7.0 PUBLIC PARTICIPATION AND AGENCY COORDINATION

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 public concerning water quality and the challenges and opportunities for CSO controls. As described in the Public Participation Plan, DEP will strategically and systematically implement activities that meet the information needs of a variety of stakeholders, in an effort to meet critical milestones in the overall LTCP schedule outlined in the 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.

7.1 Local Stakeholder Team

DEP began the public participation process for the 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 (APEC, Natural Resources Defense Council, Metropolitan Waterfront Alliance, IEC and Udalls Cove Preservation Society); community planning organizations (Douglaston Historical Society, DMA, 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 DOH).

Given the proximity of the study area to an existing park, DEP has also worked closely with DPR. In addition to engaging DPR as a stakeholder in the 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, map watershed resource uses and future uses, identify and prioritize opportunities, and help develop a strategy for implementation. DEP plans to continue to meet with DPR and the WAC to coordinate planning efforts and leverage opportunities for plan implementation.

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

DEP has held public meetings and several stakeholder group meetings to aid in the development and execution of the LTCP. The objective of the public meetings 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 and improvement projects; solicit input on waterbody uses.

  DEP and DEC co-hosted a Public Kickoff Meeting to initiate the water quality planning process for long term control of CSOs in the Alley Creek and Little Neck Bay Waterbody. The two-hour event, held at Alley Pond Environmental Center (APEC) in Queens, served to provide overview 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 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;
  - Water 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 water quality conditions.

  On May 1, 2013, DEP hosted a second Public Meeting to continue the water quality planning process for 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 status of existing 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;
  - Water 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, 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 (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.

Stakeholder Meetings

- 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, 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 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.

7.3 Coordination with Highest Attainable Use

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 the LTCP will not achieve existing WQS or the Section 101(a)(2) goals, the LTCP will include a UAA to examine whether applicable waterbody classifications criteria or standards should be adjusted by the State. The UAA assesses the waterbody's uses, which the State will consider in adjusting WQS, classifications, criteria and developing waterbody-specific criteria.

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

Furthermore, combinations of natural and manmade features prevent both the opportunity and feasibility of primary contact recreation in Alley Creek. Little Neck Bay generally meets the Class SB criteria, approximately 99 percent of the time for fecal coliform (see Table 6-4) and 95 percent of the time for enterococci (see Table 6-5). It should be noted, however, that the bathing season monthly GM fecal coliform compliance is 100 percent at Douglaston Manor Association (DMA) Beach and 30-day rolling GM enterococci compliance is 95 percent at Douglaston Manor Association (DMA) Beach, the only official bathing beach in the waterbody. However, the continued presence of non-CSO discharges, most notably stormwater from MS4 outfalls, prevents annual attainment of Class SB standards, even when 100 percent CSO volume reduction is considered (see Section 6.0). Given that CSO control alone is projected to not allow Class SB criteria to be met at all times, upgrading the classification of Little Neck Bay to Class SA under the LTCP program is not feasible.

DEP obtained public feedback on waterbody uses in Alley Creek and Little Neck Bay at the May 1, 2013 Public Meeting. That there 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 will continue to gather any additional public feedback and will provide the public UAA-related information at the third Alley Creek and Little Neck Bay Public Meeting.

7.4 Internet Accessible Information Outreach and Inquiries

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

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

Category	Mechanisms Utilized	Dates (*if applicable*) and Comments
Regional LTCP Participation	Citywide LTCP Kickoff Meeting and Open House	• June 26, 2012
	Annual Citywide LTCP Meeting – Modeling Meeting	• February 28, 2013
Waterbody-specific Community Outreach	Public meetings and open houses	• Kickoff Meeting: October 24, 2012 • Meeting #2: May 1, 2013 • Meeting #3: TBD
	Stakeholder meetings and forums	• Little Neck Bay Festival: September 29, 2012 • APEC meeting: October 24, 2012 • Queens CB 11 on June 10, 2013
	Elected officials briefings	• Queens Borough Cabinet Briefing: September 12, 2012 • Queens Borough Cabinet Meeting:

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

Category	Mechanisms Utilized	Dates (*if applicable*) and Comments
		October 21, 2013
Data Collection and Planning	Establish online comment area and process for responding to comments	• Comment area added to website on October 1, 2012 • Online comments receive response within 2 weeks of receipt
	Update mailing list database	• DEP updates master stakeholder database (700+ stakeholders) after each meeting and briefing
Communication Tools	Program Website or Dedicated Page	• LTCP Program website launched June 26, 2012 and frequently updated • Alley Creek LTCP webpage launched October 1, 2012 and frequently updated
	Social Media	• N/A
	Media Outreach	• Posting Advertisements in local newspapers and emailing stakeholders.
	FAQs	• LTCP FAQs developed and disseminated beginning June 26, 2012 via website, meetings and email
	Print Materials	• LTCP FAQs: June 26, 2012 • LTCP Goal Statement: June 26, 2012 • LTCP Public Participation Plan: June 26, 2012 • Alley Creek Summary: October 15, 2012 • LTCP Program Brochure: February 28, 2013 • Glossary of Modeling Terms: February 28, 2013 • Meeting advertisements, agendas and presentations • PDFs of poster board displays from meetings • Meeting summaries and responses to comments • Quarterly Reports • WWFPs
	Translated Materials	• As-needed basis
	Portable Informational Displays	• Poster board displays at meetings
	Advisories and Notifications	• TBD
	Construction Outreach	• N/A
Student Education	Participate in ongoing education	• Little Neck Bay Festival: September 29,

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

Category	Mechanisms Utilized	Dates (*if applicable*) and Comments
	events	2012

DEP launched its LTCP Program website on June 26, 2012. The website provides links to documents related to the LTCP program, including CSO Orders on Consent, approved WWFPs, CSO Quarterly Reports, links to related programs such as the Green Infrastructure Plan, and handouts and poster boards distributed and displayed at public meetings and open houses. A LTCP feedback email account was also created to receive LTCP-related feedback, and stakeholders can sign up to receive LTCP Program announcements via email. Refer to Appendix D, Summary of Public Comments Received via Email and DEP Responses, for this feedback. In general, DEP's LTCP Program website:

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

A specific Alley Creek LTCP webpage was created in September 2012, and includes the following information:

- Alley Creek public participation and education materials
  - Alley Creek and Little Neck Bay Summary Paper
  - Alley Creek Waterbody/Watershed Facility Plan
  - LTCP Public Participation Plan
  - LTCP submitted in November of 2013
  - Article 78 petition
- Alley Creek LTCP Meeting Announcements
- Alley Creek Kickoff Meeting Documents – October 24, 2012
  - Advertisement
  - Meeting Agenda
  - Meeting Presentation
  - Meeting Summary and Response to Comments

- Queens Borough Cabinet Presentation – September 12, 2012
- Alley Creek Meeting #2 Meeting Documents – May 1, 2013
    - Advertisement
    - Meeting Agenda
    - Meeting Presentation

Meeting Summary and Response to Comments

8.0 EVALUATION OF ALTERNATIVES

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 water quality 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 reduce CSO discharges and improve water quality (Section 8.1)
- CSO control alternatives and evaluations of each (Section 8.2)
- CSO reductions and water quality benefits achieved by the higher-ranked alternatives as well as their estimated costs (Sections 8.3 and 8.4)
- Cost-performance and water quality attainment assessment for the higher ranked alternatives to select the preferred alternative (Section 8.5)
- Use Attainability Analysis (UAA) and site-specific targets to demonstrate continuing water quality improvements for Alley Creek (Sections 8.6 and 8.7). Wet weather advisories for Little Neck Bay to be protective of primary contact during and following rainfall events.

8.1 Considerations for LTCP Alternatives under the Federal CSO Policy

This LTCP addresses the water quality goals of the federal CWA and associated EPA CSO Control Policy and the New York State Environmental Conservation Law. It builds upon the EPA NMCs, part of the EPA CSO Control Policy, as well as the conclusions presented in DEP's 2009 WWFP Consistent with the LTCP Goal Statement, this LTCP includes a UAA which examines whether applicable waterbody classifications, criteria, or standards should be adjusted by the State 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, 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 described, followed by the process for evaluating and ranking the alternatives.

8.1.a Performance

Section 6.0 presented evaluations of baseline conditions and concluded that there are no performance gaps because baseline conditions attain current WQS. Specifically, both Alley Creek and Little Neck Bay are in attainment with current DO and bacteria criteria. Also, modeling results indicate that Alley Creek cannot attain the more stringent Primary Contact WQ Criteria, the SC Classification, due to the presence of non-CSO sources of bacteria in the Creek. Therefore, discussion of performance for Alley Creek and Little Neck Bay alternatives will focus on bacteria criteria and standards.

Sensitivity analyses described in Section 6.0 assessed the possibility of attainment for the Primary Contact WQ Criteria (Class SC), and for the 2012 EPA Recommended Recreational Water Quality Criteria that may be adopted by DEC (referred to herein as Future Primary Contact WQ Criteria). The results indicate that although 100 % CSO control (complete removal of bacteria) could result in an incremental increase in attainment, it would not close the bacteria performance gap for Alley Creek when considering existing or WQ criteria. However, when the Primary Contact WQ Criteria (Class SC) was applied during recreational season, full attainment ($\geq$95%) is observed with 100% CSO control. These results are based on the predictions of the calibrated and validated numeric modeling results which will require additional validation from the post-construction monitoring of the preferred alternative.

During the development of control alternatives, performance was examined to evaluate potential WQS attainment. This LTCP includes alternatives that include 0, 25, 50, 75 and 100 percent reductions in CSO volume. However, for some alternative control measures, such as disinfection, there is no reduction in CSO volume, but a reduction in bacteria loading instead. Performance of each control alternative is measured against its ability to meet the WQS and water quality requirements for the 2040 planning horizon. It is essential that proposed control alternatives be capable of meeting the modeled anticipated performance. As such, only proven control measures are included in the plan alternatives.

8.1.b Impact on Sensitive Areas

During the development of alternatives, special consideration was made to minimize the impact of construction, to protect existing sensitive areas, and to enhance water quality 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. The 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, 1995a).

8.1.c Cost

Cost estimates for the alternatives were computed using a costing tool based on parametric costing data. This approach is assumed to provide an Association for the Advancement of Cost Engineering

(AACE) Class V estimate (accuracy range of plus 50 percent to minus 30 percent), which is appropriate for this type of planning evaluation.

For the LTCP alternatives, total project cost includes the capital cost of the project, including construction, engineering and other project development costs. Annual operation and maintenance (O&M) costs are then used to calculate the total present worth or value over the projected useful life of the project. To quantify costs and benefits, alternatives are compared based on reductions of CSO discharge volume and bacteria loading against the total cost of the alternative. The resulting graph, called the knee-of-the-curve (KOTC), is used to help select the final recommended alternative. In doing so, the alternative that achieves the greatest appreciable water quality improvements at the lowest cost is selected; this may not necessarily be the lowest cost alternative, however. Beyond the comparative evaluation of alternatives, cost-effectiveness must be assessed from a broader perspective. Recommended alternatives must be capable of achieving water quality goals in a fiscally responsible and affordable manner to ensure that resources are properly allocated across the overall citywide LTCP program.

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, and can have an impact on overall effectiveness of a control measure. Therefore, reliability and proven history were used to assess the technical feasibility and cost effectiveness of a control measure.

Several site-specific factors were considered when evaluating an alternative's technical feasibility including available space, neighborhood assimilation, impact on parks and green space, and 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 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 in the analysis, this may have affected where the facility would be constructed, or gave preference to a facility that could be expanded at a later date with minimal cost and disruption of operation.

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

As regulatory requirements change, the need for improvements in nutrient removal or disinfection could arise. The ability of a CSO control technology to be retrofitted to handle process improvements improved the rating of that technology.

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. If applicable, the project(s) would be implemented over a multi-year schedule. Because of this, permitting and approval requirements have to be identified prior to selection of the alternative. These were identified along with permit schedules where appropriate. With the exception of GI, which is assumed to occur on both private and public property, most if not all of the CSO grey technologies are limited to City-owned property and right-of-way acquisitions. Where necessary, DEP will work closely with other State and City agencies.

8.1.g Other Environmental Considerations

Impacts on the environment and surrounding neighborhood will be minimized as much as possible during construction. 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

As described in Section 7.0, DEP is committed to involving the public, regulators and other stakeholders throughout the planning process. The scope of the LTCP, background and newly collected data, WQS and it's the development and evaluation of alternatives were presented at two public meetings, one on October 24, 2012 and one on May 1, 2013. Community acceptance of the recommended plan is essential to its success. The Alley Creek and Little Neck Bay 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.

8.1.i Methodology for Ranking Alternatives

The Alley Creek and Little Neck Bay LTCP employed a three-step procedure developed to evaluate and rank control measures and alternatives:

- Step 1: Screening of Potential Control Measures

- Step 2: Development and Ranking of Control Measures
- Step 3: Final Evaluation and Selection of Preferred Watershed-wide Alternative

The goal of the process was to use the criteria described in this section 8.1 and perform a qualitative and quantitative assessment when evaluating alternatives.

An overview of the three-step procedure is presented in Table 8-1 and shown graphically in Figure 8-1. Overall, the methodology for ranking control measures moves from being highly qualitative to more quantitative as the steps progress. In Step 3, quantitative measures including cost estimates, capital and annual operation and maintenance (O&M), and predicted performance data (CSO control measures and water quality impacts) are used to perform the cost performance or KOTC analysis.

Table 8-1. Three-Step Control Measure and Watershed-Wide Alternative Evaluation and Screening Process

Factor	Step 1: Screening of Potential Control Measures	Step 2: Evaluation and Ranking of Control Measures	Step 3: Final Evaluation and Selection of Preferred Watershed-Wide Alternative
Type of Process	Qualitative	Quantitative	Cost/Performance using KOTC
Rating Criteria	Fatal flaw analysis (no quantitative metrics)	Non-economic metrics	1. Lifecycle costs: capital plus annual O&M. 2. Control level performance (see below).
Purpose/Outcome	Selection of the preferred control measures for the watershed under consideration	Determination of the higher-ranked control measures for development of alternatives using the ranking factors	1. Final ranking of alternatives based on cost per MG of CSO volume controlled ($/gallon). 2. Other KOTC parameters could also be considered such as unit cost of pollutant reduction or unit cost of days/hours of additional WQS attainment.
Process Implementation	1. Develop a list of potential control measures in a workshop setting. 2. Evaluate and screen potential control measures based on applicability to the specific waterbody/ watershed. Examine for fatal flaws or weaknesses that would prevent or limit a control measure's efficacy for CSO abatement.	1. Evaluate, score and rank the remaining control measures from Step 1. 2. Develop alternatives for the watershed using the higher ranked control measures. 3. Alternatives will be subjected to economic and cost-performance evaluations in Step 3.	1. Use the most recent waterbody and watershed modeling data to transform the process into a more quantitative direction. 2. Develop updated costing templates with the addition of annual O&M costs. 3. Assess water quality gaps. 4. Perform KOTC analysis using the most viable watershed-wide alternatives.

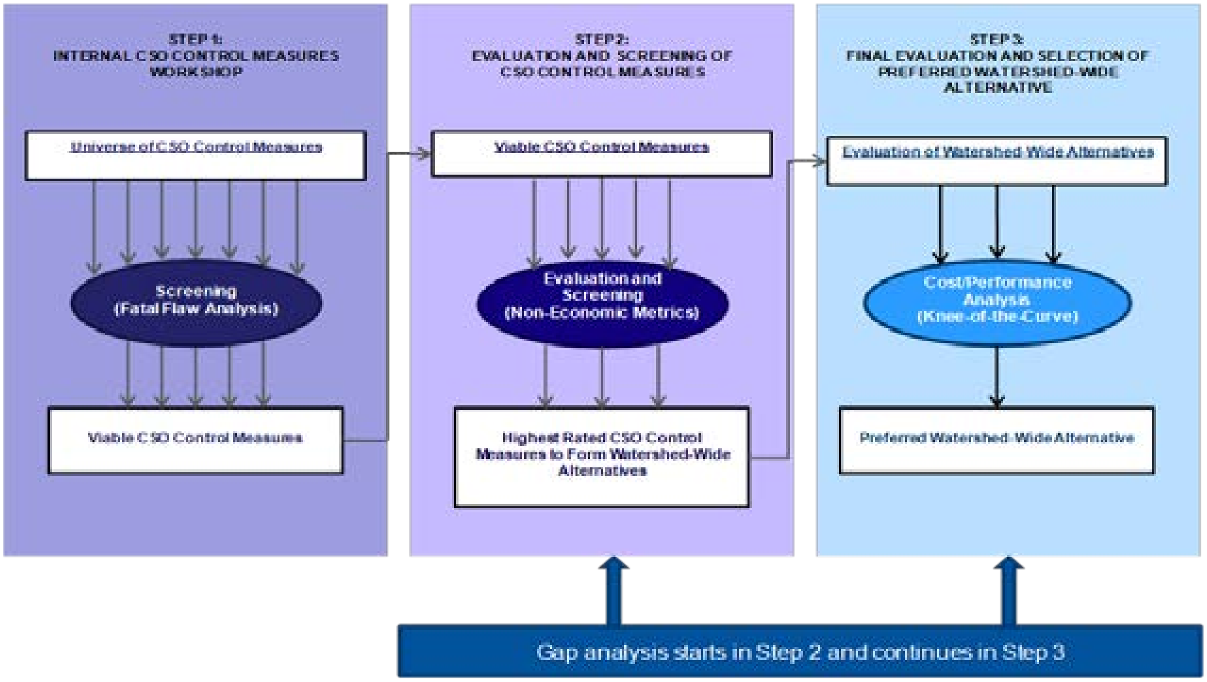


Figure 8-1. Three-Step LTCP Screening and Evaluation Process for Alley Creek and Little Neck Bay Alternatives

In Step 1, the potential technologies and control measures are evaluated qualitatively to judge their ability to meet the LTCP scope and identify fatal flaws that could disqualify a control measure from use in the watershed under consideration. Examples of fatal flaws could include insufficient land or less than desirable siting for a particular technology, a technology that is unproven in addressing the performance objectives required or an approach or alternative that would cause detrimental impact to the local community during and after construction.

In Step 2, the resulting favorable control measures are then rated using pre-defined non-economic criteria or metrics, covering the following three categories:

- Environmental Benefits
- Community and Societal Impacts
- Implementation and O&M Considerations

Factors considered for each of these three categories are described in Table 8-2. Economic considerations are not included in Step 2, but are evaluated in Step 3, when the watershed-wide alternatives are more fully developed. The control measures are rated by assigning a score for each metric with a value of "5" indicating a highly favorable rating and a "1" indicating the most unfavorable rating. The scoring scale is shown in Table 8-3.

Table 8-2. Definitions of Step 2 Metrics

Metric	Description
A. Environmental	
A1. CSO Frequency/ Volume	Decrease in discharge frequency and CSO volume.
A2. Pollutant Reduction/ Water Quality improvements	Decrease in discharge of pollutants including floatables, TSS, BOD and bacteria.
A3. Control of Discharge to Sensitive Areas	Degree to which sensitive areas, such as bathing beaches and marinas, are protected from the remaining CSO discharges.
B. Community/Societal	
B1. Environmental Justice	Degree to which the control measures affects low- and moderate-income neighborhoods.
B2. Ancillary Community Benefits	Benefits include streetscape improvements; enhanced recreational opportunities; localized street flooding; and control of discharge to waterfront public access areas.
B3. Community Disruption/ Potential for Nuisances	Disruption to the affected area during construction and subsequent routine O&M of the control measures including traffic, dust, noise, aesthetics, etc.
C. Implementation and O&M	
C1. Constructability/Permitting	Possible impediments to implementation including, but not limited to: degree of construction difficulty; environmental and operational permitting; presence of hazardous materials, subsurface or topographic conditions; permanent land requirements, easements or deed restrictions; planned redevelopment; inter-governmental jurisdictional issues; and other land use and zoning requirements.
C2. Operating Complexity/ Ease of O&M	Consistency with existing O&M practices and/or level of complexity of the project components including, but not limited to: use of chemicals; reliance on multiple sensors/meters; operation of upstream and/or downstream facilities, etc.
C3. Sustainability	Degree to which the construction and routine O&M of the control measures consumes labor, materials, chemicals, power and fuel over their useful life.

Table 8-3. Step 2 Scoring Scale

Score	General Definition
5	Highly Favorable
4	Favorable
3	Neutral
2	Unfavorable
1	Highly Unfavorable

Because the various metrics are not considered equal in terms of their relative importance, a system of weighting factors was established to ensure that the evaluation, ranking and screening process is reflective of DEP and community goals and objectives for the LTCP program. Different weighting factors were assigned to the three major categories of metrics, with the total adding to 100 percent. Furthermore, weighting factors also were assigned to each metric within each major category as the individual metrics may have different levels of importance within the major category. The overall metric weighting factor is the product of the individual metric weight and the major category weight. The overall metric weighting factors are shown in Table 8-4.

Table 8-4. Weighting Factors for Step 2 Metrics

Major Category	Category Weighting Factor	Metric	Metric Weighting Factor
A. Environmental	0.45	A1. CSO Volume/Frequency	0.16
		A2. Pollutant Reduction/Water Quality Improvements	0.16
		A3. Control of Discharge to Sensitive Areas	0.13
B. Community/ Societal	0.25	B1. Environmental Justice	0.08
		B2. Ancillary Community Benefits	0.08
		B3. Community Disruption/ Potential for Nuisances	0.09
C. Implementation and O&M	0.30	C1. Constructability/Permitting	0.15
		C2. Operating Complexity/Ease of O&M	0.09
		C3. Sustainability	0.06

The most promising or higher ranked control measures then were moved to Step 3, where they were combined to form watershed-wide alternatives. These were then evaluated in greater detail using economic criteria and other cost-performance and water quality attainment criteria. Using these expanded criteria, including the latest results from both updated landside and water quality modeling, cost-performance or KOTC evaluations were performed so that the most environmentally-sound and cost-effective alternative was selected. To construct the cost-performance curves, alternatives were developed to cover a range of CSO control spanning 25, 50, 75 and 100 percent CSO volume capture, or their equivalent, and to address the performance gaps described in Section 6.3.

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

Using this evaluation methodology, 12 control measures were deemed as being viable from the Step 1 process and passed onto Step 2. They were then scored using the metrics shown in Table 8-2, scoring definitions in Table 8-3, and weighting factors in Table 8-4. The results of Step 2 are shown in Table 8-5.

As shown in the table, scores ranged from a high of 4.02 (80.4 percent) for expanding the existing CSO Retention Tank, to a low of 2.17 (43.4 percent) for netting facilities. High Level Sewer Separation (HLSS) and Vertical Treatment System (VTS) storage were also highly ranked, with scores of 3.50 (70.0 percent) and 3.35 (67.0 percent), respectively. System optimization and GI also ranked in the top five control measures, with scores of 2.94 (58.8 percent) and 2.92 (58.4 percent), respectively. It is important to note however, that while GI and system optimization ranked in the top five, they were not able to close the performance gap in water quality as standalone control measures, and would have to be combined with other control measures to fulfill the LTCP scope. Disinfection within the existing Alley Creek CSO Retention Facility had a score of 2.76 (55.2 percent), and was also retained for further evaluation.

The top-ranked control measures from Step 2, listed in Table 8-6, were further developed into alternatives by identifying specific levels of CSO control, along with potential locations for implementation of the control measures. In keeping with the LTCP guidance, the alternatives spanned a range of CSO volumetric and/or pollutant reduction controls, including the 100 percent control level. To assist in this process, the Alley Creek and Little Neck Bay IW model was used to develop sizes of the control measures for various levels of reduction in CSO volume and pollutant loading, most notably bacteria. As shown in Table 8-7, alternatives were matched with targeted CSO volumes, ranging from 15 percent for 10 percent GI coverage, to 100 percent for a 29.5 MG expansion of the existing Alley Creek CSO Retention Tank. It should be noted that GI coverage, as referred in this section, was based upon the concept of retention. Thus, as shown in Table 8-7, a 10 percent GI coverage results in a 15 reduction in CSO volume.

Also, while not providing CSO volume reduction, disinfection within the Alley Creek CSO Retention Facility was included as a 100 percent CSO control measure. The WQ modeling described in Section 6.0 revealed that because of the high level of reduction in the bacteria concentration that would result from disinfection, this control measure was approximately equal to the 100 percent CSO volume control that would be realized with the 29.5 MG expansion of the Alley Creek CSO Retention Facility described later in this section. As noted, in addition to the 100 percent control target, there are also multiple alternatives for the 50 and 75 percent CSO volume targets. Expanded development of the alternatives is presented in the following sections.

Table 8-5. Step 2 Scoring of Control Measures

CSO Control Measure	Environmental			Community/Societal			Implementation/ O&M			Raw Score	Weighted Score	Weighted Score % of Possible Total Score
	CSO Volume & Frequency	Pollutant Reduction/ WQ Improvement	Control of Discharge to Sensitive Areas	Environmental Justice	Ancillary Community Benefits	Community Disruptions/ Potential for Nuisances	Constructability/ Permitting	Operating Complexity/ O&M Requirements	Sustainability			
	16%	16%	13%	8%	8%	9%	15%	9%	6%	No.	No.	%
High Level Sewer Separation (HLSS)	5	3	2	4	4	2	3	5	4	32	3.50	70.0
Stormwater Redirection	2	1	1	4	1	3	1	1	2	16	1.64	32.8
Expand Existing Alley Creek CSO Retention Facility	5	5	5	3	3	4	3	4	2	34	4.02	80.4
Disinfection in Existing Alley Creek CSO Retention Facility	1	4	4	3	3	4	3	1	1	24	2.76	55.2
Chemically Enhanced Settling in Existing Alley Creek CSO Retention Facility	1	3	2	3	3	4	4	2	1	23	2.58	51.6
Bar Screen in Existing Alley Creek CSO Retention Facility	1	1	1	3	3	4	5	2	3	23	2.40	48.0
Increase Pump Station and Interceptor Capacity to WWTP	2	2	2	3	3	3	3	4	2	24	2.58	51.6
VTS Storage	5	4	5	3	3	2	2	2	2	28	3.35	67.0
Netting Facilities	1	2	1	3	3	3	3	2	3	21	2.17	43.4
Green Infrastructure	2	2	2	4	4	3	3	4	5	29	2.92	58.4
System Optimization (Sewer Enhancements)	2	2	2	3	3	5	4	3	4	28	2.94	58.8
Real Time Control (RTC)	2	2	2	5	3	5	2	2	3	24	2.49	49.8

Table 8-6. Control Measures Retained for Watershed-Wide Alternatives Development

Core Control Measure(s)	Remarks
HLSS	1. For closure of moderate to large performance gaps 2. Could be supplemented by GI and/or System Optimization
Expand Existing Alley Creek CSO Retention Facility (or Additional New Downstream Retention Facility)	1. For closure of moderate to large performance gaps 2. Could be supplemented by GI and/or System Optimization
VTS Storage	1. For closure of moderate to large performance gaps 2. Could be supplemented by GI and/or System Optimization 3. For either additional downstream or new upstream storage
Disinfection in Existing Alley Creek CSO Retention Facility	1. For closure of moderate to large performance gaps 2. Could be supplemented by GI and/or System Optimization
GI	Limited to closure of small performance gaps
System Optimization (Sewer Enhancements)	Limited to closure of small performance gaps

Table 8-7. Potential Alternatives for Targeted CSO Volume Control Levels

Target CSO Volume Reduction Percent	Control Measures	Remarks
15	10 percent GI Coverage	See Section 8.2.b
25	3.0 MG Downstream Tank and 2.4 MG Upstream Tank	See Section 8.2.a.3
50	1. 6.5 MG Downstream Tank and 6.7 MG Upstream Tank 2. 100 percent HLSS (51 percent)	1. See Section 8.2.a.3 for tank and treatment alternatives 2. See Section 8.2.a.1 for HLSS alternative
65	50 percent GI Coverage (69 percent)	See Section 8.2.b
75	1. 12 MG Downstream Tank 2. 3.0 MG Downstream Tank and HLSS (71 percent)	1. See Section 8.2.a.3 for tank and treatment alternatives 2. See Section 8.2.d For the hybrid tank plus alternative
100	1. 29.5 MG Downstream Tank 2. Disinfection in Existing Alley Creek CSO Retention Facility	See Section 8.2.a.3 for tank and treatment alternatives

8.2.a Other Future Grey Infrastructure

"Grey infrastructure" refers to single-purpose systems used to control, reduce or eliminate discharges from CSOs. These are the technologies that have been traditionally employed by DEP and other wastewater utilities in their CSO planning and implementation programs, 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 the purpose of this LTCP, "Other Future Grey Infrastructure" refers to potential grey infrastructure beyond existing grey infrastructure control measures implemented based on previous planning documents.

8.2.a.1 High Level Sewer Separation

High Level Sewer Separation (HLSS) also referred to as High Level Storm Sewers, is a form of partial separation of combined sewers only in the streets or other public rights-of-way, while leaving roof leaders or other building connections unaltered. In NYC, this is typically accomplished by constructing a new stormwater system and directing flow from street inlets and catch basins to the new storm sewers. Challenges associated with HLSS include constructing new sewers with minimal disruption to the neighborhoods along the proposed alignment, finding a viable location for any necessary new stormwater outfalls, and avoiding conflicts with recent system improvements upstream of the Alley Creek CSO Retention Facility. Separation of sewers minimizes the amount of sanitary wastewater being discharged to receiving waters, but also results in increased separate stormwater discharges (which also carry pollutants) to receiving waters.

One HLSS alternative was developed for the CSS that is tributary to Regulators 46 and 47; this is referred to as Alternative 1. The CSS associated with these regulators is west of Alley Pond Park (Figure 2-9 in Section 2.0), represents 86 percent of the entire Alley Creek and Little Neck Bay CSS, and corresponds to 16 percent of the total watershed. An enlarged view of the area served by these two regulators is shown in Figure 8-2. Under this alternative, newly-separated stormwater would be conveyed through a new municipal separate storm sewer system (MS4) to Alley Creek along the route shown in Figure 8-3. The new outfall would require permitting under the MS4 program.

Hydraulic modeling using the re-calibrated IW model determined that HLSS could provide up to a 51 percent reduction of the CSO volume. Because this level was deemed to be insufficient to close the performance gap described in Section 6.3, HLSS was also considered in combination with VTS storage (see Section 8.2.d).

Figure 8-2. Combined Sewer Service Area Tributary to Regulators 46 and 47

Figure 8-3. HLSS for CSS Tributary to Regulators 46 and 47 (Alternative 1)

8.2.a.2 Sewer Enhancements

Sewer enhancements, also known as system optimization measures, aim to reduce CSO through improved operating procedures or modifications to the existing collection system infrastructure. Examples include control gate modifications, regulator or weir modifications, inflatable dams and real time control (RTC). These control measures generally retain more of the combined sewage within the existing sewer pipes during storm events. The benefits of retaining this additional volume must be balanced against the potential for sewer back-ups and flooding. Viability of these control measures is system-specific, depending on existing physical parameters such as pipeline diameter, length, slope and elevation.

Evaluations performed under previous facility plans have shown that the Alley Creek and Little Neck Bay sewer system is not suitable to significant CSO reductions through sewer system enhancements or optimization. After updating the IW collection system model and re-examining the state of RTC technology, it was found that the previous conclusions are still valid, and RTC is still not viable within Alley Creek and Little Neck Bay. Elevated static weir heights, opportunities for inflatable dams and/or control gates, and similar alternatives within the sewer system pipes have been eliminated from further consideration, due to risk of flooding in the community. At best, alternatives relying solely on sewer enhancements would be limited to small volume reductions. Although this LTCP does not propose specific alternatives under this control measure category, sewer enhancements could be considered under other alternatives (e.g., additional storage/retention alternatives may need to include sewer enhancements if the evaluation identifies pump station and sewer system conveyance limitations that impact storage dewatering).

8.2.a.3 Retention/Treatment Alternatives

Retention 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. Retention control measures considered in this LTCP include traditional, shallow, closed concrete tanks and VTS. More detailed description for traditional tanks can be found in the 2009 Alley Creek and Little Neck Bay WWFP.

As an alternative to a traditional shallow tank, additional capacity could be added by construction of a 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. Evaluation of the Alley Creek and Little Neck Bay watershed identified two candidate locations 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); and
- Upstream of the existing tank near the CSO regulators for the CSS area.

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 CSO volume reduction, were developed near this downstream location. As shown in Table 8-8, 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 8-8. Dewatering Time for Retention Alternatives

Outfall	Waterbody	Total CSO Volume in MG/yr				
		Baseline	100 Percent Capture	75 Percent Capture	50 Percent Capture	25 Percent Capture
TI-007	Alley Creek	0.1	0.1	0.1	0.1	0.1
TI-008	Alley Creek	0.0	0.0	0.0	0.0	0.0
TI-009	Little Neck Bay	0.0	0.0	0.0	0.0	0.0
TI-025	Alley Creek	132.5	0.0	33.4	66.8	99.7
Total		132.6	0.1	33.5	66.9	99.8
Additional Tank Volume Required (MG)		--	29.5	12.0	6.5	3.0
Additional Dewatering Capacity for Retention Alternatives (MGD)		NA	15	6	3.5	1.5
Dewatering Time for Retention Alternatives (days)		NA	2.0	2.0	1.8	1.9

To capture 100 percent of the 132.5 MG/yr CSO volume discharged through TI-025, an additional 29.5 MG of retention would be required. For lesser captures of 75, 50, and 25 percent, additional retention volumes of 12 MG, 6.5 MG and 3.0 MG would be required, respectively. Alternatives corresponding to these rates of CSO volume capture are:

- **Alternative 2A – 3.0 MG Retention**. Alternative 2A is designed to capture 25 percent of the CSO volume. Alternative 2A is a 3.0 MG traditional shallow tank located north of and abutting the existing tank but south of the marsh grass (see Figure 8-4). In essence, it is an expansion of the existing Alley Creek CSO Retention Facility that would drain through the existing gravity drain to the Old Douglaston PS. Adequacy of the Old Douglaston PS capacity (8.5 MGD) must be evaluated to determine whether it can handle the additional volume of captured CSO. An optional approach would employ a 3.0 MG VTS storage facility instead of a traditional shallow tank (see Figure 8-5). The VTS alternative would significantly reduce the footprint required for a new retention tank, but would extend to a much greater depth to provide the same storage volume. Because this would place the bottom of the VTS below the drain pipe at the existing Alley Creek CSO Retention Facility, the VTS would not be drained by gravity, but would instead require new pump facilities to dewater the VTS between rain events.

- **Alternative 2B – 6.5 MG Retention**. Alternative 2B is designed to capture 50 percent of the CSO volume and requires a volume of 6.5 MG, through a VTS storage facility located north of the existing tank but south of the marsh grass wetland (see Figure 8-6). Another option would employ a traditional tank located south of Northern Boulevard, as shown in Figure 8-7. To fit within the proposed sites, the 6.5 MG retention alternatives require depths that extend below the drain pipe at the existing Alley Creek CSO Retention Facility and will therefore require new pump facilities to dewater them between rain events.

- **Alternative 2C – 12 MG Retention**. Alternative 2C is a 12 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 8-8. The required tank depth would extend below the drain pipe at the existing Alley Creek CSO Retention Facility, and this alternative would therefore require new pump facilities to dewater the tank.

- **Alternative 2D – 29.5 MG Retention**. Alternative 2D is designed to capture 100 percent of the CSO volume. This alternative is comprised of a 29.5 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 8-9.

Siting Considerations

The proposed location for these alternatives has potential siting restrictions. The existing retention tank is located adjacent to wetlands in designated special Forever Wild Park Land. Special permits and permissions from regulatory agencies and potentially from the 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. Due to the limited space at this location, however, the required volume cannot be obtained unless the new tanks are deeper than the existing tank.

Figure 8-4. Alternative 2A – 3.0 MG Downstream Tank

Figure 8-5. Alternative 2A – Optional Approach for 3.0 MG Downstream Tank

Figure 8-6. Alternative 2B – 6.5 MG Downstream Tank

Figure 8-7. Alternative 2B – Optional Approach for 6.5 MG Downstream Tank

Figure 8-8. Alternative 2C – 6.5 MG Downstream Tank

Figure 8-9. Alternative 2D – 29.5 MG Downstream Tank

Dewatering Considerations

With the exception of Alternative 2A (3.0 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 Tallman Island 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 Tallman Island 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 Tallman Island WWTP.

There are two locations where flow restrictions may limit the conveyance capacity (Flushing Interceptor Chamber 2 is limited to 58 MGD, and Flushing Interceptor Regulator 9 is limited to 65 MGD). The dewatering scheme for any expanded Alley Creek and Little Neck Bay retention must be coordinated with the dewatering from the existing Alley Creek CSO Retention Facility, along with dewatering from the Flushing Creek CSO Retention Facility, to ensure that conveyance system capacity is not exceeded. Furthermore, dewatering flows from all of these retention facilities combined with dry weather flow must not exceed the Tallman Island WWTP peak design dry weather flow of 80 MGD.

The WWTP and conveyance system constraints were included in the IW model to determine whether they are significant enough to prevent any alternative from being dewatered within the target time of 2-3 days. As shown in Table 8-8, all of the alternatives can be dewatered within the target time.

