

Letter Health Consultation

EXXON/MOBIL GREENPOINT OFF-SITE PLUME
BROOKLYN, KINGS COUNTY, NEW YORK

EPA FACILITY ID: NYD00051277

Prepared by
State of New York Department of Health

SEPTEMBER 22, 2009

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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LETTER HEALTH CONSULTATION

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State of New York
Department of Health
Under a cooperative agreement with the
Agency for Toxic Substances and Disease Registry



STATE OF NEW YORK DEPARTMENT OF HEALTH

Flanigan Square 547 River Street Troy, New York 12180-2216

Richard F. Daines, M.D.
Commissioner

James W. Clyne, Jr.
Executive Deputy Commissioner

September 16, 2009

Mr. Edward Hampston
New York State Department of
Environmental Conservation
625 Broadway, 12th Floor
Albany, New York 12233-7013

Re: Letter Health Consultation
Exxon/Mobil Greenpoint Off-site Plume
Brooklyn, Kings County
Site #S224087

Dear Mr. Hampston:

The New York State Department of Health (NYSDOH), under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR) has evaluated the public health implications of the indoor air, sub-slab soil vapor and ambient air data that were collected in the Greenpoint section of Brooklyn, Kings County, New York, to assess the potential for soil vapor intrusion. This letter summarizes the NYSDOH's public health evaluation of the potential for exposures to residential indoor air contaminated through soil vapor intrusion related to a plume of petroleum free-product from a historic petroleum spill.

Site Background and Statement of Issues:

Greenpoint lies along the Newtown Creek in the northwestern corner of Kings County (Brooklyn), New York. The Greenpoint area has a long history of industrial activity dating back to the mid-1800s. In the past, multiple oil refineries operated along Newtown Creek. A series of spills on what is currently Exxon/Mobil property on the eastern end of the Greenpoint community resulted in a large plume of free-phase petroleum based hydrocarbons floating on the groundwater. Although several sources have been linked to the contamination found in the creek and the surrounding area, there are likely additional sources of both petroleum and non-petroleum contamination that have not yet been identified. Much focus has been placed on the large petroleum spill. (See the attached figure, Appendix B, Figure 1).

In 1978, the US Coast Guard found evidence of an oil spill entering Newtown Creek. Subsequent investigations found free-product from the spill encompassing more than 52-acres under Greenpoint. The volume of petroleum that was leaked and spilled in the area is estimated at 17 million gallons, but could be as much as 30 million gallons. A large portion of the petroleum is present as a “free-product” layer, which is defined as a separate phase of petroleum based products floating on the groundwater table.

There have been on-going investigations and remedial activities since the spill was recognized by the US Coast Guard. The New York State Department of Environmental Conservation (NYSDEC) estimates that about ten million gallons of product have been removed to date (NYSDEC, 2008). It is estimated that approximately 10 million gallons of recoverable product remain. Soil vapor sampling in the area has indicated elevated levels of volatile organic chemicals (VOCs) that are, at least in part, associated with the free-product plume.

During the 2006/2007 heating season, the NYSDEC collected indoor air, sub-slab soil vapor and ambient air samples to assess the potential for soil vapor intrusion to occur in the residential area near and over the plume. The term "soil vapor intrusion" refers to the process by which volatile chemicals move from a subsurface source into the indoor air of overlying buildings. The primary purpose of the State’s soil vapor intrusion investigation was to evaluate whether petroleum vapors were migrating into residential structures surrounding and overlying the free-product plume. The potential for soil vapors to migrate into structures in the commercial area that overlies the free-product plume needs additional investigation and will be assessed separately from the residential area.

The United States Environmental Protection Agency (USEPA) issued a report on September 12, 2007 titled “Newtown Creek/Greenpoint Oil Spill Study”. The USEPA chose to focus their evaluation on the Exxon/Mobil Oil Spill, stating: “Because of the more than 140+ years of heavy industry in the area of Newtown Creek, it would not be feasible in one year to evaluate potential health risks from a large number and wide variety of possible industrial contamination.”(USEPA, 2007). The USEPA report discusses the potential for soil vapor intrusion to occur in the residential area and other issues related to the historic spill.

Discussion:

During the 2006/2007 heating season, a State consultant, Ecology and Environment Engineering, P.C. (E & E), collected indoor air, sub-slab and ambient air samples from 52 homes in the area to assess the potential for vapors from the free-product plume to migrate into homes. These data are documented in the “Greenpoint Petroleum Remediation Project (Off-Site Plume Area), Vapor Intrusion/Indoor Air Sampling Report for the 2006/2007 Heating Season”, dated July 2007 (NYS DEC website).

