2005 New York Harbor Water Quality Report

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEP

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Michael R. Bloomberg, Mayor
Emily Lloyd, Commissioner

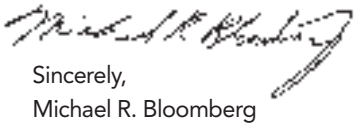
2005 New York Harbor Water Quality Report

The 2005 New York Harbor Water Quality Report represents the 96th year of comprehensive monitoring of the water quality in New York Harbor, and demonstrates the continued improvements of the City's waterways and the regeneration of their aquatic ecosystems. In fact, the Harbor is in better shape today than it has been in more than thirty years.

Under the management of the Department of Environmental Protection (DEP), the City's advanced wastewater treatment and pollution prevention programs are clearly producing positive results. Largely because of these efforts, our bathing waters are cleaner and our aquatic environment is flourishing. What's more, we are committed to do better next year.

With further enhancements to our treatment plants and other infrastructure upgrades already underway, the quality of the Harbor, and of City life, will surely continue to improve.

I encourage all New Yorkers to review this report to gain an appreciation for the extensive efforts the City has undertaken to reduce pollution in the Harbor and to protect our wonderful natural resources.



Sincerely,
Michael R. Bloomberg
Mayor

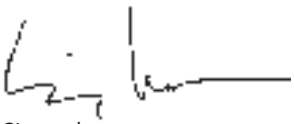
Every year, the New York City Department of Environmental Protection (DEP) performs an intensive survey of the water quality in New York Harbor. The purpose of this Harbor Survey Program is to assess the effectiveness of the City's various pollution control programs, and their combined impact on water quality. This year's report shows once again that the City has realized enormous benefits from its investments in sewer and sewage treatment infrastructure.

The DEP's Capital Plan calls for even more upgrades to wastewater treatment plants around the City and to improve the capture of combined sewer overflows. The DEP is also making major improvements in its four East River wastewater treatment plants to limit the amount of nitrogen that is discharged into Long Island Sound. In addition, the DEP has embarked this year on a large-scale planning project to create a comprehensive watershed protection program for Jamaica Bay.

These efforts will help to ensure that the waters surrounding New York City remain healthy for marine life and accessible for New Yorkers' recreational use.

Questions or suggestions about this report can be directed to Mr. Robert Ranheim of the DEP's Marine Sciences Section of the Bureau of Wastewater Treatment at (212) 860-9378.

We are proud of the results of our efforts to improve the quality of New York City's waterways. Your interest in the success of our programs is greatly appreciated.



Sincerely,
Emily Lloyd,
Commissioner

Credits and Acknowledgements

The 2005 Harbor Survey Program provided much of the data used in this report. The Harbor Survey is conducted by the NYCDEP Marine Sciences Section with support from the NYCDEP Marine Section, Special Project Laboratory, and the Newtown Creek Microbiological Laboratory.

Marine Sciences personnel responsible for the Harbor Survey included: Section Chief Beau Ranheim, Daniel Marcktell, Carrie Munill, Markus Koelbl, Andrew Owens, Yin Ren, William Lopez and Naji Yao. Marine Section personnel involved with the Harbor Survey include: Captains Will Edgar, Jeff Ferency, Abraham Lutterodt.

The Special Project Laboratory is supervised by Trikam Patel and Patrick Jagessar, with analyses performed by: Lovely Chacko, Anna Chernyak, Liji Issac and Ofafo Barker and Nicole Pinede. The Newtown Creek Micro Lab was supervised by Shirley George, analyses done by: Claudette Williams and Esmerado Castro, Lorraine Johnson and Paricher Malakkhani.

Photographs in the report are courtesy of The NYCDEP Marine Sciences Section and DEP Staff Photographer Scott Foster.

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Executive Summary

The 2005 New York Harbor Survey report presents the water quality throughout New York City waterways. The 96th annual survey is conducted by the New York City Department of Environmental Protection (NYCDEP). The survey enables New York City to track the quality of its waters and to gauge the effectiveness of its management practices. This report discusses the trends since the 1970s when much of the public investment into water quality grew in earnest.

New York Harbor has made New York City the leading metropolis of the Western Hemisphere. Improving the quality of water in the Harbor estuary also improves the quality of life in New York City. New York Harbor has enjoyed a gradual resurgence in overall quality over the past 30 years. The estuary had been the dumping ground for the New York metropolitan region's waste for many years. The revitalization is due to improved management and stewardship and to the strength of its natural resilience.

Public investment in wastewater treatment and enhanced regulatory control over waste discharges has improved water quality. The 2005 New York Harbor Survey indicates that many of the improvements of the past 30 years have continued; however, there are ongoing challenges to maintaining past gains and making new improvements.

The reduction of bacteria is one of the most dramatic water quality improvements in New York Harbor over the past 30 years. The Inner Harbor and the Upper East River-Western Long Island Sound have seen reductions by two orders of magnitude – falling from regional summer geometric means between 3,000 – 4000 cells/100mL in the early 1970s to well below 100 over the past ten years.

Dissolved oxygen, needed to support respiration by aquatic species, has shown an upward trend throughout the Harbor. On average, New York Harbor is well oxygenated and generally capable of supporting a variety of aquatic life. Dissolved oxygen is a problem in certain areas of the Harbor, particularly in bottom waters in the Western Long Island Sound and in Grassy Bay in Jamaica Bay. Summer months are especially challenging for some organisms when dissolved oxygen levels are lowest.

Algal productivity appears to be growing in Jamaica Bay. Since 1986, data from the Harbor Survey indicate a clear upward trend in algal growth in Jamaica Bay. This has both a positive and potentially negative effect. It improves food sources at the bottom of the food chain and ultimately for the top of the food chain. However, overproduction can depress water clarity and lead to lower dissolved oxygen, particularly in bottom waters.

There continue to be episodic discharges of untreated sewage into New York Harbor. These events are generally associated with periods of intense precipitation and runoff. Heavy rainfall has a significant impact on local water quality due to the combined storm and sanitary sewers (CSO). Periods of sustained or significant precipitation lead to overflows both in the conveyance systems of pipes and sewers as well as overflows at the wastewater treatment plants themselves, as volumes become unmanageable. Overflows of untreated sewage can deteriorate water quality.

Building on the gains made in the past 30 years, NYCDEP is continuing with its mission to maximize the resource value of New York Harbor. Ongoing programs include upgrading and maintaining wastewater pollution control plants, investing in systems to abate untreated sewage discharges, and reducing nutrient discharges. Moving forward, NYCDEP is undertaking new initiatives. It is partnering with other resource agencies to promote the protection and restoration of ecological habitats throughout New York Harbor.

Introduction

History and Scope of the New York Harbor Survey

The New York City Department of Environmental Protection (NYCDEP) conducted the 96th annual New York Harbor Survey in 2005. This study has conducted water quality analysis at numerous sites throughout the Harbor ranging from 12 stations in 1909 to 53 in 2005. The NYCDEP records variations and trends in water quality to develop a long-term dataset.

As the operator of the 14 wastewater pollution control plants (WPCP) and related infrastructure of pipes and outfalls in New York City, NYCDEP can track how investments and upgrades correspond to water quality trends. Many of the observed water quality improvements follow the construction, upgrading, and operational improvements at the region's WPCPs. Increased control of illegal discharges and industrial emissions into the Harbor has further helped to bring about water quality improvements

This report divides the Harbor into discussions of four regions:

- Upper East River including the Harlem River and Western Long Island Sound
- Inner Harbor - Hudson and East Rivers, Upper New York Bay, Arthur Kill, Kill Van Kull
- Jamaica Bay
- Lower Bay including Raritan Bay

NYCDEP sampling occurs throughout the year. The results in this report cover the period from May to September. These months are referred to as summer. The summer is of primary interest because it's the peak time for recreational use of the water. The summer also coincides with the greatest impairments to water quality.

The harbor survey primarily measures several parameters related to water quality:

- Dissolved Oxygen (DO)
- Fecal Coliform (FC)
- Chlorophyll a
- Secchi depth
- Nitrogen and Phosphorus compounds

Individually, these parameters give only a small picture of the health of the harbor. Taken together and over time, they draw a picture of aquatic health.

Discussion of long-term trends goes back over 30 years – corresponding to the passage of the Clean Water Act (CWA) in 1972. Although several of the NYCDEP WPCPs were already constructed at that time, upgrades and significant operational improvements have occurred since the CWA. Certain water quality parameters tracking turbidity (secchi depth) and biomass productivity (chlorophyll a) date back to 1986 while others, including dissolved oxygen and fecal coliform, go back before 1972.


2005 NYCDEP Harbor Survey Stations
WESTCHESTER COUNTY
NEW JERSEY
Hudson River
Long Island Sound
BRONX
Harlem River
MANHATTAN
East River
QUEENS
Hackensack River
Passaic River
Newark Bay
Upper New York Bay
BROOKLYN
Kill Van Kull
STATEN ISLAND
Lower New York Bay
Jamaica Bay
Rockaway
Arthur Kill
Raritan River
Raritan Bay
Sandy Hook
ATLANTIC OCEAN
N1
N3B
H3
N4
E2
N5
GC3
GC4
GC5
GC6
G2
N6
K1
K3
K2
N7
N8
K4
K5
K5A
K6
N9
N16
E10
E14
E7
E8
E5B
E5A
E6
E4
E15
SB1
BB2
SB3
BB4
J8
J7
PB2
PB3
J9A
J12
EMB1
J3
EMB2
MB1
J2
MB3
J5
SHB1
J11
J1
N
0
5
10
Miles
Legend
Inner Harbor
Upper East River - Western LIS
Lower Bay
Jamaica Bay

Fecal Coliform (FC) Bacteria – Fecal coliform concentrations are measured in NY Harbor as human-health related indicators of sewage-related pollution. Fecal coliform are a group of bacteria primarily found in human and animal intestines and are associated with sewage waste. These bacteria are widely used as indicator organisms to show the presence of such wastes in water and the possible presence of pathogenic (disease-producing) bacteria.