Retention Alternatives - Upstream Sites

As an option to locating retention tanks or shafts downstream near the existing Alley Creek CSO Retention Facility site, there may be advantages to locating retention facilities upland in the collection system, closer to the CSS. Overflow capture at these upland areas would be more concentrated, as the flow has not yet mixed with flows from stormwater from the downstream separate sewer system (SSS). Therefore, capture of a smaller volume of more concentrated combined sewage from the upland area may reduce the pollutant load to the waterbodies to the same extent as a larger volume of more dilute sewage captured at the existing Alley Creek CSO Retention Facility. However, the upstream CSS area is more highly developed than that near the existing Alley Creek CSO Retention Facility site, making it more difficult to find suitable retention tank sites. Because of the difficulty finding a suitable site, traditional shallow tanks were not considered for upstream locations. Instead, VTSs, which have a smaller footprint, were considered as LTCP alternatives at upland sites. Two such alternatives were developed; both located within the interchange for the Long Island and Clearview Expressways, and designed to capture CSO flow from Regulators 46 and 47:

- **Alternative 3A** is VTS storage designed to capture 25 percent of the CSO volume. It is comprised of a 2.4 MG vertical shaft, along with a 96-inch diameter conduit to convey flow from Regulators 46 and 47 to the shaft, and a force main to convey pump-back from the vertical shaft to the interceptor (see Figure 8-10).

- **Alternative 3B** is VTS storage designed to capture 50 percent of the CSO volume. It is comprised of a 6.7 MG vertical shaft, along with 78-inch x 84-inch and 108-inch x 84-inch conduits to convey flow from Regulators 46 and 47 to the shaft, and a force main to convey pump-back from the vertical shaft to the interceptor (see Figure 8-11).

Figure 8-10. Alternative 3A – 2.4 MG Upstream Tank

Figure 8-11. Alternative 3B – 6.7 MG Upstream Tank

In both cases, VTS storage would be located in City parkland or in New York State Department of Transportation (NYSDOT) property. Thus, both DPR and NYSDOT could have to be involved in the siting and permitting should these alternatives progress further in the evaluation process.

Treatment Alternatives – Disinfection in the Alley Creek CSO Retention Facility

General Description and Layout. Disinfection within the Alley Creek CSO Retention Facility, referred to as Alternative 4, 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 8-12, 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 sodium bisulfite 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.

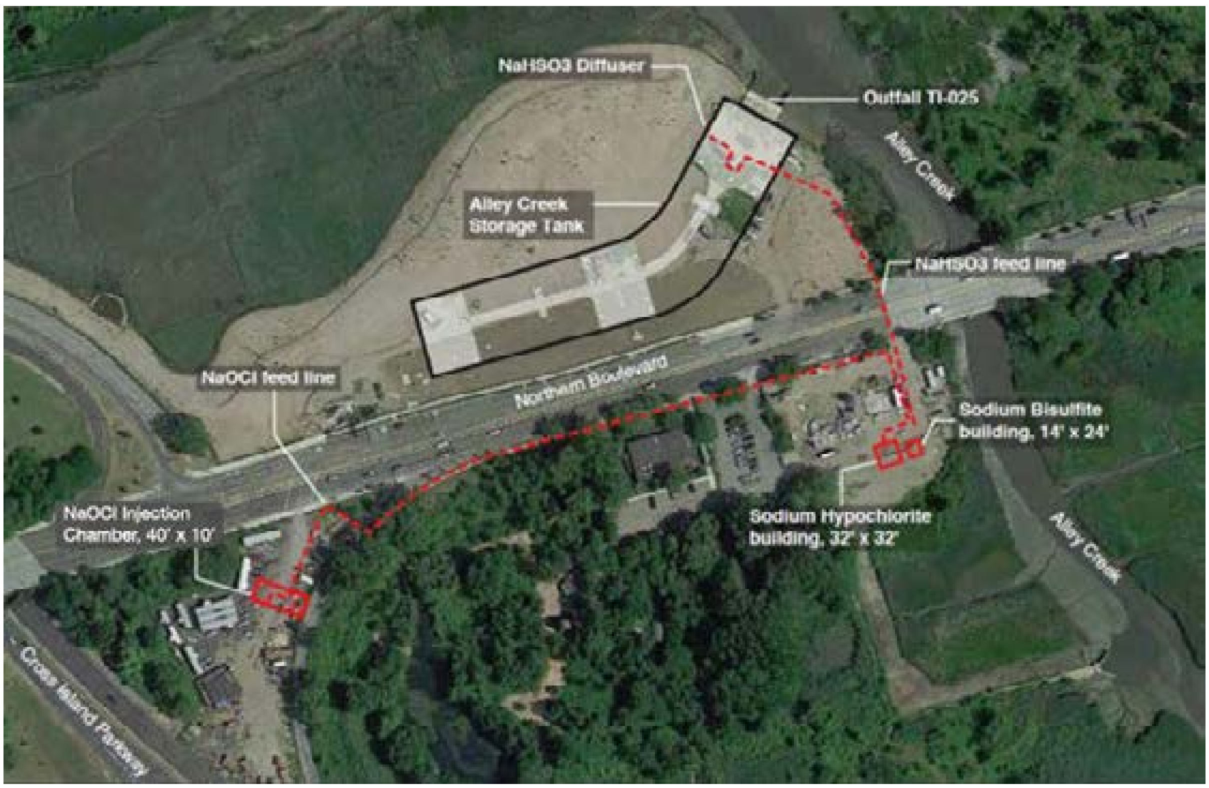


Figure 8-12. Alternative 4 – Disinfection in Existing Alley Creek CSO Retention Facility

Design Flows and Considerations. Because the tank was not designed as a chlorine contact tank, a computational fluid dynamics (CFD) modeling analysis was performed to determine if there would be adequate contact time for CSO disinfection. The CFD modeling confirmed that there will be slightly more than 11 minutes at the design peak of 327 MGD, the 10-minute average typical year peak flow from the IW landside model. This is safely within the range of what is considered high rate disinfection (HRD) typically applied to the disinfection of CSOs (5 to 10 minutes). However, because HRD would be employed, care has to be taken to ensure that proper mixing and dispersion of the chemicals occurs and that an adequate dose can be delivered. To accomplish good mixing and dispersion, diffusers would be installed at the point of injection in the two feed channels to the Alley Creek CSO Retention Facility, well upstream of where the actual tank begins. The dechlorination system would also rely on a diffuser along the tank overflow weir.

Disinfection Alley Creek CSO Retention Facility Survey. A survey of approximately 60 CSO disinfection facilities around the country revealed that kills of up to 4-log reductions (99.99 percent reductions) are readily achievable and that TRC limits, when imposed, typically range from 0.1 mg/L to 1.0 mg/L, with only a few exceptions. There are currently no bacteria or TRC limits in the Alley Creek CSO Retention Facility permit. However, while these facilities are designed to achieve 4-log reductions, they are generally operated throughout the course of the event to provide between a 2-log (99 percent) and 4-log (99.99 percent) reduction in bacteria as influent water quality and bacteria densities can vary widely from event to event and even within individual events. Other important information gained from the survey:

1. Nearly all facilities use sodium hypochlorite as the disinfectant and those that dechlorinate use sodium bisulfite.

2. A majority of the facilities dechlorinate to meet TRC limits in the receiving water bodies.

3. Discharge conditions to Alley Creek are highly sensitive to tidal fluctuations when compared to the other facilities; very little dilution of TRC is expected at low water tidal conditions due to the shallow depths.

Environmental Risks. There are environmental risks associated with chlorination. In addition to disinfection byproducts, the most immediate concern for Alley Creek and Little Neck Bay would be with total residual chlorine (TRC). EPA has established ambient TRC criteria for such discharges at 7.5 µg/L and 13 µg/L as the chronic and acute limits, respectively. ERTM water quality modeling analyses based on 2008 conditions were performed to project the potential effects of TRC within Alley Creek and Little Neck Bay, using an estimated effluent TRC concentration of 0.1 mg/L, the lower end of the typical range of TRC limits observed in the CSO disinfection facility survey. The results of this analysis indicate that the ambient TRC criteria are expected to exceed in Alley Creek and the lower or transition area of Little Neck Bay.

In order to mitigate potential adverse effects of effluent TRC residuals while still achieving sufficient kills of the human-source bacteria from the Alley Creek CSO Retention Facility, an alternative operational strategy was sought. Operating the disinfection at the Alley Creek CSO Retention Facility at the lower end of the 2- to 4-log reduction range would reduce the chlorine dose required throughout each event, and more importantly the resulting TRC. The effluent TRC concentrations would be maintained as low as possible with a target maximum concentration of 0.1 mg/L following dechlorination.

WQ model *Sensitivity to disinfection* To better understand the effectiveness in terms of WQS attainment, the water quality model was run using average rainfall year of 2008 conditions assuming both 2- and a 4-log reduction in bacteria loadings at TI-025. The results, in terms of percent attainment, are reported in Table 8-9 for five stations within the Alley Creek and Little Neck Bay waterbodies for the bathing period (Memorial Day to Labor Day). These results show virtually no difference between the 2-log and 4-log reductions, thus indicating that operating at the 2-log reduction is acceptable. Figure 8-13 follows, showing the concentrations at DMA Beach for the bathing season from Memorial Day to Labor Day, also showing that enterococci for the 2-log reduction is acceptable and very close to the 4-log reduction. Later in this section, attainment of the disinfection alternative is shown for various criteria.

Table 8-9. Bathing Period Attainment with 2- and 4-log Disinfection Operational Strategies – 2008 Conditions

Source	Station	Fecal Coliform	Enterococci	
		Bathing Season, % Attainment	Bathing Season (30-day Rolling), % Attainment	
		Geomean	Geomean	90 th percentile
			< 35 cfu/100ml	< 130 cfu/100 ml
Disinfection 2-LOG-KILL	AC1	100	47	8
Disinfection 4-LOG-KILL	AC1	100	47	8
Disinfection 2-LOG-KILL	OW2	100	100	39
Disinfection 4-LOG-KILL	OW2	100	100	40
Disinfection 2-LOG-KILL	LN1	100	100	100
Disinfection 4-LOG-KILL	LN1	100	100	100
Disinfection 2-LOG-KILL	E11	100	100	100
Disinfection 4-LOG-KILL	E11	100	100	100
Disinfection 2-LOG-KILL	DMA	100	100	91
Disinfection 4-LOG-KILL	DMA	100	100	91

Note: Fecal Coliform percent attainment applies to 200 cfu/100mL and 2000 cfu/100mL for Class SB and Class I, respectively, as applicable.

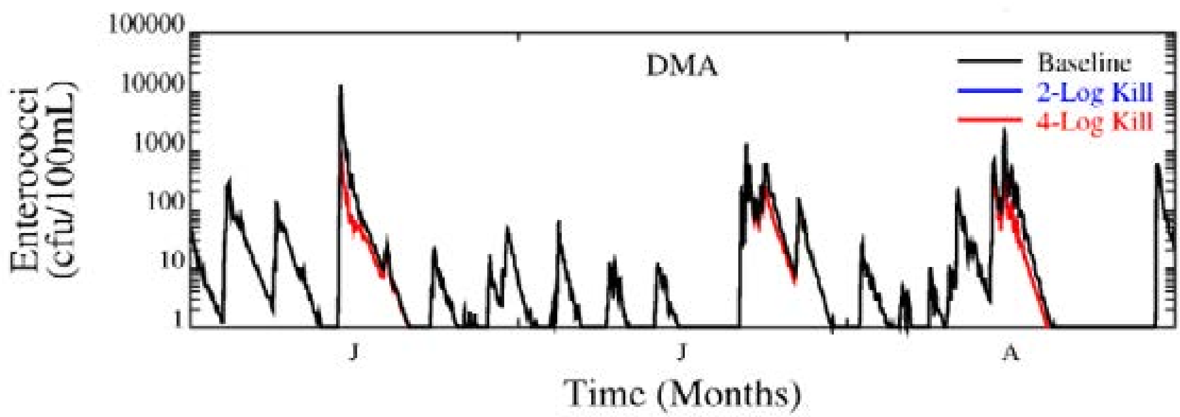


Figure 8-13. Comparison of 2- and 4-Log Reduction Disinfection Strategies for 2008 Conditions

As shown in Table 8-9, there is virtually no difference in overall annual WQS attainment throughout the waterbodies for the two disinfection operational strategies. Further, with respect to DMA Beach, the plots in Figure 8-13 reveal that the bathing season bacteria concentrations are also virtually undiscernible between the 2- and 4-log operational strategies. Thus, the alternative operational strategy of a 2-log kill target can provide a high level of CSO-derived bacteria reduction while protecting the waterbodies from excessive discharges of potentially harmful TRC.

Operating Strategy. Based on the above discussion and analysis, evaluation of the disinfection facilities associated with Alternative 4 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 sodium bisulfite, 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-source 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. However, the system may need to feed at a higher dose, such as 25 mg/L, to compensate for first-flush solids or other anomalies in the influent. Actual bench- and pilot-scale testing should be conducted to establish the actual required doses, both for the initial operational strategy and to meet potentially more restrictive operational parameters in the future. These tests would also establish the sodium bisulfite doses for dechlorination and the expected TRC levels.

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 reflective 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 to DEP staff who are already currently overburdened during wet weather conditions while adding significant expense cost.

Permitting Issues and Siting Risks. The submittal of a Form 2A to DEC to modify the Tallman Island 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. DEP has been informed by DEC that the TRC impacts would be minimal because CSO discharges from the Ally Creek Retention Facility that contained the residual chlorine would be short term and intermittent, and any excursions of the standards could be handled with a waiver or variance. The proposed location of the chemical buildings is controlled by the New York City Department of Parks and Recreation (DPR) and any siting decision 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 land owners 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.

8.2.a.4 Stormwater Redirection

As previously noted, Stormwater Redirection did not score well in the Step 2 analysis as summarized in Table 8-5. In general, the only feasible stormwater redirection, as identified by DEP, would have resulted in the redirection of already separated stormwater from a 36-acre tributary area upstream of the Alley Creek CSO Retention Facility in the vicinity of 56th Avenue, upstream of Springfield Boulevard. This area was recently separated with high level storm sewers as part of a HLSS project to reduce flooding in the local area. It was determined that this tributary area could be diverted away from the Alley Creek CSO Retention Facility and into Oakland Lake. The stormwater from this area is currently conveyed through a 48-inch storm sewer into an 8-foot 6-inch by 8-foot sewer that eventually flows into the Alley Creek CSO Retention Facility. The redirection of this stormwater into Oakland Lake could allow more flow to enter the Alley Creek CSO Retention Facility from the other tributary areas of the collection system that contain both stormwater and CSO flow, thus having higher concentrations of bacteria than the diverted flow.

IW modeling revealed that the redirection would result in a net reduction of 9.0 MGY of treated discharge from the Alley Creek CSO Retention Facility and a corresponding net increase of 16.4 MGY of stormwater into Oakland Lake. The 9.0 MGY represents roughly a 6.8 percent reduction from the current 132 MGY discharge volume from the Alley Creek CSO Retention Facility. When applying the applicable bacteria concentrations of both stormwater and sanitary flow, the resultant changes to the annual fecal coliform loadings into the two waterbodies are as follows:

- 104.6×10^{12} colonies bacteria removed from the Alley Creek CSO Retention Facility effluent and Alley Creek
- 21.7×10^{12} colonies bacteria added to Oakland Lake

Thus, there would be a net decrease in fecal coliform bacteria into the two waterbodies on the order of 83×10^{12} colonies per year. While fecal coliform was used in this analysis due to the fresh water nature of Oakland Lake, a similar redistribution of loadings would be expected for enterococci.

However, while there would be less bacteria being collectively discharged into the two waterbodies, there are a number of other pollutants contained in the redirected stormwater that could have an adverse impact on Oakland Lake. These include total suspended solids (TSS), phosphorus, PAHs and metals as well as floatables and general aesthetics. Thus, the discharge of the additional 16.4 MGY of stormwater would be increasing the loadings of these pollutants to Oakland Lake during every storm event throughout the entire year. DEP had a plan to construct a blue belt project in the Oakland Ravine area to handle this additional flow but it was cancelled due to high costs and concerns regarding detrimental impacts to Oakland Lake. These concerns as well as the minor reductions in bacteria loadings to Alley Creek that would be achieved resulted in a low score for this control alternative.

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

As discussed in Section 5.0, DEP expects 45 acres of implemented GI to be managed in onsite private properties in Alley Creek and Little Neck Bay watershed by 2030. This acreage would represent three percent of the total CSS impervious area in the watershed. This GI has been included in the baseline model projections, and is thus not categorized as an LTCP alternative. For the purpose of this LTCP, "Other Future Green Infrastructure" is defined as GI alternatives that have not been implemented under previous facility plans and which have not been included in the baseline models.

Two future GI alternatives were developed:

- **Alternative 5A** – GI developed for 10 percent of the combined sewer service area in the Alley Creek and Little Neck Bay watershed. This alternative corresponds to the overall level of GI proposed in the NYC Green Infrastructure Plan. The expected CSO volume reduction for this alternative is 15 percent.

- **Alternative 5B** – GI developed for 50 percent of the combined sewer service area in the Alley Creek and Little Neck Bay watershed. The expected CSO volume reduction for this alternative is 65 percent.

Difficulty finding sites to implement GI control measures is one of the challenges associated with GI. While the citywide goal is to develop GI for 10 percent of New York City's land area, detailed evaluations of the Alley Creek and Little Neck Bay service area found that sufficient, suitable land area is difficult to find. Greater levels of GI would require implementation on public ROW in addition to the assumed level of private GI implementation (three percent) in the baseline conditions. Alternative 5A would require 1,148 ROW bioswales, while Alternative 5B would require the equivalent of 5,743 ROW bioswales. Alternative 5B (50 percent of the Alley Creek and Little Neck Bay watershed) would not be possible without developing GI in Alley Pond Park and diverting some runoff into the park. As mentioned in Section 8.2.a.3., this park is designated special Forever Wild Park Land, and special permits and permissions from regulatory agencies and potentially from DPR would have to be obtained to construct in this area. Due to the potential siting difficulties, Alternative 5B is not feasible, and was thus eliminated from further consideration.

Also, as noted in the City of New York 2010 Green Infrastructure Plan, GI in the Alley Creek and Little Neck Bay watershed may not be cost-effective. With a large retention tank already in place, improvements in CSO reduction through GI would be relatively marginal and would likely have a high unit cost on a dollar- per-captured-gallon basis. It is important to recognize that the high cost of GI with marginal improvement in water quality makes additional GI less cost-effective.

8.2.c Hybrid Green/Grey Alternatives

Hybrid green/grey alternatives are those that combine traditional grey control measures with GI control measures, to achieve the benefits of both. Using the two technologies together can enhance their ability to minimize CSO volume, optimize the collection system capacity, and capture storm water flows before they enter the system, thereby reducing CSO. However, preliminary evaluation of GI alternatives indicated that the water quality benefits were not sufficiently cost-effective to warrant the development of any hybrid green/grey alternatives.

Because it is unlikely that HLSS alone would be capable of reducing CSO volume beyond 50 percent, a hybrid combination of HLSS with additional retention was considered. This alternative (Alternative 6) could take one of the following forms:

- HLSS plus closed concrete tank expansion at the existing Alley Creek CSO Retention Facility site; or

- HLSS plus VTS storage at the existing Alley Creek CSO Retention Facility.

Such combinations would be faced with the same challenges as when HLSS and retention control measures are considered independently, namely:

- Siting issues similar to those for tank expansion and VTS storage (park alienation, wetlands, permitting);
- Street disruptions associated with HLSS; and
- The need for routing of major new storm sewers and the permitting of a new MS4 outfall associated with HLSS.

Alternative 6 essentially combines HLSS of Alternative 1 for the areas upstream of Regulators 46 and 47 as described in Section 8.2.a.1, and a new 3.0 MG tank (or 3.0 MG upstream VTS storage) from Alternative 2A (or 2D), located downstream at the Alley Creek CSO Retention Facility site, as described in Section 8.2.a.3.

8.2.d Retained Alternatives

A summary of the alternatives developed for the Alley Creek and Little Neck Bay LTCP is presented in Table 8-10. These alternatives are subjected to economic and cost-performance evaluations in Step 3.

Table 8-10. Summary of Alternatives Developed in Step 2

Alternative	Description
1. HLSS	New HLSS for the CSS tributary to Regulators 46 and 47.
2A. 3.0 MG Additional Downstream Retention	New traditional tank expansion north of the existing Alley Creek CSO Retention Facility or new VTS storage at the existing Alley Creek CSO Retention Facility site.
2B. 6.5 MG Additional Downstream Retention	New VTS storage or new traditional tank expansion at the existing Alley Creek CSO Retention Facility site.
2C. 12 MG Additional Downstream Retention	New traditional tank expansion south of the existing Alley Creek CSO Retention Facility.
2D. 29.5 MG Additional Downstream Retention	New traditional tank expansion south of the existing Alley Creek CSO Retention Facility.
3A. 2.4 MG Additional Upstream Retention	New upstream VTS storage for the CSS tributary to Regulators 46 and 47.
3B. 6.7 MG Additional Upstream Retention	New upstream VTS storage for the CSS tributary to Regulators 46 and 47.
4. Disinfection in Existing Alley Creek CSO Retention Facility	Use of existing 5 MG tank volume for recreational season disinfection plus dechlorination.
5A. 10 percent Green Infrastructure	GI for 10 percent of the CSS area in the Alley Creek and Little Neck Bay watershed.
6. Hybrid - HLSS plus Storage Tank	HLSS for the CSS served by Regulators 46 and 47 plus additional 3.0 MG downstream retention at existing Alley Creek CSO Retention Facility site.

8.3 CSO Reductions and Water Quality Impact of Retained Alternatives

To evaluate their effects on the pollutant loadings and water quality impacts, the retained alternatives listed in Table 8-10 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.

8.3.a CSO Reductions for Retained Alternatives

Table 8-11 summarizes the projected CSO reductions for the retained alternatives. Performance of the alternatives ranged from zero to 100 percent CSO volume reduction, with the exception of Alternative 4, Disinfection in Existing CSO Retention Tank, which provides no additional CSO volume reduction, although it has a high level (99 percent) of CSO bacteria reduction on a recreational season basis.

Table 8-11. CSO Volume Performance

Alternative	CSO Volume (MGY)	CSO Volume Reduction Percent
Baseline Conditions	132	0
1. High Level Sewer Separation (HLSS)	65	51
2A. 3.0 MG Additional Downstream Retention	98	25
2B. 6.5 MG Additional Downstream Retention	65	50
2C. 12 MG Additional Downstream Retention	33	75
2D. 29.5 MG Additional Downstream Retention	0	100
3A. 2.4 MG Additional Upstream Retention	98	25
3B. 6.7 MG Additional Upstream Retention	65	50
4. Disinfection in Existing Alley Creek CSO Retention Facility (Recreational Season)	132	0
5A. 10 Percent GI	112	15
6. Hybrid – HLSS plus 3.0 MG Retention	38	71

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 8-12. The values presented in this table represent the total discharge into Alley Creek and Little Neck Bay from both CSO and stormwater sources. With respect to bacteria discharges, the best-performing alternatives were 100 percent retention (Alternative 2D) and recreational season disinfection (Alternative 4); Alternative 2D reduces the overall fecal coliform loading by roughly 50 percent and the enterococci loading by 42 percent. Alternative 4 reduces the overall fecal coliform loading by about 23 percent and the enterococci loading by roughly 20 percent. Because of the pollutants contained in the stormwater discharges, none of the CSO control alternatives could eliminate all of the bacteria discharged to Alley Creek and Little Neck Bay. HLSS (Alternative 1) was the worst-performing alternative, yielding a net increase in enterococci. Although HLSS would reduce CSO and its associated pollutants, it would also significantly increase the volume of annual stormwater discharges; the increased pollutant loads associated with the increased stormwater would thus exceed the benefits from the reduced CSO.

Table 8-12. 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	358.2	0	952.1	0
1. HLSS	377.6	-5.2	899.2	5.4
2A. 3.0 MG Additional Downstream Retention	320.6	10.1	833.1	12.1
2B. 6.5 MG Additional Downstream Retention	282.7	20.4	713.1	24.3
2C. 12 MG Additional Downstream	244.4	30.7	592.6	36.5

Alternative	Enterococci Loading (Counts/Year x 10^{12})	Enterococci Reduction Percent	Fecal Loading (Counts/Year x 10^{12})	Fecal Reduction Percent
Retention				
2D. 29.5 MG Additional Downstream Retention	207.0	40.8	475.1	48.5
3A. 2.4 MG Additional Upstream Retention	304.6	14.5	769.6	18.5
3B. 6.7 MG Additional Upstream Retention	256.2	27.5	607.1	35.0
4. Disinfection in Existing Alley Creek CSO Retention Facility (Recreational Season Operation)	282.9	19.6	715.0	23.3
5A. 10 Percent GI	376.3	5.2	893.9	5.9
6. Hybrid - 3.0 MG Storage plus HLSS	357.9	0.1	844.1	11.0

Using the data presented in the previous two tables, Figure 8-14 shows the relationship between the reductions in CSO volume and total bacteria loading. Alternatives that plot above the diagonal line have a higher reduction in total enterococci loading per unit of CSO volume reduction. Upstream retention alternatives are in this area. Since the upstream flow has not yet been diluted by stormwater from the separately sewered areas, the flow captured upstream is more concentrated, and each gallon captured upstream would therefore remove more bacteria than a gallon captured downstream near the existing Alley Creek CSO Retention Facility.

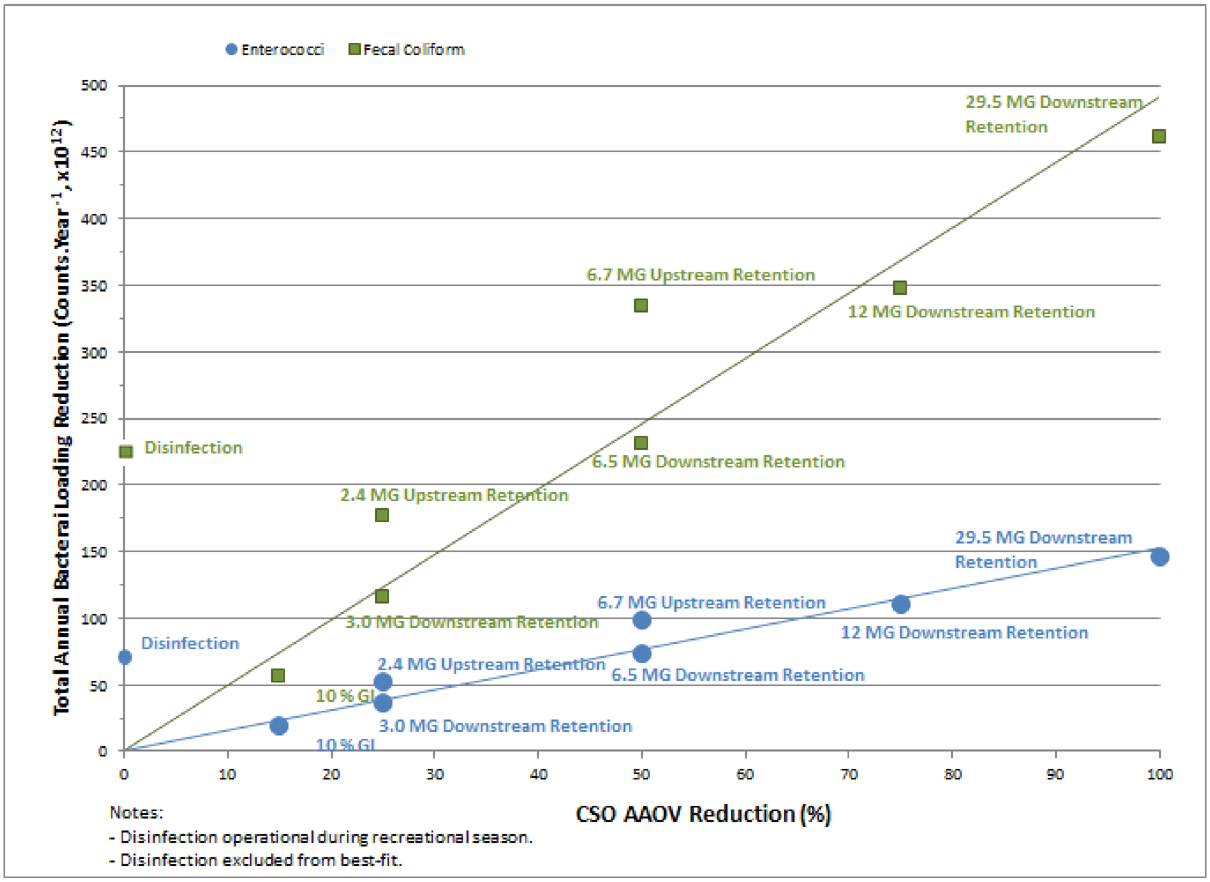


Figure 8-14. CSO Volume Reductions vs. Annual Total Bacteria Loading Reduction - 2008 Rainfall

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 8-10.

8.3.b.1 Attainment of Bacteria Standards

Alley Creek

Alley Creek is a Class I Waterbody. Historic and recent water quality monitoring, along with baseline condition modeling using ERTM, revealed that Alley Creek is currently in attainment with the Class I fecal coliform criterion. Because the Class I standards do not include enterococci, there was no need to perform a performance gap analysis with respect to the current waterbody classification. If raising the waterbody classification to the Primary Contact WQ Criteria, Class SC, is considered, none of the alternatives would result in full attainment ($\geq$95%) with existing Class SC bacteria standards annually. 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, influence the fecal and enterococci concentrations to the extent that even the 100 percent CSO control alternatives would not result in full attainment of the Class SC standards for either fecal coliform or enterococci in Alley Creek for the existing Primary Contact WQ

Criteria (Class SC) or for the Future Primary Contact WQ Criteria with 2012 EPA RWQC. However, full attainment (>95%) is observed with existing SC criteria when the standard is applied during recreational season.

Little Neck Bay

Little Neck Bay is a Class SB Waterbody. As described in Section 6.0, Little Neck Bay is in attainment with the existing Class SB fecal coliform and enterococci criteria essentially 100 percent of the time throughout the 10-year baseline period.

Near DMA Beach, the sole sensitive area in the Alley Creek and Little Neck Bay watershed, attainment with the 30-day GM fecal coliform criterion occurred approximately 100 percent of the time from roughly April through October, a period which includes the recreation season . Overall, the 10-year simulation is in compliance with the NYC DOHMH standard for enterococci 95 percent of the time at the DMA Beach with baseline conditions. When 100 % CSO control is applied, it had a marginal effect, raising the overall attainment of enterococci standards at DMA Beach to 99 percent of the time – a four percent improvement (Table 6-9, page 6-18) A similar marginal improvement would occur at the northern end of the Bay, near the East River, where attainment is already near 100 percent of the time. Attainment would rise 4 percent, from 95 to 99 percent of the time near Harbor Survey Station LN1 with the implementation of 100% CSO control (Table 6-9, page 6-18). At the transition zone in Little Neck Bay (OW2), 100% CSO control alternative resulted in 95% attainment, a four percent increase compared to the baseline. 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 municipal separate storm sewer system (MS4) and direct drainage areas, would have significant influence on the GM concentration of enterococci, to the extent that even the 100 percent CSO control alternatives would not result in compliance with the primary recreation SB standards for enterococci at all times.

8.4 Cost Estimates for Retained Alternatives

Proper evaluation of the proposed alternatives requires accurate cost estimates for each alternative. The methodology for developing these costs is dependent on the type of technology and its unique operation and maintenance requirements. The capital costs were developed as Probable Bid Cost (PBC). Total net present worth costs were determined using the estimated capital cost plus the net present worth of the projected operation and maintenance (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 8-13 in May 2013 dollars.

8.4.a HLSS

Costs for the Alternative 1 (HLSS) include the costs for the local storm sewers and the trunk sewers to convey the stormwater to Alley Creek. Trunk sewer costs are based on the sewer diameter, length, and depth of cover. Manhole costs are based on diameter of the manhole and depth. Where necessary, cost of pile supports for both the trunk sewer and manholes are included.

Cost for the collector sewers is based on the total 843-acre drainage area to be separated (see Figures 8-2 and 8-3). The total cost for HLSS is $658 million (May 2013 dollars), calculated as shown in Table 8-13.

Table 8-13. HLSS Costs

Item	May 2013 Cost ($ Million)
HLSS PBC	657
Annual O&M	0.1
Total HLSS Present Worth	658

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 May 2013 dollars. Cost estimates for retention alternatives using traditional tanks were then read from the cost curve.

Estimated costs for VTS storage include costs for construction of the shafts along with associated costs including odor control equipment, earth work, concrete work, influent and effluent structure, chemical storage and control building, mechanical equipment, electrical equipment, instrumentation and control, process equipment, and site work. Costs are dependent on the desired storage volume and do not include costs associated with land acquisition. For VTS storage located at the upstream site, costs for conduits to convey flow from Regulators 46 and 47 to the VTS are included, as well as costs for conduits to convey dewatering flow from the VTS to the existing collection system.

As shown in Table 8-14, costs for retention alternatives range from $93M to $569M.

Table 8-14. Retention Alternatives Costs

Retention Alternative	May 2013 PBC[1] ($ Million)	Annual O&M Cost ($ Million)	Total Present Worth ($ Million)
2A. 3.0 MG Additional Downstream	$83	$0.7	$93
2B. 6.5 MG Additional Downstream	$145	$0.8	$156
2C. 12 MG Additional Downstream	$294	$1.1	$310
2D. 29.5 MG Additional Downstream	$535	$2.3	$569
3A. 2.4 MG Additional Upstream	$101	$0.8	$113
3B. 6.7 MG Additional Upstream	$160	$0.9	$173

1. Average of costs for traditional shallow tank and VTS storage options.

8.4.c Disinfection in Existing Alley Creek CSO Retention Facility

The estimated costs for Disinfection in the existing Alley Creek CSO Retention Facility (Alternative 4) are summarized in Table 8-15. The Probable Bid Cost is $7.6M, 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 a significant amount of additional staff time to maintain the new equipment and systems, even for recreational season disinfection, above and beyond their current responsibilities for the Alley Creek CSO Retention Facility. As described earlier in Section 8.2.a.4, these include extensive pre-event preparations, 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. The annual O&M costs were estimated at $250,000, resulting in a 20-year life cycle present worth calculated at $11.3M.

Table 8-15. Disinfection in Existing Alley Creek CSO Retention Facility Costs

Item	Cost May 2013 ($ Million)
Disinfection System PBC	7.6
Annual O&M	0.25
Disinfection Total Present Worth, $M	11.3

8.4.d Green Infrastructure

The estimated capital cost for Alternative 5A (10 percent GI) is $41M. With an expected annual O&M cost of $1.48M and a 20-year life cycle, the estimated present worth cost would be $63M.

8.4.e Hybrid HLSS plus Additional Retention

A total cost of $751M for Alternative 6 (hybrid of HLSS plus additional retention) was obtained by adding the costs for HLSS (Alternative 1) to the costs for Alternative 2A (3.0 MG additional downstream retention), as shown in Table 8-16.

Table 8-16. Hybrid HLSS Plus 3.0 MG Retention Costs

Item	Present Worth May 2013 ($ Million)
HLSS PBC	658
3.0 MG Additional Tank Storage	93
Hybrid HLSS Plus 3.0 MG Retention Total Present Worth, $M	**751**

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 water quality improvement, operational cost, and projected probable cost to construct.

8.5.a Cost-Performance Curves

Figure 8-15 plots the relationship of percent CSO control to the total PBC of the retained alternatives. As noted, there are two points for disinfection: annual equivalent and recreational season (May 1st – October 31st) equivalent. The former represents the actual level of annual CSO control that would be realized with disinfection operational during the recreational season whereas the recreational season point shows the level of CSO control that would occur during the bathing season from Memorial Day to Labor Day and recreational season (May 1st – October 31st).

Percent CSO control ranges from a low of 15 percent (10 percent GI) to a high of 100 percent control (additional 29.5 MG downstream tank and recreational season disinfection within the bathing season), with costs spanning from a low of $11.3M (disinfection) to a high of $751M (additional 3.0 MG downstream retention with HLSS). A second order best-fit cost curve was developed based on alternatives that were judged more cost-effective for the CSO control level. There were outliers both on the negative and positive sides of the curve. The negative outliers, shown in red, were not included in the cost curve. For example, for 50 percent CSO volume reduction, the 6.5 MG Downstream Retention and 6.7 MG Upstream Retention alternatives were more cost-effective than the HLSS alternative. Therefore, the retention alternatives would be preferred with respect to that level of CSO control, rather than the HLSS alternative. Also shown in red is the positive outlier representing the CSO control of disinfection operations during the recreational season from May 1st – October 1st. It, too, was not included in the curve however it is clearly cost-beneficial in terms of CSO control vs. other alternatives. This is in part due to the fact that the Alley Creek CSO Retention Facility is already constructed and can be used as part of the disinfection alternative, thus reducing it's cost.

