Initial/Public Comment Draft

PUBLIC HEALTH ASSESSMENT

NEWTOWN CREEK

CITY OF NEW YORK
BOROUGH OF QUEENS/BROOKLYN
QUEENS/KINGS COUNTY, NEW YORK

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Prepared by:

New York State Department of Health
Center for Environmental Health
Under a Cooperative Agreement with
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SUMMARY

INTRODUCTION

The New York State Department of Health (DOH) and Agency for Toxic Substances and Disease Registry (ATSDR) want to provide the community around Newtown Creek with the best information possible about how contaminants in the creek in Queens and Brooklyn, New York might affect their health.

Public Health Assessments (PHA) fulfill the congressional mandate for a public health assessment for each site being proposed by the United States Environmental Protection Agency (EPA) to the federal National Priorities List (NPL).

The agencies have information that some city residents use Newtown Creek for recreation, such as boating tours, canoeing, kayaking, and scuba diving, and that some people catch and eat fish and crabs from the creek. There are small boat access points and places where people have been observed fishing and catching crabs on Newtown Creek.

For environmental sampling data, we have chemical contamination data for underwater creek sediments and biological contamination data for surface water. Newtown Creek's physical characteristics and a history of industrial uses and storm sewer overflows also help to inform recommendations the DOH and ATSDR make in this PHA.

CONCLUSION 1

DOH and ATSDR conclude that swimming and other full body immersion recreation (for example, wind surfing, scuba diving) in Newtown Creek could harm people's health.

BASIS FOR DECISION

There are physical and biological hazards for swimmers and other people recreating in Newtown Creek.

Waterfront uses of Newtown Creek are primarily commercial and industrial, supported, in part, by waterborne transportation. This represents physical safety concerns related to swimming and other water recreation, and includes large commercial boat traffic and in some places high bulkheads (marine retaining walls). These bulkheads may make it difficult to get out of the creek when necessary for safety. In addition, there are a number of physical hazards that could be present that could cause injury and drowning hazards that have not been assessed including; underwater hazards, steep slopes or drop offs or poor water clarity.

Water samples collected from Newtown Creek indicate that levels of coliform and enterococci bacteria exceed standards on occasion and that an increased risk of illness is likely to occur through recreational contact with the water during these time periods. Sample results indicate that the creek exceeds coliform and enterococci standards for frequent recreation (although there are no regulated bathing beaches or swimming areas on the creek and limited access for other forms of recreation). These failures to meet the bacterial standards can be attributed to combined sewage overflows and urban runoff after rainfall events. Biological hazards are

likely present at all times, but are greater after combined sewer overflows. Water from Newtown Creek contains microorganisms, such as coliform bacteria, and likely contains viruses and parasites that can make a person ill if they enter the body. Water pollution caused by fecal contamination is a serious public health concern due to the risk of contracting diseases through swallowing or coming in contact with disease causing agents such as bacteria, viruses and protozoa. This may include gastrointestinal illness caused by organisms such as *E.coli, Shigella spp., Hepatitis A, Giardia* and *Cryptosporidium.*

When swimming, human exposures to chemical hazards in the surface water is also possible, however, sampling for hazardous chemical constituents in places where people are contacting water is needed.

CONCLUSION 2

DOH and ATSDR conclude that recreational boating (for example, canoeing, kayaking, and touring) or “catch and release” fishing in Newtown Creek is not expected to harm people's health, although there may be some physical hazards, such as large commercial boat traffic, Also, certain precautions are recommended because incidental ingestion and dermal contact with the water when boating or fishing in some areas of the creek would lead to increased exposure to biological contaminants and are discussed below under general recommendations.

BASIS FOR DECISION

There are small boat access points on Newtown Creek, at the end of Manhattan Avenue and at the Newtown Creek Wastewater Treatment Plant Nature Walk in Brooklyn. There is an increased risk of illness from water contact while canoeing, boating and fishing during exceedances of indicator bacteria. Because people do not usually submerge their heads in the water during these activities, the presumed volume of incidental water consumption is lower than swimming. Subsequently, the risk of illness can also be assumed to be lower. Recreational boaters may also have increased exposure to chemical contaminants when contacting sediments, although observations and discussion with community representatives suggest that there are no places where sediment is contacted by recreational boaters.

CONCLUSION 3

The DOH and ATSDR conclude that eating fish and crabs taken from Newtown Creek could harm people's health by increasing their risk for adverse health effects if people don’t follow DOH’s fish consumption advisories.

BASIS FOR DECISION

DOH has extensive, restrictive fish advisories for the East River, and these advisories apply to Newtown Creek (DOH 2011a). Based on the close association of these waters we would expect that contaminant levels in Newtown Creek fish and crabs would be similar to levels in fish and crabs from the East River.

People who are considering eating fish and crab caught in the creek should follow the DOH

consumption advisories for fish taken from the East River to reduce their exposures to chemical contaminants (available at http://www.nyhealth.gov/environmental/outdoors/fish/fish.htm), and described as follows:

Women under 50 years old and children under 15 years old should not eat any fish from these waters. The advisory for men over 15 and women over 50 is less restrictive and is shown in the table that follows:

DOH Fish Consumption Advisory for the East River, including Newtown Creek			
Fish		**Women Under 50 & Children Under 15**	**Men Over 15 & Women Over 50**
	American eel	**don't eat** DEC regulations prohibit the harvest/possession of American eel for food	
	Atlantic needlefish	**don't eat**	up to 1 meal/month
	Blue crabs	**don't eat** **don't eat tomalley**	up to 6 crabs/week **don't eat tomalley**
	Bluefish	**don't eat**	up to 1 meal/month
	Carp	**don't eat**	up to 1 meal/month
	Channel catfish	**don't eat**	**don't eat**
	Gizzard shad	**don't eat**	**don't eat**
	Goldfish	**don't eat**	up to 1 meal/month
	Rainbow smelt	**don't eat**	up to 1 meal/month
	Striped bass	**don't eat**	up to 1 meal/month
	White catfish	**don't eat**	**don't eat**
	White perch	**don't eat**	up to 1 meal/month
Other fish not listed		**don't eat**	up to 4 meals/month