Chlorophyll a – Chlorophyll a is a plant pigment, the concentration of which in water is used as an estimate of primary productivity or phytoplankton abundance.

Phytoplankton, minute free-floating aquatic plants, form the basis of the food web. Since these organisms respond quickly to environmental changes, their abundance may serve as a measure of water quality and an indicator of greater ecosystem change.

The Harbor Survey measures Chlorophyll a (as a surrogate for phytoplankton) to provide an assessment of ecosystem health. Levels above 20 µg/L are considered enriched or eutrophic conditions, indicating a decline in water quality.

Dissolved Oxygen (DO) – The levels of oxygen dissolved in the water column are critical for respiration of most aquatic life forms, including fish and invertebrates, such as crabs, clams, zooplankton, etc. Dissolved oxygen concentration is therefore one of the most universal indicators of overall water quality and a means of determining habitat and ecosystem conditions.

Secchi Transparency – A Secchi disk is used to estimate the clarity of surface waters. High Secchi transparency (greater than 5 feet) is indicative of clear water, with declines in transparency typically due to high suspended solid concentrations or plankton blooms. Low Secchi readings (less than 3 feet) are indicative of light limiting conditions, which in turn affect primary productivity and nutrient cycling.

NYS DEC Standards for Saline Waters

Class	Best Usage of Waters	Fecal Coliform	Dissolved Oxygen (never-less-than)
SB	Bathing and other recreational use	Monthly geometric mean less than or equal to 200 cells/100mL from 5 or more samples	5.0 mg/L
I	Fishing or boating	Monthly geometric mean less than or equal to 2,000 cells/100mL from 5 or more samples	4.0 mg/L
SD	Fish survival	No standard	3.0 mg/L

Coliform and dissolved oxygen indicators are used in New York State Department of Environmental Conservation (NYS DEC) standards, to quantify ecosystem health or degradation.

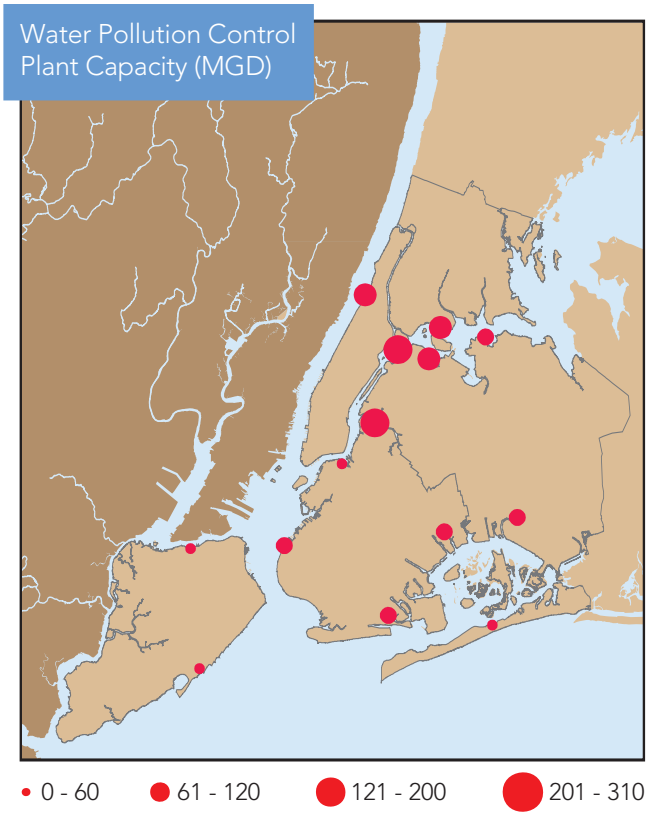
NYS DEC standards reflect a range of acceptable water quality conditions corresponding to the State-designated "best usage" of the water body. Common uses and NYS DEC standards for fecal coliform and dissolved oxygen are noted in the adjacent chart.

Point Sources of Pollution

The New York City Department of Environmental Protection's 14 WPCPs treat the sewage of New York City's residents, guests, and businesses. The infrastructure includes over 6,000 miles of collection system piping, 130,000 catch basins, and 5,000 seepage basins. Total average flows through the system are well over 1000 million gallons per day (MGD).

The treatment of wastewater at WPCPs includes primary and secondary treatment. Primary treatment refers to the removal of coarse material by screening and settling. Secondary treatment refers to the biological and chemical removal of organic matter. Finally, wastewater is disinfected with chlorine before being discharged back into the waterways.

Throughout much of New York City, the sewers collect both sanitary and storm flow. Local runoff overwhelms the sewer's discharge capacity during periods of intense rainfall sending untreated human and industrial waste into local waterways. Combined Sewer Overflows (CSO) are considered to be the largest single source of pathogens in the New York Harbor region. CSOs also convey large floatable materials into the waterways. Floatable debris, made up primarily of man-made debris, contribute to beach closures, interfere with navigation, entangle wildlife and impair aesthetics.



Non-Point Sources of Pollution

Non-point sources of pollution are contaminants that flow with rainwater into waterways or that move through the air and are deposited onto the land or water. Lawns, roads, agriculture, broken septic tanks, construction sites, and other disturbed ground areas are sources of sediment, fertilizers, pesticides, bacteria, viruses, salt, oils, grease, and heavy metals just to name a few examples.

Atmospheric deposition is a significant pathway of NPSP in this region. Deposition of mercury, nutrients, soot, and particulates are difficult to track and quantify. Airborne pollutants that make their way into the New York Harbor watershed are generated both regionally and remotely from distant sources.

Wet Weather and CSOs

New York City, as with most other municipalities designing sewers in the 1930s, built between 70 and 80% of its wastewater system to collect stormwater from street run-off as well as sanitary and industrial wastes.

When it rains, the combined flows may exceed the capacity of the WPCPs. To prevent overloads, CSO events occur, where wastewater is discharged directly to the Harbor. CSOs are the greatest source of bacteria to the Harbor.

Measures to mitigate CSO events vary and may include:

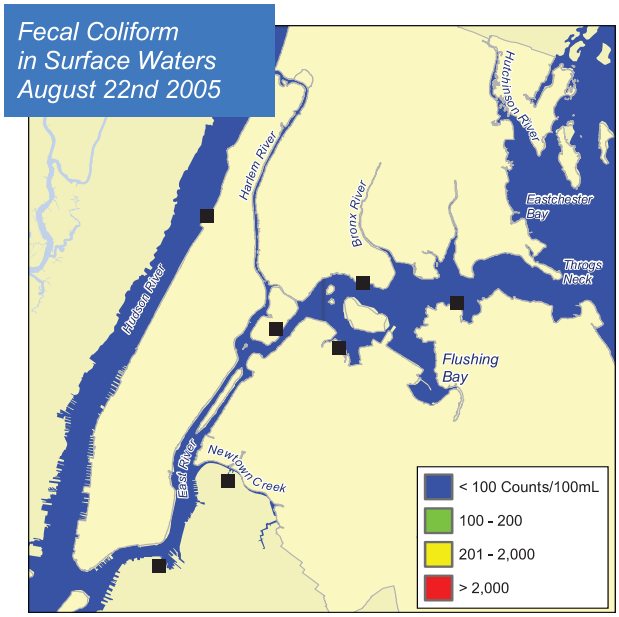
- Elimination or physically separating storm and sewer systems.
- Expansion of WPCPs.
- Creation of storage for CSO overflows followed by pumping the stored water to the treatment plant after the storm event has subsided.

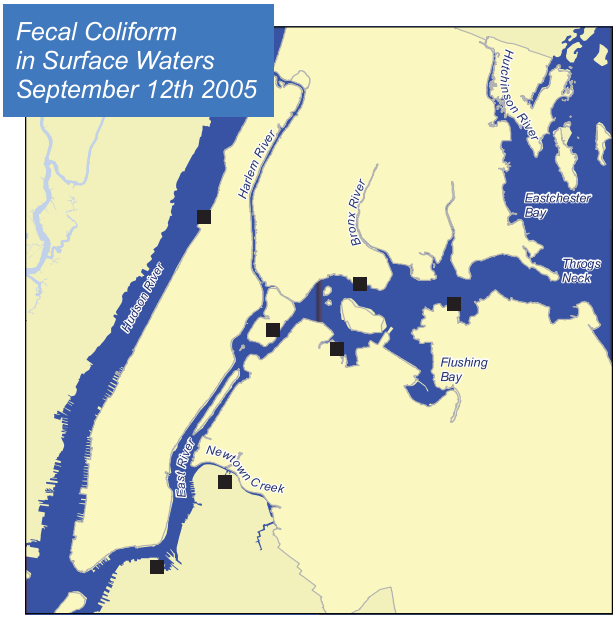
Bacteria levels are generally low throughout NYC waterways during dry weather. Bacteria levels generally rise significantly during and immediately after intense rain.

