Combined Sewer Overflow Long Term Control Plan for Alley Creek and Little Neck Bay Appendix I: 2026 Supplemental Long Term Control Plan

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The City of New York

Department of Environmental Protection

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1.0 INTRODUCTION

1.1 Purpose

This 2026 Supplemental Long Term Control Plan (LTCP) contains the New York City (NYC or City) Department of Environmental Protection (DEP)'s revisions to the approved 2017 LTCP for the Alley Creek and Little Neck Bay (DEP, 2014 and the May 2015 Appendix H, which contains DEP's responses to the Department of Environmental Conservation [DEC]'s comment letter, dated January 23, 2015, and associated LTCP section replacements). The 2026 Supplemental LTCP incorporates the findings of the 2024 Oakland Ravine Daylighting and Stormwater Technical Feasibility Study, and updated models developed for the study that include revised representations of combined sewer overflow (CSO) and stormwater discharges into the Alley Creek and Little Neck Bay. The 2026 Supplemental LTCP is now part of the approved 2017 LTCP as Appendix I.

The 2026 Supplemental LTCP summarizes DEP's plans for managing the CSO discharges into the Alley Creek and Little Neck Bay, including the findings and recommendations to advance the waterbody's level of compliance with applicable Water Quality Standards (WQS).

1.2 Format

Appendix I 2026 Supplemental LTCP includes updates from the 2024 Oakland Lake and Ravine Daylighting Feasibility Study that significantly impacted the landside and water quality (WQ) modeling, alternatives analysis, and recommended plan selection. Below is a breakdown of modifications included in the Alley Creek and Little Neck Bay 2026 Supplemental LTCP:

Section	Description
Executive Summary	A new Executive Summary replaces the approved 2017 Long Term Control Plan (LTCP) (Replaced)
Section 1 – Introduction	No Change
Section 2 – Watershed and Waterbody Characteristics	Some of the subsections of Section 2 have been revised or replaced as follows: • 2.1.a.3 Impervious Cover Analysis (Revised) • 2.1.a.5 Update Landside Modeling (Revised) • 2.1.c.1 Overview of Drainage Area and Sewer System (Revised) • 2.1.c.2 Stormwater and Wastewater Characteristics (Revised) • 2.1.c.3 Hydraulic Analysis of Sewer System (Revised) • 2.1.c.4 Identification of Sewer System Bottlenecks, Areas Prone to Flooding, and History of Sewer Backups (Replaced) • 2.1.c.5 Findings from Interceptor Inspections (Replaced) • 2.1.c.6 Status of Receiving Wastewater Treatment Plants (Revised) • 2.2.a.1 Current Waterbody Classification(s) and Water Quality Standards (Revised) • Bathing Beach Policies and Regulations (Revised) • 2.2.a.6 Compilation and Analysis of Existing Water Quality Data (Replaced)

Section	Description
Section 3 – CSO Best Management Practices	No Change – For updates to the Annual Combined Sewer Overflow (CSO) Best Management Practices Report please refer to Combined Sewer Overflows - DEP
Section 4 – Grey Infrastructure	No Change
Section 5 – Green Infrastructure	No Change – For updates to the Green Infrastructure Program please refer to https://www.nyc.gov/site/dep/water/green-infrastructure.page#
Section 6 – Baseline Conditions & Performance Gap	This new Section 6 replaces the previously approved 2014 CSO LTCP and 2015 Supplemental CSO LTCP (Replaced)
Section 7 – Public Participation & Agency Coordination	Section 7 has been revised to reflect the recent public participation and interagency coordination (Revised)
Section 8 – Evaluation of Alternatives	This new Section 8 replaces the previously approved 2014 CSO LTCP and 2015 Supplemental CSO LTCP (Replaced)
Section 9 – Long-Term Control Plan Implementation	This new Section 9 replaces the previously approved 2014 CSO LTCP and 2015 Supplemental CSO LTCP (Replaced)
Appendix A	This new Appendix A replaces the previously approved 2014 CSO LTCP and 2015 Supplemental CSO LTCP (Replaced)
Appendices B to D	No Change
Appendix E	The Use Attainability Analysis proposed in the June 2014 LTCP Appendix E and amended in the May 2015 Appendix H, Attachment 4, has not been changed but will be revisited as part of the coordinated effort between DEP and DEC to support the New York State's planned waterbody reclassification rulemaking for saline surface waters in and around New York City, including Alley Creek and Little Neck Bay.
Appendices F and G	No Change
Appendix H	Sections of the Appendix H 2015 Supplemental Documentation are either revised or replaced by the Sections of the new Appendix I 2026 Supplemental Documentation as indicated above.
Appendix I	2026 Supplemental LTCP

Collectively, the Appendix I 2026 Supplemental LTCP and the approved 2017 LTCP constitute the overall revised Alley Creek and Little Neck Bay LTCP.

As compared to the 2014 and 2015 documents of the approved 2017 LTCP, the revised sections in Appendix I consider more stringent annual criteria for fecal coliform (200 rather than 2,000 colony-forming units per 100 milliliters [cfu/100 mL]); the primary contact recreation WQ Criteria for *Enterococci* of 35 cfu/100 mL and 130 cfu/100 mL for geometric mean (GM) and statistical threshold value (STV), respectively; and the secondary contact recreation WQ Criteria for *Enterococci* of 72 cfu/100 mL and 266 cfu/100 mL for GM and STV, respectively. The dissolved oxygen (DO) criteria protecting Class I and Class SB/SC designated uses are also considered.

The Executive Summary, Sections 2.0, 6.0, 7.0, 8.0, and 9.0, and Appendix A for the Appendix I 2026 Supplemental LTCP are marked with “2026 Replaced” or “2026 Revised” at the top of each document. Replaced Sections (6.0, 8.0, 9.0, Appendix. A, and Executive Summary) have “2026 Replaced” at top of document. Revised Sections (2.0 and 7.0) have “2026 Revised” at top of document. Within revised Sections 2.0 and 7.0, titles of modified sub-sections are marked as either “2026 Revised” or “2026 Replaced”. Track changes show text revisions in the revised sub-sections. Track changes are not used for tables, figures, or major text changes in sub-sections labelled as “2026 Replaced”.

1.3 Significance

The improved model representation of CSO and stormwater discharges into the Alley Creek and Little Neck Bay and the completion of the Oakland Ravine Daylighting and Stormwater Technical Feasibility Study (DEP, 2024) presented in the attachments to Appendix I have led to revised baseline conditions and the selection of a new preferred alternative for DEP’s management of the CSO discharges into the Alley Creek and Little Neck Bay.

ATTACHMENT 1, 2026 Replaced Executive Summary

The 2014 and 2015 versions of the approved 2017 LTCP Executive Summary are replaced and superseded by the 2026 Supplemental LTCP version of the Executive Summary provided below.

EXECUTIVE SUMMARY (2026 REPLACED)

This Executive Summary is organized as follows:

- Background—An overview of the regulations, approach, and existing waterbody information,
- Findings—A summary of the key findings of the water quality (WQ) data analyses, the WQ modeling simulations, and the alternatives analysis, and
- Recommendations—A listing of recommendations for improvements that are consistent with the Federal Combined Sewer Overflow (CSO) Control Policy and the Clean Water Act (CWA).

Background

The Department of Environmental Protection (DEP) prepared this 2026 Supplemental Documentation to the Long Term Control Plan (LTCP) for Alley Creek and Little Neck Bay (2026 Supplemental LTCP) in consultation with the Department of Environmental Conservation (DEC) as DEP reviewed alternatives to the disinfection facility recommended in the LTCP for Alley Creek and Little Neck Bay as approved by DEC in 2017. The 2017 approved LTCP was submitted pursuant to a DEC Order on Consent (DEC Case No. CO2-20000107-8 as modified). Pursuant to the CSO Orders as modified in 2012 (DEC Case No. CO2-0110512-25) (2012 CSO Order) DEP was required to submit 11 waterbody-specific LTCPs to the New York State (NYS) DEC, including the approved 2017 LTCP for Alley Creek and Little Neck Bay which was submitted[1] in 2014 and 2015 (DEP, 2014; 2015).

The goal of an LTCP, as described in the LTCP Goal Statement included in the 2012 CSO Order, is to identify, with public input, appropriate CSO controls necessary to achieve waterbody-specific water quality standards (WQS) consistent with the 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 WQ assessments where the data is represented by percent attainment with bacteria targets and associated recovery times. For this 2026 Supplemental LTCP, in accordance with guidance from DEC, DEP considers that 95 percent attainment of applicable WQ Criteria constitutes compliance with the existing WQS or the Section 101(a)(2) goals conditioned on verification through rigorous post-construction compliance monitoring.

This 2026 Supplemental LTCP for Alley Creek and Little Neck Bay differs from the approved 2017 LTCP in that newer and more restrictive WQ Criteria are considered, an improved model representation of CSO and stormwater discharges into the Alley Creek and Little Neck Bay is applied for evaluating baseline

[1] DEC indicated that the July 2013 submittal was not approvable as submitted. DEP re-submitted the LTCP with revisions in November 2013. DEC disapproved that submittal. DEP challenged the disapproval of the November submittal. However, DEP made further revisions to the LTCP in response to DEC comments received in review letters dated September 12, 2013, and December 12, 2013, as well as in subsequent technical meetings held between DEC and DEP prior to the 2014 and 2015 submittals.

conditions and control alternatives, an additional CSO control alternative is considered, and a new CSO control plan is recommended. Further a Use Attainability Analysis (UAA) was not developed as part of this 2026 Supplemental LTCP. Rather, the analysis for a UAA will be completed subsequently by DEP as necessary in coordination with DEC as part of any ongoing NYS waterbody reclassification rulemaking evaluations.

Regulatory Requirements

The waters of NYC are subject to Federal and NYS laws and regulations. Particularly relevant to this 2026 Supplemental LTCP is the United States (U.S.) Environmental Protection Agency CSO Control Policy, which provides guidance on the development and implementation of LTCPs and the setting of WQS. In NYS, CWA regulatory and permitting authority has been delegated to the DEC.

Currently, existing NYS WQS for navigable waters designate Little Neck Bay as a Class SB waterbody, which is defined as "suitable for fish, shellfish, and wildlife propagation and survival." The best usages of Class SB waters are "primary and secondary contact recreation and fishing" (6 New York Code, Rules, and Regulations [NYCRR] 701.11). DEC has designated Alley Creek as a Class I waterbody, defined as "suitable for fish, shellfish, and wildlife propagation and survival." The best usages of Class I waters are "secondary contact recreation and fishing" (6 NYCRR 701.13).

This 2026 Supplemental LTCP used the bacteria criteria shown in Table ES-1, to evaluate the proposed alternatives.

Table ES-1. Classifications and Standards Applied

Analysis	Alley Creek	Little Neck Bay[2]
Existing WQ Criteria	I (Fecal Monthly GM – 200 cfu/100 mL) I (*Enterococci* rolling 30-day annual GM – 72 cfu/100 mL and STV – 266 cfu/100 mL) I (DO – 4 mg/L)	SB (Fecal Monthly GM – 200 cfu/100 mL) SB (*Enterococci* rolling 30-day recreational season GM – 35 cfu/100 mL and STV – 130 cfu/100 mL) SB (*Enterococci* rolling 30-day annual[3] GM – 72 cfu/100 mL and STV – 266 cfu/100 mL) SB/SC[1] (DO – 3 mg/L and 24-hr average DO with allowable excursions – 4.8 mg/L)
Primary Contact WQ Criteria	SB/SC[1] (Fecal Monthly GM – 200 cfu/100 mL) SB/SC[1] (*Enterococci* rolling 30-day recreational season GM – 35 cfu/100 mL and STV – 130 cfu/100 mL) SB/SC[1] (*Enterococci* rolling 30-day annual[3] GM – 72 cfu/100 mL and STV – 266 cfu/100 mL) SB/SC[1] (DO – 3 mg/L and 24-hr average DO with allowable excursions – 4.8 mg/L)	Same as above

Notes:
[1]This water quality (WQ) classification is not currently assigned to Alley Creek.

[2]Criteria were applied to the Douglas Manor Association Beach within Little Neck Bay for the entire recreational season rather than the shorter bathing season.

[3]The annual *Enterococci* criteria for secondary contact recreation apply to times outside the recreational season in waters designated for primary contact recreation use.

cfu/100 mL = colony-forming units per 100 milliliters; DO = dissolved oxygen; GM = geometric mean; mg/L milligrams per liter; = STV = 90th Percentile Statistical Threshold Value; Bathing Season = Memorial Day to Labor Day; Recreational Season = May 1 through October 31

Alley Creek Watershed

Alley Creek watershed characteristics are as shown in Figure ES-1 and the CSO and stormwater outfalls are shown in Figure ES-2.

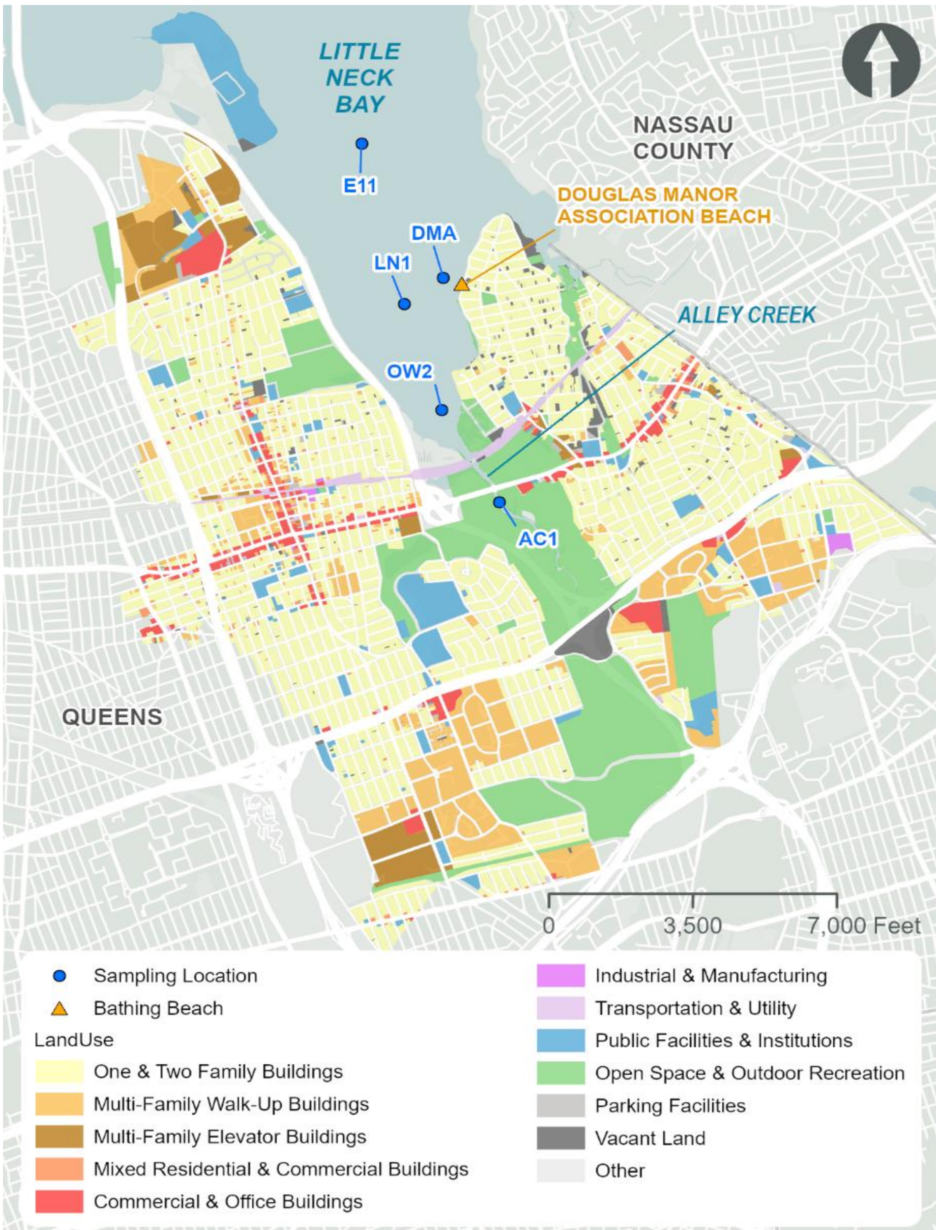

Figure ES-1. Watershed Characteristics and Sampling Locations

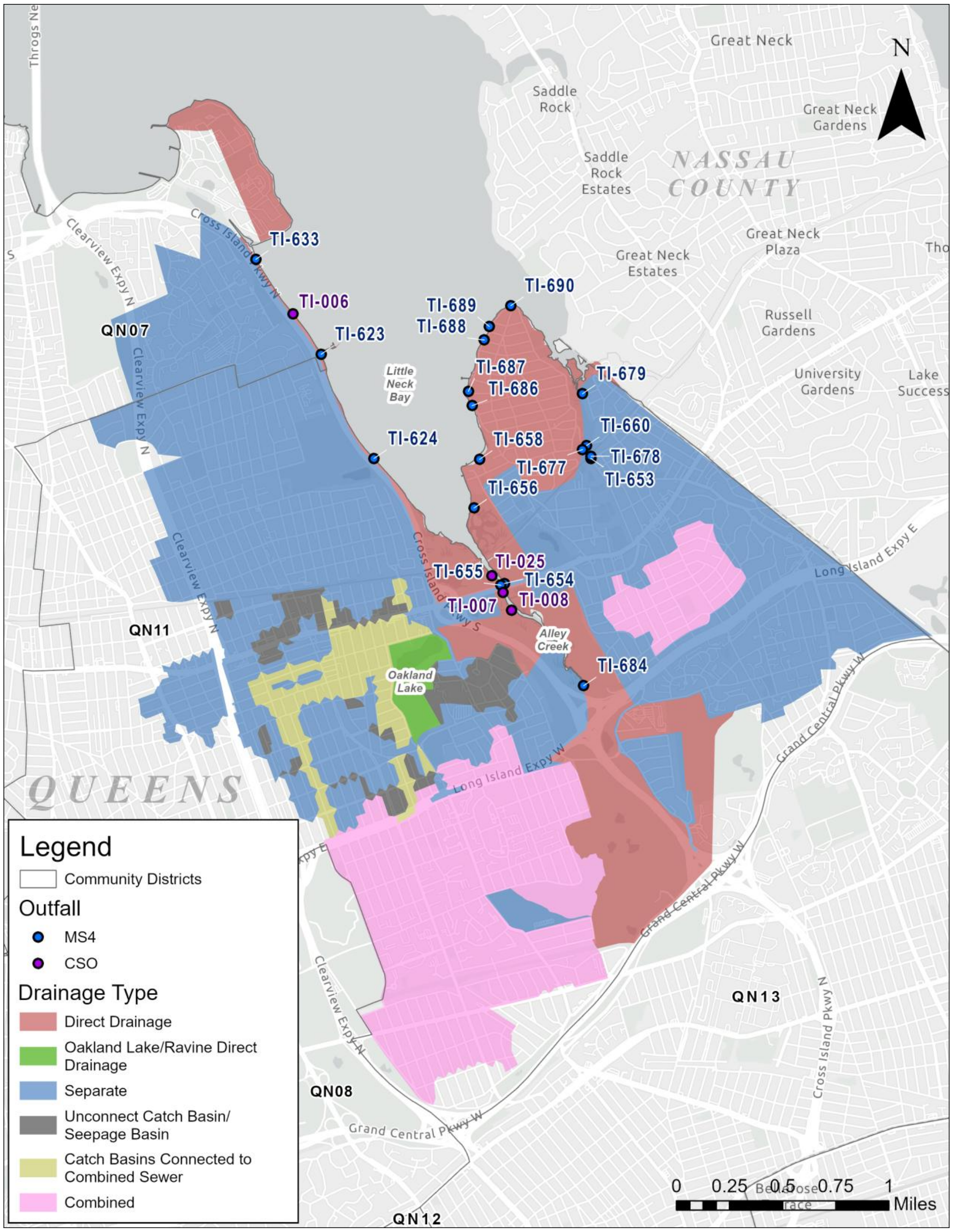

Figure ES-2. Alley Creek and Little Neck Bay New York City SPDES Permitted Outfalls

The area on the eastern shore of Little Neck Bay, known as Douglas Manor, is a private residential community. The neighborhood is predominantly composed of single-family residences served by on-site septic systems. Approximately 58 acres of drainage area generate runoff upstream of Shore Road, a waterfront roadway that follows the alignment of the eastern shore of Little Neck Bay. The Douglas Manor Association (DMA) manages a permitted private community beach known as DMA Beach, along Shore Road in the vicinity of the DMA sampling location. DMA Beach is located approximately 0.7 miles north of the mouth of Alley Creek and approximately one mile downstream from the principal CSO outfall on Alley Creek, Tallman Island (TI)-025.

DMA Beach has a permit to operate issued by the NYC Department of Health and Mental Hygiene (DOHMH). DOHMH applies a seasonal 30-day geometric mean (GM) of 35 *Enterococci* per 100 mL to trigger a beach closing. DOHMH also applies a single sample maximum of 104 *Enterococci* per 100 mL to issue beach advisories.

Findings

Analysis of WQ in Alley Creek and Little Neck Bay for this 2026 Supplemental LTCP was based on data collected by the DEP Harbor Survey Monitoring (HSM) Program between 2009 and 2024, the DEP Sentinel Monitoring Program between 2020 and 2024, and the DEP sampling performed in late 2012, 2013, and 2014 during the development of the Alley Creek and Little Neck Bay approved 2017 LTCP. For both fecal coliform and *Enterococci*, the GM and median bacteria measurements from the DEP HSM are lowest in the 2022 to 2024 years as shown in Figure ES-3. Despite declining GM and median trends and relatively low Sentinel Monitoring Program results, measured bacteria concentrations in Alley Creek are often elevated on a single sample basis. For *Enterococci*, the recent year single sample maxima in Alley Creek are between 1,000 and 10,000 colony-forming unit(s) per 100 milliliters (cfu/100 mL).

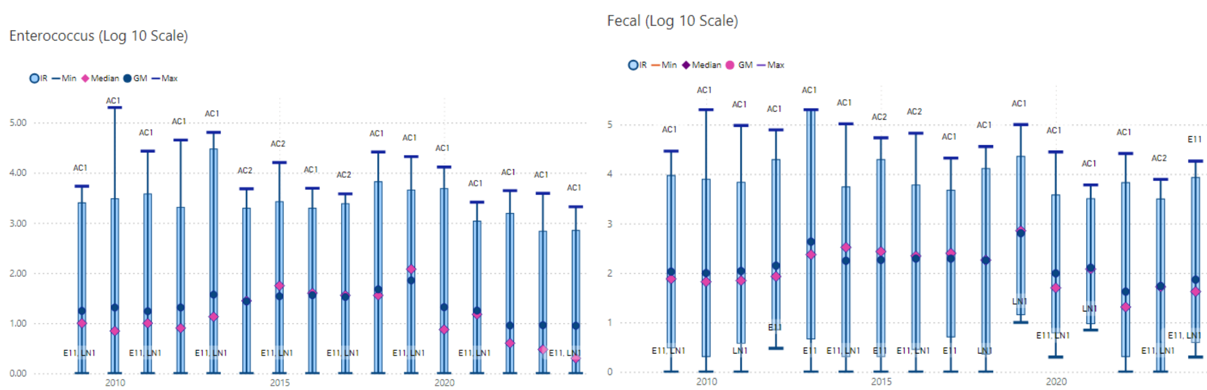

Figure ES-3. Alley Creek and Little Neck Bay New York City SPDES Permitted Outfalls

DEP conducts Illicit Discharge Detection and Elimination activities in the Alley Creek watershed to identify potential sources of bacteria to Alley Creek on an ongoing basis. DEP has completed sewer investigations, dye testing, two microbial source tracking studies, and monitoring. In 2014, DEP identified and eliminated several illegal residential connections to a storm sewer connected to the TI-684 MS4 outfall. In 2021, DEP identified and repaired a leaking sanitary sewer infiltrating an adjacent combined sewer leading to the TI-008 CSO outfall. Microbial Source Tracking (MST) testing results suggest that canine and waterfowl may be contributing, but are not predominant, bacterial sources.

Future Baseline Conditions, 100 Percent CSO Control, and Performance Gap

Analyses utilizing computer models were performed to evaluate the ability to bring Alley Creek and Little Neck Bay into compliance with the existing WQ Criteria in Alley Creek and Little Neck Bay. These analyses also evaluated the ability of Alley Creek to comply with higher use primary contact recreation WQ Criteria (Class SB/SC). These analyses focused on two primary objectives:

1. Determine the future baseline levels of compliance with WQ Criteria with all sources being discharged at existing levels (exclusive of illicit discharges) to the waterbody. These sources would primarily be stormwater and CSO. This analysis is presented for existing WQ criteria for

Alley Creek (Class I) and Little Neck Bay (Class SB) and for higher use primary contact recreation WQ Criteria for Alley Creek (Class SB/SC).

2. Determine attainment levels with 100 percent of CSO controlled, or no discharge of CSO to the waterbody, keeping the remaining stormwater and local sources. This analysis is presented for the standards and bacteria criteria shown in Table ES-1.

DEP assessed WQ using the East River Tributaries Model, a WQ model that was created and calibrated during the development of the Waterbody/Watershed Facility Plan (WWFP) in 2009. The model was modified as part of the approved 2017 LTCP development to significantly increase the grid resolution in Little Neck Bay and was recalibrated using DEP WQ monitoring data, DOHMH DMA Beach monitoring data, and the synoptic WQ sampling data collected in 2012. Model outputs for fecal and enterococci bacteria as well as DO were compared with various monitored datasets during calibration to improve the accuracy and robustness of the models to adopt them for LTCP evaluations. The WQ model was then used to calculate ambient bacteria concentrations within the waterbodies for a set of baseline conditions.

Baseline conditions were established in accordance with the guidance provided by DEC to represent future conditions. These included the following assumptions: the design year was established as 2040; TI Wastewater Treatment Plant would receive peak flows at twice the design dry weather flow (2xDDWF); grey infrastructure would include those elements recommended in the 2009 WWFP and included in Appendix A of the 2012 CSO Consent Order; and waterbody-specific GI based on the best available information. Based on the work done for the 2024 Oakland Lake Stormwater Diversion Feasibility Study, DEP determined that the appropriate GI projection for Alley Creek's combined sewer area should be 19.3 acres and this value was used for baseline modeling for this 2026 Supplemental LTCP. This approach is consistent with the original LTCP modeling methodology for representing green infrastructure in combined sewer areas.

Baseline conditions include updates to the InfoWorks Sewer System Model (IW Model) for the TI-025 and TI-008 catchment areas that were made as part of the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024). As part of the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024), the IW model underwent model refinement and calibration/validation. This refined model enhanced the detail of the sewer network by incorporating all storm and combined sewers within the study area regardless of size and by delineating modeled sub-catchments on a block-by-block basis. Additionally, as part of the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024), it was determined that approximately 89 acres within the physical boundary of the TI-025 sewershed are tributary to seepage basins or unconnected catch basins.

To understand the existing hydrologic and hydraulic conditions within the Feasibility Study drainage area, which focused on the separately sewered area contributing flow to the Alley Creek CSO Retention Facility (Outfall TI-025), an extensive flow monitoring study was conducted within the Feasibility Study area. Flow monitoring data were not collected in the separately sewered area contributing flow to the Alley Creek CSO Retention Facility as part of previous LTCP monitoring efforts. Sewer monitoring data were collected via 8 flow meters and 2 level sensors between March 2023 and July 2023 and were used to refine and calibrate/validate the IW model. During calibration, fixed runoff coefficients were adjusted as needed to achieve an acceptable match between the metered and modeled flow data at the 8 flow monitoring locations.

The refined IW Model predicts an annual average overflow volume (AAOV) of 237 million gallons per year (MG/yr) with 34 overflow events at TI-025, which is higher than the Alley Creek and Little Neck Bay approved 2017 LTCP baseline model, which predicted an AAOV of 132 MG/yr with 16 overflow events at TI-025 over the course of the DEP's typical rainfall year, 2008.

WQ assessments were conducted using continuous WQ simulations—a one-year (2008 rainfall) simulation for bacteria and dissolved oxygen (DO) assessment to support alternatives evaluation, and a 10-year (2002 to 2011 rainfall) simulation for bacteria for attainment analysis for the baseline, preferred alternative, and 100 percent CSO control scenario. The gaps between calculated baseline bacteria as well as DO were then compared to the applicable bacteria and DO criteria to quantify the level of non-attainment. Because modeled DO in Little Neck Bay and Alley Creek attains the applicable WQ Criteria, further analyses focused on bacteria.

A summary of the modeled baseline attainment results is presented in Table ES-2. Table ES-3 follows and presents projected levels of attainment for 100 percent control of the CSO discharges. The projection results in Table ES-2 indicate that for the modeled baseline conditions, much of Little Neck Bay would be in 95 percent or greater attainment with the primary contact recreation GM criteria for *Enterococci* and fecal coliform. As indicated in Table ES-3, with modeled 100 percent control of all CSOs, the projected attainment with the primary contact recreation GM criteria for *Enterococci* increases spatially in Little Neck Bay to include the OW2 station as compared to the baseline. The projection results in Table ES-3 indicate that for the modeled 100 percent CSO control conditions, Alley Creek and Little Neck Bay would be in 95 percent or greater attainment with the primary contact GM criteria for fecal coliform at all station locations. Modeled 100 percent control of CSOs is not sufficient to attain secondary or primary contact recreation GM criteria for *Enterococci* in Alley Creek.

GM averaging, as required for DEC compliance analyses, minimizes the importance of low frequency-high numbers; thus, the modeled effects of the infrequent Alley Creek CSO Retention Facility discharges, approximately once per month, are de-emphasized. Modeled stormwater contributions are more frequent, at essentially one discharge for every rain event per outfall, averaging ten events per month, and thus become important in the calculation of GM attainment. GM criteria attainment is thus highly influenced by the frequency of modeled stormwater discharges, while modeled removal of CSOs has a smaller effect.

In summary, baseline modeling showed that while Little Neck Bay has a high level of projected attainment with existing WQ Criteria for bacteria, Alley Creek does not. The modeled attainment projections for the higher use primary contact recreation criteria in Alley Creek are even lower. Further, modeled 100 percent CSO control would not result in projected attainment of the existing WQ Criteria for bacteria in Alley Creek.

Table ES-2. Baseline 10-Year Projected Compliance with Bacteria Criteria

	30-day Rolling *Enterococci*				**Monthly Fecal Coliform**
	Annual Secondary Contact Recreation		**Recreational Season Primary Contact Recreation**		**Annual Primary/Secondary Contact Recreation**
STATION[1]	**GM ≤72 cfu/100 mL (%)**	**STV ≤266 cfu/100 mL (%)**	**GM ≤35 cfu/100 mL (%)**	**STV ≤130 cfu/100 mL (%)**	**GM ≤200cfu/100 mL (%)**
AC1[2]	59.3	9.2	32.1	9.1	84.2
OW2	91.1	38.7	87.0	22.7	93.3
LN1	YES, 98.1	67.5	YES, 95.6	47.3	YES, 100
E11	YES, 100	94.6	YES, 98.8	76.4	YES, 100

	30-day Rolling *Enterococci*				Monthly Fecal Coliform
	Annual Secondary Contact Recreation		Recreational Season Primary Contact Recreation		Annual Primary/Secondary Contact Recreation
DMA	YES, 98.5	71.5	YES, 96.1	48.7	YES, 100

Notes: cfu/100 mL = colony-forming unit(s) per 100 milliliters; DMA = Douglas Manor Association; GM = geometric mean; STV = statistical threshold value, YES = 95 percent or greater attainment

[1]Station AC1 is in Alley Creek. Stations OW1, LN1, E11, and DMA are in Little Neck Bay. Station DMA is a bathing beach.

[2]The primary contact recreation water quality standard is not currently assigned to Alley Creek and represents a higher use.

Table ES-3. 100 Percent CSO Loading Removal 10-Year Projected Compliance with Bacteria Criteria

	30-day Rolling *Enterococci*				Monthly Fecal Coliform
	Annual Secondary Contact Recreation		Recreational Season Primary Contact		Annual Primary/Secondary Contact Recreation
STATION[1]	**GM ≤72 cfu/100 mL (%)**	**STV ≤266 cfu/100 mL (%)**	**GM ≤35 cfu/100 mL (%)**	**STV ≤130 cfu/100 mL (%)**	**GM ≤200cfu/100 mL (%)**
AC1[2]	77.9	20.6	50.8	13.7	YES, 97.5
OW2	YES, 99.6	75.4	YES, 97.2	49	YES, 100
LN1	YES, 100	YES, 99.1	YES, 99.7	88.4	YES, 100
E11	YES, 100	YES, 100	YES, 99.7	YES, 95.1	YES, 100
DMA	YES, 100	YES, 99.1	YES, 99.6	84.4	YES, 100

Notes: cfu/100 mL = colony-forming unit(s) per 100 milliliters; DMA = Douglas Manor Association; GM = geometric mean; STV = statistical threshold value, YES = 95 percent or greater attainment

[1]Station AC1 is in Alley Creek. Stations OW1, LN1, E11, and DMA are in Little Neck Bay. Station DMA is a bathing beach.

[2]The primary contact recreation water quality standard is not currently assigned to Alley Creek and represents a higher use.

Public Outreach

DEP followed a comprehensive public participation plan to ensure the engagement of interested stakeholders in the LTCP process. Stakeholders included both citywide and regional groups and nearby residents. Several of the groups offered comments at public meetings held for Alley Creek's LTCP. DEP conducted public outreach for the 2014/2015 LTCP that was approved in 2017 and the 2026 Supplemental LTCP. DEP will continue to gather public feedback on waterbody uses and will complete analysis for a UAA as necessary in coordination with DEC as part of any ongoing NYS waterbody reclassification rulemaking evaluations.

There was a high degree of public support for DEP's approved 2017 LTCP findings that additional grey infrastructure-based-CSO controls were not warranted, due to the WQ improvements achieved from implementation of the 2009 WWFP recommendations included in Appendix A of the 2012 CSO Consent Order, the Alley Creek CSO Retention Facility and related sewer system and pump station modifications, as well as from the related additional enhancements to the area wetlands and habitat. The $130 million (M) public investment in construction of the Alley Creek CSO Retention Facility, related collection system improvements, and ecological restoration was well-received. No support was expressed for additional

CSO controls or a higher WQ standard for Alley Creek during the public participation meetings held as part of the 2014/2015 LTCP process. Subsequent outreach to community organizations was performed in 2024 and 2025 specifically to support the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study. The DEP held a public meeting on February 5, 2026, at the Alley Pond Environmental Center to discuss the proposed alternatives considered in this 2026 Supplemental LTCP and an accompanying planned modification request to propose eliminating disinfection in lieu of the new recommended CSO control project for Alley Creek. This meeting was held prior to the final submittal of the 2026 modification request and supplemental CSO LTCP to DEC.

Evaluation of Alternatives

For the 2017 approved LTCP, a three-step evaluation process was used to evaluate control measures and CSO control alternatives. The previous process was based on an evaluation that considered factors related to environmental benefits, community and societal impacts, and considerations for implementation and operation and maintenance. Following the initial or fatal flaw step and a more rigorous numerical evaluation second step, the most promising or retained alternatives were subjected to cost performance and cost-attainment evaluations where economic factors were introduced. Subsequently, for the 2026 Supplemental LTCP, the additional downstream CSO retention alternatives for specific CSO capture percentages from the 2017 approved LTCP and the previously recommended plan for seasonal disinfection at the Alley Creek CSO Retention Facility were revised to reflect changes to the IW Model, the TI-025 CSO discharge volume, and WQS. For the 2026 Supplemental LTCP, the revised CSO capture and seasonal disinfection alternatives and the new recommended plan, the Oakland Lake and Ravine Daylighting Project, are evaluated for their ability to meet current and higher-usage WQS and costs. Table ES-4 summarizes the revised baseline and the six alternatives evaluated for the 2026 Supplemental LTCP.

Table ES-4. Alley Creek and Little Neck Bay Alternatives Summary

Alternative	CSO Volume (MGY)	CSO Volume Reduction[1] (Percent)	Fecal Coliform Reduction[2] (Percent)	*Enterococci* Reduction[2] (Percent)	Total Present Worth ($M)[3]
Baseline Conditions	237	0	0	0	0
2A. 2.5 MG Additional Downstream Retention (25% CSO Capture)	179	25	15	13	508
2B. 8 MG Additional Downstream Retention (50% CSO Capture)	118	50	32	26	755
2C. 17 MG Additional Downstream Retention (75% CSO Capture)	58	75	47	39	1,359
2D. 41 MG Additional Downstream Retention (100% CSO Capture)	1	100	65	55	2,918
3. Recreational Season Disinfection in Existing Alley Creek CSO Retention Facility	104[4]	56[4]	33	28	27.8
4. Oakland Ravine Daylighting and Stormwater Diversion	116	51	32	26	142

Notes: CSO = Combined Sewer Overflow; M = million; MG = million gallons; MGY = million gallons per year

[1]CSO annual volume reduction from baseline conditions.

[2]Includes both CSO and stormwater reduction from baseline conditions.

[3]Based on actual bid costs from similar tanks built in New York City. A cost curve plotting the storage volume (MG) against the actual bid cost was developed for the existing tanks, with costs escalated to November 2024 dollars. Cost estimates for retention alternatives using traditional tanks were then derived from the cost curve.

[4]Alternative 3 will not reduce CSO volume but will reduce bacterial loadings during the recreational season. The CSO volume during the recreational season with reduced bacterial loadings is considered a CSO volume reduction for tabulation purposes.

Alternative 3, Recreational Season Disinfection Operation in the Existing Alley Creek CSO Retention Facility, will need to address potential effluent toxicity from total residual chlorine (TRC). Therefore, in developing and evaluating the alternative, DEP sought a balance to reduce a high level of human- or CSO-derived bacteria while protecting the waterbodies from TRC. A potential operational strategy was developed and incorporated into Alternative 3. The disinfection facilities would be operated during the recreational season to achieve a targeted 2-log bacteria kill (99 percent) while seeking to produce a minimum discharge of TRC to the extent possible. Consistent with the majority of surveyed operating CSO disinfection facilities around the country, the effluent TRC in the Alley Creek CSO Retention Facility would be expected to have a maximum concentration of 0.1 milligrams per liter. This potential operational strategy is reflected in the results and the cost estimates in Table ES-4 above.

Alternative 4, the Oakland Ravine Daylighting and Stormwater Diversion Recommended Plan, achieves a significant CSO reduction while balancing constructability and impacts to the community, both within the right-of-way and at Oakland Lake itself. The concept limits sewer construction in the study area due to the proximity of the planned downstream sewer disconnections to Oakland Ravine and Lake and the planned repurposing and utilization of roughly 2,500 linear feet of existing sewer to convey the stormwater disconnected upstream. The results and cost estimates in Table ES-4 reflect 9,000 linear feet of sewer construction for the sewer diversions. Further, the Oakland Ravine Daylighting and Stormwater Diversion will include ecological benefits to Oakland Lake and Ravine and improvements to park land while avoiding the environmental impact considerations, operation and maintenance challenges, land acquisition, and potential need for park land alienation that would be associated with the implementation of the Alternative 3 Recreational Season Disinfection Operation in the Existing Alley Creek CSO Retention Facility. Sections 8 and 9 provide further descriptions and a schedule for Alternative 4 Oakland Ravine Daylighting and Stormwater Diversion.

CSO Reductions, WQ Impact with the Selected Alternative

Summary results for *Enterococci* and fecal coliform loading reductions are illustrated by Figures ES-4 and ES-5 as cost-performance curves for the various alternatives. Figure ES-4 and Figure ES-5 plot the cost of the retained alternatives against their associated projected annual *Enterococci* and fecal coliform loading reductions, respectively. The y-axis shows percentage bacteria loading reductions.

On Figure ES-4, the percent *Enterococci* CSO loading reductions ranged from a low of 13 percent (Alternative 2A. 2.5 million-gallon [MG] additional downstream retention) to a high of 55 percent (Alternative 2D. 41 MG additional downstream retention). In Figure ES-5, the percent CSO fecal coliform loading reductions ranged from a low of around 15 percent (Alternative 2A. 2.5 MG additional downstream retention) to a high of 65 percent (Alternative 2D. 41 MG additional downstream retention).

For Figures ES-4 and ES-5, second-order, best-fit curves were plotted that excluded the two outliers (Alternative 3, Seasonal Disinfection in the Existing Alley Creek CSO Retention Facility and Alternative 4, Oakland Ravine Daylighting and Stormwater Diversion). There is no discernible knee-of-the-curve for either *Enterococci* or fecal coliform. However, had the plots been drawn to encompass the two outliers, the plots would indicate these outlier alternatives are the most cost-effective options.

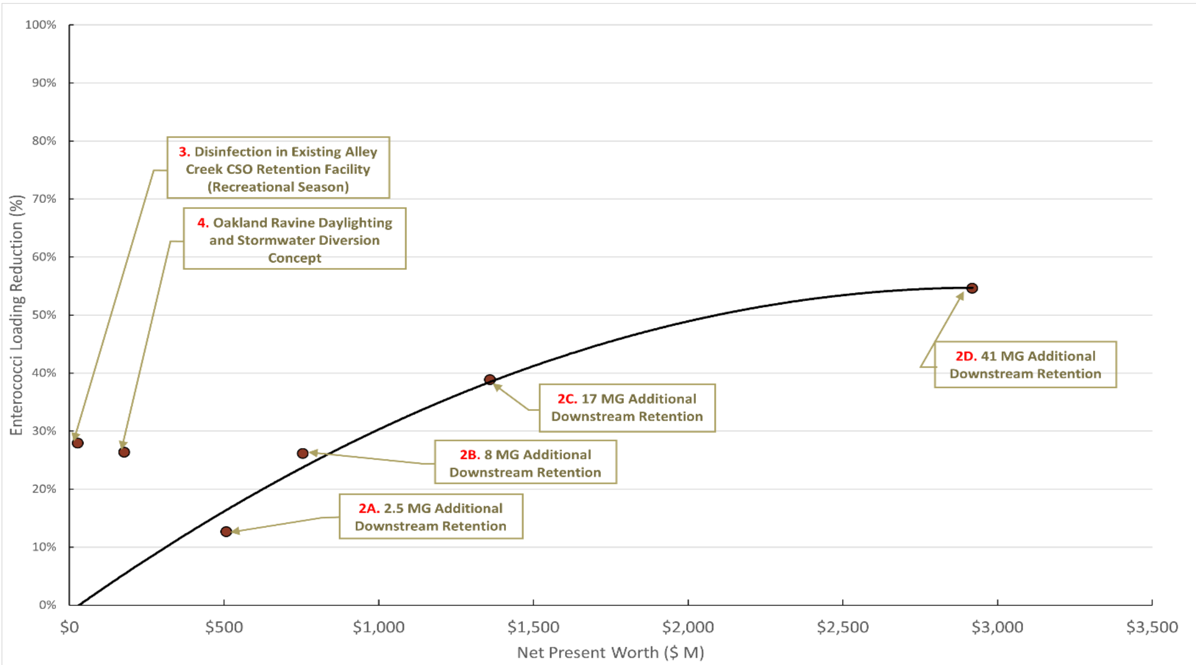

Figure ES-4. Cost vs. Enterococci Loading Reduction – 2008 Rainfall

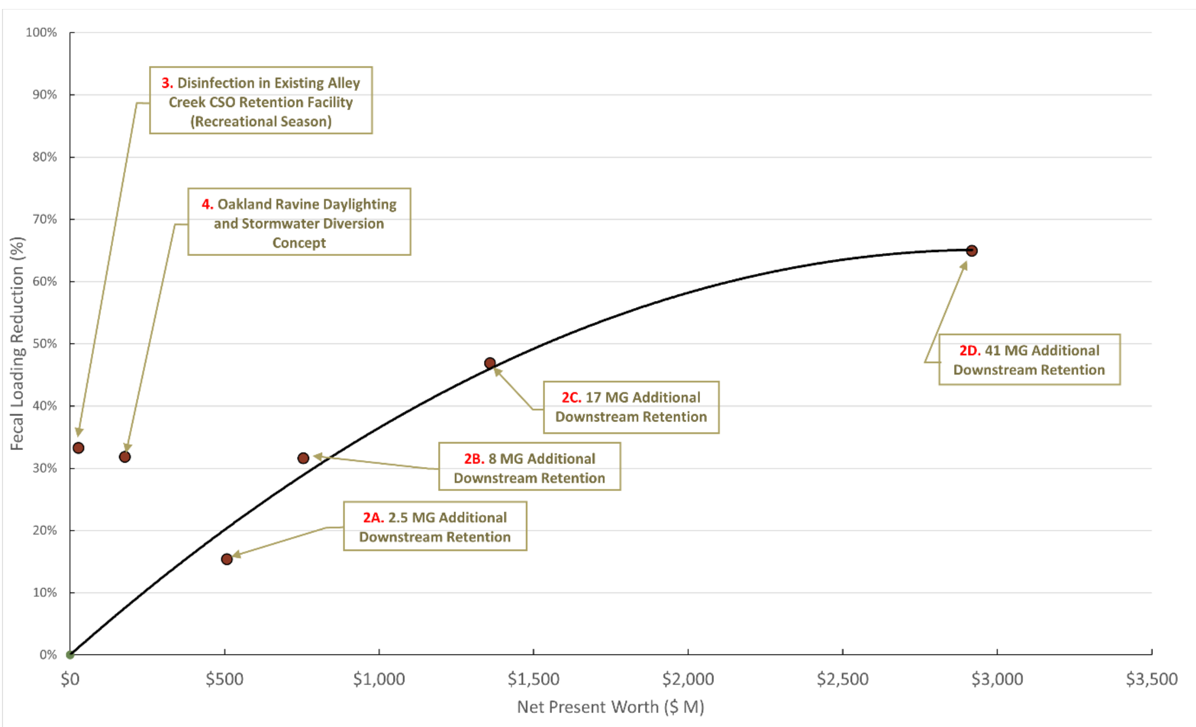

Figure ES-5. Cost vs. Fecal Coliform Loading Reduction – 2008 Rainfall

Cost-attainment curves, presented in Section 8.5.b for five station locations (Figure ES-1) in Alley Creek and Little Neck Bay, show variable results depending upon the location and the WQS. For stations in Little

Neck Bay, the largest improvements in WQS attainment for the alternatives occur with the STV criteria. For the Alley Creek Station 1 (Station AC1), the largest improvements in WQS attainment for the alternatives occur for the GM criteria, especially on an annual basis. Alternative 4 would result in similar WQ benefits at a lower cost compared to other retained alternatives, especially at Station AC1, where WQ does not yet support primary contact use.

The least costly alternatives are disinfection at the existing Alley Creek CSO Retention Facility and Oakland Ravine Daylighting and Stormwater Diversion. The 100 percent CSO control analyses established that CSO discharges are not the only factor in non-attainment of the existing and higher use WQ Criteria in Alley Creek. 100 percent CSO control results in 78 percent and 51 percent attainment of the *Enterococci* GM criteria for the existing secondary contact use and primary contact higher use, respectively, at Station AC1 (Table ES-3). Alternative 4 stands out as a cost-effective means of increased CSO capture (Table ES-4). It is thus recommended as the selected alternative for the Alley Creek and Little Neck Bay LTCP, focused on CSO Control.

This 2026 Supplemental LTCP recommendation follows the findings and adaptive nature of DEP's long-established CSO planning and abatement efforts. The Alley Creek CSO Retention Facility was first proposed in the 2003 East River Facilities Plan, followed by a re-statement in the 2009 Alley Creek WWFP. The $130M investment in the Alley Creek CSO Retention Facility, related collection system improvements, and ecological restoration were effective in reducing the volume of annual CSO overflows. The Oakland Ravine Daylighting and Stormwater Diversion improvement resulting from the 2026 Supplemental LTCP will further build upon these earlier efforts and will decrease the non-sanitary stormwater flow reaching the Alley Creek CSO Retention Facility, allowing for more of the facility's retention capacity to be utilized for CSO capture.

The recommended Oakland Ravine Daylighting and Stormwater Diversion will require continued use of the Alley Creek CSO Retention Facility to capture CSOs. Design and permitting will need to be completed prior to construction of the Oakland Ravine Daylighting and Stormwater Diversion. A post-construction compliance monitoring program will be initiated after the recommended plan improvements are operational. The Alley Creek CSO Retention Facility, along with the Daylighting and Diversion components of the recommended plan, is not expected to result in the attainment of primary contact WQ Criteria for bacteria in Alley Creek. DEP expects that as DEC proceeds with NYS's waterbody reclassification rulemaking analysis for a UAA will be necessary. Analysis for any UAA may consider a revised duration for the active preemptive wet weather advisory used for public notification when swimming and bathing at DMA Beach in Little Neck Bay are not recommended. The Oakland Ravine Daylighting and Stormwater Diversion recommended plan is more completely described in Section 8.0. The net present worth cost of the Oakland Ravine Daylighting and Stormwater Diversion is $142M. The total cost of the project, inclusive of all phases (Design/DSDC, Construction, and CM) is equal to $163M.

During the development of the 2014/2015 LTCP submittals, the public expressed their satisfaction with the current uses of Alley Creek and Little Neck Bay, made possible by DEP's $130M investments in grey infrastructure and related wetland restoration work. As such, the public was not in favor of additional construction in the watershed that could impact the restored area. Consistent with public feedback, the Oakland Ravine Daylighting and Stormwater Diversion will limit new sewer construction in the study area and will also adapt an existing sewer. Further facility planning, procurement of a design contract and consultants, performance of the engineering design, and advertising and bidding of the construction contracts will be necessary steps leading up to the construction of the Oakland Ravine Daylighting and Stormwater Diversion. Potential delays may impact the Oakland Ravine Daylighting and Stormwater Diversion, given the size, complexity, and access coordination needed to support the project elements.

Recommendations

Long-Term CSO Control Plan Implementation, UAA, and Summary of Recommendations

DEP will implement the plan elements identified in this section after DEC review and approval of the 2026 Supplemental LTCP and related modification to the CSO Orders. This 2026 Supplemental LTCP recommends the continued operation of the Alley Creek CSO Retention Facility and the construction of the Oakland Ravine Daylighting and Stormwater Diversion, and it has evaluated projected compliance with WQS based on the predicted performance of the selected CSO controls.

The LTCP analyses and recommendations for the Alley Creek and Little Neck Bay LTCP are summarized below for the following items:

1. WQ modeling results,
2. Identified non-attainment of primary contact WQ Criteria based on projected performance of selected CSO controls, and
3. Summary of recommendations.

Water Quality Modeling Results

The WQ modeling results for Alley Creek and Little Neck Bay are shown in Table ES-5 for the recommended alternative. These results provide the calculated attainment of the fecal coliform and *Enterococci* bacteria concentrations for the plan, including the Oakland Ravine Daylighting and Stormwater Diversion and the continued operation of the Alley Creek CSO Retention Facility. The results indicate the frequency with which the modeled concentrations are at or below the existing WQ Criteria in Alley Creek and Little Neck Bay, and, specifically in Alley Creek, the higher use primary contact recreation WQ Criteria. It was not necessary to perform a model simulation for the recommended alternative for DO attainment given the modeled baseline DO attainment in Alley Creek and Little Neck Bay presented in Section 6.

Based on 10-year model attainment results for *Enterococci* and fecal coliform bacteria criteria protective of secondary contact recreation shown in Table ES-5, implementation of the preferred Alternative 4 is not expected to fully attain Class I secondary contact recreation in Alley Creek. Based on 10-year model attainment results for *Enterococci* and fecal coliform bacteria criteria protective of primary and secondary contact recreation shown in Table ES-5, implementation of the preferred Alternative 4 is, except for primary contact recreation at the OW2 station, expected to attain the GM criteria fully for Class SB primary and secondary contact recreation in Little Neck Bay. The OW2 station in Little Neck Bay is tidally influenced by Alley Creek. The 10-year model results presented in Table ES-5, however, show non-attainment in Little Neck Bay of the STV criteria associated with primary and secondary contact recreation. Model attainment results for locations in addition to those in Table ES-5 are presented in Section 8 and indicate that waters near the Great Neck northeastern shoreline of Little Neck Bay, not captured by the tabulated station results, will likely require additional local source controls to attain the recreational season *Enterococci* rolling 30-day GM criteria supporting primary contact recreation.

Table ES-5. Model Calculated 10-Year Bacteria Attainment for the Recommended Alternative

	30-day Rolling *Enterococci*				Monthly Fecal Coliform
	Annual Secondary Contact Recreation		Recreational Season Primary Contact		Annual Primary/Secondary Contact Recreation
STATION[1]	GM <u><</u>72 cfu/100 mL (%)	STV <u><</u>266 cfu/100 mL (%)	GM <u><</u>35 cfu/100 mL (%)	STV <u><</u>130 cfu/100 mL (%)	GM <u><</u>200cfu/100 mL (%)
AC1[2]	69	14	42	10	90
OW2	YES, 96	54	92	31	YES, 100
LN1	YES, 100	87	YES, 97	67	YES, 100
E11	YES, 100	YES, 97	YES, 99	85	YES, 100
DMA	YES, 100	87	YES, 98	65	YES, 100

Notes: cfu/100 mL = colony-forming unit(s) per 100 milliliters; DMA = Douglas Manor Association; GM = geometric mean; STV = statistical threshold value, YES = 95 percent or greater attainment.

[1]Station AC1 is in Alley Creek. Stations OW1, LN1, E11, and DMA are in Little Neck Bay. Station DMA is a bathing beach.

[2]The primary contact recreation water quality criteria are not currently assigned to Alley Creek and represent a higher use.

UAA, WQ Compliance, and Time to Recovery

Since the Recommended Plan will not result in full compliance with existing and higher-use bacteria WQ Criteria, analysis for a UAA is needed for Alley Creek and Little Neck Bay. Since Alley Creek and Little Neck Bay are expected to attain DO criteria under baseline conditions, there is no need for a UAA as it relates to DO. A UAA for bacteria is expected to be completed as necessary by DEP in coordination with DEC as part of any ongoing NYS waterbody reclassification rulemaking evaluations. Although Alley Creek will not be capable of supporting primary contact recreation, Little Neck Bay comes very close to full attainment of primary contact recreation. Little Neck Bay could possibly be protective of primary contact recreation that does not occur during and following rainfall events when concentrations of bacteria are elevated.

To gain insight into the shorter-term impacts of wet-weather sources of bacteria, DEP has performed analyses of modeled bacteria concentrations to assess the amount of time following the end of a rainfall event required for Alley Creek and Little Neck Bay to recover and return to fecal coliform concentrations less than 1,000 cfu/100 mL and *Enterococci* concentrations less than 266 cfu/100 mL and 130 cfu/100 mL. The analyses consisted of examining the WQ model calculations for Alley Creek and Little Neck Bay bacteria concentrations for the recommended LTCP alternative for storms greater than 1.0 to 1.5 inches and for a selected August 14–15, 2008, design rainfall event. Details on the selection of the storms are provided in Section 6 of this LTCP. The storms cover approximately 90 percent of the rain events that typically occur in an average year. The times to return (or “times to recovery”) to a 1,000 cfu/100 mL fecal coliform concentration and 266 cfu/100 mL and 130 cfu/100 mL *Enterococci* concentrations are tabulated for locations within Alley Creek and Little Neck Bay in Table ES-6 and Table ES-7 for various locations within these waterbodies.

As indicated in Table ES-6, for the Recommended Plan, the modeled 10-year average time to recovery for *Enterococci* to 130 cfu/100 mL is less than 24 hours at the northern Little Neck Bay stations, including at DMA Beach. Model results for the 10-year average time to recovery for *Enterococci* to 266 cfu/100 mL are similar. Model results for the 10-year average time to recovery for fecal coliform bacteria to 1,000 cfu/100 mL are, except for the model results at Station AC1, less than 24 hours. As indicated in Table ES-7, for the Recommended Plan, the modeled design storm time to recovery for *Enterococci* to 130 cfu/100 mL is less than 24 hours at the E11 station. Model results for design storm time to recovery for *Enterococci* to 266 cfu/100 are less than 24 hours for three Little Neck Bay stations. Model results for the design storm time to recovery for fecal coliform bacteria to 1,000 cfu/100 mL are, except for the Station AC1 model results, less than 24 hours.

Wet weather advisory notifications may be considered for specific durations following rain events if necessary to protect public health.

Table ES-6. 10-Year Time to Recovery (hours) to Fecal Coliform and *Enterococci* Thresholds for Storms >1.0 to 1.5 Inches – Recommended Plan

Station	Fecal Coliform (1,000 cfu/100 mL)	*Enterococci* (266 cfu/100 mL)	*Enterococci* (130 cfu/100 mL)
	10-year Average Time to Recovery[1] (hours)		
AC1	26.6	34.6	42.5
OW2	18.5	31.0	39.9
LN1	8.0	19.7	24.8
DMA	7.2	18.9	23.2
E11	1.1	9.2	17.3

Notes:

[1] Average time to recovery values presented for storms from the 10-year simulation in the size range of >1.0 to 1.5 inches of rainfall, which includes the 90th percentile rain event. Storms were selected from recreational seasons for the fecal coliform and *Enterococci* 130 colony-forming units per 100 milliliters (cfu/100 mL) threshold evaluations. Storms were selected year-round for the *Enterococci* 266 cfu/100 mL threshold evaluations.

DMA = Douglas Manor Association

Table ES-7. Design Storm (1.02 inches) Time to Recovery (hours) to Fecal Coliform and *Enterococci* Thresholds – Recommended Plan

Station	Fecal Coliform (1,000 cfu/100 mL)	*Enterococci* (266 cfu/100 mL)	*Enterococci* (130 cfu/100 mL)
	Design Storm Time to Recovery (hours)		
AC1	27	35	43
OW2	22	34	36
LN1	10	22	34
DMA	21	22	34
E11	7	9	10

Notes: cfu/100 mL = colony-forming units per 100 milliliters; DMA = Douglas Manor Association

Summary of Recommendations

The identified LTCP elements described in this section are the culmination of efforts by DEP to assess the WQS. DEP recognizes that achieving WQ objectives requires more than the reduction of CSO discharges. DEP's CSO Control Facility Planning for these waterbodies began in 1984.

The identified elements for the Alley Creek and Little Neck Bay 2026 Supplemental LTCP are:

1. DEP will continue to use the Alley Creek CSO Retention Facility to capture CSOs.

2. DEP will implement the steps necessary (e.g., demonstration, funding, design, permitting) to construct the Oakland Ravine Daylighting and Stormwater Diversion.

3. The continued operation of the Alley Creek CSO Retention Facility, in addition to this Recommended Plan, will not result in the attainment of primary contact WQ Criteria for bacteria in Alley Creek. A UAA will be completed as necessary as part of any NYS waterbody reclassification rulemaking and upon completion will supersede the UAA proposed in June 2014 in the approved 2017 LTCP Appendix E and amended in May 2015 in Appendix H Attachment 4.

4. Pending DEC review and approval, a post-construction compliance monitoring program will be initiated after the Recommended Plan improvements are operational.

DEP established, with the NYC DOHMH, through public notification, a wet weather advisory during the bathing season (late May through early September), during which swimming and bathing would not be recommended. The active preemptive standing advisory for DMA Beach is for no swimming for 30 hours after a rainfall of 0.3 to 0.6 inches in 24 hours; for 60 hours after a rainfall of more than 0.6 inches to 2.5 inches in 24 hours; or for 72 hours after a rainfall of more than 2.5 inches in 24 hours. The updated Alley Creek and Little Neck Bay LTCP recovery time analysis, presented in Table ES-5 and Table ES-6, in conjunction with other analyses to be performed as part of any NYS's waterbody reclassification rulemaking process and UAA development, could be used to establish a revised duration of the wet weather advisory for public notification.

Section 9.0 presents the implementation of the identified elements. The implementation schedule is depicted in Figure ES-6.

Figure ES-6. Alley Creek and Little Neck Bay LTCP – Recommended Plan Schedule

DEP is committed to improving WQ in these waterbodies, which will be advanced by the improvements and recommendations presented in this plan. These goals and recommendations have been balanced with input from the public and awareness of the cost to the citizens of NYC. The use of the analysis as part of any UAA process will allow DEP and DEC to advance the goal of achieving improved water quality criteria in Alley Creek and improve the already high attainment of the Class SB WQ Criteria for Little Neck Bay.

Since the 2017 approval of the Alley Creek and Little Neck Bay LTCP, the following significant changes have been included in this Alley Creek and Little Neck Bay 2026 Supplemental LTCP:

- Additional data were compiled and evaluated in Section 2:
    - Updated WQ Criteria
    - U.S. Geological Survey MST data
    - Harbor Survey and Sentinel Monitoring data in Alley Creek and Little Neck Bay
    - DOHMH data at DMA Beach
    - Illicit discharge tracking data in Alley Creek

  - Shoreline surveys and identification of additional permitted stormwater outfalls

- Additional data and evaluations from the 2024 technical feasibility study in the Oakland Ravine portion of the Alley Creek and Little Neck Bay watershed were incorporated into the IW Model:
  - Flow monitoring
  - Reviews of sewer system as-built drawings and field verifications
  - Geographic Information Systems analyses and drainage area delineations
- Models of Alley Creek and Little Neck Bay were updated, and the baseline, 100 percent CSO Control, and loading component modeling analyses were updated in Section 6.0, and the modeling and cost performance analyses for retained and selected alternatives were updated in Section 8.0, as applicable.
- The Oakland Ravine Daylighting and Stormwater Diversion Alternative was added, and revisions to retained alternatives were made to Section 8.0.
- The Oakland Ravine Daylighting and Stormwater Diversion Alternative was added as a recommendation in Section 9.0.
- The recovery time analyses in Sections 6 and 8 were expanded to include *Enterococci* and fecal coliform thresholds and to include analyses for a 10-year record of large rainfall events in addition to a single design storm rainfall event.
- Public outreach and stakeholder engagement continued as described in Section 7.0.

The UAA for Alley Creek has not yet been revised. Use analysis will be completed subsequently as necessary by DEP in coordination with DEC as part of any NYS waterbody reclassification rulemaking evaluations.

Attachment 2 – Section 2, 2026 Revised

The 2014 and 2015 versions of the approved 2017 LTCP Section 2 have been revised and are superseded by the 2026 Supplemental LTCP version of Section 2 provided below. Track change edits show text revisions. Text, figures and tables which have been replaced are marked as replaced, and track change edits are not shown.

2.0 WATERSHED/WATERBODY CHARACTERISTICS – 2026 REVISED

This section summarizes the major characteristics of the Alley Creek and Little Neck Bay watershed and waterbody, building upon earlier documents that present a characterization of the area. These include the WWFP for Alley Creek and Little Neck Bay (DEP, 2009), the approved 2017 LTCP for Alley Creek and Little Neck Bay (DEP, 2014; 2015), and the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024), which describes the characteristics of the watershed and waterbody.

2.1 Watershed Characteristics

This subsection contains a summary of the watershed characteristics as they relate to the sewer system configuration, performance, and impacts to the adjacent waterbodies, as well as the modeled representation of the collection system used for analyzing system performance and CSO control alternatives.

2.1.a Description of Watershed – (2026 Revised)

The Alley Creek and Little Neck Bay watershed is urbanized and sub-urbanized, comprised primarily of residential areas with some commercial, industrial, and open space/outdoor recreation areas. The Alley Creek and Little Neck Bay watersheds consist of approximately ~~4,879~~4,788 acres, located on the north shore of eastern Queens County in NYC, adjacent to the Nassau County border. The land surrounding Alley Creek is mostly parkland, while that surrounding Little Neck Bay is largely residential. Several parks are found within the watershed; most notable is the Alley Pond Park, which is adjacent to Alley Creek on its eastern, western, and southern shores, south of the Little Neck Bridge (Northern Boulevard). As described later in this section, the area is served by a complex wastewater system comprised of combined, separate, and storm sewers; interceptor sewers and pumping stations (PS); several CSO and stormwater outfalls; and a CSO retention tank, the Alley Creek CSO Retention Facility.

Although the watershed has undergone major changes as this part of the City has developed, significant effort and interest by the citizens living in the area and NYC agencies has resulted in recognition of the ecological, environmental, and educational value of Alley Creek and its tidal wetlands. In contrast to the filling-in of wetlands and “hardening” of the shoreline with bulkheads that characterize most of NYC’s pre-colonial wetlands, much of Alley Creek’s wetlands and the Little Neck Bay wetlands in Udalls Cove are designated parks.

The urbanization of the Alley Creek and Little Neck Bay drainage area has led to the creation of both a combined sewer system (CSS) and separate sewer system (SSS), including its companion stormwater systems that discharge to the two waterbodies. Combined sewage of insufficient volume to overflow through CSO outfall structures to Alley Creek and Little Neck Bay is conveyed to the Tallman Island (TI) Wastewater Treatment Plant (WWTP) for treatment. As shown in Figure 2-1, Alley Creek and Little Neck Bay are located along the eastern edge of the TI WWTP tributary area.

As a residential community within NYC, several large and notable transportation corridors cross the watershed, providing access between dense commercial and residential areas. These access routes include the Cross Island Parkway, Long Island Expressway (LIE), Grand Central Parkway, and the Long Island Rail Road (LIRR) (Figure 2-2). These transportation corridors limit access to some portions of the waterbodies and must be taken into consideration when developing CSO control solutions.

