City-Wide Long Term CSO Control Planning Project

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan Report

The City of New York
Department of Environmental Protection
Bureau of Engineering Design and Construction

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Executive Summary

The New York City Department of Environmental Protection (NYCDEP) has prepared this Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan Report as required by the Administrative Order on Consent between the NYCDEP and the New York State Department of Environmental Conservation (NYSDEC). Known as NYSDEC Case #CO2-20000107-8 and also known as the Combined Sewer Overflow (CSO) Consent Order, the Administrative Consent Order required the NYCDEP to submit an "approvable Waterbody/Watershed Facility Plan" for Alley Creek and Little Neck Bay to the NYSDEC by June 2007. NYCDEP submitted a Waterbody/Watershed Facility Plan for Alley Creek and Little Neck Bay to NYSDEC on November 3, 2006. NYSDEC comments, provided to NYCDEP on June 17, 2007, were incorporated into the Plan submitted on September 28, 2007. Public comments were received through June 2008 and additional comments were received from NYSDEC on July 30, 2008. The submission date is November 30, 2008 for the revised WB/WS Facility Plan report.

Alley Creek and Little Neck Bay comprise one of 18 waterbodies defined by the CSO Consent Order that encompasses the entirety of the waters of the City of New York. The CSO Consent Order also requires that, by 2017, the NYCDEP complete a final, City-wide CSO Long-Term Control Plan (LTCP) incorporating the plans for all watersheds within the City of New York.

Purpose

The purpose of this Waterbody/Watershed (WB/WS) Facility Plan is to take the first step toward development of a Long-Term Control Plan for this waterbody. This Plan assesses the ability of the existing New York City CSO Facility Plan for Alley Creek and Little Neck Bay to provide compliance with the existing water quality standards. Where these facilities will not result in full attainment of the existing standards, additional alternatives are evaluated.

Context

This report represents the Waterbody/Watershed Facility Plan for Alley Creek and Little Neck Bay. This is one element of the City's extensive multiphase approach to CSO control that was started in the early 1970s. As described in more detail in Section 5, New York City has been investing in CSO control for decades. Elements already part of the City's CSO program and listed in the 2005 CSO Consent Order amount to over $2.1 billion of infrastructure investment. This does not include millions spent annually on control of CSOs through the Nine Minimum Controls (NMC) that have been in place since 1994, currently embodied in the 14 CSO Best Management Practices (BMP) included in the SPDES permits for the City's WPCPs.

Regulatory Setting

This Waterbody/Watershed Facility Plan has been developed in fulfillment of the 2005 CSO Consent Order requirements. This Plan addresses one of 18 waterbodies for which Waterbody/Watershed Facility Plans are being developed prior to development of a final Long-Term CSO Control Plan for the City. These Waterbody/Watershed Facility Plans contain all the elements required by the USEPA of a Long Term CSO Control Plan.

Goal of Plan

The goal of this Waterbody/Watershed Facility Plan is to attain current water quality standards in Alley Creek and Little Neck Bay by reducing CSO discharges to Alley Creek and Little Neck Bay so that they do not contribute to contraventions of the water quality standards. This Plan assesses the effectiveness of CSO controls, now in place within New York City or required by the Consent Order to be put in place, to attain water quality that complies with the NYSDEC water quality standards. This Waterbody/Watershed Facility Plan also assesses additional cost-effective CSO control alternatives or other strategies (such as water quality standards revisions) that can be employed to provide attainment with the water quality standards.

Adaptive Management Approach

Post-construction compliance monitoring (including modeling), discussed in detail in Section 8, is an integral part of this Plan, and provides the basis for adaptive management for Alley Creek and Little Neck Bay. Post-construction compliance monitoring will commence prior to implementation of CSO controls and will continue for several years in order to quantify the difference between the expected performance (as described in this Report) and the actual performance once those controls are fully implemented. Any performance gap identified by the monitoring program can then be addressed through operations adjustments, retrofitting additional controls, or initiating a Use Attainability Analysis (UAA) if it becomes clear that CSO control will not result in full attainment of applicable standards.

In addition, protocols established by NYCDEP and the City of New York for capital expenditures require certain evaluations to be completed prior to the construction of the CSO controls recommended in this Plan. Depending on the technology implemented and on the engineer's cost estimate for the project, these evaluations may include pilot testing, detailed facility planning, preliminary design, and value engineering. Each of these steps provides additional opportunities for refinement and adaptation so that the fully implemented LTCP program may achieve the goals of fishable/swimmable water quality as stipulated in the Clean Water Act.

CSO Facility Planning, Alley Creek and Little Neck Bay

The Waterbody/Watershed Facility Plan for Alley Creek and Little Neck Bay has been developed in accordance with the LTCP requirements. NYCDEP CSO Control Facility Planning for these waterbodies, however, was begun in 1984 predating the current LTCP program. The Alley Creek CSO Facility Plan was approved by NYSDEC in 2003 and became part of the CSO Consent Order in 2005. The principal facility of the 2003 Alley Creek CSO Facility Plan is a 5 MG CSO Retention Tank and its new CSO outfall TI-025 to Alley Creek. The Alley Creek CSO Facility Plan is the final product of an extensive planning and public participation process that parallels the current federal requirements for Long-Term Control Planning. At the time of LTCP commencement, the Alley Creek CSO Tank was well into design with several elements of the overall CSO Facility Plan and drainage relief projects under construction. The NYCDEP is obligated to build the Alley Creek Tank under the 2005 Consent Order.

The Alternatives Analysis performed for Alley Creek and Little Neck Bay, necessarily, therefore, included the Alley Creek Tank, now in construction. The CSO control alternatives developed and evaluated started with the Tank as the basic element. In accordance with USEPA policy, the alternatives were developed and evaluated on the basis of resulting water quality improvement beyond that resulting from the CSO Facility Plan Tank. Alternatives were evaluated to assess the USEPA recommended benchmarks such as 70, 80, and 90 percent CSO volume reduction, and 10-12, 4-6, and 0 annual event targets for untreated overflows. In addition, the presence of a bathing beach, Douglas Manor Association (DMA) Beach, on Little Neck Bay requires special consideration as a "sensitive area" according to the federal CSO policy.

Alley Creek and Little Neck Bay Watershed Development

During the mid-1800s there was a thriving commercial shellfishery in Little Neck Bay, which was particularly known for the harvest of small hard shell clams that became known as Little Neck clams. However, the developing suburban population in the adjacent watershed placed pollution pressures on the resource, and the condemnation of the shellfish beds due to pollution took place in 1909. Development of the area as a commuter suburb of New York City had significant physical impacts on the waterbody, particularly in terms of biological habitat. The Cross Island Parkway, built in the late 1930s along the western shoreline of the Bay, radically transformed the previous natural shoreline habitat. Similarly, the Long Island Railroad, the Northern Boulevard and the Long Island Expressway running along the east-west corridor disrupted wetland areas along either side of Alley Creek at the southern end of Little Neck Bay.

However, since the 1960s there has been particular interest by local environmental groups and by various city, state and federal agencies to restore some of the natural wetland areas that were degraded by previous development. Two locations where significant restoration success has occurred and is continuing are Aurora Pond on the Gabler's Creek tributary to Udalls Cove, on the east side of Little Neck Bay (see Plate ES-1); and Alley Pond, a wetland that has been restored as part of Alley Pond Park, in the headwaters of Alley Creek at the southern end of the bay.