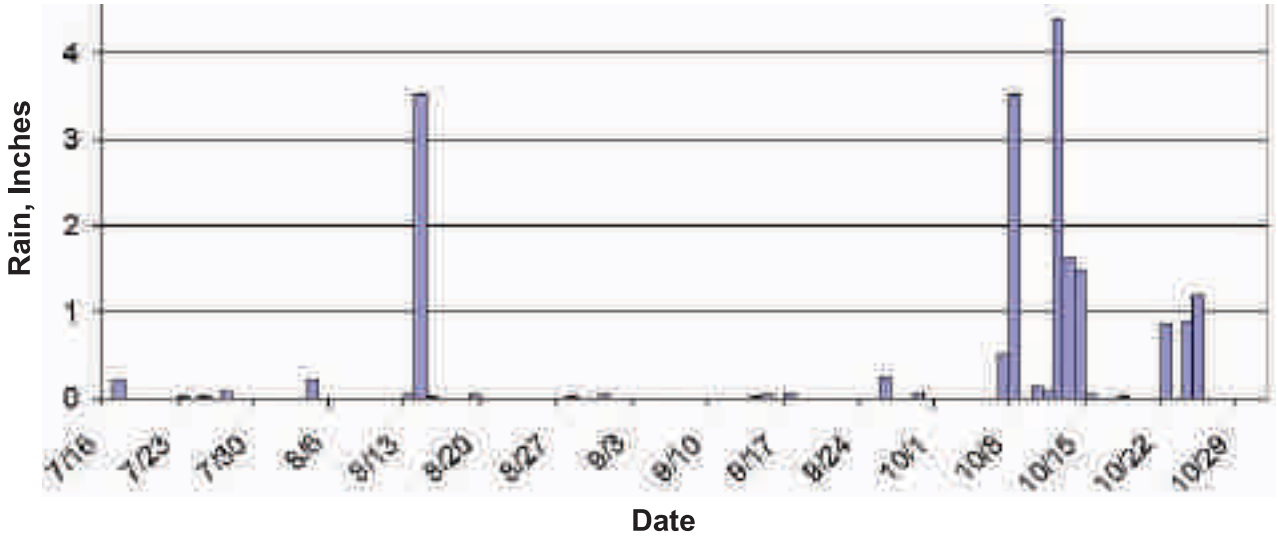
Dry Weather Fecal Coliform Levels

This graphic shows amounts of rain at LaGuardia Airport and the levels of fecal coliform measured at survey stations in the Hudson River, East River, and Western Long Island Sound.

The bacteria samples coincide with prior dry weather conditions. Results are levels below 100Counts/100mL throughout the region shown.



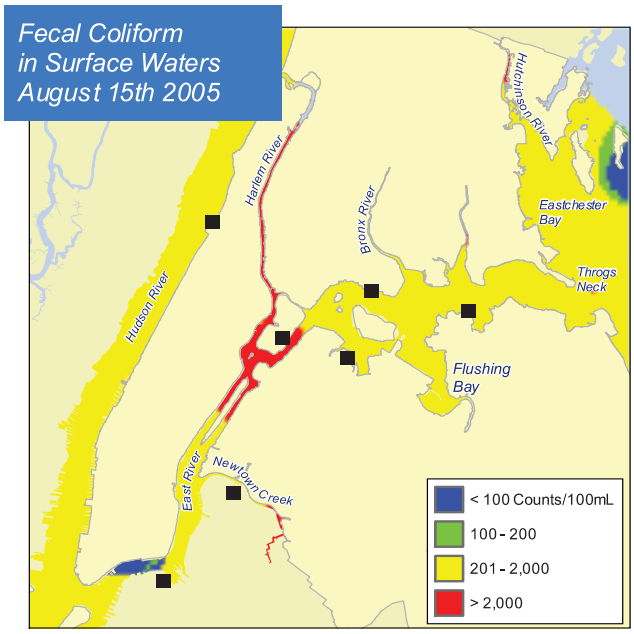


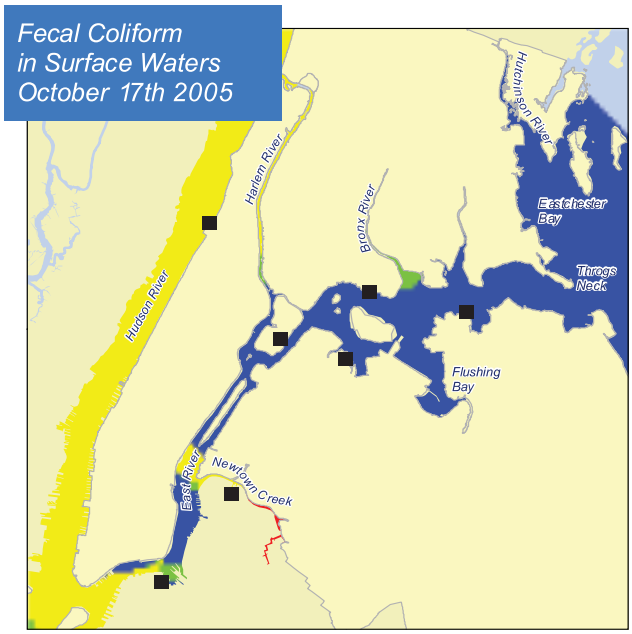


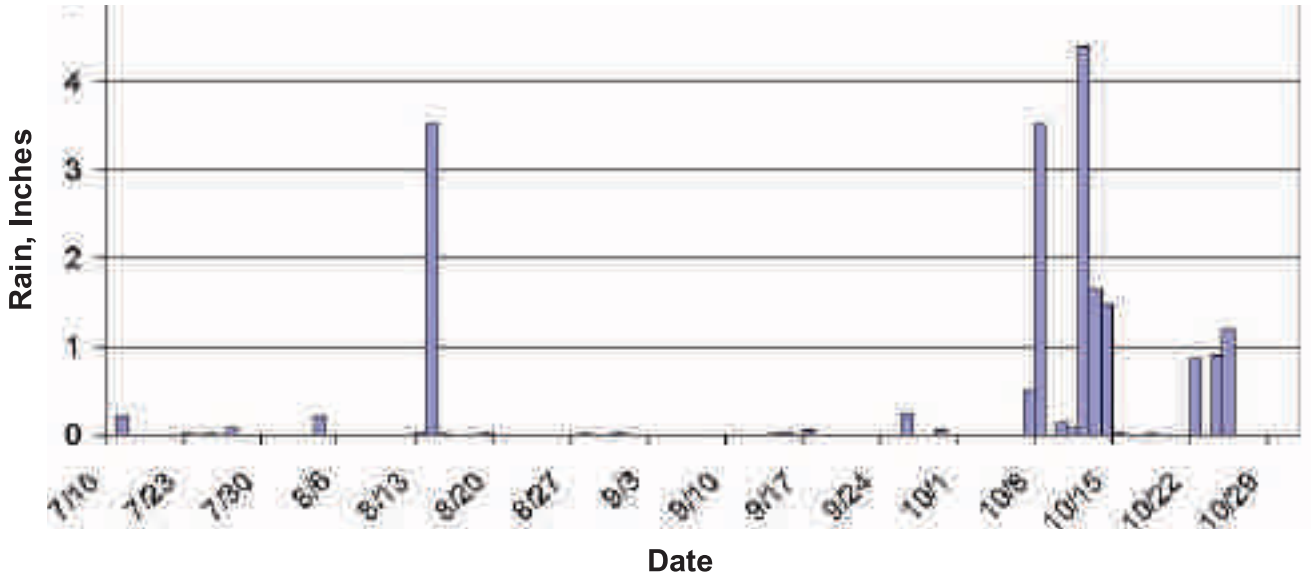
Wet Weather Fecal Coliform Levels

This graphic shows amounts of rain at LaGuardia Airport and the levels of fecal coliform measured at survey stations in the Hudson River, East River, and Western Long Island Sound.

The bacteria samples coincide with prior wet weather conditions. Significant increases in fecal coliform levels are noted throughout the region shown. Results are levels from 200 to 2000 Counts/100mL.