GENERAL RECOMMENDATIONS

For those people using Newtown Creek for recreation, the DOH and ATSDR recommend measures to reduce exposures to the biological hazards that are present. People recreating in and around the creek can reduce the risk of becoming ill by avoiding the creek water after periods of effluent discharge, rainfall, when the water is cloudy or turbid, or when pollution is observed. Since the greatest exposure to these hazards is by swallowing the water, people should avoid any activity that would result in swallowing creek water. People should wash their hands after contacting the water, especially before eating. If people get water or sediments on more than just their hands and arms, it may also be helpful to take a shower to wash off the creek water.

The ATSDR and DOH recommend that additional samples be taken in Newtown Creek so that these agencies can better evaluate people's potential exposure to contaminants in the creek. Data that are needed include data for hazardous chemical constituents in creek surface water and sediment if locations are identified where people may be contacting them while fishing and entering/launching and exiting/beaching recreational watercraft. Also needed are fish and crab sampling data specific to Newtown Creek.

NEXT STEPS

1. The ATSDR and DOH will work with the New York State Department of Environmental Conservation (DEC) and EPA to collect the environmental data needed to evaluate possible human exposures to chemical contaminants in the creek. EPA will be further evaluating the nature and extent of contamination in Newtown Creek, possible contributions to it, and the need for future cleanup of the creek.

2. ATSDR and DOH will evaluate EPA data as they become available to us to determine whether actions are needed to reduce people's exposure to contamination in the creek.

3. The ATSDR, DOH and NYCDHMH will coordinate with the DEC, EPA, NYCDEP and other involved agencies to make sure that public health messages regarding recreational use (e.g. swimming, boating and fishing) of Newtown Creek are protective of public health.

FOR MORE INFORMATION

If you have questions about the environmental investigation of Newtown Creek, please contact the EPA at (212) 637-4275. If you have questions about this Public Health Assessment or other health concerns about this site, please contact Mr. Christopher Doroski of the DOH at 518-402-7860 or 1-800-458-1158.

PURPOSE AND HEALTH ISSUES

The purpose of this public health assessment (PHA) is to evaluate human exposure pathways and health risks for contaminants related to the Newtown Creek National Priorities List (NPL) site. PHAs fulfill the congressional mandate for a public health assessment for every site being proposed to the federal NPL. Newtown Creek was proposed to the NPL on September 23, 2009 and it was added to the NPL on September 27, 2010.

BACKGROUND

A. Site Description and History:

Newtown Creek is part of the New York – New Jersey Harbor Estuary that forms the northern-most border between the New York City boroughs of Brooklyn and Queens (Kings and Queens Counties (Appendix A, Figure 1).

Newtown Creek is a tributary to the East River and includes five branches along its 3.8-mile reach: (from east to west) English Kills, East Branch, Maspeth Creek, Whale Creek, and Dutch Kills (Appendix A, Figure 1). The creek and its branches have a total surface area of approximately 165 to 170 acres. Current flow into the creek consists exclusively of storm water runoff, combined sewer overflows (CSOs), and permitted and unpermitted discharges. The creek rises and falls with the tide, but it is mostly stagnant.

In the mid-1800s, the area adjacent to Newtown Creek was one of the busiest hubs of industrial activity in New York City. More than 50 industrial facilities were located along its banks, including oil refineries, petrochemical plants, fertilizer and glue factories, sawmills, and lumber and coal yards. The creek was crowded with commercial vessels, including large boats bringing in raw materials and fuel and taking out oil, chemicals and metals. In addition to the industrial pollution that resulted from all of this activity, the city began dumping raw sewage directly into the water in 1856. During World War II, the creek was one of the busiest ports in the nation. Currently, factories and commercial facilities still operate along the creek. Various contaminated sites along the creek have contributed to the contamination of Newtown Creek. Today, as a result of its industrial history, including numerous spills, Newtown Creek is reported by EPA to be one of the nation's most polluted waterways (EPA 2011).

In the early 1990s, New York State declared that Newtown Creek was not meeting water quality standards under the Clean Water Act. The creek is classified as a saline Class D (SD) water body by the DEC. The best use of Class D (SD) waters is fishing. These waters are considered suitable for fish, shellfish and wildlife survival. This classification may be given to those water bodies that, because of natural or man-made conditions, cannot meet the requirements for primary and secondary contact recreation (for example, swimming, wading and recreational boating) and fish propagation (DEC 2010).

The Greenpoint Petroleum Remediation Project lies on land adjacent to the middle of Newtown Creek. 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 petroleum based hydrocarbons floating on the groundwater. In 1978, the US Coast Guard found evidence of an oil spill entering Newtown Creek. Subsequent investigations found product from the spill encompassing more than 52-acres under Greenpoint. The volume of petroleum that was leaked and spilled onto land in the area is estimated at 17 million gallons, but could be as much as 30 million gallons.

Use and Characteristics

According to the New York City Department of Health and Mental Hygiene (NYCDOHMH) there are no permitted bathing or swimming facilities situated along the boundaries of the Creek.