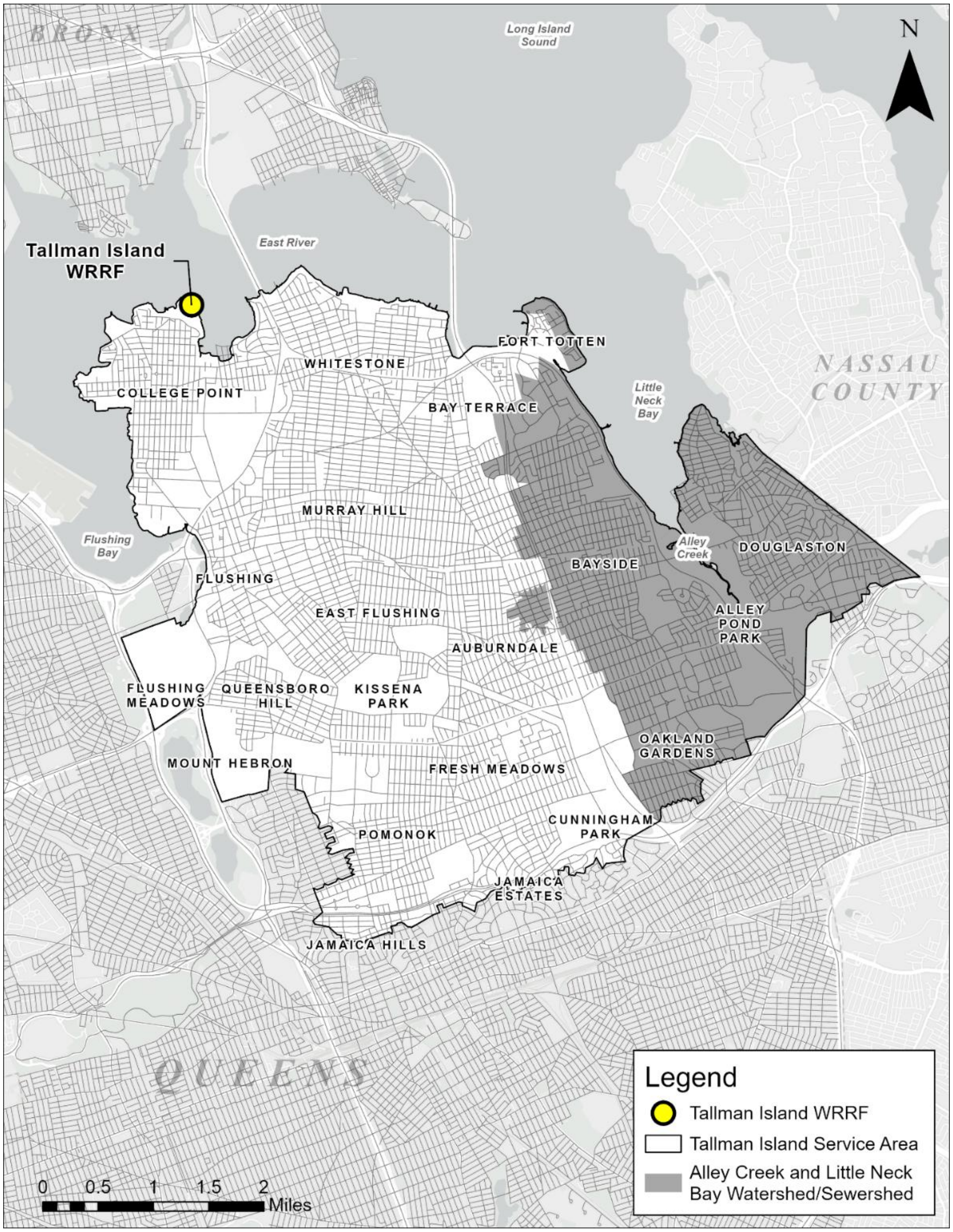

Figure 2-1. Alley Creek and Little Neck Bay Watershed Within Tallman Island WWTP – (2026 Replaced)

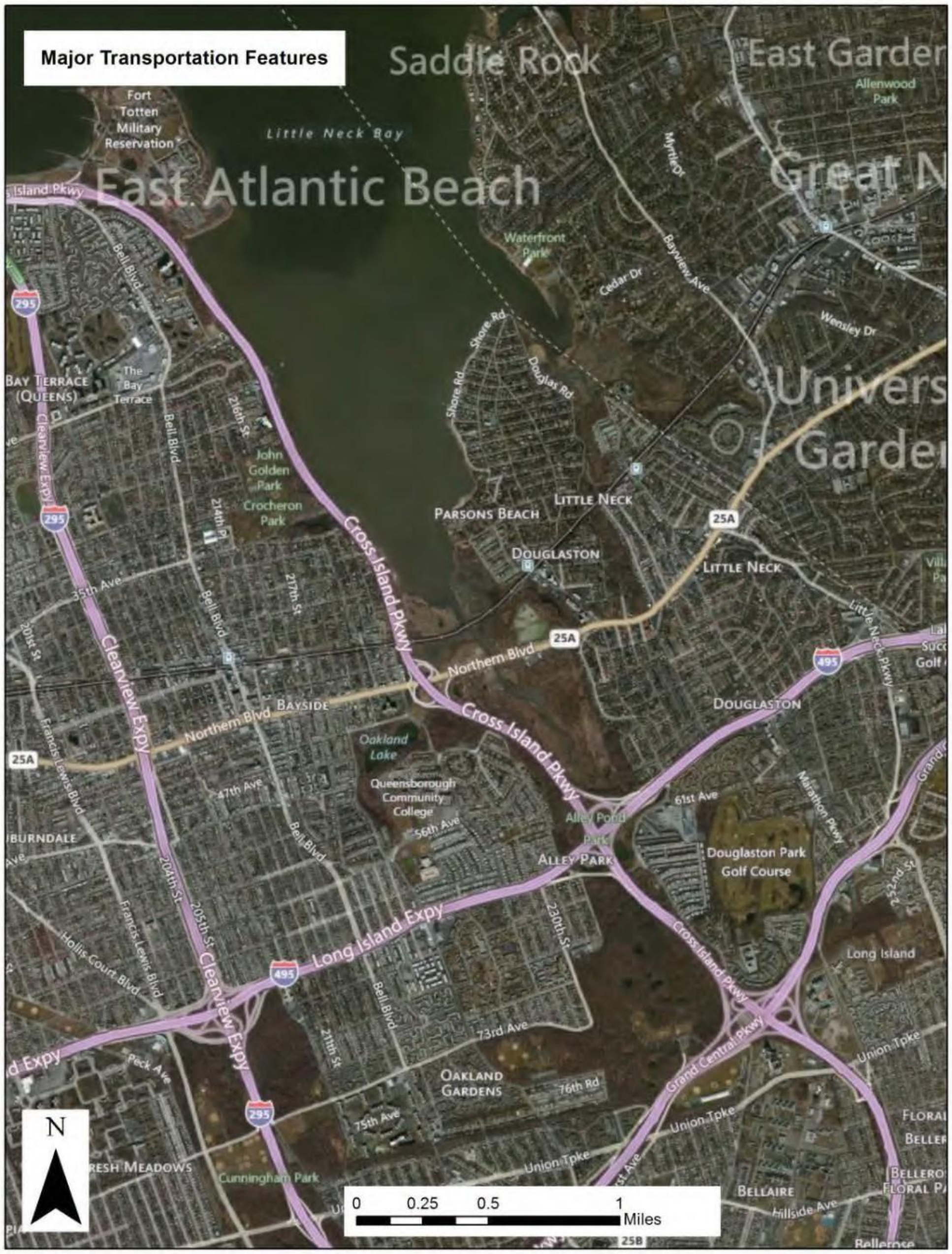

Figure 2-2. Major Transportation Features of Alley Creek and Little Neck Bay

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

Existing land use for the watershed is shown in Figure 2-3 and generally aligns with the established zone. Starting at the northeast edge of the waterbody within NYC, land immediately southeast of Udalls Cove is zoned C3 (commercial local retail), while surrounding land is zoned for low-density residential, detached and attached (R1-2, R-2, and R3-1). The whole of Douglaston Peninsula is zoned for detached housing on large lots (R1-2). The land that immediately surrounds Alley Creek is designated parkland. The residential area to the east of the creek is R1-2, while that to the west is R2. Residential land on the western shore, north of the railroad tracks, is zoned R3-2 and R2. Moving north, Crocheron Park and John Golden Park are designated parkland. The area between John Golden Park and Fort Totten is known as Bayside. Previous zoning allowed R5 (mid-density, including multi-story rowhouses). The NYC Department of City Planning (DCP) rezoned 350 blocks in the Bayside area of northeastern Queens, Community District 11. Much of the area is now rezoned into contextual districts, permitting the development of only one- and two-family homes to maintain Bayside's longstanding neighborhood character. To curb recent development trends toward unusually large single-family houses in areas currently zoned R2, DCP established a new low-density contextual zoning district, R2A. This new district limits floor area and height, as well as other bulk regulations that are different from the former R2 district (DEP website 2005). Fort Totten is zoned R3-1, C3, and NA-4. The NA-4 designation is a Special Natural Area District (SNAD). This protects the area by limiting modifications in topography, by preserving trees, plants and marine life, and natural watercourses, and by requiring clustered development to maximize preservation of natural features. Generalized land use within the NYC portion of the Alley Creek and Little Neck Bay assessment area within the riparian area of ¼ mile of the Alley Creek and Little Neck Bay shoreline is shown in Figure 2-4. Land use within the Alley Creek and Little Neck Bay drainage area is summarized in Table 2-1. The main land use is residential, with sizeable fractions of Open Space and Outdoor Recreation and Vacant Land.

Table 2-1. Land Use within the Alley Creek and Little Neck Bay Drainage Area – (2026 Replaced)

Land Use Category	Percent of Area	
	Riparian Area (¼-mile radius) Percent	Drainage Area Percent
Commercial	<1%	3%
Industrial	0%	<1%
Open Space & Outdoor Recreation	38%	22%
Public Facilities	19%	9%
Residential	40%	64%
Vacant Land	3%	2%

As of the report date, there are no proposed land use changes or major NYC development projects in the Alley Creek or Little Neck Bay assessment area.

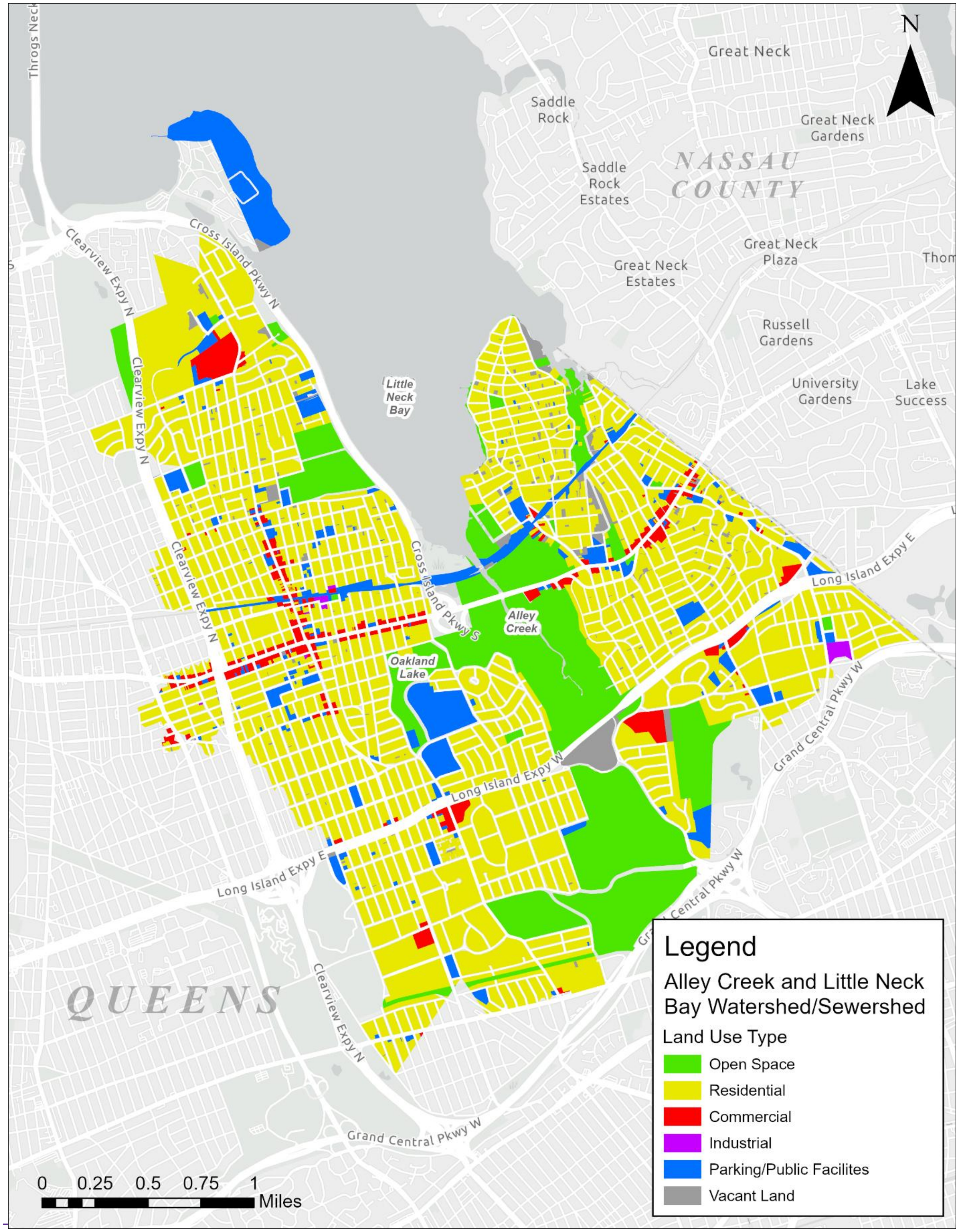

Figure 2-3. Land Use in Alley Creek/Little Neck Basin – (2026 Replaced)

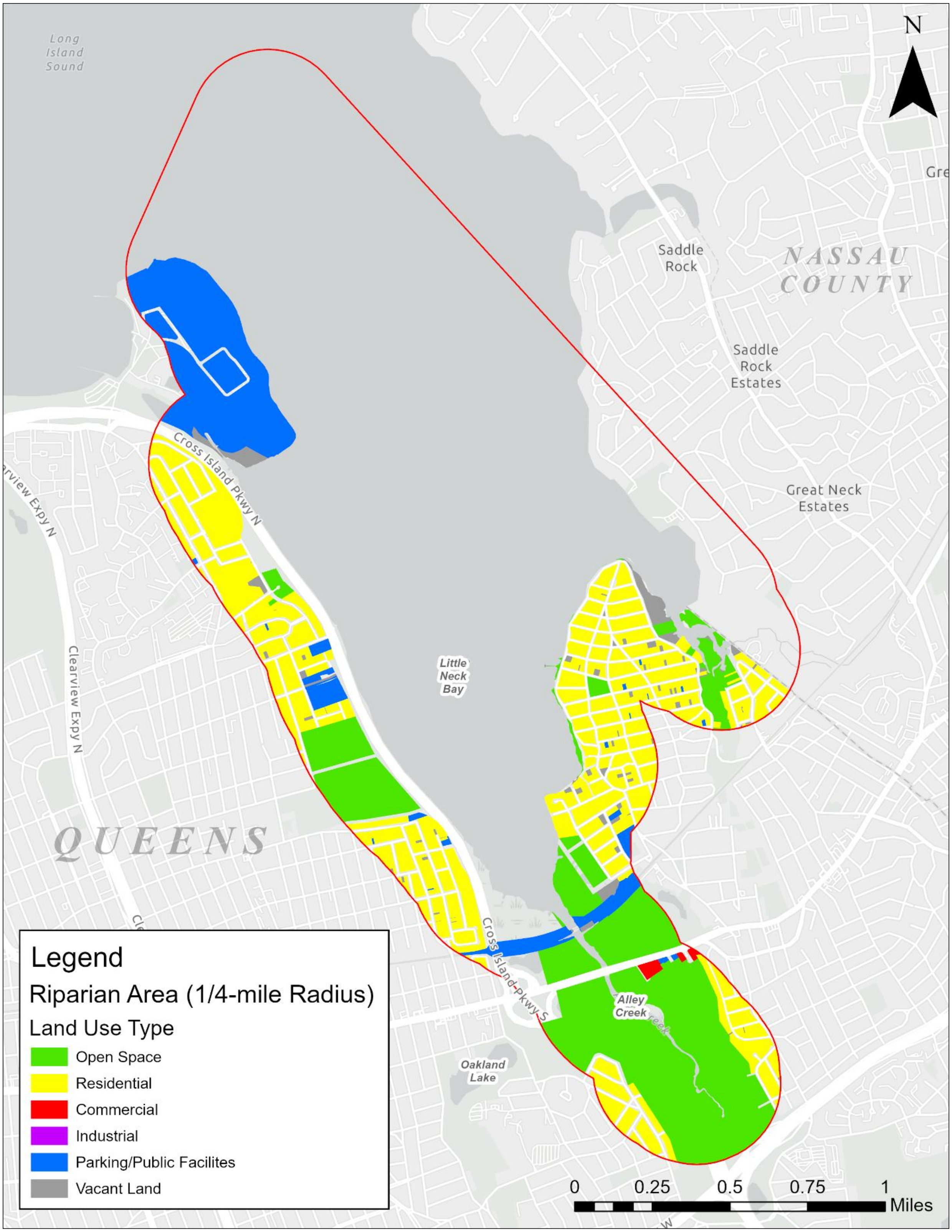

Figure 2-4. ¼ Mile Land Use in Alley Creek and Little Neck Bay – (2026 Replaced)

2.1.a.2 Permitted Discharges

The Belgrave WWTP, State Pollutant Discharge Elimination System (SPDES) NY-0026841, located in Great Neck, Nassau County, discharges to the head of Udalls Cove (Little Neck Bay), near 34th Avenue and 255th Street. The Belgrave WWTP has a design capacity of 2.0 million gallons per day (MGD) and treats on average about 1.3 MGD of secondary treated, disinfected effluent (Figure 2-5). In addition to the Belgrave WWTP, there are several permitted CSO and stormwater discharge points. These are discussed in more detail in Section 2.1.c.

Figure 2-5. Location of the Belgrave WWTP, Adjacent to Udalls Cove (View NE)

2.1.a.3 Impervious Cover Analysis (2026 Revised)

Impervious surfaces within a watershed are those characterized by an artificial surface, such as concrete, asphalt, or a rooftop. Rainfall occurring on an impervious surface will experience a small initial loss through ponding and seasonal evaporation on that surface, with the remaining rainfall volume becoming overland runoff that directly flows into the CSS and/or SSS. The impervious surface is important when characterizing a watershed and CSS performance, as well as the construction of hydraulic models used to simulate the performance of the CSS.

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. However, as described below, efforts to update the model and the impervious surface representation have been recently completed.

As the City started to focus attention on the use of green infrastructure (GI) to manage street runoff 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 essential. In addition, the City realized that it would be important to distinguish between impervious surfaces that directly introduce runoff (Directly Connected Impervious Areas, or DCIA) to the sewer system from those impervious surfaces that may not contribute any runoff to the sewers. For example, a rooftop with roof drains directly connected to the combined sewers (as required by the NYC Plumbing Code) would be an impervious surface that is directly connected. However, a sidewalk or pervious surface adjacent to a park may not contribute any runoff to the CSS and as such would not be considered to be 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. The data and the approach used are described in detail in the InfoWorks 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 in model recalibration and provided the DEP with a better idea of where GI can be deployed to reduce the runoff contributions from impervious surfaces that contribute flow to the collection system. The result of the recalibration efforts was a slight increase in the amount of runoff that enters the CSS tributary to the TI WWTP.

Further updates were made to the runoff coefficient as part of the model refinement and calibration associated with the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024); these updates are discussed in further detail in Section 2.1.a.5. The updates to the model runoff coefficient for the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study were made strictly for the portion of the model representing the Oakland Ravine Watershed. Parameters applied for the model representation of the remaining TI~~allman Island~~ catchment area were not changed.

2.1.a.4 Population Growth and Projected Flows

The DEP Bureau of Environmental Planning and Analysis (BEPA) routinely develops water consumption and dry weather wastewater flow projections for DEP's planning purposes. Water and wastewater demand projections were developed by BEPA in 2012; an average per capita water demand of 75 gallons per capita per day was determined to be 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 contained in the InfoWorks (IW) Sewer System Model (IW Model) for the TI~~allman Island~~ WWTP sewershed. This was accomplished by using geographic information systems (GIS) tools to proportion the 2040 populations locally from the 2010 census information for each landside subcatchment tributary to each CSO. Per capita dry weather sanitary sewage flows for these landside model subcatchments were established as the ratio of two factors: the year~~ per capita~~ dry weather sanitary sewage flow and the 2040 estimated population for the landside model subcatchment within the TI~~allman Island~~ WWTP service area.

2.1.a.5 Update Landside Modeling (2026 Revised)

The Alley Creek and Little Neck Bay watershed is part of the overall TI~~allman Island~~ WWTP System Model (TI Model). Several modifications to the collection system that is tributary to the TI~~allman Island~~ WWTP have occurred since the model was calibrated in 2007. Since the TI Model has been used for analyses associated with the annual reporting requirements of the SPDES permit Best Management

Practices (BMPs) and Post Construction Monitoring (PCM) for the Flushing Creek CSO Retention Facility, many of these changes have already been incorporated into the model.

Major changes to the modeled representation of the collection system that have been made since the 2007 update include:

- Representation of the Flushing Creek CSO Retention Facility for model simulations after May 2007.
- Representation of the Alley Creek CSO Retention Facility for model simulations after March 10, 2011.
- Model recalibration in 2012.
- Inclusion of the Bowery Bay drainage areas that contribute CSOs to the Flushing Creek CSO Retention Facility and to TI-010. Because the overflows from a portion of the Bowery Bay High Level sewershed conveyed to this tank through the Park Avenue outfall, this model update was performed to avoid the need to run the Bowery Bay Model as a precursor to every TI Model run.
- Updates to the TI-025 and TI-008 sewersheds as a result of the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024). To understand the existing hydrologic and hydraulic conditions within the Feasibility Study drainage area, which focused on the separately sewered area contributing flow to the Alley Creek CSO Retention Facility (Outfall TI-025), model refinement and calibration were performed. This refined model enhanced the detail of the sewer network by incorporating all storm and combined sewers within the study area regardless of size and by delineating modeled subcatchments on a block-by-block basis. Additional details on the model updates resulting from this study are provided at the end of this section.

In addition to changes made to the modeled representation of the collection system configuration, several other changes have been made to the model, including:

- ***Runoff generation methodology***, including the identification of pervious and impervious surfaces. As described in Section 2.1.a.3, the impervious surfaces were also categorized into DCIAs 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 two decades, the DEP Bureau of Water and Sewer Operations (BWSO) has been developing a GIS system that will provide the most up-to-date information available on the existing sewers, regulators, outfalls, and PSs. As part of the update and model recalibration, data from the GIS repository for interceptor sewers were used. The models will continue to evolve and be updated as more information becomes available from this source and any other field information. As noted above and at the end of this section, significant updates were made to the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024) area as a result of additional GIS and as-built review, as well as some field verification.
- ***Interceptor Sediment Cleaning Data.*** DEP ~~recently~~ completed a citywide interceptor sediment inspection and cleaning program. From April 2009 to May 2011, approximately 136 miles of the City's interceptor sewers were inspected. 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 for sections not yet 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 IW Model, an average rate of 0.1 inches/hour was used for the model calibration, while no evaporation rate was used as a conservative measure during alternatives analyses. During the update of the IW Model, hourly ET estimates obtained from four National Oceanic and Atmospheric Administration climate stations [John F. Kennedy (JFK), Newark (EWR), Central Park (NYC), 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. Based on the calibration period, the appropriate DWFs for 2005 or 2006 or another calendar year were used.
- ***Precipitation.*** A review of the rainfall records for model simulations was undertaken as part of this exercise, as discussed in Section 2.1.b.

In 2012, DEP recalibrated 13 of the City's landside models after the updates and enhancements were completed. This effort and calibration results are included in the InfoWorks Citywide Model Recalibration Report (DEP, 2012a) required by the updated Order on Consent. Following this report, DEP submitted to DEC a Citywide Hydraulic Analysis Report in December 2012 (DEP, 2012b). The general approach followed was to recalibrate the model in a stepwise 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 October 2007 using updated satellite data. 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. These areas ranged from 15 to 400 acres in spatial extent. A range of areas with different land use mixes was selected to support the development of a standardized set of coefficients that can 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 be further impacted by regulation at in-system control points (regulators, internal reliefs, etc.). During this step in the recalibration, minimal changes were made to runoff coefficients.

The result of this effort is a model with better representation of the collection system and its tributary area for the TI~~allman Island~~ WWTP basin, including Alley Creek and Little Neck Bay. ~~This updated model is used for the alternatives analysis as part of this LTCP.~~ A comprehensive discussion of the recalibration effort can be found in the InfoWorks Citywide Model Recalibration Report (DEP, 2012a).

Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study Area Updates (2026 Replaced)

The Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study (DEP, 2024) was developed to evaluate alternatives of diverting up to 100 percent of the stormwater from the separately sewered area draining to the Alley Creek CSO Retention Facility. The study focused on an approximately 711-acre area within Bayside, which is a densely populated residential neighborhood in Queens, NYC. The study area is bounded to the north by the LIRR, to the east by Alley Pond Park, to the south by the LIE, and to the west by the Clearview Expressway, in addition to a small area that extends beyond the Clearview Expressway, which carries flows through 46th Avenue, as shown in Figure 2-6.

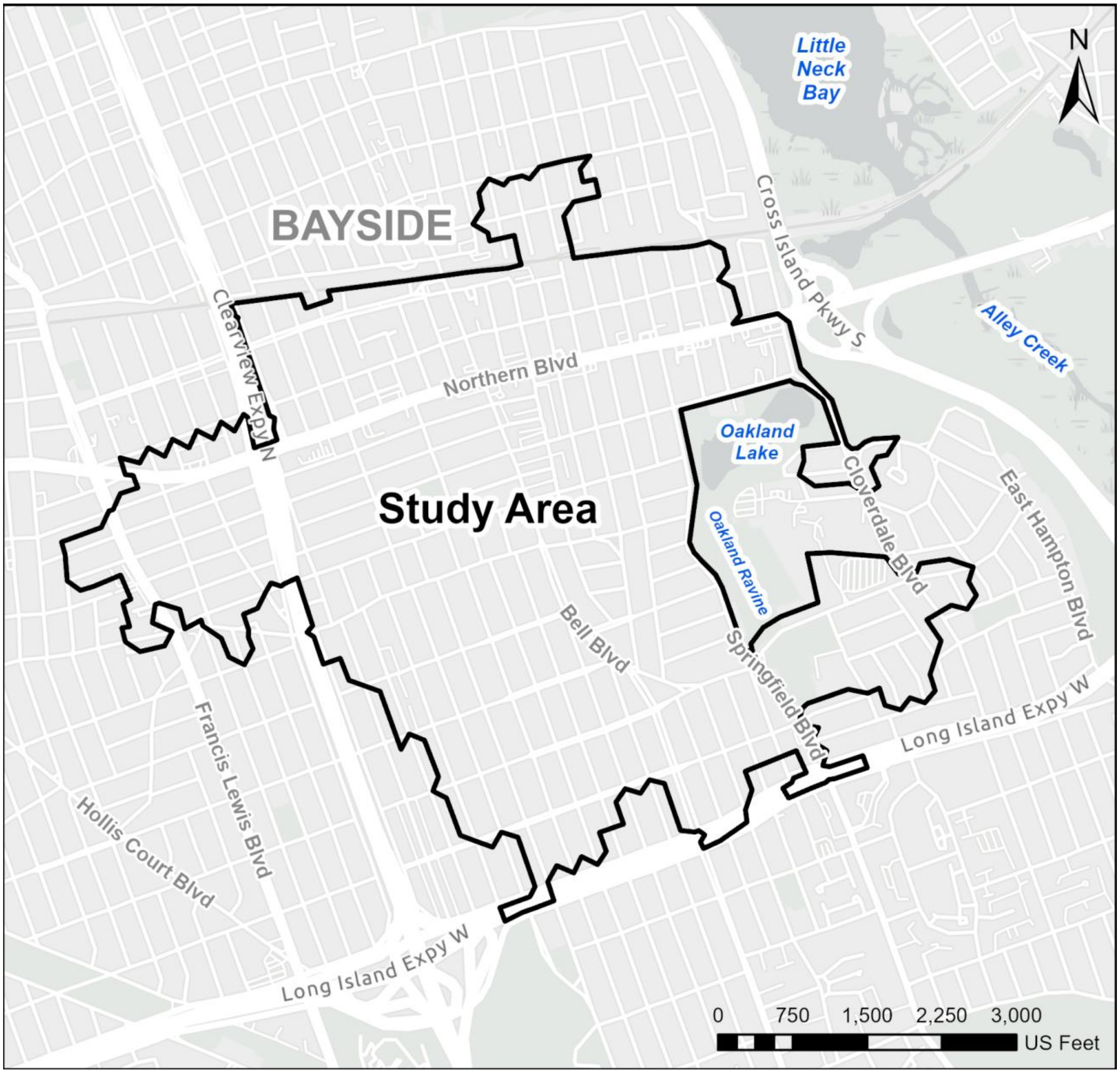

Figure 2-6. Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study Area – (2026 Replaced)

The majority of the 711-acre study area is separately sewered; however, the storm sewers connect into two large, combined sewers. These combined sewers also receive overflows from regulators TI-46 and TI-4 and are located predominately in 210th Street and Oceania Street and 218th Street and Springfield Boulevard, respectively, running from Horace Harding Expressway to 46th Avenue.

Sanitary flows within the study area are conveyed to an interceptor sewer running along 46th Avenue and eventually discharged to the TI~~allman Island~~ WWTP. Stormwater runoff from the study area is either captured by dedicated storm sewers, which eventually discharge to the CSS, or by seepage basins or unconnected catch basins, which are isolated from the sewer system. Of the 711-acre study area, 441 acres are captured by a dedicated storm sewer that discharges to the CSS, while about 181 acres drain directly to the CSS. The remaining 89 acres are tributary to seepage basins or unconnected catch basins. Figure 2-7 provides an overview of the drainage type within the study area.

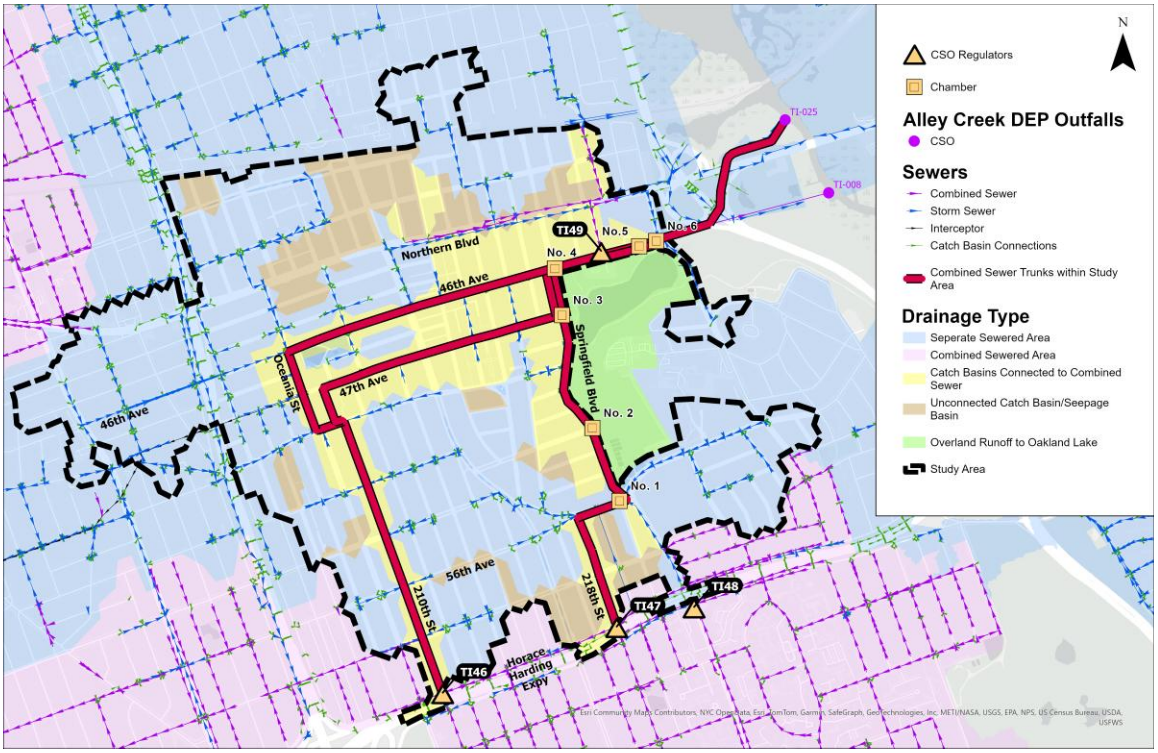

Figure 2-7. Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study Area Drainage Characteristics – (2026 Replaced)

To understand the existing hydrologic and hydraulic conditions within the study area, it was necessary to refine and calibrate a focused collection system model within the study area. The starting point for the Existing Conditions Model was the 2022 CSO BMP Model for TI~~allman Island~~; this model was updated to align with the best available information in DEP's GIS and As-Builts. This model enhanced the detail of the sewer network by incorporating all storm and combined sewers within the study area regardless of size and by delineating modeled subcatchments on a block-by-block basis.

Sewer monitoring data was collected via 8 flow meters and 2 level sensors between March 2023 and July 2023 and was used to calibrate/validate conditions during the 2023 sewer monitoring period. During calibration, fixed runoff coefficients were adjusted as needed to achieve an acceptable match between the metered and modeled flow data at the 8 flow monitoring locations.

Adjustments made to the calibrated Existing Conditions Model were incorporated into the Baseline Condition Model for Alley Creek and Little Neck Bay, using the 2014 Baseline Model. A comprehensive discussion of the updates can be found in the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024) and the Oakland Ravine Daylighting and Stormwater Diversion Sewer Monitoring and Sewer Model Calibration Tech Memorandum (DEP, 2023).

2.1.b Review and Confirm Adequacy of Design Rainfall Year

DEP has been consistently applying the 1988 annual precipitation characteristics to the landside IW models to develop pollutant loads from combined and separately sewered drainage areas. For early CSO

LTCP evaluations, 1988 ~~has been~~ was considered to be representative of long-term average conditions and therefore had been used for analyzing facilities where "typical" rather than extreme conditions serve as the basis of design, in accordance with the United States (U.S.) Environmental Protection Agency (EPA) CSO policy of using an "average annual basis" for analyses. However, the selection of 1988 as the average condition was reconsidered due to growing concerns over climate change and the potential for more extreme and possibly more frequent storm events. Recent landside modeling analyses in the City have used the 2008 precipitation pattern to drive the runoff-conveyance processes, along with the 2008 tide observations, which DEP believes to be more representative than 1988 conditions as a typical year that includes some extreme storms also.

The 2009 Alley Creek WWFP was based on 1988 rainfall conditions, but future baseline/alternative runs are performed using 2008 as the typical precipitation year. A comparison of these rainfall years, which led to the selection of 2008, is provided in Table 2-2.

Table 2-2. Comparison of Rainfall Years to Support Evaluation of Alternatives

Parameter	WWFP JFK 1988	Present Day Average 1969–2010	Present Best Fit JFK 2008
Annual Rainfall (inch)	40.7	45.5	46.3
July Rainfall (inch)	6.7	4.3	3.3
November Rainfall (inch)	6.3	3.7	3.3
Number of Very Wet Days (>2.0 inch)	3.0	2.4	3.0
Average Peak Storm Intensity (inch/hour)	0.15	0.15	0.15

in = inch; JFK = John F. Kennedy; WWFP = Waterbody/Watershed Facility Plan

2.1.c Description of Sewer System

The Alley Creek and Little Neck Bay watershed and sewershed are divided between two major political jurisdictions – the Borough of Queens (Queens County, within NYC) and Nassau County, Long Island. Most of the Queens County portion of the watershed is served by the TI~~allman Island~~ WWTP and associated collection system, as shown in Figure 2-8. The Douglas Manor neighborhood, on the east bank of Little Neck Bay in Queens, is served by private on-site septic systems. Wastewater management in the Nassau County portion of the watershed is accomplished by three sanitary sewer districts: the Belgrave Water Pollution Control District, the Great Neck Water Pollution Control District, and the Village of Great Neck. The treated effluent from the Belgrave WWTP discharges to Udalls Cove, on the east side of Little Neck Bay. The WWTPs for the other two districts discharge to Manhasset Bay, on the east side of the Great Neck Peninsula. In addition, many properties use on-site septic systems, which are not in the service areas of these three sewer districts. The locations of the three wastewater treatment facilities and the respective sewershed boundaries are as shown in Figure 2-8.

The following section describes the major features of the TI~~allman Island~~ WWTP tributary area, including the Alley Creek and Little Neck Bay watershed.

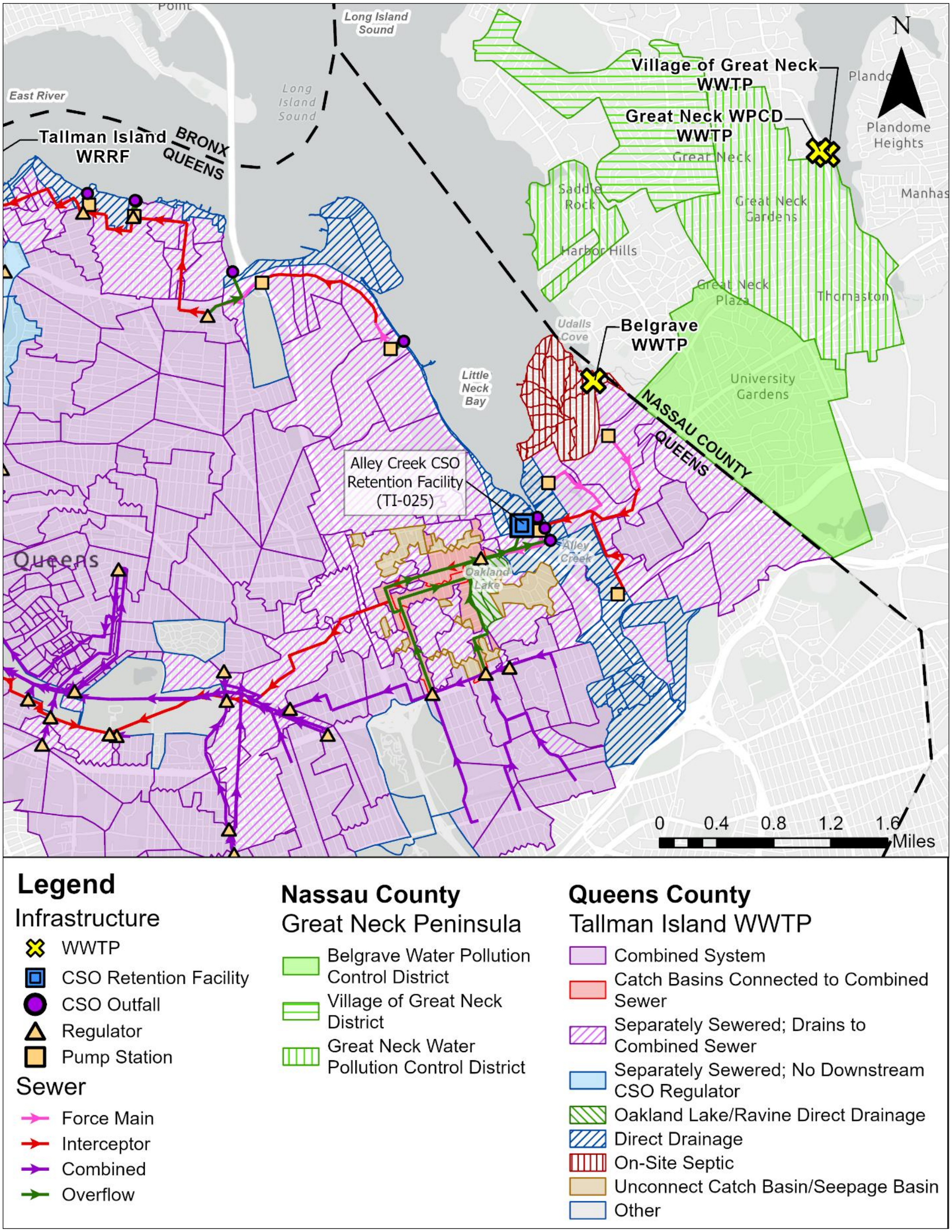

Figure 2-8. Alley Creek Wastewater Service Areas – (2026 Replaced)

2.1.c.1 Overview of Drainage Area and Sewer System – (2026 Revised)

Alley Creek and Little Neck Bay are served by the TI~~allman Island~~ WWTP. The TI~~allman Island~~ sewershed includes both sanitary SSS and CSS sewersheds, as summarized in Table 2-3 and Appendix A. CSO outfalls that discharge to Alley Creek and Little Neck Bay are summarized in Table 2-4. The TI~~allman Island~~ service area includes:

- 16 PSs, with five serving combined system areas;
- 49 combined sewer flow regulator structures; and
- 24 CSO discharge outfalls, two of which are permanently bulkheaded.

Table 2-3. Tallman Island Wastewater Treatment Plant Drainage Area[1]: Acreage Per Sewer Category – (2026 Replaced)

Sewer Area Description	Area (acres)
Combined	**8,712**
Separate • Fully separated • Watershed separately sewered, but with sanitary sewage subsequently flowing into a combined interceptor, and stormwater discharging either directly to receiving water or into a combined interceptor	**5,903** (923)[2] (4,980)
Total	**14,615**

Notes:
[1]An additional 3,080 acres of area, for facility planning and certain permitting purposes, are considered to be part of the Tallman Island drainage area but do not contribute to the WWTP. These include areas with direct drainage of stormwater to watercourses (either directly or via storm sewers), other areas not served by piped drainage systems (e.g., parks and cemeteries), and areas that use "on-site" septic systems (Douglas Manor on Douglaston Peninsula).
[2]The fully separated acreage must include 711 acres of separately sewered drainage area related to Oakland Lake.

Table 2-4. Alley Creek and Little Neck Bay Drainage Area: Acreage by Outfall/Regulator – (2026 Replaced)

Outfall	Outfall Drainage Area[4]	Regulator	Regulator Drainage Area	Regulated Drainage Area Type	Receiving Water
Alley Creek and Little Neck Bay					
TI-006	597.3	24th Avenue PS	74.8	Combined[1] and Separate	Little Neck Bay
		Clear View PS	522.5	Separate	Little Neck Bay
TI-007	1074.9	Old Douglaston PS	1074.9	Combined and Separate	Alley Creek
TI-008	55.0	N/A	N/A	Combined[2], Separate and Freshwater	Alley Creek
TI-024	376.2	New Douglaston PS	77.1	Separate	Alley Creek

Outfall	Outfall Drainage Area[4]	Regulator	Regulator Drainage Area	Regulated Drainage Area Type	Receiving Water
TI-025[3]	1,448.2	Alley Creek CSO Retention Facility	1,448.2	Combined, Separate, and Sanitary	Alley Creek

Notes:
[1]Outfall TI-006 is a Combined Sewer Overflow (CSO) which serves as an emergency bypass for the pump station. Under normal conditions, TI-006 discharges stormwater from the tributary area.
[2]During a typical year, Outfall TI-008 does not convey CSO outflow from Chamber 6, located at Cloverdale Boulevard and 223rd Street, but may convey CSO outflow during larger precipitation events.
[3]The TI-025 drainage area includes a tributary area upstream of the Horace Harding Expressway where regulators R46 and R47 regulate flow. The drainage area types are combined, separate, and sanitary. The flow downstream of the Horace Harding Expressway is mostly a separately sewered area with a small portion tributary to regulator R49, which regulates separately sewered flow and sanitary flow.
[4]Only TI-008 and TI-025 outfall drainage areas have been revised. The TI-008 outfall drainage area is refined from 1044.4 acres to 55 acres. The TI-025 outfall drainage area is refined from 1550.7 to 1448.2 acres.
N/A = not applicable; PS = Pump Station or Pumping Station; TI = Tallman Island

The TI~~allman Island~~ WWTP is located at 127-01 134th Street, in the College Point section of Queens, on a 31-acre site adjacent to Powells Cove, leading into the Upper East River, and bounded by Powells Cove Boulevard. The TI~~allman Island~~ WWTP serves a sewered area in the northeast section of Queens, including the communities of Little Neck, Douglaston, Oakland Gardens, Bayside, Auburndale, Bay Terrace, Murray Hill, Fresh Meadows, Hillcrest, Utopia, Pomonok, Downtown Flushing, Malba, Beechhurst, Whitestone, College Point, and Queensboro Hill, as shown in Figure 2-1. The collection system is shown in Figure 2-9. The total sewer length that feeds into the TI~~allman Island~~ WWTP, including sanitary, combined, and interceptor sewers, is 490 miles.

The TI~~allman Island~~ WWTP has been providing full secondary treatment since 1978. 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 TI~~allman Island~~ WWTP has a DDWF capacity of 80 MGD and is designed to receive a maximum flow of 160 MGD (twice the design dry weather flow [2xDDWF]), with 120 MGD (1.5xDDWF) receiving secondary treatment. Flows exceeding 120 MGD receive primary treatment and disinfection.

The TI~~allman Island~~ WWTP includes four principal interceptors: Main, College Point, Flushing, and Whitestone (Figure 2-9).

- The Main Interceptor is directly tributary to the TI~~allman Island~~ WWTP and picks up flow from the other three interceptors.
- The College Point Interceptor carries flow from sewersheds to the west of the WWTP, then discharges into the Powell's Cove PS, which discharges into the Main Interceptor within the WWTP premises.
- The Flushing Interceptor can be considered an extension of the Main Interceptor south of the Whitestone connection and serves most of the areas to the south in the system. The Flushing Interceptor also picks up flow from the southeast areas of the system, along the Kissena Corridor Interceptor (via trunk sewers upstream of the TI-R31 regulator), and from the Douglaston area. The Alley Creek area drains to TI~~allman Island~~ WWTP via the Kissena Corridor Interceptor.

- The Whitestone Interceptor discharges to the Main Interceptor from the west side, shortly upstream of the College Point Interceptor connection, via gravity discharge. The Whitestone Interceptor conveys flow from the area east of the WWTP along the East River.

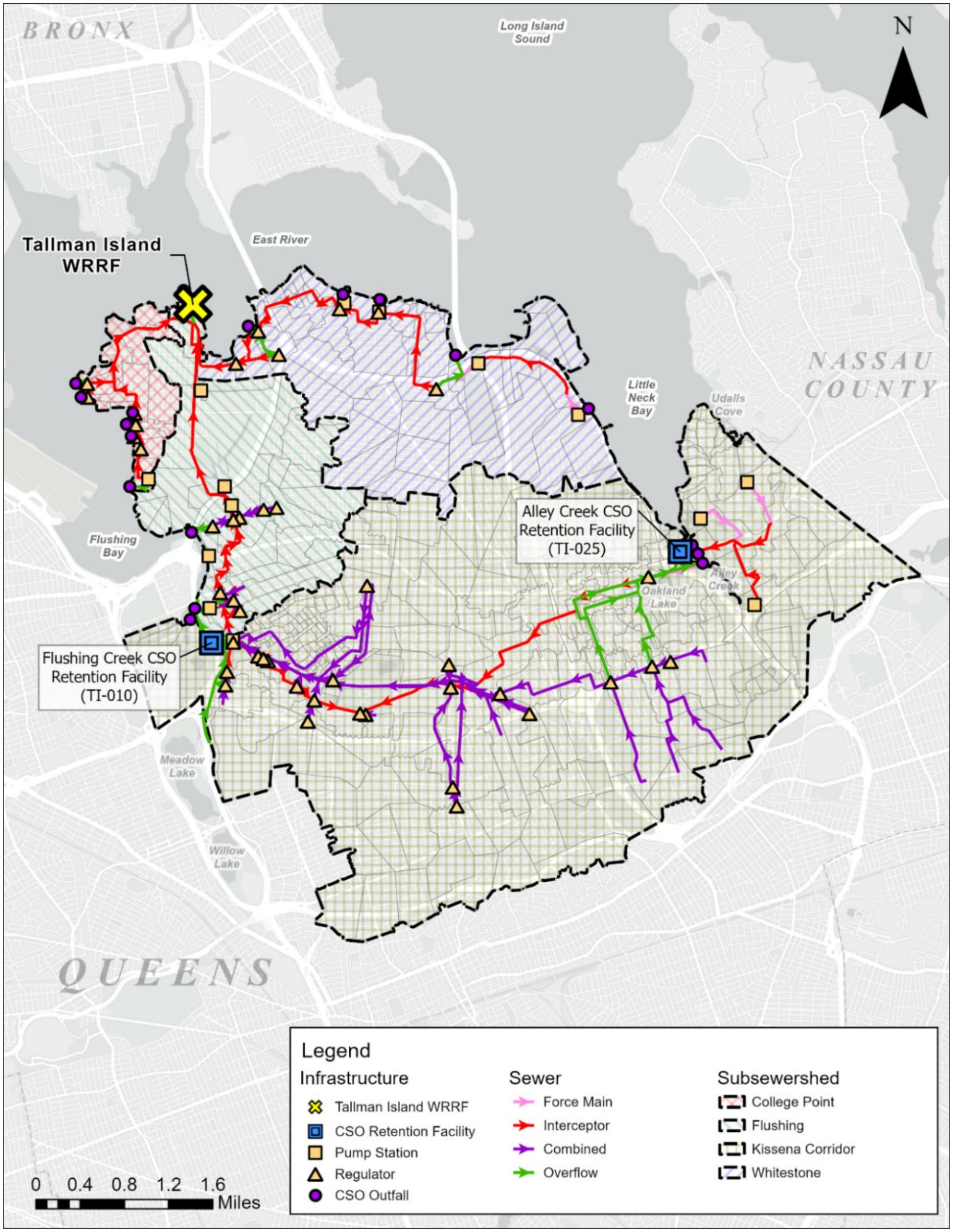

Figure 2-9. Tallman Island Wastewater Treatment Plant Service Area – (2026 Replaced)

This service area also includes two CSO retention facilities that were planned, designed, and constructed based on the East River Facility Planning and WWFP. The first one is the Flushing Creek CSO Retention Facility, with a total capacity of 43.4 million gallons (MG) (28.4 MG of offline storage and 15 MG of inline storage in large outfall pipes). This facility has been operational since May 2007. Post-event retained flow is pumped to the upper end of the Flushing Interceptor, upstream of Regulator TI-009. This structure was reconstructed in 2005 to provide adequate capacity to convey both sanitary flows and dewatered flows from the retention tank following wet weather periods.

The second facility is the Alley Creek CSO Retention Facility, which became operational as of March 11, 2011. This facility has an offline storage capacity of 5 MG. During wet weather, flows that reach the TI-008 CSO regulator are directed to the offline facility by the diversion weir in Chamber 6 of the Alley Creek CSO Retention Facility. When the storage facility reaches capacity, excess water overflows an effluent weir and is discharged to Alley Creek through Outfall TI-025 after receiving floatables control. The facility also provides some degree of primary settling. Post-event dewatering of this facility is accomplished through the upgraded Old Douglaston PS, which has a peak capacity of 8.5 MGD.

Tallman Island Non-Sewered Areas – (2026 Revised)

Some areas within the TI~~allman Island~~ service area are considered direct drainage areas and on-site septic areas, as shown in Figure 2-10, where stormwater drains directly to receiving waters without entering the CSS. Generally, these are shoreline areas adjacent to waterbodies and were delineated based on topography and the resultant direction of stormwater overland sheet flow. In addition, the onsite septic areas, located in the northern portion of the Douglaston Peninsula, are unsewered. Stormwater flows across lawns and down gutters to Little Neck Bay. Further, near-surface groundwater flow is a potential source of pollutants in Little Neck Bay.

Additionally, as part of the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024), it was determined that approximately 89 acres within the physical boundary of the TI-025 sewershed are tributary to seepage basins or unconnected catch basins.

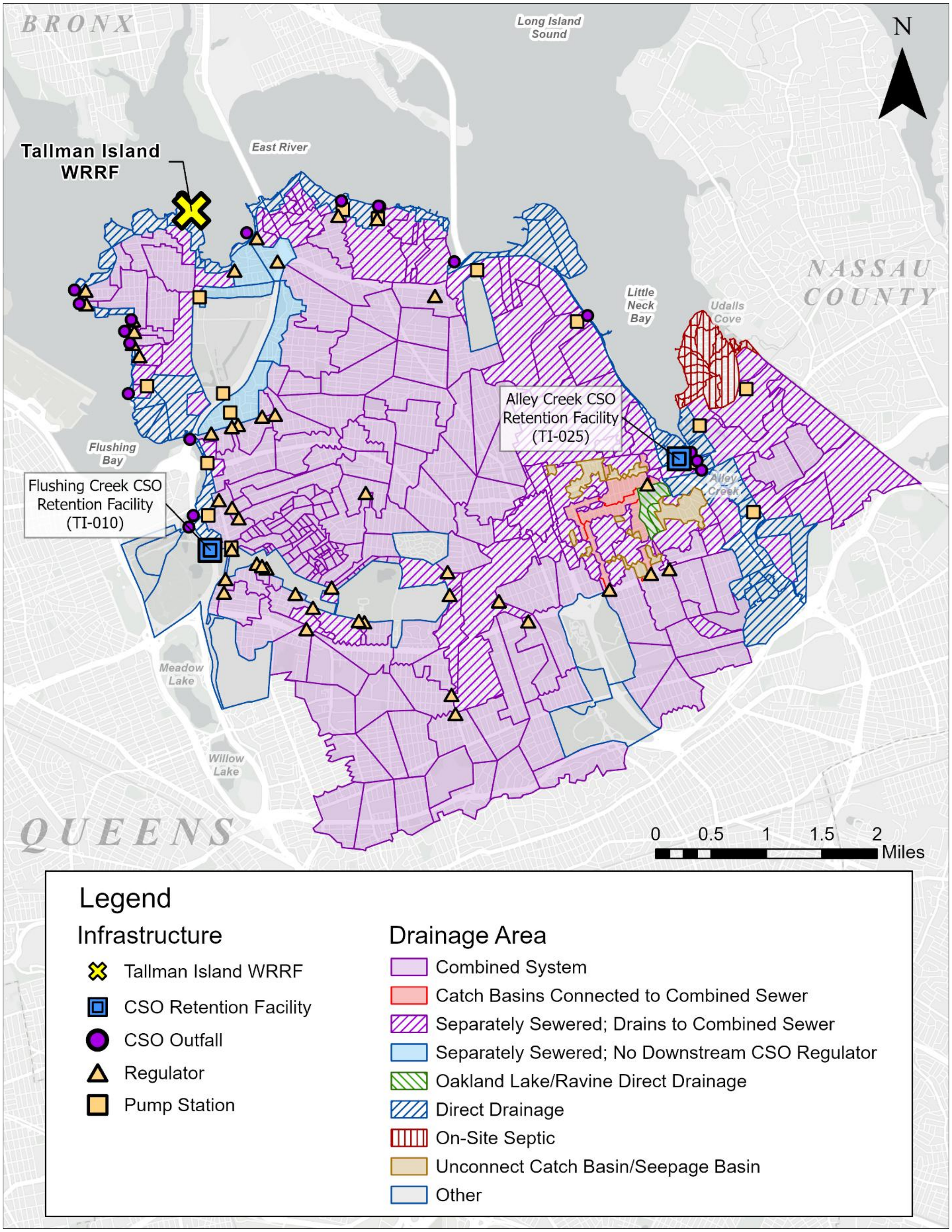

Figure 2-10. Tallman Island Wastewater Treatment Plant Drainage Area – (2026 Replaced)

Tallman Island Stormwater Outfalls – (2026 Revised)

DEP owns~~There are~~ eighteen ~~nine~~ permitted stormwater outfalls discharging to Alley Creek and Little Neck Bay, as shown in Figure 2-11; these include TI-623, TI-624, TI-633, TI-653, TI-654, TI-655, TI-656, TI-658, ~~and~~ TI-660, TI-677, TI-678, TI-679, TI-684, TI-686, TI-687, TI-688, TI-689, and TI-690. TI-684 had been previously designated as TI-024. These outfalls drain stormwater runoff from the separate sanitary sewer areas around Alley Creek and Little Neck Bay. While runoff from these areas does not enter the combined system, the direct stormwater discharges to Alley Creek and Little Neck Bay can impact WQ.

Tallman Island/Alley Creek Combined Sewer Overflows – (2026 Revised)

The TI~~allman Island~~ SPDES-permitted CSO outfalls to Alley Creek are TI-007, TI-008,~~ TI-009, TI-024,~~ and TI-025. The CSO outfall designated as TI-006 discharges into Little Neck Bay. Figure 2-11 displays the locations of Alley Creek and Little Neck Bay SPDES CSO outfalls. Note that TI-025 is the CSO outfall for the Alley Creek CSO Retention Facility, and TI-008 and TI-025 are used to convey and discharge a large portion of stormwater. In addition, outfalls TI-007 and ~~,~~ TI-006~~, and TI-024~~ serve as emergency bypasses for PSs and are therefore permitted~~designated~~ as CSO outfalls. Under normal conditions, TI-006 and TI-007 ~~TI-024~~ discharge stormwater from their tributary areas.~~, and TI-007 can overflow during large precipitation events.~~

Wet weather flows in the CSS, with incidental sanitary and stormwater contributions as summarized above, result in CSO discharges to the nearby waterbodies when the flows exceed the hydraulic capacity of the system or the specific capacity of the local regulator structure.

Douglas Manor

The area on the eastern shore of Little Neck Bay is known as Douglas Manor. The neighborhood is predominantly composed of single-family residences served by private on-site septic systems, built in individual lots zoned as R1-1 and R1-2, except for the Douglaston Club House, which is a three-story structure with a 17,100 square foot building area, located on a 102,060 square foot lot zoned for open space/outdoor recreation. Approximately 58 acres of drainage area generate runoff upstream of Shore Road, a waterfront roadway that follows the alignment of the eastern shore of Little Neck Bay. The Douglas Manor Association (DMA) manages a permitted private community beach known as DMA Beach, along Shore Road. The location of DMA Beach and Douglaston Club House, and photos depicting the overall residential land use of the neighborhood, can be seen in Figure 2-12.

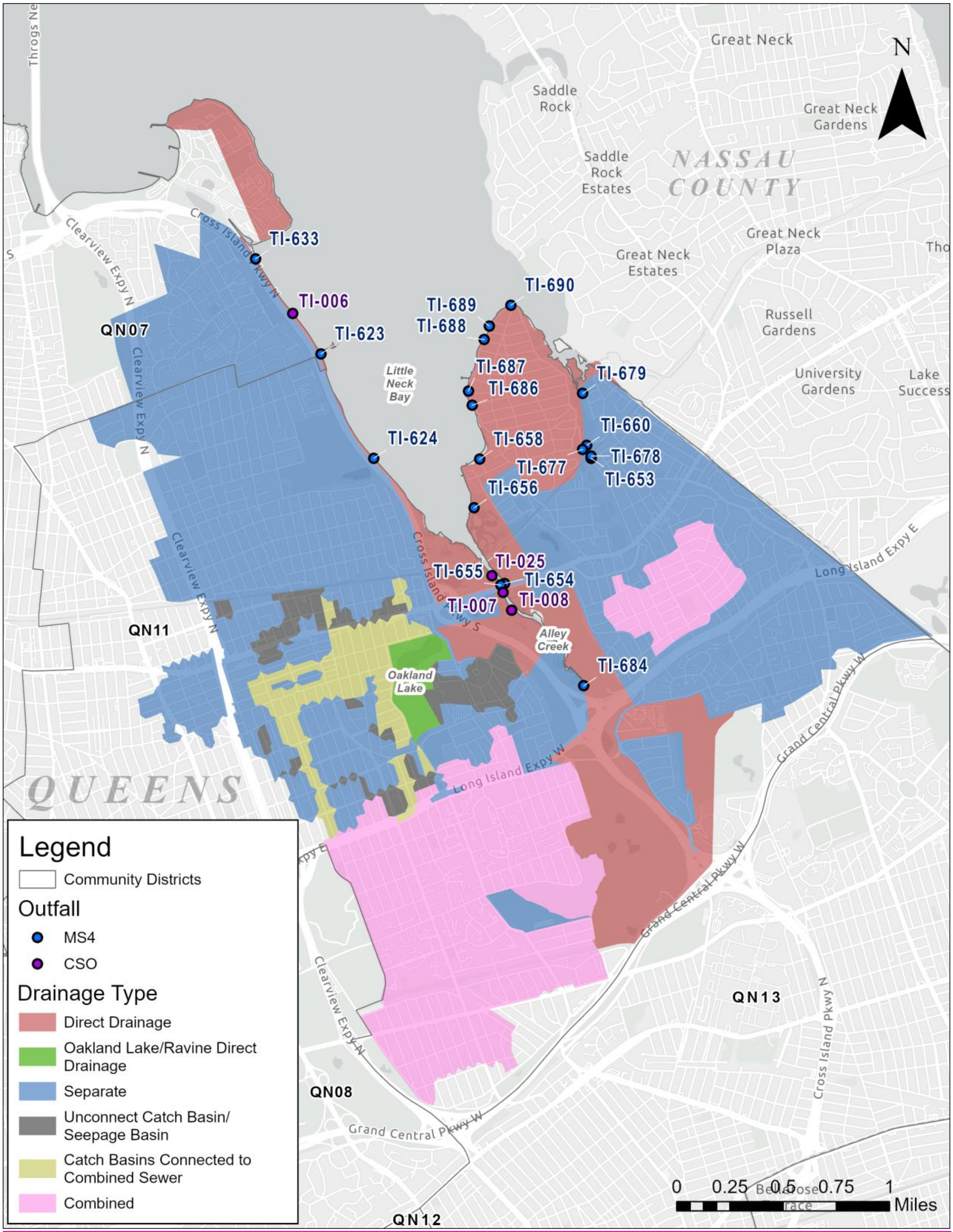

Figure 2-11. Alley Creek and Little Neck Bay State Pollutant Discharge Elimination System Permitted Outfalls – (2026 Replaced)

Figure 2-12. Douglas Manor Association

2.1.c.2 Stormwater and Wastewater Characteristics – (2026 Revised)

Pollutant loadings for the sources identified and discussed in Section 2.1.c.1 were assessed for their impacts on WQ in Alley Creek and Little Neck Bay. The pollutant concentrations found in wastewater, combined sewage, and stormwater can vary based on several factors, including flow rate, runoff contribution, and the matrix of the waste discharged to the system from domestic and nondomestic customers. Since the matrix of these waste streams can vary, it can be challenging to identify a single concentration of pollutants to use for analyzing the impact of discharges from these systems on the two waterbodies.

Although the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024) included a flow monitoring program, it did not include any WQ sampling, and thus no pollutant concentrations were updated as part of this effort.

Tallman Island Stormwater Outfalls: Stormwater overflow concentrations are assigned an Event Mean Concentrations (EMC) for inclusion in the East River Tributaries Model (ERTM) calibration and LTCP baseline analyses. Historical information and data collected from sampling events were used to guide the selection of concentrations of biochemical oxygen demand (BOD), Total Suspended Solids (TSS), total coliform, fecal coliform, and *Enterococci* to use in calculating pollutant loadings from the various sources. Table 2-5 shows EMC stormwater concentrations for NYC stormwater discharges to Alley Creek and Little Neck Bay from the TI~~allman Island~~ WWTP service area. Previously collected citywide sampling data from the Inner Harbor Facility Planning Study Facilities Planning Report (DEP, 1994) was combined with data for the EPA Harbor Estuary Program (HydroQual Environmental Engineers & Scientists, P.C. [HydroQual], 2005a) to develop these stormwater concentrations. The IW Model (Section 2.1.a.5) is used to generate the flows from NYC storm sewer outfalls, and concentrations noted in Table 2-5 are associated with the flows to develop pollutant loadings.

Tallman Island CSOs: CSO pollutant concentrations can be extremely variable and are a function of many factors. Generally, CSO concentrations are a function of local sanitary sewage and runoff entering the combined sewers. For the modeling analyses, CSO concentrations were calculated based on a mass balance of TI~~allman Island~~ WWTP sanitary sewage concentrations and EMC stormwater runoff concentrations during every hour of each storm event. Influent dry weather samples at the NYC WWTPs were used to model sanitary concentrations (DEP process control records; HydroQual, 2005b). These sanitary sewage influent concentrations are summarized in Table 2-5. Storm runoff concentrations entering the combined sewers were taken as the values shown in Table 2-5. The IW Model runs in the Water Quality Model, tracking the amount of sanitary sewage and stormwater at each location within the IW Model. When there is a CSO discharge, its pollutant concentrations will have the calculated mix of sanitary sewage and storm runoff pollutants for each hour of overflow.

Alley Creek CSO Retention Facility Discharges: A different approach was utilized when calculating the Alley Creek CSO Retention Facility effluent bacteria concentrations. The Alley Creek CSO Retention Facility bacteria concentrations were characterized by direct measurements from three storm events in 2013. These concentrations are as shown in Figure 2-13, a cumulative frequency distribution graphic. Both individual sample points are shown as well as the trend line that best fits the data distribution. Measured fecal coliform concentrations are log-normally distributed as is typical for this type of data, and values range from 27,300 to 3,400,000 most probable number of bacteria per 100 milliliters of water (MPN/100 mL). Similarly, *Enterococci* concentrations are also log-normally distributed and range from 24,000 to 580,000 MPN/100 mL. These observed concentrations are beyond the range that DEP would expect from combined sewage, which should be more highly reflective of stormwater runoff concentrations.

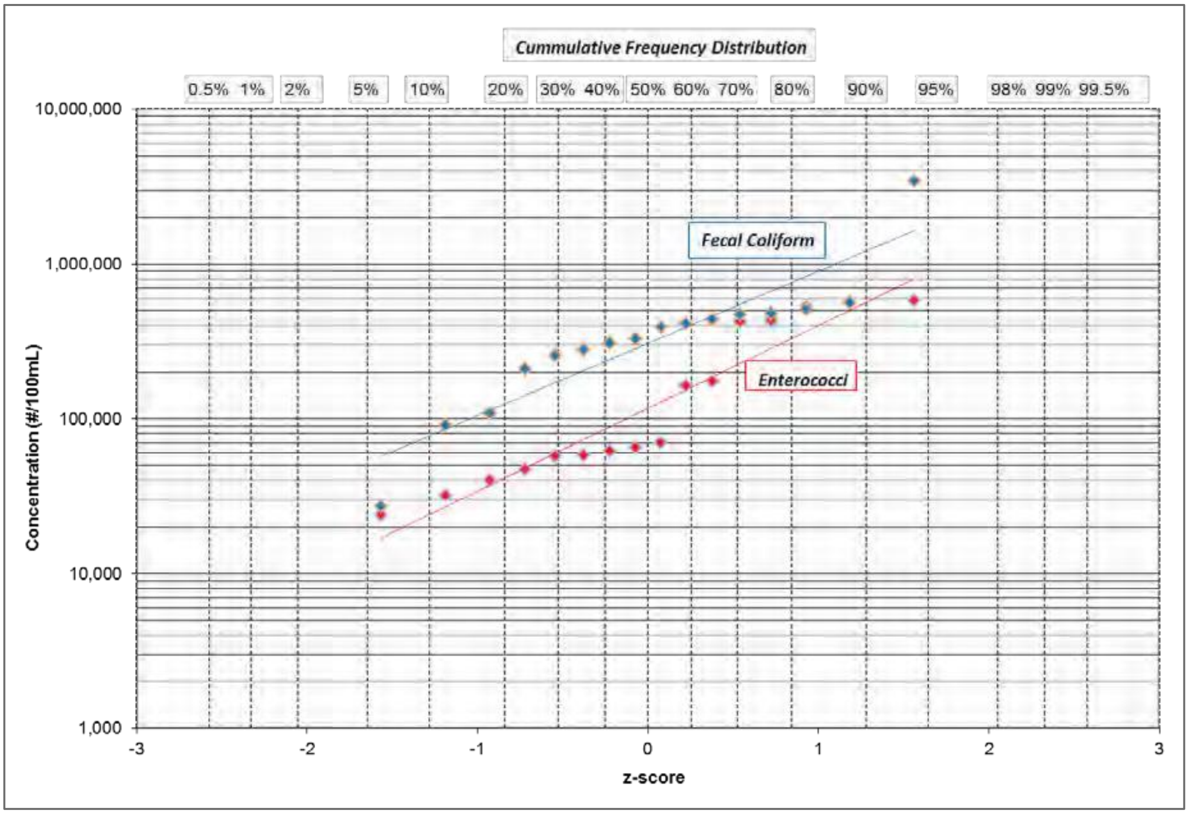

Figure 2-13. Alley Creek Combined Sewer Overflow Retention Facility Bacteria 2013 Sampling Data

Table 2-5. Sanitary and Stormwater Discharge Concentrations, Tallman Island Wastewater Treatment Plant

Constituent	Sanitary Concentration	Stormwater Concentration
$CBOD_5$ (mg/L)[1]	115	15
TSS (mg/L)[1]	140	15
Total Coliform Bacteria (MPN/100 mL)[2,3]	$25x10^6$	150,000
Fecal Coliform Bacteria (MPN/100 mL)[2,3]	$4x10^6$	35,000
Enterococci (MPN/100 mL)[2,3]	$1x10^6$	15,000

Notes:
[1]2011, 2012, 2013 DEP Process Control Tallman Island WWTP operational records
[2]HydroQual Memorandum to DEP (2005a)
[3]Bacterial concentrations expressed as “most probable number” (MPN) of cells per 100 mL.
$CBOD_5$ = five-day carbonaceous biochemical oxygen demand; DEP = Department of Environmental Protection; mg/L = milligrams per liter; TSS = Total Suspended Solids; WWTP = Wastewater Treatment Plant

Nassau County Source Concentrations: Stormwater inflows to Little Neck Bay from Nassau County were assigned the concentrations presented in Table 2-6. Effluent quality data for the Belgrave WWTP, which discharges into Little Neck Bay, were taken from DEC Discharge Monitoring Reports (DMR) submitted by the Nassau County Department of Public Works, as shown in Table 2-7. The WWTP discharges an average of 1.3 MGD. Total coliform, fecal coliform, and *Enterococci* are assumed to be negligible, as the facility provides disinfection.