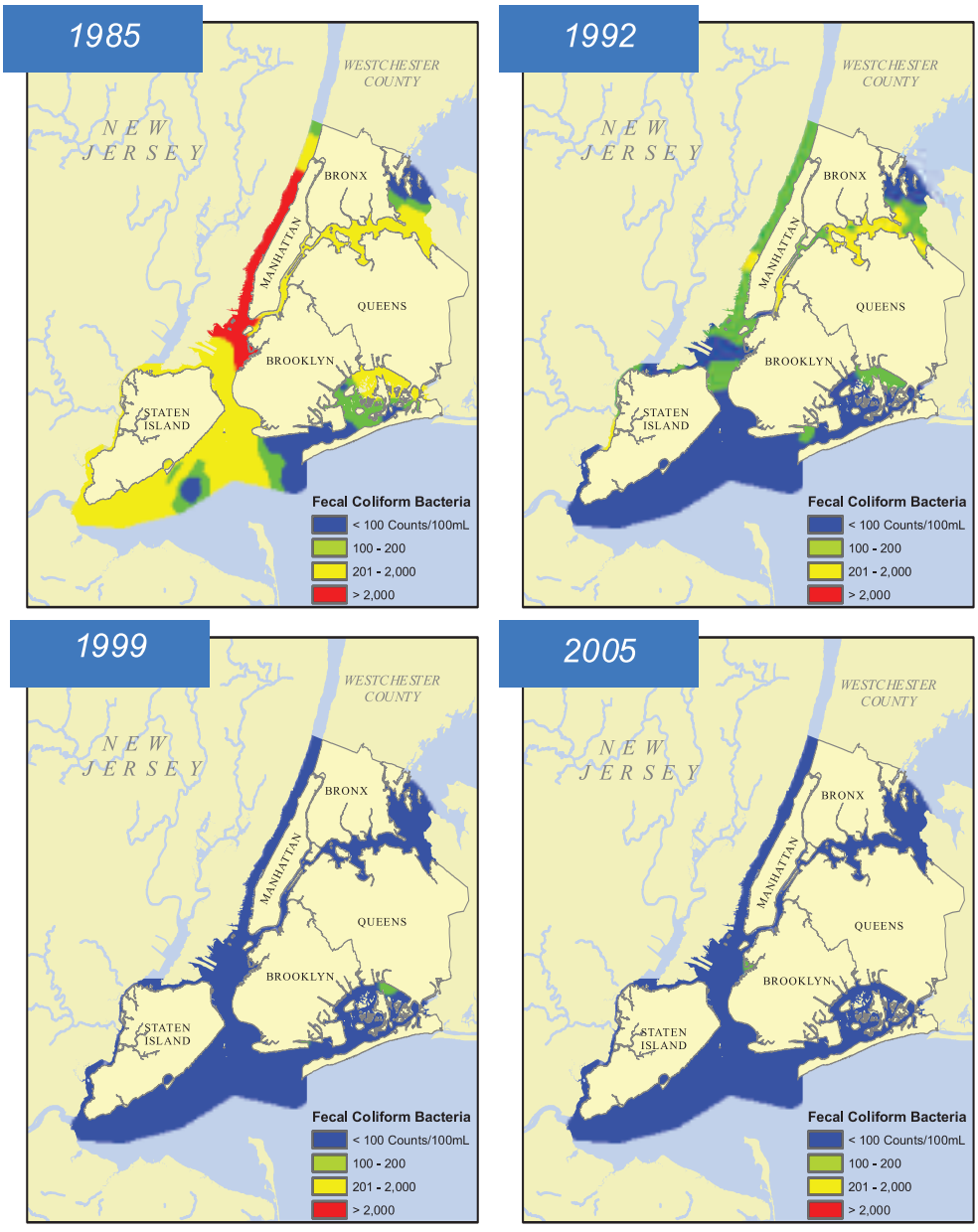
Harbor-Wide Water Quality Trends

Bacteria

Long term trends remain stable for bacteria harbor-wide. Geometric means of samples during summer months improved dramaticly between 1985 and 1992. Improvements are attributed to operation of the North River and Red Hook WPCPs beginning in 1986 and 1987 respectively.

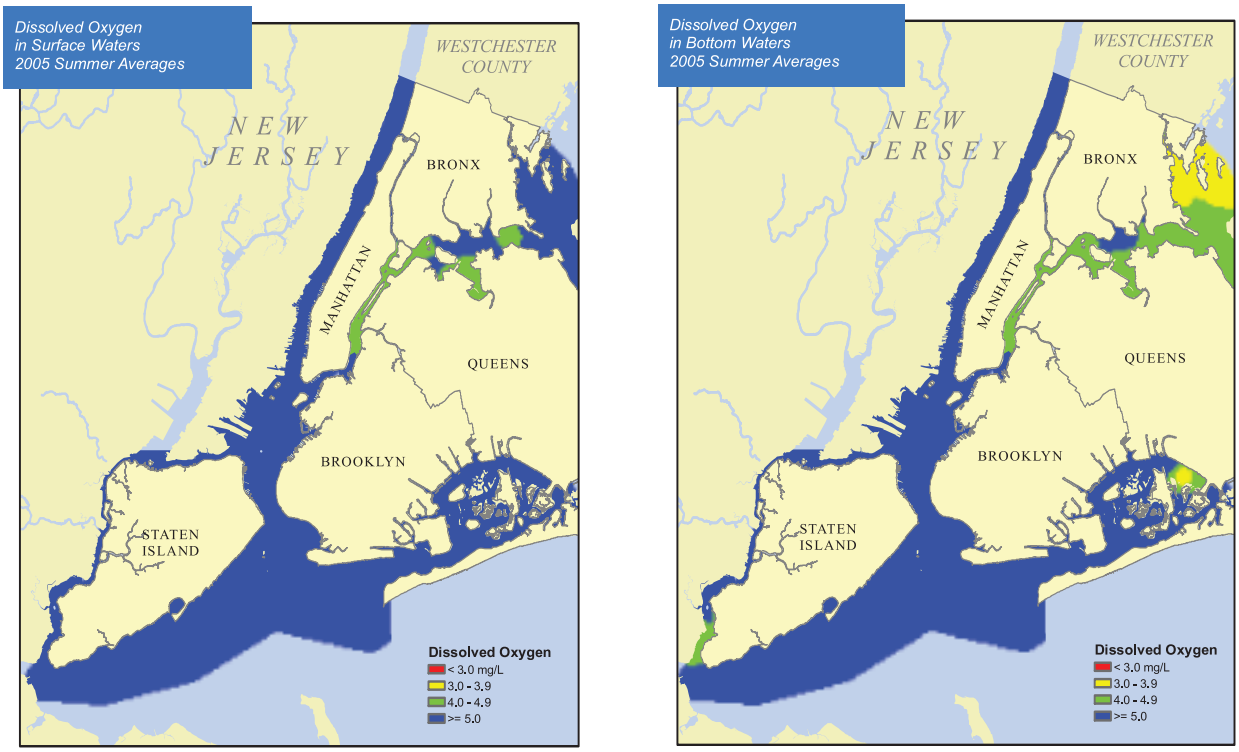
Continued overall reduction in bacteria levels during the 1990s are attributed to improved operation of combined sewer overflows.

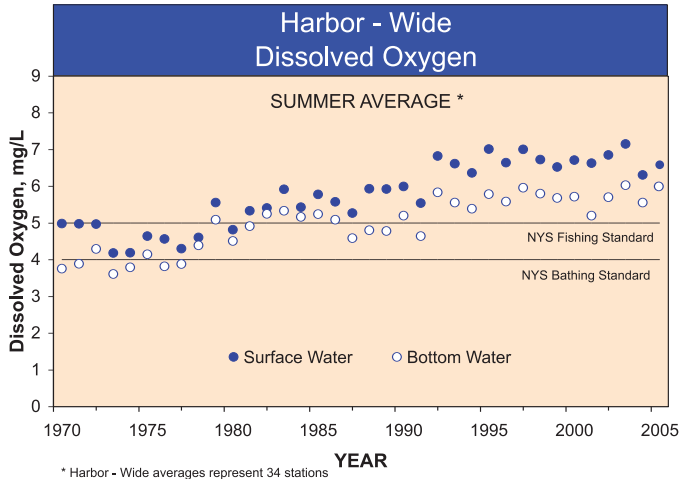
- Reduced bacteria levels are attributed to WPCP construction and upgrade.
- Bacteria levels during summer months decreased between 1985 and 1992.
- Improvements are attributed to operation of the North River and Red Hook WPCPs in 1986 and 1987.
- Further bacteria level decreases are attributed to improved operation of combined sewer overflows.
- The impact our sewage system has on water quality around NYC is currently minimal compared to past years. However, negative impacts are measured upon rain events.



- 2005 Harbor-wide average surface and bottom DO levels were 6.67 and 5.92 mg/L.
- 2005 DO levels were significantly higher than 2004 and were consistent with typical levels over the past 10 years.
- Problems continue to be observed in the Upper East River/Western Long Island Sound region.

DISSOLVED OXYGEN IN SURFACE AND BOTTOM WATERS 2005 SUMMER AVERAGES

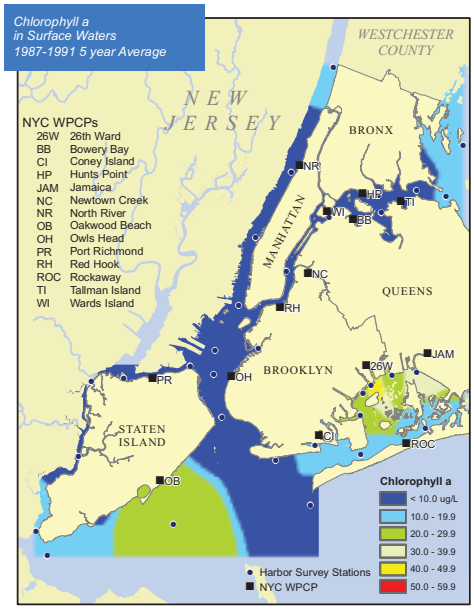


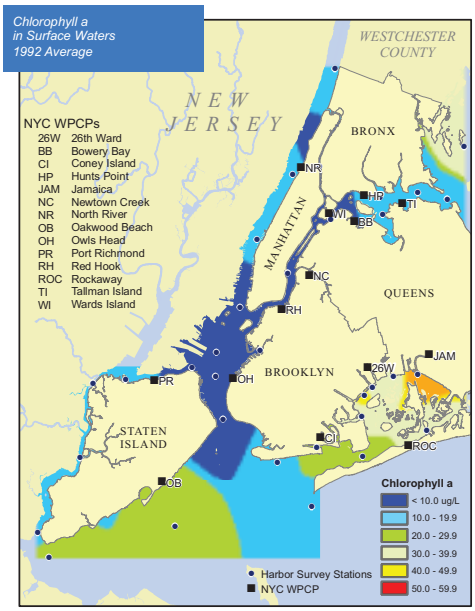


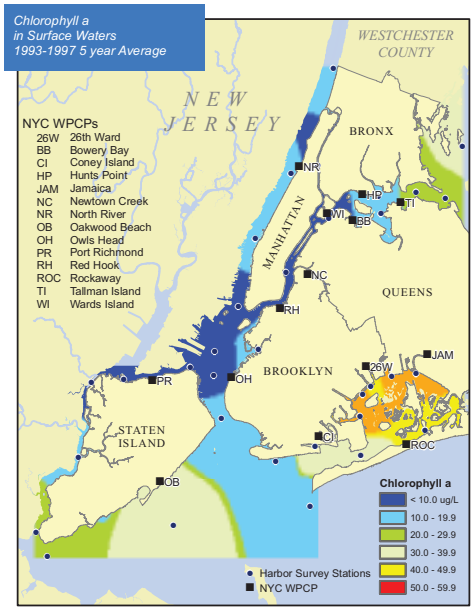
Chlorophyll a

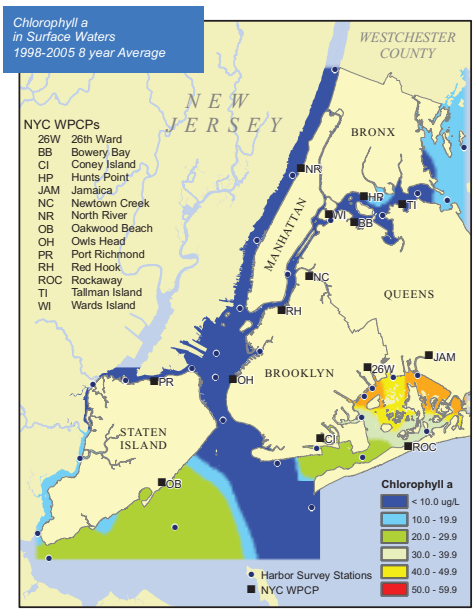
The Harbor Survey measures Chlorophyll a (as a surrogate for phytoplankton) to provide an assessment of ecosystem health. Levels above 20 µg/L are considered indicative of enriched or eutrophic conditions, indicating a decline in water quality.