Water Quality Issues

NYSDEC has classified Alley Creek as Class I and Little Neck Bay as Class SB. NYSDEC considers the SA and SB classifications to fulfill the Clean Water Act goals of fully supporting aquatic life and recreation. Class SC supports aquatic life and recreation but the recreational use of the waterbody is limited due to other factors. Class I supports the Clean Water Act goal of aquatic life protection and supports secondary contact recreation.

In 1998, NYSDEC listed Little Neck Bay as a high priority waterbody for TMDL development with its inclusion the Section 303(d) List of Impaired Waterbodies. The cause of the listing was pathogens due to CSO discharges and urban and storm runoff. Little Neck Bay continues to be listed on the 303(d) List for Pathogens through 2008 (most current list). "Alley Creek/Little Neck Bay Tributary" was listed for the first time on the 2004 Section 303(d) List

Udall's Cove, on eastern shore of Little Neck Bay

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Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Plate ES-1

and continues on the final 2008 List as a high priority waterbody for oxygen demand. The 2008 303(d) List states the causes of both pathogen impairment in Little Neck Bay and dissolved oxygen (DO) impairment in Alley Creek/Little Neck Bay Tributary as “Urban/Storm/CSO” (urban runoff, stormwater and CSOs). These waterbodies are listed in the 2008 303(d) List on “Part 3c – Waterbodies for which TMDL Development May be Deferred (Pending Implementation/Evaluation of Other Restoration Measures).” As noted in the 2008 List: “Impairments to these waters are being addressed by a 2005 Order on Consent with New York City directing the City to develop and implement watershed and facility plans to address CSO discharges and bring New York City waters into compliance with the Clean Water Act. This may include a revision of water quality standards based on a Use Attainability Analysis if fishable/swimmable goals of the CWA are not attainable. NYSDEC remains committed to the development of harbor-wide TMDLs for nutrients, pathogens and toxics. However, it is appropriate to defer development of separate TMDLs for these individual CSO-impacted waterbodies in light of the enforceable requirements of the NYC CSO Consent Order. The LTCP will serve as input to the TMDL when approved by NYSDEC as it will address the identified sources of the impairment.

Examination of available water quality data from Alley Creek indicate occasional dissolved oxygen levels below the NYSDEC Class I standard of 4.0 mg/L. Summer attainment of Alley Creek dissolved oxygen during the Baseline Condition LTCP design year was calculated to be 85 (head end) to 100 (mouth) percent attainment of Class I and 52 (head end) to >98 percent attainment of Interstate Environmental Commission (IEC) Class A dissolved oxygen standard of 5.0 mg/L. Pathogen data from 1992 CSO Facility Planning indicated that fecal and total coliform levels met Class I standards in Alley Creek approximately half of the time. More recent data (2001 to 2003) indicate compliance with fecal standards. Fecal and total coliform levels calculated during a Baseline Condition indicated levels that meet Class I standards in Alley Creek.

Similarly, available dissolved oxygen data from Little Neck Bay indicate rare occurrences of levels less than 5.0 mg/L. Summer attainment of the Class SB dissolved oxygen standard is calculated at 100 percent in Little Neck Bay during Baseline Conditions. Fecal coliform data from 2001 to 2003 indicate levels that meet standards at the stations measured (Bayside Marina and Udalls Cove).

The available pathogen data for the Douglas Manor Association (DMA) Beach is measured by New York City Department of Health and Mental Hygiene (NYCDOHMH) during the bathing season. DMA Beach experiences elevated enterococcus concentrations. These elevated levels resulted in closure of the beach for 50 days in 2007 for confirmed enterococci exceedance. Wet Weather Advisories were issued a total of 10 days and Pollution Advisories for 23 days. NYCDOHMH cited failed septic systems and the large number of recreation boats with marine sanitation devices as the major factors of potential DMA Beach pollution. The Douglaston Peninsula, the location of DMA Beach, is not sewered and uses on-site septic systems. Birds were also noted as possible sources. The bacteria sources listed by NYCDOHMH as causes of DMA Beach use impairment are not CSO-related but appear to be localized sources. As such, those suspected sources were not included in the Little Neck Bay Baseline.

For the Baseline Condition, enterococcus, fecal and total coliform standards were calculated to be met throughout Little Neck Bay. The pathogen standards are also calculated to be met during the Baseline Condition one-year simulation period at Douglas Manor Association (DMA) Beach located on Little Neck Bay, thereby, protecting the bathing use as required by NYSDEC. These CSO Alternatives analyses results for bacteria further demonstrate the importance of localized bacteria sources to DMA Beach water quality.

Alternatives Analyses Results

The alternatives for evaluation were developed and tested using the InfoWorks Tallman Island Model (TI Model and the East River Tributaries Model (ERTM) water quality model. The Baseline models include the Tallman Island WPCP upgrades necessary for compliance with the Nitrogen Control Consent Order, as described in the CSO Consent Order (upgrades for BNR). The WPCP upgrades necessary for compliance with the Nitrogen Control Consent Order were also included in the models for the evaluation of alternatives. The TI Model Baseline did not include Tallman Island WPCP collection system conveyance enhancements (CEs), those sewer system changes now embodied into the CSO Consent Order for Flushing Bay and previously part of the Omni IV Order. The end result of these CEs is “Tallman Island WPCP and associated sewer systems are capable of delivering, accepting and treating influent at or above twice the plant design flow during any storm event.” These CEs were included in the TI Model for alternatives evaluation. As set forth in the 2008 CSO Order Modification Agreement, have milestones of design completion, notice to proceed to construction and construction completion with milestone schedule dates of December 2010, December 2011 and July 2015, respectively. The results of the TI Model (stormwater, CSO, direct drainage flows and loads) were then input to the receiving water quality model, East River Tributaries Model (ERTM) to determine water quality improvement compared to the Baseline Condition.

In addition to the Baseline Condition and the current CSO Facility Plan, several alternatives were evaluated. Each started with the Alley Creek Tank. Three alternatives adding bending weirs (at TI-025, Chamber 6 and at both locations) were evaluated. Large storage tanks (15 MG, 25 MG and 30 MG) were needed to accomplish the USEPA target wet weather discharge reductions of 80, 90 and 100 percent with the accompanying reductions in CSO events to the 10-12, 4-6, and 0 levels. Resultant water quality and costs were developed for each alternative for comparative evaluation. Based on this evaluation, the current CSO Facility Plan with a weir at Chamber 6 was selected as the Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan.

Table ES-1 summarizes the performance and costs (November 2008) for each alternative. When compared to the Baseline Condition, the Alley Creek Tank that is the basis of each alternative, provides a high level of reduction (96.5 percent) of untreated CSO into the Alley Creek and Little Neck Bay. The inclusion of a weir at Chamber 6 further reduces CSO volume and by eliminating CSO from TI-008 results in 100 percent of CSO receiving the preliminary treatment of solids settling and floatables removal by passing through the tank.

Table ES-1. Performance and Cost Summary of Alternatives

Alley Creek and Little Neck Bay CSO Control Alternative	Alternative Total				
	CSO Discharge (MG)	# CSO Events	% CSO Volume Reduction from Baseline	% Reduction of Untreated CSO(1)	Cost (Millions)
1. Baseline Condition	517(2)	38	0	0	NA
2 CSO Facility Plan (FP)	273	27	47%	96.5	$31.3
Weir Alternatives					
1. FP + Weir @ TI-025	226	24	56%	96.5	$32.9
2. FP + Weir @ Ch 6	256	27	51%	100	$31.8
3. FP + Weir @ TI-025 + Weir @ Chamber 6	208	24	60%	100	$33.5
Storage Tank Alternatives					
1. 15 MG Tank	111	10	79%	96.5	$369
2. 25 MG Tank	52	5	90%	96.5	$503
3. 30 MG Tank + Weir @ TI-025 + Weir @ Chamber 6	0	0	100%	100	$558

(1) TI-025 overflows receive preliminary treatment.
(2) Includes 58.8 MG of CSO and 458.6 MG of stormwater entering downstream of the regulator.