According to the EPA, people use Newtown Creek for fishing and crabbing for human consumption. The heaviest fishing use is likely to be near the mouth of the Creek because it is closer to the East River and there is more open water (EPA 2011). EPA reports that fishing has been observed in Newtown Creek at Dutch Kills, and crabbing for consumption has been observed at the end of Manhattan Avenue in Brooklyn (Appendix A, Figure 2). Evidence of fishing was also observed on the Queens side of the creek. The New York City Department of Environmental Protection (NYC DEP) reports several other locations where fishing was observed. However, according to the NYCDEP, the dissolved oxygen levels have been observed to be close to zero, making fish survival difficult at some times.

DOH has extensive, restrictive fish consumption advisories for the East River (DOH 2011a), and these advisories apply to Newtown Creek because it is a tributary of the East River. Although we have no specific fish data for Newtown Creek, based on the close association of these waters we would expect that contaminant levels in Newtown Creek fish and crabs would be similar to levels in fish and crabs from the East River (see Figure 1). The contaminants of concern for these waters are PCBs and dioxin in fish and cadmium, PCBs and dioxin in crab. <u>Women under 50 years old and children under 15 years old should not eat any fish from these waters.</u> The advisory for women over 50 and men over 15 are less restrictive and are shown in the Summary section or on-line at http://www.nyhealth.gov/environmental/outdoors/fish/fish.htm.

Newtown Creek is used for other recreation, including kayaking, boating, and scuba diving. Small boat access points are at the end of Manhattan Avenue and at the Newtown Creek Wastewater Treatment Plant Nature Walk in Brooklyn (Appendix A, Figure 2). The New York City Department of Parks and Recreation's website (NYCDPR 2011) describes a suggested trip starting at the Manhattan Avenue launch site. The NYCDEP opened a waterfront nature walk at the Newtown Creek Wastewater Treatment Plant in September 2007, allowing public access to the waterfront.

Nevertheless, there are physical hazards for small recreational water craft, such as large commercial boat traffic, that may present a safety hazard to boaters. And, in some places there are high bulkheads (marine retaining walls that may make it difficult to get out of the creek when necessary for safety.

B. Site Visit

The DOH and the EPA have made multiple visits to the areas surrounding the Newtown Creek. Visits have been made to evaluate inactive hazardous waste sites situated along the Creek and visually assess the impact on the Creek. DOH staff members Chris Doroski, Bettsy Prohonic, Brian Hart and Don Miles, along with ATSDR and EPA staff and a representative from Riverkeepers and the Newtown Creek Alliance visited the site on April 28, 2011. The group toured the Newtown Creek Wastewater Treatment Plant Nature Walk, the Manhattan Avenue access point and two other access points. The group discussed and observed access to and recreational use of the creek. At the time of the visit, no active recreational use was observed.

C. Demographics

The NYSDOH estimated, from the 2010 Census (US Bureau of the Census 2011), that approximately 240,218 people lived within one mile of the Newtown Creek area. The age distribution of the area showed somewhat lower percentages of people <20 or >64 years old compared to Kings, Queens and New York City (NYC). There were 66,365 females of reproductive age (ages 15-44) within the area. The area has a higher proportion of whites than other parts of NYC but still has a minority population of about 63% due in part to the large Hispanic community. Based on the 2005-2009 American Community Survey (US Census Bureau 2010), a higher percentage of the population is living below the poverty level while the median household income is lower than other parts of NYC. These comparisons are provided in the following table.

Table 1. Demographics of the Newtown Creek Area, Kings and Queens Counties, and New York City. Data are from the 2010 US Census and the 2005-2009 American Community Survey.

Census Demographics Estimates	Newtown Creek Area	Queens County	Kings County (Brooklyn)	New York City
Total Population[1]	245,904	2,230,722	2,504,700	8,175,133
Percent Male	49.8	48.4	47.2	47.5
Percent Female	50.2	51.6	52.8	52.5
Age Distribution[1] (%)				
<6 years	6.8	7.1	8.4	7.5
6-19 years	14.5	16.2	18.1	16.9
20-64 years	69.6	63.9	62.0	63.4
>64 years	9.1	12.8	11.5	12.1
Race/Ethnic Distribution[1] (%)				
White	54.4	39.7	42.8	44.0
Black	10.0	19.1	34.3	25.5
Native American	<1	<1	<1	<1
Asian	10.2	22.9	10.4	12.7
Pacific Islander	<1	<1	<1	<1
Other	20.1	12.9	8.8	13.0
Multi-Racial	4.4	4.5	3.0	4.0
Percent Hispanic	43.1	27.5	19.8	28.6
Percent Minority*	63.0	72.4	64.3	66.7
Economic Description[2]				
Median household income	$42,240.45	$54,870	$42,894	$50,160
Percent below poverty level	22.4	12.1	21.8	18.6

1 US Census Bureau 2011, Summary File 1 - New York State/ prepared by the U.S. Census Bureau.
2 US Census Bureau 2010**.** 2005-2009 American Community Survey 5-Year Estimates Summary File Tracts and Block Groups.
* Minorities include Hispanics, African Americans, Asian Americans, Pacific Islanders and Native Americans, Multi-Racial and Other Americans.

The DEC and the EPA recently developed guidelines for identifying potential environmental justice communities. A potential environmental justice community is defined as a minority or low income community that may bear a disproportionate environmental burden resulting from industrial, municipal and commercial operations. A low income community is defined as one in which at least 23.59% of the population are

living below the poverty level as defined by the 2000 US Census (US Bureau of the Census 2002). A minority community is defined as one having a minority population equal to or greater than 51.1% of the total population in an urban area or 33.8% of the total population in a rural area as defined by the 2000 US Census. If a community is found to be *either* low income or minority then it is defined as a potential environmental justice community. Because the population of the Newtown Creek area exceeds the threshold for the definition of both a low income and a minority community, it is considered a potential environmental justice community.