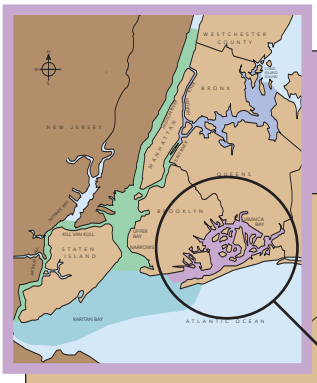
Chlorophyll levels have demonstrated a slight decrease over the last 5 years. The cessation of ocean dumping of sludge brought a spike in chlorophyll levels, most noticeable in Jamaica Bay. Recent treatment improvements have brought nutrient discharge levels back down to pre-centrate levels. This appears to have resulted in lower chlorophyll levels throughout the Harbor but particularly in Jamaica Bay as the graphs below demonstrate.











Jamaica Bay

Jamaica Bay is located at the southwestern end of Long Island. This urban, estuarine embayment and national park consists primarily of tidal wetlands, upland areas and approximately 20 square miles of open waters. The Bay and its drainage area are almost entirely within the boroughs of Brooklyn and Queens, except for a small area at the eastern end that is in Nassau County.

Jamaica Bay joins the New York Harbor to the west via the Rockaway Inlet at the tip of Breezy Point. The Bay includes the Rockaway Peninsula, which forms the southern limit of the Bay and separates it from the Atlantic Ocean.

Open waters of Jamaica Bay are classified for bathing or other recreational use (SB). Areas within the Bay's tributaries and dead-end canals are prone to reduced water quality due to direct surface runoff and poor flushing. These areas are designated for secondary contact use (I), such as fishing or boating.

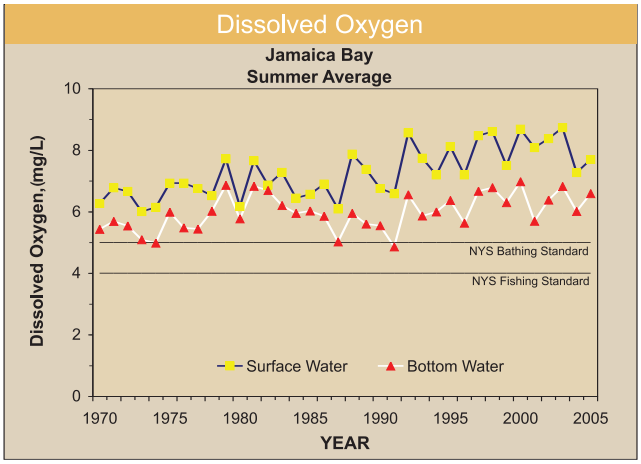
Dissolved Oxygen

Average surface and bottom DO levels in Jamaica Bay are above NYSDEC standards.

2005 surface and bottom average summer DO levels were 7.70mg/L and 6.59mg/L.

High variability is measured in DO levels in Jamaica Bay. Supersaturated DO levels are common in the bay because of algae blooms. This results in large, sudden, and variable DO changes.

DO levels are lowest further into the Bay. DO levels are lowest at the Easternmost station J12. DO levels increase moving west from J12 to J7 to J8 to J9A to J3 to J2 to J1. The trend is particularly noticeable in bottom DO levels.

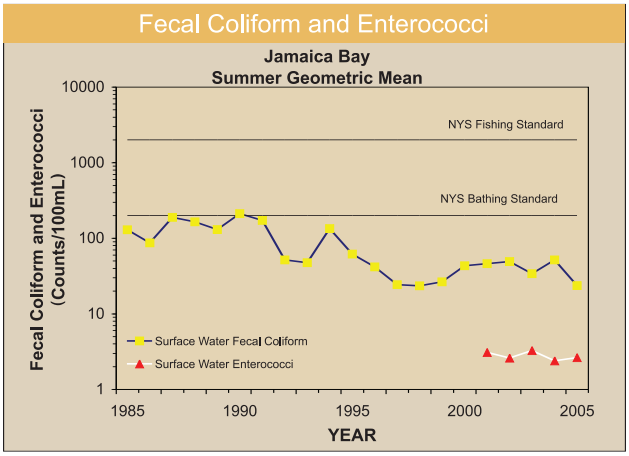


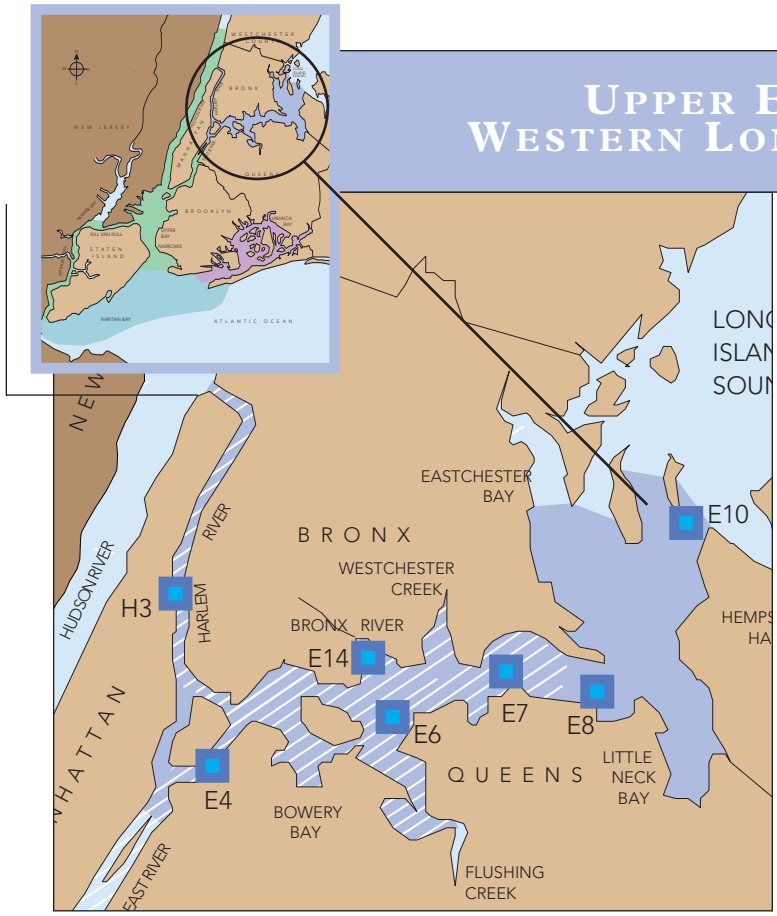
Bacteria

Bacteria levels remain low in Jamaica Bay.

Fecal Coliform summer geometric means in 2005 were 24 Counts/100mL; well below the 200Count/100mL standard for a 30 day geometric mean of 5 or more samples and a historic low.

Enterococci levels are on average less than 10 cells/100mL.





Upper East River – Western Long Island Sound

The upper East-River – Western Long Island Sound represents the northeast portion of NY Harbor from Hell Gate in the East River, northeasterly into the Long Island Sound up to the Nassau County border at Little Neck Bay.

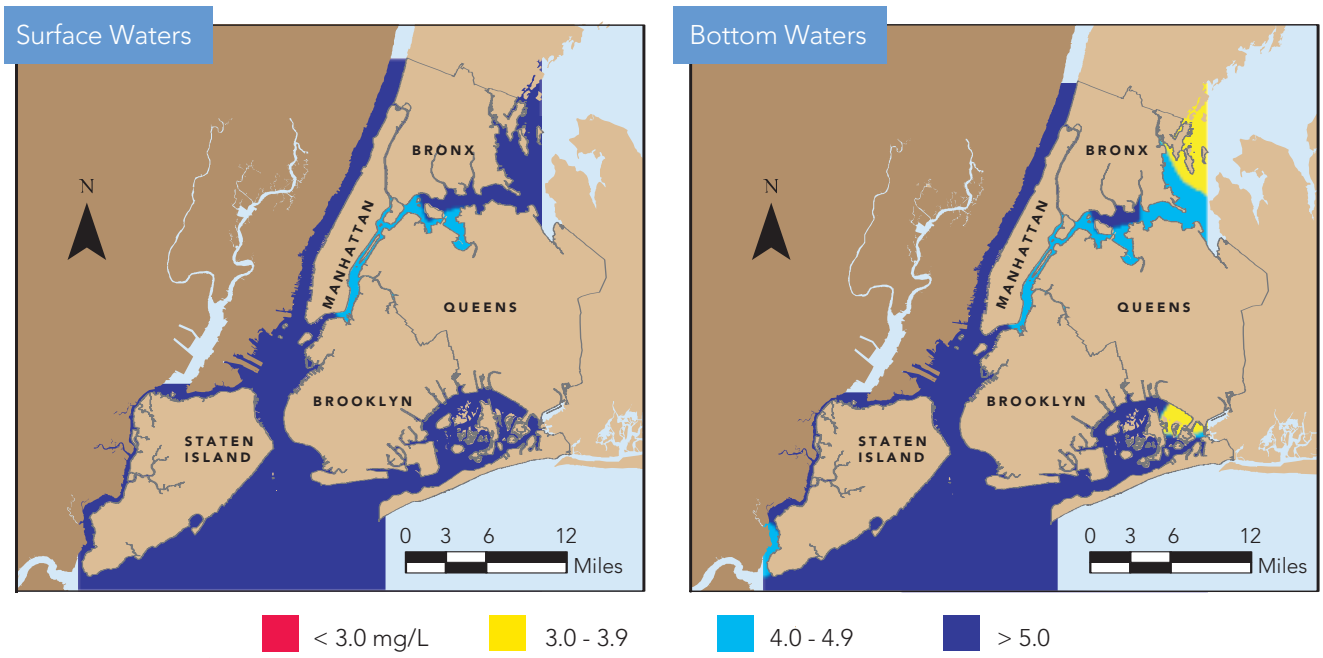
The area includes the Upper East River, Flushing Bay, Bowery Bay, the Bronx and Hutchinson Rivers, Eastchester Bay, and Little Neck Bay.