Alley Creek and Little Neck Bay WB/WS Facility Plan

Based on the above, the alternative selected as the Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan is the Alley Creek Tank and its new outfall, TI-025 with the weir at Chamber 6 ("FP + Weir @ Ch 6" in Table ES-1).

The Alley Creek CSO retention facility is being implemented by NYCDEP as one element in a larger phased project to provide drainage relief and CSO abatement for sewer service areas on the west side of Alley Creek. The Alley Creek CSO retention facility is further is described in Section 5.

The components of the Waterbody/Watershed Facility Plan for Alley Creek and Little Neck Bay are summarized as follows:

- Continued Implementation of Programmatic Controls;
- Complete and Operate the Alley Creek CSO Retention Facility
    - CSO Retention Facility, 5 MG Alley Creek Tank
    - New Chamber 6 to direct CSO to Alley Creek Tank and provide tank bypass to TI-008
    - Static weir (1 to 2 ft stop log) at Chamber 6 to minimize bypass of untreated CSO to TI-008
    - New CSO outfall, TI-025, for discharge from the Alley Creek Tank
    - Upgrade of Old Douglaston Pumping Station to empty tank
    - Fixed baffle at TI-025 for floatables retention
- Sustainable Stormwater Management

Programmatic Implementation of Sustainable Stormwater Management Initiatives

As enumerated in Section 5.8, low-impact development (LID), stormwater BMPs, and other green solutions for stormwater management will continue to be evaluated for programmatic implementation by the City of New York through efforts parallel to CSO planning. NYCDEP has taken the lead on many of these efforts on behalf of the City and expects these evaluations to yield promising technologies suitable for implementation in its CSO program as information becomes available and opportunities arise. NYCDEP is undertaking a study of BMP pilot projects and, as part of the study, will be preparing BMP plans for several drainage areas.

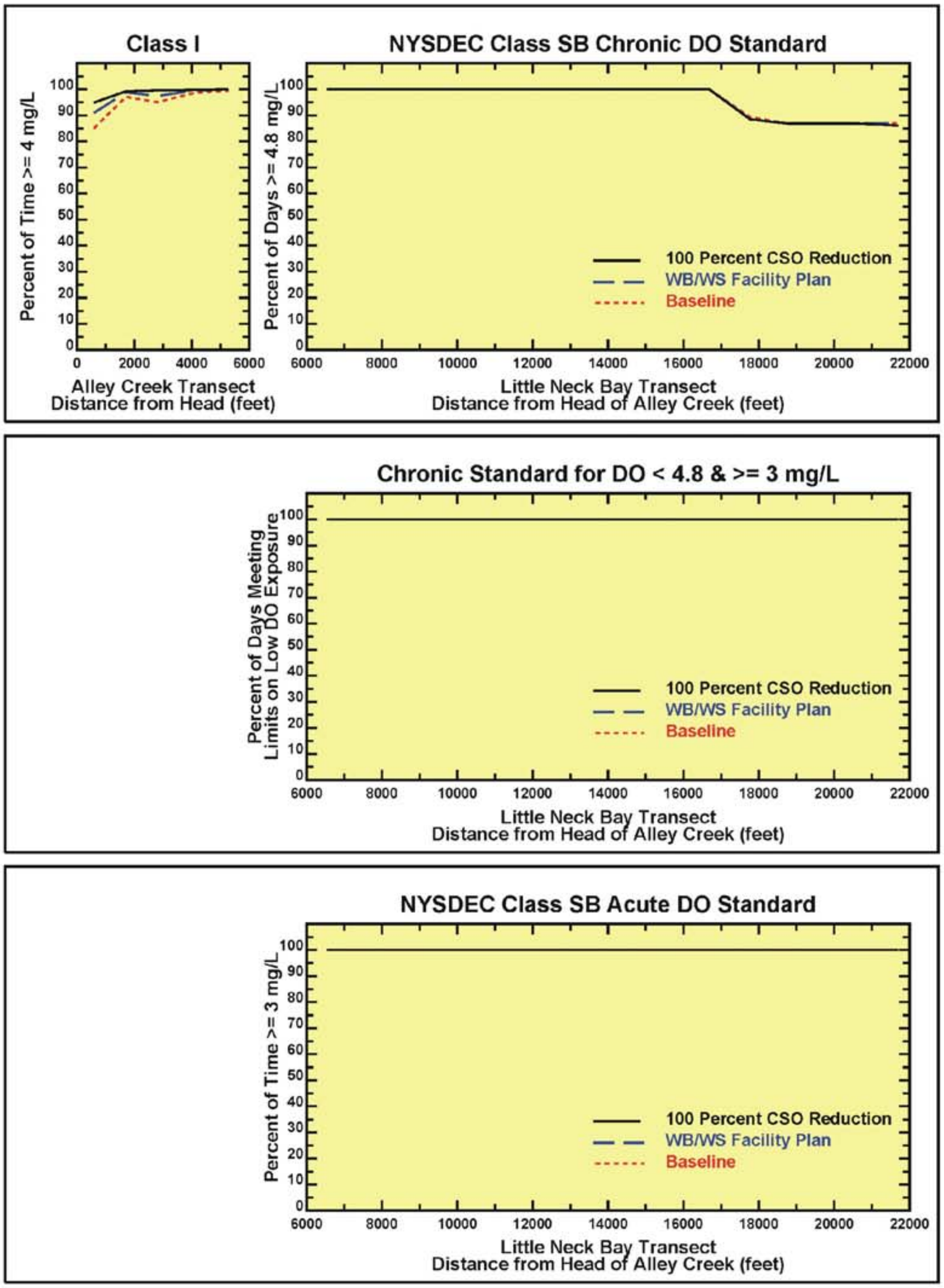
In connection with the settlement of an enforcement action taken by New York State and NYSDEC for violations of New York State law and NYSDEC regulations, NYCDEP submitted a Nitrogen Consent Judgment Environmental Benefit Project (Nitrogen EBP) Plan to NYSDEC in January 2007 that proposed stormwater pilot studies in the Jamaica Bay drainage area. Design of these pilots began in December 2008. A second Plan, the CSO EPB Plan, was submitted in March 2008 by NYCDEP in connection with the settlement of an enforcement action taken by New York State and NYSDEC for violations of New York State law and NYSDEC regulations. The CSO EPB Plan is expected to partially reduce the rate and volume of stormwater that enters the combined sewer system through stormwater BMP implementation in select drainage areas.

Lastly, NYCDEP is working with other City agencies to incorporate BMPs in both current and future development, and is evaluating potential regulatory changes to accomplish this. These changes would be included through a future modification to the current WB/WS Facility Plan or when the WB/WS Facility Plan is converted to a Drainage Basin Specific Long Term Control Plan. The subsequent City-Wide Long Term Control Plan therefore, would include Alley Creek and Little Neck Bay stormwater BMPs.

Summary of Expected Water Quality Benefits

As documented herein, implementation of the Waterbody/Watershed Facility Plan is projected to improve water quality relative to Baseline Condition. Dissolved oxygen improvement on a summer (June, July and August) basis along a spatial transect from the head of Alley Creek through the middle of Little Neck Bay to the East River is shown on Figure ES-1.

