR considers three exposure categories: 1) completed exposure pathways, that is, all five elements of a pathway are present; 2) potential exposure pathways, that is, one or more of the elements may not be present, but information is insufficient to eliminate or exclude the element; and 3) eliminated exposure pathways, that is, one or more of the elements is absent. Exposure pathways are used to evaluate specific ways in which people were, are, or will be exposed to environmental contamination in the past, present, and future.



## Completed Exposure Pathways

In the past, household members of residences A, B, and C were likely to have come in contact with site-related contaminants in soil and indoor air. Residents of residence A are also likely to come in contact with arsenic contaminated household dust. With NJDEP oversight, contaminated soil at all three residences was removed in the autumn of 2004. At residence A, the basement sump pump was replaced, the sump covered and sealed, and a fan installed to exhaust headspace vapors through an existing radon remediation system. At residence C, the basement sump was covered and sealed. Although no TCE was detected in the sump at residence B, the top of the sump was sealed to minimize the potential for vapor intrusion (M. Searfoss, NJDEP, personal communication, May 2005). Following sump remediation activities, air sampling was conducted at all three residences on June 4, 2004; results indicated that TCE concentrations were below the practical quantitation limit (PQL):

<b>Indoor Air TCE Concentrations Following Sump Remediation</b>				
<b>Residence</b>	<b>Basement TCE (<math>\mu\text{g}/\text{m}^3</math>)*</b>	<b>First Floor TCE (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>USEPA Region 3 RBC (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>NJDEP Indoor Air Guidance (<math>\mu\text{g}/\text{m}^3</math>)</b>
A	0.75 J	Not detected	0.016	2.68**
B	0.42 J	Not detected		
C	0.32 J	0.30 J		

\*micrograms of TCE per cubic meter of air

\*\*practical quantitation limit for TCE

J = estimated value

A number of other VOCs detected in the residences may be associated with the use and storage of gasoline and/or cleaning products (see Appendix C).

Therefore, exposures from the soil pathway (residences A, B, and C) appear to have been eliminated. TCE was detected in the sump water at residence C, but no indoor air sample results are available for this residence prior to the sump being sealed. Additionally, although no TCE was detected in the sump of residence B and no indoor air sample results are available for this residence prior to the sump being sealed, TCE may have entered the basement through other ways (e.g., cracks in foundation or floor). Taking this into consideration, exposures from the indoor air pathway (residences A, B, and C) appear to have been partially interrupted for household members. Since typical household cleaning methods may not adequately abate the arsenic contamination detected in residence A, this exposure pathway continues to be a concern (see Table 1).

**Potential Exposure Pathways**

There are no indoor air TCE exposures to household members of residence B since the basement is currently used for storage only. However, this may change in the future, and as such, presents a future potential exposure pathway (see Table 1).

<b>Table 1 - Exposure Pathway Elements and Time Frames</b>					
<b>Pathway Name</b>	<b>Point of Exposure</b>	<b>Route of Exposure</b>	<b>Past Pathway Status</b>	<b>Present Pathway Status</b>	<b>Future Pathway Status</b>
Surface Soil	Residential Yards A, B, C	Ingestion	Complete	Eliminated	Eliminated
Indoor Air	Indoor Air, Residences A, B, C	Inhalation	Complete	Potential	Potential
Household Dust	Household Dust, Residence A	Ingestion	Complete	Complete	Complete

**Public Health Implications**

Health effects data reported in ATSDR Toxicological Profiles for site-specific contaminants were examined and interpreted to evaluate non-cancer and cancer health effects. A summary of the public health implications is as follows; please refer to Appendix A for details of the evaluations conducted for each residence.

<b>Residence</b>	<b>Summary of Assessed Non-Cancer and Cancer Health Effects</b>
<b>A</b>	For non-cancer health effects, arsenic in soil and household dust were determined to pose a potential health concern for children. No young children reside at this residence. For cancer health effects in adults, the risk associated with arsenic in soil (based on the average concentration) and indoor air concentrations of TCE were approximately eight excess cancer cases per 100,000 individuals.
<b>B</b>	Based on the average arsenic concentration detected in the surface soil, non-cancer health effects are not expected for adults and children. For cancer health effects in adults, the risk associated with arsenic in soil (based on the average concentration) was approximately five excess cancer cases per 10,000,000 individuals.
<b>C</b>	Based on both maximum and average arsenic concentrations detected in the surface soil and the TCE concentrations in the indoor air, non-cancer health effects are not expected for adults and children. For cancer health effects in adults, the combined risk associated with arsenic in soil (based on the average concentration) and indoor air concentrations of TCE were approximately six excess cancer cases per 1,000,000 individuals.

## Health Outcome Data

In May and September of 2004, North Brunswick residents contacted the NJDHSS Cancer Epidemiology Program regarding several individuals who live near or attended North Brunswick Township High School who had been diagnosed with cancer in the past several years. In response to this concern, the Cancer Epidemiology Program reviewed cancer incidence data from 1979 through 2001 for North Brunswick Township and Middlesex County. According to the Cancer Epidemiology Program, the number and distribution of cancer types in Middlesex County did not appear to be unusual when compared to the state; in addition, a review of North Brunswick Township data by gender and age group did not indicate an unusual occurrence of any type of cancer (see Appendix D).

## Child Health Considerations

Arsenic was detected in dust samples collected from the interior of residence A. Young children, especially those less than six years of age, spend a great deal of time on the floor and put non-food items in their mouths. Although no young children currently reside at residence A, this may change in the future. A hypothetical dose was calculated based on the maximum dust concentration detected at residence A. The estimated dose (0.0032 milligrams per kilogram per day, or mg/kg/day) was above the health guideline value of 0.003 mg/kg/day for non-cancer health effects. As such, this contaminated household dust may present a health concern for children.

## Conclusions

Through a cooperative agreement with the ATSDR, the NJDHSS completed evaluations of potential health risks associated with site-related contamination detected at three residences located near the North Brunswick Township High School site. The evaluations were enclosed with February 2005 correspondence to residents which summarized conclusions and recommendations specific to the individual households. It was determined that past exposures to residents had posed a **Public Health Hazard** because remediation was necessary to prevent further exposures which could lead to potential adverse health effects. In the autumn of 2004, contaminated soil at all three residences was removed and the soil exposure pathway appears to have been eliminated. TCE was detected in the sump of two of the three residences, and indoor air samples for VOCs (including TCE) were collected at one of the three residences. Following sump remediation activities at all three residences, indoor air sampling was conducted; results indicated that trichloroethylene concentrations at all three residences were below the practical quantitation limit. Although exposures appear to have been partially interrupted, there is a potential health risk associated with future trichloroethylene exposures constituting an **Indeterminate Public Health Hazard**. Arsenic detected in the dust of one household has not been remediated to date, and exposures may present a

health concern for children. Since no children currently reside in this household, there is *No Apparent Public Health Hazard* at the present time at this residence for arsenic.

In response to cancer cluster concerns expressed by the community, the NJDHSS Cancer Epidemiology Program reviewed cancer incidence data from 1979 through 2001 for North Brunswick Township and Middlesex County. No unusual number or distributions of cancer types were determined for the township or county.

A summary of ATSDR conclusion categories are provided in Appendix E.

### **Recommendations**

1. Although there are presently no small children residing in residence A, this may change in the future. As such, arsenic in household dust should be remediated. Following remediation, additional household dust data should be collected to ensure that arsenic levels have been reduced.
2. Based on VOC analysis of indoor air samples collected following sump remediation activities, TCE concentrations persist at all three residences, albeit they are below the current practical quantitation limit. Since there is a continuing source of contamination, the NJDEP should characterize and delineate the contaminated groundwater plume at the site as soon as feasible.
3. With NJDEP oversight, groundwater and soil gas sampling should be conducted at all three residences. Results of this sampling will assist the NJDHSS in the evaluation of the vapor intrusion pathway.
4. Evaluations provided to residents in February 2005 for the indoor air pathway were based on very limited data. Additional indoor air sampling should be conducted at all three residences to better understand and evaluate current and future health risks.

