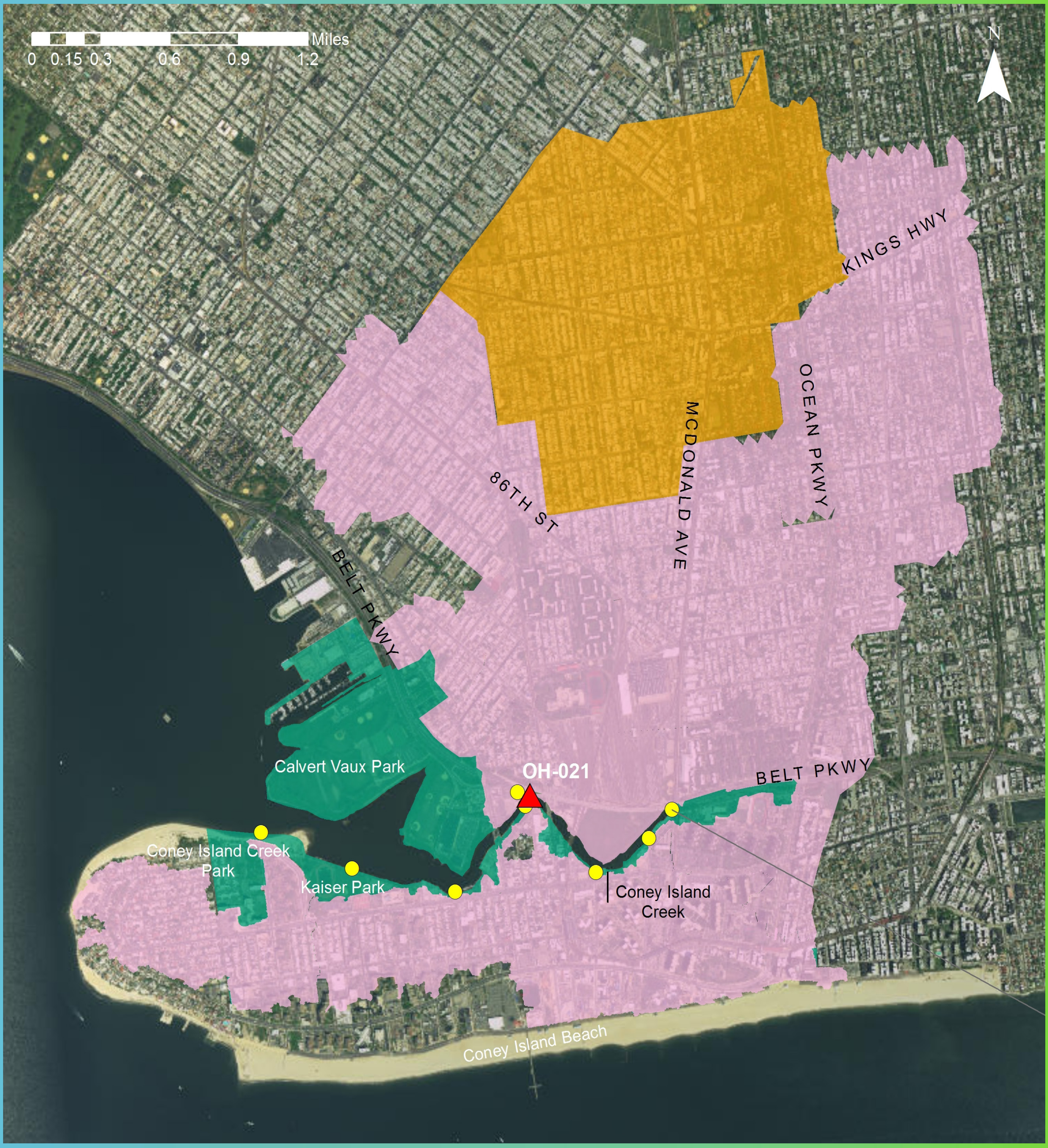
New York City Department of Environmental Protection

Capital Project No. WP-169
Long Term Control Plan II

Combined Sewer Overflow Long Term Control Plan for Coney Island Creek



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The City of New York
Department of Environmental Protection
Bureau of Wastewater Treatment

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EXECUTIVE SUMMARY

This Executive Summary is organized as follows:

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- Findings — A summary of the key findings of the water quality (WQ) data analyses, the WQ modeling simulations and the alternatives analysis.
- Evaluations and Conclusions — A list of assessments that are consistent with the Federal Combined Sewer Overflow (CSO) Control Policy and the Clean Water Act (CWA).

1. BACKGROUND

The New York City (NYC) Department of Environmental Protection (DEP) prepared this Long Term Control Plan (LTCP) for Coney Island Creek pursuant to a CSO Consent Order (Department of Environmental Conservation (DEC) Case No. CO2-20110512-25), dated March 8, 2012 (2012 CSO Consent Order), which modified a 2005 CSO Consent Order (DEC Case No. CO2-20000107-8). Under the 2012 CSO Consent Order, DEP is required to submit 11 waterbody-specific LTCPs to DEC by December 2017. The Coney Island Creek LTCP is the seventh of those LTCPs.

As described in the LTCP Goal Statement in the 2012 CSO Consent Order, the goal of each LTCP is to identify, with public input, appropriate CSO controls necessary to achieve waterbody-specific water quality standards (WQS), consistent with the Federal CSO Control Policy and related guidance. In addition, the Goal Statement provides: *"Where existing water quality standards do not meet the Section 101(a)(2) goals of the Clean Water Act, or where the proposed alternative set forth in the LTCP will not achieve existing water quality standards or the Section 101(a)(2) goals, the LTCP will include a Use Attainability Analysis examining whether applicable waterbody classifications, criteria, or standards should be adjusted by the State."* DEP conducted water quality assessments where the data is represented by percent attainment with pathogen targets and associated recovery times. Consistent with guidance from DEC, 95 percent attainment of applicable water quality criteria constitutes compliance with the existing WQS or the Section 101(a)(2) goals, conditioned on verification through post-construction compliance monitoring (PCM).

Regulatory Requirements

The waters of NYC are subject to Federal and New York State (NYS) laws and regulations. The U.S. Environmental Protection Agency (EPA) has issued a CSO Control Policy, which provides guidance on the development and implementation of LTCPs and the establishment of WQS. In NYS, CWA regulatory and permitting authority has been delegated to DEC.

DEC has designated Coney Island Creek as a Class I waterbody. The best usages of Class I waters are secondary contact recreation and fishing. These waters "shall be suitable for fish, shellfish, and wildlife propagation and survival" and the water quality "shall be suitable for primary contact recreation, although other factors may limit the use for this purpose" (6 NYCRR 701.13). Figure ES-1 shows the Coney Island Creek watershed.

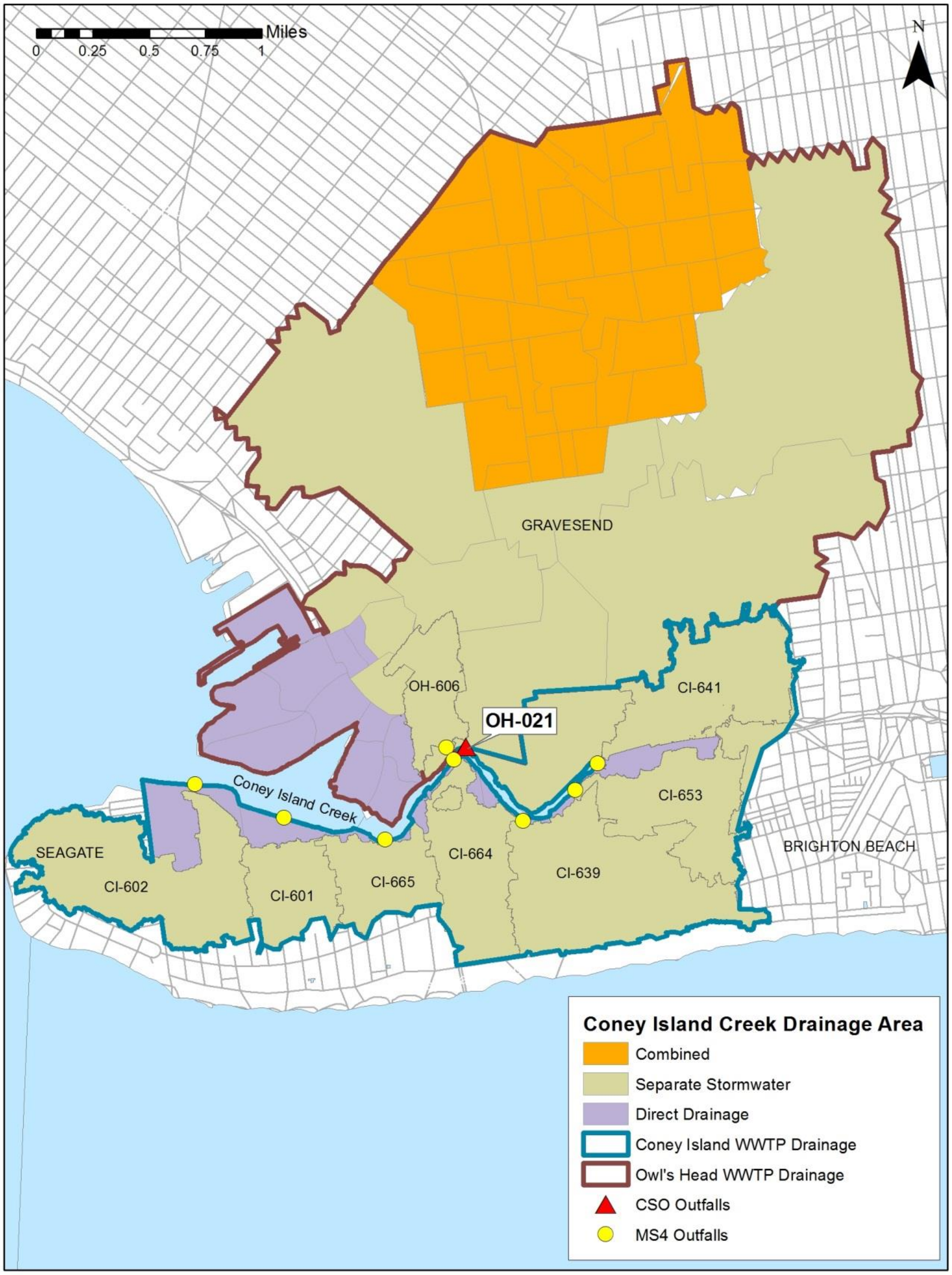

Figure ES-1. Coney Island Creek Watershed Characteristics

The criteria assessed in this Coney Island Creek LTCP include the Existing WQ Criteria (Class I), and Bacteria Primary Contact WQ Criteria/Dissolved Oxygen (DO) Class SC criteria. Enterococci criteria do not apply to tributaries such as Coney Island Creek under the Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000. However, because the 2012 EPA Recreational Water Quality Criteria (RWQC) recommended certain changes to the bacterial water quality criteria for primary contact, this LTCP includes attainment analyses for both current WQ criteria and for the proposed 2012 EPA RWQC (referred to hereinafter as the "Potential Future Primary Contact WQ Criteria"). These criteria include a 30-day rolling geometric mean (GM) for enterococci of 30 cfu/100mL, with a not-to-exceed 90th percentile statistical threshold value (STV) of 110 cfu/100mL.

Table ES-1 summarizes the Existing WQ Criteria, Bacteria Primary Contact WQ Criteria/DO Class SC Criteria and Potential Future Primary Contact WQ Criteria applied in this LTCP.

Table ES-1. Classifications and Standards Applied

Analysis	Numerical Criteria Applied	
Existing WQ Criteria	Class I	Fecal Monthly GM ≤ 200; DO never <4.0 mg/L
Bacteria Primary Contact WQ Criteria(1) / DO Class SC	Class SC	Fecal Monthly GM ≤ 200 Daily Average DO ≥ 4.8 mg/L; DO never < 3.0 mg/L
Potential Future Primary Contact WQ Criteria(2)	Entero: rolling 30-d GM – 30 cfu/100mL Entero: STV – 110 cfu/100mL	

Notes:
GM = Geometric Mean; STV = 90 Percent Statistical Threshold Value
(1) This water quality standard is not currently assigned to Coney Island Creek.
(2) DEC has not yet adopted the Potential Future Primary Contact WQ Criteria.

Coney Island Creek Watershed

The Coney Island Creek watershed characteristics and the CSO and stormwater outfalls are shown in Figure ES-1. Coney Island Creek is a saline waterbody located near the southwestern shore of the Borough of Brooklyn. Coney Island Creek is tributary to Gravesend Bay, and the Bay is tributary to the Lower New York Bay. Water quality in Coney Island Creek is influenced by multiple sources, including stormwater discharges, dry-weather sources and CSOs. The Coney Island Creek watershed comprises approximately 3,470 acres and the majority of the land immediately surrounding the shoreline is comprised primarily of industrial and commercial uses. The urbanization of the Coney Island Creek watershed has led to the creation of a large combined sewer system (CSS), as well as areas served by separate sanitary sewer systems (SSS). Stormwater drainage systems were also developed that discharge directly to Coney Island Creek, or to a nearby CSS. As shown in Figure ES-1, the Coney Island Creek watershed is served by the Owls Head (OH) Wastewater Treatment Plant (WWTP) and Coney Island (CI) WWTP service areas. Dry-weather flow is conveyed to the WWTPs for treatment. During wet-weather, the combined sewage flow that exceeds the capacity of the CSS discharges through CSO

Outfall OH-021 to Coney Island Creek. A total of eight State Pollution Discharge Elimination System (SPDES)-permitted Municipal Separate Storm Sewer System (MS4) outfalls also discharge to Coney Island Creek.

Green Infrastructure

Coney Island Creek is not a priority target area for DEP's Green Infrastructure (GI) Program. Nevertheless, DEP projects that by 2030, GI penetration rates will manage one percent of the impervious surfaces within the Coney Island Creek combined sewer service area due to right-of-way (ROW) practices, public property retrofits, and GI implementation on private properties. This projection also includes conservatively estimated new development trends based on NYC Department of Buildings (DOB) building permit data to account for compliance with DEP's citywide stormwater performance standard during the years 2013-2030.

As LTCPs are developed, baseline GI penetration rates for specific watersheds may be adjusted based on the adaptive management approach described in Section 5.2. As more information on field conditions, feasibility, and costs becomes known, and as GI projects progress, DEP will continue to model the GI penetration rates and make necessary adjustments as appropriate.

2. FINDINGS

Current Water Quality Conditions

Water quality analyses in Coney Island Creek were based, in part, on Harbor Survey Monitoring (HSM) Program data collected since 2014 and sampling conducted in support of the Coney Island Creek LTCP in March and August 2014. The sampling stations are shown in Figure ES-2.

Figure ES-3 presents fecal coliform bacteria data collected at Stations CI-2 to CI-5, for a period prior to completion of the Avenue V Pumping Station upgrade (January 2013 to October 2014), and a period after completion of the upgrade (October 2014 to August 2015). Figure ES-4 presents the enterococci data and Figure ES-5 shows the DO data for the concurrent periods. The figures represent data that were collected by multiple parties including the LTCP Program, HSM, and the Sentinel Monitoring (SM) Program.

As shown in Figure ES-3, the wet-weather fecal coliform data at Stations HSM-CIC2 and HSM-CIC3 reflects an improvement in water quality after completion of the Avenue V Pumping Station upgrade. Prior to the upgrade, the wet-weather fecal coliform geomeans were higher than the dry-weather geomeans at each sampling station. After completion of the upgrade, the wet-weather fecal coliform geomeans were much closer to the dry-weather geomeans at each station. As indicated in Figures ES-4 and ES-5, no improvement of enterococci or DO levels was observed for the concurrent period.

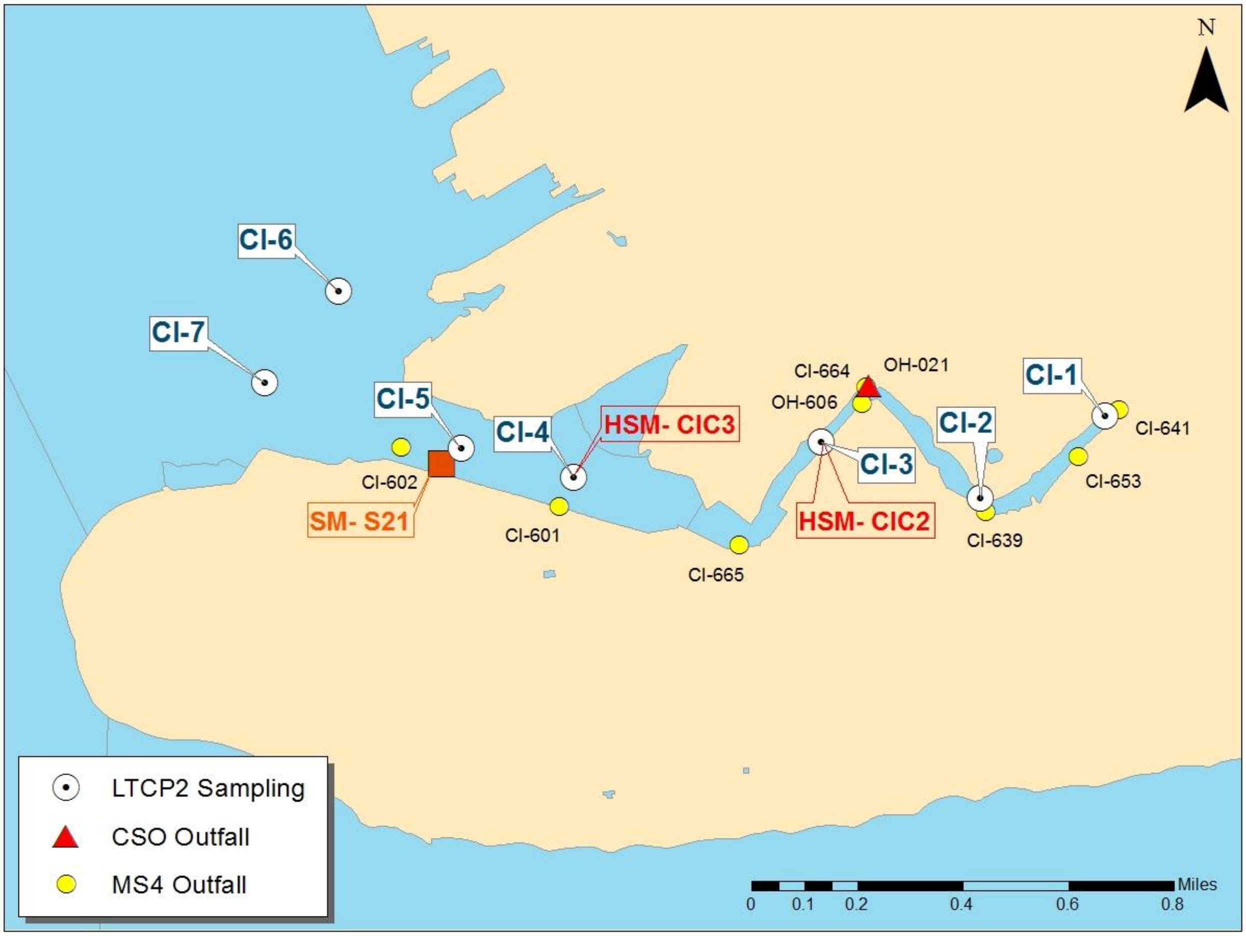

Figure ES-2. Coney Island Creek HSM Program and Dry-Weather LTCP Sampling Stations

The statistics shown in these figures were derived primarily from the HSM dataset. These statistics include 26 dry-weather data points measured at Stations CI-3 (HSM-CIC2) and CI-4 (HSM-CIC3) during two dry-weather sampling periods conducted by the LTCP Program in March 2014 and August 2014, prior to the Avenue V Pumping Station upgrade becoming fully operational in October 2014.

Many of the dry-weather fecal coliform measurements were above 10,000 cfu/100mL at Station CIC-2. This data indicates the presence of potential dry-weather discharges towards the head end of the waterbody. DEP has been proactive in identifying and abating illicit connections in the Coney Island Creek watershed, but its trackdown has not yielded a number of illicit residential connections as might be commensurate with the elevated fecal coliform data observed by the HSM data. Where illicit connections were discovered, DEP issued Commissioner's Orders for their removal, as documented in letters to DEC in September 2014 and in January 2016. Between August 2014 and January 2016, DEP inspected 53 establishments and identified 10 with illicit connections, for which it issued Commissioner's Orders for their removal. Eight of those 10 have been abated. Because DEP's trackdown efforts have not yielded a number of improperly connected residences as might be consistent with the elevated fecal coliform data observed by the HSM Program, investigations continue. However, those investigations are impacted by the extensive, simultaneous sewer improvement work.

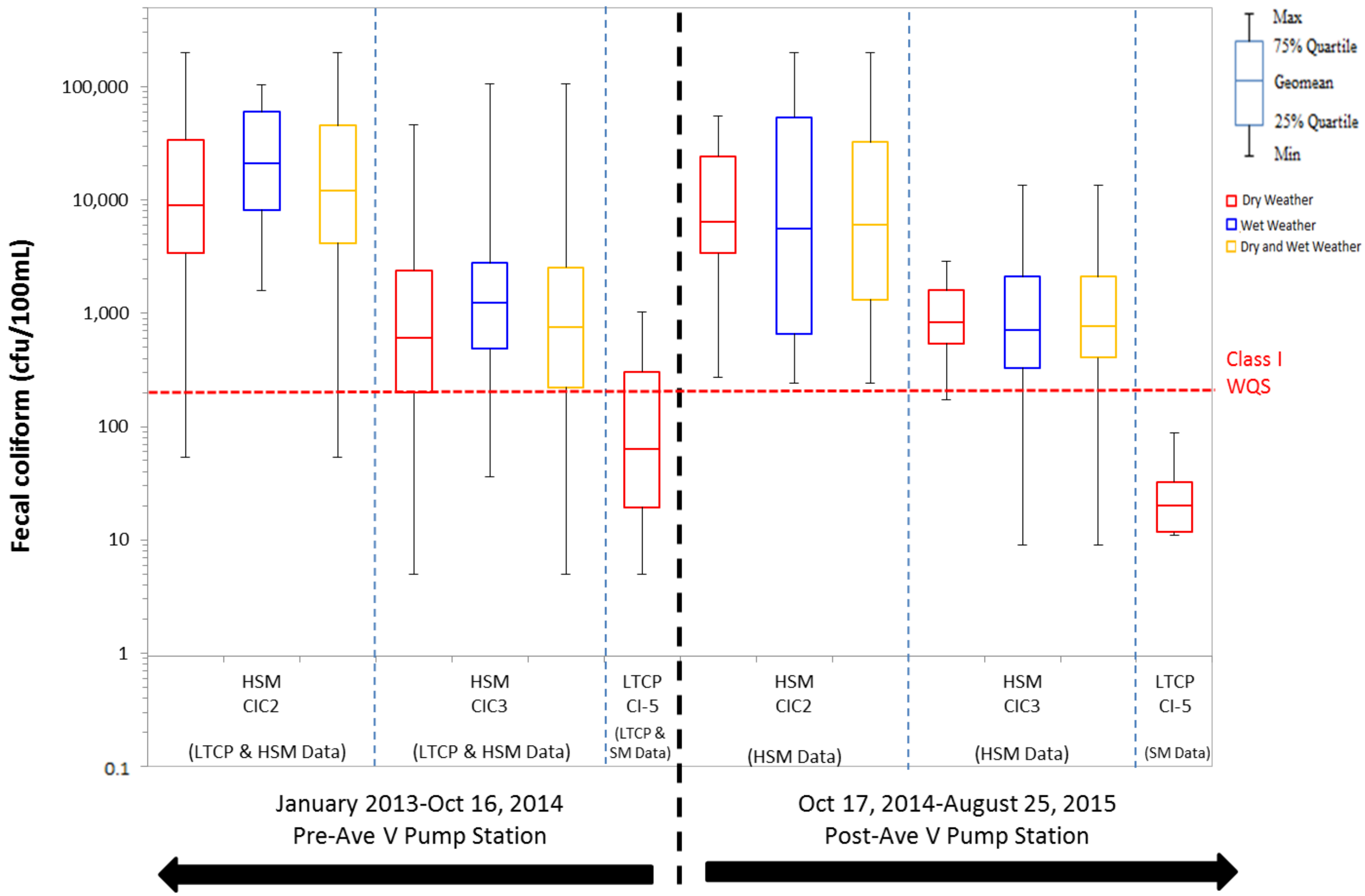

Figure ES-3. Fecal Coliform Statistics Derived From Recent Coney Island Creek Water Quality Data

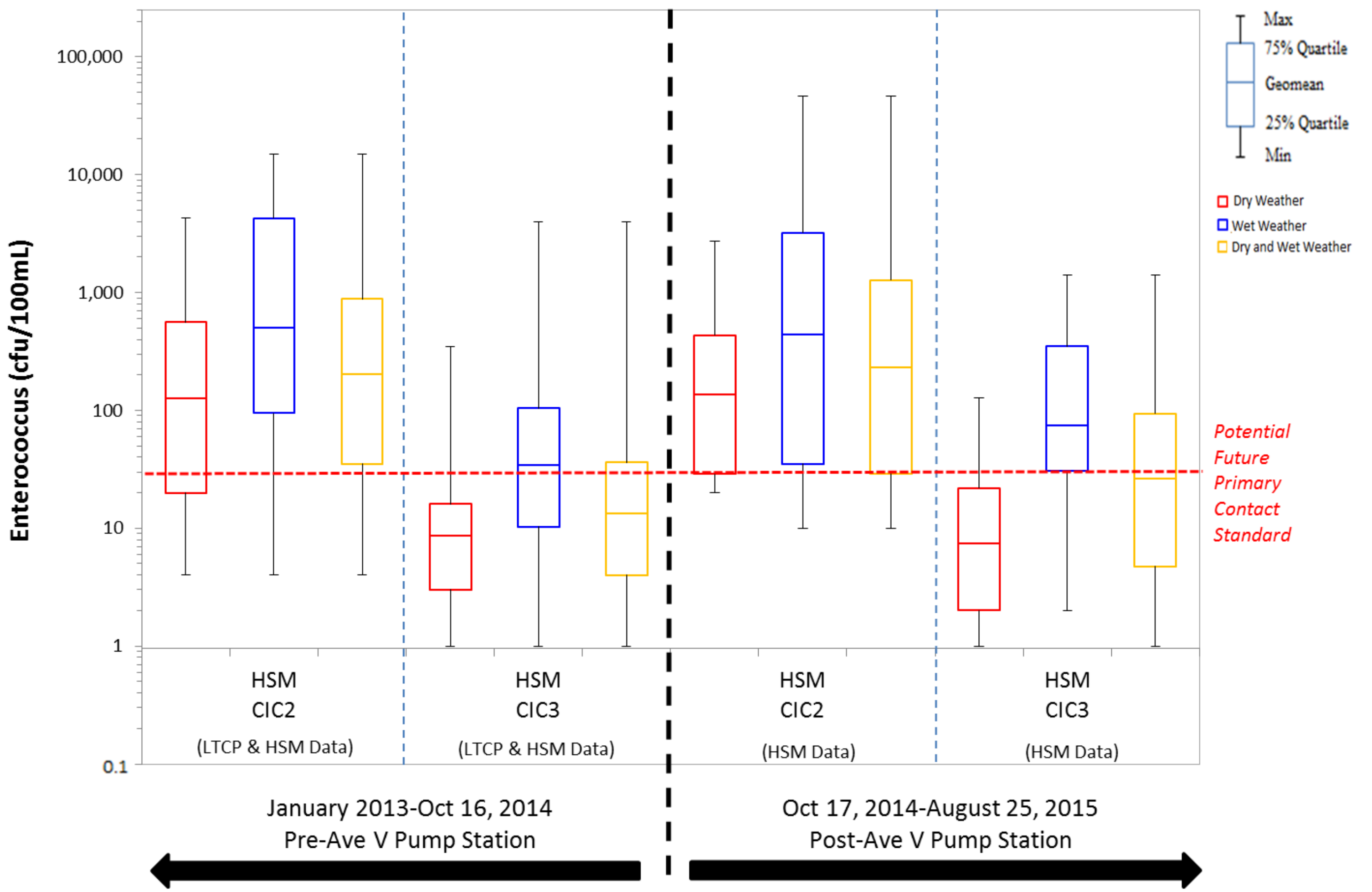

Figure ES-4. Enterococci Statistics Derived From Recent Coney Island Creek Water Quality Data

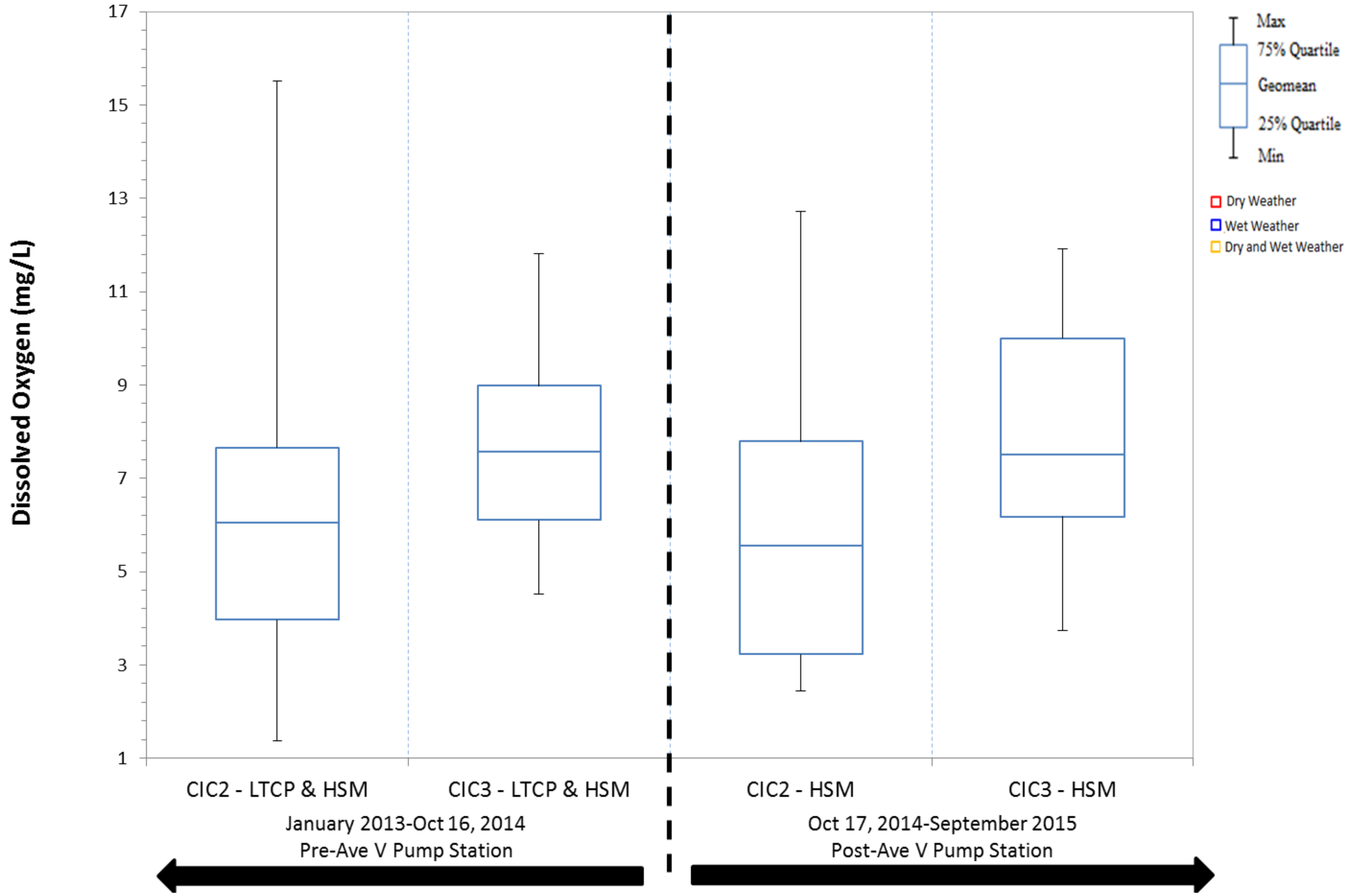

Figure ES-5. DO Statistics Derived From Recent Coney Island Creek Water Quality Data

A review of the bacteria data revealed a ratio of fecal coliform to enterococcus bacteria observed in the dry-weather receiving water samples approximately 100 times higher than the ratios observed in samples of stormwater and CSO that discharge into Coney Island Creek. Because of this finding, together with the elevated fecal coliform levels in the interior portions of Coney Island Creek disproportionately high relative to the small number of illicit connections discovered, DEP has undertaken additional evaluations of bacteria samples. These ongoing evaluations are targeted toward identifying whether some other type of interference is affecting the fecal coliform bacteria counts.

Baseline Conditions, 100% CSO Control and Performance Gap

Computer models were used to assess attainment with Existing WQ Criteria (Class I), Bacteria Primary Contact WQ Criteria and Potential Future Primary Contact WQ Criteria. The analyses focused on two primary objectives:

1. Determine the levels of compliance with water quality criteria under future baseline conditions, defined as conditions with sanitary flows based on 2040 population projections, with all other sources being discharged at existing levels to the waterbody. The sources would primarily be stormwater, direct drainage runoff, and CSO. This analysis is presented for Existing WQ Criteria, Bacteria Primary Contact WQ Criteria and Potential Future Primary Contact WQ Criteria.
2. Determine potential attainment levels without discharge of CSO to the waterbody (100 percent control), keeping the remaining non-CSO sources. This analysis is presented for the criteria shown in Table ES-1.

DEP assessed water quality using the Coney Island Creek Water Quality Model (CICWQM). This was an existing model that was updated and validated using receiving water data collected throughout 2014. Model outputs for fecal and enterococci bacteria, as well as for DO, were compared with monitored data sets during validation. This improved the accuracy and robustness of the models for LTCP evaluations. The InfoWorks CS™ (IW) sewer system model was used to provide flows and loads from intermittent wet-weather sources as input to the CICWQM water quality model. The water quality model was then used to calculate ambient pathogen concentrations within the waterbody for a set of baseline conditions.

Baseline conditions were established in accordance with the guidance provided by DEC to represent future conditions. Baseline conditions included the following assumptions: (1) the design year for projected future flows was established as 2040; (2) the Owls Head WWTP would receive peak flows at two times design dry-weather flow (2xDDWF) or wet-weather capacity of 240 million gallons per day (MGD); (3) grey infrastructure would include those elements recommended in the 2011 Waterbody/Watershed Facility Plan (WWFP); and (4) waterbody-specific GI application rates would be based on the best available information. In the case of the Coney Island Creek project area, GI was assumed to have one percent coverage.

The water quality assessments were conducted using continuous water quality simulations. A one-year (2008 rainfall) simulation for bacteria and DO assessment was used to support alternatives evaluation. A 10-year (2002 to 2011 rainfall) bacteria simulation for attainment analysis was used for the Preferred Alternative. The gaps between calculated baseline concentrations of bacteria, as well as DO, were then compared to the applicable pathogen and DO criteria to quantify the level of attainment.

Table ES-2 summarizes the baseline annual and recreational season (May 1st through October 31st) attainment of bacteria Existing WQ Criteria for the 2008 rainfall year, together with the maximum monthly fecal coliform geometric means. Non-recreation season fecal coliform GMs tend generally to be higher than recreation season GMs because bacteria have slower die-off rates at colder temperatures. For 2008, the larger disparity is due to more hours of precipitation and a greater volume of precipitation during the maximum GM month in the non-recreation season. As shown, all stations along Coney Island Creek meet Existing WQ Criteria in the recreational season (May 1st through October 31st), and Stations CI-6 and CI-7, near the mouth, meet the criteria on an annual basis. As shown in Table ES-3, DO is nearly attained for the Existing WQ Criteria with the exception of Station CI-1 where the projected attainment is 90 percent, due to poor tidal exchange and wet-weather non-CSO loading sources.

Table ES-2. Calculated 2008 Baseline Fecal Coliform Maximum Monthly GM and Attainment of Existing WQ Criteria

Station		Maximum Monthly Geometric Means (cfu/100mL)		% Attainment	
		Annual	Recreational Season	Annual	Recreational Season(1)
CI-1	Class I	1,600	99	58	100
CI-2		1,497	96	58	100
CI-3		858	56	75	100
CI-4		300	25	83	100
CI-5		276	25	83	100
CI-6		185	21	100	100
CI-7		157	16	100	100

Notes:
(1) The Recreational Season is from May 1st through October 31st. Class I standard of fecal coliform is 200 cfu/100ml.

Table ES-3. Calculated Baseline DO Attainment – Existing WQ Criteria (2008) Station

Station		DO Annual Attainment (%)
		Entire Water Column
		≥ 4.0 mg/L
CI-1	Class I	90
CI-2		95
CI-3		96
CI-4		98
CI-5		99
CI-6		99
CI-7		99

Levels of attainment for the Bacteria Primary Contact WQ Criteria on an annual or recreational season (May 1st through October 31st) basis are the same as those shown for the bacteria Existing WQ Criteria in Table ES-2, given that both standards share the same fecal coliform numerical threshold. All stations in Coney Island Creek are in attainment during the recreational season (May 1st through October 31st). On an annual basis, attainment at Stations CI-1 through CI-5 ranges from 58 to 83 percent attainment.

Table ES-4 presents a comparison of the maximum monthly geometric means and annual percent attainment for baseline conditions and 100% CSO control. The data in Table ES-4 show that CSO is a relatively minor contributor to the maximum monthly fecal coliform GM. The largest impact of the 100% CSO control scenario is calculated at the head end where there is a decrease of 64 cfu/100mL from the baseline GM of 1,600 cfu/100mL. The minimal impact of CSO is not unexpected as the upgrade of the Avenue V Pumping Station has resulted in a significant decrease in the annual CSO volume and number of CSO activations. The results also indicate there would be no change in attainment of the Class SC fecal coliform criterion due to the complete control of Coney Island Creek CSO loadings. Based on these results, the complete control of the Coney Island Creek CSO loadings alone will not close the gap between the 2008 baseline annual attainment of the Class SC fecal coliform criterion and full annual attainment. The remaining non-attainment in the non-recreational season (November 1st through April 30th) is attributable to non-CSO sources.

Table ES-4. Comparison of the Calculated 2008 Baseline and 100% Coney Island Creek CSO Control Fecal Coliform Maximum Monthly GM and Attainment of Bacteria Primary Contact WQ Criteria

Station		Maximum Monthly Geometric Means (Annual)		% Attainment (Annual)	
		Baseline	100% CSO Control	Baseline	100% CSO Control
CI-1	Class SC	1,600	1,536	58	58
CI-2		1,497	1,434	58	58
CI-3		858	809	75	75
CI-4		300	283	83	83
CI-5		276	261	83	83
CI-6		185	182	100	100
CI-7		157	153	100	100

The attainment of the DO Class SC criteria for the entire water column is presented in Table ES-5 for baseline and 100% CSO control conditions. The attainment of the daily average of greater than or equal to 4.8 mg/L is lower than the 95 percent annual target in the upper portion of the Creek, but reaches the target by Station CI-5. Attainment of the never less than 3.0 mg/L DO criterion is met at least 95 percent of the time throughout the Creek on an annual basis for the 2008 baseline conditions. Complete or 100% CSO control does not result in significant improvements in attainment of the Class SC DO criterion and, as such, does not close the gap between attainment and non-attainment.

Table ES-5. Model Calculated 2008 Baseline and 100% CSO Control DO Attainment of Class SC WQ Criteria

Station		Annual Attainment Percent Attainment (Water Column)			
		Baseline		100% Coney Island Creek CSO Control	
		≥ 4.8 mg/L	> 3.0 mg/L	≥ 4.8 mg/L	> 3.0 mg/L
CI-1	Class SC	82	95	86	97
CI-2		92	98	93	98
CI-3		92	99	93	99
CI-4		94	100	94	100
CI-5		95	100	95	100
CI-6		95	100	95	100
CI-7		97	100	97	100

The Potential Future Primary Contact WQ Criteria attainment for baseline conditions, 2008 recreational season (May 1st through October 31st), is shown below in Table ES-6. Attainment of the potential future primary contact GM criterion is poor in the upper end of the Creek with attainment ranging from 52 to 70 percent for the recreation season (May 1st through October 31st). The upper end of the Creek is close to non-CSO wet-weather bacteria sources and has reduced tidal flushing. The lower end of the Creek has full attainment of the GM criterion under these conditions. Table ES-6 shows there is essentially no attainment of the 90th percentile STV criterion in the upper end of the Creek, and attainment ranges between 10 and 69 percent in the lower end of the Creek. As shown in Table ES-7, minimal improvement in attainment of the Potential Future Primary Contact WQ Criteria would be realized from 100% CSO control.

Table ES-6. Calculated 2008 Baseline Enterococci Maximum 30-day GM and Seasonal Attainment of Potential Future Primary Contact WQ Criteria

Station		Maximum Recreational Season(1) 30-day Enterococci (cfu/100mL)		% Attainment	
		GM	90th Percentile STV	GM	90th Percentile STV
CI-1	Saline	155	5,203	52	0
CI-2		151	5,285	53	0
CI-3		83	2,524	70	2
CI-4		28	809	100	10
CI-5		27	857	100	10
CI-6		12	252	100	69
CI-7		11	262	100	65

Notes:
(1) The Recreational Season is from May 1st through October 31st.

Table ES-7. Calculated 2008 100% CSO Control Enterococci Maximum 30-day GM and Attainment of Potential Future Primary Contact WQ Criteria

Station		Maximum Recreational Season(1) 30-day Enterococci (cfu/100mL)		% Attainment	
		GM	90th Percentile STV	GM	90th Percentile STV
CI-1	Saline	155	4,844	54	0
CI-2		151	4,997	56	0
CI-3		83	2,306	75	2
CI-4		28	611	100	10
CI-5		27	627	100	11
CI-6		12	207	100	71
CI-7		11	218	100	69

Notes:
(1) The Recreational Season is from May 1st through October 31st.

The baseline modeling showed that Coney Island Creek exhibits a high level of attainment of the fecal coliform Primary Contact WQ criterion during the recreational season (May 1st through October 31st) and Class I DO on an annual basis. However, attainment of the fecal coliform Primary Contact WQ criterion drops below 95 percent at the upper reach of the Creek, from Stations CI-1 through CI-5, on an annual basis. The attainment levels with the Potential Future Primary Contact WQ Criteria are much lower throughout the Creek. Providing 100% CSO control is not predicted to significantly change the attainment of WQ criteria in Coney Island Creek.

Public Outreach

DEP's comprehensive public participation plan ensured that interested stakeholders were involved in the LTCP process. Stakeholders included local residents and citywide and regional groups, a number of whom offered comments at two public meetings held for this LTCP. DEP received a letter from the S.W.I.M. Coalition. DEP will continue to gather public feedback on waterbody uses and will provide further information to the public at a third Coney Island Creek Public Meeting. The third meeting will present the identified Preferred Alternative to the public after DEC's review of the LTCP.

Additional information on the public outreach activities is presented in Section 7 and Appendix B, Public Meeting Materials.

In addition to the two public meetings conducted to date, DEP staff met on September 9, 2015, with the Deputy Borough President (and staff), the District Managers of all of the Brooklyn Community Boards, and representatives from various Council Members to present information on Coney Island Creek water quality and waterbody characteristics and on the LTCP Program and its planning and alternatives processes.

Evaluation of Alternatives

DEP used a multi-step process to evaluate control measures and CSO control alternatives. The evaluation process considered: environmental benefits; community and societal impacts; and issues relating to implementation and operation and maintenance (O&M). After considering comments generated by detailed technical workshops, the retained alternatives were subjected to a functional review and cost-performance and cost-attainment evaluations, where economic factors were introduced. Table ES-8 presents the retained alternatives that resulted from the evaluation process.

Table ES-8. Retained Alternatives

Alternative	Description
VS1 - 25% CSO Control Shaft	• 100 ft deep, 52-ft diameter vertical storage shaft • 1.6 MG storage • 1,200 lf conveyance conduit
VS2 - 50% CSO Control Shaft	• 100 ft deep, 84-ft diameter vertical storage shaft • 4.1 MG storage • 1,200 lf conveyance conduit
DT1 - 75% CSO Control Tunnel	• 5,400-lf long, 15-ft diameter tunnel • 6.9 MG storage • 1 x 4,500 lf conveyance conduit • 1 x 4,900 lf conveyance conduit
DT2 - 100% CSO Control Tunnel	• 5,400-lf long, 21-ft diameter tunnel • 13.4 MG storage • 1 x 4,500 lf conveyance conduit • 1 x 4,900 lf conveyance conduit

Table ES-9 summarizes the projected Coney Island Creek CSO volumes, and percent reductions in CSO volume and bacteria loads for the retained alternatives.

Table ES-9. Coney Island Creek Retained Alternatives Summary

Alternative	Annual CSO Volume (MGY)	Annual CSO Volume Reduction (%)	Annual Fecal Coliform Reduction (%)	Annual Enterococci Reduction (%)
Baseline Conditions	75	-	-	-
VS1 - 25% CSO Control Shaft	56	25	25	25
VS2 - 50% CSO Control Shaft	37	50	50	50
DT1 - 75% CSO Control Tunnel	19	75	75	75
DT2 - 100% CSO Control Tunnel	0	100	100	100

Table ES-10 presents the CSO characteristics affected by this LTCP: (1) CSO volumes and frequency of overflows at Outfall OH-021 (2) the Owls Head system outside of Coney Island Creek and (3) the treated volumes at the Owls Head WWTP for both baseline conditions and the retained alternatives. As shown, the retained CSO control alternatives have little impact on the performance of the remainder Owls Head WWTP and its collection system.

Table ES-10. Summary of Predicted Impacts of Retained Alternatives – Coney Island Creek Watershed and OH WWTP Service Area

Alternative	Outfall OH-021[1]		All Other OH CSO Outfalls	Processed at OH WWTP
	Volume MGY	Annual Activations	Volume MGY	Volume MGY
Baseline Conditions	75	20	2,760	34,510
1. VS1 - 25% CSO Control Shaft	56	13	2,730	34,560
2. VS2 - 50% CSO Control Shaft	37	9	2,720	34,590
3. DT1 - 75% CSO Control Tunnel	19	6	2,710	34,620
4. DT2 - 100% CSO Control Tunnel	0	0	2,700	34,650

Notes:
(1) Only CSO outfall in Coney Island Creek watershed.

Alternative Cost of the Preferred Alternative

The alternatives were reviewed for cost effectiveness, ability to meet WQ criteria, public comments and operations. The retained alternative estimated Probable Bid Costs (PBC), annual O&M costs, and total present worth, are shown below in Table ES-11. The total present worth ranges from $89M to $214M.

Table ES-11. Cost of Retained Alternatives

Alternative	PBC ($ Million)	Annual O&M Cost ($ Million)	Total Present Worth ($ Million)
1. VS1 - 25 % CSO Control Shaft	80.0	0.6	88.9
2. VS2 - 50% CSO Control Shaft	101.6	0.6	111.2
3. DT1 - 75% CSO Control Tunnel	144.0	0.7	154.3
4. DT2 - 100 % CSO Control Tunnel	205.3	0.8	217.3

A traditional knee-of-the-curve analysis is presented in Section 8.5 of the LTCP. After considering the respective costs and potential benefits, all retained alternatives represented a high expenditure, but only minimal improvement of attainment of WQS.

Affordability and Financial Capability

DEP has been in the midst of an unprecedented period of investment to improve water quality in New York Harbor. Since 2002 alone, projects worth almost $10.0B have been completed or are under way, including projects for nutrient removal, CSO abatement, marshland restoration, and hundreds of other projects. DEP has committed nearly $4.2B from the WWFP ($2.7B) and the GI Program ($1.5), about half of which has been incurred to date. Table ES-12 provides a summary of CSO improvement projects that have been completed or are underway.

Table ES-12. Completed and Underway CSO Improvement Projects

1995 – 2015 (Completed): • NC WWTP MSP (620 MGD to 700 MGD) • Four CSO Storage Tanks (118 MG) • Pumping Station Expansions (GC & Ave V PS) • Floatables Control (Bronx & Gowanus) • NYC Green Infrastructure Program Initiated • Wet Weather Maximization (Tallman Island) • Dredging (Paerdegat Basin & Hendrix Creek) • Gowanus Canal Flushing Tunnel Expansion
2016 – 2030 (Underway): • Dredging (Flushing Bay) • Aeration (Newtown Creek) • Regulator Modifications and Floatables Control (Westchester Creek, Newtown Creek, Jamaica Tributaries) • Sewer Work (Pugsley Creek, Fresh Creek HLSS, Belt Pkwy Crossing, and Flushing Bay Low Lying Sewers) • 26th Ward Plant Wet Weather Stabilization • NYC Green Infrastructure Program
Total Costs (Completed and Ongoing): • Grey Infrastructure: $2.7 Billion • Green Infrastructure: $1.5 Billion

A preliminary Financial Capability Assessment has been conducted to assess the impact of current and future expenditures, including costs associated with the LTCP, on the financial capability of the City and on the financial burden to the rate payers and is included in Section 9.6 of this LTCP. According to EPA 1997 Guidance, a high economic impact occurs when expenditures per household exceed two percent of the Median Household Income (MHI) of the ratepayer base. The current figure is one percent for the average household, which translates to a mid-range financial impact. When combined with the score based on six additional criteria for the City's financial capacity, the EPA method indicates that the overall impact of the current wastewater expenditures fall into the "medium burden" category. The standard MHI metric used by EPA to define a high economic impact to ratepayers (i.e., affordability) is poorly applicable to NYC because of the City's skewed distribution of household income and other factors, including the very high cost of living for housing, food, transportation, and utilities relative to the nation as a whole.

EPA issued new guidance in 2014 that clarifies that permittees are encouraged to supplement the standard metrics with information that provides a more detailed and localized characterization of that permittee's financial capability and economic status of the residential ratepayer base. The type of information that could be presented includes, but is not limited to:

a. presentation of household income by quintiles;

b. poverty rates and trends;

c. cost of living;

d. total utility expenditures including expenditures to meet Safe Drinking Water Act (SDWA) mandates;

e. historical increases in rates or other dedicated revenue streams; and

f. information on the percent of households who own versus rent.

The supplemental information considered for this assessment indicates that when taking into account estimates for future spending, 50 percent of households would pay more than 2.0 percent of MHI (suggesting a "high" financial impact on residential users based on EPA guidance) by 2040 on wastewater bills alone. When accounting for both water and wastewater bills, the percentage of households spending at least 4.5 percent of their income could reach 38 percent by 2040. Taking into account cost of living adjustment factors to discount the value of household incomes to render them comparable to the U.S. average, would increase this percentage dramatically.

NYC has a poverty rate of approximately 21 percent, far higher than the national average of 15 percent. Thus, a large percentage of households would be adversely impacted by sustained rate increases. Additionally, recent data show stagnant to decreasing household incomes in the lower economic brackets. Accordingly, the snapshot picture of household income may underestimate the impacts of future rate increases.

Ultimately, the environmental, social, and financial benefits of all water-related obligations should be considered when priorities for spending are developed and implementation of mandates is scheduled, so that resources can be focused where the community will receive the greatest possible environmental benefit.

3. EVALUATIONS AND CONCLUSIONS

This LTCP found that the continued efficient operation of the upgraded Avenue V Pumping Station, the major recommendation from the 2009 WWFP, has proven to be a cost-effective CSO mitigation and WQ improvement measure. As such, it forms the foundation as the Preferred Alternative for this LTCP. Other components include the completion of the ongoing and planned sewer improvement projects within the watershed that are proposed under other non-CSO related programs.

The LTCP analyses for the Coney Island Creek LTCP recommended plan are summarized below for the following three areas:

1. Water Quality Modeling Results.
2. Use Attainability Analysis (UAA), Water Quality Compliance and Time to Recovery.
3. Summary of Recommendations.

Water Quality Modeling Results

The LTCP recommended plan water quality modeling results for Coney Island Creek are shown in Tables ES-13 through ES-16. These results provide the calculated annual and recreational attainment of the fecal coliform bacteria concentrations. The results show, for the different calculated levels of attainment, when concentrations would be at, or lower than, the Existing WQ Criteria, Bacteria Primary Contact WQ

Criteria, and Potential Future Primary Contact WQ Criteria under the 10-year simulation. Class SC DO criteria are also shown based on the 2008 WQ simulation.

The Existing WQ Criteria (200 cfu/100mL) attainment levels for the 10-year simulation are shown below in Table ES-13. As indicated in Table ES-13, the recommended plan does not achieve annual attainment of the existing fecal coliform criteria. However, the attainment is essentially realized for the recreational season (May 1st through October 31st) with the exception of Stations CI-1 and CI-2, where recreational season (May 1st through October 31st) attainment is projected to be 93 percent.

The Potential Future Primary Contact WQ Criteria attainment levels for the 10-year simulation are shown in Table ES-14. As indicated in this table, Potential Future Primary Contact WQ Criteria for enterococci (geometric mean <30 cfu/100mL) is met between 47 and 99 percent of the time and the 90th percentile STV of <110 cfu/100mL between 2 and 70 percent of the time.

The DO attainment for Existing WQ Criteria, as well as Class SC, is the same as that reported for baseline conditions in Tables ES-3 and ES-5. The LTCP framework does not evaluate DO attainment under a 10-year simulation.

Table ES-13. Calculated 10-year Preferred Alternative Attainment of Existing WQ Criteria and Bacteria Primary Contact WQ Criteria

Station		Fecal Coliform Attainment (%)	
		Annual	**Recreational Season(1)**
CI-1	Primary Contact Fecal Coliform GM < 200 cfu/100 mL	57	93
CI-2		56	93
CI-3		65	98
CI-4		90	100
CI-5		91	100
CI-6		100	100
CI-7		100	100

Notes:

(1) The Recreational Season is from May 1st through October 31st. Class I standard of fecal coliform is 200 cfu/100ml.

Table ES-14. Calculated 10-year Preferred Alternative Attainment of Potential Future Primary Contact Water Quality Criteria

Station		Enterococci Attainment Recreational Season (%)	
		GM <30	90th Percentile STV <110
CI-1	Potential Future Primary Contact WQ Bacteria Criteria	47	2
CI-2		48	2
CI-3		62	5
CI-4		81	14
CI-5		82	16
CI-6		99	70
CI-7		99	59

The LTCP assessment shows that Coney Island Creek does not meet bacteria Existing WQ Criteria annually and is very close to meeting it for the recreational season. The same is true for the Bacteria Primary Contact WQ Criteria. Table ES-15 presents an overview of the attainment status.

Table ES-15. Recommended Plan Compliance with Bacteria WQ Criteria Attainment

Location	Meets Existing WQ Criteria (Class I)	Meets Bacteria Primary Contact WQ Criteria	Meets Potential Future Primary Contact WQ Criteria
Coney Island Creek	NO(1)	NO(1)	NO

Notes:
YES indicates attainment is calculated to occur ≥ 95 percent of time.
NO indicates attainment is calculated to be ≤ 95 percent of time.
(1) Criteria not met annually but essentially met during the recreational season (May 1st through October 31st), except at Stations CI-1 and CI-2 (93%)

UAA, WQ Compliance and Time to Recovery

Given that the LTCP recommendations will not result in full compliance of WQS, DEP has prepared a UAA for Coney Island Creek (see Appendix C).

DEP performed an analysis to determine the amount of time following the end of rainfall periods required for Coney Island Creek to recover and return to fecal coliform concentrations of less than 1,000 cfu/100mL. The analysis consisted of examining water quality model bacteria concentrations for the August 14-15, 2008 storm event. The selection of the August 14-15, 2008, event for this analysis is described in Section 6. The time to return to fecal coliform concentrations below 1,000 cfu/100mL was then tabulated for each water quality station along the waterbody. The results of these analyses are summarized in Table ES-16.

As noted in the table, the duration of time for the bacteria concentrations to return to levels that the NYS Department of Health (DOH) considers safe for primary contact varies by location. Generally, approximately 24 hours would be a reasonable amount of time for Coney Island Creek to recover to DOH recommended levels. All stations recovered within 24 hours or less.

Table ES-16. Time to Recovery with Recommended Plan (August 14-15 2008)

Station	Preferred Alternative Time to Recovery (hrs) Fecal Coliform Target (1,000 cfu/100mL)
CI-1	24
CI-2	23
CI-3	20
CI-4	11
CI-5	9
CI-6	0
CI-7	0

Summary of Recommendations

The Preferred Alternative is projected to result in a very high level of seasonal attainment with existing bacteria criteria without the need to spend additional dollars on controls that would only result in a marginal benefit. Combined with the fact that the majority of the non-attainment is attributed to other non-CSO loading sources, and that even 100% CSO control would not result in further WQS improvement, the Preferred Alternative representing baseline conditions is the most suitable conclusion for this LTCP.

Water quality in Coney Island Creek has been significantly improved from the recent upgrades to the CSS associated with Outfall OH-021, the single CSO outfall that discharges to Coney Island Creek. The LTCP demonstrates that further reduction of CSO discharges, at any level, would not result in tangible improvements in attainment of WQS. As such, DEP recommends that projects to improve water quality in the Creek focus on other non-CSO sources of pollution outside the purview of this LTCP. Some of these projects, such as sewer improvements are already under construction.

This LTCP includes a UAA that assesses compliance with WQS based on the projected performance assessment conducted under this LTCP.

A wet-weather advisory during the recreational season (May 1st through October 31st), during which primary or secondary contact would not be recommended in Coney Island Creek, will be established in coordination with the NYC Department of Health and Mental Hygiene (DOHMH). The LTCP includes a recovery time analysis that can be used to establish the duration of the wet-weather advisory for public notification.

DEP is committed to improving water quality in this waterbody, and will continue to advance the improvements and actions identified under watershed improvement programs outside the CSO LTCP framework. Those initiatives are described in Section 8.0.

1.0 INTRODUCTION

This LTCP for Coney Island Creek was prepared pursuant to the Combined Sewer Overflow Consent Order (DEC Case No. CO2-20110512-25), dated March 8, 2012 (2012 CSO Consent Order), which modified a 2005 CSO Consent Order (DEC Case No. CO2-20000107-8) (2005 CSO Consent Order). Under the 2012 CSO Consent Order, DEP is required to submit ten waterbody-specific and one citywide LTCP to the DEC by December 2017. The Coney Island Creek LTCP is the seventh of those 11 LTCPs.

1.1 Goal Statement

The following is the LTCP Introductory Goal Statement, which appears as Appendix C in the 2012 CSO Consent Order. It is generic in nature, so that waterbody-specific LTCPs will take into account, as appropriate, the fact that certain waterbodies or waterbody segments may be affected by NYC's concentrated urban environment, human intervention, and current waterbody uses, among other factors. DEP will identify appropriate water quality outcomes based on site-specific evaluations in the drainage basin specific LTCP, consistent with the requirements of the CSO Control Policy and CWA.

> *"The New York City Department of Environmental Protection submits this Long Term Control Plan (LTCP) in furtherance of the water quality goals of the Federal Clean Water Act and the State Environmental Conservation Law. We recognize the importance of working with our local, State, and Federal partners to improve water quality within all citywide drainage basins and remain committed to this goal.*
>
> *After undertaking a robust public process, the enclosed LTCP contains water quality improvement projects, consisting of both grey and green infrastructure, which will build upon the implementation of the U.S. Environmental Protection Agency's (EPA) Nine Minimum Controls and the existing Waterbody/Watershed Facility Plan projects. As per EPA's CSO Control Policy, communities with combined sewer systems are expected to develop and implement LTCPs that provide for attainment of water quality standards and compliance with other Clean Water Act requirements. The goal of this LTCP is to identify appropriate CSO controls necessary to achieve waterbody-specific water quality standards, consistent with EPA's 1994 CSO Policy and subsequent guidance. Where existing water quality standards do not meet the Section 101(a)(2) goals of the Clean Water Act, or where the proposed alternative set forth in the LTCP will not achieve existing water quality standards or the Section 101(a)(2) goals, the LTCP will include a Use Attainability Analysis, examining whether applicable waterbody classifications, criteria, or standards should be adjusted by the State. The Use Attainability Analysis will assess the waterbody's highest attainable use, which the State will consider in adjusting water quality standards, classifications, or criteria and developing waterbody-specific criteria. Any alternative selected by a LTCP will be developed with public input to meet the goals listed above.*
>
> *On January 14, 2005, the NYC Department of Environmental Protection and the NYS Department of Environmental Conservation entered into a Memorandum of Understanding (MOU), which is a companion document to the 2005 CSO Order also executed by the parties and the City of New York. The MOU outlines a framework for coordinating CSO long-term planning with water quality standards reviews. We remain committed to this process outlined in the MOU, and understand*

> *that approval of this LTCP is contingent upon our State and Federal partners' satisfaction with the progress made in achieving water quality standards, reducing CSO impacts, and meeting our obligations under the CSO Orders on Consent."*

This Goal Statement has guided the development of the Coney Island Creek LTCP and accompanying UAA.

1.2 Regulatory Requirements (Federal, State, Local)

The waters of NYC are subject to Federal and NYS regulations. The following sections provide an overview of the regulatory issues relevant to long-term CSO planning.

1.2.a Federal Regulatory Requirements

The CWA established the regulatory framework to control surface water pollution, and gave the EPA the authority to implement pollution control programs. The CWA established the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES permit program regulates point sources discharging pollutants into waters of the United States. CSOs and MS4 are also subject to regulatory control under the NPDES permit program. In New York, the NPDES permit program is administered by the DEC, and is thus a State Pollution Discharge Elimination System (SPDES) program. NYS has had an approved SPDES program since 1975. Section 303(d) of the CWA and 40 CFR §130.7 (2001) require states to identify waterbodies that do not meet WQS and are not supporting their designated uses. These waters are placed on the Section 303(d) List of Water Quality Limited Segments (also known as the list of impaired waterbodies or "303(d) List"). The 303(d) List identifies the stressor causing impairment, and establishes a schedule for developing a control plan to address the impairment. Placement on the list can lead to the development of a Total Maximum Daily Load (TMDL) for each waterbody and associated pollutant/stressor on the list. Pollution controls based on the TMDL serve as the means to attain and to maintain WQS for the impaired waterbody.

As of September 2014 Coney Island Creek remains delisted as a Category 4b waterbody for which required control measures (i.e., an approved LTCP) other than a TMDL are expected to restore uses in a reasonable period of time.

Table 1-1. 2014 DEC 303(d) Impaired Waters Listed and Delisted (with Source of Impairment)

Waterbody	Pathogens	Dissolved Oxygen (DO)/Oxygen Demand	Floatables
Coney Island Creek	Delisted Category 4b Urban/Storm/CSOs	Delisted Category 4b CSOs, Urban/Storm	Delisted Category 4b CSOs, Urban/Storm

1.2.b Federal CSO Policy

The 1994 EPA CSO Control Policy provides guidance to permittees and to NPDES permitting authorities on the development and implementation of an LTCP in accordance with the provisions of the CWA. The CSO policy was first established in 1994, and was codified as part of the CWA in 2000.

1.2.c New York State Policies and Regulations

NYS has established WQS for all navigable waters within its jurisdiction. The Coney Island Creek is classified as a Class I waterbody. Based on recent revisions to the NYS regulations, Class I waterbodies are defined as follows: The best usages of Class I waters are secondary contact recreation and fishing. These waters "shall be suitable for fish, shellfish, and wildlife propagation and survival" and the water quality "shall be suitable for primary contact recreation, although other factors may limit the use for this purpose". The corresponding total and fecal coliform standards for primary contact recreation are set forth in 6 NYCRR Part 703. This LTCP reflects these new regulatory standards, i.e., Primary Contact Water Quality Criteria.

The States of New York, New Jersey and Connecticut are signatories to the Tri-State Compact, which designated the Interstate Environmental District and created the Interstate Environmental Commission (IEC). The Interstate Environmental District includes all saline waters of greater NYC, including Coney Island Creek. The IEC was recently incorporated into and is now part of the New England Interstate Water Pollution Control Commission (NEIWPCC), a similar multi-state compact of which NYS is a member. Coney Island Creek is classified as Type A under the IEC system. Details of the IEC Classifications are presented in Section 2.2.

1.2.d Administrative Consent Order

NYC and DEC entered into a 2005 CSO Consent Order to address NYC CSOs. Among other requirements, the 2005 CSO Consent Order, as successively modified, requires DEP to evaluate and to implement CSO abatement strategies on an enforceable timetable for 18 waterbodies and, ultimately, for citywide long term CSO control in accordance with the 1994 EPA CSO Control Policy; to meet construction milestones; to complete the Flushing Bay CSO Retention Facility; and to incorporate GI into the LTCP process, as proposed under NYC's Green Infrastructure Plan. In a separate MOU, DEP and the DEC provided for WQS reviews in accordance with the EPA CSO Control Policy.

1.3 LTCP Planning Approach

The LTCP planning approach includes several phases. The first is the characterization phase – an assessment of current waterbody and watershed characteristics, system operation and management practices, green and grey infrastructure projects, and system performance. DEP is gathering the majority of this information from field observations, historical records, analyses of studies and reports, and collection of new data. The next phase involves the identification and analysis of alternatives to reduce the amount and frequency of wet-weather discharges and to improve water quality. Alternatives may include a combination of green and grey infrastructure elements that are carefully evaluated using both the collection system and receiving water models. Following the analysis of alternatives, DEP develops a recommended plan, along with an implementation schedule and strategy. If the proposed alternative does not achieve existing WQS or the Section 101(a)(2) goals of CWA, an LTCP also includes a UAA examining whether applicable waterbody classifications, criteria, or standards should be adjusted by DEC.

1.3.a Integrate Current CSO Controls from Waterbody/Watershed Facility Plans (Facility Plans)

This LTCP integrates and builds upon DEP's prior efforts by capturing the findings and recommendations from the previous facility planning documents for this watershed, including the WWFP.

In June 2009, DEP issued the Coney Island Creek WWFP. The WWFP, which was prepared pursuant to the 2005 CSO Consent Order, includes an analysis and presentation of operational and structural modifications targeting the reduction of CSOs and improvement of the overall performance of the collection and treatment system within the watershed. The DEC approved the Coney Island Creek WWFP on July 15, 2009.

1.3.b Coordination with DEC

As part of the LTCP process, DEP has sought to work closely with DEC to share ideas, track progress, and work toward developing strategies and solutions to address wet-weather challenges for the Coney Island Creek LTCP.

DEP shared the Coney Island Creek alternatives and held discussions with DEC on the formulation of various control measures, and coordinated public meetings and other stakeholder presentations with DEC. On a quarterly basis, DEC, DEP, and outside technical consultants also convene for larger progress meetings that typically include technical staff and representatives from DEP and DEC's Legal Departments and Department Chiefs who oversee the execution of the CSO program.

1.3.c Watershed Planning

DEP prepared its CSO WWFPs before the emergence of GI as an established method for reducing stormwater runoff. Consequently, the WWFPs did not include a full analysis of GI alternatives for controlling CSOs. In comments on DEP's CSO WWFPs, community and environmental groups voiced widespread support for GI, urging DEP to place greater reliance upon that sustainable strategy. In September 2010, NYC published the *NYC Green Infrastructure Plan* (GI Plan). Consistent with the GI Plan, the 2012 CSO Consent Order requires DEP to analyze the use of GI in LTCP development. As discussed in Section 5.0, this sustainable approach includes the management of stormwater at its source through the creation of vegetated areas, bluebelts and greenstreets, green parking lots, green roofs, and other technologies.

1.3.d Public Participation Efforts

DEP made a concerted effort during the Coney Island Creek LTCP planning process to involve relevant and interested stakeholders, and to keep interested parties informed about the project. A public outreach participation plan was developed and implemented throughout the process; the plan is posted and regularly updated on DEP's LTCP program website, www.nyc.gov/dep/ltcp. Specific objectives of this initiative included the following:

- Develop and implement an approach that would reach interested stakeholders;

- Integrate the public outreach efforts with other aspects of the planning process; and
- Take advantage of other ongoing public efforts being conducted by DEP and other NYC agencies as part of related programs.

The public participation efforts for this Coney Island Creek LTCP are summarized in Section 7.0 in more detail.

2.0 WATERSHED/WATERBODY CHARACTERISTICS

This section summarizes the major characteristics of the Coney Island Creek watershed and waterbody, building upon earlier documents that characterize the area including, most recently, the WWFP for the Coney Island Creek (DEP, 2009). Section 2.1 addresses watershed characteristics and Section 2.2 addresses waterbody characteristics.

2.1 Watershed Characteristics

The Coney Island Creek watershed is highly urbanized, comprised primarily of residential areas with some commercial, industrial, institutional and open space/outdoor recreation areas within the Borough of Brooklyn, NY. This subsection contains a summary of the watershed characteristics as they relate to the land use, zoning, permitted discharges and their characteristics, sewer system configuration, performance, and impacts to the adjacent waterbodies, as well as the modeled representation of the collection system used to analyze system performance and CSO control alternatives.

2.1.a Description of Watershed

The Coney Island Creek watershed is comprised of approximately 3,470 acres on the southwestern shore of the Brooklyn Borough. The majority of the land immediately surrounding the shores of Coney Island Creek is primarily industrial and commercial. As described later in this section, the area is served by a complex collection system of combined and separate storm sewers, interceptor sewers and pumping stations, one CSO and eight DEP-owned stormwater outfalls. The watershed has undergone major changes as this part of NYC has been developed. As the watershed was developed, the condition of the waterbody and its shoreline was influenced by engineered sewer systems, filled-in wetlands and waterways, and an overall “hardening” of the shorelines with bulkheads.

The urbanization of the Coney Island Creek watershed has led to the creation of a large CSS, as well as areas served by municipal separate sanitary sewer systems (MS4). Stormwater drainage systems were also developed that discharge directly to Coney Island Creek, or to a nearby CSS. As shown in Figure 2-1, the Coney Island Creek watershed is served by the Owls Head (OH) WWTP and Coney Island (CI) WWTP service areas. Generally, the combined sewage is conveyed to the WWTPs for treatment. Combined sewage flow that exceeds the capacity of the CSS during wet-weather, discharges through CSO Outfall OH-021 to Coney Island Creek. A total of eight SPDES-permitted MS4 outfalls also discharge to Coney Island Creek.

As shown in Table 2-1, a total of 51 outfalls have been documented by the Shoreline Survey Unit of DEP’s Compliance Monitoring Section to exist along the shoreline of Coney Island Creek. Twelve of those outfalls are permitted DEP outfalls: CSO Outfall OH-021; eight MS4 outfalls, and three other outfalls associated with small drainage areas along the shoreline. These are described in Section 2.1.c.1. Of the remaining outfalls, four are owned by another NYC agency, and the remainder are associated with private entities.