This information about the community provides a more complete picture of the area under consideration and may suggest the need for action, including more stringent permit conditions, voluntary pollution reduction, or other corrective measures. The information should be used in making permitting decisions along with other considerations such as regulatory standards, environmental impacts, mitigation, benefits, needs, and costs

DISCUSSION

DOH and ATSDR do not have sufficient environmental and exposure information to complete an assessment of health risks presented by exposure to chemical contaminants in Newtown Creek. We have chemical contamination data for underwater creek sediments; we have no chemical data for surface water, or fish and crabs, although EPA is planning to collect additional data. Although we have no specific fish data for Newtown Creek, based on the close association of these waters we would expect that contaminant levels in Newtown Creek fish and crabs would be similar to levels in fish and crabs from the East River. We do not have information about which and how much fish and crabs people catch and eat from the Creek.

A. Environmental Contamination

Biological Contamination

Water pollution caused by fecal contamination is a serious public health concern due to the risk of contracting diseases through swallowing or coming in contact with disease causing agents such as bacteria, viruses and protozoa. Collectively, these agents are known as pathogens. Frequently, concentrations of pathogens from fecal contamination are small, and the number of different possible pathogens is large. As a result, it is not practical to routinely test for pathogens in water samples. Instead, the presence of pathogens is determined through indirect evidence by testing for an "indicator" organism such as fecal coliform or enterococci bacteria. Fecal coliform and enterococci bacteria likely come from the same sources as pathogenic organisms. Fecal coliform and enterococci bacteria are relatively easy to identify, are usually present in larger numbers than pathogens, and respond to the environment and wastewater treatment similarly to many pathogens. As a result, testing for fecal coliform and/or enterococci bacteria can

be a reasonable indication of whether water is contaminated with fecal pollution and pathogens are likely to be present.

Water samples were collected by the NYCDEP from four stations along the creek (NYCDEP 2010) and tested for bacteria. See Figure 2 for location of sampling points. Samples are generally collected on a monthly basis or more frequently to track the presence of high bacteria levels. We reviewed the data from 2005 to 2010 and concluded that the data are similar for these years so only the 2010 data were used for this discussion. Table 2, below, shows the results for coliform and enterococci bacteria samples collected in 2010. It lists sample locations, number of samples collected from each location, the range of bacteria colonies detected, the DOH standard and the number of samples that exceeded the standard.

Table 2. New York City Department of Environmental Protection Newtown Creek 2010 Bacterial Sampling Data

Coliform Bacteria

Sampling Location	Number of Samples	Coliform Range *	DOH Standard for Coliform *	Number of Samples Exceeding Standard
NC 0	22	12 - 200,000	1,000	7
NC 1	22	10 - 200,000	1,000	7
NC 2	22	10 - 200,000	1,000	8
NC 3	22	12 - 200,000	1,000	4

Enterococci Bacteria

Sampling Location	Number of Samples	Enterococci Range*	DOH Standard for Enterococci *	Number of Samples Exceeding Standard
NC 0	22	12 - 20,000	104	11
NC 1	22	4 - 20,000	104	8
NC 2	22	4 - 11,800	104	8
NC 3	22	4 - 4,900	104	7

*Units are in number of colonies per 100 milliliters of water.

For stations NC0 and NC1, 7 of 22 samples exceeded coliform standards. At station NC2, 8 of 22 samples exceeded coliform standards and 4 of 22 samples exceeded coliform standards at station NC3.

For stations NC0, 11 of 22 samples exceeded enterococci standards and 8 of 22

samples exceeded enterococci standards at NC1 and NC2. Seven of 22 samples exceeded enterococci standards at station NC3.

Although the origin of the bacteria contamination is unknown, the creek has numerous combined sewer outflows that discharge untreated sewage into the creek during high flow events.

The maximum single sample concentration of fecal coliform bacteria that is permitted in approved recreational bathing waters is 1,000 colonies/100 milliliters of water; the maximum single sample concentration of enterococci in marine water is 104 per 100 milliliters of water (DOH 2011b). Sample results exceeding these values indicate an increased risk of gastrointestinal illnesses through participating in swimming activities.

Results of samples collected from Newtown Creek indicate that fecal coliform and enterococci bacteriological standards for bathing waters in New York State were exceeded. To better interpret monitoring results and the risk of illness through recreational contact, potential pollution sources and other environmental conditions at the time of sample collection that may affect the levels of indicator bacteria should be assessed (DOH 2011b).

Chemical Contamination:

Limited data for chemical contamination of Newtown Creek sediments are from the Expanded Site Inspection Report Newtown Creek Brooklyn/Queens, New York (Weston Solutions, Inc. 2009). Additional investigations are planned by the EPA, and as additional data become available they will be used to update the health assessment as appropriate.

Sediments:

The EPA collected 58 sediment samples from Newtown Creek and six from the nearby Atlantic Basin for comparison. Sediment samples were collected at 0 to 2 feet (shallow) and 2 to 6 feet (deeper) depth intervals under water that was 7 to 23 feet deep. The Atlantic Basin is further south down the East River, near where the River meets the New York Upper Bay and across from Governor's Island. The sediment samples were analyzed for metals, volatile organic compounds (VOCs), semi-volatile organic chemicals (SVOCs) and polychlorinated biphenyls (PCBs).

EPA compared Newtown Creek sediment results to the samples collected from the Atlantic Basin and reported contaminants in the Newtown Creek samples that exceeded levels detected in the Atlantic Basin samples.