### **Public Health Action Plan**

The purpose of a Public Health Action Plan is to ensure that this health consultation not only identifies public health hazards, but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of the ATSDR and the NJDHSS to follow-up on this plan to ensure that it is implemented. The public health actions to be implemented by the ATSDR and NJDHSS are as follows:

*Public Health Actions Taken*

1. Representatives of the NJDHSS conducted a site visit of three residences located in the vicinity of the North Brunswick Township High School site on August 11, 2004.
2. An evaluation of potential public health risks associated with contamination detected at the three residences was provided to residents and the NJDEP on February 15 and 17, 2005 (see Appendix A).

*Public Health Actions Planned*

1. This health consultation will be provided to residents, board of education and township officials, NJDEP, and the Middlesex County Public Health Department. Representatives of the ATSDR and NJDHSS are available to discuss the results of this report with interested parties.
2. In cooperation with the ATSDR, a public health assessment is being prepared by the NJDHSS for the North Brunswick Township High School site.

## References

Powell-Harpstead, Inc. 2004. 2004 Site Remedial Investigation Report. June 2, 2004  
letter to Mark Searfoss, NJDEP

**Preparers of Report:**

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## **CERTIFICATION**

The Health Consultation for the North Brunswick High School, North Brunswick, New Jersey, was prepared by the New Jersey Department of Health and Senior Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated.

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Gregory V. Ulirsch  
Technical Project Officer, CAT, SPAB, DHAC  
Agency for Toxic Substances and Disease Registry (ATSDR)

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this Health Consultation and concurs with its findings.

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Alan Yarbrough  
Team Leader, CAT, SPAB, DHAC, ATSDR





## **Appendix A**



State of New Jersey

DEPARTMENT OF HEALTH AND SENIOR SERVICES  
DIVISION OF PUBLIC HEALTH PROTECTION AND EMERGENCY PREPAREDNESS  
CONSUMER AND ENVIRONMENTAL HEALTH SERVICES  
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RICHARD J. CODEY  
*Acting Governor*

FRED M. JACOBS, M.D., J.D.  
*Acting Commissioner*

February 15, 2005

Dear Residence A:

Thank you for your request for assistance in evaluating potential health risks associated with contamination detected at your residence during an investigation of the North Brunswick Township High School site, Raider Road, North Brunswick, Middlesex County. We have reviewed the environmental data for your residence provided by the New Jersey Department of Environmental Protection and have prepared the enclosed evaluation.

For non-cancer health effects, arsenic in soil and household dust were determined to pose a potential health concern for children. For cancer health effects in adults, the risk associated with arsenic in soil (based on the average concentration) and indoor air concentrations of trichloroethylene were approximately eight excess cancer cases per 100,000 individuals. This increase in cancer risk attributable to site-related contamination is small when compared with the background cancer risk in the United States. Recommendations for your household include the remediation of arsenic contaminated household dust and the sampling of groundwater and soil gas so that the vapor intrusion pathway can be evaluated.

Please feel free to contact me by telephone at 609-584-5367 or via e-mail at [Julie.Petix@doh.state.nj.us](mailto:Julie.Petix@doh.state.nj.us) if you have any questions or concerns.

Sincerely,

Julie R. Petix, M.P.H., C.P.M., H.O.  
Project Manager  
Health Assessment and Consultation Unit

Enclosures

Attachment I, Evaluation of Contaminant Exposures at Residence A  
Connecticut Department of Public Health Fact Sheet  
ToxFAQs for arsenic and trichloroethylene

c: Jerald A. Fagliano, M.P.H., Ph.D., Program Manager  
Mark Searfoss, Case Manager, NJDEP  
Gregory Ulirsch, M.S., Technical Project Officer, ATSDR  
Arthur Block, Senior Regional Representative, ATSDR

## Attachment 1

### Evaluation of Contaminant Exposures at Residence A North Brunswick, Middlesex County, New Jersey February 15, 2005

During excavation for a major renovation/expansion project at the North Brunswick Township High School in July 2003, debris and fill material, including hazardous waste, were discovered in the soil. Construction activities at the school were suspended and the New Jersey Department of Environmental Protection (NJDEP) was notified.

On behalf of the North Brunswick Township Board of Education, the engineering services firm of Powell-Harpstead, Inc., West Chester, Pennsylvania initiated a Site Remedial Investigation (SRI) of the site in the autumn of 2003. A primary purpose of the SRI was to delineate the extent of soil contamination. Based on SRI findings, site-related contamination was detected at three residential properties located on Plains Gap Road. Results of surface soil (0 – 0.5 foot depth) samples collected from your residence indicated arsenic and polycyclic aromatic hydrocarbon (PAH) contamination above NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC):

Contaminant	Average Concentration (mg/kg)*	Maximum Concentration (mg/kg)	NJDEP RDCSCC (mg/kg)
<b>Metals**</b>			
Arsenic	49.9	150	20
<b>PAHs***</b>			
Benzo[a]anthracene	0.141	1.3	0.9
Benzo[a]pyrene	0.187	1.5	0.66
Benzo[b]fluoranthene	0.301	2.2	0.9
Benzo[g,h,i]perylene	0.088	0.7	No criteria available

\*milligrams of contaminant per kilogram of soil

\*\*13 soil samples were collected for metals analysis

\*\*\*10 soil samples were collected for PAHs analysis

Although the source of PAH contamination is uncertain, arsenic was determined to be site-related (M. Searfoss, NJDEP, personal communication, 2004). Powell-Harpstead, Inc. recommended that property owners refrain from any activities which may disturb these soils (e.g., gardening, landscaping) to prevent contact with contaminated soil.

A water sample was also collected from your basement sump. At the time of sampling, the sump pump was broken and had not been functional for several months. Trichloroethylene (TCE) was detected in this sample at a concentration of 140 micrograms of TCE per liter of water ( $\mu\text{g/L}$ ). The presence of TCE in the sump water suggests TCE contamination of area groundwater.

Volatile organic compounds (VOCs) such as TCE in soil and groundwater can emit vapors that may migrate through subsurface soils and into indoor air spaces of overlying buildings. The vapor intrusion pathway may be important for buildings with or without a basement. Vapors can accumulate in occupied spaces to concentrations that may pose safety hazards, health effects, or aesthetic problems (e.g., odors). Consequently, indoor air samples from the basement and first floor of your home were collected and analyzed. Results indicated the presence of a number of VOCs, including TCE, benzene, methyl t-butyl ether, and chloroform. Some of these VOCs may be constituents of household products commonly stored in homes such as fuels, solvents, cleaners, and paints. Since groundwater and soil gas data are unavailable, the source of the VOCs, with the exception of TCE, cannot be identified. TCE results were above the U. S. Environmental Protection Agency (USEPA) Risk-Based Concentration (RBC) for TCE:

Location	TCE ( $\mu\text{g}/\text{m}^3$ )*	USEPA Region 3 RBC ( $\mu\text{g}/\text{m}^3$ )
Basement	12	0.016
First Floor (kitchen)	5.4	0.016

\*micrograms of TCE per cubic meter of air

Dust wipe samples were also collected from indoor surfaces throughout your residence. Of the nine samples collected, arsenic was detected at concentrations ranging from not detected to 53.6 micrograms of arsenic per square foot ( $\mu\text{g}/\text{ft}^2$ ) of surface tested.

On August 11, 2004, the NJDHSS conducted a site visit of your home. The purpose of the site visit was to assess current site conditions and collect information potentially related to individual exposures to contaminants of concern. Information collected during the site visit included the number and age of residents, years of occupancy, gardening and landscaping activities, home-gardened fruit and vegetable consumption, and time spent in the basement. This information was utilized in estimating past exposures and assessing the potential for health effects.

### Contaminants of Concern

As mentioned earlier, concentrations of arsenic and TCE detected at your residence were above the NJDEP RDCSCC and USEPA Region 3 RBC, respectively. For your reading, enclosed are ATSDR ToxFAQS for arsenic and TCE. ToxFAQs are prepared to provide environmental and health related facts about hazardous substances commonly found at hazardous waste sites.

Since arsenic and TCE were considered site-related contaminants, site-specific conditions were used to evaluate likely exposure scenarios for a given exposure pathway.

## **Assessment of Health Implications**

The following is a summary of our findings for your residence. Generally, average contaminant concentrations are assumed to represent the more likely exposure scenario, while maximum contaminant concentrations are used conservatively to present a less likely, worst case scenario.