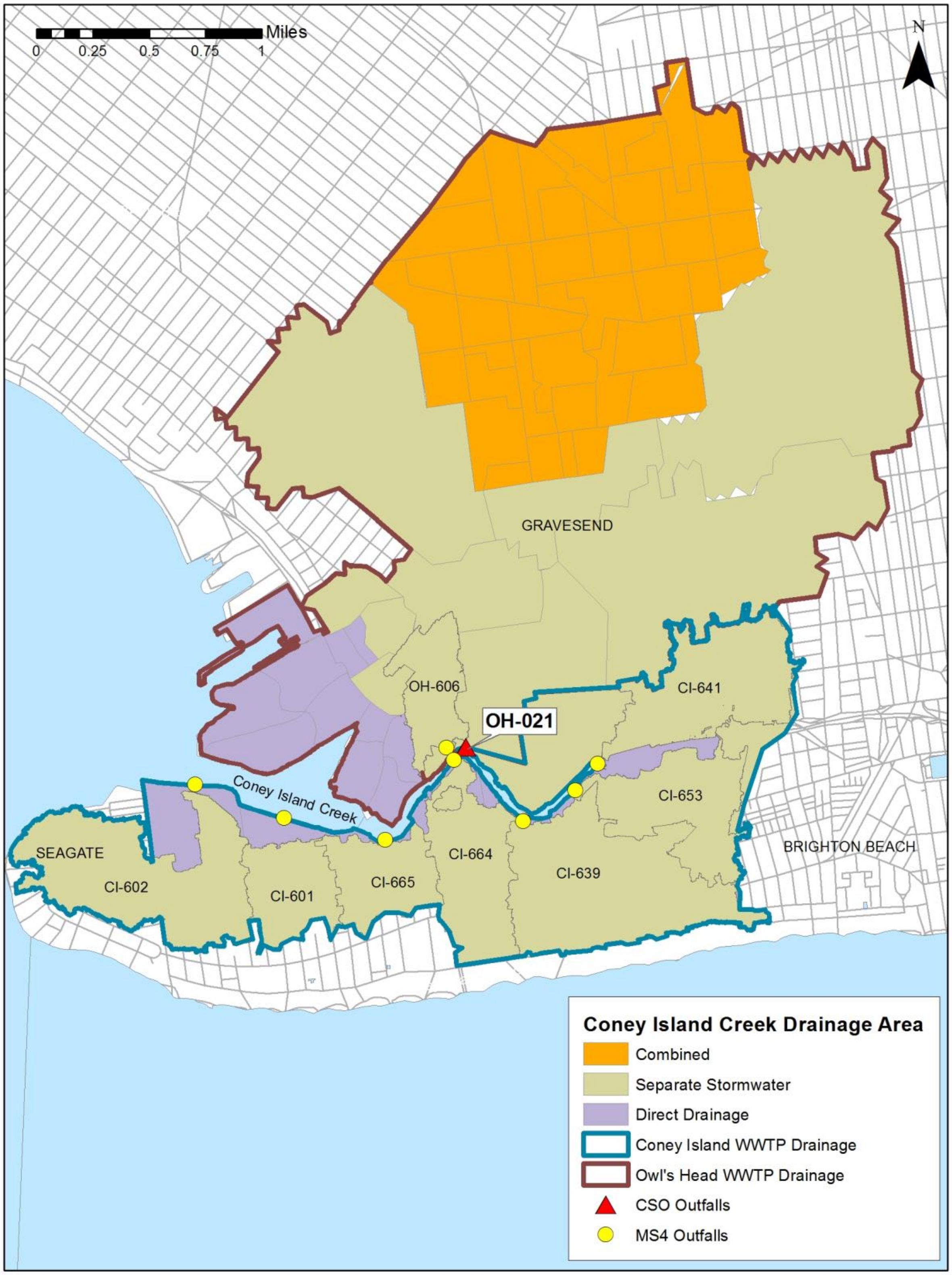

Figure 2-1. Coney Island Watershed - WWTP Service Areas and Outfalls

Table 2-1. Outfall Pipes to Coney Island Creek

Identified Ownership of Pipes	Number of Pipes
NYC DEP	DEP MS4 Permitted = 8
	DEP CSO Permitted = 1
	DEP Direct Permitted = 3
NYC Department of Transportation	4
Private	35
Total	51

As a residential community within NYC that is also an iconic recreational area for NYC residents, the Coney Island Creek area has several large and notable transportation corridors that cross the watershed to provide access between industrial, commercial and residential areas, such as Ocean Parkway, as well as major through-traffic routes, such as the Belt Parkway, that provides access to the Verrazano Bridge and to the Brooklyn-Queens Expressway. The watershed is served by the NYC transit system, and the Coney Island Rail Yard, one of the largest Metropolitan Transit Authority subway rail yards, is located along the northern shoreline of the waterbody (Figure 2-2).

2.1.a.1 Existing and Future Land Use and Zoning

The Coney Island Creek watershed contains all of the Community District 13 and a portion of Districts 11 and 15. The neighborhoods in the watershed include Gravesend, Homecrest, Coney Island and West Brighton.

Current land use in the watershed, shown in Figure 2-3, generally aligns with the established zoning. A discussion on current land uses, zoning, neighborhood and community characteristics, and NYC's planned future zoning and uses follows.

In general, the riparian areas immediately surrounding Coney Island Creek (including all blocks which are wholly or partially within a quarter mile of the shoreline) are dominated by residential uses, open space and transportation utilities. Table 2-2 summarizes the land use characteristics of both the Coney Island Creek watershed and riparian area. Riparian areas are characterized as 33 percent residential, 21 percent open space, and 46 percent a mix of various uses, including public facilities and institutions, industrial, commercial, and transportation-related uses as shown in Figure 2-4.

Table 2-2. Existing Land Use within the Coney Island Creek Drainage Area

Land Use Category	Percent of Area	
	Riparian Area (1/4-mile radius) (%)	Drainage Area (%)
Commercial	6	5
Industrial	2	1
Open Space and Outdoor Recreation	21	10
Mixed Use and Other	3	5
Public Facilities	6	6
Residential	33	59
Transportation and Utility	17	7
Parking Facilities	4	2
Vacant Land	7	4

Figure 2-2. Major Transportation Features of Coney Island Creek Watershed

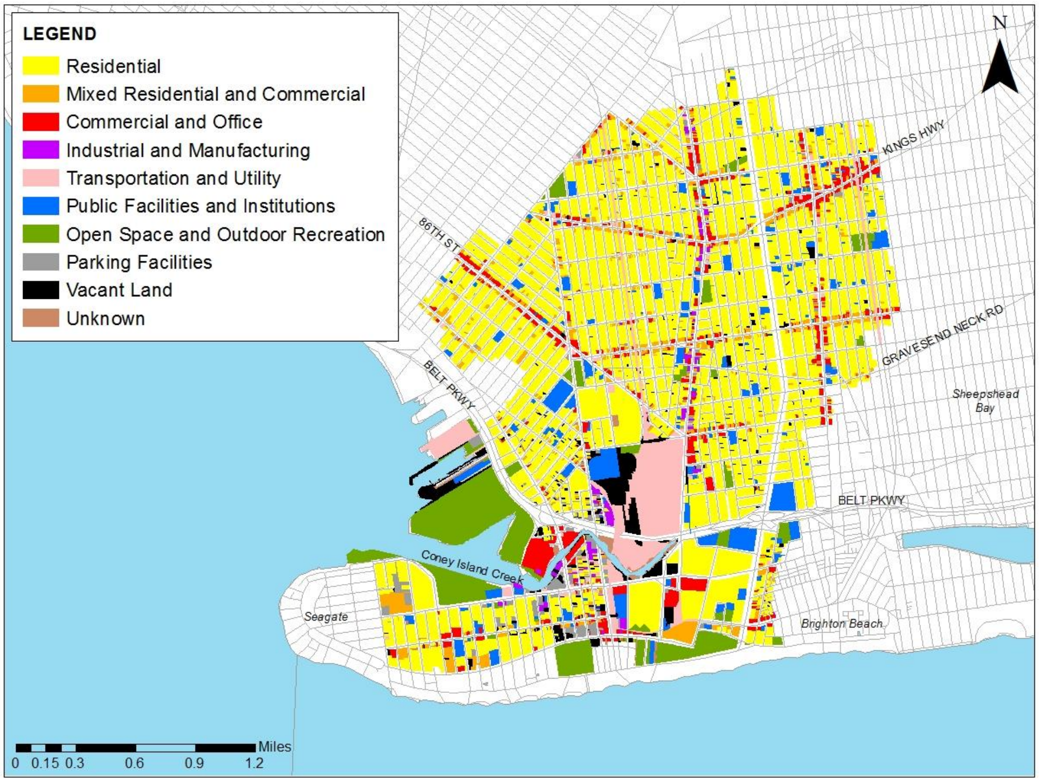

Figure 2-3. Land Use in Coney Island Creek Watershed

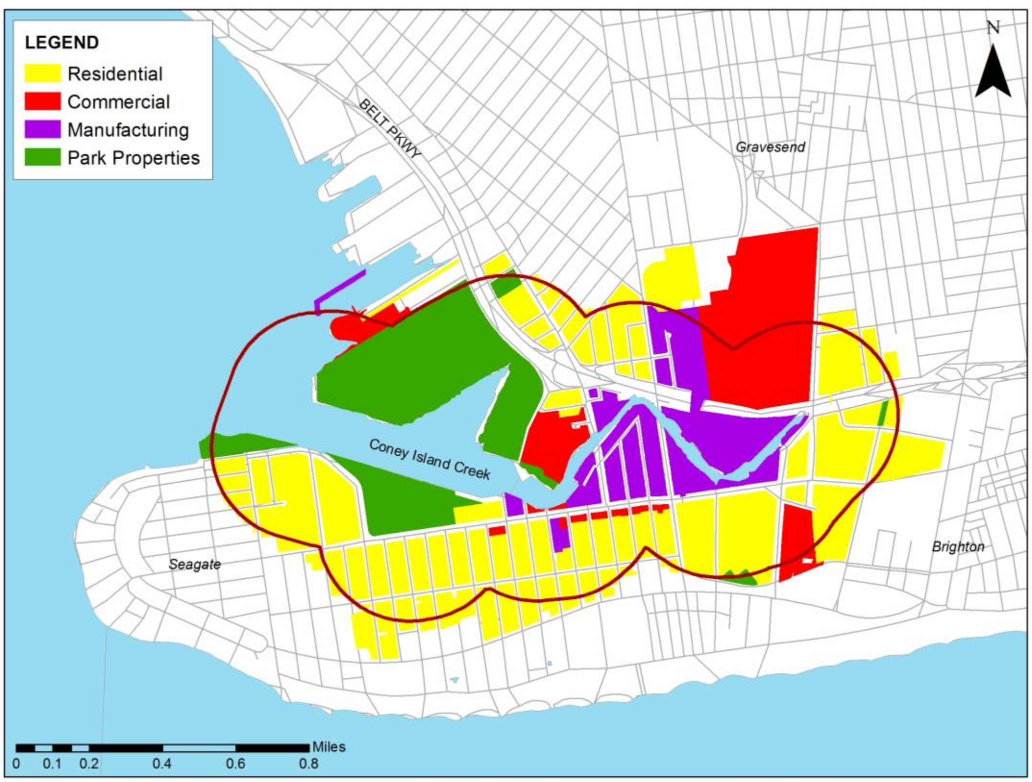

Figure 2-4. Quarter Mile Riparian Zoning in the Coney Island Creek Vicinity

As a whole, the watershed is 59 percent residential, 10 percent open space, and 31 percent a mix of various uses, including public facilities and institutions, industrial, commercial, and transportation-related uses. The study area is comprised primarily of residential land uses. Commercial land use is predominantly oriented toward serving the daily needs of the resident population. Commercial uses comprise 5 percent of the total land area. Only 1 percent of the drainage area is industrialized. Approximately 10 percent of the drainage area is occupied by open spaces such as parks and recreational facilities. Calvert Vaux Park, Coney Island Boat Basin and Kaiser Playground are among the largest open spaces in the drainage area. Several public institutions are spread throughout the study area. These include private and public schools, Brooklyn public libraries, senior citizen and day care centers, and the Coney Island Hospital.

The New York City Waterfront Revitalization Program (WRP) policies are used to evaluate proposed actions affecting future land use and zoning against 10 policy objectives: (1) residential and commercial development, (2) water-dependent and industrial users, (3) commercial and recreational boating, (4) coastal ecological systems, (5) water quality, (6) flooding and erosion, (7) solid waste and hazardous substances, (8) public access, (9) scenic resources, and (10) historic and cultural resources.

New York City Department of City Planning (DCP) has designated the majority of the Coney Island Creek watershed as part of the Coastal Zone. However, no designated Significant Maritime and Industrial Areas or Special Natural Waterfront Areas exist within the Coney Island Creek Coastal Zone. Any proposed land uses for the Coney Island Creek project area, including those associated with the LTCP, must demonstrate consistency with the WRP.

The most pertinent long-term planning information available during the preparation of this LTCP is included in the Vision 2020 – New York City Waterfront Plan. The Vision 2020 plan envisions exploring opportunities to improve existing public waterfront areas, including boat launching and fishing; to support public access/recreation; to restore wetlands; and to enhance, manage and continue to restore salt marshes and ecologically sensitive areas (Recommendation Area 1 – Coney Island Creek). The plan also recommends the study of the land use and zoning to facilitate appropriate development (Recommendation Area 2 – Special Coney Island Mixed Use District). Those two target areas are part of “Reach 16” within the Coney Island Creek watershed, as shown in Figure 2-5.

2.1.a.2 Permitted Discharges

Eight NYC permitted MS4 stormwater outfalls and one NYC permitted CSO outfall are located along Coney Island Creek. These discharge locations are discussed in more detail in Section 2.1.c. No permitted dry-weather discharges are associated with this waterbody. Based on data available on-line at the date of submittal of this LTCP, it was determined that no State-significant industrial SPDES permit holders are operating facilities located in the watershed.

Figure 2-5. Vision 2020 – Reach 16

2.1.a.3 Impervious Cover Analysis

Impervious surfaces within a watershed are those characterized by an artificial surface, such as concrete, asphalt, rock, or rooftop. Some of the rainfall that lands on an impervious surface will remain on the surface via ponding, and will disappear through evaporation. The remaining rainfall volume becomes overland runoff that may flow directly into the CSS or into a separate stormwater system, may flow to a pervious area and soak into the ground, or may flow directly to a waterbody. The impervious surface and, more specifically, the portion of the impervious surface that is directly connected to the CSS, is an important parameter in the characterization of a watershed, and in the development of hydraulic models used to simulate CSS performance.

A representation of the impervious cover was made in the 13 NYC WWTPs combined area drainage models developed in 2007 to support the several WWFPs that were submitted to DEC in 2009. The models and the impervious surface representation were recently updated.

As NYC began to focus attention on the use of GI to manage street runoff of stormwater by either slowing it down prior to entering the combined sewer network, or preventing it from entering the network entirely, it became clear that a more detailed evaluation of the impervious cover would be beneficial. In addition, NYC realized that it would be important to distinguish between impervious surfaces that introduce storm runoff directly to the sewer system (Directly Connected Impervious Areas) from those impervious surfaces that may not contribute runoff directly to the sewers. For example, a rooftop with roof drains connected directly to the combined sewers (as required by the NYC Plumbing Code), would be an impervious surface that is directly connected. However, a sidewalk or impervious surface adjacent to parkland may not contribute storm runoff to the CSS and, as such, would not be considered directly connected.

In 2009 and 2010, DEP invested in the development of high-quality satellite measurements of impervious surfaces required to conduct the analyses that improved the differentiation between pervious and impervious surfaces, as well as the different types of impervious surfaces. Flow meter data were then used to estimate the directly connected impervious area (DCIA). The data and the approach used are described in detail in the InfoWorks CS™ (IW) Citywide Model Recalibration Report (DEP, 2012a). The result of this effort yielded an updated model representation of the areas that contribute runoff to the CSS. This improved set of data aided model recalibration and better informed the deployment of GI projects to reduce runoff from impervious surfaces that contribute flow to the collection system.

2.1.a.4 Population Growth and Projected Flows

DEP routinely develops water consumption and dry-weather wastewater flow projections for DEP planning purposes. In 2012, DEP projected an average per capita water demand of 75 gallons per day that was representative of future uses. The year 2040 was established as the planning horizon, and populations for that time were developed by the DCP and the New York Transportation Metropolitan Council.

The 2040 population projection figures were then used with the dry-weather per capita sewage flows to establish the dry-weather sewage flows in the IW models for the Owls Head and Red Hook WWTP sewersheds. This was accomplished by using Geographical Information System (GIS) tools to proportion the 2040 populations locally from the 2010 census information for each landside subcatchment tributary to each CSO outfall. Per capita dry-weather sanitary sewage flows for these landside model subcatchments were established as the ratio of two factors: the per capita dry-weather sanitary sewage flow for each year; and 2040 estimated population for the landside model subcatchment within the WWTPs service areas.

2.1.a.5 Update Landside Modeling

The Coney Island Creek watershed is included within the Owls Head and Coney Island WWTPs system IW models. Several modifications to both collection systems have occurred since the models were calibrated in 2009. Given that both models have been used for analyses associated with the annual reporting requirements of the SPDES permit, Best Management Practices (BMPs) and PCM program, many of these changes already have been incorporated into the models. Other updates to the modeled representation of the collection systems that have been made since the 2009 update include:

- Additional detail and resolution incorporated at the Avenue V Pumping Station to represent the modulating influent gate and the variable speed pumps.
- Hydraulic loss coefficients and conduit diameters were updated on the branch interceptor from the CSO Regulator Av-1.
- Separate stormwater (MS4) area delineations were updated by DEP and those changes were incorporated in the IW model.
- Additional stormwater piping was added to represent separated flows tributary to the OH-021 outfall.
- OH-021 outfall pipe was explicitly modeled in greater detail (pipe sizes and inverts updated based on drawings).

In addition to changes made to the modeled representations of the collection system configuration, other changes include:

- ***2015 Validation.*** The model was updated based on temporary flow monitoring data collected from March 23, 2015 to August 12, 2015 near the Avenue V Pumping Station, as well as in four stormwater conduits. Adjustments to hydraulic loss coefficients and the pump setup were made to achieve reasonable agreement between modeled and observed flows and volumes in the combined sewers entering the Avenue V Pumping Station and the CSO discharges to OH-021. Additionally, model parameters (runoff hydrology, area delineation, etc.) describing the areas tributary to the four stormwater monitoring locations were validated.

- ***Runoff generation methodology***. The identification of pervious and impervious surfaces. As described in Section 2.1.a.3 above, the impervious surfaces were also categorized into DCIA and impervious runoff surfaces that do not contribute runoff to the collection system.

- ***GIS Aligned Model Networks.*** Historical IW models were constructed using record drawings, maps, plans, and studies. Over the last decade, DEP has been developing a GIS system that will provide the most up-to-date information available on the existing sewers, regulators, outfalls, and pump stations. Part of the update and model recalibration utilized data from the GIS repository for interceptor sewers.

- ***Interceptor Sediment Cleaning Data.*** Between April 2009 and May 2011, DEP undertook a citywide interceptor sediment inspection and cleaning program over approximately 136 miles of NYC's interceptor sewers. Data on the average and maximum sediment in the inspected interceptors were available for use in the model as part of the update and recalibration process. Multiple sediment depths available from sonar inspections were spatially averaged to represent depths for individual interceptor segments included in the model that had not yet been cleaned.

- ***Evapotranspiration Data.*** Evapotranspiration (ET) is a meteorological input to the hydrology module of the IW model that represents the rate at which depression storage (surface ponding) is depleted and available for use for additional surface ponding during subsequent rainfall events. In previous versions of the model, an average rate of 0.1 inches/hour (in/hr) was used for the model calibration, while no evaporation rate was used as a conservative measure during alternatives analyses. During the update of the model, hourly ET estimates obtained from four National Oceanic and Atmospheric Administration (NOAA) climate stations (John F. Kennedy [JFK], Newark [EWR], Central Park [CPK], and LaGuardia [LGA]) for an 11-year period were reviewed. These data were used to calculate monthly average ETs, which were then used in the updated model. The monthly variations enabled the model simulation to account for seasonal variations in ET rates, which are typically higher in the summer months.

- ***Tidal Boundary Conditions at CSO Outfalls.*** Tidal stage can affect CSO discharges when tidal backwater in a CSO outfall reduces the ability of that outfall to relieve excess flow. Model updates took into account this variable boundary condition at CSO outfalls that were influenced by tides. Water elevation, based on the tides, was developed using a customized interpolation tool that assisted in the computation of meteorologically-adjusted astronomical tides at each CSO outfall in the New York Harbor complex.

- ***Dry-Weather Sanitary Sewage Flows.*** Dry-weather sewage flows were developed as discussed in Section 2.1.a.4 above. Hourly dry-weather flow (DWF) data for 2011 were used to develop the hourly diurnal variation patterns at each plant. For the calibration period, the DWF generation rates were developed by dividing 2011 plant flows by the population from the 2010 census. The DWF generation rate was then applied to each catchment in the model based on population. The resulting DWF was then adjusted if necessary to match the calibration meters. The projected 2040 DWF were used in the LTCP Baseline Conditions model that was the basis for evaluating alternatives.

- ***Precipitation.*** The annual rainfall series that was to be used to represent a typical year of rainfall for annual model simulations was re-evaluated as part of this exercise. This re-evaluation is discussed in Section 2.1.b below.

In addition to the updates and enhancements listed above, 13 of NYC's IW landside models underwent recalibration in 2012. The recalibration process and results are included in the IW Citywide Recalibration Report (DEP, 2012a) required by the 2012 CSO Consent Order. Following this report, DEP submitted to DEC a Hydraulic Analysis Report in December 2012. The general approach followed was to recalibrate the model in a step-wise fashion beginning with the hydrology module (runoff). The following summarizes the overall approach to model update and recalibration:

- ***Site scale calibration (Hydrology).*** The first step was to focus on the hydrologic component of the model, which had been modified since 2007. Flow monitoring data were collected in upland areas of the collection systems, remote from (and thus largely unaffected by) tidal influences and in-system flow regulation, for use in understanding the runoff characteristics of the impervious surfaces. Data were collected in two phases – Phase 1 in the Fall of 2009, and Phase 2 in the Fall of 2010. The upland areas ranged from 15 to 400 acres in size. A range of areas with different land use mixes was selected to support the development of standardized sets of coefficients which could be applied to other unmonitored areas of NYC. The primary purpose of this element of the recalibration was to adjust pervious and impervious area runoff coefficients to provide the best fit of the runoff observed at the upland flow monitors.

- ***Area-wide recalibration (Hydrology and Hydraulics).*** The next step in the process was to focus on larger areas of the modeled systems where historical flow metering data were available, and which were neither impacted by tidal backwater conditions nor subjected to flow regulation. Where necessary, runoff coefficients were further adjusted to provide reasonable simulation of flow measurements made at the downstream end of these larger areas. The calibration process then moved downstream further into the collection system, where flow data were available in portions of the conveyance system where tidal backwater conditions could exist, as well as potential backwater conditions from throttling at the WWTPs. The flow measured in these downstream locations would further be impacted by regulation at in-system control points (regulators, internal relief structures, etc.). During this step in the recalibration, minimal changes were made to runoff coefficients.

The results of this effort were models with better representation of the collection systems and their tributary areas. These updated models are used for the alternatives analysis as part of the Coney Island Creek LTCP. A comprehensive discussion of the recalibration efforts can be found in the previously noted

IW Citywide Recalibration Report (DEP, 2012a) and the Hydraulic Analysis Report (DEP, December 2012). Additional model updates were made in support of this LTCP and were described earlier.

2.1.b Review and Confirm Adequacy of Design Rainfall Year

In previous planning work for the WWFPs, DEP applied the 1988 annual precipitation characteristics to the landside IW models to develop loads from combined and separately sewered drainage areas. The year 1988 was considered representative of long-term average conditions. Therefore, that year was used to analyze facilities where “typical” rather than extreme conditions served as the basis of design, in accordance with the EPA CSO Control Policy of using an “average annual basis” for analyses. However, in light of increasing concerns over climate change, with the potential for more extreme and possibly more frequent storm events, the selection of 1988 as the average condition was re-considered. A comprehensive range of historical rainfall data were evaluated from 1969 to 2010 at four rainfall gages (CPK, LGA, JFK, EWR). The 2008 JFK rainfall was determined to be the most representative of average annual rainfall across all four gages. Figure 2-6 shows the annual rainfall at JFK for 1969 through 2014. As indicated in Figure 2-6, the JFK 2008 rainfall currently used for the LTCP typical year includes almost six inches more rainfall than JFK 1998 rainfall that was used for the WWFP evaluations, and is more consistent with recent rainfall trends. As a result, recent landside modeling analyses as part of the LTCP process in NYC have used the 2008 precipitation as the typical rainfall year, together with the 2008 tide observations. Based on an analysis of 30 years of rainfall data at four rain gages (JFK, LGA, EWR, CPK), the rainfall recorded at the JFK gage in 2008 was also determined to be closest in characteristics to the 30-year average of all four gages together. The 2008 JFK data had a higher total rainfall volume than the JFK 1988 data, and was considered to be more reflective of current climate conditions. The 10-year period of 2002 to 2011 is also used to assess long-term performance of the LTCP recommended plans (see Section 6).

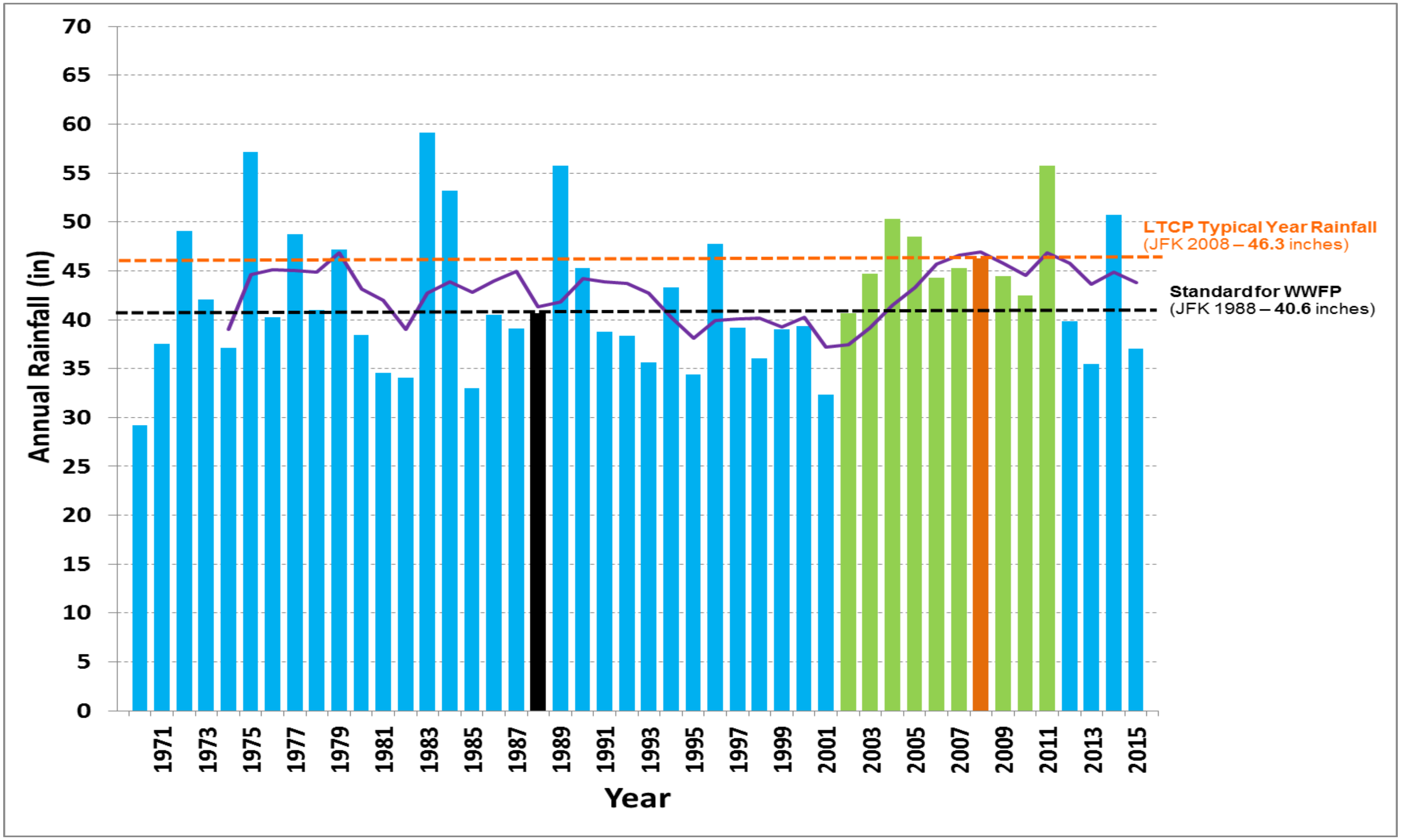

Figure 2-6. Annual Rainfall Data and Selection of the Typical Year

2.1.c Description of Sewer System

The Coney Island Creek watershed/sewershed is located within the Borough of Brooklyn (Kings County, within NYC) political jurisdiction. The watershed is served by the Owls Head and Coney Island WWTPs and associated collection systems. The Coney Island Creek watershed and associated WWTP service areas are shown in Figure 2-1. The following sections describe the major features of the Owls Head and Coney Island WWTP tributary areas. Table 2-3 shows the areas served by the various drainage system categories.

Table 2-3. Coney Island Creek Sewershed: Acreage Per Sewer System Category

Sewer Area Description	Area (acres)
Combined	839
Separate	2,304
Direct Drainage	293
Other(1)	34
Total	**3,470**

Notes:
(1) Areas not classified as stormwater separate area and also not direct drainage

The combined sewer drainage areas have been delineated over many years and during numerous planning studies. As such, they fairly accurately represent the area in the Coney Island Creek watershed serviced by combined sewers. Recently, DEP delineated the separate stormwater and direct drainage areas tributary to Coney Island Creek. The resulting delineations have been incorporated in the analyses supporting this LTCP and have enhanced the representation of the stormwater separate sewer system within the IW model framework.

2.1.c.1 Overview of Drainage Area and Sewer System

Owls Head WWTP Drainage Area and Sewer System

The northern portion of the Coney Island Creek watershed is served by the Owls Head WWTP as shown in Figure 2-1. The Owls Head sewershed includes sanitary and combined sewers. The Owls Head collection system associated with Coney Island Creek includes:

- Two pumping stations (Avenue V and Avenue U Pumping Stations);
- One combined sewer flow regulator structure; and
- One active CSO discharge outfall.

Table 2-4 shows the acreage by outfall/regulator/relief structure for the Owls Head WWTP service area within the Coney Island Creek watershed.

Table 2-4. Owls Head WWTP Service Area Within Coney Island Creek Watershed: Acreage by Outfall/Regulator/Relief Structure

Outfall	Outfall Drainage Area (acres)	Regulator/Relief Structure	Regulator Drainage Area	Regulated Drainage Area Type
OH-021[(1)]	1,628	Avenue V Pumping Station Reg Av-1	839	Combined

Notes:
(1) Outfall also discharges stormwater from MS4 stormwater separate drainage areas tributary to the outfall barrels downstream of Regulator Av-1.

The Avenue V and Avenue P Pumping Stations operate within the Owls Head portion of the Coney Island Creek sewershed. The Avenue V Pumping Station serves both a CSS and separate SSS while the Avenue U Pumping Station serves a SSS.

The Owls Head WWTP is located in the Bay Ridge section of the Borough of Brooklyn, City of New York, on the southwestern tip of the Owls Head Park. The Owls Head WWTP treats wastewater from a CSS, which serves a population of approximately 780,000 and drains stormwater flow from an area of almost 13,664 acres. The Owls Head WWTP began operating in 1952 and has been providing full secondary treatment since 1995. Treatment processes include: primary screening; raw sewage pumping; grit removal and primary settling; air activated sludge capable of operating in the step aeration mode; final settling; and chlorine disinfection. The Owls Head WWTP has a design dry-weather flow capacity of 120 MGD, and is designed to receive a maximum wet-weather flow of 240 MGD (two times design dry-weather flow [2xDDWF]), with 180 MGD (one and one-half times design dry-weather flow [1.5xDDWF]) receiving secondary treatment. Flows over 180 MGD receive primary treatment and disinfection.

Owls Head Non-Sewered Areas

No unsewered areas are known to exist in the Coney Island Creek sewershed served by the Owls Head WWTP.

Owls Head Permitted Stormwater Outfalls

One of the DEP MS4 permitted stormwater outfalls shown on Figure 2-1 (OH-606) discharges to Coney Island Creek from the Owls Head sewershed on the north side of the Creek. Runoff from this and other MS4 areas do not enter the CSS; the stormwater drains from the separate stormwater sewer system directly to Coney Island Creek through a SPDES-permitted MS4 outfall structure. Other separate stormwater drainage areas within the watershed area served by the Owls Head WWTP are tributary to CSO Outfall OH-021. The runoff from these drainage areas enters the outfall barrels downstream of Regulator Av-1 and is thus considered an MS4 loading under the LTCP framework.

One other DEP-owned 24-inch diameter outfall, OH-450, is located on the northern bank of Coney Island Creek at the Cropsey Avenue Bridge, and is classified as direct discharge. Within the analysis of this LTCP, the small drainage area associated with this outfall pipe is handled as direct drainage.

No high level storm sewer (HLSS) works are planned or ongoing in the Coney Island Creek sewershed.

Owls Head/Coney Island Creek CSOs

Wet-weather flows in the CSS result in overflows to the nearby waterbodies when the flows exceed the hydraulic capacity of the sewer system or the specific capacity of the local regulator structure. The only SPDES-permitted CSO outfall to Coney Island Creek is Outfall OH-021. The location of CSO Outfall OH-021 is shown in Figure 2-1.

Coney Island WWTP Drainage Area and Sewer System

The portion of the Coney Island Creek sewershed served by the Coney Island WWTP surrounds the southern and northeastern shores of the Creek, and generally overlays the drainage areas associated with SPDES MS4 Outfalls CI-601, CI-602, CI-665, CI-639, CI-653 and CI-641. It yields an aggregated drainage area of approximately 808 acres, served exclusively by separate sanitary sewers and stormwater sewers.

Coney Island WWTP Non-Sewered Areas

No unsewered areas are known to exist in the Coney Island Creek sewershed served by the Coney Island WWTP.

Coney Island Permitted Stormwater Outfalls

According to the MS4 permit, seven separate storm sewer outfalls are located along the shore of Coney Island Creek associated with the Coney Island WWTP service area. In addition, the DEP Shoreline Survey identified, two other outfalls, CI-596 and CI-408, which are located on the southern bank of Coney Island Creek, and classified as direct discharge. Within the analysis of this LTCP, the drainage areas associated with these pipes are handled as direct drainage.

Coney Island WWTP CSOs

As noted earlier, the Coney Island Creek watershed served by the Coney Island WWTP comprises separate sanitary sewers and stormwater sewers exclusively. No CSS elements or CSOs are associated with the collection system.

2.1.c.2 Stormwater and Wastewater Characteristics

The concentrations found in wastewater, combined sewage, and stormwater can vary based on a number of factors, including flow rate, runoff contribution, and the mix of the waste discharged to the system from domestic and non-domestic customers. Because the mix of these waste streams can vary, it can be challenging to identify a single concentration to use for analyzing the impact of discharges from these systems to receiving waters.

Data collected from sampling events were used to estimate concentrations for biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform bacteria and enterococci bacteria to use in calculating loadings from various sources.

Data collected under the LTCP sampling program summarized in the form of GM in Table 2-5 from April to June 2015, constitute the most recent data available. The sampling locations listed are located within the Owls Head WWTP service area. The range of stormwater bacteria concentrations that yield the GMs shown in Table 2-5 will be used to assign bacteria loadings to the MS4 system tributary to Coney Island Creek.

Table 2-5. Stormwater Discharge Concentrations Owls Head WWTP Service Areas

Stormwater Sampling Location	Enterococci (cfu/100mL) Sampling Period GM	Fecal Coliform (cfu/100mL) Sampling Period GM
SW-1	15,300	18,800
SW-2	27,400	35,200
SW-3	29,800	11,400
SW-4	47,600	57,400
Composite GM	27,600	27,100

The IW sewer system model (Section 2.1.a.5) is used to generate the flows from NYC storm sewer outfalls. Table 2-6 presents the concentrations that are used in conjunction with the flows to develop loadings.

Table 2-6. Coney Island Creek Source Loadings Characteristics

Source	Flow	Enterococci (cfu/100mL)(2,3)	Fecal Coliform (cfu/100mL)(2,3)	BOD-5 (mg/L)
Stormwater	IW	27,600	27,100	9
CSOs (Outfall OH-021)	IW	Monte Carlo	Monte Carlo	168 for sanitary with mass balance
Direct Drainage(1)	IW	6,000	4,000	9

Notes:

(1) Direct drainage concentrations to reflect recent update to direct drainage bacteria concentrations derived from the low end concentrations from the 2005 Memo (HydroQual 2005a, May 4, 2005, NY/NJ Harbor Estuary Program Model Application of Stormwater Sampling Results, Technical Memorandum, from the New York State Stormwater Manual and from experience in the Charles River watershed.)
(2) DEP, Coney Island Creek LTCP Sampling Program, 2015.
(3) Bacterial concentrations expressed as "colony forming units" per 100mL.

A flow monitoring and sampling program targeting CSO tributary to Coney Island Creek was implemented as part of this LTCP. Data were collected to supplement existing information on the flows/volumes and concentrations of various sources to the waterbody.

CSO concentrations can vary widely and are a function of many factors. Generally, CSO concentrations are a function of local sanitary sewage and runoff entering the combined sewers.

CSO concentrations were measured in 2015 to provide site-specific information for Outfall OH-021. The CSO bacteria concentrations were characterized by direct measurements of four CSO events during various storms throughout June to August 2015. These concentrations are shown in the form of a cumulative frequency distribution in Figure 2-7. Individual sample points are shown, as well as the trend line that best fits the data distribution. For Outfall OH-021, CSO discharges measured fecal coliform concentrations are log-normally distributed, and values range from 18,000 to 2,200,000 cfu/100mL (Figure 2-7). Similarly, enterococci concentrations are also log-normally distributed and range from 25,000 to 620,000 cfu/100mL.

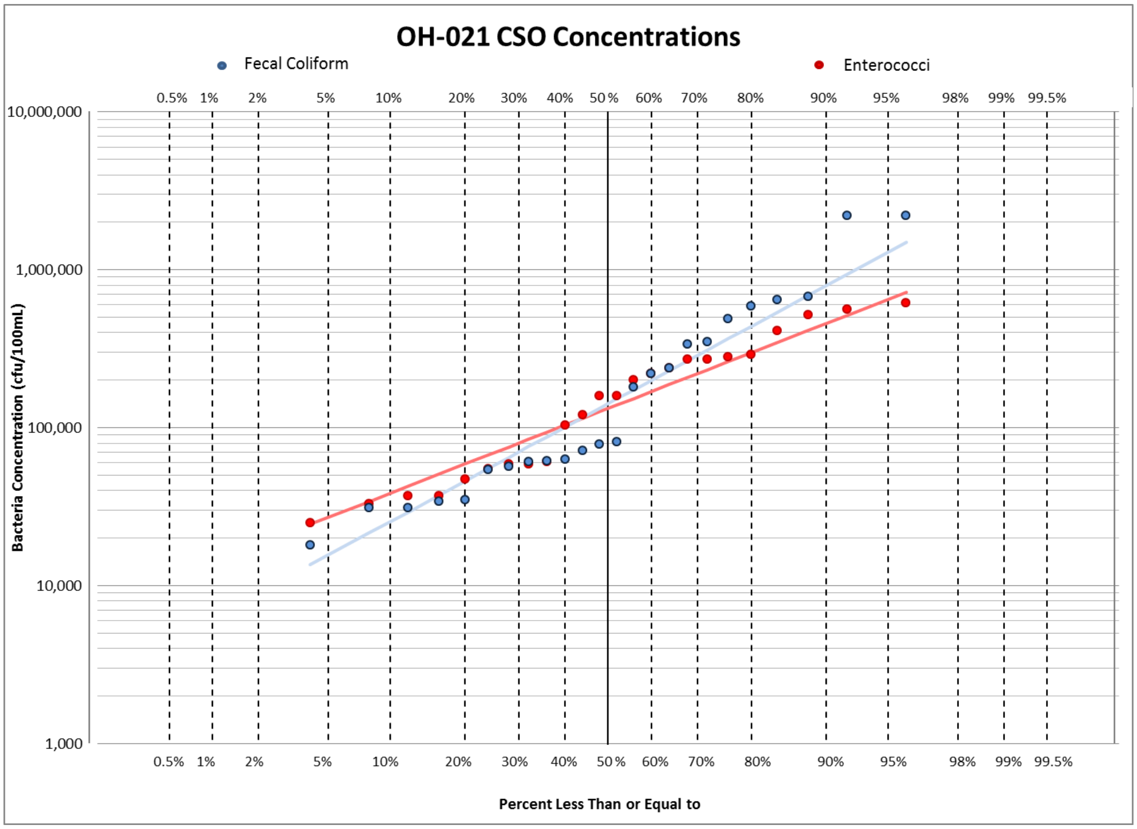

Figure 2-7. Outfall OH-021 Measured CSO Bacteria Concentrations

Flow monitoring data were collected for CSO Outfall OH-021 to support the development of the Coney Island Creek LTCP. The Owls Head WWTP IW model calibration expanded upon the recently calibrated version of the IW model used in the analysis of the Gowanus Canal LTCP (DEP, 2015). This prior version of the model was supported by the peer-reviewed data gathered under the NYC CSO Pilot Monitoring Program for other outfalls within the Owls Head collection system. A description of the IW calibration processes based on the flow monitoring data gathered for Outfall OH-021 was provided earlier in Section 2.1.a.5.

Sampling, data analyses, and water quality modeling calibration resulted in the assignment of flows and loadings to these sources for inclusion in the calibration/validation of the water quality model.

2.1.c.3 Hydraulic Analysis of Sewer System

A citywide hydraulic analysis was completed in December 2012 (an excerpt of which is included in this subsection), to provide further insight into the hydraulic capacities of key system components and system responses to various wet-weather conditions. The hydraulic analyses can be divided into the following major components:

- Annual simulations to estimate the number of annual hours that the WWTP is predicted to receive and treat up to 2xDDWF for rainfall years 2008, and with projected 2040 DWFs; and
- Estimation of peak conduit/pipe flow rates that would result from a significant single event with projected 2040 DWFs.

Detailed presentations of the data were contained in the December 2012 Hydraulic Analysis Report submitted to DEC. The objective of each evaluation and the specific approach undertaken are briefly described in the following paragraphs. Given that the Coney Island WWTP collection system does not discharge CSO to Coney Island Creek, the following descriptions refer to the Owls Head WWTP collection system exclusively.

Annual Hours at 2xDDWF for 2008 with Projected 2040 DWFs

Model simulations were conducted to estimate the annual number of hours that the Owls Head WWTP would be expected to treat 2xDDWF for the 2008 precipitation year. These simulations were conducted using projected 2040 DWF for two model input conditions – the recalibrated model conditions as described in the December 2012 IW Citywide Recalibration Report, and the Cost-Effective Grey alternative defined for the service area. The cost effective grey (CEG) elements represent the CSO controls that became part of the 2012 CSO Consent Order. For these simulations, the primary input conditions applied were as follows:

- Projected 2040 DWF conditions.
- 2008 tides and precipitation data.
- Owls Head WWTP at 2xDDWF capacity of 240 MGD.
- No sediment in the combined sewers (i.e., clean conditions).
- Sediment in interceptors representing the sediment conditions after the inspection and cleaning program undertaken in 2011 and 2012.
- No green infrastructure in combined areas.

The CEG conditions applicable to the service area included the Avenue V Pumping Station upgrade.

Key observations/findings are summarized below:

- Simulation of the 2008 annual rainfall year resulted in a prediction that the Owls Head WWTP would operate at its 2xDDWF capacity for 105 hours under the non-CEG condition. When the CEG conditions were applied in the model, the annual number of hours at 2xDDWF were slightly less – at 98 hours.
- The total volume (dry- and wet-weather combined) treated annually at the Owls Head plant for the 2008 non-CEG condition was predicted to be about 38,064 MG, while the 2008 with CEG condition resulted in a prediction that 38,074 MG would be treated at the plant – an increase of 10 MG.
- The total annual CSO volume predicted for the outfalls in the Owls Head service area were as follows:

- 2008 non-CEG: 2,198 MG
- 2008 with CEG: 2,196 MG

The above results indicate a slight decrease in the number of hours at the 2xDDWF operating capacity for Owls Head WWTP.

Estimation of Peak Conduit/Pipe Flow Rates

Model output tables containing information on several pipe characteristics were prepared, coupled with calculation of the theoretical, non-surcharged, full-pipe flow capacity of each sewer included in the models. To test the conveyance system response under what would be considered a large storm event condition, a single-event storm that was estimated to approximate a five-year return period (in terms of peak hourly intensity as well as total depth), was selected from the historical record.

The selected single event was simulated in the modeled WWFP conditions, and the second with the CEG conditions implemented. The maximum flow rates and maximum depths predicted by the models for each modeled sewer segment were retrieved and aligned with the other pipe characteristics. Columns in the tabulations were added to indicate whether the maximum flow predicted for each conduit exceeded the non-surcharged, full-pipe flow, along with a calculation of the maximum depth in the sewer as a percentage of the pipe full height. It was suspected that potentially, several of the sewer segments could be flowing full, even though the maximum flow may not have reached the theoretical maximum full-pipe flow rate for reasons such as: downstream tidal backwater, interceptor surcharge, or other capacity-limiting reasons. The resulting data were then scanned to identify the likelihood of such capacity-limiting conditions, and also to provide insight into potential areas of available capacity, even under large storm event conditions. Key observations/findings of this analysis are described below:

- Capacity exceedances for each sewer segment were evaluated in two ways for both interceptors and combined sewers:
  - Full flow exceedances, where the maximum predicted flow rate exceeded the full-pipe non-surcharged flow rate. This could be indicative of a conveyance limitation.
  - Full depth exceedances, where the maximum depth was greater than the height of the sewer segment. This could be indicative of either a conveyance limitation or a backwater condition.
- For the single storm event simulated, the model predicted that 55.8 percent (by length) of the interceptor sewer segments in the Owls Head service area would exceed full-pipe capacity flow, while about 42.8 to 44.3 percent (by length) of the upstream combined sewers would exceed their full-pipe flow.
- 100 percent (by length) of the interceptors in the Owls Head WWTP service area were predicted to flow at full depth or higher. Between 76.1 and 78.9 percent (by length) of the combined sewers were also predicted to flow at full depth, indicating that many of these sewers experienced backwater conditions from the downstream sewer (and interceptor) system as a result of either pipe or plant capacity limitations.
- The length of sewers that did not reach full depth under the CEG simulations (about 21 to 24 percent) in the Owls Head service area indicates that there is little potential for in-line storage capability in the Owls Head service area.

- The results for the system condition without CEG improvements were nearly the same as the system condition that included CEG improvements in the Owls Head service area.

2.1.c.4 Identification of Sewer System Bottlenecks, Areas Prone to Flooding and History of Sewer Back-ups

It is DEP's responsibility to maintain and operate the NYC owned collection system throughout the five boroughs. To do so, DEP employs a combination of reactive and proactive maintenance techniques. NYC's "Call 311" system routes complaints of sewer issues to DEP for response and resolution. Though not every call reporting flooding or sewer back-ups (SBUs) corresponds to an actual issue with the municipal sewer system, each call to 311 is responded to. Sewer functionality impediments identified during a DEP response effort are corrected as necessary. NYC has upgraded the Avenue V Pumping Station and has stormwater management projects planned that will improve the sewer and drainage conditions surrounding Coney Island Creek.

2.1.c.5 Findings from Interceptor Inspections

DEP has several programs with staff devoted to sewer maintenance, inspection and analysis, and regularly inspects and cleans its sewers, as reported in the SPDES BMP Annual reports. In the last decade, DEP has implemented advanced technologies and procedures to enhance its proactive sewer maintenance practices. GIS and Computerized Maintenance and Management Systems (CMMS) provide DEP with expanded data tracking and mapping capabilities, through which it can identify and respond to trends to better serve its customers. Both reactive and proactive system inspections result in maintenance, including cleaning and repair as necessary. Figure 2-8 illustrates the intercepting sewers that were inspected in the Borough of Brooklyn, encompassing the entire Coney Island Creek watershed. Throughout 2015, 5 cubic yards of sediment was removed from Owls Head WWTP intercepting sewers and 1,901 cubic yards of sediment was removed from Coney Island WWTP intercepting sewers. Citywide, the inspection of 66,262 feet of intercepting sewers resulted in the removal of 3,306 cubic yards of sediment.

DEP recently conducted a sediment accumulation analysis to quantify levels of sediments in the CSSs. For this analysis, a statistical approach was used to randomly select a sample subset of collection sewers representative of the modeled systems as a whole, with a confidence level commensurate to that of the IW watershed models. Field crews investigated each location, and estimated sediment depth using a rod and tape. Field crews also verified sewer pipe sizes shown on maps, and noted physical conditions of the sewers. The data were then used to estimate the sediment levels as a percentage of overall sewer cross-sectional area. The aggregate mean sediment level for the entire NYC was approximately 1.25 percent, with a standard deviation of 2.02 percent.

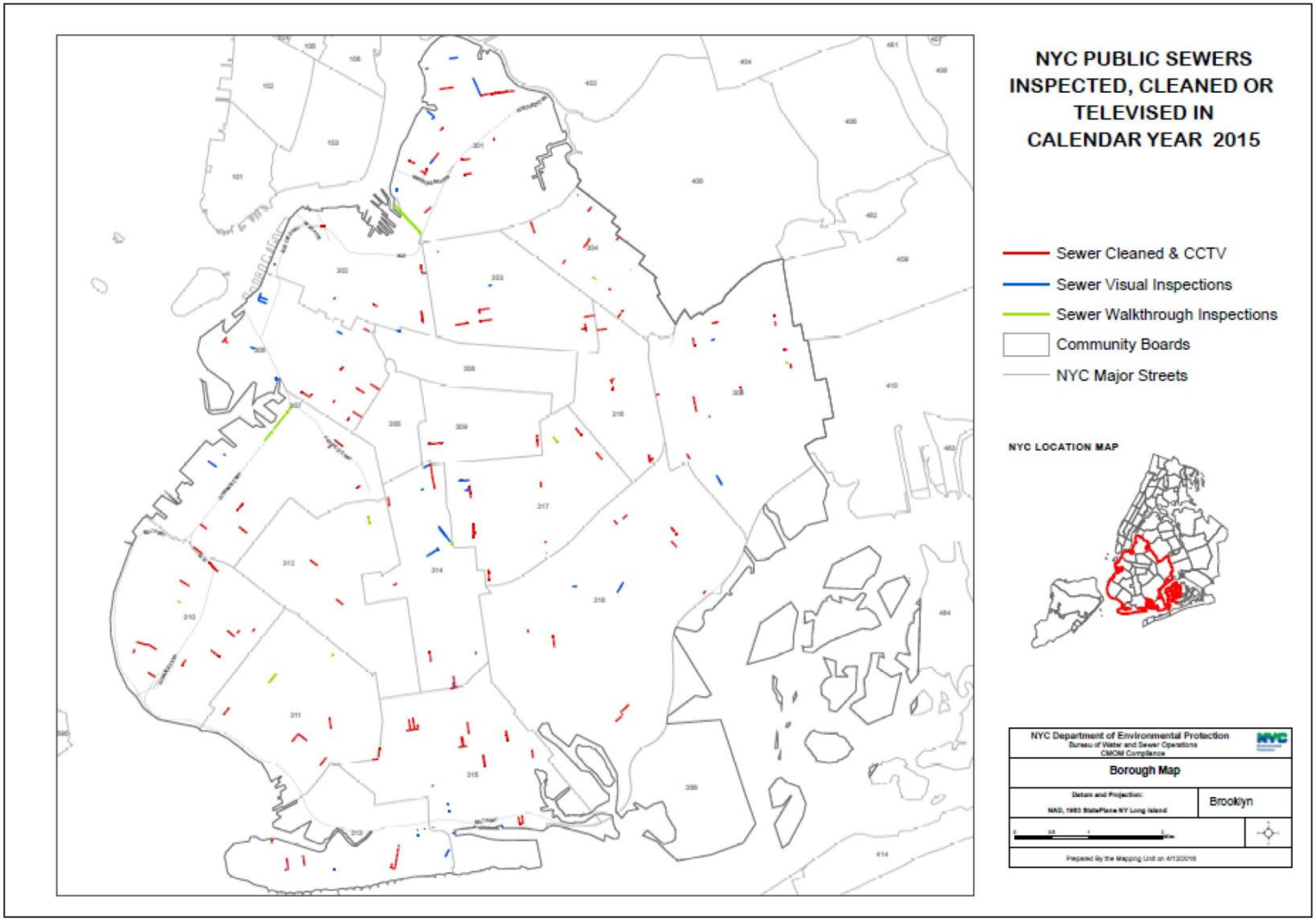

Figure 2-8. Sewers Inspected and Cleaned in Brooklyn Throughout 2014

2.1.c.6 Status of Receiving Wastewater Treatment Plants (WWTPs)

As previously noted, the Coney Island Creek watershed is served by the Owls Head WWTP and Coney Island WWTP service areas.

The Owls Head WWTP was constructed in 1952. The treatment system was upgraded in 1995 and provides secondary treatment for a design dry flow of 120 MGD. Current treatment includes preliminary treatment, primary settling, secondary treatment (activated sludge, step-feed aeration), and disinfection (sodium hypochlorite). Sludge is treated by gravity thickening and anaerobic digestion prior to off-site transportation to a landfill for disposal. It serves an area of 13,664 acres and a population of 780,000 throughout the Borough of Brooklyn. The Coney Island WWTP started operating in 1952. Its collection system within the Coney Island Creek watershed is comprised of separate sanitary sewers exclusively. The collection system does not contribute CSO flows to Coney Island Creek.

In the 1890s, Coney Island WWTP was placed into service as one of NYC's first treatment plants to help protect the City's beaches. In the 1930s, the treatment plant was upgraded from chlorine disinfection to primary treatment and, in the 1980s, the plant was upgraded again to a secondary treatment plant to comply with the CWA. The current plant capacity is 110 MGD in dry-weather and 220 MGD in wet-weather.

2.2 Waterbody Characteristics

This section of the report describes the features and attributes of Coney Island Creek. Characterizing the features of this waterbody is important for assessing the impact of wet-weather inputs and creating approaches and solutions that mitigate the impact from wet-weather discharges.

2.2.a Description of Waterbody

Coney Island Creek is a saline waterbody located in the Borough of Brooklyn, New York. Coney Island Creek is tributary to Gravesend Bay, and the Bay is tributary to the Lower New York Bay. Water quality in Coney Island Creek is influenced by stormwater discharges and dry-weather sources, as well as by CSO. The following section describes the present-day physical and water quality characteristics of Coney Island Creek, along with its existing uses.

2.2.a.1 Current Waterbody Classification(s) and Water Quality Standards

New York State Policies and Regulations

In accordance with the provisions of the CWA, the State of New York has established WQS for all navigable waters within its jurisdiction. The State has developed a system of waterbody classifications based on designated uses that include five classifications for saline waters. All classes (SA, SB, SC, I and SD) shall be suitable for primary contact recreation, although other factors may preclude such use for Class I and SD designated waterbodies. DEC has classified Coney Island Creek as a Class I waterbody.

Numerical standards corresponding to these waterbody classifications are shown in Table 2-7. Dissolved oxygen (DO) is the numerical criteria that DEC uses to establish whether a waterbody supports aquatic life uses. Total and fecal coliform bacteria concentrations are the numerical criteria that DEC uses to establish whether a waterbody supports recreational uses. In addition to numerical criteria, NYS has narrative criteria to protect aesthetics in all waters within its jurisdiction, regardless of classification (see Section 1.2.c.). As indicated in Table 2-8, these narrative criteria apply to all five classes of saline waters.

Although not separately promulgated by DEC rulemaking, the enterococci criterion of 35 cfu/100mL listed in Table 2-7 is now an enforceable standard in NYS, inasmuch as EPA established January 1, 2005 as the date upon which that criterion must be adopted for all coastal recreational waters. According to DEC's interpretation of the Beaches Environmental Assessment and Coastal Health Act, the criterion applies on a 30-day moving GM basis during the recreational season (May 1st through October 31st). Coney Island Creek waters are not considered coastal recreational waters; therefore, this criterion does not apply under current water quality classifications.

Interstate Environmental Commission

The States of New York, New Jersey, and Connecticut are signatory to the Tri-State Compact that designated the Interstate Environmental District and created the IEC. The IEC includes all saline waters of greater NYC. Coney Island Creek is a tributary of Lower New York Bay which comprises interstate waters and is regulated by IEC as Class B-1 waters. Numerical standards for IEC-regulated waterbodies are shown in Table 2-9, while narrative standards are shown in Table 2-10.

The IEC also restricts CSO discharges to within 24 hours of a precipitation event, consistent with the DEC definition of a prohibited dry-weather discharge. IEC effluent quality regulations do not apply to CSOs if the CSS is being operated with reasonable care, maintenance, and efficiency. Although IEC regulations are intended to be consistent with State WQS, the three-tiered IEC system and the five NYS saline classifications in New York Harbor do not exactly overlap spatially.

Table 2-7. New York State Numerical Surface WQS (Saline)

Class	Usage	Dissolved Oxygen (mg/L)	Total Coliform (cfu/100mL)	Fecal Coliform (cfu/100mL)	Enterococci (cfu/100mL)(7)
SA	Shellfishing for market purposes, primary and secondary contact recreation, fishing. Suitable for fish, shellfish and wildlife propagation and survival.	$\geq 4.8^{(1)}$ $\geq 3.0^{(2)}$	$\leq 70^{(3)}$	N/A	
SB	Primary and secondary contact recreation and fishing. Suitable for fish, shellfish and wildlife propagation and survival.	$\geq 4.8^{(1)}$ $\geq 3.0^{(2)}$	$\leq 2{,}400^{(4)}$ $\leq 5{,}000^{(5)}$	$\leq 200^{(6)}$	$\leq 35^{(8)}$
SC	Limited primary and secondary contact recreation, fishing. Suitable for fish, shellfish and wildlife propagation and survival.	$\geq 4.8^{(1)}$ $\geq 3.0^{(2)}$	$\leq 2{,}400^{(4)}$ $\leq 5{,}000^{(5)}$	$\leq 200^{(6)}$	N/A
I(9)	Secondary contact recreation and fishing. Suitable for fish, shellfish and wildlife propagation and survival.	≥ 4.0	$\leq 2{,}400^{(4)}$ $\leq 5{,}000^{(5)}$	$\leq 200^{(6)}$	N/A
SD(9)	Fishing. Suitable for fish, shellfish and wildlife survival. Waters with natural or man-made conditions limiting attainment of higher standards.	≥ 3.0	$\leq 2{,}400^{(4)}$ $\leq 5{,}000^{(5)}$	$\leq 200^{(6)}$	N/A

Notes:

(1) Chronic standard based on daily average. The DO concentration may fall below 4.8 mg/L for a limited number of days, as defined by the formula:

$$DO_i = \frac{13.0}{2.80 + 1.84e^{-0.1t_i}}$$

where DO_i = DO concentration in mg/L between 3.0 – 4.8 mg/L and t_i = time in days. This equation is applied by dividing the DO range of 3.0 – 4.8 mg/L into a number of equal intervals. DO_i is the lower bound of each interval (i) and t_i is the allowable number of days that the DO concentration can be within that interval. The actual number of days that the measured DO concentration falls within each interval (i) is divided by the allowable number of days that the DO can fall within interval (t_i). The sum of the quotients of all intervals (i …n) cannot exceed 1.0: i.e.,

$$\sum_{i=1}^{n} \frac{t_i(actual)}{t_i(allowed)} < 1.$$

(2) Acute standard (never less than 3.0 mg/L).
(3) Colony forming unit per 100mL value in any series of representative samples.
(4) Monthly median value of five or more samples.
(5) Monthly 80th percentile of five or more samples.
(6) Monthly geometric mean of five or more samples.
(7) This standard, although not promulgated by DEC, is now an enforceable standard in NYS, inasmuch as EPA established January 1, 2005 as the date upon which the criteria must be adopted for all coastal recreational waters.
(8) 30-day moving geometric mean.

Table 2-8. New York State Narrative WQS

Parameters	Classes	Standard
Taste-, color-, and odor-producing toxic and other deleterious substances	SA, SB, SC, I, SD A, B, C, D	None in amounts that will adversely affect the taste, color or odor thereof, or impair the waters for their best usages.
Turbidity	SA, SB, SC, I, SD A, B, C, D	No increase that will cause a substantial visible contrast to natural conditions.
Suspended, colloidal and settleable solids	SA, SB, SC, I, SD A, B, C, D	None from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages.
Oil and floating substances	SA, SB, SC, I, SD A, B, C, D	No residue attributable to sewage, industrial wastes or other wastes, nor visible oil film nor globules of grease.
Garbage, cinders, ashes, oils, sludge and other refuse	SA, SB, SC, I, SD A, B, C, D	None in any amounts.
Phosphorus and nitrogen	SA, SB, SC, I, SD A, B, C, D	None in any amounts that will result in growth of algae, weeds and slimes that will impair the waters for their best usages.

Table 2-9. IEC Numeric WQS

Class	Usage	DO (mg/L)	Waterbodies
A	All forms of primary and secondary contact recreation, fish propagation, and shellfish harvesting in designated areas	≥ 5.0	East River east of the Whitestone Bridge; Hudson River north of confluence with the Harlem River; Raritan River east of the Victory Bridge into Raritan Bay; Sandy Hook Bay; Lower New York Bay; Atlantic Ocean
B-1	Fishing and secondary contact recreation, growth and maintenance of fish and other forms of marine life naturally occurring therein, but may not be suitable for fish propagation.	≥ 4.0	Hudson River, south of confluence with Harlem River; upper New York Harbor; East River from the Battery to the Whitestone Bridge; Harlem River; Arthur Kill between Raritan Bay and Outerbridge Crossing
B-2	Passage of anadromous fish, maintenance of fish life	≥ 3.0	Arthur Kill north of Outerbridge Crossing; Newark Bay; Kill Van Kull

Table 2-10. IEC Narrative Regulations

Classes	Regulation
A, B-1, B-2	All waters of the Interstate Environmental District (whether of Class A, Class B, or any subclass thereof) shall be of such quality and condition that they will be free from floating solids, settleable solids, oil, grease, sludge deposits, color or turbidity to the extent that none of the foregoing shall be noticeable in the water or deposited along the shore or on aquatic substrata in quantities detrimental to the natural biota; nor shall any of the foregoing be present in quantities that would render the waters in question unsuitable for use in accordance with their respective classifications.
A, B-1, B-2	No toxic or deleterious substances shall be present, either alone or in combination with other substances, in such concentrations as to be detrimental to fish or inhibit their natural migration or that will be offensive to humans or which would produce offensive tastes or odors or be unhealthful in biota used for human consumption.
A, B-1, B-2	No sewage or other polluting matters shall be discharged or permitted to flow into, or be placed in, or permitted to fall or move into the waters of the District, except in conformity with these regulations.

EPA Policies and Regulations

For designated bathing beach areas, the EPA has established an enterococci reference level of 104 cfu/100mL to be used by agencies for announcing bathing advisories or beach closings in response to pollution events. The DOHMH uses a 30-day moving GM of 35 cfu/100mL to trigger such closures. If the GM exceeds that value, the beach is closed pending additional analysis. An enterococci concentration of 104 cfu/100mL is an advisory upper limit used by DOHMH. If beach enterococci data are greater than 104 cfu/100mL, a pollution advisory is posted on the DOHMH website and additional sampling is initiated. The advisory is removed when water quality is acceptable for primary contact recreation. Advisories are posted at the beach and on the agency website.

For non-designated beach areas of primary contact recreation which are used only infrequently for primary contact, the EPA has established an enterococci reference level of 501 cfu/100mL as indicative of a pollution event.

According to EPA documents, these reference levels are not binding regulatory criteria; rather, they are to be used by the State agencies to make decisions related to recreational uses and pollution control needs. For bathing beaches, these reference levels are to be used for announcing beach advisories or beach closings in response to pollution events. No areas of the Coney Island Creek shoreline are authorized by the DOHMH for bathing.

In December 2012, the EPA released RWQC recommendations that are designed to protect human health in coastal and non-coastal waters designated for primary recreational use. These recommendations were based on a comprehensive review of research and science that evaluated the link between illness and fecal contamination in recreational waters. The recommendations are intended as guidance to States, territories, and authorized tribes in developing or updating WQS to protect swimmers from exposure to pathogens found in water with fecal contamination.

The 2012 RWQC recommends two sets of numeric concentration thresholds, as listed in Table 2-11, and includes limits for both the GM (30-day) and a STV based on exceeding a 90th percentile value associated with the geometric mean. The STV is a new limit, and is intended not to be exceeded by more than 10 percent of the samples taken.

Table 2-11. 2012 RWQC Recommendations

Criteria Elements	Recommendation 1 (Estimated Illness Rate 36/1,000)		Recommendation 2 (Estimated Illness Rate 32/1,000)	
Indicator	**GM (cfu/100mL)**	**STV (cfu/100mL)**	**GM (cfu/100mL)**	**STV (cfu/100mL)**
Enterococci (saline and fresh)	35	130	30	110
E. coli (fresh)	126	410	100	320

Based upon its understanding that DEC will implement EPA's RWQC Recommendation 2, DEP has based its LTCP analyses for Coney Island Creek on the enterococci numerical criteria associated with that Recommendation.

2.2.a.2 Physical Waterbody Characteristics

Coney Island Creek is a saline tributary that runs westward and opens into Gravesend Bay, which opens to the Lower New York Bay.

The shoreline is bulkheaded or rip-rap protected throughout most of its extension, and the land use immediately surrounding the waterbody is primarily industrial.

Coney Island Creek is within the Coastal Zone Boundary as designated by the DCP.

Shoreline Physical Characterization

The shorelines of Coney Island Creek are bulkheaded or rip-rap protected throughout most of the waterbody as shown in Figures 2-9 and 2-10.

Shoreline Slope

The Coney Island Creek shoreline is bulkheaded or rip-rap protected throughout most of its extension. There are no significant natural slopes along the shoreline.

Figure 2-9. Shoreline View of Coney Island Creek (Looking East near the Mouth)

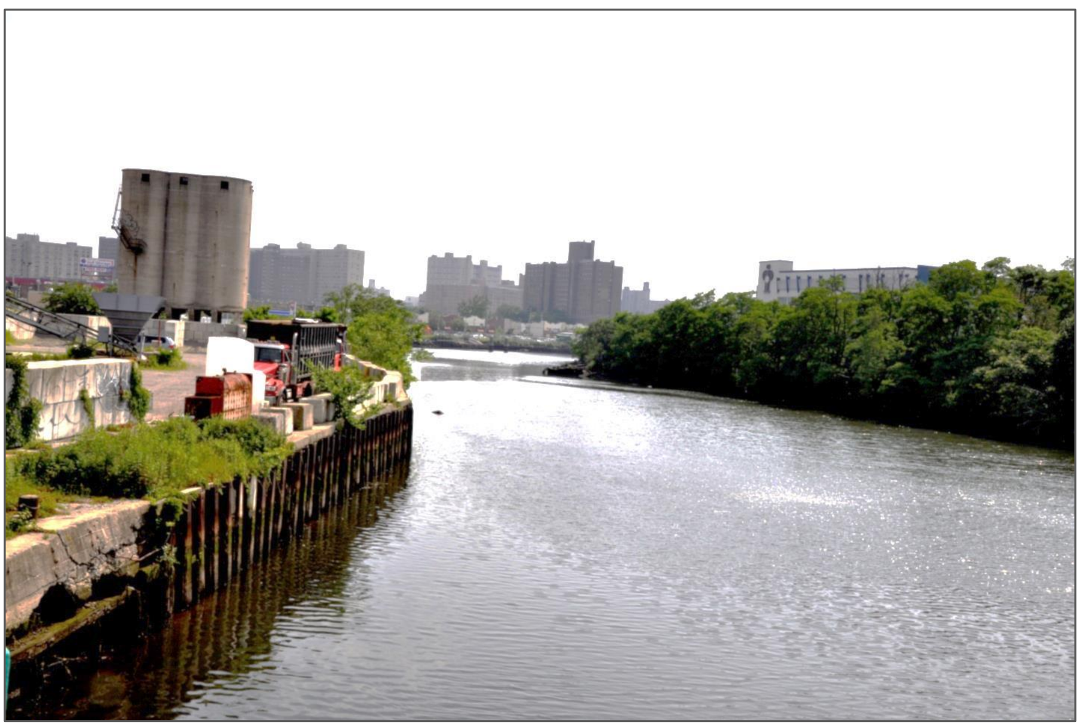

Figure 2-10. Shoreline View of Coney Island Creek (Looking West from Cropsey Ave Bridge)

Waterbody Sediment Surficial Geology/Substrata

The most recent data for sediment grain size and Total Organic Carbon (TOC) content was measured in Coney Island Creek sediments as part of the Subtidal Benthos and Icthyoplankton Characterization Field Sampling and Analysis Plan (FSAP, 2003). The sediments in the middle reach of Coney Island Creek had a percent TOC of 1.66 percent and the sediments near the mouth of the Creek had a percent TOC of 5.3 percent. One other location at the head end of the Creek revealed sediment TOC content of 5.8 percent. Thus, the sediment in the middle of the Creek had the lowest TOC content of all locations sampled. Further description of the data gathered under the 2003 FSAP are included in the Coney Island Creek WWFP (2009). Further description of the data and other information on taxa and sediment characteristics gathered under the implemented FSAP are included in the Coney Island Creek WWFP.

In response to a DEC Record of Decision (ROD) released in March 2002 on a former Manufactured Gas Plant site at the head end on the northern shore of Coney Island Creek, 3 feet of sediment were removed from the top layer of the creek bed and subsequently capped with sediment-quality material along the upper reach. This 2006 remediation work covered the creek bed from the head end to the rail bridge located approximately 2,000 feet downstream.

In 2014, New York City Economic Development Corporation (EDC) conducted a bathymetric survey of the Creek extending from the vicinity of Stillwell Avenue Bridge to the mouth of the Creek to support the Tidal Barrier Study at Coney Island Creek. The bathymetric data gathered supports the hydrodynamics model used in the LTCP evaluations described in other sections of this report.

Waterbody Type

Coney Island Creek is a saline tributary. It receives freshwater contributions from stormwater and CSOs.

Freshwater Systems Biological Systems

No NYS regulated freshwater wetlands (i.e., freshwater wetlands greater than 12.4 contiguous acres) are located in the watershed of Coney Island Creek.

Tidal/Estuarine Wetlands

Tidal/estuarine wetlands reported by the U.S. Fish and Wildlife Service National Wetlands Inventory maps are located along the southern shore of Coney Island Creek near the mouth of the Creek, as shown in Figure 2-11. The four identified classes of estuarine wetlands shown in Figure 2-11 are described in Table 2-12.