Table 2-6. Stormwater Discharge Concentrations, Nassau County

Constituent	Stormwater Concentration
$CBOD_5$ (mg/L)[1]	15
TSS (mg/L)[1]	15
Total Coliform Bacteria (MPN/100 mL)[2,3]	50,000
Fecal Coliform Bacteria (MPN/100 mL)[2,3]	25,000
Enterococci (MPN/100 mL)[2,3]	15,000

Notes:
[1]HydroQual, 2005b.
[2]HydroQual Memorandum to DEP (2005a).
[3]Bacterial concentrations expressed as "most probable number" (MPN) of cells per 100 mL.
$CBOD_5$ = five-day carbonaceous biochemical oxygen demand; DEP = Department of Environmental Protection; mg/L = milligrams per liter; TSS = Total Suspended Solids

Table 2-7. Belgrave Wastewater Treatment Plant (Nassau County) Discharge – Effluent[1]

Constituent	Concentration
$CBOD_5$ (mg/L)	10
TSS (mg/L)	10
Total Coliform Bacteria (MPN/100 mL)[2]	<200
Fecal Coliform Bacteria (MPN/100 mL)[2]	<200
Enterococci (MPN/100 mL)[2]	<200

Notes:
[1]DEC, DMR data, 475 MG/yr, at an average flow rate of 1.3 MGD.
[2]Disinfection practiced year-round.
$CBOD_5$ = five-day carbonaceous biochemical oxygen demand; DEC = Department of Environmental Conservation; DMR = Discharge Monitoring Report; mg/L = milligrams per liter; MG/yr = million gallons per year; MGD = million gallons per day; MPN/100 mL = most probable number of cells per 100 mL; TSS = Total Suspended Solids

Other Sources: A sampling program targeting other sources of pollutants contributing to Alley Creek and Little Neck Bay was implemented as part of this LTCP. Data were collected to supplement the flows/volumes and concentrations of various sources of pollutants in Alley Creek and Little Neck Bay. During dry weather, the flows and concentrations were collected from Oakland Lake and from a pond located south of the LIE, named as the LIE Pond; these are continuous sources of flow and pollutants to Alley Creek. Both freshwater impoundments support recreational activities, such as birdwatching of diverse species of waterfowl that inhabit them, and as such, bacteria sampling was a vital element of this sampling program. Sampling of the sources above was conducted to provide information for modeling WQ. The locations of these sources are depicted in Figure 2-14.

Six samples were collected from the Oakland Lake and LIE Pond outflows to characterize ambient bacteria concentrations. Samples were also collected for Microbial Source Tracking (MST) analysis at the Oakland Lake (outlet) and at LIE Pond. The MST method used sought the identification of the species and genus of the *Enterococci* and fecal coliform bacteria sampled that would allow a comparison with libraries of bacteria data to determine the most likely sources of the bacteria. The MST results and the lack of a suitable bacteria database; however, did not support a conclusive determination of the sources for any of the locations sampled. Flows were measured for both locations. The fecal coliform and *Enterococci* data for both ponds are presented in Table 2-8. Oakland Lake concentrations were based on dry weather samples collected at the lake outlet during 2012 and 2014. The LIE Pond concentrations were based on the dry weather GM of samples collected during February 2013 and late 2013/early 2014. Oakland Lake flows were determined based on monitoring of the lake outflow in the storm sewer that bypasses Chamber 6 upstream of the Alley Creek CSO Retention Facility in 2012 and 2014. The LIE Pond flows were based on a few discrete measurements in 2012 and continuous flow monitoring in 2014. The Oakland Lake and LIE Pond sources of flow and pollutants were used in the calibrations of the Water Quality Model for 2011 and 2012 and included as part of the LTCP baseline analysis. Section 2.2.a.6 provides a detailed discussion of the MST testing, which Table 2-21 summarizes.

Table 2-8. Upper Alley Creek Source Loadings Characteristics

Source	Flow (MGD)	*Enterococci* (org./100 mL)	Fecal Coliform (cfu/100 mL)	BOD_5 (mg/L)
Oakland Lake flow through Outfall TI-008	2.5 (variable)	130	150	15
LIE Pond	1.5 (variable)	75	75	15

Notes: See Figures 2-9 and 2-12 for source locations.
BOD_5 = five-day biochemical oxygen demand; cfu/100 mL = colony-forming units per 100 milliliters; LIE = Long Island Expressway; mg/L = milligrams per liter; MGD = million gallons per day; org./100 mL = organism per 100 milliliters; TI = Tallman Island

These results suggest that the concentrations of bacteria are from non-human sources, as they do not exhibit the high concentrations of bacteria found when illicit discharges are present. Although they are not noted as significant sources of bacteria, these other sources provide a continuous source of bacteria to Alley Creek and are therefore carried forward through the baseline analyses presented in Section 6.0.

Illicit Sources – (2026 Revised):

As later discussed in Section 2.2.a.6, elevated bacteria concentrations in Alley Creek indicated the potential presence of illicit discharges. As required by the DEC SPDES permits, DEP's illicit sewer connection tracking and removal enforcement program had traced and eliminated 11 illegal connections to the storm sewers that discharged through Outfall TI-024 in 2011. However, during the LTCP development, review of additional data indicated that potential illicit discharges still existed somewhere along Alley Creek. As a result, sampling was conducted in 2014 as part of the LTCP development to track these potential illicit discharges to their source. As noted above, sampling was conducted on the Oakland Lake and LIE Pond outflows, which found that although there were low levels of bacteria present, there were no signs of illicit discharges. Douglaston PS records were also reviewed and staff were interviewed, again indicating that this was not a source of bacteria in dry weather. Further, sampling and visual inspections were made of storm sewers and of the CSO regulators and outfalls (TI-007, TI-008, TI-024, and TI-025) in 2013 and 2014, all of which indicated that the only remaining source of potential illicit discharges was Outfall TI-024.

DEP is continuing to inspect the TI-024 system and locate the source of the illicit connections. As sources are found, appropriate corrective actions will be implemented according to DEP's standard procedures for these investigations. Illicit connections to this outfall, although apparently low in flow, discharge elevated concentrations of bacteria, thereby impacting bacteria levels in Alley Creek near the mouth of the creek where DEP conducts routine sampling (Station AC1). From October 2013 to November 2014, DEP identified and notified 23 establishments with illicit connections to the separate stormwater system tributary to Outfall TI-024. The owners were issued Commissioner's Orders and promptly removed the illicit connections. Further investigations will be conducted by the Compliance Monitoring Section.

Based on sampling data and calibration of the Water Quality Model, bacteria concentrations and flows associated with Outfall TI-024 were developed as provided in Table 2-9.

Table 2-9. Upper Alley Creek Source Loadings Characteristics

Source	Flow (MGD)	*Enterococci* (org./100 mL)	Fecal Coliform (cfu/100 mL)	BOD_5 (mg/L)
TI-024 Illicit Connections	0.003 to 0.04	1,000,000	4,000,000	15
TI-024 Infiltration	0.2	0	0	6.3

Notes: See Figures 2-9 and 2-11 for source locations.
BOD_5 = five-day biochemical oxygen demand; cfu/100 mL = colony-forming units per 100 milliliters; mg/L = milligrams per liter; MGD = million gallons per day; org./100 mL = organism per 100 milliliters; TI = Tallman Island

Since 2014, DEP continued inspections and dye testing in the Alley Creek drainage area. A leaking sanitary sewer was identified near the TI-008 that was repaired in May 2021. At TI-684 some repairs were made to an adjacent leaking sanitary sewer and some upstream illegal sanitary connections to the storm sewer were identified and abated.

Figure 2-14. Upper Alley Creek Point – Source Locations

At TI-024, estimated groundwater infiltration was developed from short-term continuous metering of a 96-inch by 72-inch diameter storm sewer discharging through TI-024 during 2012 and 2013. Suspected illicit connections were detected through visual observations and four bacteria samples collected in February 2014 with fecal coliform concentrations that ranged from 29,000 to 50,000 cfu/100 mL. The final concentrations for use in model calibrations were estimated as part of the calibration process. These loads were subsequently removed for the Water Quality Model baseline analysis, assuming that illicit discharges would be abated outside of the LTCP process.

DMA Local Sources: The DMA Beach area has historically exhibited elevated bacteria concentrations. These local sources and other remote bacteria sources result in frequent closures of this bathing area. ~~(Figure 2-24).~~ Receiving water sampling conducted in 2012 showed bathing area waterfront *Enterococci* GM concentrations of about 151 cfu/100 mL. Sampling in the receiving water at locations just offshore from DMA Beach in deeper water revealed a GM concentration of 37 cfu/100 mL. The former elevated concentration right on the beach being so much higher than the sample collected slightly offshore suggests local bacteria sources rather than the source being remote from the beach.

At DMA, runoff from the impervious surfaces of the lots and public roadways, along with the rainfall volume that exceeds the infiltration capacity of the pervious surfaces, is discharged to Little Neck Bay in the vicinity of DMA Beach at the seven main locations as shown in Figure 2-15. Most of the runoff is conveyed as surface sheet-flow or poorly defined shallow surface flow until crossing a concrete retaining wall between Shore Road and the beach. The main runoff drainage paths of approximately 14 acres contributing directly to DMA Beach can be seen in Figure 2-15.

During dry weather, near-surface groundwater flows downslope toward Little Neck Bay from DMA, likely carrying bacteria from septic systems with it. This suspected source of pollutants may also generate higher loadings during wet periods at a local geographical scale, when the groundwater flow is higher. Groundwater flows were estimated by assuming 200 homes, with four people per household contributing 75 gallons per capita per day. Concentrations were adjusted as part of the calibration process. These loads were subsequently removed from the LTCP baseline analysis, assuming that this source would be abated outside of the LTCP process.

The characteristics, summarized in Table 2-10, associated with the dry and wet weather sources of pollutants suspected to be associated with the on-site septic systems in the DMA area were developed through the process of calibrating the Water Quality Model.

Table 2-10. Douglas Manor Association Source Loadings Characteristics

Source	Flow (MGD)	*Enterococci* (org./100 mL)	Fecal Coliform (cfu/100 mL)	BOD_5 (mg/L)
DMA groundwater inflow (continuous)	0.06	50,000	100,000	0
DMA stormwater	Calculated from rainfall and runoff coefficient	300,000	700,000	15

BOD_5 = five-day biochemical oxygen demand; cfu/100 mL = colony-forming units per 100 milliliters; DMA = Douglas Manor Association; mg/L = milligrams per liter; MGD = million gallons per day; org./100 mL = organism per 100 milliliters

The New York City Department of Transportation (NYCDOT) Capital Project HWQ985 started in 2014 to redirect some of the sheet-flow with the primary intention of protecting the concrete retaining wall from static force loads that compromised its stability. The project was to divert runoff from the current discharge points on both sides of the pier at DMA Beach to a location farther south of the recreational area. The configuration is as shown in Figure 2-16. NYCDOT Capital Project HWQ985 also references a later project completed in June 2022 to stabilize the Shore Road embankment and roadway, north of the DMA Beach area from West Drive to Bayview Avenue, with gabion baskets after a collapse following the nor'easter of spring 2018.

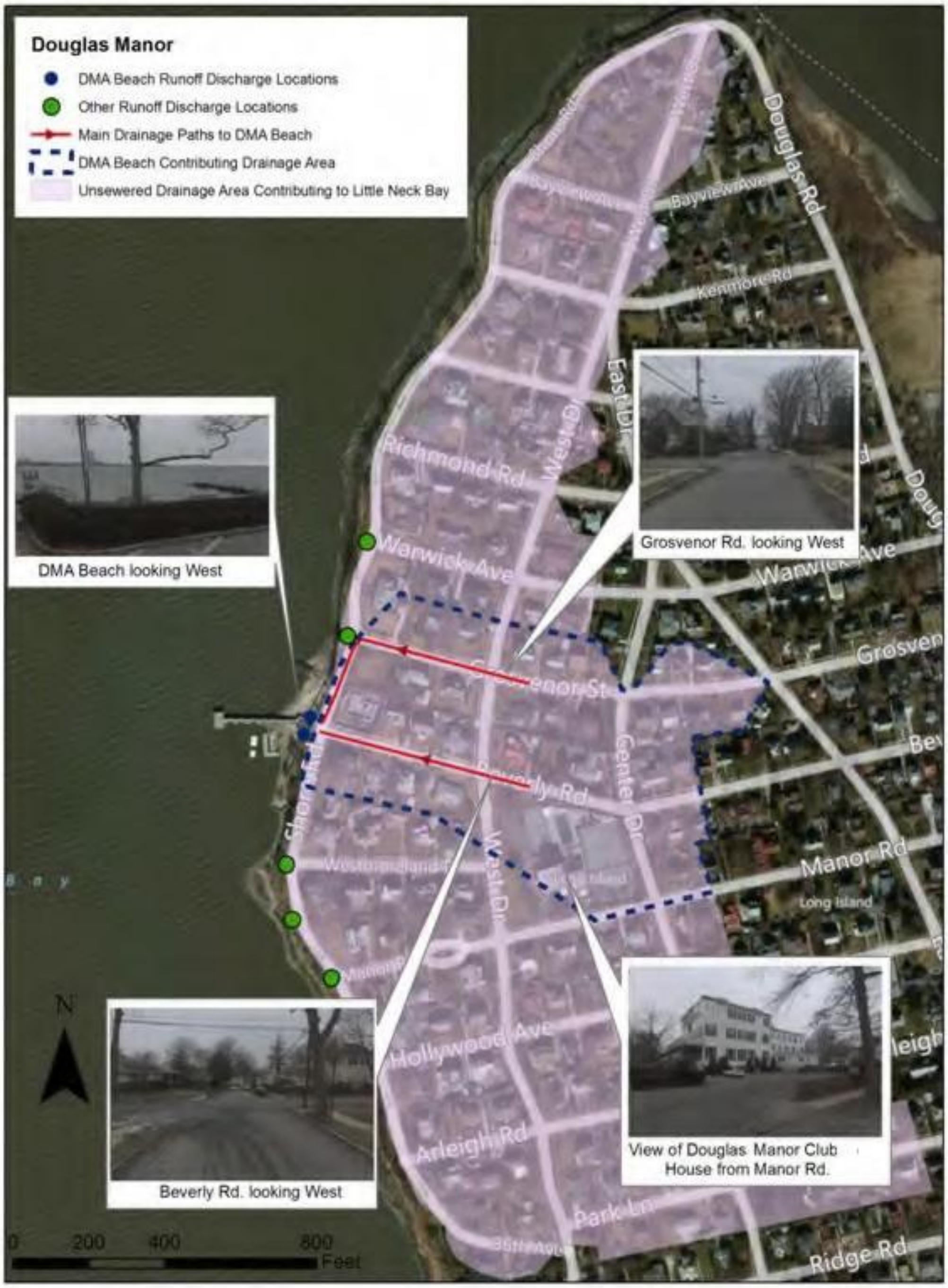

Figure 2-15. Little Neck Bay and Douglas Manor Association Beach Overland Drainage Characteristics

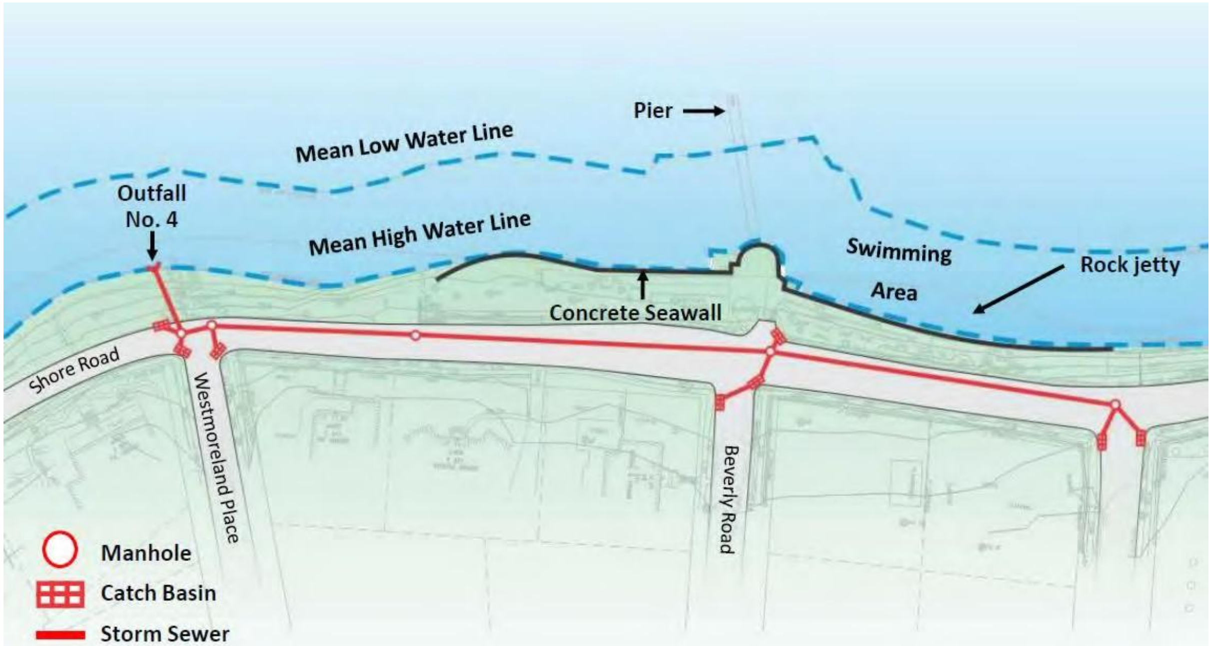

Figure 2-16. Douglas Manor Association Drainage Improvements

2.1.c.3 Hydraulic Analysis of Sewer System – (2026 Revised)

A citywide hydraulic analysis was completed in December 2012 (an excerpt of which is included in this sub-section), to provide further insight into the hydraulic capacities of key system components and system responses to various wet weather conditions. The IW Model was updated in the Alley Creek drainage area after this effort was completed, in support of the development of this LTCP and in support of the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024). Thus, the model results reported in this sub-section, while relevant for their intended use to document overall system-wide performance beyond the Alley Creek watershed, may differ slightly from volumes reported in the remainder of this LTCP. 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 the 2008 precipitation year 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 Citywide Hydraulic Analysis Report (DEP, 2012b) submitted to DEC. The objective of each evaluation and the specific approach undertaken are briefly described in the following paragraphs.

Annual Hours at 2xDDWF for 2008 with Projected 2040 Dry Weather Flows

Model simulations were conducted to estimate the annual number of hours that the TI~~allman Island~~ WWTP would be expected to treat 2xDDWF for the 2008 precipitation year, which contained a total precipitation of 46.26 inches, as measured at JFK Airport. These simulations were conducted using projected 2040 DWFs for the re-calibrated model conditions as described in the June 2012 InfoWorks Citywide Model Recalibration Report (DEP, 2012a). For the simulation, the primary input conditions that applied were as follows:

- Projected 2040 DWF conditions.
- 2008 tides and precipitation data.
- WWTP at 2xDDWF capacity of 160 MGD.
- No sediment in the combined sewers (i.e., clean conditions).
- Sediment in interceptors representing the sediment conditions after the inspection and cleaning program completed in 2011 and 2012.
- No green infrastructure.

For this simulation the TI~~allman Island~~ service area included the two CSO retention facilities, the new Whitestone Interceptor extension, and associated sewer/regulator improvements. The simulation of the 2008 precipitation year resulted in a prediction that the TI~~allman Island~~ WWTP would operate at its 2xDDWF capacity for 99 hours, up from the very limited number of hours (generally less than 10 hours a year) that the plant reached that capacity historically.

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 model. 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 model for WWFP conditions that were implemented. The model predicted the maximum flow rates and maximum depths for each sewer segment, which were then 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 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 nonsurcharged 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.
- Between 78 and 93 percent (by length) of the interceptors were predicted to flow at full depth or higher. Between 56 and 59 percent (by length) of the combined sewers were also predicted to flow at full depth, and 72 percent of the combined sewers flowed at least 75 percent full.

- The results for the system condition with WWFP improvements showed that the overall peak plant inflow and Hydraulic Gradient Line~~ (HGL)~~ near the plant improved in comparison to the non-WWFP conditions in the TI~~allman Island~~ service area.
- About 72 percent of the combined sewers (by length) reached a depth of at least 75 percent under the WWFP simulations. This indicates that little additional potential exists for in-line storage capability in the TI~~allman Island~~ system.

Based on the review of various metrics, the TI~~allman Island~~ system generally exhibits full or near-full pipe flows during wet weather, allowing little potential for inline storage capability.

2.1.c.4 Identification of Sewer System Bottlenecks, Areas Prone to Flooding, and History of Sewer Backups – (2026 Replaced)

DEP has made substantial improvements to the Alley Creek drainage system, in which over $90 million (M) was spent under Contract ER-AC1 to help eliminate historical flooding along Springfield Boulevard in Queens. These drainage system improvements, which took place from December 2002 through December 2006, consisted of the installation of larger combined sewers in certain segments of the sewershed to increase conveyance capacity; construction of storm sewers in select drainage areas to reduce the volume of stormwater entering the combined system; and construction of associated combined and stormwater outfalls to discharge the excess wet weather flows. These drainage area improvements have substantially mitigated historical flooding issues.

The Bureau of Water & Sewer Operations (BWSO), Division of Field Operations, has personnel including construction laborers, supervisors, and technical staff whose primary functions are operation, maintenance, and repair of the sewer collection and water distribution systems. For the sewer collection system, this Division performs investigations and responds to all sewer complaints received by the City's 311 call center, including sewer back-ups (SBUs), catch basin flooding, and street flooding. The Division also performs programmatic work involving sewer cleaning and catch basin survey inspections and cleaning. The group works in conjunction with BWT's Industrial Waste Section to investigate grease conditions, to perform programmatic degreasing to ensure proper operation, and to perform routine inspections with the engineering-based Collection Systems Investigation (CSI) section. Maintenance and repair yard facilities are located throughout the five boroughs of NYC; they are equipped with heavy duty and light duty construction vehicles, including truck-mounted crane vehicles (catch basin cleaning trucks), power jet flushing vehicles, power rodding auger trucks, and combined flusher/vacuum trucks.

There were 8,185 customer service requests that resulted in sewer inspections. Of those requests, DEP determined that 6,643 were unrelated to the DEP infrastructure. In response to each request, the sewer maintenance division performs an initial inspection. This initial inspection includes inspecting the downstream and upstream manholes nearest the complaint location and collecting all data relevant to the incident. If the manhole inspection determines that the complaint was unconfirmed, i.e., that the sewer was functioning as designed, crews are directed to perform hydraulic cleaning for at least two sections of sewer. If the sewer complaint is confirmed, i.e., there was evidence that the sewer was overtaxed, the crews are directed to initially perform hydraulic cleaning; if hydraulic cleaning does not alleviate the condition, crews perform mechanical cleaning to remove material obstructing flow in the sewer to resolve the condition. In response to these complaints, DEP's in-house forces cleaned over 199.42 miles of sewer. This number either represents actual footage, or, when there was no report of actual footage, represents an estimate of 150 linear feet between two manholes. As indicated, DEP performed the inspections and cleaning in response to service requests, and some of the footage may overlap with requests made at different times.

2.1.c.5 Findings from Interceptor Inspections – (2026 Replaced)

DEP continues with its interceptor inspection and cleaning program. In calendar year 2024, DEP attempted to inspect 153,400 linear feet (more than 20 percent) of the intercepting sewers; despite multiple attempts made to inspect some locations, they were found to be inaccessible because of various field conditions. DEP completed inspections of 144,927 linear feet and a total of 271.31 tons of sediment were removed from the interceptors and DEP's in-house forces cleaned 237.48 miles of sewer as a proactive measure and 199.42 miles of sewer in response to 8,185 customer service requests. In the TI~~allman Island~~ drainage area, 74.074 linear feet of interceptors were inspected and about 146 tons of sediment were removed. Table 2-11 displays the 2024 inspections conducted within the TI~~allman Island~~ catchment area resulting in corrective actions. Figure 2-17 shows the locations of DEP's 2024 inspections and cleanings.

Table **2-11. Partial Listing of 2024 Inspections Resulting in Corrective Actions – (2026 Replaced)**

Asset Name	Date Inspected	Length (ft)	Defect	Structural Index	Comments	Final Decision	Corrective Action By
PR_W_18	5/26/2023	256	SRV	5	Rollover from 2023, Create new project	Line sewer	DDC
PR_W_19	5/26/2023	275	SRV	5	Rollover from 2023, Create new project	Line sewer	DDC
TI_E_22	4/9/2024	99	SRV	5	Create new project	Line sewer	DDC
TI_E_43	4/1/2024	188	SRV	5	Create new project	Line sewer	DDC
TI_E_44	4/1/2024	182	SRV	5	Create new project	Line sewer	DDC
TI_E_45	4/1/2024	180	SRV	5	Create new project	Line sewer	DDC
TI_E_48	3/29/2024	179	SRV	5	Create new project	Line sewer	DDC
TI_E_49	3/29/2024	172	SRV	5	Create new project	Line sewer	DDC

Notes: DDC = Department of Design and Construction; ft = feet; PR = Port Richmond; TI = Tallman Island

Figure 2-17. 2024 Inspections and Cleaning Locations – 2026 Replaced

2.1.c.6 Status of Receiving Wastewater Treatment Plants – (2026 Revised)

The Alley Creek and Little Neck Bay basin is entirely within the TI~~allman Island~~ WWTP service area. DEP upgraded the TI~~allman Island~~ WWTP for Biological Nutrient Removal~~ (BNR)~~ and completed improvements that enhanced the collection system and treatment facility to convey, accept, and treat influent at 2xDDWF capacity during storm events. With respect to conveyance capacity to the WWTP ~~the status of the project work as of May 2024 is as follows~~, all work has been completed to date.

- ~~The majority of the new Whitestone Interceptor and turning chambers have been constructed.~~
- ~~The connection of the interceptor (Connection Chamber) to the Tallman Island WWTP is complete, but not activated.~~
- ~~The connection of the interceptor to the existing Whitestone Interceptor (Diversion Chamber) is ongoing.~~

~~The work on the regulator modifications is to be initiated.~~

2.2 Waterbody Characteristics

This section of the report describes the features and attributes of Alley Creek and Little Neck Bay. Characterizing the features of these waterbodies is important for assessing the impact of wet weather inputs and creating approaches and solutions that mitigate the impacts from wet weather discharges.

2.2.a Description of Waterbody

Alley Creek and Little Neck Bay are tidal waterbodies located in eastern Queens and western Nassau County, in New York State (NYS). Alley Creek is a tributary to Little Neck Bay, and the Little Neck Bay is a tributary to the East River. Alley Creek and Udalls Cove, an embayment of Little Neck Bay, have major areas of watershed preserved as parkland adjacent to the water. However, WQ in Alley Creek and Little Neck Bay is influenced by CSO and stormwater discharges. The following section describes the present-day physical and WQ characteristics of Alley Creek and Little Neck Bay, along with their existing uses.

2.2.a.1 Current Waterbody Classification(s) and Water Quality Standards – (2026 Revised)

New York State Policies and Regulations

In accordance with the provisions of the Clean Water Act (CWA), NYS has established WQS for all navigable waters within its jurisdiction. NYS has developed a system of waterbody classifications based on designated uses that includes five saline classifications for marine waters. DEC considers the Class SA and Class SB classifications to fulfill the CWA. Class SC supports aquatic life and recreation, but the primary and secondary recreational uses of the waterbody are limited due to other factors. Class I supports aquatic life protection as well as secondary contact recreation. SD waters shall be suitable only for fish, shellfish, and wildlife survival because natural or man-made conditions limit the attainment of higher standards. DEC has classified Alley Creek as Class I and Little Neck Bay as Class SB.

Numerical criteria corresponding to these waterbody classifications are as shown in Table 2-12. DEP conducted WQ assessments where the data are represented by percent attainment with pathogen targets. For this LTCP, in accordance with guidance from DEC, 95 percent attainment of applicable WQ criteria constitutes compliance with the existing WQS or the Section 101(a)(2) goals.

DO is the numerical criterion 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 2-13, these narrative criteria apply to all five classes of marine waters.

Table 2-12. New York State Numerical Surface Water Quality Standards (Saline) – (2026 Replaced)

Class	Usage	Dissolved Oxygen (mg/L)	Total Coliform (MPN/100 mL)	Fecal Coliform (MPN/100 mL)	*Enterococci* (MPN/100 mL)
SA	Shellfishing for market purposes, primary and secondary contact recreation, fishing. Suitable for fish, shellfish and wildlife propagation and survival.	≥4.8[1] ≥3.0[2]	≤70[3]	≤14[3] ≤49[7]	≤35[8,10,11] ≤130[9,10,11] ≤72[8] ≤266[9]
SB	Primary and secondary contact recreation and fishing. Suitable for fish, shellfish and wildlife propagation and survival.	≥4.8[1] ≥3.0[2]	≤2,400[4] ≤5,000[5]	≤200[6]	≤35[8,10,11] ≤130[9,10,11] ≤72[8] ≤266[9]
SC	Limited primary and secondary contact recreation, fishing. Suitable for fish, shellfish and wildlife propagation and survival.	≥4.8[1] ≥3.0[2]	≤2,400[4] ≤5,000[5]	≤200[6]	≤35[8,10,11] ≤130[9,10,11] ≤72[8] ≤266[9]
I	Secondary contact recreation and fishing. Suitable for fish, shellfish and wildlife propagation and survival.	≥4.0	≤2,400[4] ≤5,000[5]	≤200[6]	≤72[8] ≤266[9]
SD	Fishing. Suitable for fish, shellfish and wildlife survival. Waters with natural or man-made conditions limiting attainment of higher standards.	≥3.0	≤2,400[4] ≤5,000[5]	≤200[6]	N/A

Notes:
[1]Chronic criterion based on daily average. The dissolved oxygen (DO) concentration may fall below 4.8 milligrams per liter (mg/L) for a limited number of days, as defined by the formula: $DOi = 13.0/(2.80 + 1.84\, e^{-0.1t_i})$
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 several 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.
[2]Acute criterion (never less than 3.0 mg/L).
[3]Median (or geometric mean) most probable number (MPN) 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]90th percentile MPN for samples when using a multiple dilution fermentation tube test which examines three 10-milliliter sample portions, three one-milliliter sample portions and three one-tenth (0.1) milliliter sample portions.
[8]30-day geometric mean

[9]30-day 90th percentile
[10]For waters with the wet-weather standard designation, these standards will apply during dry weather periods with exceedances allowed per an approved Use Attainability Analysis.
[11]Applies during the period of May 1 to October 31 and in other instances determined by DEC or required by NYS or federal law or interstate compact.

Table 2-13. New York State Narrative Water Quality Standards

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, no 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.

Interstate Environmental Commission – (2026 Revised)

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 Interstate Environmental Commission (IEC). The IEC includes all tidal waters of greater NYC. Alley Creek and Little Neck Bay are interstate waters and are regulated by IEC as Class A waters. Numerical criteria for IEC-regulated waterbodies are shown in Table 2-14, while narrative criteria are shown in Table 2-15. While IEC regulations and WQS are applicable to Alley Creek and Little Neck Bay, IEC has yet to adopt WQS for *Enterococci*, making a detailed analysis of the IEC regulations unnecessary for this report.

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 operated with reasonable care, maintenance, and efficiency. Although IEC regulations are intended to be consistent with NYS WQS, the three-tiered IEC system and the five NYS marine classifications in New York Harbor do not spatially overlap exactly.

Table 2-14. Interstate Environmental Commission Numeric Water Quality Standards

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 the 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 the confluence with the 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, and Kill Van Kull.

DO = dissolved oxygen; mg/L = milligrams per liter

Table 2-15. Interstate Environmental Commission 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 that 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 matter shall be discharged or permitted to flow into, or be placed in, or be permitted to fall or move into the waters of the Interstate Environmental District, except in conformity with these regulations.

Bathing Beach Policies and Regulations – (2026 Replaced)

The DMA is a private club with a permit to operate a beach by NYC Department of Health and Mental Hygiene (DOHMH). DOHMH uses a 30-day moving GM of 35 MPN/100 mL during the bathing season (Memorial Day to Labor Day). If the GM exceeds that value, the beach is closed pending additional analysis. *Enterococci* of 104 MPN/100 mL are an advisory upper limit used by DOHMH. If the daily average of beach *Enterococci* data is greater than 104 MPN/100 mL, a pollution advisory is posted on the DOHMH website. Additional sampling is initiated, and the advisory is removed when WQ is acceptable for primary contact recreation. Advisories are posted at the beach and on the agency website. In addition, there is a preemptive standing advisory for DMA Beach for no swimming for 30 hours after a rainfall of 0.3 to 0.6 inches in 24 hours; for 60 hours after a rainfall of more than 0.6 inches to 2.5 inches in 24 hours; or for 72 hours after a rainfall of more than 2.5 inches in 24 hours.

2.2.a.2 Physical Waterbody Characteristics

Alley Creek and Little Neck Bay are located in the northeastern corner of Queens, near the Nassau County border. Alley Creek opens into the southeast end of Little Neck Bay. Little Neck Bay opens to the East River, between Willets Point and Elm Point, near the western portion of the Long Island Sound. Udalls Cove, an embayment on the eastern shore of Little Neck Bay, spans the Queens/Nassau County border, between Douglas Manor and Great Neck Estates.

Alley Creek is located at the southern end of Little Neck Bay and is contained within Alley Pond Park. The tidal tributary runs northward, and its mouth opens to Little Neck Bay. The 624-acre park contains forests, several ponds, facilities for active landside recreation, salt marshes and wetlands, and the creek itself. Alley Creek constitutes one of the few remaining undisturbed marsh systems in the City. The head of Alley Creek is near the intersection of the Cross Island Parkway and the LIE.

Freshwater flows to Alley Creek include stormwater and CSO discharge. Alley Creek WQ is also influenced by the saline water of Little Neck Bay.

Little Neck Bay comprises an area of approximately 1,515 acres. This open water fish and wildlife habitat extends to Fort Totten in the west and the village of Elm Point, Nassau County, in the east. The bay is bordered by residential development, Fort Totten, and the Cross Island Parkway. According to the NYC Comprehensive Waterfront Plan entitled “Plan for the Queens Waterfront” issued by the DCP, Little Neck Bay is one of the major waterfowl wintering areas on Long Island’s north shore. In addition to waterfowl use, Little Neck Bay is a productive area for marine fish and shellfish. As a result of the abundant fisheries in the bay and its proximity to the metropolitan New York area, Little Neck Bay is a regionally important recreational fishing resource.

Udalls Cove is located in the northeastern corner of Queens and extends into Nassau County. The NYC portion consists of an area of approximately 52 acres, from Little Neck Bay to the vicinity of Northern Boulevard. Most of Udalls Cove is mapped as parkland and managed by DPR as the Udalls Cove Preserve.

Little Neck Bay, Alley Creek, and Udalls Cove are located within the Coastal Zone Boundary and within a Special Natural Waterfront Boundary as designated by the DCP. All three waterbodies are also located within Significant Coastal Fish and Wildlife Habitats, as designated by the NYS Department of State.

Shoreline Physical Characterization

Alley Creek is predominantly characterized by natural, vegetated shorelines, except for the footings of the bridges for the LIRR and Northern Boulevard. The Creek is contained within Alley Pond Park, except for the eastern shore north of the LIRR. Little Neck Bay is generally characterized by altered shorelines, mainly rip-rap, with some bulkhead from Bay Street to Shore Road and from Westmorland Drive to Bayview Avenue in Douglaston. Based on field observations, vegetation exists on the waterside of some of the altered areas of Parsons Beach and Douglaston. Natural, sandy and natural vegetated areas exist along the shores of Little Neck Bay in the inlet on the southeastern portion of Fort Totten, near the mouth of Alley Creek, along the Parsons Beach and Douglaston shore, and in Udalls Cove. Most of the natural shoreline areas are within parkland. Small piers also exist along the shores, mainly along the Douglaston Peninsula.

Figures 2-18~~6~~, 2-19~~7~~, and 2-20~~18~~ show typical shorelines for the regions of the study area. Figure 2-18~~6~~ shows the rip-rap that typically fortifies much of the western shoreline of Little Neck Bay. Figure 2-19~~7~~ shows the varied types of bulkheading, rip-rap and natural shoreline found along the eastern shoreline of

Little Neck Bay. Figure 2-20~~18~~ shows the natural shorelines typical around the southern end of Little Neck Bay and Alley Creek.

The shorelines of Udalls Cove, an embayment of Little Neck Bay, consist primarily of natural, vegetated areas. Intact, concrete bulkhead areas exist from Bayview Drive to the mouth of the cove. Along Virginia Point near the Nassau County border, dilapidated timber bulkheads exist among the wetland vegetation. Much of the shoreline along the western edge of the cove borders residential areas or the Esplanade Park that runs between Marinette Street and the water. These areas are natural, in the sense that they lack riprap or bulkheading, although many of these areas are maintained by landscapers and may have been modified during road and property development.

In Udalls Cove, from the LIRR in the south to the north of Sandhill Road, Gablers Creek runs through the wetlands of Aurora Pond and the cove. The Gablers Creek in this area is contained within a cobble-lined ditch. ~~-~~Physical shoreline conditions and shoreline habitat are as shown in Figure 2-21~~19~~.

Shoreline Slope

Shoreline slope has been qualitatively characterized along shoreline banks where applicable and where the banks are not channelized or otherwise developed with regard to physical condition. “Steep” is defined as greater than 20 degrees, or an 80-foot vertical rise for each 200-foot horizontal distance perpendicular to the shoreline. Intermediate is defined as 5 to 20 degrees. Gentle is defined as less than 5 degrees, or an 18-foot vertical rise for each 200-foot horizontal distance. In general, the three classification parameters describe the shoreline slope well for the purposes of the LTCP roject.

Gentle and intermediate slopes characterize the shorelines of Little Neck Bay, Alley Creek, and Udalls Cove. The slope of the eastern shoreline of Little Neck Bay is generally characterized as intermediate. The slope of the western shoreline is generally characterized as gentle, with an area of intermediate shoreline located along Fort Totten. The slopes of both shorelines of Alley Creek are characterized as gentle. The slope of the eastern shoreline of Udalls Cove is characterized as gentle. The slope of the western shore is characterized as predominantly gentle, with one area having an intermediate slope. The intermediate slope extends along the shoreline from Beverly Road to the mouth of the cove. Shoreline slopes are as shown in Figure 2-22~~0~~.

Figure 2-18. Western Shoreline of Little Neck Bay Near 27th Ave. (Looking West)

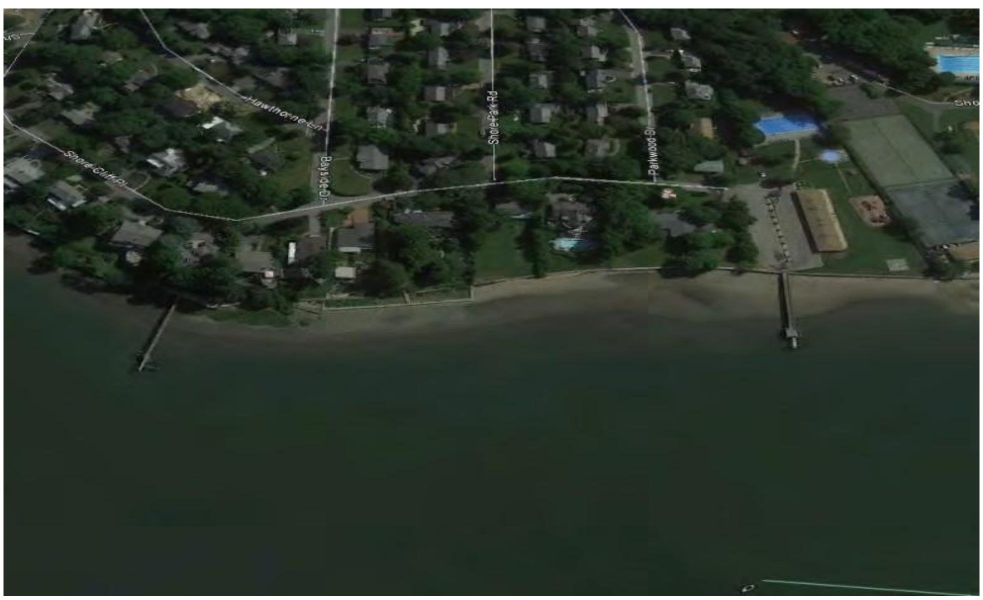

Figure 2-19. Eastern Shoreline of Little Neck Bay Near Shorecliff Place (Looking West)

Figure 2-20. Shoreline of Alley Creek (Looking North)

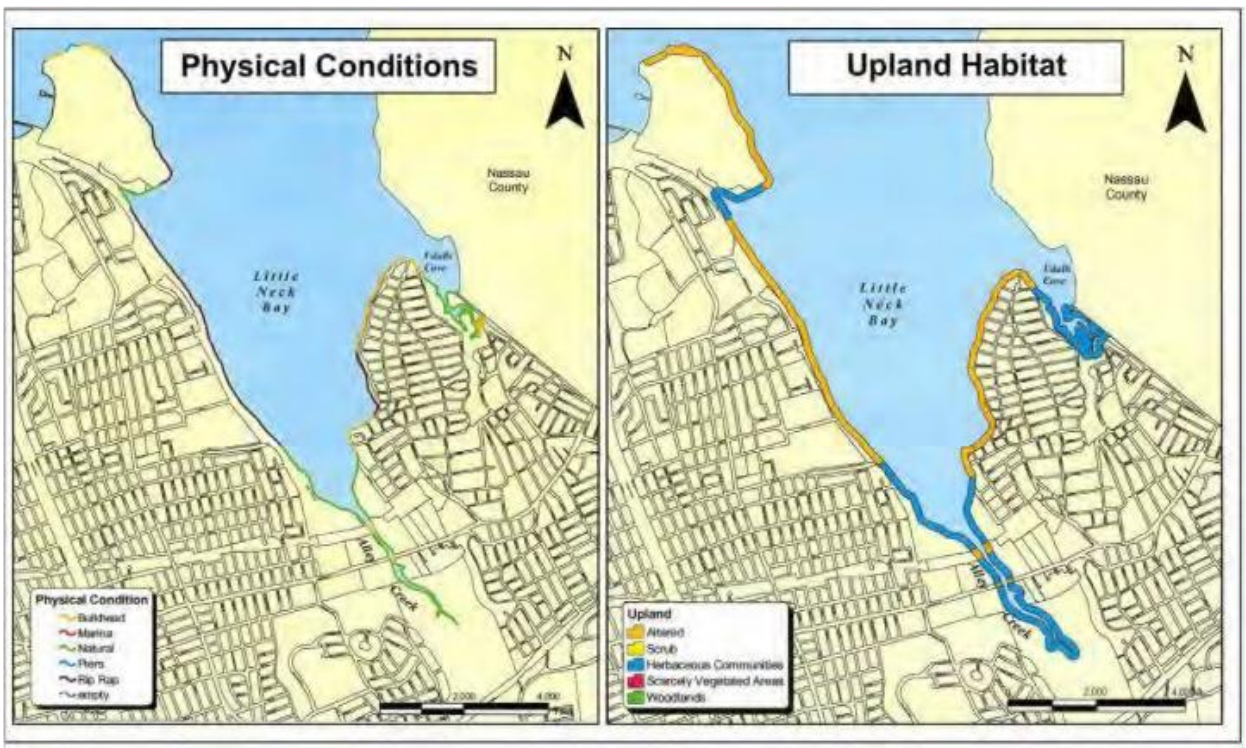

Figure 2-21. Shoreline Physical Conditions and Upland Habitat

Figure 2-22. Alley Creek Existing Shoreline Slope

Waterbody Sediment Surficial Geology/Substrata

The bottom of Little Neck Bay is generally characterized as sand. The bottom of Alley Creek is generally characterized as mud/silt/clay. These classifications have been assigned based on the following two sediment sampling programs, which analyzed sediment grain size: grab samples taken at one HydroQual sampling station in 2001 and grab samples taken at three HydroQual sampling stations in 2002. Both sampling programs were conducted as part of a Use and Standards Attainment Study (USA) performed for DEP. For the purpose of defining surficial geology/substrata, those areas where bottom samples were more than 50 percent mud/silt/clay were designated as mud/silt/clay; those areas where bottom samples were more than 50 percent sand were designated as sand. Based on one Little Neck Bay grab sample taken by the USA (2001), bottom mud/silt/clay composition was approximately 16.5 percent, while sand composition was 83.5 percent.

The USA sediment sampling (July 2002) consisted of one grab collected at one station in Little Neck Bay and two in Alley Creek. For the sample obtained in Little Neck Bay, the bottom mud/silt/clay composition was approximately 37.40 percent, and the sand composition was approximately 62.6 percent. For the two samples obtained in Alley Creek, bottom mud/silt/clay composition ranged from approximately 61.38 to 85.15 percent, while sand composition ranged from approximately 14.85 to 38.62 percent.

Waterbody Type

Little Neck Bay and the mouth of Udalls Cove are classified as embayments. Alley Creek and the portion of Udalls Cover south of Knollwood Avenue are classified as tidal tributaries. Freshwater sources at Udalls Cove include Gablers Creek, the Belgrave WWTP discharge, and discharges from the freshwater wetlands located near the cove. Similarly, Alley Creek receives freshwater from stormwater and CSO discharge, from groundwater inflows, and from the freshwater wetlands located near Alley Creek. All waters in the Alley Creek and Little Neck Bay waterbody assessment area are tidal and saline.

Tidal/Estuarine Systems Biological Systems

Tidal/Estuarine Wetlands

Tidal/Estuarine generalized wetlands in the Alley Creek and Little Neck Bay watershed are as shown in Figure 2-23~~1~~ and are described in this section. The DEC's tidal wetlands maps show the presence of numerous designated wetlands across the study area. The western and eastern shorelines of Little Neck Bay support many areas of intertidal marshes from Willets Point to the mouth of Alley Creek, with an area of coastal shoals, bars, and mudflats mapped to the south and southwest of Fort Totten. Extensive wetlands have been mapped by the DEC on both shores of Little Neck Bay south of Parsons Beach and Crocheron Park and throughout Alley Creek. These extensive wetlands tend to be mapped with high marsh or salt meadow wetlands inland of intertidal marsh wetlands, and in some areas, most notably north of the LIRR and surrounding the mouth of Alley Creek, the wetland areas are mapped on the order of 1,000 feet wide. Formerly connected wetlands are also mapped immediately south of the LIRR, inland from Alley Creek.

Udalls Cove, an embayment of Little Neck Bay, also supports extensive wetlands, generally with intertidal marsh wetlands and high marsh or salt meadow wetlands mapped inland of coastal shoals, bars, and mudflats. The open waters of Little Neck Bay are generally mapped as a littoral zone. The DEC maps designate three discontinuous intertidal wetland areas along the western bank of Little Neck Bay and Alley Creek, from roughly 1,500 feet southeast of Willets Point, along the east and south shorelines of Fort Totten, and south to 23rd Street. Three other areas of discontinuous intertidal marsh wetlands are mapped from 28th Road to Crocheron Park. A continuous intertidal wetland area is mapped from 35th Avenue to the LIRR. South of the LIRR, intertidal marshes are roughly mapped from 440 to 520 feet and 880 to 1,500 feet south of Northern Boulevard and 1,860 feet south of Northern Boulevard to the head of Alley Creek. High marsh or salt meadow wetlands are mapped from 37th Avenue to the LIRR and from roughly 120 to 1,520 feet south of Northern Boulevard.

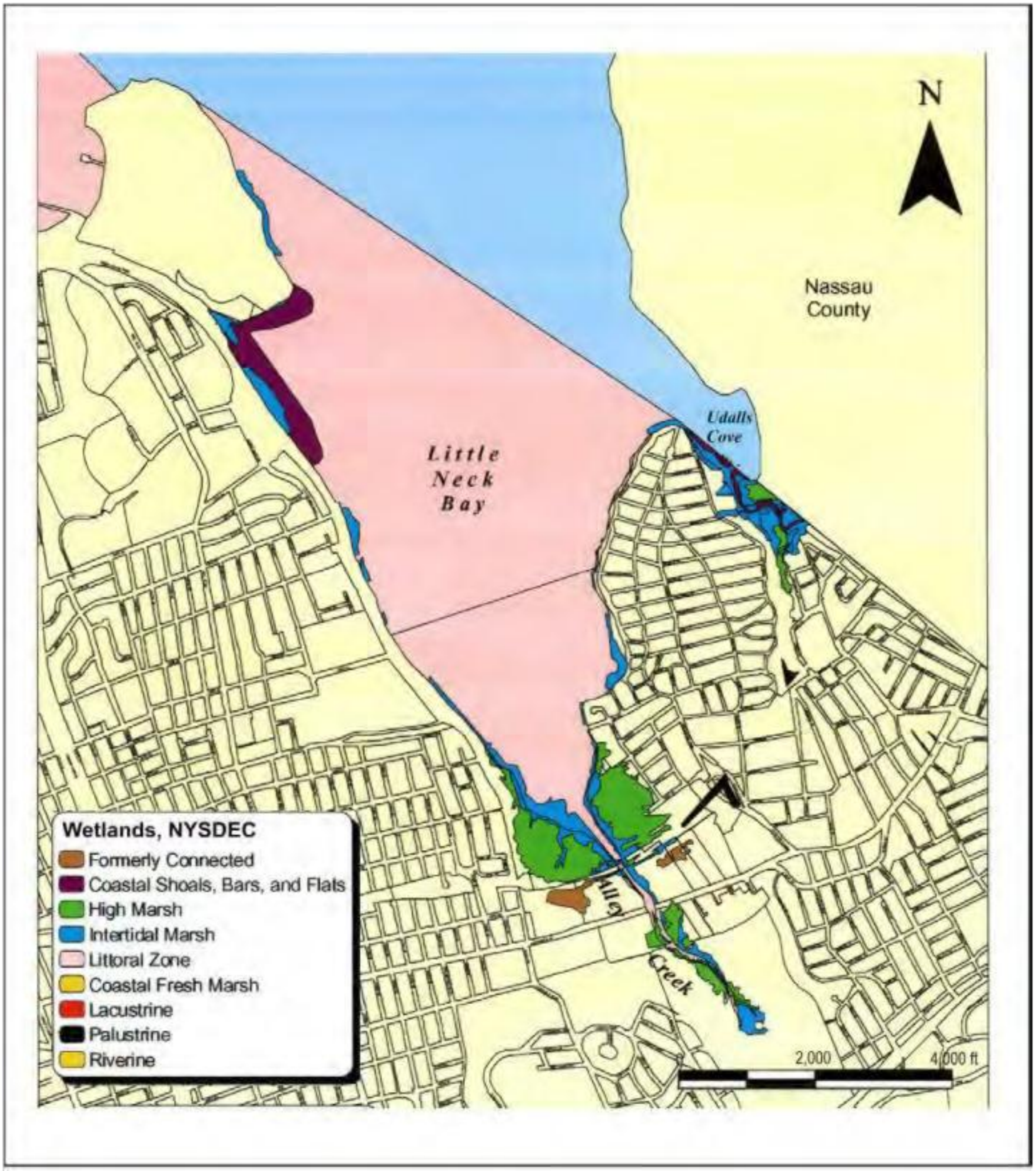

Figure 2-23. Department of Environmental Conservation (DEC) Existing Mapped Wetlands

Source: DEP, 2009

The DEC maps also show intertidal marsh wetlands along the eastern shorelines of Little Neck Bay and Alley Creek. Two areas of intertidal marsh wetlands are mapped from the pier at Beverly Road to Manor Road. Other areas of intertidal marsh wetlands exist from Arleigh Road to 233rd Street, from Regatta Place to Bay Street, and from just south of Bay Street, to the LIRR. The DEC maps show intertidal marsh wetlands stretching along the eastern shore of Alley Creek, from the LIRR to Northern Boulevard. South of Northern Boulevard, the intertidal marsh wetlands are not contiguous and are interspersed along the eastern shoreline, from Northern Boulevard to the mouth of Alley Creek, from roughly 100 to 280 feet south of Northern Boulevard, from 360 to 1,380 feet south of Northern Boulevard, and from approximately 1,660 feet south of the boulevard to the head of Alley Creek. High marsh or salt meadow wetlands are also mapped as interspersed along the eastern shoreline of Little Neck Bay and Alley Creek, from Little Neck Road to the LIRR, adjacent to the south edge of the LIRR, from 100 to 720 feet south of Northern Boulevard, from approximately 780 to 800 feet south of Northern Boulevard, and from approximately 1,380 to 1,680 feet south of the boulevard.

Thin extensions of intertidal marsh wetlands, from about 20 to 60 feet wide, extend inland from both shorelines of Alley Creek, along the southern edge of the LIRR, parallel to the train tracks. To the east of Alley Creek, these intertidal marsh wetlands extend roughly 840 feet inland along the train tracks, and two areas of formerly connected wetlands are mapped to the south of these intertidal wetlands, approximately 300 and 560 feet inland of Alley Creek. To the west of Alley Creek, the intertidal wetlands extend inland approximately 240 feet along the railroad tracks, with a small break between them, and an area of formerly connected wetlands that extends inland for approximately another 1,000 feet.

In the NYC portion of Udalls Cove, the DEC has mapped intertidal marsh wetlands from the mouth to approximately 2,500 feet south of the mouth, along both east and west shorelines. High marsh or salt meadow wetland areas are mapped in the study area, from approximately 2,000 feet to 3,000 feet southeast of the mouth of the cove, along the western shoreline of the cove. Coastal shoals, bars, and mudflats are mapped throughout the mouth and along the open water portions of Udalls Cove within the study area. The wetlands of Udalls Cove extend up to 1,600 feet from the western shoreline in NYC to the eastern shoreline in Nassau County.

The U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) maps show extensive wetlands throughout the Little Neck Bay, Alley Creek, and Udalls Cove study area. The NWI mapped wetlands are as shown in Figure 2-24~~2~~, and Table 2-17 summarizes the classification used. In the inlet between Fort Totten and Bay Terrace, three adjacent wetland areas – estuarine, intertidal, flat, regular (E2FLN); estuarine, intertidal, emergent persistent, irregular (E2EM1P); and palustrine, emergent, persistent, semi-permanent (PEM1F) – are mapped in series, stretching to the northwest from the mouth of the inlet on Little Neck Bay. Along the western shoreline of Little Neck Bay, there are two areas of estuarine, intertidal, beach/bar, regular (E2BBN) wetlands between 17th and 29th Avenues. Along the eastern shoreline of Little Neck Bay, the NWI has mapped E2BBN wetlands at 33rd Street and estuarine, intertidal, emergent, narrow-leaved persistent, regular (E2EM5N) wetlands along Parsons Beach. South of Crocheron Park, on the western shoreline of Little Neck Bay and Alley Creek, and south of Parsons Beach, on the eastern shoreline of the bay and creek, the NWI has mapped multiple wetland areas along both shorelines that span the waterbodies.

Listed from north to south, these wetland areas include E2EM5N, estuarine, intertidal, emergent, narrow-leaved persistent, irregular (E2EM5P), E2EM1P, and another area of E2EM5P, stretching from southern Little Neck Bay to the head of Alley Creek. An area of estuarine, subtidal, open water/unknown bottom, subtidal (E1OWL) wetland is mapped inland, to the west of Alley Creek, northwest of the Cross Island Expressway cloverleaf, and south of the LIRR. The open waters of Alley Creek are mapped estuarine, intertidal, streambed, and irregularly exposed (E2SBM) wetlands.

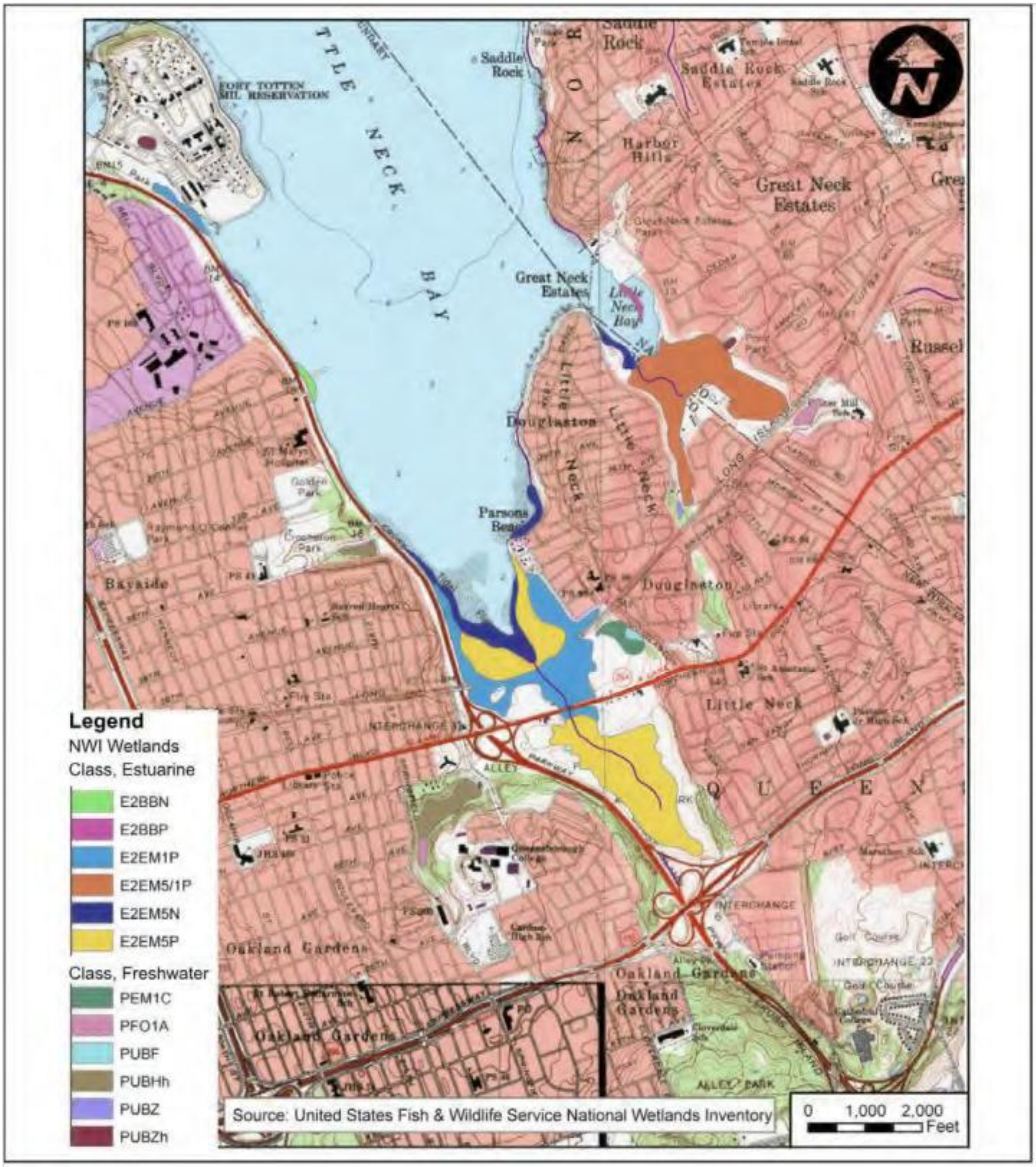

Figure 2-24. National Wetlands Inventory (NWI).

Source: DEP, 2009

Table 2-17. National Wetlands Inventory Classification Codes

National Wetlands Inventory Classification	Description
E1OWL	Estuarine, subtidal, open water/unknown bottom, subtidal
E2BBN	Estuarine, intertidal, beach-bar, regular
E2BBP	Estuarine, intertidal, beach-bar, irregular
E2EM1P	Estuarine, intertidal, emergent-persistent, irregular
E2EM5/1P	Estuarine, intertidal, emergent, narrow-leaved persistent/persistent, irregular
E2EM5N	Estuarine, intertidal, emergent, narrow-leaved, persistent, regular
E2EM5P	Estuarine, intertidal, emergent, narrow-leaved, persistent, irregular
E2FLN	Estuarine, intertidal, flat, regular
E2SBM	Estuarine, intertidal, streambed, irregularly exposed
PEM1C	Palustrine, emergent, persistent, seasonal
PEM1F	Palustrine, emergent, persistent, semi-permanent
PFO1A	Palustrine, forested, broad-leaved deciduous, temporarily flooded
POWF	Palustrine, open water/unknown bottom, intermittently exposed/permanent
POWZ	Palustrine, open water/unknown bottom, intermittently exposed/permanent
PUBF	Palustrine, unconsolidated bottom, semi-permanent
PUBHh	Palustrine, unconsolidated bottom, permanent, diked/impounded
PUBZ	Palustrine, unconsolidated bottom, intermittently exposed/permanent
PUBZh	Palustrine, unconsolidated bottom, intermittently exposed/permanent, diked/impounded

The NWI mapped multiple wetlands along the shorelines of Udalls Cove. The open waters of the cove are mapped as E1OWL. Within the NYC study area of Udalls Cove, the western shoreline north of 28th Avenue is mapped as E2EM5N. South of 28th Avenue, both shorelines of Udalls Cove within the study area are mapped as estuarine, intertidal, emergent, narrow-leaved persistent/persistent, irregular (E2EM5/1P) wetlands. The NWI has mapped the waters as E2SBM where the cove's open waters narrow into a tidal river.

Aquatic and Terrestrial Communities

The DCP Plan for the Queens Waterfront (DCP, 1993) reports a diverse range of species supported by the habitat in the Alley Creek and Little Neck Bay area. Little Neck Bay is a productive area for marine finfish and shellfish. The Bay serves as an important nursery and feeding area for striped bass (*Morone saxatilis*) and numerous other species. A variety of finfish species can be found in the tidal shallows and Alley Creek. Although its waters are not certified for commercial shellfishing, Little Neck Bay is a hard clam-producing area. Alley Pond Park and Udalls Cove contain abundant shellfish and crustaceans. The habitats also serve as breeding areas for several species of birds, as a spring and fall stopover for several migratory species, and as avian wintering areas for several species. Shorebirds and wading birds use the Udalls Cove area extensively. The area also supports numerous terrestrial and amphibious wildlife species. The June 2009 Alley Creek and Little Neck Bay WWFP provides a more detailed summary of the aquatic and terrestrial communities (DEP, 2009).

Freshwater Systems Biological Systems

The generalized freshwater wetlands areas shown in Figure 2-23~~1~~ are described in more detail in this section. The DEC Freshwater Wetlands Maps show seven areas of freshwater wetlands in the study area. The areas are mapped in the inlet between Fort Totten and Bay Terrace, extending along the Cross Island Parkway southeast of Totten Avenue; on the west shoreline of Alley Creek, extending south along the Cross Island Parkway from the cloverleaf at Northern Boulevard to the Creek, roughly 800 feet south of Northern Boulevard; inland from the eastern shoreline of Alley Creek, extending along the southern edge of the LIRR and the western edge of the Douglaston Parkway; in two discontinuous areas along both shorelines of Alley Creek, from roughly 600 feet south of Northern Boulevard to the head of the creek; and in Udalls Cove, from Hollywood Avenue to Sandhill Road, and between Sandhill Road and the LIRR.

The NWI maps show three areas of freshwater (palustrine) wetlands in the Little Neck Bay, Alley Creek, and Udalls Cove study area, as indicated in Figure 2-24~~2~~. In the inlet between Fort Totten and Bay Terrace, a palustrine, emergent, persistent, semi-permanent (PEM1F) wetland is mapped at the northeast edge of tidal wetlands, as described above. An area of palustrine, emergent, persistent, seasonal (PEM1C) is mapped inland of the eastern shore of Alley Creek adjacent to the southern edge of the LIRR, with an area of palustrine, open water/unknown bottom, intermittently exposed/permanent (POWF) wetlands adjacent to the PEM1C wetlands. In addition, an area of palustrine, open water/unknown bottom, intermittently exposed/permanent (POWZ) is mapped to the west of Udalls Cove, between Sandhill Road and the LIRR.

2.2.a.3 Current Public Access and Uses

Alley Creek, its shoreline, areas immediately adjacent to the water, and much of the surrounding drainage area of the creek are within Alley Pond Park. Access to Alley Creek is provided by the park, but no facilities for primary contact recreation are available. The park does not provide any regular secondary contact recreation opportunities; however, the Urban Park Rangers do run structured programs. One such program, “Alley Pond Adventure,” is an overnight summer camping program that includes supervised canoeing (secondary contact recreation use) and fishing.

The major use of Alley Creek is passive non-contact recreation. There are hiking trails that offer views of the water. Another significant, passive use of Alley Creek is for environmental education associated with wetland habitat. The Alley Pond Environmental Center, located near the mouth of Alley Creek, offers an extensive naturalist program with outreach to schools throughout NYC.

Swimming (primary contact recreation use) is an existing use in Little Neck Bay at the privately owned bathing beach located on the eastern shore of the bay at Douglas Manor. As seen in Figure 2-11~~9~~, the DMA Beach is located approximately 0.7 miles north of the mouth of Alley Creek and approximately one mile downstream from the principal CSO outfall on Alley Creek, TI-025. DOHMH beach bacteria monitoring is conducted weekly during the bathing season from Memorial Day through Labor Day. In addition to the supervised bathing at the DMA Beach, bathing has been reported to occur from the boating docks along this shoreline, but this is not a sanctioned use.

The Cross Island Parkway, running parallel to the shoreline, limits access to the water on the western side of Little Neck Bay. There is no swimming noted along this shoreline. Access to the Bay for boating (secondary contact recreation use) is provided at the public marina in Bayside, operated under a concession from the DPR. This facility is open seasonally between May 1 and October 31 and has accommodation for 150 boats. Fort Totten, located at the northeast point of Little Neck Bay, is also operated by DPR and provides public access for canoeing and kayaking. Additionally, special events permit fishing from the docks.

Passive recreation is a major use of Little Neck Bay. There is also a hiking/bicycle path that runs between the shoreline of Little Neck Bay and the Cross Island Parkway, providing viewing of the Bay, and fishing takes place along this pathway. Another wetland area used for environmental education is Aurora Pond, adjacent to Udalls Cove, an eastern tributary to the Little Neck Bay. Environmental education, hiking, biking, and promenades are passive waterbody uses that do not involve either primary or secondary contact with the water. Fishing in Little Neck Bay may include limited contact with the water.

2.2.a.4 Identification of Sensitive Areas

The Federal EPA CSO Control 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 and endangered species and their habitat; and
- Additional areas determined by the Permitting Authority (i.e., DEC).

General Assessment of Sensitive Areas

An analysis of the waters of the Alley Creek and Little Neck Bay with respect to the EPA CSO Control Policy was conducted and is summarized in Table 2-18.

Table 2-18. Sensitive Areas Assessment

CSO Discharge Receiving Water Segments	Current Uses Classification of Waters Receiving Combined Sewer Overflow (CSO) Discharges Compared to Sensitive Areas Classifications or Designations[1]						
	Outstanding National Resource Water	National MarineSanctuaries[2]	Threatened and Endangered Species and their Habitat[3]	Primary Contact Recreation	Public Water Supply Intake	Public Water Supply Protected Area	Shellfish Bed
Alley Creek	None	None	Yes	No[4]	None[5]	None[5]	None
Little Neck Bay	None	None	No	Yes	None[5]	None[5]	None

Notes: [1]Classifications or Designations per CSO Policy.
[2]As shown at http://www.sactuaries.noaa.gov/oms/omsmaplarge.html.
[3]Department of State Significant Coastal Fish and Wildlife Habitats website (http://nyswaterfronts.com/water-front_natural_narratives.asp).
[4]Existing uses include secondary contact recreation and fishing, Class I.
[5]These waterbodies contain salt water.