EPA reported that several metals, VOCs, SVOCS (PAHs and bis(2-ethylhexyl)phthalate) and PCBs (Aroclor 1242 and 1254) in some Newtown Creek shallow samples exceeded levels found in Atlantic Basin samples. Those chemicals potentially of concern for fish

uptake in New York included PCBs, cadmium and lead. Only the levels of the VOCs chlorobenzene and isopropylbenzene were reported above Atlantic Basin levels in the shallow sediment samples; however, several of the deeper sediment samples contained petroleum related compounds at levels above Atlantic Basin samples.

B. Pathways Analysis

This section of the Public Health Assessment identifies completed exposure pathways associated with past, present and future uses of the creek. An exposure pathway is how an individual could be exposed to contaminants in the creek. An exposure pathway is comprised of five elements:

(1) A contaminant source,
(2) Environmental media and transport mechanisms,
(3) A point of exposure,
(4) A route of exposure, and,
(5) A receptor population.

The source of contamination is the place where contaminant releases to the environment occurs (any waste disposal area or point of discharge). In the case of Newtown Creek, the original source is unknown. Environmental media and transport mechanisms carry contaminants from the source area to points where human exposures may occur. The exposure point is a location where actual or potential human contact with a contaminated medium (soil, air, water, biota) may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (ingestion, inhalation, and dermal absorption). The receptors are the people who are exposed or may potentially become exposed to contaminants at a point of exposure. Two types of exposure pathways are evaluated in this PHA. A completed exposure exists when all five elements of an exposure pathway are documented. A potential exposure pathway exists when any one of the five elements comprising an exposure pathway is not met or not known to have been met.

Potential Exposure Pathways**:**

DOH and ATSDR identified one way people may be using the Creek for recreation – swimming, however we do not have clear evidence that swimming in Newtown Creek is occurring. Nevertheless, we evaluate this potential exposure further in the health assessment.

Completed Exposure Pathways**:**

DOH and ATSDR identified two ways people are using the Creek for recreation - boating and fishing (including crabbing). Exposures to contaminants present in the surface water can occur through incidental ingestion or dermal absorption during recreation activities such as boating or fishing. Although the exact number of people participating

in recreational activities within the boundaries of the Creek is not known, increases in access to the Creek in the future may increase the number of people using the Creek. We have limited information about how many people fish in the Creek and eat fish and crabs taken from the Creek. The DOH has a health advisory for limiting the consumption of fish and crabs taken from the Creek (DOH 2011a).

Because we do not have chemical contamination sampling data for fish or crabs specifically from Newtown Creek, we cannot evaluate this pathway further at this time. Nevertheless, it is likely that contamination within the Creek in surface water, sediments (e.g. PCBs) and in the creosoted bulkhead ties contributes to contamination of edible biota in the Creek and results in increased exposures to those who eat fish and crabs from the Creek.

People may come into direct contact with contaminated sediments and dermally absorb contaminants while entering/launching or exiting/beaching small water craft in areas of the creek not bound by bulkheads during low tide, although observations and discussion with community representatives suggest that there are no places where sediment is contacted by recreational boaters. People will not be directly contacting sediments that are deep under water and, therefore, sediments are not evaluated further here.

C. Public Health Implications Adult and Child's Health Considerations

Recreational use of Newtown Creek for activities such as swimming, boating and fishing can result in exposure to chemical and biological contaminants via dermal absorption and incidental ingestion. An analysis of the potential for health risks associated with ingestion and dermal exposure to biological contaminants while using the Creek for recreation is presented below. Eating fish or crabs from the creek can also result in exposure to chemical and biological contaminants via ingestion. Because we do not have information about which and how much fish or crabs people catch and eat from the Creek, we cannot evaluate these exposures.

Chemicals

DOH and ATSDR have insufficient information about levels of chemical contaminants in environmental media that people may contact (e.g. surface water) to evaluate health risks associated with exposure to contaminants in Newtown Creek. DOH and ATSDR will evaluate data collected by EPA as they become available to us.

Pathogens

Research suggests a direct relationship between the extent of exposure to contaminated water, the area of the body in contact with contaminated water and the risk of subsequent illness (WHO 2003). Sample results in excess of 1,000/100 milliliters of water for coliform or 104/100 milliliters of water for enterococci suggest an increased risk of gastrointestinal illnesses through participating in swimming activities. This

increase is based on an assumption that swimming includes submerging the face and head under the surface of the water. Pathogens that cause gastrointestinal illness are transmitted through the fecal-oral route. Submersing the head during swimming can result in ingestion of water. It has been demonstrated that the average child and young adult swimmer swallows 37 ml of water during a 45 minute swimming session. Adult swimmers swallow 16 ml on average. Ingestion volumes may be even higher for toddler age children (Dufour, *et al.* 2006). While the average volume of water consumed by swimming may appear of little significance, several pathogens known to be found in sewage contaminated waters, such as *E.coli* O157:57, *Shigella* spp., Hepatitis A, *Giardia* and *Cryptosporidium* have relatively low infective doses, which means that swallowing a very few number of these pathogens can result in illness. Immersing the head in the water while swimming also increases the likelihood of eye, ear, and nose infections.

Published reports have identified an increased risk of illness from other water contact activities such as canoeing, boating and fishing in water with indicator bacteria exceedances (Rijal et al, 2009). Because the head is not usually submerged in the water during these activities, the presumed volume of incidental water consumption is lower than swimming. Subsequently, the risk of illness can also be assumed to be lower. Experimental data have demonstrated a correlation between the volumes of water contacted during recreational activities with the risk of gastrointestinal illness. For example, canoeing had a higher risk of illness than fishing or pleasure boating, respectively. Estimated water ingestion rates for these activities showed a similar relationship (Rijal et al, 2009). Increased duration and frequency of participation in recreational activities also increases the risk of illness.