Some of the Upper East River – Western Long Island Sound area is classified as (I), for uses such as fishing or boating. The area east of the Bronx-Whitestone Bridge is classified as (SB), for bathing usage.

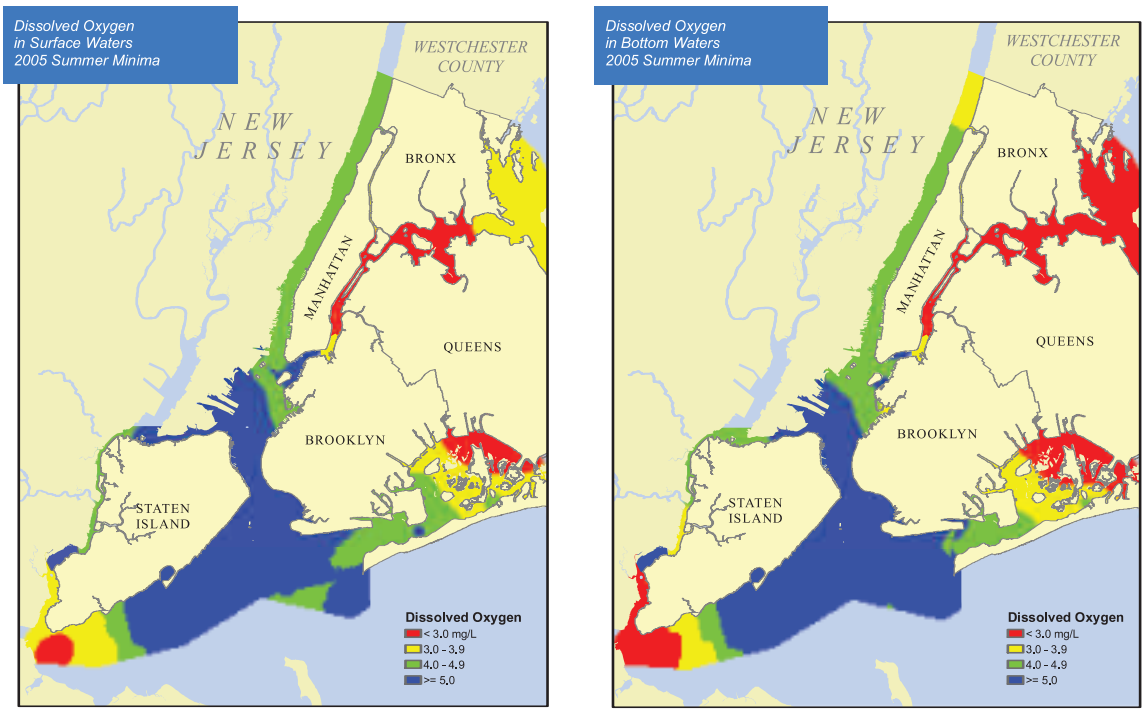
Dissolved Oxygen

2005 DO levels in the Upper East River and Western Long Island Sound are the lowest throughout the harbor. Bottom water average DO levels decreased further into the Sound.

Dissolved Oxygen in Surface and Bottom Waters
2005 Summer Averages



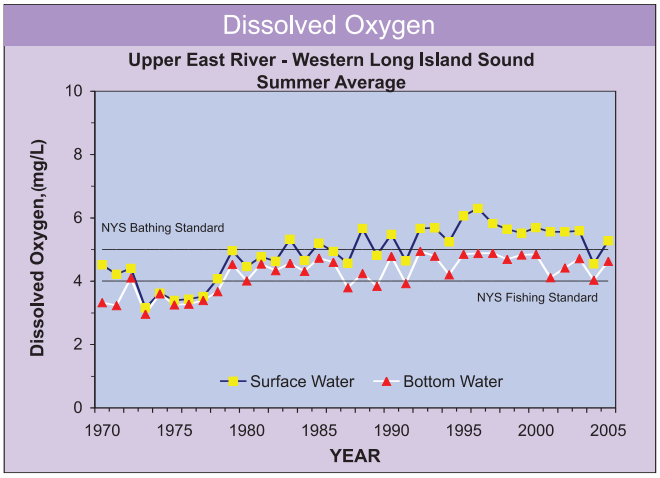
Dissolved Oxygen in Surface and Bottom Waters
2005 Summer Minima



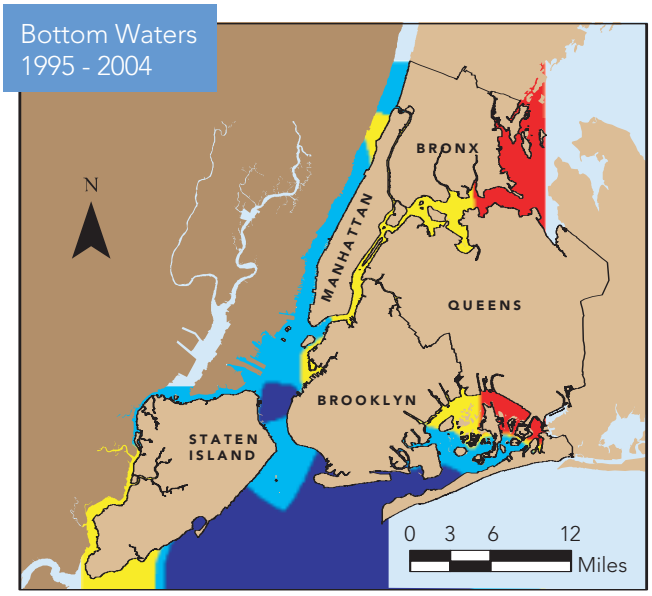
2005 Summer Minimum DO levels in the Upper East River Western Long Island Sound are the lowest throughout the Harbor.

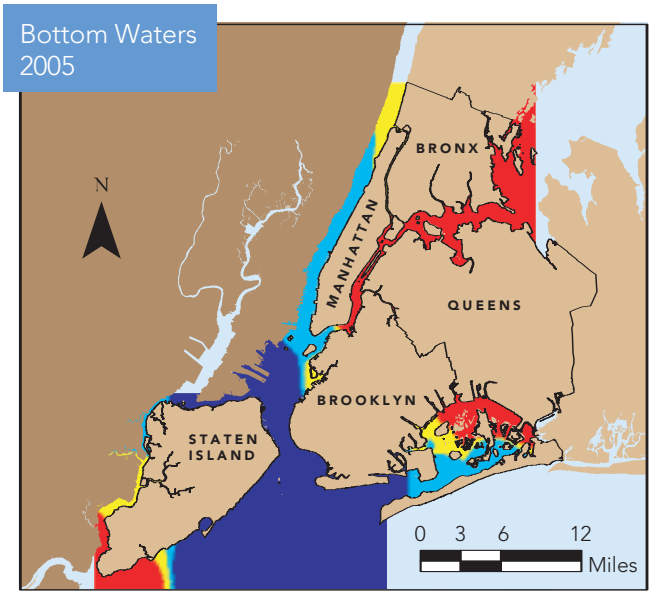
Incidents of hypoxia (DO <3.0mg/L) were measured in surface and bottom waters at all stations.

The extent and duration of hypoxia (DO<3.0mg/L) become significantly worse further into the Long Island Sound. Hypoxia events were recorded from July 18th through September 12th. Minimum DO levels were recorded on August 15th. The frequency and extent of hypoxia events are significantly worse traveling northeasterly from the East River into the Long Island Sound (from E2 to E4 to E6 &E14 to E7 to E8 to E10).



DISSOLVED OXYGEN IN BOTTOM WATERS 1995 - 2005 SUMMER MINIMA





< 3.0 mg/L 3.0 - 3.9 4.0 - 4.9 > 5.0

Summer bottom minimum DO levels decreased in the East River and Western Long Island Sound in 2005 compared with average minimum DO over the ten year period from 1995 – 2004.

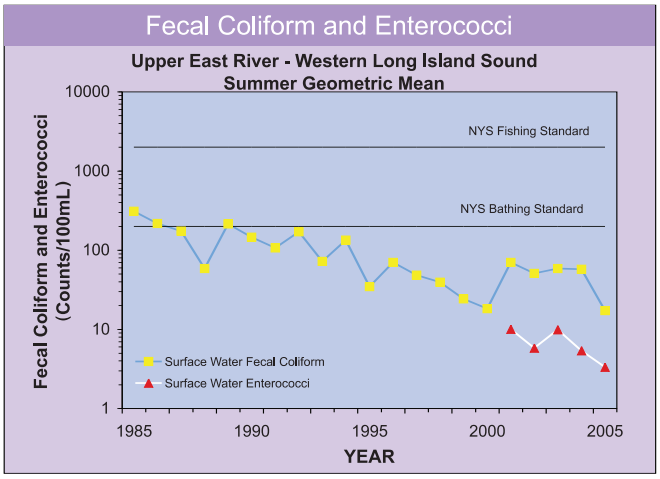
Furthermore, it is suggested that the spatial extent of hypoxia (DO<3.0mg/L) has become worse in recent years. More hypoxia events are recorded over a wider regional area in 2005 compared with the previous 10 years.