### **Soil and Dust Contamination**

The main route of exposure to contaminated soil is by incidental ingestion from hand-to-mouth contact. This assessment evaluated the potential for both non-cancer and cancer health effects from exposures to the contaminants found at your property. Since children differ physiologically from adults and generally exhibit behaviors that increase exposure potential, their health risks were calculated separately.

#### ***Arsenic in Surface Soil***

Factors taken into account included: maximum and average soil contamination concentrations; standard ingestion rates for adults and children; exposure duration (e.g., years of residency, seasonal considerations); and assumed body weight of adults and children. Arsenic exposure from eating home-grown fruits and vegetables is uncertain. However, arsenic and other contaminants may be taken up by root and leafy vegetables, but less so in fruiting vegetables. Enclosed is a fact sheet which discusses the safety of growing and eating fruits and vegetables from residential yards that may have soil contamination.

As previously discussed, the maximum surface soil concentration of arsenic detected at your residence was 150 mg/kg. Arsenic was also detected in four of the nine dust wipe samples collected throughout the interior of your residence. It was assumed that this dust contamination was associated with soil that was entrained in outdoor air and infiltrated into your residence via ventilation and/or tracked in on shoes or clothing.

Non-cancer health effects: Based on the average arsenic concentration detected in the surface soil at your residence, the exposure doses calculated for adults and children were below the health guideline value. The health guideline value for arsenic is set at a level meant to protect against non-cancer health effects, specifically dermal lesions. Based on the maximum arsenic concentration detected in the surface soil, the exposure dose calculated for your child (0.00034 milligrams per kilogram per day, or mg/kg/day) approximately equal to the health guideline value of 0.0003 mg/kg/day. An uncertainty factor of three was used by the ATSDR to derive the health guideline value to account for variations among individual sensitivity. It is important to note that a worst case exposure scenario is not considered representative for your child. As such, following long term exposure at the maximum arsenic concentration detected, non-cancer health effects are possible, although unlikely.

Cancer health effects: The site-specific lifetime excess cancer risk (LECR) indicates the cancer potential of contaminants. LECR estimates are usually expressed in terms of excess cancer cases in an exposed population in addition to the background rate of cancer. Based on the average arsenic concentration detected in the surface soil at your residence, a LECR for adults was estimated to be approximately eight excess cancer cases per 1,000,000 individuals; at the maximum arsenic concentration detected, the LECR was estimated to be approximately three excess cancer cases per 100,000 individuals. This increase in cancer risk attributable to site-related contamination is small when compared with the background cancer risk in the United States. For perspective, according to the American Cancer Society, one in three people are expected to get some form of cancer during their lifetime.

### ***Arsenic in Household Dust***

As previously mentioned, arsenic was detected in dust samples collected from the interior of your residence. Young children, especially those less than six years of age, spend a great deal of time on the floor and put non-food items in their mouths. It is our understanding that there are no young children residing at your residence. Since this may change in the future, a hypothetical dose was calculated based on the maximum dust concentration detected at your residence. The estimated dose (0.0032 mg/kg/day) was above the health guideline value (0.0003 mg/kg/day) for non-cancer health effects. As such, this contaminated household dust may present a health concern for children.

### **Indoor Air TCE Contamination**

Factors taken into consideration included: indoor air concentrations; standard inhalation rates of adults and children; exposure duration (including consideration of time spent in the basement particularly during the summer months when family members slept in the basement); and assumed body weights of adults and children.

Non-cancer health effects: At the present time, there is no health guideline value available to compare with TCE exposures occurring for more than one year. There is, however, an “intermediate” health guideline value available for TCE exposures occurring for more than 14 days but less than a year. The TCE concentration detected in your basement is about 45 times less than the intermediate health guideline value for TCE. As such, non-cancer health effects are unlikely for both adults and children at the concentration detected.

Cancer health effects: Based on the TCE concentrations detected in the indoor air at your residence, a LECR for adults was estimated to be approximately seven excess cancer cases per 100,000 individuals. Again, this increase in cancer risk attributable to site-related contamination is small when compared with the background cancer risk in the United States. For perspective, according to the American Cancer Society, one in three people are expected to get some form of cancer during their lifetime.

## **Past and Current Status of Exposure Pathways**

So far, health effects associated with the contaminants of concern detected at your residence were evaluated individually. Since the cumulative or synergistic effects of mixtures of contaminants may increase their public health impact, we also evaluated their cumulative health risks. For non-cancer health effects, arsenic was the only contaminant that posed a potential risk, and this was only at the maximum concentration detected. For cancer health effects in adults, the combined risk associated with arsenic in soil (based on the average concentration) and indoor air concentrations of TCE were approximately eight excess cancer cases per 100,000 individuals.

Under NJDEP oversight, contaminated soil at your residence was removed. Additionally, the basement sump pump was replaced, the sump covered and sealed, and a fan installed to exhaust headspace vapors through an existing radon remediation system. The results of a second air sampling round indicated that TCE concentrations were estimated to be below the NJDEP practical quantitation limit. Therefore, exposures from the soil and indoor air pathways appear to have been interrupted for household members. Since typical household cleaning methods may not adequately abate the arsenic contamination detected in your household dust, this exposure pathway continues to be a concern.

## **Recommendations**

Based on the above assessment, our recommendations are as follows:

1. Although there are presently no small children residing at your residence, this may change in the future. As such, arsenic in household dust should be remediated. Following remediation, additional household dust data should be collected to ensure that arsenic levels have been reduced.
2. Groundwater and soil gas sampling should be conducted at your residence. Results of this sampling will assist the NJDHSS in the evaluation of the vapor intrusion pathway. If soil gas data indicate the potential for vapor intrusion, additional indoor air sampling should be conducted at your residence.

In cooperation with the ATSDR, a Public Health Assessment is being prepared by the NJDHSS for the North Brunswick Township High School site which will detail the process of evaluating and interpreting environmental data and public health risks. Additional environmental data that becomes available from the NJDEP will be reviewed and evaluated in the Public Health Assessment.





State of New Jersey

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RICHARD J. CODEY  
*Acting Governor*

FRED M. JACOBS, M.D., J.D.  
*Acting Commissioner*

February 15, 2005

Dear Residence B:

Thank you for your request for assistance in evaluating potential health risks associated with contamination detected at your residence during an investigation of the North Brunswick Township High School site, Raider Road, North Brunswick, Middlesex County. We have reviewed the environmental data for your residence provided by the New Jersey Department of Environmental Protection and have prepared the enclosed evaluation.

Based on the average arsenic concentration detected in the surface soil at your residence, non-cancer health effects are not expected for adults and children. For cancer health effects in adults, the risk associated with arsenic in soil (based on the average concentration) was approximately five excess cancer cases per 10,000,000 individuals. This increase in cancer risk attributable to site-related contamination is very small when compared with the background cancer risk in the United States. Typically, health guideline values developed for carcinogens are based on one excess cancer case per 1,000,000 individuals. Recommendations for your household include the sampling of groundwater and soil gas so that the vapor intrusion pathway can be evaluated and the identification and removal of potential household indoor air contamination sources.

Please feel free to contact me by telephone at 609-584-5367 or via e-mail at [Julie.Petix@doh.state.nj.us](mailto:Julie.Petix@doh.state.nj.us) if you have any questions or concerns.

Sincerely,

Julie R. Petix, M.P.H., C.P.M., H.O.  
Project Manager  
Health Assessment and Consultation Unit

Enclosures

Attachment I, Evaluation of Contaminant Exposures at Residence B  
ToxFAQs for gasoline, arsenic, and trichloroethylene

c: Jerald A. Fagliano, M.P.H., Ph.D., Program Manager  
Mark Searfoss, Case Manager, NJDEP  
Gregory Ulirsch, M.S., Technical Project Officer, ATSDR  
Arthur Block, Senior Regional Representative, ATSDR

**Attachment 1**

**Evaluation of Contaminant Exposures at Residence B  
North Brunswick, Middlesex County, New Jersey  
February 15, 2005**

During excavation for a major renovation/expansion project at the North Brunswick Township High School in July 2003, debris and fill material, including hazardous waste, were discovered in the soil. Construction activities at the school were suspended and the New Jersey Department of Environmental Protection (NJDEP) was notified.