Water samples collected from Newtown Creek indicate that levels of fecal coliform and enterococci bacteria exceed standards and that an increased risk of illness is likely to occur through recreational contact with the water. The risk of illness will increase in the presence of undertreated sewage or overflow events. The extent of the increased risk will be dependent on the extent of effluent treatment, the volume of pathogens released, the amount of rain or snowmelt runoff and other factors. Environmental factors such as sunlight, tides, currents and wind can also affect the fate and transport of pathogens in waters and require extensive site specific assessment, sampling and modeling to quantify indicator and pathogen concentrations and the risk of illness during varied conditions. A site specific assessment of this magnitude has not been performed for Newtown Creek.

For biological contamination of surface water, hand to mouth contact during and after participating in water contact recreation also increases risk of illness. As a result, children can be at higher risk of gastrointestinal illness, even without submerging their heads underwater. Increased duration and frequency of water contact recreational activities will also increase the risk of illness. It has been demonstrated that the average child and young adult swimmer swallows 37 ml of water during a 45 minute swimming

session. Adult swimmers swallow 16 ml on average. Ingestion volumes may be even higher for toddlers (Dufour, *et al.* 2006).

D. Health Outcome Data Evaluation.

The DOH has not previously evaluated health outcome data specifically for the Newtown Creek neighborhood. Both DOH and NYCDOHMH provide health statistics for the neighborhoods in Brooklyn and Queens surrounding the creek. DOH is in the process of conducting a Health Outcomes Review for the Newtown Creek area because of community concerns about possible exposure to chemicals from the Greenpoint oil spill or in the creek. No exposure to chemicals has been documented and the outcomes reviewed are not related to exposure to the pathogens likely to be present in the creek. A Health Outcomes Review is a type of study that uses currently available data to evaluate rates of specific health outcomes in a defined geographic area to determine if rates are elevated. The Newtown Creek area Health Outcomes Review will evaluate cancer, birth defects and other adverse birth outcome rates in an area within 1/4 mile of the creek as well as an additional area of Greenpoint near the Greenpoint Petroleum Remediation Project (Figure 2). This study area was chosen with input from community members. Data from the DOH Cancer Registry, Congenital Malformation Registry and Vital Statistics will be used to conduct the Health Outcomes Review.

COMMUNITY HEALTH CONCERNS

DOH and ATSDR continue to gather and evaluate community concerns. We have received expressions of concerns from people in the communities near the Greenpoint Petroleum Remediation Project. Other community health concerns were identified from websites maintained by community groups and organizations and in discussions with their representatives (e.g. Newtown Creek Alliance and Riverkeeper). A summary of the concerns and our responses are as follows:

Comment: Community members are concerned about the overall water quality of Newtown Creek and the contribution that the Greenpoint Petroleum Remediation Project and other sites along the creek make to water quality problems.

Response: DOH and ATSDR do not have complete information about the overall water quality of Newtown Creek. The EPA will be assessing what contribution Greenpoint Petroleum Remediation Project and other sites have on Newtown Creek. The DOH and DEC will work with EPA to address any new site-specific potential exposure pathways identified in the community.

Comment: People are concerned about the creek's suitability for recreational uses such as swimming and kayaking.

Response: DOH and ATSDR conclude that swimming in Newtown Creek could harm

people's health. This is because Newtown Creek has physical and biological hazards for swimmers. DOH and ATSDR conclude that recreational boating (for example, canoeing or kayaking) in Newtown Creek is not expected to harm people's health if precautions are taken. This is because of physical hazards and an increased risk of illness from water contact associated with boating during times of higher indicator bacteria counts.

Comment: Some people are concerned about the safety of eating fish and crabs taken from the creek.

Response: People who are considering eating fish and crab caught in the creek should follow the DOH consumption advisories for fish taken from the East River to reduce their exposures to chemical contaminants. Details of the fish advisories are presented elsewhere in this document. The fish advisories are also available in Spanish and Chinese language versions.

CONCLUSIONS

DOH and ATSDR conclude that swimming and other full body immersion recreation (for example, wind surfing, scuba diving) in Newtown Creek could harm people's health (see Appendix B).

> Waterfront uses of Newtown Creek are primarily commercial and industrial, and are supported, in part, by waterborne transportation. This represents physical safety concerns related to swimming and other water recreation, and includes large commercial boat traffic and in some places high bulkheads (marine retaining walls). These bulkheads may make it difficult to get out of the creek when necessary for safety. In addition, there are a number of physical hazards that could be present that could cause injury and drowning hazards that have not been assessed including; underwater hazards, steep slopes or drop offs or poor water clarity.
>
> Water samples collected from Newtown Creek indicate that levels of coliform and enterococci bacteria exceed standards on occasion and that an increased risk of illness is likely to occur through recreational contact with the water during these time periods. These exceedances of the bacterial standards can be attributed to combined sewage overflows and urban runoff after rainfall events. Water from Newtown Creek contains microorganisms, such as coliform bacteria, and likely contains viruses and parasites that can make a person ill if they enter the body. Water pollution caused by fecal contamination is a serious public health concern due to the risk of contracting diseases through swallowing or coming in contact with disease causing agents such as bacteria, viruses and protozoa. This may include gastrointestinal illness caused by organisms such as *E.coli, Shigella spp., Hepatitis A, Giardia* and *Cryptosporidium.*

When swimming, human exposure to chemical hazards in the surface water is also possible; however, sampling for hazardous chemical constituents in places where people are contacting water is needed.

DOH and ATSDR conclude that recreational boating (for example, canoeing, kayaking, and touring) or “catch and release” fishing in Newtown Creek is not expected to harm people's health, although there may be some physical hazards, such as large commercial boat traffic, Also, certain precautions are recommended because incidental ingestion and dermal contact with the water when boating or fishing in some areas of the creek would lead to increased exposure to biological contaminants and are discussed below under general recommendations.