This analysis identified two issues of potential concern:

- *Threatened and endangered species at Alley Creek.* The Coastal Fish and Wildlife Habitat rating form indicates that the Northern harrier (*Circus hudsonius*), a threatened bird species, winters in Alley Pond Park.
- *Primary contact recreation in Little Neck Bay.* The DMA Beach, a private beach, is located on the western shore of the Douglaston Peninsula.

The threatened Northern harrier is a raptor whose diet consists strictly of land mammals (mice, voles, and insects). Its presence is due to the relatively large, protected wetlands in Alley Pond Park rather than the waters or aquatic life of Alley Creek. The presence of the Northern harrier therefore does not define Alley Creek as a sensitive area for threatened species, according to the EPA CSO Control Policy. There are no threatened and endangered species present in Udalls Cove or Little Neck Bay.

Findings for Sensitive Areas

One sensitive area is located within Little Neck Bay – the DMA Beach (Figure 2-11~~0~~), as defined by the EPA CSO Control Policy. Accordingly, the LTCP addresses the policy requirements, which include: (a) prohibit new or significantly increased overflows; (b) eliminate or relocate overflows that discharge to sensitive areas if physically possible, economically achievable, and as protective as additional treatment, or provide a level of treatment for remaining overflows adequate to meet standards; and (c) provide reassessments in each permit term based on changes in technology, economics, or other circumstances for those locations not eliminated or relocated (EPA, 1995).

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

DEP has been collecting New York Harbor WQ data since 1909. These data are utilized by regulators, scientists, educators, and citizens to assess impacts, trends, and improvements in the WQ of New York Harbor.

The Harbor Survey Monitoring (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 the open waters of the harbor and smaller tributaries within the City. The number of WQ parameters measured has also increased from five in 1909 to over 20 at present.

Harbor WQ 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, WQ in New York Harbor has improved to the point that the waters are now utilized for recreation and commerce throughout the year. Still, impacted areas remain within the New York Harbor. The LTCP process has begun to focus on those areas within the New York Harbor that remain impacted; it will examine 10 waterbodies and their drainage basins and develop a comprehensive plan for each waterbody.

The HSM Program focuses on *Enterococci* and fecal coliform bacteria, DO, chlorophyll 'a', and Secchi transparency as the WQ parameters of concern. Data are presented in four sections, each delineating a geographic region within the New York Harbor. Alley Creek and Little Neck Bay are located within the Upper East River – Western Long Island Sound section. This area contains nine open water monitoring stations and five tributary sites. Figure 2-25 shows the location of Stations E11, LN1, and AC1 of the HSM Program.

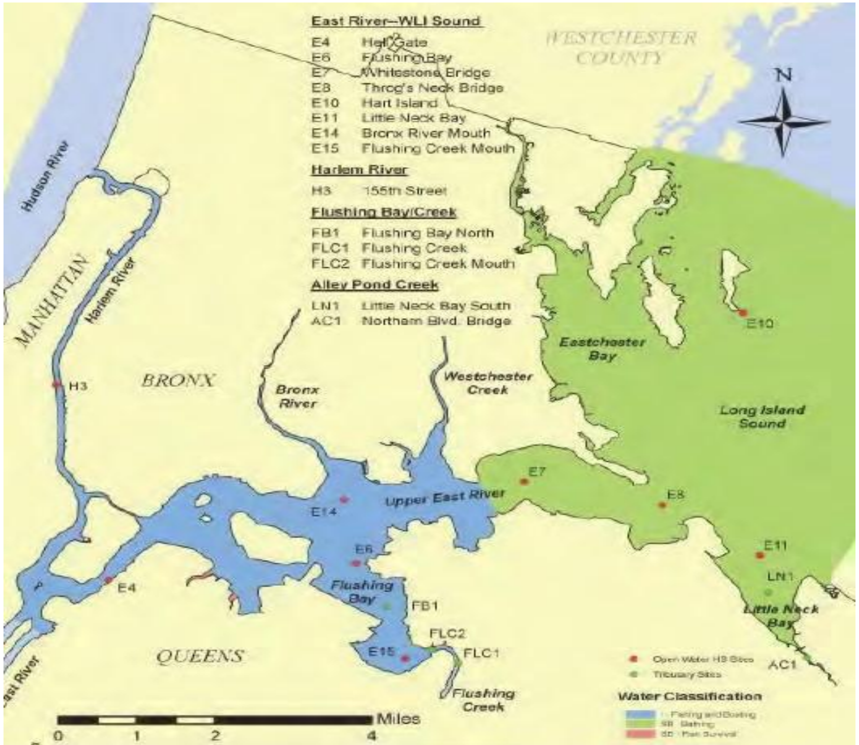

Figure 2-25. Harbor Survey Upper East River – Western Long Island Sound Region

The following sections provide an overview of the bacteria quality and DO levels of Alley Creek and Little Neck Bay based on data collected by DEP as part of the HSM Program and as part of this LTCP. Additional information from the HSM Program can be found at the following location. http://www.nyc.gov/html/dep/html/harborwater/harborwater_quality_survey.shtml

2.2.a.6 Compilation and Analysis of Existing Water Quality Data – (2026 Replaced)

DEP Harbor Survey Data and Department of Health and Mental Hygiene Data – (2026 Replaced)

Data collected within Alley Creek and Little Neck Bay are available from sampling conducted by DEP HSM and from the DOHMH. DEP HSM routinely samples locations in Alley Creek and Little Neck Bay, while the DOHMH samples the DMA Beach. During the 2025 bathing season, the DOHMH reported that based on DOHMH monitoring results and established wet weather advisory precipitation thresholds, the DMA Beach was open for 24 days or 22 percent of the time with 83 notification days including 81 advisory days and 2 closure days.

Figures 2-26 and 2-27 present several statistical parameters of the DEP Harbor Survey bacteria data. Shown on these figures are the site yearly GMs over the 2009 to 2024 period, along with medians and data ranges (minimum to maximum and 25th percentile to 75th percentile).

Figures 2-26 and 2-27 present fecal coliform and *Enterococci* bacteria data collected at Stations AC1, AC2, LN1, and E11 in Alley Creek and Little Neck Bay. The stations sampled varied by year. For both fecal coliform and *Enterococci*, the GM and median measures of central tendency are lowest in the 2022 to 2024 years and the maxima in these recent years are among the lowest since 2009. On Figures 2-28 and 2-29, HSM data for Alley Creek collected during wet and dry weather conditions are shown with Sentinel Monitoring data collected during strictly dry weather conditions. Bacteria concentrations measured during Sentinel Monitoring are on the lower end of the range measured by HSM. Despite declining central tendency trends for Alley Creek and Little Neck Bay and relatively low Sentinel Monitoring results in Alley Creek, overall measured bacteria concentrations in Alley Creek are often elevated on a single sample basis.

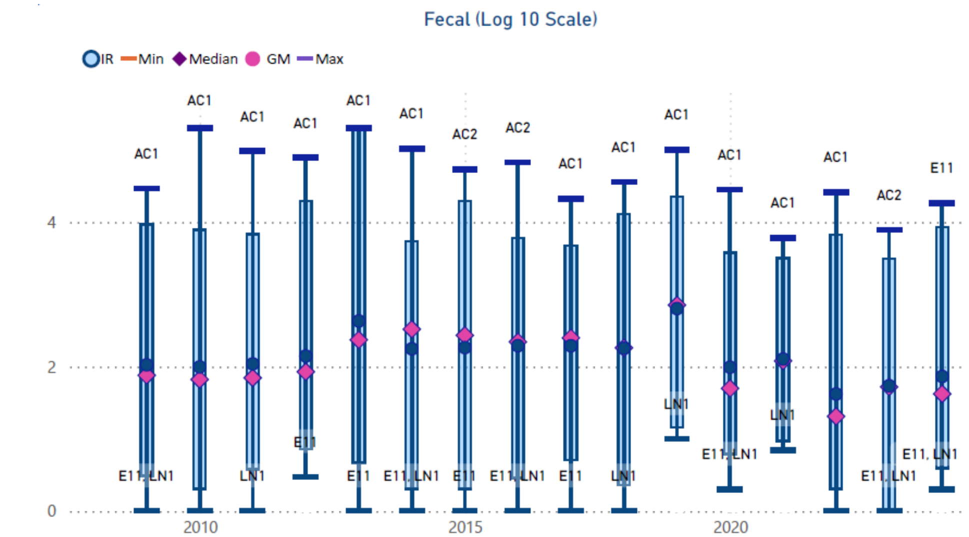

Figure 2-26. Fecal Coliform Harbor Survey Monitoring Data – 2026 Replaced

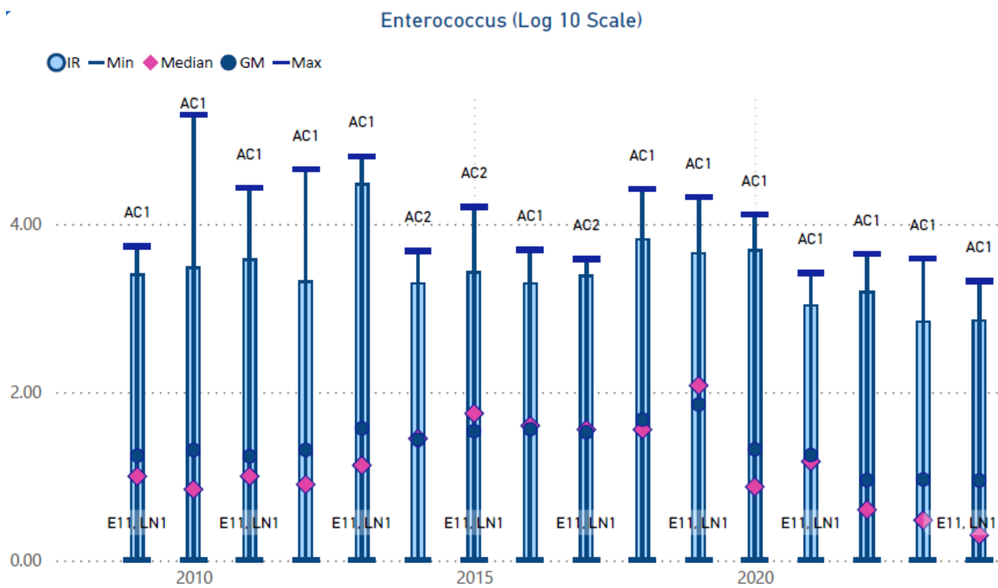

Figure 2-27. Enterococci Harbor Survey Monitoring Data – 2026 Replaced

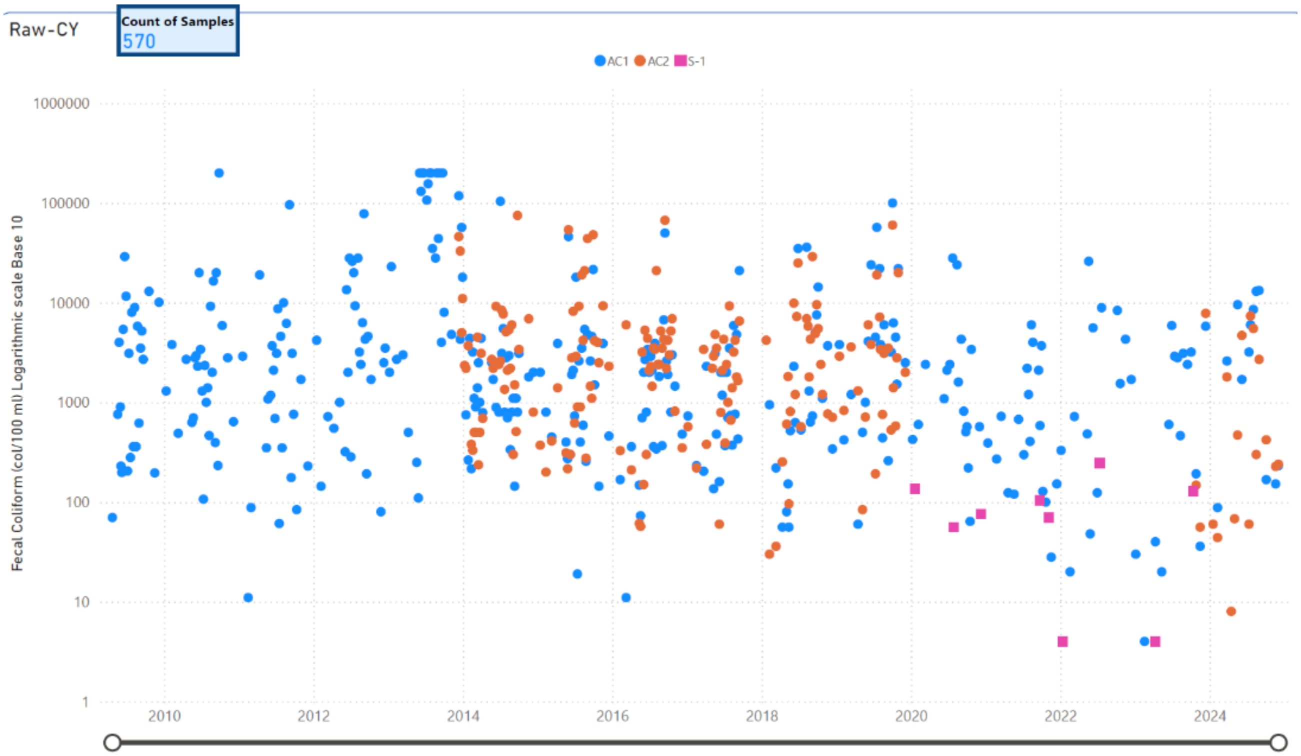

Figure 2-28. Alley Creek Fecal Coliform Data – 2026 Replaced

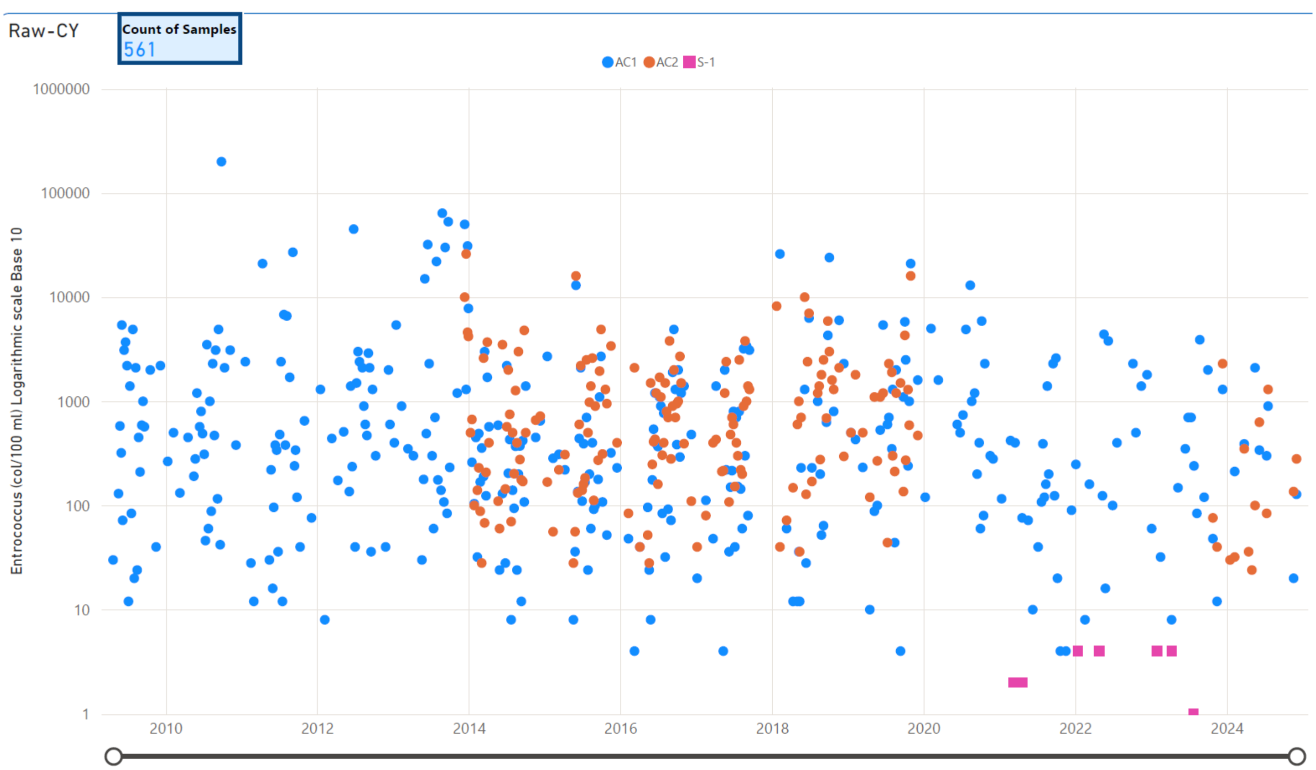

Figure 2-29. Alley Creek *Enterococci* Data – 2026 Replaced

<u>Dissolved Oxygen:</u>

Figure 2-30 presents several statistical parameters of the DEP Harbor Survey DO data. Shown on this figure are the site yearly GMs over the 2009 to 2024 period, along with medians and data ranges (minimum to maximum and 25th percentile to 75th percentile). For purposes of DO, minimum and 25th percentile concentration values are especially important. Figure 2-30 presents DO data collected at Stations AC1, AC2, LN1, and E11 in Alley Creek and Little Neck Bay. The stations sampled varied by year. The minimum and 25th percentile concentrations measured in recent years at Stations AC1 and AC2 in Alley Creek are sometimes below 4 mg/L so are of potential regulatory concern.

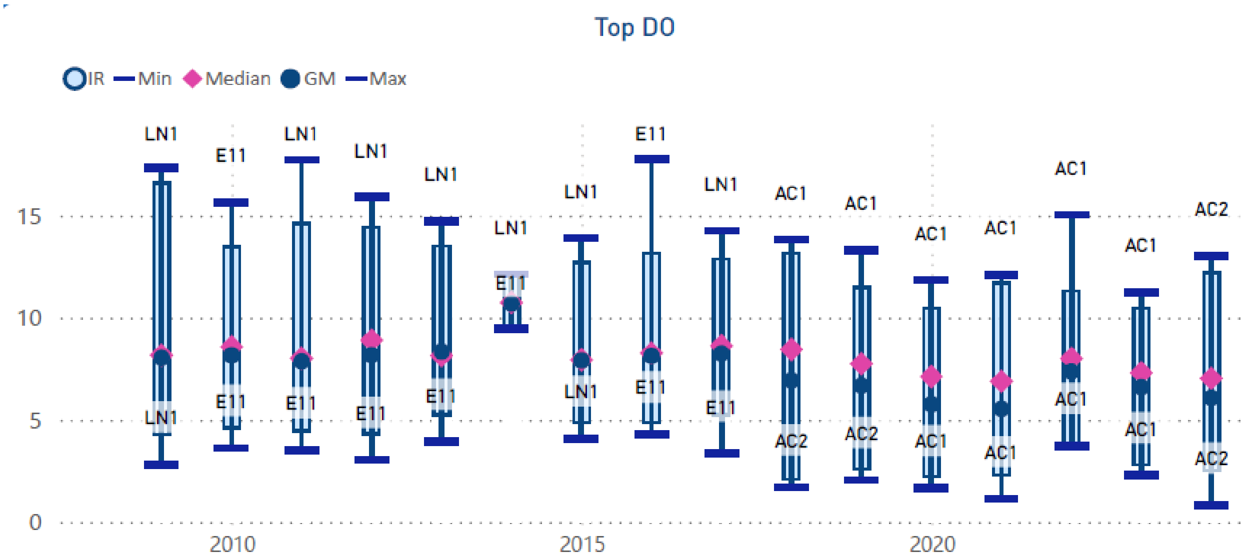

Figure 2-30. Dissolved Oxygen Harbor Survey Monitoring Data – 2026 Replaced

Microbial Source Tracking – (2026 Revised)

MST studies were performed in the Alley Creek and Little Neck Bay watershed in 2014, 2020, and 2021.

2014 Microbial Source Tracking Study

Because of a large resident population of waterfowl in the Oakland Lake and LIE Pond~~both~~ impoundments, it was speculated that the observed elevated bacteria in Alley Creek might be from a source other than humans. To test this, MST was performed to attempt to determine the host (bird, dog, or human) that contributed the observed fecal pollution to the waterbodies. Fecal pollution can originate from point sources such as sewage, effluent from WWTPs and stormwater, and from non-point sources such as leaking septic systems, agriculture, or wildlife runoff where the entry point of contamination to surface waters is not obvious. In either case, mammalian sources leave genetic tracers that can be detected in the laboratory.

Detection and quantification of gene biomarkers for human, bird, and dog sources were performed by Source Molecular Laboratory, based in Florida, using quantitative Polymerase Chain Reaction DNA analytical technology proprietary to the laboratory. A general marker was quantified as copy numbers per mL, which is roughly analogous to bacteria concentrations (although not related). Then two human markers, one bird marker, and one dog marker were targeted for presence/absence, and if found to be present, quantified in the same manner as the general marker. Those results that were below the detection limits of the associated genetic assay were classified as negative. A negative result did not confirm the absence of fecal contamination. As previously noted, the results cannot be considered to be absolute due to the low bacteria levels in the samples. The results for the five sampling events are summarized in Table 2-20~~1~~.

Table 2-20. Total Organic Carbon Microbial Source Tracking Sampling Results

Date	**1/3/2014**		**1/11/2014**		**2/1/2014**		**2/12/2014**		**2/25/2014**	
Location	**Human 1**	**Human 2**	**Human 1**	**Human 2**	**Human 1**	**Human 2**	**Human 1**	**Human 2**	**Human 1**	**Human 2**
Oakland Lake Outlet	-	-	-	-	Positive		-	-	-	-
Oakland Lake main Inflow (OL6)	Positive	Positive	-	-	-	-	-	-	-	-
LIE Pond	-	-	-	-	-	-	-	-	-	-
Location	**Bird**		**Bird**		**Bird**		**Bird**		**Bird**	
Oakland Lake	Positive (t)		Positive (d)		Positive (t)		-		-	
Oakland Lake main Inflow (OL6)	Positive		-		-		-		-	
LIE Pond	Positive		-		-		Positive (t)		-	
Location	**Dog**		**Dog**		**Dog**		**Dog**		**Dog**	
Oakland Lake	-		-		-		-		-	
Oakland Lake main Inflow (OL6)	Positive		-		-		-		-	
LIE Pond	-		-		-		-		-	

(t): trace; (d) detected in duplicate sample

Bird markers were found to be positive in three of five Oakland Lake samples and two of five LIE Pond samples. The single positive for dog marker detection coincided with positives for all other markers for that event at the QCC outfall, suggesting a higher level of contamination. The dog marker can have a false positive when human markers are abundant. Only one of two human markers was detected in a single event, suggesting a limited human contribution to the fecal contamination observed.

Source Molecular Laboratory indicated that the results showed trends typical of other projects. However, a set of five measurements at one location may not be statistically significant to make an appropriate interpretation of the overall results, especially considering the relatively infrequent positives in the results. Due to the low bacteria levels, further sampling was not performed. The frequency of positive results is the most important parameter when ranking sites with respect to the contribution of a particular host to the contamination.

2020 and 2021 Microbial Source Tracking Study – (2026 Revised)

In 2020, DEP partnered with the US Geological Survey (USGS) on a ~~microbial source tracking (~~MST~~)~~ study to identify the source(s) and relative host contributions of bacterial contamination in Alley Creek. The object of the study was to analyze water samples for markers using the quantitative polymerase chain reaction method to characterize the various sources of fecal contamination (humans, waterfowl, and canines) in addition to microbiological and chemical constituents associated with human sewage. In 2021, DEP and the USGS completed sample collection for the study at three outfalls and in Oakland Lake and conducted intensive sampling at the outfall TI-024 (TI-024 has been redesignated as TI-684) to investigate the area for illicit discharges.

Results indicated that human MST markers were detected in 27 of the 28 samples collected at the three outfall sites along Alley Creek (TI-025, TI-008, and TI-024) during dry- and wet-weather conditions and regardless of tidal conditions; canine Bacteroides and waterfowl-associated Helicobacter markers were less prevalent. The less prevalent marker results indicate that canine and waterfowl are contributing but not predominant sources at the three outfall sites.

Because neither Oakland Lake nor groundwater were identified by this study as a significant source of fecal indicator bacteria (FIB) to Alley Creek, it was determined that they could not be the source of the high concentration of human MST markers. However, sampling during low tide revealed influence of a damaged sanitary sewer line parallel to the combined sewer connecting to Alley Creek from Oakland Lake. This condition resulted in elevated concentrations of FIB and human and canine MST markers. Sewer line repairs that were completed toward the end of the study resulted in a substantial decrease in FIB and MST marker concentrations.

The USGS published the final report in July 2022 (Assessment of Fecal Contamination Sources to Alley Creek, Queens County, New York, August 2020–June 2021 https://pubs.er.usgs.gov/publication/sir20225068). DEP continues to assess the area by taking samples, walking the sewer, and eliminating any illegal discharge, if found.

Alley Creek Long Term Control Plan Sampling

To supplement the WQ sampling information that is available from DEP and DOHMH, a sampling program was conducted during the development of this LTCP. This sampling was targeted at developing a better understanding of the spatial variability of the WQ trends within Little Neck Bay, especially in the vicinity of DMA Beach. An array of sampling locations, as shown on Figure 2-31~~0~~, was developed to fill in the areas between the DEP and DOHMH sampling locations. Samples were collected at these locations in both dry and wet weather in November and December 2012. The emphasis of the sampling program was on bacteria indicators.~~, although data were developed for other WQ indicators such as DO~~.

As noted previously in Section 2.1.c.2, MST samples were also collected at DMA Beach. The results obtained did not provide a conclusive determination of the most likely source of the bacteria sampled for the reasons presented in that earlier discussion.

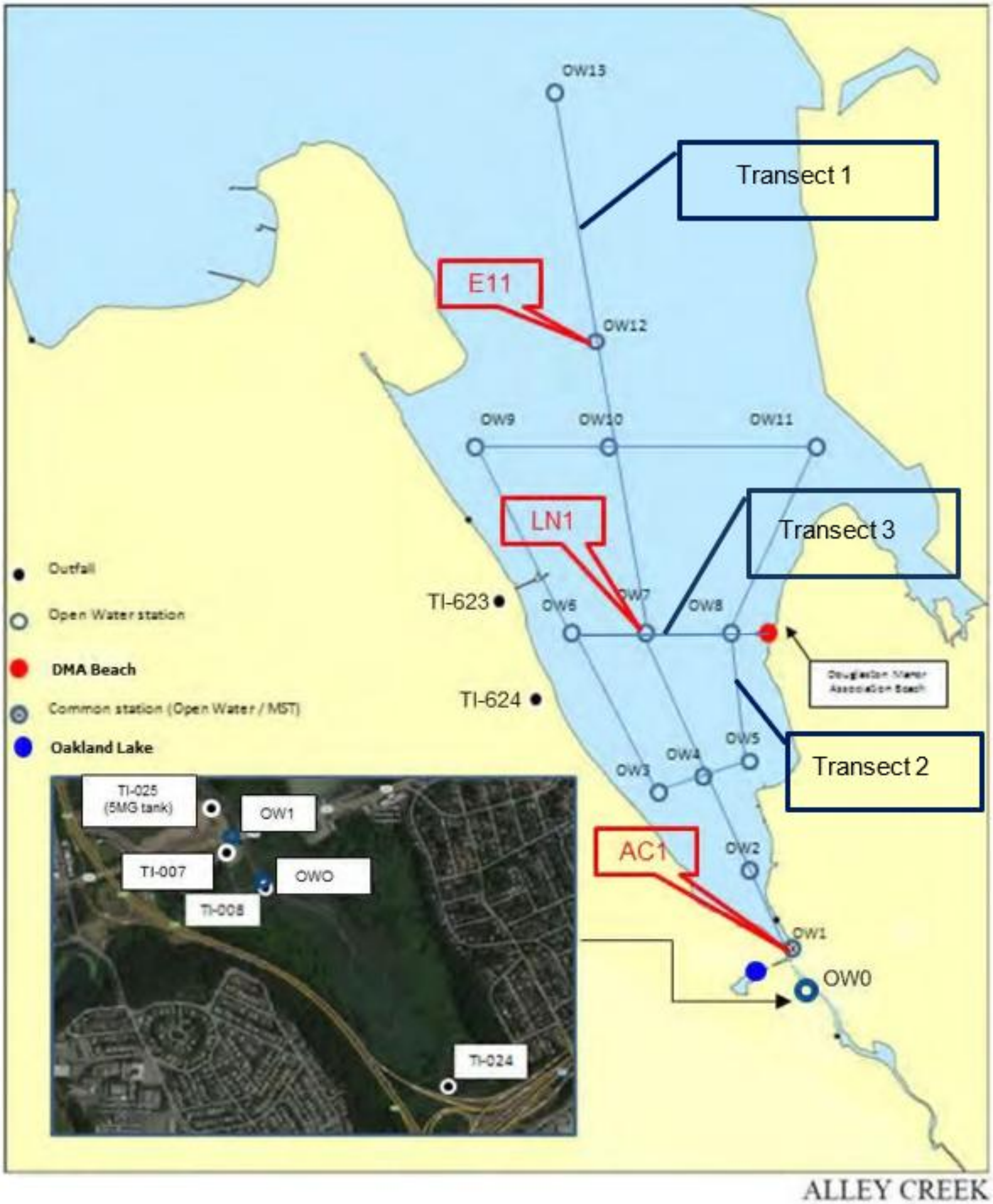

Figure 2-31. 2012 Intensive Sampling and Harbor Survey Monitoring Locations

The results of this sampling effort are provided in Figures 2-32~~1~~ and 2-33~~2~~ for *Enterococci* and fecal coliform in wet weather, and Figures 2-34~~3~~ and 2-35~~4~~ present these results for dry weather. As shown in Figures 2-32~~1~~, and 2-33~~2~~, there appears to be a gradient of bacteria from Alley Creek to the center portion of Little Neck Bay along the Bay centerline (Stations OW2, OW4, and OW7), along the eastern shoreline (Stations OW2, OW5, and OW8), and along the western shoreline (Stations OW2, OW3, and

OW6). That gradient has the elevated bacteria concentrations at the locations in Alley Creek, and they decrease from the Creek towards the Upper East River. Locations further removed from Alley Creek (Stations OW9 through OW13) seem to have bacteria concentrations that are almost equal and appear to be more related to East River sources than they are related to Alley Creek sources. The lack of a relationship between the values at these outer stations and the inner stations indicates that the bacteria concentrations at these locations are likely associated with other sources of bacteria in the system that are impacting the greater East River and western Long Island Sound.

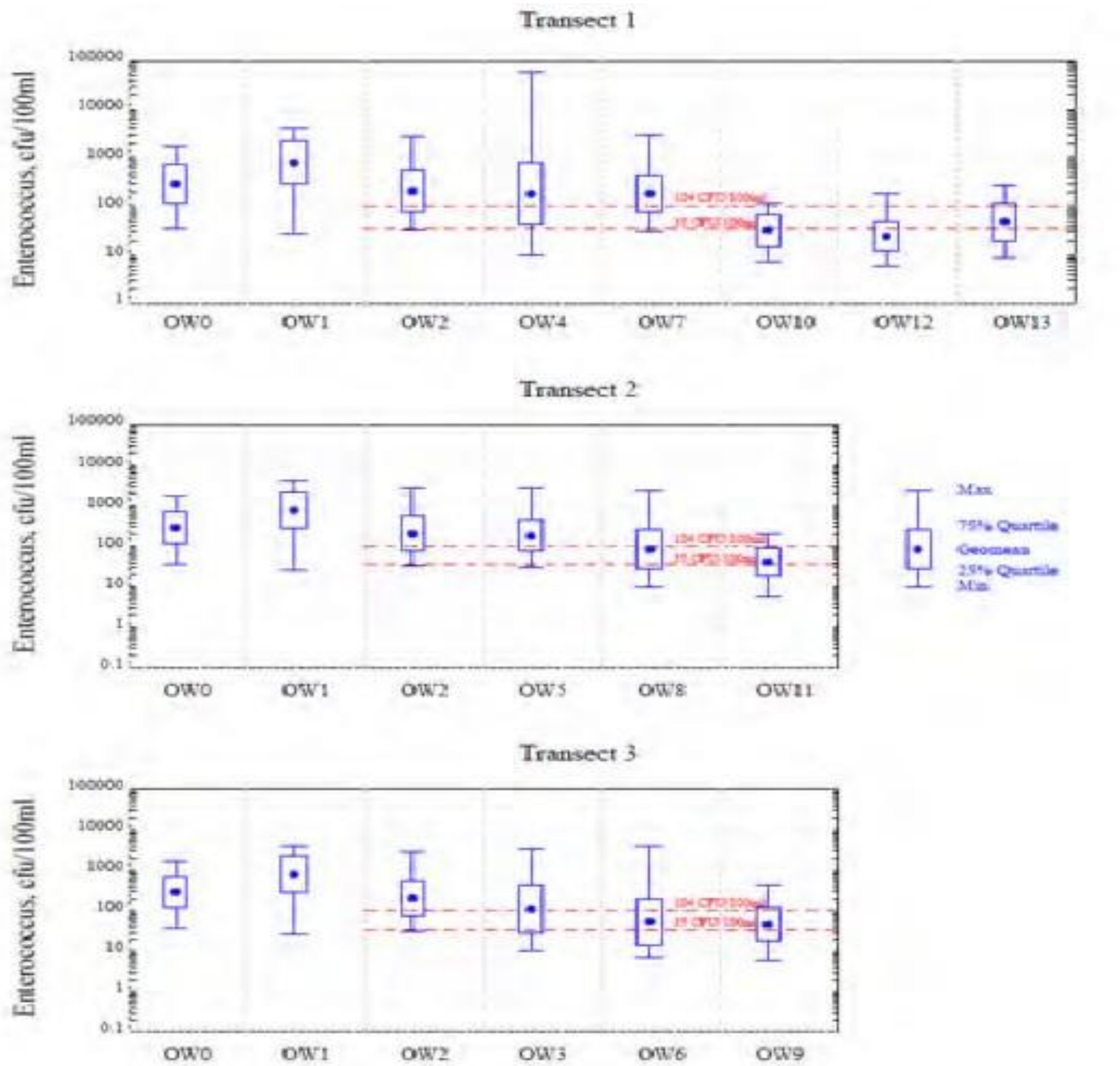

Figure 2-32. FSAP Wet Weather *Enterococci* Concentrations

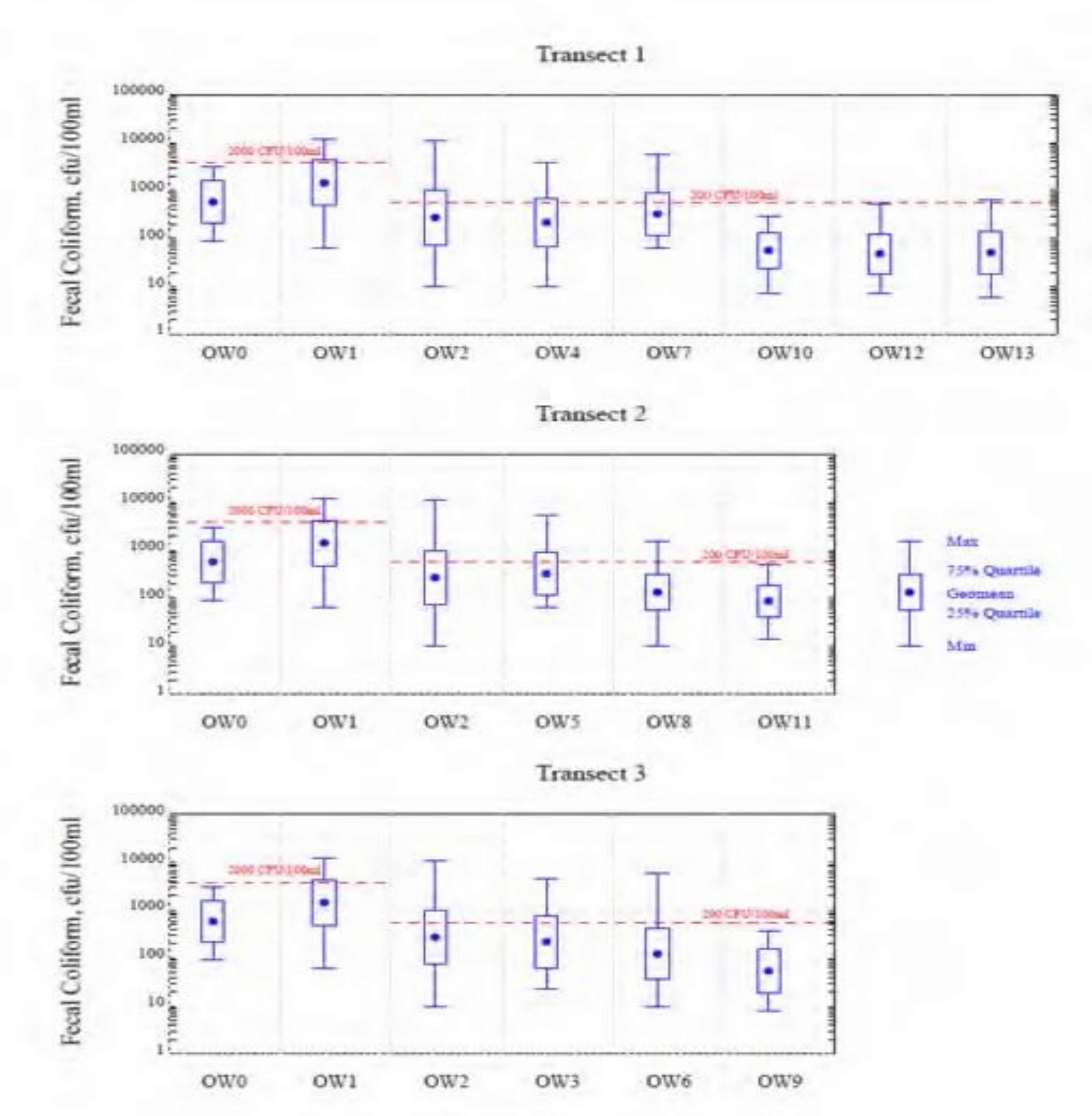

Figure 2-33. FSAP Wet Weather Fecal Coliform Concentrations

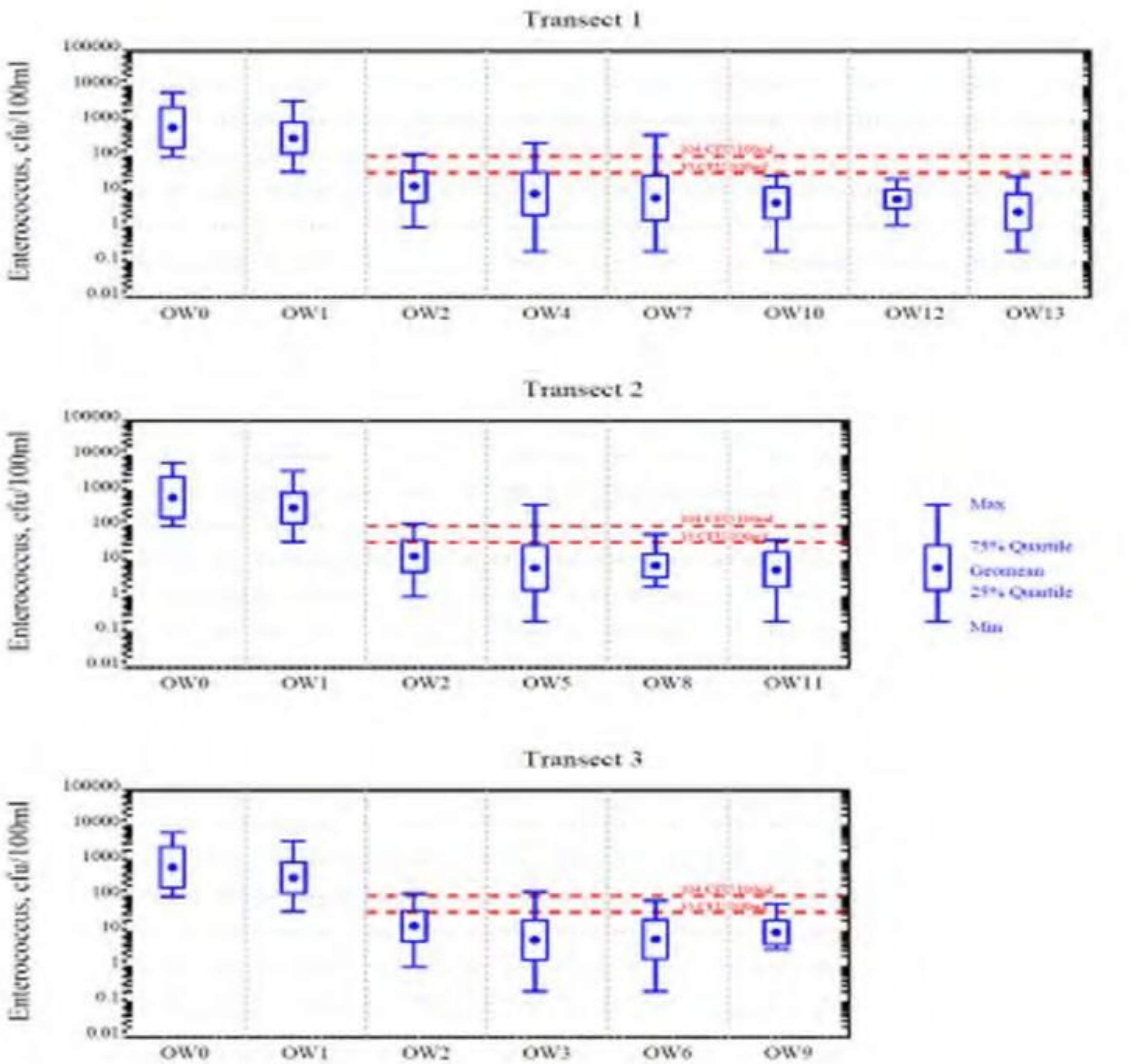

Figure 2-34. FSAP Dry Weather *Enterococci* Concentrations

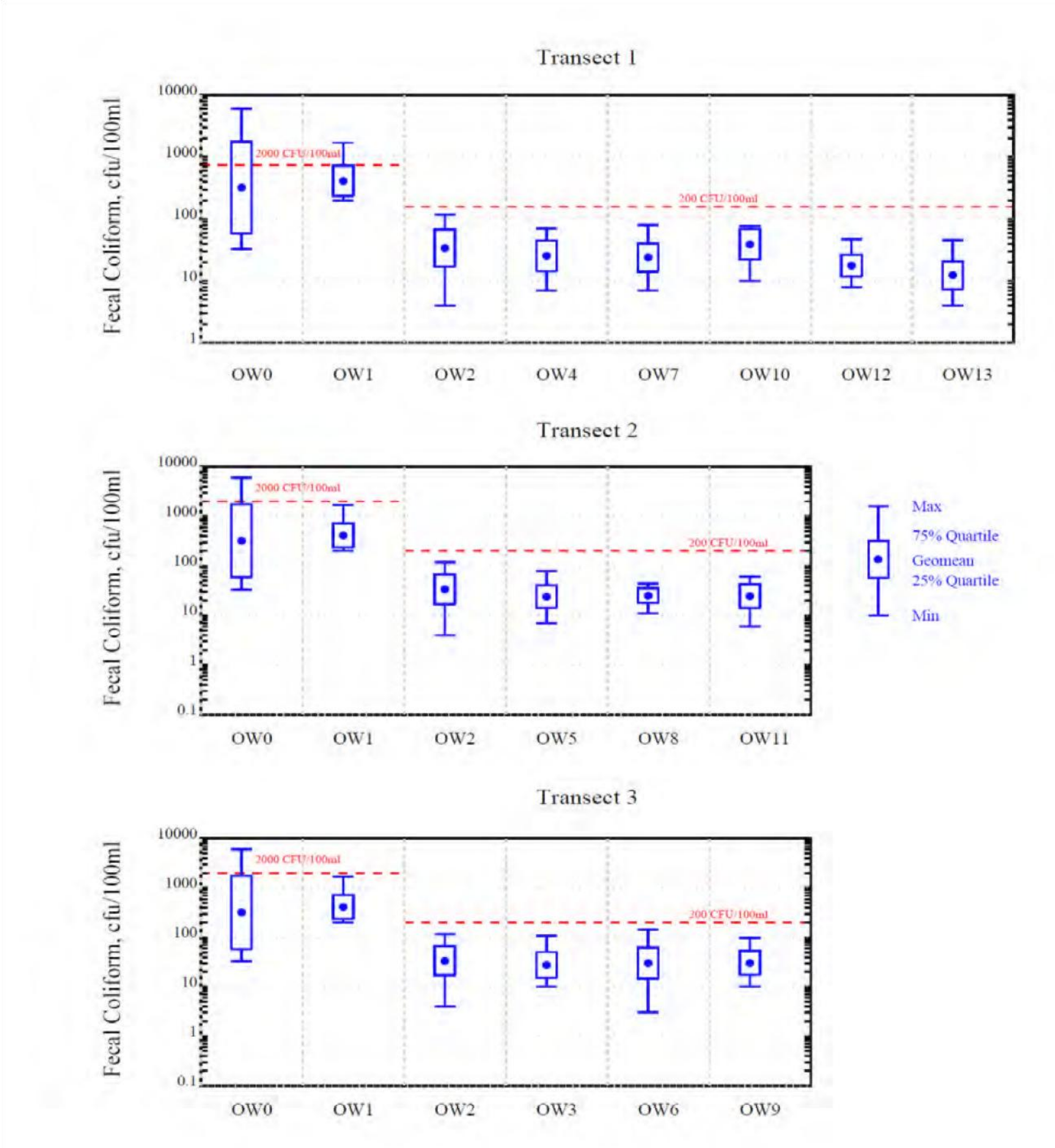

Figure 2-35. FSAP Dry Weather Fecal Coliform Concentrations

Similarly, the concentrations of bacteria at the DMA Beach shoreline that appear on Transect 3 (Stations OW6, OW7, OW8, and DMA Beach), in close vicinity to Station OW8, are higher in wet weather than the Station OW8 concentrations, suggesting a local source of bacteria in the DMA area.

~~The DO concentrations for the period of 2009 through April 2011 and May 2011 through the end of 2012 for Alley Creek and Little Neck Bay areas are summarized in Figure 2-35. The figure shows the surface DO concentrations in the upper panel and the bottom-level DO concentrations in the lower panel. For the Alley Creek sampling locations (Station AC1), there is only a single DO reading taken (mid-depth), which~~

~~is displayed in the upper panel. DO concentrations are shown as the period mean, the 25th percentile and 75th percentile concentrations, as well as the period minimum and maximum values.~~

~~The DO concentrations at Station AC1 are more limited, and prior to May 2011, all the data show concentrations greater than 4.0 mg/L. After May 2011, only 68 percent of the measurements were found to be greater than 4.0 mg/L.~~

Attachment 3 – Section 6

The 2014 and 2015 versions of the approved 2017 LTCP Section 6 are replaced and superseded by the 2026 Supplemental LTCP version of Section 6 provided below.

6.0 BASELINE CONDITIONS AND PERFORMANCE GAP – 2026 REPLACED

Key to the development of the 2026 Supplemental LTCP for Alley Creek and Little Neck Bay is the assessment of WQ with applicable WQS within each waterbody. The WQ was assessed using the ERTM WQ Model, recalibrated with both HSM and the synoptic WQ data collected in 2012. The ERTM simulated ambient bacteria concentrations within the two waterbodies for a set of baseline conditions, as described in this section. The IW Model was used to provide flows and loads from intermittent wet weather sources as input to the ERTM.

Two types of continuous WQ simulations were performed to evaluate the gap between the calculated bacteria levels and the WQS. A one-year simulation (using average 2008 rainfall) was performed for bacteria and DO. This shorter-term continuous simulation served as a basis for evaluation of control alternatives. A 10-year (2002–2011) simulation was performed for bacteria to assess the baseline conditions, evaluate the performance gap, and analyze the impacts of the final alternative.

This section of the report describes the baseline conditions and the bacteria concentrations calculated by ERTM. It further describes the gap between calculated baseline bacteria concentrations and the WQS when the calculated concentrations exceed the criteria.

6.1 Define Baseline Conditions

Establishing baseline conditions is an important step in the LTCP process, since the baseline conditions are used to compare the effectiveness of CSO controls and to predict whether WQ goals would be attained after the implementation of the recommended LTCP. Baseline conditions for this LTCP were established in accordance with guidance provided by DEC to represent future conditions. Specifically, these conditions included the following assumptions:

- The design year was established as 2040
- The TI WWTP receives peak flows at 2xDDWF
- Grey infrastructure includes those recommended in the 2009 WWFP
- Waterbody-specific GI application rates are based on the best available information

Mathematical modeling tools were used to calculate the CSO volume and pollutant loads and their impact on WQ. The performance gap between calculated WQS was assessed herein by comparing the baseline conditions with WQS. In addition, complete removal of CSO was evaluated. Further analyses were conducted for CSO control alternatives in Section 8.0.

The IW Model was used to develop stormwater flows, conveyance system flows, and CSO volumes for a defined set of future or baseline conditions. For the Alley Creek and Little Neck Bay LTCP, baseline conditions were developed in a manner consistent with the earlier 2009 Alley Creek and Little Neck Bay WWFP approved by DEC. However, based on more recent data as well as the public comments received on WWFP, it was recognized that some of the baseline condition model input data needed to be updated to reflect more recent meteorological conditions as well as current operating characteristics of various collection and conveyance system components. Furthermore, the mathematical models were also updated from their configurations and calibration developed and documented during development of the earlier WWFP. IW Model alterations reflected a deeper understanding of dry and wet weather sources, catchment areas, and new or upgraded physical components of the system. Updates to ERTM included more refined segmentation. Model input changes that have resulted from physical changes in the system were described in Section 2.1. The new IW Model network was then used to establish baseline conditions and as a tool to evaluate the impact of alternative operating strategies and physical changes to the system.

Following are the baseline modeling conditions primarily related to DWF rates, wet weather capacity for the TI WWTP, sewer conditions, precipitation conditions, and tidal boundary conditions. Each of these is briefly discussed in the section below:

- Wet Weather Capacity: The rated wet weather capacity at TI WWTP is 160 MGD (2xDDWF). All projects associated with more reliably conveying and treating 2xDDWF have been completed, including improvements to headworks at TI WWTP and construction of a parallel interceptor.
- Sewer conditions: The IW Model was developed to represent the sewer system on a macro scale that included all conveyance elements greater than 48 inches in equivalent diameter, along with all regulator structures and CSO outfall pipes. Post-cleaning levels of sediments were also included for the interceptors in the collection system to better reflect actual conveyance capacities to the WWTPs.
- IW Model: Includes updates to the TI-025 and TI-008 sewersheds that were made as part of the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024). To understand the existing hydrologic and hydraulic conditions within the Feasibility Study drainage area, which focused on the separately sewered area contributing flow to the Alley Creek CSO Retention Facility (Outfall TI-025), model refinement and calibration were performed. This refined model enhanced the detail of the sewer network by incorporating all storm and combined sewers within the study area regardless of size and by delineating modeled subcatchments on a block-by-block basis.

6.1.a Hydrological Conditions

Previous evaluations of the Alley Creek watershed used the 1988 precipitation characteristics as the typical representative year. However, for this LTCP, the precipitation characteristics for 2008 were used for the baseline condition, as well as for alternative evaluations. In addition to the 2008 precipitation pattern, the observed tide conditions that existed in 2008 were also applied in the models as the tidal boundary conditions at the CSO outfalls that discharge to tidally influenced waterbodies. For longer-term 10-year evaluations, the period from 2002 through 2011 was analyzed.

6.1.b Flow Conservation

Consistent with previous studies, the dry weather sanitary sewage flows used in baseline modeling were escalated to reflect anticipated growth in NYC. In the past, flow estimates were based on the 2000 census, and growth rates were estimated by the Mayor’s Office and DCP to arrive at projected 2045 sanitary flow rates. These flows were then applied to the model, although they were conservative and did not account for flow conservation measures. The updated analyses use the 2010 census data to reassign population values to the watersheds in the model and project up to 2040 sanitary flows. These projections also reflect water conservation measures that have significantly reduced flows to the WWTPs and freed up capacity in the conveyance system.

6.1.c BMP Findings and Optimization

A list of BMPs, along with brief summaries of each and their respective relationships to the EPA Nine Minimum Controls (NMCs), was reported in detail in Section 3.0 as they pertain to Alley Creek CSOs. In general, the BMPs address operations and maintenance (O&M) 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 WQ 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 setting up and using the IW Model to simulate CSO discharges and in establishing non-CSO discharges that impact WQ in Alley Creek and Little Neck Bay:

- Sentinel Monitoring – In accordance with BMPs #1 and #5, DEP collects quarterly samples of bacteria WQ at the mouth of Alley Creek in dry weather to assess whether dry weather sewage discharges occur. In 2011 and 2012, DEP used its in-house personnel to trace and remove dry weather sewer connections from 11 homes that were improperly connected to storm sewers that discharge through Outfall TI-024. Dye testing and inspections of homes continue to identify and remediate remaining illegal connections on an as-needed basis. Although illicit sources of bacteria were included in the ERTM 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 – DEP routinely inspects and cleans the interceptors on a recurring 5-year cycle.
- Combined Sewer Sediments – The IW Model assumed no sediment in upstream combined trunk sewers in accordance with BMP #2.
- WWTP Flow Maximization – In accordance with BMP #3, DEP treats wet weather flows up to 2xDDWF that are conveyed to the TI WWTP. DEP follows this wet weather plan, and cleaning of the interceptor sediments has increased the ability of the system to convey 2xDDWF to the treatment plant. With the installation of the Whitestone interceptor extension, WWTP has received 2xDDWF more frequently. The baseline IW Model simulates CSO discharges with the WWTP accepting and treating 2xDDWF and with the Whitestone interceptor extension.
- Wet Weather Operation Plans (WWOP) – The Alley Creek CSO Retention Facility WWOP (BMP #4) is contained within the TI WWTP WWOP. This Plan establishes procedures for pumping down the Alley Creek CSO Retention Facility after wet weather events to make room for the next event. The IW Model was set up to simulate operating conditions and pumping rates/methods consistent with WWOP.

6.1.d Elements of Facility Plan and GI Plan

The Alley Creek and Little Neck Bay LTCP includes the following grey projects recommended in the 2009 WWFP. Construction of this grey infrastructure was completed in early 2011, and the Alley Creek CSO Retention Facility became operational on March 11, 2011. Details of these projects are as follows:

- New 1,475-foot-long multi-barrel outfall sewer extending to a new outfall on Alley Creek (TI-025).

- New 5 MG Alley Creek CSO Retention Facility:
  - New diversion chamber (Chamber 6) to direct CSO to the new Alley Creek CSO Retention Facility and to provide tank bypass to TI-008.
  - Weir set within Chamber 6 to pass all flows up to the DEP 5-year design flow into the tank.
  - New CSO outfall, TI-025, for discharge from the tank.
  - Fixed baffle at TI-025 for floatable retention, minimizing release of floatables to Alley Creek.
  - Upgrade of Old Douglaston PS to empty tank and convey flow to TI WWTP after the end of the storm.

Based on the work done for the 2024 Oakland Lake Stormwater Diversion Feasibility Study, DEP determined that the appropriate green infrastructure projection for Alley Creek's combined sewer area should be 19.3 acres and this value was used for baseline modeling for this 2026 Supplemental LTCP. This approach is consistent with the approved 2017 LTCP modeling methodology for representing green infrastructure in combined areas.

6.1.e Non-CSO Discharges

In several sections of the TI WWTP drainage area, stormwater drains directly to receiving waters without entering the combined system or separate storm sewer system. These areas are depicted as "Direct Drainage" or "Local Sources" in Figure 2-10 in Section 2.0 and were delineated 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. Significant "direct drainage" areas include Fort Totten, Douglaston Manor, and Alley Pond Park, all of which are tributary to Alley Creek and Little Neck Bay. In addition, the northern portion of Douglaston Peninsula, as was indicated in Figure 2-10, is currently unsewered. This area appears to contribute pollutants to adjacent Little Neck Bay waters during dry and wet weather.

"Other" areas are largely comprised of parkland, such as the portions of Flushing Meadows, Corona Park, Kissena, Cunningham, and Clearview Parks, and Mt. Hebron and Flushing Cemeteries. These areas were depicted as "other" drainage areas in Figure 2-10 in Section 2.0. The "other" category also includes special cases, such as the former Flushing Airport in College Point (now a commercial distribution center), where sanitary flow is conveyed to the WWTP, and stormwater is conveyed through separate stormwater collection systems to the receiving waters. The abovementioned areas are generally outside the Alley Creek and Little Neck Bay watershed, including Oakland Lake, LIE Pond, and an area in the headwaters of Alley Creek.

Overall, the "direct drainage" and "other" areas cover roughly 3,654 acres of the TI WWTP (1,484 direct drainage acres and 2,170 "other" acres). In Alley Creek and Little Neck Bay, the "direct drainage" and "other" areas are 828 acres and 192 acres, respectively, totaling 1,020 acres.

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

The IW Model was used to develop CSO volumes for baseline conditions; it included the Alley Creek CSO Retention Facility, which is operational, and assumed the implementation of three percent on-site GI. Using these overflow volumes, pollutant loadings from the CSOs were generated using the *Enterococci*, fecal coliform, and BOD concentrations that were used in the recalibration of the Alley Creek portion of the ERTM. In addition to the CSO pollutant loadings, storm sewer discharges, and other continuous sources of flow affect WQ in Alley Creek and Little Neck Bay.

Continuous flows and loadings from Oakland Lake and the upstream Alley Creek area were assumed to be the same for the baseline condition as they were in the 2011 and 2012 existing conditions, for which the bacteria ERTM was calibrated, with the following exceptions:

- Little Neck Bay DMA area – Localized sources of non-CSO contamination were assumed to be mitigated outside the LTCP program.
- Upper Alley Creek watershed – The illicit discharge detection and elimination (IDDE) program conducted a comprehensive study in this drainage area. Track-down work conducted showed no obvious sources of contaminated stormwater being discharged into Oakland Lake or the LIE Pond. Additionally, bacteria samples collected within Oakland Lake and its outlet, along with the LIE Pond outlet, showed bacteria concentrations that were well below levels that could be considered typical for such urban waterways. Potential illicit connections were identified in outfalls TI-024 (TI-684) and TI-008. A leaking sanitary sewer was identified near the TI-008 that was repaired in May 2021. At TI-024 (TI-684) some repairs were made to an adjacent leaking sanitary sewer and some illegal sanitary connections to the storm sewer were also abated. The IDDE is an ongoing program and is still active in Alley Creek. As such, no illicit discharges are included in the baseline conditions, and illicit discharges and other sources of dry weather contamination into Alley Creek were assumed to be mitigated for modeling purposes.
- Localized sources – During the 2011 and 2012 bacteria model calibrations, stormwater runoff from DMA was assigned higher than typical stormwater bacteria concentrations, which represented the impact of localized sources. Based on the assumption that improvements will be undertaken to address these localized sources, the additional bacteria loading from the stormwater runoff has been eliminated from the future condition baseline evaluations. As such, in the baseline condition, stormwater runoff from the DMA area was assigned the same bacteria concentrations used for other portions of the system that have stormwater discharges within the Alley Creek and Little Neck Bay watershed.
- Updated hydrologic and hydraulic conditions from the refined IW modeling supporting the 2024 Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study – The Oakland Ravine Feasibility Study focused on refining the IW Model for the separately sewered drainage area contributing flow to the Alley Creek CSO Retention Facility (Outfall TI-025). The refined IW Model included enhanced detail of the sewer network by incorporating all storm and combined sewers within the TI-025 drainage area regardless of size and by delineating modeled sub-catchments on a block-by-block basis. The refined IW Model predicts an annual average overflow volume (AAOV) of 237 MGY with overflow 34 events at TI-025, which is higher than the 2014 Alley Creek CSO LTCP baseline model, which predicted an AAOV of 132 MGY with 16 overflow events at TI-025 over the course of the DEP's typical rainfall year, 2008.

The pollutant concentrations assigned to the various sources of pollution in Alley Creek and Little Neck Bay are summarized in Table 6-1.

Table 6-1. Pollutant Concentration for Various Sources in Alley Creek

Pollutant Source	_Enterococci_ (cfu/100 mL)	Fecal Coliform (cfu/100 mL)	BOD_5 (mg/L)
Stormwater	15,000	35,000	15
Alley Creek CSO Retention Facility	Monte Carlo 10,564 to 697,067	Monte Carlo 25,380 to 3,725,812	115[1]
Direct Drainage [2]	6,000	4,000	15

Pollutant Source	*Enterococci* (cfu/100 mL)	Fecal Coliform (cfu/100 mL)	BOD_5 (mg/L)
Oakland Lake Baseflow[3]	130	150	15
LIE Pond Baseflow [3]	75	75	15

Notes:

[1]Sanitary sewage concentration for Tallman Island WWTP Combined Sewer Overflow (CSO) concentrations were calculated using the IW Model and by mass balance.

[2]Direct drainage bacteria concentrations are based on NYS Stormwater Manual, Charles River LTCP, and National Stormwater Database for commercial and industrial land uses.

[3]Oakland Lake and LIE Pond receive groundwater inflows.

BOD_5 = five-day biochemical oxygen demand; cfu/100 mL = colony-forming units per 100 milliliters; LIE = Long Island Expressway; mg/L = milligrams per liter

Typical (2008) baseline volumes and loads of CSO, stormwater, direct drainage, and localized dry weather sources of pollution to Alley Creek are summarized in Table 6-2. The specific SPDES-permitted outfalls associated with these sources were shown in Figure 2-11 in Section 2.0. Additional tables can be found in Appendix A. The information in these tables is provided for the 2008 rainfall condition. CSO effluent concentrations were assigned based on a Monte Carlo analysis that was conducted to reproduce the range and distribution of the observed Alley Creek CSO Retention Facility fecal coliform and *Enterococci* concentrations. As discussed in Section 2.0, the Alley Creek CSO Retention Facility overflow bacteria concentrations were determined by using monitored tank concentrations, shown in Figure 2-13, and IW modeled overflow volumes. For 2008, the IW Model calculates that a total of 237.6 MG discharges from the Alley Creek CSO Retention Facility (237.5 MG) and the TI-008 (0 MG) and TI-007 (0.1 MG) outfalls.

Table 6-2. Annual Combined Sewer Overflow, Stormwater, Direct Drainage, Local Sources Volumes and Loads (2008 Rainfall)

Totals by Source by Waterbody		Volume	*Enterococci*	Fecal Coliform	BOD_5
Waterbody	**Source**	**Total Discharge (MG/year)**	**Total Org. (10^12)**	**Total Org. (10^12)**	**Total lbs**
Alley Creek	CSO	237.6	1453	4,008	31,662
	Stormwater	242.7	136.7	304.6	30,316
	Direct Drainage	194.9	44.26	29.51	24,344
	Oakland Lake/TI-008 (baseflow)	802.2	3.30	3.81	100,173
	Alley Creek Headwater	835.5	0.00	0.00	90,885
	LIE Pond	934.1	2.65	2.65	116,584
Total		**3,247**	**1,640**	**4,349**	**393,965**
Little Neck Bay	CSO	0.00	0.00	0.00	0.00
	Nassau Stormwater	1569	890.7	1485	195,984

Totals by Source by Waterbody		Volume	*Enterococci*	Fecal Coliform	BOD_5
Waterbody	**Source**	**Total Discharge (MG/year)**	**Total Org. (10^12)**	**Total Org. (10^12)**	**Total lbs**
	Stormwater	515.3	292.7	683.2	64,365
	Direct Drainage	144.5	32.83	21.88	18,061
	Nassau WWTP	476.6	0.00	0.00	5,043
	Local Sources	0.00	0.00	0.00	0.00
Total		**2,705**	**1,216**	**2,190**	**283,453**

Notes:
[1]Loading sources are grouped by modeled waterway point of entry but may affect water quality in either waterway based on modeled fate and transport.
[2]Nassau County stormwater is modeled as entering Little Neck Bay and may be transported to Alley Creek. Nassau County contributions to stormwater entering Alley Creek via Queens have not been separated in the model.
BOD_5 = five-day biochemical oxygen demand; CSO = Combined Sewer Overflow; LIE = Long Island Expressway; Org. = organism; TI = Tallman Island; WWTP = Wastewater Treatment Plant

6.3 Performance Gap

Concentrations of bacteria and DO in Alley Creek and Little Neck Bay are controlled by a number of factors, including the volumes of all sources of pollutants into the waterbodies and the concentrations of the respective pollutants. Since a large amount of the flow and pollutant loads discharged into these waterbodies are caused by rainfall events, the frequency, duration, and amounts of rainfall will also strongly influence WQ in these waterbodies. The Alley Creek portion of the ERTM was used to simulate bacteria concentrations in Alley Creek for the baseline conditions, using 2002–2011 data and DO concentrations using 2008 data. Hourly model calculations were saved and post-processed for comparison with the existing WQ Criteria. For Alley Creek, post-processed model results were also compared to higher-use WQ Criteria. The performance gap was then developed as the difference between the model-calculated baseline waterbody DO and bacteria concentrations and the applicable numerical WQS. Accordingly, the analysis is broken up into two sections:

- Assessment of existing WQ Criteria compliance for Alley Creek and Little Neck Bay; and
- Assessment of Alley Creek compliance with higher use primary contact WQ Criteria (Class SB/SC).

The 2025 Existing WQ Criteria include Little Neck Bay as a Class SB waterbody and Alley Creek as a Class I waterbody, with the numeric criteria presented in Table 6-3. The *Enterococci* criteria for primary contact recreation are applied as a rolling 30-day GM and 30-day 90th percentile STV for the six-month recreational period from May 1 through October 31. Existing conditions also consider DMA Beach as an officially recognized swimming beach regulated by the DOHMH. Although the NYC DOHMH criterion for *Enterococci* applies to a bathing season from Memorial Day to Labor Day, a rolling 30-day GM, the performance gap has been evaluated for the longer six-month recreational season from May 1 to October 31. A summary of the criteria that were applied is shown in Table 6-3.

Table 6-3. Classifications and Criteria Applied for Bacteria Gap Analysis

Analysis	Alley Creek	Little Neck Bay[2]
Existing WQ Criteria	I (Fecal Coliform Monthly GM – 200 cfu/100 mL) I (*Enterococci* rolling 30-day annual GM – 72 cfu/100 mL and STV – 266 cfu/100 mL) I (DO – 4 mg/L)	SB (Fecal Coliform Monthly GM – 200 cfu/100 mL) SB (*Enterococci* rolling 30-day recreational season GM – 35 cfu/100 mL and STV – 130 cfu/100 mL) SB (*Enterococci* rolling 30-day annual[3] GM – 72 cfu/100 mL and STV – 266 cfu/100 mL) I (DO – 3 mg/L and daily average – 4.8 mg/L with allowable excursions)
Primary Contact WQ Criteria	SB/SC[1] (Fecal Coliform Monthly GM – 200 cfu/100mL) SB/SC[1] (*Enterococci* rolling 30-day recreational season GM – 35 cfu/100 mL and STV – 130 cfu/100 mL) SB/SC[1] (*Enterococci* rolling 30-day annual[3] GM – 72 cfu/100 mL and STV – 266 cfu/100 mL) I (DO – 3 mg/L and daily average – 4.8 mg/L with allowable excursions)	Same as above

Notes:

[1]This water quality classification is not currently assigned to Alley Creek.
[2]Criteria for the gap analysis were applied to the DMA Beach within Little Neck Bay for the entire recreational season rather than the shorter bathing season.
[3]The annual *Enterococci* criteria for secondary contact recreation apply to times outside the recreational season in waters designated for primary contact recreation use.

cfu/100 mL = colony-forming units per 100 milliliters; DO = dissolved oxygen; GM = Geometric Mean; mg/L = milligrams per liter; STV = 90th Percentile Statistical Threshold Value; WQ = water quality; New York City Department of Health and Mental Hygiene (NYC DOHMH) Bathing Season = Memorial Day to Labor Day; Recreational Season = May 1 through October 31.