While the resulting curve does not show a clear KOTC, the two disinfection points, annual equivalent and recreational season are far to the left of the plot. Had the calculated best-fit line been instead hand drawn to include both of these points, a clear KOTC would result, thus suggesting that the disinfection alternative is the most cost-effective from a cost-performance basis.

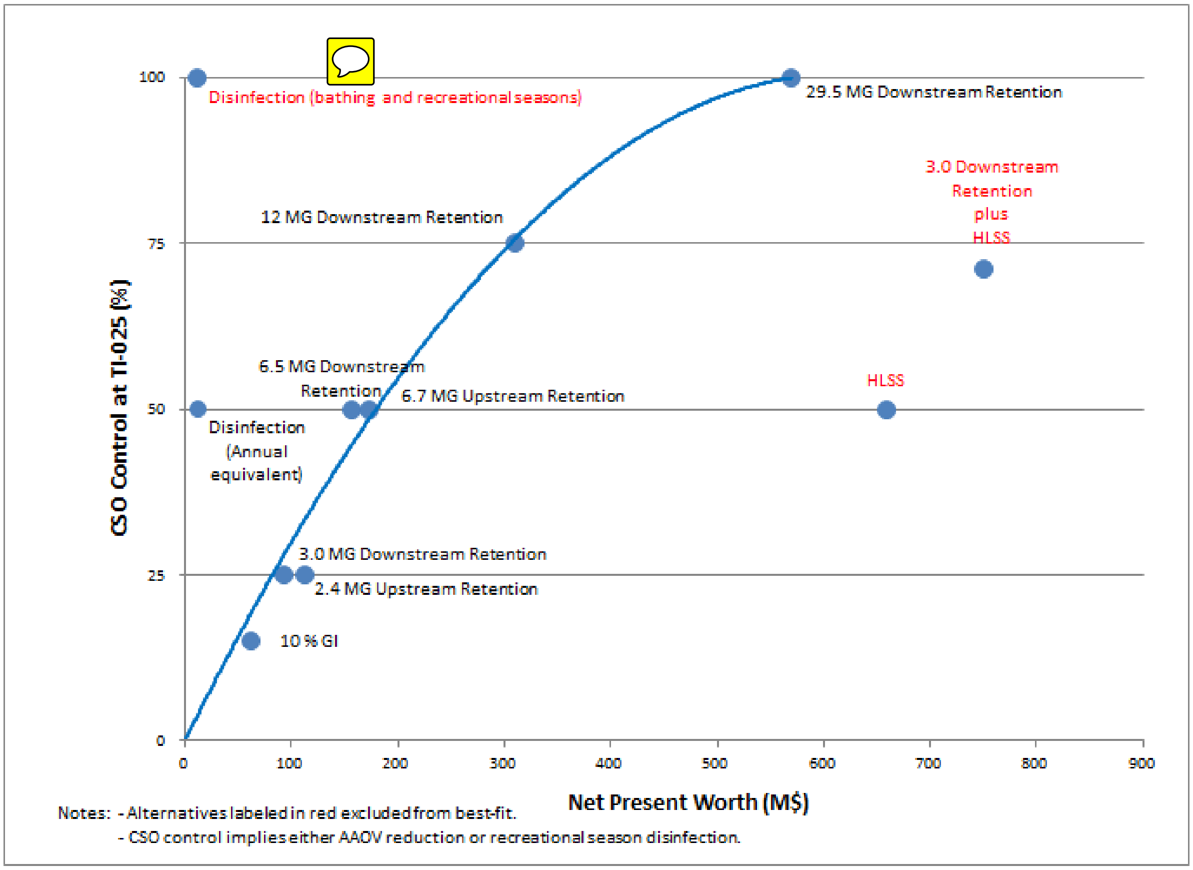


Figure 8-15. Cost vs. CSO Volume Reduction
(except disinfection alternative as noted) - 2008 Rainfall

Along with overall CSO volume control a goal of the LTCP is to reduce bacteria loadings to the waterbody to the extent that such loadings are caused by CSOs. Figures 8-16 and 8-17 plot the cost of the retained alternatives against their associated projected annual enterococci and fecal coliform loading reductions, respectively. The primary Y-axis (left side) shows percent bacteria loading reductions at TI-025, the outfall for the existing Alley Creek CSO Retention Facility. The secondary Y-axis (right side) shows the total loading reductions including other sources of bacteria, most notably, stormwater.

Percent enterococci CSO loading reduction ranged from a low of 0 or near 0 percent (additional 3.0 MG downstream retention plus HLSS, in red to the extreme right on the figure) to a high of 100 percent (29.5 downstream retention). The maximum CSO enterococci loading reduction corresponds to 41 percent reduction in total loadings. The percent CSO fecal coliform loading reduction ranged from a low of around 12 percent (HLSS or 10 percent GI) to a high of 100 percent reduction (29.5 downstream retention). The maximum CSO fecal coliform loading reduction corresponds to 41 percent reduction in total loadings. The costs increase to $751M (additional 3.0 MG downstream retention plus HLSS).

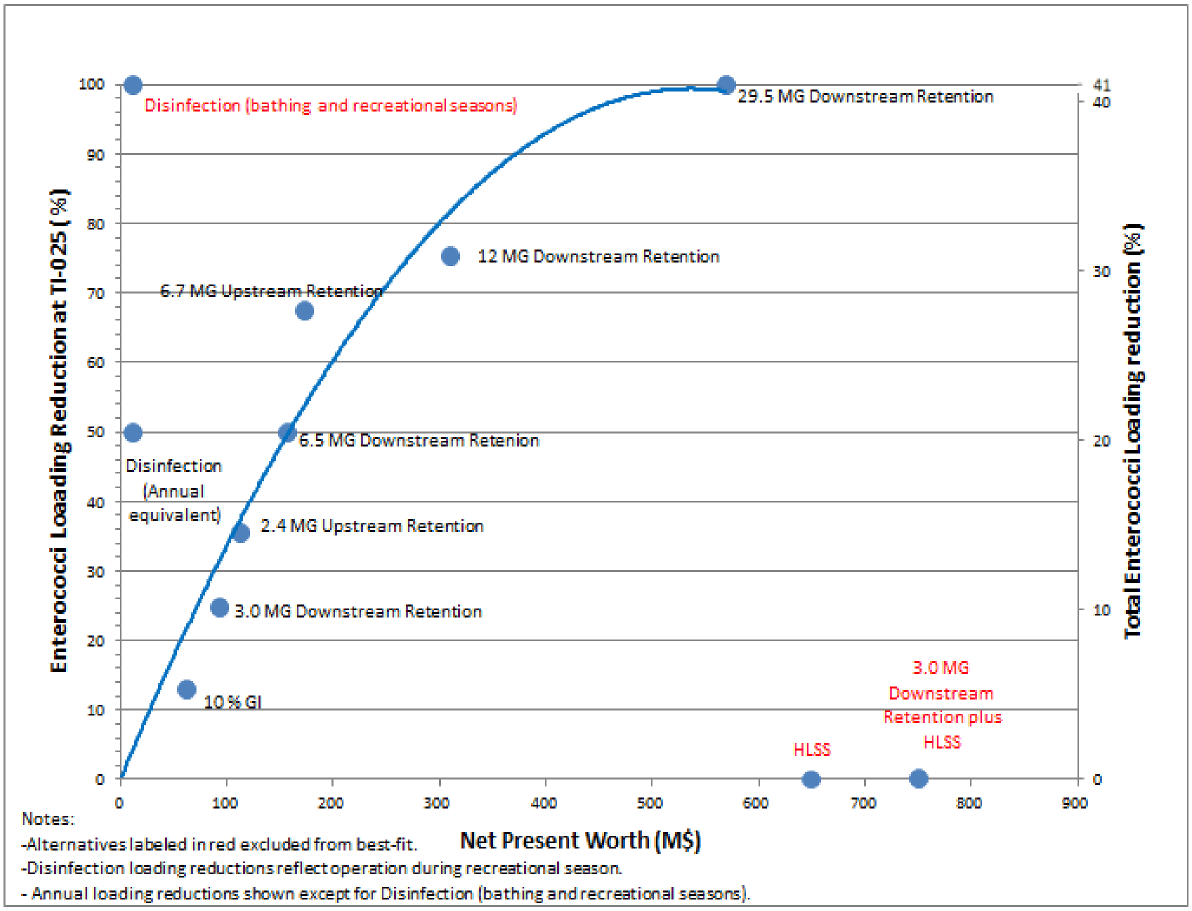


Figure 8-16. Cost vs. Enterococci Loading Reduction - 2008 Rainfall

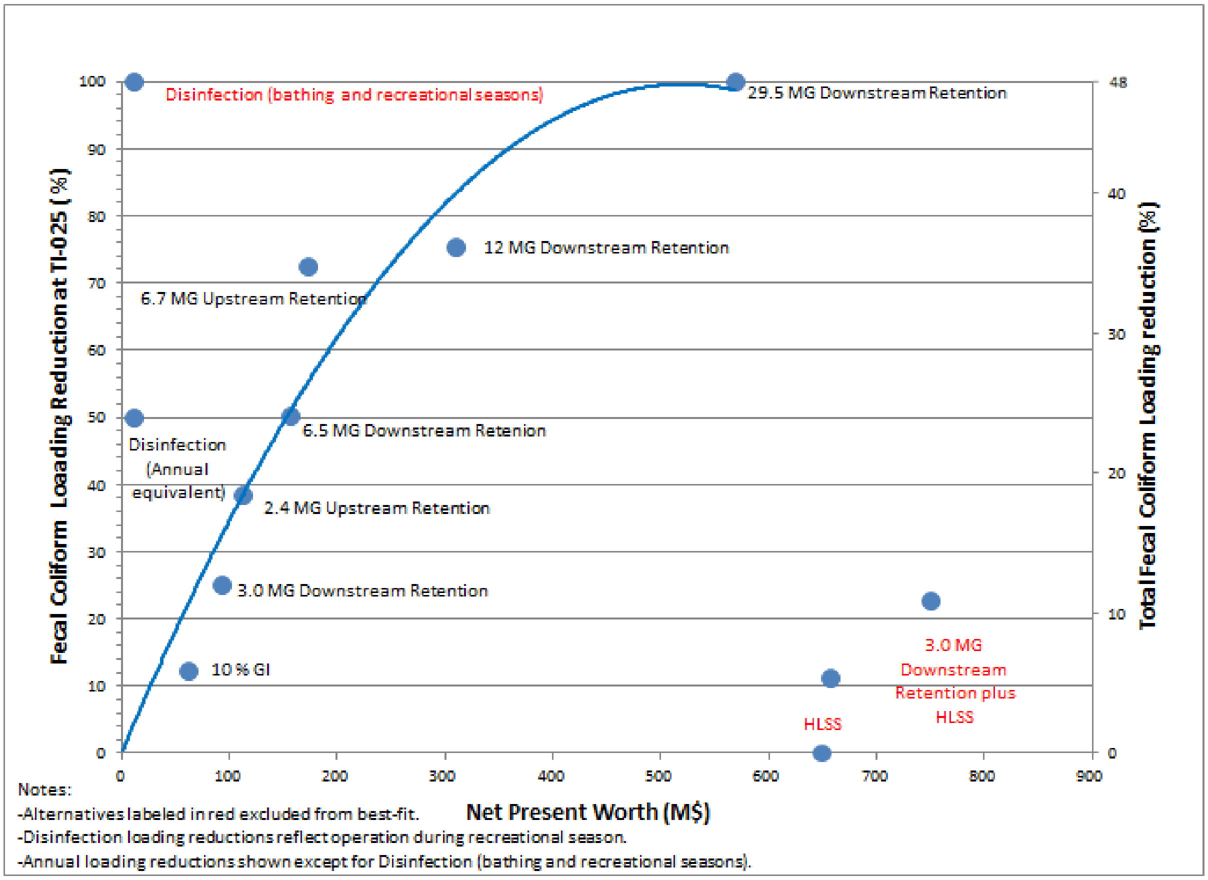


Figure 8-17. Cost vs. Fecal Coliform Loading Reduction – 2008 Rainfall

Best fit curves were again plotted that excluded outliers that are shown in red on the two figures. As with the previous best-fit curve comparing costs versus level of CSO control (Figure 8-15), 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 disinfection points, annual equivalent and recreational season, the plot would indicate that disinfection, at $11.3M, is the most cost effective alternative.

8.5.b Cost-Attainment Curves

This section addresses costs of the CSO alternatives versus attainment with existing WQ criteria, Primary Contact WQ Criteria (SC) and Future Primary Contact WQ Criteria with modifications to the bacteria criteria due to 2012 EPA RWQC. As previously discussed in Section 6.0, attainment of existing bacteria criteria occurs essentially 100 percent of the time for both Alley Creek and Little Neck Bay under baseline conditions. Therefore, because there are no performance gaps with existing bacteria criteria, plots demonstrating this 100 percent attainment are embedded in the cost attainment plots developed for the WQS options. These plots are presented as Figures 8-18 through 8-22 for five stations within Alley Creek and Little Neck Bay. In these plots, baseline conditions attainment is represented by the points overlaying 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 Future Primary Contact WQ Criteria with 2012 EPA RWQC. However, when these attainment points refer to existing standards, the levels of attainment realized by the operational disinfection during the recreational season are computed for the recreational and bathing seasons, as applicable.

Considering attainment with Future Primary Contact WQ Criteria with 2012 EPA RWQC modification to the enterococci criteria, namely the 35 cfu/100mL 30-day rolling GM and a Statistical Threshold Value (STV) of 130 cfu/100mL, attainment of this enterococci criteria for Little Neck Bay varied with time of year and location in the Bay. Regarding the GM criterion at the northern end of the Bay, the performance gap was small, with annual attainment occurring 96 percent of the time at Station E11 under baseline conditions.

Figure 8-18 shows the modeled improvement in annual attainment at Station E11 for each alternative. When considering an STV of 130 cfu/100mL, the performance gap was small, with annual attainment occurring 69 percent of the time at Station E11 under baseline conditions. As previously discussed, the improvements in attainment of future criteria shown are marginal, rising a maximum of 6 percent, for the alternative with the greatest improvement (100 percent CSO control). Recent input from DEC has stated that the alternate criteria of rolling 30 day GM of 30 cfu/100mL and STV of 110 cfu/100mL will be adopted. However, the attainment analyses included in this LTCP are for 35 and 130 cfu/100mL respectively.

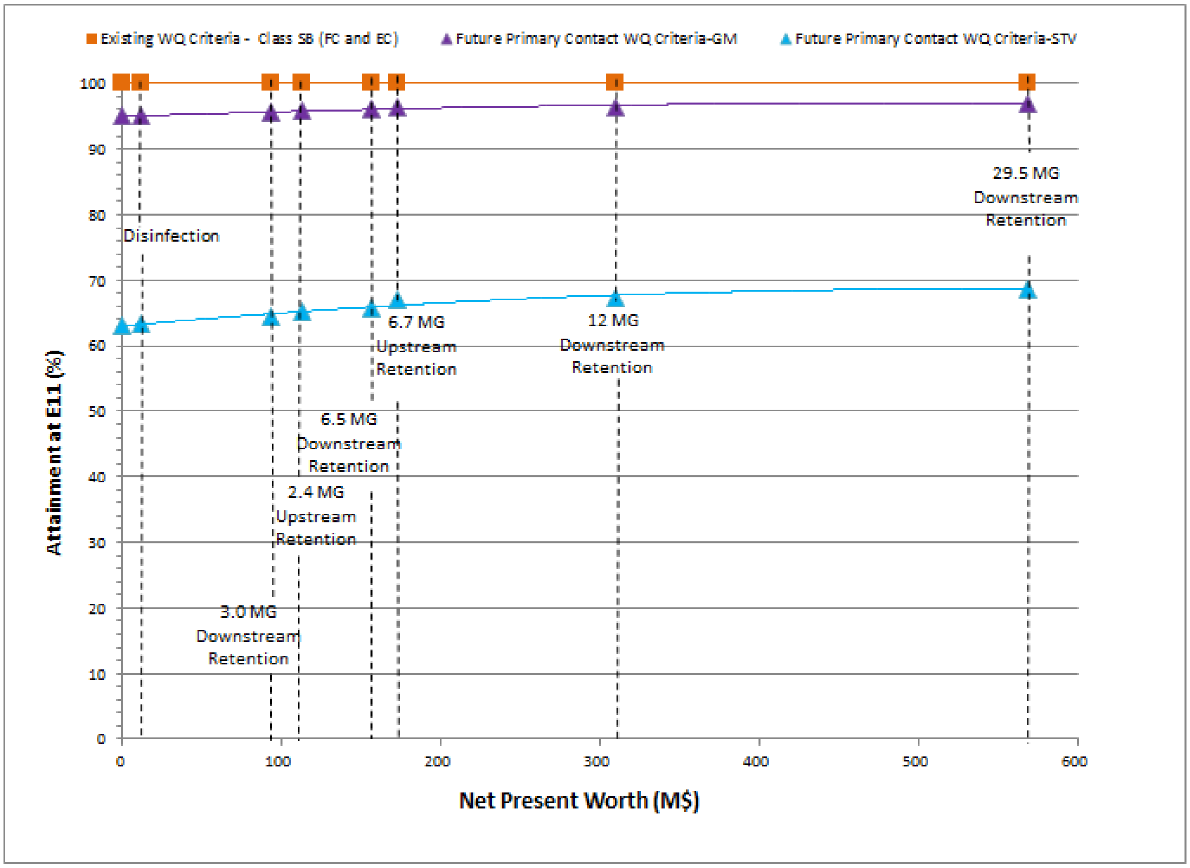


Figure 8-18. Cost vs. Bacteria Attainment near East River (Station E11) – 2008 Rainfall

Figure 8-19 shows the ability of each alternative to attain Class SB WQS at DMA Beach, and summer attainment of NYCDOHMH recreational waters standards as a function of the total project cost. Baseline conditions are in attainment with existing WQ criteria (Class SB and NYCDOHMH) 100 percent of the time. Considering Future Primary Contact WQ Criteria with 2012 EPA RWQC, controlling 100 percent of the CSO would result in a maximum seven percent increase in annual attainment of the STV criterion, with all other alternatives having a lesser degree of improvement. The cost attainment curves for applicable standards for Station LN1, presented in Figure 8-20, are essentially identical to the curves for DMA Beach.

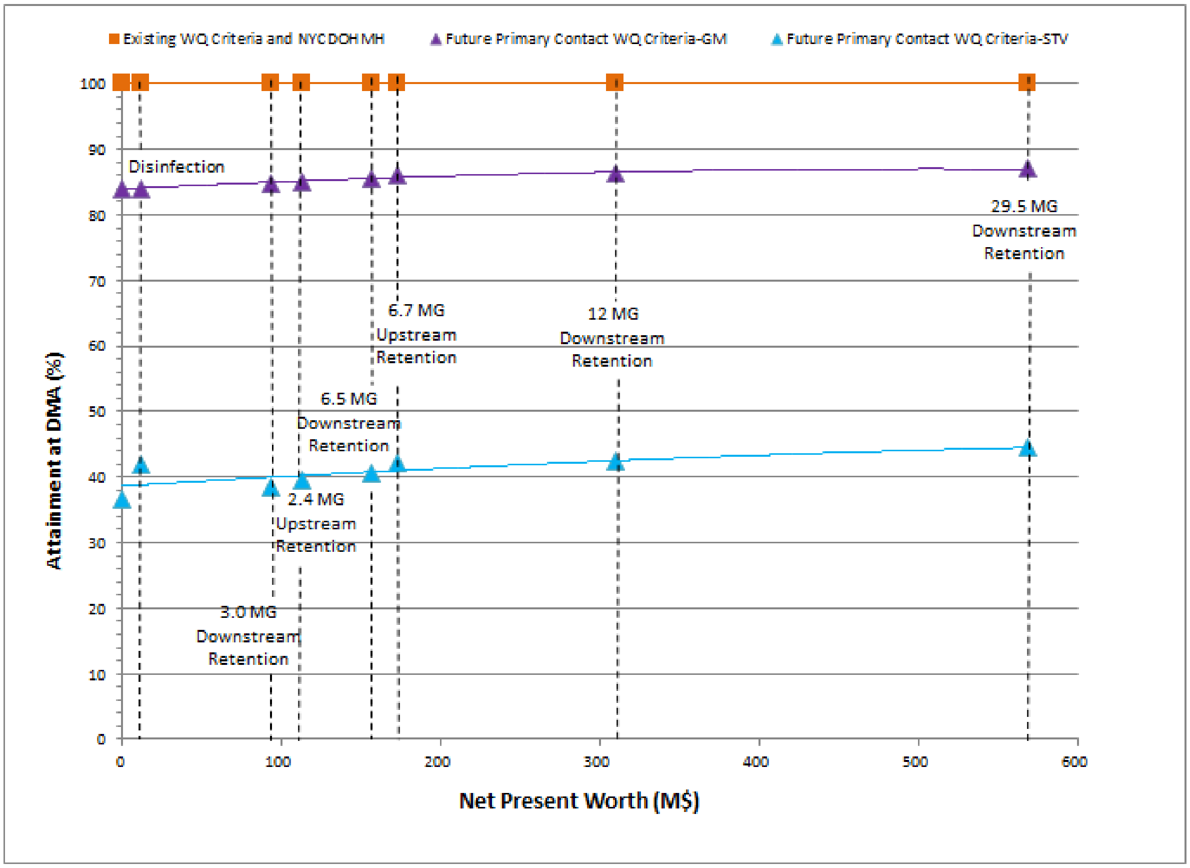


Figure 8-19. Cost vs. Bacteria Attainment at DMA Beach – 2008 Rainfall

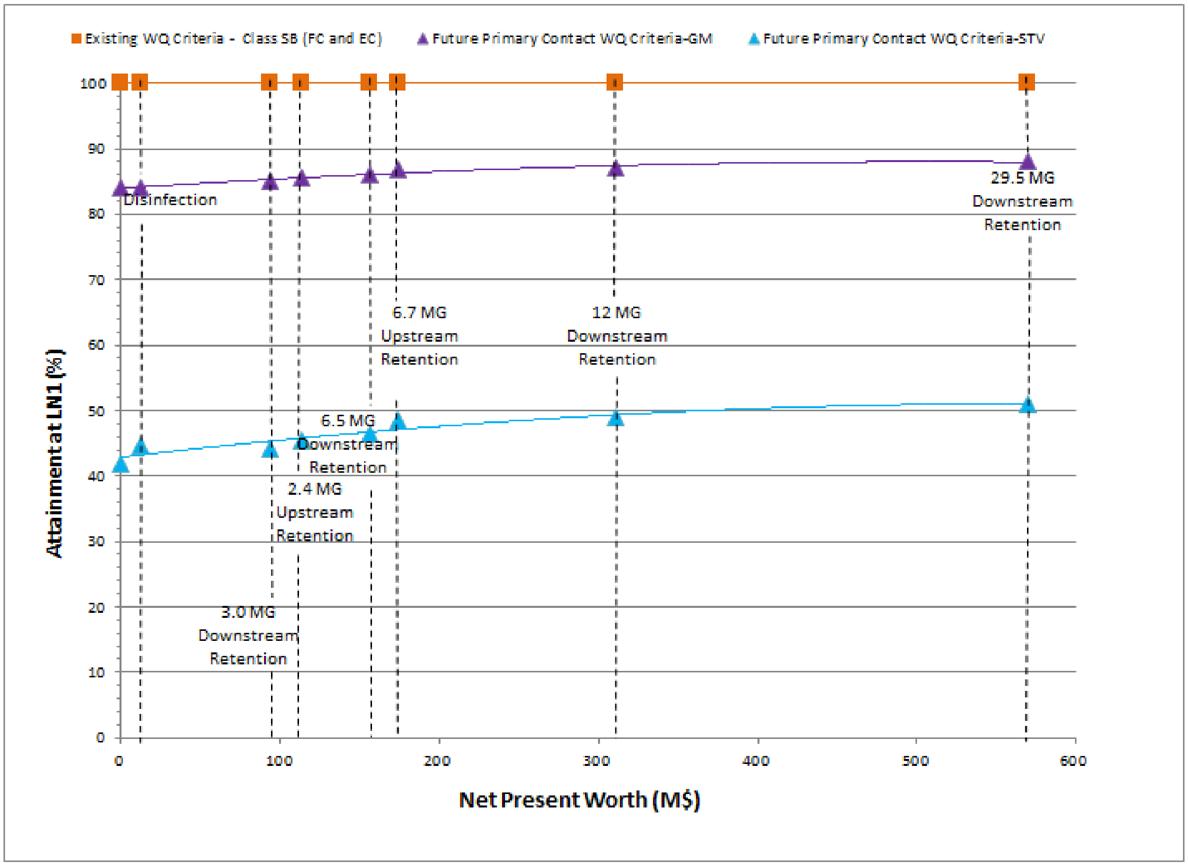


Figure 8-20. Cost vs. Bacteria Attainment at Little Neck Bay (Station LN1) – 2008 Rainfall

Figure 8-21 shows that Station OW2, in the tidal mixing zone between Alley Creek and Little Neck Bay, would attain existing bacteria criteria essentially 100 percent of the time. The figure also depicts the ability of each alternative to attain the 2012 EPA RWQC modification enterococci criteria as a function of the total project cost. Baseline conditions would be in attainment with these criteria approximately 70 percent of the time regarding the GM criterion, and nine percent of the time regarding the STV criterion. Controlling 100 percent of the CSO would result approximately in only a five percent increase in annual attainment of both enterococci criteria, with all other alternatives having a lesser degree of improvement.

Figure 8-22 depicts the attainment gain that would result from multiple alternatives at Station AC1. The curves reflect attainment with existing applicable Class I standard, possible upgrade to Primary Contact WQ Criteria (Class SC), and the Future Primary Contact WQ Criteria with 2012 EPA RWQC. As shown, the largest improvement would be realized in attaining Future Primary Contact WQ Criteria with 2012 EPA RWQC enterococci GM criterion with 100 percent CSO control. Under this scenario, there would only be a six percent increase in attainment over baseline conditions, from 10 percent to 16 percent.

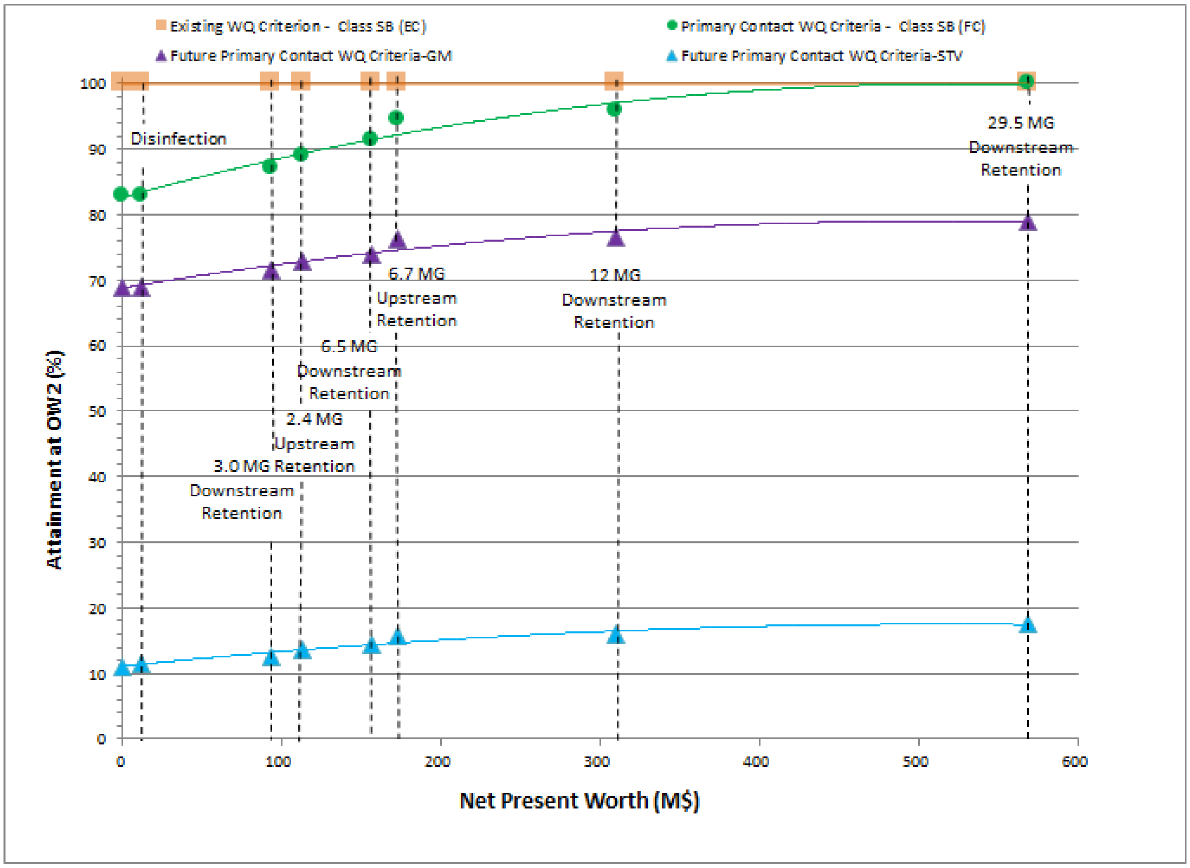


Figure 8-21. Cost vs. Bacteria Attainment at Southern Little Neck Bay (Station OW2) – 2008 Rainfall

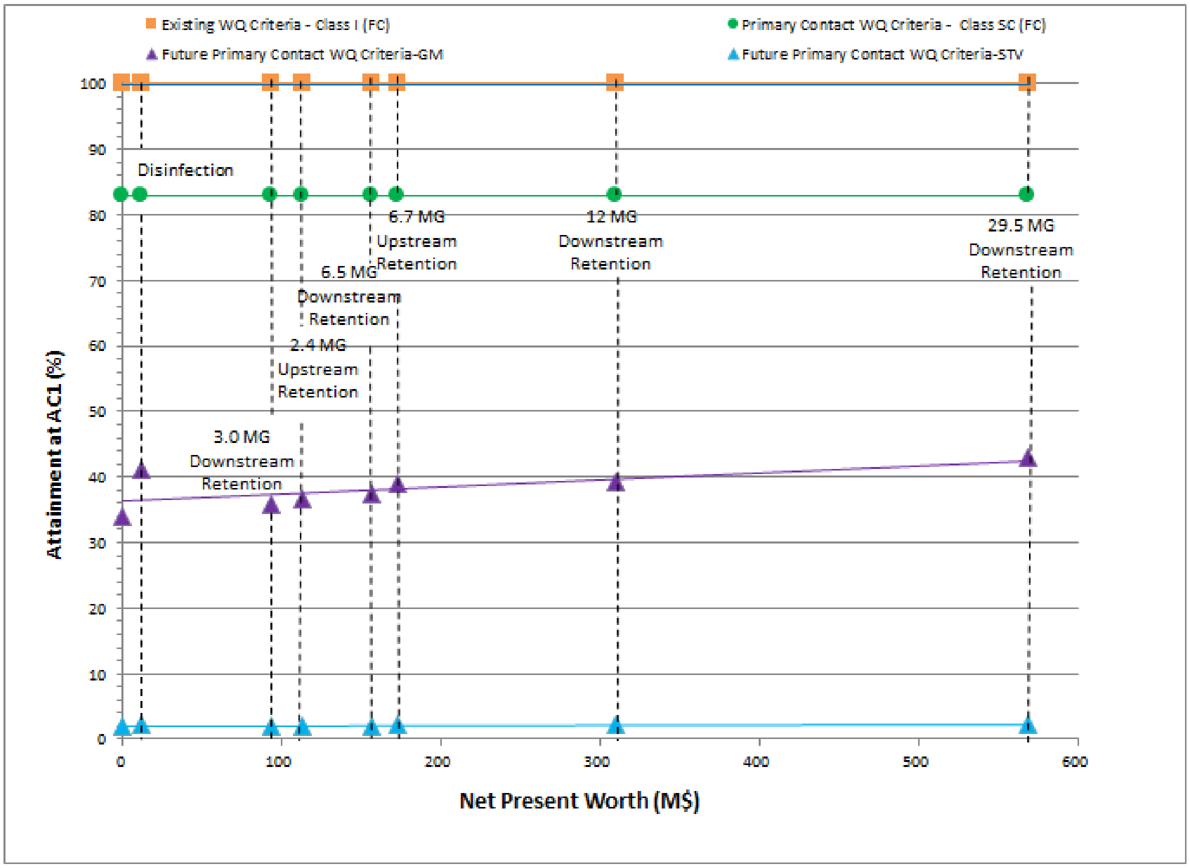


Figure 8-22. Cost vs. Bacteria Attainment at Alley Creek (Station AC1) – 2008 Rainfall

Results show that capturing additional volume of CSO, regardless of the degree of capture, does not significantly improve the attainment of existing or Future Primary Contact WQ Criteria at Station AC1. The remaining non-attainment is caused by other sources of pollution such as stormwater. Ecological and physical changes to the characteristics of the waterbody may also be contributing to future non-attainment.

8.5.c Preferred Alternative

Based upon the series of cost performance (Figures 8-15 through 8-17) and cost attainment (Figures 8-18 through 8-22) plots presented in this section, Alternative 4, Disinfection within the existing Alley Creek CSO Retention Facility, is the most cost effective alternative with respect to CSO control. It also removes the remaining human or CSO-source bacteria discharges. However, it only increases attainment with by a few percent (see below), and poses a risk of chlorine toxicity. The proposed disinfection system, as described in Section 8.2.a.2 and shown graphically in Figure 8-13, is based on the following:

- Disinfection would occur during the recreation season as defined by the period of May through October. The disinfection facilities would be operated to minimize chlorine (sodium hypochlorite) dosing by having a targeted bacteria reduction in the order of 2 logs, or 99 percent

- Dechlorination of the effluent, if necessary, (via sodium bisulfite) would be applied to minimize the discharge of excess chlorine with a maximum effluent concentration of TRC set at 0.1 mg/L

As discussed earlier in this section, this operational strategy of targeted 2-log reduction recreational season disinfection provides the critical balance of high rates of bacteria reduction and protection of the waterbodies from the potential harmful effects of TRC.

The cost attainment plots (Figures 8-18 through 8-22) did not demonstrate significant improvements in the level of attainment with either current or Future Primary Contact WQ Criteria options. These plots were based on the 2008 typical year model simulations. The WQ model was also used to characterize WQS attainment for the recommended alternative of recreational season disinfection by running the model for the full 10 years simulation period as was done for the baseline and 100 percent CSO control conditions. The results of these runs are summarized in Tables 8-17 (annual attainment) and 8-18 (recreation season attainment).

Table 8-17. Calculated 10-year Bacteria Attainment for the Recommended Alternative– Annual Period

Location		Existing WQ Criteria		Primary Contact WQ Criteria (Class SC for Alley Creek)		Future Primary Contact WQ Criteria	
		Criterion	Attainment (%)	Criterion	Attainment (%)	Criterion	Attainment (%)
Alley Creek	AC1	Fecal ≤2,000	100	Fecal ≤200	90	Fecal ≤200	90
Little Neck Bay	OW2	Fecal ≤200	97	Fecal ≤200	97	Fecal ≤200	97
	LN1	Fecal ≤200	99	Fecal ≤200	99	Fecal ≤200	99
	E11	Fecal ≤200	100	Fecal ≤200	100	Fecal ≤200	100
	DMA	Fecal ≤200	100	Fecal ≤200	100	Fecal ≤200	100
		Enterococci ≤35(1)	99	Enterococci ≤35(2)	99	Enterococci ≤35(2)	99

Notes: (1) Bathing season (Memorial Day – Labor Day)
(2) Recreational season (May 1st – October 31st)

Table 8-18. Calculated 10-year Bacteria Attainment for the Recommended Alternative – Recreational Season Only

Location		Existing WQ Criteria		Primary Contact WQ Criteria (Class SC for Alley Creek)		Future Primary Contact WQ Criteria	
		Criterion	Attainment (%)	Criterion	Attainment (%)	Criterion	Attainment (%)
Alley Creek	AC1	Fecal ≤2,000	100	Fecal ≤200	98	Enterococci ≤35(2)	64
						STV≤130(2)	10
Little Neck Bay	OW2	Fecal ≤200	100	Fecal ≤200	100	Enterococci ≤35(2)	95
		Enterococci ≤35(2)	95	Enterococci ≤35(2)	95	STV≤130(2)	31
	LN1	Fecal ≤200	100	Fecal ≤200	100	Enterococci ≤35(2)	99
		Enterococci ≤35(2)	99	Enterococci ≤35(2)	99	STV≤130(2)	73
	E11	Fecal ≤200	100	Fecal ≤200	100	Enterococci ≤35(2)	100
		Enterococci ≤35(2)	100	Enterococci ≤35(2)	100	STV≤130(2)	85
	DMA	Fecal ≤200	100	Fecal ≤200	100	Enterococci ≤35(2)	99
		Enterococci ≤35(1)	99	Enterococci ≤35(2)	99	STV≤130(2)	69

Notes: (1) Bathing season (Memorial Day – Labor Day)
(2) Recreational season (May 1st – October 31st)

As noted in Table 8-17 with disinfection during the recreational period, Alley Creek is projected to attain the existing fecal coliform criterion (Class I) 100 percent of the time and attain the fecal criteria for the Primary Contact WQ Criteria (Class SC) 90 percent of the time. This situation changes when examining attainment during the recreational period when disinfection would be practiced (Table 8-18) as compliance with the fecal coliform criterion of the Primary Contact WQ Criteria would increase to 98 percent and would basically be in compliance with the standards. However as noted in Table 8-18, when examining the recreational season, the enterococci criterion (Future Primary Contact

WQ Criteria) will not be attained in Alley Creek. Examination of projected attainment in Little Neck Bay (Table 8-17 and Table 8-18) shows that the Class SB criteria are largely attained for the fecal coliform bacteria criterion. While the attainment is high with existing SB criteria (GM of 35 cfu/100 ml enterococci) at all LNB locations, it drops significantly for the recreational periods for the Future Primary Contact WQ Criteria when the STV values are examined. Table 8-19 shows the projected 90^{th} percentile enterococci concentrations with the recommended plan in place.