Table 2-12. National Wetlands Inventory Classification Codes

National Wetlands Inventory Classification	Description
E2US2M	Estuarine, inter-tidal, unconsolidated sand shore, irregularly exposed
E2US2N	Estuarine, inter-tidal, unconsolidated sand shore, regularly flooded
E2US2P	Estuarine, inter-tidal, unconsolidated sand shore, irregularly flooded
E2USM	Estuarine, inter-tidal, unconsolidated shore, irregularly exposed

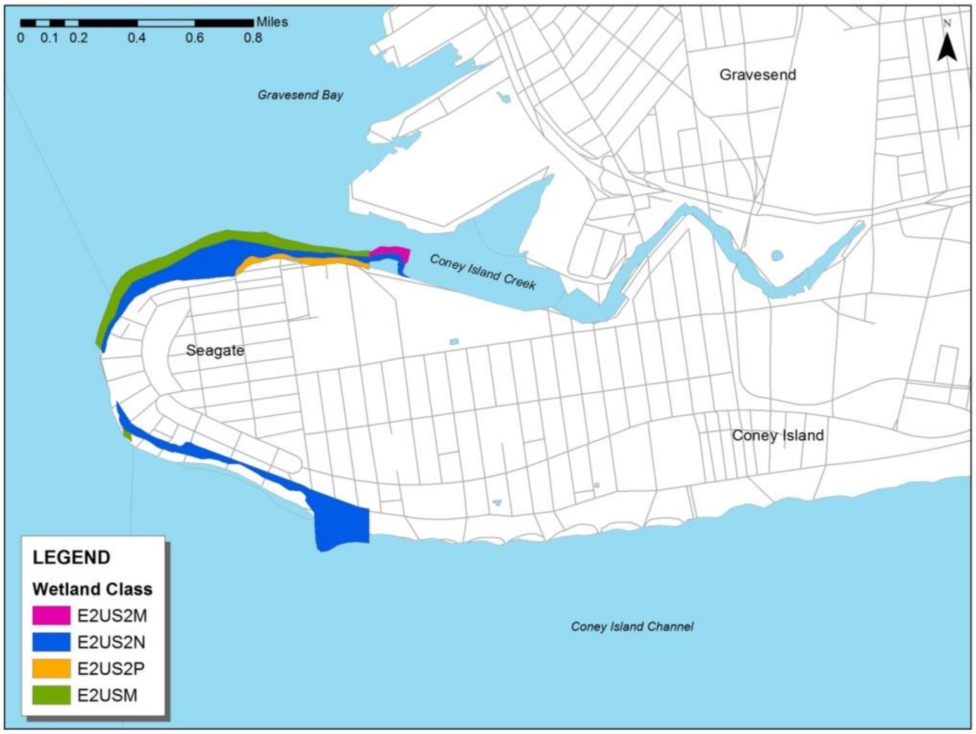

Figure 2-11. Wetlands in Coney Island Creek Watershed

2.2.a.3 Current Public Access and Uses

Primary contact recreation use (swimming) is not an existing sanctioned use in Coney Island Creek. Secondary contact recreation opportunities are also limited, due primarily to access restrictions imposed by the physical characteristics of the shoreline and surrounding land uses. However, five identified access points are located along Coney Island Creek as shown in Figures 2-12 through 2-17.

Figure 2-12. Access Points to Coney Island Creek

The Calvert Vaux Park (Figure 2-13), largely bounded by Gravesend Bay, was created primarily out of sand, soil and rock excavated for the construction of the Verrazano-Narrows Bridge. It offers opportunities for wildlife observation supported by other recreational grounds such as a playground, a main entry rain garden, two synthetic turf fields, basketball courts, bocce courts, six baseball diamonds, a soccer field and a newly restored waterfront.

Figure 2-13. Calvert Vaux Park

The Six Diamonds Park (Figure 2-14) is located along W. 22nd Street from Bay 52nd Street to Bay 56th Street. The park includes six baseball diamonds and two soccer fields.

Figure 2-14. Six Diamonds Park at the Coney Island Boat Basin

The Home Depot Walkway (Figure 2-15) is located at 2970 Cropsey Avenue in Brooklyn. The walkway includes trees, seating, supplemental public access area and an observation corridor on Lower New York Bay.

Figure 2-15. The Home Depot Walkway

Kaiser Park (Figure 2-16) is located along Coney Island Creek from W. 24th Street to W. 32nd Street. The pier in the park is often used for fishing by the locals. The Verrazano-Narrows Bridge is visible from the shore of the park. The park includes soccer, football and baseball fields and a jogging track.

Figure 2-16. Kaiser Park

Coney Island Creek Park (Figure 2-17) is located between Sea Gate Avenue and W. 33rd Street at the mouth of Coney Island Creek. The area is mostly comprised of many types of grass, shrubs, and trees. A small garden is located in the area. A large sand dune was placed on the property in 2001.

Figure 2-17. Coney Island Creek Park

2.2.a.4 Identification of Sensitive Areas

Federal CSO Policy requires that the LTCP give the highest priority to controlling overflows to sensitive areas. The policy defines sensitive areas as:

- Waters designated as Outstanding National Resource Waters (ONRW);
- National Marine Sanctuaries;
- Public drinking water intakes;
- Waters designated as protected areas for public water supply intakes;
- Shellfish beds;
- Water with primary contact recreation;
- Waters with threatened or endangered species and their habitat; and
- Additional areas determined by the Permitting Authority (i.e., DEC).

General Assessment of Sensitive Areas

Coney Island Creek was analyzed under the federal CSO Policy as set forth in Table 2-13.

Table 2-13. Sensitive Areas Assessment

CSO Discharge Receiving Water Segments	Current Uses Classification of Waters Receiving CSO Discharges Compared to Sensitive Areas Classifications or Designations(1)							
	Outstanding National Resource Water (ONRW)	National Marine Sanctuaries(2)	Threatened or Endangered Species and their Habitat (3)	Primary Contact Recreation	Public Water Supply Intake	Public Water Supply Protected Area	Shellfish Bed	Additional Area Determined by Permitting Authority
Coney Island Creek	None	None	No	No(4)	None(5)	None(5)	None	No

Notes:
(1) Classifications or Designations per CSO Policy.
(2) NOAA.
(3) Department of State - Significant Coastal Fish and Wildlife Habitats.
(4) Existing uses include fish and wildlife survival, Class I.
(5) This waterbody contains salt water.

2.2.a.5 Tidal Flow and Background Harbor Conditions and Water Quality

DEP has been collecting New York Harbor water quality data since 1909. These data are utilized by regulators, scientists, educators, and citizens to assess impacts, trends, and improvements in the water quality of New York Harbor. The HSM Program has been the responsibility of DEP's Marine Sciences Section for the past 27 years. These initial surveys were performed in response to public complaints about quality-of-life near polluted waterways. The initial effort has grown into a survey that consists of 72 stations distributed throughout both the open waters of the Harbor and the smaller tributaries within NYC. The number of water quality parameters measured has also increased from 5 in 1909, to over 20 at present.

Harbor water quality has improved dramatically since the initial surveys. Infrastructure improvements and the capture and treatment of virtually all dry-weather sewage are the primary reasons for this improvement. During the last decade, water quality in New York Harbor has improved to the point that the waters are now utilized for recreation and commerce throughout the year. The LTCP process has begun to focus on areas could be improved still further. The LTCP program evaluates 11 waterbodies and their drainage basins and develops a comprehensive improvement plan for each.

The HSM Program focuses on the water quality parameters of fecal coliform and enterococci bacteria, DO and Secchi disk transparency. HSM data are presented in four sections, each delineating a geographic region within the Harbor. The Coney Island Creek is located within the Lower New York Bay (HR-Lower New York Bay) section. This area contains six open-water monitoring stations and two tributary sites. Figure 2-18 shows the location of two HSM tributary Stations, CIC2 and CIC3.

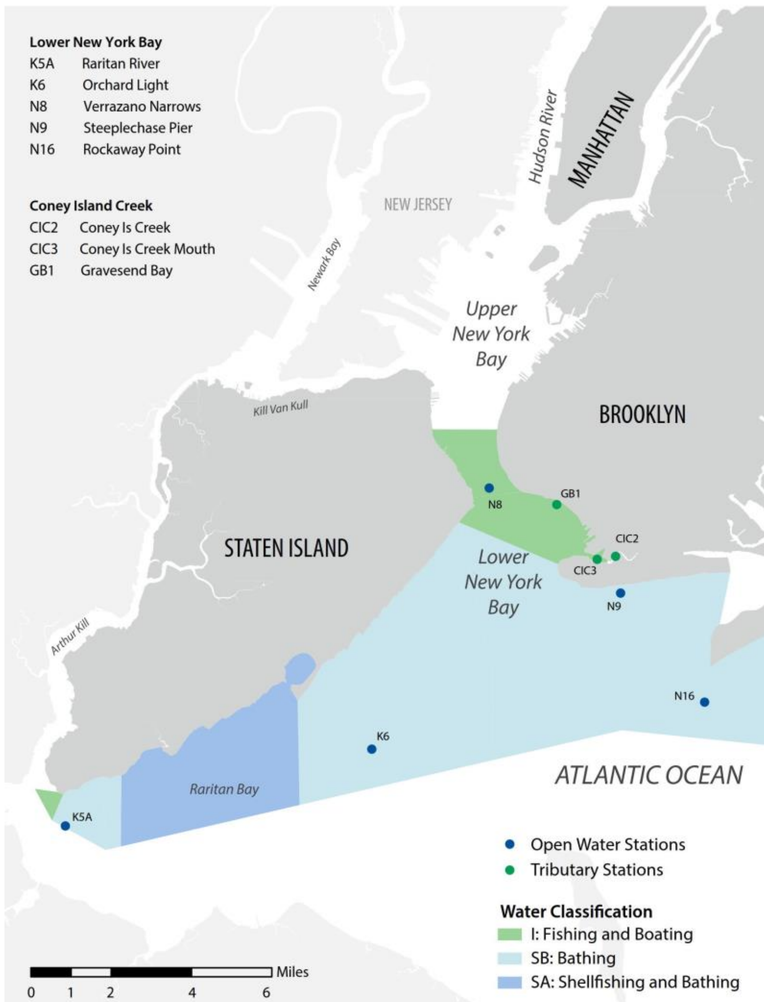

Figure 2-18. Harbor Survey HR-Lower New York Bay Region

2.2.a.6 Compilation and Analysis of Existing Water Quality Data

Data collected within the Coney Island Creek are available from sampling conducted by DEP's HSM Program from 2010 to 2015, and from intensive sampling conducted in March and August 2014 to support the Coney Island Creek LTCP. The sampling locations of both programs are shown in Figure 2-19 followed by an overview of the available recent data for Coney Island Creek.

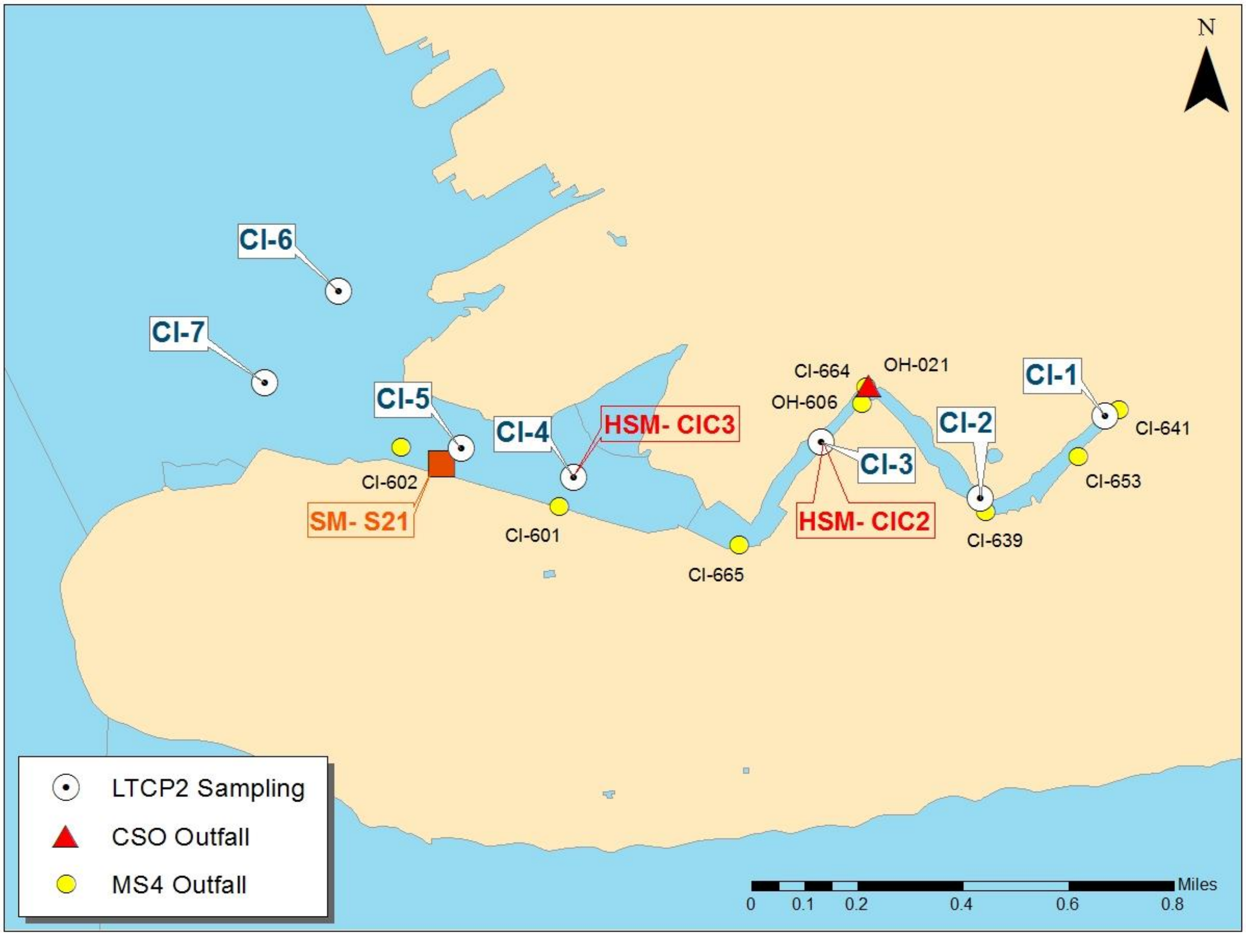

Figure 2-19. Coney Island Creek HSM Program and Dry-Weather LTCP Campaign Sampling Stations

The data indicate that for the post-Avenue V Pumping Station upgrade period, from October 2014 to September 2015, the Harbor Survey fecal coliform measurements show some improvement in water quality along Coney Island Creek, as measured at WQ Stations HSM-CIC2 and HSM-CIC3, depicted in Figure 2-20. However, an improvement of enterococci or DO levels was not observed for the concurrent period, as shown in Figures 2-21 and 2-22. The statistics shown in these figures were derived primarily from the HSM dataset. These statistics also include 26 dry-weather data points measured at Stations CI-3 (HSM CIC2) and CI-4 (HSM CIC3) during two dry-weather receiving water sampling campaigns conducted by the LTCP program in March 2014 and August 2014, prior to the Avenue V Pumping Station upgrade becoming fully operational in October 2014.

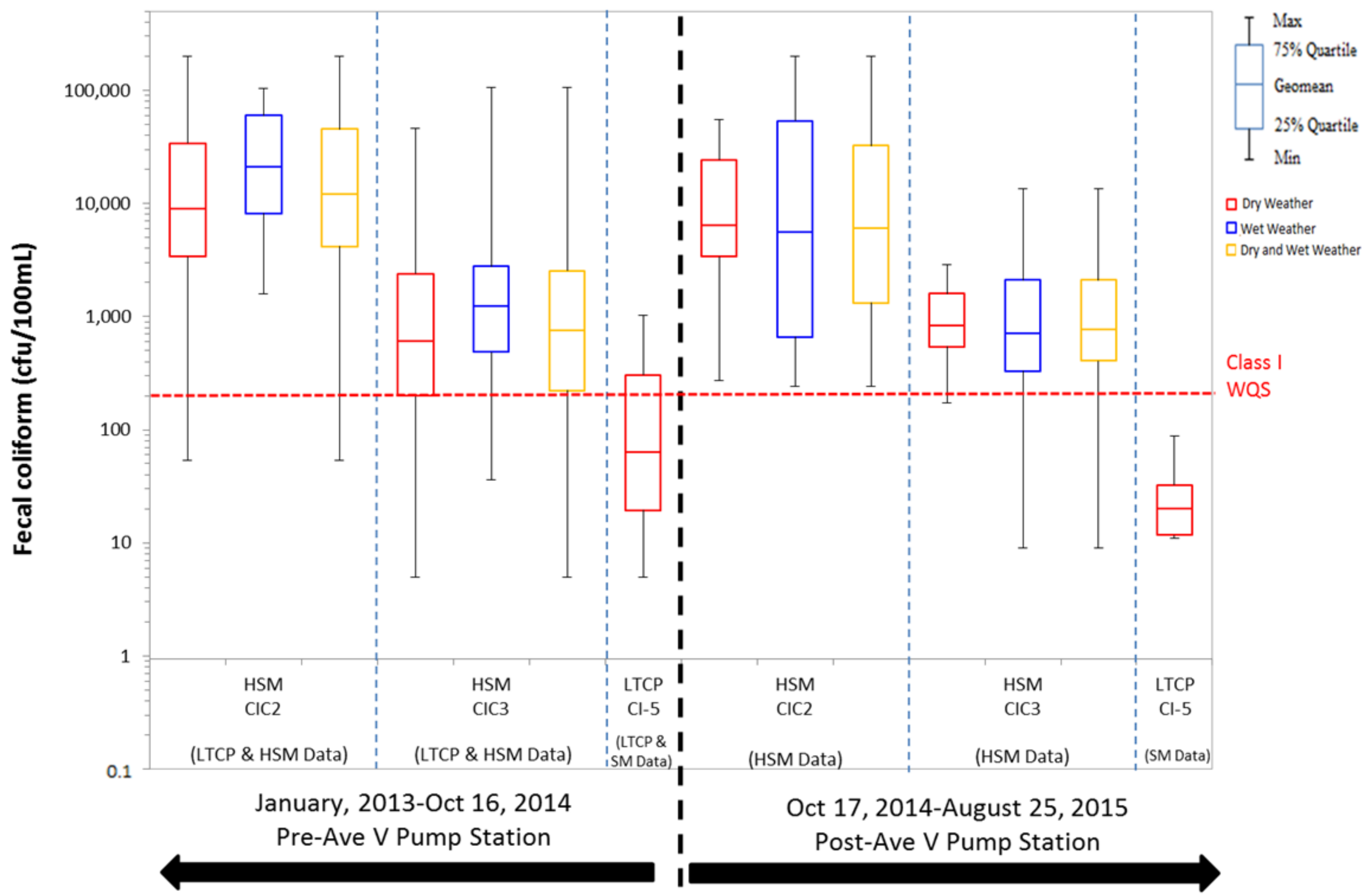

Figure 2-20. Fecal Coliform Statistics Derived From Recent Coney Island Creek Water Quality Data

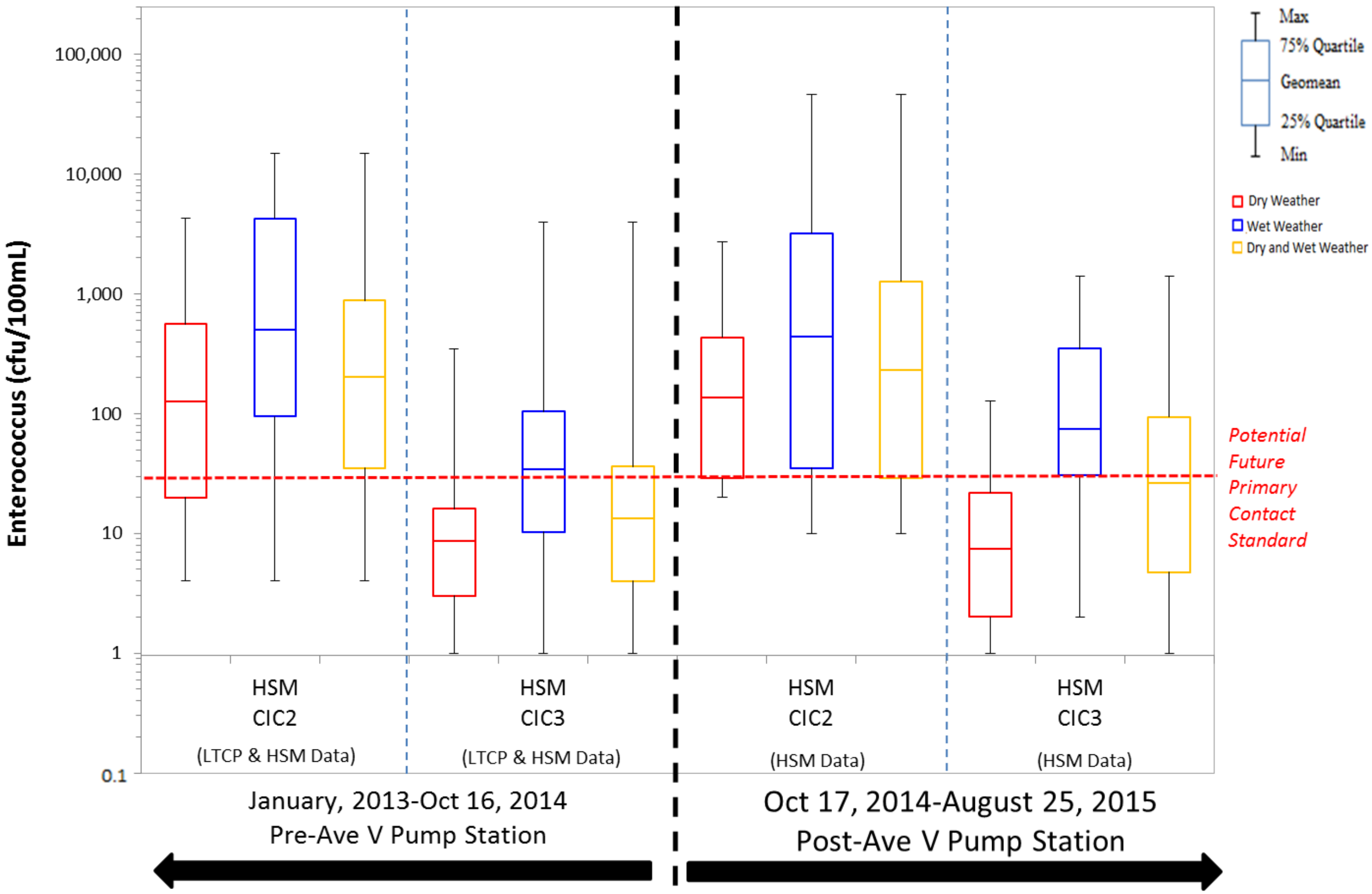

Figure 2-21. Enterococci Statistics Derived From Recent Coney Island Creek Water Quality Data

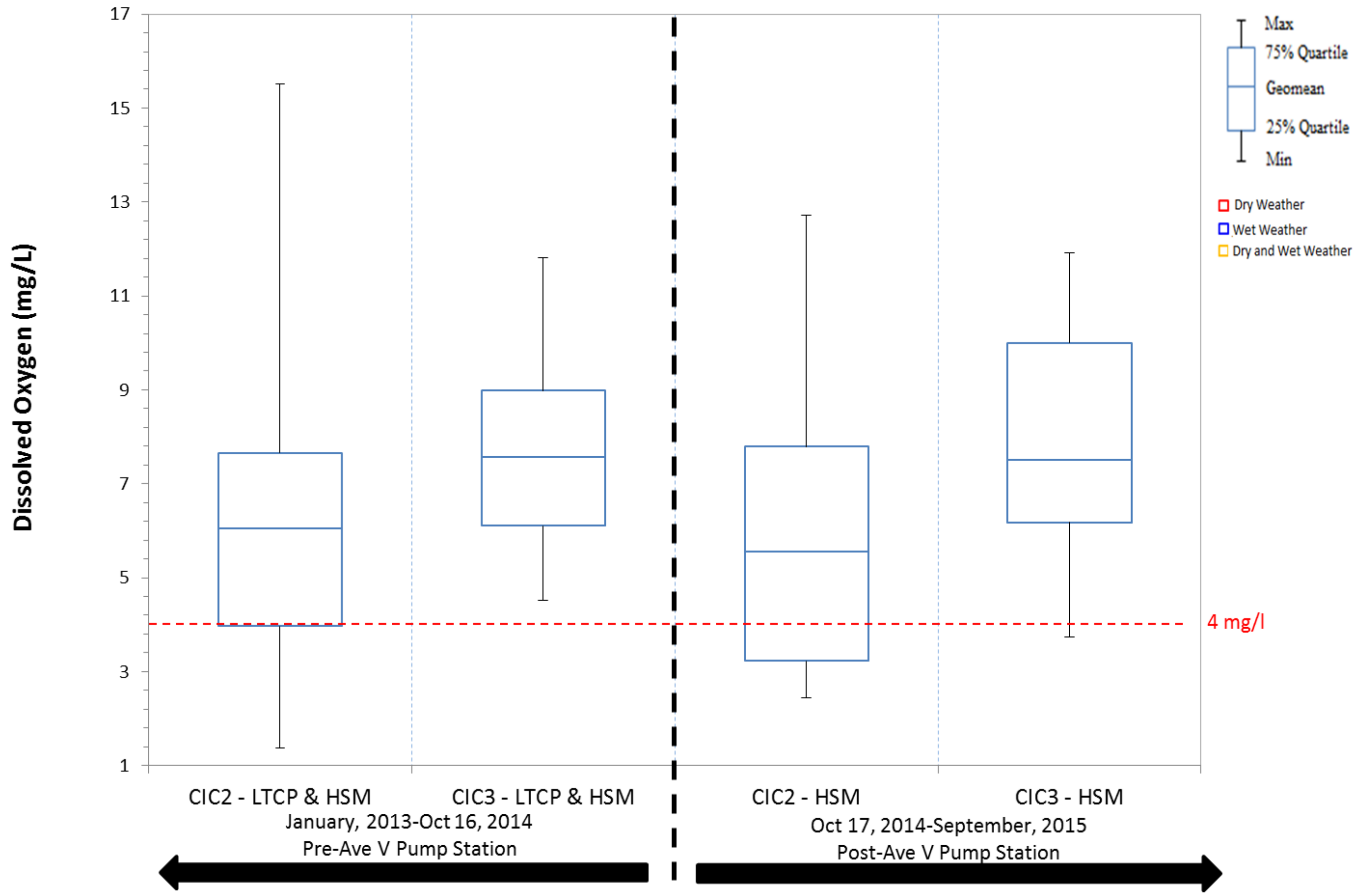

Figure 2-22. DO Statistics Derived From Recent Coney Island Creek Water Quality Data

Fecal coliform and enterococci are indicators of human waste and pathogenic bacteria. According to data collected between January 2013 and September 2015, fecal coliform annual geometric means representative of all-weather conditions are above the existing Class I primary contact bacteria criteria at Stations CIC2 and CIC3, with values of 13,009 cfu/100mL and 1,000 cfu/100mL, respectively. The computed enterococci GMs are 221 and 17 cfu/100mL for Stations CIC2 and CIC3, respectively.

DO is the oxygen in a waterbody available for aquatic life forms. Hypoxia is a water quality condition associated with low DO, and occurs when DO levels fall below 3.0 mg/L. DO measurements below 3.0 mg/L were recorded at Stations CIC2 and CIC3 in Coney Island Creek during the summer period, consistent with observations from prior summers.

Secchi disk transparency is a measure of the clarity of surface waters. Clarity is measured as a depth when the Secchi disk blends in with the water and is no longer visible. Clarity is most affected by the concentrations of suspended solids and plankton. Lack of clarity limits sunlight, which inhibits the nutrient cycle. The average summer Secchi depth at Station CIC3 was 3.66 feet. No measurements were reported for the concurrent period for Station CIC2.

Again, recent water quality data collected within Coney Island Creek are available from sampling conducted by DEP's HSM Program and from intensive sampling conducted in in March and August 2014 in support of the Coney Island Creek LTCP. The latter dry-weather sampling events captured water quality representative of dry-weather conditions at the stations depicted in Figure 2-19. The results gathered by these LTCP program dry-weather campaigns are shown in Figures 2-24 and 2-25. The data indicate fecal coliform concentrations were typically measured between 10,000 and 20,000 cfu/100mL at Station CIC2. The data indicate the presence of potential dry-weather discharges towards the head end of the waterbody. DEP has been proactive in identifying and abating illicit connections in the Coney Island Creek watershed. Of 53 establishments inspected, 10 were discovered to be illicitly connected to a storm sewer tributary to OH-021. As a result of DEP's enforcement actions and issuance of Commissioner's Orders for their removal, eight of the 10 were fully abated and two are working with contractors to complete their abatements. Of six homes found illicitly connected to a storm sewer tributary to CI-664, four have reconnected to a sanitary sewer, one home has been demolished, and one does not have a sewer fronting the property. DEP's trackdown efforts have not yielded a number of improperly connected residences as might correspond to the elevated fecal coliform data observed by the HSM Program. As such, investigations will continue, but are necessarily impacted by extensive, simultaneous sewer improvement work.

No wet-weather water quality data was collected by the LTCP program. However, water quality data representative of dry and wet-weather conditions were collected by the HSM Program and have been described earlier in this section and in Section 2.2.a.5, above. These data are used to validate the Coney Island Creek water quality models supporting the development of this LTCP.

Because the elevated fecal coliform levels in the interior portions of Coney Island Creek do not correlate with the relatively low numbers of improper connections that DEP has identified to date, DEP has undertaken an additional, parallel trackdown effort to better understand the measurements through supplemental data analyses and microbiological laboratory investigations. The first step in this process was an assessment of the fecal coliform measurements and development of a better understanding of what is being measured in the Coney Island Creek fecal coliform tests. It is undisputed that the fecal coliform test is not the best indicator of enteric bacteria, and EPA has recommended enterococci bacteria measurements as a better indicator of enteric bacteria. EPA continues to research better micro bacteria indicator measurements.

The ratio of fecal coliform to enterococci at locations in and adjacent to Coney Island Creek varied significantly spatially, higher during warm weather and higher during dry-weather. As shown in Figure 2-23, the ratio of fecal coliform to enterococci is almost 100 within Coney Island Creek, while it is less than 10 at locations in New York Harbor in the vicinity of the Creek (HSM Stations N6, N7, N8, and N9).

These observations point to behavior of the fecal data measurements that are inconsistent with the enterococci measurements. One possible conclusion drawn from this observation is that the Coney Island Creek fecal coliform test is not providing a good indicator of *Escherichia coli*, the more specific indicator of human pollution. The fecal coliform test can measure Klebsiella, Enterobacter and Citrobacter bacteria species in addition to *Escherichia coli*. These bacteria can grow under appropriate conditions and may not in fact be indicators of intestinal or enteric pollution. These bacteria can live in the animal and human gut, but can also live in the environment, and are easily isolated from the soil, polluted water and plants. As such, their presence in polluted waters may not necessarily indicate fecal pollution.

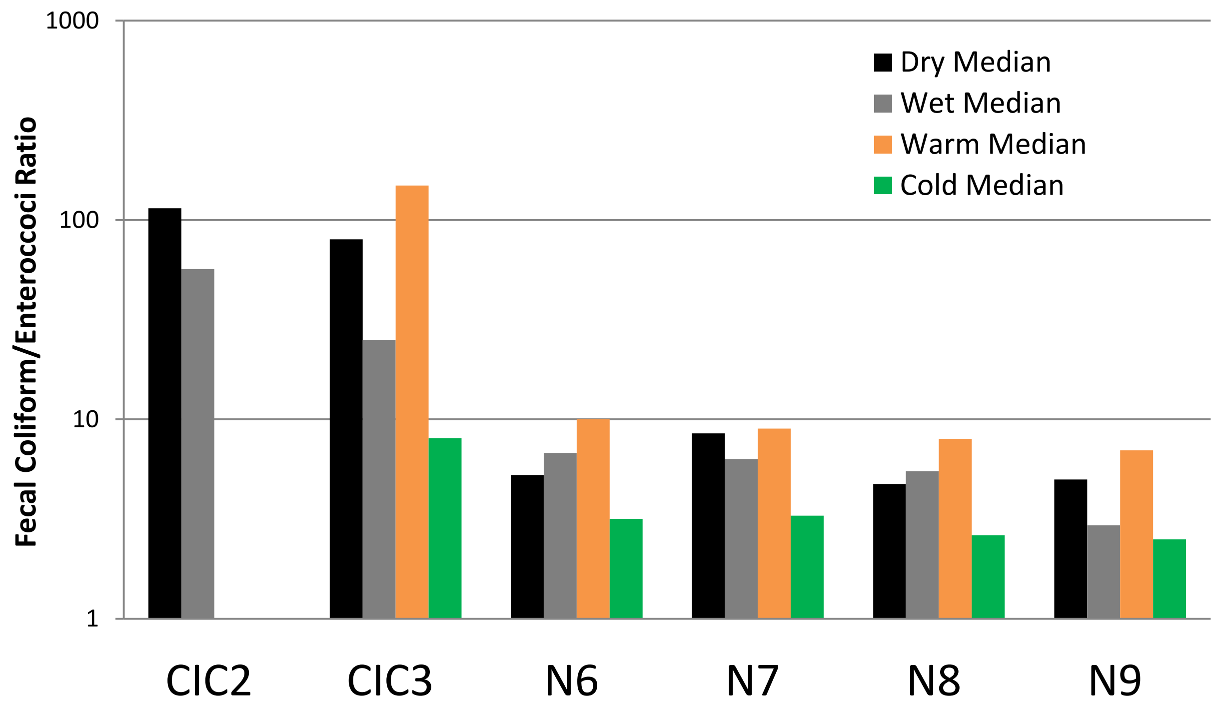

Figure 2-23. Fecal Coliform/Enterococci Ratio in Coney Island Creek

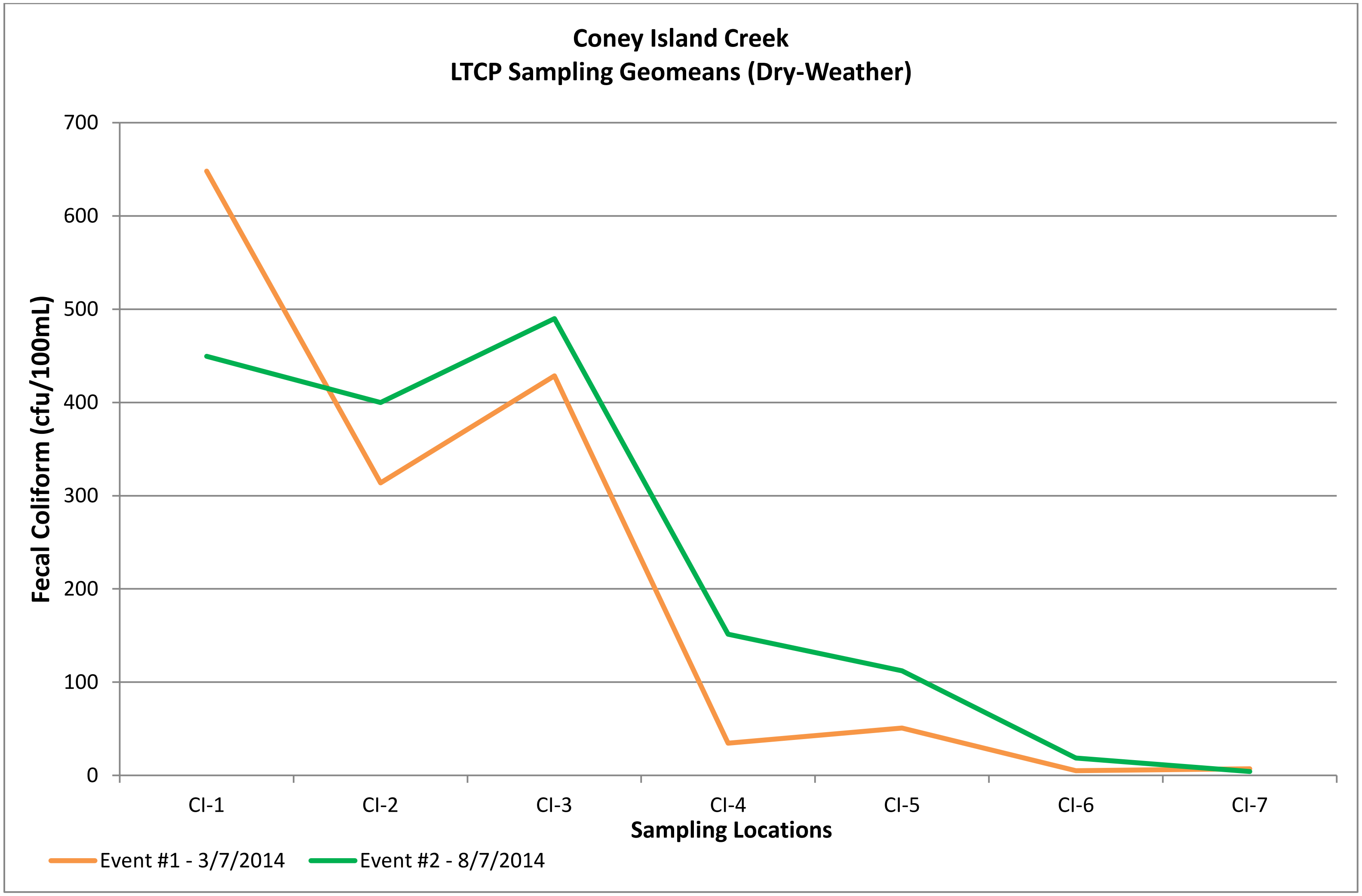

Figure 2-24. Fecal Coliform Data from LTCP Dry-Weather Campaign – Coney Island Creek (March and August 2014)

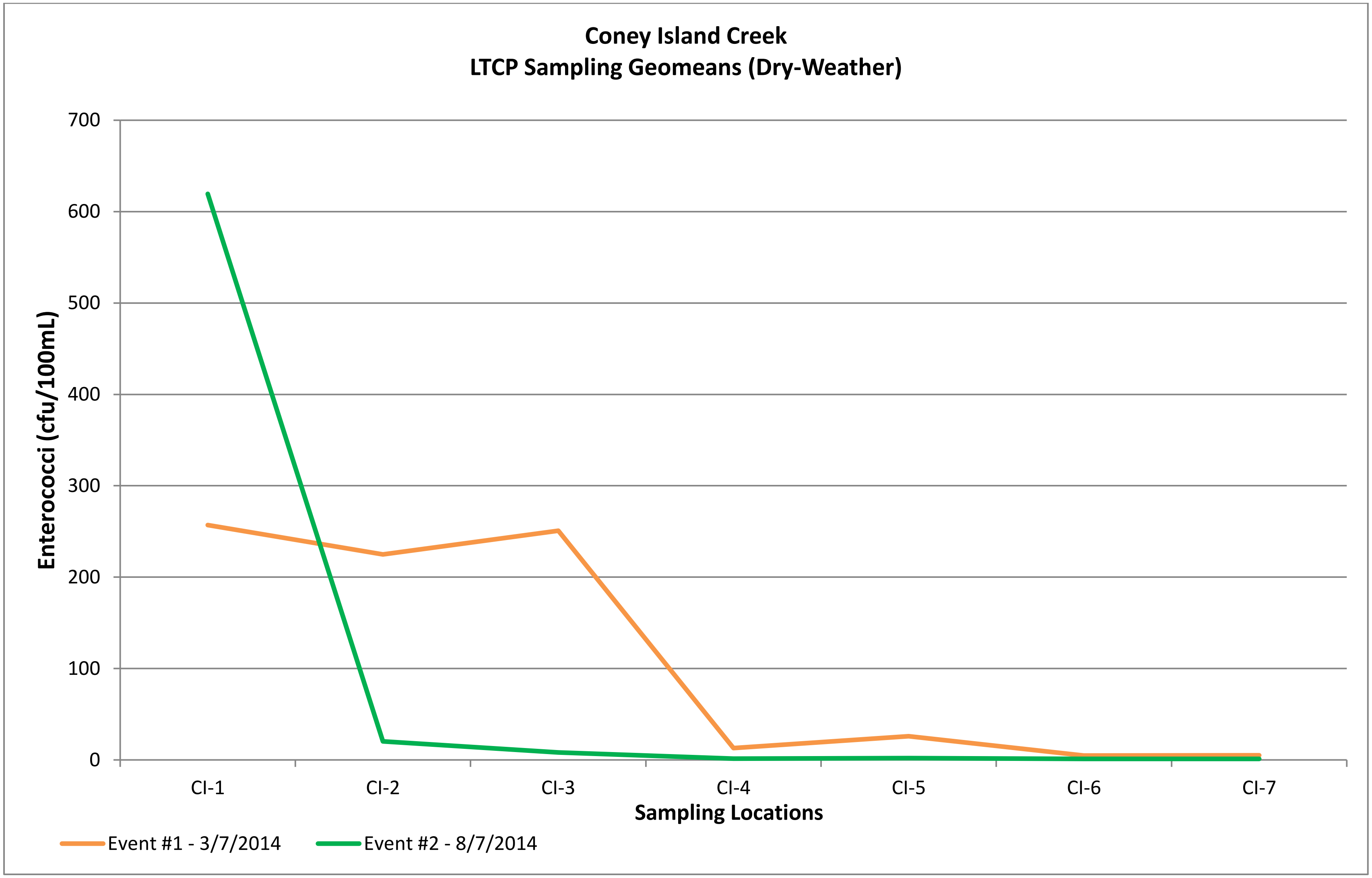

Figure 2-25. Enterococci Data from LTCP Dry-Weather Campaign – Coney Island Creek (March and August 2014)

DEP has initiated a step-wise process to determine whether the fecal coliform measurements in Coney Island Creek are truly indicators of intestinal pollution or whether they are false positives originating from non-*Escherichia coli* growing on the incubated media. If the latter, these measurements may be unrelated to human health risks and should not be compared to receiving water standards. The approach being taken consists of the following elements.

- Split Samples – Samples are being collected and analyzed by both DEP's HSM Program in-house laboratory and the LTCP contract laboratory (eurofins QC, Inc). Split samples are being performed for both fecal coliform bacteria and enterococci.

- Fecal coliform verification – A verification procedure is being conducted to establish the validity of both blue color colonies typical colonies and atypical colonies. This involves inoculating both tubes with samples from colonies picked from the membrane filters after completion of the 24-fecal coliform test. Essentially, this takes the fecal coliform test another step to determine whether the measured colonies are likely to be *Escherichia coli*.

- Gram staining – This is an additional step for the verification procedure noted above that determines whether the colonies being identified as fecal coliform bacteria truly show the characteristics of being Gram negative non-spore forming rods, and thus are likely to be *Escherichia coli*.

2.2.a.7 Water Quality Modeling

In addition to the collection, compilation, and analysis of measurements described in Section 2.2.a.6, water quality modeling was also used to characterize and assess the Coney Island Creek water quality. A model computational grid was used in the LTCP analysis to represent the Coney Island Creek waterbody. The model computational grid, shown in Figure 2-26, was used for LTCP hydrodynamic, pathogens, and dissolved oxygen modeling. The validation of these water quality models using measurements collected during 2014 is described in the Coney Island Creek LTCP Sewer System and Water Quality Modeling Report (DEP, 2016). The measurements used for model calibration and validation include LTCP, DEP Harbor Survey and Sentinel Monitoring, with wet-weather volumetric loading information from validated IW models. Once calibrated and validated, the water quality models were used to aid in the assessment of water quality benefits associated with LTCP CSO control alternatives, as will be presented in Sections 6 and 8.

Figure 2-26. Computational Grid for Coney Island Creek Water Quality Modeling

3.0 CSO BEST MANAGEMENT PRACTICES

The SPDES permits for all 14 WWTPs in NYC require DEP to report annually on the progress of the following 13 CSO BMPs:

1. CSO Maintenance and Inspection Program
2. Maximum Use of Collection Systems for Storage
3. Maximize Flow to Publicly Owned Treatment Plant (POTW)
4. Wet Weather Operating Plan (WWOP)
5. Prohibition of Dry Weather Flow
6. Industrial Pretreatment
7. Control of Floatable and Settleable Solids
8. Combined Sewer Replacement
9. Combined Sewer Extension
10. Sewer Connection and Extension Prohibitions
11. Septage and Hauled Waste
12. Control of Runoff
13. Public Notification

The 2015 BMP Annual Report included a section on *Additional CSO BMP Special Conditions*. This section was submitted pursuant to Item 5.c. in Appendix B of Additional CSO BMP Special Conditions in the SPDES Permits. Item 5.b requires DEP to submit monthly reports of all known or suspected CSO discharges from key regulators outside the period of a critical wet-weather event. For the first year after the effective date of the 2014 CSO BMP Order, Item 5.b also required DEP to quarterly "submit for New York State Department of Environmental Conservation approval an engineering analysis of the cause(s) for each discharge and an analysis of options to reduce or eliminate similar future events." Subsequent updates of the engineering analyses are to be provided in the CSO BMP Annual Reports. The 2015 BMP Annual Report did not identify any key regulators for Coney Island Creek.

The BMPs listed above are equivalent to the Nine Minimum Controls (NMCs) required under the EPA National CSO Policy and were developed by the EPA to represent BMPs that would serve as technology-based CSO controls. The BMP's were intended to be "determined on a best professional judgment basis by the NPDES permitting authority" and to be the best available technology-based controls that permittees could implement within two years. EPA developed two guidance manuals that embodied the underlying intent of the NMCs for permit writers and municipalities, offering suggested language for SPDES permits and programmatic controls that could accomplish the goals of the NMCs (EPA, 1995a, 1995b). A comparison of the EPA's NMCs to the 13 SPDES BMPs is shown in Table 3-1.

Table 3-1. Comparison of EPA Nine Minimum Controls with SPDES Permit BMPs

EPA Nine Minimum Controls	SPDES Permit Best Management Practices
NMC 1: Proper Operations and Regular Maintenance Programs for the Sewer System and the CSOs	BMP 1: CSO Maintenance and Inspection Program BMP 4: Wet Weather Operating Plan BMP 8: Combined Sewer Replacement BMP 9: Combined Sewer Extension BMP 10: Sewer Connection and Extension Prohibitions BMP 11: Septage and Hauled Waste
NMC 2: Maximum Use of the Collection System for Storage	BMP 2: Maximum Use of Collection Systems for Storage
NMC 3: Review and Modification of Pretreatment Requirements to Assure CSO Impacts are Minimized	BMP 6: Industrial Pretreatment
NMC 4: Maximization of Flow to the POTW for Treatment	BMP 3: Maximize Wet Flow to POTW BMP 4: Wet Weather Operating Plan
NMC 5: Prohibition of CSOs During Dry Weather	BMP 5: Prohibition of Dry Weather Overflow
NMC 6: Control of Solid and Floatable Material in CSOs	BMP 7: Control of Floatables and Settleable Solids
NMC 7: Pollution Prevention	BMP 6: Industrial Pretreatment BMP 7: Control of Floatables and Settleable Solids BMP 12: Control of Runoff
NMC 8: Public Notification to Ensure that the Public Receives Adequate Notification of CSO Occurrences and CSO Impacts	BMP 13: Public Notification
NMC 9: Monitoring to Effectively Characterize CSO Impacts and the Efficacy of CSO Controls	BMP 1: CSO Maintenance and Inspection Program BMP 5: Prohibition of Dry Weather Overflow BMP 6: Industrial Pretreatment BMP 7: Control of Floatables and Settleable Solids

On May 8, 2014 DEP and DEC entered into an administrative Consent Order[1],extending and modifying the parties' 2010 CSO BMP Consent Order. The 2014 Consent Order's Schedule of Compliance identified new milestones and milestones that already have been achieved. Upcoming milestones include the following:

- Issuing Notice to Proceed to Construction for repair, rehab or replacement of interceptors;
- Post-construction compliance monitoring;
- Maximizing flow at WWTPs;
- CSO monitoring and equipment at key regulators;
- Updating WWOPs with throttling protocols and updating critical equipment lists;
- Bypass reporting;
- Key regulator monitoring reporting;
- Regulators with CSO monitoring equipment identification program reporting; and

[1] 2014 CSO BMP Consent Order. DEC File No. R2-20140203-112.

- Hydraulic modeling verification.

This section is based on the practices summarized in the 2015 Best Management Practices Annual Report (2015 BMP Annual Report) and the 2014 CSO BMP Consent Order.

This section presents a brief summary of each BMP and its respective relationship to the federal NMCs. In general, the BMPs address operation and maintenance procedures, maximum use of existing systems and facilities, and related planning efforts to maximize capture of CSO and to reduce contaminants in the CSS, thereby reducing water quality impacts.

3.1 Collection System Maintenance and Inspection Program

This BMP addresses NMC 1 (Proper Operations and Regular Maintenance Programs for the Sewer System and the CSOs) and NMC 9 (Monitoring to Effectively Characterize CSO Impacts and the Efficacy of CSO Controls). Through regularly scheduled inspections of the CSO regulator structures and the performance of required repair, cleaning, and maintenance work, dry-weather overflows and leakage can be prevented and flow to the WWTP can be maximized. Specific components of this BMP include:

- Inspection and maintenance of CSO tide gates;
- Telemetering of regulators;
- Reporting of regulator telemetry results;
- Recording and reporting of events that cause discharge at outfalls during dry-weather; and,
- DEC review of inspection program reports.

Details of recent preventative and corrective maintenance reports can be found in the appendices of the BMP Annual Reports.

3.2 Maximizing Use of Collection System for Storage

This BMP addresses NMC 2 (Maximum Use of the Collection System for Storage) and requires cleaning and flushing to remove and prevent solids deposition within the collection system, and an evaluation of hydraulic capacity. These practices enable regulators and weirs to be adjusted to maximize the use of system capacity for CSO storage, which reduces the amount of overflow. DEP provides general information in the 2015 BMP Annual Report, describing the status of citywide Supervisory Control and Data Acquisition, regulators, tide gates, interceptors, in-line storage projects, and collection system inspections and cleaning.

Additional data gathered in accordance with the requirements of the 2014 CSO BMP Consent Order, such as CSO monitoring, will be used to verify and/or further calibrate the hydraulic model developed for the CSO LTCPs.

3.3 Maximizing Wet Weather Flow to WWTPs

This BMP addresses NMC 4 (Maximization of Flow to the POTW for Treatment), and reiterates the WWTP operating targets established by the SPDES permits regarding the ability of the WWTP to receive and treat minimum flows during wet-weather. The WWTP must be physically capable of receiving a minimum of two times design dry-weather flow (2xDDWF) through the plant headworks; a minimum of 2xDDWF through the primary treatment works (and disinfection works, if applicable); and a minimum of one and one-half times design dry-weather flow (1.5xDDWF) through the secondary treatment works during wet-weather. The actual process control set points may be established by the WWOP required in BMP 4.

NYC's WWTPs are physically capable of receiving a minimum of twice their permit-rated design flow through primary treatment and disinfection in accordance with their DEC-approved WWOPs. However, the maximum flow that can reach a particular WWTP is controlled by a number of factors, including: hydraulic capacities of the upstream flow regulators; storm intensities within different areas of the collection system; and plant operators, who can restrict flow using "throttling" gates located at the WWTP entrance to protect the WWTP from flooding and process upsets. DEP's operations staff is trained in how to maximize pumped flows without impacting the treatment process, critical infrastructure, or public safety. For guidance, DEP's operations staff follow their plant's DEC-approved WWOP, which specifies the "actual Process Control Set Points," including average flow, in accordance with Sections VIII (3) and (4) of the SPDES permits. Analyses presented in the 2015 BMP Annual Report indicate that DEP's WWTPs generally complied with this BMP during 2014.

The 2014 CSO BMP Consent Order has a number of requirements related to maximizing wet-weather flows to WWTPs including, but not limited to:

- An enforceable compliance schedule to ensure that DEP maximizes flow to and through the WWTP during wet-weather events;
- Incorporating throttling protocol and guidance at the WWTPs;
- Updating the critical equipment lists for WWTPs, which includes screening facilities at pump stations that deliver flow directly to the WWTP and at WWTP headworks; and,
- Reporting bypasses to the DEC per the 2014 CSO BMP Consent Order.

3.4 Wet Weather Operating Plan

This BMP addresses NMC 1 (Proper Operations and Regular Maintenance Programs for the Sewer System and the CSOs) and NMC 4 (Maximization of Flow to the POTW for Treatment). To maximize treatment during wet-weather events, WWOPs were developed for each WWTP drainage area in accordance with the DEC publication entitled *Wet Weather Operating Practices for POTWs with Combined Sewers*. Components of the WWOPs include:

- Unit process operating procedures;
- CSO retention/treatment facility operating procedures, if relevant for that drainage area; and,
- Process control procedures and set points to maintain the stability and efficiency of biological nutrient removal processes, if required.

As required by the 2014 CSO BMP Consent Order, DEP resubmitted all WWOPs, including the Owls Head WWTP WWOP and Coney Island WWTP, to DEC in December 2014. DEC has not yet responded to those submittals.

3.5 Prohibition of Dry Weather Overflows

This BMP addresses NMC 5 (Prohibition of CSOs during Dry Weather) and NMC 9 (Monitoring to Effectively Characterize CSO Impacts and the Efficacy of CSO Controls), and requires that any dry- weather overflow event be promptly abated and reported to DEC within 24 hours. A written report must follow within 14 days and contain the information required by the corresponding SPDES permit. The status of the shoreline survey, the Dry Weather Discharge Investigation Report, and a summary of the total bypasses from the treatment and collection system are provided in the BMP Annual Reports.

Dry-weather overflows from the CSS are prohibited and DEP's goal is to reduce and/or eliminate dry- weather bypasses.

The 2015 data for regulators and pump stations reveal that there were no dry-weather overflows to Coney Island Creek. However, as noted in Section 2.0, DEP's 2014 and 2015 investigation of 53 establishments revealed 10 illicit connections in the MS4 drainage area tributary to outfall OH-021. DEP commenced enforcement proceedings with Commissioner's Orders for their removal and eight have been fully abated. The two remaining illicit connections are in the process of properly reconnecting to a sanitary sewer.

3.6 Industrial Pretreatment Program

This BMP addresses three NMCs: NMC 3 (Review and Modification of Pretreatment Requirements to Assure CSO Impacts are Minimized); NMC 7 (Pollution Prevention); and NMC 9 (Monitoring to Effectively Characterize CSO Impacts and the Efficacy of CSO Controls). By regulating the discharges of toxic pollutants from unregulated, relocated, or new Significant Industrial Users tributary to CSOs, this BMP addresses the maximization of persistent toxics treatment from industrial sources upstream of CSOs. Specific components of this BMP include:

- Consideration of CSOs in the calculation of local limits for indirect discharges of toxic pollutants;
- Scheduled discharge during conditions of non-CSO, if appropriate for batch discharges of industrial wastewater;
- Analysis of system capacity to maximize delivery of industrial wastewater to the WWTP, especially for continuous discharges;
- Exclusion of non-contact cooling water from the CSS and permitting of direct discharges of cooling water; and
- Prioritization of industrial waste containing toxic pollutants for capture and treatment by the WWTP over residential/commercial service areas.

Since 2000, the average total industrial metals loading to NYC WWTPs has been declining. As described in the 2015 BMP Annual Report, the average total metals discharged by all regulated industries to the WWTPs was 12.2 lbs/day, and the total amount of metals discharged by regulated industrial users remained very low. Applying the same percentage of CSO bypass (1.5 percent) from the CSO report to the current data, it is estimated that, on average, less than 0.181 lbs/day of total metals from regulated industries bypassed to CSOs in 2015 (DEP, 2016).

3.7 Control of Floatables and Settleable Solids

This BMP addresses NMC 6 (Control of Solid and Floatable Material in CSOs), NMC 7 (Pollution Prevention), and NMC 9 (Monitoring to Effectively Characterize CSO Impacts and the Efficacy of CSO Controls), by requiring the implementation of the following four practices to eliminate or minimize the discharge of floating solids, oil and grease, or solids of sewage origin that cause deposition in receiving waters.

- Catch Basin Repair and Maintenance: This practice includes inspection and maintenance scheduled to ensure proper operations of basins.
- Catch Basin Retrofitting: By upgrading basins with obsolete designs to contemporary designs with appropriate street litter capture capability; this program is intended to increase the control of floatable and settleable solids citywide.
- Booming, Skimming and Netting: This practice implements floatables containment systems within the receiving waterbody associated with applicable CSO outfalls. Requirements for system inspection, service and maintenance are also established.
- Institutional, Regulatory, and Public Education: The report must also include recommendations for alternative NYC programs and an implementation schedule to reduce the water quality impacts of street and toilet litter.

3.8 Combined Sewer Replacement

This BMP addresses NMC 1 (Proper Operations and Regular Maintenance Programs for the Sewer Systems and the CSO's), requiring all combined sewer replacements to be approved by the DOH and to be specified within the DEP's Master Plan for Sewage and Drainage. Whenever possible, separate sanitary and storm sewers should be used to replace combined sewers. Each BMP Annual Report describes the citywide plan, and addresses specific projects occurring in the reporting year.

Within the separate sanitary service area of the Coney Island WWTP serving the peninsula south of Coney Island Creek, the first Capital Project (CONISPH01) in the watershed is currently in construction and is scheduled to be completed in the fall of 2016. The project will include the installation of a new larger outfall at West 15th Street, new storm sewers, replacements of existing sanitary sewers, replacement and upgrading of existing trunk and distribution water mains in West 15th Street between Hart Place and Surf Avenue, as well as the replacement of existing storm sewers in a portion of Surf Avenue between Stillwell and West 17th Street.

3.9 Combined Sewer Extension

This BMP addresses NMC 1 (Proper Operations and Regular Maintenance Programs for the Sewer System and the CSOs). A brief status report is provided in the 2015 BMP Annual Report. According to the report, DEP completed four private sewer extensions in 2015. To minimize stormwater entering the CSS, this BMP requires combined sewer extensions to be accomplished using separate sewers whenever possible. If separate sewers must be extended from combined sewers, analyses must be performed to demonstrate that the sewage system and treatment plant are able to convey and treat the increased dry- weather flows with minimal impact on receiving water quality.

3.10 Sewer Connection & Extension Prohibitions

This BMP addresses NMC 1 (Proper Operations and Regular Maintenance Programs for the Sewer System and the CSOs), and prohibits sewer connections and extensions that would exacerbate recurrent instances of either sewer back-up or manhole overflows upon letter notification from DEC. Wastewater connections to the CSS downstream of the last regulator or diversion chamber are also prohibited. Each BMP Annual Report contains a brief status report for this BMP and provides details pertaining to chronic sewer back-up and manhole overflow notifications submitted to DEC when necessary. For the calendar year 2015, conditions did not require DEP to prohibit additional sewer connections or sewer extensions.

3.11 Septage and Hauled Waste

This BMP addresses NMC 1 (Proper Operations and Regular Maintenance Programs for the Sewer System and the CSOs). The discharge or release of septage or hauled waste upstream of a CSO (e.g., scavenger waste) is prohibited under this BMP. Scavenger wastes may only be discharged at designated manholes that never drain into a CSO, and only with a valid permit. The 2008 BMP Annual Report summarizes the three scavenger waste acceptance facilities controlled by DEP, and the regulations governing discharge of such material at the facilities. The facilities are located in the Hunts Point, Oakwood Beach, and 26th Ward WWTP service areas. The program remained unchanged through the 2015 BMP Annual Report.

3.12 Control of Runoff

This BMP addresses NMC 7 (Pollution Prevention) by requiring all sewer certifications for new development to follow DEP rules and regulations, to be consistent with the DEP Master Plan for Sewers and Drainage, and to be permitted by the DEP. This BMP ensures that only allowable flow is discharged into the combined or storm sewer system.

A rule to “reduce the release rate of storm flow from new developments to 10 percent of the drainage plan allowable or 0.25 cfs per impervious acre, whichever is higher (for cases when the allowable storm flow is more than 0.25 cfs per impervious acre),” was promulgated on January 4, 2012, and became effective on July 4, 2012.

3.13 Public Notification

BMP 13 addresses NMC 8 (Public Notification to Ensure that the Public Receives Adequate Notification of CSO Occurrences and CSO Impacts) as well as NMC 1 (Proper Operations and Regular Maintenance Programs for the Sewer System and the CSOs) and NMC 9 (Monitoring to Effectively Characterize CSO Impacts and the Efficacy of CSO Controls).

This BMP requires easy-to-read identification signage to be placed at or near CSO outfalls, with contact information for DEP, to allow the public to report observed dry-weather overflows. All signage information and appearance must comply with the Discharge Notification Requirements listed in the SPDES permit.

This BMP also requires that a system be in place to determine the nature and duration of an overflow event, and that potential users of the receiving waters are notified of any resulting, potentially harmful conditions. The BMP allows the DOHMH to implement and manage the notification program. Accordingly, the Wet Weather Advisories, Pollution Advisories and Closures are tabulated for all NYC public and private beaches. There are no bathing beaches in Coney Island Creek. The nearest beaches to Coney Island Creek are the private Sea Gate Beach and public Coney Island Beach. The Sea Gate Beach had one closure in 2015 from 6/24/2015 to 6/25/2015. The Coney Island Beach had no warnings or closures in 2015 according to the 2015 BMP Annual Report.

3.14 Characterization and Monitoring

Previous studies have characterized and described the Owls Head WWTP collection system, Coney Island WWTP collection system, and the water quality for Coney Island Creek (see Chapters 3 and 4 of the Coney Island Creek WWFP, 2009). Additional data were collected and are analyzed in this LTCP (see Section 2.2). Continued monitoring occurs under a variety of DEP initiatives, such as floatables monitoring programs and the DEP Harbor Monitoring Survey, and is reported in the BMP Annual Reports under SPDES BMPs 1, 5, 6 and 7, as described above.

Future monitoring includes the installation of CSO monitoring equipment (Doppler sensors in the telemetry system and inclinometers where feasible), at key regulators for the purpose of detecting CSO discharges (2014 CSO BMP Consent Order). Following installation of the CSO monitoring equipment, a monthly report of all known or suspected CSO discharges from key regulators, outside the period of a critical wet-weather event, will be submitted to DEC. Additional quarterly reports and one comprehensive report summarizing one year of known or suspected CSO discharges will be submitted to DEC describing the cause of each discharge and providing options to reduce or eliminate similar future events, with an implementation schedule.

3.15 CSO BMP Report Summaries

In accordance with the SPDES permit requirements, annual reports summarizing the citywide implementation of the 13 BMPs described above are submitted to DEC. DEP has submitted 13 annual reports to date, covering calendar years 2003 through 2015. The 2015 BMP Annual Report is divided into 14 sections, one for each of the BMPs in the SPDES permits and one section for the SPDES Permit CSO BMP Special Conditions. Each section of the annual report describes ongoing DEP programs, provides statistics for initiatives occurring during the preceding calendar year, and discusses overall environmental improvements.

4.0 GREY INFRASTRUCTURE

4.1 Status of Grey Infrastructure Projects Recommended in Facility Plans

CSO planning in Coney Island Creek began under the 1998 Coney Island Creek (CIC) CSO Facility Planning Project. This planning focused on quantifying and assessing the impacts of CSO discharges to Coney Island Creek, which is located in Southwestern Brooklyn and is a tributary to Gravesend Bay. Initial recommendations in the 1998 Coney Island Creek CSO Facilities Planning Report were modified in September 2003 and further supplemented by the Coney Island Creek WWFP Report, submitted in June 2009. All documents recommended the expansion of the capacity of the Avenue V Pumping Station from 30 to 80 MGD and the construction of two force mains, one for wet weather flow and one for dry-weather flow. This project was ultimately designed, constructed, and became fully operational in 2014.

4.1.a Completed Projects

The facility planning activities through 2003 did not reflect the watershed planning approach that has more recently been determined by the EPA to be the most appropriate to assessing water quality improvements. Moreover, the proposed facility plan would not have resulted in compliance with then-existing WQS. Therefore, the proposed 2003 Coney Island Creek CSO Facility Plan was re-evaluated as part of the DEP Use and Standards Attainment Project, and the July 2009 Coney Island WWFP evaluated the plan still further. The plan recommended increasing the capacity of the Avenue V Pumping Station, but recommended no other grey infrastructure.

Avenue V Pumping Station

Table 4-1 summarizes the design flow basis for the upgrade of the Avenue V Pumping Station. The combined sewer wet weather flow component to the upgraded pumping station was estimated to be 42.0 MGD. This was determined based on a long term rainfall capture simulation (20 years, 1964-1984) using a computer model developed under the Coney Island Creek CSO study. This peak CSO pumping rate was determined with the goal of reducing CSOs to the Creek by 85 to 90 percent. The design peak sanitary flow from the separately sewered portion of the pumping station was 34.6 MGD. Accordingly, the minimum required pumping station capacity was 76.6 MGD, and an 80 MGD station capacity was used for design purposes.

Table 4-1. Design Flow Basis for the Upgrade of the Avenue V Pumping Station

Source	Dry Weather (MGD)		Wet Weather (MGD)
	Average	Peak	
Sanitary Sewers	19.2	34.6	34.6
Combined Sewers	7.6	13.7	42.0
Total	26.8	48.3	76.6[(1)]

Notes:
(1) Current real time dry-weather flow data observed by the 79G Contractor since 2009 shows the actual daily average to the approximately 18 MGD with a peak of 27 MGD.

New Forcemains

At the time of the pump station upgrade evaluation, the conveyance capacity of the existing force mains was found to be insufficient for the proposed new pump station capacity. As part of the Avenue V Pumping Station rehabilitation and upgrade, the installation of new force mains was required to provide additional conveyance capacity. The Avenue V Pumping Station had the capacity to pump approximately 30 MGD of dry or wet weather flow, and the minimum flow rate was approximately 8 MGD. Two force mains, a 24-inch and a 30-inch, conveyed the pumped flow from the Avenue V Pumping Station to a 78-inch gravity sewer. Additional conveyance capacity was required to handle both dry and wet weather flow from the expanded Avenue V Pumping Station. Multiple force mains were planned to be provided to increase operational flexibility and redundancy as part of the Pumping Station upgrade work. Various flow routing schemes to convey the flow from the Avenue V Pumping Station to the Owls Head Wastewater Treatment Plant (WWTP) were investigated. Ultimately, approximately 18,300 linear feet of force main were constructed to convey dry-weather flow to the SE-133 Owls Head Interceptor and 13,100 linear feet of force main were constructed to convey wet weather flow to Regulator 9A. Figures 4-1 and 4-2 show the Avenue V Pumping Station upgrade and new force mains. The upgraded pumping station and new force mains became fully operational July 2014.

4.1.b Ongoing Projects

The New York City Department of Design and Construction (DDC) is constructing new storm sewers and outfalls for a 248 acre neighborhood within Brooklyn Community District 13. The proposed project involves the reconstruction and enlargement of three existing outfalls, installation of new stormwater collection sewers, relocation and upgrade of distribution and trunk water mains, and relocation and upgrade of sanitary sewer lines along with the reconstruction of affected streets. Due to the drainage area's low-lying topography, the proposed stormwater collection sewers are wide and shallow, and therefore require the relocation of sanitary lines and water mains within certain segments of built streets. Construction of the proposed project will also require the relocation of utilities, as necessary, within the proposed project area. Finally, the proposed project includes the design and construction of a consolidated wetland restoration plan at Calvert Vaux Park to address all permanent wetland impacts associated with the reconstruction and enlargement of three existing stormwater outfalls.

Figure 4-3 provides a visual summary of the project's scope and bounds.

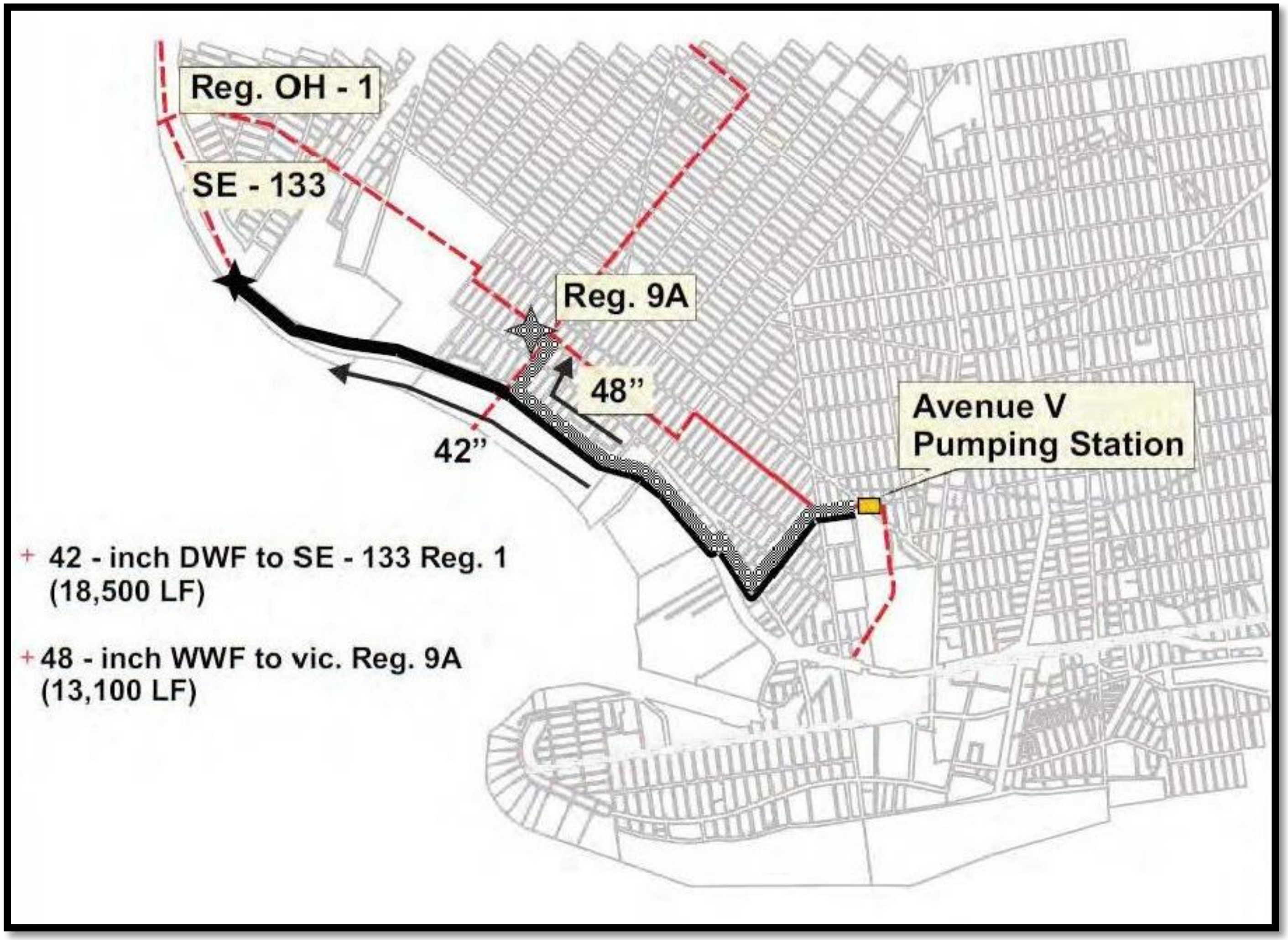

Figure 4-1. New Force Mains for Avenue V Pumping Station

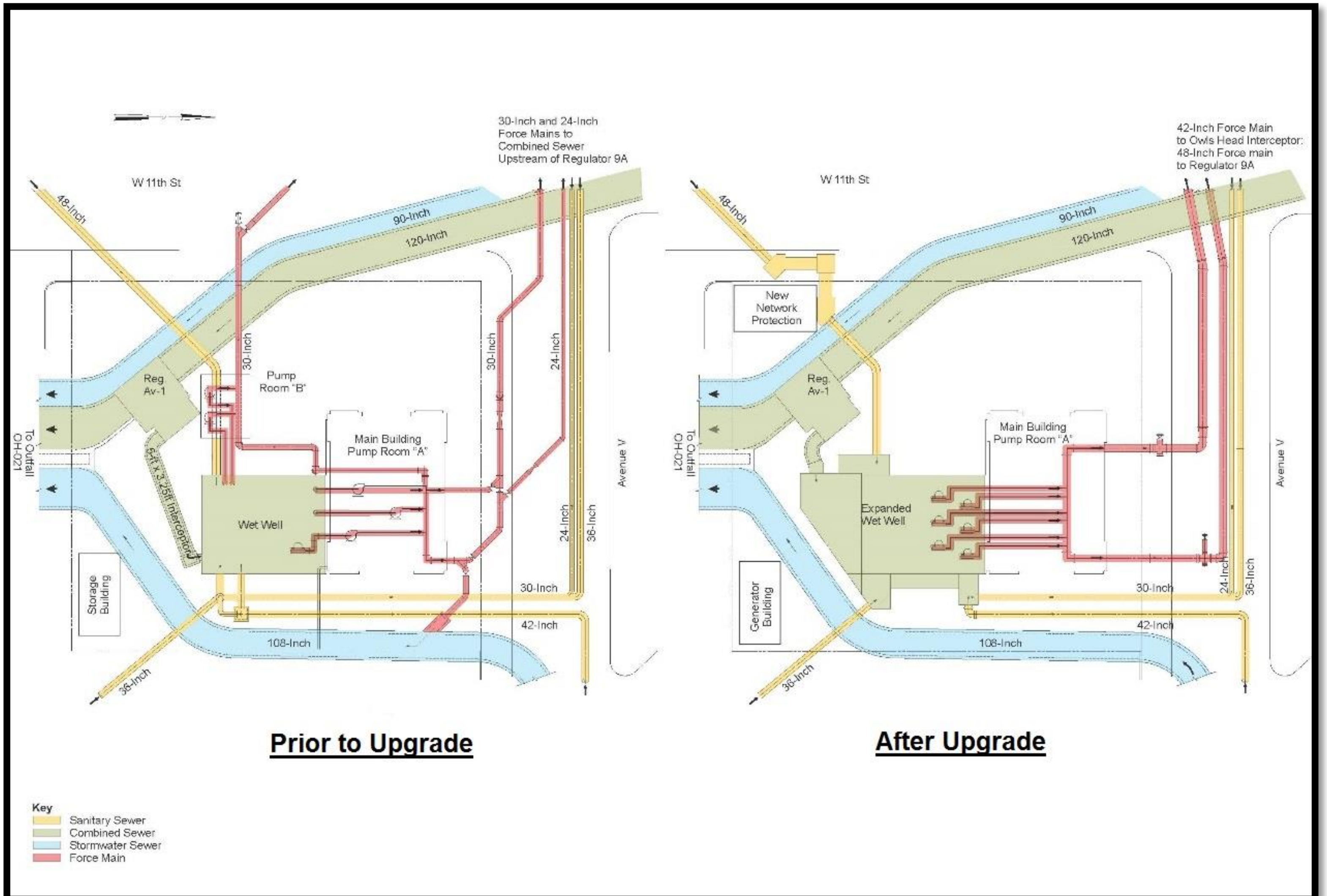

Figure 4-2. Schematic of Avenue V Pumping Station Before and After Upgrade

Figure 4-3. DDC Storm Sewer and Outfall Project

4.1.c Planned Projects

DEP proposes a variety of resiliency improvements for the Coney Island WWTP and pumping stations within the Coney Island sewershed, consistent with the October 2013 NYC Wastewater Resiliency Plan. However, no other CSO-related grey infrastructure projects are planned. Impacts on the frequency and/or amount of CSO overflows from the proposed WWTP and pumping station improvements will be determined when the specific projects are identified.