The percent of time that Alley Creek dissolved oxygen is greater than or equal to its Class I standard of 4.0 mg/L increases for the WB/WS Facility Plan case for the summer as is shown on the left side panel. Similarly, it can be seen that dissolved oxygen in Little Neck Bay exceeds its Class SB chronic standard of a daily average of 4.8 mg/L (top right panel) 100 percent of the time for all alternatives including Baseline Condition. For the northern section of the bay influenced by the East River and western Long Island Sound, daily averages of 4.8 mg/L are met for 80 out of 92 summer days. The middle right side panel shows that the chronic dissolved oxygen standard for limiting exposure to low dissolved oxygen (<4.8 DO ≥ 3.0) is met 100 percent of the days. The acute dissolved standard is shown on the bottom right side panel and indicates that dissolved oxygen in Little Neck Bay is calculated to be greater than 3.0 mg/L for 100 percent of the time.



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Summer Dissolved Oxygen for Alley Creek/Little Neck Bay Transect

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE ES-1

Bacteria standards for enterococcus, total coliform and fecal coliform in Little Neck Bay are calculated to be met at DMA Beach and all other locations at all times for each of the alternatives and the Baseline Condition. To differentiate among the alternatives for bacteria a cost benefit analysis was performed using the decrease in bacteria as a function of cost. As an example, Figure ES-2 shows the cost benefit at DMA Beach, Bayside Marina (Little Neck Bay) and Alley Creek for reduced pathogen levels. The WB/WS Facility Plan improves water quality with respect to these parameters over Baseline Conditions and represents a cost-effective, reasonable plan.

All of the flow through the Alley Creek Tank will receive passive treatment for floatables removal (baffle) and by settling of solids (gravity settling). Since 100 percent of the total Baseline CSO is captured and/or treated, a significant improvement in floatables will result from the WB/WS Facility Plan implementation. In all of the water quality analyses, additional CSO controls beyond those proposed herein (including 100 Percent CSO Reduction) are not projected to provide significant additional water quality benefits.

Implementation Schedule and Cost

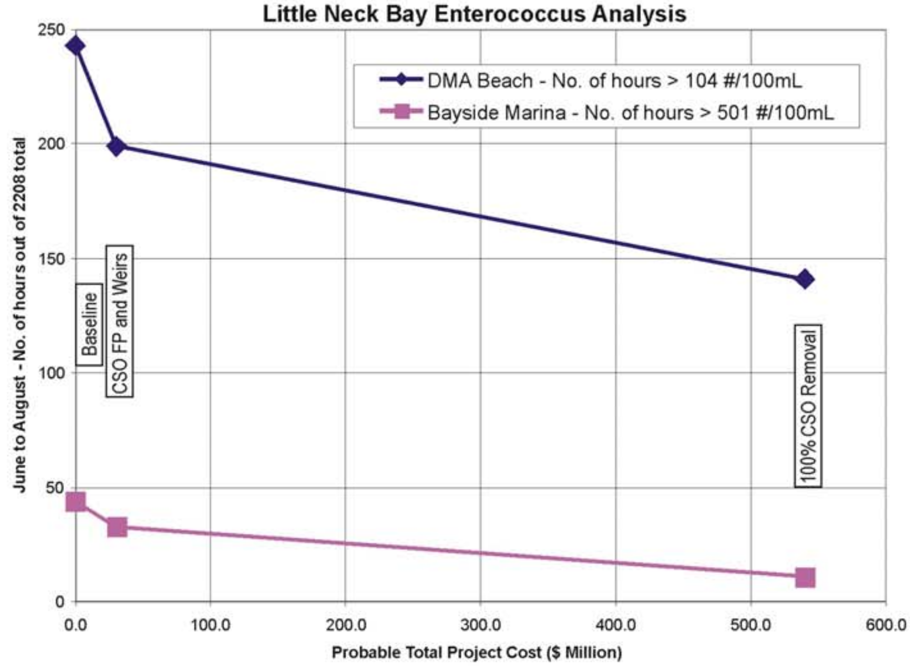
The implementation of the elements of the Alley Creek and Little Neck Bay Waterbody/ Watershed Facility Plan is well underway. The Construction Completion milestone for the Alley Creek CSO Retention Facility and new outfall, TI-025, is December 2009. The estimated cost for all CSO-related elements is $31.8 million. (November 2008 dollars). This Alley Creek CSO project is a portion of a larger drainage improvement and restoration project that totals $136 million.

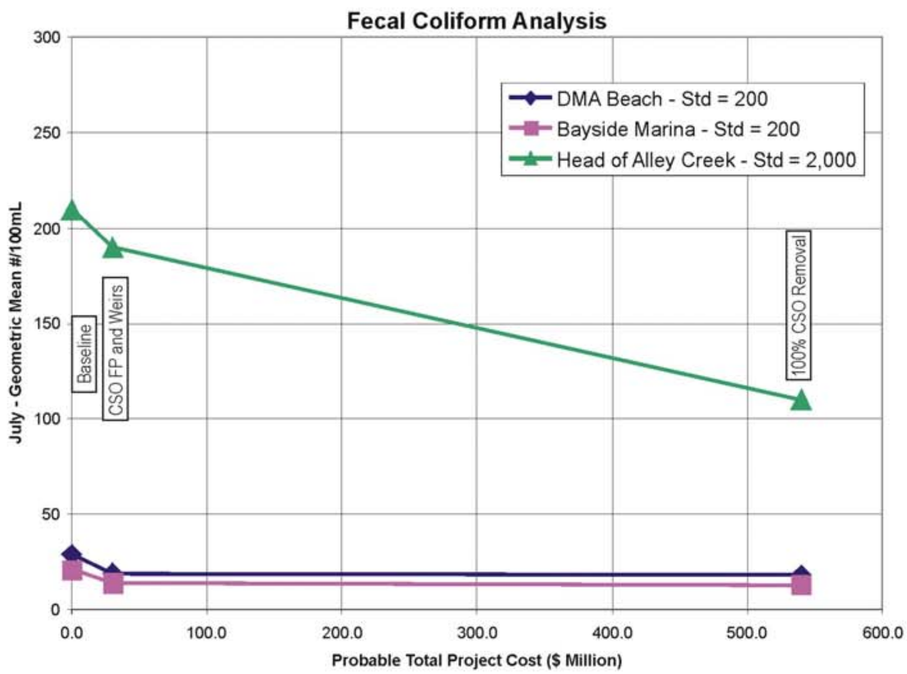
Post-Construction Monitoring

Post-construction monitoring will be integral to assessment of the control elements of the Waterbody/Watershed Facility Plan. Monitoring will consist of collecting receiving water quality data, relevant precipitation data and data characterizing the operation of the sewer system. The performance of the tank will be monitored for overflow volumes and bypasses, if any. Analysis of these data will provide an indication of how the controls are performing irrespective of natural wet-weather variations.

Consistency with Federal CSO Control Policy

The Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan was developed so that it satisfies the requirements of the federal CSO Control Policy. Through extensive water quality and sewer system modeling, data collection, community involvement, and engineering analysis, the NYCDEP has adopted this Plan to incorporate the findings of over two decades of inquiry to achieve the highest reasonably attainable use of Alley Creek and Little Neck Bay. This Watershed/Waterbody Facility Plan addresses each of the nine elements of long-term CSO control as defined by federal policy and described herein. In addition, the Waterbody/Watershed Facility Plan satisfies the metrics of the Demonstration Approach as defined in USEPA Policy.