There are small boat access points on Newtown Creek, at the end of Manhattan Avenue and at the Newtown Creek Wastewater Treatment Plant Nature Walk in Brooklyn. There is an increased risk of illness from water contact activities associated with canoeing, boating and fishing during exceedances of indicator bacteria. Because people do not usually submerge their heads in the water during these activities, the presumed volume of incidental water consumption is lower than swimming. Subsequently, the risk of illness can also be assumed to be lower. Recreational boaters may also have increased exposure to chemical contaminants when contacting sediments, although observations and discussion with community representatives suggest that there are no places were sediment is contacted by recreational boaters.

The DOH and ATSDR conclude that eating fish and crabs taken from Newtown Creek could harm people's health by increasing their risk for adverse health effects.

DOH has extensive, restrictive fish advisories for the East River (DOH 2011a), and these advisories apply to Newtown Creek. Based on the close association of these waters we would expect that contaminant levels in Newtown Creek fish and crabs would be similar to levels in fish and crabs from the East River. People who are considering eating fish and crab caught in the creek should follow the DOH consumption advisories for fish and crabs taken from the East River to reduce their exposures to chemical contaminants. Women under 50 years old and children under 15 years old should not eat any fish from these waters. Further advice can be found in the “Summary” section above or on-line at http://www.nyhealth.gov/environmental/outdoors/fish/fish.htm.

RECOMMENDATIONS

For those people using Newtown Creek for recreation, the DOH and ATSDR recommend measures to reduce exposures to the biological hazards that are present. People recreating in and around the creek can reduce the risk of becoming ill by avoiding the creek water after periods of effluent discharge, rainfall, when the water is cloudy or turbid, or when pollution is observed. Since the greatest exposure to these

hazards is by swallowing the water, people should avoid any activity that would result in swallowing creek water. People should wash their hands after contacting the water and sediments, especially before eating. If people get water on more than just their hands and arms, it may also be helpful to take a shower to wash off the creek water.

The ATSDR and DOH recommend additional sampling of Newtown Creek so that these agencies can better evaluate people's potential exposure to chemical contaminants. Surface water sampling is needed in locations where people are entering the water. Sediment or creek side soil sampling is needed if locations are identified where people may be contacting them during recreational activities. Fish and crab sampling data specific to Newtown Creek are also needed to evaluate whether existing fish consumption advisories are sufficiently protective for fish and crabs taken from Newtown Creek.

PUBLIC HEALTH ACTION PLAN

The DOH will evaluate any new data provided by DEC or EPA on surface water from public access areas or sediments if locations are identified where people may be contacting them. DOH and ATSDR will determine whether additional public health recommendations are needed based on those new data.

The DOH will evaluate new data provided by DEC or EPA on edible fish and crabs to determine whether the DOH fish consumption advisories for the Creek should be modified.

The DOH, in conjunction with ATSDR, will evaluate any other new environmental, toxicological and/or health outcome data as they become available to us.

The ATSDR, DOH and NYCDHMH will coordinate with the DEC, EPA, NYCDEP and other involved agencies to make sure that public health messages regarding recreational use (e.g. swimming, boating and fishing) of Newtown Creek are protective of public health.

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APPENDIX A
Figures

Figure 1. Overview map of the Newtown Creek, Queens, New York.