At each home, a sub-slab soil vapor sample was collected to determine the presence of contaminants directly under the structure. A basement/lowest level air sample and, if the lowest level was not routinely occupied, a first floor living space air sample were collected. For comparison, an outdoor air sample was collected at

each home. The samples at each home, sub-slab soil vapor, indoor air and ambient air samples, were collected concurrently over a 24-hr period in 6-liter SUMMA® canisters. The canisters were sent to and analyzed by Air Toxics, Ltd. of Folsom, California, a NYSDOH Environmental Laboratory Approved Program-certified laboratory, for VOCs in accordance with analytical method TO-15. The analyte list was developed with consideration of standard VOCs typically included at Air Toxics and the types of volatile compounds generally associated with gasoline and petroleum products. In addition to the primary samples, duplicate samples were collected at a few locations to evaluate laboratory quality.

For each home, the E & E recorded information about the structure and practices of the occupants. This included information such as the floor plan, heating system, whether occupants smoke, occupation and use of dry cleaning services. The E & E also recorded an inventory of potential VOC-containing products stored in the home which included the condition of the container and a measurement of total VOCs near the item using a hand-held VOC detecting instrument. This information was gathered to help assess the indoor air data and aid in discerning sources of contamination potentially not attributable to soil vapor intrusion.

Two homes near each other had high levels of several chemicals in both the sub-slab and indoor air that could not be correlated to any known environmental contamination. Considering the types of chemicals (i.e. methylene chloride and acetone) found in high concentrations in these two homes and results of nearby homes, it is unlikely that the petroleum free-product plume was the source. NYS DEC and NYS DOH staff met with homeowners of one home and visited both homes. The residents of both homes are related to each other. Staff observed that one home was undergoing major renovations and contained a large amount of home improvement and assorted VOC-containing products. Some of those products were observed to be improperly sealed. NYS DEC and NYS DOH staff advised the homeowners about the storage practices and use of these products. Levels of contaminants in subsequent sampling of these two homes were much lower. Since the data from these two homes for the 2006/2007 sampling event is not representative of the overall data in the area and indicative of the observed home improvement activities, they have been excluded from this evaluation.

NYSDOH evaluated the data from the remaining 50 homes using an approach consistent with October 2006 *Guidance for Evaluating Soil Vapor Intrusion in the State of New York (Guidance, NYSDOH, 2006)*. The evaluation compares the concentrations of petroleum-related chemicals found in the sub-slab soil vapor and indoor air at each home taking into account specific conditions of each house, potential sources of indoor air contamination, outdoor air results and any other known information included on the questionnaire completed for each home.

A few homes did show a potential for soil vapor intrusion related to chlorinated solvents (primarily tetrachloroethene and trichloroethene). The sources of the chlorinated solvents in the area are still under investigation by the NYS DEC. Since the chlorinated solvents are unrelated to the petroleum spill, the data for these chemicals has not been included in this letter health consultation.

The data on petroleum-related chemicals were compared to the 75th percentile and upper fence concentrations for indoor air listed in Appendix C of the *Guidance* (NYSDOH, 2006). Some homes had concentrations of some chemicals above levels typically found in most homes. Upon examination of the data and product inventories, NYS DOH staff determined that in many of these instances the levels were due to storage and use of chemical containing products in the home, not from vapor intrusion. The data from these homes are shown on Table 1 (Appendix A). Description of these homes are as follow:

- House 1 had the highest concentrations of 1,2,3-trimethylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 4-ethyltoluene, ethyl benzene, xylenes, toluene and a few other chemicals. The owner of this home operates a home renovation business out of the home, and many items were listed on the product inventory. The basement is primarily used for storage and a workshop, while the first floor is used as a living area and an office. Furthermore, the sub-slab vapor concentrations were lower than the concentrations found in indoor air.
- House 2 had elevated concentrations of heptane and cyclohexane. These chemicals were not detected in the home's sub-slab vapor, indicating that the source was something used or stored in the home. The product inventory for this home listed many items that were potential sources, although none specifically listed these chemicals. An apartment is located in the basement.
- House 3, 4 and 6 all had a few chemicals in their indoor air that were above the concentrations we typically observe in indoor air. These chemicals were found in lower concentrations in each respective homes' sub-slab, indicating that the source was something used or stored in the home. In Houses 3 and 4, no first floor samples were collected.
- House 5 had the highest concentrations of decane and nonane. These chemicals were not detected in the home's sub-slab, indicating that the source was something used or stored in the home. Although the product inventory for this home only listed a couple items, it was noted that the home was recently renovated. Indoor air samples were taken from the basement and from a first floor apartment.