4.2 Other Water Quality Improvement Measures Recommended in Facility Plans (Dredging, Floatables, Aeration)

No additional water quality improvement measures were recommended for Coney Island Creek.

4.3 Post-Construction Monitoring

The PCM is integral to the optimization of the Coney Island Creek LTCP, providing data for model validation and feedback on system performance. Each year's data set will be compiled and evaluated to refine the understanding of the interaction between Coney Island Creek and the actions identified in this LTCP, with the ultimate goal of fully attaining compliance with current WQS or supporting a UAA to revise such standards, if appropriate. The PCM program contains two basic components:

1. Receiving water data collection in Coney Island Creek at the stations of DEP's HSM and SM programs; and

2. Modeling the collection system and receiving waters to characterize water quality using the existing InfoWorks CS™ (IW) and CICWQM, respectively.

The details provided herein are limited to the Coney Island Creek PCM and may be modified as DEP's CSO planning advances through the completion of other LTCPs, including the Citywide LTCP in 2018.

PCM in Coney Island Creek commenced before the upgraded Avenue V Pumping Station became fully operational. Build-out of Green Infrastructure to cover 1 percent of the sewershed's impervious surfaces draining to combined sewers is scheduled to be completed by 2030, but is not slated for the immediate future. Monitoring will continue for five years after the grey infrastructure controls are in place, to quantify the difference between the expected and actual performance. Any gap identified by the monitoring program can then be addressed through operational adjustments, retrofitting additional controls, or through the implementation of additional technically feasible and cost-effective alternatives. If it becomes clear that CSO control alone will not result in full attainment of applicable WQS, DEP will pursue the necessary regulatory mechanism for a UAA. The first annual PCM report will be submitted June 30, 2016.

4.3.a Collection and Monitoring of Water Quality in the Receiving Waters

PCM sampling in the Coney Island Creek Stations CIC2 and CIC3 commenced in January 2013, prior to the facility being placed into operation. Figure 4-4 shows the PCM Stations CIC2 and CIC3. For Coney Island Creek, PCM sampling is being conducted by the HSM program four times per month, from May through October, and then monthly during the remainder of the year. It is anticipated that PCM associated with any additional CSO controls identified for implementation as part of this LTCP would consist of a continuation of the existing HSM program in the Coney Island Creek watershed.

Measured parameters relating to receiving water quality include: Dissolved Oxygen (DO), fecal coliform, enterococci, chlorophyll 'a', and Secchi depth. With the exception of enterococci, NYC has used these parameters for decades to identify historical and spatial trends in water quality throughout New York Harbor.

The HSM program measures dissolved oxygen and chlorophyll 'a' at surface and bottom depths; the remaining parameters are measured at the surface only.

As was noted in both Sections 2.0 and 3.0, the HSM program has detected elevated dry-weather levels of bacteria concentrations towards the head end of Coney Island Creek, which are generally associated with illicit connections to the predominant separate stormwater system of its watershed. As detailed in earlier sections, DEP's enforcement efforts have addressed those illicit connections, resulting in full abatement or, with respect to two such connections, to abatement work nearing completion.

Figure 4-4. HSM Sampling Locations, Coney Island Creek

4.3.b CSO Facilities Operations – Flow Monitoring and Effluent Quality

Any flow and effluent quality monitoring program would be dependent on the types and sizes of proposed CSO controls implemented under this LTCP. Effluent quality data is not expected to be collected routinely at an unmanned facility, nor is routine CSO flow and effluent quality data anticipated to be collected on outfalls for which no controls have been provided. If the implemented control is permitted under the SPDES, the conditions of that permit regarding effluent monitoring would be followed.

4.3.c Assessment of Performance Criteria

CSO controls implemented under this LTCP will be designed to achieve a specific set of water quality and/or CSO reduction goals as established in this LTCP, and as directed in the subsequent Basis of Design Report that informs the design process. If no additional CSO controls are proposed, then affirmation of water quality projections would be necessary. In both cases, the PCM data, coupled with the modeling framework used for annual reporting, will be used to assess the performance of the CSO controls implemented in comparison to the water quality goals.

Differences between actual overflows and model-predicted overflows are often attributable to the fact that the model results are based on the rainfall measured at a single NOAA rain gauge being taken to represent the rainfall over the entire drainage area. In reality, storms move through the area and are variable so that the rainfall actually varies over time and space. Because rainfall patterns tend to even out over the area over time, the practice of using the rainfall measured at one nearby location typically provides good agreement with long term performance for the collection system as a whole; however, model results for any particular storm may vary somewhat from observations.

Given the uncertainty associated with potentially widely varying precipitation conditions, rainfall analysis is an essential component of the PCM. For Coney Island Creek, the most representative long term rainfall data record is available from the National Weather Service's John F. Kennedy International Airport (JFK) gauge. Rain data for each calendar year of the PCM program will be compared to the 10-year model period (2002-2011) and to the JFK 2008 rain data used for alternative evaluations. Statistics, including number of storms, duration, total annual and monthly depths, and relative and peak intensities, will be used to classify the particular reporting year as wet or dry relative to the time series on which the concept was based. Uncertainty in the analysis may be supplemented with radar rainfall data where there is evidence of large spatial variations.

The reporting year will be modeled utilizing the existing IW/CICWQM framework using the reporting year tides and precipitation. The resulting CSO discharges and water quality attainment will then be compared with available PCM data for the year as a means of validating model output. The level of attainment will be calculated from the modeling results and coupled with the precipitation analysis to determine relative improvement and the existence of any gap. Three successive years of evaluation will be necessary before capital improvements are considered, but operational adjustments will be considered throughout operation and reporting.

5.0 GREEN INFRASTRUCTURE

By capturing stormwater runoff and managing it through the processes of volume retention, infiltration, evapotranspiration, and re-use, GI can reduce stormwater flow into CSS.[1] In 2010, the DEP wrote and adopted the *NYC Green Infrastructure Plan: A Sustainable Strategy for Clean Waterways* ("GI Plan"), which was subsequently incorporated into the 2012 CSO Consent Order.

Over the next 20 years, DEP is planning for $2.4B in public and private funding for targeted GI installations, and $2.9B in cost-effective grey infrastructure upgrades to reduce CSOs. The Green Infrastructure Program, including citywide and CSO tributary area-specific implementation, is described below. Pursuant to the 2012 CSO Consent Order, DEP publishes the *Green Infrastructure Annual Report* every April 30th to provide details on GI implementation and related efforts. These reports can be found at http://www.nyc.gov/html/dep/html/ stormwater/nyc_green_infrastructure_plan.shtml.

5.1 NYC Green Infrastructure Plan (GI Plan)

The GI Plan presents an alternative approach to improving water quality through additional CSO volume reductions and outlines strategies to implement decentralized stormwater source controls. An initial estimate, produced in 2010, was based on a hybrid green/grey infrastructure approach that indicated DEP could reduce CSO volume by an additional 3.8 billion gallons per year (BGY), or approximately 2 BGY more than by implementing an all-grey strategy. In addition to its primary objective, enhancing water quality in NYC, the GI Plan will yield co-benefits that include improved air quality, urban heat island mitigation, carbon sequestration, increased shade, and increased urban habitat for pollinators and wildlife, among other co-benefits.

In January 2011, DEP created the Office of Green Infrastructure to implement the GI Plan, and committed $1.5B in funding through 2030, including $5M in Environmental Benefit Project (EBP) funds.[2] The Office of Green Infrastructure (OGI), in conjunction with other DEP Bureaus and partner NYC agencies, is tasked with designing and constructing GI practices that capture and manage stormwater runoff by infiltration and evapotranspiration before it reaches the CSS.

The OGI has developed design standards for ROW GI Practices, such as Bioswales (ROWBs), Stormwater Greenstreets, and rain gardens, and is developing additional GI standards to address various certain field conditions and restrictions. New standards include the Right-of-way Infiltration Basins, Green Strips, and porous pavement. The OGI is also developing on-site GI guidelines to retrofit city-owned properties. These standards include porous pavement, rain gardens, retention systems, and synthetic turf.

[1] U.S. EPA, March 2014. *Greening CSO Plans: Planning and Modeling Green Infrastructure for Combined Sewer Overflow (CSO) Control.*

[2] EBP projects are undertaken in connection with the settlement of an enforcement action taken by New York State and DEC for violations of New York State law and DEC regulations.

5.2 Citywide Coordination and Implementation

DEP has identified several target CSO tributary areas (target areas) for GI implementation based on the following criteria: annual CSO volume; frequency of CSO events; other CSO control projects undertaken through the WWFP; and other grey system improvements planned for the future. DEP also notes outfalls in close proximity to existing and future public access locations. Over the course of the 20-year Green Infrastructure Program, DEP will continue to review and expand the number of targeted areas for the Green Infrastructure Program. The current target areas are shown in Figure 5-1. DEP employs adaptive management principles to implement the Green Infrastructure Program, which allows for factoring in field conditions, costs, and other challenges as it proceeds toward each milestone. DEP continues to identify additional Area-wide GI contracts for implementation.

Identifying target areas enables DEP to focus resources on specific outfall CSO Tributary Drainage Areas (TDAs) to analyze all potential GI opportunities, to saturate these areas with GI practices to the extent possible, and to achieve efficiencies in design and construction. This Area-wide strategy is made possible by DEP's standardized GI designs and procedures, and provides an opportunity to measure and to evaluate the CSO benefits of Area-wide GI implementation at the outfall level.

DEP utilizes the Area-wide strategy for all public property retrofits, as described in more detail in the *2013 Green Infrastructure Annual Report*. DEP works directly with its partner agencies on retrofit projects at public schools, public housing, parkland, and other NYC-owned property within the target areas. DEP coordinates on a regular basis with partner agencies to review designs for new projects and to gather current capital plan information to identify opportunities to integrate GI into planned public projects.

DEP manages several of its own design and construction contracts for rights-of-way and on-site GI practices. The EDC, the NYC Department of Parks and Recreation (DPR), and the DDC manage the design and construction of several of these Area-wide contracts in conjunction with DEP. For GI Program status, please refer to the 2015 Green Infrastructure Annual Report on DEP's website.

5.2.a Community Engagement

Stakeholder participation is a critical success factor for the effective implementation of decentralized GI projects. To this end, DEP engages and educates local neighborhoods, community groups, and other environmental and urban planning stakeholders about their role in the management of stormwater. DEP's outreach efforts involve presentations and coordination with elected officials, community boards, stormwater advocacy organizations, green job non-profits, environmental justice organizations, schools and universities, Citizens Advisory Committees, civic organizations, and other NYC agencies.

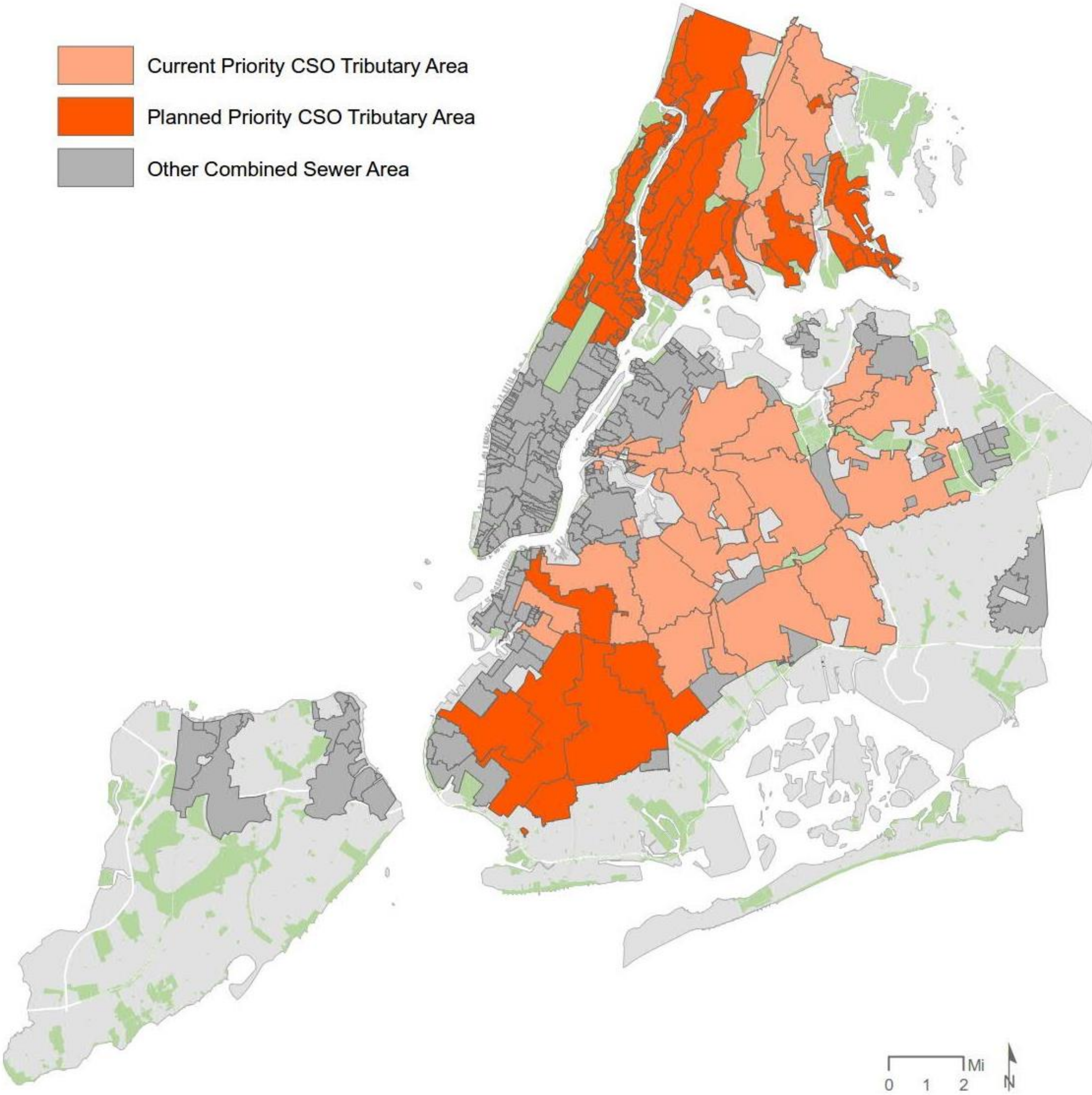

Figure 5-1. Current and Planned Priority CSO Tributary Areas

DEP launched its new website at www.nyc.gov/dep in 2013. As part of this update, DEP reorganized and added new content to the GI pages at www.nyc.gov/dep/greeninfrastructure. Users can now easily access more information on the Green Infrastructure Program, including Standard Designs for ROW GI practices. Users can also view a map of the target areas to learn whether GI is coming to their neighborhood.

DEP also created an educational video on the Green Infrastructure Program. This video gives a brief explanation of the environmental challenges posed by CSOs, while featuring GI technologies such as retention/detention systems, green/blue roofs, rain gardens, porous paving and permeable pavers. The video is available at DEP's YouTube© page.

To provide more information about the Green Infrastructure Program, DEP developed an informational brochure that describes the site selection and construction process for projects in the ROW. The brochure also includes frequently asked questions and answers, and explains the co-benefits of GI.

DEP notifies abutting property owners in advance of ROW GI construction projects. In each contract area, DEP and its partner agencies provide construction liaison staff to be present during construction. The contact information for the construction liaison is affixed to the door hangers for use if the need to alert NYC to a problem which arises during construction.

As part of its ongoing outreach efforts, DEP continues to make presentations to elected officials and their staffs, community boards, and other civic and environmental organizations about the Green Infrastructure Program, upcoming construction schedules, and final GI locations.

5.3 Completed Green Infrastructure to Reduce CSOs (Citywide and Watershed)

DEP's *Green Infrastructure Annual Reports* contain the most up-to-date information on completed projects and can be found on the DEP website. Reporting on completed projects on a citywide and watershed basis by April 30th is a requirement of the 2012 CSO Consent Order. In addition, Quarterly Progress Reports are posted on the DEP LTCP webpage: http://www.nyc.gov/ html/dep/html/ cso_long_ term_ control_plan/index.shtml.

5.3.a Green Infrastructure Demonstration and Pilot Projects

The Green Infrastructure Program applies an adaptive management approach, based on information collected and evaluated from Demonstration Projects and on pilot monitoring results. In particular, accumulated information will be used to develop the 2016 GI performance metrics report relating the benefits of CSO reduction to GI implementation.

Pilot Site Monitoring Program

DEP initiated site selection and design of its Pilot Monitoring Program in 2009. This program provides DEP opportunities to test different designs and monitoring techniques, and to determine the most cost-effective, adaptable, and efficient GI strategies. Specifically, the pilot monitoring aimed to assess the effectiveness of each of the evaluated source controls at reducing the volume and/or rate of stormwater runoff from the drainage area by measuring quantitative aspects (e.g., source control inflow and outflow rates), as well as qualitative issues (e.g., maintenance requirements, appearance and community perception). Since 2010, more than 30 individual pilot GI practices have been constructed and monitored as part of the citywide pilot program for GI. These practices include: ROW GI such as bioswale rain gardens; rooftop practices such as blue roofs and green roofs; subsurface detention/retention systems with open bottoms for infiltration; porous pavement; and bioretention facilities. Data collection began in 2010, as construction for each of the monitoring sites has been completed. Pilot Monitoring Program results will assist in validating modeling methods and parameters. Results are discussed further in Section 5.3.e.

Neighborhood Demonstration Area Projects

The 2012 CSO Consent Order includes design, construction, and monitoring milestones for three Neighborhood Demonstration Area Projects (Demonstration Projects), which DEP met in 2012 and 2013. DEP has completed construction of GI practices within a total of 66 acres of tributary area in Hutchinson River, Newtown Creek and Jamaica Bay CSO TDAs. DEP has monitored these GI practices to study the benefits of GI application on a neighborhood scale and from a variety of techniques. A Post-Construction Compliance Monitoring (PCM) Report was submitted to DEC in August 2014. DEP received requests for clarification from DEC and submitted an updated PCM Report in January 2015. The results obtained from the Demonstration Projects, including monitoring, will be incorporated into the 2016 Performance Metrics Report, which will model the CSO reductions from GI projects. The approximately one-year pre-construction monitoring for all three Demonstration Projects started in fall 2011, and the approximately one-year PCM continued throughout 2013.

Construction of ROWBs as part of the Hutchinson River Green Infrastructure Demonstration Project was completed in April 2013 by the DPR. There were 22 ROWBs installed within the 24-acre tributary area, and the design and construction costs were approximately $625,000. In the 23-acre Jamaica Bay Green Infrastructure Demonstration Project, DEP completed 31 ROW GI installations in 2012 and the permeable pavement retrofit projects at New York City Housing Authority's (NYCHA) Seth Low Houses in 2013. The total design and construction costs were approximately $1.5M. In the 19-acre Newtown Creek Green Infrastructure Demonstration Project, DEP constructed 19 ROWBs, two rain gardens, and a subsurface storm chamber system on the site of NYCHA's Hope Gardens Houses. The projects were completed in 2013, and costs totaled approximately $1.6M for design and construction. For more detailed information on the Demonstration Projects, see the *2012 Green Infrastructure Annual Report.*

While DEP's Pilot Monitoring Program provides performance data for individual GI installations, the Demonstration Projects provided standardized methods and information for calculating, tracking, and reporting derived stormwater volume reductions, impervious area managed, and other benefits associated with both multiple installations within identified sub-TDAs. The data collected from each of the three demonstration areas will enhance DEP's understanding of the benefits of GI relative to runoff control and resulting CSO reduction. The results will then be extrapolated for calculating and modeling water quality and cost-benefit information on a citywide and waterbody basis in the 2016 Performance Metrics Report.

5.3.b Public Projects

In coordination with city agency and non-profit partners, DEP continues to identify, design and construct public property GI retrofit projects. To date, DEP has identified 80 parks, 44 schools, and 20 public housing developments for GI retrofit feasibility analysis and preliminary design. Detailed information on the site selection and design processes for public property retrofit projects can be found in the Citywide Coordination and Implementation section of the Green Infrastructure Annual Reports.

The "Schoolyards to Playgrounds" program, one of PlaNYC 2030's initiatives aimed at ensuring that all New Yorkers live within a ten-minute walk from a park, is a collaboration between the non-profit Trust for Public Land (TPL), DPR, New York City Department of Education (DOE), and New York City School Construction Authority (SCA) to renovate public school playgrounds and extend playground access to surrounding neighborhoods. In 2011, DEP joined TPL, SCA, and DOE funding up to $5M for construction of up to ten GI schoolyards each year for the next four years. The partnership is a successful component of DEP's strategy to leverage public-private partnerships to improve public property using GI retrofits. Six projects have been completed to date. The partnership continues to identify new sites for analysis and design.

Up-to-date information on public property retrofit projects can be found in the Performance Standard for New Development section of the Green Infrastructure Annual Reports.

5.3.c Performance Standard for New Development

DEP's stormwater performance standard ("stormwater rule") enables NYC to manage discharges to the CSS from new developments or major site alterations. Promulgated in July 2012,[3] the stormwater rule requires that any new premises or any requests for sewer site connections to NYC's CSS comply with stricter stormwater release rates, effectively requiring greater on-site detention. DEP's companion document, *Guidelines for the Design and Construction of Stormwater Management Systems,*[4] assists the development community and licensed professionals in the selection, planning, design, and construction of on-site source controls that comply with the stormwater rule.

The stormwater rule applies to new development or the alteration of an existing development in combined sewer areas of NYC. For a new development, the stormwater release rate[5] is required to be 0.25 cubic feet per second (cfs) or 10 percent of the drainage plan allowable flow, whichever is greater.[6] If the allowable flow is less than 0.25 cfs, then the stormwater release rate shall be equal to the allowable flow. For alterations, the stormwater release rate for the altered area will be directly proportional to the ratio of the altered area to the total site area, and no new points of discharge are permitted.[7] As discussed in Section 5.4. below, DEP anticipates that the stormwater rule will contribute to CSO reductions in each priority watershed.

5.3.d Other Private Projects (Grant Program)

Green Infrastructure Grant Program

Since its introduction in 2011, the Grant Program has sought to strengthen public-private partnerships and public engagement in the design, construction and maintenance of GI.

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[3] See Chapter 31 of Title 15 of the *Rules of the City of New York Governing House/Site Connections to the Sewer System*. (New York City, N.Y., Rules, Tit. 15, § 31).
[4] The *Guidelines* are available at DEP's website, at http://www.nyc.gov/html/dep/pdf/green_infrastructure/ stormwater_guidelines_ 2012_final.pdf.
[5] New York City, N.Y., Rules, Tit. 15, § 31-01(b)
[6] Allowable flow is defined as the storm flow from developments based on existing sewer design criteria that can be released into an existing storm or combined sewer.
[7] New York City, N.Y., Rules, Tit. 15, § 31-03(a)(2)

The 2012 CSO Consent Order requires the Grant Program to commit $3M of EBP funds[8] to projects by 2015. DEP met this commitment in 2014.

Green Roof Property Tax Abatement

Since 2008, the NYC Green Roof Tax Abatement (GRTA) has provided a fiscal incentive to install green roofs on private property. DEP has worked with the Mayor's Office of Long Term Planning and Sustainability, the DOB, the Department of Finance (DOF) and the Office of Management and Budget, as well as with environmental advocates and green roof designers, to modify and to extend the GRTA through 2018. DEP has met with stakeholders and incorporated much of their feedback to improve the next version and to help increase the number of green roofs in NYC. Additionally, DEP funded an outreach position to educate applicants and to assist them through the abatement process.

The tax abatement includes an increase to the value of the abatement from $4.50 to $5.23 per square foot, to continue offsetting construction costs by roughly the same value as the original tax abatement. Also, given that rooftop farms tend to be larger than typical green roofs (approximately one acre in size), the abatement value cap was also increased from $100,000 to $200,000 to allow such applicants to receive the full value of the abatement. Finally, based on the amount allocated for this abatement, the total annual amount available for applicants (i.e., in the aggregate) is $750,000 in the first year, and $1,000,000 in each subsequent year through March 15, 2018. The aggregate amount of abatements will be allocated by the DOF on a pro rata basis. More information on the Green Roof Property Tax Abatement can be found in *Green Infrastructure Annual Reports.*

5.3.e Projected vs. Monitoring Results

Pilot Site Monitoring Program

As mentioned above, more than 30 pilot GI practices have been constructed and monitored as part of the pilot program. Quantitative monitoring parameters included:

- Water quantity: inflow, outflow, infiltration, soil moisture and stage.
- Weather: evaporation, rainfall, wind, relative humidity and solar radiation.
- Water/soil quality: diesel/gas, nutrients, TSS, TOC, salts, metals, soil sampling and infiltrated water sampling.

Monitoring efforts focused on the functionality of the GI practices and their impact on runoff rates and volumes, along with water and soil quality and typical maintenance requirements. Quantitative monitoring was conducted primarily through remote monitoring equipment (such as pressure transducer water level loggers) that allowed for monitoring the infiltration and stormwater management performance at five-minute intervals. On-site testing and calibration efforts included infiltration tests and metered

[8] EBP Projects are undertaken by DEP in connection with the settlement of an enforcement action taken by New York State and the New York State Department of Environmental Conservation for violations of New York State law and DEC regulations.

discharges to calibrate flow monitoring equipment and to assess the validity of assumptions used in pilot performance analysis.

Monitoring analyses through 2013 demonstrated that all pilot GI practices are providing effective stormwater management, particularly for storms with depths of one inch or less. All GI practices have provided benefits for storms greater than one inch, with specific impacts varying based upon location and type. In many cases, bioretention practices have fully retained the volume of one inch storms.

Monitoring activities will be discontinued at several sites that have multiple years of performance data and have exhibited relatively consistent performance throughout that period. Further monitoring at these locations may be resumed in the future to further examine long term performance. Monitoring data for these locations is included in the *2012 Pilot Monitoring Report*. In addition, up-to-date information on the Pilot Monitoring Program can be found in the *2013 Green Infrastructure Annual Report*.

Neighborhood Demonstration Area Projects

The objective of DEP's Demonstration Projects is to maximize the management and control of stormwater runoff near where it is generated, and then to monitor the reduction of combined sewage originating from identified sub-TDAs. DEP's PCM Report documented the performance of installed GI practices in the demonstration areas and was submitted to DEC in August 2014. After receiving comments from DEC, the report was resubmitted in January 2015. The 2016 Performance Metrics Report will relate the benefits of CSO reduction associated with the type and number of GI constructed, and detail methods by which DEP will calculate the CSO reduction benefits in the future.

The three Demonstration Projects were selected because the existing sewers flow in a single combined sewer pipe of a certain size to a receiving manhole where monitoring could take place. In each of the Demonstration Projects, DEP identified GI opportunities in the ROW, and on-site at NYC-owned property.

The combined sewer flow reductions achieved by built GI practices were monitored through the collection of high quality flow monitoring data at the point at which the CSS exits the Demonstration Project area's delineated sub-drainage tributary area. Monitoring activities consisted of recording combined flow and depth and using meters placed within a key outlet sewer at a manhole. Data acquisition was continuous, with measurements recorded at 15-minute intervals.

Data collection continued for approximately one-year each for pre- and post-construction. Subsequent analysis involved a review of changes in pervious and impervious surface coverage between pre- and post-construction conditions, consisting of several elements, including statistical analyses. This statistical analysis will enable DEP to determine the overall amount of combined flow reduction within the Demonstration Project's tributary area and the impervious area managed associated with GI practices implemented at scale.

Project data collected will be used to calibrate the IW computer model to the monitored flows for pre- and post-construction conditions. Post-construction performance data will be used to ensure that retention modeling techniques adequately account for the degree of flow reduction within TDAs with planned GI and equivalent CSO volume reductions.

5.4 Future Green Infrastructure in the Watershed

5.4.a Relationship Between Stormwater Capture and CSO Reduction

The modeling approach described here outlines how CSO reductions are projected for waterbody-specific projected GI penetration rates (see Section 6). Potential CSO reduction, and load reduction, through stormwater capture in the Coney Island Creek was evaluated using the landside model, developed in IW modeling software, based on the extent of GI (retention and detention) practices in combined sewer areas. The extent of stormwater capture from GI projects is configured in terms of a percent of impervious cover where one inch of stormwater is managed through different types of GI practices. Due to their distributed locations within a subcatchment, retention for different GI practices is lumped on a subcatchment level in the landside model. This is also due to the fact that the landside model does not include small combined sewers and cannot model them in a distributed manner. Retention is modeled with the applicable storage and/or infiltration elements. Similarly, the distributed detention locations within a subcatchment are represented as a lumped detention tank, with the applicable storage volume and constricted outlet configured based on allowable peak flows from their respective subcatchment. Modeling methods designed during the development of DEP's GI Plan have been refined over time to better characterize the retention and detention functions.

5.4.b Opportunities for Cost-Effective CSO Reduction Analysis

For each LTCP, the citywide target for managing one inch of precipitation on 10-percent impervious area in combined sewered areas has been broken out into estimated targets for each waterbody and used to calculate the baseline CSO reductions from GI projects. The estimated targets for each waterbody are the best information available because the GI implementation is being carried out simultaneous to the LTCP's development. At this time, there are no additional GI projects identified in the watershed that would exceed the baseline target rate (as described above and below). The Green Infrastructure Program will be implemented through 2030 and the final penetration rate will be reassessed as part of the adaptive management approach.

5.4.c Watershed Planning to Determine 20 Year Penetration Rate for Inclusion in Baseline Performance

DEP has developed a waterbody prioritization system described above in Section 5.2. This approach builds upon existing data and generates informed estimates.

Waterbody-specific penetration rates for GI are estimated based on the best available information from modeling efforts, WWFPs, the GI Plan, CSO outfall tiers data, and historic building permits.

The following criteria were applied to compare and prioritize watersheds in order to determine waterbody-specific GI penetration rates:

- Water Quality Standards (WQS)
  - Fecal Coliform
  - Total Coliform
  - Dissolved Oxygen

- Cost-effective grey investments

- Planned/constructed grey investments
- Projected CSO volume reductions
- Remaining CSO volumes
- Total capital costs

- Additional considerations:
  - Background water quality conditions
  - Public concerns and demand for recreational uses
  - Site-specific limitations (i.e., groundwater, bedrock, soil types, etc.)
  - Presence of high frequency outfalls
  - Eliminated or deferred CSO storage facilities
  - Additional planned CSO controls not captured in WWFPs or 2012 CSO Consent Order (i.e., high level storm sewers [HLSS])

The overall goal for this prioritization is to saturate GI implementation rates within the priority watersheds, such that the total managed impervious acres will be maximized based on the specific opportunities and field conditions in Coney Island Creek, as well as costs.

Green Infrastructure Baseline Penetration Rate – Coney Island Creek

Applying the above criteria, Coney Island Creek, which has a total tributary combined sewer impervious area of 3,120 acres, is not a priority target area for DEP's Green Infrastructure Program. DEP projects that by 2030, GI penetration rates will manage one percent of the impervious surfaces within the Coney Island Creek combined sewer service area due to ROW practices, public property retrofits, and GI implementation on private properties. This projection also includes conservatively estimating new development trends based on DOB building permit data to account for compliance with DEP's citywide stormwater performance standard during the years 2013-2030.

Furthermore, as LTCPs are developed, baseline GI penetration rates for specific watersheds may be adjusted based on the adaptive management approach described above in Section 5.2. As more information on field conditions, feasibility, and costs becomes known, and as GI projects progress, DEP will continue to model the GI penetration rates and seek to make necessary adjustments as appropriate.

6.0 BASELINE CONDITIONS AND PERFORMANCE GAP

The key to the development of the Coney Island Creek LTCP is the assessment of water quality using applicable WQS within the waterbody. Water quality was assessed using the CICWQM, verified with both Harbor Survey and the synoptic water quality data collected in 2014. The InfoWorks CS^{TM} (IW) sewer system model was used to provide flows and loads from intermittent wet-weather sources as input to the CICWQM model.

The assessment of water quality described herein began with a baseline condition simulation to determine the future bacterial levels without additional CSO controls. Next, a simulation was performed to determine bacteria levels under the assumption of 100% CSO control within the creek. The baseline condition was then compared to the 100% CSO control simulation. The gap between the two scenarios was then assessed to determine whether bacteria criteria could be attained through application of CSO controls. Continuous water quality simulations were performed to evaluate the gap between the calculated baseline bacteria and DO levels and both the Existing WQ Criteria and Next Higher Use Classifications. As detailed below, a one-year simulation using 2008 JFK Airport rainfall was performed for bacteria and DO. This simulation served as a basis for evaluating the control alternatives presented in Section 8.0.

This section of the LTCP describes the baseline conditions, the bacteria concentrations and loads calculated by the IW model, and the resulting bacteria concentrations calculated by the CICWQM. It further describes the gap between calculated baseline bacteria concentrations and both the existing and potential future WQS. The section also assesses whether the gap could be closed through CSO reductions alone (100% CSO control).

6.1 Define Baseline Conditions

Establishing baseline conditions is an important step in the LTCP process. Baseline conditions are used to compare and contrast the effectiveness of CSO controls and to predict whether water quality goals would be attained after implementing the preferred LTCP alternative. Baseline conditions for this LTCP were established in accordance with guidance set forth by the DEC to represent future conditions. Specifically, these conditions included the following assumptions:

- Dry-weather flow and loads based on CY2040 projections.
- The Owls Head WWTP accepting and treating peak flows at 2xDDWF during wet-weather events.
- Green Infrastructure in one percent of the impervious surfaces within the CSS service area.
- Cost-effective Grey Infrastructure CSO controls included in the 2012 CSO Consent Order. For Coney Island Creek this includes the recently completed Avenue V Pumping Station upgraded to 80 MGD and associated new force mains to convey the flow.
- Precipitation characteristics from 2008 at the JFK rainfall gauge which has been selected as the typical year rainfall.

Mathematical modeling tools were used to calculate the CSO volume and loads and their impacts on water quality. The performance gap was assessed by comparing the baseline conditions with WQS. Complete removal or control of CSO loadings was also evaluated. Further analyses were conducted for CSO control alternatives as presented in Section 8.0.

The IW model was used to develop stormwater flows, conveyance system flows and CSO volumes within Coney Island Creek sewershed for a defined set of future or baseline conditions. For the Coney Island Creek LTCP, the baseline conditions were developed in a manner consistent with the earlier WWFPs for other waterbodies. However, based on more recent data, as well as on the public comments received on those WWFPs, DEP updated some baseline condition model input data to reflect both more recent meteorological conditions and more current operating characteristics of various collection and conveyance system components. In addition, the mathematical models were updated from their configurations and levels of calibration developed and documented prior to this LTCP. IW model modifications reflected a better understanding of sources, catchment areas and new or upgraded physical components of the system. A model recalibration report was issued in 2012 (*InfoWorks Citywide Recalibration Report, June 2012a*) that used improved impervious surface satellite data. Water quality modeling was conducted using a version of CICWQM with updated bathymetry and finer grid resolution than for the Coney Island Creek WWFP. Updates to the IW model and the water quality model are described in *Coney Island Creek LTCP Sewer System and Water Quality Modeling Report (DEP, 2016).* The updated IW model network was used to estimate CSO volumes and loads for the baseline conditions. It also was used as a tool to estimate CSO volumes and loads resulting from CSO control alternatives evaluated in Section 8.0.

The baseline modeling conditions primarily related to DWF rates, wet-weather capacity for the Owls Head WWTP, sewer conditions, loadings and boundary conditions, precipitation conditions and dry-weather flow rates and tidal boundary conditions:

- **Rainfall/Tides:** The 2008 year rainfall and tides were used in the model, in addition to evaluating a 10-year period (2002-2011).
- **Dry-Weather Flows:** The 2040 projected dry-weather flow rates at the Owls Head WWTP is 85 MGD.
- **Wet-Weather Capacity**: The rated wet-weather capacity at the Owls Head WWTP is 240 MGD (2xDDWF).
- **Sewer Conditions**: The IW model was developed to represent the sewer system on a macro scale, generally including all conveyance elements with equivalent diameters of 48 inches or larger, as well as regulating structures and CSO outfall pipes. Post-Interceptor cleaning levels of sediments were also included for the interceptors in the collection system to better reflect actual conveyance capacities to the WWTPs.

6.1.a Hydrological Conditions

For this LTCP, the precipitation characteristics for 2008 were used for the baseline condition, as well as for alternatives evaluations and were considered to be representative of a typical rainfall year. In addition to the 2008 precipitation pattern, 2008 observed tide conditions were also applied in the model.

6.1.b Flow Conservation

Consistent with previous studies, the dry-weather sanitary sewage flows used in the baseline modeling were escalated to reflect anticipated population growth in NYC. In 2014, DEP completed a detailed analysis of water demand and wastewater flow projections. A comprehensive GIS analysis was performed to apportion total population among the 14 WWTP drainage areas throughout NYC. For this analysis, Transportation Analysis Zones were overlaid with WWTP drainage areas. Population projections for 2010-2040 were derived from population projections developed by DCP and New York Metropolitan Transportation Council. These analyses used the 2010 census data to reassign population values to the watersheds in the model and project sanitary flows to 2040. These projections also reflect water conservation measures that already have significantly reduced flows to the WWTPs and freed capacity in the conveyance system.

6.1.c Best Management Practices Findings and Optimization

A list of BMPs, together with a brief summary of each and its respective relationship to the EPA NMC were reported in Section 3.0, as they pertain to Coney Island Creek CSOs. In general, the BMPs address operation and maintenance procedures, maximum use of existing systems and facilities and related planning efforts to maximize capture of CSO and reduce contaminants in the CSS, thereby improving water quality conditions.

The following provides an overview of the specific elements of various DEP, SPDES and BMP activities as they relate to the development of the baseline conditions, specifically in developing and using the IW models to simulate CSO discharges and in establishing non-CSO discharges that impact water quality in the Coney Island Creek:

- Sentinel Monitoring: In accordance with BMPs #1 and #5, DEP collects quarterly samples of bacteria water quality at one location in the Coney Island Creek (near Station C-5 as established for this LTCP and shown in Section 2) in dry-weather to assess whether dry-weather sewage overflows occur, or whether illicit connections to storm sewers exist. Evidence of illicit sanitary sewer connections was observed based on these data. Although illicit sources were included in the water quality model calibration exercises to accurately simulate the observed ambient bacteria concentrations, these sources were excluded from the baseline conditions, to reflect future corrected conditions.

- Interceptor Sediments: Sewer sediment levels determined through the post-cleaning inspections are included in the IW model.

- Combined Sewer Sediments: The IW models assume no sediment in upstream combined trunk sewers in accordance with BMP #2.

- WWTP Flow Maximization: In accordance with the 2014 CSO BMP Consent Order, the Owls Head WWTP treats wet-weather flows that are conveyed to the plant, up to 2XDDW. DEP follows the wet-weather operating plan and receives and regularly treats 2xDDWF. Cleaning of the interceptor sediments has increased the ability of the system to convey 2xDDWF to the WWTP.

- Wet Weather Operation Plan: The Owls Head WWOP (BMP #4) establishes procedures for pumping at the plant headworks to assure treatment of 2xDDWF.

6.1.d Elements of Facility Plan and GI Plan

Cost-effective grey infrastructure for the Coney Island Creek watershed included in the 2012 CSO Consent Order has been represented in the IW and water quality models as a baseline condition. The grey infrastructure includes the recently completed Avenue V Pumping Station upgrade and expansion to 80 MGD and associated new force mains that convey up to 80 MGD to the Owls Head collection system.

The GI plan for Coney Island Creek is also included in the baseline modeling. A GI application of one percent of the impervious surfaces through on-site detention has been assumed in the baseline modeling.

6.1.e Non-CSO Discharges

Over approximately the past 30 years, DEP has invested heavily in mapping and delineating combined sewer drainage areas and piping systems as part of CSO facility planning and waterbody watershed facility planning efforts. Non-CSO drainage areas historically have not received the same level of effort. Non-CSO drainage areas were first identified during WWFP activities as land areas that were not contained within the CSO drainage areas. They were labeled as direct drainage and stormwater drainage areas but that distinction had no real meaning because both areas were assigned the same runoff characteristics. As part of LTCP, DEP has sought to better define these areas. Direct drainage areas (parks, cemeteries, large un-occupied open areas, etc.) are now assigned lower pathogen runoff concentrations than those assigned to more urbanized non-CSO (residential, commercial areas with a separate storm sewer system) drainage areas. In addition, a category of highway runoff has been established, although in many cases the highway runoff is grouped with other stormwater discharges.

In several sections of the Coney Island Creek drainage area, runoff drains directly to receiving waters via overland flow, open channels, or privately owned pipes, without entering the combined system or NYC separate storm sewer system. These areas were depicted as “Direct Drainage” in Figure 6-1 and were estimated based on topography and the direction of stormwater runoff flow in those areas. In general, shoreline areas adjacent to waterbodies comprise the direct drainage category, as they consist of parks and marinas, as well as many sections of highways adjacent to Coney Island Creek.

6.2 Baseline Conditions – Projected CSO Volumes and Loadings after the Facility Plan and GI Plan

As previously noted, the IW model was used to develop CSO volumes for the baseline conditions incorporating implementation of a one percent GI build-out and of grey infrastructure. Using these overflow volumes, loadings from the CSOs were generated using the enterococci, fecal coliform and BOD concentrations and provided input to the receiving water quality model, CICWQM. CICWQM was assessed using 2014 monitoring data collected during the Coney Island Creek LTCP, Harbor Survey Program data, and 2014 Sentinel Monitoring data. The assessment consisted of comparing the time series and cumulative frequency distributions of 2014 collected concentration data against the time series and cumulative frequency distribution output from the model for storms of similar sizes.

In addition to CSO loadings, storm sewer discharges and direct drainage also impact the water quality in the Coney Island Creek. The concentrations assigned to the various sources to Coney Island Creek are summarized in Table 6-1. Concentrations in Table 6-1 represent typical stormwater, direct drainage and sanitary sewage concentrations for the Coney Island Creek drainage area and are based on water quality data collected from the Coney Island Creek area.

For the modeling simulations, CSO concentrations were calculated using the stormwater and sanitary concentrations assigned in Table 6-1, multiplied by the flow calculated by the IW model. The model provides a calculated fraction of flow from stormwater and flow from sanitary sources, as follows:

$$C_{cso} = fr_{san}*C_{san} + fr_{sw}*C_{sw}$$

where: C_{cso} = CSO concentration

C_{san} = sanitary concentration

C_{sw} = stormwater concentration

fr_{san} = fraction of flow that is sanitary

fr_{sw} = fraction of flow that is stormwater

Table 6-1. Source Concentrations from NYC Sources

Source	Enterococci (cfu/100mL)	Fecal Coliform (cfu/100mL)	BOD_5 (mg/L)
Urban Stormwater(2)	27,600	27,100	9
CSOs (OH-021)(1)	Monte Carlo	Monte Carlo	Mass Balance (Sanitary = 168)
Sanitary for Mass Balance CSOs (OH-015)(1)	1,000,000	4,000,000	Mass Balance (Sanitary = 168)
Highway Runoff(3)	7,000	12,000	9
Direct Drainage(3)	6,000	4,000	9

Notes:

(1) Coney Island Creek LTCP Sewer System and Water Quality Modeling, 2016. Outfall OH-15 is included in the model domain, but does not discharge directly into Coney Island Creek.
(2) Measured data.
(3) Basis – NYS Stormwater Manual, Charles River LTCP, National Stormwater Data Base.

MS4 areas in the IW model have been updated with areas based on desk-top analysis conducted by DEP. Non-MS4 stormwater areas and direct drainage areas are meant to represent the remaining areas of the drainage areas, and do not always consider the drainage area of each individual outfall. Figure 6-1 presents the IW subcatchments within the drainage area of Coney Island Creek.

Typical baseline volumes of CSO, stormwater and direct drainage to the Coney Island Creek are summarized in Table 6-2 for the 2008 year. The specific SPDES permitted outfalls associated with these sources were shown in Figure 2-12. Additional tables summarizing annual volumes and loadings can be found in Appendix A. The information in these tables is provided for the 2008 rainfall condition.

Table 6-2. 2008 Baseline Loading Summary

Totals by Source by Waterbody		Volume	Enterococci	Fecal Coliform	BOD
Waterbody	**Source**	**Total Discharge (MG/yr)**	**Total Org (10^12/yr)**	**Total Org (10^12/yr)**	**Total Lbs/yr**
Coney Island Creek	CSO	75	585	1,078	11,176
	MS4 Stormwater	1,259	1,278	1,265	94,486
	Non-MS4 Stormwater	21	14	19	1,618
	Direct Drainage	44	11	7	3,494
Total		**1,405**	**1,399**	**1,888**	**2,369**
Gravesend Bay	Bay CSO	1,106	6,931	24,577	298,088
	Bay Stormwater	105	127	104	7,880
	Bay Direct Drainage	131	30	20	9,897
Total		**1,391**	**1,342**	**7,088**	**24,701**

OH-021 is the only CSO that discharges directly into Coney Island Creek, as shown in Table 6-3. It overflows one to two times per month on average for 2008 conditions. The loading for the CSO was developed using the Monte Carlo approach based on sampling data.

Table 6-3. 2008 CSO Volume and Overflows per Year

CSO	Volume[(1)]	Annual Overflow Events
	Total Discharge (MG/yr)	**Total (No./yr)**
OH-021	75	20
Total	75	20

Notes:

(1) Volumes are rounded to the nearest MG.

The total annual volume and average source loadings based on the 2008 year are shown in Table 6-2. The location of the Coney Island Creek SPDES permitted outfalls are depicted in Figure 6-1.

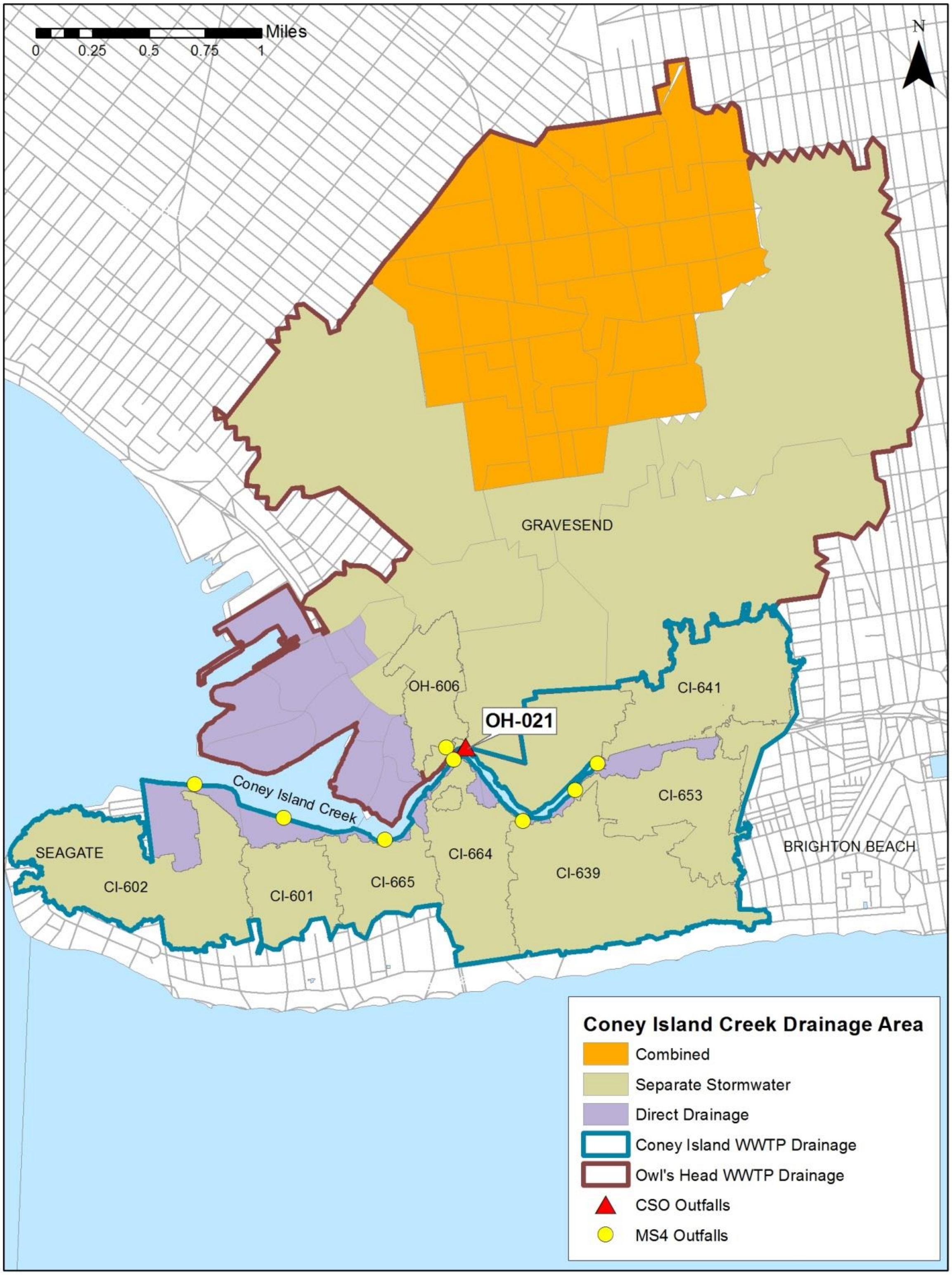


Figure 6-1. InfoWorks Subcatchments within Coney Island Creek

6.3 Performance Gap

Bacteria and DO concentrations in Coney Island Creek are controlled by a number of factors, including the volumes of all sources into the waterbodies, the concentrations of the respective loadings, and by the exchange of tidal flow with Gravesend Bay. Because much of the flow and loads discharged into this waterbody are the result of runoff from rainfall events, the frequency, duration and amounts of rainfall strongly influence the Coney Island Creek's water quality.

The CICWQM was used to simulate bacteria and DO concentrations for the baseline conditions using 2008 rainfall and tidal data. Hourly model calculations were saved for post-processing and comparison with the Existing WQ Criteria, Primary Contact Criteria and the Potential Future Primary Contact WQ Criteria for bacteria, as well as designated and next higher use classifications for DO, as discussed in Section 6.3.c. The performance gap was then developed as the difference between the model calculated baseline waterbody DO and bacteria concentrations, and the applicable numerical WQS. The analysis is developed to address the following three sets of criteria:

- Existing WQ Criteria (Class I);
- Primary Contact WQ Criteria (Class SC) and DO next higher use classification, and;
- Potential Future Primary Contact Recreational WQ Criteria (2012 EPA RWQC).

Within the following sections, analyses are described that reflect the differences in attainment both spatially and temporally. The temporal assessment focuses on compliance with the applicable fecal coliform water quality criteria over the entire year and in the case of enterococci, during the recreational season of May 1st through October 31st. Attainment was evaluated for the LTCP sampling stations shown in Section 2, Figure 2-19.

A summary of the criteria that were applied is shown in Table 6-4. Analyses in this LTCP were performed using the 30-day rolling Geometric Mean of 30 cfu/100mL and the STV of 110 cfu/100mL for enterococci.

Table 6-4. Classifications and Standards Applied

Analysis	Numerical Criteria Applied	
Existing WQ Criteria	Class I	Fecal Monthly GM ≤ 200; DO never <4.0 mg/L
Primary Contact WQ Criteria(1) / DO Class SC	Class SC	Fecal Monthly GM ≤ 200 Daily Average DO ≥ 4.8 mg/L; DO never < 3.0 mg/L
Potential Future Primary Contact WQ Criteria(2)	Entero: rolling 30-d GM – 30 cfu/100mL Entero: STV – 110 cfu/100mL	

Notes:
GM = Geometric Mean; STV = 90 Percent Statistical Threshold Value
(1) This water quality standard is not currently assigned to the saline Coney Island Creek.
(2) DEC has not yet adopted the Potential Future Primary Contact WQ Criteria.

6.3.a CSO Volumes and Loadings Needed to Attain Current Water Quality Standards

Assessing the performance gap required calculating the Coney Island Creek fecal coliform concentrations under baseline conditions and then establishing whether the gap could be closed through reductions to, or control of, CSO overflows. The assessment was to determine whether the Coney Island Creek water quality would meet Existing WQ Criteria.

2008 Annual Rainfall Simulation – Bacteria

A one-year simulation of bacteria water quality was performed for the 2008 baseline loading conditions, assuming all known dry-weather illicit discharges have been eliminated. The results of these simulations are summarized in Table 6-5. The results shown in this table summarize the highest calculated monthly GM on an annual basis and during the recreational season (May 1st through October 31st). The maximum monthly GM is presented for each sampling location in Coney Island Creek.

Table 6-5. Calculated 2008 Baseline Fecal Coliform Maximum Monthly GM and Attainment of Existing WQ Criteria

Station		Maximum Monthly Geometric Means (cfu/100mL)		% Attainment	
		Annual	Recreational Season	Annual	Recreational Season(1)
CI-1	Class I	1,600	99	58	100
CI-2	Class I	1,497	96	58	100
CI-3	Class I	858	56	75	100
CI-4	Class I	300	25	83	100
CI-5	Class I	276	25	83	100
CI-6	Class I	185	21	100	100
CI-7	Class I	157	16	100	100

Notes:
(1) The Recreational Season is from May 1st through October 31st. Class I standard of fecal coliform is 200 cfu/100ml.

Table 6-5 presents the annual attainment (percent) of the fecal coliform GM criterion of 200 cfu/100mL. Fecal coliform geometric means are higher near the head end of the creek and decrease toward the mouth. On an annual basis the percent attainment is low at the upper end of the creek with five months exceeding the criteria. All five of these months fall within the non-recreation season due to rainfall patterns and lower ambient water column temperatures that result in lower bacteria die-off rates. The recreation season is calculated to have 100% attainment of the criteria.

2008 Annual Rainfall Simulation – Dissolved Oxygen

Water quality model simulation DO attainment results are presented in Table 6-6 for year 2008 conditions as calculated for the entire water column. When assessing the water column in its entirety, attainment of the DO criterion is very high. With the exception of the very head end of the creek, all of the station locations that were assessed have a water column annual attainment of 95 percent or greater for year

2008 conditions. CSO OH-021 does not discharge at the head end of the creek, so other factors in addition to CSO discharges contribute to non-attainment of the Class I DO criterion at Station CI-1.

Table 6-6. Model Calculated Baseline DO Attainment – Existing WQ Criteria (2008)

Station		Annual Attainment (%)
		Entire Water Column
		>=4.0 mg/L
CI-1	Class I	90
CI-2	Class I	95
CI-3	Class I	96
CI-4	Class I	98
CI-5	Class I	99
CI-6	Class I	99
CI-7	Class I	99

Table 6-7 presents a comparison of the Class I DO criterion attainment under baseline and 100% CSO control. The model generally calculates changes of only a one or two percent improvement in attainment with the DO criterion. Thus, CSO loads are only a contributing factor and not the controlling factor for DO concentrations that are lower than the criterion, and CSO controls will not improve DO concentrations substantially. This is not unexpected inasmuch as the DO in Coney Island Creek is also affected by stormwater loads, eutrophication, and poor tidal flushing.

Table 6-7. Model Calculated Baseline and 100% CSO Control DO Attainment – Existing WQ Criteria (2008)

Station		Annual Attainment Percent Attainment (Water Column)	
		Baseline	100% Coney Island Creek CSO Control
CI-1	Class I	90	92
CI-2	Class I	95	96
CI-3	Class I	96	97
CI-4	Class I	98	98
CI-5	Class I	99	99
CI-6	Class I	99	99
CI-7	Class I	99	99

6.3.b CSO Volumes and Loadings that Would be Needed to Support the Next Highest Use or Swimmable/Fishable Uses

Bacteria

The next highest use for Coney Island Creek is Class SC with fishing being the best usage. As of November 2015, DEC now requires Class SD and I waterbodies meet the primary contact bacteria criteria. The primary contact fecal coliform criterion is a monthly GM less than or equal to 200 cfu/100mL.

The 2008 baseline condition scenario was rerun with the Coney Island Creek CSO loadings removed. This projection represents the maximum possible reduction of Coney Island Creek CSO loads and is referred to as the 100% CSO control scenario. It should, however, be noted that CSO OH-015 discharges into Gravesend Bay and remained at baseline conditions for this CSO control scenario. All other conditions from the baseline projection remain unchanged in the 100% CSO control scenario. Table 6-8 presents the maximum monthly fecal coliform GM concentration and the annual attainment of the Class SC criterion for fecal coliform.

Table 6-8. Comparison of the Calculated 2008 Baseline and 100% Coney Island Creek CSO Control Fecal Coliform Maximum Monthly GM and Attainment of Bacteria Primary Contact WQ Criteria

Station		Maximum Monthly Geometric Means (Annual)		% Attainment (Annual)	
		Baseline	100% CSO Control	Baseline	100% CSO Control
CI-1	Class SC	1,600	1,536	58	58
CI-2		1,497	1,434	58	58
CI-3		858	809	75	75
CI-4		300	283	83	83
CI-5		276	261	83	83
CI-6		185	182	100	100
CI-7		157	153	100	100

Table 6-8 shows that the CSO is a relatively minor contributor to the maximum monthly fecal coliform GM. The largest impact of the CSO control is calculated at the head end where there is a decrease of 64 cfu/100mL from the baseline GM of 1,600 cfu/100mL. This is not unexpected inasmuch as the upgrade of the Avenue V Pumping Station, which is included in the baseline, has resulted in a significant decrease in the annual CSO volume from 275 million gallons per year (MGY) to 74 MGY and number of CSO activations from 54 to 20 activations per year. The results also indicate there is no change in attainment of the Class SC fecal coliform criterion due to the complete control of Coney Island Creek CSO loadings. Based on these results, the complete control of Coney Island Creek CSO loadings will not alone close the gap between the 2008 baseline attainment of the Class SC fecal coliform criterion and full annual attainment. The remaining non-attainment, all of which occurs during the non-recreational season (November 1st through April 30th), is attributable to non-CSO sources.

Dissolved Oxygen

The attainment of the DO Class SC criteria for the entire water column is presented in Table 6-9, respectively, for the baseline and 100% Coney Island Creek CSO control conditions. The attainment of the Class SC daily average of greater than or equal to 4.8 mg/L is lower than the 95 percent annual target in the upper portion of the creek, but reaches the target by Station CI-5. Attainment of the never-less-than 3.0 mg/L DO criterion is met at least 95 percent of the time throughout the creek on an annual basis for the 2008 baseline conditions. 100% CSO control does not result in significant improvements in attainment of the Class SC criterion, and as such does not close the gap between attainment and non-attainment.

Table 6-9. Model Calculated 2008 Baseline and 100% CSO Control DO Attainment of Class SC/SB WQ Criteria

Station		Annual Attainment Percent Attainment (Water Column)			
		Baseline		100% Coney Island Creek CSO Control	
		≥ 4.8 mg/L	>3.0 mg/L	≥ 4.8 mg/L	> 3.0 mg/L
CI-1	Class SC	82	95	86	97
CI-2		92	98	93	98
CI-3		92	99	93	99
CI-4		94	100	94	100
CI-5		95	100	95	100
CI-6		95	100	95	100
CI-7		97	100	97	100

6.3.c Potential Future Primary Contact WQ Criteria

As noted in Section 2.0, EPA released its RWQC recommendations in December 2012. These included recommendations for recreational water quality criteria for protecting human health in all coastal and non-coastal waters designated for primary contact recreation use. The standards would include a rolling 30-day GM of either 30 cfu/100mL or 35 cfu/100mL and a 90th percentile STV during the rolling 30-day period of either 110 cfu/100mL or 130 cfu/100mL. An analysis using the 2008 baseline and 100% CSO control condition model simulation results was conducted using both the 30 cfu/100mL GM and 110 cfu/100mL 90th percentile STV criteria, to assess attainment with these potential future RWQC.

6.3.d Load Reductions Needed to Attain the Potential Future Primary Contact WQ Criteria

Additional water quality modeling analyses were performed to assess the extent to which CSO and non-CSO sources impact enterococci concentrations at key locations in Coney Island Creek. That analysis consisted of first assessing the baseline conditions for enterococci and then determining whether complete Coney Island Creek CSO elimination could close the gap between the baseline conditions and the potential future recreational water quality criterion of a 30-day rolling GM enterococci concentration of 30 cfu/100mL. The results of the analyses are presented in Table 6-10 for the maximum 30-day GM and attainment of the rolling 30-day GM criterion. All results are for the attainment of the Potential Future Primary Contact WQ Criteria during the May 1st through October 31st recreational season, as defined by the DEC.

Table 6-10. Calculated 2008 Baseline Enterococci Maximum 30-day GM and Seasonal Attainment of Potential Future Primary Contact WQ Criteria

Station		Maximum Recreational Season 30-day Enterococci (cfu/100mL)		% Attainment (Seasonal)	
		GM	90th Percentile STV	GM	90th Percentile STV
CI-1	Saline	155	5,203	52	0
CI-2		151	5,285	53	0
CI-3		83	2,524	70	2
CI-4		28	809	100	10
CI-5		27	857	100	10
CI-6		12	252	100	69
CI-7		11	262	100	65

Attainment of the potential future primary contact GM criterion is poor in the upper end of the creek for 2008 baseline conditions with attainment ranging from 52 to 70 percent for the recreation season. The upper end of the creek has less volume to dilute incoming bacteria loading and has reduced tidal flushing. The lower end of the creek has full attainment of the GM criterion under these conditions. Table 6-10 shows there is essentially no attainment of the 90th percentile STV criterion in the upper end of the creek and ranges between 10 and 69 percent in the lower end of the creek.

Water quality modeling analyses conducted to assess attainment of the enterococci criteria with complete removal of the CSO enterococci loadings, as provided in Table 6-11, show marginal increases in attainment of the 30-day GM criterion of 0 to 5 percent. Even with complete Coney Island Creek CSO control, the enterococci criterion of a maximum GM of 30 cfu/100mL is not attained at Stations CI-1 through CI-3 but would be attained in the lower portions of Coney Island Creek. There are also small improvements in the attainment of the 90th percentile STV criterion, but those are insufficient to achieve compliance with the standard.

Table 6-11. Calculated 2008 100% CSO Control Enterococci Maximum 30-day GM and Attainment of Potential Future Primary Contact WQ Criteria

Station		Maximum Recreational Season 30-day Enterococci (cfu/100mL)		% Attainment	
		GM	90th Percentile STV	GM	90th Percentile STV
CI-1	Saline	155	4,844	54	0
CI-2		151	4,997	56	0
CI-3		83	2,306	75	2
CI-4		28	611	100	10
CI-5		27	627	100	11
CI-6		12	207	100	71
CI-7		11	218	100	69

A load source component analysis was conducted for the 2008 baseline condition using JFK Airport rainfall data, to better understand of how each source type contributes to bacteria concentrations in

Coney Island Creek. The source types include CSO, stormwater, direct drainage, sources to Gravesend Bay and the boundary (Hudson River). Stormwater was not broken down into MS4 and non-MS4 stormwater because non-MS4 stormwater represents less than two percent of the stormwater fecal coliform loading. The analysis included the calculation of fecal coliform and enterococci bacteria GMs in total and from each component. For fecal coliform, a maximum winter month (December) was analyzed because the decay rate is lower in winter, resulting in generally higher fecal coliform concentrations. Enterococci was evaluated on a recreational season (May 1st through October 31st) basis. The 30-day period chosen for the enterococci component analysis included both the maximum 30-day period and the 30-day period where the maximum contribution of CSOs to the geometric mean was observed.

Table 6-12 summarizes the fecal coliform component analysis for the maximum winter month during 2008 for Coney Island Creek. The fecal coliform criterion is exceeded during this maximum winter month (December) at Stations CI-1 through CI-5. The maximum monthly CSO contribution is 64 cfu/100mL at Station CI-1. If DEP were to fully control the CSOs, there would be no changes from the current non-attainment of the Primary Contact WQ Criteria (Class SC) fecal coliform criterion, as reductions from other sources would still be required.

Table 6-12 also summarizes the enterococci component analysis. Two analyses were conducted, one for the period with the maximum 30-day GM, and one for the period with the maximum CSO contribution to the 30-day GM. The period with the maximum enterococci 30-day GM has no CSO contribution and is primarily the result of stormwater sources. During the period of maximum CSO contribution, CI-2 has the largest contribution from CSO at 18 cfu/100mL. Therefore, CSO alone would not be responsible for an exceedance of the 30-day GM criterion under 2008 baseline conditions during the recreation season.

Table 6-12. Fecal and Enterococci GM Source Components

Source	Station	Fecal Coliform Contribution (cfu/100mL)	Enterococcus Contribution (cfu/100mL)	Enterococcus Contribution (cfu/100mL)
		Annual Worst Month December Monthly GM	Max 30-Day Rolling GM during the Recreational Season (May 1st through October 31st)	Max(1) 30-Day Rolling GM during the Recreational Season (May 1st through October 31st)
CSO	CI-1	64	0	17
Stormwater	CI-1	1,433	148	88
Direct Drainage	CI-1	71	5	3
Bay Sources	CI-1	9	0	0
Boundary	CI-1	23	2	1
Total	CI-1	**1,600**	**155**	**109**
CSO	CI-2	63	0	18
Stormwater	CI-2	1,342	145	84
Direct Drainage	CI-2	54	3	2
Bay Sources	CI-2	10	0	0
Boundary	CI-2	28	2	1
Total	CI-2	**1,497**	**151**	**105**
CSO	CI-3	49	0	10
Stormwater	CI-3	721	77	44
Direct Drainage	CI-3	26	2	2
Bay Sources	CI-3	18	0	0

Table 6-12. Fecal and Enterococci GM Source Components

Source	Station	Fecal Coliform Contribution (cfu/100mL)	Enterococcus Contribution (cfu/100mL)	Enterococcus Contribution (cfu/100mL)
		Annual Worst Month December Monthly GM	Max 30-Day Rolling GM during the Recreational Season (May 1st through October 31st)	Max(1) 30-Day Rolling GM during the Recreational Season (May 1st through October 31st)
Boundary	CI-3	44	1	1
Total	CI-3	**858**	**83**	**57**
CSO	CI-4	17	0	3
Stormwater	CI-4	177	22	13
Direct Drainage	CI-4	12	1	1
Bay Sources	CI-4	29	1	0
Boundary	CI-4	65	5	2
Total	CI-4	**300**	**28**	**19**
CSO	CI-5	15	0	3
Stormwater	CI-5	155	21	12
Direct Drainage	CI-5	10	1	1
Bay Sources	CI-5	29	1	0
Boundary	CI-5	67	5	2
Total	CI-5	**276**	**27**	**18**
CSO	CI-6	3	0	1
Stormwater	CI-6	16	2	1
Direct Drainage	CI-6	1	0	0
Bay Sources	CI-6	82	4	2
Boundary	CI-6	83	6	3
Total	CI-6	**185**	**12**	**7**
CSO	CI-7	4	0	1
Stormwater	CI-7	38	5	3
Direct Drainage	CI-7	1	0	0
Bay Sources	CI-7	33	1	0
Boundary	CI-7	81	6	3
Total	CI-7	**157**	**11**	**7**

Notes:
(1) Based on the 30-day period with the maximum CSO contribution to the GM.

Table 6-12 indicates that CSO impacts to attainment are limited within Coney Island Creek, although the extent of CSO contribution varies both spatially and temporally. As such, the alternatives analysis described in Section 8.0 focuses on reduction of the CSO discharges to Coney Island Creek.

6.3.e Time to Recovery

The analyses provided above examine the long term impacts of wet-weather sources, as is required by Existing and Potential Future Primary Contact WQ Criteria (monthly GM and 30-day GM). Shorter-term impacts are not evaluated using these regulatory criteria. Therefore, to gain insight to the shorter-term impacts of wet-weather sources of bacteria, DEP has reviewed the DOH guidelines relative to single sample maximum bacteria concentrations that DOH believes "constitute a potential hazard to health if used for bathing." The presumption is that if the bacteria concentrations are lower than these levels, then the waterbodies do not pose potential hazards if primary contact is practiced.

DOH considers fecal coliform concentrations that exceed 1,000 cfu/100mL to be potential hazards to bathing. Water quality modeling analyses were conducted to assess the amount of time following the end of rainfall required for the saline portion of Coney Island Creek to recover and return to concentrations of less than 1,000 cfu/100mL.