8.6 Use Attainability Analysis (UAA)

The CSO Order requires a UAA to be included in LTCPs "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 UAA shall "examine[e] whether applicable waterbody classifications, criteria, or standards should be adjusted by the State". The UAA process specifies that States can remove a designated use which is not an existing use if the scientific assessment can demonstrate that attaining the designated use is not feasible for at least one of six reasons:

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

As part of the LTCP, elements of a UAA, including the six conditions presented above, will be used to determine if changes to the designated use is warranted, considering a potential adjustment to the designated use classification as appropriate. A UAA for Alley Creek is attached hereto as Appendix E.

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 water quality benefits associated with CSO reduction is a cornerstone of this LTCP Update.

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

- Waterbody meets WQ requirements. This may either be the existing WQS (where primary contact is already designated) or assess for an upgrade to the Primary Contact WQ Criteria (where the existing standard is not a Primary Contact WQ Criteria). In either case, a high-level assessment of the factors that define a given designated use is performed, and if the level of control required to meet this goal can be reasonably implemented, a change in designation may be pursued following implementation of CSO controls and post-construction 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. As noted in Table 6-11 of Section 6.0, “local sources” contribute a summer 30-day maximum GM of 18 cfu/100mL of enterococci at location Station AC1 in Alley Creek for year 2008 conditions. NYC stormwater discharges and direct drainage contribute a maximum 30-day GM of 46 cfu/100mL at this location. At Station OW2 in Little Neck Bay these numbers reduce to 1 cfu/100mL and 16 cfu/100mL, respectively, while at location LN1 they are reduced further to 0 cfu/100mL and36 cfu/100mL, respectively. It should be noted that these two sources alone result in maximum summer 30-day GM concentrations of enterococci that are higher than the primary contact recreation criterion of 35 cfu/100mL for Alley Creek.

DEP is committed to further characterization and reduction of the local sources and is conducting follow-up investigations into their causes and possible mitigation. The goal of this would be to eliminate illicit discharges into Alley Creek. DEP, however, does not believe the dry weather bacteria concentrations emanating from Oakland Lake or the LIE Pond are illicit discharges, but are likely the result of waterfowl or other animals living in these natural settings. It is thus anticipated that these natural sources will remain unchanged in the future and are thus made part of the baseline conditions. In addition, while control of bacteria levels in NYC stormwater is currently being negotiated between the DEC and DEP in the draft Municipal Separate Storm Sewer Systems (MS4) permit, clear direction has not yet been provided as to the levels of stormwater reduction that will be required and/or are feasible. Therefore, although DEP has proposed a plan to control bacteria discharged from the Alley Creek CSO Retention Facility during the recreational season, there will continue to be other sources of bacteria that will preclude attainment of the future enterococci criteria within portions of Little Neck Bay.

8.6.b Fishable/Swimmable Waters

As noted in Section 8.1, and in other previous sections, 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 and SB classifications as fulfillment of the CWA..

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

Alley Creek

Water quality modeling analyses, conducted for Alley Creek, and summarized in Tables 8-17 and 8-18, shows that the Creek is predicted to comply with the Primary Contact WQ Criteria (Class SC limited primary/secondary contact) monthly fecal coliform criterion of 200 cfu/100mL 90 percent of the time (annual average) in the 10-year simulation period. Compliance with the potential 30-day GM bathing criterion of 35 cfu/100mL enterococci is predicted (Table 8-18) to be 64 percent on average during recreational periods for the recommended plan conditions. As such, Alley Creek would not comply with the existing SC WQS, should they be implemented in the future, based on NYS DEC fecal coliform primary contact recreation standards annually or the Future Primary Contact WQ Criteria (2012 EPA RWQC criteria). However, the recommended alternative results in full attainment ($\geq$95%) of Primary Contact WQ Criteria when applied during the recreational season.

Little Neck Bay

As noted in Section 8.5, Little Neck Bay is for the most part projected to comply, under the recommended plan conditions, with applicable bacteria WQS for Class SB waters fecal coliform and for the 30-day recreational period GM enterococci criteria of 35 cfu/100mL but not for the STV portion of the 2012 RWQC criteria, should they be implemented in the future. The results summarized above and in Table 8-18 indicate that Little Neck Bay attains WQ (primary contact) with the recommended plan except for a small transition zone which come close to attainment (95 percent attainment). Since the existing NYS DEC Primary Contact WQ Criteria are projected to be attained a UAA is not required at this time for Little Neck Bay.

As noted, DEP is proposing disinfection of the Alley Creek CSO Retention Facility during the recreational season to reduce the human source of bacteria during the bathing season (Memorial Day to Labor Day). Even with CSO disinfection, the results are not predicted to change Alley Creek compliance sufficiently enough to attain primary contact WQ criteria 100 percent of the time throughout the entire creek because of the remaining non-CSO bacteria sources. Since the Primary Contact WQ Criteria (Class SC) standards are projected to be un-attainable, a UAA is required at this time for Alley Creek.

A UAA is required to justify this based on the relevant criteria listed above. Since the analyses prove that even 100 percent elimination of CSO sources does not result in attainment, the UAA includes a discussion of factor number 3 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). The UAA also cites the lack of access and channel suitability for primary contact recreation activities as well.

8.6.c Assessment of Highest Attainable Use

The analyses contained herein, as noted above in Section 8.5.c and summarized in Table 8-19 indicate that the existing NYS DEC Class SB (primary contact water quality) criteria for bacteria are projected to be attained to a high degree within all of Little Neck Bay even coming close to full attainment in the small portion of the bay near the mouth of Alley Creek during the recreation season. However, Class SC (limited primary/secondary contact water quality) criteria for bacteria are not predicted to be fully attained within Alley Creek with the recommended alternative. Further, analyses conducted and described in Section 6.0 shows that 100 percent CSO controls would not provide for full compliance with the Primary Contact WQ Criteria or Future Primary Contact WQ Criteria, for Alley Creek.

Table 8-19. 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 SC for Alley Creek)**	**Future Primary Contact WQ Criteria[(1)]**
Alley Creek		YES	NO	NO
Little Neck Bay	Inner Bay	YES	N/A	YES
	Outer Bay	YES	N/A	YES
DMA Beach		YES	N/A	YES

Note: YES - indicates attainment is calculated to occur ≥ 95 percent of time.
NO – indicates attainment is calculated to be less ≤ 95 percent of time.
(1) No areas would be in attainment if STV values are adopted in 2015 by NYS DEC

The modeling analysis assessed whether the recommended plan would improve water quality to allow for Class SC criteria in Alley Creek, both annually and for the recreational season. As shown in Tables 8-17 and 8-18, fecal coliform bacteria levels would approach the Class SC criteria, attaining them a high percent of the time. The lowest level of enterococci bacteria attainment of the existing 30-day recreational period GM of 35 cfu/100mL would be 95 percent attainment in the inner portions of Little Neck Bay, which is assumed herein to allow for the designated use. As noted in Table 8-18, attainment with the Future Primary Contact WQ Criteria would not occur 100 percent of the time in Alley Creek with the recommended plan for the enterococci criteria as measured by the 30-day GM and the STV values.

In summary, assuming that local sources of contamination into Little Neck Bay in the vicinity of DMA Beach are controlled, the Bay generally is projected to meet the existing Class SB bacteria criteria, including nearly 100 percent compliance at DMA Beach. Little Neck Bay is projected to attain SB standard and even come close to full attainment in the inner portions of the Bay near the mouth of Alley Creek. Alley Creek, however, cannot attain the primary contact classification of SC, limited primary and secondary contact recreation, through CSO controls alone annually but full attainment is observed when Primary Contact WQ Criteria are applied during recreational season.

8.7 Water Quality Goals

A goal of the Clean Water Act is for all water bodies to attain fishable-swimmable water where that goal can be attained. Analyses provided above indicate that waters in the outer portions of Little Neck Bay including DMA beach can fully support that use with the recommended alternative. Full attainment with the future primary contact recreation STV values, does not appear to be possible based on the analyses contained herein for Alley Creek or Little Neck Bay however.

DEP has developed an approach to move toward the goal of primary contact recreation water quality conditions with the recommended plan to disinfect Alley Creek CSO Retention Facility overflows during the recreational season. However, as noted, the EPA RWQC primary contact recreation geometric mean criteria (GM or STV) cannot be fully attained in Alley Creek nor throughout Little Neck Bay (STV value) even with this additional level of protection. Therefore, DEP is proposing that (a) DEC consider site specific water quality geometric mean targets for Alley Creek, (b) DEP would issue advisories for periods when elevated bacteria concentrations are present in primary contact waters, and (c) DEC not adopt RWQC STV values as proposed at 110 or 130 cfu/100mL. The advisory approach is an approach that has been in place at NYC DOHMH certified bathing beaches for many years (http://www.nyc.gov/html/doh/html/environmental/beach-homepage.shtml).

8.7.a Site-Specific Water Quality Targets

Based on the analyses of the 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 fully support existing secondary uses, including nature education and wildlife propagation. Alley Creek is projected to attain its current Class I classification, but because of sources of bacteria to the Creek, such as localized sources and municipal stormwater discharges, it is not feasible for the waterbody to fully meet the water quality criteria associated with the next higher classification of SC except during the recreational season.

As described later in Section 9.0, DEP is committed to investigating ways to improve water quality in Alley Creek by tracking down dry weather sources of bacteria from TI-024, and controlling them to the extent practical. DEP is also engaged in discussions with DEC related to control of municipal stormwater. However, at this time, the nature and full extent of practical controls for these two sources is unknown. Therefore, although attaining fishable/swimmable WQS in Alley Creek is a long term future target, secondary limited primary contact use classification appears to be a practical short-term goal. Such a classification could be protective of primary contact during the recreation season outside of the periods during and after rainfall. Although, combinations of natural and manmade 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 meets the Class SB standards almost 100 percent of the time when examined for the DEC fecal coliform monthly criterion, as well as the 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 some times, under existing conditions. However, these local sources will need to be eliminated to continue to improve bacteria compliance in Little Neck Bay so that full attainment of the Class SB is achieved.

Future Water Quality

DEP is committed to improving water quality in Alley Creek and Little Neck Bay. Recreation season disinfection of the overflow from the Alley Creek CSO Retention Facility is one step in that process. Toward that end, DEP suggests that site-specific water quality targets be established for Alley Creek and Little Neck Bay that will allow DEP to continue to improve water quality in the system over time. Site-specific targets are recommended to advance towards the numerical limits established by DEC, SC bacteria standards and Future Primary Contact WQ Criteria with 2012 EPA RWQC. These targets are shown in Table 8-20.

DEP has identified the following higher attainable bacteria targets:

- Recreational Season (May 1st – October 31st): Uses of Alley Creek and Little Neck Bay are generally oriented around the recreational season. During the recreational season, boaters use the waters and DMA Beach is certified for swimming. The preferred alternative in Section 8.5, which DEP intends to pursue, is recreational season disinfection of the Alley Creek CSO Retention Facility effluent so that human bacteria discharged from the retention facility are reduced. With this focus on protecting the general public during the period of primary contract recreation, DEP proposes that water quality targets should be protective where the bathing uses are present and less stringent targets established where primary contact uses do not exist. DEP projects the potential to attain the following numerical site-specific targets during the recreational season against which continual water quality improvements be measured:

    - DMA Beach: Maximum rolling 30-day recreational season GM enterococci value of 35cfu /100mL and Monthly fecal coliform GM concentration of 200 cfu /100mL

    - Little Neck Bay: Maximum rolling 30-day recreational season GM enterococci value of 35 cfu /100mL and Monthly fecal coliform GM concentration of 200 cfu/100mL

    - Alley Creek: 30-day recreational season GM enterococci value of 130 cfu /100mL and Monthly recreational season fecal coliform GM concentration of 200 cfu/100mL

- Non-recreational Season (November 1st – April 30th): Uses in Alley Creek and Little Neck Bay are reduced; boating is still an activity for the transition periods between summer and winter but the number or users is reduced and water temperatures not conducive to primary contact, and, the DMA Beach is not certified by DOHMH for bathing. DEP projects the potential to attain the following numerical site-specific targets during the recreational season against which continual water quality improvements be measured:
    - DMA Beach: Monthly fecal coliform GM concentration of 200 cfu/100mL
    - Little Neck Bay: Monthly fecal coliform GM concentration of 200 cfu/100mL
    - Alley Creek: Monthly fecal coliform GM concentration of 500 cfu /100mL

The identified recreational season water quality targets are summarized in Table 8-20 in comparison to the bacteria water quality criteria. This table also provides a summary of the calculated bacteria criteria attainment. As noted in this table, the plan results in a high level of attainment with these proposed numerical targets.

Also as noted above, DEP does not believe that adoption of the STV portions of the 2012 EPA RWQC is warranted at this time. Analyses presented herein clearly show that adoption of STV values of 130 cfu/100mL is not attainable. Alternatively, DEP believes that if an STV value is required, it should be derived specifically for individual portions of Alley Creek and Little Neck Bay based on measured enterococci concentrations and their variability.

Table 8-20. Summary of Recreational Period Bacteria Water Quality Targets

	Existing WQ Criteria	Primary Contact WQ Criteria	Site-Specific Targets with Disinfection (cfu/100mL)	Attainment with Site Specific Targets (%)
Little Neck Bay	Fecal Coliform ≤ 200 Enterococci ≤ 35(2)	Fecal Coliform No change Enterococci ≤ 35(2)	Fecal Coliform ≤ 200	100
			Enterococci ≤ 35	95(3) 100(4)
Alley Creek	Fecal Coliform ≤ 2000	Fecal Coliform ≤ 200	Fecal Coliform ≤ 200	98
			Enterococci ≤ 130	100

	Existing WQ Criteria	Primary Contact WQ Criteria	Site-Specific Targets with Disinfection (cfu/100mL)	Attainment with Site Specific Targets (%)
DMA Beach	Fecal Coliform ≤ 200	Fecal Coliform No change	Fecal Coliform ≤ 200	100
	Enterococci ≤ 35(1)	Enterococci ≤ 35(2)	Enterococci ≤ 35	99

Notes: (1) Bathing season (Memorial Day – Labor Day)
(2) Recreational season (May 1st – October 31st)

Although Alley Creek will not be capable of supporting primary contact 100 percent of the time and Little Neck Bay comes very close to full attainment, these water bodies could possibly be protective of primary contact should it occur as long as it did not occur during and following rainfall events. In addition, even though Little Neck Bay is projected to be fully capable of primary contact, concentrations of bacteria are elevated during and after rainfall events. Toward that end, DEP has reviewed the New York State Department of Health guidelines relative to single sample maximum bacteria concentrations that they believe “constitutes a potential hazard to health if used for bathing.” The presumption is that if the bacteria concentrations are lower than these levels, then the water bodies do not pose a potential hazard if primary contact is practiced.

From NYS DOH

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

Operation and Supervision

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

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

Fecal coliform concentrations that exceed 1,000 cfu/100mL and or enterococci concentrations exceeding 104 cfu/100mL are considered potential hazards by the State Department of Health and should be avoided. Water quality modeling analyses described herein assess the amount time following the end of rainfall required for Alley Creek and Little Neck Bay to recover and return to concentrations less than 1,000 cfu/100mL fecal coliform and 130 cfu/100mL enterococci. The value 130 was used instead of 104 as recent EPA guidance indicates that the 104 value will no longer be relevant.

The analyses consisted of examining the water quality model calculated Alley Creek and Little Neck Bay bacteria concentrations for recreation periods (May 1st to October 31st) abstracted from 10 years of model simulations. The time to return (or “time to recover”) to 1,000 or 130 was then calculated for each storm with the various size categories and the median time after the end of rainfall was then calculated for each rainfall category.

The results of these analyses are summarized in Table 8-21 for various locations within Alley Creek and Little Neck Bay. As noted the duration of time within which bacteria concentrations are expected to be higher than NYS DOH considers safe for primary contact varies with location and with rainfall event size. Generally, a value of around 24 hours is reasonable for Alley Creek (AC1) and Little Neck Bay (OW2).

Table 8-21. Time to Recover (hours) To Fecal = 1,000 cfu/100mL and Entero = 130 cfu/100mL

	AC1		OW2		LN1		DMA	
Interval	**Fecal**	**Entero**	**Fecal**	**Entero**	**Fecal**	**Entero**	**Fecal**	**Entero**
<0.1	-	-	-	-	-	-	-	-
0.1-0.4	5	10	-	-	-	-	-	-
0.4-0.8	8	21	4	11	-	-	-	-
0.8-1.0	12	26	5	16	-	-	-	2
1.0-1.5	12	31	7	27	-	7	-	4
>1.5	14	31	12	27	-	16	2	12

Primary contact uses may be suspended for 24 hours following rain events to protect public health.

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 water quality 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 LTCP are:

1. DEP will continue to use the Alley Creek CSO Retention Facility to capture CSOs thus reducing overflows by 132 mgd per year.
2. DEP will continue to implement the Green Infrastructure program.
3. DEP will implement the steps necessary (i.e. funding, design, permitting, etc.) to construct a new facility at the existing Alley Creek CSO Retention Facility to disinfect during the recreational season (May 1st to October 31st).
4. The LTCP includes a UAA that identifies feasible site-specific WQ targets based on the projected performance of the selected CSO controls. A post construction monitoring program will be initiated after the WWFP improvements are operational. Based upon the results of such monitoring, the site-specific WQ targets may need to be reviewed
5. DEP will establish with the NYC Department of Health and Mental Hygiene through public notification a 24-hour wet weather advisory during the Recreational Season (May 1 to October 31), during which swimming and bathing would not be recommended. The LTCP includes a recovery time analysis that can be used to establish the 24-hour wet weather advisory for public notification.

Section 9.0 presents the implementation of the identified elements.

9.0 Long Term CSO Control Plan Implementation

The evaluations performed for this Alley Creek LTCP concluded is the recommendations be in implemented are from Alternative 4, Disinfection within the Existing Alley Creek CSO Retention Facility, in Section 8. This conclusion was the result of the cost performance and cost attainment analyses that were presented in Section 8.5 that showed that seasonal disinfection, potentially followed by dechlorination, is the preferred alternative. As previously noted in Section 8.5, the recommendation was based on the removal of human or CSO-source bacteria reduction (2-log or 99 percent) that would result from its implementation, not the level of additional attainment of Existing and Future Primary Contact WQ Criteria that would result. As demonstrated in both Sections 6.0 and 8.0, significant gains in WQS attainment cannot be achieved through the control of the CSO discharges alone.

This recommendation follows the sequence of previous CSO planning for Alley Creek and Little Neck Bay. The retention facility was first recommended in the 2003 Facilities Plan, and then re-stated in the 2009 WWFP as the preferred alternative. Following the $130M (million) investment in the watershed for the retention facility, related collection system improvements, and ecological restorations, the existing Alley Creek CSO Retention Facility is again the focus of this latest plan. In the case of this LTCP, the current recommendation is enhancing the effectiveness of the retention facility by further reducing the bacterial loadings to the two waterbodies via the disinfection process.

9.1 Adaptive Management (Phased Implementation)

Adaptive management, as defined by EPA, is the process by which new information about the characteristics of a watershed is incorporated into a watershed management plan. The process relies on establishing a monitoring program, evaluating monitoring data and trends and making adjustments or changes to the plan. In the case of this LTCP, adaptive management may result in future adjustments to the operations of the Alley Creek CSO Retention Facility based on lessons learned.

DEP will continue to apply the principles of adaptive management based on its annual evaluation of PCM data which is collected to optimize the operation and effectiveness of the facility. This will ensure that the facility provides the maximum level of AAOV reduction through timely post- and inter-storm dewatering.

Further, in order to achieve the targeted 2-log reduction of bacteria from the retention facility effluent while striving to minimize the discharge of TRC, DEP will review operational data of the disinfection system, such as sodium hypochlorite dosing and the resulting kills; sodium bisulfite dosing if needed; and the monitoring of effluent TRC concentrations, so that the overall process can be optimized and the potential harmful effects of TRC can be minimized.

Another aspect of the LTCP's phased adaptive management deals with interim or incremental water quality. Because of the inability to meet future Primary Contact WQ Criteria, the concept of "Site-Specific Targets" was discussed for Alley Creek and Little Neck Bay in Section 8.7, recommendations for such are described in Section 9.7. The water quality of the two waterbodies will be monitored and compared with these incremental targets as part of PCM.

As part of the upcoming municipal separate storm sewer system (MS4) permitting program, the impacts of stormwater on water quality will be addressed by DEP. Since stormwater loads were also found to be significant, this may impact the attainment of Alley Creek and Little Neck Bay along with the proposed CSO control that is recommended in this LTCP.

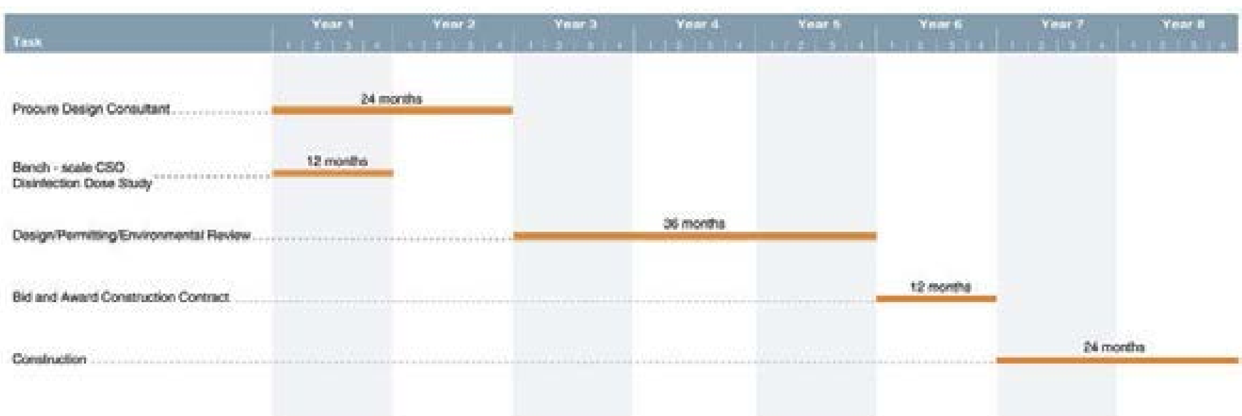
DEP will also continue to monitor water quality of two waterbodies through its ongoing monitoring programs. When evidence of dry weather sources of pollution is found, track downs will be initiated. Such activities will be reported to DEC on a quarterly basis as is currently required.

9.2 Implementation Schedule

The disinfection system and construction will include an interim facility and a Standard Design Facility. The schedule presents the duration of time needed for the Standard Design Facility which begins with the approval of the LTCP by DEC. Figure 9-1 shows the implementation schedule for the construction of disinfection system at the Alley Creek CSO Retention Facilities for the Standard Design Facility. The interim facility requirements and schedule are discussed in Appendix G. The interim facility will allow disinfection to begin at an earlier time and will be removed after the Standard Design Facility is operational. The disinfection facility will be operated from May 1st to October 31st (Recreational Season).

The project will include receiving approval for use of the land from the NYC Department of Parks and Recreation, funding approval, roadway access improvements and DOT approvals, selection of design flows, dosage rates, TRC evaluations, and utilities availability. A more detailed disinfection project approach is presented in Appendix G.

Table 9-1. Alley Creek Disinfection Facility Schedule-Standard Design Facility



9.3 Operation Plan/O&M

DEP is committed to optimizing the operation of the existing Alley Creek CSO Retention Facility. This will ensure that the tank provides the maximum level of overflow volume reduction through timely post- and inter-storm dewatering of groundwater infiltration and tank seepage. DEP will also continue to collect and evaluate PCM data to optimize the operation and effectiveness of the facility. Accordingly, the Standard Operating Procedure (SOP) for such operations was recently revised to reflect this commitment. As a result of these revisions, the following improvement to the SOPs is currently being tested and implemented:

- Stored volume will be pumped back from the Alley Creek CSO Retention Facility when total flow to the Tallman Island WWTP is below 90 MGD after a wet weather event. Previously, this plant flow rate was set at 80 MGD to minimize wet weather impacts on plant performance. This adjustment should provide better capture of CSOs in the facility.

The addition of the proposed disinfection system will require a new WWOP and SOPs, as appropriate, for the retention facility as well. As was noted in Section 9.2, in addition to ensuring proper O&M for said facilities, DEP will strive to optimize their operation as well with the intent of maintaining high rates of disinfection (99 percent) while minimizing the discharge of TRC to the waterbodies.

9.4 Projected Water Quality Improvements

The improvement in water quality resulting from the LTCP recommendation will be the high degree of reduction of human or CSO-source bacteria during the recreational season. During this recreational season, the periodic discharges from the Alley Creek CSO Retention Task from outfall TI-025 will be disinfected.

Other improvements in the water quality of the two waterbodies are expected to continue as the result of ongoing efforts to further quantify and abate, to the extent feasible, the localized sources of pollution in the upper Alley Creek watershed and the application (by new development or re-development) of 3 percent GI. These improvements will be tracked and documented through continued DEP water quality monitoring as part of the PCM and HSM. Other future pollutant reduction programs, such as those pertaining to MS4s, will be implemented based on future watershed characterization and modeling, and other potential MS4 permit requirements that result in improvements in the water quality of the two waterbodies.

9.5 Post Construction Monitoring Plan and Program Reassessment

Ongoing DEP monitoring programs will continue, including PCM associated with the Alley Creek CSO Retention Facility and the HSM. This is in addition to DOHMH's DMA Beach monitoring and DEP's Sentinel Monitoring of the shoreline. Harbor Survey data collected from Stations AC1, LN1 and E11 will be used to periodically review and assess the water quality trends in the waterbodies. Depending upon the findings, the data from these programs could form the basis of additional recommendations for inclusion in, as appropriate, the 2017 Citywide LTCP.

Following the construction of the disinfection system at the retention facility, the seasonal benefits from that operation will be assessed as part of PCM and HSM programs as well.

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, and the CWA . The LTCP revealed that Alley Creek currently attains the Class I bacteria criteria but cannot support the Primary Contact WQ Criteria classification (SC), even with 100 percent CSO control. It also showed, however, that Alley Creek is not suitable for contact recreation due to several natural and manmade factors listed in the UAA discussion of Section 8.6. A UAA has therefore been prepared and is attached to the LTCP (see Appendix D) as a means to formally demonstrate and acknowledge the suitability of continued Class I designation for Alley Creek.

Unlike Alley Creek, the Class SB Little Neck Bay fully attains the existing bacteria criteria on an annual basis. This high level of attainment also includes 100 percent attainment of NYS DOHMH recreational waters criteria at DMA Beach, the only formal designated swimming beach within the two waterbodies. It should be noted that in a recent communication with the DEC that 95 percent attainment of applicable water quality criteria is interpreted as achieving the existing water quality standards.

9.6.a Affordability and Financial Capability

EPA has recognized the importance of taking a community's financial status into consideration, and in 1997, issued "Combined Sewer Overflows: Guidance for Financial Capability Assessment and Schedule Development." This financial capability guidance contains a two-phased assessment approach. Phase one examines affordability in terms of impacts to residential households. This analysis applies the residential indicator (RI), which examines the average cost of household water pollution costs (wastewater and stormwater) relative to a benchmark of 2 percent of service area-wide median household income (MHI). The results of this preliminary screening analysis are assessed by placing the community in one of three categories:

- Low economic impact: average wastewater bills are less than 1 percent of MHI.
- Mid-range economic impact: average wastewater bills are between 1 percent and 2 percent of MHI.
- Large economic impact: average wastewater bills are greater than 2 percent of MHI.

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

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

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

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

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

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

Furthermore, EPA in 2012 released its "Integrated Municipal Stormwater and Wastewater Planning Approach Framework," which is supportive of a flexible approach to prioritizing projects with the greatest water quality benefits and the use of innovative approaches like green infrastructure (U.S. EPA, 2012). EPA, in conversation with communities, the U.S. Conference of Mayors, and the National Association of Clean Water Agencies, is also preparing a Financial Capability Framework which clarifies and explains the flexibility within their CSO guidance.

This section of this Long Term Control Plan begins to explore affordability and financial capability concerns as outlined in the 1997 and 2001 Guidance documents. This section will also explore additional socioeconomic indicators that reflect affordability concerns within the New York City context. Since DEP is tasked with preparing 10 Long Term Control Plans for individual waterbodies and 1 Long Term Control Plan for the East River and Open Waters, we expect that a complete picture of the effect of the comprehensive CSO Program would be available in 2017 to coincide with the schedule for completion of all the plans.

9.6.a.1 Background on DEP Spending

As the largest water and wastewater utility in the nation, DEP provides over a billion gallons of drinking water daily to more than 8 million NYC residents, visitors and commuters as well as one million upstate customers. DEP maintains over 2,000 square miles of watershed comprised of 19 reservoirs, 3 controlled lakes, several aqueducts, and 6,600 miles of water mains and distribution pipes. DEP also collects and treats wastewater. Averaged across the year, the system treats approximately 1.3 billion gallons of wastewater per day collected through 7,400 miles of sewers, 95 pump stations and 14 in-city treatment plants. In wet weather, the system can treat up to 3.5 billion gallons per day of combined storm and sanitary flow. In addition to the treatment plants, DEP has four CSO storage facilities. DEP recently launched a $2.4 billion green infrastructure program, of which $1.5 billion will be funded by DEP, and the remainder will be funded through private partnerships. This Long Term Control Plan (LTCP) for Alley Creek is one of ten waterbody-specific LTCPs that DEP is developing over the next several years in addition to a Citywide LTCP due in 2017 to manage and abate CSOs throughout the NYC's waterbodies.

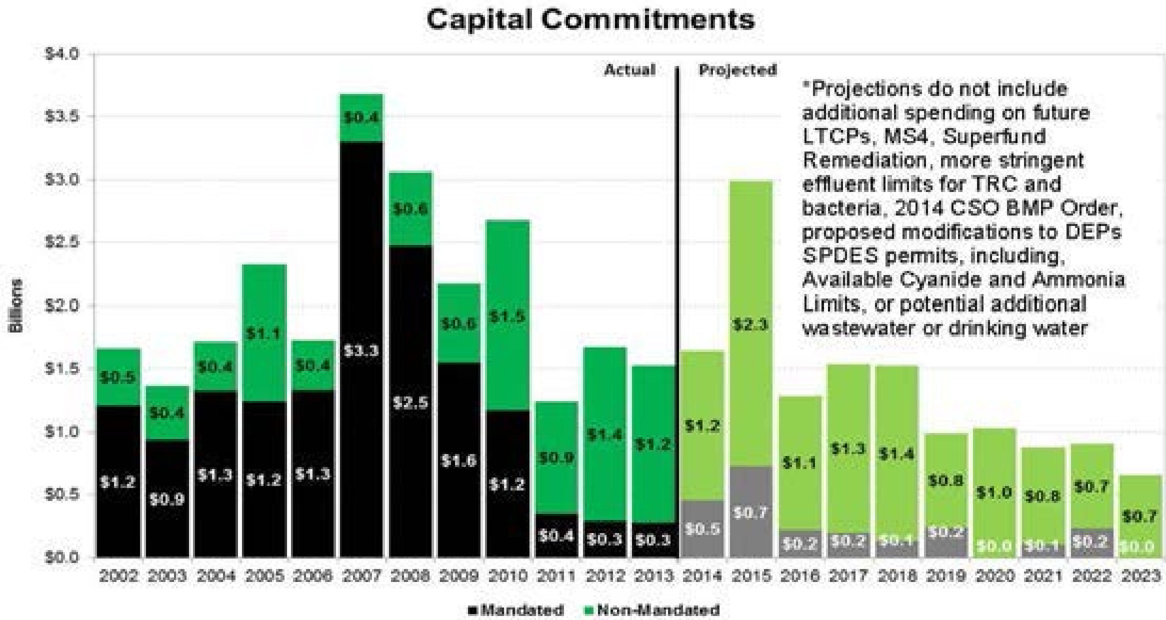


Figure 9-1. Historical and Projected Capital Commitments

9.6.a.2 Currently Budgeted and Recent Completed Mandated Programs

As shown in Figure 9-1, from Fiscal Year (FY) 2002 through FY 2013, 62 percent of DEP's capital spending was for wastewater and water mandates. Many projects have been important investments that safe-guard our water supply and improve the water quality of our receiving waters in the Harbor and its estuaries. These mandates and associated programs are described below.

Wastewater Mandated Programs

The following wastewater programs and projects have been initiated to comply with Federal and state laws and permits:

- CSO abatement and stormwater management programs

  DEP has initiated a number of projects to reduce CSOs and eliminate excess infiltration and inflow of groundwater and stormwater into the wastewater system. These projects include: construction of CSO abatement facilities, optimization of the wastewater system to reduce the volume of CSO discharge, controls to prevent debris that enters the combined wastewater system from being discharged, dredging of CSO sediments that contribute to low dissolved oxygen (DO) and poor aesthetic conditions, and other water quality based enhancements to enable attainment of the WQS. These initiatives impact both the capital investments that must be made by DEP as well as operations and maintenance (O&M) expenses. Historical commitments on and those currently in DEP's 10 year capital plan for CSOs are estimated to be about $3.3 billion. FY13 annual operating costs for stormwater expenses are estimated to have been about $63M. DEP will be required to make additional investments in stormwater controls pursuant to MS4 requirements.

- Biological nutrient removal

  In 2006, NYC entered into a Consent Judgment (Judgment) with the DEC, which required DEP to upgrade five water pollution control plants by 2017 in order to reduce nitrogen discharges and comply with draft State Pollutant Discharge Elimination System nitrogen limits. Pursuant to a modification and amendment to the Judgment, DEP has agreed to upgrade three additional plants and to install additional nitrogen controls at one of the plants, which was included in the original Judgment. As in the case of CSOs and stormwater, these initiatives include capital investments made by DEP ($280 million to date and an additional $123M in the 10-year capital plan) as well as O&M expenses (chemicals alone in FY13 amounted to $2.5M),

- Wastewater Treatment Plant Upgrades

  The Newtown Creek WWTP has been upgraded to secondary treatment pursuant to the terms of a Consent Judgment with DEC. The total cost of the upgrade is estimated to be $5 billion. In 2011, DEP certified that the Newtown Creek plant met the effluent discharge requirements of the Clean Water Act, bringing all 14 plants into compliance with the secondary treatment requirements.

Drinking Water Mandated Programs

Under the federal Safe Drinking Water Act and the New York State Sanitary Code, water suppliers are required to either filter their surface water supplies or obtain and comply with a determination from EPA that allows them to avoid filtration. In addition, EPA has promulgated a rule known as Long Term 2 (LT2) that requires that unfiltered water supplies receive a second level of pathogen treatment [e.g., ultraviolet (UV) treatment in addition to chlorination] by April 2012. LT2 also requires water suppliers to cover or treat water from storage water reservoirs. The following DEP projects have been undertaken in response to these mandates:

- Croton Watershed- Croton Water Treatment Plant

  Historically, NYC's water has not been filtered because of its good quality and long retention times in reservoirs. However, more stringent federal standards relating to surface water treatment have resulted in a federal court consent decree (the Croton Water Treatment Plant Consent Decree), which mandates the construction of a full-scale water treatment facility to filter water from NYC's Croton watershed. Construction on the Croton Water Treatment Plant began in late 2004. DEP estimates that the facility will begin operating in 2015. To date, DEP has committed roughly $3.2 billion in capital costs. During start-up and after commencement of operations, DEP will also incur annual expenses for labor, power, chemicals, and other costs associated with plant O&M. For FY15, O&M costs are estimated to be about $23 million.

- Catskill/Delaware Watershed- Filtration Avoidance Determination

  Since 1993, DEP has been operating under a series of Filtration Avoidance Determinations (FADs), which allow the City to avoid filtering surface water from the Catskill and Delaware systems. In 2007, EPA issued a new FAD (2007 FAD), which requires the City to take certain actions over a 10-year period to protect the Catskill and Delaware water supplies. In 2014, the New York State Department of Health issued mid-term revisions to the 2007 FAD. Additional funding has been added to the CIP through 2017 to support these mid-term FAD revisions. DEP has committed about $1.5 billion to date and anticipates that expenditures for the current FAD will amount to $200 million.