6.3.a CSO Volumes and Loadings Needed to Attain Current Water Quality Standards – 2025 Replaced

As described in Section 2.0 and indicated above, Alley Creek is currently designated as a Class I waterbody, and Little Neck Bay is designated as a Class SB waterbody. As such, both waterbodies have annual criteria for fecal coliform (i.e., GM) and *Enterococci* (i.e., GM and STV). Alley Creek is classified as a secondary contact waterbody with the *Enterococci* criterion being in effect on an annual basis in accordance with criteria in Table 6-3. Little Neck Bay is classified as a primary contact waterbody with primary contact *Enterococci* criteria in effect during the recreational season (May 1 through October 31) in accordance with criteria in Table 6-3. Both waterbodies also have DO criteria associated with the Class I and Class SB designations as shown in Table 6-3. Model results for bacteria and DO criteria attainment are considered for Alley Creek (Station AC1) and Little Neck Bay (Stations OW2, LN1, DMA, and E11) for 2008 rainfall conditions. Model results for bacteria criteria attainment are also considered for 2002 to 2011 rainfall conditions.

2008 Rainfall Annual Simulation

Fecal Coliform:

- Alley Creek – Under 2008 baseline conditions, Alley Creek at Station AC1 is in modeled attainment with the monthly GM fecal coliform criterion of 200 cfu/100 mL for all 6 months during the recreational season and for 4 out of 6 months during the non-recreational season.
- Little Neck Bay – Under 2008 baseline conditions, stations within Little Neck Bay are in modeled attainment with the monthly GM fecal coliform criterion of 200 cfu/100 mL almost 100 percent of the time, with the only exception being Station OW2, which is very slightly in modeled nonattainment for two winter months.

The modeled fecal coliform attainment for 2008 baseline conditions for Alley Creek (Station AC1) and Little Neck Bay (Stations OW2, LN1, DMA, and E11) is shown in Table 6-4. Modeled attainment at Stations AC1 and OW2 is also shown as a time series in Figure 6-1. Figure 6-1 shows the Class I and Class SB fecal coliform criterion of 200 cfu/100 mL as dashed green lines and the post-processed monthly GM WQ Model outputs for fecal coliform as solid black lines. The time series in Figure 6-1 shows that the maximum months of modeled fecal coliform results at Station OW2 are practically at the criterion.

Table 6-4. Calculated 2008 Baseline Fecal Coliform Attainment of Existing Monthly GM Criterion of 200 cfu/100 mL

Station	Recreational Season Attainment (%)	Annual Attainment (%)
AC1	100	83
OW2	100	83
LN1	100	100
DMA	100	100
E11	100	100

cfu/100 mL = colony-forming units per 100 milliliters, GM = geometric mean, Recreational Season = May 1 to October 31

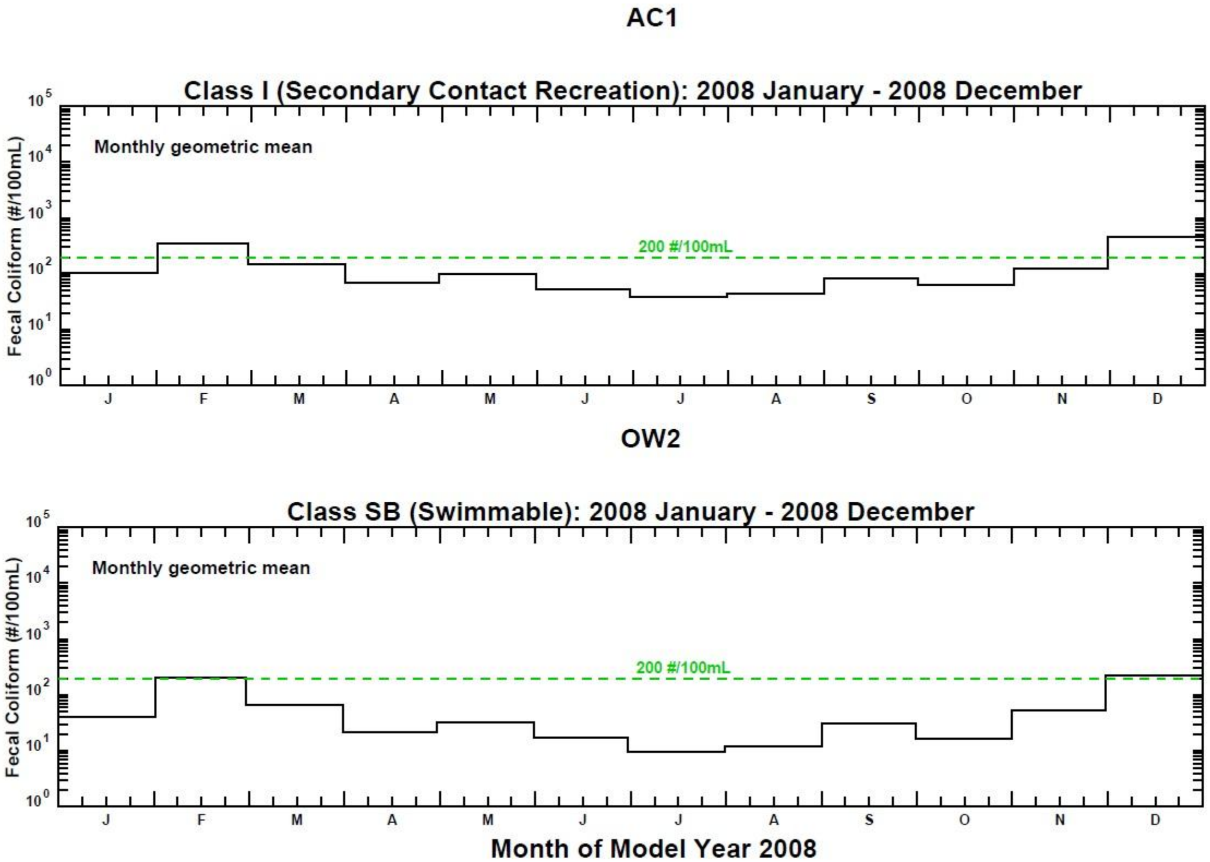

Figure 6-1. Stations AC1 and OW2 Model Calculated Baseline Fecal Coliform Concentrations (2008 Rainfall) – 2025 Replaced

Enterococci:

- Alley Creek GM – Under 2008 baseline conditions, Alley Creek at Station AC1 is in modeled attainment with the secondary contact recreation rolling 30-day GM *Enterococci* criterion of 72 cfu/100 mL almost 60 percent of the time.
- Little Neck Bay GM – Under 2008 baseline conditions, stations within Little Neck Bay are in modeled attainment with the primary contact recreation rolling 30-day GM *Enterococci* criterion of 35 cfu/100 mL 100 percent of the time during the recreational season. Model results at these stations also attain the secondary contact recreation rolling 30-day GM *Enterococci* criterion of 72 cfu/100 mL more than 92 percent of the time annually. The model results for three of the four stations show greater than 95 percent attainment annually.
- Alley Creek STV – Under 2008 baseline conditions, Alley Creek at Station AC1 is in modeled attainment with the secondary contact recreation rolling 30-day 90th percentile STV *Enterococci* criterion of 266 cfu/100 mL less than 3 percent of the time.
- Little Neck Bay STV – Under 2008 baseline conditions, stations within Little Neck Bay are in modeled attainment with the primary contact rolling 30-day 90th percentile STV *Enterococci* criterion of 130 cfu/100 mL from 11 percent to 84 percent of the time during the recreational

season. Model results at these stations also attain the secondary contact recreation rolling 30-day 90th percentile STV *Enterococci* criterion of 266 cfu/100 mL 36 percent to 90 percent of the time annually.

The modeled *Enterococci* attainment for 2008 baseline conditions for Alley Creek (Station AC1) and Little Neck Bay (Stations OW2, LN1, DMA, and E11) is shown in Table 6-5. Model results at these stations are also shown as time series in Figures 6-2 to 6-6. In Figures 6-2 to 6-6, the instantaneous (black line) and rolling 30-day GM (blue line) *Enterococci* Model calculated concentrations are presented. For all stations, the *Enterococci* secondary contact recreation criteria of 72 cfu/100 mL (dashed red line) and 266 cfu/100 mL (dashed green line) are shown. For the Little Neck Bay stations, the *Enterococci* primary contact recreation criteria of 35 cfu/100 mL (dashed red line, recreational season) and 130 cfu/100 mL (dashed green line, recreational season) are also shown.

Table 6-5. Calculated 2008 Baseline Enterococci Attainment of Existing Rolling 30-day Criteria

Station	***Enterococci* Rolling 30-day GM**		***Enterococci* Rolling 30-day 90th Percentile STV**	
	Primary Contact ≤35 cfu/100 mL Recreational Season Attainment (%)	**Secondary Contact ≤72 cfu/100 mL Annual Attainment (%)**	**Primary Contact ≤130 cfu/100 mL Recreational Season Attainment (%)**	**Secondary Contact ≤266 cfu/100 mL Annual Attainment (%)**
AC1	N/A	59.6	N/A	2.7
OW2	100	92.3	11.1	36.6
LN1	100	98.1	55.4	67.5
E11	100	100	50.4	89.4
DMA	100	97.7	83.5	60.7

N/A = not applicable, GM = geometric mean, STV = statistical threshold value, cfu = colony forming unit

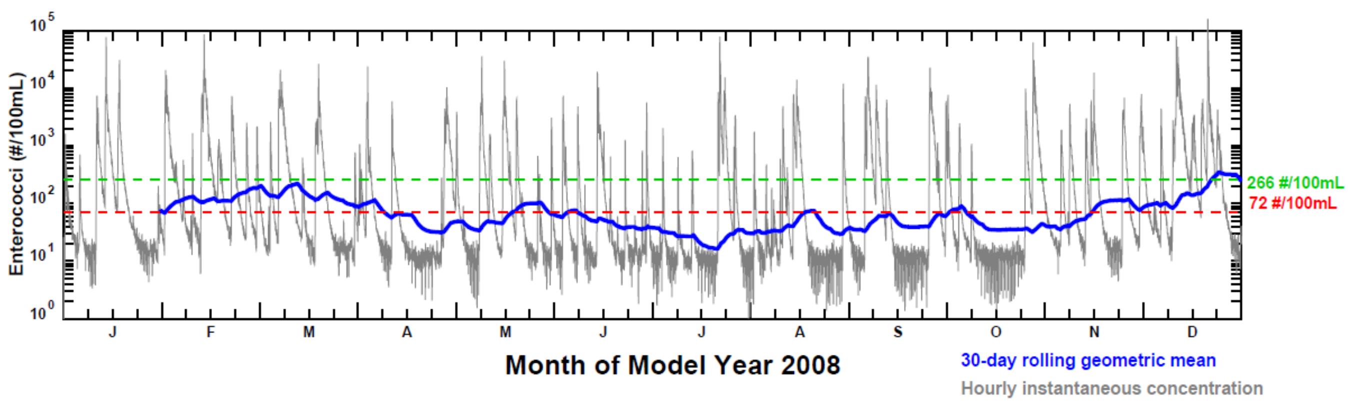

Figure 6-2. Calculated Baseline AC1 *Enterococci* Concentrations (2008 Rainfall)

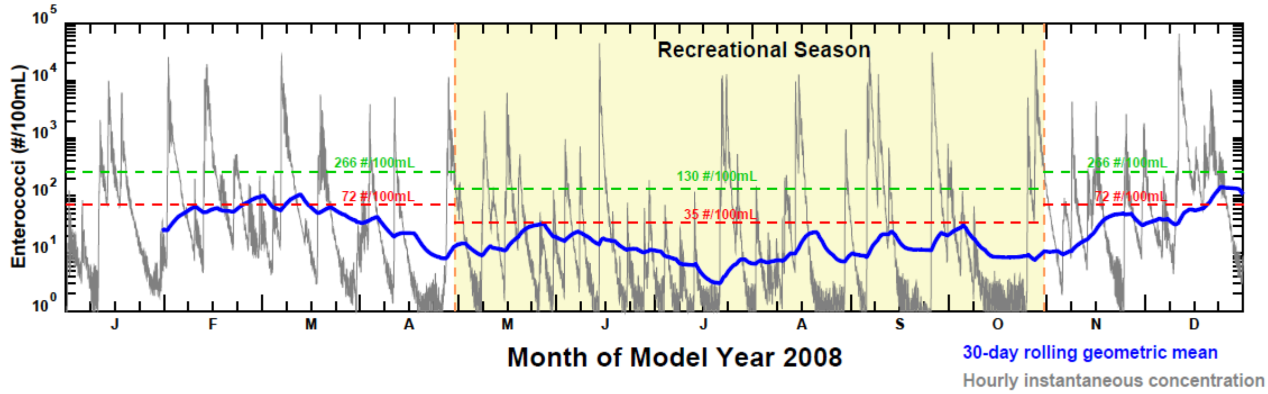

Figure 6-3. Calculated Baseline OW2 *Enterococci* Concentrations (2008 Rainfall)

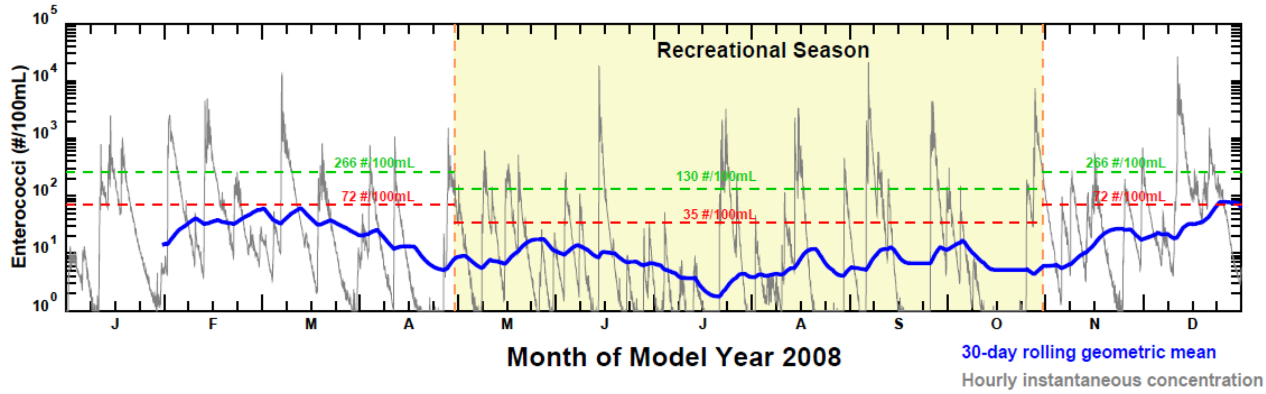

Figure 6-4. Calculated Baseline LN1 *Enterococci* Concentrations (2008 Rainfall)

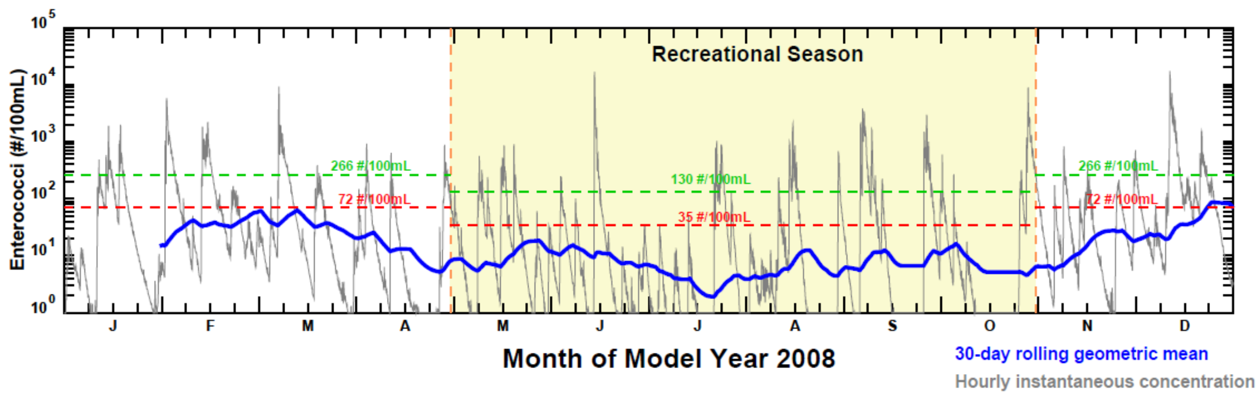

Figure 6-5. Calculated Baseline DMA Enterococci Concentrations (2008 Rainfall)

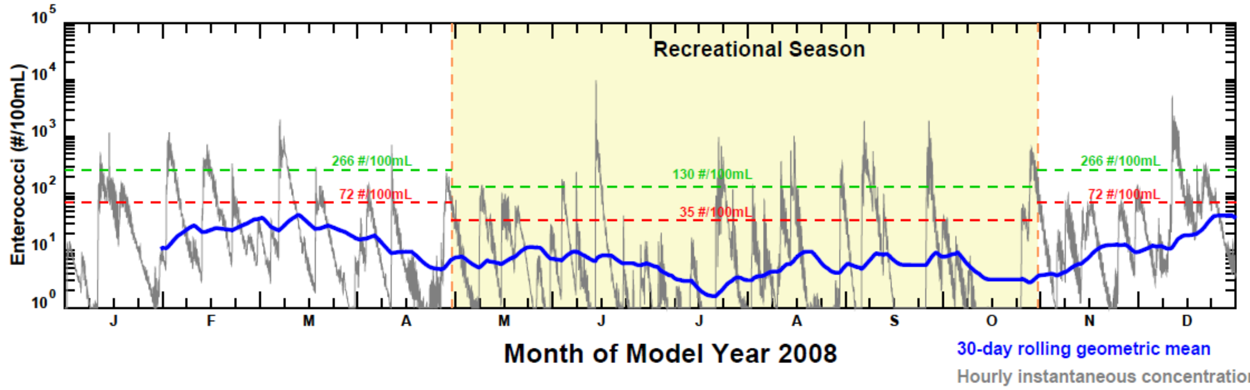

Figure 6-6. Calculated Baseline E11 Enterococci Concentrations (2008 Rainfall)

Dissolved Oxygen:

- Alley Creek – Modeling calculations for WQ indicate that the overall attainment with the Class I DO criterion of 4 mg/L is 96 percent for the year at Station AC1 in Alley Creek.
- Little Neck Bay – Modeling calculations indicate that the overall attainment with the Class SB DO acute criterion of 3 mg/L is 100 percent for the year at the Little Neck Bay Stations. The overall attainment with the Class SB DO chronic criterion of 24-hour averages above 4.8 mg/L except for excursions of allowable durations is 100 percent for the year at Little Neck Bay Stations and 99 percent for the year at the DMA Beach Station. Even though there are modeled excursions below the DO criteria in a few summer months, modeled attainment is between 96 percent and 100 percent, depending on the station location.

Table 6-6 presents the ERTM simulation of DO concentrations and measures of attainment with the numerical WQS. Under baseline conditions the calculated DO concentrations tend to be somewhat higher in Little Neck Bay than in Alley Creek, and all stations are in 96 percent or greater attainment of existing criteria.

Table 6-6. Model Calculated Baseline Dissolved Oxygen Attainment (2008 Rainfall)

Station	Hours <3.0 mg/L	Hours <4 mg/L	24-Hour Averages <4.8 mg/L	Annual Attainment (%)
AC1	47.5	339.9	24.5	96[1]
OW2	0	0.1	0	100[2]
LN1	0.2	7.8	0	100[2]
DMA	6.9	33.2	2.4	99[2]
E11	0	0	0	100[2]

Notes: Alley Creek (Station AC1) and Little Neck Bay (Stations OW2, LN1, DMA, and E11); mg/L = milligrams per liter
[1]Existing Class I criterion of never less than 4 mg/L.
[2]Existing Class SB criteria of never less than 3 mg/L with allowable excursions of 24-hour averaged dissolved oxygen below 4.8 mg/L.

10-Year Long Term Simulation and Existing Criteria Performance Gap

In addition to the simulation of baseline conditions for 2008 rainfall, 10-year baseline conditions for 2002-2011 rainfall were simulated for bacteria WQ. The 10-year simulation was used for the performance gap analysis. The purpose of the performance gap analysis is to determine how much of the gap between projected WQ, and designated Class I and Class SB criteria is due to CSO discharges, the focus of the LTCP. In addition to the baseline simulation, the performance gap analysis also includes a 10-year simulation of 100 percent CSO control for comparison to baseline results.

Since the model results for the 2008 baseline period show that Alley Creek and Little Neck Bay would meet the existing criteria for DO, there is no performance gap for DO using existing criteria. Discussion of the performance gap for existing criteria is focused on bacteria. For the discussion that follows, 100 percent CSO control can be taken as either 100 percent volumetric control or disinfection, as both would produce similar levels of bacteria attainment according to the model.

Fecal Coliform:

- Alley Creek – The modeled 10-year average recreational season attainment of the fecal coliform monthly GM in Alley Creek at Station AC1 would improve from 93.3 percent under the baseline to 100 percent under the 100 percent CSO control scenario. The modeled 10-year average annual attainment of the fecal coliform monthly GM at Station AC1 would improve from 84.2 percent under the baseline to 97.5 percent under the 100 percent CSO control scenario. CSO control is therefore capable of closing the performance gap for the 10-year average attainment of the fecal coliform monthly GM at Station AC1 in Alley Creek during the recreational season and annually.
- Little Neck Bay – The modeled 10-year average recreational season attainment of the fecal coliform monthly GM in Little Neck Bay at Stations OW2, LN1, E11, and DMA is greater than 95 percent. There is no fecal coliform performance gap at the Little Neck Bay stations for the recreational season. The modeled 10-year average annual attainment of the fecal coliform monthly GM in Little Neck Bay at Stations LN1, E11, and DMA is 100 percent and is 93.3 percent at Station OW2. There is no fecal coliform performance gap at the Little Neck Bay LN1, E11, and DMA stations on an annual basis, only at Station OW2. The modeled 10-year average annual attainment of the fecal coliform monthly GM at Station OW2 would improve from 93.3 percent under the baseline to 100 percent under the 100 percent CSO control scenario. CSO control is therefore capable of closing the performance gap for the 10-year average annual attainment of the fecal coliform monthly GM at Station OW2 in Little Neck Bay.

The modeled fecal coliform attainment for 10-year baseline and 100 percent CSO Control conditions for Alley Creek (Station AC1) and Little Neck Bay (Stations OW2, LN1, DMA, and E11) is shown in Table 6-7. Modeled attainment at all model grid cell locations in Alley Creek and Little Neck is shown as mosaic map images in Figure 6-7.

Table 6-7. Calculated 10-Year Average Baseline and 100 Percent CSO Control Fecal Coliform Attainment of Existing Monthly GM Criterion of 200 cfu/100 mL

Station	Recreational Season 10-Year Average Attainment (%)		Annual 10-Year Average Attainment (%)	
	Baseline	100% CSO Control	Baseline	100% CSO Control
AC1	93.3	100	84.2	97.5
OW2	98.3	100	93.3	100
LN1	100	100	100	100
E11	100	100	100	100
DMA	100	100	100	100

CSO = Combined Sewer Overflow, cfu/100 mL = colony-forming units per 100 milliliters, GM = geometric mean, Recreational Season = May 1 to October 31

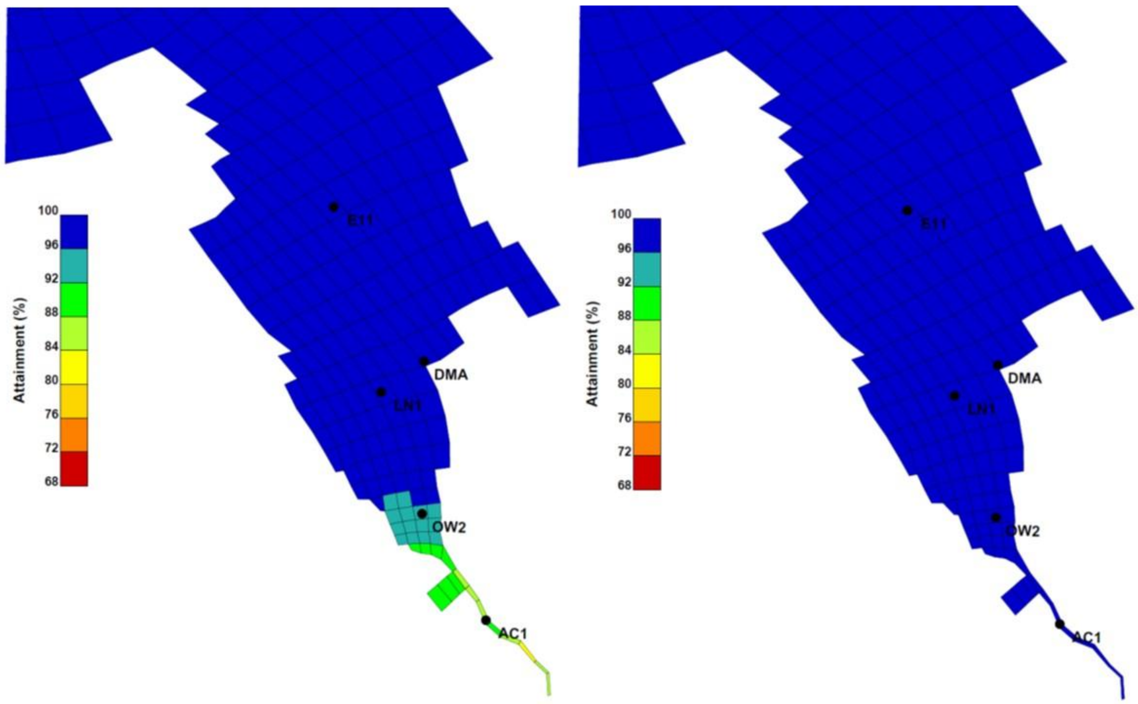

Figure 6-7. 10-Year Average Baseline (left) and 100 Percent CSO Control (right) Attainment of Existing Fecal Coliform Geometric Mean Criterion, <200 cfu/100 mL

Figure 6-7 shows that the calculated 10-year long-term attainment of the existing fecal coliform criterion under baseline conditions is quite high. In Alley Creek, the modeled 10-year baseline attainment for the fecal coliform criterion is greater than 80 percent. When the Alley Creek CSO Retention Facility and other CSOs are modeled as 100 percent controlled, the entirety of Alley Creek is calculated to achieve greater than 96 percent attainment of the fecal coliform criterion. 100 percent CSO Control would address the fecal coliform attainment gap in the baseline based on 10-year model results.

Figure 6-7 shows that most areas in Little Neck Bay achieve 100 percent modeled attainment with the fecal coliform criterion under baseline conditions, while a small area in lower Little Neck Bay has between 88 and 96 percent modeled attainment with the fecal coliform criterion. Based on 10-year average model results for 100 percent CSO control, greater than 96 percent attainment of the fecal coliform criterion is expected throughout Little Neck Bay. 100 percent CSO Control would address the fecal coliform attainment gap in the baseline based on 10-year average model results.

Enterococci:

- Alley Creek GM – The modeled 10-year average attainment of the secondary contact rolling 30-day GM at Station AC1 in Alley Creek improves from 59.3 percent under the baseline to 77.9 percent under the 100 percent CSO control scenario.
- Little Neck Bay GM – Under 10-year average baseline conditions, the LN1, E11, and DMA Stations within Little Neck Bay are in modeled attainment with the primary contact recreation rolling 30-day GM *Enterococci* criterion of 35 cfu/100 mL more than 95 percent of the time during the recreational season. Model results at these three stations also attain the secondary contact recreation rolling 30-day GM *Enterococci* criterion of 72 cfu/100 mL more than 98 percent of the time annually. There is no *Enterococci* GM performance gap at Little Neck Bay stations LN1, E11,

and DMA based on the 10-year average modeled baseline conditions. The modeled 10-year average recreational season attainment of the primary contact rolling 30-day GM at Station OW2 in Little Neck Bay improves from 87 percent under the baseline to 97.2 percent under the 100 percent CSO control scenario. Modeled 10-year average annual attainment of the secondary contact rolling 30-day GM at Station OW2 in Little Neck Bay improves from 91.1 percent under the baseline to 99.6 percent under the 100 percent CSO control scenario. The modeled performance gaps for 30-day GM *Enterococci* criteria at Little Neck Bay Station OW2 are closed with 100 percent CSO control.

- Alley Creek STV – The modeled 10-year average attainment of the secondary contact rolling 30-day 90th percentile STV at Station AC1 in Alley Creek improves from 9.2 percent under the baseline to 20.6 percent under the 100 percent CSO control scenario.
- Little Neck Bay STV – The modeled 10-year average attainment of the primary contact rolling 30-day 90th percentile STV at the Little Neck Bay stations improves from a range of 22.7 percent to 76.4 percent under the baseline to a range of 49 percent to 95.1 percent under the 100 percent CSO control scenario. The modeled performance gap for the primary contact rolling 30-day 90th percentile STV *Enterococci* criterion at Little Neck Bay Station E11 is closed with 100 percent CSO control during the recreational season. The modeled 10-year average attainment of the secondary contact rolling 30-day 90th percentile STV at the Little Neck Bay stations improves from a range of 38.7 percent to 94.6 percent under the baseline to a range of 75.4 percent to 100 percent under the 100 percent CSO control scenario. The modeled performance gap for the secondary contact rolling 30-day 90th percentile STV *Enterococci* criterion at Little Neck Bay Stations LN1, E11, and DMA is closed with 100 percent CSO control.

The modeled *Enterococci* attainment for 10-year baseline and 100 percent CSO Control conditions for Alley Creek (Station AC1) and Little Neck Bay (Stations OW2, LN1, DMA, and E11) is shown in Table 6-8. Modeled attainment at all model grid cell locations in Alley Creek and Little Neck is shown as mosaic map images in Figures 6-8 to 6-11.

Table 6-8. Calculated 10-Year Average Baseline and 100 Percent CSO Control Enterococci Attainment of Existing Rolling 30-day Criteria

Station	*Enterococci* Rolling 30-day GM				*Enterococci* Rolling 30-day 90th Percentile STV			
	Primary Contact ≤35 cfu/100 mL Recreational Season Attainment (%)		Secondary Contact ≤72 cfu/100 mL Annual Attainment (%)		Primary Contact ≤130 cfu/100 mL Recreational Season Attainment (%)		Secondary Contact ≤266 cfu/100 mL Annual Attainment (%)	
	Baseline	100% Control	Baseline	100% Control	Baseline	100% Control	Baseline	100% Control
AC1	N/A	N/A	59.3	77.9	N/A	N/A	9.21	20.6
OW2	87.0	97.2	91.1	99.6	22.7	49.0	38.68	75.4
LN1	95.6	99.7	98.1	100	47.3	88.4	67.48	99.1
E11	98.8	99.7	100.0	100	76.4	95.1	94.64	100.0
DMA	96.1	99.6	98.5	100	48.7	84.4	71.46	99.1

N/A = not applicable, CSO = Combined Sewer Overflow, GM = geometric mean, STV = Statistical Threshold Value, Recreational Season = May 1 to October 31, cfu = colony forming unit

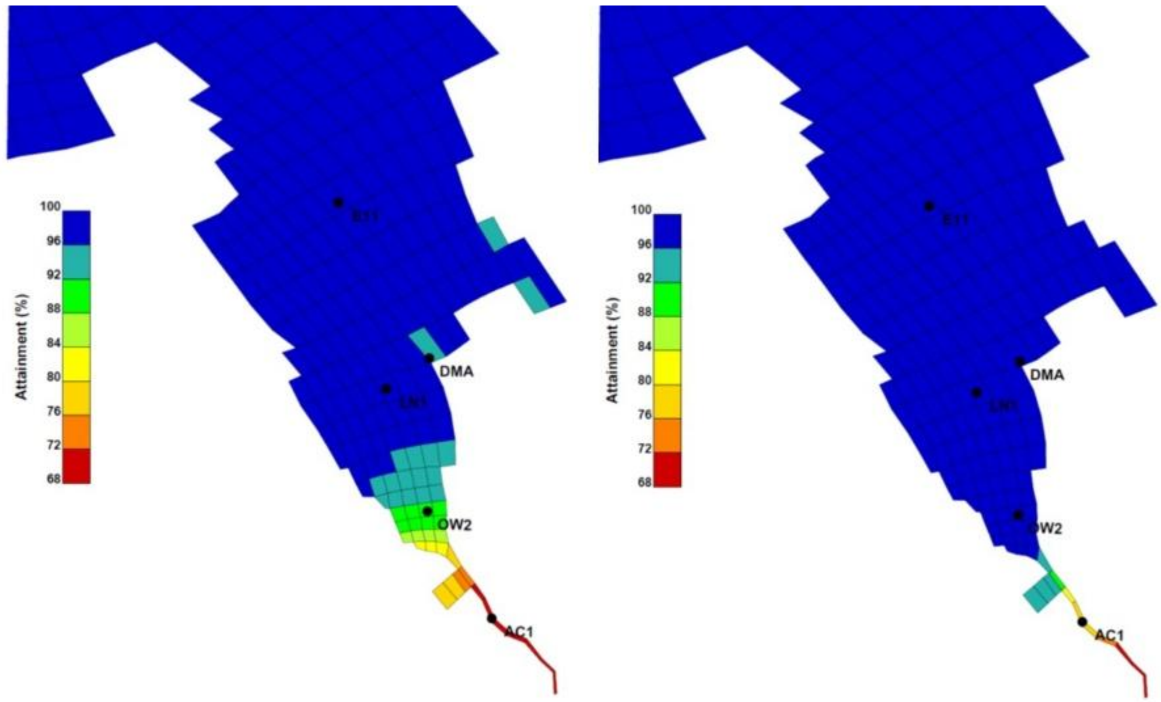

Figure 6-8. 10-Year Average Baseline (left) and 100 Percent CSO Control (right) Attainment of Existing Enterococci Annual Secondary Contact Recreation Geometric Mean Criterion, <72 cfu/100 mL

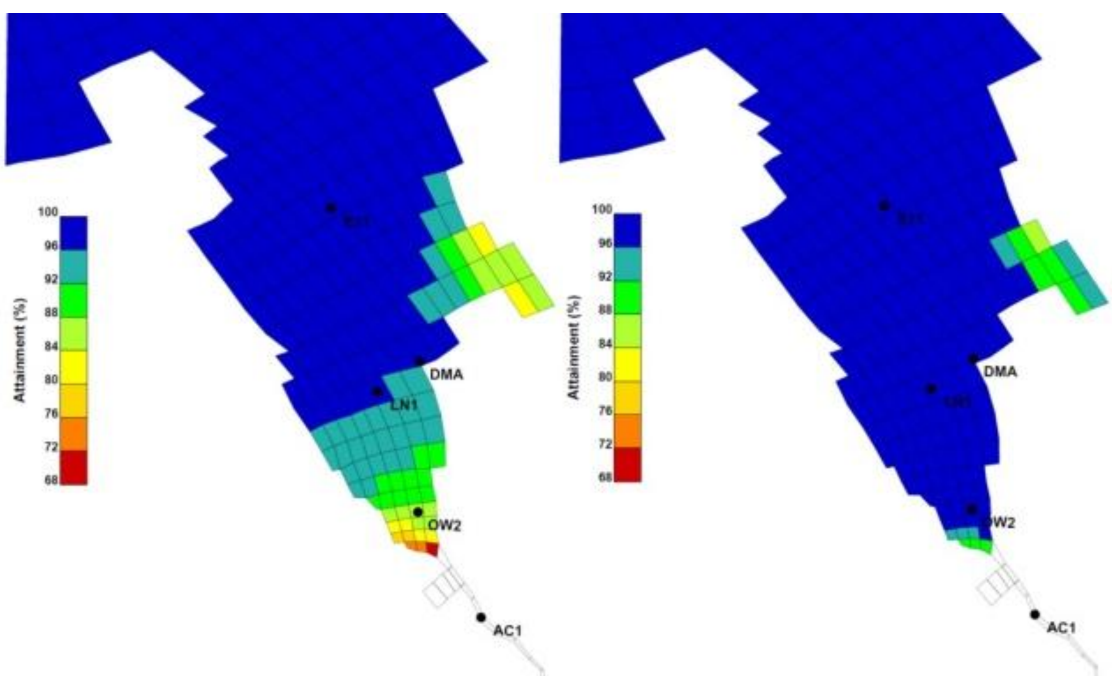

Figure 6-9. 10-Year Average Baseline (left) and 100 Percent CSO Control (right) Attainment of Existing *Enterococci* Recreational Period Primary Contact Recreation Geometric Mean Criterion, ≤35 cfu/100 mL

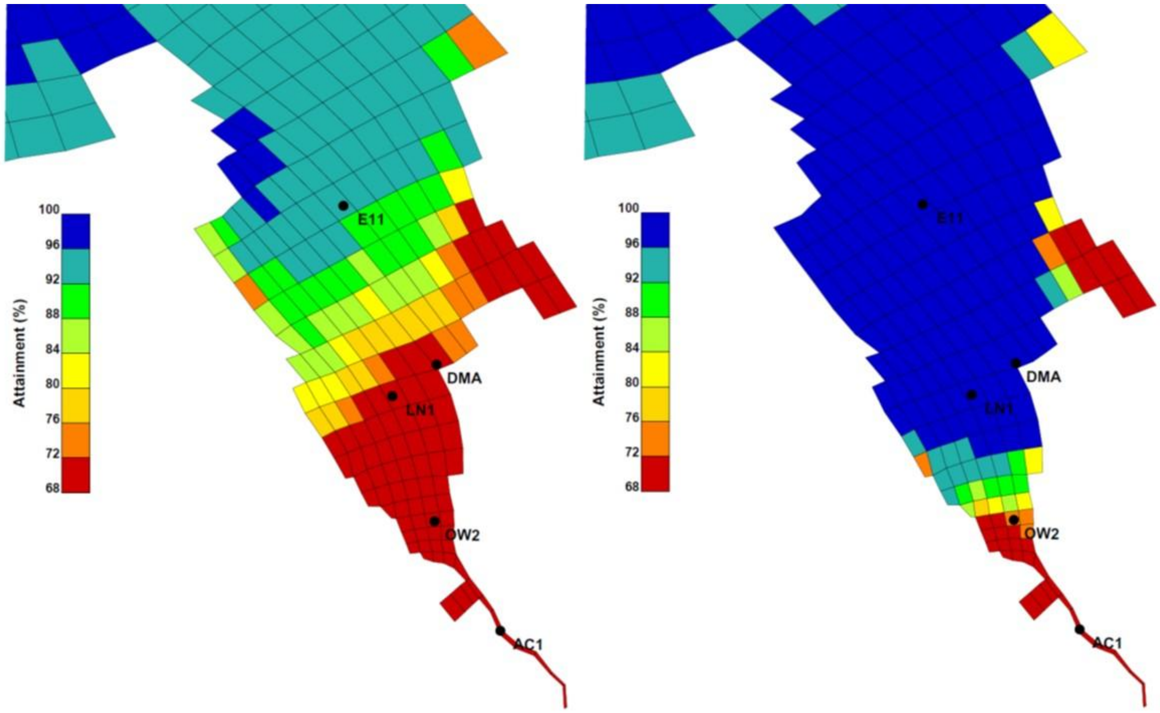

Figure 6-10. 10-Year Average Baseline (left) and 100 Percent CSO Control (right) Attainment of Existing Enterococci Annual Secondary Contact Recreation 90th Percentile Statistical Threshold Value Criterion, <266 cfu/100 mL

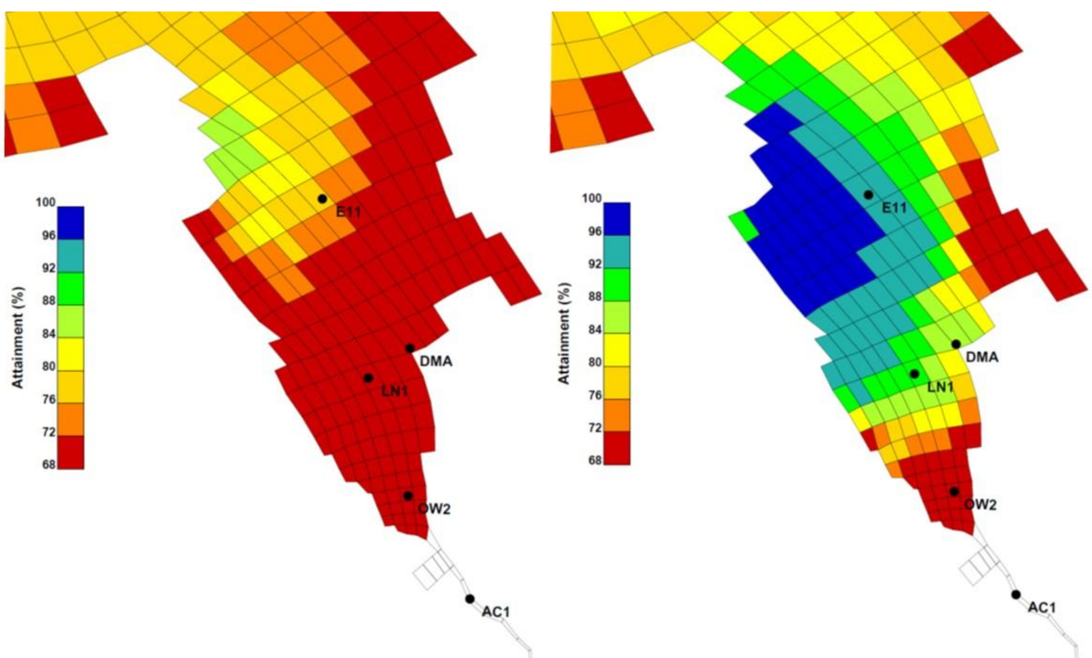

Figure 6-11. 10-Year Average Baseline (left) and 100 Percent CSO Control (right) Attainment of Existing Enterococci Recreational Season Primary Contact Recreation 90th Percentile Statistical Threshold Value Criterion, <130 cfu/100 mL

Figure 6-8 shows the modeled benefits of 100 percent CSO control for the 10-year average attainment of the secondary contact recreation *Enterococci* GM standard throughout Alley Creek and Little Neck Bay. Within Alley Creek, the modeled attainment percentages of the rolling 30-day *Enterococci* GM less than 72 cfu/100 mL improved from a spatial range of 68 percent to 80 percent for baseline conditions to a spatial range of 68 percent to 96 percent for 100 percent CSO Control. Remaining modeled non-attainment in Alley Creek is mostly at the head of Alley Creek. Modeled baseline conditions in Little Neck Bay include mostly greater than 96 percent attainment and limited portions of Little Neck Bay with modeled attainment as low as 80 percent. Throughout Little Neck Bay, modeled 100 percent CSO Control achieves greater than 96 percent attainment of the rolling 30-day *Enterococci* GM less than 72 cfu/100 mL, fully addressing the spatially limited gaps from modeled baseline conditions.

Figure 6-9 shows the spatial benefits of modeled 100 percent CSO control for the 10-yr average attainment of the primary contact *Enterococci* standard throughout Little Neck Bay. The area in Little Neck Bay calculated to be in attainment of the GM portion of the primary contact standard with 100 percent CSO control has greatly increased. Much of the improvement occurred within southern Little Neck Bay, where the modeled spatial area not in full attainment was reduced by approximately 88 percent (i.e., from 51 model grid cells to 6 model grid cells) and the modeled attainment increased from greater than 68 percent to greater than 88 percent. Similarly, in the eastern embayment section of Little Neck Bay, the modeled spatial area not in full attainment was reduced by approximately 50 percent (i.e., from 16 model grid cells to 8 model grid cells), and the modeled attainment increased from greater than 80 percent to greater than 84 percent. Although modeled 100 percent CSO control does not fully close the primary contact recreation GM attainment gap in all areas of Little Neck Bay, the remaining modeled gap with greater than 84 percent attainment is spatially limited.

Figures 6-10 and 6-11 show the modeled spatial extent and magnitudes of improvements to attainment of the *Enterococci* STV criteria that could be achieved if CSO were fully controlled. The modeled STV attainment results suggest that non-CSO sources local to Alley Creek and the eastern shoreline of Upper Little Neck Bay contribute to the modeled nonattainment of the *Enterococci* STV criteria.

6.3.b CSO Volumes and Loadings that Would Be Needed to Support the Next Highest Use or Swimmable/Fishable Uses – 2025 Replaced

Bacteria

The DEC is required to periodically review if a waterbody can be reclassified to its Primary Contact WQ Criteria. Little Neck Bay is already classified as an SB waterway. This LTCP assessed the level of attainment for Alley Creek, which is a Class I waterbody of primary contact recreation based on an *Enterococci* 30-day rolling recreational season GM of 35 cfu/100 mL. Model calculations presented above in Figure 6-2 show that under the baseline conditions, Station AC1 would not meet the higher use Class SB/SC criterion for *Enterococci* during the recreational season. Figure 6-2 shows that the modeled *Enterococci* 30-day rolling GM concentrations exceed 72 cfu/100 mL and even more frequently exceed the 35 cfu/100 mL needed for primary contact during the May through October 2008 recreational season. Figure 6-12 presents a spatial depiction of the calculated 10-year attainment for higher use Class SB/SC *Enterococci* during the recreational season (30-day rolling GM of 35 cfu/100 mL) under baseline conditions. Overall, Station AC1 achieves 32 percent modeled attainment of the higher use *Enterococci* primary contact GM criterion for the recreational seasons during the 10-year modeling evaluation period. Table 6-9 presents the recreational season *Enterococci* primary contact GM modeled percent attainment at Station AC1.

Because model calculations indicate that Alley Creek would not meet the higher use Class SB/SC criteria under baseline conditions, an analysis was conducted to determine how much of the gap between projected WQ and the higher use Class SB/SC criteria is due to CSO discharges, the focus of the LTCP. Figure 6-13 presents the 10-year attainment of the Class SB/SC *Enterococci* 30-day rolling GM criterion with 100 percent CSO control. The 10-year GM attainment at Station AC1 would improve from 32 percent to 50 percent under the 100 percent CSO control scenario. Table 6-9 presents the recreational season *Enterococci* 30-day rolling GM and STV concentration percent attainment at Station AC1 during the 10-year assessment period with 100 percent CSO control.

The comparison of Figures 6-12 and 6-13 shows the benefits of 100 percent CSO control toward the attainment of the higher-use, primary contact *Enterococci* standard throughout Alley Creek. Figure 6-12 shows that for modeled baseline conditions, almost the entire Alley Creek would attain the recreational season's *Enterococci* 30-day GM between 68 and 72 percent. Figure 6-13 shows that for modeled 100 percent CSO control conditions, the spatial extent of the 68 to 72 percent attainment is reduced, with the remainder of Alley Creek having somewhat higher attainment. With 100 percent CSO control, the downstream reach of Alley Creek leading into Little Neck Bay would attain the recreational season *Enterococci* 30-day GM between 76 and 92 percent.

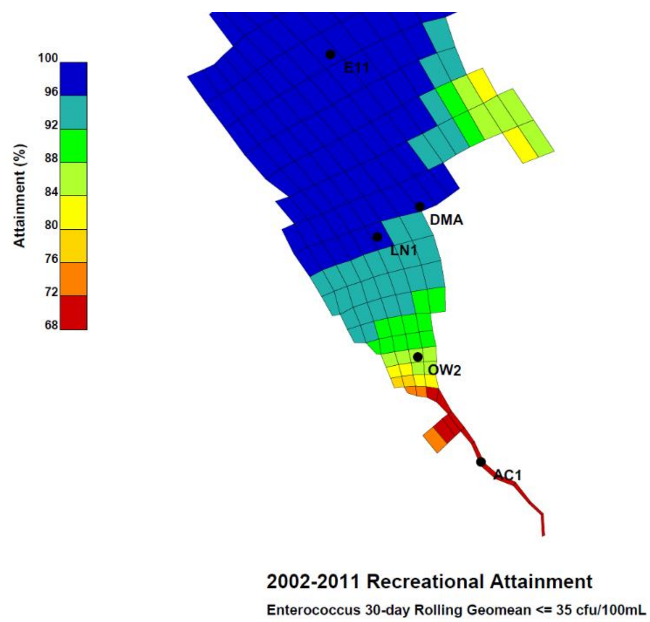

Figure 6-12. 10-Year Attainment of Class SB/SC *Enterococci* Geometric Mean Criterion[1] – Baseline Conditions

Note: [1]This higher use, water quality standard is not currently assigned to Alley Creek

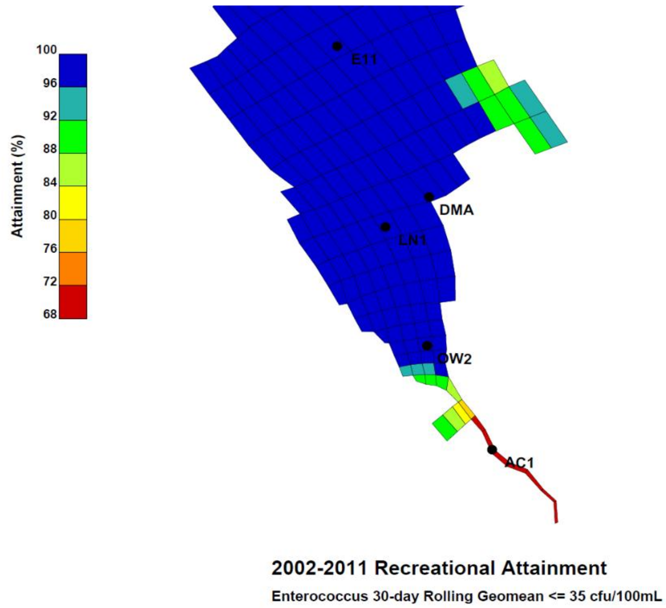

Figure 6-13. 10-Year Attainment of Class SB/SC *Enterococci* Geometric Mean Criterion[1] – 100 Percent CSO Control

Note: [1]This higher use, water quality standard is not currently assigned to Alley Creek

Table 6-9. *Enterococci* Geometric Mean Class SB/SC Attainment[1] Baseline and 100 Percent Combined Sewer Overflow Control – Station AC1 (10-Year)

Year	Recreational Season Attainment 30-day Rolling GM <35 cfu/100 mL (%)		Recreational Season Attainment 30-day 90th % STV <130 cfu/100 mL (%)	
	Baseline	100% CSO Control	Baseline	100% CSO Control
2002	39.6	48.3	20.5	24.4
2003	37.3	51.7	0.0	9.7
2004	2.4	34.2	0.0	0.0
2005	48.3	68.0	25.5	33.7
2006	13.1	25.8	0.0	3.7
2007	38.3	66.8	9.5	12.7
2008	27.6	58.7	4.1	5.0
2009	17.1	34.6	0.0	1.2
2010	60.8	67.1	25.5	41.1
2011	36.5	52.0	6.0	5.4
Average	**32.1**	**50.8**	**9.1**	**13.7**

Note: [1]This higher use, water quality standard is not currently assigned to Alley Creek

cfu/100 mL = colony-forming units per 100 milliliters; CSO = Combined Sewer Overflow; GM = geometric mean; mL = milliliters; STV = statistical threshold value

Dissolved Oxygen

Upgrading Alley Creek to Class SB/SC would require that it meet the DO chronic criterion of a daily average DO concentration of greater than or equal to 4.8 mg/L, with some allowance for excursions based on the DO exposure-duration curve included in the criterion, as well as an acute criterion of never less than 3.0 mg/L. Table 6-10 presents modeled annual attainment with the higher use Class SB/SC DO criteria at Station AC1, the location having the lowest DO concentrations. Annual attainment of the chronic criterion is reached 93.5 percent of the time under baseline conditions.

Table 6-10. Model Calculated Dissolved Oxygen Results for Class SB/SC Criteria[1] at Station AC1 – Baseline and 100 Percent Combined Sewer Overflow Control Conditions (10-Year)

Station	Annual Attainment (%)	
	Chronic	Acute
AC1 (Baseline)	93.3	99.5
AC1 (100 Percent CSO Control)	99.4	99.8

Note: [1]This higher use, water quality standard is not currently assigned to Alley Creek
CSO = Combined Sewer Overflow

The 100 percent CSO control scenario was evaluated to assess the impact of CSO discharges on nonattainment of the higher use DO criteria, or the gap between attainment and nonattainment caused by CSO discharges. For the discussion that follows, 100 percent CSO control is 100 percent volumetric control. The modeled attainment of the higher use Class SB/SC criteria for DO at Station AC1 with complete CSO control is also presented in Table 6-10. The annual modeled attainment would increase to 99.4 percent for the chronic criterion.

6.3.c Loading Source Component Analysis

The analyses presented in Sections 6.3.a and 6.3.b indicate that complete control of CSOs alone will not close the gap between the predicted baseline *Enterococci* concentrations and the Primary Contact Criteria rolling 30-day GM criterion of 35 cfu/100 mL to achieve 100 percent attainment, especially in Alley Creek and southeastern portions of Little Neck Bay. Additional WQ modeling analyses were performed to assess the extent to which CSO and non-CSO sources impact *Enterococci* concentrations at key locations in Alley Creek and Little Neck Bay. A loading source component analysis was conducted for the 2008 baseline condition to provide a better understanding of how each source type contributes to fecal coliform and *Enterococci* concentrations in Alley Creek and Little Neck Bay. Based on legacy versions of the Alley Creek and Little Neck Bay IW and ERTM, the loading source component types previously included the East River at the mouth of Little Neck Bay, local source inputs (Oakland Lake and LIE Pond), Nassau County stormwater, NYC stormwater, and CSOs. With the current versions of IW and ERTM, Nassau County and NYC stormwater were combined and run as a loading component to isolate how stormwater and direct drainage contribute to fecal coliform and *Enterococci* concentrations in Alley Creek and Little Neck Bay. The analysis was completed at Stations AC1, OW2, LN1, E11, and DMA. The analysis for fecal coliform included annual GM, the maximum winter month (December) GM, and the maximum recreational season month (May) GM. The results of the fecal coliform component analysis are presented in Table 6-11. The analysis for *Enterococci* included the calculation of *Enterococci* GMs for the maximum 30-day period during the year and the maximum 30-day period during the recreational season from May 1 to October 31, as well as the 90th percentile STV values during these periods. The 90th percentile STV concentrations are not necessarily additive but are presented for illustrative purposes. The partial GM model results of the *Enterococci* component analysis are presented in Table 6-12. A full table of *Enterococci* GM and STV model results is included in Appendix A.

The fecal component analysis shows that both Stations AC1 and OW2 would not be in attainment of the Class SB/SC criterion for the maximum winter month condition. For both locations the model calculations indicate that stormwater from direct drainage runoff and from stormwater outfalls would not contribute enough fecal coliform alone to cause non-attainment of the criterion. For the winter nonattainment at the AC1 and OW2 Stations, stormwater accounts for approximately 33 percent of the modeled baseline maximum winter month fecal coliform GM concentration.

The modeling assessment of the *Enterococci* GM components annually and for the recreational season (May 1 to October 31) shows the contribution of stormwater to GM during these periods. The stormwater source contributes significantly to the modeled *Enterococci* GMs during these periods. This result is because stormwater is discharged during each rain event, and the use of the GM gives more weight to sources that discharge more frequently (e.g., stormwater) than those that discharge less often. In Little Neck Bay, the modeled stormwater influence on the maximum *Enterococci* 30-day GM is greater during the recreational season than annually. In Alley Creek, the modeled stormwater influence on the maximum *Enterococci* 30-day GM is similar for the recreational season and annually. The largest stormwater percentage contribution to a maximum *Enterococci* 30-day rolling GM is 68 percent and occurs at the DMA station during the recreational season. The smallest stormwater percentage contribution to a maximum *Enterococci* 30-day rolling GM is 24 percent and occurs at the E11 station outside of the recreational season.

Table 6-11. Fecal Coliform Geometric Mean Source Components

Source	Station	Fecal Coliform Contribution, cfu/100 mL		
		Annual GM	Maximum Summer Month	Maximum Winter Month
NYC & Nassau Stormwater	AC1	37.8	33.2	154.1
Total	**AC1**	**137**	**101.3**	**467.7**
NYC & Nassau Stormwater	OW2	20.7	17.3	73.9
Total	**OW2**	**60.6**	**32.6**	**225**
NYC & Nassau Stormwater	LN1	13.0	11.5	43.6
Total	**LN1**	**36.4**	**18.7**	**133.3**
NYC & Nassau Stormwater	E11	4.9	5.0	11.8
Total	**E11**	**27.4**	**14.4**	**89.1**
NYC & Nassau Stormwater	DMA	13.5	12.2	47.1
Total	**DMA**	**37.6**	**19.7**	**141.9**

cfu/100 mL = colony-forming units per 100 milliliters; DMA = Douglas Manor Association; GM = Geometric mean; NYC = New York City; stormwater = from direct drainage runoff and from stormwater outfalls

Table 6-12. *Enterococci* Geometric Mean Source Components

Source	Station	*Enterococci* Contribution, cfu/100 mL	
		Annual 30-day Maximum GM	Recreational Season 30-day Maximum GM
NYC & Nassau Stormwater	AC1	135.9	35.8
Total	**AC1**	**348.7**	**104.8**
NYC & Nassau Stormwater	OW2	62.1	17.4
Total	**OW2**	**143.6**	**33.2**

Source	Station	*Enterococci* Contribution, cfu/100 mL	
		Annual 30-day Maximum GM	Recreational Season 30-day Maximum GM
NYC & Nassau Stormwater	LN1	36.6	11.6
Total	**LN1**	**79.2**	**17.8**
NYC & Nassau Stormwater	E11	10.2	5.1
Total	**E11**	**42.5**	**11.7**
NYC & Nassau Stormwater	DMA	41.4	12.6
Total	**DMA**	**87.5**	**18.6**

cfu/100 mL = colony-forming units per 100 milliliters; DMA = Douglas Manor Association; GM = Geometric mean; NYC = New York City; stormwater = from direct drainage runoff and from stormwater outfalls

Stormwater Contribution to Non-Attainment

Table 6-12 presents the modeled maximum 30-day rolling GM *Enterococci* concentrations for all sources combined and for stormwater alone. The calculated maximum 30-day rolling GM *Enterococci* concentrations contributed by stormwater alone at all stations are less than or only slightly greater than the primary contact recreation GM criterion of 35 cfu/100 mL during the recreational season for the baseline conditions. Stormwater alone would cause nonattainment of the primary contact GM criterion at the Alley Creek Station based on the model results. Table 6-12 also shows modeled nonattainment of the secondary contact recreation GM criterion of 72 cfu/100 mL annually for all stations except E11. At Station AC1, modeled secondary contact recreation GM criterion nonattainment would be caused by stormwater alone.

Further reductions in *Enterococci* bacteria would result from programs that focus on stormwater only if those programs could effectively reduce stormwater sources during the periods during which the maximum GMs are calculated to occur. As stormwater sources are not part of this CSO LTCP with respect to the development of control measures, the alternatives that are the focus of the following sections of this report focus on reduction of the remaining CSO discharges to Alley Creek and Little Neck Bay.

6.3.d Time to Recovery

The fecal coliform and *Enterococci* analyses provided above in Section 6.3.c focused on the long-term impacts of wet-weather sources, as is required by existing criteria (i.e., monthly or 30-day GMs). Shorter-term impacts are not evaluated using these regulatory criteria. Therefore, to gain insight into the shorter-term impacts of wet weather sources of bacteria, WQ modeling analyses were conducted to assess the amount of time following the end of rainfall required for Alley Creek and Little Neck Bay to recover and return to target fecal coliform concentrations of less than 1,000 cfu/100 mL and *Enterococci* concentrations less than 266 cfu/100 mL and 130 cfu/100 mL. Note that for Alley Creek, this analysis was conducted for informational purposes, and that primary contact recreation is not a designated use in a Class I waterway such as Alley Creek.

The approach to developing a “Time to Recovery” began with an analysis of JFK Airport rainfall data for the period of 2002–2011. The Synoptic Surface Plotting (SYNOP) model was used to identify each individual storm and 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 1 through October 31) of the 10-year period resulted in a 90th percentile rainfall event of 1.09 inches. For Alley Creek and Little Neck Bay, the JFK Airport rainfall data were compared against ERTM bacteria results for the 10 recreational seasons to determine how long it took for the water column concentration to return to target threshold bacteria concentrations from the end of the rain event. The various rainfall events were then placed into rain event size "bins" ranging from less than 0.1 inch to greater than 1.5 inches. Only rain events that reached the target threshold concentrations before the beginning of the next storm were included. The average time to recovery for each bin at each WQ station was calculated. Table 6-13 presents the modeled times to recovery for the baseline condition and the 100 percent CSO control scenario for Alley Creek and Little Neck Bay for the greater than 1.0 to 1.5 inches rainfall bin. This rainfall bin includes the 90th percentile event. The 90th percentile event was also evaluated on a standalone basis as presented in Table 6-14.

1.0 to 1.5 Inch Rainfall Bin

As indicated in Table 6-13, under modeled baseline conditions, the average fecal coliform times of recovery exceed 24 hours at Stations AC1 and OW2. With removal of NYC CSOs from Alley Creek and Little Neck Bay (i.e., 100 percent CSO control), the modeled average fecal coliform time to recovery for all stations assessed falls well below 24 hours. Under the baseline conditions, none of the stations assessed had an average *Enterococci* modeled time to recovery to 130 cfu/100 mL less than 24 hours. With modeled removal of NYC CSOs from Alley Creek and Little Neck Bay (i.e., 100 percent CSO control), the average *Enterococci* time to recovery fell below 24 hours for the LN1, DMA, and E11 stations. Even with 100 percent CSO control, the modeled *Enterococci* time to recovery to 130 cfu/100 mL remained longer than 24 hours at the Stations AC1 and OW2. As indicated in Table 6-13, under the baseline conditions, except for station E11, none of the stations assessed had an average modeled *Enterococci* time to recovery to 266 cfu/100 mL less than 24 hours. With modeled removal of NYC CSOs from Alley Creek and Little Neck Bay (i.e., 100 percent CSO control), the modeled average *Enterococci* time to recovery to 266 cfu/100 mL fell below 24 hours for all five stations.

Table 6-13. 10-year Time to Recovery Fecal Coliform and *Enterococci* for >1.0 to 1.5 inches Storms

Station	10-year Average Time to Recovery[1] (hours)					
	Fecal Coliform Threshold (1,000 cfu/100 mL)		*Enterococci* Threshold (130 cfu/100 mL)		*Enterococci* Threshold (266 cfu/100 mL)	
	Baseline	100% CSO Control	Baseline	100% CSO Control	Baseline	100% CSO Control
AC1	35.6	15.1	53.4	30.3	47.6	21.5
OW2	29	5.5	50.4	25.7	44.6	17.8
LN1	16.3	0.4	41.9	11.7	32.9	6.8
DMA	14.9	0.3	33.9	13.2	31.7	8.3
E11	4.8	0.3	24.2	12.7	17.1	5.2

Notes:
[1]Average time to recovery values presented for storms from the 10-year simulation in the size range of >1.0 to 1.5-inches of rainfall, which includes the 90th percentile rain event. Storms selected from recreational seasons for the fecal coliform and *Enterococci* 130 cfu/100 mL threshold evaluations. Storms selected year-round for the *Enterococci* 266 cfu/100 mL threshold evaluations.

cfu/100 mL = Colony-forming units per 100 milliliters; CSO = Combined Sewer Overflow

90th Percentile Design Storm Event

Additional analyses consisted of examining the ERTM calculation for Alley Creek and Little Neck Bay bacteria concentrations for the selected August 14–15, 2008, JFK rainfall event, a design storm that produced 1.02 inches of precipitation and approximates a 90th percentile rainfall event for the NYC area for the period of 2002–2011. A principal feature of this storm, aside from its volume, was that the time until the next rainfall could allow the bacteria concentrations enough time to reach the target concentrations.

Table 6-14 presents the modeled design storm time to recovery for the baseline condition and the 100 percent CSO control scenario. Under the baseline conditions, Stations AC1 and OW2 have modeled times to recovery for fecal coliform of 36 and 34 hours, respectively. The other stations in Little Neck Bay have modeled time to recovery for fecal coliform ranging between 8 and 22 hours. Once the modeled CSO loading is removed, the maximum modeled fecal coliform time to recovery is 7 hours at Station AC1, so Alley Creek and Little Neck Bay would be expected to have a fecal coliform time to recovery less than 24 hours for a storm of the design storm magnitude. In the case of fecal coliform time to recovery, the gap between the modeled existing times to recovery and the target time to recovery can be achieved with CSO controls. Model results in Table 6-14 also indicate that under baseline conditions the times of recovery for the design storm exceed 24 hours for both *Enterococci* endpoints at all stations. With the modeled implementation of 100 percent CSO control, the maximum modeled *Enterococci* time to recovery would be reduced to 23 hours.

Table 6-14. Design Storm Time to Recovery

Station	Time to Recovery (hours)					
	Fecal Coliform Threshold (1,000 cfu/100 mL)		*Enterococci* Threshold (130 cfu/100 mL)		*Enterococci* Threshold (266 cfu/100 mL)	
	Baseline	100% CSO Control	Baseline	100% CSO Control	Baseline	100% CSO Control
AC1	36	7	51	23	42	15
OW2	34	4	47	21	36	10
LN1	22	0	45	9	34	5
DMA	22	0	45	7	34	0
E11	8	1	21	4	10	2

cfu/100 mL = Colony-forming units per 100 milliliters; CSO = Combined Sewer Overflow

Attachment 4, Section 7 – 2026 Revised

The 2014 and 2015 versions of the approved 2017 LTCP Section 7 have been revised and are superseded by the 2026 Supplemental LTCP version of Section 7 provided below. Track change edits show text revisions. Text, figures and tables which have been replaced are marked as replaced and track change edits are not shown.

7.0 PUBLIC PARTICIPATION AND AGENCY COORDINATION – 2026 REVISED

DEP is committed to implementing a proactive and robust public participation program to inform the public of the development of the watershed-specific and Citywide LTCPs. Public outreach and public participation are important aspects of plans designed to reduce CSO-related impacts to achieve waterbody-specific WQS, consistent with the federal CSO Policy and 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,~~ and~~ 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~~ wider public concerning WQ~~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 2012 Order on Consent signed by DEC and DEP on March 8, 2012.

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 as a result of public comments received will be posted annually to DEP's website, along with the quarterly summary of public participation activities reported to DEC.

Subsequent public outreach has been performed specifically to support the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024); additional public participation opportunities to support this effort were conducted in winter 2026.

7.1 Local Stakeholder Team (2026 Revised)

DEP began the public participation process for the approved 2017 Alley Creek and Little Neck Bay LTCP by reaching out to the Queens Borough President's Office and Community Board 11~~,~~ to identify the stakeholders who would be instrumental to the development of this LTCP. Stakeholders identified included citywide and regional groups, including environmental organizations (Alley Pond Environmental Center [APEC], Natural Resources Defense Council, Metropolitan Waterfront Alliance, IEC, and Udalls Cove Preservation Society); community planning organizations (Douglaston Historical Society, DMA, and Bayside Marina); design and economic organizations (Queens Chamber of Commerce and Auburndale Improvement Association); academic and research organizations (Queens College and Polytechnic University of New York); and City government agencies (DCP, DOHMH, and NYS DOH).