Enterococcus and Fecal Coliform Benefit of Waterbody/Watershed Facility Plan to Douglas Manor Association Beach, Little Neck Bay and Alley Creek

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Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE ES-2

The Demonstration Approach metrics are based primarily on whether the selected alternative is projected to meet applicable water quality standards. As described above, the Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan is projected to meet all applicable pathogen standards 100 percent of the time during the design (typical) precipitation year. Dissolved oxygen criteria SB standards are also projected to be attained 100 percent of the time in Little Neck Bay. Dissolved oxygen will improve in Alley Creek but standards will not be attained at all times. Higher levels of control—up to and including 100 percent CSO abatement, the equivalent of total sewer separation, however, are not projected to provide significantly improved dissolved oxygen. Narrative criteria for aesthetics cannot be expected to be met. In light of the high level of floatables control and the removable of settleable solids in the Alley Creek Tank, a significant aesthetic benefit will result. Further improvement would require control of non-CSO sources such as stormwater.

Douglas Manor Association Beach, "Sensitive Area" Status in WB/WS Facility Plan

There is a sensitive area present in Little Neck Bay (a permitted bathing beach) as defined by the USEPA Long Term CSO Control Plan Policy. The Waterbody/Watershed Facility Plan and LTCP will, therefore, address the USEPA 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 reassessments in each permit term based on changes in technology, economics, or other circumstances for those locations not eliminated or relocated (USEPA, 1995a).

"(a) Prohibit new or significantly increased overflows,"

There will be no new or significantly increased overflows in the immediate vicinity of the DMA beach. The Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan estimates a reduction of the volume of CSO discharged by 51 percent and a reduction of untreated CSO volume by 100 percent for the design year.

"(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;"

The alternatives analyses concluded that elimination (or relocation) of CSO overflows is not economically achievable and that elimination of CSOs does not result in water quality that meets water quality standards at DMA Beach at all times. The remaining CSOs were shown to have relatively little influence on DMA Beach water quality. The water quality improvements resulting from the WB/WS Facility Plan compared to Baseline are similar to improvements expected to result from 100 Percent CSO Removal. The determination of pollutant loads into Alley Creek and Little Neck Bay (Section 3) and the CSO control alternatives evaluation (Section 7) indicate that stormwater control is required for additional water quality improvement particularly in Alley Creek. Control of localized pathogen sources that impact DMA Beach is needed to achieve the enterococcus standard and the swimmable CWA goal.

"(c) Provide reassessments in each permit term based on changes in technology, economics, or other circumstances for those locations not eliminated or relocated."

The Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan includes provisions for the reassessment of CSOs TI-025 and TI-008 for their impact on DMA Beach water quality and the opportunity to further reduce CSO overflows to Alley Creek and Little Neck Bay (Section 8.5).

Available NYCDOHMH DMA Beach monitoring data will be reviewed in conjunction with the LTCP post-construction monitoring program data, and beach advisories and closures will be included in the DMA Beach assessment report.

Summary

The Alley Creek and Little Neck Bay WB/WS Facility Plan furthers the NYCDEP City-wide goals of CSO abatement and attainment of water quality standards. This WB/WS Facility Plan satisfies USEPA CSO Policy requirements and will be incorporated into a Long Term Control Plan for the entire city. Through extensive sewer system and water quality modeling, data collection, community involvement, and engineering analyses, the NYCDEP has developed a Plan that incorporates the findings of over two decades of inquiry to achieve the highest reasonably attainable water quality and associated use of Alley Creek and Little Neck Bay.

1.0 Introduction

The City of New York owns and operates 14 water pollution control plants (WPCPs) and their associated collection systems through the New York City Department of Environmental Protection (NYCDEP). The system contains approximately 450 combined sewer overflows (CSOs) located throughout the New York Harbor complex. NYCDEP is executing a comprehensive watershed-based approach to long-term CSO control planning to address the impacts of these CSOs on the water quality and use of the waters of New York Harbor. As illustrated in Figure 1-1, multiple waterbody assessments are being conducted that consider all causes of non-attainment of water quality standards and identify opportunities and requirements for maximizing beneficial uses. This Long-Term CSO Plan (LTCP) report, Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan Report, provides the details of the assessment and the actions that will be taken to improve water quality in one of these waterbodies, Alley Creek and Little Neck Bay (Item 1 in Figure 1-1.)

New York City's environmental stewardship of the New York Harbor began in 1909 with water quality monitoring "to assess the effectiveness of New York City's various water pollution control programs and their combined impact on water quality" that continues today (annual NYCDEP NY Harbor Water Quality Survey Reports, 2000-2007). CSO abatement has been ongoing since the 1950s, when conceptual plans were first developed for the reduction of CSO discharges into Spring Creek in Jamaica Bay. From 1975 through 1977, the City conducted a harbor-wide water quality study funded by a Federal Grant under Section 208 of the Water Pollution Control Act Amendments of 1972. This study confirmed tributary waters in the New York Harbor were negatively affected by CSOs. At that time, dry-weather discharges, which have since been eliminated by NYCDEP, were also occurring. In 1984 a City-wide CSO abatement program was developed that initially focused on establishing planning areas and defining how facility planning should be accomplished. The City was divided into eight individual project areas that together encompass the entire harbor area. Four open water project areas were developed (East River, Jamaica Bay, Inner Harbor and Outer Harbor), and four tributary project areas were defined (Flushing Bay, Paerdegat Basin, Newtown Creek, and Jamaica Tributaries). The State Pollutant Discharge Elimination System (SPDES) permits for each WPCP required development of CSO Facility Plans for each project area. The permits for each WPCP, administered by the New York State Department of Environmental Conservation (NYSDEC), apply to CSO outfalls as well as WPCP discharges and stormwater outfalls. Therefore, the SPDES permits contain conditions for compliance with applicable federal and New York State requirements for CSOs.

In 1992, NYCDEP entered into an Administrative Consent Order with NYSDEC that was incorporated into the SPDES permits with a provision stating that the Consent Order governs NYCDEP's obligations for its CSO program. The 1992 Order was modified in 1996 to add a catch basin cleaning, construction, and repair program. A new Consent Order that became effective in 2005 supersedes the 1992 Consent Order and its 1996 modifications, with the intent to bring all CSO-related matters into compliance with the provisions of the Clean Water Act and New York State Environmental Conservation Law. The new Consent Order contains requirements to evaluate and implement CSO abatement strategies on an enforceable timetable for 18 waterbodies and, ultimately, for city-wide long-term CSO control. NYCDEP and

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Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

LTCP Project Waterbody Assessment Areas

FIGURE 1-1

NYSDEC also entered into a separate Memorandum of Understanding (MOU) to facilitate water quality standards reviews in accordance with the federal CSO control policy.

This Alley Creek and Little Neck Bay LTCP Report is explicitly required by item I.B, Appendix A of the 2005 Consent Order, and is intended to be consistent with the United States Environmental Protection Agency (USEPA) CSO Control Policy. In 1994, USEPA issued a national CSO Policy that requires municipalities to develop a long-term plan for controlling CSOs (i.e., a Long-Term Control Plan or LTCP). The CSO policy became law in December 2000 with the passage of the Wet Weather Water Quality Act of 2000. The approach to developing the LTCP is specified in USEPA CSO Control Policy and Guidance Documents, and involves the following nine minimum elements,

1. System Characterization, Monitoring and Modeling;
2. Public Participation;
3. Consideration of Sensitive Areas;
4. Evaluation of Alternatives;
5. Cost/Performance Consideration;
6. Operational Plan;
7. Maximizing Treatment at the Treatment Plant;
8. Implementation Schedule; and
9. Post Construction Compliance Monitoring Program.