On behalf of the North Brunswick Township Board of Education, the engineering services firm of Powell-Harpstead, Inc., West Chester, Pennsylvania initiated a Site Remedial Investigation (SRI) of the site in the autumn of 2003. A primary purpose of the SRI was to delineate the extent of soil contamination. Based on SRI findings, site-related contamination was detected at three residential properties located on Plains Gap Road. Results of surface soil samples collected from your residence indicated arsenic contamination above NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC):

<b>Contaminant</b>	<b>Average Concentration (mg/kg)*</b>	<b>Maximum Concentration (mg/kg)</b>	<b>NJDEP RDCSCC (mg/kg)</b>
Arsenic**	14.79	45.2	20

\*milligrams of arsenic per kilogram of soil

\*\*six surface soil samples were collected for metals analysis (five samples were collected at a depth of 0 – 0.5 feet, one sample was collected at a depth of 0.3 – 0.8 feet)

According to the NJDEP, arsenic contamination was determined to be site-related (M. Searfoss, NJDEP, personal communication, 2004). Powell-Harpstead, Inc. recommended that property owners refrain from any activities which may disturb these soils (e.g., gardening, landscaping) to prevent contact with contaminated soil.

A water sample was also collected from your basement sump. Although no contamination was detected, trichloroethylene (TCE) was detected in the sump water of neighboring residences. The presence of TCE in the sump water suggests TCE contamination of area groundwater.

Volatile organic compounds (VOCs) such as TCE in soil and groundwater can emit vapors that may migrate through subsurface soils and into indoor air spaces of overlying buildings. The vapor intrusion pathway may be important for buildings with or without a basement. Vapors can accumulate in occupied spaces to concentrations that may pose safety hazards, health effects, or aesthetic problems (e.g., odors). Consequently, indoor air samples from the basement and first floor of your home were collected and analyzed. Results indicated the presence of TCE as well as a number of other VOCs including

benzene, chloroform, p-dichlorobenzene, methyl t-butyl ether, and 1,2,4-trimethylbenzene, at concentrations above US Environmental Protection Agency (USEPA) Risk-Based Concentrations (RBCs). Some of these substances, as well as others detected in your home at lower concentrations (such as toluene, ethylbenzene, and xylene) may be associated with the use and storage of gasoline and/or cleaning products. It is important to note that the highest concentrations of these contaminants were detected on the first floor of your home. For your reading, enclosed is an ATSDR ToxFAQS for gasoline. ToxFAQs are prepared to provide environmental and health related facts about hazardous substances commonly found at hazardous waste sites.

Since groundwater and soil gas data are unavailable, the source of the VOCs, with the exception of TCE, cannot be identified as being site related. TCE results were as follows:

<b>Location</b>	<b>TCE (<math>\mu\text{g}/\text{m}^3</math>)*</b>	<b>USEPA Region 3 RBC (<math>\mu\text{g}/\text{m}^3</math>)</b>
Basement	0.42	0.016
First Floor (family room)	Not detected	0.016

\*micrograms of TCE per cubic meter of air

Dust wipe samples were also collected from nine indoor surfaces throughout your residence. Results did not indicate the presence of any site-related contamination above applicable standards.

On August 11, 2004, the NJDHSS conducted a site visit of your home. The purpose of the site visit was to assess current site conditions and collect information potentially related to individual exposures to contaminants of concern. Information collected during the site visit included the number and age of residents, years of occupancy, gardening and landscaping activities, and time spent in the basement. This information was utilized in estimating past exposures and assessing the potential for health effects.

### **Contaminants of Concern**

As mentioned earlier, concentrations of arsenic and TCE detected at your residence were above the NJDEP RDCSCC and USEPA Region 3 RBC, respectively. For your reading, enclosed are ATSDR ToxFAQS for arsenic and TCE. ToxFAQs are prepared to provide environmental and health related facts about hazardous substances commonly found at hazardous waste sites.

Since arsenic and TCE were considered site-related contaminants, site-specific conditions were used to evaluate likely exposure scenarios for a given exposure pathway.

## Assessment of Health Implications

The following is a summary of our findings for your residence. Generally, average contaminant concentrations are assumed to represent the more likely exposure scenario, while maximum contaminant concentrations are used conservatively to present a less likely, worst case scenario.

### Soil and Dust Contamination

The main route of exposure to contaminated soil is by incidental ingestion from hand-to-mouth contact. This assessment evaluated the potential for both non-cancer and cancer health effects from exposures to the contaminants found at your property. Since children differ physiologically from adults and generally exhibit behaviors that increase exposure potential, their health risks were calculated separately.

#### *Arsenic in Surface Soil*

Factors taken into account included: maximum and average soil contamination concentrations; standard ingestion rates for adults and children; exposure duration (e.g., years of residency, seasonal considerations); and assumed body weight of adults and children.

As previously discussed, the maximum surface soil concentration of arsenic detected at your residence was 45.2 mg/kg. Arsenic was not detected in any of the nine dust wipe samples collected throughout the interior of your residence.

Non-cancer health effects: Based on the average arsenic concentration detected in the surface soil at your residence, the exposure doses calculated for adults and children were below the health guideline value. The health guideline value for arsenic is set at a level meant to protect against non-cancer health effects, specifically dermal lesions. Based on the maximum arsenic concentration detected in the surface soil, the exposure dose calculated for your youngest child (0.00053 milligrams per kilogram per day, or mg/kg/day) exceeds the health guideline value of 0.0003 mg/kg/day. An uncertainty factor of three was used by the ATSDR to derive the health guideline value to account for variations among individual sensitivity. Following long term exposure at the maximum arsenic concentration detected, non-cancer health effects are possible. It is important to note that this worst case exposure scenario may not be representative for your child.

Cancer health effects: The site-specific lifetime excess cancer risk (LECR) indicates the cancer potential of contaminants. LECR estimates are usually expressed in terms of excess cancer cases in an exposed population in addition to the background rate of cancer. Based on the average arsenic concentration detected in the surface soil at your residence, a LECR for adults was estimated to be approximately five excess cancer cases per 10,000,000 individuals; at the maximum arsenic concentration detected, the LECR was estimated to be approximately two excess cancer cases per 1,000,000 individuals. This increase in cancer risk attributable to site-related contamination is very small when

compared with the background cancer risk in the United States. For perspective, according to the American Cancer Society, one in three people are expected to get some form of cancer during their lifetime.

### ***Arsenic in Household Dust***

Young children, especially those less than six years of age, spend a great deal of time on the floor and put non-food items in their mouths. As previously mentioned, arsenic was not detected in dust samples collected from the interior of your residence.

### **Indoor Air TCE Contamination**

Factors taken into consideration included: indoor air concentrations; standard inhalation rates of adults and children; exposure duration (including consideration of time spent in the basement); and assumed body weights of adults and children. As previously stated, no TCE was detected in the indoor air sample collected from your family room. Although TCE was detected in the basement, you had indicated that other than the occasional storage visit, you and your family do not spend any time in the basement. As such, health effects associated with TCE exposures are not expected.

### **Past and Current Status of Exposure Pathways**

Past exposures associated with the contaminants of concern detected at your residence were evaluated. Based on the average arsenic concentration detected in the surface soil at your residence (the likely exposure scenario), non-cancer health effects are not expected for adults and children. For cancer health effects in adults, the risk associated with arsenic in soil (based on the average concentration) was approximately five excess cancer cases per 10,000,000 individuals.

Under NJDEP oversight, contaminated soil at your residence has been removed. Therefore, exposures from the soil pathway appear to have been interrupted for household members. There are no TCE exposures to household members since the basement is currently used for storage only.

### **Recommendations**

Based on the above assessment, our recommendations are as follows:

1. Groundwater and soil gas sampling should be conducted at your residence. Results of this sampling will assist the NJDHSS in the evaluation of the vapor intrusion pathway. If soil gas data indicate the potential for vapor intrusion, additional indoor air sampling should be conducted at your residence.

2. A large number of VOCs were detected in the indoor air of your home, and some of these contaminants were detected at higher concentrations on the first floor. It is possible that the sources of these substances are related to the use and/or storage of

gasoline, household cleaning products, and solvents. This contamination may be addressed by identifying and removing these products from your home.