- UV Disinfection Facility

  In January 2007, DEP entered into an Administrative Order on Consent (UV Order) with EPA pursuant to EPA's authority under LT2 requiring DEP to construct a UV facility by 2012. Since late 2012, water from the Catskill and Delaware watersheds has been treated at DEP's new UV disinfection facility in order to achieve Cryptosporidium inactivation. To date, capital costs committed to the project amount to $1.6 billion. DEP is also now incurring annual expenses for property taxes, labor, power, and other costs related to plant O&M. FY13 O&M costs were $20.8 million including taxes.

9.6.a.3 Future System Investment

Over the next nine years, the percentage of already identified mandated project costs in the CIP is anticipated to decrease, but DEP will be funding critical but non-mandated state of good repair projects and other projects needed to maintain NYC's infrastructure to deliver clean water and treat wastewater. Moreover, DEP anticipates that there will be additional mandated investments as a result of Municipal Separate Stormwater System (MS4) compliance, proposed modifications to DEP's in-city WWTP SPDES permits, Superfund remediation, CSO LTCPs, the 2014 CSO Best Management Practices Consent Order. It is also possible that DEP will be required to invest in an expensive cover for Hillview Reservoir as well as other additional wastewater and drinking water mandates. Additional detail for anticipated future mandated and non-mandated wastewater programs is provided below, with the exception of CSO LTCPs which are presented in Section 9.6.f.

Potential or Unbudgeted Wastewater Regulations

- MS4 Permit Compliance

  Currently, DEP's separate stormwater system is regulated through DEP's 14 WWTP-specific SPDES permits. On February 5, 2014, DEC issued a draft MS4 permit that will cover MS4 separate stormwater systems for all City agencies. Under the proposed MS4 permit, the permittee will be NYC.

  DEP will be responsible for developing a stormwater management program plan for NYC to facilitate compliance with the proposed permit terms as required by DEC. This plan will also develop the legal authority to implement and enforce the stormwater management program as well as develop enforcement and tracking measures and provide adequate resources to comply with the MS4 permit. Some of the potential permit conditions identified through this plan may result in increased costs to DEP and those costs will be more clearly defined upon completion of the plan. The permit also requires the NYC to conduct fiscal analysis of the capital and O&M expenditures necessary to meet the requirements of this permit, including any development, implementation and enforcement activities required, within three years of the Effective Permit date.

The draft MS4 permit compliance costs are yet to be estimated. DEP's annual historic stormwater capital and O&M costs have averaged $131.6 million. However, given the more stringent draft permit requirements, future MS4 compliance costs are anticipated to be significantly higher than DEP's current stormwater program costs. The future compliance costs will also be shared by other NYC departments that are responsible for managing stormwater. Total compliance costs for stormwater programs in other major urban areas, such as Philadelphia and Washington DC, are projected to be $2.4 billion and, $2.6 billion, respectively, which will result in extensive annual expenditures. Each of these programs contains both grey and green infrastructure components, similar to those anticipated for NYC, to meet mandated requirements. The geographic area covered by New York City's MS4 program is larger than the MS4 area in either Philadelphia or Washington DC. New York City's MS4 area is over 131 square miles, while Philadelphia's MS4 area is just over 78 square miles, and Washington DC's area is even less at approximately 31 square miles, or about 25 percent of that in New York City.

- Draft SPDES Permit Compliance

In June 2013, NYSDEC issued draft SPDES permits which, if finalized, will have a substantial impact on DEP's Total Residual Chlorine (TRC) program and set more stringent ammonia and available cyanide limits. These proposed modifications include requirements that DEP:

- Perform a degradation study to evaluate the degradation of TRC from the chlorine contact tanks to the edge of the designated mixing zone for comparison to the water-quality-based effluent limit and standard. The scope of work for this study is required within six months of the effective date of the SPDES permit, and the study must be completed 18 months after the approval of the scope of work. Based upon verbal discussions with DEC, DEP believes that this study may result in the elimination of the 0.4 mg/l uptake credit previously included in the calculation of TRC limits thereby decreasing the effective TRC limits by 0.4 mg/l at every plant.

- Comply with new unionized ammonia limits. These proposed limits will, at some plants, potentially interfere with the chlorination process, particularly at 26th Ward and Jamaica.

- Monitor for available cyanide and ultimately comply with a final effluent limit for available cyanide. Available cyanide can be a byproduct of the chlorination process.

- DEC has also advised DEP that fecal coliform, the parameter that has been historically used to evaluate pathogen kills and chlorination performance/control will be changing to enterococcus. This change will likely be incorporated in the next round of SPDES permits scheduled in the next five years. Enterococcus has been shown to be harder to kill with chlorine and may require process changes to disinfection that would eliminate the option of adding de-chlorination after the existing chlorination process.

The potential future costs for these programs have yet to be determined. Preliminary compliance costs for TRC control and ammonia control are estimated to be up to $$560Mand $840M, respectively.

- CSO Best Management Practices Order

  On May 8, 2014, DEC and DEP entered into an agreement for the monitoring of CSO compliance, reporting requirements for bypasses, and notification of equipment out of service at the WWTP during rain events. The 2014 CSO BMP Order incorporates, expands, and supersedes the 2010 CSO BMP Order by requiring DEP to install new monitoring equipment at identified key regulators and outfalls and to assess compliance with requirements to "Maximize Flow to the WWTP". The costs for compliance for this Order have not yet been determined, but DEP expects this program to have significant capital costs as well as expense costs.

- Superfund Remediation

  There are currently three Superfund sites in NYC, at various stages of investigation. The Gowanus Canal Remedial Investigation/Feasibility Study (RI/FS) is complete, and Remedial Design work will take place in the next three to five years. The Newtown Creek RI/FS completion is anticipated for 2018, and the Former Wolff-Alport Chemical Corporation has only recently been listed as a Superfund site.

  DEP's ongoing costs for these projects are estimated at about $50-60M for the next ten years, not including design or construction costs for the Gowanus Canal. EPA's selected remedy for the Gowanus Canal requires that NYC build two combined sewage overflow retention tanks. While the EPA estimated cost is $78 million, the DEP estimate based on actual construction experience in NYC is $380-760 million for construction, with an additional $40-80 million for design. Potential alternatives to the EPA selected remedy will be evaluated during the Gowanus LTCP process. Similar Superfund mandated CSO controls at Newtown Creek could add costs of $1 to 2 billion.

Potential, Unbudgeted Drinking Water Regulation

- Hillview Reservoir Cover

  LT2 also mandates that water from uncovered storage facilities (including DEP's Hillview Reservoir) be treated or that the reservoir be covered. DEP has entered into an Administrative Order with the New York State Department of Health (NYSDOH) and an Administrative Order with EPA, which mandate NYC to begin work on a reservoir cover by the end of 2018. In August 2011, EPA announced that it would review LT2 and its requirement to cover uncovered finished storage reservoirs such as Hillview. DEP has spent significant funds analyzing water quality, engineering options, and other matters relating to the Hillview Reservoir. Potential costs affiliated with construction are estimated to be on the order of $1.6 billion.

Other: State of Good Repair Projects and Sustainability/Resiliency Initiatives

Wastewater Projects

- Climate Resiliency

  In October 2013, on the first anniversary of Hurricane Sandy, DEP released the NYC Wastewater Resiliency Plan, the nation's most detailed and comprehensive assessment of the risks that climate change poses to a wastewater collection and treatment system. The groundbreaking study, initiated in 2011 and expanded after Hurricane Sandy, was based on an asset-by-asset analysis of the risks from storm surge under new flood maps at all 14 treatment plants and 58 of NYC's pumping stations, representing more than $1 billion in infrastructure.

  DEP estimates to spend $447 million in cost-effective upgrades at these facilities to protect valuable equipment and minimize disruptions to critical services during future storms. It is estimated that investing in these protective measures today will help protect this infrastructure from over $2 billion in repeated flooding losses over the next 50 years. DEP is currently pursuing funding through the EPA State Revolving Fund Storm Mitigation Loan Program.

  DEP will coordinate this work with the broader coastal protection initiatives, such as engineered barriers and wetlands, described in the 2013 report, "A Stronger, More Resilient New York," and continue to implement the energy, drinking water, and drainage strategies identified in the report to mitigate the impacts of future extreme events and climate change. This includes ongoing efforts to reduce CSOs with green infrastructure as part of LTCPs and build-out of high level storm sewers that reduce both flooding and CSOs. It also includes build-out of storm sewers in areas of Queens with limited drainage and continued investments and build-out of the Bluebelt system.

- Energy projects at WWTPs

  The City's blueprint for sustainability, *PlaNYC 2030: A Greener, Greater New York*, set a goal of reducing the City's greenhouse gases (GHG) emissions from 2006 levels by 30 percent by 2017. This goal was codified in 2008 under Local Law 22. In order to meet the PlaNYC goal, DEP is working to reduce energy consumption and GHG emissions through: reduction of fugitive methane emissions, investment in cost-effective, clean energy projects, and energy efficiency improvements.

  Fugitive methane emissions from wastewater treatment plants currently account for approximately 170,000 metric tons (MT) of carbon emissions per year and 30% of DEP's overall emissions. To reduce GHG emissions and to increase on-site, clean energy generation, DEP has set a target of 60 percent beneficial use of the biogas produced by 2017. Recent investments by DEP to repair leaks and upgrade emissions control equipment have already resulted in a 30 percent reduction of methane emissions since a peak in 2009. Going forward, DEP has approximately $500 million allocated in its capital improvement plan to make additional system repairs to flares, digester domes, and digester gas piping, in order to maximize capture of fugitive emissions for beneficial use or flaring.

A 12 megawatt cogeneration system is currently in design for the North River WWTP and estimated to be in operation in Spring 2019. This project will replace 10 direct-drive combustion engines, which are over 25 years old and use fuel oil, with five new gas engines enhancing the plant's operational flexibility, reliability, and resiliency. The cogeneration system will produce enough energy to meet the plant's base electrical demand and the thermal demand from the treatment process and building heat, in addition to meeting all of the plants emergency power requirements. The project is taking a holistic approach and includes: (1) improvements to the solids handling process to increase biogas production and reduce treatment, transportation and disposal costs; (2) optimization of biogas usage through treatment and balancing improvements; and (3) flood proofing the facility to the latest FEMA 100-yr flood elevations plus 32 inches to account for sea level rise. The cogeneration system will double the use of anaerobic digester gas produced on-site; eliminate fuel oil use, and off-set utility electricity use, which will reduce carbon emissions by over 10,000 metric tons per year, the equivalent of removing ~2,000 vehicles from the road. The total project cost is estimated at $212M. DEP is also initiating an investment-grade feasibility study to evaluate the installation of cogeneration at the Wards Island WWTP, the City's second largest treatment plant.

To reduce energy use and increase energy efficiency, DEP has completed energy audits at all 14 in-city wastewater treatment plants (WWTPs). Close to 150 energy conservation measures (ECMs) relating to operational and equipment improvements to aeration, boilers, dewatering, digesters, HVAC, electrical, thickening and main sewage pumping systems have been identified and accepted for implementation. Energy reductions from these ECMs have the potential to reduce greenhouse gas emissions by over 160,000 MT of carbon emissions at an approximate cost of $140M. DEP is developing implementation plans for these measures.

Water Projects

- Water for the Future

  In 2011, DEP unveiled Water for the Future: a comprehensive program to permanently repair the leaks in the Delaware Aqueduct, which supplies half of New York's drinking water. Based on a 10-year investigation and more than $200M of preparatory construction work, DEP is currently designing a bypass for a section of the Delaware Aqueduct in Roseton and internal repairs for a tunnel section in Wawarsing. Since DEP must shut down the Aqueduct when it is ready to connect the bypass tunnel, DEP is working on projects that will supplement the City's drinking water supply during the shutdown, such as developing the groundwater aquifers in Jamaica, Queens, and implementing demand reduction initiatives, such as offering a toilet replacement program. Construction of the shafts for the bypass tunnel is underway, and the project will culminate with the connection of the bypass tunnel in 2021. The cost for this project is estimated to be about $1.5 billion.

- Gilboa Dam

  DEP is currently investing in a major rehabilitation project at Gilboa Dam at Schoharie Reservoir. Reconstruction of the dam is the largest public works project in Schoharie County, and one of the largest in the entire Catskills. This project is estimated to cost roughly $ 440 million.

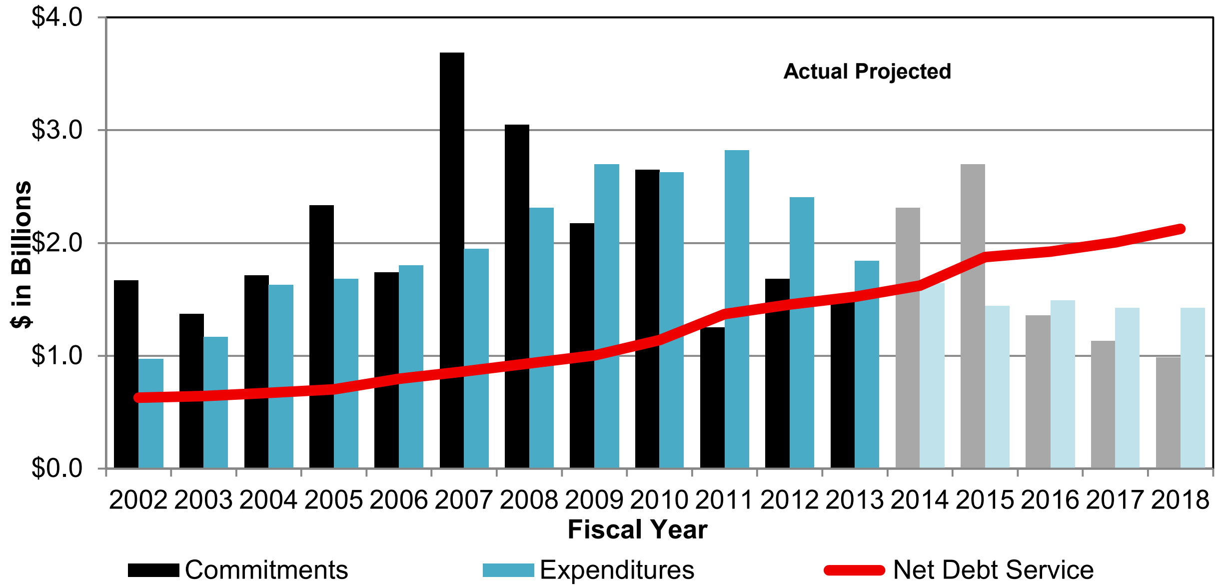


Figure 9-2. Past Costs and Debt Service

As shown in Figure 9-2, increases in capital expenditures have resulted in increased debt. While confirmed expenditures may be on the decline over the next few years, debt service continues to be on the rise in future years, occupying a large percentage of DEP's operating budget (approximately 45 percent in FY15).

9.6.b Background on History of DEP Water and Sewer Rates

The NYC Water Board is responsible for setting water and wastewater rates sufficient to cover the costs of operating NYC's water supply and wastewater systems (the "System"). Water supply costs include those associated with water treatment, transmission, distribution, and maintaining a state of good repair. Wastewater service costs include those associated with wastewater conveyance and treatment, as well as stormwater service, and maintaining a state of good repair. The NYC Municipal Water Finance Authority ("MWFA") issues revenue bonds to finance NYC's water and wastewater capital programs, and the costs associated with debt service consume a significant portion of the System revenues.

For FY15, most customers will be charged a uniform water rate of $0.49 per 100 gallons of water. Wastewater charges are levied at 159 percent of water charges ($0.79 per 100 gallons). There is a small percentage of properties that are billed a fixed rate. Under the Multifamily Conservation Program, some properties are billed at a fixed per-unit rate if they comply with certain conservation measures. Some nonprofit institutions are also granted exemption from water and wastewater charges on the condition that their consumption is metered and their consumption falls within specified consumption threshold levels. Select properties can also be granted exemption from wastewater charges (i.e., pay only for water services) if they can prove that they do not burden the wastewater system (e.g., they recycle wastewater for subsequent use onsite).

There are also currently a few programs that provide support and assistance for customers in financial distress. The Safety Net Referral Program uses an existing network of NYC agency and not-for-profit programs to help customers with financial counseling, low-cost loans, and legal services. The Water Debt Assistance Program (WDAP) provides temporary water debt relief for qualified property owners who are at risk of mortgage foreclosure. While water and wastewater charges are a lien on the property served, and NYC has the authority to sell these liens to a third party, or lienholder, in a process called a lien sale, DEP offers payment plans for customers who may have difficulty paying their entire bill at one time. The agency has undertaken an aggressive communications campaign to ensure customers know about these programs and any exclusions they may be qualified to receive, such as the Senior Citizens Homeowner's Exemption and the Disabled Homeowner's Exemption. DEP also just announced the creation of a Home Water Assistance Program (HWAP) to assist low-income homeowners. In this program, DEP will partner with the NYC Human Resources Administration (HRA), which administers the Federal Home Energy Assistance Program (HEAP), to identify homeowners who would be eligible to receive an annual credit on their DEP bill.

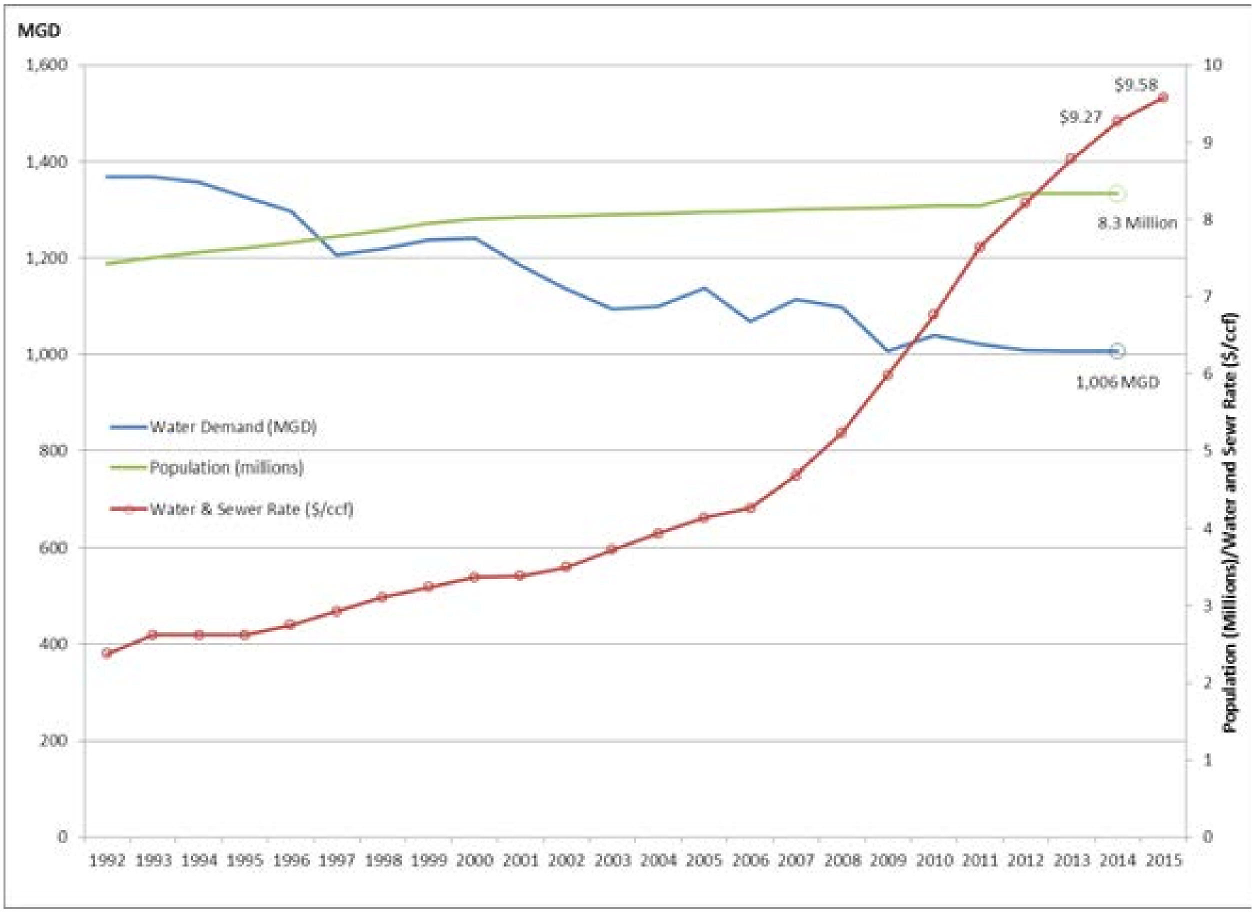


Figure 9-3. Population, Consumption Demand, and Water and Sewer Rates Over Time

Figure 9-3 shows how water and sewer rates have increased over time and how that compares with system demand and population. Despite a modest rise in population, water consumption rates have been falling since the 1990s due to metering and increases in water efficiency measures. At the same time, rates have been rising to meet the cost of service associated with DEP's capital commitments. DEP operations are funded almost entirely through rates paid by our customers with less than 2 percent of spending supported by federal and state assistance over the past 10 years. From FY 2002 to FY 2015, water and sewer rates have risen 173 percent. This is despite the fact that DEP has diligently tried to control operating costs. To mitigate rate increases, DEP has diligently managed operating expenses, and since 2011, the agency has had four budget cuts to be able to self-fund critical agency operating needs. Additionally, DEP has undertaken an agency-wide Operational Excellence (OpX) program to review and improve the efficiency of the agency's operations; to date initiatives have been implemented that result in a recurring annual benefit of $80M.

9.6.c Residential Indicator

As discussed above, the first economic test as part of EPA's 1997 CSO guidance is the residential indicator (RI), which compares the average annual household water pollution control cost (wastewater and stormwater related charges) to the median household income of the service area. Average household wastewater cost can be estimated by approximating the residential share of wastewater treatment and dividing it by total number of households. Since the wastewater bill in NYC is a function of water consumption, average household costs are estimated based on consumption rates by household type in Table 9-2 below.

Table 9-2: Residential Water and Wastewater Costs compared to MHI

	Average Annual Wastewater Bill ($/year)	Wastewater RI (Wastewater Bill/MHI*)	Total Water and Wastewater Bill ($/Year)	Water and Wastewater RI (Water and Wastewater Bill/MHI)
Single Family**	629	**1.14%**	1,025	**1.85%**
Multi-family***	409	**0.74%**	666	**1.20%**
Average Household Consumption****	534	**0.97%**	870	**1.57%**
MCP	599	**1.08%**	976	**1.76%**

*Note Latest MHI data is $50,895 based on 2012 ACS data, estimated MHI adjusted to present is $55,308
** Based on 80,000 gallons/year consumption and FY 2015 Rates
*** Based on 52,000 gallons/year consumption and FY 2015 Rates
**** Based on average consumption across all metered residential units of 67,890 gallons/year and FY 2015 rates

As shown in Table 9-2, the RI for wastewater costs varies between 0.74 percent of MHI to 1.14 percent of MHI depending on household type. Since DEP is a water and wastewater utility and the ratepayers receive one bill for both charges, it is also appropriate to look at the total water and wastewater bill in considering the RI, which varies from 1.2 percent to 1.76 percent of MHI.

Based on this initial screen, current wastewater costs pose a low to mid-range economic impact according to the 1997 CSO Guidance. However, there are several limitations to using MHI in the context of a city like New York. NYC has a large population and more than three million households. Even if a relatively small percentage of households were facing unaffordable water and wastewater bills, there would still be a significant number of households experiencing this hardship. For example, more than 690,000 households in NYC (about 23 percent of NYC's total) earn less than $20,000 per year and have estimated wastewater costs well above 2 percent of their household income. Therefore, there are several other socioeconomic indicators to consider in assessing residential affordability, as described below.

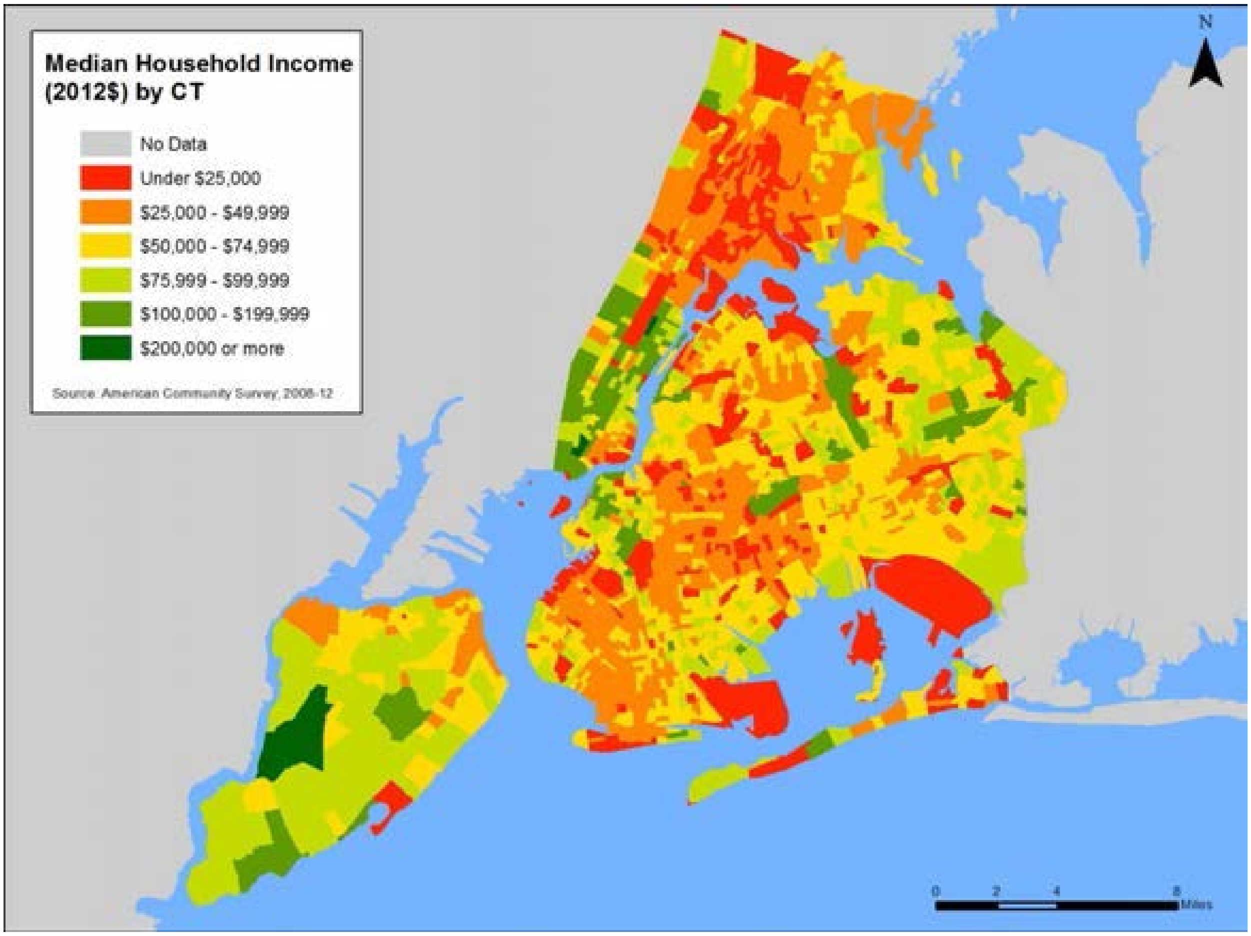
9.6.c.1 Income Levels

In 2012, the latest year for which Census data is available, the MHI in NYC was $50,895. As shown in Table 9-3, across the NYC boroughs, MHI ranged from $32,460 in the Bronx to $70,963 in Staten Island. Figure 9-4 shows that income levels also vary considerably across NYC neighborhoods, and there are several areas in NYC with high concentrations of low-income households.

Table 9-3. Median Household Income

Location	2012 (MHI)
United States	$51,371
New York City	$50,895
Bronx	$32,460
Brooklyn	$45,230
Manhattan	$67,099
Queens	$54,713
Staten Island	$70,963

Source: U.S. Census Bureau 2012 ACS 1-Year Estimates.



Source: U.S. Census Bureau 2008-2012 ACS 5-Year Estimates.

Figure 9-4. Median Household Income by Census Tract

As shown in Figure 9-5 on the following page, after 2008, MHI in NYC actually decreased for several years, and it has just begun to recover to the 2008 level. At this same time, costs continued to increase.

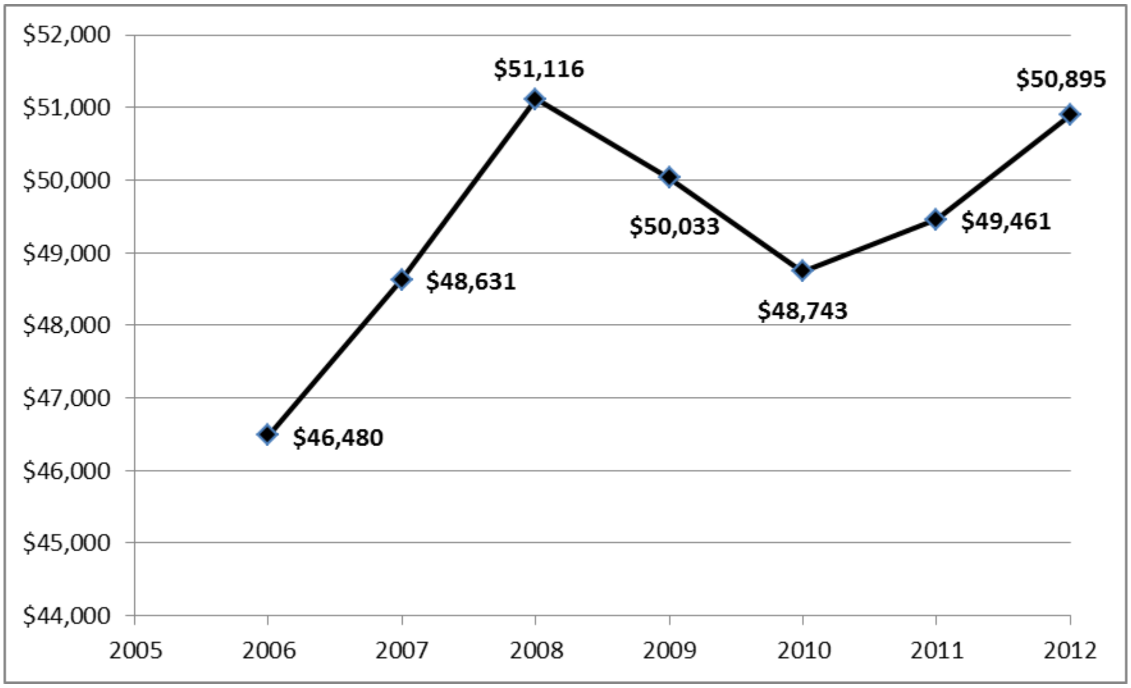


Figure 9-5. NYC Median Household Income Over Time

9.6.c.2 Income Distribution

NYC currently ranks as one of the most unequal cities in the United States in terms of income distribution. NYC's income distribution highlights the need to focus on metrics other than Citywide MHI in order to capture the disproportionate impact on households in the lowest income brackets. It is clear that MHI does not represent "the typical household" in NYC. As shown in Figure 9-6, incomes in NYC are not clustered around the median, but rather there are greater percentages of households at both ends of the economic spectrum. Also, the percentage of the population with middle-class incomes between $20,000 and $100,000 is 11.5 percent less in NYC than in the U.S. generally.

Source: U.S. Census Bureau 2012 ACS 1-Year Estimates.

Figure 9-6. Income Distribution for NYC and U.S.

9.6.c.3 Poverty Rates

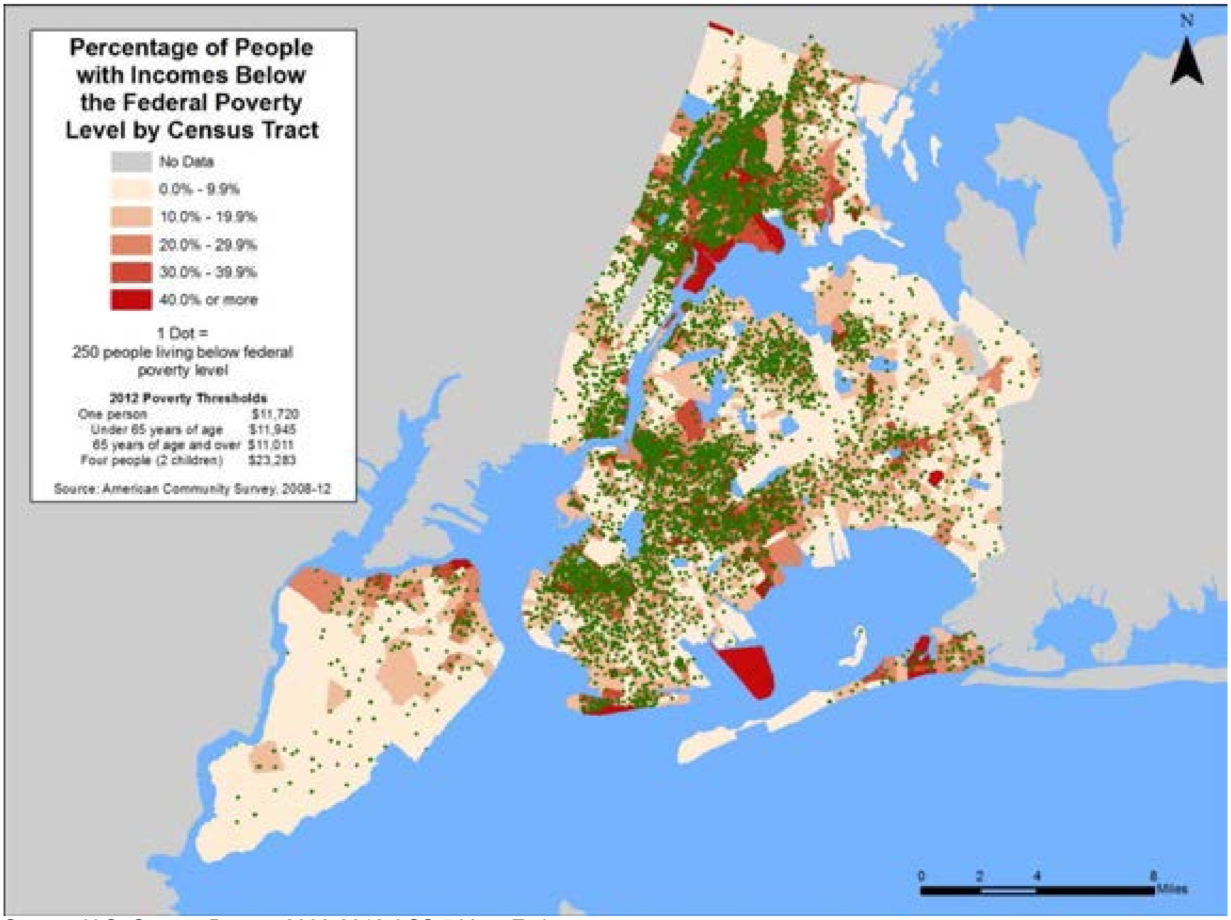
Based on the latest available census data, 21.2 percent of NYC residents are living below the federal poverty level (more than 1.7 million people, which is greater than the entire population of Philadelphia). This compares to a national poverty rate of 15.9 percent despite the similar MHI levels for NYC and the United States as a whole. As shown in Table 9-4, across the NYC boroughs, poverty rates vary from 11.6 percent in Staten Island to 31 percent in the Bronx.

Table 9-4: NYC Poverty Rates

Location	Percentage of Residents Living Below the Federal Poverty Level (%) (ACS 2012)
United States	15.9
New York City	21.2
Bronx	31.0
Brooklyn	24.3
Manhattan	17.8
Queens	16.2
Staten Island	11.6

Figure 9-7 shows that poverty rates also vary across neighborhoods, with several areas in NYC having a relatively high concentration of people living below the federal poverty level. Each green dot represents

250 people living in poverty. While poverty levels are concentrated in some areas, there are pockets of poverty throughout NYC. An RI that relies on MHI alone fails to capture these other indicators of economic distress. Two cities with similar MHI could have varying levels of poverty.



Source: U.S. Census Bureau 2008-2012 ACS 5-Year Estimates.

Figure 9-7. Poverty Clusters and Rates in NYC

The New York City Center for Economic Opportunity (CEO) has argued that the official (federal) poverty rate does not provide an accurate measure of the number of households truly living in poverty conditions (CEO, 2011). This is especially relevant in NYC, where the cost of living is among the highest in the nation. According to CEO, federal poverty thresholds do not reflect current spending patterns, differences in the cost of living across the nation, or changes in the American standard of living (CEO, 2011). To provide a more accurate accounting of the percentage of NYC's population living in poverty, CEO developed an alternative poverty measure based on methodology developed by the National Academy of Sciences (NAS).

The NAS-based poverty threshold reflects the need for clothing, shelter, and utilities, as well as food (which is the sole basis for the official poverty threshold). The threshold is established by choosing a point in the distribution of expenditures for these items, plus a small multiplier to account for miscellaneous expenses such as personal care, household supplies, and non-work-related transportation. CEO adjusted the NAS-based threshold to account for the high cost of living in NYC.