Bacteria

Average bacteria levels are low in the Upper East River – Western Long Island Sound region.

Average Fecal Coliform levels in 2005 remain below the 200 Count/100mL standard for a 30 day geometric mean of 5 or more samples.

Enterococci levels are on average less than 10 Count /100mL.



Lower New York Bay– Raritan Bay

The Lower NY Bay – Raritan Bay vicinity represents the most oceanic portion of the Harbor Survey Program. This 100 square mile area is represented by 5 survey stations and is composed mostly of open shallow waters, partially confined by Brooklyn's Coney Island to the north, Staten Island to the northwest, and New Jersey's Middlesex and Monmouth Counties and Sandy Hook to the south. The remainder of its eastern boundary is open to Rockaway Inlet and the greater Atlantic Ocean.

This area of the harbor is classified for bathing and other recreational use (SB). Portions of those waters are also designated for the permitted use of shellfishing (for relay to cleaner waters, but not for direct consumption), having a stricter use classification of SA.

Dissolved Oxygen

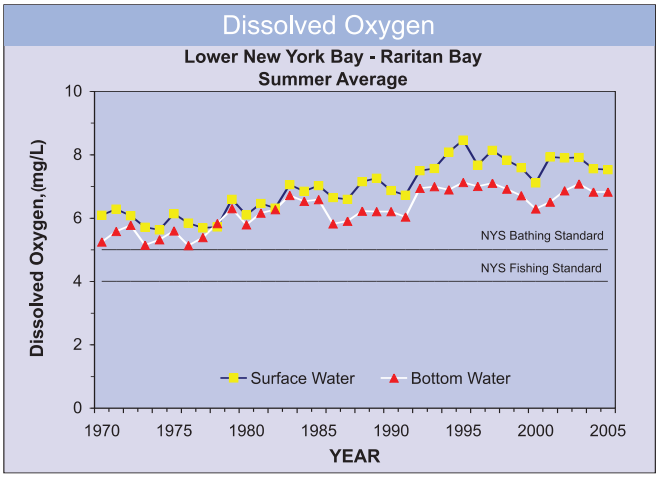
Average surface and bottom DO levels in Jamaica Bay are above NYSDEC standards.

2005 surface and bottom average summer DO levels were 7.53mg/L and 6.82mg/L.

Supersaturated DO levels are common in the Raritan Bay area because of algae blooms.

Low DO levels were sometimes measured at the station near the mouth of the Raritan River.

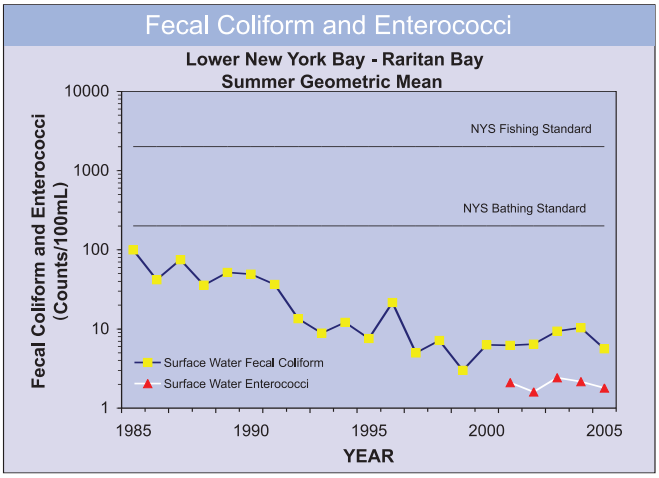
Average DO levels are the highest throughout NYC waterways at station K6 near Great Kills state park. Typically, saturated DO conditions exist at station K6 because of algae blooms.



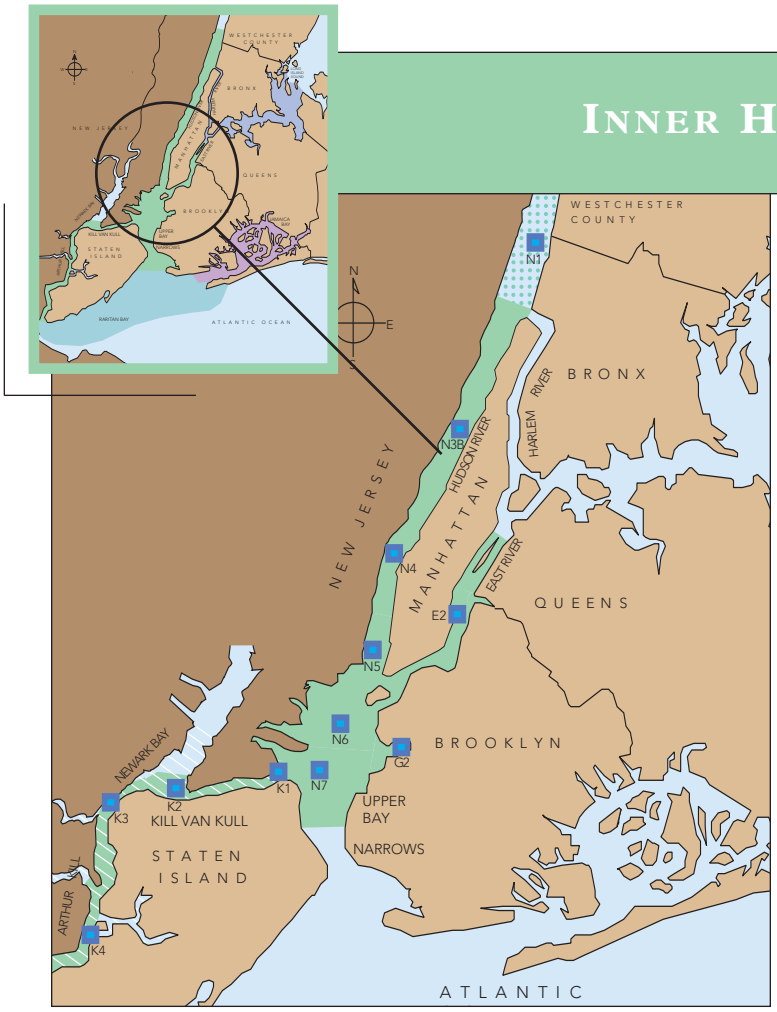
Bacteria

Bacteria levels remain low in the Lower Bay and Raritan Bay.

Fecal Coliform summer geometric means in 2005 were 6 Counts/100mL. Enterococci measures were similarly low.



Inner Harbor Area



The Inner Harbor area includes: the Hudson River from the NYC-Westchester line through the Battery to the Verrazano Narrows; the Lower East River to the Battery; and the Kill Van Kull-Arthur Kill system.

This area contains 14 survey stations that are grouped together due to common water uses and functions.

The Hudson River from North of the Harlem River to Westchester County is designated as SB fro bathing. Most of the Inner Harbor area excluding the Kills is classified by NYSDEC as (I), for uses such as fishing or boating. The area in the Kills is classified as SD for fish survival only.

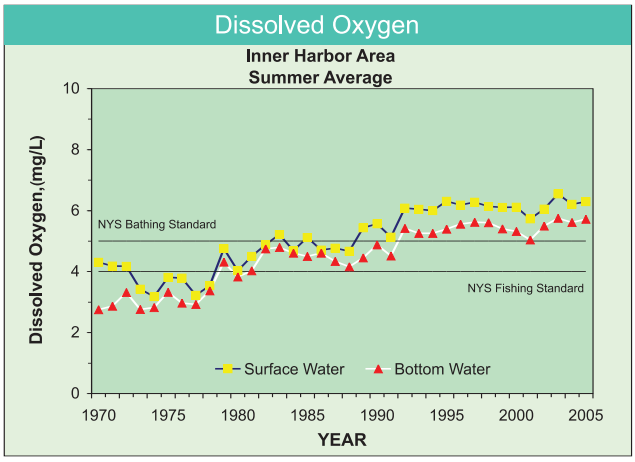
Dissolved Oxygen

Average surface and average bottom DO levels in the Inner Harbor are above NYSDEC standards for primary contact recreation and commercial fisheries during summer months.

Both surface and bottom average DO levels in the Inner Harbor region are near historic highs. 2005 surface and bottom average summer DO levels were 6.29mg/L and 5.72mg/L.

20% of both surface and bottom DO measurements in the lower East River station E2 failed to comply with its NYSDEC I classification and standard of 4.0mg/L.

27% of bottom DO measurements and 13% of surface DO measurements failed to comply with its NYSDEC SB classification and standard of 5.0mg/L.

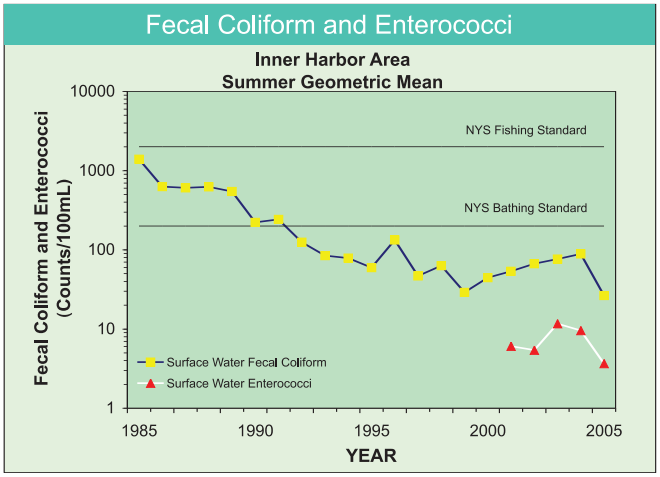


Bacteria

Bacteria levels remain low in the Inner Harbor region.