In cooperation with the ATSDR, a Public Health Assessment is being prepared by the NJDHSS for the North Brunswick Township High School site which will detail the process of evaluating and interpreting environmental data and public health risks. Additional environmental data that becomes available from the NJDEP will be reviewed and evaluated in the Public Health Assessment.



State of New Jersey

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FRED M. JACOBS, M.D., J.D.  
*Acting Commissioner*

February 17, 2005

Dear Residence C:

Thank you for your request for assistance in evaluating potential health risks associated with contamination detected at your residence during an investigation of the North Brunswick Township High School site, Raider Road, North Brunswick, Middlesex County. We have reviewed the environmental data for your residence provided by the New Jersey Department of Environmental Protection and have prepared the enclosed evaluation.

Based on arsenic concentrations detected in the surface soil and the trichloroethylene concentrations in the indoor air at your residence, non-cancer health effects are not expected for adults and children. For cancer health effects in adults, the combined risk associated with arsenic in soil (based on the average concentration) and indoor air concentrations of trichloroethylene were approximately six excess cancer cases per 1,000,000 individuals. This increase in cancer risk attributable to site-related contamination is small when compared with the background cancer risk in the United States. Recommendations for your household include the sampling of groundwater and soil gas so that the vapor intrusion pathway can be evaluated and the identification and removal of potential household indoor air contamination sources.

Please feel free to contact me by telephone at 609-584-5367 or via e-mail at [Julie.Petix@doh.state.nj.us](mailto:Julie.Petix@doh.state.nj.us) if you have any questions or concerns.

Sincerely,

Julie R. Petix, M.P.H., C.P.M., H.O.  
Project Manager  
Health Assessment and Consultation Unit

Enclosures

Attachment I, Evaluation of Contaminant Exposures at Residence C  
ToxFAQs for gasoline, arsenic, and trichloroethylene

c: Jerald A. Fagliano, M.P.H., Ph.D., Program Manager  
Mark Searfoss, Case Manager, NJDEP  
Gregory Ulirsch, M.S., Technical Project Officer, ATSDR  
Arthur Block, Senior Regional Representative, ATSDR

## Attachment 1

### Evaluation of Contaminant Exposures at Residence C North Brunswick, Middlesex County, New Jersey February 17, 2005

During excavation for a major renovation/expansion project at the North Brunswick Township High School in July 2003, debris and fill material, including hazardous waste, were discovered in the soil. Construction activities at the school were suspended and the New Jersey Department of Environmental Protection (NJDEP) was notified.

On behalf of the North Brunswick Township Board of Education, the engineering services firm of Powell-Harpstead, Inc., West Chester, Pennsylvania initiated a Site Remedial Investigation (SRI) of the site in the autumn of 2003. A primary purpose of the SRI was to delineate the extent of soil contamination. Based on SRI findings, site-related contamination was detected at three residential properties located on Plains Gap Road. Results of surface (0 – 0.5 foot depth) soil samples collected from your residence indicated arsenic contamination above NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC):

Contaminant	Average Concentration (mg/kg)*	Maximum Concentration (mg/kg)	NJDEP RDCSCC (mg/kg)
Arsenic**	16.67	46.1	20

\*milligrams of arsenic per kilogram of soil

\*\*13 surface soil samples were collected for metals analysis

According to the NJDEP, arsenic contamination was determined to be site-related (M. Searfoss, NJDEP, personal communication, 2004). Powell-Harpstead, Inc. recommended that property owners refrain from any activities which may disturb these soils (e.g., gardening, landscaping) to prevent contact with contaminated soil.

A water sample was also collected from your basement sump. Trichloroethylene (TCE) was detected in this sample at a concentration of 4 micrograms of TCE per liter of water ( $\mu\text{g/L}$ ). The presence of TCE in the sump water suggests TCE contamination of area groundwater.

Volatile organic compounds (VOCs) such as TCE in soil and groundwater can emit vapors that may migrate through subsurface soils and into indoor air spaces of overlying buildings. The vapor intrusion pathway may be important for buildings with or without a basement. Vapors can accumulate in occupied spaces to concentrations that may pose safety hazards, health effects, or aesthetic problems (e.g., odors). Consequently, indoor air samples from the basement and first floor of your home were collected and analyzed. Results indicated the presence of TCE as well as a number of other VOCs including benzene, chloroform, carbon tetrachloride, p-dichlorobenzene, and



methyl t-butyl ether at concentrations above US Environmental Protection Agency (USEPA) Risk-Based Concentrations (RBCs). Some of these substances, as well as others detected in your home at lower concentrations (such as toluene, ethylbenzene, and xylene) may be associated with the use and storage of gasoline and/or cleaning products. It is important to note that the highest concentrations of these contaminants were detected in your basement. For your reading, enclosed is an ATSDR ToxFAQS for gasoline. ToxFAQs are prepared to provide environmental and health related facts about hazardous substances commonly found at hazardous waste sites.

Since groundwater and soil gas data are unavailable, the source of the VOCs, with the exception of TCE, cannot be identified. TCE results were as follows:

<b>Location</b>	<b>TCE (<math>\mu\text{g}/\text{m}^3</math>)*</b>	<b>USEPA Region 3 RBC (<math>\mu\text{g}/\text{m}^3</math>)</b>
Basement	0.32	0.016
First Floor (living room)	0.30	0.016

\*micrograms of TCE per cubic meter of air

Dust wipe samples were also collected from nine indoor surfaces throughout your residence. Results did not indicate the presence of site-related contamination above applicable standards.

On August 11, 2004, the NJDHSS conducted a site visit of your home. The purpose of the site visit was to assess current site conditions and collect information potentially related to individual exposures to contaminants of concern. Information collected during the site visit included the number and age of residents, years of occupancy, gardening and landscaping activities, and time spent in the basement. This information was utilized in estimating past exposures and assessing the potential for health effects.

### **Contaminants of Concern**

As mentioned earlier, concentrations of arsenic and TCE detected at your residence were above the NJDEP RDCSCC and USEPA Region 3 RBC, respectively. For your reading, enclosed are ATSDR ToxFAQS for arsenic and TCE. ToxFAQs are prepared to provide environmental and health related facts about hazardous substances commonly found at hazardous waste sites.

Since arsenic and TCE were considered site-related contaminants, site-specific conditions were used to evaluate likely exposure scenarios for a given exposure pathway.

### **Assessment of Health Implications**

The following is a summary of our findings for your residence. Generally, average contaminant concentrations are assumed to represent the more likely exposure

scenario, while maximum contaminant concentrations are used conservatively to present a less likely, worst case scenario.

## **Soil and Dust Contamination**

The main route of exposure to contaminated soil is by incidental ingestion from hand-to-mouth contact. This assessment evaluated the potential for both non-cancer and cancer health effects from exposures to the contaminants found at your property. Since children differ physiologically from adults and generally exhibit behaviors that increase exposure potential, their health risks were calculated separately.

### ***Arsenic in Surface Soil***

Factors taken into account included: maximum and average soil contamination concentrations; standard ingestion rates for adults and children; exposure duration (e.g., years of residency, seasonal considerations); and assumed body weight of adults and children.

As previously discussed, the maximum surface soil concentration of arsenic detected at your residence was 46.1 mg/kg. Arsenic was not detected in any of the nine dust wipe samples collected throughout the interior of your residence.

Non-cancer health effects: Based on both the maximum and average arsenic concentrations detected in the surface soil at your residence, the exposure doses calculated for adults and children were below the health guideline value. The health guideline value for arsenic is set at a level meant to protect against non-cancer health effects, specifically dermal lesions. As such, non-cancer health effects are not expected to occur.

Cancer health effects: The site-specific lifetime excess cancer risk (LECR) indicates the cancer potential of contaminants. LECR estimates are usually expressed in terms of excess cancer cases in an exposed population in addition to the background rate of cancer. Based on the average arsenic concentration detected in the surface soil at your residence, a LECR for adults was estimated to be approximately three excess cancer cases per 1,000,000 individuals; at the maximum arsenic concentration detected, the LECR was estimated to be approximately seven excess cancer cases per 1,000,000 individuals. This increase in cancer risk attributable to site-related contamination is small when compared with the background cancer risk in the United States. For perspective, according to the American Cancer Society, one in three people are expected to get some form of cancer during their lifetime.