Subsequent sections of the report will discuss each of these elements in more depth, along with the simultaneous coordination with State Water Quality Standards (WQS) review and revision as appropriate. However, it should be noted that the CSO abatement plan discussed herein had been substantially developed by the NYCDEP and approved by the NYSDEC under the 1992 Order prior to implementation of the CSO policy. Therefore, some of the required LTCP requirements are more fully addressed in reference documents. For example, detailed evaluations of water quality and sewer system models and CSO control alternatives can be found in facility planning documents as referenced in the present document and/or other reports generated in association with this report.

1.1 ASSESSMENT AREA

The waterbody portion of the Alley Creek and Little Neck Bay Waterbody/Watershed (WB/WS) Facility Plan assessment area follows the NYSDEC designation of Alley Creek and Little Neck Bay in its Codes, Rules and Regulations. This area is designated as all waters extending into Alley Creek and Little Neck Bay, beginning at the southern, upstream origins of Alley Creek, which is just north of the interchange of the Long Island Expressway and the Cross Island Parkway, to the downstream mouth of Little Neck Bay as it enters the Long Island Sound, between the Fort Totten Military Reservation on the west side and Kings Point on the east side. The NYSDEC lists Alley Creek as an estuary, with a Class I waterbody classification and a size of 18.4 acres. Little Neck Bay is listed as an estuary, with a Class SB waterbody classification and a size of 1,515 acres (NYSDEC, 2002).

The watershed and sewershed of the Alley Creek and Little Neck Bay portion of the assessment area includes the neighborhoods of Bay Terrace, Bayside, Oakland Gardens, Douglaston, and Little Neck within Queens County, including most of Community District 11 and the western portion of Community District 7. On the eastern side of the Little Neck Bay, the watershed and sewershed also includes a portion of the Great Neck Peninsula in Nassau County. Most of the Queens County areas are serviced by the eastern portion of the sewer system tributary to the Tallman Island WPCP, with the exception of some properties on the Douglaston Peninsula that are served by on-site septic systems. The areas adjacent to the bay on its eastern Nassau County shore are served by a mixture of sanitary sewer districts and individual on-site septic systems. Figure 1-2 illustrates the New York City Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan Assessment Area. The total watershed/sewershed of the assessment area is 4,879 acres. The areas of direct drainage to the waterbody (828 acres), separately sewered areas (2,941 acres), combined sewer areas (918 acres), and "other" (direct drainage areas not immediately adjacent to the waterbody, 192 acres) are shown. The Tallman Island CSO outfalls that discharge to Alley Creek and Little Neck Bay are indicated. CSO outfall TI-025 is the future outfall of overflow from the Alley Creek CSO Retention Facility currently under construction. The discharge location of the Belgrave (Nassau County) WPCP is shown. Community Districts are indicated.

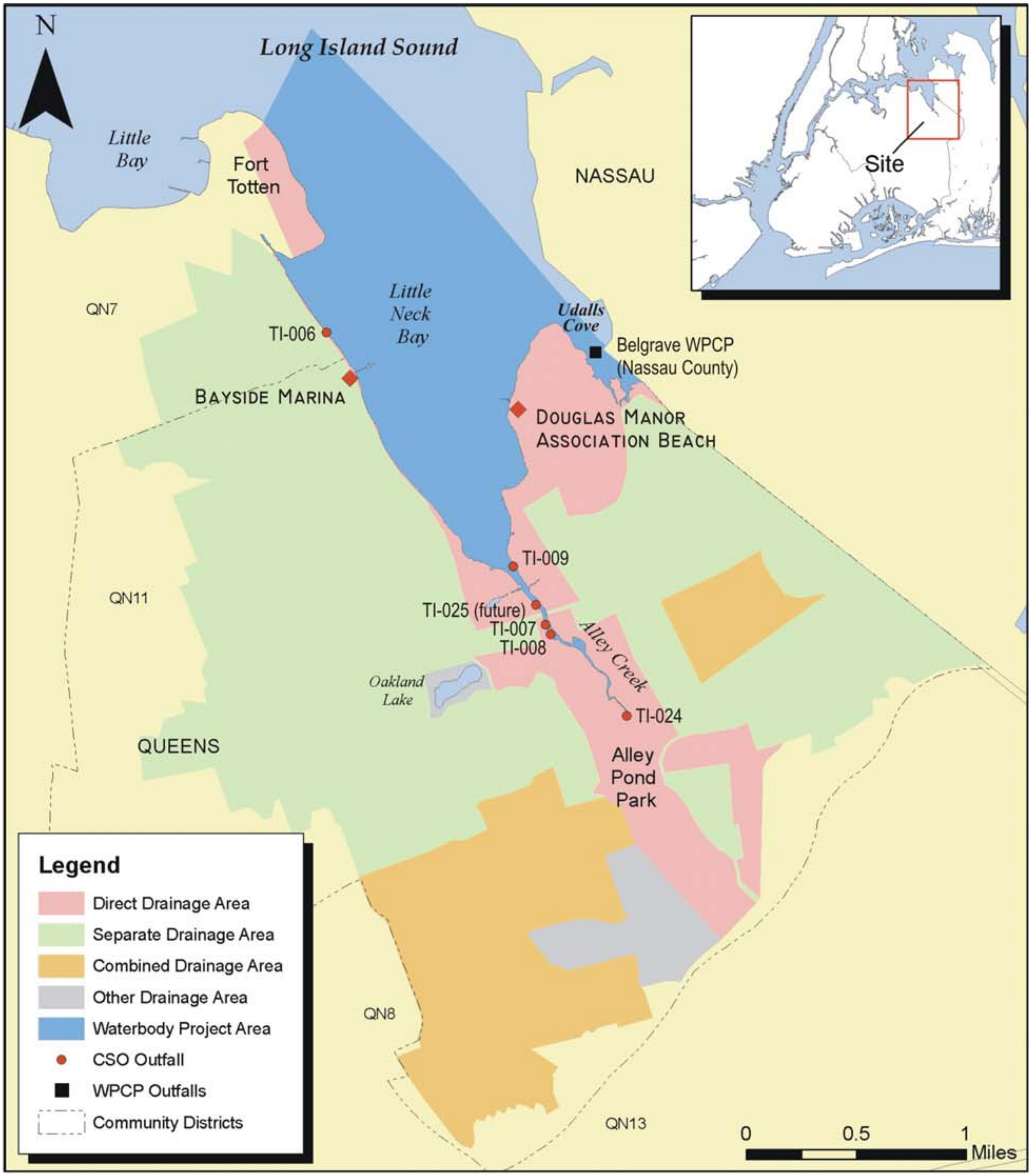
1.2 REGULATORY CONSIDERATIONS

The waters of the City of New York are primarily subject to New York State regulation, but must also comply with the policies of the USEPA, as well as water quality standards established by the Interstate Environmental Commission (IEC). The following sections detail the regulatory issues relevant to long-term CSO planning.

1.2.1 Clean Water Act

Although federal laws protecting water quality were passed as early as 1948, the most comprehensive approach to clean water protection was enacted in 1972, with the adoption of the Federal Water Pollution Control Act Amendments, commonly known as the Clean Water Act (CWA), including the amendments adopted in 1977. The CWA established the regulatory framework to control surface water pollution, and gave USEPA the authority to implement pollution control programs. Among the key elements of the CWA was the establishment of the National Pollutant Discharge Elimination System (NPDES) permit program, which regulates point sources that discharge pollutants into waters of the United States. Combined sewer overflows and municipal separate storm sewer systems (MS4) are also subject to regulatory control under the NPDES program. In New York State, the NPDES permit program is administered by the State through NYSDEC, and is thus a SPDES program. New York has had an approved SPDES program since 1975.