From NYS DOH

https://www.health.ny.gov/regulations/nycrr/title_10/part_6/subpart_6-2.htm

Operation and Supervision

6-2.15 Water quality monitoring
(a) No bathing beach shall be maintained … to constitute a potential hazard to health if used for bathing. To determine if the water quality constitutes a potential hazard … shall consider one or a combination of any of the following items: results of a sanitary survey; historical water quality model for rainfall and other factors; verified spill or discharge of contaminants affecting the bathing area; and water quality indicator levels specified in this section.

(1) Based on a single sample, the upper value for the density of bacteria shall be: (i) 1,000 fecal coliform bacteria per 100 ml; or …(iii) 104 enterococci per 100 ml for marine water; ….

The LaGuardia Airport (LGA) rainfall data were first analyzed for the period of 2002-2011. The surface synoptic observations (SYNOP) model was used to identify each individual storm and to calculate the storm volume, duration and start and end times. Rainfall periods separated by four hours or more were considered separate storms. Statistical analysis of the individual rainfall events for the recreational seasons (May 1st through October 31st) of the 10-year period resulted in a 90th percentile rainfall event of 1.09 inches. Based on this information, a storm approximating the 90th percentile storm was chosen from the 2008 recreational season as a design storm. This design storm was the August 15, 2008 JFK rainfall event, which resulted in 1.02 inches of precipitation. A principal feature of this storm, aside from its volume, was the time until the next rainfall allows concentrations time to reach the fecal coliform target concentration.

Table 6-13 presents the time to recovery for the baseline condition and the 100% Coney Island Creek CSO control scenario. Under the baseline conditions, Station CI-1 has the longest time to recovery of 24 hours. DEC has indicated that it is desirable to have a time to recovery of less than or equal to 24 hours. The other stations in Coney Island Creek have time to recovery ranging between 0 and 23 hours. Thus, under the design storm conditions, Coney Island Creek meets the desired target of a time to recovery less than or equal to 24 hours. When the fecal coliform loading from CSO OH-021 is removed, there are only small changes in the time to recovery. There is an improvement of two hours at Station CI-4, and one hour at Stations CI-1 and CI-5. In summary, the time to recovery is consistent with DEC's desired target of 24 hours, irrespective of whether CSO discharges are present.

Table 6-13. Time to Recovery

Station		Time to Recovery (hours) Fecal Threshold (1,000 cfu/100mL)	
		Baseline	100% CSO Control
CI-1	Saline	24	23
CI-2		23	23
CI-3		20	20
CI-4		11	9
CI-5		9	8
CI-6		0	0
CI-7		0	0

7.0 PUBLIC PARTICIPATION AND AGENCY COORDINATION

DEP is committed to implementing a proactive and robust public participation program to inform the public about the development of watershed-specific and citywide LTCPs. Public outreach and public participation are important aspects of LTCPs, which are designed to reduce CSO-related impacts to achieve waterbody-specific WQS, consistent with the Federal CSO Policy and the CWA, and in accordance with EPA and DEC mandates.

DEP's Public Participation Plan was released to the public on June 26, 2012, and describes the tools and activities DEP will use to inform, involve and engage a diverse group of stakeholders and the broader public throughout the LTCP process. The purpose of the Plan is to create a framework for communicating with, and soliciting input from, interested stakeholders and the broader public concerning water quality and the challenges and opportunities for CSO controls. As described in the Public Participation Plan, DEP will strategically and systematically implement activities that meet the information needs of a variety of stakeholders in an effort to meet critical milestones in the overall LTCP schedule outlined in the amended 2012 CSO Order on Consent.

As part of the CSO Quarterly Reports, DEP will report to DEC on public participation activities outlined in the Public Participation Plan. Updates to the Public Participation Plan that are implemented in response to public comments will be posted annually to DEP's website, along with the quarterly summary of public participation activities reported to DEC.

7.1 Local Stakeholder Team

DEP began the public participation process for the Coney Island Creek LTCP by reaching out to the Coney Island Creek Community Boards to identify the stakeholders who would be instrumental to the development of this LTCP. Stakeholders identified included both citywide and regional groups, including: environmental organizations (National Recreation and Park Association, S.W.I.M. Coalition, Water Front Alliance, Coney Island Beautification Project, New York – New Jersey Harbor and Estuary Program); community planning organizations (Brooklyn Community Board #13, New Yorkers for Parks); academic and research organizations (New York Aquarium); and City governmental agencies (NYC Economic Development Corporation).

7.2 Summaries of Stakeholder Meetings

DEP held two public meetings and one stakeholder group meeting to aid in the development and execution of the LTCP. The objectives of the public meetings and a summary of the discussions are presented below:

Public Meetings

- <u>Public Meeting #1: Coney Island Creek LTCP Kickoff Meeting (November 4, 2015)</u>

  Objectives: Provide overview of LTCP process, public participation schedule, watershed characteristics and improvement projects; solicit input on waterbody uses.

DEP and DEC co-hosted a Public Kickoff Meeting to initiate the water quality planning process for long term control of CSOs in the Coney Island Creek Waterbody. The two-and-half-hour event, held at PS 90, Brooklyn, provided information about DEP's LTCP Program, presented information on the Coney Island Creek watershed characteristics and status of waterbody improvement projects, solicited information from the public about its use of the Coney Island Creek, and described additional opportunities for public input and outreach. The presentation can be found at http://www.nyc.gov/dep/ltcp/. Approximately 15 stakeholders from 10 different non-profit, community, planning, environmental, economic development, governmental organizations and the broader public attended the event, as did one media representative.

The Coney Island Creek LTCP Kickoff Public Meeting was the first opportunity for public participation in the development of this LTCP. As part of the development of the LTCP, and in response to stakeholder comments, DEP provided detailed information about each of the following:

- CSO reductions and potential existing and future CSO-related projects in Coney Island Creek;
- Modeling baseline assumptions utilized during LTCP development;
- Rainfall amounts and other assumptions utilized during LTCP development;
- Water quality data collection;
- Existing Coney Island Creek CSO discharges; and
- Future public meeting announcements.

A summary of the meeting, including stakeholder comments and questions and DEP's responses are posted to DEP's website and are included in Appendix B, Public Participation Materials.

- <u>Public Meeting #2: Coney Island Creek LTCP Alternatives Review Meeting (April 20, 2016)</u>

Objectives: Review proposed alternatives, related waterbody uses and water quality conditions.

On April 20, 2016, DEP hosted a second Public Meeting to continue discussion of the water quality planning process for long term control of CSOs in Coney Island Creek. The purpose of the two-hour event, held at the New York Aquarium Education Hall in Coney Island, Brooklyn, was to describe the alternatives identification and selection processes, and receive public comment on that information. The presentation is on DEP's LTCP Program Website: http://www.nyc.gov/dep/ltcp. Approximately 40 stakeholders from several different non-profit, community planning, environmental, economic development, and governmental organizations, as well as the general public, attended the event.

As part of the development of the LTCP, and in response to stakeholder comments, DEP provided detailed information about each of the following:

- Addressing previous public comments received regarding: evaluation of alternatives that will make the Creek safe for fishing and swimming; concerns about legacy contamination in the Creek; elimination of illicit discharges; and assessment of Green Infrastructure in the vicinity of the Creek.
- Recent investments and ongoing construction within the Coney Island Creek watershed.

- Modeling baseline assumptions utilized during LTCP development, including the rainfall conditions utilized;
- Existing and future predicted CSO discharges;
- Water quality data collection;
- Stormwater inputs/contributions to Coney Island Creek;
- Green infrastructure and grey infrastructure potential alternatives;
- Opportunity to review and comment on the draft Coney Island Creek LTCP; and
- Future public meeting announcements.

Four breakout sessions were then held to further discuss:

- Public concern and interests in CSO control;
- Water quality classifications and uses;
- Green Infrastructure and municipal separate storm sewer system program; and
- Water rates and affordability.

A summary of the meeting including stakeholder comments and questions as well as DEP's responses are posted on DEP's website, and are included in Appendix B, Public Participation Materials.

- Public Meeting #3: Draft LTCP Review Meeting (not yet scheduled)

Objectives: Present LTCP after review by DEC

This meeting will present the final recommended plan to the public after DEC review. Outcomes of the discussion and a copy of presentation materials will be posted to DEP's website.

Stakeholder Meetings

- Meeting with Brooklyn Borough Hall (September 9, 2015)

DEP staff met with the Deputy Borough President (and staff), the District Managers of all of the Brooklyn Community Boards, and representatives from various Council Members to present information on Coney Island Creek water quality and waterbody characteristics and on the LTCP Program and its planning and alternatives processes.

- Meeting with SWIM Coalition and Coney Island Beautification Project (February 6, 2016)

The SWIM Coalition and the Coney Island Beautification Project hosted an LTCP workshop at the NY Aquarium. DEP Staff attended and presented to approximately 40 attendees. DEP Staff presented on the Coney Island Creek LTCP as well as the MS4 Program.

Public Comments Received

DEP received the following comments:

- S.W.I.M Coalition Comments on the forthcoming Coney Island Creek CSO Long Term Control Plan, December 4, 2015.

These comments are posted to DEP's website and are included in Appendix B, Public Participation Materials.

7.3 Coordination with Highest Attainable Use

DEC has designated Coney Island Creek a Class I water quality classification. The best usages of Class I waters are "secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival. In addition, the water quality shall be suitable for primary contact recreation, although other factors may limit the use for this purpose". Coney Island Creek does not attain the existing Class I WQS for bacteria and DO. The Creek cannot fully achieve the Primary Contact Bacteria WQ Criteria based on fecal coliform on an annual basis. Even 100 percent CSO reduction would not bring the waterbody into compliance with WQS. However, the analyses show that Primary Contact Bacteria WQ Criteria is projected to essentially be attained throughout the recreational season (May 1st through October 31st) a high percentage of the time, although bacteria levels will be elevated during and after rain events. There are no permitted swimming locations or sanctioned infrastructure or equipment supporting secondary contact recreation along Coney Island Creek; thus, the non-attainment of the swimmable standard during and after rainfall or during the non-recreational season (November 1st through April 30th) would not impact such uses.

It should be emphasized that the Coney Island Creek watershed, although surrounded by commercial and industrial uses in most areas, does provide informal shoreline access points for on-shore recreation, which attract the public to take advantage of the recreational uses of the waterway. These uses should be protected in recreational periods, with the exception of during rain events when advisories will be in place.

Based on the projected water quality conditions and the UAA process (presented in Appendix C), it is anticipated that the Coney Island Creek should remain a Class I waterbody (with a wet-weather advisory) during the recreational season (May1st through October 31st).

7.4 Internet Accessible Information Outreach and Inquiries

Both traditional and electronic outreach tools are important elements of DEP's overall communication effort. DEP will ensure that outreach tools are accurate, informative, up-to-date and consistent, and are widely distributed and easily accessible. Table 7-1 presents a summary of Coney Island Creek LTCP public participation activities.

Table 7-1. Summary of Coney Island Creek LTCP Public Participation Activities Performed

Category	Mechanisms Utilized	Dates (if applicable) and Comments
Regional LTCP Participation	Citywide LTCP Kickoff Meeting and Open House	• June 26, 2012
	Annual Citywide LTCP Meeting – Modeling Meeting	• February 28, 2013
	Annual Citywide LTCP Meeting #3	• December 11, 2014
	Annual Citywide LTCP Meeting #4	• January 12, 2016
Waterbody-specific Community Outreach	Public meetings and open houses	• Kickoff Meeting: November 4, 2015 • Meeting #2: April 20, 2016 • Meeting #3: TBD
	Stakeholder meetings and forums	• Borough Board and Borough Services Meeting on September 9, 2015 • SWIM Coalition and Coney Island Beautification Meeting on February 6, 2016
	Elected officials briefings	• November 18, 2014
Data Collection and Planning	Establish online comment area and process for responding to comments	• Comment area added to website on October 1, 2012 • Online comments receive response within two weeks of receipt
	Update mailing list database	• DEP updates master stakeholder database (700+ stakeholders) before each meeting
Communication Tools	Program Website or Dedicated Page	• LTCP Program website launched June 26, 2012 and frequently updated • Coney Island Creek LTCP web page launched
	Social Media	• TBD
	Media Outreach	• Published advertisements in newspapers: the Brooklyn Paper, Bay News, Mill Basin-Marine Park Courier, Bay Ridge Courier, Brooklyn Courier, Caribbean Life and La Voz
	FAQs	• LTCP FAQs developed and disseminated beginning June 2014 via website, meetings and email
Communication Tools	Print Materials	• LTCP FAQs: June 11, 2014 • LTCP Goal Statement: June 26, 2012 • LTCP Public Participation Plan: June 26, 2012 • LTCP Program Brochure: February 12, 2015 • Glossary of Modeling Terms: February 28, 2013 • Meeting advertisements, agendas and

Table 7-1. Summary of Coney Island Creek LTCP Public Participation Activities Performed

Category	Mechanisms Utilized	Dates (if applicable) and Comments
		presentations • PDFs of poster board displays from meetings • Meeting summaries and responses to comments • Quarterly Reports • WWFPs
	Translated Materials	• As-needed basis
	Portable Informational Displays	• Poster board displays at meetings
Student Education	Participate in ongoing education events	• N/A
	Provide specific green and grey infrastructure educational modules	• N/A

DEP launched its LTCP Program website on June 26, 2012. The website provides links to documents related to the LTCP Program, including CSO Orders on Consent, approved WWFPs, CSO Quarterly Reports, links to related programs, such as the Green Infrastructure Plan, and handouts and poster boards distributed and displayed at public meetings and open houses. An LTCP feedback email account was also created to receive LTCP-related feedback, and stakeholders can sign up to receive LTCP Program announcements via email. In general, DEP's LTCP Program Website:

- Describes the LTCP process, CSO-related information and citywide water quality improvement programs to-date;
- Describes waterbody-specific information including historical and existing conditions;
- Provides the public and stakeholders with timely updates and relevant information during the LTCP process, including meeting announcements;
- Broadens DEP's outreach campaign to further engage and educate the public on the LTCP process and related issues; and
- Provides an online portal for submission of comments, letters, suggestions, and other feedback.

A dedicated Coney Island Creek LTCP webpage was created in October 2015, and includes the following information:

- Coney Island Creek public participation and education materials
  - Coney Island Creek Summary Paper
  - LTCP Public Participation Plan
- Coney Island Creek Kickoff Meeting Documents – November 4, 2015
  - Advertisement
  - Meeting Presentation
  - Meeting Summary and Response to Comments

- Coney Island Creek Meeting #2 Meeting Documents – April 20, 2016
  - Meeting PresentationMeeting Summaries and Responses to Comments

8.0 EVALUATION OF ALTERNATIVES

This section of the LTCP describes the development and evaluation of CSO control measures and watershed-wide alternatives. A CSO control measure is defined as a technology (e.g., treatment or storage), practice (e.g., NMC or BMP), or other method (e.g., source control or GI) of abating CSO discharges or the effects of such discharges on the environment. Alternatives evaluated herein are comprised of a single CSO control measure or a group of control measures that will collectively address the water quality objectives for Coney Island Creek.

This section contains the following information:

- Process for developing and evaluating CSO control alternatives that reduce CSO discharges and improve water quality (Section 8.1).
- CSO control alternatives and their evaluation (Section 8.2).
- CSO reductions and water quality benefits achieved by the higher-ranked alternatives, as well as their estimated costs (Sections 8.3 and 8.4).
- Cost-performance and water quality attainment assessment for the higher-ranked alternatives to select the preferred alternative (Section 8.5).

Water quality attainment of CSO control alternatives evaluated in this section considered the bacteria WQ criteria presented in Section 6.0, Table 6-3. The preferred alternative is also evaluated in terms of attainment of the existing Dissolved Oxygen (DO) criteria.

8.1 Considerations for LTCP Alternatives Under the Federal CSO Policy

This LTCP addresses the water quality objectives of the CWA, the CSO Control Policy, and the New York State Environmental Conservation Law (ECL). This LTCP also builds upon the conclusions presented in DEP's June 2009 Coney Island Creek WWFP. As required by the 2012 CSO Consent Order, when the proposed alternative set forth in the LTCP will not achieve Existing WQ Criteria or the Section 101(a)(2) goals, a UAA must be prepared. A UAA is the mechanism to examine whether applicable waterbody classifications, criteria, or standards should be adjusted by the State. If deemed necessary under these conditions, the UAA would assess the compliance of the next higher classification that the State would consider in adjusting WQS and developing waterbody-specific criteria.

The remainder of Section 8.1 discusses the development and evaluation of CSO control measures and watershed-wide alternatives to comply with the CWA in general, and with the CSO Control Policy in particular. The evaluation factors considered for each alternative are described, followed by the process for evaluating the alternatives.

8.1.a Performance

Section 6.0 presented evaluations of baseline LTCP conditions, and concluded that Existing WQ Criteria (Class I) for bacteria cannot be attained on an annual basis even with 100% CSO control due to limited tidal exchange and flushing, and the presence of other sources of pollutants being discharged. Full attainment of the Existing WQ Criteria (Class I) for bacteria is, however, attained under baseline conditions during the recreational season (May 1st through October 31st). As such, subsequent discussion of performance for Coney Island Creek alternatives will focus on bacteria criteria for Existing WQ Criteria (Class I) and Potential Future Primary Contact WQ Criteria, consistent with the 2012 U.S. Environmental Protection Agency (EPA) 2012 Recreational Water Quality Criteria (RWQC) (2012 EPA RWQC).

The analyses in Section 6.0 also showed that Coney Island Creek cannot attain the designated Class I DO criterion, even with 100% CSO control in place. DO attainment is addressed herein, however the primary focus of the cost-performance analysis is bacteria reduction and attainment of bacteria criteria.

A major focus of the development and evaluation of control alternatives is the ability to achieve bacteria load reduction and to attain applicable water quality criteria. A two-step process is used. First, based upon watershed or InfoWorks CS™ (IW) model runs for typical year (2008) rainfall, the level of CSO control of each alternative is established, including the reduction of CSO volume, fecal coliform, and enterococci loading. The second step uses the estimated levels of CSO control to project levels of attainment in the receiving waters. This step uses the CICWQM. LTCPs are typically developed with alternatives that span a range of CSO volumetric (and loadings) reductions. Accordingly, this LTCP includes alternatives that consider a wide range of reductions in CSO loadings - up to 100% CSO control - including investments made by DEP through green and grey infrastructure. Intermediate levels of CSO volume control, approximately 25, 50 and 75 percent, are also evaluated. However, for some alternative control measures, such as disinfection, there would be no reduction in CSO volume but significant reductions in bacteria loading would result instead. Performance of each control alternative is measured against its ability to meet the CWA and water quality requirements for the 2040 planning horizon as described in Section 6.0.

8.1.b Impact on Sensitive Areas

In developing LTCP alternatives, special effort is made to minimize the impact of construction, to protect existing sensitive areas when identified, and to enhance overall water quality in sensitive areas. As described in Section 2.0, no sensitive areas exist within Coney Island Creek so only construction impacts were considered, as appropriate.

8.1.c Cost

Cost estimates for the alternatives were computed using a costing tool based on parametric costing data. This approach provides an Association for the Advancement of Cost Engineering Class 5 estimate (accuracy range of minus 20 to 50 percent to plus 30 to 100 percent), which is typical and appropriate for this type of planning evaluation. For the purpose of this LTCP, all costs are in February 2016 dollars.

For the LTCP alternatives, PBC was used as the estimate of the construction cost. Annual O&M costs are then used to calculate the net present worth (NPW) over the projected useful life of the project. A lifecycle of 20 years and an interest rate of 3 percent were assumed resulting in a Present Worth Factor of 14.877.

To quantify costs and benefits, alternatives are compared based on reductions of both CSO discharge volume and bacteria loading against the NPW of the alternative. These costs are then used to plot the performance and attainment curves. A pronounced inflection point appearing in the resulting graphs, the so-called KOTC point, suggests a potential cost-effective alternative for further consideration. In essence, this would reflect the alternative that achieves the greatest appreciable water quality improvements per unit of cost. However, this may not necessarily be the lowest cost alternative. The final, or preferred, alternative must be capable of improving water quality in a fiscally responsible and affordable manner to ensure that resources are properly allocated across the overall citywide LTCP program. These monetary considerations also must be balanced with non-monetary factors, such as environmental benefits, technical feasibility and operability, which are discussed below.

8.1.d Technical Feasibility

Several factors were considered when evaluating technical feasibility, including:

1. Effectiveness for controlling CSO
2. Reliability
3. Implementability

The effectiveness of individual CSO control measures was assessed based on their ability to reduce CSO frequency, volume, and pollutant loading. Reliability is an important operational consideration, and can have an impact on overall effectiveness of a control measure. Therefore, reliability and proven history were used to assess the technical feasibility and cost-effectiveness of a control measure.

Several site-specific factors were considered to evaluate an alternative’s implementability, including available space, neighborhood assimilation, impact on parks and green space, and overall practicability of installing - and later maintaining - CSO controls. In addition, the method of construction was factored into the final selection. Some technologies require specialized construction methods that typically incur additional costs.

8.1.e Cost-Effective Expansion

All alternatives evaluated were sized to handle the CSO volumes based on the 2008 typical rainfall year and 2040 design year dry-weather flows, with the understanding that the predicted and actual flows may differ. To help mitigate the difference between predicted and actual flows, adaptive management was considered for those CSO technologies that can be expanded in the future to capture or treat additional CSO flows or volumes, should it be needed. In some cases, this may have affected where the facility would be constructed, or gave preference to a facility that could be expanded at a later date with minimal cost and disruption of operation.

Breaking construction into segments allowed adjustment of the design of future phases based on the performance of already-constructed phases. Lessons learned during operation of the current facilities can be incorporated into the design of the future facilities. However, phased construction also exposes the local community to a longer construction period. Where applicable, for those alternatives that can be expanded, the LTCP discusses how easily they can be expanded, what additional infrastructure may be required, and if additional land acquisition would be needed.

As regulatory requirements change, other water quality improvements may be required. The ability of a CSO control technology to be retrofitted to handle process improvements benefits the assessment of that technology.

8.1.f Long Term Phased Implementation

The recommended implementation steps associated with the preferred alternative are structured in a way that makes them adaptable to change by expansion and modification, in response to new regulatory and/or local drivers. If applicable, the project(s) would be implemented over a multi-year schedule.

Because of this, permitting and approval requirements must be identified prior to selection of the alternative. These are identified along with permit schedules where appropriate. With the exception of GI, which is assumed to occur on both private and public property, most if not all of the CSO grey technologies are limited to NYC-owned property and right-of-way-acquisitions. DEP will work closely with other NYC agencies, and NYS as necessary, to ensure proper coordination with other government entities.

8.1.g Other Environmental Considerations

Consideration will be given to minimizing impacts on the environment and surrounding neighborhood during construction. These impacts could potentially include traffic, site access issues, park and wetland disruption, noise pollution, air quality, and odor emissions. To minimize environmental impacts, they will be identified with the selection of the recommended plan and communicated to the public. The specific details on the mitigation of the identified concerns and/or impacts, such as erosion control measures and the rerouting of traffic will be addressed in a pre-construction environmental assessment.

8.1.h Community Acceptance

As described in Section 7.0, DEP is committed to involving the public, regulators and other stakeholders throughout the planning process. The scope of the LTCP, background and newly collected data, WQS, and the development and evaluation of alternatives, were presented in public meetings. Community acceptance of the recommended plan is essential to its success. As such, DEP has used the LTCP public participation process to assist in gaining that acceptance. The Coney Island Creek LTCP is intended to improve water quality as the public's health and safety are a high priority of DEP. The goal of raising awareness of, and access to, waterbodies was considered throughout the alternative analysis. Several CSO control measures, such as GI, have been shown to enhance communities while increasing local property values. As such, the benefits of GI were considered in the formation of the baseline and the final recommended plan.

8.1.i Methodology for Ranking Alternatives

The multi-step evaluation process that DEP employed in developing the Coney Island Creek LTCP proposed CSO control measures and watershed-wide alternatives included the following:

1. Evaluating benchmarking scenarios, including baseline and 100% CSO control, to establish the full range of controls within the Coney Island Creek watershed. The results of this step were described in Section 6.0.

2. Developing a list of promising control measures for further evaluation.

3. Establishing levels of intermediate CSO control that provide a range between baseline and 100 percent and conducting receiving water quality simulations of these intermediate control levels.

4. Conducting an initial "brainstorming" meeting with DEP staff on November 10, 2015, to review the most promising control measures and to solicit additional options to explore.

5. Conducting a second "brainstorming" meeting on January 29, 2016, to further review additional details on the most promising control measures and to solicit additional options to further explore.

6. Conducting a final LTCP workshop on February 23, 2016, during which the water quality benefits, costs and fatal flaws of the remaining alternatives under consideration were evaluated.

The focal points of this process were the meetings and workshops listed above. Prior to the first meeting, the universe of control measures that were evaluated in the 2009 WWFP was revisited from the perspective of the LTCP goal statement and in light of the implemented WWFP. Additional control measures were also identified and assessed. The resultant control measures were introduced at the first meeting. Based on discussions at the first meeting, further additional control measures were identified. A preliminary evaluation of these control measures was then conducted including an initial estimation of costs and water quality impacts. During the second meeting, promising alternatives were reviewed in more detail. The final LTCP workshop included updated alternative assessments and a final fatal flaw analysis.

The range of control measures that were considered fall under the categories of Source Control, System Optimization, CSO Relocation, Water Quality/Ecological Enhancement, Treatment, and Storage, with the following constituents:

1. **Source Control**
   - Additional GI
   - High Level Storm Sewers

2. **System Optimization**
   - Fixed Weirs
   - Parallel Interceptor/Sewer
   - Bending Weirs and Control Gates, Pump Station Optimization
   - Pump Station Expansion

3. **CSO Relocation**
   - Flow Tipping to Other Watersheds, Pump Station Modification
   - Pump Station Modifications
   - Flow Tipping with Conduit/Tunnel and Pumping

4. **Water Quality/Ecological Enhancement**
   - Floatables Control
   - Environmental Dredging
   - Mechanical Aeration
   - Flushing Tunnel

5. **Treatment**
   - Outfall Disinfection
   - Retention Treatment Basin
   - High Rate Clarification
   - Wastewater Treatment Plant Expansion

6. **Storage**
   - In-System
   - Shaft

- Tank
- Tunnel

Figure 8-1 presents these control measures according to their relative cost and level of complexity. The control measures in the upper left hand corner are generally the least costly and least complex to construct and/or operate while those towards the lower right are the most costly and most complex to construct and/or operate. The level of loading removal performance of each measure typically corresponds with the level of cost and complexity.

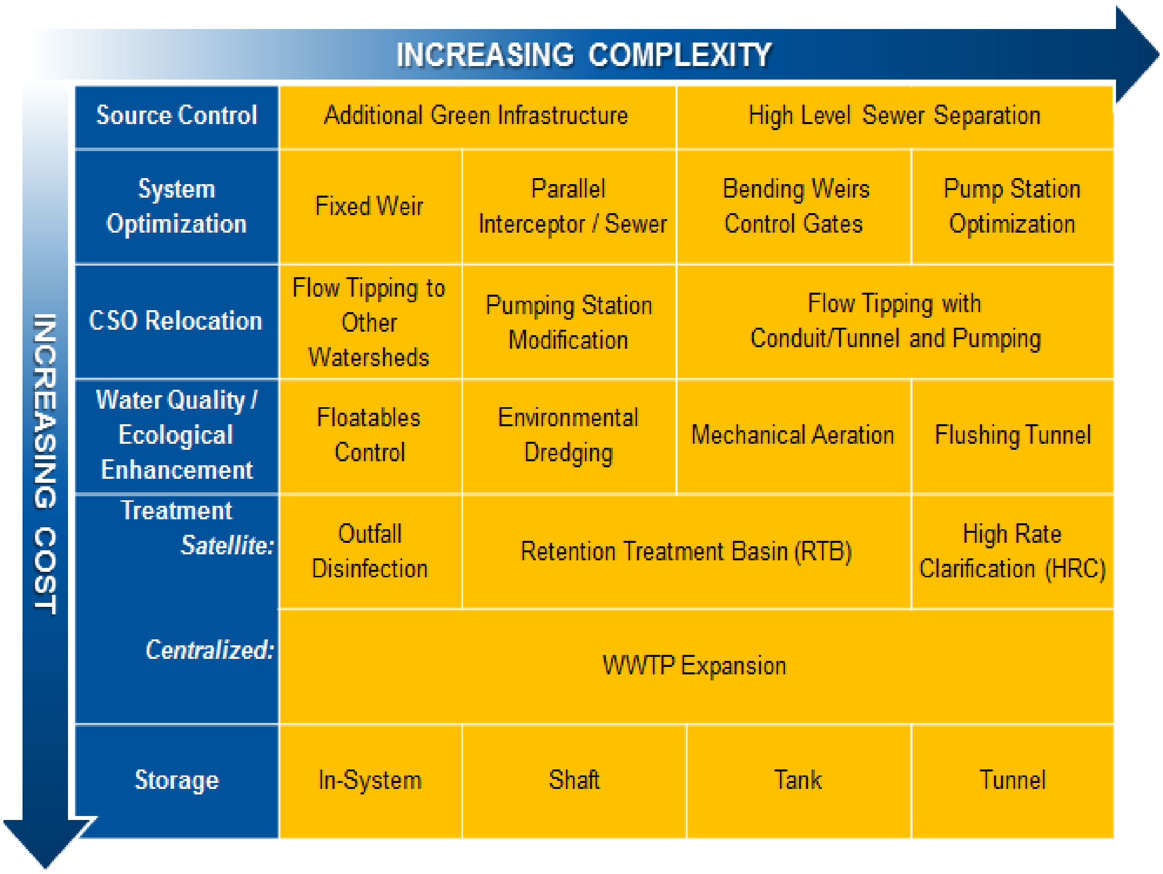


Figure 8-1. Matrix of CSO Control Measures for Coney Island Creek

During the initial screening meeting, most of the control measures advanced to a second level of evaluation with the exception of the following:

- Additional Green Infrastructure: Prior evaluations demonstrated that there is no additional opportunity for GI implementation within the combined areas of the Coney Island Creek watershed, beyond the 1 percent included in the baseline scenario.
- High Level Sewer Separation: See Section 8.2.a.1.
- Parallel Interceptor/Sewer: The conveyance capacity along the combined sewer system upstream of the Avenue V Pumping Station is controlled by the pump station capacity; hence, a solution that increases conveyance capacity of the upstream combined sewer system alone would result in no CSO volume reduction. An increase in conveyance capacity of the interceptor

carrying the Avenue V Pumping Station pumped flow to the Owls Head Wastewater Treatment Plant (WWTP) would similarly have no impact on CSO volume to Coney Island Creek unless accompanied by an upgrade of the recently upgraded Avenue V Pumping Station and force main. This option was ruled out due to the likelihood that there would be less onerous, less complex and more viable CSO reduction alternatives for further consideration.

- Flow Tipping to Other Watersheds: A gravity based CSO relocation alternative is not feasible for the combined areas within the Coney Island Creek watershed due to the topography of the area.
- Pump Station Modification: This option, particularly pump station design capacity increase, was ruled out due to the limitations of the downstream conveyance system to which the pump station would discharge during wet-weather. Increasing the pumping capacity would essentially relocate CSO volume to New York Bay and would not produce an increase in treated CSO at the Owls Head WWTP. It should be noted that the upgrade of the Avenue V Pumping Station did result in some limited amount of flow tipping to the New York Bay that could not be conveyed to the Owls Head WWTP due to hydraulic restrictions in the affected interceptor system.
- Flow Tipping with Conduit/Tunnel and Pumping: Direct diversion to another watershed was not found to be practical due to the length of required diversion conduits.
- Environmental Dredging: Sediment build-up associated with CSOs in Coney Island Creek was not identified throughout this or previous planning efforts and data gathered by various agencies, including the most recent bathymetry data gathered by EDC in 2014. It should be noted, however, that previous dredging had occurred along the upper reach of the Creek under an ECL remediation project.
- Mechanical Aeration: WQ modeling indicated that compliance with the designated Class I DO criterion is achieved for LTCP baseline conditions at all but the most upstream sampling location, and that 100% CSO control would have little to no impact on minimum DO levels in Coney Island Creek. Thus, an in-stream DO improvement solution to mitigate CSO impacts was not evaluated within the LTCP framework.
- Retention Treatment Basin (RTB): RTBs were ruled out of the evaluation process for two reasons: limited space for the associated large tankage and the absence of evidence for the need for the removal of suspended solids or BOD. These pollutants were not identified as loadings contributing to non-attainment of WQS.
- High Rate Clarification (HRC): As noted above for the RTB discussion, HRC was also screened out for further evaluation as neither CSO-related suspended solids or BOD were identified as contributing to non-attainment.
- WWTP expansion: No space is available at the Owls Head WWTP for further capacity expansion.
- Storage Tank: Storage tanks were not considered further due to the very limited space available for the footprint required for a storage tank facility. Other more space-efficient storage solutions, such as vertical shafts and deep tunnels, were considered.

The evaluation of the initially retained control measures is described in Section 8.2.

8.2 Matrix of Potential CSO Reduction Alternatives to Close Performance Gap from Baseline

The alternatives evaluations for Coney Island Creek focused on the sole discharging CSO outfall, OH-021. Each control measure was initially evaluated on three of the key considerations described in Section 8.1: (1) benefits, as expressed by level of CSO control and attainment; (2) costs; and (3) challenges, such as siting and operations. Using this methodology, the control measures listed in Section 8.1 were evaluated on a cost-performance basis and used to develop the CSO reduction alternatives.

Following the LTCP outline, these control measures are described under the following categories: Other Future Grey Infrastructure, Other Future Green Infrastructure and Hybrid Green/Grey Alternatives, and subsets thereof.

8.2.a Other Future Grey Infrastructure

For the purpose of this LTCP, "Other Future Grey Infrastructure" refers to potential grey infrastructure beyond existing control measures implemented based on previous planning documents. "Grey infrastructure" refers to systems used to control, reduce or eliminate discharges from CSOs. These are the technologies that have been traditionally employed by DEP and other wastewater utilities in their CSO planning and implementation programs. They include retention tanks, tunnels and treatment facilities, including satellite facilities, and other similar capital-intensive projects.

Grey infrastructure projects implemented under previous CSO control programs and facility plans, such as the 2009 WWFP, are described in Section 4.0, most notably the upgrade of the Avenue V Pumping Station from 30 MGD to 80 MGD and the associated force main improvements.

8.2.a.1 High Level Sewer Separation

High Level Sewer Separation is a form of partial separation that takes runoff from the streets or other public rights-of-way out of the combined sewers, while leaving roof leaders or other building connections unaltered. In NYC, this is typically accomplished by constructing a new stormwater system and directing flow from street inlets and catch basins to the new storm sewers. Challenges associated with HLSS include constructing new sewers with minimal disruption to the neighborhoods along the proposed alignment, and finding a viable location for necessary new stormwater outfalls. Separation of sewers minimizes the amount of CSO being discharged to receiving waters, but can also result in increased separate stormwater discharges (which may also carry loadings) to receiving waters.

HLSS was considered in the WWFP. However, as was noted then, the additional and more frequent pollution loadings that would result from the new stormwater discharges are a concern. Typically, DEP implements HLSS projects to control localized flooding. Because localized flooding has not been a documented problem in the watershed after the Avenue V Pumping Station upgrade, and due to the concern of potential additional stormwater-related pollution, HLSS was not evaluated further.

8.2.a.2 Sewer Enhancements

Sewer enhancements, also known as system optimization, aim to reduce CSO through improved operating procedures or modifications to the existing collection system infrastructure. Examples include: regulator or weir modifications including fixed and bending weirs; control gate modifications; real time control; and increasing the capacity of select conveyance system components, such as gravity lines, pump stations and/or force mains. Force main relocation or interceptor flow regulation also would fall under this category. These control measures generally retain more of the combined sewage within the collection system during storm events. The benefits of retaining this additional volume must be balanced against the potential for sewer back-ups and flooding, or the relocation of the CSO discharge elsewhere in the watershed or an adjacent watershed. Viability of these control measures is system-specific, depending on existing physical parameters such as pipeline diameter, length, slope and elevation. For Outfall OH-021, both static weir raising and installing a bending weir were evaluated. The bending weir was found to have no impact on CSO volume due to the influence of the tide (the operating range of the bending weir fell below the mean tide elevation). Raising the static weir caused adverse impacts to the hydraulic grade line upstream of the regulator, increasing the risk of flooding. Lengthening the weir to offset the hydraulic grade line impacts was impractical due to the magnitude of the additional weir length required. As such, sewer enhancements were not retained for further evaluation.

8.2.a.3 Retention/Treatment Alternatives

A number of the control measures considered for the Coney Island Creek LTCP fall under the dual category of treatment and retention. For the purposes of this LTCP, the term “storage” is used in lieu of “retention”. These control measures include in-line or in-system storage and off-line shaft, tank, and deep tunnel storage. Treatment refers to disinfection, in either CSO outfalls or RTBs, and other, more advanced treatment processes such as HRC.

In-line storage upstream of Regulator Av-1 was screened out from further consideration because the existing conveyance system has no available capacity that could be used without increasing the risk of flooding. In-line storage in the outfall downstream of Regulator Av-1 was evaluated for feasibility. However, this alternative would have required hydraulically isolating the middle barrel of the three-barrel outfall for CSO storage, and constructing a weir/gate structure at the downstream end of the outfall. Due to the flat topography of this area and the tidal influences, modeling indicated that these features could not be implemented without creating adverse hydraulic grade line impacts upstream of the Av-1 regulator.

With respect to off-line storage control measures, due to the limited availability of land within the Coney Island Creek watershed, as noted above, only vertical shaft and tunnel storage remained after the initial screening process described in Section 8.1. In essence, tank storage was discarded from further consideration due to its large footprint requirements. It is noted that a land use analysis of the parcels in the watershed in the vicinity of the Avenue V Pumping Station and Regulator Av-1 revealed that there were no suitable lots with an available footprint larger than 40,000 sf. Unlike traditional tank storage, tunnel storage or the newer concept of shaft storage require less permanent above-ground property per equivalent unit of storage volume.

Vertical Shaft Storage

Off-line vertical storage shafts were initially evaluated for the 25, 50, 75 and 100% CSO control levels. The layouts were based on a maximum shaft depth of 100 feet, with the diameter adjusted to provide the intended storage volume. Since the largest shaft storage facilities that have been constructed to date are in the range of 7 MG of storage capacity, control levels requiring more than 7 MG were assumed to require multiple shafts. Based on these sizing considerations and an assessment of potential sites, it was determined that only one potentially viable site existed, and it would only be big enough to accommodate up to the 50 percent control level. Expanding the site investigation downstream along the outfall and upstream from the Avenue V Pumping Station did not yield any additional potential sites.

As a result, the vertical storage shaft alternatives carried forward included facilities for 25 and 50 percent CSO control, designated as Alternatives VS1 and VS2, respectively. The general layout for Alternative VS2 is depicted in Figure 8-2. As shown, the 50 percent control shaft size would fit in the parking lot within the Coney Island New York City Transit (NYCT) railyard. The solid circle in Figure 8-2 represents the shaft structural diameter and the dashed circle depicts the space required around the shaft during construction. As depicted on the figure, this CSO storage alternative would require a new diversion structure located just upstream of Regulator Av-1, a micro-tunneled gravity conveyance conduit from the diversion structure to the storage shaft, a dewatering pump station located within the shaft, and a dewatering force main that would be installed within the gravity conveyance conduit. The layout for Alternative VS1 would be similar, but the shaft size and corresponding construction area would be smaller. Details on the two vertical shaft alternatives are presented in Table 8-1. The dewatering system capacity for the vertical shaft storage alternatives is presented below in Table 8-3, along with the dewatering capacity required for the deep tunnel storage alternatives.

Table 8-1. Vertical Shaft Storage Characteristics for Alternatives VS1 and VS2

Shaft Options	Level of Service (CSO Volumetric Capture)	
	VS1 (25%)	VS2 (50%)
Volume (MG)	1.6	4.1
Diameter (ft)	52	84
Depth (ft)	100	100
Conveyance conduit length (lf)	1,200	1,200
Conveyance conduit diameter (ft)	4.5	5.5
NPW ($ Millions)	89	111

With respect to treatment measures, RTB and HRC treatment were discarded for the reasons described above in Section 8.1. Outfall disinfection was evaluated under this LTCP; however, it would require significant reconfiguration of the existing triple barrel outfall that would increase risk of flooding due to the resultant increase in hydraulic gradient line. Therefore, it too was not considered further.

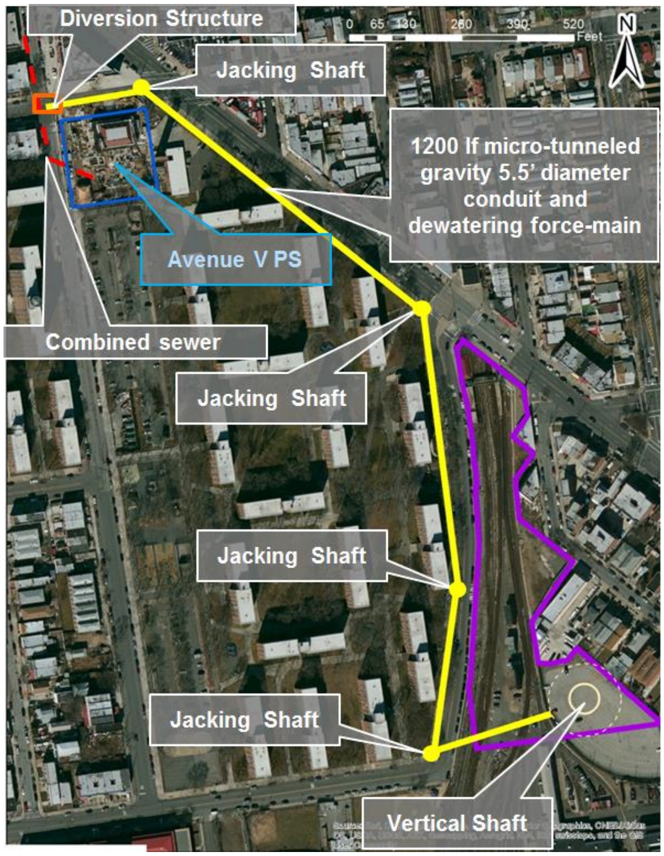


Figure 8-2. Layout of Alternative VS2 – Vertical Shaft at NYCT Railyard Parking Lot

The benefits, costs and challenges associated with vertical shaft storage are as follows:

Benefits

The primary benefit of the vertical shaft storage is the level of CSO volume reduction that can be achieved with lower above-ground land requirements than traditional off-line storage tanks.

Cost

The estimated NPW for this control measure is $89M for the 25 percent CSO control shaft and $111M for the 50 percent CSO control shaft. Details of the estimates are presented in Section 8-4.

Challenges

One of the major challenges with shaft storage is the required O&M in deep, confined spaces. Also, the concept of shaft storage for CSO controls is relatively new and there are only a limited number of operating facilities in the country. Other challenges include sediment deposition in the shaft, unforeseen geotechnical conditions, and operation of the deep dewatering pump station. A major specific challenge associated with shaft storage for Outfall OH-021 is the extensive conveyance system needed to feed the storage shaft due to the distance between the shaft site and the CSS regulator.

Even with these challenges, however, both shaft storage alternatives were carried forward for inclusion in the evaluation of basin-wide alternatives because of their ability to attain the 25 and 50 percent levels of volumetric CSO control.

Deep Tunnel Storage

Deep tunnel storage was analyzed for Outfall OH-021, as tunnel storage could provide the 75 and 100% CSO control levels that the shafts could not attain. The layout of the proposed tunnel is shown on Figure 8-3 along with the alignment of the associated conveyance system. As indicated in Figure 8-3, an extensive near-surface conveyance system would be required to convey flow from a new diversion structure just upstream of Regulator Av-1 to the tunnel. Picking up the overflow at the end of the outfall and avoiding the additional conveyance piping was determined to be infeasible. The OH-21 outfall has three barrels. Separate stormwater ties into the outfall just downstream of Regulator Av-1, and the three barrels are hydraulically interconnected. Hydraulically isolating one of the barrels for just CSO, and providing a diversion structure to the tunnel at the downstream end, would have resulted in adverse hydraulic grade line impacts upstream of Regulator Av-1. Therefore, providing a diversion structure upstream of Regulator Av-1 appeared to be the only feasible way to divert CSO to the tunnel.

Table 8-2 summarizes the key dimensions of the components of the two tunnel alternatives evaluated. These alternatives were designated DT1 for the 75 percent control option, and DT2 for the 100 percent control option. The benefits, costs and challenges associated with tunnel storage are as follows:

Benefits

The primary benefit of the tunnel storage is the high level of CSO volume reduction with minimal permanent above-ground land requirements.

Cost

The estimated NPW for this control measure is $205M for the 75% CSO control tunnel and $217M for the 100% CSO control tunnel. Details of the estimates are presented in Section 8-4.

Challenges

One of the major challenges with tunnel storage is the required O&M in deep, confined spaces. Also, DEP has no operating experience with tunnels in its wastewater system. Other challenges include sediment deposition in the tunnel, potential for hydraulic surge conditions, unforeseen geotechnical conditions, and operation of the deep tunnel dewatering pump station. Specific challenges associated with deep tunnel storage for Outfall OH-021 include the required extensive conveyance system needed to convey the flows from the regulator to the tunnel and the location of the shafts within the Belt Parkway ROW and areas adjacent to access ramps.

Even with these challenges, however, both of these tunnel alternatives were carried forward for inclusion in the evaluation of basin-wide alternatives due to their ability to attain the 75 and 100 percent levels of volumetric CSO control. Collectively, the two shaft alternatives coupled with the two tunnel alternatives provided the LTCP with 25, 50, 70 and 100 percent volumetric control alternatives.

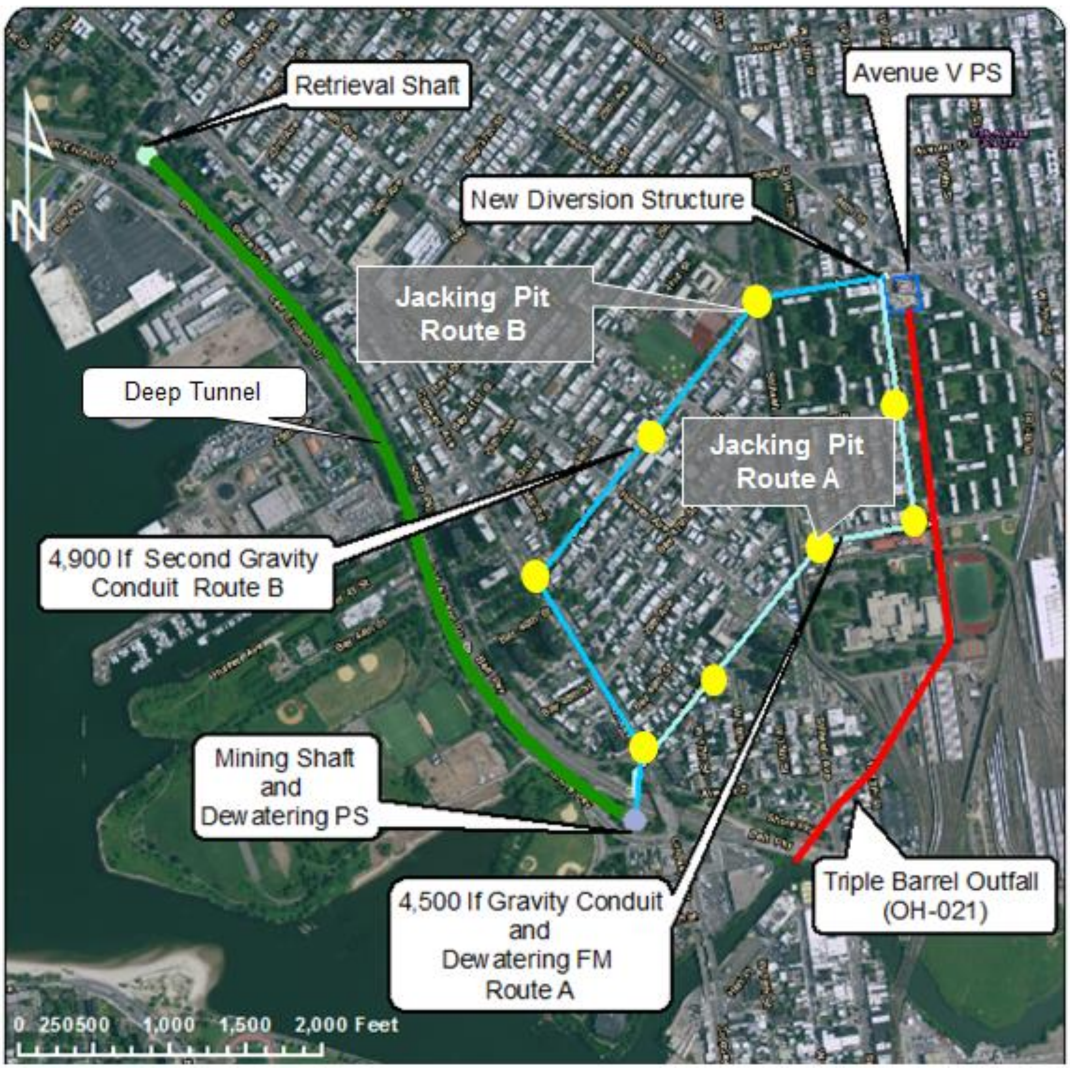


Figure 8-3. Layout of Alternatives DT1 and DT2 – Tunnel for Outfall OH-021

Table 8-2. Deep Tunnel Characteristics for Alternatives DT1 and DT2

Tunnel Options	Level of Service (CSO Volumetric Capture)	
	DT1 (75%)	DT2 (100%)
Tunnel Volume (MG)	6.9	13.4
Tunnel Length (lf)	5,400	5,400
Tunnel Diameter (ft)	15	21
NPW ($ Millions)	154	217

All of the retention alternatives described above would require dewatering of the retained CSO volumes after wet-weather events subside. The capacity of the required dewatering systems is shown in Table 8-3 for each of these alternatives based on a targeted two-day dewatering period.

Table 8-3. Dewatering System Capacity of Retention Alternatives Based on Two-Day Dewatering

Alternative		Storage Volume (MG)	PS Capacity (MGD)
Vertical Shaft VS1 and VS2	25% CSO Control	1.6	0.8
	50% CSO Control	4.1	2.1
Deep Tunnel (DT1 and DT2)	75% CSO Control	6.9	3.5
	100% CSO Control	13.4	6.7

8.2.a.4 Water Quality/Ecological Enhancement

Coney Island Creek was once physically connected to Sheepshead Bay to the east. Urban development and the construction of the Belt Parkway led to the hydraulic separation of both waterbodies and the attendant increase of urban runoff. The increased runoff contributions carry floatables and other constituents that are conveyed to the waterbody primarily through the MS4 and other stormwater outfalls and, to a lesser extent, CSO Outfall OH-021. Water Quality/Ecological Enhancement Alternatives evaluated under this LTCP targeted the capture of floatables associated with the remaining CSO discharges (post-Avenue V Pumping Station upgrade) and the improvement of water circulation in Coney Island Creek. As part of the evaluation process described in Section 8.1, mechanical aeration and environmental dredging were discarded early in the overall evaluations process. This left two technologies for consideration: (1) an underflow baffle to provide floatables control for the remaining CSO discharges at Outfall OH-021; and (2) a flushing tunnel that would pump non-CSO impacted waters from Sheepshead Bay to the head end of Coney Island Creek to improve circulation and possibly improve water quality. These alternatives are described below.

Underflow Baffle at Regulator Av-1

Various floatables control solutions were considered for the CSO discharges at Outfall OH-021. Following a fatal flaw analysis, it was determined that the most feasible floatables control solution would be an underflow baffle at Regulator Av-1. During the evaluation process, however, it was determined that the additional headloss created by the underflow baffle would increase the risk of upstream flooding. To offset that headloss, a hydraulic relief structure with a 130-foot long weir would be required upstream of the regulator. A layout of the underflow baffle and required upstream hydraulic relief structure is shown in Figure 8-4. As shown, the hydraulic relief structure would need to be quite large to house the required 130 linear feet (lf) of weir. The structure would discharge CSO to the adjacent stormwater barrel that is also tributary to Outfall OH-021. The discharges at the relief structure would be limited to storms larger than the largest event in the typical year and would not activate for the smaller storms.

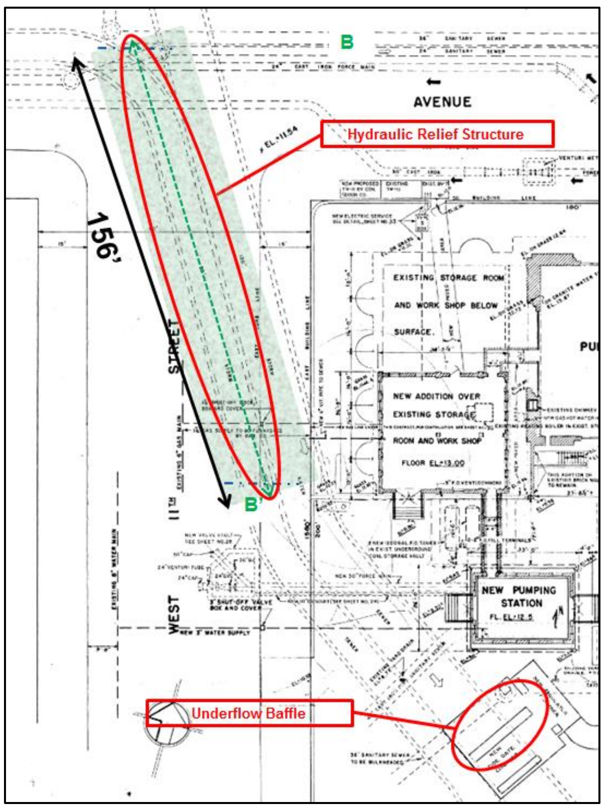


Figure 8-4. Underflow Baffle and Relief Structure at Regulator Av-1

The benefits, costs and challenges of the underflow baffle are as follows:

<u>Benefits</u>

The primary benefit of an underflow baffle is that it requires low maintenance as the captured floatables would be routed to the Avenue V Pumping Station after the storm recedes. Other floatables control solutions, such as screens or net bags, are more maintenance intensive.

Cost

The estimated NPW for this control measure is $60M, including the upstream hydraulic relief structure.

Challenges

The specific challenges associated with the floatables baffle include the need to construct an extensive hydraulic relief structure upstream of the regulator to neutralize the increase in hydraulic grade line. The construction of the structure would require demolishing and build-out of new roof and walls in the adjacent stormwater conduit, and would disrupt traffic at the intersection of Avenue V and W 11th Street.

Due to the projected high costs and construction impacts of the relief structure associated with the baffle alternative, this alternative was not retained for further evaluation. An additional consideration for not carrying this alternative forward is that the CSO discharge from Regulator Av-1 represents only 5 percent of the annual wet-weather discharge volume to Coney Island Creek in the typical year. Accordingly, most of the floatables observed at the downstream Cropsey Avenue boom were observed to be associated with MS4 and other stormwater discharges, not sanitary debris from the single CSO in the watershed.

Flushing Tunnel – 80 MGD

A Flushing Tunnel was evaluated that would continuously pump 80 MGD of water from Sheepshead Bay to the head end of Coney Island Creek. The concept was modeled after the recently-refurbished Gowanus Canal Flushing Tunnel. The 80 MGD flow rate was selected for the evaluation as it corresponded with a manageable-sized micro-tunnel diameter (66 inches) for conveying the flow via force main to Coney Island Creek, and provided for a reasonable rate of flushing water. The flushing tunnel would include the following features: (1) intake structure at the upper northern shore of Sheepshead Bay; (2) gravity conveyance system connecting to an intake structure to the tunnel pump station wet well; (3) the pump station itself equipped with debris screens and manual control gates within its perimeter; (4) force main; and (5) outlet structure to control the flow release conditions at the head end of Coney Island Creek. Figure 8-5 shows the layout of the flushing tunnel concept and potential locations for the pump station.

Benefits

The primary benefit of the Flushing Tunnel is that it improves water circulation along Coney Island Creek.

Cost

The estimated NPW for the tunnel and pump station is $150M.

Challenges

The specific challenges associated with this alternative include the extensive force main routing adjacent to the Belt Parkway and the tunneling difficulties that it poses as well as extensive permitting and environmental studies. Furthermore, as was demonstrated by the CICWQM, the tunnel would not improve the level of attainment to any measurable degree as there is no fecal coliform attainment gap during the recreational season (May 1st through October 31st), and DO attainment is very close to compliance.

Due to the estimated high cost and the challenges described above, this alternative was not retained for further evaluation.

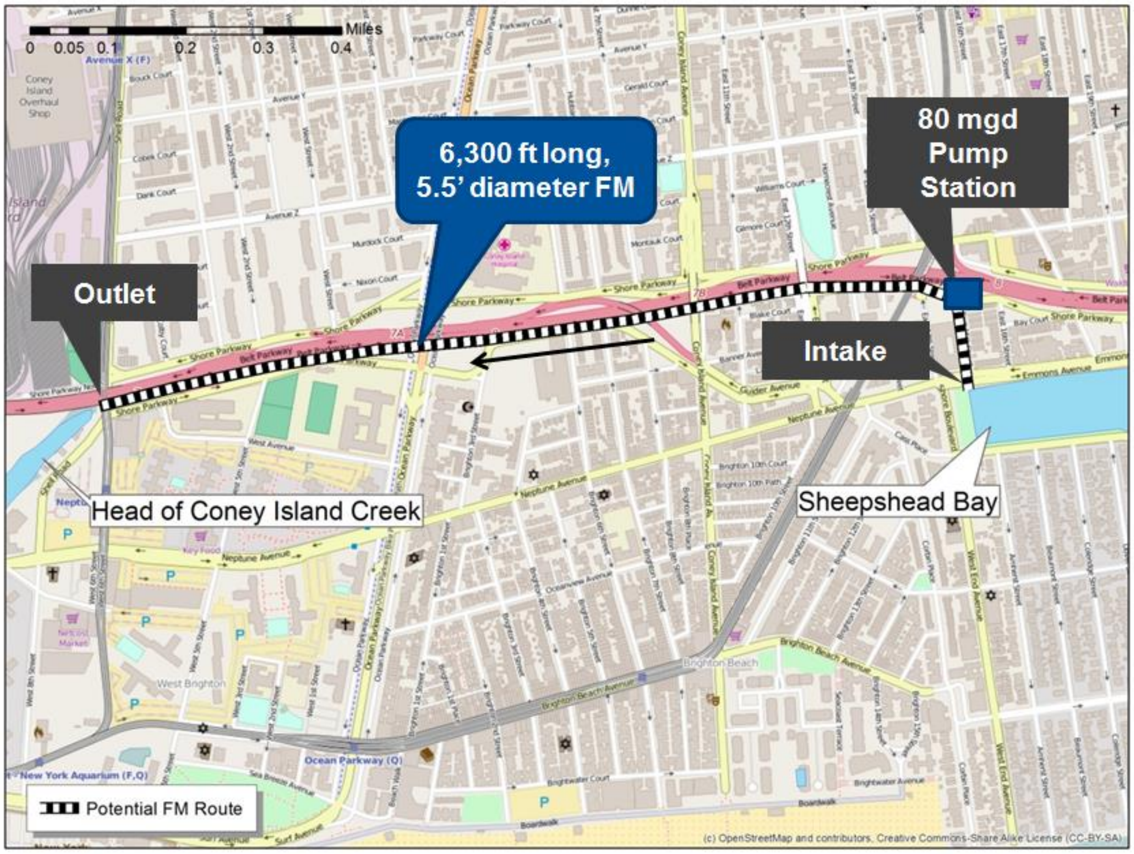


Figure 8-5. Flushing Tunnel Pumping 80 MGD from Sheepshead Bay to Coney Island Creek

8.2.b Future Green Infrastructure (Various Levels of Penetration)

As discussed in Section 5.0, DEP projects that GI penetration rates would manage 1 percent of the impervious surfaces within the Coney Island Creek portion of the Owls Head combined sewer service area. This GI has been included as part of the baseline model projections, and is thus not categorized as an LTCP alternative.

For the purpose of this LTCP, "Other Future Green Infrastructure" is defined as GI alternatives that are in addition to those implemented under previous facility plans and those included in the baseline conditions. Because DEP is working on the implementation of GI area-wide contracts in the Coney Island Creek watershed, additional GI beyond the baseline is not being considered for this LTCP at this time. DEP intends to saturate each target tributary drainage area with as much GI as feasible, as discussed in Section 5.0. Should conditions show favorable feasibility for penetration rates above the current targets, DEP will seek to take advantage of those opportunities as they become known.

8.2.c Hybrid Green/Grey Alternatives

Hybrid green/grey alternatives are those that combine traditional grey control measures with GI control measures, to achieve the benefits of both. However, as discussed above, development of the baseline GI projects for this watershed are already planned and further GI is not envisioned at this time. Therefore, no controls in this category are proposed for Coney Island Creek LTCP.

8.2.d Retained Alternatives

The intended outcome of the previous evaluations was the development of a list of retained control measures for Outfall HP-021. These retained alternatives will be assessed using the more rigorous cost-performance and cost-attainment analyses. That list is presented in Table 8-4. The reasons for excluding the non-retained control measures from further consideration are also noted in the table.

Table 8-4. Summary of Next Level of Control Measure Screening

Control Measure	Category	Retained for Further Analysis?	Remarks
HLSS	Source Control	NO	No identified localized flooding to address; would result in increased stormwater-related pollutant loads.
Additional GI Build-out	Source Control	NO	Planned 1% GI build-out in the watershed (included in the baseline); additional available sites unlikely to be identified.
Sewer System Enhancements	System Optimization	NO	No identified tangible opportunities along the existing collection system.
Flow Tipping/ PS Upgrade	CSO Relocation	NO	Impractical due to topography, distance to interceptor and current interceptor capacity.
In-line Storage	Storage	NO	No available capacity without increasing risk of flooding.
Off-line Storage (Tanks)	Storage	NO	Limited space for local or upstream tanks and low ratio of benefit to cost.
Off-line Storage (Shafts)	Storage	YES	Designated as Alternatives VS1 and VS2 for 25% and 50% volumetric control, respectively.
Off-line Storage (Tunnels)	Storage	YES	Designated as Alternatives DT1 and DT2 for 75% and 100% volumetric control, respectively.
Retention/Treatment Basins	Treatment	NO	Limited space. Also, BOD and TSS have not been identified as a source of non-attainment.
Outfall and Direct Disinfection	Treatment	NO	No available capacity to separate CSO from SW along the outfall barrel without increasing risk of flooding.
High Rate Clarification	Treatment	NO	BOD and TSS have not been identified as a source of non-attainment. Other control measures provide similar levels of bacteria reduction at a lower cost.

Table 8-4. Summary of Next Level of Control Measure Screening

Control Measure	Category	Retained for Further Analysis?	Remarks
Floatables Control	Water Quality/ Ecological Enhancement	NO	Would require extensive hydraulic relief structure to mitigate risk of flooding.
Environmental Dredging	Water Quality/ Ecological Enhancement	NO	No evidence of CSO-related sediment build-up.
Mechanical Aeration	WQ/ Ecological Enhancement	NO	DO levels are in attainment except in far upstream reach, where impact of CSO on DO is minimal.

As shown in Table 8-4, the retained control measures for Coney Island Creek include two configurations of off-line storage: vertical shafts and deep tunnels. These measures, which would provide a range of volumetric control from 25 to 100 percent, are presented in Table 8-5 along with a summary description of their specific components.

Table 8-5. Retained Alternatives

Alternative	Description
VS1 - 25% CSO Control Shaft	• 100 ft deep, 52-ft diameter storage shaft • 1.6 MG storage • 1,200 lf conveyance conduit
VS2 - 50 % CSO Control Shaft	• 100 ft deep, 84-ft diameter storage shaft • 4.1 MG storage • 1,200 lf conveyance conduit
DT1 - 75% CSO Control Tunnel	• 5,400-lf long, 15-ft diameter tunnel • 6.9 MG storage • Route A: 4,500 lf conveyance conduit • Route B: 4,900 lf conveyance conduit
DT2 - 100% CSO Control Tunnel	• 5,400-lf long, 21-ft diameter tunnel • 13.4 MG storage • Route A: 4,500 lft conveyance conduit • Route B: 4,900 lft conveyance conduit

The retained alternatives presented in Table 8-5 were then analyzed on the basis of their cost-effectiveness in reducing loads and improving attainment of WQS. These more advanced analyses are described in Sections 8.3 through 8.5.

8.3 CSO Reductions and Water Quality Impact of Retained Alternatives

To evaluate effects on bacteria loadings and water quality impacts, the retained alternatives listed in Table 8-5 were analyzed using both the Coney Island Creek watershed model and the water quality model. Evaluations of levels of CSO control for each alternative are presented below. In all cases, the predicted reductions shown are relative to the baseline conditions using 2008 John F. Kennedy

International Airport (JFK) rainfall as described in Section 6.0. The baseline assumptions were described in detail in Section 6.0 and include implementation of the grey infrastructure projects from the WWFP, along with the 1 percent GI penetration.

8.3.a CSO Volume and Bacteria Loading Reductions of Retained Alternatives

Table 8-6 summarizes the projected Coney Island Creek CSO volumes, and percent reductions in annual CSO volume and bacteria loads for the retained alternatives. Figure 8-6 presents a plot of annual bacteria load versus percent annual CSO volume reduction.

Table 8-6. Coney Island Creek Retained Alternatives Summary

Alternative	Annual CSO Volume (MGY)	Annual CSO Volume Reduction (%)	Annual Fecal Coliform Reduction (%)	Annual Enterococci Reduction (%)
Baseline Conditions	75	-	-	-
VS1 - 25% CSO Control Shaft	56	25	25	25
VS2- 50% CSO Control Shaft	37	50	50	50
DT1- 75% CSO Control Tunnel	19	75	75	75
DT2 - 100% CSO Control Tunnel	0	100	100	100

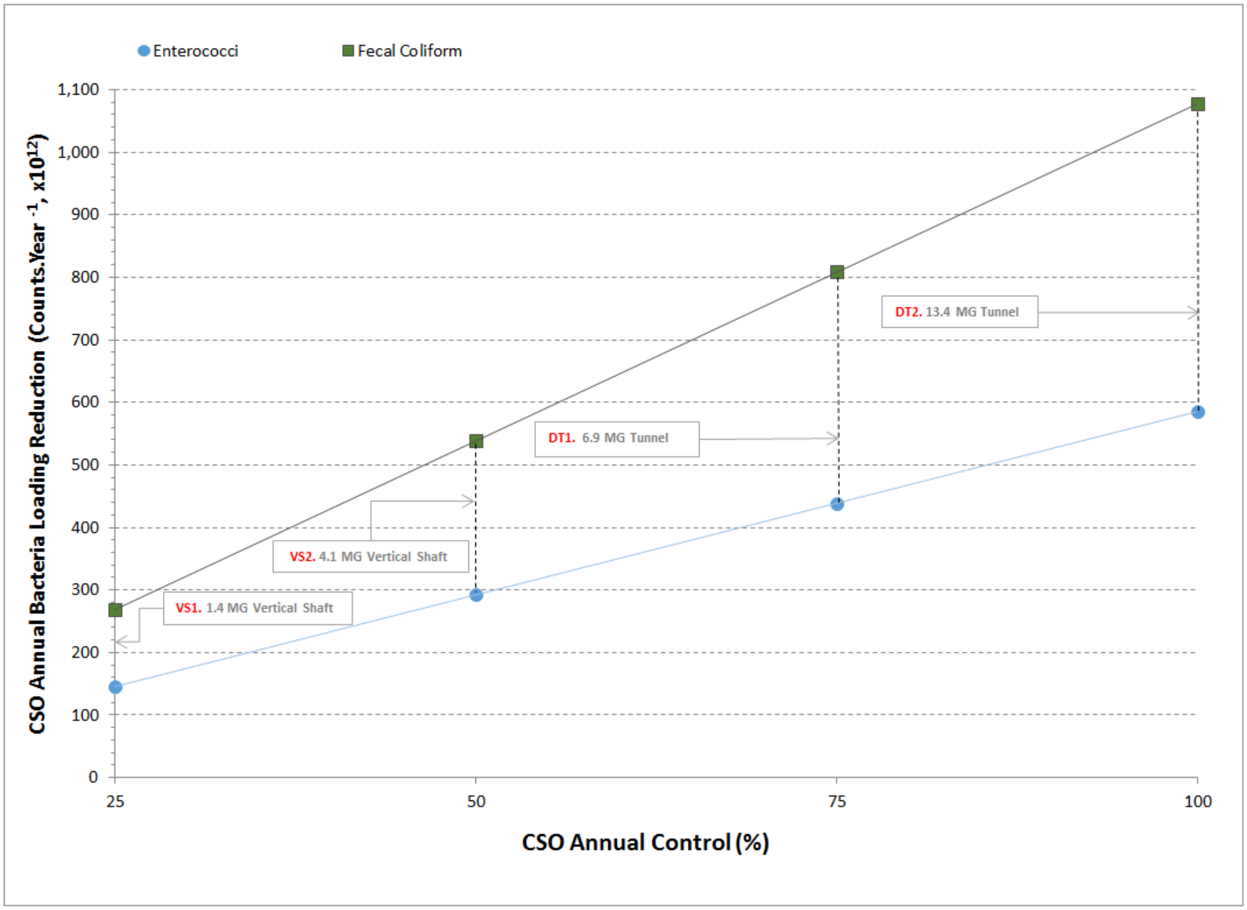


**Figure 8-6. CSO Volume Reductions vs.
Annual CSO Bacteria Loading Reduction (2008 Rainfall)**

Because the retained control alternatives would reduce loadings from the single CSO outfall through storage, the predicted bacteria loading reductions of the alternatives are directly proportional to the projected CSO volume reductions.

Table 8-7 presents the impacts of the retained alternatives on: (1) annual CSO volumes and frequency of overflows at Outfall OH-021; (2) annual CSO volume in the Owls Head system outside of Coney Island Creek; and (3) the treated volumes at the Owls Head WWTP. As indicated in Table 8-7, none of the alternatives are predicted to affect CSO volumes outside of Coney Island Creek.

Table 8-7. Summary of Predicted Impacts of Retained Alternatives – Coney Island Creek Watershed and OH WWTP Service Area

Alternative	Outfall OH-021(1)		All Other OH CSO Outfalls	Processed at OH WWTP
	Annual Volume MGY	Annual Activations	Annual Volume MGY	Annual Volume MGY
Baseline Conditions	75	20	2,760	34,510
1. VS1 - 25% CSO Control Shaft	56	13	2,730	34,560
2. VS2 - 50% CSO Control Shaft	37	9	2,720	34,590
3. DT1 - 75% CSO Control Tunnel	19	6	2,710	34,620
4. DT2 - 100 % CSO Control Tunnel	0	0	2,700	34,650

Note:
(1) Only CSO outfall in Coney Island Creek watershed.

8.3.b Water Quality Impacts

This section describes the levels of attainment with applicable current and potential future bacteria criteria within the Coney Island Creek that would be achieved through implementation of the retained CSO control alternatives listed in Table 8-5. The previous discussion focused on the predicted level of volumetric or bacteria pollution reductions.