The results for petroleum-related chemicals in the remaining 44 homes are summarized on Table 2 (Appendix A).

Exposure Pathways:

The data from the investigation show that soil vapor intrusion related to the petroleum contamination is not occurring and is unlikely to occur based on the concentrations of site-related chemicals found in sub-slab soil vapor samples collected from under area homes. Some homes had concentrations of a few petroleum-related and non-petroleum-related chemicals above levels typically found in residential indoor air and NYS DOH staff provided individualized guidance to those residents about product use and storage. Many homeowners were advised to reduce exposures to chemicals in household products by ensuring that containers are tightly closed and, if possible, storing paints, solvents and similar products in areas where people spend little time, such as an outdoor shed or garage. We further recommended that when using these products, people should make sure the area is properly ventilated.

Public Health Implications:

Several chemicals were detected in six houses at levels greater than those we typically expect to find in indoor air. Most of these chemicals were found at levels below their public health assessment comparison values. A comparison value is a concentration of an environmental contaminant in air that is unlikely to cause adverse health effects assuming a lifetime of exposure. The risk for cancer or non-cancer health effects from exposure to chemicals at levels below their air comparison values is very low or minimal. Seven chemicals (1,2,3-trimethylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, ethyl benzene, xylenes) were detected at levels that exceed both typical indoor air levels and their public health assessment air comparison values (Appendix A, Table 3). These chemicals were selected for further evaluation. The public health implications of exposures to these chemicals were evaluated using the NYS DOH procedures for assessing health risks (Appendix C).

The highest levels of many of the chemicals selected for further evaluation were found in House 1, where the owner operates a home improvement business in his basement. The sampling results from House 1 were distinctly different from the other homes. Ethyl benzene was detected at up to 41 mcg/m³ in the basement, which exceeds both typical indoor levels and its air comparison value for cancer effects (1 mcg/m³). The highest level found in a sample collected from the first floor of House 1 was 5.7 mcg/m³, which is within the upper range for typical indoor air levels for residential properties for ethyl benzene. The levels of ethyl benzene in the other homes were within typical ranges. Trimethylbenzenes were detected in House 1 as high as 54, 38 and 14 mcg/m³ in basement samples, (above both typical levels and the non-cancer comparison value of 6 mcg/m³) and 2.9, 7.5 and 11 mcg/m³ in the first floor samples. Trimethylbenzenes were within typical ranges in the other houses, with the exception of House 4, where they slightly exceeded typical levels. Similarly, the levels of xylenes exceeded typical levels and the health comparison value of 100 mcg/m³ in the basement of House 1 (highest level of 160 mcg/m³). Xylenes were found at a high of 22 mcg/m³ in the first floor in House 1. Xylenes were within or slightly above typical ranges in the other houses.

Ethyl benzene causes cancer in laboratory animals exposed to high levels in air for their lifetimes (ATSDR, 2007a). Long-term exposure to ethyl benzene at levels above 1 mcg/m³ up to 41 mcg/m³ is estimated to pose a low increased risk for cancer (the estimated cancer risk is between one in one million and five in one hundred thousand). Exposure to high levels of ethyl benzene, trimethylbenzenes, and xylenes is associated with several non-carcinogenic health effects, primarily on the nervous system, liver and kidneys (ATSDR, 2007a,b; US EPA, 1999). The risk for non-cancer health effects posed by long-term exposure to highest level of chemicals detected in indoor air at House 1 would be moderate for trimethylbenzenes, low for xylenes and minimal for ethyl benzene (Appendix C).

Conclusion:

NYS DOH and ATSDR conclude that petroleum-related compounds in the Exxon/Mobil Greenpoint Off-site free-product plume area are not expected to harm people's health

via the soil vapor intrusion pathway (Appendix D). However, six homes had elevated levels of volatile organic chemicals in indoor air that may result in low to moderate risk for health effects. The presence of these chemicals was likely related to use and/or storage of products containing these chemicals in each home. Staff advised the homeowners regarding actions they can take to minimize the exposure of each homes occupants to these chemicals.