The CWA requires that discharge permit limits are based on receiving water quality standards (WQS) established by the State. These standards should "wherever attainable, provide water quality for the protection and propagation of fish, shellfish and wildlife and for recreation in and on the water and take into consideration their use and value of public water supplies, propagation of fish, shellfish, and wildlife, recreation in and on the water, and agricultural, industrial, and other purposes including navigation" (40 CFR 131.2). The standards must also have an antidegradation policy for maintaining water quality at acceptable levels, and a strategy for meeting these standards must be developed for those waters not meeting WQS. The most common type of strategy is the development of a Total Maximum Daily Load (TMDL). TMDLs



New York City
Department of Environmental Protection

Alley Creek and Little Neck Bay Waterbody/Watershed Assessment Area

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 1-2

determine what level of pollutant load would be consistent with meeting WQS. TMDLs also allocate acceptable loads among sources of the relevant pollutants.

Section 305(b) of the CWA requires states to periodically report water quality of waterbodies under their respective jurisdictions and Section 303(d) requires states to identify impaired waters where specific designated uses are not fully supported. The NYSDEC Division of Water addresses these requirements by following its Consolidated Assessment and Listing Methodology (CALM). The CALM includes monitoring and assessment components that determine water quality standards attainment and designated use support for all waters of New York State. Waterbodies are monitored and evaluated on a five-year cycle. Information developed during monitoring and assessment is inventoried in the Waterbody Inventory/Priority Waterbody List (WI/PWL). The WI/PWL incorporates monitoring data, information from state and other agencies, and public participation. The Waterbody Inventory refers to the listing of all waters, identified as specific individual waterbodies that are assessed within the state. The Priority Waterbodies List is the subset of waters in the Waterbody Inventory that have documented water quality impacts, impairments or threats. The Priority Waterbodies List provides the candidate list of waters to be considered for inclusion on the Section 303(d) List.

In 1998, NYSDEC listed Little Neck Bay as a high priority waterbody for TMDL development with its inclusion on the Section 303(d) List. The cause of the listing was pathogens due to CSO discharges and urban and storm runoff. Little Neck Bay continues to be listed on the 303(d) List for Pathogens through 2008 (most current list). "Alley Creek/Little Neck Bay Tributary" was listed for the first time on the 2004 Section 303(d) List as a high priority waterbody for oxygen demand. The 2008 NYSDEC 303(d) List includes the Alley Creek/Little Neck Bay Tributary as impaired for dissolved oxygen caused by oxygen demand. The 2008 303(d) List sources of both pathogen impairment in Little Neck Bay and dissolved oxygen (DO) impairment in Alley Creek/Little Neck Bay Tributary are listed as CSOs, urban runoff and stormwater. The Alley Creek and Little Neck Bay waters are included in "Part 3c" of the 2008 303(d) List. Part 3c lists "Waterbodies for which TMDL Development May be Deferred (Pending Implementation/Evaluation of Other Restoration Measures)." The Alley Creek/Little Neck Bay Tributary and Little Neck Bay are specifically noted that "Impairments to these waters are being addressed by 2005 Order on Consent with NYC directing the city to develop and implement watershed and facility plans to address CSO discharges and bring New York City waters into compliance with the Clean Water Act. This may include a revision of water quality standards based on a Use Attainability Analysis if fishable/swimmable goals of the CWA are not attainable. NYSDEC remains committed to the development of harbor-wide TMDLs for nutrients, pathogens and toxins. However, it is appropriate to defer development of separate TMDLs for these individual CSO-impacted waterbodies in light of the enforceable requirements of the NYC CSO Consent Order." (NYSDEC, 2008).

Another important component of the CWA is the protection of uses. USEPA regulations state that a designated use for a waterbody may be refined under limited circumstances through a Use Attainability Analysis (UAA). In the UAA, the state would demonstrate that one or more of a limited set of situations exists to make such a modification. First, it could be shown that the current designated use cannot be achieved through implementation of applicable technology-based limits on point sources or cost-effective and reasonable management practices for nonpoint sources. Alternatively, a determination could be made that the cause of non-attainment is due to natural background conditions or irreversible human-caused conditions. Another alternative would be to establish that attaining the designated use would cause substantial environmental damage or substantial and widespread social and economic costs. If the findings of a UAA suggest authorizing the revision to a use or modification of a water quality standard is appropriate, the analysis and the accompanying proposal for such a modification must go through public participation and the USEPA review and approval processes.

1.2.2 Federal CSO Policy

The first national CSO Control Strategy was published by USEPA in the Federal Register on September 8, 1989 (54 FR 37370). The goals of this strategy were to minimize water quality, aquatic biota, and human health impacts from CSOs by ensuring that CSO discharges comply with the technology and water quality based requirements of the CWA. On April 19, 1994, USEPA officially noticed the CSO Control Policy (59 FR 18688), which established a consistent national approach for controlling discharges from all CSOs to the waters of the United States. The CSO Control Policy provides guidance to permittees and NPDES permitting authorities such as NYSDEC on the development and implementation of an LTCP in accordance with the provisions of the CWA to attain water quality standards. On December 15, 2000, amendments to Section 402 of the CWA (known as the Wet Weather Water Quality Act of 2000) were enacted, incorporating the CSO Control Policy by reference.

USEPA has stated that its CSO Control Policy represents a comprehensive national strategy to ensure that municipalities, permitting authorities, water quality standards authorities and the public engage in a comprehensive and coordinated planning effort to achieve cost-effective CSO controls that ultimately meet appropriate health and environmental objectives and requirements (USEPA, 1995a). Four key principles of the CSO Control Policy ensure that CSO controls are cost-effective and meet the objectives of the CWA:

1. Clear levels of control are provided that would be presumed to meet appropriate health and environmental objectives;

2. Sufficient flexibility is allowed to municipalities to consider the site-specific nature of CSOs and to determine the most cost-effective means of reducing pollutants and meeting CWA objectives and requirements;

3. A phased approach to implementation of CSO controls is acceptable; and

4. Water quality standards and their implementation procedures may be reviewed and revised, as appropriate, when developing CSO control plans to reflect the site-specific wet weather impacts of CSOs.

In addition, the CSO Control Policy clearly defines expectations for permittees, WQS authorities, and NPDES permitting and enforcement authorities. Permittees were expected to have implemented USEPA's nine minimum controls (NMCs) by 1997, after which long-term control plans should be developed. The NMCs are embodied in the 14 Best Management Practices (BMPs) required by NYSDEC as discussed in Section 5.3, and include:

1. Proper operations and maintenance of combined sewer systems and combined sewer overflow outfalls;
2. Maximum use of the collection system for storage;

3. Review and modification of pretreatment requirements to determine whether nondomestic sources are contributing to CSO impacts;
4. Maximizing flow to the Publicly Owned Treatment Works (POTWs);
5. Elimination of CSOs during dry weather;
6. Control of solid and floatable material in CSOs;
7. Pollution prevention programs to reduce contaminants in CSOs;
8. Public notification; and
9. Monitoring to characterize CSO impacts and the efficacy of CSO controls.

WQS authorities should review and revise, as appropriate, State WQS during the CSO long-term planning process. NPDES permitting authorities should consider the financial capability of permittees when reviewing CSO control plans.