DEP has continued coordination with the DOH and DOHMH regarding fish advisory promotion information and outreach strategies. DEP ensures this information is available to local and regional stakeholders on the LTCP website and at public meetings.

Given the proximity of the study area to ~~an existing park~~Alley Pond Park and the Oakland Lake/Ravine, DEP has also worked closely with the Department of Parks and Recreation (DPR). In addition to engaging DPR as a stakeholder in the approved 2017 LTCP process, DEP and DPR collaborated in the coordination of data collection and the identification of stormwater management strategies included in DPR's Alley Creek Watershed Planning and Habitat Restoration Study. This two-year study endeavors to identify ways DPR can shift from an opportunistic pursuit of restoration actions to intentional watershed-based restoration planning. As part of this process, DPR identified stakeholders and is in the process of formulating resource management goals for the study, mapping watershed resource uses and future uses, ~~identify~~ identifying and ~~prioritize~~ prioritizing opportunities, and ~~help~~ helping develop a strategy for implementation. DEP plans to continue to meet with DPR and the Watershed Advisory Committee~~WAC~~ to coordinate planning efforts and leverage opportunities for plan implementation.

Most recently, starting in 2022, DEP has worked very closely with DPR as part of the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024). The recommendation from this study centers around diverting stormwater to Oakland Lake and Ravine, which presents an opportunity to enhance Oakland Ravine and Lake by providing co-benefits to the community. As such, DEP has worked closely with DPR for the full duration of the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study to date and plans to continue that collaboration in the coming months. On September 4, 2024, DPR issued a letter to NYSDEC documenting their concern about the potential disinfection strategy at Alley Creek and expressing their support of the Oakland Ravine Daylighting and Stormwater Diversion concept.

~~In addition, DEP will continue to coordinate with the DOH and DOHMH regarding fish advisory promotion information and outreach strategies. DEP ensures this information is available to local and regional stakeholders on the LTCP website and at public meetings.~~

7.2 Summaries of Stakeholder Meetings (2026 Revised)

DEP has held public meetings and several stakeholder group meetings to aid in the development and execution of the LTCP. The objectives and brief summaries of the major public meetings held during the approved 2017 LTCP development and more recently as part of the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024)~~and a summary of the discussion~~ are presented below:

Public Meetings

Public Meeting #1: Alley Creek LTCP Kickoff Meeting (October 24, 2012)

Objectives: Provide ~~overview of LTCP process, public participation schedule, watershed characteristics~~an overview of the 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 WQ~~water quality~~ planning process for ~~long term~~long-term control of CSOs in the Alley Creek and Little Neck Bay Waterbody. The two-hour event, held at ~~Alley Pond Environmental Center (~~APEC~~)~~ in Queens, served to provide an overview of information about DEP's LTCP Program, present information on the Alley Creek and Little Neck Bay watershed characteristics and status of waterbody improvement projects, obtain public information on waterbody uses in Alley Creek, and describe additional opportunities for public input and outreach. The presentation can be found at http://www.nyc.gov/dep/ltcp. Approximately 15 stakeholders attended the event, from over ten different non-profit, community planning, environmental, economic development, and governmental organizations, as well as the general public.

The Alley Creek LTCP Kickoff Public Meeting was the first opportunity for public participation in the development of the LTCP. In response to stakeholder comments, DEP provided detailed information about each of the following as part of the development of the LTCP:

- CSO reductions and the cost of existing and future CSO-related projects in Alley Creek;
- Modeling baseline assumptions utilized during LTCP development;
- Rainfall numbers and assumptions utilized during LTCP development;
- WQ~~ater quality~~ data collection;
- Existing Alley Creek and Little Neck Bay CSO discharges; and
- Future public meeting announcements.

Stakeholder comments and DEP's responses were emailed to all attendees and posted to DEP's website~~,~~ and are also described in Appendix B, ~~Long Term Control Plan (~~LTCP~~)~~ Alley Creek Kickoff Meeting – Summary of Meeting and Public Comments Received.

Public Meeting #2: Alley Creek LTCP Alternatives Review Meeting (May 1, 2013)

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

On May 1, 2013, DEP hosted a second Public Meeting to continue the WQ~~water quality~~ planning process for ~~long term~~long-term control of CSOs in Alley Creek and Little Neck Bay. The purpose of the two-hour event, held at APEC in Queens, was to provide background and an overview of the LTCP planning process; present Alley Creek watershed characteristics and the status of existing WQ~~water quality~~ conditions; obtain public input on waterbody uses in Alley Creek and Little Neck Bay; and describe the alternatives identification and selection process. The presentation is on DEP's LTCP Program Website: http://www.nyc.gov/dep/ltcp. Ten stakeholders attended the event, from five different non-profit, community planning, environmental, economic development, and governmental organizations, as well as the general public.

In response to stakeholder comments, DEP provided detailed information for each of the following as part of the development of the LTCP:

- Modeling baseline assumptions utilized during LTCP development, including the rainfall
- conditions utilized;
- WQ~~ater quality~~ data collection;
- Stormwater inputs/contributions to Alley Creek and Little Neck Bay;
- Green infrastructure and grey infrastructure potential alternatives;
- Ecological restoration opportunities in Alley Creek and Little Neck Bay;
- Opportunity to review and comment on the draft Alley Creek LTCP;
- Existing Alley Creek and Little Neck Bay CSO discharges; and
- Future public meeting announcements.

Stakeholder comments and DEP's responses were emailed to all attendees and posted to DEP's website~~,~~ and are also described in Appendix C, Alley Creek Meeting #2 – Summary of Meeting and Public Comments Received.

During this Public Meeting #2, there was a high degree of public support for the DEP's findings that additional grey infrastructure-based CSO controls were not warranted due to the improvements that DEP made based on the 2009 WWFP (DEP, 2009) and the fact that additional construction projects could affect the natural ecosystem conditions in this upper Alley Creek watershed.

Public Meeting #3: Draft LTCP Review Meeting (December 11, 2014)

Objectives: Present LTCP and associated UAA.

On December 11, 2014, DEP hosted a Public Meeting to initiate the WQ planning process for long-term control of combined sewer overflows throughout the City. The two-hour event, held at Hostos College, served to provide an overview of information about DEP's LTCP Program, present information on the Citywide watershed characteristics and status of waterbody improvement projects, obtain public information on waterbody uses, and describe additional opportunities for public input and outreach. The presentation can be found at http://www.nyc.gov/dep/ltcp. Approximately 35 stakeholders from different non-profit, community, planning, environmental, economic development, and governmental organizations~~,~~ and the broader public attended the event, and one reporter from local Brooklyn papers.

Public Meeting #4: Draft LTCP Review Meeting (November 17, 2015)

Objectives: Final LTCP Plan Review.

On November 17, 2015, DEP hosted a Public Meeting to present a recommended alternative for long-term control of CSOs in Alley Creek and Little Neck Bay. The presentation is on DEP's LTCP Program Website: http://www.nyc.gov/dep/ltcp.

~~Public Meeting #3: Draft LTCP Review Meeting (TBD)~~

~~*Objectives: Present LTCP and associated UAA*~~

~~*This meeting schedule is to be announced. The purpose is to 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.*~~

Public/Stakeholder Meetings Approved 2017 LTCP

- **September 12, 2012**
    - DEP attended the Queens Borough Cabinet Meeting and presented information on public outreach for the Alley Creek LTCP to Queens Borough President~~, Helen Marshall,~~ Helen Marshall and Queens Borough Cabinet members. In addition to presenting information on public outreach, DEP answered questions regarding the Alley Creek LTCP development schedule and process, elements of the approved Alley Creek WWFP, and CSO controls. DEP provided Community Board representatives with a PowerPoint presentation on September 21, 2012, to be forwarded to their constituents. The presentation was also posted to DEP's LTCP Program website: http://www.nyc.gov/dep/ltcp.
- **September 29, 2012**

- DEP staffed a table at the Little Neck Bay Festival at the APEC in Douglaston, Queens. DEP distributed an Alley Creek LTCP summary, an Alley Creek LTCP Kickoff notice~~ and other LTCPrelated~~, and other LTCP-related educational materials to attendees. Approximately 20 stakeholders from over seven organizations and the broader public asked to be added to DEP's LTCP stakeholder database.

October 24, 2012

- DEP met with APEC staff to discuss APEC's existing educational programs and ways that DEP can support and build upon these efforts. DEP will continue to meet and work with APEC throughout the development of waterbody-specific LTCPs~~,~~ to support the development of environmental educational information for grades K-12.

October 21, 2013

- DEP met with the Queens Borough office to present on the Alley Creek LTCP. In addition to presenting information on public outreach, DEP answered questions regarding the Alley Creek LTCP development schedule and process, elements of the approved Alley Creek WWFP, and CSO controls.

Public/Stakeholder Meetings 2026 Supplemental LTCP

1. **October 29, 2024**
   - On October 29, 2024, DEP held a meeting at Alley Pond Environmental Center to discuss the current projects within Alley Creek, including the Alley Creek Constructed Wetlands and the Oakland Ravine Daylight and Stormwater Diversion Feasibility Study. Representatives from various local community organizations attended. In general, the concept was well-received, and the representatives were able to ask DEP questions and provide feedback from the community's perspective.

2. **February 5, 2026**
   - On February 5, 2026, DEP had an in-person public meeting at the Alley Pond Environmental Center to present on the upcoming modification request to eliminate disinfection and substitute it for the Oakland Lake and Ravine Daylighting Project.

7.3 Coordination with Highest Attainable Use (2026 Revised)

In cases where existing WQS do not meet the Section 101(a)(2) goals of the CWA, or where the proposed alternative ~~set forth in~~outlined in the LTCP will not achieve existing WQS or the Section 101(a)(2) goals, the LTCP had~~will included~~dincludes a UAA to examine whether ~~applicable waterbody classifications criteria or standards should be adjusted by the State~~NYS~~the State~~ should adjust applicable waterbody classifications, criteria or standards. The UAA assesses the waterbody's uses, which the NYS~~State~~ will consider in adjusting WQS, classifications, and criteria, and developing waterbody-specific criteria. A UAA will be completed as necessary as part of any NYS waterbody reclassification rulemaking and upon completion will supersede the UAA proposed in June 2014 in the approved 2017 LTCP Appendix E and amended in May 2015 in Appendix H Attachment 4.

Comprehensive modeling analysis of baseline conditions, along with the future anticipated conditions after implementing the revised recommended LTCP projects, ~~show~~ shows that Alley Creek will remain a ~~highly productive~~ Class I waterbody that can partially~~fully~~ support secondary contact recreation uses, including nature education and wildlife propagation. Alley Creek is not in attainment with its current Class I classification, and~~but~~ it is not feasible for the waterbody to meet the WQ~~water quality~~ criteria associated with the next higher (Class SB/SC) classification.

~~Furthermore, combinations of natural and manmade features prevent both the opportunity and feasibility of primary contact recreation in Alley Creek.~~ Modeled percent attainment of secondary and primary contact recreation in Alley Creek is shown in Table 7-1 for baseline and 100 percent CSO control conditions. ~~-~~Even modeled 100 percent CSO control would not result in attainment of secondary and primary contact recreation in Alley Creek. As discussed in Section 6, a modeling source component analysis shows stormwater *Enterococci* as a contributing cause for the modeled baseline non-attainment of secondary and primary contact recreation.

Table 7.1. Modeled Percent Attainment of Secondary and Primary Contact Recreation in Alley Creek at Station AC1 – 2026 Replaced

Use	Criterion	10-Year Baseline % Attainment	10-Year 100% CSO Control % Attainment
Annual Secondary Contact Recreation Class I	Fecal Coliform Monthly GM ≤200 cfu/100mL	84.2	97.5
	Enterococci 30-day Rolling GM ≤72 cfu/100mL	59.3	77.9
	Enterococci 30-day Rolling 90th Percentile STV ≤266 cfu/100mL	9.2	20.6
Recreational Season Primary Contact Recreation Class SB/SC[1]	Fecal Coliform Monthly GM ≤200 cfu/100mL	93.3	100
	Enterococci 30-day Rolling GM ≤35 cfu/100mL	32.1	50.8
	Enterococci 30-day Rolling 90th Percentile STV ≤130 cfu/100mL	9.1	13.7

[1]The primary contact recreation water quality standard is not currently assigned to Alley Creek.
CSO= Combined Sewer Overflow, cfu/100 mL = colony-forming units per 100 milliliters, GM = geometric mean, STV = statistical threshold value, Recreational Season = May 1 to October 31

DEP obtained public feedback on waterbody uses in Alley Creek and Little Neck Bay at the May 1, 2013, Public Meeting. ~~.~~ T~~hat t~~here was a high degree of public support for DEP's findings that additional grey infrastructure-based CSO controls were not warranted due to the improvements made based on the 2009 WWFP (DEP, 2009). DEP ~~will~~ continued to gather ~~any~~ ~~additional~~ further public feedback on waterbody uses and ~~will~~ provided the public ~~LTCPUAA related~~with LTCP-related information at the third Alley Creek and Little Neck Bay Public Meeting in 2014. Revised information ~~pertaining to~~about attainable uses and current standards attainment will be communicated to the public in coordination with any NYS waterbody reclassification rulemaking.

7.4 Internet Accessible Information Outreach and Inquiries (2026 Replaced)

Both traditional and electronic outreach tools are important elements of DEP's overall communication effort. DEP will ensure outreach tools are accurate, informative, up-to-date, and consistent~~,~~ and are widely distributed and easily accessible.

Electronic copies of the initial Alley Creek LTCP and all subsequent resubmissions, as well as documentation from public meetings are available on DEP's website at the following location: ~~Alley Creek - DEP~~ . ~~**Table 7-1** presents a summary of Alley Creek LTCP public participation activities.~~ Alley Creek - DEP.

Attachment 5 – Section 8

The 2014 and 2015 versions of the approved 2017 LTCP Section 8 are replaced and superseded by the 2026 Supplemental LTCP version of Section 8 provided below.

8.0 EVALUATION OF ALTERNATIVES – 2026 REPLACED

This section of the LTCP describes the development and evaluation of CSO control measures and watershed alternatives. A CSO control measure is defined as a technology (e.g., treatment, storage, etc.), practice (e.g., NMC or BMP), or other method (e.g., source control, GI, etc.) capable of abating CSO discharges or the effects of such discharges on the environment. Alternatives are comprised of a single CSO control measure or a group of control measures that will collectively address the WQ goals and objectives for Alley Creek and Little Neck Bay.

This section contains information about the following:

- The process for developing and evaluating CSO control alternatives that mitigate CSO discharges and improve WQ (Section 8.1).
- CSO control alternatives and evaluations of each (Section 8.2).
- Mitigation of CSO discharges and WQ benefits achieved by the set of higher-ranked alternatives as well as their estimated costs (Sections 8.3 and 8.4).
- Cost performance and WQ attainment assessment for the higher-ranked alternatives to select the preferred alternative (Section 8.5).
- UAA to be used for Alley Creek to assess compliance with Primary Contact WQ Criteria and propose advisories based on the predicted performance of the selected CSO mitigation strategies.

As noted in earlier sections, the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (“Oakland Ravine Feasibility Study”) was submitted to DEC on November 25, 2024. This Oakland Ravine Feasibility Study evaluated alternatives to divert up to 100 percent of the stormwater from the separately sewered area draining to the Alley Creek CSO Retention Facility and divert this flow to Oakland Lake and Ravine. The intent of the Feasibility Study was to evaluate alternatives to reduce CSO discharges into Alley Creek to replace the construction and operation of a chlorination and dechlorination “disinfection system” during the recreational season.

To understand the existing hydrologic and hydraulic conditions within the Feasibility Study drainage area, which focused on the separately sewered area contributing flow to the Alley Creek CSO Retention Facility (Outfall TI-025), model refinement and calibration were performed. This refined model enhanced the detail of the sewer network by incorporating all storm and combined sewers within the study area regardless of size and by delineating modeled subcatchments on a block-by-block basis. The model was calibrated and then used to develop a baseline condition model, which is further detailed in the revised Section 6.0 attached to Appendix I.

As described in the revised Section 6.0 attached to the Appendix I 2026 Supplemental LTCP, DEP established a revised baseline condition implemented by using a refined IW Model that was developed for the Oakland Ravine Feasibility Study. The refined IW Model predicts an annual average overflow volume (AAOV) of 237 MGY with 34 overflow events at TI-025, which is higher than the 2014 Alley Creek CSO

LTCP baseline model, which predicted an AAOV of 132 MGY with 16 overflow events at TI-025 over the course of the DEP's typical rainfall year, 2008.

This Alley Creek and Little Neck Bay CSO LTCP 2026 Supplemental Documentation also uses the refined IW Model from the Oakland Ravine Feasibility Study to evaluate select alternatives against the updated baseline. During the development of control alternatives, performance was evaluated for potential WQS attainment. The evaluation includes alternatives that result in 0, 25, 50, 75, and 100 percent reductions in CSO volume, based on the refined IW Model. However, for some alternative CSO control measures, such as disinfection, there is no reduction in CSO volume, but a reduction in bacteria loading instead. Performance of each CSO control for each selected alternative is measured against its ability to meet current WQS and WQ requirements for the 2040 planning horizon.

Results for new alternative CSO controls are based on CSO mitigation and WQS attainment as predicted by the revised IW and WQ models and are included below. Results that were presented in the 2014 LTCP and in the 2015 Appendix H Supplemental Documentation are not included.

8.1 Considerations for LTCP Alternatives under the Federal CSO Policy

This Alley Creek and Little Neck Bay 2026 Supplemental LTCP addresses the WQ goals of the federal CWA and associated EPA CSO Control Policy and the NYS Environmental Conservation Law. It builds upon the EPA NMCs, part of the EPA CSO Control Policy, as well as the conclusions presented in NYC DEP, 2009 WWFP. Consistent with the LTCP Goal Statement, after this LTCP, a standalone UAA is to be developed as part of NYS's waterbody reclassification rulemaking. The UAA will examine whether applicable waterbody classifications, criteria, or standards should be adjusted by NYS because the proposed alternative set forth in this LTCP will not achieve existing WQS or the Section 101(a)(2) goals. The UAA assesses the waterbody's attainable use, which the State will consider in adjusting WQS, classifications, and criteria and developing waterbody-specific criteria.

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

8.1.a Performance

A summary of the baseline condition of the revised IW Model output data for volume and frequency of discharge of the CSO outfalls to Alley Creek and Little Neck Bay is provided in Table 8-1. The locations of these outfalls are shown in Figure 8-1.

Table 8-1. Baseline CSO Discharges Tributary to Alley Creek and Little Neck Bay (2008 Typical Year)

Receiving Waterbody	Combined Sewer Outfalls (CSOs)	Discharge Volume (MGY)	No. of Discharges	Percentage of Total CSO Discharge to Alley Creek/Little Neck Bay
Alley Creek	TI-007[1]	0.1	2	<0.1%
	TI-008[2]	0	0	0%
	TI-025[3]	238	34	100%
	Subtotal	**238**	**34**	**100%**
Little Neck Bay	TI-006[1]	0	0	0%

Receiving Waterbody	Combined Sewer Outfalls (CSOs)	Discharge Volume (MGY)	No. of Discharges	Percentage of Total CSO Discharge to Alley Creek/Little Neck Bay
	TI-009	0	0	0%
	Subtotal	**0**	**0**	**0%**
Total CSO		**238**	**34 maximum**	**100.0%**

Notes:
[1]Outfalls TI-006 and TI-007 are permitted as Combined Sewer Overflows (CSOs) and serve as emergency bypasses for pump stations but under normal conditions discharge only stormwater from tributary areas.

[2]Outfall TI-008 discharges flow to Alley Creek; however, there is no flow presented above since the weir upstream of TI-008 does not tip during the typical 2008 rainfall year (i.e., no mixed flow is discharging from TI-008). This flow is primarily from Oakland Lake and a small section of storm sewers, totaling approximately 816 MGY. Since the flow is not combined sewage but predominantly stormwater and baseflow under 2008 conditions, it is excluded from CSO volume reporting. Outfall TI-008 may convey CSO outflow during larger precipitation events.

[3]The Outfall TI-025 drainage area includes a tributary area upstream of the Horace Harding Expressway with two regulators controlling flow. The drainage area types are combined, separate, and sanitary. The flow downstream of the Horace Harding Expressway is mostly from a separately sewered area with a small portion tributary to a regulator for separately sewered flow and sanitary flow.

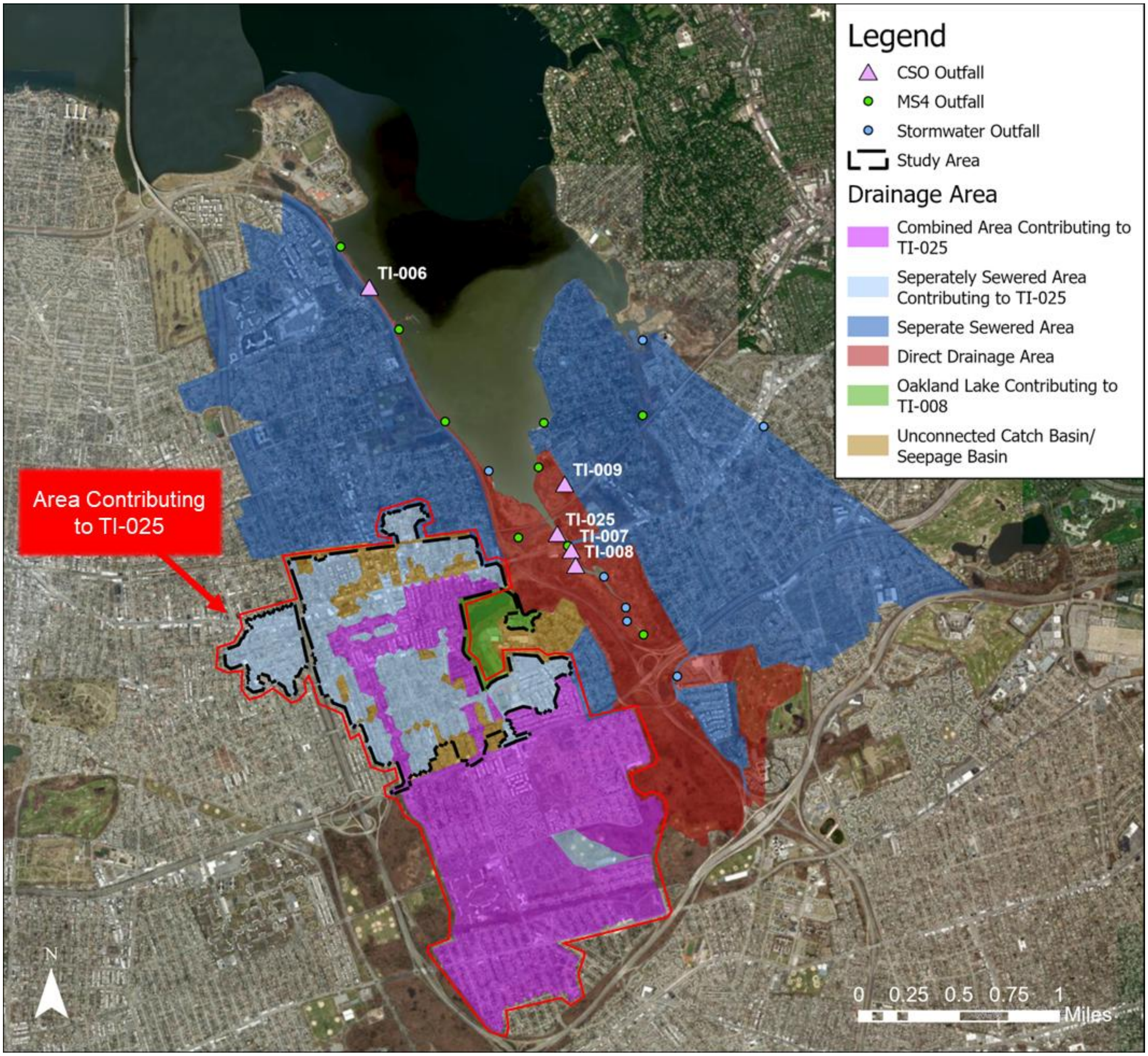

Figure 8-1. CSO Discharges to Alley Creek and Little Neck Bay

To determine the influence of CSO control on the attainment of existing WQ criteria, a Performance Gap Analysis was performed for Alley Creek and Little Neck Bay. The results of the analysis are summarized in the revised Section 6.3b attached to the Appendix I 2026 Supplemental LTCP. The evaluations concluded that Alley Creek and Little Neck Bay can fully support the DO-dependent existing uses, fish, shellfish, and wildlife propagation and survival, but cannot fully support the primary and secondary contact recreation existing uses due to fecal coliform and *Enterococci* bacteria concentrations. Therefore, discussion of performance for Alley Creek and Little Neck Bay alternatives focuses on attainment of bacteria criteria and standards. It is essential that proposed control alternatives can meet the modeled anticipated performance. As such, only proven control measures are included as alternatives.

8.1.b Impact on Sensitive Areas

During the development of control alternatives, special consideration was made to minimize the impact of construction, to protect existing sensitive areas, and to enhance WQ in sensitive areas. As described in Section 2.0, there is one sensitive area within Alley Creek and Little Neck Bay, namely the DMA Beach in Little Neck Bay. This Alley Creek and Little Neck Bay 2026 Supplemental LTCP, therefore, addresses the following EPA CSO Control Policy requirements: (a) prohibit new or significantly increased overflows; (b) eliminate or relocate overflows that discharge to sensitive areas if physically possible, economically achievable, and as protective as additional treatment, or provide a level of treatment for remaining overflows adequate to meet standards; and (c) provide for reassessments in each permit term based on changes in technology, economics, or other circumstances for those locations not eliminated or relocated (EPA, 1995).

8.1.c Cost

As part of this Alley Creek and Little Neck Bay CSO LTCP 2026 Supplemental Documentation, an updated Knee-of-the-Curve (KOTC) was prepared to focus on the results for new control alternatives from the revised IW Model. Costs presented in the approved 2017 LTCP are not included.

Cost estimates for the control alternatives were computed using a costing tool based on parametric costing data. This approach provides an Association for the Advancement of Cost Engineering International 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 update, all cost estimates developed for the evaluation of alternatives are in 2024 dollars unless specifically noted otherwise.

For the estimate of the construction costs for the control alternatives, DEP used the 2024 Probable Bid Cost (PBC). Annual operation and maintenance costs were then used to calculate the total or net present worth (NPW) over the projected useful life of the project. A lifecycle of 100 years and an interest rate of 4.0 percent were assumed, resulting in a Present Worth Factor of 24.505. A 100-year lifecycle was applied for all alternatives, for consistency with the longer service life of the tank alternatives. To quantify costs and benefits, control alternatives were compared based on reductions of both CSO discharge volume and bacteria loading against the total cost of the alternative. These costs were then used to plot the performance and attainment curves. A pronounced inflection point appearing in the resulting graphs, the KOTC point, suggests a potential cost-effective alternative for further consideration. In theory, this curve would reflect the alternative that achieves the greatest appreciable WQ improvements per unit of cost. However, cost/performance or cost/attainment curves do not always identify a distinct “knee,” and if an alternative does fall on a distinct “knee,” it may not necessarily be the recommended plan. The recommended plan must be capable of improving WQ 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 nonmonetary factors, such as construction impacts, environmental benefits, technical feasibility, and operability, which are discussed below.

8.1.d Technical Feasibility

Several factors were considered when evaluating technical feasibility, including:

- Effectiveness in controlling CSO
- Reliability

- Implementation

The effectiveness of CSO control measures was assessed based on their ability to reduce CSO frequency, volume, and intensity. Reliability is an important operational consideration that can have an impact on the 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 alternative.

Several site-specific factors were considered when evaluating an alternative's technical feasibility, including available space, neighborhood assimilation, impact on parks and green or blue spaces, and the overall practicability of installing the CSO control. 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 2040 design year's CSO volume, 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 additional CSO flows or volumes, should it be needed. In some cases, this analysis may have influenced the location of or prioritized a facility that could be expanded later with minimal cost and operational disruption.

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. For those alternatives that can be expanded, the LTCP discusses how easily they can, what additional infrastructure may be required, and whether DEP would need to acquire additional land.

Changes in regulatory requirements may necessitate improvements in nutrient removal or disinfection. The ability of a CSO control technology to be retrofitted to handle process improvements improved its rating.

8.1.f Long-Term Phased Implementation

The final recommended plan is structured in a way that makes it adaptable to change via expansion and modifications in response to new regulatory and/or local drivers. The project(s) would be implemented over a multi-year schedule, as detailed in Section 9.

8.1.g Other Environmental Considerations

Minimizing impacts on the environment and surrounding neighborhood as much as possible during construction involves several considerations. These considerations include traffic impacts, site access issues, park and wetland disruption, noise pollution, air quality, and odor emissions. To ensure that environmental impacts are minimized, they will be identified with the selection of the recommended plan and communicated to the public. Any identified potential concerns will be addressed in a pre-construction environmental assessment.

8.1.h Community Acceptance

Section 7.0 outlines DEP's commitment to involving the public, regulators, and other stakeholders throughout the planning process. The Alley Creek and Little Neck Bay 2026 Supplemental LTCP is intended to be an integral part of the community, enhancing the quality of life in the neighborhood while addressing CSOs. The public's health and safety are the first priority of the plan. Raising awareness of and access to waterbodies is a goal of the plan and was considered during the alternative analysis. Several CSO control measures, such as GI, have been shown to enhance the community while increasing local property values, and, as such, the benefits of GI were considered in the formation of the final recommended plan.

A substantial amount of public and stakeholder outreach has been performed recently, specifically to support the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study (DEP, 2024). Additional public participation opportunities to support this effort have been conducted in winter 2025/2026. On October 29, 2024, DEP held a meeting at Alley Pond Environmental Center to discuss the Alley Creek Engineered Wetlands and the Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study and a subsequent public meeting to discuss the 2026 Supplemental LTCP and proposed modification request was held on February 5, 2026. Representatives from various local community organizations attended these meetings and provided general support for the recommended stormwater diversion to Oakland Lake and Ravine. Several follow-up meetings and site visits were conducted with representatives from community organizations and are described in more detail in Section 7.0.

8.1.i Methodology for Ranking Alternatives

As noted in earlier sections, the Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study (DEP, 2024) was initiated to evaluate alternatives to divert up to 100 percent of the stormwater from the separately sewered area draining to the Alley Creek CSO Retention Facility in an effort to identify an alternative to the operation of a chlorination and dechlorination "disinfection system" during the recreational season.

The multi-step evaluation process DEP used to revisit the approved alternative (operation of a chlorination and dechlorination "disinfection system" during the recreational season) included meetings with DEP staff, regulators, and stakeholders, and a full feasibility study as listed below:

1. In August 2019, NYC DEP informed NYSDEC that disinfection system design will be paused to conduct additional investigations into alternatives to disinfection. NYSDEC responded in September 2019 that milestones for the disinfection system remain in effect.
2. In January 2022, NYC DEP officially requested to eliminate the disinfection system and began developing a scope to pursue the Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study.
3. In November 2022, NYC DEC and NYC DEP approved the scope for the Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study, and the effort was initiated. NYC DEP performed the Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study from November 2022 through November 2024. The study culminated in the development of the Oakland Ravine Daylighting and Stormwater Diversion Technical Feasibility Study Report (DEP, 2024).
4. July 2023 – NYS DEC agrees to an extension of the disinfection system milestones to evaluate ecological projects.
5. Following the November 3, 2023, workshop, NYS DEC reviewed the new modeled CSO volumes for Alley Creek and Little Neck Bay, as well as the preliminary Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study alternatives. NYS DEC requested WQ modeling for Alley

Creek, which was added to the scope of the Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study and performed over the subsequent months.

6. Technical workshops and site visits were held with NYS DEC on the following dates:
    a. November 3, 2023 – Workshop #1: Sewer Monitoring and Modeling
    b. November 27, 2023 – Workshop #2: Alternative Analysis
    c. March 5, 2024 – Workshop #3: WQ
    d. June 12, 2024 – Site Visit
    e. June 28, 2024 – CSO LTCP Meeting
7. November 2023 – NYS DEC reviews refined baseline and preferred alternative; requests WQ modeling for Alley Creek.
8. See Section 7 for additional stakeholder meetings.

The focal points of this process were the meetings and workshops listed above, as well as the Stakeholder engagement discussed in Section 7. As noted earlier, the Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study (DEP, 2024) was initiated with the goal of evaluating alternatives to divert up to 100 percent of the stormwater from the separately sewered area draining to the Alley Creek CSO Retention Facility. This study centered around the assessment of the CSO control performance of various permutations of disconnection and diversion options. The following were considered in the development and evaluation of alternatives:

- Ease of disconnection from the CSS and identifying downstream locations to discharge
- CSO reduction potential
- Maintaining the hydraulic integrity of the surrounding collection system
- Assessing the depth of construction and other utility crossings
- Analyzing the hydraulic impact at Oakland Lake, if applicable

The Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study (DEP, 2024) culminated with the selection of a recommended alternative. This alternative was selected due to its large CSO reduction relative to its limited constructability constraints and impact on the hydraulics of Oakland Lake. To support the development of this 2025 Alley Creek and Little Neck Bay CSO LTCP update, the Oakland Ravine Daylighting and Stormwater Diversion Concept was evaluated against other control measures, as discussed in the subsequent sections.

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

Table 8-2 presents the alternatives that were assessed using the IW Model (DEP, 2024).

Table 8-2. Potential Alternatives for Targeted CSO Volume Control Levels

Target CSO Volume Reduction Percent	Control Measures	Remarks
25	• 2.5 MG Downstream Tank	See Section 8.2.d.
50	• 8 MG Downstream Tank	See Section 8.2.d

Target CSO Volume Reduction Percent	Control Measures	Remarks
	• Oakland Ravine Daylighting and Stormwater Diversion Concept	
75	17 MG Downstream Tank	See Section 8.2.d
100	Disinfection in Existing Alley Creek CSO Retention Facility 41 MG Downstream Tank	See Section 8.2.d

CSO = Combined Sewer Overflow; MG = million gallons

8.2.a Other Future Grey Infrastructure

"Grey infrastructure" refers to single-purpose systems used to control, reduce, mitigate 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 and encompass retention tanks; dedicated and centralized treatment plants, including high-rate physical-chemical treatment (also referred to as high-rate clarification); and other similar capital-intensive facilities. Grey infrastructure implemented under previous CSO control programs and facility plans (such as the 2009 WWFP) was described in Section 4.0 and includes the Alley Creek CSO Retention Facility (a traditional, shallow, below-ground concrete retention tank), along with major related sewer system and pump station modifications.

The existing Alley Creek CSO Retention Facility captures up to 5 MG of CSO volume per storm event and was designed for capture of over 50 percent of the CSO volume discharged to Alley Creek and Little Neck Bay. For this Alley Creek and Little Neck Bay CSO LTCP 2026 Supplemental Documentation, "Other Future Grey Infrastructure" refers to potential grey infrastructure based on previous planning documents that go beyond the existing grey infrastructure control measures already implemented.

As part of this supplemental LTCP, targeted retention alternatives were assessed and are discussed in detail in Section 8.2.d**.**

8.2.d Retained Alternatives

The objective of CSO retention is to reduce overflows by intercepting combined sewage in an offline or inline storage element during wet weather for controlled release into the WWTP after the storm event. Similar to what was provided in the approved 2017 LTCP, the retention control measures presented based on the revised IW Model include traditional, shallow, closed concrete tanks.

As an alternative to a traditional shallow tank, additional capacity could be added by construction of a Vertical Treatment Shaft (VTS) for the purposes of storage only. Extending deeper into the ground compared to a traditional shallow tank, the VTS can provide a large storage capacity while occupying a smaller ground surface footprint. The smaller footprint may allow for versatility when siting the VTS. As with traditional shallow tanks, VTSs typically require odor control systems, washdown/solids removal systems, tank dewatering pumps, and access for cleaning and maintenance.

Siting considerations are key factors in determining the viability of additional storage and may influence the selection of the type of tank—traditional shallow tank or VTS storage—and its location. The present evaluation of the Alley Creek and Little Neck Bay watershed considered only one candidate location for siting additional retention facilities:

- Downstream, near the existing Alley Creek CSO Retention Facility (including both adjacent to the existing tank and to the south of Northern Boulevard); Retention Alternatives—Downstream Sites

Downstream sites are near the existing Alley Creek CSO Retention Facility, which is located just north of Northern Boulevard between the Cross Island Parkway and Alley Creek. Additional retention could be constructed adjacent to the existing Alley Creek CSO Retention Facility, sharing the influent sewers, control structures, facility drain piping, and outfall that have already been built. Several retention alternatives, spanning a range of 25 to 100 percent reduction in CSO volume, were developed near this downstream location. Under baseline conditions with the Alley Creek CSO Retention Facility in operation, virtually all of the CSO discharge to Alley Creek and Little Neck Bay is conveyed through Outfall TI-025, which is the outfall associated with the Alley Creek CSO Retention Facility.

Table 8-3 below presents the size and dewatering parameters for the retention alternatives.

Table 8-3. Volume and Dewatering Rate for Retention Alternatives

Outfall	Waterbody	Total CSO Volume in MG/yr				
		Baseline	100% Capture	75% Capture	50% Capture	25% Capture
TI-007	Alley Creek	0.13	0.13	0.13	0.13	0.13
TI-009	Little Neck Bay	0.00	0.00	0.00	0.00	0.00
TI-006	Little Neck Bay	0.00	0.00	0.00	0.00	0.00
TI-008	Alley Creek	0.00	0.00	0.00	0.00	0.00
TI-025	Alley Creek	237.82	0.65	58.37	117.94	178.68
Total		**237.94**	**0.78**	**58.49**	**118.06**	**178.81**
Additional Tank Volume Required (MG)		--	41	17	8	2.5
Additional Dewatering Capacity for Retention Alternatives (MGD)[1]		NA	15	12	8	5

CSO = Combined Sewer Overflow; MG = million gallons; MGD = million gallons per day; MG/yr = million gallons per year; TI = Tallman Island

Notes:
[1]The retention alternatives target dewatering within 24 hours.

To capture 100 percent of the 237.94 MG/yr CSO volume discharged through TI-025, an additional 41 MG of retention would be required. For lesser captures of 75, 50, and 25 percent, additional retention volumes of 17 MG, 8 MG, and 2.5 MG would be required, respectively. Alternatives corresponding to these rates of CSO volume capture are

- **Alternative 2A – 2.5 MG Retention**. Alternative 2A is designed to capture 25 percent of the CSO volume. Alternative 2A is a 2.5 MG traditional shallow tank located north of and abutting the existing tank but south of the marsh grass (see Figure 8-2).
- **Alternative 2B – 8.0 MG Retention**. Alternative 2B is designed to capture 50 percent of the CSO volume and requires a volume of 8.0 MG. It is a traditional tank located south of Northern Boulevard, as shown in Figure 8-3. To fit within the proposed sites, the 8.0 MG retention alternative would likely require depths that extend below the drainpipe at the existing Alley Creek CSO Retention Facility and will therefore require new pump facilities to dewater them between rain events.

- **Alternative 2C – 17 MG Retention**. Alternative 2C is a 17 MG traditional rectangular concrete tank designed to capture 75 percent of the CSO volume. The proposed location is south of Northern Boulevard, as shown in Figure 8-4. The required tank depth would extend below the drainpipe at the existing Alley Creek CSO Retention Facility, and this alternative would therefore require new pump facilities to dewater the tank.
- **Alternative 2D – 41 MG Retention**. Alternative 2D is designed to capture 100 percent of the CSO volume. This alternative is comprised of a 41 MG rectangular tank and a pumping facility to dewater the tank between rain events. The proposed location for the facility is south of Northern Boulevard, as shown in Figure 8-5.

Siting Considerations

The proposed location for these alternatives has potential siting restrictions. The existing retention tank is located adjacent to wetlands in the designated special Forever Wild Park Land. Special permits and permissions from regulatory agencies and potentially from the NYC Department of Parks & Recreation (DPR) would need to be obtained in order to construct in this area. Note that the larger traditional tank expansions (50, 75, and 100 percent capture) would be difficult to site in the region north of the existing Alley Creek CSO Retention Facility without encroaching into the marsh grass wetland area. Therefore, traditional tank alternatives for 50 to 100 percent capture were placed south of the Alley Creek CSO Retention Facility.

Figure 8-2. Alternative 2A – 2.5 MG Downstream Tank

Figure 8-3. Alternative 2B – *8 MG Downstream Tank*

Figure 8-4. Alternative 2C – *17 MG Downstream Tank*

Figure 8-5. Alternative 2D – *41 MG Downstream Tank Dewatering Considerations*

With the exception of Alternative 2A (2.5 MG traditional tank expansion), all of these retention alternatives are deeper than the existing tank and therefore cannot drain by gravity to the Old Douglaston PS. Instead, they would require new pump stations to pump the captured sewage either directly to the collection system in the direction of the TI WWTP or to the Old Douglaston PS (a two-pump process).

Retention alternatives would temporarily store captured CSO volume until the end of the rain event, after which they would be dewatered into the collection system for conveyance to the TI WWTP. Potentially competing constraints must be evaluated to determine the feasibility of any retention alternative. The captured CSO volume must be pumped within a reasonable time following a storm event to avoid generation of odor and corrosion associated with septic conditions and to dewater the retention tank before the next storm event. At the same time, however, the collection system must be evaluated to determine whether it can convey the additional dewatering flow to TI WWTP. For the current evaluation, dewatering over 1-2 days was targeted.

Disinfection in Existing Alley Creek CSO Retention Facility

General Description and Layout. Seasonal disinfection within the Alley Creek CSO Retention Facility, referred to as Alternative 3, would involve retrofitting the tank with chlorination and dechlorination systems, along with buildings to house the delivery, storage, and feed equipment for each of the chemicals. Ancillary electrical, controls, and HVAC systems would also be included, along with an operations area. Two chemicals would be used: sodium hypochlorite (NaOCl) for chlorination (disinfection) and sodium bisulfite ($NaHSO_3$) for dechlorination. As shown in Figure 8-, the sodium hypochlorite would be fed to a mixing chamber located along the influent channels to the Alley Creek CSO Retention Facility. Dechlorination would be provided by feeding $NaHSO_3$ to diffusers located along the effluent weir. Preliminary siting of the chemical buildings is ongoing. Siting options being evaluated include property adjacent to the Old Douglaston PS, as shown in the figure, a site to the west closer to where the influent channels cross under Northern Boulevard, as well as other sites.

Figure 8-6. Disinfection in Existing Alley Creek CSO Retention Facility

Environmental Risks. There are certain environmental risks associated with chlorination and dechlorination that must be addressed for the specific waterbody. While chlorine disinfection is an approved EPA CSO treatment technology and widely practiced throughout the U.S., Alley Creek is a unique waterbody with extremely limited circulation. During low tides Alley Creek is essentially a mudflat, as shown in Figure 8-7. There are no public access points, nor could Alley Creek support primary or secondary contact recreational activities given its shallow depth and sediment characteristics.

Figure 8-7. Stagnant circulation and exposed bed conditions at low tide in Alley Creek

WQ model *Sensitivity to disinfection.* To better understand the effectiveness in terms of WQS attainment, the 2025 WQ Model, using refined IW developed during the Oakland Ravine Feasibility Study, was run using the average rainfall year of 2008 Conditions, assuming a 2-log reduction in bacteria loadings at TI-025. The results, in terms of percent attainment, are reported in Table 8-4 for five stations within the Alley Creek and Little Neck Bay waterbodies for the recreational season (May 1 to October 31). Figure 8-8 follows, showing time series of the *Enterococci* concentrations at the DMA Beach sensitive area for the recreational season with and without disinfection of bacteria loadings from TI-025. Disinfection helps reduce peak *Enterococci* concentrations at the DMA Beach during the recreational season. Later in this section, attainment for the disinfection alternative and baseline are shown for various criteria for periods beyond the recreational season as applicable.

Table 8-4. Recreational Season Attainment with Alternative 3, 2-log Disinfection Operational Strategy for Loading from TI-025 – 2008 Conditions

Station	Fecal Coliform Attainment (%)[2]		Primary Contact Recreation *Enterococci* Attainment (%)				Secondary Contact Recreation *Enterococci* Attainment (%)[2]			
	Monthly GM <200 cfu/100 mL		Rolling 30-day GM <35 cfu/100 mL		Rolling 30-day 90th Percentile STV <130 cfu/100 mL		Rolling 30-day GM <72 cfu/100 mL		Rolling 30-day 90th Percentile STV <266 cfu/100 mL	
	Base	Alt 3	Base	Alt 3	Base	Alt 3	Base	Alt 3	Base	Alt 3
AC1[1]	100	100	28	55	4	5	89	96	5	16
OW2	100	100	100	100	11	47	100	100	57	80
LN1	100	100	100	100	55	81	100	100	86	100
E11	100	100	100	100	84	98	100	100	100	100
DMA	100	100	100	100	50	70	100	100	88	100

Notes:
[1]*Enterococci* criteria for primary contact recreation do not apply to Station AC1 and are shown for informational purposes only.
[2]While attainment results are reported in this table for the recreational season only, fecal coliform and secondary contact recreation *Enterococci* criteria apply annually.
cfu/100 mL = colony-forming units per 100 milliliters; GM = geometric mean

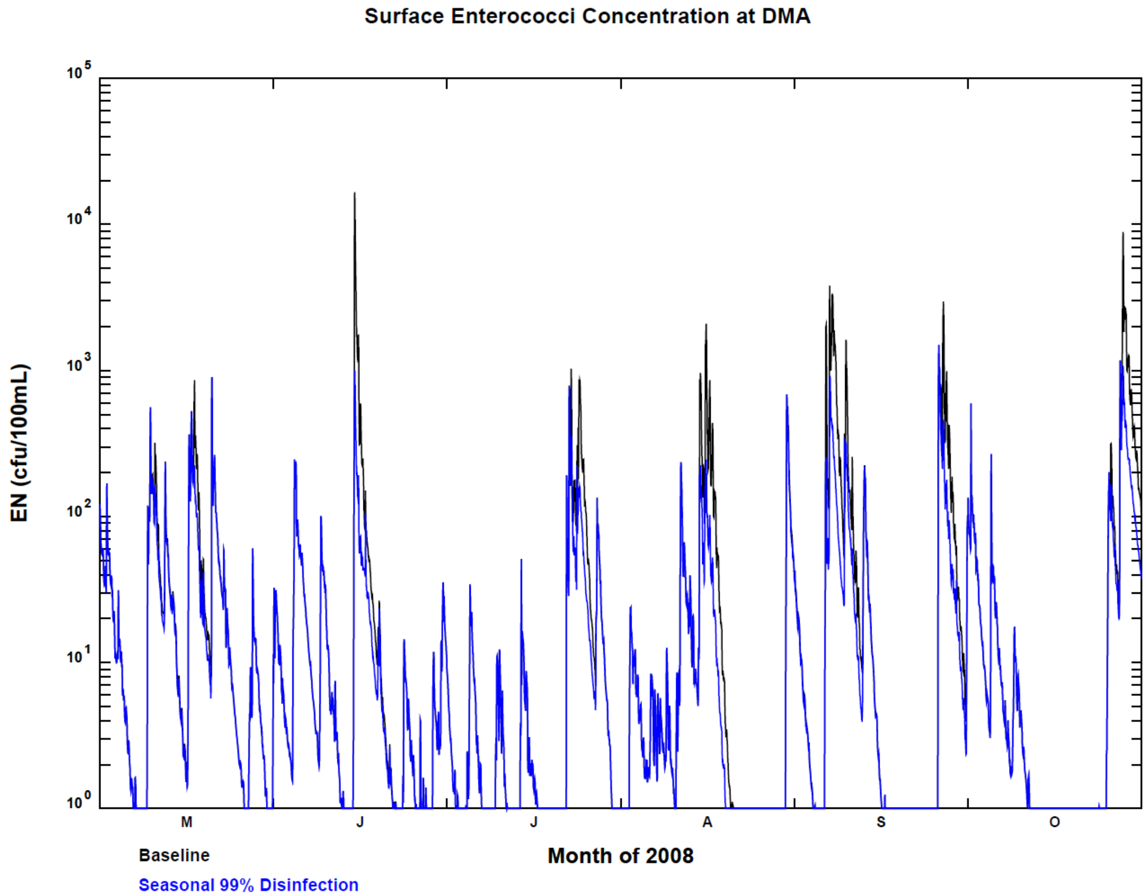

Figure 8-8. 2008 Comparison of *Enterococci* at DMA Beach for Modeled 2-Log Reduction (99 Percent) Seasonal Disinfection of the TI-025 Discharge and Baseline Conditions

As shown in Table 8-4, there is greater than 96 percent modeled attainment of the existing applicable 30-day *Enterococci* GM bacteria criteria at the stations in both waterways during the recreational season with Alternative 3 seasonal disinfection (99 percent kill) of the TI-025 discharge. Station E11 would attain the primary contact STV criterion more than 95 percent of the time during the 2008 recreational season with Alternative 3. The Alternative 3 results have better attainment than baseline results, especially for GM criteria in Alley Creek and STV criteria in both waterways. Thus, the operational strategy of a 2-log kill target can provide a high level of CSO-derived bacteria reduction, including attainment of the secondary contact GM criteria at the AC1 station in Alley Creek but would require dechlorination and automated complex controls to reliably keep TRC effluent limits less than 0.1 mg/L.

Operating Strategy. Based on the above discussion and analysis, the evaluation of the disinfection facilities associated with Alternative 3 was based on the following alternative operational strategy:

- Chlorine, in the form of sodium hypochlorite, would be fed at low doses with a goal of achieving kills in the order of 2-logs, or a 99 percent reduction.
- Dechlorination, in the form of $NaHSO_3$, would be provided to remove excess TRC with a goal of meeting a maximum TRC effluent concentration of 0.1 mg/L.
- Initial sodium hypochlorite feed rate would be based on influent flow and a target dose. As the tank fills, process control would then focus on TRC minimization.

- Disinfection would only be performed at the Alley Creek CSO Retention Facility during the recreational season as a further means of reducing the discharge of TRC.

While this alternative disinfection operational strategy provides the necessary balance between the reduction in human- or CSO-sourced bacteria and protecting the two waterbodies, future imposition of effluent standards for bacteria and/or TRC by DEC in the Alley Creek CSO Retention Facility permit is possible. It should be noted that none of the satellite CSO facilities surveyed operated without limits for one or both of these criteria. In order to ensure that the disinfection facilities can achieve possible future bacteria and TRC limits, the system should have the ability to provide higher doses of sodium hypochlorite to achieve higher levels of bacteria kills, if required. With regard to the actual doses, based on the preliminary design assumptions, a maximum dose of 10 mg/L of sodium hypochlorite would typically be required for most conditions.

Operation and Maintenance. Operation of disinfection and dechlorination at the Alley Creek CSO Retention Facility would pose a number of challenges. The Alley Creek CSO Retention Facility is a satellite facility, which is not currently manned or staffed. As is reflected in the cost estimates of Section 8.4, dedicated operations staff would need to be mobilized and deployed in anticipation of all wet weather events. While this level of effort is reflected in the cost estimates, such operations would incur additional duties for DEP staff who are already currently overburdened during wet weather conditions while adding significant expense.

Permitting Issues and Siting Risks. The submittal of a Form 2A to DEC to modify the TI SPDES permit will likely be required. Effluent bacteria limits or other considerations for operating the facility may be required. Such requirements may result in increased operational costs and beyond what is assumed for this alternative. The siting for any proposed location of the chemical buildings must be made in coordination with the DPR. In addition, it is possible that the siting may require alienation of parkland as well as local land use approvals. Rights-of-way will need to be obtained from the landowners for utilities. Water supply will need to be arranged for and provided. Access to and from the site, including a certain amount of truck traffic, will be necessary. As the project is further developed, additional siting issues and risks may be identified.

Oakland Ravine Daylighting and Stormwater Diversion Concept

As noted earlier, the Oakland Ravine Daylighting and Stormwater Diversion concept was developed as part of the Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study (DEP, 2024). The concept was ultimately selected due to its large CSO reduction relative to its limited constructability constraints and impact on the hydraulics of Oakland Lake. This concept achieves an annual CSO reduction of 51 percent, or 121 MGY, based on the typical rainfall year, 2008, and limits the number of new sewers to be constructed by utilizing existing sewers to divert stormwater to Oakland Ravine and Lake, which minimizes constructability issues.

Figure 8-9 provides an overview of the concept, with detailed discussion in the following sections.

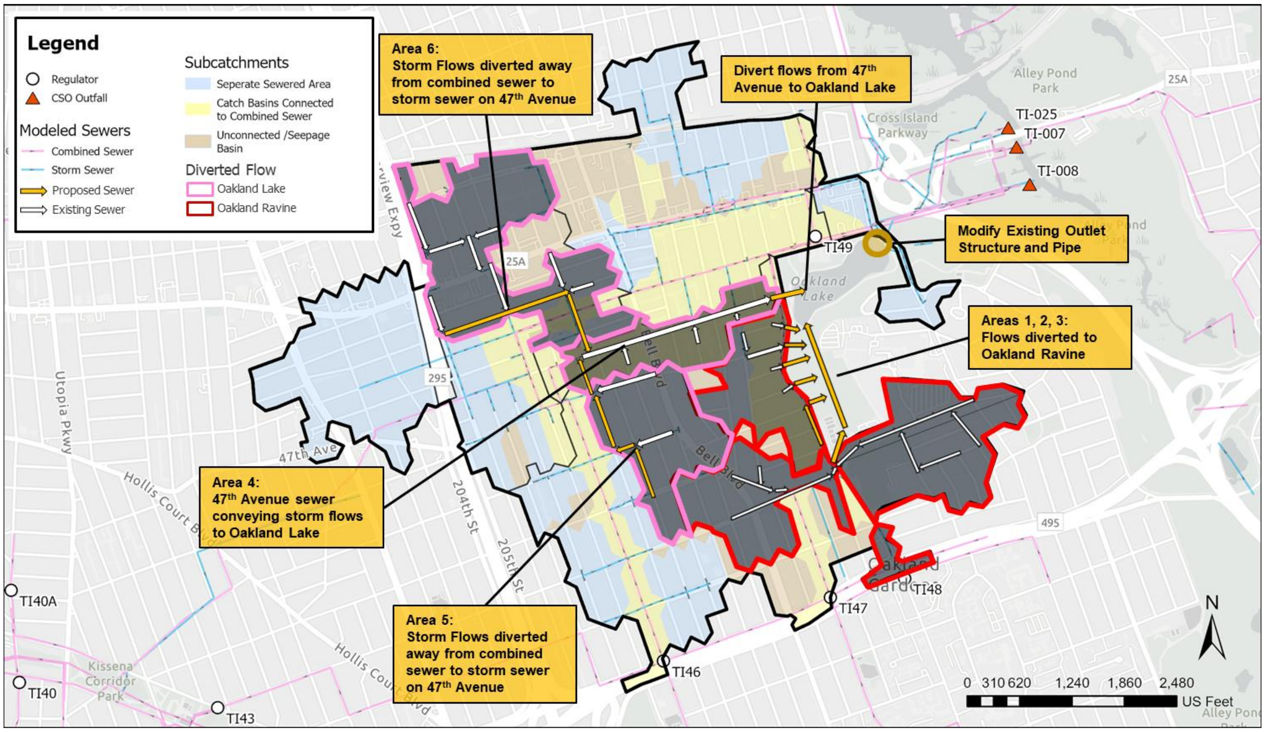

Figure 8-9. Oakland Ravine Daylighting and Stormwater Diversion

The Oakland Ravine Daylighting and Stormwater Diversion concept combines essentially two main elements: (1) Oakland Lake and Ravine Improvements/Ecological Work and (2) ROW Sewer Disconnection and Diversion. Further detail on the specific components is shown in Figure 8-10.

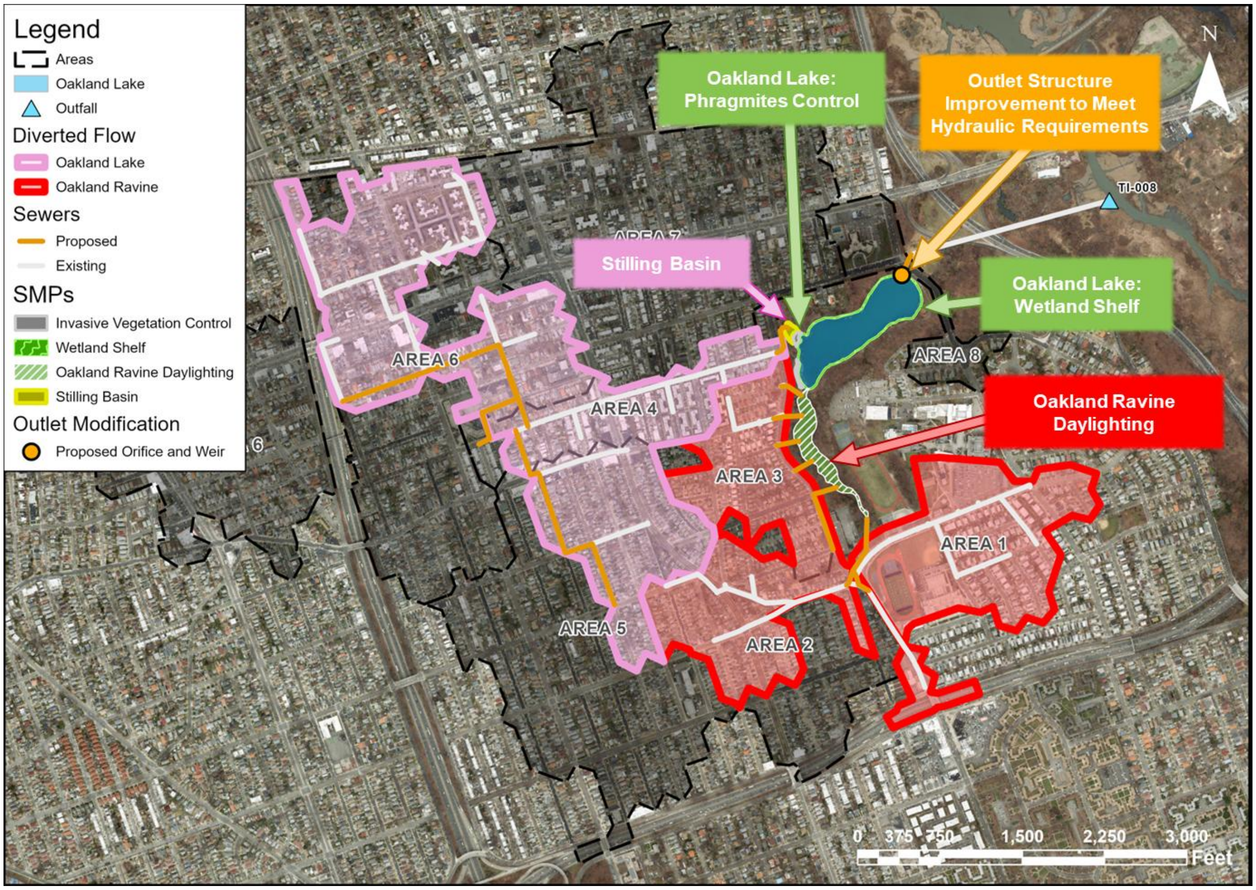

Figure 8-10. Oakland Ravine and Lake Stormwater Diversion Concept Components

The Oakland Lake and Ravine Improvements/Ecological Work are shown in green on Figure 8-10 and would be undertaken first, along with the Ravine Daylighting components. As shown in Figure 8-10, Areas 1, 2, and 3 are directed to the Ravine and do require modification to existing sewers as well as proposed sewers to divert flows from Springfield Boulevard catch basins directly to the Ravine.

The majority of the proposed sewer work occurs in the pink area, which is directed to a stilling basin prior to being discharged to Oakland Lake. The concept also requires modification of the Oakland Lake outlet structure.

Wetland Shelf and Invasive Vegetation Removal and Control

A wetland shelf would be implemented around Oakland Lake to provide additional treatment for the system. The wetland shelf will be a roughly 10-foot-wide shallow vegetated area that will span the perimeter of Oakland Lake, where possible. The modifications to the outlet structure as part of this project would cause the water surface level of the lake to rise during wet weather, resulting in vegetation along the shoreline being temporarily submerged until it returns to its typically dry weather water surface level. To ensure the wetland shelf effectively sustains these fluctuations during wet weather, it would be planted with vegetation suitable for both dry and wet conditions. The benefits of the wetland shelf include filtering and trapping of pollutants and sediment, as well as enhancing the biodiversity and ecosystem of Oakland Lake. This effort will be paired with invasive vegetation removal.

Oakland Lake Outlet Structure Improvements

To manage the additional flow being diverted to Oakland Lake, the existing outlet structure of Oakland Lake must be modified. The existing outlet structure would be retrofitted with a weir and orifice combination to allow for detention during wet weather events and to promote continuous flow during dry weather. The weir would be 60 feet long with a crest elevation of 14 feet Queens Sewer Datum (QSD) and include four 6-foot-wide by 1-foot-high rectangular orifice slots, all with an invert elevation of 12.5 feet QSD. The proposed orifice elevation would drop the existing water surface level during dry weather by roughly 6 inches to maximize the storage capacity of Oakland Lake.

Oakland Ravine Improvements

The Oakland Ravine and Lake Stormwater Diversion Concept diverts stormwater from sewers in Areas 1, 2, and 3 to Oakland Ravine, aiding in partially restoring the way the area functioned naturally before sewers were constructed. The majority of flow diversion to Oakland Ravine would occur at the top of Oakland Ravine by 56th Avenue and Springfield Boulevard. Area 3 would contribute flow along the Ravine through five newly constructed storm sewer segments that divert runoff from groups of catch basins or existing storm sewers along Springfield Boulevard. These five storm sewers discharge throughout the quarter-mile length of Oakland Ravine and would be spaced roughly 250 feet apart from one another. Stilling basins, or other forms of energy dissipation structures, would be constructed at the discharge point of the storm sewers being diverted to the Ravine to provide erosion control and sedimentation.

To effectively manage the stormwater being diverted to Oakland Ravine, nature-based solutions would be implemented at Oakland Ravine to improve WQ. The upper portion of Oakland Ravine would be modified to include step pools and rock riffles, which are effective at providing energy dissipation and flow attenuation for the peak flows that would be diverted to the head of Oakland Ravine. Invasive vegetation in the downstream half of Oakland Ravine will be removed and replaced with shoreline plantings and emergent wetlands, in addition to a daylighted stream. These modifications allow for sedimentation and vegetation filtration and absorption, while enhancing the biodiversity of the ecosystem. Figure 8-11 presents the conceptual enhancement of the Ravine.

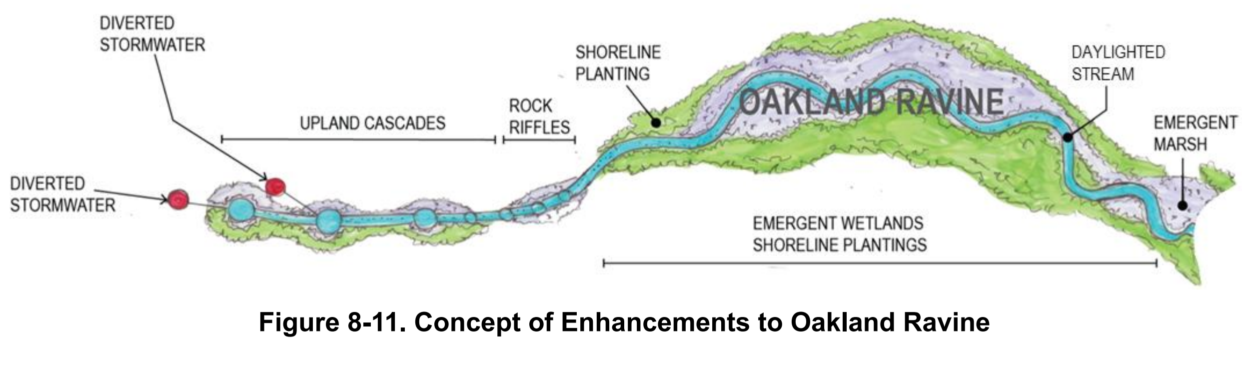

Figure 8-11. Concept of Enhancements to Oakland Ravine

Stilling Basin/Pocket Wetland

Stormwater from Areas 4, 5, and 6 would be diverted to Oakland Lake directly and bypass the Ravine. Prior to entering Oakland Lake, flows from these areas would be conveyed to a stilling basin and pocket wetland, which would provide velocity attenuation, sediment settling, and erosion control for the diverted stormwater flow.

Sewer Work

This concept utilizes upstream diversion and downstream conveyance components to remove stormwater from the CSS and ultimately CSO at TI-025. There will be a partial reconstruction of the CSS where stormwater from pockets of separately sewered areas will be intercepted prior to reaching combined sewage and conveyed to Oakland Ravine or Lake via constructed storm sewers or repurposed sewers. A combined sewer will be reconstructed and rerouted to allow for repurposing of a combined sewer to a storm sewer to optimize the usage of existing infrastructure and limit the quantity of sewer construction.

This concept requires the installation of approximately 7,824 LF of Storm Sewer and 1,058 LF of Combined Sewer.

8.2.d Retained Alternatives

A summary of the alternatives developed for the Alley Creek and Little Neck Bay 2026 Supplemental LTCP is presented in Table 8-5.

Table 8-5. Summary of Alternatives

Alternative	Description
2A	2.5 MG Downstream Tank
2B	8 MG Downstream Tank
2C	17 MG Downstream Tank
2D	41 MG Downstream Tank
3	Disinfection
4	Oakland Ravine Daylighting and Stormwater Diversion Concept

MG = million gallons

8.3 CSO Reductions and Water Quality Impact of Retained Alternatives

To evaluate their effects on the pollutant loadings and WQ impacts, the retained alternatives listed in Table 8-5 were analyzed using both the Alley Creek and Little Neck Bay watershed (IW) and receiving water/waterbody (ERTM) models. Evaluations of CSO volume reductions and/or bacteria load reductions for each alternative are presented below. In all cases, the reductions shown are relative to the baseline conditions using 2008 JFK rainfall as described in Section 6.0, which includes refinements to the IW Model developed during the Oakland Ravine Feasibility Study.

8.3.a CSO Reductions for Retained Alternatives

Table 8-6 summarizes the projected CSO reductions for the retained alternatives. Note that Alternative 3, Seasonal Disinfection in Existing CSO Retention Tank, provides no additional CSO volume reduction, although it has a high level (99 percent) of CSO bacteria reduction on a recreational season basis.

Table 8-6. CSO Volume Performance

Alternative	CSO Volume (MGY)	CSO Volume Reduction Percent
Baseline Conditions	237	-
2A. 2.5 MG Additional Downstream Retention	179	25%
2B. 8 MG Additional Downstream Retention	118	50%
2C. 17 MG Additional Downstream Retention	58	75%
2D. 41 MG Additional Downstream Retention	1	100%

3. Disinfection in Existing Alley Creek CSO Retention Facility (Recreational Season)	104[1]	56%[1]
4. Oakland Ravine Daylighting and Stormwater Diversion Concept	116	51%

Notes:

[1]Alternative 3 will not reduce CSO AOV but will reduce bacterial loadings from this outfall during the recreational season. The CSO volume associated with the reduced bacterial loading is not included in the table. The table presents the remaining untreated CSO volume during the non-recreational season.