### ***Arsenic in Household Dust***

Young children, especially those less than six years of age, spend a great deal of time on the floor and put non-food items in their mouths. As previously mentioned, arsenic was not detected in dust samples collected from the interior of your residence.

## **Indoor Air TCE Contamination**

Factors taken into consideration included: indoor air concentrations; standard inhalation rates of adults and children; exposure duration (including consideration of time spent in the basement); and assumed body weights of adults and children.

Non-cancer health effects: At the present time, there is no health guideline value available to compare with TCE exposures occurring for more than one year. There is, however, an “intermediate” health guideline value available for TCE exposures occurring for more than 14 days but less than a year. The concentration detected in your living room is about 1,700 times less than the intermediate health guideline value for TCE. As such, non-cancer health effects are unlikely for both adults and children at the concentration detected.

Cancer health effects: Based on the TCE concentration detected in your living room, a LECR for adults was estimated to be approximately three excess cancer cases per 1,000,000 individuals. Again, this increase in cancer risk attributable to site-related contamination is small when compared with the background cancer risk in the United States. For perspective, according to the American Cancer Society, one in three people are expected to get some form of cancer during their lifetime.

## **Past and Current Status of Exposure Pathways**

Potential health risks associated with the contaminants of concern detected at your residence were evaluated individually. Since the cumulative or synergistic effects of mixtures of contaminants may increase their public health impact, we also evaluated their cumulative health risks. As stated above, non-cancer health effects associated with arsenic and TCE exposures were not expected at the levels detected at your residence. For cancer health effects in adults, the combined risk associated with arsenic in soil (based on the average concentration) and indoor air concentrations of TCE were approximately six excess cancer cases per 1,000,000 individuals.

Under NJDEP oversight, contaminated soil at your residence has been removed. Additionally, the basement sump was covered and sealed. The results of a second air sampling round indicated that TCE concentrations were estimated to be below the NJDEP practical quantitation limit. Therefore, exposures from the soil and indoor air pathways appear to have been interrupted for household members.

## **Recommendations**

Based on the above assessment, our recommendations are as follows:

1. Groundwater and soil gas sampling should be conducted at your residence. Results of this sampling will assist the NJDHSS in the evaluation of the vapor intrusion

pathway. If soil gas data indicate the potential for vapor intrusion, additional indoor air sampling should be conducted at your residence.

2. A large number of VOCs were detected in the indoor air of your home, and some of these contaminants were detected at higher concentrations in your basement. It is possible that the sources of these substances are related to the use and/or storage of gasoline, household cleaning products, and solvents. This contamination may be addressed by identifying and removing these products from your home.

In cooperation with the ATSDR, a Public Health Assessment is being prepared by the NJDHSS for the North Brunswick Township High School site which will detail the process of evaluating and interpreting environmental data and public health risks. Additional environmental data that becomes available from the NJDEP will be reviewed and evaluated in the Public Health Assessment.

## **Appendix B**

- Avoid working in the yard on windy days, when dust can be stirred up and possibly increase your exposure.
- Consider wearing a mask if you spend time in dusty areas.
- Wash your hands after gardening.
- Wash work clothes to remove dust and dirt.
- Take your shoes off at the door to avoid tracking soil into your home.

### Preparing Fruits and Vegetables

- Clean your hands, cutting boards, and kitchen tools with hot, soapy water and rinse well before and after handling your fruits and vegetables.
- Soak garden produce in cool water and rinse thoroughly until the water runs clear. Commercial vegetable-cleaning products are available in supermarkets to help free soil residues from your produce. These products work well with leafy vegetables. Vinegar can also be used for cleaning produce.
- Scrub firm fruits and root crops with a vegetable-cleaning brush to remove dust and dirt before peeling or eating.
- Peel root crops like carrots, rutabagas, radishes, and turnips.
- Wash berry fruits like strawberries and blackberries, and remove the “caps” (the tops of the berries where the stem and leaves attach).

### Buy Some, Grow Some

- Eat some fruits and vegetables from your garden and some from the farmer’s market or grocery store. Eating a mix of homegrown and commercial products can help reduce your potential exposure.

### Creating Play Areas for Children

- Fill sandboxes with sand or soil from an outside source such as a commercial gardening center.
- Cover bare soil with grass or other material such as mulch.
- Keep children from playing in contaminated soil. The most likely way for children to become exposed to arsenic is from ingesting (eating) dirt.
- Have children wash hands and faces after they play in the yard.



### Cleaning Your Home

- Remove work and play shoes before entering your house.
- Damp-mop floors and wipe down counters, tables, and window ledges regularly.
- To reduce dust levels in the home, consider upgrading your vacuum cleaner bags to those that filter better or simply change your bags more often. Some persons may want to buy a vacuum cleaner with a HEPA (high-efficiency particulate air) filter to better reduce dust levels.
- Wash the soil from homegrown fruits and vegetables before bringing them into your home.
- Keep pets out of areas of contaminated soil. Dogs and cats carry contaminated soil on their feet and fur into the home. Bathe your pets frequently.



For more information about ATSDR’s work at Spring Valley, visit our web site at [www.atsdr.cdc.gov/sites/springvalley](http://www.atsdr.cdc.gov/sites/springvalley) or contact any of ATSDR’s Spring Valley Team members:

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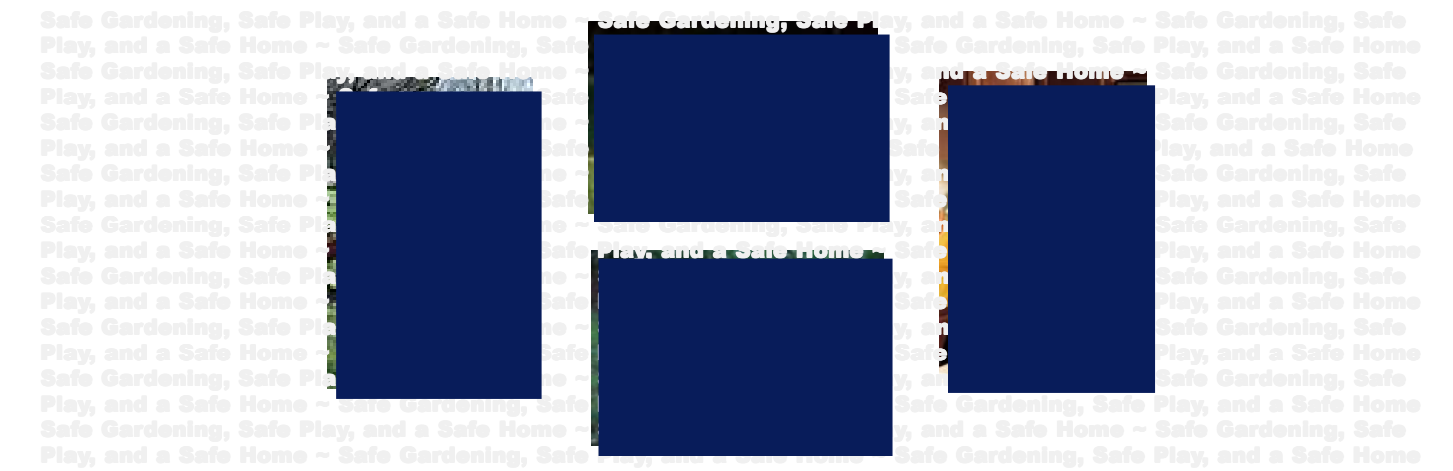
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## Safe Gardening, Safe Play, and a Safe Home

An interim guide to reducing arsenic exposure in Spring Valley

This pamphlet was designed for residents of Spring Valley. The purpose is to provide residents with good health practice tips for the home, lawn and garden work, and play. By following the tips in this pamphlet, residents can greatly reduce their exposure to arsenic as well as to other potentially harmful materials such as pesticides and germs that might be in the soil.



### Introduction

Approximately 146 properties in the Spring Valley area have some soil arsenic levels greater than 20 parts per million (ppm), a level designated by local and federal officials as a clean-up level for this community. Although the levels of arsenic detected in this community are in some cases elevated in soil, limited exposure studies to date suggest that the arsenic is not getting into residents’ bodies in any greater amounts than what you would find in the general public. Although this is reassuring, it is recognized that some residents may still be concerned until the cleanup of their yards has occurred. For those and other concerned residents, the good practice tips in this pamphlet will be effective in reducing exposures to arsenic, pesticides, and germs that might be present in the soil.