Fecal Coliform summer geometric means in 2005 were 27 Counts/100mL, well below the 200 Count/100mL standard for a 30 day geometric mean of 5 or more samples, and a historic low.

Enterococci levels are on average less than 4cells/100mL.



Tributary Surveys

Newtown Creek Background

Newtown Creek is a navigable channel draining into the East River and marks a border between Queens and Brooklyn. It is also the historic center of industry in the New York region. Industries continue to be the primary users of Newtown Creek. Industrial sites and the Newtown Creek Water Pollution Control Plant border its bulkheaded shoreline.

Water quality in Newtown Creek is influenced by: 1) direct discharges into the creek from CSOs, from the Newtown Creek Water Pollution Control Plant (WPCP), and from permitted industries; 2) limited water circulation between the creek and the Harbor; 3) oil that was spilled in the area over 50 years ago continues to seep out of the bulkhead along the south side of the waterway.

NYCDEP manages Capital projects and Pollution Control Programs affecting water quality in Newtown Creek. The major project is upgrading and expanding the Newtown Creek WPCP to achieve more stringent effluent limits. Newtown Creek WPCP interim upgrade construction is on target for completion in 2007.

2003 Secondary Treatment Upgrade Construction at Newtown Creek WPCP Construction

2005 Secondary Treatment Upgrade Construction at Newtown Creek WPCP Construction

2005 Newtown Creek Water Quality

The Harbor Survey Program monitored four sites in Newtown Creek during 2005 (NC0, NC1, NC2, NC3). Oxygen depletion, high bacteria levels, and algal blooms were measured in Newtown Creek.

DO, Bacteria, Nitrogen, and Chlorophyll a levels are shown from the mouth towards the head of Newtown Creek (NC3 to NC2 to NC1 to NC0). Data from East River survey points nearest Newtown Creek are also shown (station E2). Water quality deteriorates further into the creek. Conditions become increasingly hypoxic from creek mouth to creek head.

Characteristics of hypoxic conditions are: 1) low DO levels; 2) high bacteria levels; 3) increased reduced forms of Nitrogen; 4) decreased oxidized forms of Nitrogen; 5) high Chl 'a' levels.

DO levels were depleted near the head of Newtown Creek (NC0). Annual average surface DO at the creek mouth (NC3) was 3.44mg/L +/- 0.64mg/L (n=15). DO levels in the East River were 4.80mg/L +/-0.53mg/L (n=15). Surface DO decreased further into the creek (Figure a). Surface DO was 0.86mg/L at the creek head (NC0). Hypoxic conditions are common at the creek head. Further effects of hypoxia are observed in nitrogen levels.

Annual average surface Nitrogen levels are shown (Figure b). Nitrogen in the form of nitrates and nitrites (oxidized forms) are compared with nitrogen from ammonium (reduced forms). Oxidized nitrogen decreases and reduced nitrogen increases from NC3 to NC0. The trend is characteristic of hypoxic conditions further into the creek.

High bacteria populations were measured in Newtown Creek during 2005. Annual Average Fecal Coliform and Enterococci levels were far higher than levels found in the East River (Figure c). Furthermore, bacteria levels increase from mouth to head.

Average and maximum Chlorophyll a levels in Newtown Creek are among the highest measured throughout the harbor. Large differences between maximum and minimum levels indicate algal blooms (Figure d). When the algae die they sink to the bottom sediment and are decomposed by bacteria. Algal blooms deteriorate water quality because decomposition of dead algae leads to oxygen depletion.

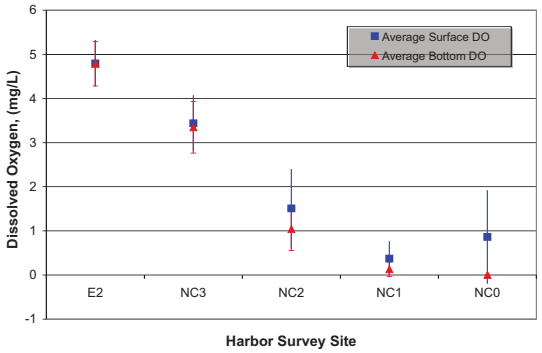


Figure a. 2005 Newtown Creek Dissolved Oxygen

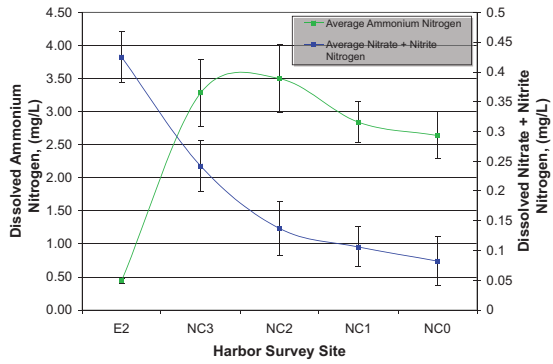


Figure b. 2005 Newtown Creek Nutrient Levels

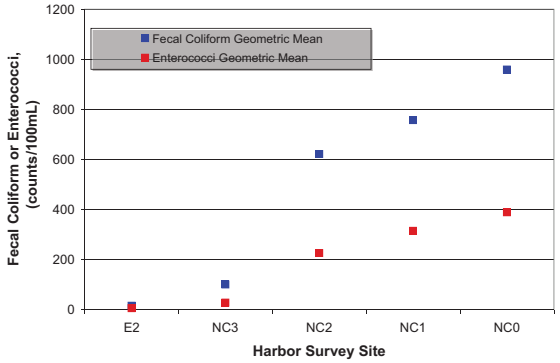


Figure c. 2005 Newtown Creek Bacteria Levels

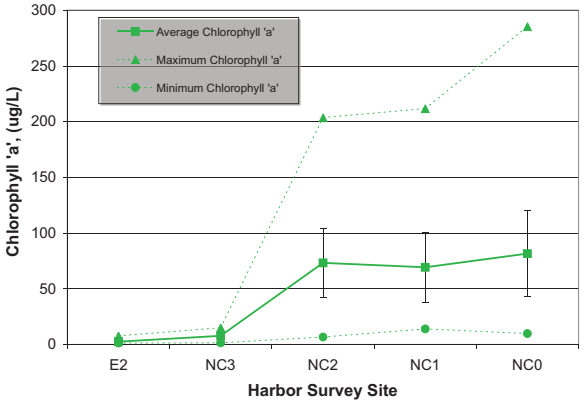


Figure d. 2005 Newtown Creek Chlorophyll 'a'

DEP Program

LONG-TERM CSO CONTROL PLANNING PROJECT

In 2004, the New York City Department of Environmental Protection (DEP) began to develop a Long-Term CSO Control Plan (LTCP) to address the impacts of combined sewer overflow (CSO) to water quality and uses in the New York Harbor. The combined sewer collection system delivers over 1.8 billion gallons per day of flow to the City's 14 water pollution control plants during dry weather and up to 3.6 billion gallons per day during wet weather. However, when the capacity of the collection system is exceeded during wet weather, a mixture of stormwater and sanitary wastewater can be discharged from over 450 CSO outfall locations along the shores of New York Harbor. The volume of these CSO discharges impairs the City's ability to meet water quality standards.

The LTCP Project aims to improve water quality in New York City through a comprehensive examination of 18 watershed planning areas and all waterbodies that receive CSO discharges. The watershed-based approach considers all causes of non-attainment of water quality standards and identifies opportunities for maximizing beneficial uses.

The LTCP for each waterbody will include a thorough characterization of the collection system, and will evaluate alternative abatement strategies based on cost and performance considerations, public participation, and direct impacts to critical habitat, beaches, and other sensitive areas. Existing and planned CSO abatement facilities will be incorporated into each LTCP as appropriate, and the final plan will commit to an implementation schedule with compliance monitoring to ensure that anticipated water quality improvements are realized in a timely fashion. A final City-wide LTCP is scheduled for completion in 2017 and will integrate all LTCPs from the watershed planning areas.

The LTCP Project is part of the City's ongoing commitment to environmental stewardship, and is a positive step towards achieving the fishable and swimmable water quality goals of the Clean Water Act throughout New York Harbor, ensuring that future generations can enjoy the benefits of this important natural resource.

Staten Island Bluebelt

The Staten Island Bluebelt a cost-effective storm water management for approximately one third of Staten Island's land area. The program preserves natural drainage corridors, called Bluebelts, including streams, ponds, and other wetland areas. Preservation of these wetland systems allows them to perform their functions of conveying, storing, and filtering storm water. In addition, the Bluebelts provide important community open spaces and diverse wildlife habitats. The Bluebelt program saves tens of millions of dollars in infrastructure costs when compared to providing conventional storm sewers for the same land area. This program demonstrates how wetland preservation can be economically prudent and environmentally responsible.

A watershed is a geographic area that contributes water to a particular stream or water body. The current Bluebelt system drains 15 watersheds clustered at the southern end of the Island, plus the Richmond Creek watershed. The combined area of these 16 watersheds totals approximately 10,000 acres.

The New York City Department of Environmental Protection (DEP) has completed new drainage plans for these 16 watersheds. These plans connect the natural drainage corridors with conventional storm sewers for an integrated storm water management system.

The wetlands located within the watershed areas act as flood control measures. By temporarily storing floodwaters, wetlands help protect adjacent and downstream property owners from flood damage. Urban wetlands are especially valuable in this regard because the impervious surfaces created by urban development, like streets and rooftops, increase the rate, velocity and volume of surface water runoff.

DEP has an ongoing program to purchase wetland properties for inclusion into the Bluebelt system. Other publicly and privately owned wetland areas are also incorporated into the system. These properties include New York City park land, New York State wetland preserves, Designated Open Space, and other City-owned properties.

How Does the Bluebelt Work

1. Construct storm water wetland
2. Stream restoration
3. Sand filter
4. Retrifit of existing pond
5. Culvert improvements
6. Stream daylighting and meandering
7. Outlet stilling basin

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEP

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