CSO = combined sewer overflow; MG = million gallons; MGY = million gallons per year

8.3.b Bacteria Reductions for Retained Alternatives

Water Quality Impacts. A summary of the projected bacteria discharges for the retained alternatives is presented in Table 8-7. The values presented in this table represent the total discharge to Alley Creek and Little Neck Bay from CSO, stormwater, and other sources. With respect to bacteria discharges, the best-performing alternatives were 100 percent and 75 percent retention (Alternatives 2D and 2C). 50 percent retention, recreational season disinfection, and Oakland Ravine Daylighting and Stormwater Diversion (Alternatives 2B, 3, and 4, respectively) each have similar but lower reductions of bacteria discharges. Alternative 2D reduces the overall fecal coliform loading by roughly 65 percent and the *Enterococci* loading by 55 percent. Alternative 4 reduces the overall fecal coliform loading by about 32 percent and the *Enterococci* loading by roughly 26 percent. Because of the pollutants contained in the stormwater discharges and other sources, none of the CSO control alternatives could eliminate all of the bacteria discharged to Alley Creek and Little Neck Bay.

Table 8-7. Summary of the Total Projected Bacteria Discharges from All Sources – 2008 Rainfall

Alternative	*Enterococci* Loading (Counts/Year x 10^{12})	*Enterococci* Reduction Percent	Fecal Loading (Counts/Year x 10^{12})	Fecal Reduction Percent
Baseline Conditions	2,856	0	6,538	0
2A. 2.5 MG Additional Downstream Retention (25% CSO Capture)	2,495	13%	5,535	15%
2B. 8 MG Additional Downstream Retention (50% CSO Capture)	2,110	26%	4,474	32%
2C. 17 MG Additional Downstream Retention (75% CSO Capture)	1,747	39%	3,473	47%
2D. 41 MG Additional Downstream Retention (100% CSO Capture)	1,297	55%	2,296	65%
3. Disinfection in Existing Alley Creek CSO Retention Facility (Recreational Season)	2,059	28%	4,364	33%
4. Oakland Ravine Daylighting and Stormwater Diversion Concept	2,104	26%	4,459	32%

CSO = Combined Sewer Overflow; MG = million gallons

Using the data presented in the previous two tables, Figure 8-12 shows that there is a linear relationship between the reductions in CSO volume and total bacteria loading. The linear relationship is consistent with the retained alternatives effectively being capture-based (i.e., disinfection mimics capture) near the existing Alley Creek CSO Retention Facility.

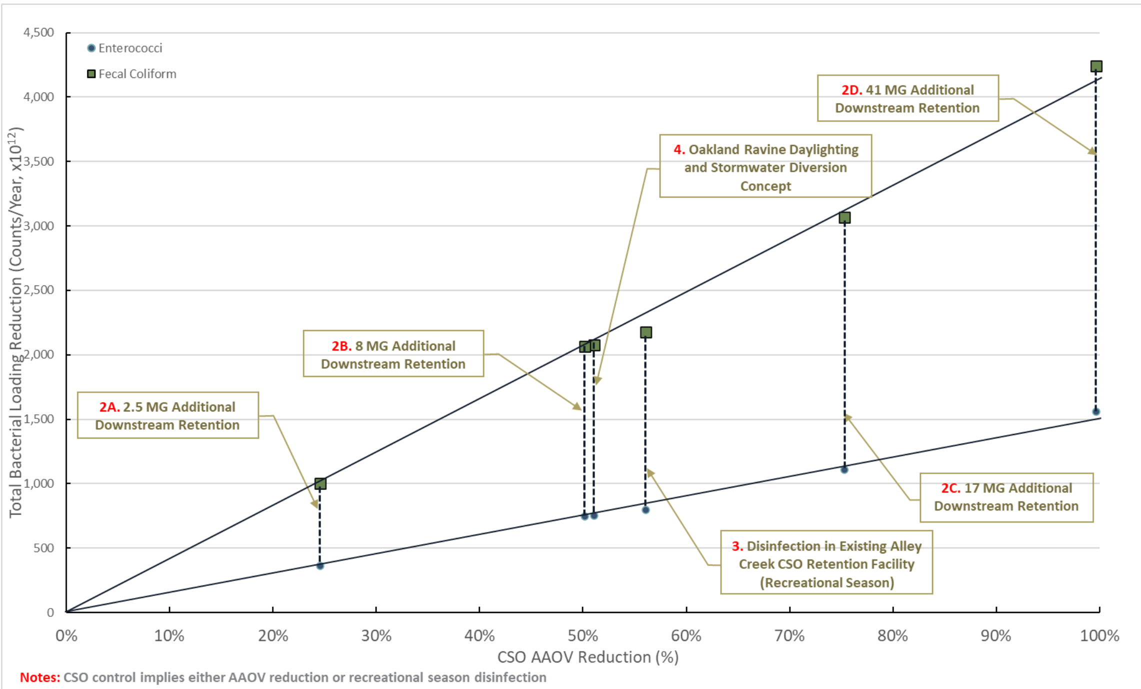

Figure 8-12. CSO Volume Reductions vs. Annual Total Bacteria Loading Reduction - 2008 Rainfall Water Quality Impacts

This section describes the levels of attainment with applicable bacteria criteria within Alley Creek and Little Neck Bay that would be achieved through implementation of the retained CSO control alternatives listed in Table 8-5.

8.3.b.1 Attainment of Bacteria Standards

Alley Creek

Alley Creek is a Class I Waterbody. Historic and recent WQ monitoring, along with baseline condition modeling using ERTM, showed that Alley Creek is currently not in attainment with the Class I fecal coliform and *Enterococci* criteria. As explained in the gap analysis presented in Section 6.3, bacteria loadings from other sources, such as stormwater from MS4 and direct drainage areas and local background dry weather sources, including natural contributions from wildlife, influence the fecal and *Enterococci* concentrations to the extent that even the 100 percent CSO control alternative would not result in full attainment of the Class I GM and STV standards for *Enterococci* in Alley Creek. Although the Class I standard for fecal coliform could likely be fully attained (>95 percent) in Alley Creek with 100 percent CSO control based on 10-year model results, none of the other modeled retained alternatives are projected to achieve full attainment. Model results for 2008 for Alternative 4 project attainment of the Class I standard for fecal coliform 83 percent of the time at the AC1 station. The modeled 10-year attainment of the Class I *Enterococci* criteria with 100 percent CSO control is 78 percent for the rolling 30-day GM and 21 percent for the rolling 30-day 90th percentile STV at the AC1 Station. Based on 2008 model results, Alternative 4 attainment of *Enterococci* secondary contact recreation is projected to be 70 percent for the rolling 30-day GM and 7 percent for the rolling 30-day 90th percentile STV at the AC1 station. The modeled Alternative 4 2008 partial attainment of *Enterococci* secondary contact recreation at Station AC1 outperforms the modeled attainment for Alternative 2B (50 percent CSO Control) and Alternative 3 (Seasonal Disinfection).

Little Neck Bay

Little Neck Bay is a Class SB Waterbody. As described in Section 6.0, portions of Little Neck Bay are not in attainment with the existing Class SB fecal coliform and *Enterococci* criteria throughout the 10-year baseline period. The Class SB standard for fecal coliform could likely be fully attained (>95 percent) annually in Alley Creek with either 100 percent CSO control or Alternative 4 based on 10-year model results. Model results for 2008 for the retained alternatives project full annual attainment of the Class SB standard for fecal coliform at four station locations in Little Neck Bay starting at 25 percent CSO capture. Model results for the 2008 seasonal disinfection project achieving attainment of the Class SB standard for fecal coliform at the OW2 station in Little Neck Bay only 83 percent of the time annually, a drawback of seasonal disinfection as compared to annual CSO capture.

The Class SB rolling 30-day GM criterion for *Enterococci* during the recreational season could likely be attained for the majority of Little Neck Bay (except for several model grid cells having >84 percent attainment) with 100 percent CSO control based on 10-year model results. The 10-year recreational season model results for Alternative 4 project a larger area of Little Neck Bay in non-attainment of the Class SB rolling 30-day GM criterion for *Enterococci* as compared to the 100 percent CSO control alternative and project attainment greater than 80 percent at individual locations in Little Neck Bay. Based on 2008 model results, full attainment is projected at the four Little Neck Bay stations of the Class SB rolling 30-day GM criterion for *Enterococci* during the recreational season for baseline conditions and for all retained alternatives. Based on 2008 and 10-year model results, with the exception of the E11 station under 2008 conditions, the Class SB *Enterococci* rolling 30-day 90th percentile STV for primary contact during the recreational season is projected to be unattainable with CSO controls. As explained in the gap analysis presented in Section 6.3, *Enterococci* loadings from non-CSO sources, such as local background dry weather loadings as well as stormwater loadings both from MS4 and direct drainage areas, are projected to have significant influence on the GM concentration of *Enterococci*, to the extent that even the 100 percent CSO control alternatives are not projected to result in compliance with the primary recreation SB standards for *Enterococci* at all times.

Beyond the recreational season, 10-year modeling results indicate that the *Enterococci* rolling 30-day GM criterion supporting secondary contact recreation is not projected to be attained in the portion of Little Neck Bay near Station OW2 but is projected to be attained with CSO control. Similarly, 10-year modeling results indicate that 100 percent CSO Control is projected to attain the *Enterococci* rolling 30-day 90th percentile STV criterion, supporting annual secondary contact recreation at most locations other than in the vicinity of the OW2 station. 2008 results project that full attainment of the *Enterococci* rolling 30-day GM criterion supporting secondary contact recreation would require Alternative 4 or greater than 75 percent CSO capture. The 2008 rolling 30-day 90th percentile STV attainment supporting secondary contact is projected to be achieved at Station E11 for Alternative 4 and CSO capture of 50 percent or more.

Near DMA Beach, the sole sensitive area in the Alley Creek and Little Neck Bay watershed, 10-year modeled attainment with the monthly GM fecal coliform criterion at the DMA Station occurred for each of the 120 months in the modeled 10-year period. Overall, the 10-year simulation projects compliance with the NYC Department of Health and Mental Hygiene's (DOHMH) rolling 30-day GM standard for *Enterococci* 96 percent of the time during the recreational seasons (May 1 to October 31), and perhaps even more during the warmer bathing seasons (Memorial Day to Labor Day), at the DMA Beach with baseline conditions. When 100 percent CSO control is applied, it has a marginal effect, raising the overall projected attainment of *Enterococci* standards at DMA Beach to more than 99 percent of the time during the recreational seasons—an almost four percent improvement (Table 6-8 in Section 6). As indicated in Section 2.0, DOHMH has yet to adopt an STV or Beach Action Value (BAV) but applies a daily exceedance of 104 cfu/100 mL for posting advisories. The STV (30-day rolling 90th percentile less than 130 cfu/100 mL) attainment for the 10-year simulation at the DMA station suggests exceedances of 104 cfu/100 mL more than 50 percent of the time during the recreational seasons under baseline conditions and more than 16 percent of the time during recreational seasons with 100 percent CSO control.

8.4 Cost Estimates for Retained Alternatives

Proper evaluation of the proposed CSO control alternatives requires accurate cost estimates for each alternative. The methodology for developing these costs is dependent on the type of technology and its unique O&M requirements. The capital costs were developed as PBC. Total NPW costs were determined using the estimated capital cost plus the NPW of the projected O&M costs, with an assumed interest rate of three percent over a 20-year life cycle, resulting in a present worth factor of 14.877. Costs are as shown in Table 8-8 in November 2024 dollars.

8.4.b Retention

Cost estimates for retention using traditional tanks were based on actual bid costs from similar existing tanks built in NYC. A cost curve plotting the storage volume (MG) against the actual bid cost was developed for the existing tanks, with all costs escalated to November 2024 dollars. Cost estimates for retention alternatives using traditional tanks were then derived from the cost curve.

Table 8-8 presents costs for the retention alternatives.

Table 8-8. Retention Alternatives Costs

Retention Alternative	November 2024 PBC[1] ($ Million)	Annual O&M Cost ($ Million)	Total Present Worth ($ Million)
2A. 2.5 MG Additional Downstream Retention	484	1.6	508
2B. 8 MG Additional Downstream Retention	716	2.7	755
2C. 17 MG Additional Downstream Retention	1,310	3.3	1,359
2D. 41 MG Additional Downstream Retention	2,840	5.3	2,918

Notes:
[1]Average of costs for traditional shallow tank.
MG = million gallons; O&M = Operations and Maintenance; PBC = Probable Bid Cost

8.4.c Disinfection in Existing Alley Creek CSO Retention Facility

The estimated costs for disinfection in the existing Alley Creek CSO Retention Facility were developed in the January 2020 Basis of Design Report for Contract CSO-AC-DF-DES, “For the Engineering Design Services and Design Services During Construction of a Disinfection System at the Alley Creek CSO Retention Facility,” and are summarized in Table 8-9.The PBC is $21.4M and includes separate feed and storage buildings for the two chemicals, all of the ancillary support systems and equipment, and the associated electrical and instrumentation systems. Also included are the feed lines between the buildings and the tank and diffusers.

In addition to the direct energy and chemical costs, the O&M costs associated with this alternative include projected staffing hours to maintain and operate the system during the recreational season. As described earlier in Section 8.2.a.4, these include pre-event preparations and during-event and post-event activities, including line flushing and general cleaning. These activities are in addition to the close process monitoring typically required during the events themselves, as well as preventative maintenance of all equipment between events and for chemical deliveries. The annual O&M costs were estimated at $430,000, resulting in a 20-year life cycle present worth of $27.8 M.

Table 8-9. Disinfection in Existing Alley Creek CSO Retention Facility Costs

Item	Cost November 2024 ($ Million)
Disinfection System Probable Bid Cost	21
Annual Operations and Maintenance	0.4
Disinfection Total Present Worth, $ Million	27.8

Oakland Lake Daylighting and Stormwater Diversion Alternative

The Oakland Ravine Daylighting and Stormwater Diversion concept achieves a significant CSO reduction while balancing constructability and impacts to the community, both within the ROW and at Oakland Lake itself. The concept limits re-sewering in the study area due to the downstream disconnections being near Oakland Ravine and Lake, as well as repurposing and utilizing roughly 2,500 LF of existing sewer on 47th Avenue to convey the stormwater disconnected upstream.

Table 8-10 presents the cost for the Oakland Lake Daylighting and Stormwater Diversion Alternative.

Table 8-10. Oakland Lake Daylighting and Stormwater Diversion Alternative Cost

Stormwater Diversion Alternative	November 2024 PBC[1] ($ Million)	Annual O&M Cost ($ Million)	Total Present Worth ($ Million)
Oakland Lake and Ravine Daylighting and Stormwater Diversion Alternative	127.5	1	142.4

8.5 Cost-Attainment Curves for Retained Alternatives

The final step of the analysis is determining the cost-effectiveness of the alternatives based on their projected WQ improvement, operational cost, and projected probable cost to construct.

8.5.a Cost-Performance Curves

Figure 8-13 plots the relationship of percent CSO control to the total PBC of the retained alternatives. The disinfection alternative is presented in terms of an annual equivalent, which is the actual level of CSO control that would be realized over a typical year with disinfection only operational during the recreational season. This method is to ensure a direct comparison with the other retained alternatives.

Percent CSO control ranges from 25 percent (alternative 2A. 2.5 MG additional downstream retention) to 100 percent control (alternative 2D. 41 MG additional downstream retention), with costs spanning from $27.8M (disinfection, no additional downstream retention) to $2,918M (additional 41 MG downstream retention). A second-order, best-fit cost curve was developed based on alternatives that were judged more cost-effective for the CSO control achieved. There were outliers on the positive side of the curve that were not included in the cost curve. For example, for 50 percent CSO volume reduction, the Disinfection and Stormwater Diversion alternatives were more cost-effective than the Additional Downstream Retention alternative. Therefore, the disinfection or daylighting alternatives would be preferred with respect to that amount of CSO control, rather than the retention alternative.

While the resulting curve does not show a clear KOTC, the disinfection and stormwater diversion concept points are far to the left of the plot. Had the calculated best-fit line instead been altered to include both of these points, a clear KOTC would result, thus suggesting that these alternatives are the most cost-effective from a cost-performance basis.

Along with overall CSO volume control, the goal of the LTCP is to reduce bacteria loadings to the waterbody to the extent that such loadings are caused by CSOs. Figure 8-14 and Figure 8-15 plot the cost of the retained alternatives against their associated projected annual *Enterococci* and fecal coliform loading reductions, respectively. The Y-axis shows percent bacteria loading reductions at TI-025, the outfall for the existing Alley Creek CSO Retention Facility.

Percent *Enterococci* CSO loading reduction ranged from a low of 13 percent (Alternative 2A. 2.5 MG additional downstream retention) to a high of 55 percent (Alternative 2D. 41 MG additional downstream retention). The percent CSO fecal coliform loading reduction ranged from a low of around 15 percent (Alternative 2A. 2.5 MG additional downstream retention) to a high of 65 percent reduction (Alternative 2D. 41 MG additional downstream retention).

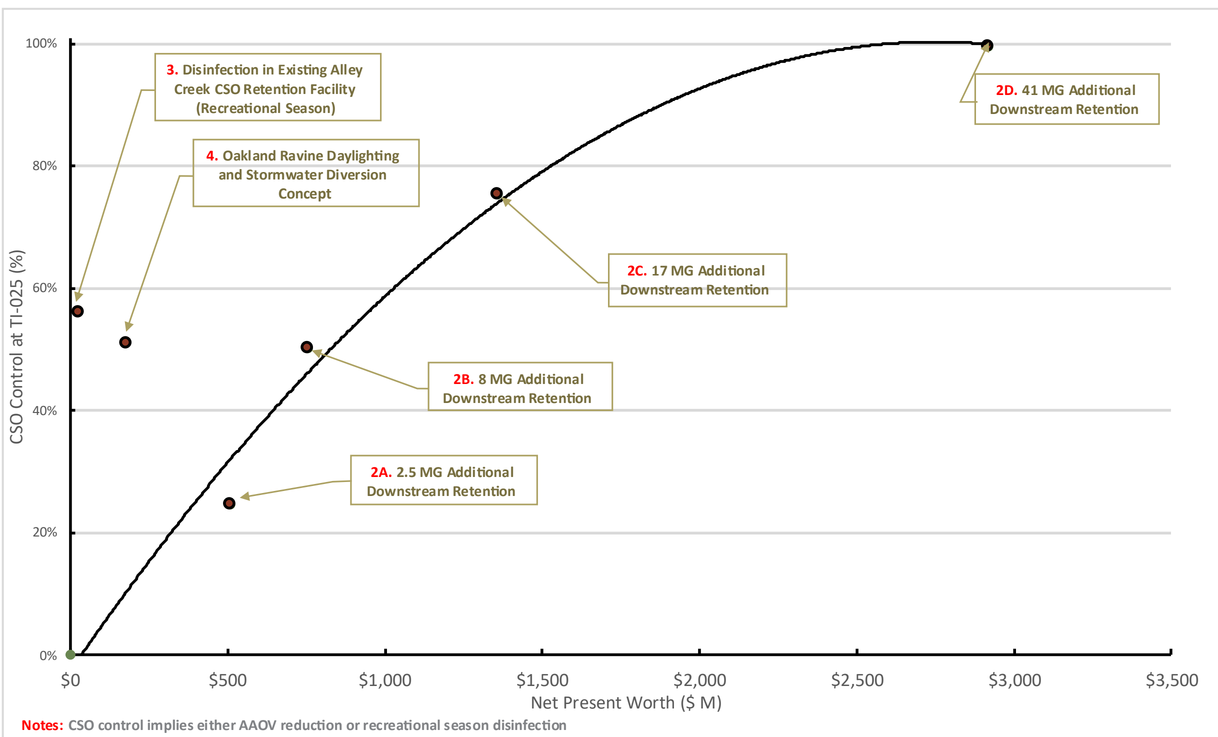

Figure 8-13. Cost vs. CSO Volume Reduction (except disinfection and Oakland Ravine alternatives as noted) – 2008 Rainfall

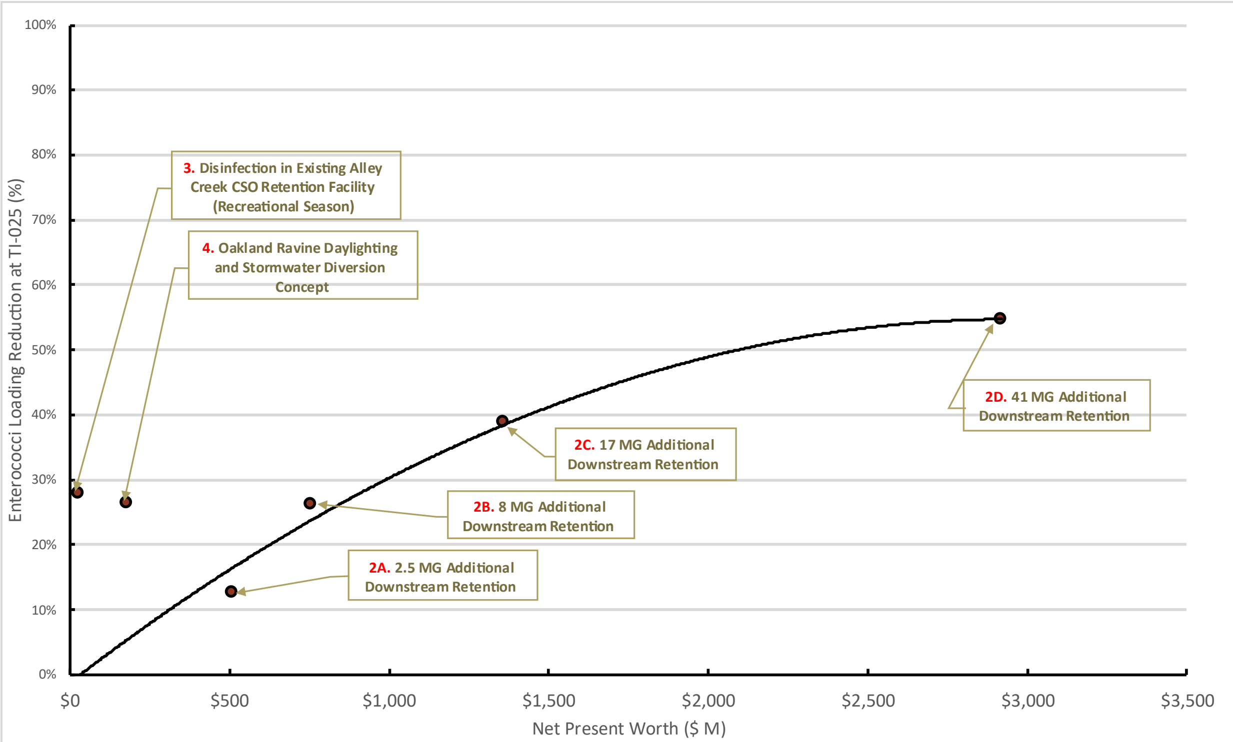

Figure 8-14. Cost vs. *Enterococci* Loading Reduction – 2008 Rainfall

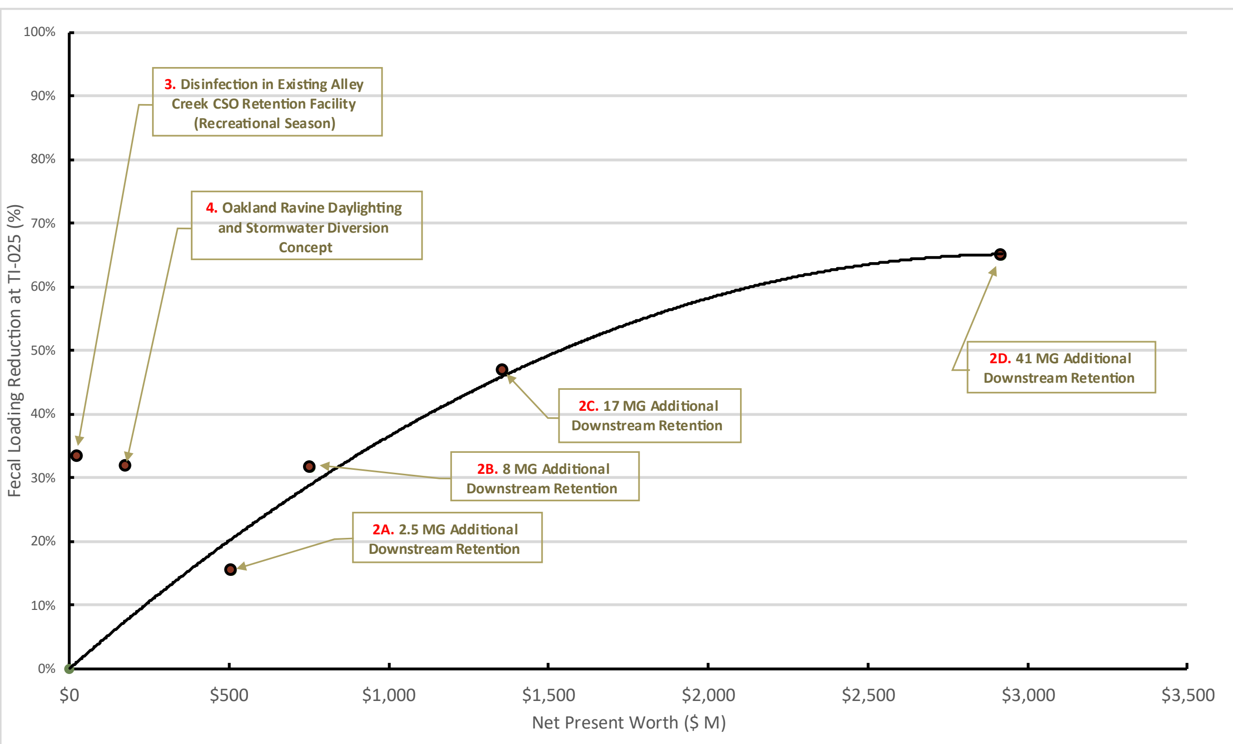

Figure 8-15. Cost vs. Fecal Coliform Loading Reduction – 2008 Rainfall

Second-order best-fit curves were again plotted that excluded the two outliers (Alternative 3 Disinfection in Existing Alley Creek CSO Retention Facility and Alternative 4 Oakland Ravine Daylighting and Stormwater Diversion Concept). As with the previous best-fit curve comparing costs versus level of CSO control (Figure 8-13), there are no discernable KOTCs for either *Enterococci* or fecal coliform. However, as with that earlier curve, had the plots been drawn to encompass the two outliers, the plot would indicate these outlier alternatives are the most cost-effective options.

8.5.b Cost-Attainment Curves

This section addresses costs of the CSO control alternatives versus attainment with Existing WQ Criteria for Alley Creek and Little Neck Bay, with Potential Future Higher Use Primary Contact WQ Criteria. Cost-attainment plots developed for the bacteria WQS are presented as Figure 8-16 through Figure 8-20 for five stations within Alley Creek and Little Neck Bay. In these plots, baseline conditions attainment is represented by the points overlying the Y-axis. Attainment curves shown reflect results from ERTM runs with typical year rainfall as input (2008 JFK) and therefore may show slightly different results than those provided from the 2002 to 2011 ten-year simulations. It should also be noted that, regarding *Enterococci* criteria for the stations within Little Neck Bay, the disinfection points for these curves represent the annual equivalent of operational disinfection during the recreational season, the actual gain in attainment that would occur taking into account the entire year, when considering Existing Secondary Contact and Existing Fecal WQ Criteria which are promulgated for annual attainment. When these attainment points refer to Existing or Potential Future Higher Use Primary Contact WQ Criteria for *Enterococci*, the levels of attainment realized by the operational disinfection during the recreational season are computed for the recreational season.

Modeled attainment of Existing Primary Contact WQ Criteria for *Enterococci* for Little Neck Bay varies with time of year and location in the Bay. The 30-day rolling GM *Enterococci* criterion at the northern end of the Bay is achieved 100 percent of the time during the recreational season at Station E11 under 2008 baseline conditions. Similarly, at Station E11 for modeled 2008 baseline conditions, the fecal coliform monthly GM criterion and the 30-day rolling GM *Enterococci* criterion for secondary contact are fully attained annually. Effectively, at Station E11, there are no performance gaps for bacteria GM criteria.

Figure 8-16 shows the modeled improvement in annual attainment at Station E11 for each alternative for all existing bacteria criteria. When considering the 30-day rolling 90th percentile STV of 130 cfu/100 mL for primary contact recreation, the performance gap is approximately 15 percent, with recreational season attainment occurring 84 percent of the time at Station E11 under baseline conditions and 99 percent of the time with 100 percent CSO control. The Seasonal Disinfection alternative provides up to 14 percent improvement in attainment of the primary contact STV, while the Oakland Lake Retained Alternative provides marginal improvement in attainment of the primary contact STV.

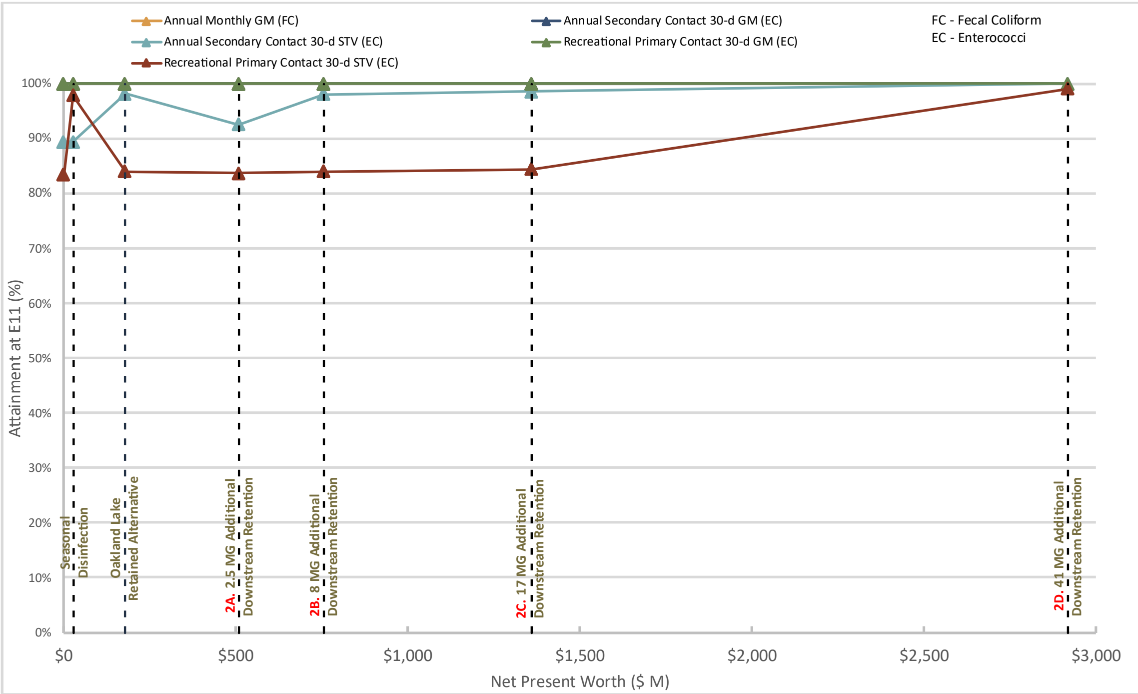

Figure 8-16. Cost vs. Bacteria Attainment near East River (Station E11) – 2008 Rainfall

Figure 8-17 shows the ability of each alternative to attain Class SB WQS at DMA Beach as a function of the total project cost. Baseline rolling 30-day GM conditions are in attainment with Existing WQ Criteria (Class SB and DOHMH) 100 percent of the time during the recreational season. Controlling 100 percent of the CSO would result in a 36 percent increase in recreational season attainment of the primary contact STV criterion, with all other alternatives having a lesser degree of improvement. The Seasonal Disinfection alternative provides up to 19 percent improvement, while the Oakland Lake Retained Alternative provides 18 percent improvement in attainment. The cost-attainment curves for applicable standards for Station LN1, presented in Figure 8-18, are similar to the curves for DMA Beach with somewhat better attainment.

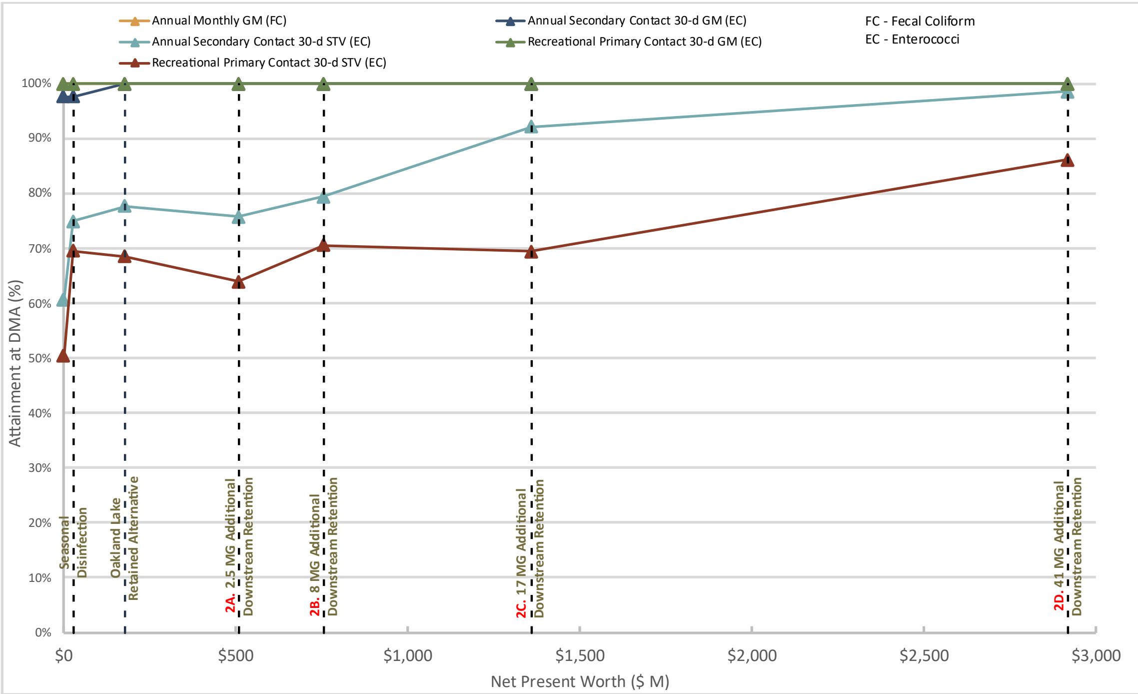

Figure 8-17. Cost vs. Bacteria Attainment at DMA Beach – 2008 Rainfall

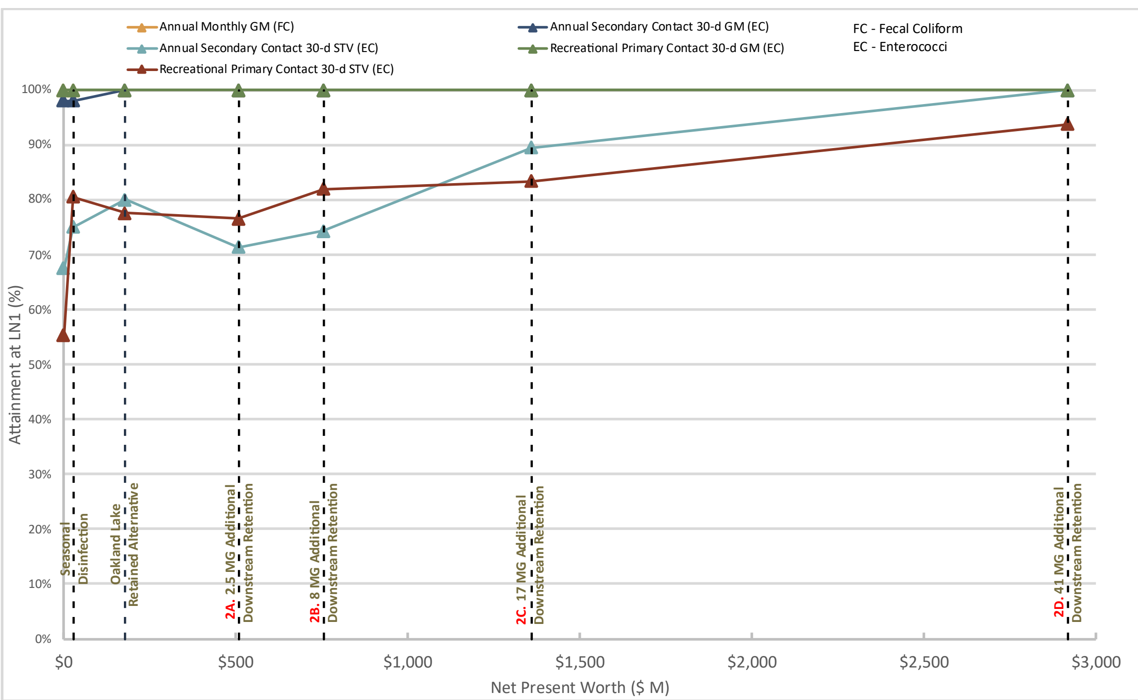

Figure 8-18. Cost vs. Bacteria Attainment at Little Neck Bay (Station LN1) – 2008 Rainfall

Figure 8-19 shows that at Station OW2, in the tidal mixing zone between Alley Creek and Little Neck Bay, there is a 17 percent modeled attainment gap (i.e., 83 percent attainment) annually for the monthly fecal coliform criterion under 2008 baseline conditions and no attainment gap during the recreational season for the 30-day rolling *Enterococci* GM criterion. At the OW2 station, there is only 11 percent and 37 percent modeled attainment of the primary and secondary contact rolling 90th percentile STV criteria, respectively, or attainment gaps of 89 percent and 63 percent, respectively. Controlling 100 percent of the CSO would result in 38 and 43 percent increases in annual attainment of the *Enterococci* STV criteria. These increases in the STV attainment associated with 100 percent CSO control fall short of full attainment. All other retained alternatives would result in even smaller improvements and larger shortfalls.

Figure 8-20 depicts the attainment gain that would result from multiple alternatives at Station AC1. The curves reflect modeled attainment with the existing applicable Class I standard and possible higher use upgrade to Primary Contact WQ Criteria (Class SB/SC). As shown, the largest improvement would be realized in progress toward attaining the higher use Primary Contact *Enterococci* rolling 30-day GM criterion during the recreational season with 100 percent CSO control. Under this scenario, there would only be a maximum 32 percent increase in attainment over baseline conditions, from 28 percent to 60 percent.

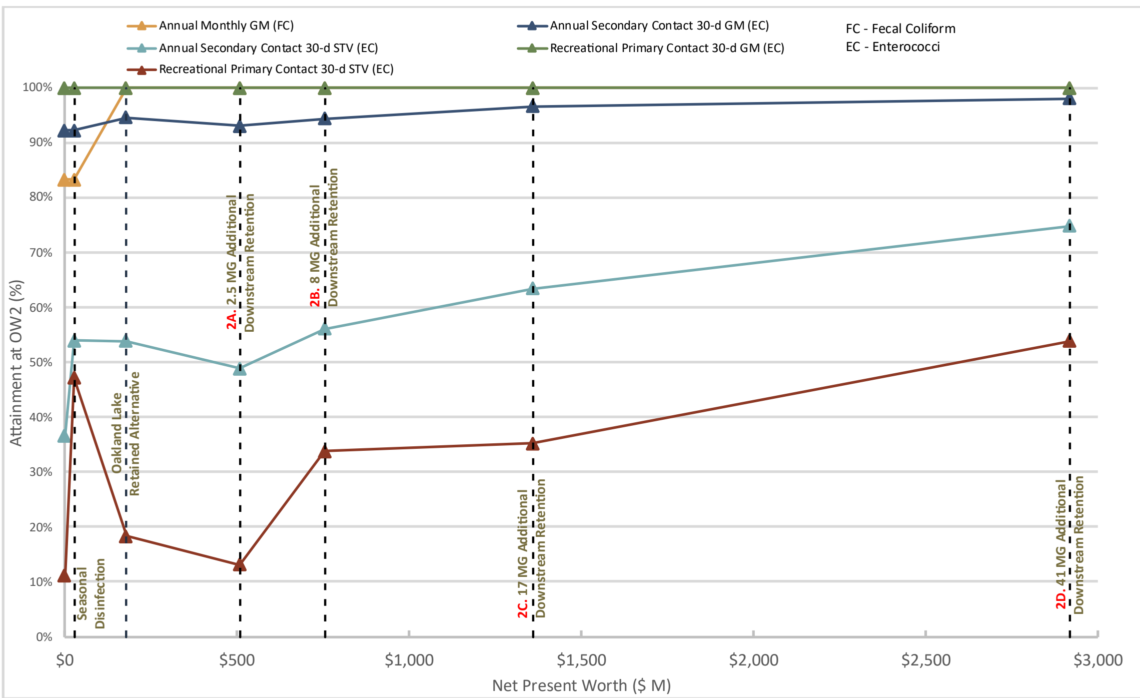

Figure 8-19. Cost vs. Bacteria Attainment at Inner Little Neck Bay (Station OW2) – 2008 Rainfall

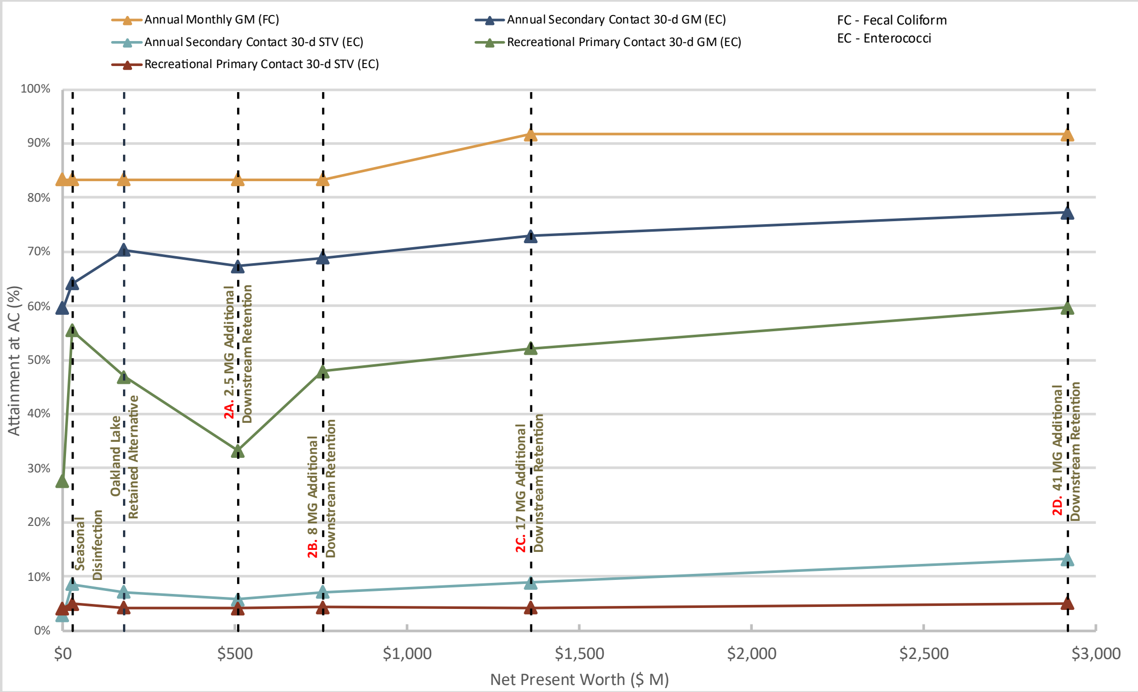

Figure 8-20. Cost vs. Bacteria Attainment at Alley Creek (Station AC1) – 2008 Rainfall

Modeling results show that capturing additional volumes of CSO, regardless of the degree of capture, does not significantly improve the attainment of existing Secondary Contact or higher use Primary Contact WQ Criteria for 30-day rolling 90th percentile STVs at Station AC1. The remaining non-attainment is caused by other sources of pollution. Ecological and physical changes to the characteristics of the waterbody may also be contributing to future non-attainment.

8.5.c Conclusion on Preferred Alternative

Alternative 4 of the CSO LTCP 2026 Supplemental Documentation, the Oakland Ravine Daylighting and Stormwater Diversion concept, with continued operation of the TI-025 CSO Retention Facility, was selected as the new preferred alternative for Alley Creek and Little Neck Bay. It provides a viable alternative to disinfection with comparable WQ improvements along with some additional ecological and community benefits at a slightly higher overall project cost. Alternative 4 has been evaluated against other control measures, and the Oakland Ravine Feasibility Study demonstrates that it is a viable and constructible alternative. Based upon the series of cost performance (Figure 8-13 through Figure 8-15) and cost-attainment (Figure 8-16 through Figure 8-20) plots presented in this section, Alternative 4 would result in similar WQ benefits at a lower cost as compared to other retained alternatives, especially at the AC1 Station where WQ does not yet support the primary contact use. The cost-attainment plots (Figure 8-16 through Figure 8-20) are based on the 2008 typical year model simulations. The WQ model was also used to characterize WQS attainment for the recommended alternative by running the model for the full 10-year simulation period, as was done for the baseline and 100 percent CSO control conditions. The results of the 10-year run, depicting attainment of WQ Criteria with the preferred alternative, are summarized in Table 8-11 and Figures 8-21 to 8-25.

Table 8-11. Modeled 10-year Bacteria Attainment for the Preferred Alternative 4

Waterway	Station	ANNUAL			RECREATIONAL SEASON	
		Fecal Coliform	*Enterococci*		*Enterococci*	
		Monthly GM ≤200 cfu/100 mL (%)	30-day Rolling GM ≤72 cfu/100 mL (%)	30-day Rolling STV ≤266 cfu/100 mL (%)	30-day Rolling GM ≤35 cfu/100 mL (%)	30-day Rolling STV ≤130 cfu/100 mL (%)
Alley Creek[1]	AC1	90	69	14	42	10
Little Neck Bay	OW2	100	96	54	92	31
	LN1	100	100	87	97	67
	E11	100	100	97	99	85
	DMA	100	100	87	98	65

Notes:
[1]The recreational season *Enterococci* criteria protective of Class SB/SC primary contact recreation do not apply to Alley Creek, which is a Class I waterway.
cfu/100 mL = colony-forming units per 100 milliliters; GM = geometric mean

Based on 10-year model results for annual bacteria criteria attainment shown in Table 8-11, implementation of the preferred Alternative 4 is not expected to fully attain Class I secondary contact recreation in Alley Creek. Based on 10-year model results for annual and recreational season bacteria criteria attainment shown in Table 8-11, implementation of the preferred Alternative 4 is, except for primary contact recreation at the OW2 station, expected to fully attain the GM criteria for Class SB primary and secondary contact recreation in Little Neck Bay. The 10-year model results presented in Table 8-11, however, show non-attainment in Little Neck Bay of the STV criteria associated with primary and secondary contact recreation.

In addition to the 10-year attainment model results at the representative station locations in Alley Creek and Little Neck Bay shown in Table 8-11, 10-year model results were also used to calculate attainment in all model grid cells as shown in Figure 8-21 to Figure 8-25. The attainment calculations in all model grid cells allow for more comprehensive spatial assessment. Figure 8-24 shows that based on model results, waters near the Great Neck northeastern shoreline of Little Neck Bay, not captured by the tabulated station results, will likely require additional local source controls to attain the recreational season *Enterococci* rolling 30-day GM criteria supporting primary contact recreation. As captured by results in Table 8-11, Figure 8-24 also highlights the nonattainment near the mouth of Little Neck Bay in the vicinity of the OW2 station tidally influenced by Alley Creek.

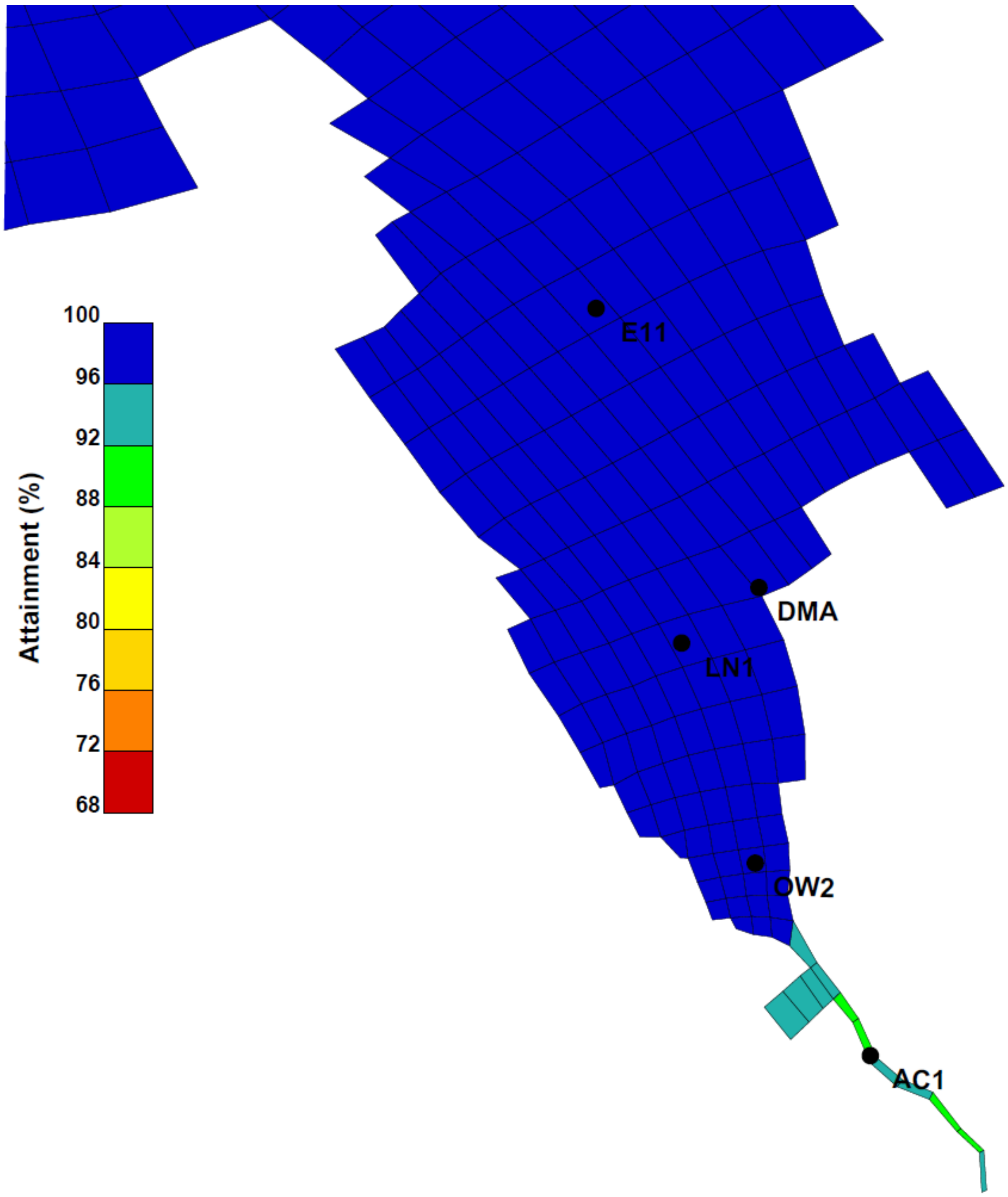

Figure 8-21. Modeled 10-year Annual Fecal Coliform Monthly GM ≤200 cfu/100 mL Attainment for the Preferred Alternative 4 – Revised 2025

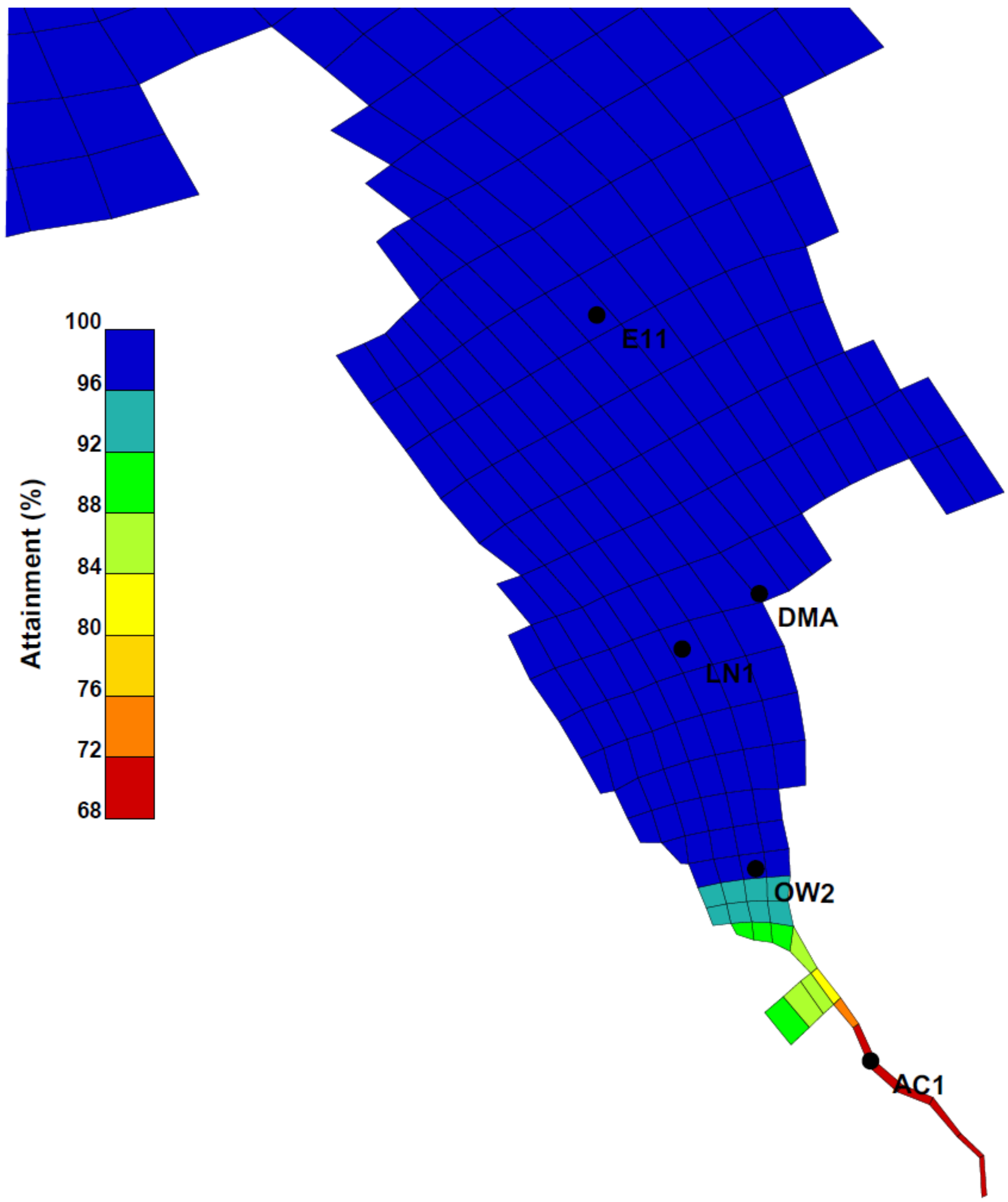

Figure 8-22. Modeled 10-year Annual *Enterococci* Rolling 30-day GM ≤72 cfu/100 mL Attainment for the Preferred Alternative 4

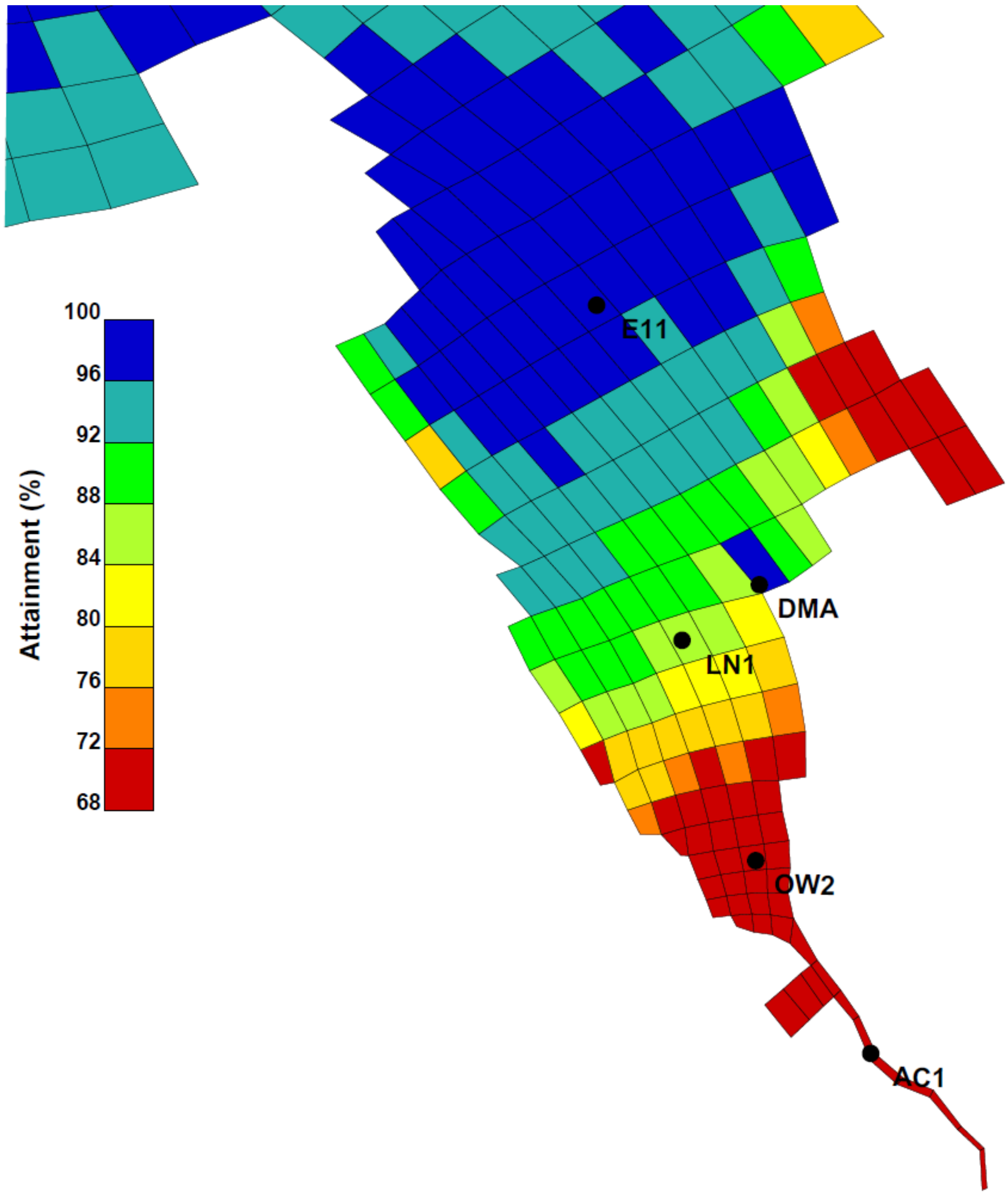

Figure 8-23. Modeled 10-year Annual *Enterococci* Rolling 30-day 90th Percentile STV ≤266 cfu/100 mL Attainment for the Preferred Alternative 4

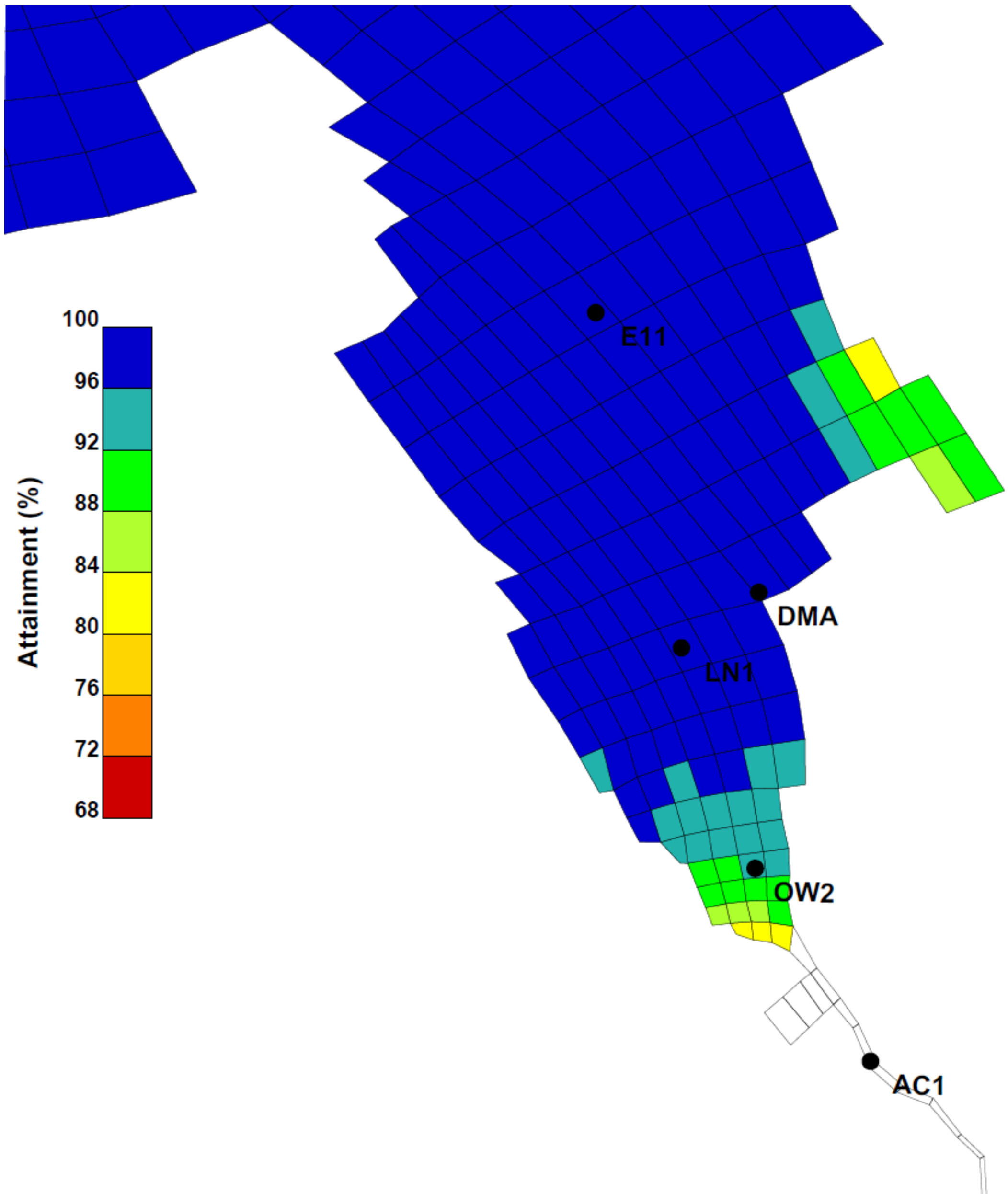

Figure 8-24. Modeled 10-year Recreational Season *Enterococci* Rolling 30-day GM <35 cfu/100 mL Attainment for the Preferred Alternative 4

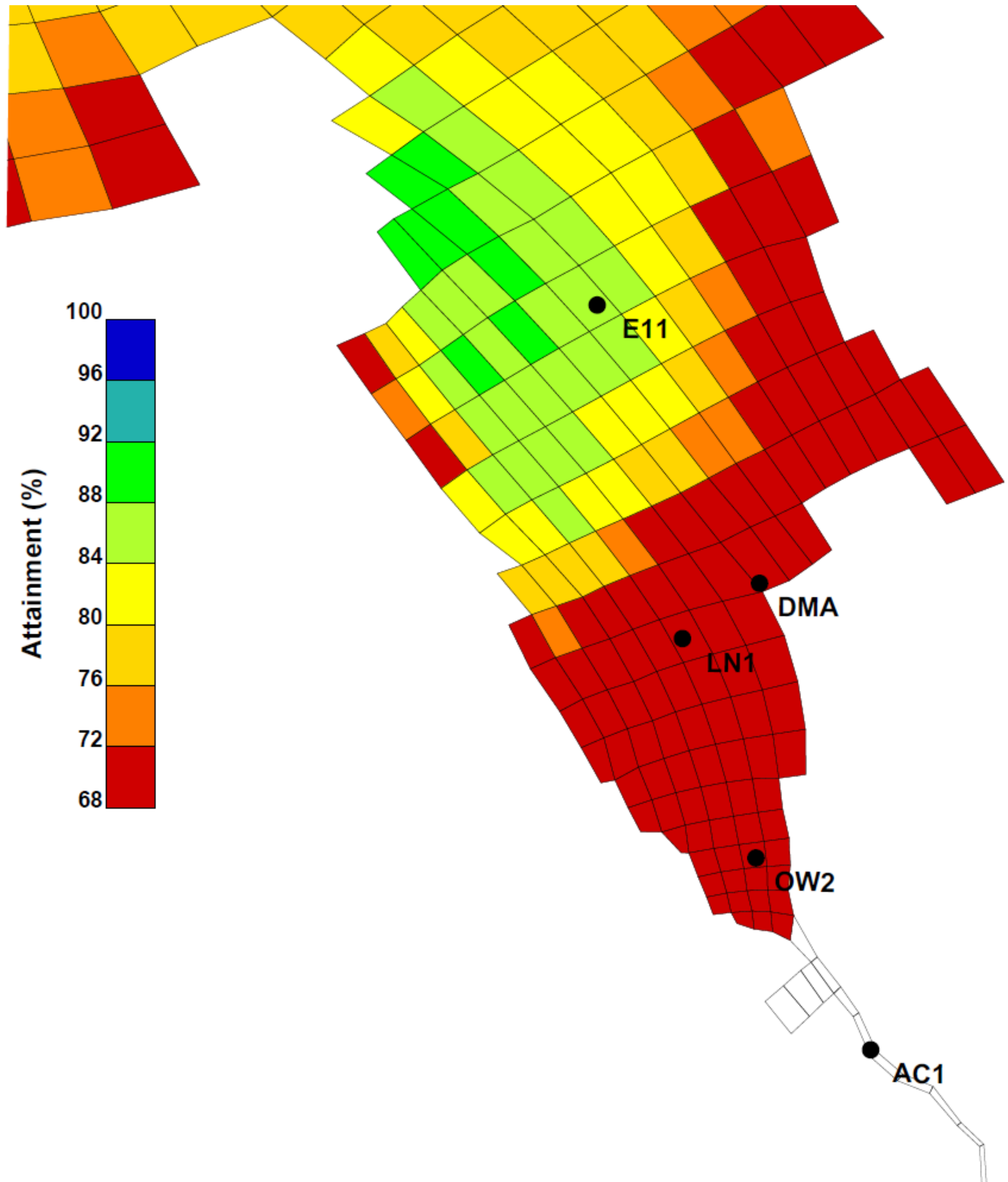

Figure 8-25. Modeled 10-year Recreational Season *Enterococci* Rolling 30-day 90th Percentile STV ≤130 cfu/100 mL Attainment for the Preferred Alternative 4

8.6 Use Attainability Analysis

The CSO Order requires a UAA to be included in LTCPs "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 that 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 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 NYS 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 WQ, 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.

A future 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. A UAA will be completed as part of the coordinated effort between DEP and DEC to support NYS's ongoing waterbody reclassification rulemaking effort for saline waters in and around NYC.

As noted in previous sections, modeling indicates that with the implementation of the Recommended Plan, Alley Creek will achieve less than 95 percent attainment for the Class I *Enterococci* 30-day GM and STV criteria and the fecal coliform monthly GM criterion. Model results show that with the implementation of the Recommended Plan, parts of Little Neck Bay along the Great Neck shoreline and in the vicinity of Station OW2 will achieve less than 95 percent compliance with the Class SB recreational season *Enterococci* 30-day GM criterion. Model results show that with the implementation of the Recommended Plan, Little Neck Bay will achieve less than 95 percent compliance with the Class SB recreational season *Enterococci* 30-day STV criterion. Therefore, a Use Attainability Analysis is needed for Alley Creek and Little Neck Bay.