Basis for Decision:

- The concentrations of volatile organic chemicals in most of the homes studied were within concentrations that are generally similar to what we commonly find in the indoor air of homes unaffected by soil vapor intrusion.
- In the homes where the indoor air concentrations of volatile organic chemicals were found above concentrations found in most homes, the sub-slab concentrations of those chemicals were lower, indicating that soil vapor intrusion is unlikely. Likely sources are something stored or used inside the building.

Recommendations:

Based on an evaluation of the available data, the NYS DOH recommends the following to assess and minimize future exposures:

- *Additional characterization:* The groundwater and geology in the area should be further characterized to determine if the potential for site-related soil vapor intrusion needs to be evaluated outside the current study area.
- *Soil vapor intrusion in the residential area:* Although the data to date indicate that soil vapor from the petroleum spill is not occurring in the residential area, the need for additional soil vapor intrusion investigation should continue to be evaluated.
- *Soil vapor intrusion in the commercial area:* The potential for vapor intrusion into area businesses should be evaluated and investigated as appropriate. Any structures with site-related soil vapor intrusion should be mitigated as necessary. This exposure pathway will be evaluated separately.
- *Chlorinated solvents:* The source of chlorinated solvents detected in the sub-slab of a couple of homes should be investigated; however, this investigation is outside the scope of the Exxon/Mobil petroleum spills.

Sincerely,



Dawn E. Hettrick, P.E.
Senior Sanitary Engineer
Bureau of Environmental Exposure Investigation

cc: G. Litwin / D. Miles / J. Crua/FILE\
A. Grey, Ph.D.
D. Luttinger Ph.D./ T. Johnson Ph.D.
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L. Graziano/R. Stephenson

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Appendix A
Tables

Table 1: Homes in the Exxon/Mobil Greenpoint Off-site Plume study area
with specific chemicals detected above typical background

All values in micrograms per cubic meter (µg/m³)

Analyte	House #1		House #2		House #3		House #4		House #5		House #6	
	Indoor	Sub-slab	Indoor	Sub-slab	Indoor	Sub-slab	Indoor	sub-slab	Indoor	Sub-slab	Indoor	sub-slab
1,2,3-Trimethylbenzene μ	6.4 - 38	ND	ND	ND	ND	ND	3.6 - 3.8	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene μ	3.5 - 54	0.33 - 1.7	1.1	1.2	6.3	2.1	12 - 13	0.43	1.3 - 2.4	1.6	2.6 - 8.5	2.7
1,3,5-Trimethylbenzene μ	1.2 - 14	ND	ND	ND	2.5	0.83	3.4 - 3.8	0.14	0.42 - 0.81	0.46	0.68 - 2.2	0.73
2,2,4-Trimethylpentane	3.3 - 24	ND μ	ND	ND μ	ND	ND μ	ND	ND μ	ND	ND	2.4 - 8.8	1.1
2,3-Dimethylpentane	4.2 - 5.7	ND μ	4	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylpentane	3.2 - 3.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Ethyltoluene	2.6 - 30	1.3	1	0.87	8.4	2.1	9.1 - 9.2	0.3	1.2 - 2.9	1.2	1.8 - 5.8	2
Benzene	1.7 - 8.5	1.3	1.5	0.34	2.9	0.92	1.6 - 1.8	ND	1.4 - 1.6	0.62	2.2 - 2.6	1.1
Butylbenzene	7.2 - 66	ND	ND	ND	ND	ND	5.5 - 5.7	ND	ND	ND	ND	ND
Cyclohexane	0.68 - 7	2.3	6.7	ND	2	1	ND	ND	1.5 - 2.2	1.4	0.79 - 1.6	2
Decane	22 - 220	ND	11	6.3	28	7.5	22	ND	12 - 460	ND	ND - 7.2	8.1
Ethyl Benzene	4.4 - 41	ND	0.92	1.1	3.4	1.2	3.1 - 3.2	0.65	0.88 - 1.4	1	1.7 - 4.4	1.7
Heptane	2.8 - 22	0.36 - 1.2	120	ND	5.2	1.5	2.6 - 2.7	0.55	2.2 - 2.3	1.2	1.8 - 3.9	1.4
Hexane	4.3 - 42	2.2	3.1	ND	5	2.9	3.9 - 5	0.41	2.1 - 2.7	0.93	2.8 - 7.4	16
m,p-Xylene	17 - 160	0.66 - 2.8	2.7	2.3	12	3.1	11	0.85	2.9 - 3.6	2.4	5.2 - 13	4.5
Nonane	7.6 - 32	ND	ND	ND	32	5.3	7.5 - 7.6	ND	18 - 180	ND μ	0.79 - 3.4	ND
Octane	17 - 25	ND	ND	ND	5.7	ND	4.8 - 4.9	ND	ND	ND	ND - 1.2	ND
o-Xylene	4.8 - 53	ND	0.85	0.7	3.8	0.95	4.7 - 4.9	0.28	1 - 1.4	0.99	2 - 5.5	1.5
Propylbenzene	0.58 - 7.1	ND	ND	ND	2.1	0.53	2 - 2.1	ND	0.3 - 0.6	ND	0.34 - 1.1	0.37
sec-Butylbenzene	5.5 - 5.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.3 - 0.33	0.78
Styrene	0.9 - 8.6	ND	ND	ND	0.9	0.3	ND	ND	0.32 - 0.75	0.3	0.55 - 2.9	8
Toluene	24 - 200	2.9 - 15	21	22	29	13	8.4 - 9	5.4	7.6 - 15	10	16 - 21	18