In addition, the NAS-based income measure uses a more inclusive definition of resources available to households compared to the federal measure, which is based on pre-tax income. Along with cash income after taxes, it accounts for the cash-equivalent value of nutritional assistance and housing programs (i.e., food stamps and Section 8 housing vouchers). It also recognizes that many families face the costs of commuting to work, child care, and medical out-of-pocket expenses that reduce the income available to meet other needs. This spending is accounted for as deductions from income. Taken together, these adjustments create a level of disposable income that, for some low-income households, can be greater than pre-tax cash income.

CEO's methodology shows that in NYC, poverty-level incomes are actually much higher than those defined at the federal level, which results in a higher percentage of NYC residents living in poverty than is portrayed by national measures. As an example, in 2008, CEO's poverty threshold for a two-adult, two-child household was $30,419. The federal poverty threshold for the same type of household was $21,834. In that year, 22.0 percent of NYC residents (about 1.8 million people) were living below the CEO poverty threshold income; 18.7 percent were living below the federal poverty threshold.

More recently, the U.S. Census Bureau developed a Supplemental Poverty Measure (SPM), reflecting the same general approach as that of CEO. The federal SPM factors in some of the financial and other support offered to low-income households (e.g., housing subsidies, low-income home energy assistance) and also recognizes some nondiscretionary expenses that such households bear (e.g., taxes, out-of-pocket medical expenses, and geographic adjustments for differences in housing costs) (U.S. Census Bureau, 2012).

Nationwide, the SPM indicates that there are 5.35 percent more people in poverty than the official poverty threshold would indicate. The SPM also indicates that inside Metropolitan Statistical Areas the difference is 11.2 percent more people in poverty, and within "principal cities," the SPM-implied number of people in poverty is 5.94 percent higher than the official poverty measure indicates.

9.6.c.4 Unemployment Rates

In 2013 the annual average unemployment rate for NYC was 7.7 percent according to NYS Department of Labor, compared to a national average of 7.1 percent. Over the past two decades, NYC's unemployment rate has generally been significantly higher than the national average. Due to the recent recession, the national unemployment rate has increased significantly, moving closer to that of NYC.

9.6.c.5 Cost of Living and Housing Burden

NYC residents face relatively high costs for nondiscretionary items (e.g., housing, utilities) compared to individuals living almost anywhere else in the nation as shown in Figure 9-8. While water costs are comparable to other average of other U.S. cities, the housing burden is substantially higher.

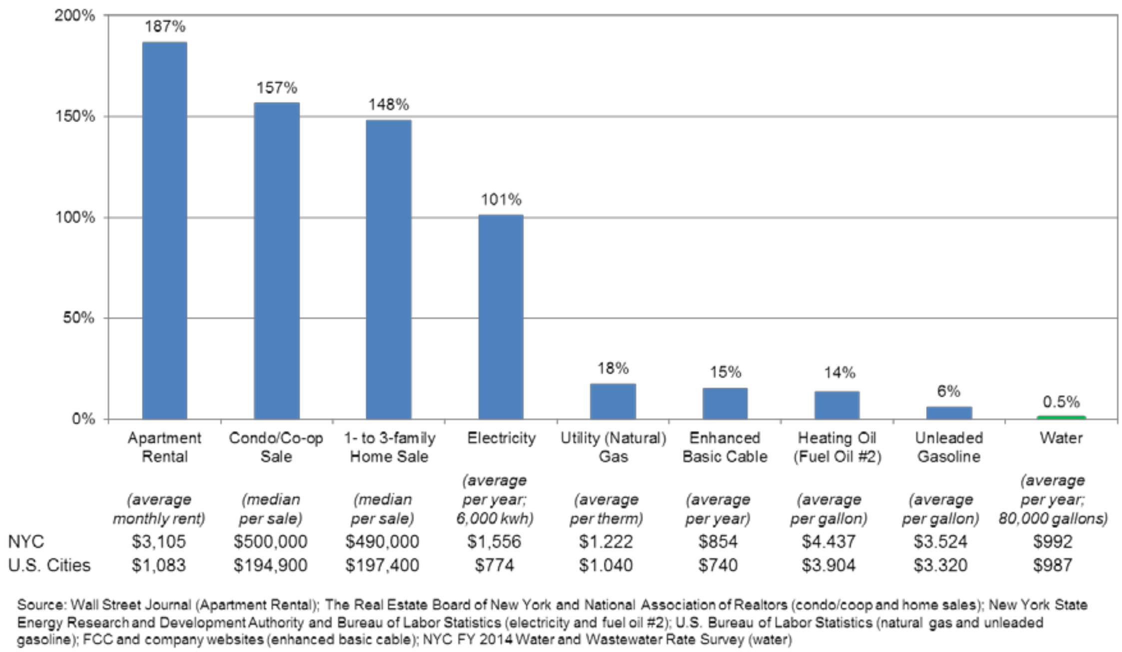


Figure 9-8: Comparison of Costs Between NYC and other US Cities

Approximately 67 percent of all households in NYC are renter-occupied, compared to about 35 percent of households nationally. For most renter households in NYC, water and wastewater bills are included in the total rent payment. Rate increases may be passed on to the tenant in the form of a rental increase, or born by the landlord. In recent years, affordability concerns have been compounded by the fact that gross median rents have increased, while median renter income has declined as shown in Figure 9-9 (NYC Housing, 2014).

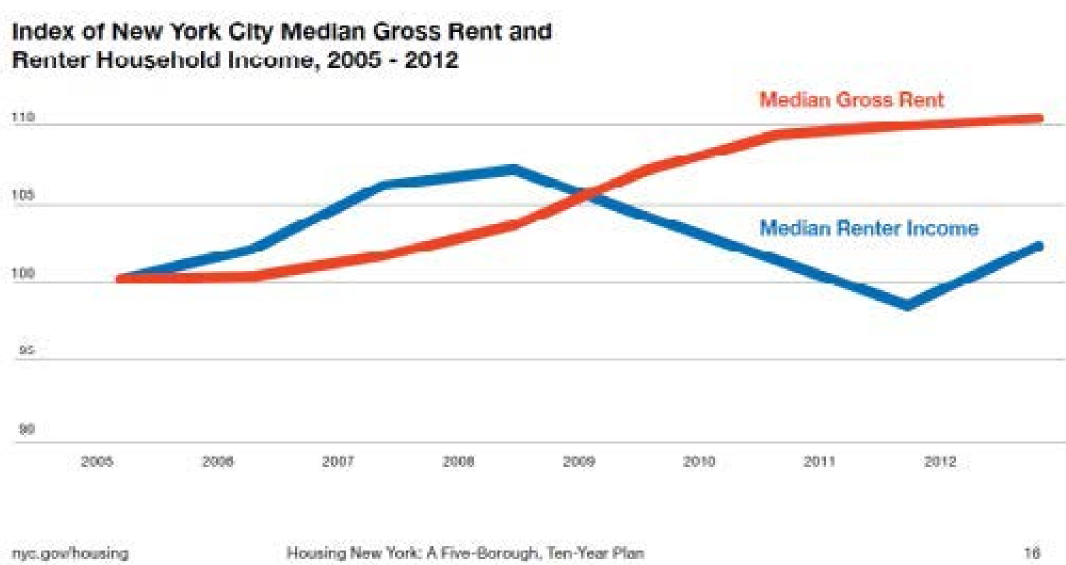


Figure 9-9: Median Gross Rent vs. Median Renter Income

Most government agencies consider housing costs of between 30 percent and 50 percent of household income to be a moderate burden in terms of affordability; costs greater than 50 percent of household income are considered a severe burden.

A review of Census data shows approximately 21 percent of NYC households (close to 645,000 households) spent between 30 percent and 50 percent of their income on housing, while about 25 percent (748,000 households) spent more than 50 percent. This compares to 20.0 percent of households nationally that spent between 30 percent and 50 percent of their income on housing and 16.2 percent of households nationally that spent more than 50 percent. This means that 46 percent of households in NYC versus 36.2 percent of households nationally spent more than 30 percent of their income on housing.

The New York City Housing Authority is responsible for 172,223 affordable housing units (9 percent of the total renter households in NYC). The agency is estimated to pay about $186M for water and wastewater in FY15. This total represents about 5.9 percent of their $3.14 billion operating budget. Even a small increase in rates could potentially impact the agency's ability to provide affordable housing and/or other programs.

9.6.d Financial Capability Indicators

The second phase of the 1997 CSO Guidance develops the Permittee Financial Capability Indicators (FCI), which are compared to national benchmarks and are used to generate a score that is the average of six economic indicators. Lower FCI scores imply weaker economic conditions. Table 9-5 summarizes the FCI scoring as presented in the 1997 CSO Guidance.

Table 9-5. Financial Capability Indicator Scoring

Financial Capability Metric	Strong (Score = 3)	Mid-range (Score = 2)	Weak (Score = 1)
Debt indicator			
Bond rating (GO bonds, revenue bonds)	AAA-A (S&P) Aaa-A (Moody's)	BBB (S&P) Baa (Moody's)	BB-D (S&P) Ba-C (Moody's)
Overall net debt as percentage of full market value	Below 2%	2–5%	Above 5%
Socioeconomic indicator			
Unemployment rate	More than 1 percentage point below the national average	+/- 1 percentage point of national average	More than 1 percentage point of national average
MHI	More than 25% above adjusted national MHI	+/- 25% of adjusted national MHI	More than 25% below adjusted national MHI
Financial management indicator			
Property tax revenues as percentage of FMPV	Below 2%	2–4%	Above 4%
Property tax revenue collection rate	Above 98%	94–98%	Below 94%

Table 9-6: NYC Financial Capability Indicator Score

Financial capability metric	Actual value	Score
Debt indicators		
Bond rating (GO bonds)	AA (S&P) AA (Fitch) Aa2 (Moody's)	Strong/3
Bond rating (Revenue bonds)	AAA (S&P) AA + (Fitch) Aaa-A (Moody's)	
Overall net debt as percentage of FMPV	4.5%	Midrange/2
GO		
Debt	$41.2 billion	
Market value	$917.7 billion	
Socioeconomic indicators		
Unemployment rate (2013 annual average)	0.6 percentage point above the national average	Mid-range/2
NYC unemployment rate	7.7%	
United States unemployment rate	7.1%	
MHI as percentage of national average	99%	Mid-range/2
Financial management indicators		
Property tax revenues as percentage of FMPV	2.2%	Mid-range/2
Property tax revenue collection rate	98.2%	Strong/3
Permittee Indicators Score		2.3

New York City's FCI score based on this test is presented in Table 9-6 and further described below.

9.6.d.1 Bond Rating

The first financial benchmark is NYC's bond rating for both general obligation (G.O.) and revenue bonds. A bond rating performs the isolated function of credit risk evaluation. While many factors go into the investment decision-making process, bond ratings can significantly affect the interest that the issuer is required to pay, and thus the cost of capital projects financed with bonds. According to EPA's criteria – based on the ratings NYC has received from all three rating agencies [Moody's, Standard & Poor's (S&P), and Fitch Ratings] – NYC's financing capability is considered "strong." Specifically, NYC's G.O. bonds are rated AA by S&P and Fitch and Aa2 by Moody's; and MWFA's General Resolution revenue bonds are rated AAA by S&P, AA+ by Fitch, and Aa1 by Moody's, while MWFA's Second General Resolution revenue bonds (under which most of the Authority's recent debt has been issues) are rated AA+ by S&P, AA+ by Fitch, and Aa2 by Moody's. This results in a "strong" rating for this category.

Nonetheless, NYC's G.O. rating and MWFA's revenue bond ratings are high due to prudent fiscal management, the legal structure of the System, and the Water Board's historical ability to raise water and wastewater rates. However, mandates over the last decade have significantly increased the leverage of the System, and future bond ratings could be impacted by further increases to debt beyond what is currently in forecast.

9.6.d.2 Net Debt as a Percentage of FMPV

The second financial benchmark measures NYC's outstanding debt as a percentage of FMPV. Currently NYC has over $41.6 billion in outstanding G.O. debt, and the FMPV within NYC is $917.7 billion. This results in a ratio of outstanding debt to FMPV of 4.5 percent and a "mid-range" rating for this indicator. If $30.6 billion of MWFA revenue bonds that support the System are included, net debt as a percentage of FMPV increases to 7.8 percent, which results in a "weak" rating for this indicator. Furthermore, if NYC's $37.5M of additional debt that is related to other services and infrastructure is included, the resulting ratio is 8.6 percent net debt as a percentage of FMPV.

9.6.d.3 Unemployment rate

For the unemployment benchmark, the 2013 annual average unemployment rates for NYC were compared to those for the United States. NYC's 2013 unemployment rate of 7.7 percent is 0.6 basis points (or 8.5 percent) higher than the national average of 7.1 percent. Based on EPA guidance, NYC's unemployment benchmark would be classified as "mid-range". However, it is important to note that over the past two decades, NYC's unemployment rate has generally been significantly higher than the national average. Due to the recession, the national unemployment is much closer to NYC's unemployment rate. Additionally, the unemployment rate measure identified in the 1997 financial guidance sets a relative comparison at a snapshot in time. It is difficult to predict whether the unemployment gap between the U.S. and NYC will once again widen, and it may be more relevant to look at longer term historical trends, of the service area.

9.6.d.4 MHI

The MHI benchmark compares the community's MHI to the national average. Using ACS 2012 single-year estimates, NYC's MHI is $50,895 and the nation's MHI is $51,371. Thus, NYC's MHI is 99 percent of the national MHI, resulting in a "mid-range" rating for this indicator. However, as discussed above in this section, MHI does not provide an adequate measure of affordability or financial capability. MHI is a poor indicator of economic distress and bears little relationship to poverty or other measures of economic need. In addition, reliance on MHI alone can be a very misleading indicator of the affordability impacts in a large and diverse city such as NYC.

9.6.d.5 Tax Revenues as a Percentage of Full Market Property Value

This indicator, which EPA also refers to as the "property tax burden", attempts to measure "the funding capacity available to support debt based on the wealth of the community," as well as "the effectiveness of management in providing community services". According to the New York City Property Tax Annual report issued in FY13, NYC had collected $20.1 billion in real property taxes against a $917.7 billion FMPV, which amounts to 2.2 percent of FMPV. For this benchmark, NYC received a "mid-range" score. Also, this figure does not include water and wastewater revenues. Including $3.5 billion of FY13 System revenues increases the ratio to 2.6 percent of FMPV.

However, this indicator (including or excluding water and wastewater revenues) is misleading because NYC obtains a relatively low percentage of its tax revenues from property taxes. In 2007, property taxes accounted for less than 41 percent of NYC's total non-exported taxes, meaning that taxes other than property taxes (e.g., income taxes, sales taxes) account for nearly 60 percent of the locally borne NYC tax burden.

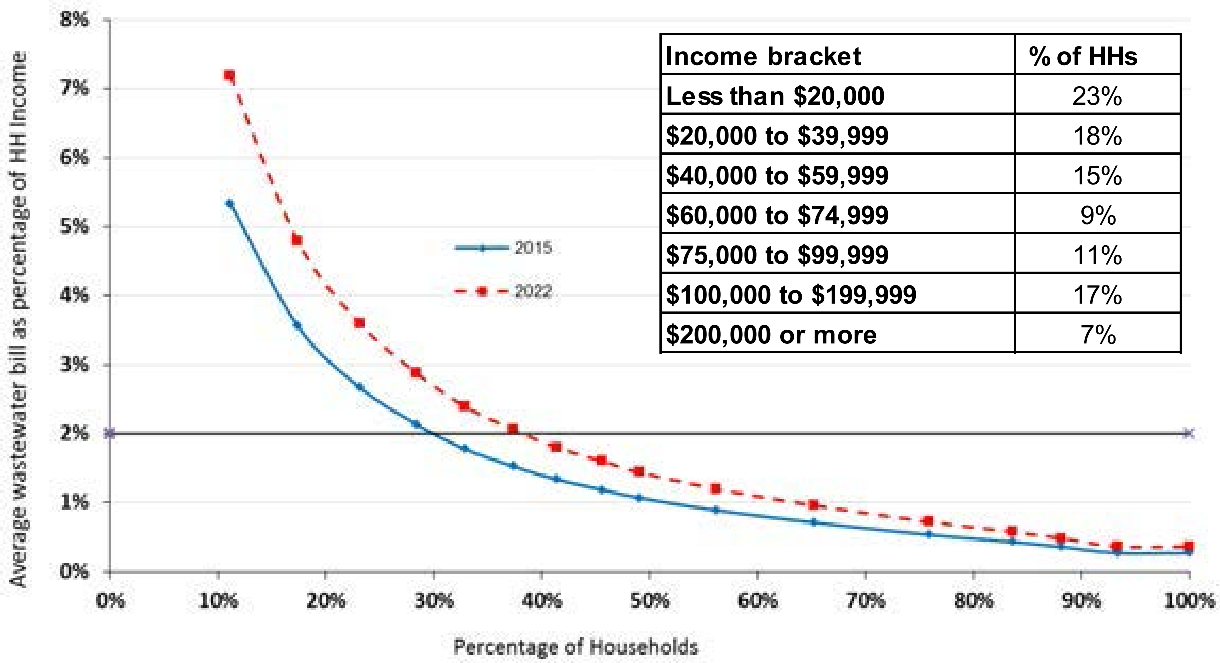
9.6.d.6 Property Tax Collection Rate

The property tax collection rate is a measure of “the efficiency of the tax collection system and the acceptability of tax levels to residents”. This New York City Property Tax Annual report issued in FY13 indicates NYC’s total property tax levy was $20.1 billion, of which 98.2 percent was collected, resulting in a “mid-range” rating for this indicator.

It should be noted, however, that the processes used to collect water and wastewater charges and the enforcement tools available to water and wastewater agencies differ from those used to collect and enforce real property taxes. The New York City Department of Finance, for example, can sell real property tax liens on all types of non-exempt properties to third parties, who can then take action against the delinquent property-owners. DEP, in contrast, can sell liens on multi-family residential and commercial buildings whose owners have been delinquent on water bills for more than one year, but it cannot sell liens on single-family homes. The real property tax collection rate thus may not accurately reflect the local agency’s ability to collect the revenues used to support water supply and wastewater capital spending.

9.6.e Future Household Costs

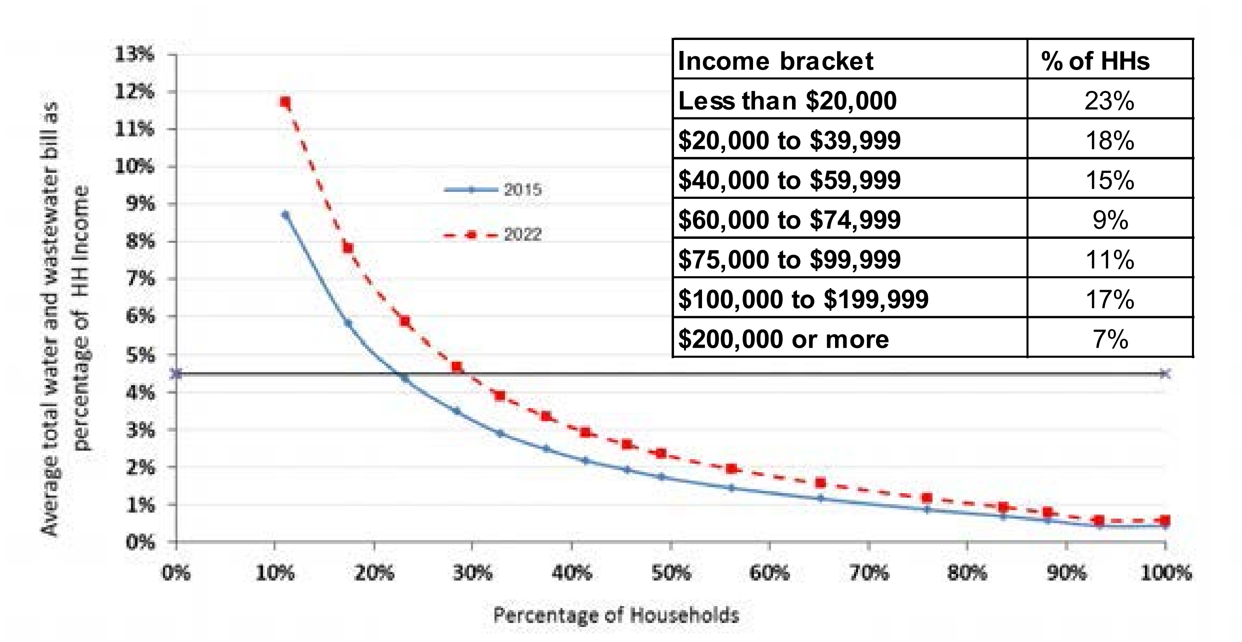
For illustration purposes, Figure 10 shows the average estimated household cost for wastewater services compared to household income versus the percentage of households in various income brackets for the years 2015 and 2022. As shown, 50 percent of households are estimated to pay more than 1 percent of their income on wastewater service in 2015. Roughly 30 percent of households are estimated to pay 2 percent or more of their income on wastewater service alone in 2015. Estimating modest future rate and income increases (based on costs in the CIP and historic Consumer Price Index data, respectively), up to 37 percent of households could be paying more than 2 percent of their income on wastewater services by 2022. These projections are preliminary and do not include additional future wastewater spending associated with the programs outlined in Section 1.1.2 Future System Investment. When accounting for these additional costs, it is likely that an even greater percentage of households could be paying well above 2 percent of their income on wastewater services in the future.



Income bracket	% of HHs
Less than $20,000	23%
$20,000 to $39,999	18%
$40,000 to $59,999	15%
$60,000 to $74,999	9%
$75,000 to $99,999	11%
$100,000 to $199,999	17%
$200,000 or more	7%

Figure 9-10: Estimated Average Wastewater Household Cost Compared to Household Income (FY15 & FY22)

DEP, like many utilities in the nation, provides both water and wastewater service, and its rate payers see one bill. Currently the average combined water and sewer bill is around 1.6 percent of MHI, but 23 percent of households are estimated to be currently paying more than 4.5 percent of their income, and that could increase to about 30 percent of households in future years as shown in Figure 9-11. Again, this estimate does not include additional spending for the additional water and wastewater programs outlined in Section 9.6.a.2 - Future System Investment.



Income bracket	% of HHs
Less than $20,000	23%
$20,000 to $39,999	18%
$40,000 to $59,999	15%
$60,000 to $74,999	9%
$75,000 to $99,999	11%
$100,000 to $199,999	17%
$200,000 or more	7%

Figure 9-11: Estimated Average Total Water and Wastewater Cost as a Percentage of Household Income (FY15 and FY22)

9.6.f Potential Impacts of CSO LTCPs to Future Household Costs

As previously discussed, DEP is facing significant future wastewater spending commitments associated with several regulatory compliance programs. This section presents the potential range of CSO LTCP implementation costs for NYC and describes the potential resulting impacts to future household costs for wastewater service. The information in this section reflects a simplified household impact analysis that will be refined in future LTCP waterbody submittals. All referenced Waterbody / Watershed Facility Plan (WWFP) costs presented in this section have been escalated to June 2014 dollars using the Engineering News-Record City Cost Index (ENRCCI) for New York for comparison purposes.

9.6.f.1 Estimated Costs for Waterbody CSO Recommended Alternative

As discussed in Section 8.8, the principal element of the CSO control alternative recommended in the 2007 Alley Creek and Little Neck Bay Waterbody / Watershed Facility Plan (WWFP), i.e. 5 MG Alley Creek CSO Retention Facility and new CSO outfall, has been constructed. With the facility now in operation, CSO volume has been reduced to 132 million gallons for the 2008 typical year. To date, approximately $138.9 million has been committed to grey CSO control infrastructure.

The recommendations LTCP alternative for Alley Creek and Little Neck Bay is to provide seasonal disinfection the Alley Creek CSO Retention Facility effluent to reduce the human pathogens discharged during the recreational season. DEP is also committed to investigating and reducing the local sources of hum-source pollution to improve water quality of the waterbodies. The recommended LTCP alternative also includes 45 acres of implemented green infrastructure in the Alley Creek and Little Neck Bay watershed by 2030.

The total presented worth cost for the grey component of the LTCP alternative which reflects capital costs and O&M costs over the projected useful life of the project is $11.3M.

DEP's LTCP planning process was initiated in 2012 and will extend until the end of 2017 per the Consent Order schedule. Overall anticipated CSO program costs for NYC will not be known until all of the LTCPs have been developed and approved. However, DEP did develop CSO control costs as part of a previous WWFP effort. These costs are presented in Table 9-7, and they will be supplemented by LTCP recommended alternative costs in future waterbody LTCP affordability sections as new costs become available.

Costs for the recommended alternatives as well as 25 percent, 50 percent, and 100 percent CSO control are included in Table 9-7 to provide a possible range of future CSO control costs. Also, green infrastructure is a major component of the CSO Consent Order. The overall green infrastructure program cost is estimated at $2.4 billion, of which $1.5 billion will be spent by DEP. The green infrastructure program costs are in addition to the grey CSO control costs and are therefore presented as a separate line item. As shown in Table 9-7, overall future CSO control costs could range from $4.1 billion to $85.6 billion.

Table 9-7 also presents CSO control costs that have been committed from FY 2002 through FY 2013 and in DEP's FY2014-2024 CIP. When excluding these committed costs, the range of possible future CSO control costs is $1.1 billion to $82.7 billion.

9.6.f.2 Potential Impacts to Future Household Costs

To estimate the impact of the possible range of future CSO control costs to ratepayers, the annual household cost impact of the future Citywide CSO control costs was calculated for the CSO spending scenarios. The cost estimates presented will evolve over the next few years as the LTCPs are completed for the 10 waterbodies. The cost estimates will be updated as the LTCPs are completed.

A 4.75 percent interest rate was used to determine the estimated annual interest cost associated with the capital costs, and the annual debt service was divided by the FY 2015 Revenue Plan value to determine the resulting percent rate increase. This also assumes bonds are structured for a level debt service amortization over 32 years. Note that interest rates on debt could be significantly higher in the future. As Table 9-8 shows, the Recommended CSO Control and 25 percent CSO Control scenarios would result in a 2 percent rate increase. The 50 percent CSO Control scenario would result in a double-digit rate increase of 15 percent, and the 100 percent CSO Control scenario would result in a substantial 118 percent rate increase. These rate increases translate into additional annual household costs of up to $1,207. Both the 50 percent and 100 percent CSO control scenarios represent a substantial increase in annual household costs, which only reflects possible future CSO control program costs. The cost of the additional future mandated and non-mandated programs discussed in Section 9.6.a.2 - Future System Investment would further increase the annual burden to ratepayers. For illustrative purposes, estimates for future spending on TRC, Ammonia, MS4, Superfund and Hillview Cover have been assumed in Table 9-8 and Table 9-9, and these are subject to change.

Table 9-7: Range of Potential Future CSO Costs

Waterbody / Watershed[1]	Historical and Current CIP Commitments	Baseline Committed Grey Infrastructure Costs			Additional LTCP Recommended Alternative	LTCP Recommended Alternative Cost	25% CSO Control Cost[2]	50% CSO Control Cost[2]	100% CSO Control Cost[2]
		Committed FY2002-FY2013	Committed in 2014-2024 CIP	Total Existing Committed					
Alley Creek and Little Neck Bay	CSO Abatement Facilities and East River CSO	$141,916,025	$ (3,085,000)[3]	$138,831,025	Disinfection in Existing CSO Retention Facility	$11,300,000	$113,000,000	$173,000,000	$569,000,000
Westchester Creek	Hunts Point WPCP Headworks	$7,800,000	$88,425,000	$96,225,000	Green Infrastructure Implementation and Post Construction Monitoring	TBD	$200,000,000	$420,000,000	$731,400,000
Hutchinson River	*Hunts Point WPCP Headworks*	*$3,000,000*	*$0*	*$3,000,000*	*TBD*	*TBD*	*$173,849,412*	*$427,937,014*	*$830,465,268*
Flushing Creek	*Flushing Bay Corona Avenue Vortex Facility, Flushing Bay CSO Retention, Flushing Bay CSO Storage*	*$360,348,471*	*$46,334,000*	*$406,682,471*	*TBD*	*TBD*	*$169,672,037*	*$339,344,073*	*$6,628,747,129*
Bronx River	*Installation of Floatable Control Facilities, Hunts Point Headworks*	*$46,989,901*	*$106,000*	*$47,095,901*	*TBD*	*TBD*	*$36,165,246*	*$90,413,115*	*$1,218,286,583*
Gowanus Canal	*Gowanus Flushing Tunnel Reactivation, Gowanus Facilities Upgrade*	*$174,828,480*	*$3,139,000*	*$177,967,480*	*TBD*	*TBD*	*$249,182,401*	*$529,512,603*	*$1,148,481,688*
Coney Island Creek	*Avenue V Pumping Station, Force Main Upgrade*	*$199,749,241*	*$2,485,000*	*$202,234,241*	*TBD*	*TBD*	*$59,646,395*	*$119,292,789*	*$1,163,462,575*

Waterbody / Watershed[1]	Historical and Current CIP Commitments	Baseline Committed Grey Infrastructure Costs			Additional LTCP Recommended Alternative	LTCP Recommended Alternative Cost	25% CSO Control Cost[2]	50% CSO Control Cost[2]	100% CSO Control Cost[2]
		Committed FY2002-FY2013	Committed in 2014-2024 CIP	Total Existing Committed					
Jamaica Bay	*Improvements of Flow Capacity to Fresh Creek-26th Ward Drainage Area, Hendrix Creek Canal Dredging, Shellbank Destratification, Spring Creek AWCP Upgrade*	*$141,135,131*	*$323,733,000*	*$464,868,131*	*TBD*	*TBD*	*$180,881,883*	*$367,416,325*	*$4,142,534,281*
Flushing Bay[4]	*See Flushing Creek*	*$0*	*$0*	*$0*	*TBD*	*TBD*	*$222,270,368*	*$791,802,838*	*$4,787,918,645*
Newtown Creek	*English Kills Aeration, Newtown Creek Water Quality Facility, Newtown Creek Headworks*	*$160,099,445*	*$91,312,000*	*$251,411,445*	*TBD*	*TBD*	*$566,569,452*	*$1,586,394,467*	*$3,421,512,923*
East River and Open Waters	*Bowery Bay Headworks, Inner Harbor In-Harbor Storage Facilities, Reconstruction of the Port Richmond East Interceptor Throttling Facility, Outer Harbor CSO Regulator Improvements, Hutchinson River CSO*	*$153,145,476*	*$43,131,000*	*$196,276,476*	*TBD*	*TBD*	*$534,921,268*	*$7,016,829,726*	*$59,488,594,159*
Bergen and Thurston Basins[5]	Pumping Station and Force Main Warnerville	*$41,876,325*	$ (180,000)[3]	*$41,696,325*	NA	NA	NA	NA	NA
Paerdegat Basin[5]	Retention Tanks, Paerdegat Basin Water Quality Facility	*$397,605,260*	$ (4,609,000)[3]	*$392,996,260*	NA	NA	NA	NA	NA

Waterbody / Watershed[1]	Historical and Current CIP Commitments	Baseline Committed Grey Infrastructure Costs			Additional LTCP Recommended Alternative	LTCP Recommended Alternative Cost	25% CSO Control Cost[2]	50% CSO Control Cost[2]	100% CSO Control Cost[2]
		Committed FY2002-FY2013	Committed in 2014-2024 CIP	Total Existing Committed					
Green Infrastructure Program[6]	Miscellaneous Projects Associated with City-wide Green Infrastructure Program	$24,200,000	$907,005,000	$931,205,000	Full Implementation of Green Infrastructure Program	$1,500,000,000	$1,500,000,000	$1,500,000,000	$1,500,000,000
TOTAL		*$1,852,693,755*	*$ 1,497,796,000*	*$3,350,489,755*		*$1,511,300,000*	*$4,006,158,462*	*$13,361,942,951*	*$85,630,403,250*

Notes:
1. The shaded waterbody rows include current LTCP alternative and cost information. Other waterbody rows are presented in italics and will be updated in future waterbody LTCP affordability chapters as new alternatives and costs become available.
2. 25%, 50%, and 100% CSO costs are estimated using knee of the curve / cost vs. CSO control plots from WWFPs and LTCPs and do not subtract historic and currently committed costs, which are presented separately. All costs taken from the WWFPs have been escalated to June 2014 dollars for comparison purposes using the ENRCCI for New York.
3. Negative values for Alley Creek and Little Neck Bay, Bergen and Thurston Basins, and Paerdegat Basin reflect a de-registration of committed funds.
4. Committed costs for Flushing Bay are captured in the committed costs reported for Flushing Creek.
5. Bergen and Thurston Basins and Paerdegat Basin are not part of the current LTCP effort; thus, no LTCP detail is provided for them.
6. DEP's green infrastructure program costs are assumed to be the same regardless of the CSO control level.

Table 9-8: CSO Control Program Household Cost Impact

Capital Spending Scenario	Projected Capital Cost ($M)[1]	Annual Debt Service ($M)[2]	% Rate Increase from FY 2015 Rates	Additional Annual Household Cost	
				Single-Family Home	Multi-Family Unit
Current CIP	13,664	839	24	$245	$159
Future Potential Mandated Program Costs for MS4, TRC, Ammonia, Superfund, and Hillview Cover[3]	7,000	430	12	$125	$82
100% CSO Control	82,715	5,079	145	$1,483	$964
50% CSO Control	10,446	641	18	$187	$122
25% CSO Control	1,090	67	2	$20	$13
Citywide LTCP CSO Control Alternatives[4]	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*

Notes:
1. CSO Capital costs have been reduced to reflect historic and currently committed costs for CSO control projects (see Table 6).
2. Assumes bonds are structured for a level debt service amortization over 32 years at a 4.75% interest rate.
3. DEP will face additional future wastewater mandated program costs. While these costs have not been finalized, the following estimated costs for select programs are included to represent potential future annual household cost on top of costs for the CSO control program: MS4 Permit Compliance - $2.5 billion, TRC - $560 million, Ammonia $840 million Superfund Remediation - $1.5 billion million, and $1.6 billion for Hillview Cover.
4. Projected capital cost for the City-wide recommended LTCP CSO control alternatives is not currently available. This information will be included in the City-wide LTCP following completion of the individual waterbody LTCPs.

Table 9-9. Total Estimated Cumulative Future HH Costs/MHI

Capital Spending Scenario	Total Projected Annual Household Cost[1]		Total Water and Wastewater HH Cost / MHI[2]		Total Wastewater HH Cost / MHI[2]	
	Single-family Home	Multi-family Unit	Single-family Home	Multi-family Unit	Single-family Home	Multi-family Unit
FY 2015 Rates	$1,025	$666	1.9%	1.2%	1.1%	0.74%
Current CIP	$1,270	$825	2.0%	1.3%	1.2%	0.81%
Other Future Potential Mandated Program Costs for MS4, TRC, Ammonia, Superfund, and Hillview Cover	$1,395	$907	2.2%	1.5%	1.4%	0.89%
100% CSO Control +CIP +Other	$2,878	$1,871	4.6%	3.0%	2.8%	1.84%
50% CSO Control+CIP+Other	$1,582	$1,029	2.5%	1.6%	1.6%	1.01%
25% CSO Control+CIP+Other	$1,415	$920	2.3%	1.5%	1.4%	0.90%
Citywide LTCP CSO Control Alternatives	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*

Notes:
1. Projected household costs are estimated from rate increases presented in Table 9-7.
2. Future costs were compared to assumed 2020 MHI projection.

Table 9-9 presented above shows the potential range of future spending and its impact on household cost and compared to MHI. While these estimates are preliminary, it should be noted (as discussed in detail earlier in this section) that comparing household cost to MHI alone does not tell the full story since a large percentage of households below the median could be paying a larger percentage of their income on these costs.

9.6.g Benefits of Program Investments

DEP has been in the midst of an unprecedented period of investment to improve water quality in New York Harbor. Projects worth $9.9 billion have been completed or are under way since 2002 alone, including projects for nutrient removal, CSO abatement, marshland restoration in Jamaica Bay, and hundreds of other projects. In-City investments are improving water quality in New York Harbor and restoring a world-class estuary while creating new public recreation opportunities and inviting people to return to NYC's 578 miles of waterfront. A description of Citywide water quality benefits resulting from previous and ongoing programs is provided below, followed by the anticipated benefits of water quality improvements to Alley Creek and Little Neck Bay resulting from implementation of the recommended CSO control alternative.

9.6.g.1 Citywide Water Quality Benefits from Previous and Ongoing Programs and Anticipated Alley Creek and Little Neck Bay Water Quality Benefits

Water quality benefits have been documented in New York Harbor and its tributaries from the almost $10 billion investment that NYC has already made in both grey and green infrastructure. Approximately 95 percent of New York Harbor is available for boating and kayaking and 14 of NYC's beaches provide access to swimmable waters in the Bronx, Brooklyn, Queens and Staten Island.

Of the $9.9 billion already invested, almost 20 percent has been dedicated to controlling CSOs and stormwater. That investment has resulted in NYC capturing and treating over 70 percent of the combined stormwater and wastewater that otherwise would be directly discharged to our waterways during periods of heavy rain or runoff. Projects that have already been completed include Green Infrastructure projects in 26th Ward, Hutchinson River and Newtown Creek watersheds; area wide green infrastructure contracts; Avenue V Pump Station and Force Main; and the Bronx River Floatables Control. Several other major projects are in active construction or design. The water quality improvements already achieved have allowed greater access of the waterways and shorelines for recreation as well as enhanced environmental habitat and aesthetic conditions in many of NYC's neighborhoods.