Coney Island Creek is a Class I waterbody. Based on the analysis presented in Section 6.0, it was revealed that all locations along this portion of the waterbody are currently in attainment with the Class I fecal coliform criterion of 200 cfu/100mL during the recreational season (May 1st through October 31st). As explained in the Section 6.3 gap analysis discussion, bacteria loadings from other sources, particularly stormwater, direct drainage and other urban wet-weather discharges to Coney Island Creek, influence the fecal and enterococci concentrations to the extent that even the control of 100 percent of the CSO discharges to the Creek would not result in full attainment of fecal coliform criterion on an annual basis. The relationship between levels of CSO control through implementation of the retained alternatives, including 100 percent, and predicted levels of WQS attainment, are discussed in greater detail in Section 8.5.

8.4 Cost Estimates for Retained Alternatives

Evaluation of the retained alternatives requires cost estimation. The methodology for developing these costs is dependent upon the type of technology and its O&M requirements. The construction costs were developed as PBC and the total net present worth costs were determined by adding the estimated PBC to the NPW of the projected annual O&M costs at an assumed interest rate of 3 percent over a 20-year life cycle. All costs are in February 2016 dollars.

8.4.a Alternative VS1 – 1.6 MG Vertical Shaft

Costs for Alternative VS1 include planning-level estimates of the costs to construct and install the various components of a 1.6 MG Vertical Shaft, as well as the conveyance system between Regulator Av-1 and the shaft. This alternative is described in detail in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative VS1 is $89M as shown in Table 8-8.

Table 8-8. Costs for Alternative VS1 – 1.6 MG Vertical Shaft for 25% CSO control

Item	February 2016 Cost ($ Million)
Construction Cost	80.0
Annual O&M Cost	0.6
Total Present Worth	88.9

8.4.b Alternative VS2 – 4.1 MG Vertical Shaft

Costs for Alternative VS2 include planning-level estimates of the costs to construct and install the various components of a 4.1 MG Vertical Shaft, as well as the conveyance system between Regulator Av-1 and the shaft. This alternative is described in detail in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative VS2 is $111M as shown in Table 8-9.

Table 8-9. Costs for Alternative VS2 – 4.1 MG Vertical Shaft for 50% CSO control

Item	February 2016 Cost ($ Million)
Construction Cost	101.6
Annual O&M Cost	0.6
Total Present Worth	111.2

8.4.c Alternative DT1 – 6.9 MG Deep Tunnel

Costs for Alternative DT1 include planning-level estimates of the costs to construct and install the various components of a 6.9 MG Deep Tunnel, as well as the conveyance system between Regulator Av-1 and the tunnel drop shaft. This alternative is described in detail in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative DT1 is $154M as shown in Table 8-10.

Table 8-10. Costs for Alternative DT1– 6.9 MG Deep Tunnel for 75% CSO Control

Item	February 2016 Cost ($ Million)
Construction Cost	144.0
Annual O&M Cost	0.7
Total Present Worth	154.3

8.4.d Alternative DT2 – 13.4 MG Deep Tunnel

Costs for Alternative DT2 include planning-level estimates of the costs to construct and install the various components of a 13.4 MG Deep Tunnel, as well as the conveyance system between Regulator Av-1 and the tunnel drop shaft. This alternative is described in detail in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative DT2 is $217M as shown in Table 8-11.

Table 8-11. Costs for Alternative DT2– 13.4 MG Deep Tunnel for 100% CSO Control

Item	February 2016 Cost ($ Million)
Construction Cost	205.3
Annual O&M Cost	0.8
Total Present Worth	217.3

The cost estimates of these retained alternatives are summarized below in Table 8-12 and are then used in the development of the cost-performance and cost- attainment plots presented in Section 8.5.

Table 8-12. Cost of Retained Alternatives

Alternative	PBC ($ Million)	Annual O&M Cost ($ Million)	Total Present Worth ($ Million)
1. VS1 - 25 % CSO Control Shaft	80.0	0.6	88.9
2. VS2- 50% CSO Control Shaft	101.6	0.6	111.2
3. DT1 - 75% CSO Control Tunnel	144.0	0.7	154.3
4. DT2 - 100 % CSO Control Tunnel	205.3	0.8	217.3

8.5 Cost-Attainment Curves for Retained Alternatives

The final step of the analysis is to evaluate the cost-effectiveness of the alternatives based on their NPW and projected impact on CSO loadings and attainment of applicable WQS.

8.5.a Cost-Performance Curves

Cost-performance curves were developed by plotting the costs of the retained alternatives against their predicted level of CSO control. Generally, CSO control is defined as the degree or rate of bacteria reduction through volumetric capture, treatment, or combinations of the two. Both the cost-performance and subsequent cost-attainment analyses focus on bacteria loadings and bacteria WQ criteria.

A linear best-fit cost curve was developed based on those alternatives judged most cost-effective for a defined level of CSO control as estimated by IW modeling for the typical year rainfall (2008). For the Coney Island Creek LTCP, the retained alternatives provide year-round volumetric reduction and the best-fit lines were based on annual levels of control.

The goal of the LTCP is to reduce CSO bacteria loadings to the waterbody so that such loadings no longer contribute to non-attainment of applicable WQS. Figures 8-7, 8-8 and 8-9 present the cost of the alternatives plotted against their associated projected annual CSO volume, enterococci and fecal coliform loading reductions, respectively. For the bacteria load reduction curves in Figures 8-8 and 8-9, the primary vertical axis shows percent CSO bacteria loading reductions. The secondary vertical axis shows the corresponding total bacteria loading reductions, as a percentage, when loadings from other non-CSO sources of bacteria are included.

Predicted enterococci and fecal coliform CSO loading reductions range from a low of 25 percent for Alternative VS1 – 1.6 MG Vertical Shaft, to a high of 100 percent for Alternative DT2 – 13.4 MG Deep Tunnel. When total loadings are considered, including non-CSO sources of bacteria, these reductions span from 8 percent to 31 percent for enterococci and from 12 percent to 46 percent for fecal coliform.

As shown in Figures 8-7 through 8-9, no clear KOTC is associated with a given alternative covering the range of costs from $89M to $217M. However, based on the slope of the line through the points, Alternatives DT1 and DT2 appeared to show slightly diminishing returns versus cost compared to Alternatives VS1 or VS2.

8.5.b Cost-Attainment Curves

The cost-performance plots shown in Figures 8-7 through 8-9 indicate that the retained alternatives would provide incremental gains in performance as the size and cost of the alternatives increased. The next step of the LTCP evaluation is a cost-benefit assessment of the water quality improvements realized by each retained alternative, as measured through attainment of bacteria WQS.

As such, this section evaluates the relationship of the costs of the retained alternatives versus their expected level of attainment of Primary Contact WQ Criteria and Potential Future Primary Contact WQ Criteria as simulated using CICWQM under 2008 rainfall conditions. For the Primary Contact WQ Criteria, attainment of the monthly GM of 200 cfu/100mL both on an annual and recreational season (May 1st through October 31st) basis is plotted. For the Potential Future Primary Contact WQ Criteria, attainment of the rolling 30-day GM and the STV are plotted. The resultant curves are presented as Figures 8-10 through 8-16 for seven locations along Coney Island Creek.

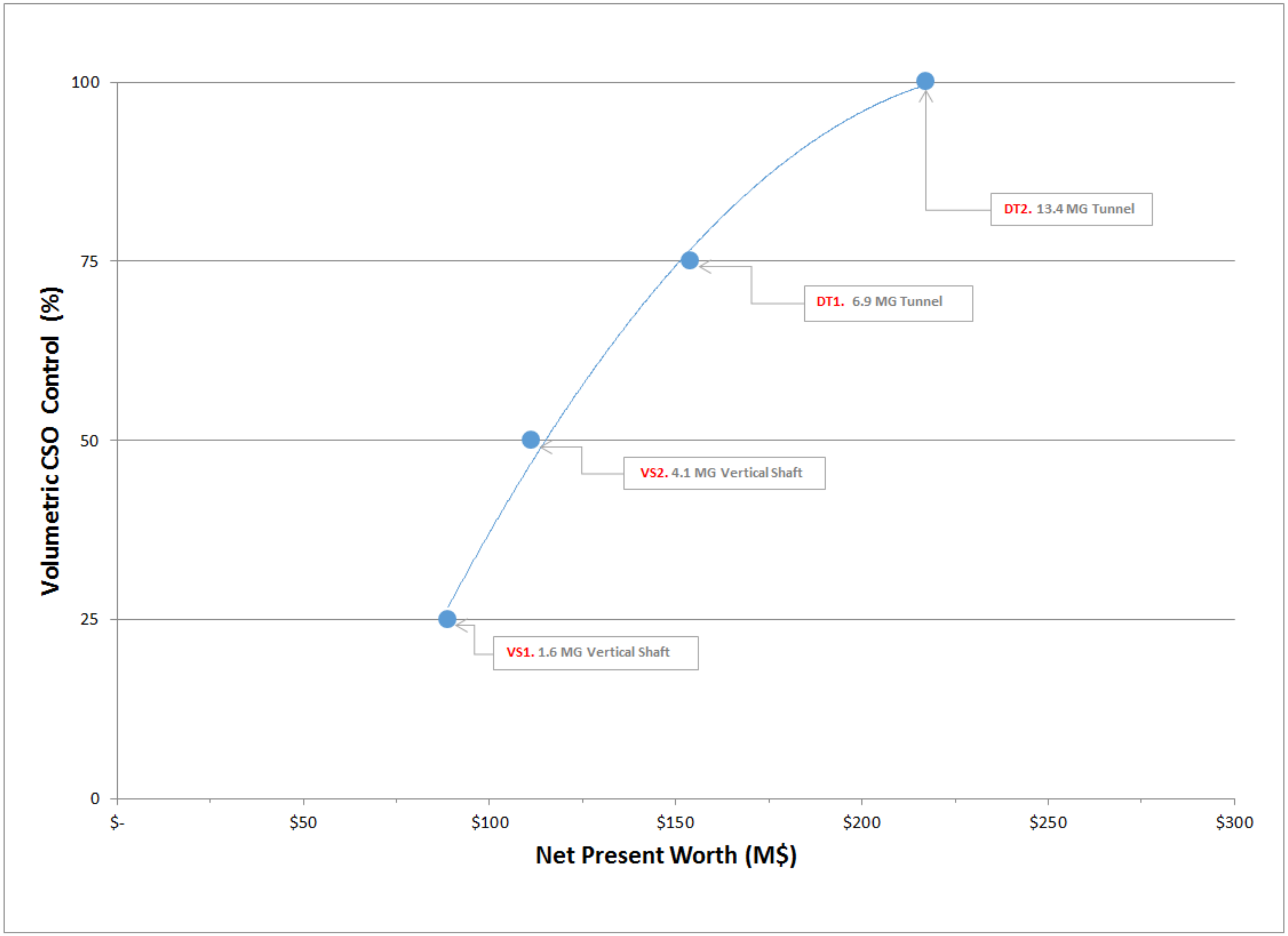


Figure 8-7.Cost vs. Volumetric CSO Control (2008 Rainfall)

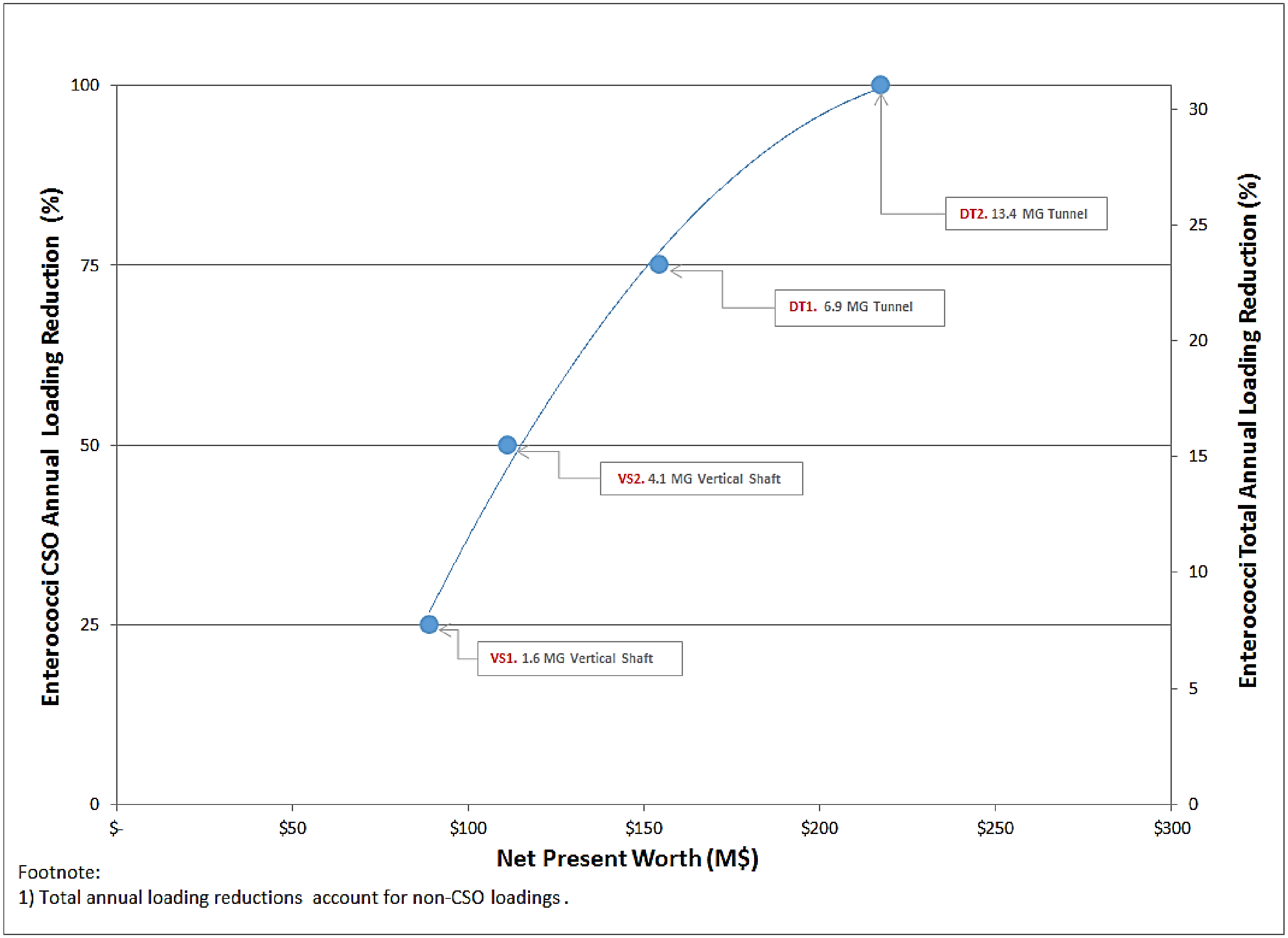


Figure 8-8. Cost vs. Enterococci Loading Reduction (2008 Rainfall)

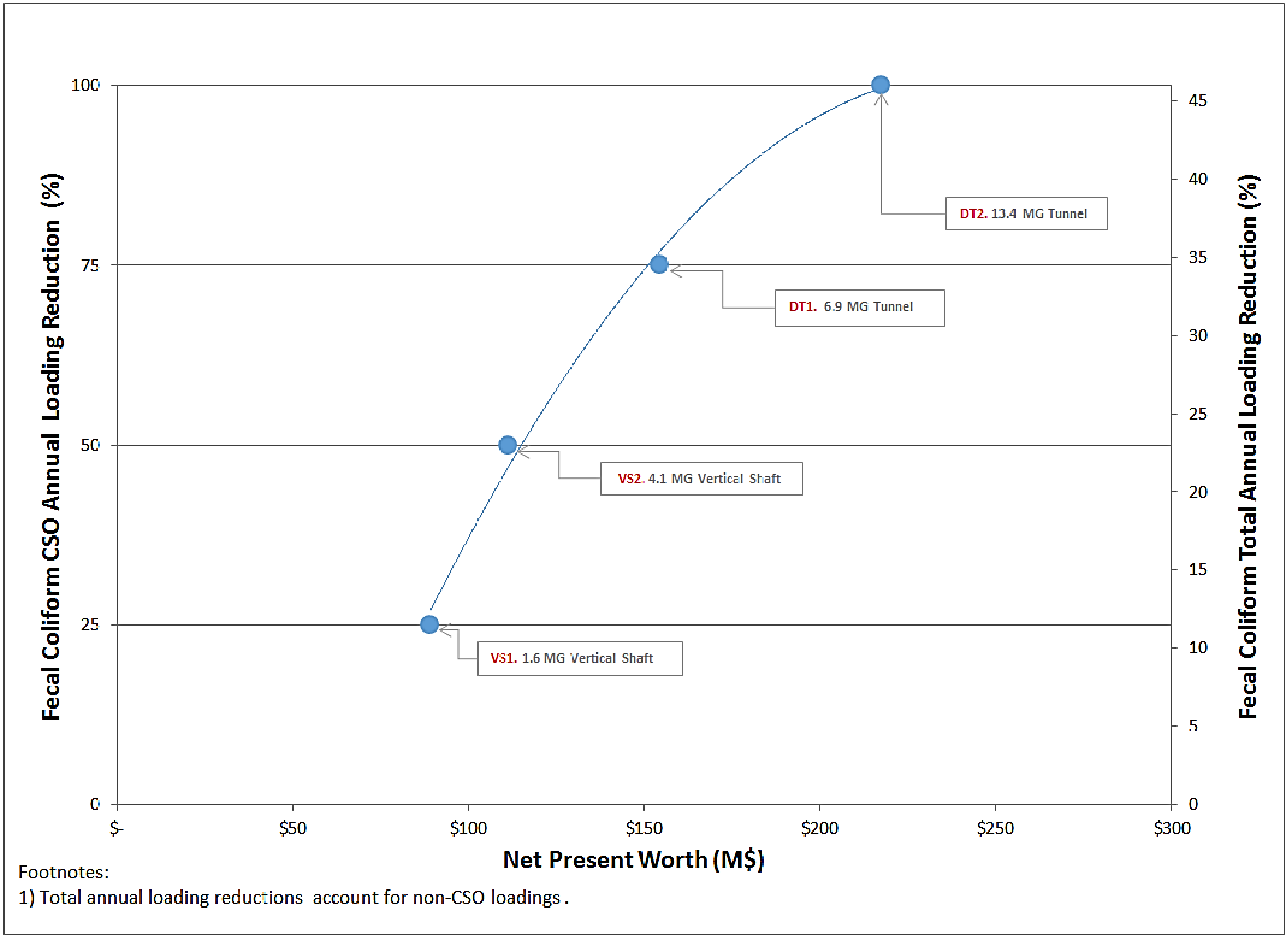


Figure 8-9. Cost vs. Fecal Coliform Loading Reduction (2008 Rainfall)

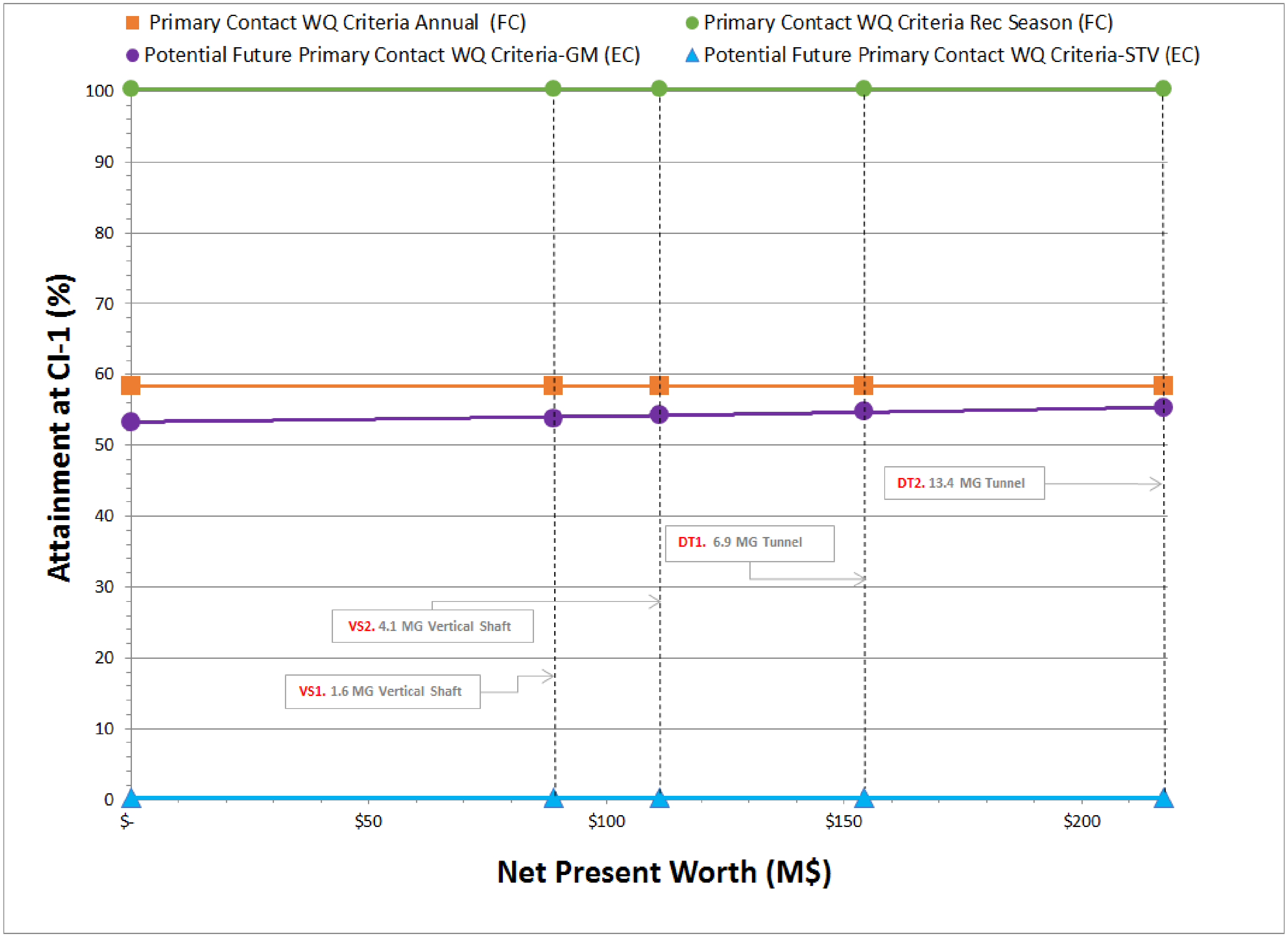


Figure 8-10. Cost vs. Bacteria Attainment at Station CI-1 (2008 Rainfall)

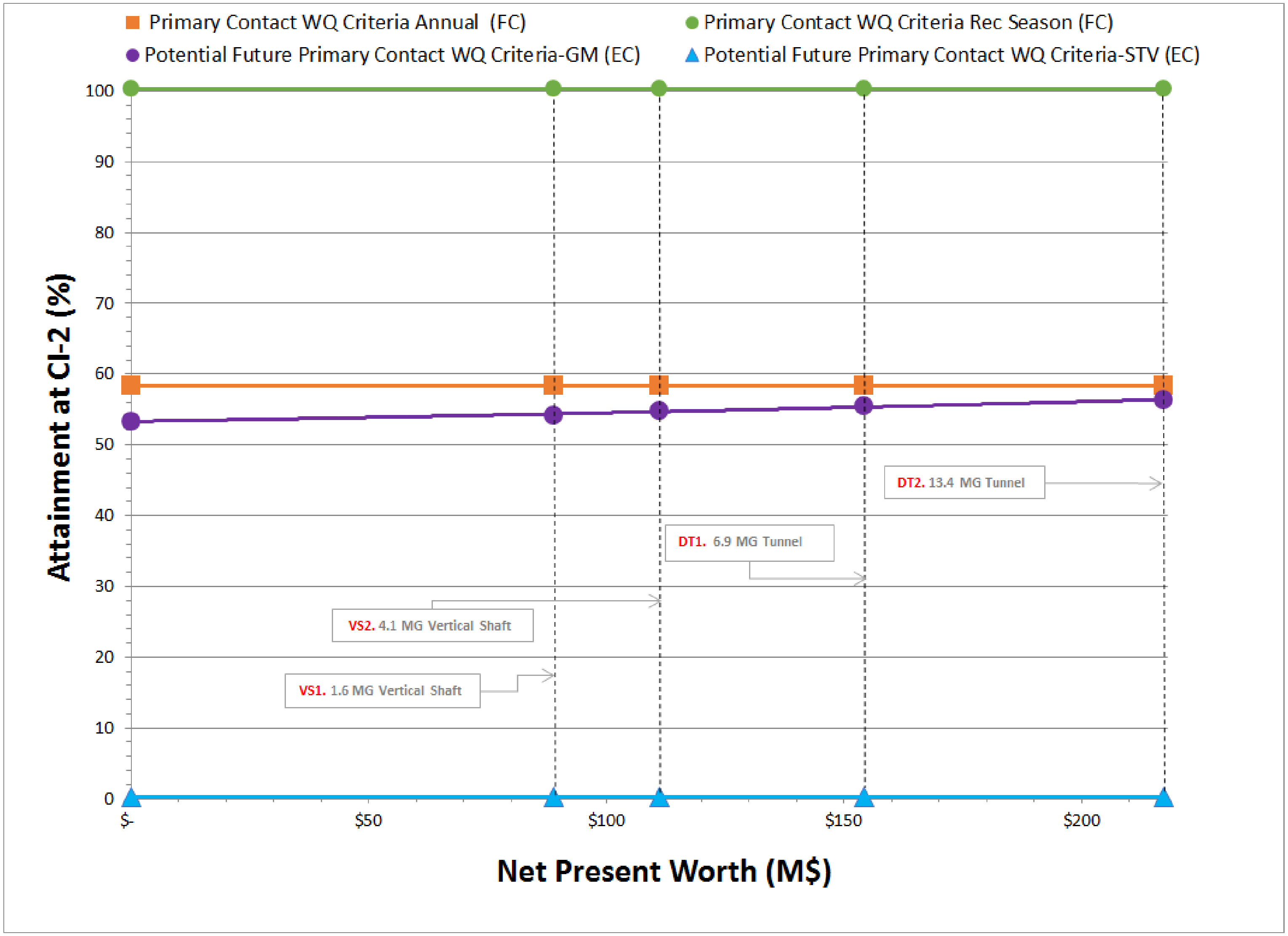


Figure 8-11. Cost vs. Bacteria Attainment at Station CI-2 (2008 Rainfall)

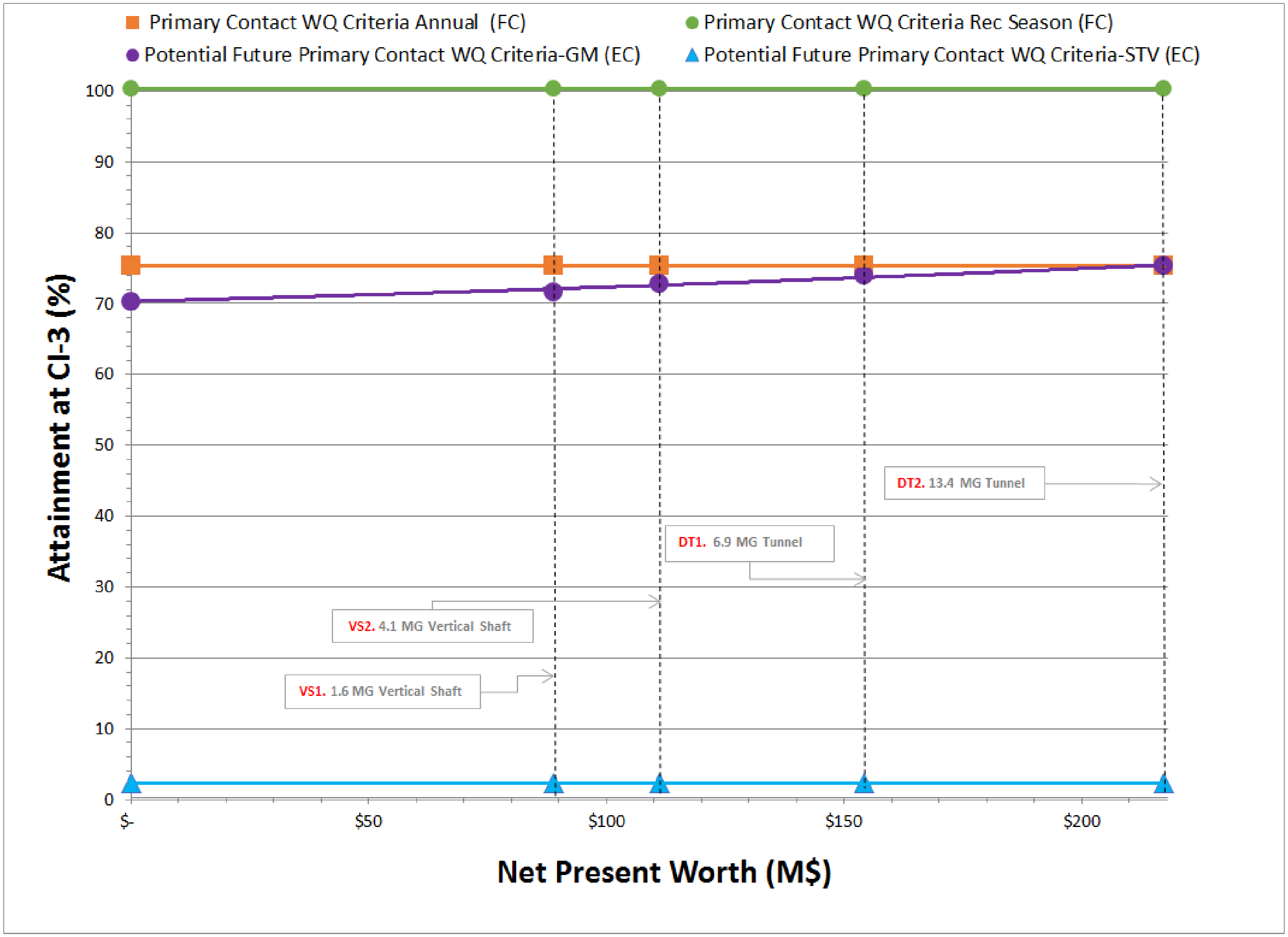


Figure 8-12. Cost vs. Bacteria Attainment at Station CI-3 (2008 Rainfall)

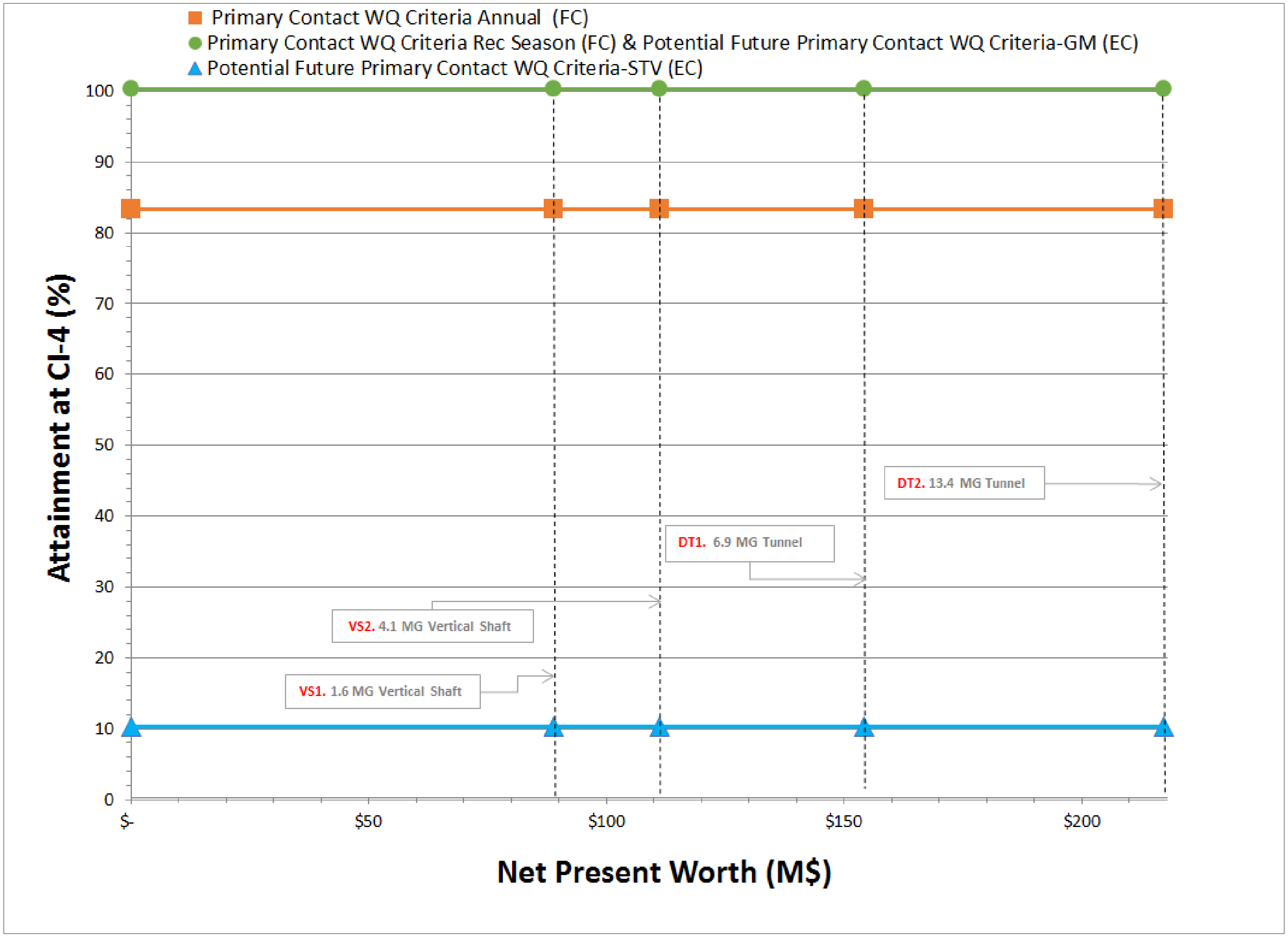


Figure 8-13. Cost vs. Bacteria Attainment at Station CI-4 (2008 Rainfall)

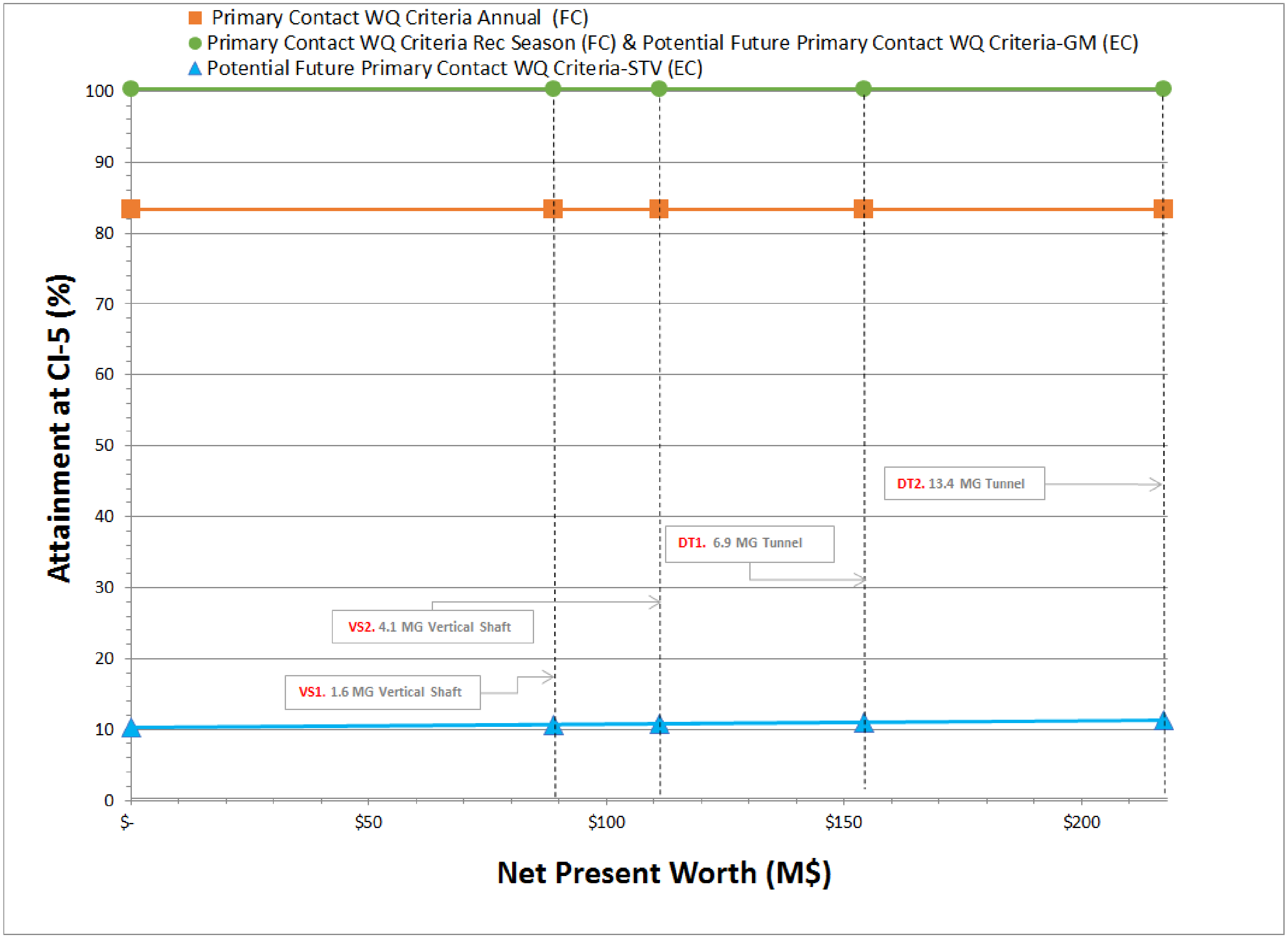


Figure 8-14. Cost vs. Bacteria Attainment at Station CI-5 (2008 Rainfall)

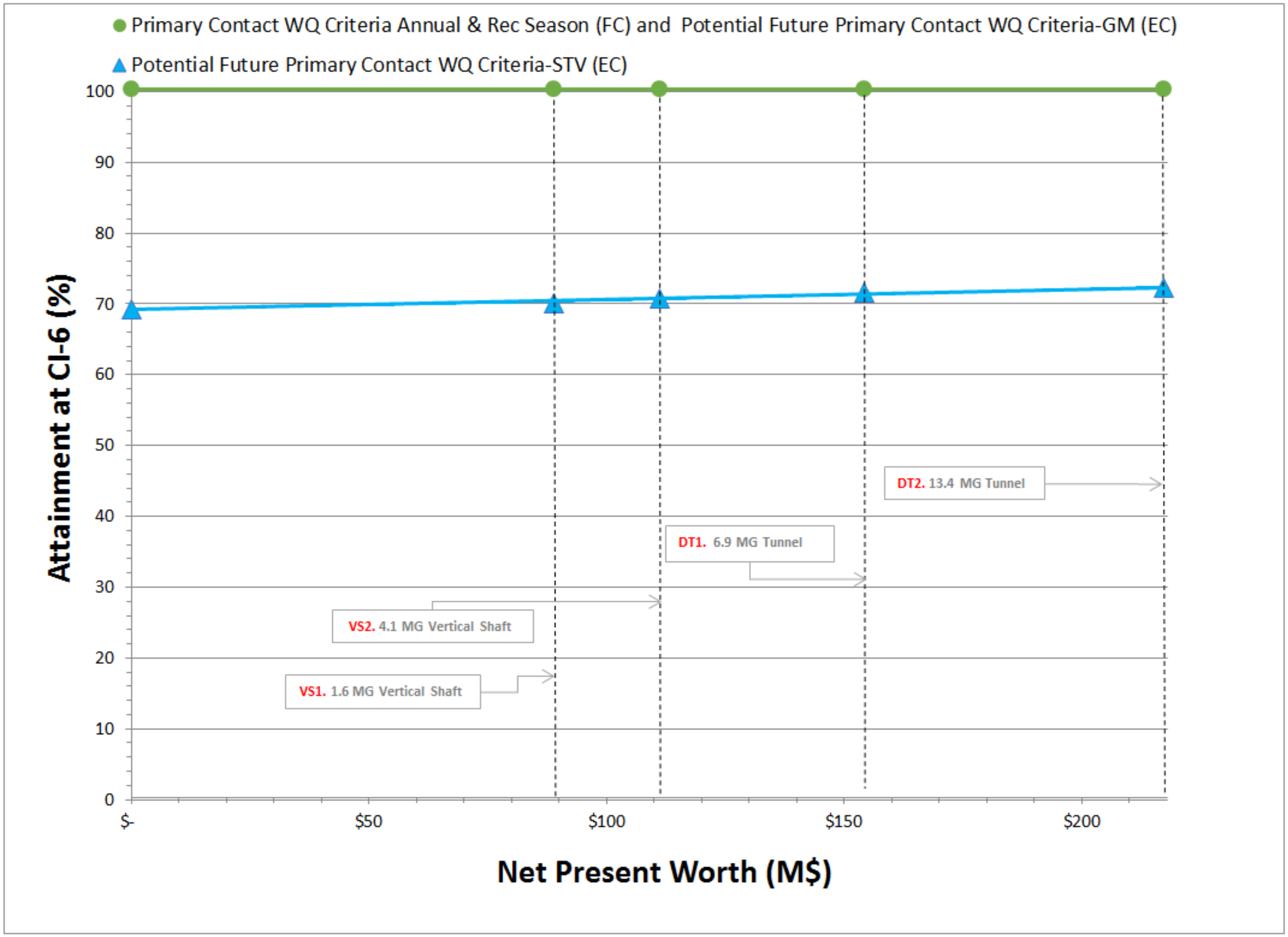


Figure 8-15. Cost vs. Bacteria Attainment at Station CI-6 (2008 Rainfall)

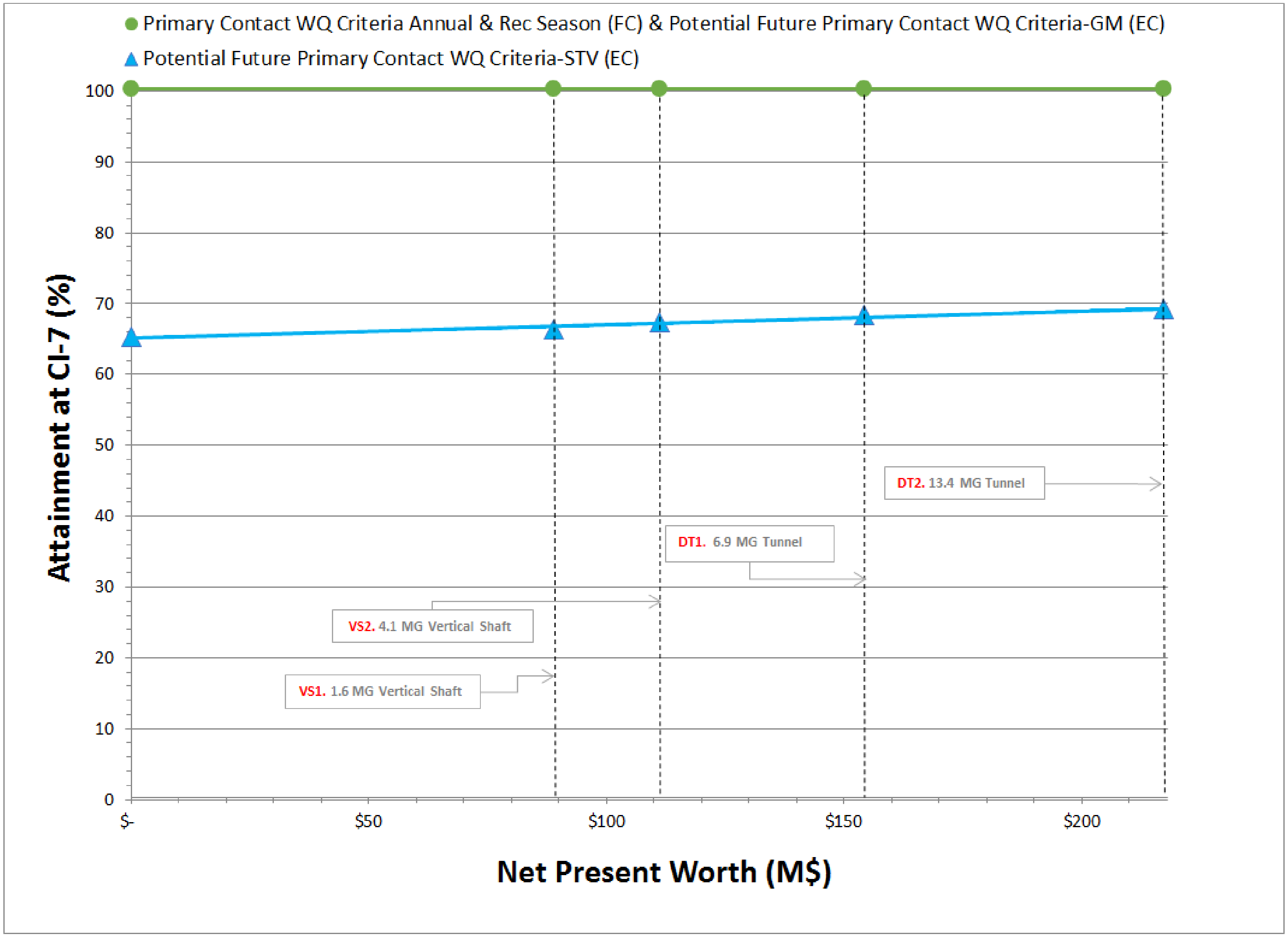


Figure 8-16. Cost vs. Bacteria Attainment at Station CI-7 (2008 Rainfall)

As indicated in Figures 8-10 to 8-16, Coney Island Creek is predicted to be in compliance with the Primary Contact WQ fecal coliform criterion during the recreational season (May 1st through October 31st) at all stations, for baseline conditions and all four alternatives evaluated, for the 2008 typical year. At Stations CI-1 to CI-5, annual attainment of the Primary Contact WQ Criteria is predicted to be lower, with the minimum attainment being 58 percent at the head end of the Creek (Station CI-1). None of the alternatives resulted in a change in the annual attainment values, so even with 100% CSO control, the Primary Contact WQ Criteria would not be attained on an annual basis at all of the stations.

As demonstrated in Section 6.0, and shown graphically on Figures 8-10 through 8-16, the seasonal Primary Contact WQ Criteria attainment is already achieved under baseline conditions. The greatest benefit of a hypothetical implementation of 100% CSO control within the Coney Island Creek watershed would be at Station CI-3, where attainment of the GM Potential Future Primary Contact WQ Criteria would increase from 70 percent under baseline conditions to 75 percent with 100% CSO control. The required level of control for such a minor improvement in attainment of the Potential Future Primary Contact WQ Criteria would have a NPW cost of about $217M.

All the retained alternatives that offer intermediate levels of CSO control are projected to realize even less improvement in attainment of current or potential future WQS.

8.5.c Conclusion on Preferred Alternative

The selection of the preferred alternative for the Coney Island Creek LTCP included consideration of public input, predicted environmental and water quality benefits and costs. The following discussion presents the rationale for selecting the retained alternative that was deemed the preferred alternative.

The previous sections described the results of the cost-performance and cost-attainment analyses that were performed on the retained alternatives for the Coney Island Creek LTCP. The cost-performance curves showed either Alternative VS1 or VS2 as the most cost-effective retained alternative with respect to the level of CSO control. Based on the slope of the line through the points, Alternatives DT1 and DT2 appeared to show slightly diminishing returns versus cost. However, no clear inflection point was evident from the plot.

When the retained alternatives are evaluated in terms of their cost-effectiveness in improving attainment of WQS, it is clear that no meaningful gains are associated with any level of CSO control, including 100 percent.

Based on the findings above, it is evident that the most cost-effective alternative for significantly reducing CSOs to Coney Island Creek has already been implemented. That project, the upgrade of the Avenue V Pumping Station, resulted in nearly a 70 percent reduction in the annual CSO volume discharged to Coney Island Creek. Since the retained alternatives for additional levels of CSO control presented above would have minimal to no impact on improving attainment of WQS, the preferred alternative for the Coney Island Creek LTCP is the continuation of the GI implementation program included in the baseline conditions, as well as other sewer improvements planned or already taking place in the Coney Island Creek watershed.

The CICWQM model was used to characterize WQS attainment for this preferred alternative by running the model for the full 10-year (2002-2011) simulation period. During this simulation period it was assumed that any potential illicit discharges to the Creek are abated. Results from this broader 10-year simulation period are presented in Tables 8-13 through 8-16. In particular, Table 8-13 shows the attainment with the Primary Contact WQ fecal coliform criterion on an annual and recreational season (May 1st through October 31st) basis; Table 8-14 shows the attainment with the existing (Class I) WQ criteria for DO; Table 8-15 shows the attainment with the Class SC DO criteria; and Table 8-16 calculated 10-year preferred alternative attainment of Potential Future Primary Contact WQ Criteria.

It should be noted that these modeling analyses were conducted using the assumption that ongoing microbial analyses will show that the existing high levels of fecal coliform in the Creek are not enteric related and will be resolved through changes to microbial laboratory analyses. Should this not be the case, these analyses will need to be revised.

Table 8-13. Calculated 10-year Preferred Alternative Attainment of Existing WQ Criteria and Bacteria Primary Contact WQ Criteria

Station[(1)]		Fecal Coliform Attainment (%)	
		Annual	Recreational Season[(1)]
CI-1	Primary Contact Fecal Coliform GM < 200 cfu/100mL	57	93
CI-2		56	93
CI-3		65	98
CI-4		90	100
CI-5		91	100
CI-6		100	100
CI-7		100	100

Notes:
(1) The Recreational Season is from May 1st through October 31st. Class I standard of fecal coliform is 200 cfu/100ml.

Table 8-14. Model Calculated Preferred Alternative DO Attainment – Existing WQ Criteria (2008) Station

		DO Annual Attainment (%)
		Entire Water Column
		≥ 4.0 mg/L
CI-1	Saline (Class I)	90
CI-2		95
CI-3		96
CI-4		98
CI-5		99
CI-6		99
CI-7		99

Table 8-15. Model Calculated 2008 Preferred Alternative DO Attainment - Class SC WQ Criteria

Station		DO Annual Attainment (%) (Water Column) Preferred Alternative	
		≥ 4.8 mg/L	≥ 3.0 mg/L
CI-1	Saline (Class SB)	82	95
CI-2		92	98
CI-3		92	99
CI-4		94	100
CI-5		95	100
CI-6		95	100
CI-7		97	100

Table 8-16. Calculated 10-year Preferred Alternative Attainment of Potential Future Primary Contact Water Quality Criteria

Station		Enterococci Attainment Recreational Season (%)	
		GM <30	90th Percentile STV <110
CI-1	Potential Future Primary Contact WQ Bacteria Criteria	47	2
CI-2		48	2
CI-3		62	5
CI-4		81	14
CI-5		82	16
CI-6		99	70
CI-7		99	59

The preferred alternative is projected to result in a very high level of seasonal attainment with existing bacteria WQ. The other retained alternatives would require expenditure of significant cost and would provide only marginal benefit. The majority of the non-attainment is attributable to other non-CSO loading sources, and even 100 percent CSO control would not provide further WQS improvement. For these reasons, the preferred alternative, representing baseline conditions, is the most suitable outcome for this LTCP.

8.6 Use Attainability Analysis

The 2012 CSO Consent Order requires that a UAA be included in an LTCP "where existing WQS do not meet the Section 101(a)(2) goals of the CWA, or where the proposed alternative set forth in the LTCP will not achieve existing WQS or the Section 101(a)(2) goals". The UAA shall "examine whether applicable waterbody classifications, criteria, or standards should be adjusted by the State." The UAA process specifies that States can remove a designated use which is not an existing use if the scientific assessment can demonstrate that attaining the designated use is not feasible for at least one of six reasons:

1. Naturally occurring loading concentrations prevent the attainment of the use; or
2. Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met; or
3. Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or
4. Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the waterbody to its original condition or to operate such modification in a way that would result in the attainment of the use; or
5. Physical conditions related to the natural features of the waterbody, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or
6. Controls more stringent than those required by Sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.

As part of the LTCP, elements of a UAA, including the six conditions presented above, will be used to determine if changes to the designated use are warranted, considering a potential adjustment to the designated use classification as appropriate.

For Coney Island Creek, projected compliance, i.e., at least 95 percent attainment, will not be met for the following water quality criteria:

- Annual Primary Contact Fecal coliform monthly geometric mean criterion of 200 cfu/100mL.
- Recreational Season Primary Contact Fecal coliform monthly geometric mean criterion of 200 cfu/100mL.
- Annual Class I DO criterion of never less than 4.0 mg/L.

The non-compliance with these WQS is discussed in the UAA in Appendix C.

8.6.a Use Attainability Analysis Elements

The objectives of the CWA include providing for the protection and propagation of fish, shellfish, wildlife, and recreation in and on the water. Cost-effectively maximizing the water quality benefits associated with CSO reduction is a cornerstone of this LTCP.

To simplify this process, DEP and DEC have developed a framework that outlines the steps taken under the LTCP in two possible scenarios:

1. Waterbody meets WQ requirements. This may either be the existing WQS (where primary contact is already the designated best use) or assess for an upgrade. In either case, a high-level assessment of the factors that define a given designated use is performed, and if the level of control required to meet this goal can be reasonably implemented, a change in designation may be pursued following implementation of CSO controls and post-construction compliance monitoring.

2. Waterbody does not meet WQ requirements. In this case, if a higher level of control is not feasible, the UAA must justify the shortcoming using at least one of the six criteria (see Section 8.6 above). It is assumed that if 100 percent elimination of CSO sources does not result in attainment, the UAA would include factor number 3 at a minimum as justification (human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied, or would cause more environmental damage to correct than to leave in place).

As discussed in Section 2.0 and 6.0, stormwater, direct drainage and CSOs contribute to bacteria levels in Coney Island Creek. As noted in Table 6-12 of Section 6.0, the 2008 component analysis also indicates that 100 percent removal of CSOs would not result in complete attainment of the Primary Contact WQ Criterion for fecal coliform and demonstrates that other sources contribute to the non-attainment of bacteria Primary Contact WQS criteria. These non-CSO sources also preclude attainment of the designated Class I and next higher classification SC DO criteria, as demonstrated in Table 6-7, where it is reported that 100% CSO control would not bring the upper head end of the Creek into compliance, i.e., 95 percent at a minimum.

8.6.b Fishable/Swimmable Waters

The goal of this LTCP is to identify appropriate CSO controls necessary to achieve waterbody-specific WQS, consistent with EPA's CSO Control Policy and subsequent guidance. DEC considers that compliance with Class I WQS, the current classification of Coney Island Creek, as fulfillment of the CWA's fishable/swimmable goal.

The preferred alternative summarized in Section 8.5 results in the levels of attainment with fishable/swimmable criteria as follows.

Water quality modeling analyses conducted for the 10-year simulation period, summarized in Tables 8-13 and 8-17, show that portions of Coney Island Creek are not projected to comply with the Existing WQ Criteria (Class I) monthly fecal coliform criterion of 200 cfu/100mL for that period. For the recreational season (May 1st through October 31st), the waterbody will be very close to compliance, with 100 percent attainment throughout except at the head end of the Creek, where projected attainment levels are 93 percent.

Compliance with the Potential Future Primary Contact WQ Criteria of 30 cfu/100mL for enterococci is predicted (Table 8-17) to be lower than attainment of the fecal coliform criterion. Attainment of the enterococci 30-day rolling GM during the recreational season (May 1st through October 31st) ranged from 47 to 99 percent. Attainment of the 110 cfu/100mL STV criterion during the recreational season (May 1st through October 31st) ranged from 2 to 70 percent.

Based on the previously demonstrated non-CSO related cause for non-attainment of WQS, DEP is proposing that the continued efficient operation of the Avenue V Pumping Station, in addition to the implementation of the currently planned GI for the Coney Island Creek watershed, constitute the LTCP recommended plan.

A UAA is required to justify this selection based on the relevant criteria listed above. Since the analyses proved that even 100 percent elimination of CSO sources does not result in attainment, the UAA in Appendix C includes a discussion on the sources of pollution that prevent the attainment of WQS.

8.6.c Assessment of Highest Attainable Use

The analyses contained herein, as noted above in Section 8.5.c and summarized in Table 8-17, indicate that Coney Island Creek is not projected to comply with the Primary Contact WQ Criteria 100 percent of the time on an annual or recreational season (May 1st through October 31st) basis. For the purpose of this LTCP, compliance with the standards was considered to be achieved for 95 percent attainment or higher. The modeling analysis assessed whether the recommended plan would improve water quality to allow for attainment of the Primary Contact WQ Criteria, both annually and during the recreational season (May 1st through October 31st). As shown in Table 8-13 above, fecal coliform bacteria levels are projected to meet the criterion seasonally, under the modeling assumptions, at all but two locations near the head of the Creek (Stations CI-1 and CI-2) but still do not attain the criterion on an annual basis at all but two locations closer to Lower New York Bay (Stations CI-6 and CI-7). Table 8-17 summarizes the compliance for the identified plan.

Table 8-17. LTCP Compliance with WQ Standards

Location	Meets Existing WQ Criteria (Class I)	Meets Potential Future Primary Contact WQ Criteria
Coney Island Creek	NO(1,2)	NO(1)

Note:
(1) NO indicates attainment is calculated to be ≤ 95 percent of time.
(2) Primary Contact WQ monthly geomean criteria not met annually or during the recreational season (May 1st through October 31st).

8.7 Water Quality Goals

8.7.a Existing Water Quality

Based on the analyses of Coney Island Creek and the WQS associated with the designated uses, it is concluded that Coney Island Creek is a productive Class I waterbody that essentially can support existing uses, kayaking and wildlife propagation towards the mouth and wildlife propagation throughout its extension. As previously noted, upstream areas of the Creek at the head end, where non-CSO loading sources are primarily responsible for the localized decline in attainment WQS, are not fully protective of its designated use.

8.7.b Potential Future Water Quality Criteria

DEP is committed to improving water quality in Coney Island Creek. However, as demonstrated throughout this LTCP, CSOs are not the primary source of non-attainment of WQS. Based on this assessment, DEP has identified instruments for Coney Island Creek that will allow DEP to continue to improve water quality in the system over time. Wet-weather advisories based on time-to-recovery analysis are recommended for consideration while the work advances on abatement of other non-CSO sources of pollution. The goal of this process will ultimately be attainment of the Existing WQ Criteria, and potentially others under consideration by DEC, including Potential Future Primary Contact WQ Criteria consistent with the EPA 2012 RWQC.

8.7.c Time to Recovery

Although Coney Island Creek could possibly be protective of the primary contact use during the recreational season (May 1st through October 31st), it will not be capable of supporting primary contact 100 percent of the time towards the head end. Even with the significant CSO reductions resulting from grey infrastructure currently in operation, as well as planned GI, the waterbody cannot support primary contact during and following rainfall events. Toward the goal of maximizing the amount of time that Coney Island Creek can achieve water quality levels to support primary contact, DEP has performed an analysis to assess the amount of time following the end of a rainfall event required for Coney Island Creek to recover and return to fecal coliform concentrations less than 1,000 cfu/100mL. The analyses consisted of examining the water quality model simulation of the August 14-15, 2008 storm. Details on the selection of this storm are provided in Section 6.0. The time to return to 1,000 cfu/100mL was then tabulated for each location along Coney Island Creek. As with the other water quality runs for Coney Island Creek, the time-to-recovery analysis was based on a condition that illicit discharges are abated. The results of this analysis are summarized in Table 8-18. As noted, the duration of time within which bacteria concentrations are expected to be higher than the DOH considers safe for primary contact varies by location in Coney Island Creek. The time to recovery, however, is within the DEC desired target of 24-hours for the preferred alternative. In Coney Island Creek, the predicted time to recovery is driven primarily by the non-CSO wet-weather loadings impacting the Creek.

Table 8-18. Time to Recovery with Recommended Plan (August 14-15, 2008)

Station	Preferred Alternative Time to Recovery (hrs) Fecal Coliform Target (1,000 cfu/100mL)
CI-1	24
CI-2	23
CI-3	20
CI-4	11
CI-5	9
CI-6	0
CI-7	0

8.8 Recommended LTCP Elements to Meet Water Quality Goals

Water quality in Coney Island Creek has significantly improved with the recent upgrades to the Avenue V Pumping Station located upstream of Outfall OH-021, the only CSO outfall that discharges to Coney Island Creek. The LTCP demonstrated that further reduction of CSO discharges, up to 100 percent control, would not result in tangible improvements in attainment of WQS. As such, DEP recommends that efforts to improve water quality in the Creek focus on other non-CSO sources of pollution outside the purview of this LTCP.

This LTCP includes a UAA that assesses compliance with Primary Contact WQ Criteria based on projected performance of the currently operational CSO controls.

A wet-weather advisory during the recreational season (May 1st through October 31st) during which primary or secondary contact would not be recommended in Coney Island Creek will be established in coordination with the DOHMH. The LTCP includes a recovery time analysis that can be used to establish the duration of the wet-weather advisory for public notification.

DEP is committed to improving water quality in this waterbody, which will be advanced by the improvements and actions identified under watershed improvement programs outside the CSO LTCP framework.

DEP will also continue its trackdown program to remove illicit discharges, and on a parallel track, will continue the additional fecal coliform microbial testing. These efforts will either result in a reduction in Coney Island Creek fecal coliform levels by the elimination of illicit discharges or by changes made to the microbial laboratory analyses design to target enteric pathogen indicators only.

9.0 LONG-TERM CSO CONTROL PLAN IMPLEMENTATION

The evaluations performed for this Coney Island Creek LTCP concluded that the Creek does not meet its current Class I water quality classification for bacteria. The evaluations also found that 100 percent control of CSO discharges would not result in full attainment of the annual Class I or the seasonal Primary Contact WQ Criteria, the key LTCP bacteria criterion. As detailed in Sections 6.0 and 8.0, due to the influence of other wet-weather pollution sources in Coney Island Creek, full attainment of Primary Contact WQ Criteria cannot be achieved through the control of CSO discharges to the Creek alone. In sum, other factors affecting the Creek's water quality limit its highest attainable use to secondary contact recreation.

9.1 Adaptive Management (Phased Implementation)

As defined by EPA, adaptive management is the process by which new information about the characteristics of a watershed is incorporated into a watershed management plan on a continuing basis. The process relies on establishing a monitoring program, evaluating monitoring data and trends and making adjustments or changes to the plan. The DEP will continue to apply the principles of adaptive management to this LTCP based on its annual evaluation of monitoring data, which will be collected to sustain the operation and effectiveness of the CSO controls currently operational.

NYC is also developing a program to further address stormwater discharges as required under NYC's Municipal Separate Stormwater Sewer System (MS4) permit. This program, together with the actions identified in this LTCP, may further improve water quality in Coney Island Creek.

DEP will also continue to monitor the water quality of Coney Island Creek through its ongoing monitoring programs. Continuing DEP's initiatives from 2014 through 2016, mentioned in Section 2.0, if evidence of dry-weather sources of pollution is found, track downs will be initiated. Such activities will be reported to the DEC on a quarterly basis as is currently required under the Owls Head WWTP SPDES permit.

9.2 Implementation Schedule

No recommended projects are proposed by this LTCP. However, the planned GI included in the LTCP baseline conditions for this waterbody is scheduled to be fully implemented by the year 2030.

9.3 Operational Plan/O&M (Operation and Maintenance)

Although no recommended projects are proposed by this LTCP, DEP is nevertheless committed to continue operating the components of the combined sewers associated with Outfall OH-021, particularly the upgraded Avenue V Pumping Station, to the highest level of efficiency.

9.4 Projected Water Quality Improvements

Improvements in water quality will continue to be realized as GI projects are completed. These future improvements are included in the LTCP baseline and are not a recommendation of this LTCP. DEP is also developing a Stormwater Management Program as part of the MS4 permit to manage urban sources of stormwater runoff to protect and provide additional improvements to water quality.

9.5 Post-Construction Monitoring Plan and Program Reassessment

Ongoing DEP monitoring programs will continue, including the HSM and SM Programs. Harbor Survey data collected from Stations CIC2 and CIC3 will be used to periodically review and assess the water quality trends in Coney Island Creek. Depending on the findings, the data from these programs could form the basis of additional recommendations for inclusion in, as appropriate, the 2017 Citywide LTCP.

9.6 Consistency with Federal CSO Control Policy

The Coney Island Creek LTCP was developed to comply with the requirements of the Federal or EPA CSO Control Policy and associated guidance documents, and with the CWA. The LTCP revealed that Coney Island Creek does not attain the WQS of its designated classification (Class I), the primary contact water quality criterion for bacteria, or the Class SC/SB dissolved oxygen acute or chronic criteria. LTCP projections also reveal that Coney Island Creek will not attain the Potential Future Primary Contact WQ Criteria. This is so because, as this LTCP's analyses demonstrate, non-CSO sources of pollutant loadings are the cause of non-attainment.

9.6.a Affordability and Financial Capability Introduction

EPA has recognized the importance of taking a community's financial status into consideration, and in 1997, issued "Combined Sewer Overflows: Guidance for Financial Capability Assessment and Schedule Development." EPA's financial capability guidance contains a two-phased assessment approach. Phase I examines affordability in terms of impacts to residential households. This analysis applies the residential indicator (RI), which examines the average cost of household water pollution costs (wastewater and stormwater) relative to a benchmark of two percent of service area-wide MHI. The results of this preliminary screening analysis are assessed by placing the community in one of three categories:

- Low economic impact: average wastewater bills are less than one percent of MHI.
- Mid-range economic impact: average wastewater bills are between one percent and two percent of MHI.
- High economic impact: average wastewater bills are greater than two percent of MHI.

The second phase develops the Permittee Financial Capability Indicators (FCI), which examine several metrics related to the financial health and capabilities of the impacted community. The indicators are compared to national benchmarks and are used to generate a score that is the average of six economic indicators: bond rating; net debt; MHI; local unemployment; property tax burden; and property tax collection rate within a service area. Lower FCI scores imply weaker economic conditions, and thus the increased likelihood that additional controls would cause substantial economic impact.

The results of the RI and the FCI are then combined in a Financial Capability Matrix to give an overall assessment of the permittee's financial capability. The result of this combined assessment can be used to establish an appropriate CSO control implementation schedule.

Significantly, EPA recognizes that the procedures set out in its guidance are not the only appropriate analyses to evaluate a community's ability to comply with CWA requirements. EPA's 2001 "Guidance: Coordinating CSO Long-term Planning with Water Quality Standards Reviews" emphasizes this by stating:

> *The 1997 Guidance "identifies the analyses States may use to support this determination [substantial and widespread impact] for water pollution control projects, including CSO LTCPs. States may also use alternative analyses and criteria to support this determination, provided they explain the basis for these alternative analyses and/or criteria* (U.S. EPA, 2001, p. 31)".

Likewise, EPA has recognized that its RI and FCI metrics are not the sole socioeconomic basis for considering an appropriate CSO compliance schedule. EPA's 1997 guidance recognizes that there may be other important factors in determining an appropriate compliance schedule for a community, and contains the following statement that authorizes communities to submit information beyond that which is contained in the guidance:

> *It must be emphasized that the financial indicators found in this guidance might not present the most complete picture of a permittee's financial capability to fund the CSO controls. … Since flexibility is an important aspect of the CSO Policy, permittees are encouraged to submit any additional documentation that would create a more accurate and complete picture of their financial capability* (U.S. EPA, 1997, p. 7).

Furthermore, in 2012, EPA released its "Integrated Municipal Stormwater and Wastewater Planning Approach Framework," which is supportive of a flexible approach to prioritizing projects with the greatest water quality benefits and the use of innovative approaches like GI (U.S. EPA, 2012). In November of 2014, EPA released its "Financial Capability Assessment Framework" clarifying the flexibility within their CSO guidance. Although EPA did not modify the metrics established in the 1997 guidance, the 2014 Framework reiterates that permittees are encouraged to supplement the core metrics with additional information that would "create a more accurate and complete picture of their financial capability" that may "affect the conclusion" of the analysis.

For example, EPA will consider:

- All CWA costs presented in the analysis described in the 1997 Guidance, and
- SDWA obligations as additional information about a permittee's financial capability.

EPA will also consider alternative disaggregation of household income (e.g., quintiles), as well as economic indicators including, but not limited to:

- Actual poverty rates,
- Rate of home ownership,
- Absolute unemployment rates, and
- Projected, current, and historical wastewater (sewer and stormwater costs) as a percentage of household income, quintile, geography or other breakdown.

The purpose of presenting these data is to demonstrate that the local conditions facing the municipality deviate from the national average to the extent that the metrics established in the 1997 guidance are inadequate for accurately assessing the municipality's financial capacity for constructing, operating, and implementing its LTCP in compliance with its regulatory mandates.

This section of this LTCP begins to explore affordability and financial capability concerns as outlined in the 1997 and 2001 guidance documents and the 2014 Framework, and analyzes the financial capability of NYC to make additional investments in CSO control measures, in light of the relevant financial indicators, the overall socioeconomic conditions in NYC, and the need to continue spending on other water and sewer projects. The analysis is presented both in terms of the EPA's Financial Capability Guidance framework and by applying several additional factors of particular relevance to NYC's unique socioeconomic character.

Because DEP is tasked with preparing ten LTCPs for individual waterbodies and one LTCP for the East River and Open Waters, DEP expects that a complete picture of the effect of the comprehensive CSO program will be available in 2017 to coincide with the schedule for completion of all the plans. This affordability and financial capability section will be refined in each LTCP submittal as project costs are further developed, and to reflect the latest available socioeconomic metrics.

9.6.b Residential Indicator

As discussed above, the first economic test as part of EPA's 1997 CSO guidance is the RI, which compares the average annual household water pollution control cost (wastewater and stormwater related charges) to the MHI of the service area. Average household wastewater cost can be estimated by approximating the residential share of wastewater treatment and dividing it by total number of households. In NYC, the wastewater bill is a function of water consumption. Therefore, average household costs and the RI are estimated based on consumption rates by household type, as shown in Table 9-1.

Table 9-1. Residential Water and Wastewater Costs compared to Median Household Income (MHI)

	Average Annual Wastewater Bill ($/year)	Wastewater RI (Wastewater Bill/MHI[1]) (%)	Total Water and Wastewater Bill ($/Year)	Water and Wastewater RI (Water and Wastewater Bill/MHI) (%)
Single-family[2]	661	**1.23**	1,077	**2.00**
Multi-family[3]	430	**0.80**	700	**1.30**
Average Household Consumption[4]	542	**1.00**	883	**1.64**
MCP[5]	617	**1.14**	1,005	**1.86**

Notes:

(1) Latest MHI data is $52,996 based on 2014 ACS data, estimated MHI adjusted to present is $53,961.
(2) Based on 80,000 gallons/year consumption and proposed Fiscal Year (FY) 2017 Rates.
(3) Based on 52,000 gallons/year consumption and proposed FY2017 Rates.
(4) Based on average consumption across all metered residential units of 65,534 gallons/year and proposed FY2017 Rates.
(5) Multi-family Conservation Plan (MCP) is a flat fee per unit for customers who will implement certain conservation measures.

As shown in Table 9-1, the RI for wastewater costs varies between 0.8 percent of MHI to 1.23 percent of MHI depending on household type. Because DEP is a water and wastewater utility and the ratepayers receive one bill for both charges, it is also appropriate to look at the total water and wastewater bill in considering the RI, which varies from 1.3 percent to 2.0 percent of MHI.