Notations and references

ND = not detected

Values in **BOLD** are above the "upper fence" for that specific chemical (see Table 3) in indoor air

Table 2: Range of detected petroleum-related chemicals in remaining 44 homes and outdoor air for 50 homes in the Exxon/Mobil Greenpoint Off-site Plume study area

All values in micrograms per meter cubed (g/m3)

Analyte (g/m3)	Indoor Air Samples (44 homes) Range detected	Sub-Slab Samples (44 homes) Range detected	Outdoor Air (50 homes) Range detected
1,2,3-Trimethylbenzene	ND	4.1	ND
1,2,4-Trimethylbenzene	ND - 4.5	1.7 - 32	ND - 2.1
1,3,5-Trimethylbenzene	ND - 1.5	0.25 - 3.4	ND - 0.77
2,2,4-Trimethylpentane	ND - 1.4	10 - 10	ND - 1
2,3-Dimethylpentane	ND - 0.75	8.1	ND
2,4-Dimethylpentane	ND	ND	ND
4-Ethyltoluene	ND - 3.1	0.16 - 6.1	ND - 2.1
Benzene	0.74 - 5.3	0.28 - 5.8	ND - 2.4
Butylbenzene	ND	4.5 - 5.7	ND
Cyclohexane	ND - 4.2	0.24 - 21	ND - 1.8
Decane	ND - 67	4.3 - 57	ND - 15
Ethyl Benzene	ND - 2.4	0.49 - 8.8	ND - 4.7
Heptane	ND - 6.5	0.21 - 65	ND - 2.5
Hexane	ND - 12	0.28 - 8.4	ND - 4
m,p-Xylene	ND - 6.7	0.49 - 93	ND - 6.7
Nonane	ND - 5.1	3.7 - 96	ND - 11
Octane	ND	4 - 5.6	ND
o-Xylene	ND - 2.2	0.33 - 32	ND - 2.7
Propylbenzene	ND - 0.87	0.23 - 2	ND - 0.56
sec-Butylbenzene	ND	ND	ND
Styrene	ND - 1.1	0.26 - 2.3	ND - 2.1
Toluene	3.7 - 62	0.74 - 91	2.5 - 33

ND = not detected

g/m3 = micrograms per meter cubed

* From NYS DOH 2003, Study of volatile organic chemicals in air of fuel oil heated homes

Upper Fence = Calculated as 1.5 times the interquartile range (difference between the 25th and 75th percentile values) above the 75th percentile value.

NA = not available

Table 3: Typical Indoor Air Levels and Health Comparison Values for Petroleum-Related Chemicals

All values in micrograms per meter cubed (g/m3)