8.6.a Use Attainability Analysis Elements

The objectives of the CWA are to provide for the protection and propagation of fish, shellfish, wildlife, and recreation in and on the water. Cost-effectively maximizing the WQ benefits associated with CSO reduction is a cornerstone of this LTCP Supplemental Update.

To simplify this process, DEP and DEC have developed a framework that outlines the steps to be taken under the LTCP and DEC's waterbody reclassification rulemaking in two possible scenarios:

- Waterbody meets WQ requirements. This may either be the existing WQS (where primary contact is already designated) or an assessment for an upgrade to the Primary Contact WQ Criteria (where the existing standard is not a Primary Contact WQ Criteria). In either case, an 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.
- 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, local background dry weather sources, direct drainage, and stormwater introduced through the urbanization of the Alley Creek watershed contribute to bacteria levels in Alley Creek and Little Neck Bay. Table 6-2 in Section 6 shows that while the *Enterococci* loading to Alley Creek is dominated by CSO, the *Enterococci* loading to Little Neck Bay is dominated by stormwater. The model was used to assess the impacts of stormwater loading on WQ in both waterways. As noted in Table 6-12 of Section 6.0, based on a modeling analysis of the stormwater (including direct drainage) loading component, NYC and Nassau County stormwater contributes a recreational season 30-day maximum GM of 35.8 cfu/100 mL of *Enterococci* at location Station AC1 in Alley Creek for year 2008 conditions. At Station OW2 in Little Neck Bay, this number reduces to 17.4 cfu/100 mL, while at location LN1, the number is reduced further to 11.6 cfu/100 mL. It should be noted that stormwater alone results in a maximum recreational season 30-day GM concentration of *Enterococci* in Alley Creek that is higher than the primary contact recreation criterion of 35 cfu/100 mL.

Further, as noted in Table 6-12 of Section 6.0, NYC and Nassau County stormwater contributes an annual 30-day maximum GM of 135.9 cfu/100 mL of *Enterococci* at location Station AC1 in Alley Creek for year 2008 conditions. At Station OW2 in Little Neck Bay, this number reduces to 62.1 cfu/100 mL, while at location LN1, the number is reduced further to 36.6 cfu/100 mL. It should be noted that stormwater alone results in a maximum annual 30-day GM concentration of *Enterococci* in Alley Creek that is higher than the secondary contact recreation criterion of 72 cfu/100 mL. Model results in the supplemental tables in Appendix A show that NYC and Nassau County stormwater contributes an annual 30-day maximum 90th percentile STV greater than 266 cfu/100 mL of *Enterococci* at the AC1 and OW2 stations, precluding protection of secondary contact recreation at these locations. Except for model results at the E11 station, other model results for annual 30-day maximum 90th percentile STV from stormwater are greater than 130 cfu/100 mL, singularly precluding attainment of the primary contact recreation STV criterion.

DEP is committed to further characterization and reduction of the local sources and is conducting follow-up investigations into their causes and possible mitigation as part of its Illicit Discharge Detection and Elimination Program, which is part of the MS4 permit. The goal of this would be to eliminate illicit discharges to Alley Creek. DEP, however, does not believe the dry weather bacteria concentrations are entirely illicit discharges but are likely in part the result of waterfowl or other animals living in the natural settings. It is thus anticipated that these natural sources will remain unchanged in the future and are therefore part of the baseline conditions. Although DEP has proposed a plan to control bacteria through the continued use of the Alley Creek CSO Retention Facility to capture CSOs and implementation of the Oakland Ravine Daylighting and Stormwater Diversion concept, there will continue to be other sources of bacteria that will likely preclude full attainment of the bacteria criteria within Alley Creek and Little Neck Bay.

8.6.b Fishable/Swimmable Waters

As noted previously, 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 the SA, SB, and SC classifications as fulfillment of the CWA.

Fecal Coliform and Enterococci

The recommended alternative summarized in Section 8.5 results in the following levels of bacteria attainment with the fishable/swimmable criteria.

Alley Creek

WQ modeling analyses, conducted for Alley Creek and Little Neck Bay for 10-year recommended plan conditions, show that Alley Creek is not expected to comply with the bacteria WQS for Class I waters or for the higher-use WQS for Class SB waters. Since primary contact WQ Criteria are not expected to be attained in Alley Creek, and even a 100 percent reduction in CSO discharges is not projected to attain primary contact standards, a UAA is being pursued for Alley Creek as part of DEC's waterbody reclassification rulemaking.

Little Neck Bay

Little Neck Bay is currently Classified as a Primary Contact waterbody and is projected to have a high level of attainment of the existing primary contact WQ Criteria for both the Fecal Coliform and *Enterococci* GMs. There are some lower attainments of the primary contact WQ Criteria for *Enterococci* STV, especially in the inner portion of Little Neck Bay near the head end, but relatively higher attainments in the open waters of Little Neck Bay.

As noted, DEP is proposing the continued operation of the Alley Creek CSO Retention Facility to capture CSOs and the development of the Oakland Ravine Daylighting and Stormwater Diversion concept. DEP's proposed actions will reduce the human source of bacteria to Alley Creek and Little Neck Bay.

Dissolved Oxygen

Alley Creek and Little Neck Bay are expected to attain the DO criteria at least 95 percent of the time, the desired target of DEC. As that goal is attained, both areas are deemed to be in compliance with the DO criteria. As such, there is no need for a UAA as it relates to DO.

8.6.c Assessment of Highest Attainable Use

The analyses contained herein, as noted above in Section 8.5.c and summarized in Table 8-12, indicate that the existing NYS DEC Class SB (primary contact WQ) GM criteria for bacteria are projected to not be attained in Alley Creek. Further, modeling analyses conducted and described in Section 6.0 show that 100 percent CSO controls would not provide for full compliance with the higher use Primary Contact WQ Criteria for Alley Creek.

Table 8-12. Recommended Plan Compliance with Clean Water Act Bacteria Water Quality Criteria

Location		Bacteria Water Quality Standards Met Under Recommended Plan		
		Existing WQ Criteria	Primary Contact WQ Criteria (Class SB/SC for Alley Creek)	Partial Attainments (%)
Alley Creek		NO	NO	42% Recreational Season GM 10% Recreational Season STV <68% to 88% Annual GM 14% Annual STV 88% to 96% Annual Fecal Coliform GM
Little Neck Bay	Inner Bay	NO	N/A	80% to 100% Recreational Season GM <72% Recreational Season STV 88% to 100% Annual GM <68% to 88% Annual STV
	Outer Bay	NO	N/A	<68% to 92% Recreational Season STV

Location		Bacteria Water Quality Standards Met Under Recommended Plan		
		Existing WQ Criteria	Primary Contact WQ Criteria (Class SB/SC for Alley Creek)	Partial Attainments (%)
				80% to 100% Annual STV
	Northeastern Shore	NO	N/A	80% to 100% Recreational Season GM <68% to 80% Recreational Season STV <68% to 100% Annual STV
DMA Beach		NO	N/A	65% Recreational Season STV 87% Annual STV

Notes:

YES – indicates attainment is calculated to occur ≥95 percent of time.

NO – indicates attainment is calculated to be less ≤95 percent of time.

Recreational Season geometric mean (GM) – indicates *Enterococci* 30-day rolling GM ≤35 colony-forming units per 100 milliliters (cfu/100 mL)

Recreational Season STV – indicates *Enterococci* 30-day rolling 90th percentile ≤130 cfu/100 mL

Annual GM – indicates *Enterococci* 30-day rolling GM ≤72 cfu/100 mL

Annual STV – indicates *Enterococci* 30-day rolling 90th percentile ≤266 cfu/100 mL

Annual Fecal Coliform GM – indicates Fecal Coliform monthly GM ≤200 cfu/100 mL

Endpoints for which modeled full attainment is calculated are not listed in the partial attainment summary.

Additional modeled attainment percentages are reported in Table 8-11 and Figure 8-21 to Figure 8-25.

The modeling analysis assessed whether the recommended plan would improve WQ to allow for Class SB/SC criteria in Alley Creek, both annually and for the recreational season. As shown in Table 8-11 and Table 8-12, modeled bacteria levels would fail to attain the Class I or Class SB/SC criteria at least 95 percent of the time in Alley Creek. As shown in Figure 8-24, the lowest level of modeled *Enterococci* bacteria attainment of the existing 30-day rolling recreational period GM of 35 cfu/100 mL would be 96 percent attainment in the DMA Beach and outer portions of Little Neck Bay, which is assumed herein to allow for the designated use much of the time at those locations in Little Neck Bay. In the inner portions of Little Neck Bay and along a reach of the northeastern shoreline, the lowest level of modeled *Enterococci* bacteria attainment of the recreational period existing 30-day rolling GM of 35 cfu/100 mL would be 80 percent attainment.

8.7 Water Quality Goals

A goal of the CWA is for all waterbodies to attain fishable-swimmable water where that goal can be attained. Analyses provided above indicate that waters even in the outer portions of Little Neck Bay, including DMA Beach, cannot fully support swimmable use with the recommended alternative due to non-attainment of the STV criteria. Full attainment with the primary contact recreation STV values does not seem possible based on the analyses contained herein for Alley Creek or Little Neck Bay.

DEP has developed an approach to move toward the goal of primary contact recreation WQ conditions with the recommended plan to continue to operate the CSO Retention Facility and advance the Oakland Ravine and Lake stormwater diversion. However, as noted, the primary contact recreation criteria (GM or STV) cannot be fully attained in Alley Creek, and not even 100 percent CSO control would enable Alley Creek to attain primary contact WQS.

8.7.a Site-Specific Water Quality Targets

Based on the analyses of these waterbodies, and the WQS associated with the designated uses, the following conclusions can be drawn:

Alley Creek

Alley Creek remains a highly productive Class I waterbody that can support some existing secondary uses, including nature education and wildlife propagation, but not secondary contact recreation. Alley Creek is not projected to attain its current Class I classification because of sources of bacteria to Alley Creek, such as localized sources and multi-jurisdictional stormwater discharges, in addition to CSO discharge. It is not feasible for the waterbody to fully meet the WQ Criteria associated with secondary contact or the next higher classification of SB/SC.

DEP is committed to investigating ways to improve WQ in Alley Creek by tracking down dry weather sources of bacteria from MS4 outfalls under the IDDE program. Therefore, although attaining fishable/swimmable WQS in Alley Creek is a long-term future target, working toward attaining secondary contact recreation appears to be a practical short-term goal. Although combinations of natural and man-made features, as well as desired uses by the public, prevent the opportunity and feasibility of primary contact recreation in Alley Creek.

Little Neck Bay

Little Neck Bay generally (aside from two small areas) meets the Class SB standards greater than 95 percent of the time when examined for the DEC fecal coliform monthly criterion, as well as the rolling 30-day recreational season GM *Enterococci* criterion. It should also be noted that the recreational season compliance (30-day rolling GM) is projected to be nearly 100 percent at DMA Beach for the recommended alternative, the only official bathing beach in the waterbody, which is monitored by DOHMH using the 30-day GM criterion. The presence of non-CSO discharges, dry weather sources, and suspected failed septic systems in Douglaston Manor prevents attainment of Class SB standards sometimes, even with the recommended plan. However, these local sources, in addition to local sources impacting Alley Creek, will need to be eliminated to continue to improve bacteria compliance in Little Neck Bay so that full attainment of the Class SB, including STV, is achieved.

Future Water Quality, Time to Recovery

DEP is committed to improving WQ in Alley Creek and Little Neck Bay. DEP will achieve WQ improvements through the continued use of the Alley Creek CSO Retention Facility to capture CSOs and the development of the Oakland Ravine and Lake Stormwater Diversion concept. Although Alley Creek will not be capable of supporting primary contact, Little Neck Bay comes very close to full attainment of primary contact recreation. Little Neck Bay could possibly be protective of primary contact that does not occur during and following rainfall events when concentrations of bacteria are elevated. To gain insight into the shorter-term impacts of wet-weather sources of bacteria, DEP has performed analyses of modeled bacteria concentrations to assess the amount of time following the end of a rainfall event required for Alley Creek and Little Neck Bay to recover and return to fecal coliform concentrations less than 1,000 cfu/100 mL and *Enterococci* concentrations less than 266 cfu/100 mL and 130 cfu/100 mL.

The analyses consisted of examining the WQ Model calculations for Alley Creek and Little Neck Bay bacteria concentrations for the Recommended Plan for storms greater than 1.0 to 1.5 inches and for the selected August 14–15, 2008, JFK rainfall design event. Details on the selection of the storms are provided in Section 6 of this LTCP. The storms cover approximately 90 percent of the rain events that would occur in an average year. The times to return (or "times to recovery") to a

1,000 cfu/100 mL fecal coliform concentration and 266 cfu/100 mL and 130 cfu/100 mL *Enterococci* concentrations were tabulated for each location within Alley Creek and Little Neck Bay. The results of the analyses are summarized in Table and

Station	Fecal Coliform (1,000 cfu/100 mL)	*Enterococci* (266 cfu/100 mL)	*Enterococci* (130 cfu/100 mL)
	10-year Average Time to Recovery[1] (hours)		
AC1	26.6	34.6	42.5
OW2	18.5	31.0	39.9
LN1	8.0	19.7	24.8
DMA	7.2	18.9	23.2
E11	1.1	9.2	17.3

Notes:

[1] Average time to recovery values presented for storms from the 10-year simulation in the size range of >1.0 to 1.5 inches of rainfall, which includes the 90th percentile rain event. Storms were selected from recreational seasons for the fecal coliform and *Enterococci* 130 colony-forming units per 100 milliliters (cfu/100 mL) threshold evaluations. Storms were selected year-round for the *Enterococci* 266 cfu/100 mL threshold evaluations.

DMA = Douglas Manor Association

Table for various locations within these waterbodies.

As indicated in Table, for the Recommended Plan, the modeled 10-year average time to recovery for *Enterococci* to 130 cfu/100 mL is less than 24 hours at the northern Little Neck Bay stations, including at DMA Beach. Model results for the 10-year average time to recovery for *Enterococci* to 266 cfu/100 mL are similar. Model results for the 10-year average time to recovery for fecal coliform bacteria to 1000 cfu/100 mL are, with the exception of the AC 1 station, less than 24 hours. As indicated in

Station	Fecal Coliform (1,000 cfu/100 mL)	*Enterococci* (266 cfu/100 mL)	*Enterococci* (130 cfu/100 mL)
	10-year Average Time to Recovery[1] (hours)		
AC1	26.6	34.6	42.5
OW2	18.5	31.0	39.9
LN1	8.0	19.7	24.8
DMA	7.2	18.9	23.2
E11	1.1	9.2	17.3

Notes:

[1] Average time to recovery values presented for storms from the 10-year simulation in the size range of >1.0 to 1.5 inches of rainfall, which includes the 90th percentile rain event. Storms were selected from recreational seasons for the fecal coliform and *Enterococci* 130 colony-forming units per 100 milliliters (cfu/100 mL) threshold evaluations. Storms were selected year-round for the *Enterococci* 266 cfu/100 mL threshold evaluations.

DMA = Douglas Manor Association

Table , for the Recommended Plan, the modeled design storm time to recovery for *Enterococci* to 130 cfu/100 mL is less than 24 hours at the E11 station. Model results for design storm time to recovery for *Enterococci* to 266 cfu/100 are less than 24 hours for three Little Neck Bay stations. Model results for design storm time to recovery for fecal coliform bacteria to 1000 cfu/100 mL are, with the exception of the AC 1 station, less than 24 hours.

Table 8-13. 10-Year Time to Recovery (hours) to Fecal Coliform and Enterococci Thresholds for Storms >1.0 to 1.5 Inches – Recommended Plan

Station	Fecal Coliform Threshold (1,000 cfu/100 mL)	*Enterococci* (266 cfu/100 mL)	*Enterococci* Target (130 cfu/100 mL)
	10-year Average Time to Recovery[1] (hours)		
AC1	26.6	34.6	42.5
OW2	18.5	31.0	39.9
LN1	8.0	19.7	24.8
DMA	7.2	18.9	23.2
E11	1.1	9.2	17.3

Notes:
[1] Average time to recovery values presented for storms from the 10-year simulation in the size range of >1.0 to 1.5 inches of rainfall, which includes the 90th percentile rain event. Storms were selected from recreational seasons for the fecal coliform and *Enterococci* 130 colony-forming units per 100 milliliters (cfu/100 mL) threshold evaluations. Storms were selected year-round for the *Enterococci* 266 cfu/100 mL threshold evaluations.

Table 8-14. Design Storm (1.02 inches) Time to Recovery (hours) to Fecal Coliform and Enterococci Thresholds – Recommended Plan

Station	Fecal Coliform Threshold (1,000 cfu/100 mL)	*Enterococci* Threshold (266 cfu/100 mL)	*Enterococci* Threshold (130 cfu/100 mL)
	Design Storm Time to Recovery (hours)		
AC1	27	35	43
OW2	22	34	36
LN1	10	22	34
DMA	21	22	34
E11	7	9	10

cfu/100 mL = colony-forming units per 100 milliliters

8.8 Recommended LTCP Elements to Meet Water Quality Goals

The identified LTCP elements described in this section are the culmination of efforts by DEP to assess the WQS. DEP recognizes that achieving WQ objectives requires more than the reduction of CSO discharges. DEP's CSO Control Facility Planning for these waterbodies began in 1984.

The identified elements for the Alley Creek and Little Neck Bay 2026 Supplemental LTCP are:

1. DEP will continue to use the Alley Creek CSO Retention Facility to capture CSOs.
2. DEP will implement the steps necessary (e.g., demonstration, funding, design, permitting) to construct the Oakland Ravine and Lake Stormwater Diversion concept.
3. The constructed tank, in addition to this Recommended Plan, will not result in the attainment of primary contact WQ Criteria for bacteria in Alley Creek. A UAA will be completed as necessary as part of any NYS waterbody reclassification rulemaking and upon completion will supersede the UAA proposed in June 2014 in the approved 2017 LTCP Appendix E and amended in May 2015 in Appendix H Attachment 4.
4. A post-construction compliance monitoring program will be initiated after the Recommended Plan improvements are operational.

DEP established, with the NYC Department of Health and Mental Hygiene, through public notification, a wet weather advisory during the recreational season (May 1st through October 31st), during which swimming and bathing would not be recommended. The active preemptive standing advisory for DMA Beach is for no swimming for 30 hours after a rainfall of 0.3 to 0.6 inches in 24 hours; for 60 hours after a rainfall of more than 0.6 inches to 2.5 inches in 24 hours; or for 72 hours after a rainfall of more than 2.5 inches in 24 hours. The updated Alley Creek and Little Neck Bay LTCP recovery time analysis, presented in Table and

Station	Fecal Coliform (1,000 cfu/100 mL)	*Enterococci* (266 cfu/100 mL)	*Enterococci* (130 cfu/100 mL)
	10-year Average Time to Recovery[1] (hours)		
AC1	26.6	34.6	42.5
OW2	18.5	31.0	39.9
LN1	8.0	19.7	24.8
DMA	7.2	18.9	23.2
E11	1.1	9.2	17.3

Notes:

[1] Average time to recovery values presented for storms from the 10-year simulation in the size range of >1.0 to 1.5 inches of rainfall, which includes the 90th percentile rain event. Storms were selected from recreational seasons for the fecal coliform and *Enterococci* 130 colony-forming units per 100 milliliters (cfu/100 mL) threshold evaluations. Storms were selected year-round for the *Enterococci* 266 cfu/100 mL threshold evaluations.

DMA = Douglas Manor Association

5. Table , in conjunction with other analyses to be performed as part of the State's waterbody reclassification rulemaking process and UAA development, could be used to establish a revised duration of the wet weather advisory for public notification.

Section 9.0 presents the implementation of the identified elements.

Attachment 6 – Section 9

The 2014 and 2015 versions of the approved 2017 LTCP Section 9 are replaced and superseded by the 2026 Supplemental LTCP version of Section 9 provided below.

9.0 LONG TERM CSO CONTROL PLAN IMPLEMENTATION – 2026 REPLACED

The evaluations performed for this LTCP, in conjunction with those performed as part of the Oakland Ravine Daylighting and Stormwater Diversion Feasibility Study (DEP, 2024), indicate that the Oakland Ravine Daylighting and Stormwater Diversion concept should be selected as the recommended alternative, in lieu of disinfection at the Alley Creek CSO Retention Facility during the recreational season (May 1 through October 31). This conclusion was based on several factors, including:

- Projected large CSO reduction relative to its limited constructability constraints and impact on the hydraulics of Oakland Lake,
- Significant ecological benefits to Oakland Lake and Ravine,
- Community co-benefits (improvements to Parks property),
- Concerns with the implementation of disinfection in Alley Creek given limited dilution, operation and maintenance complexities, and park alienation required for site acquisition.

The WQ in Alley Creek and Little Neck Bay will be improved through the implementation of the following:

1. DEP will continue to use the Alley Creek CSO Retention Facility to capture CSOs.
2. DEP will implement the necessary steps (e.g., facility planning, design, permitting, etc.) to construct the Oakland Ravine and Lake Stormwater Diversion concept.

The analyses developed herein indicate that the baseline and Recommended Plan will achieve attainment with applicable DO WQ Criteria in Alley Creek and Little Neck Bay. Alley Creek and Little Neck Bay have segments where applicable bacteria WQ Criteria cannot be attained at all times under baseline or Recommended Plan conditions. Certain segments remain in nonattainment under the theoretical case of no NYC CSO loadings, suggesting a need for a UAA.

9.1 Adaptive Management (Phased Implementation)

Adaptive management, as defined by the EPA, 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 post-construction monitoring (PCM) program, evaluating monitoring data and trends, and making adjustments or changes to the plan. 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 currently operational CSO controls.

NYC is implementing a program to address stormwater discharges as part of its City-wide MS4 Permit and GI Consent Order. This Stormwater Management Program (SWMP) for the MS4 Permit, along with the actions identified in this LTCP, may further improve WQ in Alley Creek and Little Neck Bay. For more information on the City's MS4 Program, please visit nyc.gov/dep/ms4.

DEP will also continue to monitor the WQ of Alley Creek and Little Neck Bay through its ongoing HSM and SM Programs, as discussed in Section 2.0. For example, if evidence of dry-weather sources of pollution is found, DEP will initiate investigations to identify the source. Such activities will continue to be reported to DEC on a quarterly basis, as is currently required under the SPDES permits for each of the WRRFs with permitted CSO outfalls that may discharge during wet weather to Alley Creek and Little Neck Bay.

9.2 Implementation Schedule

The implementation schedules for the elements of the Alley Creek and Little Neck Bay LTCP Recommended Plan are presented in Figure 9-1. The schedule presents the estimated duration of time needed to conduct further facility planning, procure a design contract and consultants, perform the engineering design, advertise and bid the construction contracts, and complete the construction of the actions identified in this LTCP. The schedules represent the best estimate at this conceptual level given the size, complexity, and access coordination needed to support the projects.

9.3 Operational Plan/O&M

DEP is committed to effectively incorporating the Oakland Ravine Daylighting and Stormwater Diversion concept components into the grey and green improvement projects currently built and planned for Alley Creek and Little Neck Bay. Program-specific O&M plans will be developed for the Oakland Lake and Ravine enhancements, BMPs, and ecological features.

9.4 Projected Water Quality Improvements

As described in Section 8, the elements of the Recommended Plan will reduce CSO and bacterial loadings to Alley Creek by continuing to operate the Alley Creek CSO Retention Facility and by diverting stormwater from the Alley Creek CSO Retention Facility to Oakland Lake and Ravine. Improvements associated with the CSO reduction will be tracked and documented through continued DEP WQ monitoring as part of PCM and HSM. The Recommended Plan will provide benefits beyond WQ improvement to Alley Creek; specific benefits to Oakland Lake and Ravine include restoring the original hydrology of Oakland Lake and Ravine, providing ecological enhancements, and enhancing the space for the community.

Figure 9-1. Alley Creek and Little Neck Bay LTCP – Recommended Plan Schedule

Planning-level costs have been prepared for the various project components and are presented in the following tables (Table 9-1 through Table 9-2). *Note that the costs provided below are preliminary planning level costs and assume a 50 percent contingency for construction; Design/Design Services During Construction (DSDC) is 10 percent of construction cost, and construction management (CM) is 18 percent of construction cost.*

Table 9-1. Oakland Lake Preliminary Cost

Phase	Invasive Vegetation Control and Wetland Shelf	Oakland Lake and Parkland Improvements	Sewer Diversion[1]	Total
Design/DSDC	$150,000	$1,500,000	$6,000,000	$7,650,000
Construction	$1,500,000	$15,000,000	$60,000,000	$76,500,000
CM	$270,000	$2,700,000	$10,800,000	$13,770,000
Total	**$1,920,000**	**$19,200,000**	**$76,800,000**	**$97,920,000**

[1]*The sewer diversion to Oakland Lake includes 6,100 linear feet of sewer construction with a preliminary diameter range of 24 to 108 inches.*

Table 9-2. Oakland Ravine Preliminary Cost

Phase	Daylighting, Natural Enhancements, and BMPs	Sewer Diversion[1]	Total
Design/DSDC	$2,000,000	$3,100,000	$5,100,000
Construction	$20,000,000	$31,000,000	$51,000,000
CM	$3,600,000	$5,580,000	$9,180,000
Total	**$25,600,000**	**$39,680,000**	**$65,280,000**

[1]*The sewer diversion to Oakland Ravine includes 2,900 linear feet of sewer construction with a preliminary diameter range of 12 to 84 inches.*

9.5 Post-Construction Monitoring Plan and Program Reassessment

Ongoing DEP monitoring programs such as the HSM and PCM associated with the Alley Creek CSO Retention Facility will provide WQ data. DEP will conduct PCM after the construction of the elements of the Recommended Plan is completed to assess effectiveness in terms of WQ improvements and CSO reductions.

9.6 Consistency with Federal CSO Policy

The Alley Creek and Little Neck Bay LTCP was developed to comply with the requirements of the EPA CSO Control Policy and associated guidance documents, as well as the CWA.

The selection of the preferred alternative was based on multiple considerations, including public input, environmental benefits, cost-effectiveness, community and societal impacts, and issues related to implementation and O&M. Bacterial WQ was also a consideration given that, as identified in Section 6, the modeled baseline conditions do not fully attain existing WQ Criteria for bacteria.

Table 9-3 presents the projected attainment of existing Class SB Primary Contact Recreation Criteria for *Enterococci* bacteria for Little Neck Bay and Class I Secondary Contact Recreation Criteria for *Enterococci* for Alley Creek for baseline conditions and the Recommended Plan based on 10-year model simulations. As shown in Table 9-3, calculated attainment of the rolling 30-day recreational period GM for *Enterococci* supporting primary contact recreation is greater than 95 percent at the Little Neck Bay stations under baseline conditions, except for at OW2, where the calculated 10-year attainment of the rolling 30-day recreational period GM for *Enterococci* is 87 percent. With modeled implementation of the Recommended Plan, the calculated 10-year attainment of the rolling 30-day recreational period GM for *Enterococci* supporting primary contact recreation increases to greater than 92 at OW2 and greater than 97 percent at the remaining Little Neck Bay stations. In addition, the modeled implementation of the Recommended Plan improves the calculated attainment of the STV criterion supporting primary contact recreation as compared to baseline conditions. As expected, based on the modeled 100 percent CSO control results presented in Section 6, the Recommended Plan does not achieve greater than 95 percent attainment of the STV criterion supporting primary contact recreation in Little Neck Bay. Based on modeling results in Section 6, going to 100 percent CSO control would attain the STV criterion supporting primary contact recreation greater than 95 percent of the time during the recreational season only at E11 and not at other stations within Little Neck Bay.

Model results presented in Table 9-3 also show the 10-year percent attainment for the *Enterococci* annual secondary contact rolling 30-day GM criterion. Most Little Neck Bay stations have greater than 98 percent annual attainment of the *Enterococci* secondary-contact GM criterion for baseline conditions. OW2 has 91 percent annual attainment of the *Enterococci* secondary-contact GM criterion for baseline conditions. Based on the 10-year model results presented in Table 9-3, the Recommended Plan would improve the annual attainment of the *Enterococci* secondary-contact GM criterion to 96 percent at OW2. The model results indicate that the 10-year attainment of the *Enterococci* annual secondary contact rolling 30-day GM criterion within Alley Creek at AC1 is 59 percent for baseline conditions and 69 percent for the Recommended Plan. The 10-year non-attainment of the *Enterococci* annual secondary contact rolling 30-day GM criterion within Alley Creek at AC1 would occur even with 100 percent CSO control as presented in Section 6. Further, the Recommended Plan would improve upon the baseline attainment of the STV criterion supporting secondary contact recreation, albeit to a somewhat lesser extent than 100 percent CSO control. The STV supporting annual secondary contact recreation is attained annually under the Recommended Plan greater than 95 percent of the time only at E11 in Little Neck Bay, based on 10-year model results.

In addition to the results presented in Table 9-3, based on the 10-year model simulation, the Recommended Plan would attain the fecal coliform monthly GM criterion applicable to both Class I and Class SB 95 percent to 100 percent of the time during the recreational season at the Little Neck Bay and Alley Creek stations. On an annual basis, the Recommended Plan would 100 percent attain the fecal coliform monthly GM criterion at the four stations in Little Neck Bay with 90 percent annual attainment at the Alley Creek station.

Table 9-3. Model Projected 10-Yr Attainment of Existing and Higher Use WQ Criteria for *Enterococci* Bacteria for Baseline Conditions and the Recommended Plan

	BASELINE				RECOMMENDED PLAN			
	Annual Secondary Contact Recreation		Recreational Season Primary Contact		Annual Secondary Contact Recreation		Recreational Season Primary Contact	
STATION[1]	GM <72 cfu/100 mL (%)	90th STV <266 cfu/100 mL (%)	GM <35 cfu/100 mL (%)	90th STV <130 cfu/100 mL (%)	GM <72 cfu/100 mL (%)	90th STV <266 cfu/100 mL (%)	GM <35 cfu/100 mL (%)	90th STV <130 cfu/100 mL (%)
AC1[2]	59.3	9.2	32.1	9.1	69.3	14.4	41.8	10.4
OW2	91.1	38.7	87.0	22.7	96.0	54.5	92.2	31.1
LN1	98.1	67.5	95.6	47.3	99.9	86.9	97.4	67.1
E11	100.0	94.6	98.8	76.4	100.0	96.8	99.5	84.9
DMA	98.5	71.5	96.1	48.7	99.9	87.3	97.8	64.9

Notes: cfu/100 mL = colony-forming unit(s) per 100 milliliters; GM = geometric mean, STV = statistical threshold value

[1]Station AC1 is in Alley Creek. Stations OW1, LN1, E11, and DMA are in Little Neck Bay

[2]The Primary Contact Recreation water quality standard is not currently assigned to Alley Creek and represents a higher use.

Affordability and Financial Capability Summary

The DEC is currently undergoing a citywide waterbody reclassification, and many additional waterbodies are likely to be upgraded to primary contact. However, for CSO-impacted waterbodies that are not projected to be able to attain primary contact bacterial standards, DEP will need to submit a Use Attainability Analysis (UAA) in accordance with EPA guidelines for a UAA (https://www.epa.gov/wqs-tech/use-attainability-analysis-uaa). As part of these UAAs, DEP will include detailed financial and affordability data required by the EPA's Financial Capability Assessment (FCA) guidance (https://www.epa.gov/waterfinancecenter/clean-water-act-financial-capability-assessment-guidance). The most recent FCA was included as a section within the Harlem River UAA (https://dec.ny.gov/sites/default/files/2025-04/harlemriveruseattainanalysis.pdf) accepted by DEC in late 2025 and demonstrates the challenging economic circumstances experienced by NYS households. In subsequent UAA submittals, including Alley Creek, DEP will provide updated FCA submittals in accordance with EPA guidelines.

Compliance with Water Quality Goals

Little Neck Bay (Class SB) and Alley Creek (Class I) WQ has been approved via complete CSO projects, including the 5 MG CSO Storage Tank in Alley Creek. Additional WQ improvements will be achieved by implementing the Oakland Lake and Ravine Daylighting Project, continued GI implementation, and MS4 BMPs. Even with these improvements, Alley Creek is not projected to be able to attain primary contact bacterial standards, and even 100 percent CSO controls are not projected to bring this waterbody into attainment due to limited circulation and other sources of bacterial loadings.

The CSO Order Goal Statement stipulates that, in situations where the proposed alternatives presented in the LTCP will not achieve existing WQS or the CWA Section 101(a)(2) goals, the LTCP will include a UAA. The non-attainment of existing WQ Criteria for fecal coliform and *Enterococci* in Alley Creek as identified in the 2025 revisions to Sections 6 and 8 and summarized above will ultimately be addressed by the UAA being completed as part of the NYS's waterbody reclassification rulemaking and will supersede the UAA proposed in the June 2014 LTCP (DEP, 2014) Appendix E and amended in the May 2015 Appendix H Attachment 4.

Attachment 7

The 2014 and 2015 versions of the Approved 2017 LTCP Appendix A are replaced and superseded by the 2026 Supplemental LTCP version of Appendix A provided below.

APPENDIX A: SUPPLEMENTAL TABLES – 2026 REPLACED

Tallman Island Wastewater Treatment Plant Drainage Area: Acreage by Outfall/Regulator

Outfall	Outfall Drainage Area[1]	Regulator	Regulator Drainage Area[2]	Regulated Drainage Area Type	Receiving Water
East River					
TI-003	494.5	R10A	224.6	Separate	Powells Cove
		R10B	269.9	Combined	Powells Cove
		R10	114.2	Separate	Powells Cove
TI-004	68.1	R11	68.1	Combined	East River
TI-005	179.3	R12	179.3	Separate	East River
TI-019	27	R02	27	Combined	East River
TI-020	60.1	R01	60.1	Combined	East River
TI-023	769.9	R13	769.9	Combined	Little Bay
Alley Creek and Little Neck Bay					
TI-006	597.3	24th Avenue PS	74.8	Separate	Little Neck Bay
		Clear View PS	522.5	Separate	Little Neck Bay
TI-007	1074.9	Old Douglaston PS	1074.9	Combined and Separate	Alley Creek
TI-008	55.0	N/A	N/A	Combined, Separate and Freshwater[3]	Alley Creek
TI-684	376.2	New Douglaston PS	77.1	Separate	Alley Creek
TI-025	1448.2[4]	N/A	N/A	Combined, Separate, and Sanitary	Alley Creek
Flushing Bay and Creek					
TI-010	6416.0	R29	122.9	Combined and Separate	Flushing Creek
		R30	787	Combined and Separate	Flushing Creek
		R31	503.4	Combined, Separate and Other	Flushing Creek
		R32	2.7	Combined	Flushing Creek
		R33	2.5	Combined	Flushing Creek

Outfall	Outfall Drainage Area[1]	Regulator	Regulator Drainage Area[2]	Regulated Drainage Area Type	Receiving Water
		R34	7.6	Combined	Flushing Creek
		R35	43.6	Combined	Flushing Creek
		R37	366	Combined	Flushing Creek
		R39	35.3	Combined	Flushing Creek
		R40	135.4	Combined	Flushing Creek
		R40A	119.8	Combined	Flushing Creek
		R41	529	Combined and Other	Flushing Creek
		R43	515.7	Combined, Separate and Other	Flushing Creek
		R44	141.4	Combined	Flushing Creek
		R45	613.1	Combined	Flushing Creek
		R45A	1043.3	Combined	Flushing Creek
		R50	343.6	Combined	Flushing Creek
		R59	68.6	Combined	Flushing Creek
TI-011	943.2	R09	278.2	Combined and Separate	Flushing Creek
		R51	369.4	Combined	Flushing Creek
		R52	16.3	Combined	Flushing Creek
		R53	46.3	Combined	Flushing Creek
		R54	28.1	Combined	Flushing Creek
TI-012	13	122nd Street PS	13	Separate	Flushing Bay
TI-013	28.3	R08	Disconnected from R08	Separate	Flushing Bay
TI-014	18.5	R07	18.5	Combined	Flushing Bay
TI-015	18.6	R06	18.6	Combined	Flushing Bay
TI-016	73.5	R05	73.5	Combined	Flushing Bay

Outfall	Outfall Drainage Area[1]	Regulator	Regulator Drainage Area[2]	Regulated Drainage Area Type	Receiving Water
TI-017	3.5	R04	3.5	Combined	Flushing Bay
TI-018	30.9	R03	30.9	Combined	Flushing Bay
TI-022	308.2	R55	156.8	Combined	Flushing Creek
		R56	85	Combined	Flushing Creek
		R57	14.6	Combined	Flushing Creek
		R58	51.8	Combined	Flushing Creek

Notes:
[1]Only TI-008 and TI-025 outfall drainage areas have been revised for the 2026 CSO LTCP Supplemental Documentation. The TI-008 outfall drainage area is refined from 1044.4 acres to 55 acres. The TI-025 outfall drainage area is refined from 1550.7 to 1448.2 acres.
[2]For locations with regulators in series, the incremental regulator drainage area is listed.
[3]TI-008 is a CSO outfall likely to overflow during higher than typical rainfall conditions. The TI-008 outfall also receives outflow from Oakland Lake and a small separately sewered area. The model assumes a disconnect in the drainage area upstream of the weir in the chamber at the intersection of Cloverdale Boulevard and 223rd Street.
[4]The TI-025 drainage area includes a tributary area upstream of the Horace Harding Expressway where regulators R46 and R47 regulate flow. The drainage area types are combined, separate, and sanitary. The flow downstream of the Horace Harding Expressway is mostly a separately sewered area with a small portion tributary to regulator R49, which regulates separately sewered flow and sanitary flow.
N/A = not applicable; PS = Pump Station or Pumping Station; TI = Tallman Island

Annual Combined Sewer Overflow, Stormwater, Direct Drainage, Local Source Volumes (2008 Rainfall), Baseline

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
Alley Creek	TI-007[1]	ODPS Bypass	0.1
Alley Creek	TI-008	R07	0
Alley Creek	TI-025	R29, R30	**237.5**
Little Neck Bay	TI-009	------	0
		Total CSO	**237.6**

[1]TI-007 is a Combined Sewer Outfall which serves as emergency bypass for a pump station. Under normal conditions TI-007 discharges stormwater.

CSO = Combined Sewer Overflow; MG/Yr = million gallons per year; ODPS = Old Douglaston Pump Station; PS = Pump Station or Pumping Station; TI = Tallman Island

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Discharge, (MG/Yr)**
Alley Creek	TI-008	N/A	14.9
Alley Creek	TI-024	N/A	122.6
Alley Creek	TI-654	N/A	59.9
Alley Creek	TI-655	N/A	7.2
Alley Creek	TI-659	N/A	24.3
Alley Creek	TI-629	N/A	4.1
Alley Creek	TI-630	N/A	9.8

Direct Drainage	N/A	N/A	339.4
Little Neck Bay	TI-006[1]	N/A	174.5
Little Neck Bay	TI-543	N/A	13
Little Neck Bay	TI-623	N/A	2.7
Little Neck Bay	TI-625	N/A	110.9
Little Neck Bay	TI-628	N/A	29.5
Little Neck Bay	TI-633	N/A	33.2
Little Neck Bay	TI-658	N/A	43.2
Little Neck Bay	TI-656	N/A	12.3
Little Neck Bay	TI-660	N/A	51.2
Little Neck Bay	TI-668	N/A	44.7
Little Neck Bay	Nassau County	N/A	1569
Total Stormwater			**2,666.50**

[1]TI-006 is a Combined Sewer Overflow which serves as emergency bypass for a pump station. Under normal conditions TI-006 discharges stormwater.

MG/Yr = million gallons per year; TI = Tallman Island

Local Sources			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
Alley Creek	TI-008	Oakland Lake	802.2
Alley Creek	Headwater	N/A	835.5
Alley Creek	LIE Pond	N/A	934.1
		Total Dry Weather	**2,571.80**

LIE = Long Island Expressway; MG/Yr = million gallons per year; TI = Tallman Island

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
Alley Creek	N/A	N/A	3,247.00
Little Neck Bay	N/A	N/A	2,705.40

MG/Yr = million gallons per year

Totals by Source			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
CSO	N/A	N/A	238
Stormwater	N/A	N/A	2667
Local Sources Baseflows	N/A	N/A	2,571.80

CSO = Combined Sewer Overflow; MG/Yr = million gallons per year

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total Discharge (MG/Yr)**
Alley Creek	CSO	7	237.6
	Stormwater	14	437.6
	Local Sources	79	2,571.80
		Total	**3,247.0**
Little Neck Bay	WPCP	18	476.6
	CSO	0	0
	Stormwater	82	2,228.9
	Local Sources	0	0
		Total	**2,705.5**

CSO = Combined Sewer Overflow; MG/Yr = million gallons per year; WPCP = Water Pollution Control Plans

Annual Combined Sewer Overflow, Stormwater, Direct Drainage Local Sources *Enterococci* Loads (2008 Rainfall), Baseline

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-007	ODPS Bypass	0.8
Alley Creek	TI-008	R07	0
Alley Creek	TI-025	R29, R30	1452.3
Little Neck Bay	TI-009	N/A	0
		Total CSO	**1453.1**

CSO = Combined Sewer Overflow; ODPS = Old Douglaston Pump Station; Org. = organism; PS = Pump Station or Pumping Station; TI = Tallman Island

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-008	Oakland Lake	7.3
Alley Creek	TI-024	N/A	69.6
Alley Creek	TI-654	N/A	34.0
Alley Creek	TI-655	N/A	4.1
Alley Creek	TI-659	N/A	13.8
Alley Creek	TI-629	N/A	2.3
Alley Creek	TI-630	N/A	5.6
Direct Drainage	N/A	N/A	77.1
Little Neck Bay	TI-006	N/A	99.2
Little Neck Bay	TI-543	N/A	7.4
Little Neck Bay	TI-623	N/A	1.5
Little Neck Bay	TI-625	N/A	63.0
Little Neck Bay	TI-628	N/A	16.7
Little Neck Bay	TI-633	N/A	18.9
Little Neck Bay	TI-656	N/A	7.0
Little Neck Bay	TI-658	N/A	24.5
Little Neck Bay	TI-660	N/A	29.1
Little Neck Bay	TI-668	N/A	25.4
Little Neck Bay	Nassau County	N/A	890.7
		Total Stormwater	**1397.2**

N/A = not applicable; Org. = organism; TI = Tallman Island

Local Sources			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-008	Oakland Lake	3.3
Alley Creek	Headwater	N/A	0
Alley Creek	LIE Pond	N/A	2.7
		Total Dry Weather	**6**

LIE = Long Island Expressway; Org. = organism; TI = Tallman Island

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	N/A	N/A	1,640.10
Little Neck Bay	N/A	N/A	1,216.20

Org. = organism

Totals by Source			
Source	**Outfall**	**Regulator**	**Total Org.x10^12**
CSO	N/A	N/A	1,453
Stormwater	N/A	N/A	1,397
Local Sources	N/A	N/A	6

CSO = Combined Sewer Overflow; Org. = organism

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total Org.x10^12**
Alley Creek	CSO	89	1,453.2
	Stormwater	11	180.9
	Local Sources	0	5.9
		Total	**1,640.1**
Little Neck Bay	WPCP	0	0
	CSO	0	0
	Stormwater	100	1,216.2
	Local Sources	0	0
		Total	**1,216.2**

CSO = Combined Sewer Overflow; Org. = organism; WPCP = Water Pollution Control Plans

Annual Combined Sewer Overflow, Stormwater, Direct Drainage

Local Sources Fecal Coliform Loads (2008 Rainfall), Baseline

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-007	ODPS Bypass	3.0
Alley Creek	TI-008	R07	0.0
Alley Creek	TI-025	R29, R30	4,005.0
Little Neck Bay	TI-009	N/A	0.0
		Total CSO	**4,008**

CSO = Combined Sewer Overflow; ODPS = Old Douglaston Pump Station; Org. = organism; PS = Pump Station or Pumping Station; TI = Tallman Island

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-008	Oakland Lake	2.8
Alley Creek	TI-024	N/A	162.4
Alley Creek	TI-654	N/A	79.3
Alley Creek	TI-655	N/A	9.5
Alley Creek	TI-659	N/A	32.2
Alley Creek	TI-629	N/A	5.4
Alley Creek	TI-630	N/A	13.0
Direct Drainage	N/A	N/A	51.4

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Little Neck Bay	TI-006	N/A	231.6
Little Neck Bay	TI-543	N/A	17.3
Little Neck Bay	TI-623	N/A	3.6
Little Neck Bay	TI-625	N/A	146.9
Little Neck Bay	TI-628	N/A	39.1
Little Neck Bay	TI-633	N/A	44.0
Little Neck Bay	TI-656	N/A	16.3
Little Neck Bay	TI-658	N/A	57.2
Little Neck Bay	TI-660	N/A	67.9
Little Neck Bay	TI-668	N/A	59.3
Little Neck Bay	Nassau County	N/A	1,484.6
		Total Stormwater	**2,524**

N/A = not applicable; Org. = organism; TI = Tallman Island

Local Sources			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-008	Oakland Lake	3.8
Alley Creek	Headwater	N/A	0.0
Alley Creek	LIE Pond	N/A	2.7
		Total Dry Weather	**6.5**

LIE = Long Island Expressway; Org. = organism; TI = Tallman Island

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	N/A	N/A	4,348.60
Little Neck Bay	N/A	N/A	2,189.60

Org. = organism

Totals by Source			
Source	**Outfall**	**Regulator**	**Total Org.x10^12**
CSO	N/A	N/A	4,008
Stormwater	N/A	N/A	2,524
Local Sources	N/A	N/A	6.5

CSO = Combined Sewer Overflow; Org. = organism

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total Org.x10^12**
Alley Creek	CSO	92	4,008
	Stormwater	8	334.1
	Local Sources	0	6.5
		Total	**4,348.6**
Little Neck Bay	WPCP	0	0.0
	CSO	0	0
	Stormwater	100	2,189.6
	Local Sources	0	0
		Total	**2,189.6**

CSO = Combined Sewer Overflow; Org. = organism; WPCP = Water Pollution Control Plans

Annual Combined Sewer Overflow, Stormwater, Direct Drainage,

Local Sources BOD_5 Loads (2008 Rainfall)

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total lbs**
Alley Creek	TI-007	ODPS Bypass	30
Alley Creek	TI-008	R07	0
Alley Creek	TI-025	R29, R30	31,632
Little Neck Bay	TI-009	N/A	0
		Total CSO	**31,662**

CSO = Combined Sewer Overflow; lbs = pounds; ODPS = Old Douglaston Pump Station; PS = Pump Station or Pumping Station; TI = Tallman Island

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total lbs**
Alley Creek	TI-008	Oakland Lake	1863
Alley Creek	TI-024	N/A	15,305
Alley Creek	TI-654	N/A	7,478
Alley Creek	TI-655	N/A	893
Alley Creek	TI-659	N/A	3,035
Alley Creek	TI-629	N/A	514
Alley Creek	TI-630	N/A	1,229
Direct Drainage	N/A	N/A	42,405
Little Neck Bay	TI-006	N/A	21,791
Little Neck Bay	TI-543	N/A	1,629
Little Neck Bay	TI-623	N/A	341
Little Neck Bay	TI-625	N/A	13,854
Little Neck Bay	TI-628	N/A	3,684
Little Neck Bay	TI-633	N/A	4,150
Little Neck Bay	TI-656	N/A	1,536
Little Neck Bay	TI-658	N/A	5,391
Little Neck Bay	TI-660	N/A	6,399
Little Neck Bay	TI-668	N/A	5,589
Little Neck Bay	Nassau County	N/A	195,984
		Total Stormwater	**333,070**

CSO = Combined Sewer Overflow; lbs = pounds; N/A = not applicable; TI = Tallman Island

Local Sources			
Waterbody	**Outfall**	**Regulator**	**Total lbs**
Alley Creek	TI-008	Oakland Lake	100,173
Alley Creek	Headwater	N/A	90,885
Alley Creek	LIE Pond	N/A	116,584
		Total Dry Weather	**307,643**

lbs = pounds; LIE = Long Island Expressway; TI = Tallman Island

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total lbs**
Alley Creek	N/A	N/A	393,965
Little Neck Bay	N/A	N/A	283,453

lbs = pounds

Totals by Source			
Waterbody	**Outfall**	**Regulator**	**Total lbs**
CSO	N/A	N/A	31,662
Stormwater	N/A	N/A	333,070
Local Sources	N/A	N/A	307,643

CSO = Combined Sewer Overflow; lbs = pounds

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total lbs**
Alley Creek	CSO	8	31,661
	Stormwater	14	54,661
	Local Sources	78	307,643
		Total	**393,965**
Little Neck Bay	WPCP	2	5,043
	CSO	0.0	0
	Stormwater	98	278,410
	Local Sources	0.0	0
		Total	**283,452**

CSO = Combined Sewer Overflow; lbs = pounds; WPCP = Water Pollution Control Plans

2008 Rainfall Model-Calculated DO and Measures of Attainment[1] for Baseline Conditions (Station AC1)

Station: AC1			
Month in 2008	**Monthly Average DO (mg/L)**	**Monthly Minimum DO (mg/L)**	**Percent of Time DO>=4.0 mg/L**
Jan	9.8	6.3	100
Feb	10.9	7.4	100
Mar	10.2	5.6	100
Apr	8.4	4.9	100
May	6.0	3.3	99
Jun	4.7	2.3	79
Jul	6.2	2.8	925
Aug	6.5	3.3	98
Sep	5.1	1.9	85
Oct	7.3	3.5	99
Nov	7.5	4.6	100
Dec	8.4	5.5	100
Year	**7.8**	**1.9**	**96**

Notes:

[1] Statistical concentrations and attainment percentages were calculated from hourly model results for each of ten depth layers first and then depth averaged for reporting.

DO = dissolved oxygen; mg/L = milligrams per liter

2008 Rainfall Model-Calculated DO and Measures of Attainment[1] for Baseline Conditions (Station LN1)

Station: LN1			
Month in 2008	**Monthly Average DO (mg/L)**	**Monthly Minimum DO (mg/L)**	**Percent of Time DO>=4.0 mg/L**
Jan	11.4	10	100
Feb	12.9	11.7	100
Mar	12.3	11	100
Apr	10.4	9.2	100
May	8	6.6	100
Jun	6.5	5.5	100
Jul	7.7	4.7	99
Aug	8.6	5.5	100
Sep	7.4	6.1	100
Oct	9	6.4	100
Nov	8.8	7.8	100
Dec	10	9.1	100
Year	**9.4**	**4.7**	**100**

Notes:

[1]Statistical concentrations and attainment percentages were calculated from hourly model results for each of ten depth layers first and then depth averaged for reporting.

DO = dissolved oxygen; mg/L = milligrams per liter

2008 Rainfall Model-Calculated DO and Measures of Attainment[1] for Baseline Conditions (Station E11)

Station: E11			
Month in 2008	**Monthly Average DO (mg/L)**	**Monthly Minimum DO (mg/L)**	**Percent of Time DO>=4.8 mg/L**
Jan	10.8	9.5	100
Feb	12.2	11.0	100
Mar	11.9	10.6	100
Apr	10.2	9.1	100
May	8.1	6.8	100
Jun	6.7	5.9	100
Jul	7.9	5.6	100
Aug	7.8	5.6	100
Sep	6.9	5.9	100
Oct	8.1	6.3	100
Nov	8.3	7.5	100
Dec	9.5	8.4	100
Year	**9.0**	**5.6**	**100**

Notes:
[1]Statistical concentrations and attainment percentages were calculated from hourly model results for each of ten depth layers first and then depth averaged for reporting.
DO = dissolved oxygen; mg/L = milligrams per liter

Monthly Surface Fecal Coliform Geometric Mean (cfu/100mL) – Baseline Condition – AC1 (10-Year Simulation)

Year	Month												Annual Percent Attainment
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2002	96	26	142	96	71	46	17	82	77	127	**258**	117	92
2003	69	**297**	177	102	63	**430**	30	42	50	75	182	**282**	75
2004	100	65	105	194	129	65	96	48	72	44	175	**214**	92
2005	**215**	99	140	122	57	36	61	14	26	**349**	128	**396**	75
2006	**280**	53	43	98	86	151	87	41	59	155	196	56	92
2007	161	69	167	**366**	49	64	53	66	23	98	127	**435**	83
2008	102	**331**	146	66	95	51	38	44	83	61	121	**452**	83
2009	112	38	69	180	109	**294**	49	58	42	189	57	**486**	83
2010	60	**204**	**288**	139	42	26	26	32	66	106	79	173	83
2011	193	193	**366**	164	51	36	36	**218**	60	104	97	180	83
% Att.	80	70	80	90	100	80	100	90	100	90	90	40	84

Monthly Surface Fecal Coliform Geometric Mean (cfu/100mL) – 100 Percent CSO Control Condition – AC1 (10-Year Simulation)

Year	Month												Annual Percent Attainment
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2002	76	26	93	74	52	36	17	52	46	79	162	85	100
2003	60	172	135	99	55	149	28	35	40	57	108	160	100
2004	97	47	104	119	99	47	53	39	46	41	103	143	100
2005	147	88	106	74	46	32	33	14	24	157	71	172	100
2006	155	51	39	75	52	92	50	31	48	79	112	45	100
2007	94	69	99	150	41	50	33	44	21	59	101	**236**	92
2008	77	199	98	50	81	43	32	32	50	49	84	**261**	92
2009	81	37	70	115	86	146	46	36	34	103	47	**236**	92
2010	48	147	148	85	32	22	22	25	44	69	54	83	100
2011	136	136	167	99	42	32	33	103	42	73	66	90	100
% Att.	100	100	100	100	100	100	100	100	100	100	100	70	98

Model-Calculated DO and Measures of Attainment for Baseline Conditions – Class SB Criterion[1] (Station AC1)

Station: AC1			
Month in 2008	**Monthly Average DO (mg/L)**	**Monthly Minimum DO (mg/L)**	**Percent of Time DO>=4.8 mg/L**
Jan	9.8	6.3	100
Feb	10.9	7.4	100
Mar	10.2	5.6	100
Apr	8.4	4.9	100
May	6	3.3	88
Jun	4.7	2.3	45
Jul	6.2	2.8	80
Aug	6.5	3.3	90
Sep	5.1	1.9	62
Oct	7.3	3.5	97
Nov	7.5	4.6	100
Dec	8.4	5.5	100
Year	**7.6**		**88**

[1]Class SB has not been assigned to Alley Creek.
DO = dissolved oxygen; mg/L = milligrams per liter

2008 Rainfall Model-Calculated DO and Measures of Attainment for 100 Percent CSO Control Conditions – Class SB Criterion[1] (Station AC1)

Station: AC1			
Month in 2008	**Monthly Average DO (mg/L)**	**Monthly Minimum DO (mg/L)**	**Percent of Time DO>=4.8 mg/L**
Jan	10.1	6.7	100
Feb	11.3	7.8	100
Mar	10.5	6	100
Apr	8.7	5.3	100
May	6.3	3.7	94
Jun	5	2.7	60
Jul	6.6	3.4	87
Aug	7	4	96
Sep	5.6	2.4	78
Oct	7.6	4.2	99
Nov	7.7	5.1	100
Dec	8.7	5.9	100
Year	**7.9**		**93**

[1]Class SB has not been assigned to Alley Creek.

DO = dissolved oxygen; mg/L = milligrams per liter

Calculated 2008 Baseline Surface *Enterococci* Concentrations from Stormwater[1] and Total Loading Sources

Source	Station	*Enterococci* Contribution, cfu/100 mL			
		Geometric Mean		90th Percentile	
		Annual	Max 30-day rolling	Annual	Max 30-day rolling
Stormwater	AC1	16	136	739	2651
Total (Baseline)	**AC1**	**68**	**349**	**1694**	**4625**
Stormwater	OW2	10	62	193	471
Total (Baseline)	**OW2**	**22**	**144**	**519**	**2330**
Stormwater	LN1	7	37	95	203
Total (Baseline)	**LN1**	**13**	**79**	**236**	**805**
Stormwater	E11	3	10	35	82
Total (Baseline)	**E11**	**9**	**43**	**117**	**386**
Stormwater	DMA	7	41	107	236
Total (Baseline)	**DMA**	**13**	**88**	**238**	**817**

[1]The stormwater loading component includes stormwater and direct drainage from New York City and Nassau County.

cfu/100 mL = colony-forming units per 100 milliliters; DMA = Douglas Manor Association; Max = maximum; NYC = New York City

Annual CSO, Stormwater, Direct Drainage, and Local Source Volumes (2008 Rainfall), Recommended Plan

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
Alley Creek	TI-007[1]	ODPS Bypass	0.1
Alley Creek	TI-008	R07	0
Alley Creek	TI-025	R29, R30	116.5
Little Neck Bay	TI-009	N/A	0
		Total CSO	**116.6**

[1]TI-007 is a Combined Sewer Outfall which serves as emergency bypass for a pump station. Under normal conditions TI-007 discharges stormwater.

CSO = Combined Sewer Overflow; MG/Yr = million gallons per year; ODPS = Old Douglaston Pump Station; PS = Pump Station or Pumping Station; TI = Tallman Island

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Discharge, (MG/Yr)**
Alley Creek	TI-008	N/A	14.9
Alley Creek	TI-024	N/A	122.6
Alley Creek	TI-654	N/A	59.9
Alley Creek	TI-655	N/A	7.2
Alley Creek	TI-659	N/A	24.3
Alley Creek	TI-629	N/A	4.1
Alley Creek	TI-630	N/A	9.8
Direct Drainage	N/A	N/A	339.4
Little Neck Bay	TI-006[1]	N/A	174.5
Little Neck Bay	TI-543	N/A	13

Little Neck Bay	TI-623	N/A	2.7
Little Neck Bay	TI-625	N/A	110.9
Little Neck Bay	TI-628	N/A	29.5
Little Neck Bay	TI-633	N/A	33.2
Little Neck Bay	TI-658	N/A	43.2
Little Neck Bay	TI-656	N/A	12.3
Little Neck Bay	TI-660	N/A	51.2
Little Neck Bay	TI-668	N/A	44.7
Little Neck Bay	Nassau County	N/A	1569
Total Stormwater			**2,666.40**

[1]TI-006 is a Combined Sewer Outfall which serves as emergency bypass for a pump station. Under normal conditions TI-006 discharges stormwater.

MG/Yr = million gallons per year; TI = Tallman Island

Local Sources			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
Alley Creek	TI-008	Oakland Lake	990.3
Alley Creek	Headwater	N/A	835.5
Alley Creek	LIE Pond	N/A	934.1
		Total Dry Weather	**2,759.90**

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
Alley Creek	N/A	N/A	3,314.10
Little Neck Bay	N/A	N/A	2,705.40

Totals by Source			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
CSO	N/A	N/A	116.6
Stormwater	N/A	N/A	2666.4
Local Sources Baseflows	N/A	N/A	2,759.90

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total Discharge (MG/Yr)**
Alley Creek	CSO	4	116.6
	Stormwater	13	437.3
	Local Sources	83	2,759.9
		Total	**3,314.1**
Little Neck Bay	WPCP	17	476.6
	CSO	0	0
	Stormwater	83	2,228.9
	Local Sources	0	0
		Total	**2,705.5**

Annual CSO, Stormwater, Direct Drainage, and Local Sources *Enterococci* Loads (2008 Rainfall), Recommended Plan

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-007	ODPS Bypass	0.8
Alley Creek	TI-008	R07	0
Alley Creek	TI-025	R29, R30	700
Little Neck Bay	TI-009	N/A	0
		Total CSO	**701**

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-008	R07	7.3
Alley Creek	TI-024	N/A	69.6
Alley Creek	TI-654	N/A	34.0
Alley Creek	TI-655	N/A	4.1
Alley Creek	TI-659	N/A	13.8
Alley Creek	TI-629	N/A	2.3
Alley Creek	TI-630	N/A	5.6
Direct Drainage	N/A	N/A	77.1
Little Neck Bay	TI-006	N/A	99.2
Little Neck Bay	TI-543	N/A	7.4
Little Neck Bay	TI-623	N/A	1.5
Little Neck Bay	TI-625	N/A	63.0
Little Neck Bay	TI-628	N/A	16.7
Little Neck Bay	TI-633	N/A	18.9
Little Neck Bay	TI-656	N/A	7.0
Little Neck Bay	TI-658	N/A	24.5
Little Neck Bay	TI-660	N/A	29.1
Little Neck Bay	TI-668	N/A	25.4
Little Neck Bay	Nassau County	N/A	890.7
		Total Stormwater	**1397.1**

Local Sources			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-008	Oakland Lake	3.3
Alley Creek	Headwater	N/A	0.0
Alley Creek	LIE Pond	N/A	2.7
		Total Dry Weather	**6.0**

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	N/A	N/A	887.9
Little Neck Bay	N/A	N/A	1,216.2

Totals by Source			
Source	**Outfall**	**Regulator**	**Total Org.x10^12**
CSO	N/A	N/A	701
Stormwater	N/A	N/A	1,397.10
Local Sources	N/A	N/A	6

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total Org.x10^12**
Alley Creek	CSO	80	701
	Stormwater	20	180.9
	Local Sources	1	5.9
		Total	**887.9**
Little Neck Bay	WPCP	0	0
	CSO	0	0
	Stormwater	100	1,216.20
	Local Sources	0	0
		Total	**1,216.20**

Annual CSO, Stormwater, Direct Drainage, and Local Sources Fecal Coliform Loads (2008 Rainfall), Recommended Plan – 2025 Revised

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-007	ODPS Bypass	3
Alley Creek	TI-008	R07	0
Alley Creek	TI-025	R29, R30	1,926
Little Neck Bay	TI-009	N/A	0
		Total CSO	**1,929**

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-008	N/A	2.8
Alley Creek	TI-024	N/A	162.4
Alley Creek	TI-654	N/A	79.3
Alley Creek	TI-655	N/A	9.5
Alley Creek	TI-659	N/A	32.2
Alley Creek	TI-629	N/A	5.4
Alley Creek	TI-630	N/A	13.0
Direct Drainage	N/A	N/A	51.4
Little Neck Bay	TI-006	N/A	231.6
Little Neck Bay	TI-543	N/A	17.3
Little Neck Bay	TI-623	N/A	3.6
Little Neck Bay	TI-625	N/A	146.9
Little Neck Bay	TI-628	N/A	39.1
Little Neck Bay	TI-633	N/A	44.0
Little Neck Bay	TI-656	N/A	16.3

Little Neck Bay	TI-658	N/A	57.2
Little Neck Bay	TI-660	N/A	67.9
Little Neck Bay	TI-668	N/A	59.3
Little Neck Bay	Nassau County	N/A	1,484.6
		Total Stormwater	**2523.7**

Local Sources			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-008	Oakland Lake	3.8
Alley Creek	Headwater	N/A	0.0
Alley Creek	LIE Pond	N/A	2.7
		Total Dry Weather	**6.5**

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	N/A	N/A	2,269.80
Little Neck Bay	N/A	N/A	2,189.60

Totals by Source			
Source	**Outfall**	**Regulator**	**Total Org.x10^12**
CSO	N/A	N/A	1929.2
Stormwater	N/A	N/A	2523.7
Local Sources	N/A	N/A	6.5

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total Org.x10^12**
Alley Creek	CSO	85	1929.2
	Stormwater	15	334.1
	Local Sources	0	6.5
		Total	**2,269.8**
Little Neck Bay	WPCP	0	0
	CSO	0	0
	Stormwater	100	2189.6
	Local Sources	0	0
		Total	**2,189.6**

GLOSSARY

1.5xDDWF	One and one-half times design dry weather flow
2xDDWF	Twice the design dry weather flow
AAOV	Annual average overflow volumes
AMP	Asset Management Plan
APEC	Alley Pond Environmental Center
B	Billion
BEPA	Bureau of Environmental Planning and Analysis
BMP	Best Management Practices
BNR	Biological Nutrient Removal
BOD	Biochemical oxygen demand
BWSO	Bureau of Water and Sewer Operations
$CBOD_5$	Five-day carbonaceous biochemical oxygen demand
cfu/100 mL	Colony-forming unit(s) per 100 milliliters
CIP	Capital Improvement Plan
CM	Construction Management
COLA	Cost of Living Adjustment
COLI	Cost of Living Index
CPI	Consumer Price Index
CSO	Combined Sewer Overflow
CSS	Combined sewer system
CWA	Clean Water Act
CY	Calendar Year
DCIA	Directly Connected Impervious Areas
DCP	Department of City Planning
DEC	Department of Environmental Conservation
DEP	Department of Environmental Protection
DMA	Douglas Manor Association
DMR	Discharge Monitoring Reports
DO	Dissolved oxygen
DOH	Department of Health
DOHMH	Department of Health and Mental Hygiene
DPR	Department of Parks & Recreation
DWF	Dry weather flow
EMS	Event Mean Concentrations
EPA	United States Environmental Protection Agency
ERTM	East River Tributaries Model
ET	Evapotranspiration
FAD	Filtration Avoidance Determinations
FAQs	Frequently Asked Questions
FCA	Financial Capability Assessment
FY	Fiscal year
GHG	Greenhouse gases
GI	Green infrastructure
GIS	Geographic Information Systems

GM	geometric mean
HEAP	Home Energy Assistance Program
HSM	Harbor Survey Monitoring
HydroQual	HydroQual Environmental Engineers & Scientists, P.C.
IEC	Interstate Environmental Commission
IW	InfoWorks
IW Model	InfoWorks Sewer System Model
JFK	John F. Kennedy
lb(s)	Pound(s)
LIE	Long Island Expressway
LIRR	Long Island Rail Road
LTCP2	Long Term Control Plan 2
LTCP	Long Term Control Plan
M	Million
MCP	Multi-family Conservation Plan
MG	Million gallons
MGD	Million gallons per day
mg/L	Milligrams per liter
MG/yr	Million gallons per year
MHI	Median Household Income
MMP	Mercury Minimization Program
MPN/100 mL	Most probable number of bacteria per 100 milliliters of water
MS4	Municipal separate storm sewer systems
MST	Microbial Source Tracking
N/A	Not applicable
$NaHSO_3$	Sodium bisulfite
ng/L	Nanograms/liter
NMC	Nine Minimum Controls
NWI	National Wetlands Inventory
NPW	net present worth
NYC or City	New York City
NYCDOT	New York City Department of Transportation
NYCHA	New York City Housing Authority
NYCRR	New York Code, Rules, and Regulations
NYS	New York State
O&M	Operations and maintenance
ODPS	Old Douglaston Pump Station
OneNYC	One New York: The Plan for a Strong and Just City
Org.	Organism
PBC	Probable Bid Cost
PCM	Post-Construction Monitoring
PS	Pump Station or Pumping Station
QSD	Queens Sewer Datum
RI	Residential indicator
RI/FS	Remedial Investigation/Feasibility Study
RWQC	Recreational Water Quality Criteria

S&P	Standard and Poor's
SNAD	Special Natural Area District
SPDES	State Pollutant Discharge Elimination System
SSS	Separate sewer system
Station AC1	Alley Creek Station 1
STV	Statistical threshold value
SYNOP	Synoptic Surface Plotting
TI	Tallman Island
TI Model	Tallman Island Wastewater Treatment Plant System Model
TRC	Total Residual Chlorine
TSS	Total Suspended Solids
UAA	Use Attainability Analysis
U.S.	United States
USA	Use and Standards Attainment Study
UV	Ultraviolet
VTS	Vertical Treatment Shaft
WPCP	Water Pollution Control Plans
WQ	Water quality
WQBEL	Water quality based effluent limit
WQS	Water Quality Standards
WWFP	Waterbody/Watershed Facility Plan
WWOP	Wet Weather Operation Plans
WWTP	Wastewater Treatment Plant

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