Based on this initial screen, current wastewater costs pose a low to mid-range economic impact according to the 1997 EPA guidance. However, several factors limit using MHI as a financial indicator for a city like New York. NYC has a large population and more than three million households. Even if a relatively small percentage of households were facing unaffordable water and wastewater bills, there would still be a significant number of households experiencing this hardship. For example, more than 702,000 households in NYC (about 22 percent of NYC's total) earn less than $20,000 per year and have estimated wastewater costs well above 2 percent of their household income. Therefore, there are several other socioeconomic indicators to consider in assessing residential affordability, as described later in this section.

9.6.c Financial Capability Indicators

The second phase of the 1997 CSO guidance develops the Permittee FCI, which examine several metrics related to the financial health and capabilities of the impacted community. The indicators are compared to national benchmarks and are used to generate a score that is the average of six economic indicators, including bond rating, net debt, MHI, local unemployment, property tax burden, and property tax collection rate within a service area. Lower FCI scores imply weaker economic conditions and thus the increased likelihood that additional controls would cause substantial economic impact.

Table 9-2 summarizes the FCI scoring as presented in the 1997 CSO guidance. NYC's FCI score based on this test is presented in Table 9-3 and further described below.

Table 9-2. Financial Capability Indicator Scoring

Financial Capability Metric	Strong (Score = 3)	Mid-range (Score = 2)	Weak (Score = 1)
Debt Indicator			
Bond rating (G.O. bonds, revenue bonds)	AAA-A (S&P) Aaa-A (Moody's)	BBB (S&P) Baa (Moody's)	BB-D (S&P) Ba-C (Moody's)
Overall net debt as percentage of full market value	Below 2%	2–5%	Above 5%
Socioeconomic Indicator			
Unemployment rate	More than 1 percentage point below the national average	+/- 1 percentage point of national average	More than 1 percentage point above the national average
MHI	More than 25% above adjusted national MHI	+/- 25% of adjusted national MHI	More than 25% below adjusted national MHI
Financial Management Indicator			
Property tax revenues as percentage of Full Market Property Value (FMPV)	Below 2%	2–4%	Above 4%
Property tax revenue collection rate	Above 98%	94–98%	Below 94%

Table 9-3. NYC Financial Capability Indicator Score

Financial Capability Metric	Actual Value	Score
Debt Indicators		
Bond rating (G.O. bonds)	AA (S&P) AA (Fitch) Aa2 (Moody's)	Strong/3
Bond rating (Revenue bonds)	AAA (S&P) AA+ (Fitch) Aa1 (Moody's)	
Overall net debt as percentage of FMPV	4.1%	Mid-range/2
G.O. Debt	$40.5B	
Market value	$986.0B	
Socioeconomic Indicators		
Unemployment rate (2015 annual average)	0.4 percent above the national average	Mid-range/2
NYC unemployment rate	5.7%	
United States unemployment rate	5.3%	
MHI as percentage of national average	98.8%	Mid-range/2
Financial Management Indicators		
Property tax revenues as percentage of FMPV	2.3%	Mid-range/2
Property tax revenue collection rate	98.6%	Strong/3
Permittee Indicators Score		2.3

Notes:
Debt and Market Value Information as of June 30, 2015.

9.6.c.1 Bond Rating

The first financial benchmark is NYC's bond rating for both general obligation (G.O.) and revenue bonds. A bond rating performs the isolated function of credit risk evaluation. While many factors go into the investment decision-making process, bond ratings can significantly affect the interest that the issuer is required to pay, and thus the cost of capital projects financed with bonds. According to EPA's criteria – based on the ratings NYC has received from all three rating agencies [Moody's, Standard & Poor's (S&P), and Fitch Ratings] – NYC's financing capability is considered "strong" for this category.

NYC's G.O. rating and Municipal Water Finance Authority's (MWFA) revenue bond ratings are high due to prudent fiscal management, the legal structure of the system, and the Water Board's historic ability to raise water and wastewater rates. However, mandates over the last decade have significantly increased the leverage of the system, and future bond ratings could be impacted by further increases to debt beyond what is currently forecasted.

9.6.c.2 Net Debt as a Percentage of Full Market Property Value (FMPV)

The second financial benchmark measures NYC's outstanding debt as a percentage of FMPV. At the end of FY2015, NYC had more than $40.5 billion in outstanding G.O. debt, and the FMPV within NYC was $986.0 billion. This results in a ratio of outstanding debt to FMPV of 4.1 percent and a "mid-range" rating for this indicator. If $29.9B of MWFA revenue bonds that support the system are included, net debt as a percentage of FMPV increases to 7.1 percent, which results in a "weak" rating for this indicator.

Furthermore, if NYC's $42.2B of additional debt that is related to other services and infrastructure is also included, the resulting ratio further increases to 11.4 percent net debt as a percentage of FMPV.

9.6.c.3 Unemployment Rate

For the unemployment benchmark, the 2015 annual average unemployment rate for NYC was compared to that for the U.S. NYC's 2015 unemployment rate of 5.7 percent is 0.4 percent higher than the national average of 5.3 percent. Based on EPA guidance, NYC's unemployment benchmark would be classified as "mid-range". It is important to note that over the past two decades, NYC's unemployment rate has generally been significantly higher than the national average. Due to the recession, the national unemployment is now closer to NYC's unemployment rate. Additionally, the unemployment rate measure identified in the 1997 financial guidance sets a relative comparison at a snapshot in time. It is difficult to predict whether the unemployment gap between the United States and NYC will once again widen further, and it may be more relevant to look at longer term historical trends of the service area.

9.6.c.4 Median Household Income (MHI)

The MHI benchmark compares the community's MHI to the national average. Using American Community Survey (ACS) 2014 single-year estimates, NYC's MHI is $52,996 and the nation's MHI is $52,657. Thus, NYC's MHI is nearly 100 percent of the national MHI, resulting in a "mid-range" rating for this indicator. However, as discussed above in this section, MHI does not provide an adequate measure of affordability or financial capability. MHI is a poor indicator of economic distress and bears little relationship to poverty or other measures of economic need. In addition, reliance on MHI alone can be a very misleading indicator of the affordability impacts in a large and diverse city such as NYC.

9.6.c.5 Tax Revenues as a Percentage of Full Market Property Value

This indicator, which EPA also refers to as the "property tax burden", attempts to measure "the funding capacity available to support debt based on the wealth of the community," as well as "the effectiveness of management in providing community services". According to the NYC Property Tax Annual report issued for FY2015, NYC had billed $22.6B in real property taxes against a $986.0B FMPV, which amounts to 2.3 percent of FMPV. For this benchmark, NYC received a "mid-range" score. This figure does not include water and wastewater revenues; including $3.8B of FY2015 system revenues increases the ratio to 2.7 percent of FMPV.

However, this indicator (including or excluding water and wastewater revenues) is misleading because NYC obtains a relatively low percentage of its tax revenues from property taxes. In 2007, property taxes accounted for less than 41 percent of NYC's total non-exported taxes, meaning that taxes other than property taxes (e.g., income taxes, sales taxes) account for nearly 60 percent of the locally borne NYC tax burden.

9.6.c.6 Property Tax Collection Rate

The property tax collection rate is a measure of "the efficiency of the tax collection system and the acceptability of tax levels to residents". The FY2015 NYC Property Tax Annual report indicates NYC's total property tax levy was $22.6B, of which 98.6 percent was collected, resulting in a "strong" rating for this indicator.

It should be noted, however, that the processes used to collect water and wastewater charges and the enforcement tools available to water and wastewater agencies differ from those used to collect and enforce real property taxes. The DOF, for example, can sell real property tax liens on all types of non-exempt properties to third parties, who can then take action against the delinquent property owners. DEP, in contrast, can sell liens on multi-family residential and commercial buildings whose owners have been delinquent on water bills for more than one year, but it cannot sell liens on single-family homes. The real property tax collection rate thus does not accurately reflect the local agency's ability to collect the revenues used to support water supply and wastewater capital spending.

9.6.d Summary of the Phase 1 and Phase 2 Indicators

The results of the Phase 1 (Residential Indicator) and the Phase 2 (Permittee Financial Capability Indicators) evaluations are combined in the Financial Capability Matrix (see Table 9-4), to evaluate the level of financial burden the current CWA program costs may impose on NYC. Based on a RI score of 1.0 percent (using average household consumption), and a FCI score of 2.3, NYC's Financial Capability Matrix score is "Medium Burden". The score falls more solidly in the "Medium Burden" category when considering the higher RI scores of 1.23 percent and 1.14 percent for single-family and multi-family conservation plan households, respectively.

Table 9-4. Financial Capability Matrix

Permittee Financial Capability Indicators Score (Socioeconomic, Debt, and Financial Indicators)	Residential Indicator (Cost Per Household as a % of MHI)		
	Low Impact (Below 1.0%)	**Mid-Range (Between 1.0 and 2.0%)**	**High Impact (Above 2.0%)**
Weak (Below 1.5)	Medium Burden	High Burden	High Burden
Mid-Range (Between 1.5 and 2.5)	Low Burden	**Medium Burden**	High Burden
Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden

9.6.e Socioeconomic Considerations in the New York City Context

As encouraged by EPA's financial capability assessment guidance, several additional factors of particular relevance to NYC's unique socioeconomic character are provided in this section to aid in the evaluation of affordability implications of the costs associated with anticipated CWA compliance on households in NYC.

9.6.e.1 Income Levels

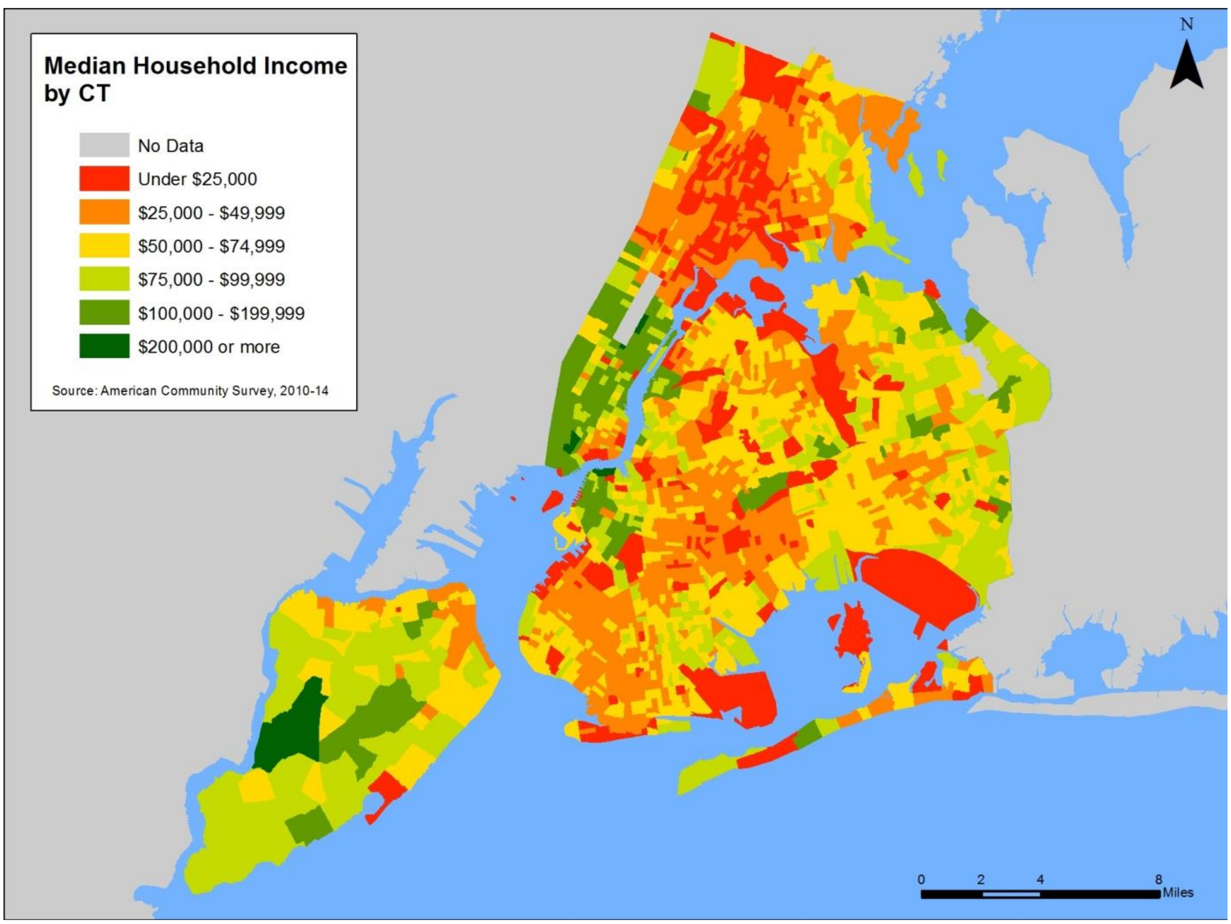
In 2014, the latest year for which Census data is available, the MHI in NYC was $52,996. As shown in Table 9-5, across the NYC boroughs, MHI ranged from $33,712 in the Bronx to $76,089 in Manhattan. Figure 9-1 shows that income levels also vary considerably across NYC neighborhoods, and there are several areas in NYC with high concentrations of low-income households.

As shown in Figure 9-2, after 2008, MHI in NYC actually decreased for several years, and it took several years to recover to the 2008 level. However, during this period, the cost of living continued to increase.

Table 9-5. Median Household Income

Location	2014 (MHI)
United States	$53,657
New York City	$52,996
Bronx	$33,712
Brooklyn	$47,966
Manhattan	$76,089
Queens	$57,241
Staten Island	$71,121

Source: U.S. Census Bureau 2014 ACS 1-Year Estimates.



Source: U.S. Census Bureau 2010-2014 ACS 5-Year Estimates.

Figure 9-1. Median Household Income by Census Tract

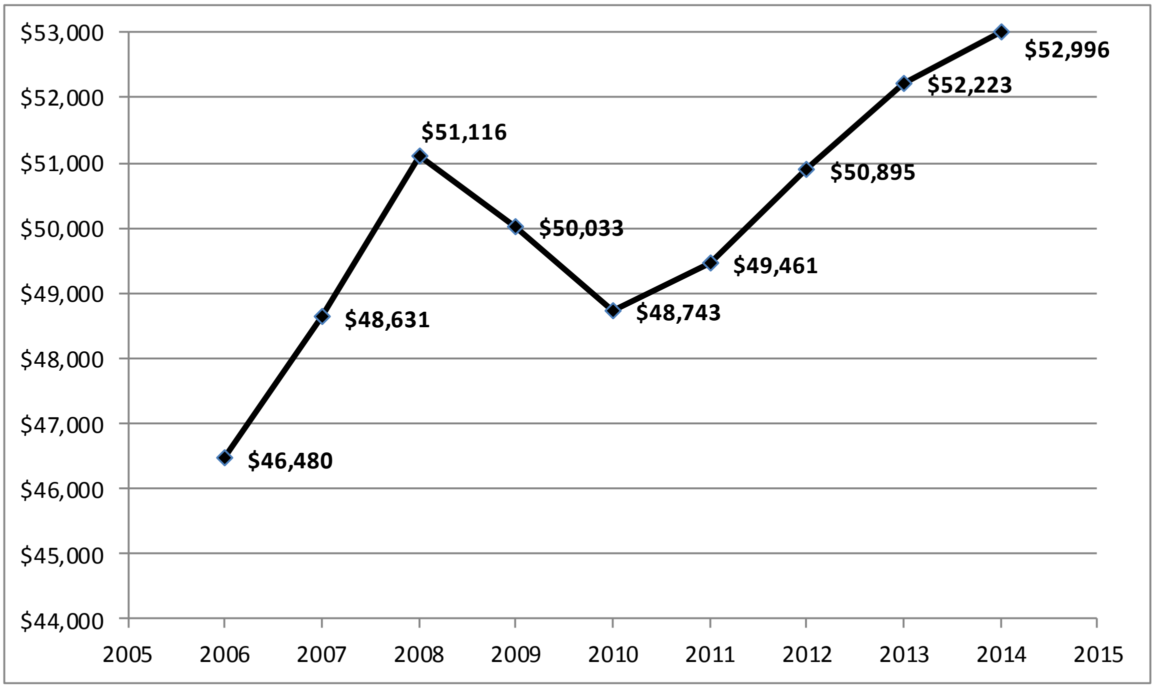
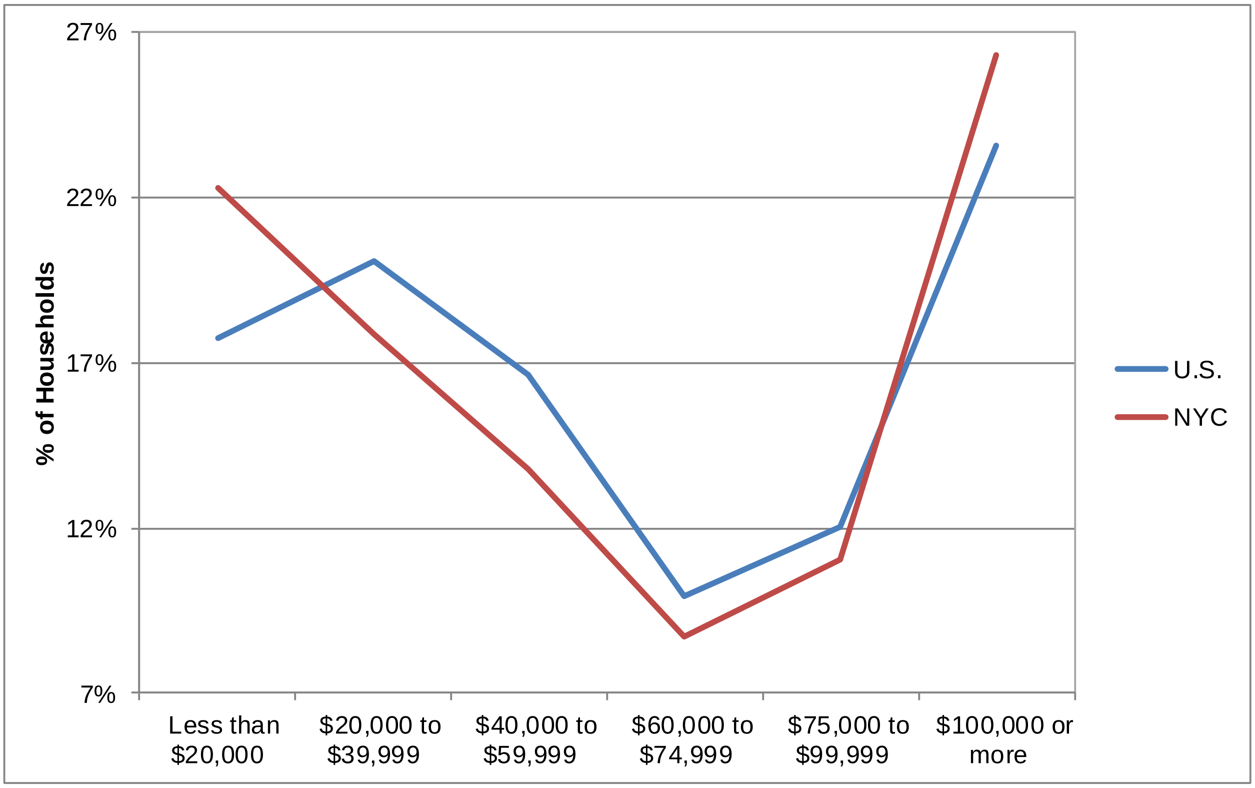


Figure 9-2. NYC Median Household Income over Time

9.6.e.2 Income Distribution

NYC currently ranks as one of the most unequal cities in the United States (U.S.) in terms of income distribution. NYC's income distribution highlights the need to focus on metrics, other than citywide MHI to capture the disproportionate impact on households in the lowest income brackets. It is clear that MHI does not represent "the typical household" in NYC. As shown in Figure 9-3, incomes in NYC are not clustered around the median. Rather, a greater percentage of NYC households exist at either end of the economic spectrum. Also, the percentage of the population with middle-class incomes between $20,000 and $100,000 is 7.3 percent less in NYC than in the United States generally.

As shown in Table 9-6, the income level that defines the upper end of the Lowest Quintile (i.e., the lowest 20 percent of income earners) in NYC is $17,691, compared to $21,909 nationally. This further demonstrates that NYC has a particularly vulnerable, and sizable, lower income population. Table 9-7 compares the average household consumption RI for the Lowest Quintile, Second Quintile, and MHI for NYC using the proposed FY 2017 rates. As shown in this table, households in the Lowest Quintile have a RI of at least 3.01 percent, which easily exceeds EPA's "High Financial Impact" threshold of 2.0 percent.



Source: U.S. Census Bureau 2014 ACS 1-Year Estimates.

Figure 9-3. Income Distribution for NYC and U.S.

Table 9-6. Household Income Quintile Upper Limits in New York City and the United States (2014$)

Quintile	New York City	United States
Lowest Quintile	$17,691	$21,909
Second Quintile	$39,774	$42,004
Third Quintile	$70,330	$67,650
Fourth Quintile	$119,854	$109,108
Lower Limit of Top 5 Percent	$249,609	$203,671

Source: U.S. Census Bureau 2014 ACS 1-Year Estimates.

Table 9-7. Average Household Consumption Residential Indicator for Different Income Levels using Proposed FY 2017 Rates

Income Level	RI(1)
Lowest Quintile Upper Limit	3.01%
Second Quintile Upper Limit	1.34%
MHI	1.00%

Note:
(1) RI calculated by dividing average household consumption annual wastewater bill of $542 (using proposed FY 2017 rates) by income level values adjusted to 2016 dollars.

9.6.e.3 Poverty Rates

Based on the latest available Census data, 20.9 percent of NYC residents are living below the federal poverty level (more than 1.7 million people, which is greater than the entire population of Philadelphia). This is significantly higher than the national poverty rate of 15.5 percent, despite similar MHI levels for NYC and the U.S. as a whole. As shown in Table 9-8, across the NYC boroughs, poverty rates vary from 14.5 percent in Staten Island to 31.6 percent in the Bronx.

Table 9-8. NYC Poverty Rates

Location	Percentage of Residents Living Below the Federal Poverty Level
United States	15.5
New York City	20.9
Bronx	31.6
Brooklyn	23.4
Manhattan	17.6
Queens	15.2
Staten Island	14.5

Source: U.S. Census Bureau 2014 ACS 1-Year Estimates.

Figure 9-4 shows that poverty rates also vary across neighborhoods, with several areas in NYC having a relatively high concentration of people living below the federal poverty level. Each green dot represents 250 people living in poverty. While poverty levels are highly concentrated in some areas, smaller pockets of poverty exist throughout NYC. Because an RI that relies on MHI alone fails to capture these other indicators of economic distress, two cities with similar MHI could have disparate levels of poverty.

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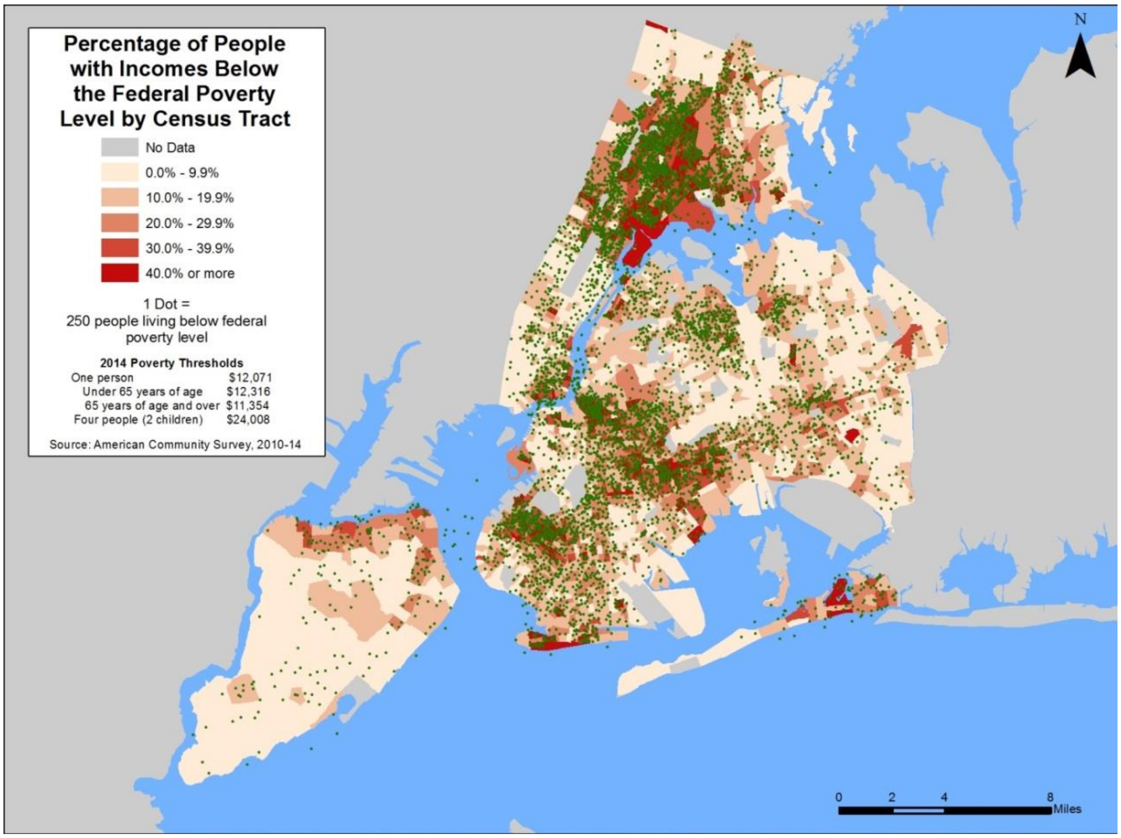
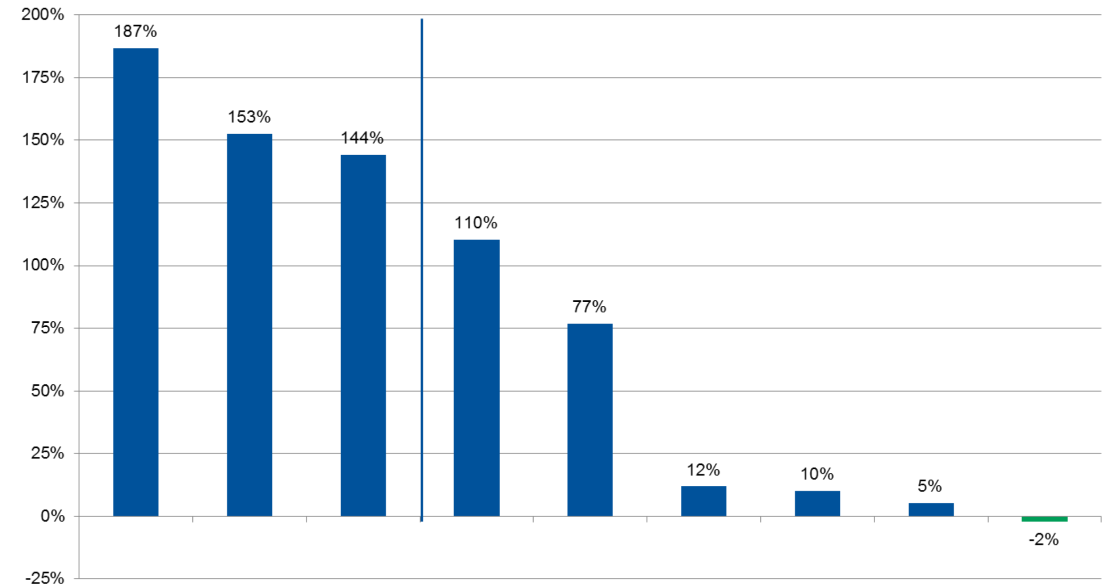


Source: U.S. Census Bureau 2010-2014 ACS 5-Year Estimates

Figure 9-4. Poverty Clusters and Rates in NYC

9.6.e.4 Cost of Living and Housing Burden

NYC residents face relatively high costs for nondiscretionary items (e.g., housing, utilities) compared to individuals living almost anywhere else in the nation, as shown in Figure 9-5. While water costs are slightly less than the average for other major United States cities, the housing burden is significantly higher.



	Apartment Rental	Condo/Co-op Sale	1- to 3-Family Home Sale	Electricity	Utility (Natural) Gas	Internet	Heating Oil (Fuel Oil #2)	Unleaded Gasoline	Water & Wastewater
	(average monthly rent)	(median per sale)	(median per sale)	(average per year; 6,000 kwh)	(average per year)	(average per year, 25-50 Mbps)	(average per gallon)	(average per gallon)	(average per year; 80,000 gallons)
NYC	$3,223	$516,000	$510,000	$1,741	$1,269	$795	$3.10	$2.22	$1,025
U.S. Cities	$1,124	$204,300	$208,900	$828	$718	$711	$2.81	$2.11	$1,048

Source: Wall Street Journal and New York Times (apartment rental); The Real Estate Board of New York and National Association of Realtors (condo/co-op and 1-3 family home sale); Consolidated Edison and U.S. Bureau of Labor Statistics "BLS" (electricity); National Grid and American Gas Association (natural gas); The Open Technology Institute (internet); New York State Energy Research and Development Authority and U.S. BLS (heating oil); U.S. BLS (gasoline); NYC FY 2015 Water and Wastewater Rate Report (water & wastewater)

Figure 9-5. Comparison of Costs between NYC and other U.S. Cities

Approximately 67 percent of all households in NYC are renter-occupied, compared to about 35 percent of households nationally. In recent years, affordability concerns have been compounded by the fact that gross median rents in NYC have increased, while median renter income has declined. Although renter households may not directly receive water and wastewater bills, these costs are often indirectly passed on to them in the form of rent increases. Increases in water and sewer costs that are born by landlords and property owners could also indirectly impact tenants, as it may limit the ability to perform necessary maintenance. Although it can be difficult to discern precisely how much the water and sewer rates impact every household, particularly those in multi-family buildings and affordable housing units, EPA's 1997 Guidance nevertheless requires that all households in the service area be identified and used to establish an average cost per household for use in financial capability and affordability analyses. This LTCP financial capability assessment considers a lower average annual wastewater bill for households in multi-family buildings (due to a lower annual consumption value) as compared to single-family households, and also examines average consumption across the board.

Most government agencies consider housing costs of between 30 percent and 50 percent of household income to be a moderate burden in terms of affordability; costs greater than 50 percent of household income are considered a severe burden.

A review of 2014 ACS Census data shows approximately 18 percent of NYC households (close to 174,000 households) spent between 30 percent and 50 percent of their income on housing, while about 20 percent (193,000 households) spent more than 50 percent. This compares to 15 percent of households nationally that spent between 30 percent and 50 percent of their income on housing and 10 percent of households nationally that spent more than 50 percent. This means that 38 percent of households in NYC versus 25 percent of households nationally spent more than 30 percent of their income on housing costs.

NYCHA is responsible for 172,223 affordable housing units (9 percent of the total renter households in NYC). NYCHA paid approximately $182M for water and wastewater in FY2015. This total represents approximately 5.8 percent of its $3.14B operating budget. Even a small increase in rates could potentially impact the agency's ability to provide affordable housing and/or other programs and, in recent years, NYCHA has experienced funding cuts and operational shortfalls.

In sum, the financial capability assessment for NYC must look beyond the EPA 1997 Guidance, and must additionally consider the socioeconomic conditions discussed in this section including NYC's income distribution, water and wastewater rate impacts on households with income below the median level, poverty rates, housing costs, total tax burden, and long-term debt. Because many utilities provide both drinking and wastewater services and households often pay one consolidated bill, financial capability and affordability must consider total water and wastewater spending. Scheduling and priorities for future spending should consider the data presented here and below with respect to historical and future commitments.

9.6.f Background on Historical DEP Spending

As the largest water and wastewater utility in the nation, DEP provides over a billion gallons of drinking water daily to more than eight million NYC residents, visitors and commuters, as well as to one million upstate customers. DEP maintains over 2,000 square miles of watershed comprised of 19 reservoirs, three controlled lakes, several aqueducts, and 6,600 miles of water mains and distribution pipes. DEP also collects and treats wastewater. Averaged across the year, the system treats approximately 1.3 billion gallons of wastewater per day collected through 7,500 miles of sewers, 95 pump stations and 14 in-NYC WWTPs. In wet-weather, the system can treat up to 3.5 billion gallons per day of combined storm and sanitary flow. In addition to its WWTPs, DEP also has four CSO storage facilities. In 2010, DEP launched a 20-year, $2.4B GI program, of which $1.5B will be funded by DEP, with the remainder funded through private partnerships.

9.6.f.1 Historical Capital and Operations and Maintenance Spending

As shown in Figure 9-6, from FY2002 through FY2015, 64 percent of DEP's capital spending was for wastewater and water mandates. Figure 9-7 identifies associated historical wastewater and water operating expenses from FY2005 through FY2015, which have generally increased over time reflecting the additional operational costs associated with NYC's investments. Many projects have been important investments that safeguard our water supply and improve the water quality of our receiving waters in the Harbor and its estuaries. These mandates and associated programs are described below.

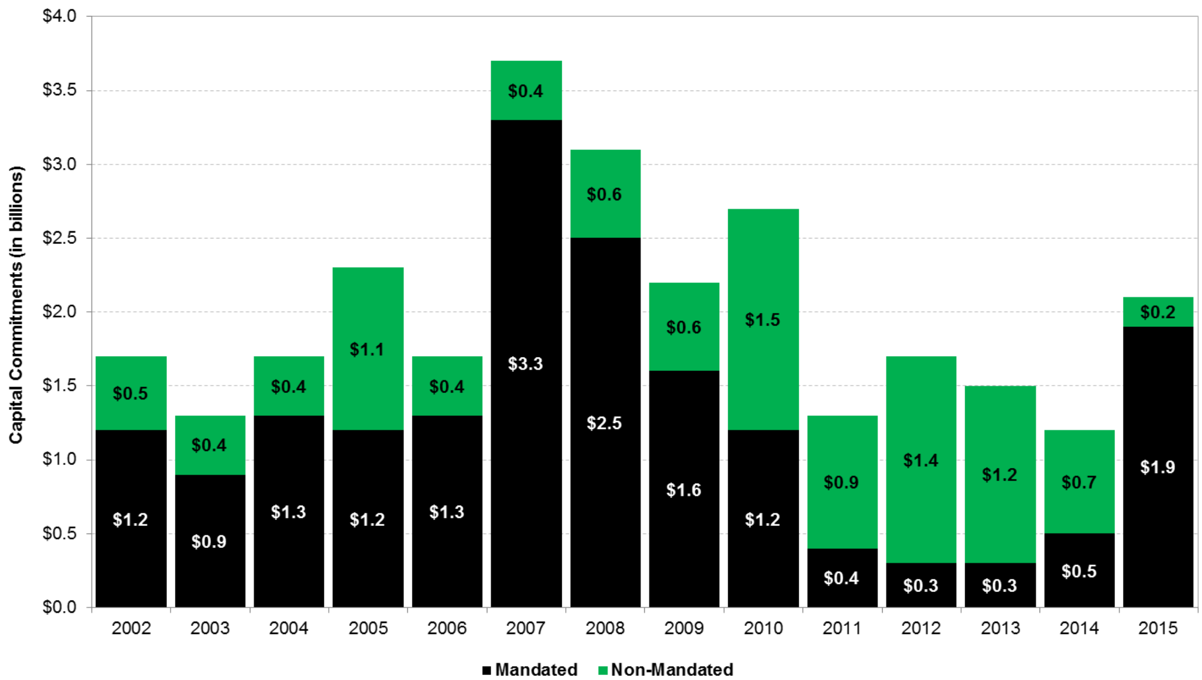


Figure 9-6. Historical Capital Commitments

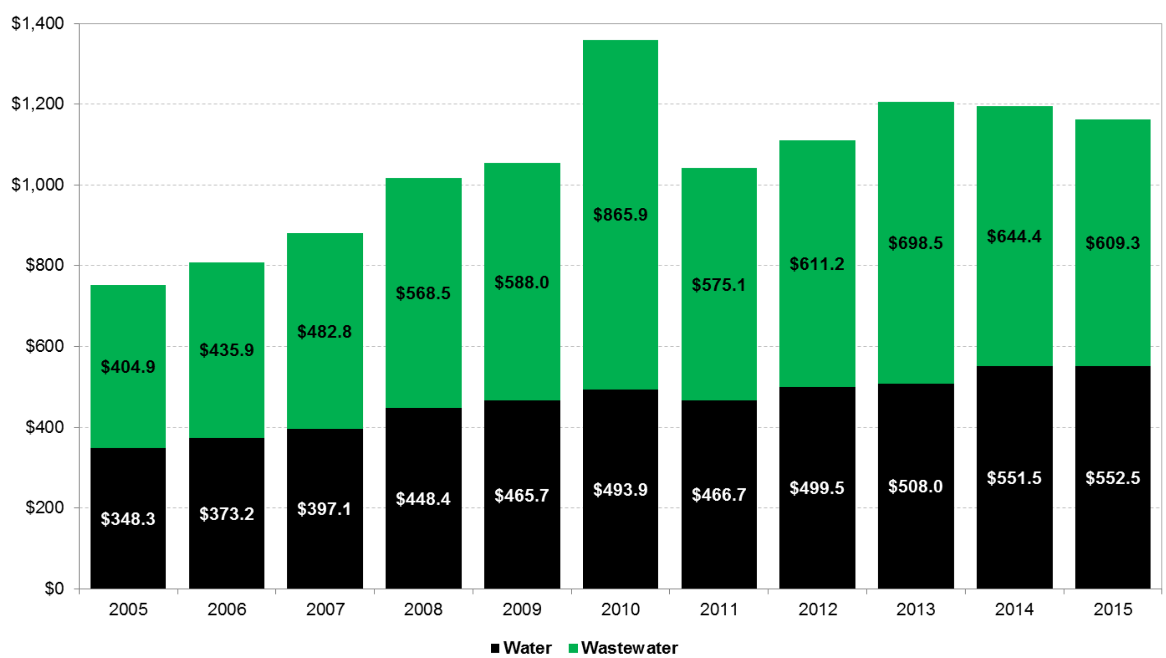


Figure 9-7. Historical Operating Expenses

9.6.f.2 Wastewater Mandated Programs

The following wastewater programs and projects have been initiated to comply with federal and state laws and permits:

- CSO abatement and stormwater management programs

  DEP has initiated a number of projects to reduce CSOs, including construction of CSO abatement facilities, optimization of the wastewater system to reduce the volume of CSO discharge, controls to prevent floatables and debris that enters the combined wastewater system from being discharged, dredging of CSO sediments that contribute to low DO and poor aesthetic conditions, and other water quality based enhancements to enable attainment of the WQS. These initiatives impact both the capital investments that DEP must make, and its O&M expenses. Historical commitments and those currently in DEP's ten year capital plan for CSOs are estimated to cost $4.3B. DEP expects that additional investments in stormwater controls will be required of it, as they will be for other NYC agencies, pursuant to MS4 requirements.

- Biological nitrogen removal

  In 2006, NYC entered into a Consent Judgment with DEC, which required DEP to upgrade five WWTPs by 2017 to reduce nitrogen discharges and comply with draft SPDES nitrogen limits. Pursuant to a modification and amendment to the Consent Judgment in 2011, DEP agreed to upgrade three additional WWTPs and to install additional nitrogen controls at one of the WWTPs included in the original Consent Judgment. As in the case of CSOs and stormwater, these initiatives include capital investments made by DEP (over $1B to-date and an additional $103M in the 10-year capital plan) as well as O&M expenses. (Chemicals alone in FY2014 amounted to $3.2M per year and by FY2017 are estimated to be about $21M per year.)

- Wastewater Treatment Plant Upgrades

  The Newtown Creek WWTP has been upgraded to secondary treatment pursuant to the terms of a Consent Judgment with DEC. The total cost of the upgrade is estimated to be $5B. In 2011, DEP certified that the Newtown Creek WWTP met the effluent discharge requirements of the CWA, bringing all 14 WWTPs into compliance with the secondary treatment requirements.

9.6.f.3 Drinking Water Mandated Programs

Under the federal SDWA and the New York State Sanitary Code, water suppliers are required to either filter their surface water supplies or obtain and comply with a determination from EPA that allows them to avoid filtration. In addition, EPA promulgated a rule known as Long Term 2 (LT2) that required that unfiltered water supplies receive a second level of pathogen treatment (e.g., ultraviolet [UV] treatment in addition to chlorination) by April 2012. LT2 also requires water suppliers to cover or treat water from storage water reservoirs. The following DEP projects have been undertaken in response to these mandates:

- Croton Watershed - Croton Water Treatment Plant

  Historically, NYC's water has not been filtered because of its good quality and long retention times in reservoirs. However, more stringent federal standards relating to surface water treatment resulted in a federal court consent decree, which mandated the construction of a full-scale water treatment facility to filter water from NYC's Croton watershed. Construction on the Croton Water Treatment Plant began in late 2004, and the facility began operating in 2015. To-date, DEP has spent roughly $3.2B in capital costs. Since commencement of operations, DEP is also now incurring annual expenses for labor, power, chemicals, and other costs associated with plant O&M. For FY2015, O&M costs are estimated to be about $23M.

- Catskill/Delaware Watershed - Filtration Avoidance Determination

  Since 1993, DEP has been operating under a series of Filtration Avoidance Determinations (FADs), which allow NYC to avoid filtering surface water from the Catskill and Delaware systems. In 2007, EPA issued a new FAD (2007 FAD), which requires NYC to take certain actions over a ten-year period to protect the Catskill and Delaware water supplies. In 2014, the DOH issued mid-term revisions to the 2007 FAD. Additional funding was added to the Capital Improvement Plan (CIP) through 2017 to support these mid-term FAD revisions. DEP has committed about $1.7B to-date and anticipates that expenditures for the next FAD will amount to $200M.

- UV Disinfection Facility

  In January 2007, DEP entered into an Administrative Consent Order (UV Order) with EPA pursuant to EPA's authority under LT2 requiring DEP to construct a UV facility by 2012. Since late 2012, water from the Catskill and Delaware watersheds has been treated at DEP's new UV disinfection facility in order to achieve Cryptosporidium inactivation. To-date, capital costs committed to the project amount to $1.6B. DEP is also now incurring annual expenses for property taxes, labor, power, and other costs related to plant O&M. FY2015 O&M costs were $19.3M, including taxes.

9.6.f.4 Other: State of Good Repair Projects

In addition to mandated water and wastewater programs, DEP has invested in critical projects related to maintenance and repair of its assets and infrastructure.

9.6.f.5 Initiatives to Reduce Operational Expenditures

To mitigate rate increases, DEP has diligently managed operating expenses and has undertaken an agency-wide program to review and trim costs and to improve the efficiency of the agency's operations. DEP has already implemented changes through this program that will result in a financial benefit of approximately $98.2M in FY2016.

9.6.g History of DEP Water and Sewer Rates

9.6.g.1 Background on DEP Rates

The NYC Water Board is responsible for setting water and wastewater rates sufficient to cover the costs of operating NYC's water supply and wastewater systems (the System). Water supply costs include those associated with water treatment, transmission, distribution, and maintaining a state of good repair. Wastewater service costs include those associated with wastewater conveyance and treatment, stormwater service, and maintaining a state of good repair. The NYC MWFA issues revenue bonds to finance NYC's water and wastewater capital programs, and the costs associated with debt service consume a significant portion of the system revenues. As shown in Figure 9-8, increases in capital expenditures have resulted in increased debt. While confirmed expenditures may decline over the next few years, debt service continues to be on the rise in future years, and will continue to do so with future spending commitments. In FY2015, debt service represented a large percentage (approximately 44 percent) of the System's operating budget.

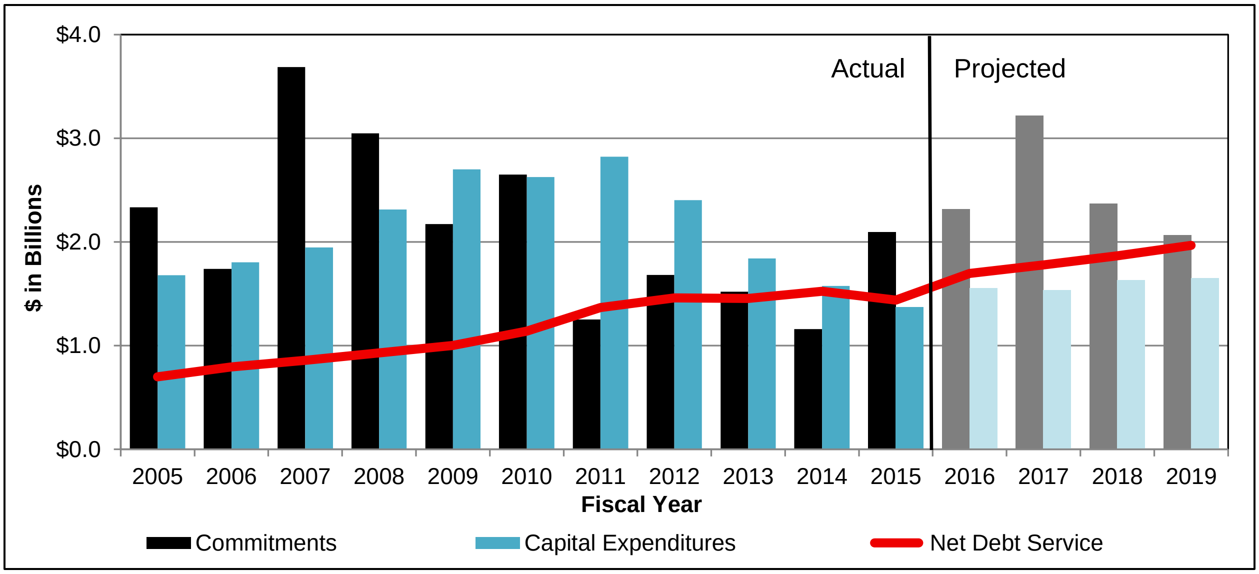


Figure 9-8. Past Costs and Debt Service

For FY2017, most customers will be charged a proposed uniform water rate of $0.52 per 100 gallons of water. Wastewater charges are levied at 159 percent of water charges ($0.83 per 100 gallons). A small percentage of properties are billed a fixed rate. Under the Multi-family Conservation Program (MCP), some properties are billed at a fixed per-unit rate if they comply with certain conservation measures. Some nonprofit institutions are also granted exemption from water and wastewater charges on the condition that their consumption is metered and falls within specified consumption threshold levels. Select properties can also be granted exemption from wastewater charges (i.e., pay only for water services) if they can prove that they do not burden the wastewater system (e.g., they recycle wastewater for subsequent use on-site).

9.6.g.2 Historical Rate Increases to meet Cost of Service

Figure 9-9 shows how water and sewer rates have increased over time and how that compares with system demand and population. Despite a rise in population, water consumption rates have been falling since the 1990s due to metering and increases in water efficiency measures. The increase in population has not kept pace with the increase in the cost of service associated with DEP's capital commitments over the same time period. Furthermore, the total cost of service is spread across a smaller demand number due to the decline in consumption rates. As a result, DEP has had to increase its rates to meet the cost of service. DEP operations are funded almost entirely through rates paid by our customers. From FY2000 to FY2017, water and sewer rates have risen 199 percent, almost tripling. This is despite the fact that DEP has diligently trimmed operating costs and improved the efficiency of the agency's operations

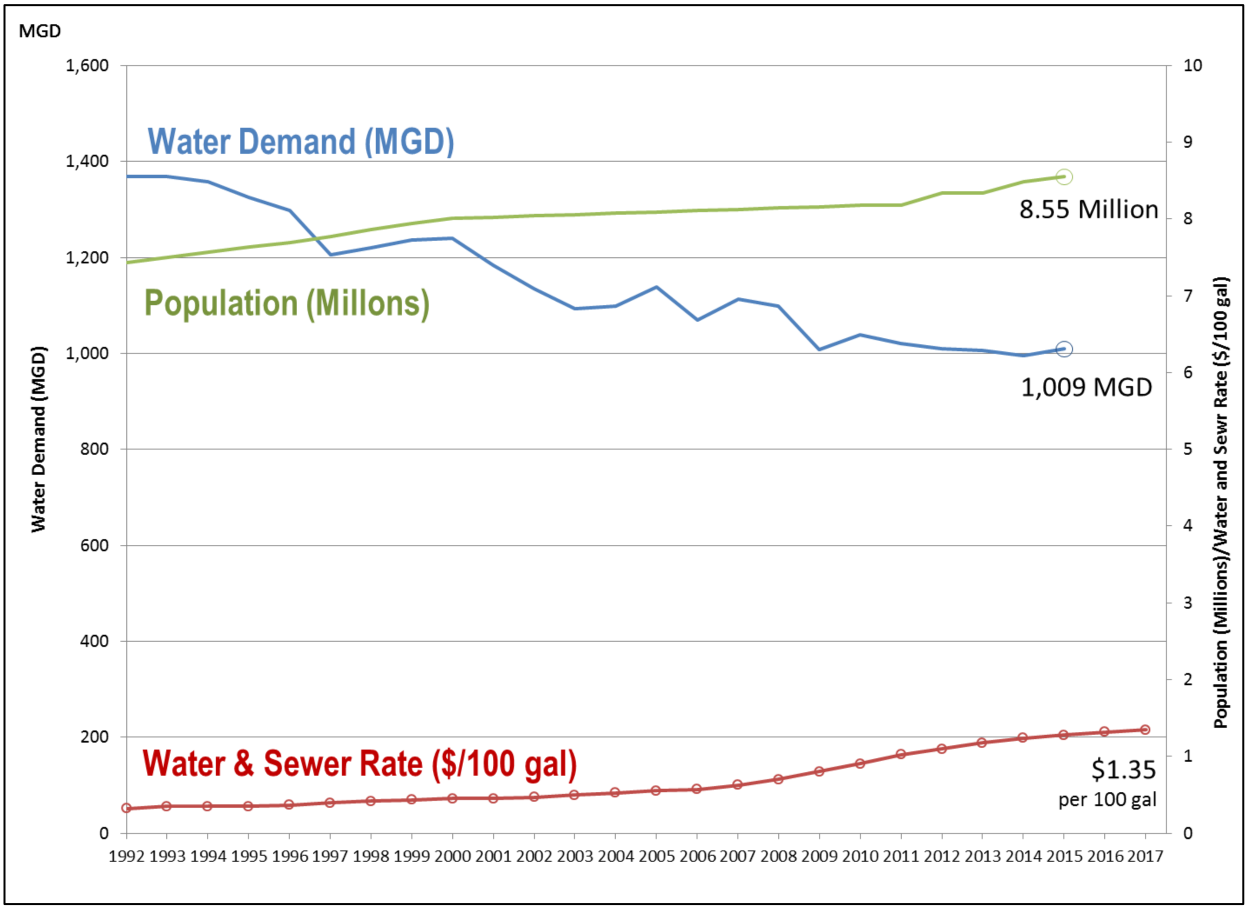


Figure 9-9. Population, Consumption Demand, and Water and Sewer Rates over Time

9.6.g.3 Customer Assistance Programs

Several programs provide support and assistance for customers in financial distress, and DEP continues to expand these programs. The Safety Net Referral Program uses an existing network of NYC agency and not-for-profit programs to help customers with financial counseling, low-cost loans, and legal services. The Water Debt Assistance Program provides temporary water debt relief for qualified property owners who are at risk of mortgage foreclosure. While water and wastewater charges are a lien on the property served, and NYC has the authority to sell these liens to a third party, or lienholder, in a process called a lien sale, DEP offers payment plans for customers who may have difficulty paying their entire bill at one time. DEP and the Water Board also recently created a Home Water Assistance Program (HWAP) to assist low-income homeowners. In this program, DEP has partnered with the NYC Human Resources Administration, which administers the Federal Home Energy Assistance Program (HEAP), and DOF, which provides tax exemptions to senior and disabled homeowners, to identify low-income homeowners who receive HEAP assistance and/or tax exemptions and, thus, are automatically eligible to receive a credit on their DEP bill. DEP is proposing to raise the credit by the general rate increase in FY2017 to $118.32 and to expand HWAP to include as many as 68,200 additional seniors with annual income of less than $50,000 based on DOF verification (approximately 14 percent of total accounts). The proposed expansion of the HWAP program is detailed in Table 9-9.

Table 9-9. Proposed Expansion of the Home Water Assistance Program

Recipient	Current Recipients	Benefit of Current Program with Credit of $118.32 ($M)	Recipients Including Additional Seniors	Benefit with Additional Seniors ($M)
HEAP	11,600	$1.37	11,600	$1.37
Disabled	3,300	$0.39	3,300	$0.39
Seniors	36,800	$4.35	105,000	$12.42
Total	**51,700**	**$6.12**	**119,900**	**$14.19**
Increase in Benefit			**68,200**	**$8.07**

In addition, approximately 58.5 percent of NYCHA customers are on the MCP, whereby they pay a flat fee, provided they implement certain conservation measures. There is also a proposed Multi-family Water Assistance Program for Affordable Housing, where a $250 credit per housing unit would be issued for qualified projects identified by the NYC Housing Preservation and Development. The credit reflects 25 percent of the MCP rate, on which many of the eligible properties are billed. Up to 40,000 housing units will receive this credit, providing $10M of assistance.

The agency has undertaken a communications campaign to ensure that customers know about these programs and any benefits they may be qualified to receive.

9.6.h Future System Investment

Over the next decade, the percentage of mandated project costs already identified in the CIP is anticipated to decrease, but DEP will be funding critical state of good repair projects and other projects needed to maintain NYC's infrastructure to deliver clean water and treat wastewater. Accordingly, as of September 2015, DEP's capital budget for FY2016 through FY2025 is $17.3B. This budget projects capital commitments averaging $1.5B per year, which is similar to the average spending from FY2011 through FY2015 shown in Figure 9-6 above. Moreover, DEP anticipates that there will be additional mandated investments as a result of MS4 compliance, proposed modifications to DEP's in-City WWTP SPDES permits, Superfund remediation, and the 2014 CSO BMP Consent Order. It is also possible that DEP will be required to construct a cover for Hillview Reservoir, as well as other additional wastewater and drinking water mandates. This additional spending is identified as encouraged by the EPA financial capability assessment guidance to create a more accurate and complete picture of NYC's financial capability. Additional details for anticipated future mandated and non-mandated programs are provided below.

9.6.h.1 Potential or Unbudgeted Wastewater Regulations

- Municipal Separate Storm Sewer System (MS4) Permit Compliance

  DEC issued a citywide MS4 permit to NYC, effective on August 1, 2015, that covers municipal separate stormwater system for all NYC agencies.

  DEP is required to coordinate efforts with other NYC agencies and to develop a stormwater management program plan for NYC to facilitate compliance with the permit. This plan will include the necessary legal authority to implement and enforce the stormwater management program, and will develop enforcement and tracking measures and provide adequate resources to comply with the MS4 permit. Some of the stormwater control measures identified through this plan may result in increased costs to DEP, and those costs will be more clearly defined upon completion of the plan. The permit also requires NYC to conduct fiscal analysis of the capital and O&M expenditures necessary to meet the requirements of this permit, including any development, implementation and enforcement activities required, within three years of the effective permit date.

  The full MS4 permit compliance costs are yet to be estimated. DEP's annual historic stormwater capital and O&M costs have averaged $131.6M. However, given the more stringent requirements in the MS4 permit, future MS4 compliance costs are anticipated to be significantly higher than DEP's current stormwater program costs. The future compliance costs will also be shared by other NYC agencies that are responsible for managing stormwater. The projected cost for stormwater and CSO programs in other major urban areas such as Philadelphia and Washington DC are quite high, $2.4B and $2.6B, respectively. According to preliminary estimates completed by Washington District Department of Environment, the MS4 cost could be $7B (green build-out scenario) or as high as $10B (traditional infrastructure) to meet the TMDLs. In FY2014, Philadelphia reported $95.4M for MS4 spending, whereas Washington DC reported $19.5M as part of these annual reports (Philadelphia, 2014; Washington DC, 2014).

  Limited data currently exists for estimating future NYC MS4 compliance costs. Based on estimates from other cities, stormwater retrofit costs have been estimated between $25,000 and $35,000 per impervious acre on the low end, to between $100,000 and $150,000 on the high end. Costs would vary based on the type and level of control selected. For the purpose of developing preliminary MS4 cost estimates for NYC for this analysis, a stormwater retrofit cost of $35,000 per impervious acre was assumed, which results in estimated MS4 compliance costs of about $2B for NYC.

- SPDES Permit Compliance

  On November 1, 2015, newly modified SPDES permits for DEP 14 WWTPs went into effect. These modifications to the SPDES permits may have significant monetary impacts to DEP and include the following requirements:

  - New effluent ammonia limits at many of the DEP WWTPs, and these new effluent ammonia limits may require upgrades at the North River, 26th Ward, and Jamaica WWTPs.

- Monthly sampling for free cyanide with results submitted in a report due on February 1, 2017. After review of the results, DEC may reopen the permits to add a limit or action level for free cyanide.

- Beginning three years from the effective date of the Permit (11/01/2018), maintain and implement an Asset Management Plan (AMP) covering the DEP's WWTPs, pump stations, and CSO control facilities to prioritize the rehabilitation and replacement of capital assets that comprise the AMP Treatment System.

- Develop, implement, and maintain a Mercury Minimization Program (MMP). The MMP is required because the 50 nanograms/liter (ng/L) permit limit exceeds the statewide water quality based effluent limit (WQBEL) of 0.70 ng/L for Total Mercury. The goal of the MMP will be to reduce mercury effluent levels in pursuit of the WQBEL.

- DEC has also advised DEP that fecal coliform, which is the parameter that has been historically used to evaluate pathogen kills and chlorination performance/control, will be changing to enterococcus in accordance with the requirements under the EPA Recreational Water Quality Criteria. This change could result in additional compliance costs.

- The BMPs for CSOs section of the permit has been revised as follows:

    - Additional requirements related to DEP's CSOs to maximize flow were added to the permit as a new Additional CSO BMP Special Condition section, as required pursuant to the 2014 CSO BMP Order. The SPDES Additional CSO Special Conditions include monitoring of any CSOs from specified regulators, reporting requirements for bypasses, and providing notification of equipment out-of-service at the WWTPs during rain events. DEP to assess compliance with requirements to "Maximize Flow to the WWTP" using CSO data from key regulators and to identify options for reducing or eliminating CSOs that occur prior to the WWTP achieving twice design flow. A schedule for reasonable and costs effective options that can be completed within two years must be submitted to DEC for review and approval. Other projects that cannot be completed within two years shall be considered as part of the LTCP process. The costs for compliance for this new permit requirement have not yet been determined, but DEP expects this program will require the expenditure of additional capital and expense dollars.

- Total Residual Chlorine (TRC) Consent Order

  As part of the TRC Consent Order effective October 8, 2015, DEP is required to construct alternate disinfection at 6 WWTPs and following completion of ambient water quality monitoring for TRC may need to develop TRC Facility Plans for the WWTPs that may require further upgrades to the disinfection facility to comply with the TRC SPDES limit.

- Superfund Remediation

  Two major Superfund sites in NYC may affect DEP's Long Term Control Plans, and are at different stages of investigation. The Gowanus Canal Remedial Investigation/ Feasibility Study

(RI/FS) is complete, and remedial design work will take place in the next three to five years. The Newtown Creek RI/FS completion is anticipated for 2018.

DEP's ongoing costs for these projects are estimated to total approximately $50-60M for the next ten years, excluding design or construction costs. EPA's selected remedy for the Gowanus Canal requires that NYC build two combined sewage overflow retention tanks. Potential Superfund costs for the Gowanus Canal range from $650M to $1B. Similar Superfund mandated CSO controls at Newtown Creek could add costs of over $1B.

9.6.h.2 Potential, Unbudgeted Drinking Water Regulation

- Hillview Reservoir Cover

  LT2 also mandates that water from uncovered storage facilities, including DEP's Hillview Reservoir, be treated or that the reservoir be covered. DEP has entered into an Administrative Order with the NYSDOH and an Administrative Order with EPA, both of which mandate NYC to begin work on a reservoir cover by the end of 2018. In August 2011, EPA announced that it would review LT2 and its requirement to cover uncovered finished storage reservoirs such as Hillview. DEP has spent significant funds analyzing water quality, engineering options, and other matters relating to the Hillview Reservoir. Potential costs affiliated with construction are estimated to be on the order of $1.6B.

9.6.h.3 Other: State of Good Repair Projects and Sustainability/Resiliency Initiatives

Wastewater Projects

- Climate Resiliency

  In October 2013, on the first anniversary of Hurricane Sandy, DEP released the NYC Wastewater Resiliency Plan, the nation's most detailed and comprehensive assessment of the risks that climate change poses to a wastewater collection and treatment system. The groundbreaking study, initiated in 2011 and expanded after Hurricane Sandy, was based on an asset-by-asset analysis of the risks from storm surge under new flood maps at all 14 WWTPs and 58 of NYC's pumping stations, representing more than $1B in infrastructure.

  DEP estimates that it will spend $447M in cost-effective upgrades at these facilities to protect valuable equipment and to minimize disruptions to critical services during future storms. It is estimated that investing in these protective measures today will help protect this infrastructure from over $2B in repeated flooding losses over the next 50 years. DEP is currently pursuing funding through the EPA State Revolving Fund Storm Mitigation Loan Program for these upgrades.

  DEP will coordinate this work with the broader coastal protection initiatives, such as engineered barriers and wetlands, described in the 2013 report, "A Stronger, More Resilient New York," and continue to implement the energy, drinking water, and drainage strategies identified in the report to mitigate the impacts of future extreme events and climate change. This includes ongoing efforts to reduce CSOs with GI as part of LTCPs and build-out of high level storm sewers that reduce both flooding and CSOs. It also includes build-out of storm sewers in areas of Queens with limited drainage and continued investments and build-out of the Bluebelt system.

- Energy projects at WWTPs

  NYC's blueprint for sustainability, PlaNYC 2030: A Greener, Greater New York, set a goal of reducing NYC's greenhouse gases (GHG) emissions from 2006 levels by 30 percent by 2017. This goal was codified in 2008 under Local Law 22. In April 2015, NYC launched an update to PlaNYC called One New York: The Plan for a Strong and Just City (OneNYC), which calls for reducing New York City's greenhouse gas emissions by 80 percent below 2005 levels by 2050. In order to meet the OneNYC goal, DEP is working to reduce energy consumption and GHG emissions through reduction of fugitive methane emissions; investment in cost-effective, clean energy projects; and energy efficiency improvements. DEP has approximately $500M allocated in its CIP to make additional system repairs to flares, digester domes, and digester gas piping, in order to maximize capture of fugitive emissions for beneficial use or flaring. A 12 megawatt cogeneration and electrification system is currently in design for the North River WWTP and is estimated to be in operation in winter 2020. The total project cost is estimated at $278M. To reduce energy use and increase energy efficiency, DEP has completed energy audits at all 14 in-City WWTPs. Close to 150 energy conservation measures (ECMs) relating to operational and equipment improvements to aeration, boilers, dewatering, digesters, heating, ventilation and air conditioning, electrical, thickening, and main sewage pumping systems have been identified and accepted for implementation. Energy reductions from these ECMs have the potential to reduce greenhouse gas emissions by over 160,000 MT of carbon emissions at an approximate cost of $140M.

Water Projects

- Water for the Future

  In 2011, DEP unveiled Water for the Future, a comprehensive program to permanently repair the leaks in the Delaware Aqueduct, which supplies half of New York's drinking water. Based on a 10-year investigation and more than $200M of preparatory construction work, DEP is designing a bypass for a section of the Delaware Aqueduct in Roseton and internal repairs for a tunnel section in Wawarsing. Since DEP must shut down the Aqueduct when it is ready to connect the bypass tunnel, DEP is also working on projects that will supplement NYC's drinking water supply during the shutdown, such as implementing demand reduction initiatives, such as offering a toilet replacement program, replacing municipal fixtures, and providing demand management assistance to the wholesale customers located north of NYC. Construction of the shafts for the bypass tunnel is underway, and the project will culminate with the connection of the bypass tunnel in 2022. The cost for this project is estimated to be about $1.5B.

- Gilboa Dam

  DEP is currently investing in a major rehabilitation project at Gilboa Dam at Schoharie Reservoir. Reconstruction of the dam is the largest public works project in Schoharie County, and one of the largest in the entire Catskills. The rehabilitation of Gilboa Dam is part of an approximately $458M program to build and improve other facilities near the dam.

- Kensico Eastview Connection 2

  To ensure the resilience and provide critical redundancy of infrastructure in NYC's water supply system, DEP will be constructing a new tunnel between the Kensico Reservoir and the Ultraviolet Disinfection Facility. The cost for this project is estimated to be about $1.1B.

- Activation of City Tunnel No. 3 Brooklyn/Queens

  The Brooklyn/Queens leg of City Tunnel No. 3 is a 5.5-mile section in Brooklyn that connects to a 5-mile section in Queens. The project is scheduled for completion in the 2020s. When activated, the Brooklyn/Queens leg will deliver water to Staten Island, Brooklyn, and Queens and provide critical redundancy in the system. This project is estimated to cost about $652M.

9.6.i Potential Impacts of CSO LTCPs to Future Household Costs

As previously discussed, DEP is facing significant future wastewater spending commitments associated with several regulatory compliance programs. This section presents the anticipated CSO LTCP implementation costs for NYC and describes the potential resulting impacts to future household costs for wastewater service, when coupled with DEP's current and future investments. As described below, estimating the future rate and income increases through 2040 based on the cumulative impacts of this investment and DEP's other future spending, up to 50 percent of households could pay two percent or more of their income for wastewater services. The information in this section will be refined in future LTCP waterbody submittals.

9.6.i.1 Estimated Costs for Waterbody CSO Preferred Alternative

As discussed in Section 8.8, the preferred LTCP alternative for Coney Island Creek does not include further CSO control related projects. Existing floatables control measures at the Cropsey Avenue Bridge will continue controlling the discharge of floatables associated with the remaining CSO volume at Outfall OH-021. DEP will continue to conduct PCM to determine benefits to bacteria and DO levels from the recently upgraded Avenue V Pumping Station and associated infrastructure. Plans also include management of one percent of the combined sewer impervious area by implementing GI in Coney Island Creek watershed by 2030 and were included in the LTCP baseline conditions. As such, there are no costs directly ascribable to the LTCP preferred alternative.

To-date, approximately $200M has been committed to grey CSO control infrastructure in the Coney Island Creek system.

9.6.i.2 Overall Estimated Citywide CSO Program Costs

DEP's LTCP planning process was initiated in 2012 and will extend through the end of 2017 pursuant to the 2012 CSO Consent Order schedule. Overall anticipated CSO program costs for NYC will not be known until all of the LTCPs have been developed and approved. Capital costs for the LTCP preferred alternatives that have been identified to-date are presented in Table 9-10. Also, GI is a major component of the 2012 CSO Consent Order. The overall GI program cost is estimated at $2.4B, of which $1.5B will be spent by DEP. The GI program costs are in addition to the grey CSO program costs and are therefore presented as a separate line item.

As illustrated in Table 9-10, from FY2002-FY2014, DEP has committed about $2B to CSO control. While the LTCP process is not complete, DEP has committed additional funding towards CSO in the current CIP. Approximately $1.68B has been committed towards CSO investments, which could be some combination of grey, green, and treatment options from F2015- FY2025.

Costs for waterbodies where a LTCP has not yet been prepared will be identified in future LTCP waterbody submittals. The LTCP preferred alternatives for these waterbodies could be a mix of treatment and storage options.

Table 9-10. Committed Costs and Range of Future CSO Program Costs and Water Quality Improvements[1]

Waterbody / Watershed	Historical and Current CIP Commitments	Incurred Cost FY2002-FY2014	Committed Cost FY2015-FY2025[4]	Total Existing CSO Program Cost	LTCP Costs[5]	CSO Reductions from LTCP	
						CSO Volume Reduced (Million Gallons)	CSO Volume Treated (Million Gallons)
Alley Creek and Little Neck Bay	CSO Abatement Facilities and East River CSO	$139,131,521	$12,000,000	$151,131,521	$7,600,000	0	131
Westchester Creek	Hunts Point WWTP Headworks, Regulator Modification, Pugsley Creek Parallel Sewer	$7,800,000	$78,062,000	$85,862,000	$0	0	0
Hutchinson River	Hunts Point WWTP Headworks	$2,876,930	$108,000,000	$110,876,930	$90,000,000	0	584
Flushing Creek	Flushing Bay Corona Avenue Vortex Facility, Flushing Bay CSO Retention, Flushing Bay CSO Storage	$357,015,599	$10,549,000	$367,564,599	$6,890,000	0	82
Bronx River	Installation of Floatable Control Facilities, Hunts Point WWTP Headworks	$46,989,901	$0	$46,989,901	$110,100,000	170	0
Gowanus Canal	Gowanus Flushing Tunnel Reactivation, Gowanus Facilities Upgrade	$176,165,050	$314,463,000	$490,628,050	Included in Superfund Costs [6]	90	0
Coney Island Creek	Avenue V Pumping Station, Force Main Upgrade	$200,899,634	($958,000)	$199,941,634	$0	0	0
Jamaica Bay	Improvements of Flow Capacity to 26th Ward Drainage Area, Hendrix Creek Canal Dredging, Shellbank Destratification, Spring Creek AWCP Upgrade, 26 Ward Wet Weather Improvements	$173,711,633	$397,389,000	$571,110,633			
Flushing Bay[2]	High Level Regulator Mods, Low Level Diversion Sewer (See Flushing Creek for Costs)	$0	$60,094,000	$60,094,000			
Newtown Creek	English Kills Aeration, Newtown Creek Headworks, Bending Weirs, & Floatables Control	$159,639,614	$91,103,000	$250,742,614			
East River and Open Waters	Bowery Bay Headworks, Inner Harbor In-Line Storage, Port Richmond Throttling Facility, Tallman Island Conveyance Improvements, Outer Harbor CSO Regulator Improvements	$153,145,476	($69,000)	$153,076,476			
Bergen and Thurston Basins[3]	Warnerville Pumping Station and Force Main, Bending Weirs	$41,771,863	($187,000)	$41,584,863			
Paerdegat Basin	Retention Tanks, Paerdegat Basin Water Quality Facility	$397,046,297	($5,019,000)	$392,027,297			
Green Infrastructure Program	Miscellaneous Projects Associated with City-wide Green Infrastructure Program	$176,118,589	$ 989,645,000	$1,165,763,589			
Other CSO Controls		$10,429,814	$ 940,050,000	$ 950,479,814			
Total Grey		$1,866,623,333	$2,005,477,000	$3,872,100,333			
Total Grey + Green		$ 2,042,741,921	$ 2,995,122,000	$ 5,037,863,921			

Notes:
(1) All costs reported in this table reflect estimated capital costs only (i.e., probable bid cost). Projected O&M costs are not included. Capital costs are based on estimates from September 2015.
(2) Committed costs for Flushing Bay are captured in the committed costs reported for Flushing Creek;
(3) Bergen and Thurston Basins and Paerdegat Basin are not part of the current LTCP effort; thus, no LTCP detail is provided for them.
(4) Negative values reflect de-registration of committed funds.
(5) LTCP Construction Costs are based on 2015 dollars and are not escalated out to mid-point of construction. None of the LTCPs have been approved and the costs are subject to change.
(6) Potential Superfund costs for the Gowanus Canal range from $650M to $1B
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9.6.i.3 Potential Impacts to Future Household Costs

The potential future rate impacts of the possible future CSO control capital costs were determined by considering capital investments in the current CIP (FY2017-2025); estimated future DEP investments from 2026 to 2040 of $1.5B per year, which is based on the current CIP average of $1.5B per year, inflated by 3 percent per year beginning in 2026; and a conceptual $5B in LTCP spending through 2040 (actual costs have not yet been determined). This potential $5B in LTCP spending is in addition to the $4.2B in existing commitments associated with the WWFP grey CSO control projects and the citywide GI program, resulting in a potential total CSO program financial commitment of $9.2B (see Table 9-11). The cost estimates presented will evolve over the next two years as the LTCPs are completed for the remaining waterbodies and will be updated as the LTCPs are completed.