Analyte	Typical Indoor Air Levels *			Comparison Values	
	25th percentile	75th percentile	Upper Fence	Cancer ¹	Non-cancer ²
1,2,3-Trimethylbenzene	<0.25	1.1	2.5	-	- ^a
1,2,4-Trimethylbenzene	0.7	4.3	9.8	-	6 ^b
1,3,5-Trimethylbenzene	0.3	1.7	3.9	-	6 ^b
2,2,4-Trimethylpentane	NA	NA	NA	-	- ^c
2,3-Dimethylpentane	<0.25	2.2	5.2	-	- ^c
2,4-Dimethylpentane	<0.25	2	4.7	-	- ^c
4-Ethyltoluene	NA	NA	NA	-	- ^d
Benzene	1.10	5.9	13	0.13 ^e	30 ^b
Butylbenzene	<0.25	0.5	1.1	-	- ^d
Cyclohexane	<0.25	2.6	6.3	-	6000 ^b
Decane	1.2	6.6	15	-	- ^c
Ethyl Benzene	0.4	2.8	6.4	1 ^f	2000 ^g
Heptane	1	7.6	18	-	- ^c
Hexane	0.6	5.9	14	-	700 ^b
m,p-Xylene	0.5	4.6	11	-	100 ^b
Nonane	0.4	3.4	7.9	-	- ^c
Octane	0.3	2.3	5.2	-	- ^c
o-Xylene	0.4	3.1	7.1	-	100 ^b
Propylbenzene	<0.25	0.7	1.5	-	- ^d
sec-Butylbenzene	<0.25	0.6	1.2	-	- ^d
Styrene	<0.25	0.6	1.4	-	1000 ^b
Toluene	3.5	25	57	-	300 ^h

* Based on the NYS DOH 2003, Study of volatile organic chemicals in air of fuel oil heated homes

Upper Fence = Calculated as 1.5 times the interquartile range (difference between the 25th and 75th percentile values) above the 75th percentile value

NA = Not Available: Chemical not assessed

Table 3: Typical Indoor Air Levels and Health Comparison Values for Petroleum-Related Chemicals
Notations and references continued

1 Air Concentrations corresponding to an increased lifetime cancer risk of one in one million assuming continuous exposure.

2 Reference concentration or equivalent, i.e. an estimated air concentration that is without appreciable risk for non-cancer health effects assuming an exposure duration up to a lifetime.

^a The comparison value for 1,2,4- and 1,3,5-trimethylbenzene was used as a surrogate.