### Enjoying Your Lawn and Garden



Eating fruits and vegetables and getting plenty of exercise are essential parts of a healthy lifestyle. People enjoy many activities on their lawn and in their garden, which provide places both for exercise and for growing fresh fruits and vegetables. The levels of arsenic found in the soil of most properties in Spring Valley are at or below background (natural) levels and present no health hazard for people doing lawn or garden activities. Still, some families have arsenic in their soil at levels higher than the clean-up level and wish to reduce their exposure to the lowest possible level. Activities such as playing, gardening, and working on your lawn can increase your opportunity for exposure even though they are healthful. The information in this pamphlet will help you understand how to reduce your chances of exposure so you do not feel you have to give up the outdoor activities that you and your family enjoy. Understand that each property is different. Some of the tips outlined may apply to your situation and some may not.

### Arsenic

A major source of elevated arsenic in Spring Valley surface soils is from degradation of chemical warfare agents tested there during World War I (WWI).

The U.S. Environmental Protection Agency (EPA), Army Corps of Engineers (ACOE), and the D.C. Department of Health set an arsenic cleanup level of 20 ppm for yards in Spring Valley. ACOE has removed soil from some contaminated properties and is planning to continue soil removals over the next several years. Until the contaminated soil is replaced, residents may



reduce their chances of exposure by following the guidelines in this pamphlet. Additional information about arsenic can be found at the ATSDR Spring Valley Information Repository at Palisades Library (4901 V Street N.W. at 49<sup>th</sup> Street N.W.) or through the ATSDR Spring Valley Web site at [www.atsdr.cdc.gov/sites/springvalley](http://www.atsdr.cdc.gov/sites/springvalley).

## Arsenic and Gardening



Arsenic is a naturally occurring element. Two types of arsenic are found in the environment. The first is **inorganic arsenic**, which is usually found in the environment combined with other elements such as oxygen, iron, and sulfur. The second type of arsenic is **organic arsenic**. Organic arsenic is formed by arsenic combined with carbon and hydrogen. It is found in plants, fish, and shellfish and is considered less harmful than inorganic arsenic.

For most properties in Spring Valley the soil arsenic levels are not high enough to cause any health problems associated with eating homegrown vegetables. Indeed, even for those areas showing elevated levels of arsenic, the uptake into home grown vegetables or fruits, is not likely to be sufficient to cause any health effects to persons gardening in the soil or eating vegetables grown in the garden. This will be explained below.

Gardening in soil with elevated levels of arsenic has two main issues: cleaning soil from the edible portion of the plant and absorption of arsenic by the plant. It is always a good health practice to wash all fruits and vegetables thoroughly whether they are bought or homegrown. Washing the soil from your homegrown fruits and vegetables is one of the most effective ways of reducing your exposure to not only arsenic but to pesticides and germs as well.

Most edible plants absorb some small amounts of arsenic, but usually do not contain enough arsenic to be of health concern. The amount of arsenic absorbed by plants can depend on many factors. Some of the most important factors are soil acidity, nutrient content, iron, organic matter, and plant type. Plants can absorb more arsenic if you have acidic soil. Keeping your soil at a near-neutral range (pH 6–7) can help reduce the amount of arsenic absorbed in plants. Maintaining adequate levels of plant nutrients in your soil can help reduce arsenic absorption. Adding a balanced commercial fertilizer to soil can help maintain correct levels of key plant nutrients. Iron can prevent arsenic from being absorbed. The iron combines with arsenic to form iron arsenate, a form of arsenic that is not well absorbed by plants. Increased amounts of organic matter are also helpful; the organic matter binds to arsenic and reduces how much plants take up. Some lawn and garden products contain arsenic, so it is a good idea to check with your lawn and garden store for products that do not contain arsenic.

Another important thing to keep in mind is that arsenic deposited by the chemical weapons tests in Spring Valley has been in the soil for 80 years. The longer the arsenic stays in the soil, the more it becomes bound to the soil, making it less available to plants and humans.

Arsenic levels in garden areas tend to be lower than in other areas of the property because most gardeners add soil conditioners such as compost and topsoil. By adding these conditioners, the concentration of arsenic in the soil is diluted. Some gardeners might want to add additional compost or topsoil from an area of their yard that does not have elevated levels of arsenic. In some cases it may be best to remove the soil from the place you want to garden and replace it with topsoil from a commercial garden center.

Plants vary in the amount of arsenic they absorb from the soil and where they store arsenic. Some plants move arsenic from the roots to the leaves, while others absorb and store it in the roots only. Fruit-type vegetables such as tomatoes concentrate arsenic in the roots and very little arsenic is taken up in the edible portion of the plant. Leafy vegetables also store arsenic in their roots, but some is also stored in the stems and leaves. Lettuce and some members of the Brassica plant family such as collards, kale, mustard, and turnip greens store more arsenic in the leaves than do other crops, but not at concentrations high enough to cause concern. Root crops such as beets, turnips, carrots, and potatoes absorb most of the arsenic in the surface skin of the vegetable. By peeling the skins of root crops, you can eliminate the portion of the plant that contains arsenic. Again, garden vegetables grown in Spring Valley should not contain enough arsenic to be of health concern. Recommendations for conditioning your soil, washing vegetables, and peeling root crops are intended to provide you the property owner with additional options for reducing exposure to arsenic.

For some properties with limited space for gardens, a raised garden bed might be an option. Instructions for building a raised garden bed can be found in most gardening books. The raised beds can be filled with soil from commercial gardening centers or from an area of your yard that does not contain elevated levels of arsenic. Your local agricultural extension office is an excellent source of for all types of gardening information.



## Can I Eat Fruits and Vegetables Grown in My Garden?

Yes. Homegrown fruits and vegetables are highly unlikely to contain arsenic levels that would affect your health. Vegetables grown in soils with arsenic will take up some small amounts of arsenic. However, we believe the benefits from the eating your homegrown fruits and vegetables outweigh the risk presented by their arsenic content. By following the recommendations in the Tips for Safe Gardening, Safe Play, and a Safe Home section, you can greatly reduce your exposure to arsenic from the soil.

## Unknown Buried Material

As the result of activities performed at the American University Experimental Station during WWI, dangerous materials used in the war effort were often buried as a means of disposal. ACOE, using historical records, has identified several areas of concern and continues to investigate. Buried items already discovered include buried munitions (both conventional and those containing chemical warfare agents), chemical weapon agents in ceramic jugs, laboratory waste, and other related items. These items have been buried since WWI and many have rusted and deteriorated to a point that they pose little health risk but it is possible for some to contain chemical agents. There have been very few reports of these items being uncovered through normal yard work, but the possibility does exist. Existing gardens and flowerbeds that have already been tilled or dug in are considered very low risk, but you should follow precautions. If you dig up any suspicious glass or metal object, do not attempt to remove the item yourself. Call ACOE at 1-800-434-0988, 410-962-7522, or 202-686-3359 for assistance.

## Tips for Safe Gardening, Safe Play, and a Safe Home

### Preparing Your Garden Soil

We are all exposed to a little arsenic every day. The recommendations below are for people who want to keep their exposure to the minimum possible. These recommendations are intended to be on the safe side. Under normal circumstances, a lapse in following these recommendations will not, by itself, lead to health problems.

- Increase the organic matter in your soil by adding compost or manure from outside sources such as commercial garden centers.
- Keep soil pH in the near-neutral range (pH 6–7). For a soils test, check with your local agricultural extension office or purchase a soils test kits at a garden center.
- Maintain adequate levels of plant nutrients by using a balanced commercial fertilizer.
- Maintain adequate levels of iron in your soil.
- Consider building a raised-bed garden. Fill it with topsoil and compost from outside sources or areas of your yard that do not have elevated levels of arsenic.



*Note: Do not use chromated copper arsenate (CCA)-treated wood to build your raised garden beds. CCA contains arsenic that can leach into your soil. Use a safer nonarsenic pressure-treated wood such as ammoniacal copper quaternary (ACQ). Bricks, stone, or other wood products such as cedar or redwood can be used to build a raised garden bed.*

### Working in the Garden and Yard

- Avoid eating or drinking while working in the yard or garden because contaminated soil and dust might get on your food and you could accidentally swallow it.
- Dampen soils with water before you garden to limit the amount of dust you inhale.