More work is needed, and DEP has committed to working with DEC to further reduce CSOs and make other infrastructure improvements to gain additional water quality improvements. The consent order signed in 2012 between DEP and DEC outlines a combined grey and green approach to reduce CSOs. This LTCP for Alley Creek and Little Neck Bay is just one of the detailed plans that DEP is preparing by the year 2017 to evaluate and recommend additional control measures for reducing CSO and improving water quality in New York Harbor (the "Harbor"). DEP is also committed to extensive water quality monitoring throughout the Harbor which will allow better assessment of the effectiveness of the controls implemented.

As noted above, a major component of the Consent Order that DEP and NYSDEC developed is green infrastructure stormwater control measures. DEP is targeting a 10 percent application rate for implementing green infrastructure in combined sewer areas. The green infrastructure will take multiple forms including green or blue roofs, bioinfiltration systems, right of way bioswales, rain barrels, and porous pavement. These measures provide benefits beyond the associated water quality improvements. Depending on the measure installed, they can recharge groundwater, provide localized flood attenuation, provide sources of water for non-potable use such as watering lawns or gardens, reduce heat island effects on streets and sidewalks, improve air quality, enhance aesthetic quality, and provide recreational opportunities. These are all benefits that contribute to the overall quality of life for residents of NYC.

A detailed discussion of anticipated water quality improvements to Alley Creek and Little Neck Bay is included in Section 8.0, and a copy of the UAA submitted as part of the LTCP is included in the appendix.

9.6.h Conclusions

As part of the LTCP process, DEP will continue to develop and refine the affordability and financial capability assessments for each individual waterbody as it works toward an expanded analysis for the Citywide LTCP. In addition to what is outlined in the federal CSO guidance on financial capability, DEP has presented in this section a number of additional socioeconomic factors for consideration in the context of affordability and assessing potential impacts to our ratepayers. Furthermore, DEP feels it is important to include a fuller range of future spending obligations and has sought to present an initial picture of that here. Ultimately the environmental, social, and financial benefits of all water-related obligations should be considered when priorities for spending are developed and implementation of mandates are scheduled, so that resources can be focused where the community will get the most environmental benefit.

9.7 Compliance with Water Quality Goals

As noted above, Alley Creek is currently attaining the Class I bacteria criteria. The assessment of the waterbody indicates that Alley Creek cannot support primary contact water quality (Class SC), nor is it suitable for such uses because of natural and manmade features, such as lack of access, marshy tidal flat conditions, etc. The UAA, described above and attached as Appendix E, was prepared to document these findings.

As discussed above, DEP proposes “Site-Specific Targets” to provide for and monitor the continual improvement of water quality in Alley Creek and Little Neck Bay. These site-specified targets are presented in Table 8-20 with the preferred alternative. They are based on 10-year water quality model simulations that account for CSO and stormwater sources; assume that disinfection is implemented and in operation throughout the recreational season, illicit discharges to the storm system are eliminated, and that suspected DMA septic system contamination issues are corrected. They represent a reasonable range of targets that can be met the majority of the time, given implementation of the recommended LTCP. DEC will review and comment on the site-specific targets as part of the UAA review process.

DEP is seeking a SPDES variance from the anticipated Water Quality Based Effluent Limitation (WQBEL) for the Alley Creek CSO Retention Facility, and the application is attached as Appendix F per DEC requirements. Specifically, the variance request is based on the anticipation of occasional exceedances of WQS for (a) suspended, colloidal and settleable solids; (b) oil and floating substances; and (c) DO. Because complete elimination of periodic excursions from the WQS would require 100 percent CSO control, and because even with their complete removal, DO numeric limits are not fully attained, a variance from the presumed WQBEL of 100 percent CSO control is being requested. The criteria for such a variance are identical to those for a UAA, and DEP anticipates that the same approval framework will be applicable to variance requests. For the Alley Creek CSO Retention Facility SPDES variance, factor #3 is applicable (human-caused conditions or sources of pollution prevent attainment of the standard or guidance value and cannot be remedied or would cause more environmental damage to correct than to leave in place).

10. REFERENCES

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11.0 GLOSSARY

µg/L:	Microgram per liter
1.5xDDWF:	One and One-half Times Design Dry Weather Flow
2xDDWF:	Two Times Design Dry Weather Flow
AAOV:	Annual Average Overflow Volumes
APEC:	Alley Pond Environmental Center
BEACH:	Beaches Environmental Assessment and Coastal Health
BEPA	Bureau of Environmental Planning and Analysis
BGY:	Billon Gallons Per Year
BMP:	Best Management Practice
BNR:	Biological Nutrient Removal
BOD:	Biochemical Oxygen Demand
BWSO:	Bureau of Water and Sewer Operations
CAC:	Citizens Advisory Committee
CEO:	New York City Center for Economic Opportunity
CFR:	Code of Federal Regulation
CFU	Colony-Forming Unit
CIP:	Capital Improvement Program
Conc:	Abbreviation for "Concentration".
CSO:	Combined Sewer Overflow
CSS:	Combined Sewer System
CWA:	Clean Water Act
DCIA:	Directly Connected Impervious Areas
DCP:	New York City Department of City Planning
DDWF:	Design Dry Weather Flow

DEC:	New York State Department of Environmental Conservation
DEP:	New York City Department of Environmental Protection
DMA Beach:	Douglas Manor Association Beach
DMR:	Discharge Monitoring Report
DNA:	Deoxyribonucleic Acid
DO:	Dissolved Oxygen
DOB:	New York City Department of Buildings
DOF:	New York City Department of Finance
DOH:	New York State Department of Health
DOHMH:	New York City Department of Health and Mental Hygiene
DOS	New York State Department of State
DOT:	New York City Department of Transportation
DPR:	New York City Department of Parks and Recreation
DWF:	Dry Weather Flow
E. Coli:	Escherichia Coli.
EBP:	Environmental Benefit Project
ECL	New York State Environmental Conservation Law
ECM:	Energy Conservation Measure
EMC:	Event Mean Concentration
ENRCCI:	Engineering News-Record City Cost Index
EPA:	United States Environmental Protection Agency
ERTM:	East River Tributaries Model
ET:	Evapotranspiration
FAD:	Filtration Avoidance Determination
FCI:	Financial Capability Indicators
FMPV:	Full Market Property Value

FT	Abbreviation for "Feet"
FY:	Fiscal Year
GI:	Green Infrastructure
GIS:	Geographical Information System
GM:	Geometric Mean
G.O.:	General Obligation
GPD:	Gallons per Day
GPS:	Global Positioning System
GRTA:	NYC Green Roof Tax Abatement
HEAP:	Home Energy Assistance Program
HGL:	Hydraulic Gradient Line
HLSS:	High Level Sewer Separation
HRA:	New York City Human Resources Administration
HRD	High Rate Disinfection
HRT:	High Rate Treatment
HSM	Harbor Survey Monitoring
HVAC	Heating, Ventilation, and Air Conditioning
HWAP:	Home Water Assistance Program
I/I:	Inflow/Infiltration
IEC:	Interstate Environmental Commission
in.:	Abbreviation for "Inches".
IW:	InfoWorks CS™
JFK:	John F. Kennedy International Airport
KOTC:	Knee-of-the-Curve
LA:	Load Allocation
LC:	Loading Capacity

LGA:	LaGuardia Airport
LIE	Long Island Expressway
LNB	Little Neck Bay
LT2	Long Term 2
LTCP:	Long Term Control Plan
mg/L:	milligrams per liter
MG:	Million Gallons
MGD:	Million Gallons Per Day
MGY	Million Gallons Per Year
MHI:	Median Household Income
mL:	milliliters
MOU:	Memorandum of Understanding
MPN:	Most Probable Number
MS4:	Municipal separate storm sewer systems
MSS:	Marine Sciences Section
NaHSO3	Sodium Bisulfite
$NaOCl^-$	Sodium Hypochlorite
NAS:	National Academy of Sciences
NEIWPCC:	New England Interstate Water Pollution Control Commission
NMC:	Nine Minimum Control
No./mL (or #/mL):	Number of bacteria organisms per milliliter
NOAA:	National Oceanic and Atmospheric Administration
NPDES:	National Pollutant Discharge Elimination System
NRG	Natural Resources Group
NWI:	National Wetland Inventory

NYC:	New York City
NYCRR:	New York State Code of Rules and Regulations
NYD:	New York District
NYS	New York State
NYSDOS:	New York State Department of State
O&M:	Operation and Maintenance
OGI:	Office of Green Infrastructure
OMB:	Office of Management and Budget
ONRW:	Outstanding National Resource Waters
PAH:	Polycyclic Aromatic Hydrocarbons
PCM:	Post Construction Monitoring
POTW:	Publicly Owned Treatment Plant
Pounds per day:	lbs/day; unit of measure
PS:	Pump Station or Pumping Station
RI:	Residential Indicator
RI/FS:	Remedial Investigation/Feasibility Study
ROWB:	Right-of-way bioswales
RTC:	Real-Time Control
RWQC:	Recreational Water Quality Criteria
SBU	Sewer Backup
SCADA:	Supervisory Control and Data Acquisition
SIU:	Significant Industrial User
SNAD:	Special Natural Area District
SPDES:	State Pollutant Discharge Elimination System
SPM:	Supplemental Poverty Measure

SSS:	Separate sewer system
STV:	Statistical Threshold Value
TBD:	To Be Determined
TC:	Total coliform
TI	Tallman Island
TMDL:	Total Maximum Daily Load
TOC:	Total Organic Carbon
TRC:	Total Residual Chlorine
TSS:	Total Suspended Solids
UAA:	Use Attainability Analysis
ULURP:	Uniform Land Use Review Procedure
USEPA:	United States Environmental Protection Agency
UV:	Ultraviolet Light
VTS:	Vertical Treatment Shaft
WAC:	Watershed Advisory Committee
WDAP:	Water Debt Assistance Program
WQ	Water Quality
WQBEL	Water Quality Based Effluent Limitation
WQS:	Water Quality Standards
WWFP:	Waterbody/Watershed Facility Plan
WWOP:	Wet Weather Operating Plan
WWTP:	Wastewater Treatment Plant

Appendix A: Supplemental Tables

Tallman Island WWTP Drainage Area: Acreage By Outfall/Regulator

Outfall	Outfall Drainage Area	Regulator	Regulator Drainage Area	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 Ave 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	1044.4	R46	404.4	Combined	Alley Creek
		R47	455.9	Combined and Separate	Alley Creek
		R49	80.5	Separate	Alley Creek
TI-024	376.2	New Douglaston PS	77.1	Separate	Alley Creek
TI-025	1550.7	Alley Creek CSO Retention Facility	1550.7	Combined and Separate	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
		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

Outfall	Outfall Drainage Area	Regulator	Regulator Drainage Area	Regulated Drainage Area Type	Receiving Water
		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 St 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
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

Note: For locations with regulators in series, the incremental regulator drainage area is listed.

**Annual CSO, Stormwater, Direct Drainage,
Local Source Baseline Volumes (2008 Rainfall)**

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
Alley Creek	TI-007	ODPS Bypass	0.1
Alley Creek	TI-008	R07	0.0
Alley Creek	TI-025	R29, R30	**132.0**
Little Neck Bay	TI-009	------	0.0
		Total CSO	**132.1**

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Discharge, (MG/Yr)**
Alley Creek	TI-008	Oakland Lake	14.0
Alley Creek	TI-024	NA	122.4
Alley Creek	TI-654	NA	59.8
Alley Creek	TI-655	NA	52.9
Alley Creek	TI-659	NA	24.3
Alley Creek	TI-629	NA	4.1
Alley Creek	TI-630	NA	9.8
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
Direct Drainage	NA	NA	47.6
Little Neck Bay	TI-006	NA	174.2
Little Neck Bay	TI-543	NA	13.0
Little Neck Bay	TI-623	NA	2.7
Little Neck Bay	TI-625	NA	114.8
Little Neck Bay	TI-628	NA	29.4
Little Neck Bay	TI-633	NA	33.2
Little Neck Bay	TI-658	NA	15.4
Little Neck Bay	TI-656	NA	12.3
Little Neck Bay	TI-660	NA	51.1
Little Neck Bay	TI-668	NA	3.9
		Total Stormwater	**784.9**

Local Sources			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
Alley Creek	TI-008	Oakland Lake	670.0
Alley Creek	LIE Pond		930.0
		Total Dry Weather	**1,600.0**

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
Alley Creek			2,067.0
Little Neck Bay			450.0

Totals by Source			
Waterbody	**Outfall**	**Regulator**	**Total Discharge (MG/Yr)**
CSO			132.1
Stormwater			784.9
Local Sources-Baseflows			1,600.0

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total Discharge (MG/Yr)**
Alley Creek	CSO	7	132.1
	Stormwater	19	334.9
	Local Sources	73	1,600.0
		Total	**2,067.0**
Little Neck Bay	CSO	0	0
	Stormwater	100	450.0
	Local Sources	0	0
		Total	**450.0**

**Annual CSO, Stormwater, Direct Drainage,
Local Sources Enterococci Loads (2008 Rainfall)**

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-007	ODPS Bypass	0.1
Alley Creek	TI-008	R07	0.0
Alley Creek	TI-025	R29, R30	789.2
Little Neck Bay	TI-009		0.0
		Total CSO	**789.3**

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-008	Oakland Lake	7.1
Alley Creek	TI-024	NA	69.5
Alley Creek	TI-654	NA	34.0
Alley Creek	TI-655	NA	30.0
Alley Creek	TI-659	NA	13.8
Alley Creek	TI-629	NA	2.3
Alley Creek	TI-630	NA	5.6
Direct Drainage	NA	NA	27.0
Little Neck Bay	TI-006	NA	98.9
Little Neck Bay	TI-543	NA	7.4
Little Neck Bay	TI-623	NA	1.5
Little Neck Bay	TI-625	NA	65.2
Little Neck Bay	TI-628	NA	16.7
Little Neck Bay	TI-633	NA	18.8
Little Neck Bay	TI-656	NA	7.0
Little Neck Bay	TI-658	NA	8.8
Little Neck Bay	TI-660	NA	29.0
Little Neck Bay	TI-668	NA	2.2
		Total Stormwater	**444.3**

Local Sources			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-008	Oakland Lake	3.3
Alley Creek	LIE Pond		2.6
		Total Dry Weather	**5.9**

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek			984.5
Little Neck Bay			255.5

Totals by Source			
Source	**Outfall**	**Regulator**	**Total Org.x10^12**
CSO			789.3
Stormwater			444.8
Local Sources			5.9

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total Org.x10^12**
Alley Creek	CSO	80	789.3
	Stormwater	19	189.3
	Local Sources	1	5.9
		Total	**984.5**
Little Neck Bay	CSO	0	0
	Stormwater	100	255.5
	Local Sources	0	0
		Total	**255.5**

**Annual CSO, Stormwater, Direct Drainage,
Local Sources Fecal Coliform Loads (2008 Rainfall)**

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-007	ODPS Bypass	0.1
Alley Creek	TI-008	R07	0.0
Alley Creek	TI-025	R29, R30	2,170.8
Little Neck Bay	TI-009		0.0
		Total CSO	**2,170.9**

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-008	Oakland Lake	2.7
Alley Creek	TI-024	NA	162.2
Alley Creek	TI-654	NA	79.2
Alley Creek	TI-655	NA	70.1
Alley Creek	TI-659	NA	32.1
Alley Creek	TI-629	NA	5.4
Alley Creek	TI-630	NA	13.0
Direct Drainage	NA	NA	63.0
Little Neck Bay	TI-006	NA	230.8
Little Neck Bay	TI-543	NA	17.3
Little Neck Bay	TI-623	NA	3.6
Little Neck Bay	TI-625	NA	152.0
Little Neck Bay	TI-628	NA	39.0
Little Neck Bay	TI-633	NA	43.9
Little Neck Bay	TI-656	NA	16.3
Little Neck Bay	TI-658	NA	20.4
Little Neck Bay	TI-660	NA	67.7
Little Neck Bay	TI-668	NA	5.1
		Total Stormwater	**1,023.8**

Local Sources			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek	TI-008	Oakland Lake	3.8
Alley Creek	LIE Pond		2.6
		Total Dry Weather	**6.4**

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total Org.x10^12**
Alley Creek			2,605.0
Little Neck Bay			596.1

Totals by Source			
Source	**Outfall**	**Regulator**	**Total Org.x10^12**
CSO			2,170.9
Stormwater			1,023.8
Local Sources			6.4

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total Org.x10^12**
Alley Creek			
	CSO	50	2,170.9
	Stormwater	49	427.7
	Local Sources	0	6.4
		Total	**2,605.0**
Little Neck Bay			
	CSO	0	0
	Stormwater	100	596.1
	Local Sources	0	0
		Total	**596.1**

Annual CSO, Stormwater, Direct Drainage, Local Sources BOD_5 Loads (2008 Rainfall)

Combined Sewer Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Lbs**
Alley Creek	TI-007	ODPS Bypass	13
Alley Creek	TI-008	R07	0
Alley Creek	TI-025	R29, R30	18,494
Little Neck Bay	TI-009		0
		Total CSO	**18,507**

Stormwater Outfalls			
Waterbody	**Outfall**	**Regulator**	**Total Lbs**
Alley Creek	TI-008	Oakland Lake	4,555
Alley Creek	TI-024	NA	15,313
Alley Creek	TI-654	NA	7,481
Alley Creek	TI-655	NA	4,834
Alley Creek	TI-659	NA	3,035
Alley Creek	TI-629	NA	513
Alley Creek	TI-630	NA	1,230
Direct Drainage	NA	NA	5,912
Little Neck Bay	TI-006	NA	21,796
Little Neck Bay	TI-543	NA	1,629
Little Neck Bay	TI-623	NA	341
Little Neck Bay	TI-625	NA	14,358
Little Neck Bay	TI-628	NA	3,681
Little Neck Bay	TI-633	NA	4,150
Little Neck Bay	TI-656	NA	1,539
Little Neck Bay	TI-658	NA	5,382
Little Neck Bay	TI-660	NA	6,397
Little Neck Bay	TI-668	NA	5,582
		Total Stormwater	**107,728**

Local Sources			
Waterbody	**Outfall**	**Regulator**	**Total Lbs**
Alley Creek	TI-008	Oakland Lake	0
Alley Creek	LIE Pond		0
		Total Dry Weather	**0**

Totals by Waterbody			
Waterbody	**Outfall**	**Regulator**	**Total Lbs**
Alley Creek			61,380
Little Neck Bay			64,855

Totals by Source			
Waterbody	**Outfall**	**Regulator**	**Total Lbs**
CSO			18,507
Stormwater			107,728
Local Sources			0

Totals by Source by Waterbody			
Waterbody	**Outfall**	**Percent**	**Total Lbs**
Alley Creek			
	CSO	30.2	18,507
	Stormwater	69.8	42,873
	Local Sources	0.0	0
		Total	**61,380**
Little Neck Bay			
	CSO	0.0	0
	Stormwater	100.0	64,855
	Local Sources	0.0	0
		Total	**64,855**

2008 Rainfall Model-Calculated DO and Measures of Attainment 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	11.0	7.3	100
Feb	12.0	8.7	100
Mar	11.0	6.4	100
Apr	8.9	5.1	100
May	6.5	3.2	99
Jun	5.1	2.1	89
Jul	6.6	3.1	95
Aug	6.8	3.5	99
Sep	5.6	1.2	91
Oct	8.0	4.4	100
Nov	8.6	4.4	100
Dec	9.7	6.2	100
Year	8.3		**98**

2008 Rainfall Model-Calculated DO and Measures of Attainment 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	11.7	10.1	100
Feb	12.9	11.3	100
Mar	12.2	10.8	100
Apr	10.3	9.1	100
May	8.1	6.6	100
Jun	5.9	4.5	98
Jul	5.6	2.8	66
Aug	7.0	3.2	95
Sep	7.4	5.8	100
Oct	9.1	6.6	100
Nov	9.1	7.8	100
Dec	10.3	8.9	100
Year	9.1		**96**

2008 Rainfall Model-Calculated DO and Measures of Attainment 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	12.1	10.9	100
Mar	11.9	10.5	100
Apr	10.1	8.8	100
May	8.0	6.3	100
Jun	6.0	4.9	99
Jul	6.0	3.5	80
Aug	6.1	4.2	90
Sep	6.6	5.1	100
Oct	8.0	6.0	100
Nov	8.4	7.3	100
Dec	9.6	8.3	100
Year	8.5		**97**

Monthly Fecal Coliform Geometric Mean (cfu/100mL) – Baseline Condition – AC1 (10-Year Simulation)

Year	Month												Percent Attainment
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2002	63	25	188	93	46	43	14	25	47	86	**222**	76	92
2003	30	132	199	81	74	**227**	32	56	86	51	169	166	92
2004	44	50	129	143	119	37	92	39	76	29	159	116	100
2005	123	81	107	109	22	33	21	16	11	**270**	95	**290**	83
2006	**291**	64	22	90	68	113	46	41	38	149	**218**	55	83
2007	157	67	152	**264**	27	50	66	52	15	80	145	**340**	83
2008	105	**451**	169	50	110	57	19	54	57	43	100	**312**	83
2009	75	41	53	150	71	**404**	79	31	18	144	39	**587**	83
2010	42	187	**243**	40	29	17	15	18	32	51	53	75	92
2011	150	135	**320**	150	53	36	25	**313**	89	104	83	149	83
% Att.	90	90	80	90	100	80	100	90	100	90	80	60	83

Monthly Fecal Coliform Geometric Mean (cfu/100mL) – 100 Percent CSO Control Condition - AC1 (10-Year Simulation)

Year	Month												Percent Attainment
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2002	63	25	161	78	42	36	13	22	36	68	187	83	100
2003	27	106	161	73	66	147	28	45	70	39	125	122	100
2004	44	40	129	108	112	32	59	35	51	26	123	108	100
2005	118	78	89	87	22	33	19	14	11	157	80	177	100
2006	**221**	53	22	77	52	95	32	34	38	89	164	51	92
2007	113	67	110	163	27	43	43	39	15	62	125	**322**	92
2008	96	**289**	137	46	107	49	17	43	41	37	92	**261**	83
2009	68	41	53	117	64	**320**	70	30	17	113	38	**387**	83
2010	36	146	156	37	25	17	15	17	31	41	51	53	100
2011	119	123	**221**	113	47	29	23	161	60	83	67	108	92
% Att.	90	90	90	100	100	90	100	100	100	100	100	70	94

2008 Rainfall Model-Calculated DO and Measures of Attainment for 100 Percent CSO Control Conditions – Class SB Criterion (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	11.0	7.3	100
Feb	12.0	8.7	100
Mar	11.0	6.4	100
Apr	8.9	5.1	100
May	6.5	3.2	94
Jun	5.1	2.1	56
Jul	6.6	3.1	82
Aug	6.8	3.5	94
Sep	5.6	1.2	72
Oct	8.0	4.4	99
Nov	8.6	4.4	100
Dec	9.7	6.2	100
Year	**8.3**		**91**

2008 Rainfall Model-Calculated DO and Measures of Attainment for 100 Percent CSO Control Conditions – Class SB Criterion (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	11.1	7.5	100
Feb	12.0	8.9	100
Mar	11.1	6.7	100
Apr	9.0	5.2	100
May	6.6	3.4	96
Jun	5.2	2.2	64
Jul	6.7	3.2	85
Aug	7.1	3.6	95
Sep	5.9	1.3	80

Station: AC1			
Month in 2008	**Monthly Average DO (mg/L)**	**Monthly Minimum DO (mg/L)**	**Percent of Time DO>=4.8 mg/L**
Oct	8.1	4.6	99
Nov	8.6	4.6	100
Dec	9.8	6.6	100
Year	**8.4**		**93**

Calculated Baseline Enterococci Concentrations from Various Loading Sources

Source	**Station**	**Enterococci Contribution, cfu/100mL**			
		Geometric Mean		**90th Percentile**	
		Annual	**Max 30-day**	**Annual**	**Max 30-day**
East River	AC1	0	4	3	28
Local Sources	AC1	14	18	21	17
Nassau County Stormwater	AC1	2	4	5	8
NYC Stormwater	AC1	48	254	1,243	4,187
CSO	AC1	8	53	414	1,061
Total	**AC1**	**72**	**332**	**1,685**	**5,302**
East River	OW2	0	6	7	48
Local Sources	OW2	3	4	3	3
Nassau County Stormwater	OW2	2	8	17	26
NYC Stormwater	OW2	12	86	267	654
CSO	OW2	3	25	127	1,142
Total	**OW2**	**20**	**129**	**421**	**1,873**
East River	LN1	0	8	11	69
Local Sources	LN1	1	1	0	0
Nassau County Stormwater	LN1	3	15	37	72
NYC Stormwater	LN1	4	36	89	172
CSO	LN1	1	11	42	270
Total	**LN1**	**9**	**71**	**179**	**583**
East River	E11	3	18	44	172
Local Sources	E11	0	0	0	0

Source	Station	Enterococci Contribution, cfu/100mL			
		Geometric Mean		90th Percentile	
		Annual	Max 30-day	Annual	Max 30-day
Nassau County Stormwater	E11	2	12	22	38
NYC Stormwater	E11	2	9	22	57
CSO	E11	0	3	13	74
Total	**E11**	**7**	**41**	**100**	**339**
East River	DMA	1	9	13	71
Local Sources	DMA	0	1	0	0
Nassau County Stormwater	DMA	3	20	50	88
NYC Stormwater	DMA	3	36	86	170
CSO	DMA	1	12	34	299
Total	**DMA**	**8**	**76**	**183**	**628**

Appendix B: Long Term Control Plan (LTCP) Alley Creek Kickoff Meeting – Summary of Meeting and Public Comments Received

On October 24th, 2012 DEP and the New York State Department of Environmental Conservation (DEC) co-hosted a Public Kickoff Meeting to initiate the water quality planning process for long term control of combined sewer overflows in the Alley Creek and Little Neck Bay Waterbody. The two-hour event, held at the Alley Pond Environmental Center in Queens served to provide overview information about DEP's Long Term Control Plan (LTCP) Program, present information on the Alley Creek 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. Fifteen stakeholders from over 10 different non-profit, community planning, environmental, economic development, governmental organizations and the broader public attended the event.

The Alley Creek LTCP Kickoff Public Meeting was the first opportunity for public participation in a LTCP for the Alley Creek and Little Neck Bay Waterbody. As part of DEP's LTCP Public Participation Plan, Alley Creek's Long Term Control Planning process will be posted on DEP's website, shown above. The public will have more opportunities to provide feedback and participate in the development of Alley Creek's waterbody-specific LTCP. Specific questions asked during the Alley Creek LTCP public kickoff meeting are summarized below with DEP's responses for each.

- What are the CSO related projects in Alley Creek? When will they be built? How much did they cost?
    - *Sewer improvements and a new outfall have already been constructed to help increase sewer system capacity and reduce sewer surcharging and street flooding. This project consisted of installing storm sewers and the construction of a new outfall at a cost of $93 million. In addition, a combined sewer overflow (CSO) retention facility was built to collect about 5 million gallons of combined sewage during rain event. This facility, also referred to as a CSO retention tank, reduces CSOs discharging to Alley Creek by more than 50% or 517 million gallons per year (MGY) down to 256 MGY. The remaining CSO receives partial treatment before being discharged. This facility was built at a cost of $29 million.*

- Which CSO outfalls are connected to the CSO tank? Is TI-024 connected to the tank?
    - *Outfalls TI-008 and TI-025 are connected to the CSO tank. TI-025 receives partially treated overflow from the tank and TI-008 will rarely overflow (under extreme storms) due to the reconfiguration of Chamber 6 weir to divert all flows for a design storm towards the tank. Outfall TI-024 is connected to a pump station relief which rarely overflows.*

- Are the CSO projects that have been built included in the baseline of the model?
    - *Yes, the CSO improvement projects will be part of the baseline in the model.*

- Is DEP using JFK rainfall data only? What years of rainfall numbers is DEP using to model and plan for the long term control of combined sewer overflows in Alley Creek? How is climate change being taken into account?
    - *DEP has been using local rain gauge data (LaGuardia Airport and Douglaston Pump Station) and supplementing with radar rainfall data to support the model calibrations. However, to provide consistency in planning for citywide LTCP projects, DEP is using a specific rainfall record from JFK for baseline and alternatives' analyses scenarios. 2008 data from JFK which includes an annual rainfall of 46.3 inches was chosen based on statistical analyses. Projections for future rainfall and sea level rise conditions will be incorporated into the modeling scenarios as will a longer rainfall record covering the last*

10 years (2002-2011) to assess pathogen compliance for meeting the appropriate water quality standards.

- Does the model take into account wastewater treatment plants that are not controlled by DEP, such as the Great Neck Wastewater Treatment Plant (WWTP) in Nassau County?
  - *Yes, the model accounts for flows and loadings based on discharge monitoring reports for the Belgrave WWTP in Great Neck.*

- How is the water quality data being collected in the Alley Creek and Little Neck Bay Waterbody? Is it automated or manual? Is data being collected from the CSO tank?
  - *DEP's Harbor Survey program collects ambient water quality grab samples at 3 locations in Alley Creek and Little Neck Bay weekly during recreational season (May 1-September 30) and monthly during non-recreational season (October 1-April 30). In addition, NYC DOHMH monitors Douglas Manor Association Beach 5-times in a 30-day period during recreational season for bacteria indicator concentrations. The ambient water quality monitoring data will be supplemented by additional water quality surveys that DEP will conduct in the fall of 2012 during wet and dry weather periods. Overflow data from the tank is being collected as part of the post-construction monitoring program, which will also be used to refine the model for supporting the LTCP project.*

- Does the model simulate tides? Was the sampling activity timed with the tides?
  - *The model does simulate tides. Kings Point is the closest tide station maintained by the National Oceanic and Atmospheric Administration (NOAA). Tidal adjustment factors developed by NOAA are applied to the Kings Point data to develop tidal conditions within AC/LNB waterbody. AC/LNB is part of the larger East River Tributaries Model (ERTM) to be used for the receiving water quality analyses. ERTM covers from Long Island Sound through the lower New York Bay/ Newark Bay areas and simulates the entire tidal variations within this area, calibrated based on NOAA gage data from Sandy Hook (NJ), The Battery and Kings Point. For the additional water quality sampling to be performed by DEP, sampling will take place in morning and afternoon surveys and bottom and top layer samples are collected. This is the protocol for city-wide sampling, being performed in a number of waterbodies over a period of several years.*

- Does the model simulate actual storms?
  - *Yes, the model simulates actual storms for an annual rainfall record. Spatially varied hourly rainfall records are provided as input, but the models have the ability to take 5-minute data if available and needed to meet a project need. Outputs can be generated at 5-minute intervals, although the receiving water quality models typically require hourly average inputs from the watershed models.*

- What is the plume in the satellite images of Alley Creek and Little Neck Bay in the presentation? Could it be smoke?
  - *As this is an image retrieved from publicly available Google maps, which are snapshots taken at different time periods, it is likely that these images had captured cloud cover. Images available from different public-domain sites were reviewed and this cloud cover didn't exist in those images.*

- What is the estimate of total CSO that goes into Little Neck Bay? What is the estimate for the total diluted sewage into Little Neck Bay?

  - *With the tank online, it is projected that 256 MGY of partially treated CSOs would be discharged to Alley Creek before flowing into Little Neck Bay. While the new annual rainfall from 2008 will create more overflows (in comparison to the above estimates developed from 1988 rainfall), DEP anticipates that the tank will perform better than projected and reduce CSOs further. DEP will continue to monitor the post-construction performance of the tank and will update the model with new data and use to generate revised annual overflows into Alley Creek and eventually into the Little Neck Bay.*

- Are there plans for separate sewers in the watershed/waterbody?
  - *DEP will evaluate the potential for separate sewers in the combined sewer area of the watershed and other alternatives as part of the LTCP development process. Stormwater from some portions of the Alley Creek/Little Neck Bay watershed are currently managed using seepage pits and the DEP's capital plan includes installation of new storm sewers in these areas since the seepage pits were originally built as temporary structures to manage Stormwater until new storm sewers were built.*

- Is DEP installing a new outfall on Udall's Cove? Where was storm water going before (at Udall's Cove)? How are storm water outfalls planned in Little Neck Bay and how is this related to the Bluebelt program?
  - *DEP, working with the Department of Parks and Recreation, is installing a new storm sewer outfall and outlet-stilling basin. Previously the stormwater runoff went directly overland into the cove. The project is similar to the DEP Bluebelt program which discharges stormwater into a managed wetland with a forebay before discharging to a receiving waterbody via an outfall structure.*

- When will a date be set for the second public meeting for Alley Creek and Little Neck Bay Long Term Control Plan Public Participation process?
  - *The next public meeting is scheduled for winter 2013. DEP will provide the date of the next meeting to stakeholders and community members well in advance to ensure maximum participation.*

Appendix C: Long Term Control Plan (LTCP) Alley Creek Public Meeting #2 – Summary of Meeting and Public Comments Received

On May 1, 2013, DEP hosted a second Public Meeting to continue the water quality planning process for long term control of combined sewer overflows (CSOs) in Alley Creek and Little Neck Bay. The purpose of the two-hour event, held at the Alley Pond Environmental Center in Queens, was to provide background and an overview of the LTCP planning process, present Alley Creek watershed characteristics and status of existing water quality conditions, obtain public input on waterbody uses in Alley Creek/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 from more than five different non-profit, community planning, environmental, economic development, governmental organizations and the broader public attended the event.

The Alley Creek LTCP Public Meeting #2 was the second opportunity for public participation in the LTCP development process for Alley Creek/Little Neck Bay. As part of DEP's LTCP Public Participation Plan, all Alley Creek/Little Neck Bay LTCP development process documents will be posted on the above website. The public will have additional opportunities to provide feedback and participate in the development of this LTCP. Specific questions asked during the meeting and DEP's responses are summarized below.

- What is the overall goal for water quality in Alley Creek/Little Neck Bay?
    - *The goal of each LTCP is to identify appropriate CSO controls necessary to achieve waterbody-specific water quality standards, consistent with the Federal CSO Policy and water quality goals of the Clean Water Act. Specific water quality goals for all individual LTCPs are subject to public input and evaluation or potential alternatives during the LTCP development process.*

- Will the draft LTCP, to be issued in June 2013, be available for public comment?
    - *Yes, all stakeholders will have the opportunity to review and comment on the draft LTCP. DEP will submit the draft LTCP to DEC on June 30, 2013, at which time DEC will review and determine a date for public release and comment.*

- Regarding the graphs in the presentation, what are the modeled lines colored red and black and is the scale logarithmic?
    - *The red lines are model predictions at the top portion of water quality model segments. Each water quality model cell has ten layers from top to bottom. The black represent bottom depth predictions. Yes, the scale is logarithmic.*

- What are the acceptable levels of enterococci and fecal coliform in Alley Creek/Little Neck Bay?
    - *The fecal coliform monthly geometric mean standard is 200 per 100mL for Class SB (Little Neck Bay) and 2,000 per 100 mL for Class I (Alley Creek). The enterococci standard is 435 per 100 mL for Class SB (Little Neck Bay) and is not listed for Class I waterbodies (Alley Creek).*

- Do the values of enterococci go up to 1,000 per 100 mL? Are the enterococci measured data typically below model predications?
    - *The enterococci values do approach 1,000 per 100 mL. However, data are variable: sometimes model results are higher and sometimes lower. In general, the model results generally follow the trends in the data.*

- Based on the bar graphs of pollutant loadings in the presentation, are the largest loads to Alley Creek/Little Neck Bay from non-CSO sources?