^b US EPA reference concentration

^c The comparison value for hexane was used as a surrogate

^d The comparison value for xylenes was used as a surrogate

^e Based on US EPA unit risk

^f Based on NYS DOH unit risk

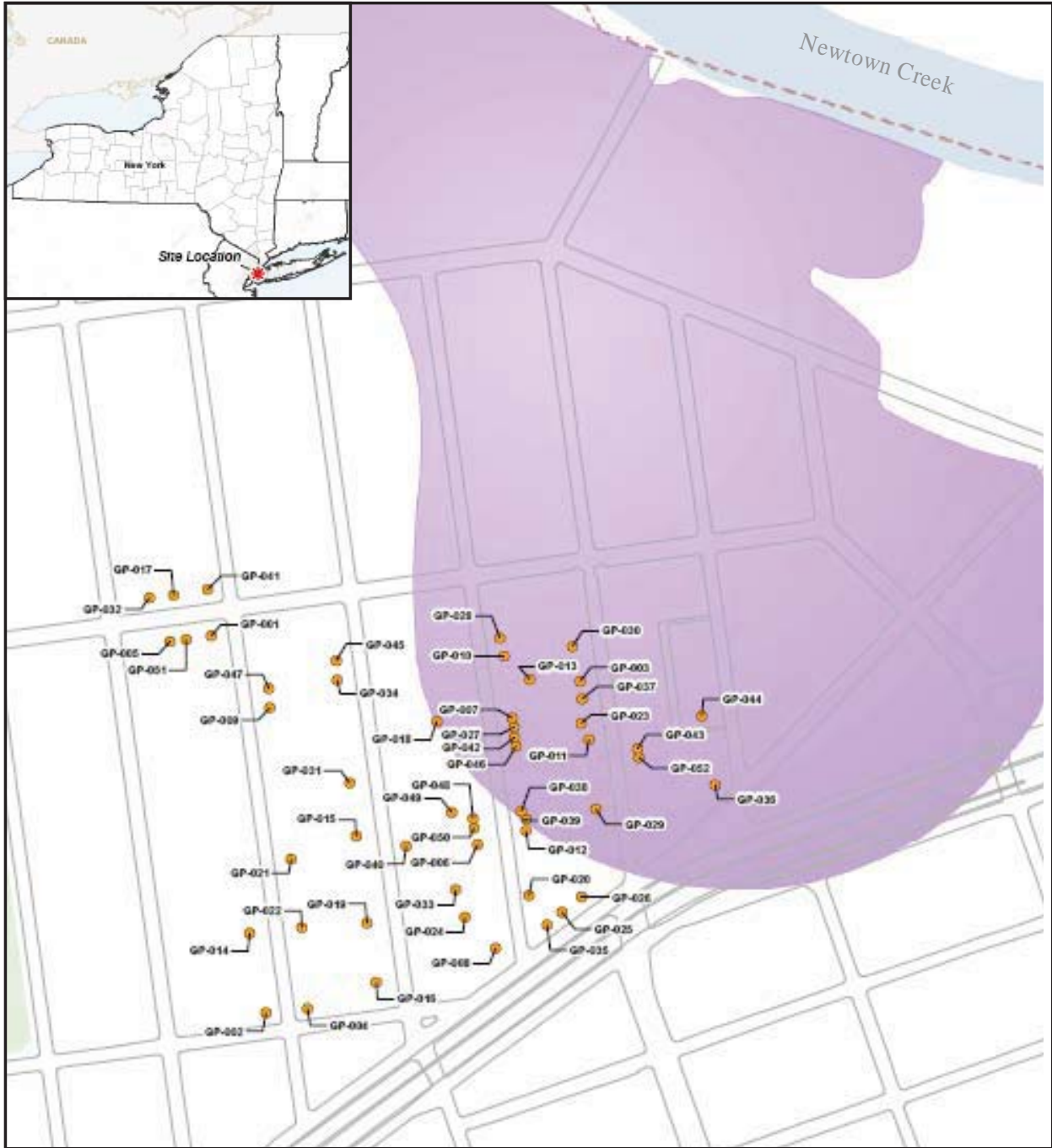
^g CAL EPA reference exposure level

^h ATSDR minimal risk level

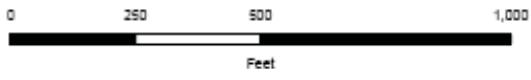
APPENDIX B

Figure

Figure 1.
Greenpoint Indoor Air Sample Location Map



- Indoor Air Sampling Location
- Transportation Line
- Buildings
- Open Space
- Approximate Plume Location
(Based on Information provided by Roux and SAIC)



APPENDIX C

NYS DOH PROCEDURE FOR EVALUATING POTENTIAL HEALTH RISKS FOR CONTAMINANTS OF CONCERN

NYS DOH PROCEDURE FOR EVALUATING POTENTIAL HEALTH RISKS FOR CONTAMINANTS OF CONCERN

To evaluate the potential health risks from contaminants of concern associated with the Exxon Mobil Greenpoint Off-site plume, the New York State Department of Health assessed the risks for cancer and non-cancer health effects.

Increased cancer risks were estimated by using site-specific information on exposure levels for the contaminant of concern and interpreting them using cancer potency estimates derived for that contaminant by the US EPA or, in some cases, by the NYS DOH. The following qualitative ranking of cancer risk estimates, developed by the NYS DOH, was then used to rank the risk from very low to very high. For example, if the qualitative descriptor was "low", then the excess lifetime cancer risk from that exposure is in the range of greater than one per million to less than one per ten thousand. Other qualitative descriptors are listed below:

Qualitative Descriptions for Excess Lifetime Cancer Risk

<u>Risk Ratio</u>	<u>Qualitative Descriptor</u>
equal to or less than one per million	very low
greater than one per million to less than one per ten thousand	low
one per ten thousand to less than one per thousand	moderate
one per thousand to less than one per ten	high
equal to or greater than one per ten	very high

An estimated increased excess lifetime cancer risk is not a specific estimate of expected cancers. Rather, it is a plausible upper bound estimate of the probability that a person may develop cancer sometime in his or her lifetime following exposure to that contaminant.

There is insufficient knowledge of cancer mechanisms to decide if there exists a level of exposure to a cancer-causing agent below which there is no risk of getting cancer, namely, a threshold level. Therefore, every exposure, no matter how low, to a cancer-causing compound is assumed to be associated with some increased risk. As the dose of a carcinogen decreases, the chance of developing cancer decreases, but each exposure is accompanied by some increased risk. There is general consensus among the scientific and regulatory communities on what level of estimated excess cancer risk

is acceptable. An increased lifetime cancer risk of one in one million or less is generally not considered a significant public health concern.