## **Appendix C**



This fact sheet answers the most frequently asked health questions (FAQs) about automobile gasoline. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**SUMMARY: Exposure to automotive gasoline most likely occurs from breathing its vapor at a service station while filling a car's fuel tank. At high levels, automotive gasoline is irritating to the lungs when breathed in and irritating to the lining of the stomach when swallowed. Exposure to high levels may also cause harmful effects to the nervous system. Automotive gasoline has been found in at least 23 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).**

### What is automotive gasoline?

(Pronounced ô'tə-mō'tiv[gās'ə-lēn')

The gasoline discussed in this fact sheet is automotive used as a fuel for engines in cars. Gasoline is a colorless, pale brown, or pink liquid, and is very flammable.

Gasoline is a manufactured mixture that does not exist naturally in the environment. Gasoline is produced from petroleum in the refining process.

Typically, gasoline contains more than 150 chemicals, including small amounts of benzene, toluene, xylene, and sometimes lead. How the gasoline is made determines which chemicals are present in the gasoline mixture and how much of each is present. The actual composition varies with the source of the crude petroleum, the manufacturer, and the time of year.

### What happens to automotive gasoline when it enters the environment?

- Small amounts of the chemicals present in gasoline evaporate into the air when you fill the gas tank in your car or when gasoline is accidentally spilled onto surfaces and soils or into surface waters.

- Other chemicals in gasoline dissolve in water after spills to surface waters or underground storage tank leaks into the groundwater.
- In surface releases, most chemicals in gasoline will probably evaporate; others may dissolve and be carried away by water; a few will probably stick to soil.
- The chemicals that evaporate are broken down by sunlight and other chemicals in the air.
- The chemicals that dissolve in water also break down quickly by natural processes.

### How might I be exposed to automotive gasoline?

- Breathing vapors at a service station when filling the car's fuel tank is the most likely way to be exposed.
- Working at a service station.
- Using equipment that runs on gasoline, such as a lawn mower.
- Drinking contaminated water.
- Being close to a spot where gasoline has spilled or leaked into the soil.

### How can automotive gasoline affect my health?

Many of the harmful effects seen after exposure to gasoline are due to the individual chemicals in the gasoline mix-

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

ture, such as benzene and lead. Inhaling or swallowing large amounts of gasoline can cause death.

Inhaling high concentrations of gasoline is irritating to the lungs when breathed in and irritating to the lining of the stomach when swallowed. Gasoline is also a skin irritant. Breathing in high levels of gasoline for short periods or swallowing large amounts of gasoline may also cause harmful effects on the nervous system.

Serious nervous system effects include coma and the inability to breathe, while less serious effects include dizziness and headaches.

There is not enough information available to determine if gasoline causes birth defects or affects reproduction.

### How likely is automotive gasoline to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified automotive gasoline for carcinogenicity. Automotive gasoline is currently undergoing review by the EPA for cancer classification.

Some laboratory animals that breathed high concentrations of unleaded gasoline vapors continuously for 2 years developed liver and kidney tumors. However, there is no evidence that exposure to gasoline causes cancer in humans.

### Is there a medical test to show whether I've been exposed to automotive gasoline?

Laboratory tests are available that can measure elevated blood or urine levels of lead (as an indication of exposure to leaded gasoline only), benzene, or other substances that may result from exposure to gasoline or other sources. These meth-

ods are sensitive enough to measure background levels and levels where health effects may occur. These tests aren't available in most doctors' offices, but can be done at special laboratories that have the right equipment.

### Has the federal government made recommendations to protect human health?

The EPA has established many regulations to control air pollution. These are designed to protect the public from the possible harmful health effects of gasoline.

The American Conference of Governmental Industrial Hygienists (ACGIH) set a maximum level of 890 milligrams of gasoline per cubic meter of air (890 mg/m<sup>3</sup>) for an 8-hour workday, 40-hour workweek.

### Glossary

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Crude petroleum: Petroleum that has not been processed.

Dissolve: To disappear gradually.

Evaporate: To change into a vapor or a gas.

Irritant: A substance that causes an abnormal reaction.

Mixture: A combination of two or more components.

Refining process: The process by which petroleum is purified to form gasoline.

Tumor: An abnormal mass of tissue.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for automotive gasoline. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



## **Appendix D**



## FACT SHEET FOR NORTH BRUNSWICK CANCER INQUIRY

**Cancer** Unfortunately, cancer is very common; the National Cancer Institute estimates that the lifetime risk of being diagnosed with cancer is 46 percent among men and 38 percent among women. The risk of developing cancer increases with age, so more cancer would be expected in a community that is aging. Cancer consists of over 100 different diseases with different risk factors for each. Therefore, it is difficult to pinpoint one cause for many different types of cancer.

**Cancer and the Environment** Scientists believe that only about two percent of cancer cases are related to the environment. When cancer is due to contact with a cancer-causing agent, it usually takes 10 to 30 or more years for the cancer to develop.

**Cancer Risk Factors** Generally, cancer results from lifestyle factors including smoking cigarettes, lack of exercise, drinking heavily, and diet, communicable diseases, reproductive patterns, family history, genetics, and sexual behavior. For more information about risk factors for different types of cancers, you may wish to view *New Jersey Facts & Figures 2002* on our website <http://www.state.nj.us/health/cancer/statistics.htm>, the American Cancer Society website [www.cancer.org](http://www.cancer.org) or the National Cancer Institute website [www.nci.nih.gov](http://www.nci.nih.gov)

**Cancer Incidence** As a result of your concern, we reviewed cancer incidence data from 1979 through 2001 for North Brunswick Township and Middlesex County. The number and distribution of cancer types in Middlesex County did not appear to be unusual when compared to the state. We examined the data we have for North Brunswick Township by gender and age group and did not see an unusual occurrence of any type of cancer. That is, the patterns of cancer incidence in North Brunswick Township appear to be consistent with state and county patterns.

**North Brunswick High School** Regarding your concerns about exposure to the contamination at the North Brunswick High School site, there must be a completed pathway from the contaminant to the body for an environmental contaminant to cause cancers or other diseases. This could occur through air, water, food, or direct contact with the skin. NJDEP is investigating the North Brunswick High School contamination site. They have found arsenic, beryllium and cadmium at higher levels than the NJDEP's Residential Cleanup Criteria in soil samples that were taken in October 2003. Generally, these substances have been found to cause cancer in individuals who work in certain occupations and are exposed to high amounts of chemicals over long periods of time. NJDEP determined that individuals might be exposed to these carcinogens through soil ingestion/absorption and inhalation. To reduce or eliminate these pathways of exposure, NJDEP will be removing, covering, and limiting access to the exposed material. You may want to contact the New Jersey Site Remediation Program (SRP) Office of Community Relations at 609-984-3081, to find more information about the site clean up and remediation.

**Drinking Water** The NJDEP does not consider groundwater ingestion as a potential pathway for contaminants from the North Brunswick High School site since the area is serviced by a public water system that is regularly monitored. For more information about drinking water in New Jersey you can contact the NJDEP Water Supply Administration at (609) 292-5550 or <http://www.nj.gov/dep/watersupply/safedrnk.htm>

### **For more information**

Local Health Officer: David A. Papi, 732-745-3100

Cancer Epidemiology Services, NJ Department of Health & Senior Services: Lisa Paddock 609-588-3500

## **APPENDIX E**

## Summary of ATSDR Conclusion Categories

Category	Definition
Urgent Public Health Hazard	Applies to sites that have certain physical hazards or evidence of short-term (less than 1 year), site-related exposure to hazardous substances that could result in adverse health effects and require quick intervention to stop people from being exposed.
Public Health Hazard	Applies to sites that have certain physical hazards or evidence of chronic, site-related exposure to hazardous substances that could result in adverse health effects.
Indeterminate Public Health Hazard	Applies to sites where critical information is lacking (missing or has not yet been gathered) to support a judgment regarding the level of public health hazard.
No Apparent Public Health Hazard	Applies to sites where exposure to site-related chemicals might have occurred in the past or is still occurring, but the exposures are not at levels expected to cause adverse health effects.
No Public Health Hazard	Applies to sites where no exposure to site-related hazardous substances exists.