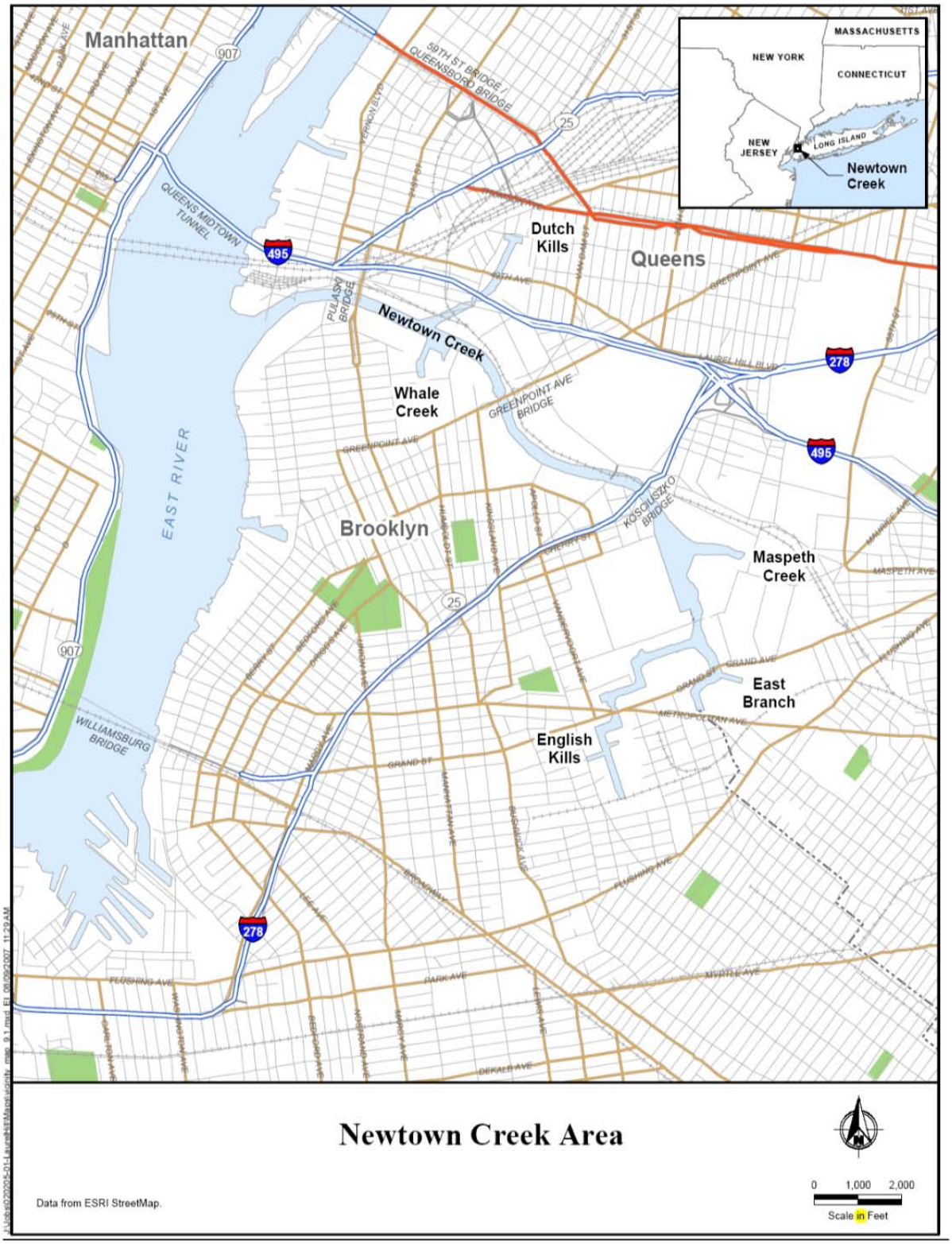
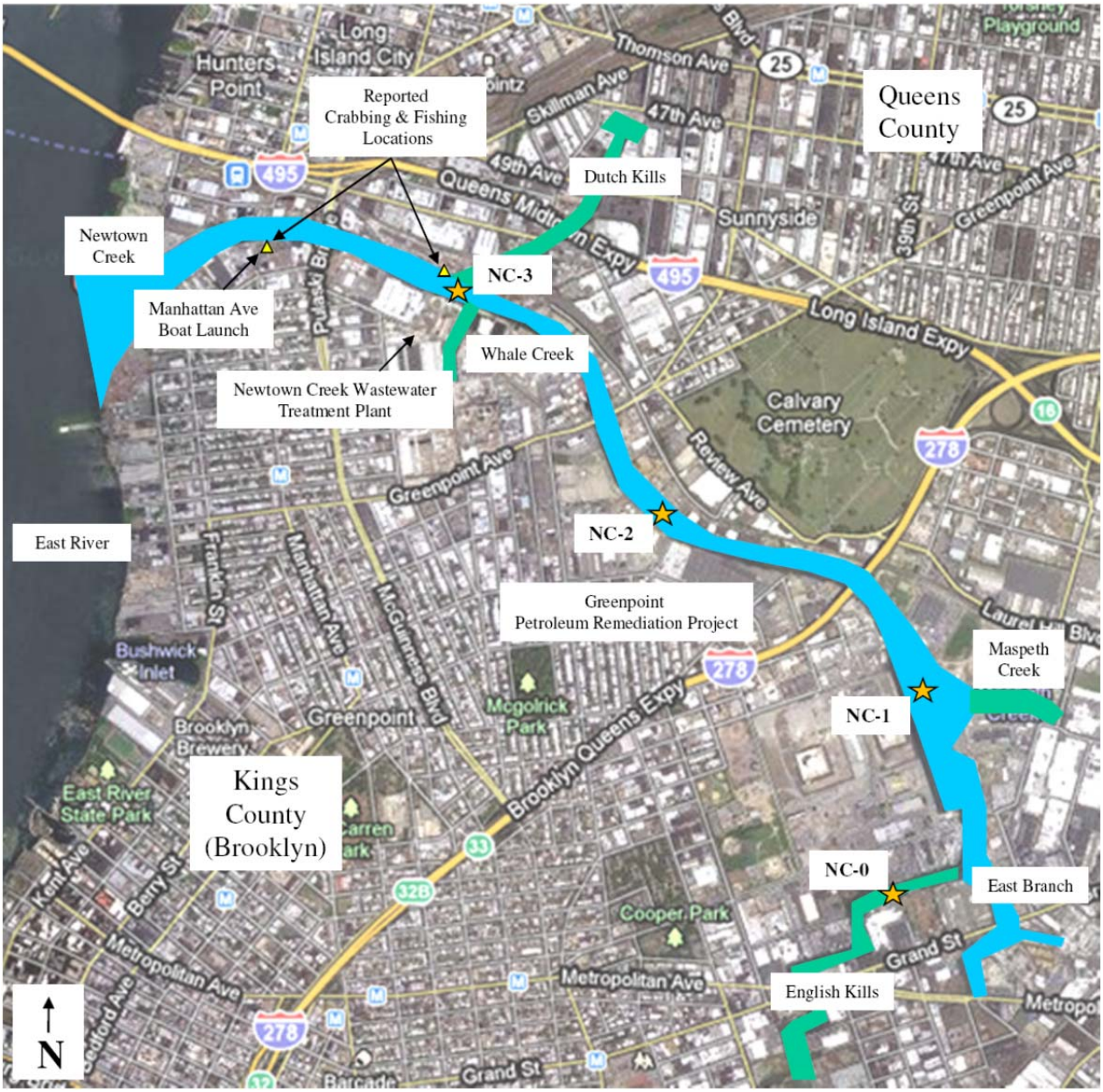


Figure 2. Newtown Creek map of locations where fishing and boating was observed.



APPENDIX B

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. The conclusions are based on the information available to the author(s) at the time they are written.

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.