Table 9-11. Financial Commitment to CSO Reduction

New York City's CSO Program	Financial Commitment ($B)
Waterbody/Watershed Facility Plan and other CSO Projects	$2.7
Green Infrastructure Program	$1.5
LTCP	$5.0(1)
Total	**$9.2**

Notes:

(1) Total LTCP costs are not currently known. For conceptual purposes, up to $5B in LTCP spending through 2040 is assumed. Actual costs will be determined as part of the LTCP planning process.

A 4.75 percent interest rate was used to determine the estimated annual interest cost associated with the capital costs, and the annual debt service was divided by the FY2017 Revenue Plan value to determine the resulting percent rate increase. This also assumes bonds are structured for a level debt service amortization over 32 years. Note that interest rates on debt could be significantly higher in the future. For illustration purposes, future annual O&M increases and other incremental costs were estimated based on historical data.

As Table 9-12 shows, implementation of the current CIP (FY2017-2025) would result in a 60 percent rate increase by 2025. Additional potential mandates and CIP investments from 2026 to 2040 (using an average of $1.5B per year, inflated by 3 percent per year), as well as the up to $5B in total LTCP spending, could add an additional 134 percent. Cumulatively the rates could increase on the order of 194 percent higher than 2016 values.

Table 9-13 shows the potential range of future spending and its impact on household cost compared to MHI for the analysis years of 2016 (current conditions), 2025 (end of current CIP), and 2040 (accounts for anticipated additional spending). While these estimates are preliminary, it should be noted (as discussed in detail earlier in this section), that comparing household cost to MHI alone does not tell the full story since a large percentage of households below the median could be paying a larger percentage of their income on these costs.

Table 9-12. Potential Future Spending Incremental Additional Household Cost Impact

Analysis Year	Percent Rate Increase from Proposed FY 2017 Rates	Additional Annual Household Cost		
		Single-family Home	Multi-family Unit	Average Cost
2025[(1)]	60%	$645	$420	$528
2040[(2)]	134%	$1,447	$940	$1,186
Cumulative Total	**194%**	**$2,092**	**$1,360**	**$1,714**

Notes:

(1) Includes costs for the Current CIP (2017-2025), which has $1.2B in LTCP spending.

(2) Reflects costs in addition to costs through 2025. Includes an estimated $1.5B in annual spending with inflation for 2025-2040. Total LTCP costs are not currently known. For conceptual purposes, up to $5B in LTCP spending through 2040 is assumed.

Figure 9-10 shows the average estimated household cost for wastewater services compared to household income, versus the percentage of households in various income brackets for 2016 (using the proposed FY 2017 rate) and projected future rates for 2025 and 2040 (based on detail included in Table 9-10). As shown, roughly 30 percent of households are estimated to pay two percent or more of their income on wastewater service alone in 2016. Estimating the future rate and income increases to 2025 and 2040 (based on the projected costs in Table 9-12 and historic Consumer Price Index data, respectively), up to 50 percent of households could be paying more than 2 percent of their income on wastewater services when all future spending scenarios would be in place—the average wastewater bill is estimated to be about 2 percent of MHI in 2040. This is summarized in Table 9-14.

Table 9-13. Total Estimated Cumulative Future Household Costs / Median Household Income

Year	Total Projected Annual Household Cost[1]			Projected MHI[2]	Total Water and Wastewater HH Cost / MHI			Total Wastewater HH Cost / MHI		
	Single-family Home	Multi-family Unit	Average HH Cost		Single-family Home	Multi-family Unit	Average HH Cost	Single-family Home	Multi-family Unit	Average HH Cost
2016	$1,078	$700	$883	$53,961	2.00%	1.30%	1.64%	1.23%	0.80%	1.00%
2025	$1,723	$1,120	$1,411	$63,026	2.73%	1.78%	2.24%	1.68%	1.09%	1.37%
2040	$3,170	$2,060	$2,597	$79,830	3.97%	2.58%	3.25%	2.44%	1.58%	2.00%

Notes:
(1) Projected household costs are estimated from rate increases presented in Table 9-12.
(2) Costs were compared to assumed MHI projection which was estimated using Census and Consumer Price Index data.

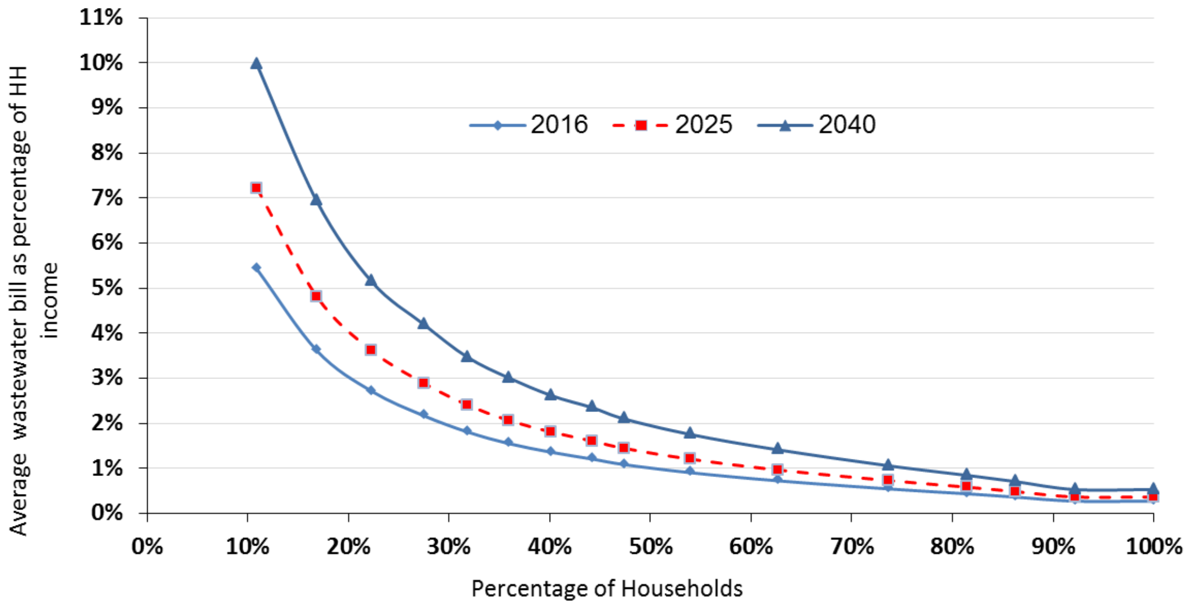

Figure 9-10. Estimated Average Wastewater Household Cost Compared to Household Income (2016, 2025, and 2040)

Table 9-14. Average Household Wastewater Bill / Income Snapshot over Time

Year	RI using Average Wastewater Cost/MHI	RI using Average Wastewater Cost/Upper Limit of Lowest Quintile	RI using Average Wastewater Cost/Upper Limit of Second Quintile	Percent of HH estimated to be paying more than 2% of HH income on Wastewater Services
2016	1.0%	3.0%	1.3%	30%
2025	1.4%	4.1%	1.8%	35%
2040	2.0%	6.0%	2.6%	50%

DEP, like many utilities in the nation, provides both water and wastewater service, and its rate payers see one bill. Currently the average combined water and sewer bill is around 1.6 percent of MHI, but approximately 22 percent of households are estimated to be paying more than 4.5 percent of their income, and that could increase to about 38 percent of households in future years by 2040 as shown in Figure 9-11.

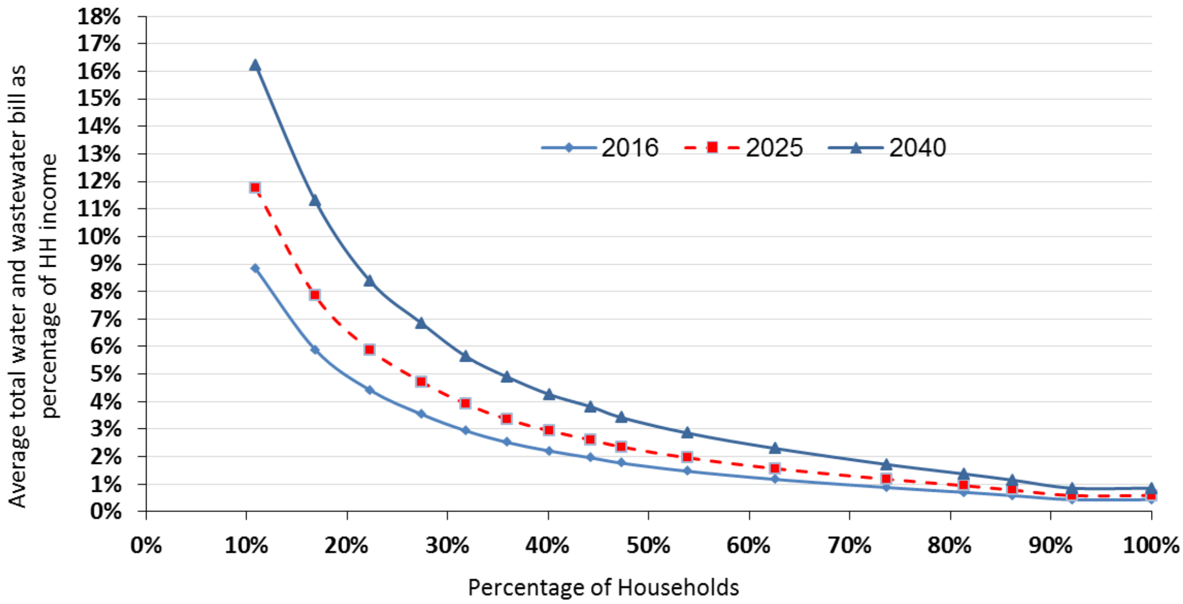

Figure 9-11. Estimated Average Total Water and Wastewater Household Cost Compared to Household Income (2016, 2025, and 2040)

9.6.j Benefits of Program Investments

DEP has been in the midst of an unprecedented period of investment to improve water quality in New York Harbor. Projects worth almost $10B have been completed or are underway since 2002 alone, including projects for nutrient removal, CSO abatement, marshland restoration in Jamaica Bay, and hundreds of other projects. In-NYC investments are improving water quality in the Harbor and restoring a world-class estuary while creating new public recreational opportunities and inviting people to return to NYC's 578 miles of waterfront. A description of citywide water quality benefits resulting from previous and ongoing programs is provided below, followed by the anticipated benefits of water quality improvements to the Coney Island Creek resulting from implementation of the baseline projects.

9.6.j.1 Citywide Water Quality Benefits from Previous and Ongoing Programs and Anticipated Coney Island Creek Water Quality Benefits

Water quality benefits have been documented in the Harbor and its tributaries from the almost $10B investment that NYC has already made in grey and GI since 2002. Approximately 95 percent of the Harbor is available for boating and kayaking, and 14 of NYC's beaches provide access to swimmable waters in the Bronx, Brooklyn, Queens and Staten Island.

Figure 9-12 shows the historical timeline of DEP's investments in wastewater infrastructure since the CWA of 1972. Of the $10B invested since 2002, almost 20 percent has been dedicated to controlling CSOs and stormwater. That investment has resulted in NYC capturing and treating over 70 percent of the combined stormwater and wastewater that otherwise would be directly discharged to our waterways during periods of heavy rain or runoff. Projects that have already been completed include: GI projects in 26th Ward, Hutchinson River and Newtown Creek watersheds; area-wide GI contracts; Avenue V Pumping Station and Force Main; and the Bronx River Floatables Control. Several other major projects are in active construction or design. The water quality improvements already achieved have allowed greater access of the waterways and shorelines for recreation, as well as enhanced environmental habitat and aesthetic conditions in many of NYC's neighborhoods.

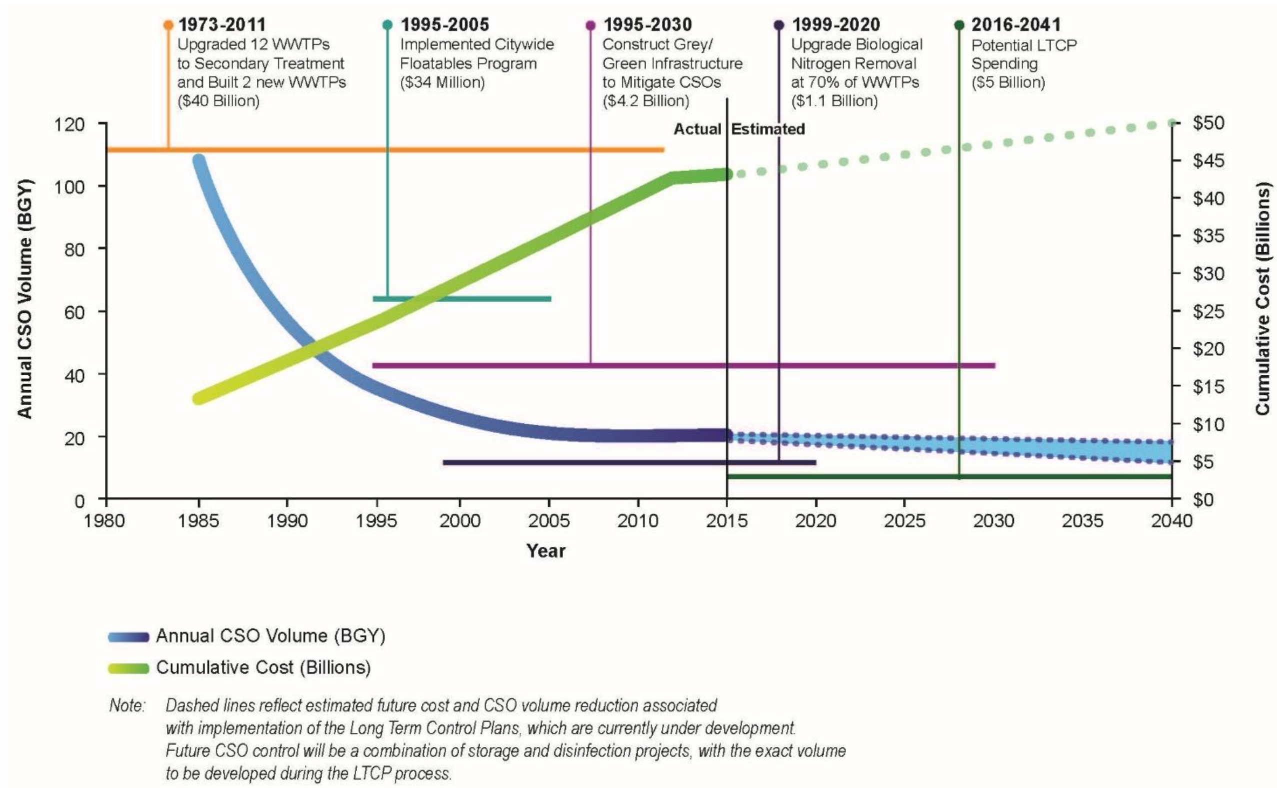

Figure 9-12. Historical Timeline for Wastewater Infrastructure Investments and CSO Reduction Over Time

Although significant investments have been made for water quality improvements Harbor-wide, more work is needed. DEP has committed to working with DEC to further reduce CSOs and make other infrastructure improvements to gain additional water quality improvements. The 2012 CSO Consent Order between DEP and DEC outlines a combined grey and green approach to reduce CSOs. This LTCP for the Coney Island Creek is just one of the detailed plans that DEP is preparing by the year 2017 to evaluate and identify additional control measures for reducing CSO and improving water quality in the Harbor. DEP is also committed to extensive water quality monitoring throughout the Harbor which will allow better assessment of the effectiveness of the controls implemented.

As noted above, a major component of the 2012 CSO Consent Order that DEP and DEC developed is GI stormwater control measures. DEP is targeting implementing GI in priority combined sewer areas citywide. GI will take multiple forms, including green or blue roofs, bioinfiltration systems, right-of-way bioswales, rain barrels, and porous pavement. These measures provide benefits beyond their associated water quality improvements. Depending on the measure installed, they can recharge groundwater, provide localized flood attenuation, provide sources of water for non-potable use (such as watering lawns or gardens), reduce heat island effect, improve air quality, enhance aesthetic quality, and provide recreational opportunities. These benefits contribute to the overall quality of life for residents of NYC.

A detailed discussion of anticipated water quality improvements to the Coney Island Creek is included in Section 8.0.

9.6.k Conclusions

As part of the LTCP process, DEP will continue to develop and refine the affordability and financial capability assessments for each individual waterbody as it works toward an expanded analysis for the citywide LTCP. In addition to what is outlined in the Federal CSO guidance on financial capability, DEP has presented in this section a number of additional socioeconomic factors for consideration in the context of affordability and assessing potential impacts to our ratepayers. Furthermore, it is important to include a fuller range of future spending obligations and DEP has presented an initial picture of that in this section. Ultimately, the environmental, social, and financial benefits of all water-related obligations should be considered when priorities for spending are developed and implementation of mandates are scheduled, so that resources can be focused where the community will get the most environmental benefit.

9.7 Compliance with Water Quality Goals

As noted above, Coney Island Creek is currently not attaining the Class I bacteria criterion. The assessment of the waterbody indicates that Coney Island Creek does not attain Primary Contact WQ Criteria, nor is it suitable for such uses. A UAA is included with this LTCP.

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11.0 GLOSSARY

1.5xDDWF:	One and One-half Times Design Dry Weather Flow
2xDDWF:	Two Times Design Dry Weather Flow
AACE:	Association for the Advancement of Cost Engineering
AMP:	Asset Management Plan
BEACH:	Beaches Environmental Assessment and Coastal Health
BGY:	Billon Gallons Per Year
BMP:	Best Management Practice
BOD:	Biochemical Oxygen Demand
CEG:	Cost Effective Grey
CI:	Coney Island
CIC:	Coney Island Creek
CICWQM:	Coney Island Creek Water Quality Model
CIP:	Capital Improvement Plan
CPK:	Central Park
CSO:	Combined Sewer Overflow
CSS:	Combined Sewer System
CWA:	Clean Water Act
DCIA:	Directly Connected Impervious Areas
DCP:	New York City Department of City Planning
DDC:	New York City Department of Design and Construction
DDWF:	Design Dry Weather Flow
DEC:	New York State Department of Environmental Conservation
DEP:	New York City Department of Environmental Protection
DOB:	New York City Department of Buildings

DOE:	New York City Department of Education
DOF:	New York City Department of Finance
DOH:	New York State Department of Health
DOHMH:	New York City Department of Health and Mental Hygiene
DPR:	New York City Department of Parks and Recreation
DWF:	Dry Weather Flow
EBP:	Environmental Benefit Project
ECL:	New York State Environmental Conservation Law
ECM:	Energy Conservation Measure
EDC:	New York City Economic Development Corporation
EPA:	United States Environmental Protection Agency
ET:	Evapotranspiration
EWR:	Newark Liberty International Airport
FAD:	Filtration Avoidance Determination
FCA:	Financial Capability Analysis
FCI:	Financial Capability Indicators
FMPV:	Full Market Property Value
FT:	Abbreviation for “Feet”
FY:	Fiscal Year
GHG:	Greenhouse Gases
GI:	Green Infrastructure
GIS:	Geographical Information System
GM:	Geometric Mean
G.O.:	General Obligation
GRTA:	NYC Green Roof Tax Abatement
HEAP:	Home Energy Assistance Program

HH:	Household
HLSS:	High Level Storm Sewers
HRC:	High Rate Classification
HSM:	Harbor Survey Monitoring Program
HWAP:	Home Water Assistance Program
IEC:	Interstate Environmental Commission
in.:	Abbreviation for “Inches”.
in/hr:	Inches per hour
IW:	InfoWorks CS™
JFK:	John F. Kennedy International Airport
KOTC:	Knee-of-the-Curve
lbs/day:	pounds per day
lf:	Linear feet
LGA:	LaGuardia Airport
LT2:	Long Term 2
LTCP:	Long Term Control Plan
MCP:	Multifamily Conservation Program
mg/L:	milligrams per liter
MG:	Million Gallons
MGD:	Million Gallons Per Day
MGY:	Million Gallons Per Year
MHI:	Median Household Income
MMP:	Mercury Minimization Program
MOU:	Memorandum of Understanding
MPN:	Most probable number
MS4:	Municipal separate storm sewer systems

MWFA:	New York City Municipal Water Finance Authority
NMC:	Nine Minimum Control
NOAA:	National Oceanic and Atmospheric Administration
NPDES:	National Pollutant Discharge Elimination System
NPW:	Net Present Worth
NYC:	New York City
NYCHA:	New York City Housing Authority
NYCRR:	New York Codes, Rules and Regulations
NYCT:	New York City Transit
NYS:	New York State
O&M:	Operation and Maintenance
OGI:	Office of Green Infrastructure
OH:	Owls Head
PBC:	Probable Bid Cost
PCM:	Post-Construction Compliance Monitoring
POTW:	Publicly Owned Treatment Plant
PS:	Pump Station or Pumping Station
RI:	Residential Indicator
ROD:	Record of Decision
ROW:	Right-of-Way
ROWB:	Right-of-way bioswales
RTB:	Retention Treatment Basin
RWQC:	Recreational Water Quality Criteria
S&P:	Standard and Poor
SCA:	NYC School Construction Authority
SDWA:	Safe Drinking Water Act

SM:	Sentinel Monitoring
SPDES:	State Pollutant Discharge Elimination System
SSS:	Sanitary Sewer Systems
STV:	Statistical Threshold Value
SWIM:	Stormwater Infrastructure Matters Coalition
SYNOP:	Synoptic Surface Plotting Models
TBD:	To Be Determined
TMDL:	Total Maximum Daily Load
TOC:	Total Organic Carbon
TRC:	Total Residual Chlorine
TSS:	Total Suspended Solids
UAA:	Use Attainability Analysis
U.S.:	United States
UV:	Ultraviolet Light
WQ:	Water Quality
WQBEL:	Water Quality Based Effluent Limitations
WQS:	Water Quality Standards
WWFP:	Waterbody/Watershed Facility Plan
WWOP:	Wet Weather Operating Plan
WWTP:	Wastewater Treatment Plant

Appendix A: Supplemental Tables

Annual CSO, Stormwater, Direct Drainage,
Local Source Baseline Volumes (2008 Rainfall)

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
Coney Island Creek	OH-021	V	74.5
Gravesend Bay	OH-015	9	1105.7
		Total CSO	**1180.2**

MS-4 Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Discharge, (MG/Yr)**
Coney Island Creek	CI-601	NA	38.4
Coney Island Creek	CI-602	NA	79.0
Coney Island Creek	CI-639	NA	118.9
Coney Island Creek	CI-640	NA	49.3
Coney Island Creek	CI-641	NA	78.6
Coney Island Creek	CI-653	NA	65.0
Coney Island Creek	CI-664	NA	65.9
Coney Island Creek	CI-665	NA	42.7
Coney Island Creek	OH-021	NA	721.5
		Total MS-4	**1259.2**

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Discharge, (MG/Yr)**
Coney Island Creek	OH--62	NA	9.5
Gravesend Bay	OH--63	NA	10.6
Gravesend Bay	OH--64	NA	15.2
Gravesend Bay	OH--65	NA	38.0
Gravesend Bay	OH-875	NA	33.3
		Total Stormwater	**106.6**

Direct Runoff Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Discharge, (MG/Yr)**
Coney Island Creek	OH--68	NA	3.5
Coney Island Creek	OH--69	NA	5.1
Coney Island Creek	OH--70	NA	2.2
Coney Island Creek	OH--71	NA	3.3
Coney Island Creek	OH--72	NA	7.0
Coney Island Creek	OH--73	NA	6.0
Coney Island Creek	CI--61a	NA	5.5
Coney Island Creek	CI--61b	NA	4.6
Coney Island Creek	CI--61c	NA	2.8
Coney Island Creek	CI--61d	NA	3.9
Gravesend Bay	OH--61	NA	16.2
Gravesend Bay	OH--66	NA	9.3
Gravesend Bay	OH--67	NA	6.5
Gravesend Bay	OH--86	NA	9.4
Gravesend Bay	OH--87	NA	21.1
Gravesend Bay	CI--61	NA	68.6
		Total Direct Runoff	**175.3**

Highway Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
Coney Island Creek	CI--61e		11.7
Gravesend Bay	OH--88		7.6
		Total Highway	**19.3**

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
Coney Island Creek			1399.0
Gravesend Bay			1341.7

Totals by Source			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
CSO			1180.2
MS-4			1259.2
Stormwater			106.6
Direct Runoff			175.3
Highway			19.3

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total Discharge (MG/Yr)**
Coney Island Creek	CSO	3	74.5
	MS-4	46	1259.2
	Stormwater	0	9.5
	Direct Runoff	2	44.1
	Highway	0	11.7
Gravesend Bay	CSO	40	1105.7
	MS-4	0	0.0
	Stormwater	4	97.1
	Direct Runoff	5	131.2
	Highway	0	7.6
		Total	**2740.7**

Annual CSO, Stormwater, Direct Drainage,
Local Sources Enterococci Loads (2008 Rainfall)

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (10^{12} cfu/Yr)**
Coney Island Creek	OH-021	V	548.1
Gravesend Bay	OH-015	9	7010.5
		Total CSO	**7558.5**

MS-4 Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (10^{12} cfu/Yr)**
Coney Island Creek	CI-601	NA	40.2
Coney Island Creek	CI-602	NA	82.6
Coney Island Creek	CI-639	NA	124.4
Coney Island Creek	CI-640	NA	13.1
Coney Island Creek	CI-641	NA	82.2
Coney Island Creek	CI-653	NA	68.0
Coney Island Creek	CI-664	NA	69.0
Coney Island Creek	CI-665	NA	44.8
Coney Island Creek	OH-021	NA	753.6
		Total MS-4	**1277.8**

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (10^{12} cfu/Yr)**
Coney Island Creek	OH--62	NA	10.1
Gravesend Bay	OH--63	NA	11.3
Gravesend Bay	OH--64	NA	16.1
Gravesend Bay	OH--65	NA	39.7
Gravesend Bay	OH-875	NA	34.8
		Total Stormwater	**111.9**

Direct Runoff Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (10^{12} cfu/Yr)**
Coney Island Creek	OH--68	NA	0.9
Coney Island Creek	OH--69	NA	1.2
Coney Island Creek	OH--70	NA	0.6
Coney Island Creek	OH--71	NA	0.8
Coney Island Creek	OH--72	NA	1.6
Coney Island Creek	OH--73	NA	1.4
Coney Island Creek	CI--61a	NA	1.3
Coney Island Creek	CI--61b	NA	1.1
Coney Island Creek	CI--61c	NA	0.7
Coney Island Creek	CI--61d	NA	0.9
Gravesend Bay	OH--61	NA	3.7
Gravesend Bay	OH--66	NA	2.2
Gravesend Bay	OH--67	NA	1.5
Gravesend Bay	OH--86	NA	2.1
Gravesend Bay	OH--87	NA	4.8
Gravesend Bay	CI--61	NA	15.6
		Total Direct Runoff	**40.6**

Highway Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (10^{12} cfu/Yr)**
Coney Island Creek	CI--61e		3.6
Gravesend Bay	OH--88		2.3
		Total Highway	**5.9**

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total Load (10^{12} cfu/Yr)**
Coney Island Creek			1850.2
Gravesend Bay			7144.6

Totals by Source			
Waterbody	**Outfall**	**Regulator**	**Total Load (10^{12} cfu/Yr)**
CSO			7558.5
MS-4			1277.8
Stormwater			111.9
Direct Runoff			40.6
Highway			5.9

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total Load (10^{12} cfu/Yr)**
Coney Island Creek	CSO	6	548.1
	MS-4	14	1,277.8
	Stormwater	0	10.1
	Direct Runoff	0	10.6
	Highway	0	3.6
Gravesend Bay	CSO	78	7010.5
	MS-4	0	0.0
	Stormwater	1	101.8
	Direct Runoff	0	30.0
	Highway	0	2.3
		Total	**8,994.7**

Annual CSO, Stormwater, Direct Drainage,
Local Sources Fecal Coliform Loads (2008 Rainfall)

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (10^{12} cfu/Yr)**
Coney Island Creek	OH-021	V	971.5
Gravesend Bay	OH-015	9	24927.9
		Total CSO	**25899.4**

MS-4 Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (10^{12} cfu/Yr)**
Coney Island Creek	CI-601	NA	39.5
Coney Island Creek	CI-602	NA	81.1
Coney Island Creek	CI-639	NA	122.1
Coney Island Creek	CI-640	NA	22.4
Coney Island Creek	CI-641	NA	80.7
Coney Island Creek	CI-653	NA	66.8
Coney Island Creek	CI-664	NA	67.7
Coney Island Creek	CI-665	NA	43.9
Coney Island Creek	OH-021	NA	739.9
		Total MS-4	**1264.2**

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (10^{12} cfu/Yr)**
Coney Island Creek	OH--62	NA	9.9
Gravesend Bay	OH--63	NA	11.1
Gravesend Bay	OH--64	NA	15.8
Gravesend Bay	OH--65	NA	39.0
Gravesend Bay	OH-875	NA	34.1
		Total Stormwater	**109.9**

Direct Runoff Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (10^{12} cfu/Yr)**
Coney Island Creek	OH--68	NA	0.6
Coney Island Creek	OH--69	NA	0.8
Coney Island Creek	OH--70	NA	0.4
Coney Island Creek	OH--71	NA	0.6
Coney Island Creek	OH--72	NA	1.1
Coney Island Creek	OH--73	NA	0.9
Coney Island Creek	CI--61a	NA	0.9
Coney Island Creek	CI--61b	NA	0.7
Coney Island Creek	CI--61c	NA	0.5
Coney Island Creek	CI--61d	NA	0.6
Gravesend Bay	OH--61	NA	2.5
Gravesend Bay	OH--66	NA	1.4
Gravesend Bay	OH--67	NA	1.0
Gravesend Bay	OH--86	NA	1.4
Gravesend Bay	OH--87	NA	3.2
Gravesend Bay	CI--61	NA	10.4
		Total Direct Runoff	**27.0**

Highway Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (10^{12} cfu/Yr)**
Coney Island Creek	CI--61e		9.0
Gravesend Bay	OH--88		5.8
		Total Highway	**14.8**

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total Load (10^{12} cfu/Yr)**
Coney Island Creek			2261.7
Gravesend Bay			25053.6

Totals by Source			
Waterbody	**Outfall**	**Regulator**	**Total Load (10^{12} cfu/Yr)**
CSO			25899.4
MS-4			1264.2
Stormwater			109.9
Direct Runoff			27.0
Highway			14.8

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total Load (10^{12} cfu/Yr)**
Coney Island Creek	CSO	4	971.5
	MS-4	5	1,264.2
	Stormwater	0	9.9
	Direct Runoff	0	7.1
	Highway	0	9.0
Gravesend Bay	CSO	91	24927.9
	MS-4	0	0.0
	Stormwater	0	100.0
	Direct Runoff	0	20.0
	Highway	0	5.8
		Total	**27,315.3**

Annual CSO, Stormwater, Direct Drainage,
Local Sources BOD_5 Loads (2008 Rainfall)

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (Lbs/Yr)**
Coney Island Creek	OH-021	V	10839.3
Gravesend Bay	OH-015	9	294987.1
		Total CSO	**305826.3**

MS-4 Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (Lbs/Yr)**
Coney Island Creek	CI-601	NA	2887.9
Coney Island Creek	CI-602	NA	5930.9
Coney Island Creek	CI-639	NA	8927.3
Coney Island Creek	CI-640	NA	3702.6
Coney Island Creek	CI-641	NA	5896.9
Coney Island Creek	CI-653	NA	4882.6
Coney Island Creek	CI-664	NA	4950.2
Coney Island Creek	CI-665	NA	3213.1
Coney Island Creek	OH-021	NA	54066.3
		Total MS-4	**94457.8**

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (Lbs/Yr)**
Coney Island Creek	OH--62	NA	726.9
Gravesend Bay	OH--63	NA	811.3
Gravesend Bay	OH--64	NA	1152.6
Gravesend Bay	OH--65	NA	2849.1
Gravesend Bay	OH-875	NA	2495.7
		Total Stormwater	**8035.5**

Direct Runoff Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (Lbs/Yr)**
Coney Island Creek	OH--68	NA	290.7
Coney Island Creek	OH--69	NA	403.3
Coney Island Creek	OH--70	NA	182.6
Coney Island Creek	OH--71	NA	274.6
Coney Island Creek	OH--72	NA	542.9
Coney Island Creek	OH--73	NA	468.6
Coney Island Creek	CI--61a	NA	429.6
Coney Island Creek	CI--61b	NA	361.9
Coney Island Creek	CI--61c	NA	231.4
Coney Island Creek	CI--61d	NA	308.2
Gravesend Bay	OH--61	NA	1227.6
Gravesend Bay	OH--66	NA	716.9
Gravesend Bay	OH--67	NA	510.7
Gravesend Bay	OH--86	NA	706.3
Gravesend Bay	OH--87	NA	1584.9
Gravesend Bay	CI--61	NA	5150.0
		Total Direct Runoff	**13390.3**

Highway Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Load (Lbs/Yr)**
Coney Island Creek	CI--61e		890.7
Gravesend Bay	OH--88		571.6
		Total CSO	**1462.3**

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total Load (Lbs/Yr)**
Coney Island Creek			110408.5
Gravesend Bay			312763.7

Totals by Source			
Waterbody	**Outfall**	**Regulator**	**Total Load (Lbs/Yr)**
CSO			305826.3
MS-4			94457.8
Stormwater			8035.5
Direct Runoff			13390.3
Highway			1462.3

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total Load (Lbs/Yr)**
Coney Island Creek	CSO	3	10839.3
	MS-4	22	94,457.8
	Stormwater	0	726.9
	Direct Runoff	1	3493.7
	Highway	0	890.7
Gravesend Bay	CSO	70	294987.1
	MS-4	0	0.0
	Stormwater	2	7308.6
	Direct Runoff	2	9896.5
	Highway	0	571.6
		Total	**423,172.2**

Appendix B: Long Term Control Plan (LTCP) Coney Island Creek Meeting #1 – Summary of Meeting and Public Comments Received

On November 4, 2015 DEP hosted the first public meeting for the water quality planning process for long term control of combined sewer overflows (CSOs) in Coney Island Creek. The two-hour event, held at the PS 90, Brooklyn, provided overview information about DEP's Long Term Control Plan (LTCP) Program, presented information on the Coney Island Creek watershed characteristics and status of waterbody improvement projects, obtained public information on waterbody uses in Coney Island Creek, and described additional opportunities for public input and outreach. The presentation can be found at http://www.nyc.gov/dep/ltcp.

Approximately fifteen people from the public attended the event as well as representatives from the Department of Environmental Protection and the New York State Department of Environmental Conservation. The following summarizes the questions and comments from attendees as well as responses given.

Q. An attendee asked what is the rest of the City's sewer area besides 60% of combined sewer area?

A. DEP stated that the rest of the area is separate stormwater and direct drainage.

Q. An attendee asked if gravity and slope have influence on the CSO activation?

A. DEP stated that topography and slope of the area do impact how the CSO flows.

Q. An attendee expressed a concern about odor issues near Outfall OH-021 during dry weather?

A. DEP stated that they did not experience strong odors during recent waterbody excursion some staff had taken. During the excursion, some dry weather flows were and were identified as potential illicit connections. Regarding illicit connections, DEP stated that over 30 establishments were dye tested and six were found to have illicit connections. The Sentinel Monitoring program abated these connections and continues to work on track down and abatement of illicit connections within the creek.

Q. An attendee asked what were the number of activations for Coney Island Creek obtained from the model?

A. DEP stated that flowmeters were installed and the data was used to calibrate the model and calculate the number of CSO events.

Q. An attendee asked what is DEC's input and does DEC approve/disapprove LTCP plans?

A. DEP stated that we conduct sampling, modeling and analytical work and then engineers develop alternatives and prepare an LTCP report which gets submitted for DEC for review and approval. There is a comment process between DEP and DEC until a final decision is made.

Q. An attendee asked if DEP has any coordination with EDC?

A. DEP stated that they and EDC coordinate closely.

Q. An attendee asked if DEP advocates eating fish?

A. DEP stated that recommended use for the Coney Island Creek is “Recreational Fishing” for sports not eating, as per the DEC fish advisory on the DEC website.

Q. An attendee asked if DEP collects benthic samples?

A. DEP stated that it tests only for water quality such as bacteria and dissolved oxygen (DO). There are other specific programs that sample for benthic but it is much more labor intense and therefore samples on less frequent bases.

Q. An attendee asked why DEP doesn’t sample for other toxic chemicals in the Creek and who is going to test if this is not under DEP’s mandate?

A. DEP stated that the LTCP CSO program is focused on pathogens and DO and as a result there are limits to what water quality tests are conducted for the process. Other agencies such as the New York State Department of Environmental Conservation conduct their own water quality tests and initiate water quality programs.

Q. An attendee asked why bacteria from dogs fecal matter that washes with stormwater is not addressed?

A. DEP stated that public education to encourage people to properly dispose of dog waste is part of the solution.

Q. An attendee asked what would cause DEP to dredge a waterbody?

A. DEP stated that one of the causes is exposed contaminated with heavy metals sediment mounds. CSO typically is not a source of heavy metals

Long Term Control Plan (LTCP) Coney Island Creek Meeting # 2 – Summary of Meeting and Public Comments Received

On April 20, 2016 DEP hosted the second public meeting for the water quality planning process for the Long Term Control Plan (LTCP) of combined sewer overflows (CSOs) in Coney Island Creek. The two-hour event was held at the New York Aquarium's Education Hall in Coney Island, Brooklyn. DEP presented information on:

- Addressing previous public comments received regarding: evaluation of alternatives that will make the Creek safe for fishing and swimming; concerns about legacy contamination in the Creek; elimination of illicit discharges; and assessment of Green Infrastructure in the vicinity of the Creek.
- Recent investments and ongoing construction within the Coney Island Creek watershed.
- NYC Green Infrastructure program.
- Results from LTCP sampling program.
- Evaluation of potential alternatives.

Four breakout sessions were then held to further discuss:

- Public concern and interests in CSO control
- Water quality classifications and uses
- Green Infrastructure and municipal separate storm sewer system (MS4) program, and
- Water rates and affordability.

The event finished with DEP providing a summary of discussions held during the breakout sessions, the ongoing LTCP public participation program, the next steps for the LTCP, and a brief question and answer session. The presentation and breakout session poster boards can be found at http://www.nyc.gov/dep/ltcp.

Approximately forty people from the public attended the event, as well as representatives from the Department of Environmental Protection (DEP). The following summarizes the questions and comments from attendees, as well as responses given.

Q: An attendee asked if the issue has been addressed at Ave. V Pump Station where dry weather discharges were occurring.

> A: DEP responded that there was a rare issue caused by an electrical problem within the Variable Frequency Pumping, but it is resolved now.

Q: An attendee asked whether the new construction on Neptune and Mermaid Avenues and 33rd and Bayview is related to a DEP project.

A: DEP stated that yes this is correct. DEP is currently installing storm and sanitary sewers, as well as trunk and distribution mains in this area.

Q: DEP presented a slide on Legacy Industrial Contamination and environmental dredging that was conducted by the New York State Department of Environmental Conservation (DEC). An attendee asked where the dredged material was transported to.

> A: DEP responded that there are strict regulations as to where materials can be disposed. There are several different facilities depending upon the type of contamination. A public meeting attendee stated that he believes the material was treated on site.

Q: An attendee asked for confirmation that DEP was referring to the site of the former gas tanks.

A: DEP responded yes, the project was related to the former Brooklyn Borough Gas Works site at the head end of Coney Island Creek.

Q: An attendee asked how stormwater flow can be tracked in the sewer.

A: DEP responded that a dye study is conducted in order to determine the flow. In the past, smoke testing was used in the sewer pipe.

Q: An attendee asked what the status of the water quality is now compared to the goals that DEP has set for the future.

A: DEP responded that this question will be discussed later in the presentation.

Q: An attendee asked if any studies were ever conducted regarding retention time at different parts of the Creek.

A: DEP responded that retention time is a part of the model used for Coney Island Creek. However, the retention time is not a variable that is typically looked at but can be generated.

Q: An attendee asked if the DEP speaker is referring to the 2009 HydroQual model and if sampling has been done since that study.

A: DEP responded that the 2009 HydroQual model was the starting point. Additional sampling was done in 2015 to add data and evaluate the model.

Q: An attendee asked if there are any plans for the Pump Station located at W. 24th Street near the Mark Twain Junior High School.

A: DEP responded that this is a former fire control Pumping Station and New York City is looking into potential uses of it.

Q: An attendee commented that new developments are being constructed on the east side of Coney Island Creek. The attendee stated that these developers should provide shoreline access points for the public and that by not doing so an opportunity was missed.

A: DEP responded that the comment will be taken into consideration.

Q: An attendee expressed concern about new developments and additional stormwater runoff that could contribute to CSOs. The attendee asked if DEP is taking these developments into consideration.

A: DEP responded that any new development in the CSO area has to comply with the 2012 stormwater rule which greatly increased how much runoff new development must control onsite. For the Long Term Control Plans the DEP model is based on future projections (year 2040) from City planning that takes into consideration the flows and loads with future development.

Q: An attendee asked what the purpose of the vertical and horizontal storage tanks/pumping stations and where do they pump to, Avenue V?

A: DEP responded that both a vertical shaft and a horizontal tunnel are types of CSO storage that will hold the CSO until the storm is over. The mixture of stormwater and sanitary flow is then pumped to Avenue V during dry weather and then to the Wastewater Treatment Plant.

Q: An attendee asked how deep vertical shafts and horizontal tunnels go.

A: DEP responded that the horizontal tunnels can be 40 to 80 feet deep while vertical shafts are often 100 feet deep.

Q: An attendee expressed concern about observing a truck dumping possible food products into the water recently. Is there a direct number to call regarding the issue?

A: DEP responded that DEC should be contacted though 1-8844-DEC-ECOS or 1-844-332-3267 and that it is always good to inform several parties. DEP asked to contact them as well and they will speak with DEC regarding the issue.

Q: An attendee asked how the storage tanks and tunnels are to be constructed.

A: DEP responded that they are looking into the topography of Coney Island. The terrain has some construction challenges but DEP believes that it could be possible. DEP has reached out to a consulting company that specializes in tunnels to see what is viable or not.

Q: An attendee asked if DEP has established a timeline as to when the vertical tunnel construction will start.

A: DEP responded that right now they do not even have a recommendation from the consulting company, and DEP is still evaluating their options. DEP also reiterated that the most cost-effective CSO project was already implemented with the construction of the Ave. V pump station upgrade. CSO volumes were reduced by 69% as a result of the project.

Breakout Session Summaries

Following the presentation, 4 breakout sessions were convened throughout the room for 30 minutes to allow for more detailed discussion surrounding the following topics:

- CSO controls
- Water Quality Classification and Uses
- Green Infrastructure and MS4
- Water Rates and Affordability

CSO Controls

Approximately 11 individuals visited the CSO controls breakout session hosted by Jim Mueller. The following topics were discussed during the session:

- Bending wire heights
- Illegal discharges
- Separate sewer system
- Diminishing returns for additional CSO control
- Continue to focus on illicit discharges
- Source control as a part of Toolbox option
- Educational programs along the Coney Island Creek
- Source control for existing MS4
- Relocation of stormwater discharges
- Fecal/Enterococcus ratio
- Impact of stormwater on flooding
- Illegal curb cuts and impervious pavement within privet properties
- CSO control before and now

Water Quality Classification and Uses

Approximately 10 individuals visited the Water Quality Classification and Uses breakout session hosted by Keith Mahoney and Lily Lee. The following topics were discussed during the session:

- Sampling program and remediation of dry weather sources
- Floatables control within the Creek
- Coastal barrier and how it can affect the water quality
- MS4 program
- Capping off all MS4 outfalls
- Dissolved oxygen attainment within the Creek
- Illicit discharges to the Creek and ways of preventing it
- Oyster shelling program within the Creek
- Grant programs available within the Coney Island Creek watershed

Green Infrastructure and MS4

Approximately 9 individuals visited the Green Infrastructure and MS4 breakout session hosted by Mikelle Adgate. The following topics were discussed during the session:

- What is MS4 and how it can be connected with Green Infrastructure Programs
- Why Green Infrastructure was not included in LTCP for Coney Island Creek
- How many Green Infrastructure Programs are feasible within Coney Island Creek watershed
- What is bioswale and how bioswale implementation can help the community
- Impact and limitations of groundwater towards Green Infrastructure projects
- Green roofs as a part of Green Infrastructure Program
- What public spaces can be used for Green Infrastructure and MS4
- Public and Privet Grant Programs
- MS4 as a new initiative to expand Green Infrastructure opportunities within the Creek
- Funding allocation for CSO and MS4
- Possibility of waterborne insects within Green Infrastructure Programs and MS4 (Zika Virus)

Affordability

Approximately 3 individuals visited the Affordability breakout session hosted by Sangamithra Iyer. The following topics were discussed during the session:

- Cost funding and schedule for CSO projects
- Funding schedule for each project
- Home Water Assistance Programs
- Water and sewer rates

S.W.I.M. Coalition
Stormwater Infrastructure Matters: utilizing stormwater as a resource, not a waste!

December 4, 2015

The Honorable Emily Lloyd
Commissioner
NYC DEP
59-17 Junction Blvd
Flushing, NY 11373

RE: S.W.I.M. Coalition Comments on the forthcoming Coney Island Creek CSO Long Term Control Plan

Dear Commissioner Lloyd,

The Stormwater Infrastructure Matters (S. W. I. M.) Coalition submits this letter in response to the New York City Department of Environmental Protection's (DEP) invitation for public comments concerning the development of the Coney Island Creek CSO Long Term Control Plan (LTCP).

The S.W.I.M. Coalition represents over 70 organizations dedicated to ensuring swimmable and fishable waters around New York City through natural, sustainable stormwater management practices. Our members are a diverse group of community-based, citywide, regional and national organizations, water recreation user groups, institutions of higher education, and businesses.

On behalf of the S.W.I.M. Coalition Steering Committee, please accept these comments regarding the Coney Island Creek LTCP process:

Public Participation

At the November 4th Kick-off meeting for the Coney Island Creek CSO LTCP, community members raised concerns regarding the public notification process for DEP's public meetings and suggested that DEP post fliers in highly trafficked public spaces in order to accomplish better attendance of the meetings. There were no more than a dozen attendees for the November 4th public meeting outside of NYC DEP, and including representatives from NYS DEC and SWIM Coalition. Several attendees noted that they did not see any public notices about the meeting but rather heard about it through personal contacts.

We appreciate DEP's efforts over the last several years to improve its openness about the CSO LTCP planning process and its willingness to receive constructive feedback from S.W.I.M. and other members of the public. Engaging the community is an educational opportunity and a chance for DEP to build alliances with and promote the need for an informed citizenry that understands the relationship of water consumption and water quality.

Lack of attendance at the public meetings results in missed educational opportunities for the community. A scarcity of public notification loses the trust of the local community who would like to be informed of water quality improvements in the neighborhood, and who can influence their neighbors and build awareness about ways citizens can assist the City's water quality improvement efforts.

Outreach could be expanded by sending fliers to residents in the watershed, reaching out to local community organizations for help with distribution of the flyers, and making announcements in local news sources used by the community in languages that reflect the demographics of the population. Offering to webcast the meetings for those unable to physically attend the meeting would result in DEP's ability to reach a larger number of people, some of whom cannot physically travel to the meetings in person.

In addition to the specific comments above, we'd like to reiterate several recommendations for improved public engagement that we've included in past comment letters, specifically in our September 2014 letter to Commissioner Emily Lloyd regarding DEP's LTCP process for all waterbodies. Below is a summary of some of those suggestions:

- Presentations should be tailored to the audience in a style to which recreational water users and concerned citizens can relate on a personal level.

- For the second public meeting, the public must be given more time to comment and must be provided with a real draft plan as well as the power point summary

- DEP should explore online technologies to solicit feedback, such as crowd-sourcing anecdotal data or using an interactive map to demonstrate where and how participants use the waterways.

Integration With Area-wide Planning

According to the Kick-off meeting presentation, the Coney Island Creek watershed is served mostly (76 percent) by the Municipal Separate Stormwater Sewer System (MS4). Stormwater runoff from the MS4 area results in 1.5 billion gallons of stormwater discharge, compared to the 235 million gallons of CSO discharge. The forthcoming MS4 stormwater management plan (SWMP) will have to manage more than three-quarters of the ongoing pollution that impacts Coney Island Creek. Even a one hundred percent CSO reduction will only address a fraction of the ongoing pollution in the creek, so alternatives for CSO reduction cannot be evaluated alone.

Beyond MS4 and CSO considerations, other significant activity in the area, such as the Economic Development Corporation's (EDC) Feasibility Study, is a concern for residents of Coney Island and the surrounding neighborhoods, and will have an impact on DEP's water quality improvement plans. We recommend that DEP acknowledge the EDC study in the proposed Long Term Control Plan, and outline how various outcomes of the study could impact the City's water quality improvement plans for the Creek.

At the next public meeting, it would be useful to provide a review of all the recent water quality improvement programs that have taken place in the area to-date (DEP's efforts and those of other agencies and entities working in the area) and those which will take place over the next 3-5 years (i.e. the MS4 Stormwater Management Plan). This would give community members a better understanding of all the long term work slated to be conducted in their neighborhoods, how DEP's work in the area is related to the bigger picture, and what DEP's full scope of work will entail in the years ahead.

To echo City Council Member Trager's comments at the November 4th public meeting, it is vitally important to view the Coney Island Creek drainage area in the broader context of how it connects to the entire peninsula, and to portray how the proposed alternatives in the Coney Island Creek CSO LTCP can contribute to peninsula-wide solutions.

It is important to note that several attendees at the November 4th public meeting raised concerns about industrial pollutants in the Creek. We understand that NYC DEP's LTCP process is limited to solely addressing CSO reduction. However, the ultimate goal of the long term control plans is to improve water quality in Coney Island Creek and NYC waterways. This cannot be attained without assessing water quality holistically and considering other sources of water pollution. In addition to the MS4 sources of stormwater runoff, this includes the industrial pollutants that locals believe may include PCBs and heavy metals.

We recommend that DEP coordinate with NYS DEC to properly characterize the water quality in the public presentation and fact sheets for the Creek and to develop a comprehensive, coordinated plan to address all pollutants of concern to human and environmental health.

Existing Uses

Regardless of the designated use, it's important to note that people eat the fish caught in Coney Island Creek, community members stated this very clearly during the meeting. DEP's compliance with federal water quality standards is to ensure that the City's waterways are fishable and swimmable.

We hope that DEP's water quality improvement plans for Coney Island Creek will propose alternatives that ensure the waterbody will ultimately be fishable and clean enough for the education programs, such as the Coastal Classroom program led by City Parks Foundation in Kaiser Park, as well as the community stewardship projects and other activities conducted near the water's edge to continue without risking the health of the citizens who participate in them. As already mentioned, this approach would require addressing MS4 discharge and industrial contaminants, in addition to wet and dry weather CSO discharges.

Illicit sewer connections

In the public meeting, DEP noted that dry weather sampling indicated illegal discharges of sewage into the creek. One citizen from the area noted that she had identified a specific dry weather discharge site in the sewershed which appeared to be a significant contributor to contamination in the Creek. Such actions by local community members are vital to water quality improvement and should be recognized as exemplary and whenever possible, featured in DEP's public communication materials. If more citizens are rewarded and recognized publicly for their efforts, it is likely that others will get involved and help locate and monitor illegal discharges.

Also, a clear communication of DEP's investigative process for eliminating illegal discharges would help citizens understand how much time it takes to locate and disconnect the source of the discharges. We find it important for DEP to outline, in their forthcoming proposed water quality improvement plans, how the agency will conduct investigations into the origins of current illicit connections and what DEP plans to do to eliminate them in the future.

Green Infrastructure

NYC DEP's Green Infrastructure Plan has a goal of managing stormwater, through green infrastructure, on 10 percent of all impervious surfaces in combined sewer service areas of the City by 2030.

S. W. I. M. Coalition commends DEP for its diligence in implementing the ambitious citywide GI plan. However, these efforts have not yet been equally distributed throughout the city.

Coney Island Creek watershed has received no green infrastructure so far through the City's GI plan, and is only scheduled to have 7 of the 3,470 acres of impervious surface (in the drainage area) managed through green infrastructure investment by 2030.

We believe that there is opportunity in the Coney Island Creek watershed for more than 7 acres (a mere 1% of the of CSO impervious area) to be managed by green infrastructure. We recommend that DEP broaden the scope of GI in the Coney Island Creek watershed to include practices beyond bioswales, such as green roofs and permeable pavers and expand GI into upstream areas covered by the MS4.

We would also like to note that there are several well-established community stewardship groups in the area who are well-poised and interested in advocating for and supporting the implementation of local green infrastructure in public spaces near and around the Creek.

We encourage DEP to provide the community with an assessment of the potential for green infrastructure on public and private property in the entire drainage area (CSO and MS4) for the Creek, and develop a more robust green infrastructure goal for the area.

****

Thank you for the opportunity to comment on the development of the Coney Island Creek CSO Long Term Control Plan. The S. W. I. M. Coalition will continue to reach out to, and educate the public, on water quality issues in the City. We look forward to continuing our dialogue with DEP on the CSO Long Term Control Plans and the MS4 Stormwater Management Plans in the year ahead.

Sincerely,

Julie A. Welch, Coalition Coordinator
On Behalf of the S. W. I. M. Coalition Steering Committee

Sean Dixon, Riverkeeper
Michelle Luebke, Bronx River Alliance
Larry Levine, Natural Resources Defense Council
Paul Mankiewicz, The Gaia Institute
Tatiana Morin, New York City Soil & Water Institute
Jaime Stein, Pratt Institute
Shino Tanikawa, New York City Soil & Water Conservation District

CC:
Judith Enck, Regional Administrator, US EPA Region 2
Joan Leary Matthews, Director, Clean Water, US EPA Region 2
Jim Tierney, Assistant Commissioner for Water Resources,NYS DEC
Joseph DiMura, Director, Bureau of Water Compliance, NYS DEC
Gary Kline, Section Chief, Bureau of Water Compliance, NYS DEC
Angela Licata, Deputy Commissioner, NYC DEP

Appendix C: Coney Island Creek Use Attainability Analysis

EXECUTIVE SUMMARY

The New York City Department of Environmental Protection (DEP) has performed a Use Attainability Analysis (UAA) for Coney Island Creek in accordance with the 2012 Combined Sewer Overflow (CSO) Consent Order. Coney Island Creek is a tidal waterbody in the Borough of Brooklyn. It exchanges waters with Gravesend Bay and New York Bay (Figure 1). The Coney Island Creek watershed is located throughout south Brooklyn and is served by the Owls Head and Coney Island Waste Water Treatment Plants (WWTP). The waters of Coney Island Creek are saline throughout its extension and receive freshwater input from stormwater, direct drainage and CSO discharges.

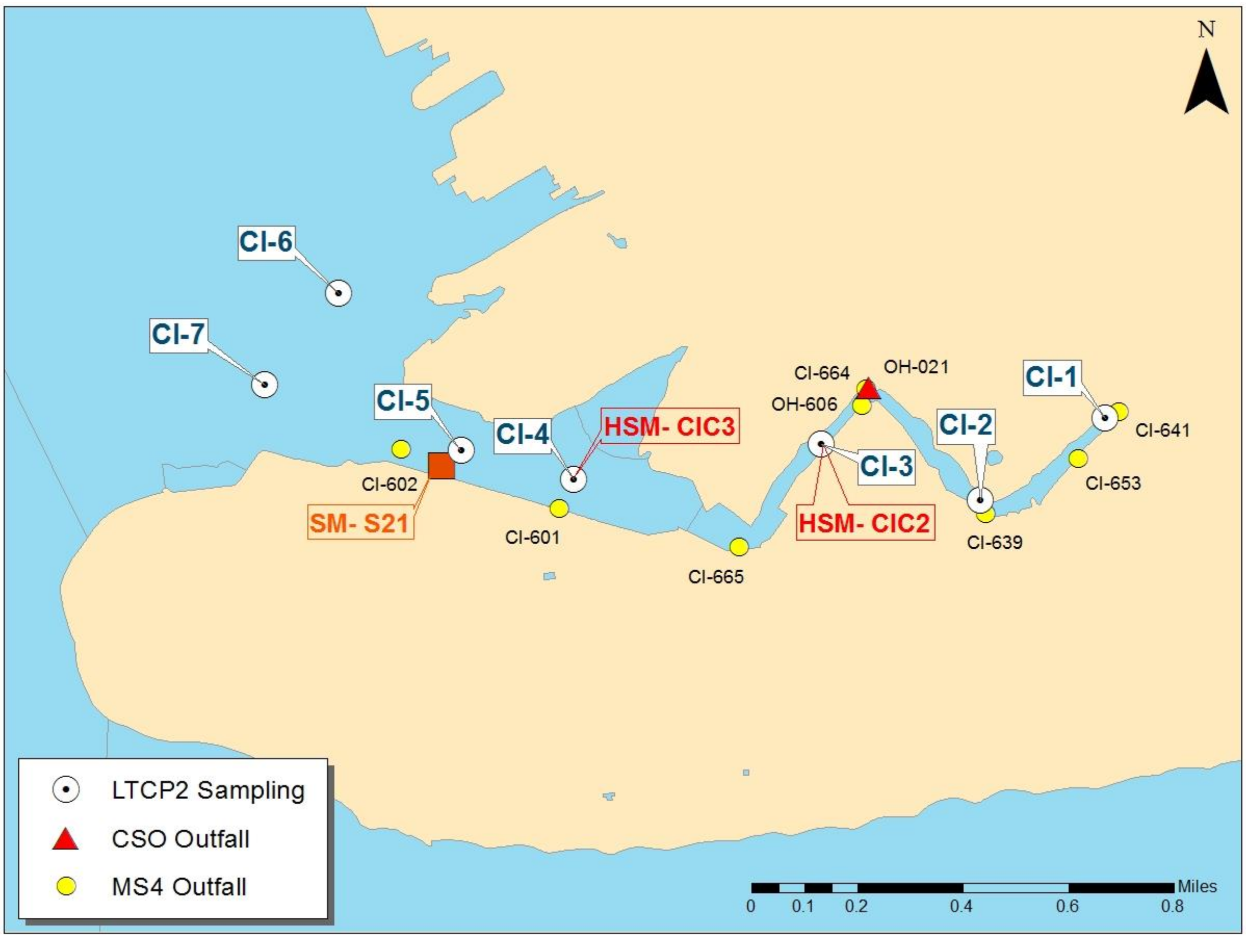

Figure 1. Overview of Water Quality Stations and Permitted Outfalls in Coney Island Creek

Detailed analyses performed during the Coney Island Creek Long Term Control Plan (LTCP) concluded that the fecal coliform water quality (WQ) criterion in this waterbody would not be attained both annually and during the recreational season (May 1st through October 31st). The analyses also revealed that Class I, and next higher classification Class SB, dissolved oxygen (DO) criteria would also not be attained with the implementation of the preferred alternative. These analyses also suggested that annual fecal coliform, as well as Class I or SB DO criteria, will not be fully attained even with the implementation of 100% CSO control. This is not unexpected as DO in Coney Island Creek is also affected by stormwater loads, eutrophication, and poor tidal flushing.

However, the preferred alternative results are essentially meeting the recreational season (May 1st through October 31st) attainment target of 95 percent and above for the fecal coliform criteria at all stations, with exception of the upstream Station CI-1, where attainment is 93 percent. Enterococci criteria do not apply to tributaries such as Coney Island Creek under the Beaches Environmental Assessment and Coastal Health (BEACH) act of 2000. Each applicable criterion is discussed below:

Fecal Coliform

> Detailed analyses performed during the Coney Island Creek LTCP under the 10 year simulation period concluded that the designated Class I water quality standards (WQS) are essentially attained (95 percent or higher) for the fecal coliform criterion during the recreational season (May 1st through October 31st). However, based on this technical assessment, it was found that, the preferred alternative would achieve 57 to 91 percent attainment on an annual basis at Stations CI-1 through CI-5, respectively. Based on the 2008 simulation, even with 100% CSO control, the annual attainment of the fecal coliform criterion would range from 58 to 83 percent at Stations CI-1 through CI-5, respectively. However, as noted before, with the LTCP preferred alternative, the fecal coliform criterion is essentially attained *during the recreational season (May 1st through October 31st).*

Dissolved Oxygen

> Based on the technical assessment, the waterbody is not projected to attain the existing Class I DO criteria at least 95 percent of the time for the entire water column on an annual basis. However, only Station CI-1, at the head end of the Creek has less than 95 percent attainment, where the model projections report 90 percent attainment. The waterbody is not projected to attain the Class SB DO criteria on an annual basis also. Attainment of the Class SB DO criteria is computed to be in the range of 82 to 94 percent at the four upstream-most of the seven stations evaluated in the Creek (and more than 95 percent at the remainder stations). For both Class I and Class SB DO WQS, 100 percent CSO control would not realize full attainment of the corresponding criteria.

Coney Island is a valuable resource to the adjacent communities, as well as to all New York City (NYC) residents due to the unique character and opportunities offered at the surrounding neighborhood. However, most of the aquatic recreational opportunities are associated with the ocean beachfront and not the Creek. There are no sanctioned primary or secondary contact uses along the Creek, nor is there infrastructure or equipment supporting them.

Coney Island Creek provides recreational opportunities for landside recreation such as wildlife observation, fishing, jogging and biking (Figure 2). Besides its support to waterfront on-shore activities, it provides ecological habitat for fish and wildlife species. Some wetland habitat is located at the southern shore of the mouth of the Creek, along the tip of the Coney Island Peninsula, where WQS attainment is projected to be protective of the ecological environment.

.Figure 2. Coney Island Creek Waterfront Public Areas

Limited areas of the outer portions of the Creek near Six Diamonds Park (near Coney Island Boat Basin) and Coney Island Creek Park, do provide opportunities for the public to come into contact with the water. Uses such as kayaking, jet skiing, and wading have been observed to occur at these locations.

Based on the detailed analyses provided above, projected fecal coliform and DO levels do not meet the existing standards under the designated classification. Non-attainment appears to be related to non-CSO sources in Coney Island Creek. However, it is recommended that after other non-CSO focused programs conclude their evaluations, the attainment of the designated Class I WQS be reassessed and the best use of the Creek be revised accordingly. DEP will continue to issue wet-weather advisories informed by the time to recovery analyses presented in the Coney Island Creek LTCP. However, it should be noted that although the water quality might be largely protective of primary contact during the recreational season (May 1st through October 31st), other factors, such as adjacent land use and safety, must be taken into account, inasmuch as there are no Department of Health and Mental Hygiene (DOHMH) certified bathing beaches anywhere within the waterbody nor sanctioned boat launching infrastructure or equipment along the Creek.

INTRODUCTION

Regulatory Considerations

The New York State Department of Environmental Conservation (DEC) has designated Coney Island Creek as a Class I waterbody. The best usages of Class I waters are *"secondary contact recreation and fishing. These waters shall be suitable for secondary contact and fishing"* (6 NYCRR 701.11). In November 2015, DEC amended the State WQS to require Class I waterbodies to be suitable for primary contact although other factors may preclude such use.

Federal policy recognizes that the uses designated for a waterbody may not be attainable, and the UAA has been established as the mechanism to modify the WQS in such a case. Here, Coney Island Creek does not meet the existing designated use classification for bacteria and DO, but would essentially attain the bacteria primary contact WQ criteria at all stations during the recreational season (May1st through October 31st), except at the very head end of the waterbody where attainment is projected to be 93 percent. Furthermore, even the complete elimination of CSO discharges will not result in attainment of the designated WQS.

This UAA identifies the attainable and existing uses of Coney Island Creek and compares them to those designated by DEC in order to provide data to establish appropriate WQ goals for this waterway. An examination of several factors related to the physical condition of the waterbody and the actual and possible uses suggests that attainment of bacteria or DO criteria associated with existing Class I standards is not projected to occur. Furthermore, it is projected that the waterbody would not fully attain recreational season Primary Contact Bacteria WQ Criteria, and even 100 percent CSO reduction would not bring the waterbody into compliance. Under Federal regulations (40 CFR 131.10), six factors may be considered in conducting a UAA:

1. Naturally occurring pollutant concentrations prevent the attainment of the use; or
2. Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met; or
3. Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or
4. Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the waterbody to its original conditions or to operate such modification in a way that would result in the attainment of the use; or
5. Physical conditions related to the natural features of the waterbody, such as the lack of proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or
6. Controls more stringent than those required by Sections 301(b) and 306 of the Clean Water Act (CWA) would result in substantial and widespread economic and social impact.

Identification of Existing Uses

The waterfront area surrounding Coney Island Creek is predominantly altered on the eastern and western banks. Some open space exists along the shoreline towards the mouth of the Creek. There are no sanctioned access points to the inner portions of the Creek for aquatic recreation purposes along its extension. Open outdoor spaces that support on-shore recreation are distributed along both banks towards the mouth of the Creek.

Coney Island Creek is not suitable for bathing; as such, no DOHMH certified bathing beaches exist anywhere within the waterbody. Because open space partially surrounds the waterbody towards the mouth, opportunities exist for fishing and canoeing/kayaking. However, due to limited access, altered shorelines (bulkheads and rip-rap) and industrial uses, the bulk of the waterbody extension is not conducive to primary contact recreation although secondary contact recreation opportunities exist toward the mouth of the Creek. Figures 3a and 3b show examples of the Coney Island Creek shoreline.

Figure 3a. Coney Island Creek Shoreline (Southern Shoreline Looking East)

Figure 3b. Coney Island Creek Park (Looking North West from the Park)

ATTAINMENT OF DESIGNATED USES

Coney Island Creek is a Class I waterbody, suitable for secondary contact recreation near the mouth and aquatic life propagation and survival throughout most of its extension. As noted previously, Coney Island Creek is not used frequently for secondary contact recreation, and primary contact is not a permitted use. As part of this LTCP, an analysis was performed to assess the level of attainment of the primary contact fecal coliform criterion ammended to Class I waters of the State by DEC in November 2015.

Water quality modeling and observed data indicate that the primary contact bacteria criterion is not being achieved annually but is essentially attained for the recreational season (May 1st through October 31st). The non-attainment is due to stormwater, direct drainage and CSO discharges accruing to poor tidal flushing conditions. However, analyses indicate that the waterbody under the preferred alternative would essentially attain the primary contact fecal coliform (monthly mean) numeric criterion during the recreational season (May 1st through October 31st) except at upstream Station CI-1, where attainment is 93 percent. The water quality stations are shown in Figure 1.

It should be noted that these modeling analyses were conducted using the assumption that ongoing microbial analyses will show that the existing high levels of fecal coliform in the Creek are not enteric related and will be resolved through changes to microbial laboratory analyses. Should this not be the case, these modeling analyses will need to be revised.

An analysis was also conducted during the development of the LTCP water quality model to predict the recovery time in Coney Island Creek following a rain event. As primary contact uses could be essentially attained in Coney Island Creek during the recreational season (May 1st through October 31st) a high percent of the time, DEP used the primary contact fecal coliform recreation warning level of 1,000 cfu/100mL from the Department of Health (DOH) guidelines in this analysis. The result of the analysis is summarized in Sections 6 and 8 of the Coney Island Creek LTCP report. As noted, the duration within which fecal coliform bacteria concentrations are expected to be higher than DOH considers safe for primary contact varies along the Creek, ranging from 24 hours at the upper head end (Station CI-1), to never reaching the numerical threshold at the mouth of the Creek. Generally, a conservative value of around 24 hours appears to be reasonable for Coney Island Creek.

DEP has been using model projections in various waterbodies and near beaches to assist with advisories that are typically issued twice a day. The recovery time is essentially the timeline throughout which the waterbody will not support primary contact and is intended to advise the water users of the potential health risks associated with this use during this time period.

CONCLUSIONS

Coney Island Creek does not attain the existing Class I WQS for bacteria and DO. The Creek cannot fully achieve the Primary Contact Bacteria WQ Criteria based on fecal coliform on an annual basis. However, the analyses show that Primary Contact Bacteria WQ Criteria is projected to essentially be attained throughout the recreational season (May 1st through October 31st) a high percentage of the time, although bacteria levels will be elevated during and after rain events. There are no permitted swimming locations or sanctioned infrastructure or equipment supporting secondary contact recreation along Coney Island Creek; thus, the non-attainment of swimmable standards during and after rainfall or during the non-recreational season (November 1st through April 30th) would not impact such uses. Non-attainment of the fecal coliform primary contact criterion is attributable to the following UAA factors:

Fecal Coliform:

- Human caused conditions (direct drainage and urban runoff) create high bacteria levels that prevent the attainment of the use and that cannot be fully remedied for large storms (UAA factor #3).

Dissolved Oxygen

- Human caused conditions (wastewater treatment plant nitrogen discharges to the Lower East River and Hudson River) create a level of eutrophication in the Lower Bay that prevents the attainment of the use and that cannot be fully remedied (UAA factor #3).
- Physical conditions related to the natural features of the waterbody, such as the lack of proper substrate, cover, flow, depth, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses (UAA factor #5).

It should be emphasized that the Coney Island Creek watershed, although surrounded by commercial and industrial uses in most areas, does provide informal shoreline access points for on-shore recreation, which attract the public to take advantage of the recreational uses of the waterway. These uses should be protected in recreational periods, with the exception of during rain events when advisories will be in place.

RECOMMENDATIONS

Coney Island Creek does not attain the current bacteria Class I criterion for fecal coliform on an annual basis but attains largely on a seasonal basis. However, as noted above, there is no formal infrastructure or equipment supporting access to the Creek for aquatic recreation purposes and the current uses are primarily associated with on-shore activities throughout its extension, as well as boating/kayaking/wading near the mouth. The general public indicated that Coney Island Creek should be made safe for fishing and swimming in the future. This awareness was demonstrated in the attendance and input received through the public participation process, where the desire for continued improvement in water quality was conveyed and brought into the LTCP framework. Because the LTCP assessments demonstrated that CSOs are not the primary source responsible for non-attainment, and that complete elimination of CSO discharges would not bring the waterbody into compliance with WQS, DEP, through the LTCP process, recommends that no further CSO reduction projects be included in the LTCP preferred alternative, beyond the continuous efficient operation of the upgraded Avenue V pump station, as well as other sewer improvements being proposed and built under the scope of other non-CSO related programs. To protect designated uses, DEP would implement wet-weather advisories during the recreational season (May 1st through October 31st) while advancing the waterbody towards the numerical limits established. With anticipated reductions in stormwater loadings resulting from sewer improvements and other source control projects, Coney Island Creek could be protective of limited primary contact should it occur, as long as it did not occur during or following rainfall events. DO WQS are not met for the designated Class I standard. However, only the head end of the Creek does not provide at least 95 percent attainment of the Class I DO criterion. The LTCP analyses demonstrated that 100 percent CSO control would not bring DO levels into compliance with the criterion at this location. Consistent with the causes for non-attainment of other WQS, the projected DO levels appear to be associated with non-CSO related sources in Coney Island Creek.