  - *Yes, according to the data, stormwater appears to be the source of large pollutant loadings into Alley Creek and Little Neck Bay.*

- Is the bacteria measured in Little Neck Bay resulting from impacts of unsewered areas of Douglas Manor?
  - *No, based on the data, the water quality impacts from Douglas Manor appear to be localized.*

- Is DEP collaborating with Nassau County on reducing storm water pollution load?
  - *DEP anticipates future collaboration with Nassau County during the Municipal Separate Storm Sewer System (MS4) Citywide Permit development and implementation process.*

- What is grey infrastructure?
  - *Grey infrastructure typically denotes large-scale, centralized end-of-pipe controls such as retention tanks or sewer modifications. Examples include: bending weirs, CSO retention tanks and high level storm sewer separation.*

- What is the difference between detention and retention?
  - *Detained stormwater flows are captured, stored and then slowly released to the sewer system. Retained stormwater flows are captured and either infiltrate into the ground, undergo evapotranspiration, or are recycled onsite, and are not released to the sewer system.*

- In the *NYC Green Infrastructure Plan*, a three percent application rate (on private property) is assumed to occur by 2040. What is the basis of this?
  - *DEP estimates that through redevelopment and required adherence to DEP's revised Standards for Stormwater Release Rates, which requires redevelopment and new development projects to achieve a more stringent stormwater release rate in combined sewer areas, that green infrastructure will be implemented on private property. This percentage was developed based on redevelopment project applications received by the New York City Department of Buildings (DOB) over the last 10 years. In addition, DEP offers grants through the NYC Green Infrastructure Grant Program for private and residential properties in combined sewer areas.*

- Why is there not more green infrastructure planned in Alley Creek/Little Neck Bay?
  - *A 10 percent green infrastructure application alternative is being evaluated for the Alley Creek/Little Neck Bay LTCP, based on DEP's target of 10 percent green infrastructure application rate citywide (that is, 10% of the impervious combined sewer area) in combined sewer areas. A 50 percent green infrastructure application alternative (of the impervious combined sewer area) is also being evaluated.*

- The potential project footprint for the 29.5 million gallon CSO retention tank draft alternative would be large. Can DEP consider non-structural alternatives and green infrastructure solutions instead of grey infrastructure alternatives?
  - *As discussed during the presentation, the goal of each LTCP is to identify appropriate CSO controls necessary to achieve waterbody-specific water quality standards, consistent with the Federal CSO Policy and water quality goals of the Clean Water Act. Therefore, DEP is required to evaluate a myriad of potential alternatives, which will include green infrastructure, during the alternatives analysis component of the LTCP development process. The alternatives analysis is utilized to gauge potential CSO reductions and associated water quality improvements and does not take into account constructability.*

- Regarding the draft alternatives, what is the difference between an “upstream” and “downstream” tank?
    - *An upstream tank would capture flows at the upstream combined sewer area. A downstream tank would capture flows near the combined sewer outfall The downstream tank would need to be larger to achieve the same amount of combined sewer flow reduction since there is more stormwater mixed in.*

- Has the existing five million gallon Alley Creek CSO retention tank resulted in water quality improvements?
    - *Based on initial assessments, the CSO retention tank has contributed to water quality improvements. DEP will continue to assess and quantify water quality improvements.*

- Can the LTCP requirements be modified so that the plan addresses other sources as well as CSOs?
    - *The purpose and scope of all LTCPs, including the Alley Creek/Little Neck Bay LTCP where stormwater is the largest source of watershed pollutants, is to address CSOs in combined sewer areas and not other sources of water quality impairments (e.g., directly discharged stormwater inputs in separately sewered areas). The forthcoming MS4 Citywide Permit will include requirements related to stormwater inputs from separately-sewered drainage areas.*

- The focus of this LTCP should be changed to reducing storm sewer runoff into marsh land and improving habitat, and overall emphasis should be on ecology, rather than recreation.
    - *Each LTCP is a comprehensive evaluation of long term solutions to reduce CSOs and improve water quality in New York City’s waterbodies and waterways and does not focus on reducing storm sewer runoff. Improved or increased recreation is one of the main considerations required for each LTCP. Regarding enhanced ecology, in 2011, DEP completed a $20 million environmental restoration of the northern portion of Alley Pond Park in Bayside, Queens. DEP constructed eight acres of tidal wetlands and eight acres of native coastal grassland and shrubland habitat in an effort to reduce CSOs in Alley Creek and Little Neck Bay. The new plantings and restored wetlands absorb stormwater runoff, reducing the amount that enters and overwhelms the combined sewer system during wet weather events.*

- DEP should consider acquiring property as a means of water quality protection.
    - *In order to control significant amounts of stormwater and to achieve potential water quality improvements equivalent to potential improvements from grey and/or green infrastructure, DEP would need to acquire numerous larger properties, which may be infeasible considering the built-out and highly urbanized nature of New York City. DEP believes that its broad citywide effort to effectively manage stormwater and CSOs using a hybrid grey/green infrastructure approach will lead to improved water quality.*

- DEP should invest in salt marsh restoration. What kind of pollution reduction could be anticipated from salt marshes?
    - *The New York City Department of Parks and Recreation’s (DPR) ongoing and complementary watershed planning and restoration efforts would likely include these evaluations in non-CSO areas contributing to Alley Creek/Little Neck Bay. DEP will be providing support for these efforts even after the submittal of the LTCP on June 30, 2013. Dependent upon the design of the salt marsh, some pollution reduction may be possible.*

- At the end of the public meeting, Mr. Paul Kenline (NYSDEC) read a prepared statement on behalf of NYSDEC. A summary of the statement is included below:

  In March 2012, the State entered into a revised Order on Consent with DEP. This order provides the regulatory and technical framework for New York City to achieve compliance with the Clean Water Act's water quality goals through the development and implementation of CSO Long Term Control Plans. For the next 48 months, the City is required to submit ten waterbody-specific Long Term Control Plans for the State to review, culminating in a Citywide Long Term Control Plan in 2017. The Plans are required to achieve the highest attainable uses of the waters, regardless of their current New York State DEC water quality classification and standards.
  [1]With your input, and in collaboration with the City and EPA, the State will determine what types of water uses will be available to the public by evaluating, selecting and implementing CSO reduction projects or alternatives, including integrating the City's green infrastructure program. This June, DEP is required to submit for review the first of these water quality planning reports, for the Alley Creek/Little Neck Bay waterbodies and the combined sewage drainage areas. The State has had numerous technical discussions and will continue these discussions with the City over issues with the proposed Long Term Control Plan, including evaluating baseline conditions of the sewage treatment system concerning the CSO volume discharged to New York City's waters, verification of baseline conditions, and that DEP has verified the Long Term Control Plan assumption that all sewers are clean and free of significant sediment and/or obstructions by conducting representative physical inspections of larger diameter sewers within the drainage area (Technical Memorandum to DEC regarding Estimation of Sediment Levels for Pipes Represented in the Hydraulic Model of the NYC Sewer System used for LTCP Reporting (DEP, June 21, 2013)). DEC looks forward to reviewing the draft LTCP so that these technical issues may be vetted by the Department's technical staff. The State thanks you again for your interest and participation.

[1] *NOTE: DEP does not agree with NYSDEC's statement that the Long Term Control Plans are required to achieve the highest attainable uses of the waters, though the Plans will assess the waterbody's highest attainable use. The CSO Consent Order includes the following statement of the goal of the LTCP:*

The goal of this LTCP is to identify appropriate CSO controls necessary to achieve waterbody- specific water quality standards, consistent with EPA's 1994 CSO Policy and subsequent guidance. Where existing water quality standards do not meet the Section 101(a)(2) goals of the Clean Water Act, or where the proposed alternative set forth in the LTCP will not achieve existing water quality standards or the Section 101(a)(2) goals, the LTCP will include a Use Attainability Analysis examining whether applicable waterbody classifications, criteria, or standards should be adjusted by the State. The Use Attainability Analysis will assess the waterbody's highest attainable use, which the State will consider in adjusting water quality standards, classifications, or criteria and developing waterbody-specific criteria.

Appendix D: Summary of Public Comments Received via Email and DEP Responses

- March 29, 2013: Thanks for keeping us all in the loop on the LTCP. That was an eye-opening meeting for me. I, and some of those with whom I spoke, left the meeting wondering if there are other DEP forums in which more feedback is solicited on the direction that the LTCP is taking. For example, I've been told that what largely got people recycling is that it was promoted in schools. When kids came home talking about it, adults started taking more interest. Along those lines, it occurred to me that the City has a captive audience of over a million public school kids. Why don't they all know about how the City functions as infrastructure? Why don't they all know to not do dishes, laundry etc. during rain events? Is there a process in the development of the LTCP for public input like this?

    - *Thanks for writing in. We completely agree. We do have an Education component at DEP to help introduce kids to their City's infrastructure; however this is mostly geared towards the Water Supply system and the watershed. While we would certainly like to do much more, we are also constrained by our resources. However, your suggestion is a good one and we have been exploring ways to tap into the school network to get the word out about what everyone can be doing to improve our City's water and sewer infrastructure.*

- April 17, 2013: I am unable to find the LTCP for Jamaica Bay, Paerdegat Basin that was apparently approved in February 2007. Is that document available? Also, does the Coney Island Water Pollution Control Plant have a Wet Weather Operating Plan?

    - *Thank you for your questions. The Waterbody Watershed Facility Plans (WWFP) for Jamaica Bay and Paerdegat Basin, one of Jamaica Bay's tributaries, was completed in October 2011 and can be found here:*
      http://www.hydroqual.com/projects/ltcp/wbws/jamaica_bay.htm.
    - *WWFPs were the precursor to Long Term Control Plans (LTCPs). The Jamaica Bay and Tributaries LTCP will be completed in June 2016. Please refer to our LTCP Program Website for additional information:*
      http://www.nyc.gov/html/dep/html/cso_long_term_control_plan/index.shtml. The Coney Island Wastewater Treatment Plant (WWTP) does have a wet weather operating plan.

Appendix E: Alley Creek Use Attainability Analysis

EXECUTIVE SUMMARY

The New York City Department of Environmental Protection (DEP) has performed a Use Attainability Analysis (UAA) in accordance with the 2012 CSO Order on Consent for Alley Creek, a Class I waterbody. Detailed analyses conducted during development of the Alley Creek and Little Neck Bay Long Term Control Plan (LTCP) concluded that Little Neck Bay will meet its designated recreational uses for a high percentage of the time, 100 percent for fecal coliform and near 100 percent for enterococci criteria during the recreational season (May 1st through October 31st). Alley Creek, however, was found to be unable to attain Primary Contact Water Quality (WQ) Criteria 100 percent of the time. The inability to meet a primary contact standard is primarily due to direct drainage, CSO and stormwater outfalls, although there are also some local background dry weather sources of pollution in the upper Alley Creek watershed including those created by waterfowl populations and natural wildlife. Based upon modeling, DEP projects that with completion of the projects detailed in this LTCP, there will be some marginal improvement in water quality in Alley Creek. On the basis of these findings, DEP is requesting, through the UAA process, that the New York State Department of Environmental Conservation (DEC) retain the Class SB primary contact recreation classification for Little Neck Bay and consider site-specific targets for Alley Creek.

INTRODUCTION

Regulatory Considerations

DEC has designated Alley Creek as a Class I waterbody with a best use of secondary contact recreation. The Class I classification does not provide for primary contact.

Federal policy recognizes that the uses designated for a waterbody may not be attainable and the UAA has been established as the mechanism to modify the WQS in such a case. This UAA identifies the attainable and existing uses of Alley Creek and compares them to those designated by DEC, in order to provide data to establish appropriate WQS for these waterways. Several factors related to the physical condition of these waterbodies and the actual and possible uses suggest that these uses may not be attainable. Under federal regulations (40 CFR 131.10), six factors may be considered in conducting a UAA:

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

6. Controls more stringent than those required by sections 301(b) and 306 of the Act [CWA] would result in substantial and widespread economic and social impact.

Identification of Existing Uses

The Alley Creek watershed is primarily residential with some commercial, industrial, and open space/outdoor recreation areas. The immediate shorelines of Alley Creek are wholly contained within Alley Pond Park, and tidal wetlands extend from the open water portion of Alley Creek to its banks in most areas.

Much of Alley Creek's wetlands are designated parks because of significant effort and interest on the part of citizens living in the area and in recognition of the ecological, environmental, and educational value of Alley Creek and its tidal wetlands. The natural features of the waterbody limits its use for primary contact. There are no kayak launching locations or swimmable/wading beach areas in this watershed. The marshland nature of the waterbody (Figure 1), its comparatively small incised channel that can be seen in the middle during low tides, and the substrate unsuitable for wading or bathing (Figure 2), make the waterbody unsuitable for primary contact uses.

Figure 1. NYSDEC Wetlands Inventory (2009, WWFP)

Figure 2. Looking North at Little Neck Bridge on Northern Boulevard

Certain areas of Alley Creek are used for secondary contact use and fishing. Local residents are known to fish in the area near the LIRR Bridge at the mouth of Alley Creek via small water craft, and from the Little Neck Bridge on Northern Boulevard. An increasingly popular use of Alley Pond Park is camping, wildlife observation and hiking (Figure 3).

Figure 3. Urban Park Rangers Day Camp Program

There are potential naturally occurring sources of pathogens to Alley Creek. A significant number of waterfowl reside in Alley Pond Park and are regularly visible on the waters of Alley Creek, Oakland Lake and other tributary ponds, as shown in Figure 4. The evidence gathered at this time suggests that this population is contributing pathogen loads to Alley Creek.

Figure 4. Waterfowl Population at LIE Tributary Pond

ATTAINMENT OF DESIGNATED USES

Alley Creek is a Class I waterbody, suitable for secondary contact recreation and aquatic life propagation and survival. As noted previously, Alley Creek is used infrequently for contact recreation of any kind, and no evidence of primary contact recreation could be identified. However, as part of the LTCP, an analysis was performed to assess the level of attainment if DEC were to reclassify Alley Creek to Class SC (limited primary contact recreation).

Water quality modeling indicates that the existing Class I WQS (fecal coliform bacteria) would be achieved with the recommended LTCP projects. Attainment of primary contact criteria (existing and potential future), within Alley Creek, is not anticipated due to multiple pollutant sources other than CSO. A component analysis of pathogen concentrations in Alley Creek showed that non-attainment of the geometric mean during the worst 30-day period occurred throughout, and was a consequence of multiple sources of pathogen loads including direct drainage runoff, stormwater and local background dry weather sources of pollution. Sensitivity analyses performed with removing individual sources indicated that the recommended recreational season disinfection of CSO, would result in 94% annual attainment of the existing Class SC criteria (based on fecal coliform) but could increase up to 98% if such Class SC criteria is applied during the recreational season only.

An analysis was also conducted during the development of the LTCP using 10 years of water quality model projections from 2001 through 2011 to predict the time to recover in Alley Creek following a rain event. Although primary contact uses cannot be attained in Alley Creek, DEP used the primary contact fecal coliform recreation criterion of 1,000 counts/100 ml from the NYS DOH guidelines and 130 counts/100 ml from the 2012 Recreational Water Quality Criteria (RWQC) recommendations in this analysis. The result of the analysis is summarized in Table 1 for Alley Creek. As noted, the duration of time within which pathogen concentrations are expected to be higher than NYS DOH considers safe for primary contact varies based on rainfall event size. Generally, a value of around 24 hours appears to be reasonable.

Table 1. Time to Recover (hrs) to Fecal Coliform of 1,000/100mL and Enterococci of 130/100mL

	AC1	
Interval Storm (in)	**Fecal hrs**	**Entero hrs**
<0.1	-	-
0.1-0.4	5	10
0.4-0.8	8	21
0.8-1.0	12	26
1.0-1.5	12	31
>1.5	14	31

DEP has been using model projections in various waterbodies and near beaches to assist with advisories that are typically issued twice a day. The recovery time is essentially the timeline that the waterbody will not support primary contact and is intended to advise the water users of the potential health risk associated with this use during this time period.

CONCLUSIONS

The majority of Little Neck Bay attains primary recreation contact water quality criteria over 99 percent of the time. However, Alley Creek is not predicted to attain the Primary Contact WQ Criteria of SC (based on fecal coliform) on an annual basis. In this area, only limited access to the waterbody is possible due to extensive tidal wetlands along the shoreline. As a result, it is used by a very small population for secondary contact uses. Non-attainment is attributable to one or more of the following UAA factors:

- Naturally occurring pollutant concentrations prevent the attainment of the use vicinity [See UAA factor #1 (40 CFR 131.10(g)(2)]
- Naturally-occurring (tidal) low water levels in the receiving water in this vicinity (See UAA factor #2 (40 CFR 131.10(g)(2))
- Human caused conditions (direct drainage and urban runoff) create high bacteria levels that prevent the attainment of the use and that cannot be fully remedied for large storms [See factor #3 (40 CFR 131.10(g)3)].

RECOMMENDATIONS

The majority of Little Neck Bay attains the fishable and swimmable goals of the CWA over 99 percent of the time. Even with the implementation of the proposed plan to disinfect Alley Creek CSO Retention Facility overflows, which DEP projects will result in incremental improvements to water quality, Alley Creek will be unable to attain the primary contact Class SC standards on an annual basis. As such, site-specific targets may be considered for Alley Creek on a temporal basis for recreational and non-recreational season, as described below. In addition, an advisory period is recommended for Alley Creek for a period of 24 hours after the end of a rainfall event that results in an overflow to the creek.

As DEP is committed to improving water quality during the Alley Creek recreation season, DEP is committing to implement disinfection of the overflow from the Alley Creek CSO Retention Facility. DEP has identified below site-specific targets for Alley Creek that will allow DEP to continue to improve water quality over time. Site-specific targets are identified for consideration to advance towards the numerical limits established, or under consideration by DEC, including SC pathogen standards and Future Primary Contact WQ Criteria consistent with the 2012 EPA RWQC. DEP notes that these site-specific targets are based on projections and may require adjustment based upon post-construction monitoring results. These site-specific targets are shown below.

Recreational Season (May 1st – October 31st):

- 30-day recreational season GM enterococci value of 130 cfu /100mL and Monthly recreational season fecal coliform GM concentration of 200 cfu/100mL

Non-recreational Season (November 1st – April 30th):

- Monthly fecal coliform GM concentration of 500 cfu /100mL

Appendix F: SPDES Variance

By submitting this variance application, the New York City Department of Environmental Protection (DEP) is not waiving its right to seek other regulatory options for addressing applicable water quality standards, including a request for water quality standards revisions based upon a Use Attainability Analysis.

APPLICATION FOR VARIANCE

TO WATER QUALITY BASED EFFLUENT LIMITATION

Tallman Island Water Pollution Control Plant

SPDES Permit No NY-0026239

Outfall TI-025

The New York City Department of Environmental Protection (NYCDEP) seeks a variance from the anticipated Water Quality Based Effluent Limitation ("WQBEL") for the Alley Creek CSO Facility permitted under the Tallman Island SPDES Permit as Outfall TI-025. This variance application is based on information set forth in the *Alley Creek Long-Term CSO Control Plan Report* (the "Report") submitted June 2013 as updated November 2013.

This variance request is based on the anticipation of occasional exceedances of the water quality standards for: (a) Suspended, colloidal and settleable solids; (b) Oil and floating substances; and (c) Dissolved oxygen (DO). Modeling and engineering estimations indicate that complete elimination of periodic excursions from those water quality standards would require a water quality-based effluent limitation (WQBEL) of 100% CSO capture. Accordingly, for the reasons set forth below, we hereby request a variance from the presumed WQBEL of 100% CSO capture.

Specifically, DEP requests that the permit will specify "operational conditions" based limits for the Facility as an "alternative effluent control strategy" defined under Section 302(a) of the Clean Water Act. Based on NYSDEC's April 12, 2006 letter regarding the Paerdegat Basin CSO facility, DEP understands that the enforceable conditions for the operation of the Alley Creek Facility would be based on its design specifications, its Wet Weather Operating Plan (WWOP), and the 14 BMPs for CSOs for the duration of the variance. This approach is consistent with NYSDEC's stated belief that numerical effluent limits are not appropriate for CSO-based discharges such as those that will occasionally occur from the Alley Creek CSO Retention Facility due to episodic heavy or intense rainfall events.

Alley Creek CSO Retention Facility

The Alley Creek CSO Retention Facility provides 5 million gallons of in-line storage of combined sewage. The facility was completed in June 2011 and was certified as being operational as of March 11, 2011. The facility has been in continuous operation since that time and remains so presently. The anticipated performance of the facility under typical annual conditions was a 54 percent CSO volume reduction, a 70 percent TSS loading reduction, and a 66 percent reduction in BOD discharged to Alley Creek. The resulting water quality benefits are expected to meet the WQS for pathogens in both Alley Creek and Little Neck Bay, and the dissolved oxygen standard at least 96 percent of the time during a typical rainfall year.

Because of its flow-through configuration, CSO discharges through the facility receive solids and floatables removal. However, the New York State standard for Suspended, Colloidal and Settleable Solids is “None from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages.” Similarly, for Oil and Floating Substances the limit is “No residue attributable to sewage, industrial wastes or other wastes, nor visible oil film nor globules of grease” (6 NYCRR Part 702.17). There is therefore a practical limitation to the facility being able to attain these WQBELs. Further, minimum DO requirements in Alley Creek (4.0 mg/L) and Little Neck Bay (4.8 mg/L) cannot be attained even with 100% CSO removal.

Environmental Benefits

The Alley Creek CSO Retention Facility significantly improves the water quality and environmental conditions in Alley Creek and Little Neck Bay, as demonstrated in the Alley Creek LTCP. Bacteriological conditions will improve to a level whereby the existing Class Icriteria for total coliform and fecal coliform should be fully achieved. Dissolved oxygen (DO) will also significantly improve, and is expected to be attained at least 96% of the time. Odors will be substantially eliminated by the high level capture of settleable material, and the benthic habitat and diversity of aquatic life in Alley Creek is expected to improve accordingly.

Regulatory Assessment

As described in the Alley Creek LTCP, complete attainment of numerical and narrative water quality criteria applicable to Alley Creek and Little Neck Bay would not be achieved even with 100% capture of CSO discharges, which would require an additional 29.5 million gallon storage facility with an estimated cost of $569 million. The Alley Creek CSO facility was selected based on the "knee-of-the-curve” analysis consistent with USEPA's CSO Control Policy.

USEPA guidance as contained in *Coordinating CSO Long-Term Planning with WQS Reviews* provides for regulatory reviews and revision, as appropriate, of water quality standards when considering CSO control plans to reflect the site-specific wet weather impact of CSOs and to reconcile designated uses with what is attainable cost-effectively. However, NYSDEC has stated that it prefers that DEP apply for a variance to the presumed WQBELs rather than seek water quality standards revisions.

Application for Variance to WQBELs

As noted, the requirements for variances to effluent limitations are based on standards and guidance values and contained in 6 NYCRR Part 702.17. Complete elimination of periodic excursions from the following water quality standards applicable to Alley Creek and Little Neck Bay would require a WQBEL of 100% CSO capture.

Water Quality Standards for Class I Waters*

Parameter	Standard
Suspended, colloidal and settleable solids	None from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best
Oil and floating debris	No residue attributable to sewage, industrial wastes or other wastes, nor visible oil film nor globules of grease.
Dissolved Oxygen	Not less than 4.0 mg/L at any time (Alley Creek)

*Compiled from 6 NYCRR Part 703.

In order to meet the above-referenced standards, DEP would be required to attain 100% CSO capture, As this level of CSO capture is neither cost-effective nor consistent with CSO Control Policy specifications, we request a variance to the presumed WQBEL of 100% CSO capture.

The following narrative presents the information or the source of information to support this application under 6 NYCRR Part 702.17. Responses are provided to those subsections of Section 702.17 which are applicable to DEP and to the Alley Creek CSO Facility.

Sec. 702.17(a) [DEC] may grant, to a SPDES permittee, a variance to a water quality-based effluent limitation included in a SPDES permit.

As the SPDES permittee, DEP seeks a variance to the presumed water quality based effluent limitation of 100% CSO retention for the Alley Creek CSO Retention Facility. The variance should be incorporated into the Tallman Island WPCP SPDES Permit, NY-0026239.

Sec. 702.17(a)(1) A variance applies only to the permittee identified in such variance and only to the pollutant specified in the variance, A variance does not affect or require the department to modify a corresponding standard or guidance value.

The variance is requested for the following effluent constituents in the periodic overflows from the Alley Creek CSO Retention Facility.

- Suspended, colloidal and settleable solids;
- Oil and floating substances;
- BOD and other oxygen demanding substances (for DO).

It is understood that this variance is only applicable to the Tallman Island WPCP SPDES permit governing the Alley Creek Facility and would not modify any water quality standard or guidance value.

Sec. 702.17(a)(3) A variance shall not be granted that would likely jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of such species critical habitat.

The LTCP notes that the Northern Harrier (Circus cyaneus) is a threatened species known to over-winter in Alley Pond Park. Northern Harriers feed on small animals such as mice and voles, for which they hunt by flying low over fields and marshes. They eat their prey on the ground, they perch on low posts or trees, and their nests are concealed on the ground in grasses or wetland vegetation.

Because this bird species does not feed on aquatic life and does not use water for habitat, the variance would not jeopardize its continued existence or result in the destruction or adverse modification of its critical habitat.

Sec. 702.17(a)(4)) A variance shall not be granted if standards or guidance values will be attained by implementing effluent limits required under section 750-1.11(a) of this Title and by the permittee implementing cost-effective and reasonable best management practices for nonpoint source control.

The requirements applicable to CSO outfalls and CSO retention facilities are set forth in NYSDEC's Technical and Operational Guidance (TOGS) 1.6.3, which requires that all technology based effluent limits for CSOs must be developed using Best Professional Judgment (BPJ). BPJ has been used to develop the Alley Creek LTCP and some excursions from water quality standards are expected after implementation. Best management practices applied for nonpoint source control will also not achieve attainment.

Sec. 702.17(a)(5) A variance term shall not exceed the term of the SPDES permit. Where the term of the variance is the same as the permit, the variance shall stay in effect until the permit is reissued, modified or revoked.

DEP acknowledges that the variance will not exceed the term of the Tallman Island WPCP SPDES permit; however, in the absence of a UAA, it is likely that the variance will need to be renewed. As appropriate, DEP may timely file an application for such renewal.

Sec. 702.17(b)(1), (2), (3) (4) and (5) A variance may be granted if the requestor demonstrates that achieving the effluent limitation is not feasible because:

(1) Naturally occurring pollutant concentrations prevent attainment of the standard or guidance value,

(2) Natural, ephemeral, intermittent or low flow conditions or water levels prevent attainment, unless these conditions may be compensated for by the discharge of sufficient volume of effluent to enable the standard or guidance value to be met without violating water conservation requirements,

(3) Human-caused conditions or sources of pollution prevent attainment of the standard or guidance value and cannot be remedied or would cause more environmental damage to correct them to leave in place,

(4) Dams, diversions or other types of hydrologic modifications preclude attainment of the standard or guidance value, 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 such attainment,

(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 chemical water quality, preclude attainment of the standard or guidance value; or

(6) Controls more stringent than those required by Section 750-1.11(a) would result in substantial and widespread economic and social impact.

This subsection requires the applicant to demonstrate that achieving the WQBEL is not feasible due to a number of site-specific factors. These factors established by New York State Environmental Conservation Law are the same as those in 40 CFR 131.10(g) which indicate Federal requirements for a Use Attainability Analysis (UAA). In the framework DEP and DEC have agreed to for UAAs, at least one of these six criteria must be met, and it is expected that this agreement would also be applicable to a SPDES Variance request. Because 100% CSO removal does not enable attainment, factor #3 at a minimum would provide justification (human caused conditions).

Sec. 702.17(c) In addition to the requirements of subdivision (b) of this section, the requestor shall also characterize, using adequate and sufficient data and principles, any increased risk to human health and the environment associated with granting the variance compared with attainment of the standard or guidance value absent the variance, and demonstrate to the satisfaction of the department that the risk will not adversely affect the public health, safety and welfare.

This subsection requires the applicant to demonstrate to NYSDEC any increased risk to human health associated with granting of the variance compared with attainment of the water quality standards absent the granting of the variance. As noted above under Sec. 702.17(a)(1), this variance application is for suspended, colloidal and settleable solids, and oil and floating substances in the periodic overflows from the Alley Creek CSO Retention Facility. These substances pose no significant risk to human health. In addition, pathogen criteria are expected to be fully attained and therefore no variance is requested for these parameters. Very limited risk to the environment is expected absent attainment of the standard.

Sec. 702.17(d), The requestor shall submit a written application for a variance to the department. The application shall include:

(I) All relevant information demonstrating that achieving the effluent limitation is not feasible based on subdivision (b) of this section; and

(2) All relevant information demonstrating compliance with the conditions in subdivision (c) of this section.

This application and the Alley Creek LTCP satisfy the requirements of this subsection.

Appendix G: Disinfection Approach for Alley Creek CSO Retention Facility

1.0 INTRODUCTION

This document summarizes DEP's proposed disinfection approach for Alley Creek and, in particular, provides details with respect to a proposed interim disinfection facility ("Interim Facility"). The implementation of the Interim Facility would (i) advance the timeline for disinfecting the Alley Creek CSO Retention Facility overflows and (ii) enable DEP to obtain operational performance data on the disinfection of the variable flows and loads associated with CSOs to inform the development of a Standard Design Facility.

DEP's operational strategy for both the Interim Facility and the Standard Design Facility is to reduce human source bacteria to the maximum extent feasible while limiting the TRC level in the discharge to the receiving water to limit toxicity impacts to the receiving water. DEC has informed DEP that TRC impacts would be minimal because the CSO discharges from the Alley Creek retention tank containing residual chlorine would be short-termed and intermittent. DEC has further stated that any excursions of the standards could be handled through a wavier or variance. For both facilities, disinfection will be practiced during the recreational season, defined by DEC as May 1st to October 31.

1.1 Standard Design Facility

A conceptual design and layout for a Standard Design disinfection system for the Alley Creek CSO Retention Facility is presented in this LTCP based on experience and evaluations of similar CSO disinfection facilities in New York State and elsewhere across the country. The basic design involves retrofitting the existing CSO tank with a chlorination and dechlorination system using a two chemical system of sodium hypochlorite for chlorination and sodium bisulfite for dechlorination, if necessary. The Standard Design Facility described in Section 8 of this LTCP will be delivered through a design-bid-build approach, the standard method of procuring and constructing DEP capital facilities. To allow for the required steps in the design-bid-build approach, a schedule of approximately nine years will be necessary to fully implement the facilities described in the LTCP. These steps will proceed on a parallel path with the design and construction of the Interim Facility.

The nine year schedule is necessary to provide sufficient time to: obtain funding for initiating design, procure a design consultant, coordinate with other agencies (i.e. DOT and DPR, as well as possibly seek alienation legislation), undertake site acquisition, conduct environmental review, obtain necessary permit, complete design, bid the project and construct the required facilities.

1.2 Interim Facility

As was recently discussed with DEC, DEP will progress with an Interim Facility to advance the schedule for initiating disinfection of overflows from the Alley Creek CSO Retention Facility. This Interim Facility will also provide an opportunity to collect performance data and can be used to inform the design of the Standard Design Facility.

The Interim Facility is envisioned to be temporary in nature and assumed not to require permanent buildings, or major capital construction, however, it is possible that it could involve alienation of parkland. The Interim Facility would most likely be skid or trailer mounted with climate control and ventilation systems to protect the chemicals, pumps and instrumentation. Utility hookups for water and electricity service to the trailers are also assumed. A roadway for chemical delivery and access to the Interim Facility is needed and would be part of the construction work. DEP is considering both solid (calcium hypochlorite) and liquid (sodium hypochlorite) forms of disinfection. Further investigations of a solid vs liquid system are needed as the solid systems tend to be for smaller applications and the applicability will depend on the design criteria that will be established during the detailed design of the Standard Design Facility. Typically, these small systems can have difficulty providing sufficient dose at very high peak flow rates, which can reach 350 MGD.

The Interim Facility may need to be custom designed and constructed, as DEP is not aware of any sufficiently sized Interim Facility that is readily available from a vendor or manufacturer. The Interim Facility is expected to be procured and constructed through a DEP Job Order Contractor (JOC) to further expedite the implementation schedule

1.2.a Interim Facility Siting

One challenge with implementing the Interim Facility is siting the necessary temporary facilities. Based on a search of NYC property records it was determined that DEP does not own available adequate siting to meet the needs of establishing the Interim System. After a review of the surrounding area, two potential sites along the influent sewer route have been preliminarily identified and are shown on Figure 1 as "Site 1" and "Site 2". Site 1 located north of Northern Boulevard is owned by the NYC Department of Parks and Site 2, the land south of Northern Boulevard is believed to be controlled by the NYC Department of Transportation. Site 2 is located within the cloverleaf interchange for the Cross Island Parkway and Northern Blvd. Negotiating an agreement and/or an MOU with landowners would be required to temporarily site the facilities.

Figure 1. Alley Creek CSO Facility

1.2.b Interim Facility Operations

The Interim Facility operation would be triggered by combined sewer flows entering the Alley Creek CSO Retention Facility. Therefore, all flows entering the tank would be targeted for disinfection resulting in dosing of events that do not create an overflow. The CSO volume that is fully captured by tank and chlorinated will be pumped back to the Tallman Island WWTP, in accordance with the wet weather operating plan. The disinfected tank flow is not expected to have any impact on plant performance as any residual chlorine in the CSO pump back flow will be consumed as the pump back flow is introduced into the collection system.

A preliminary evaluation was conducted to determine the 10-minute peak flows to the Alley Creek CSO Retention Facility during the recreational season for the 2008 average rainfall year. The analysis was performed with the InfoWorks landside model and presented below in Figure 2 to ascertain the range of flows that should be expected when an Interim Facility is in service. For the average year (2008) the peak 10-minute flow was determined to be 352 MGD, with the influent flow below 240 MGD 99.9% of the time and below 101 MGD 99.0% of the time. Due to the highly variable flow, the design will need to consider sizing of metering pumps and chemical storage to effectively cover the wide range of influent flows. The design will need to consider a longer term rainfall record as peak flows will likely be higher than those in the average year and well as the targeted flow to disinfect (i.e. 99% , 99.9%).

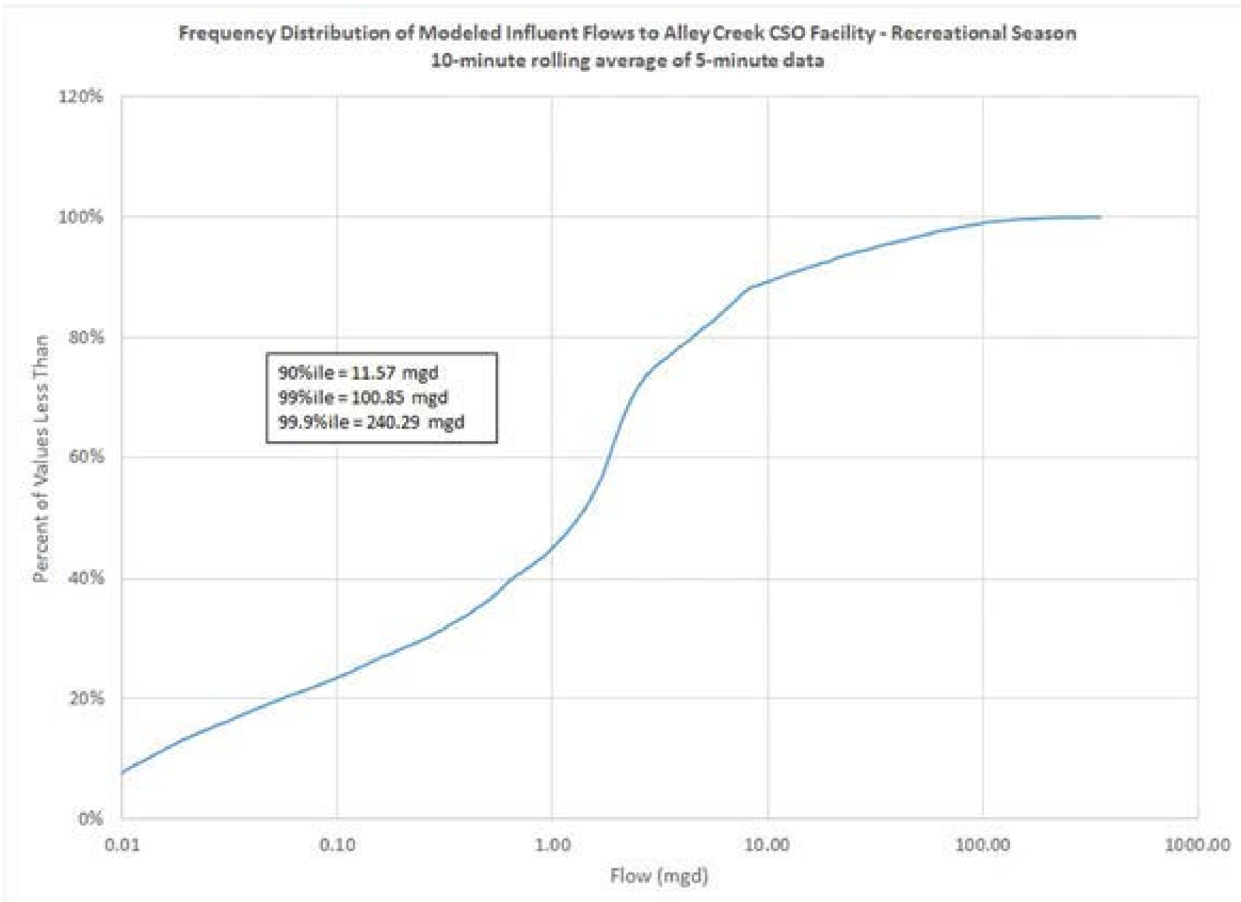

Figure 2. Frequency Distribution of Modeled Influent Flow to Alley Creek CSO Retention Facility – Recreational Season

1.3 Schedule for Interim Facility

The schedule for start-up of the Interim Facility is dependent upon negotiating an agreement with the property owners for the siting of the Interim Facility. DEP will work toward initiating seasonal disinfection by May 2019 as previously agreed to with DEC, contingent upon successfully obtaining a site. The design of the Interim Facility will be advanced in parallel with discussion with the property owners. Once a siting agreement is reached, DEP will initiate the procurement of the trailer mounter/skid mounted unit and should be able to initiate disinfection earlier than the May 2019 date.