For non-carcinogenic health risks, the contaminant intake was estimated using exposure assumptions for the site conditions. This dose was then compared to a risk reference dose (estimated daily intake of a chemical that is likely to be without an appreciable risk of health effects) developed by the US EPA, ATSDR and/or NYS DOH. The resulting ratio was then compared to the following qualitative scale of health risk:

Qualitative Descriptions for Non-carcinogenic Health Risks

<u>Ratio of Estimated Contaminant Intake to Risk Reference Dose</u>	<u>Qualitative Descriptor</u>
equal to or less than the risk reference dose	minimal
greater than one to five times the risk reference dose	low
greater than five to ten times the risk reference dose	moderate
greater than ten times the risk reference dose	high

Non-carcinogenic effects unlike carcinogenic effects are believed to have a threshold, that is, a dose below which adverse effects will not occur. As a result, the current practice is to identify, usually from animal toxicology experiments, a no-observed-effect-level (NOEL). This is the experimental exposure level in animals at which no adverse toxic effect is observed. The NOEL is then divided by an uncertainty factor to yield the risk reference dose. The uncertainty factor is a number that reflects the degree of uncertainty that exists when experimental animal data are extrapolated to the general human population. The magnitude of the uncertainty factor takes into consideration various factors such as sensitive sub-populations (for example, children or the elderly), extrapolation from animals to humans, and the incompleteness of available data. Thus, the risk reference dose is not expected to cause health effects because it is selected to be much lower than dosages that do not cause adverse health effects in laboratory animals. The measure used to describe the potential for non-cancer health effects to occur in an individual is expressed as a ratio of estimated contaminant intake to the risk reference dose. A ratio equal to or less than one is generally not considered a significant public health concern. If exposure to the contaminant exceeds the risk reference dose, there may be concern for potential non-cancer health effects because the margin of protection is less than that afforded by the reference dose. As a rule, the greater the ratio of the estimated contaminant intake to the risk reference dose, the greater the level of concern. This level of concern depends upon an evaluation of a number of factors such as the actual potential for exposure, background exposure, and the strength of the toxicologic data.

Appendix D
Conclusion Categories and Hazard Statements

Conclusion Categories and Hazard Statements

ATSDR has five distinct descriptive conclusion categories that convey the overall public health conclusion about a site or release, or some specific pathway by which the public may encounter site-related contamination. These defined categories help ensure a consistent approach in drawing conclusions across sites and assist the public health agencies in determining the type of follow-up actions that might be warranted.

1. Short-term Exposure, Acute Hazard “ATSDR concludes that...could harm people’s health.”

This category is used for sites where short-term exposures (e.g. < 1 yr) to hazardous substances or conditions could result in adverse health effects that require rapid public health intervention.

2. Long-term Exposure, Chronic Hazard “ATSDR concludes that...could harm people’s health”

This category is used for sites that pose a public health hazard due to the existence of long-term exposures (e.g. > 1 yr) to hazardous substance or conditions that could result in adverse health effects.

3. Lack of Data or Information “ATSDR cannot currently conclude whether...could harm people’s health.”

This category is used for sites in which data are insufficient with regard to extent of exposure and/or toxicologic properties at estimated exposure levels to support a public health decision.

4. Exposure, No Harm Expected “ATSDR concludes that ... is not expected to harm people’s health”

This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past, and/or may occur in the future, but the exposure is not expected to cause any adverse health effects.

5: No Exposure, No Harm Expected “ATSDR concludes that ...will not harm people’s health.”

This category is used for sites that, because of the absence of exposure, are not expected to cause any adverse health effects.

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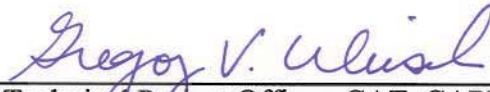
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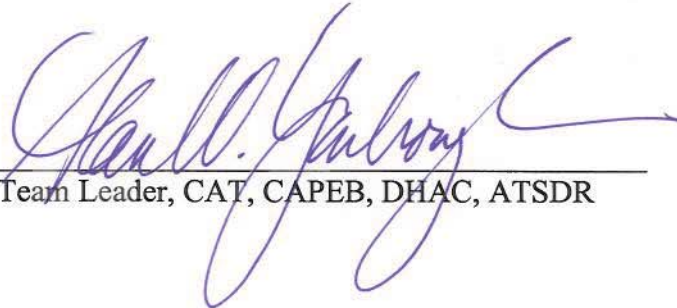
CERTIFICATION

The letter health consultation for the Greenpoint-Williamsburg site (Exxon-Mobil Greenpoint Off-site Plume) was prepared by the New York State Department of Health 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 letter health consultation was initiated. Editorial review was completed by the cooperative agreement partner.



Technical Project Officer, CAT, CAPEB, DHAC

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



Team Leader, CAT, CAPEB, DHAC, ATSDR