In July 2001, USEPA published *Coordinating CSO Long-Term Planning with Water Quality Standards Reviews*, additional guidance to address questions and describe the process of integrating development of CSO long-term control plans with water quality standards reviews (USEPA, 2001d). The guidance acknowledges that the successful implementation of an LTCP requires coordination and cooperation among CSO communities, constituency groups, states and USEPA using a watershed approach. As part of the LTCP development, USEPA recommends that WQS authorities review the LTCP to evaluate the attainability of applicable water quality standards. The data collected, analyses and planning performed by all parties may be sufficient to justify a water quality standards revision if a higher level of designated uses is attainable or if existing designated uses are not reasonably attainable. If the latter is true, then the USEPA allows the state WQS authorities to consider several options:

- Apply site-specific criteria;
- Apply criteria at the point of contact rather than at the end-of-pipe through the establishment of a mixing zone, waterbody segmentation, or similar;
- Apply less stringent criteria when it is unlikely that recreational uses will occur or when water is unlikely to be ingested;
- Subcategories of uses, such as precluding swimming during or immediately following a CSO event or developing a CSO subcategory of recreational uses; and
- A tiered aquatic life system with subcategories for urban systems.

If the waterbody supports a use with more stringent water quality requirements than the designated use, USEPA requires the State to revise the designated use to reflect the higher use being supported. Conversely, USEPA requires that a UAA be performed whenever the state proposes to reduce the level of protection for the waterbody. States are not required to conduct UAAs when adopting more stringent criteria for a waterbody. Once water quality standards are revised, the CSO Control Policy requires post-implementation compliance monitoring to evaluate the attainment of designated uses and water quality standards and to determine if further water quality revisions and/or additional long-term control planning is necessary. USEPA provides a schematic chart (Figure 1-3) in its guidance for describing the coordination of LTCP development and water quality standards review and revision (USEPA, 2001d). This WB/WS

Facility Plan is the work product between steps 4 and 5 on Figure 1-3. This plan will form the basis for the LTCP for Alley Creek and Little Neck Bay.

It is important to note that New York City's CSO abatement efforts were prominently displayed as model case studies by USEPA during a series of seminars held across the United States in 1994 to discuss the CSO Control Policy with permittees, WQS authorities, and NPDES permitting authorities (USEPA, 1994). New York City's field investigations, watershed and receiving water modeling, and facility planning conducted during the Paerdegat Basin Water Quality Facility Planning Project were specifically described as a case study during the seminars. Additional NYCDEP efforts in combined sewer system characterization, mathematical modeling, water quality monitoring, floatables source and impact assessments, and use attainment were also displayed as model approaches to these elements of long-term CSO planning.

1.2.3 New York State Policies and Regulations

In accordance with the provisions of the Clean Water Act, the State of New York has established water quality standards for all navigable waters within its jurisdiction. The State has developed a system of waterbody classifications based on designated uses that includes five saline classifications for marine waters, as shown in Table 1-1.

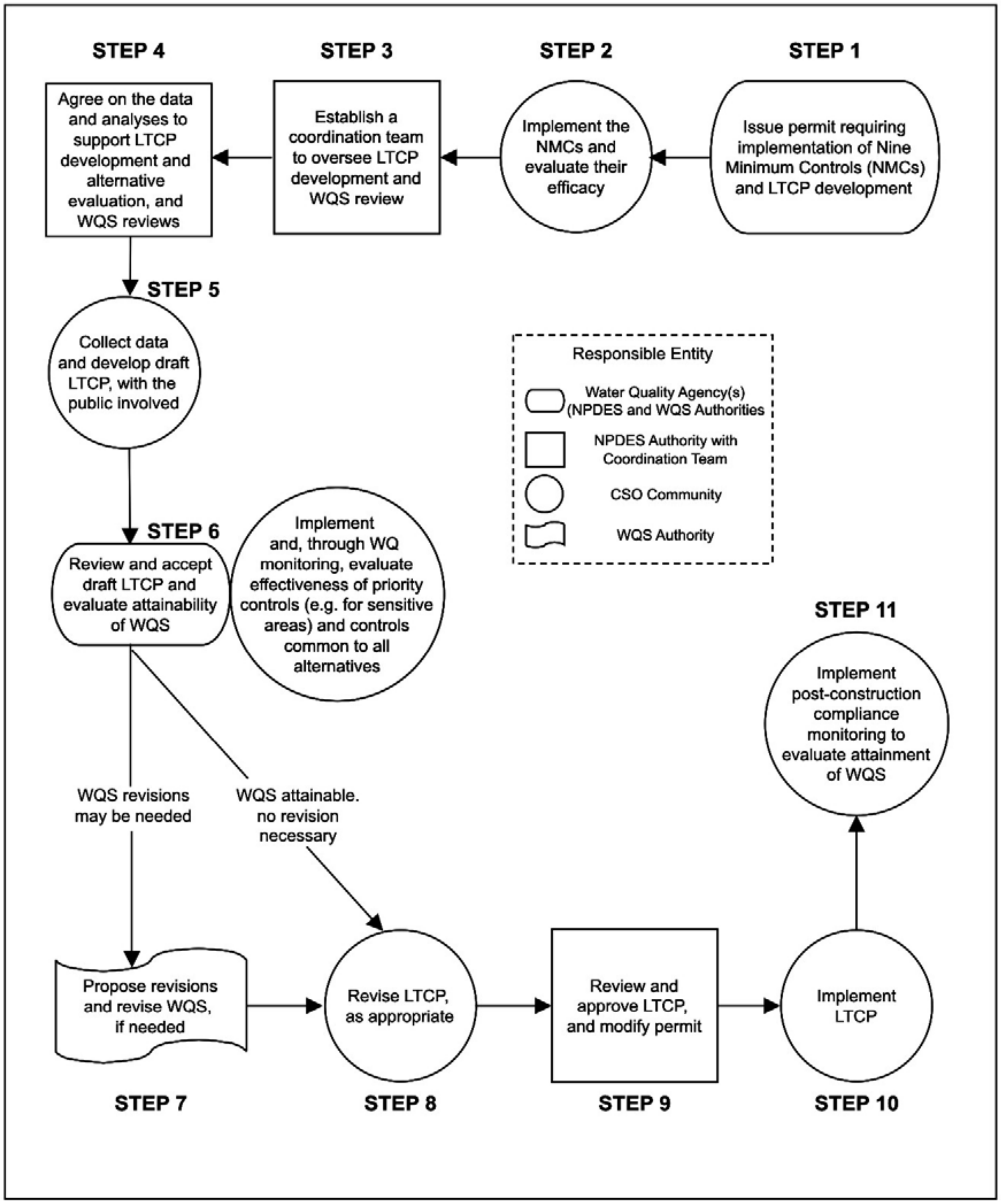
NYSDEC considers the SA and SB classifications to fulfill the Clean Water Act goals of fully supporting aquatic life and recreation. Class SC supports aquatic life and recreation but the recreational use of the waterbody is limited due to other factors. Class I supports the Clean Water Act goal of aquatic life protection and supports secondary contact recreation. SD waters shall be suitable only for fish, shellfish and wildlife survival because natural or manmade conditions limit the attainment of higher standards. NYSDEC has classified Alley Creek as Class I and Little Neck Bay as Class SB.

Dissolved Oxygen

Dissolved oxygen is the numerical standard that NYSDEC uses to establish whether a waterbody supports aquatic life uses. The numerical dissolved oxygen standard for Alley Creek (Class I) requires that dissolved oxygen concentrations shall not be less than 4.0 mg/L at any time at any location within Alley Creek. Little Neck Bay Class SB dissolved oxygen standards include an acute and a chronic exposure component. The ambient water quality dissolved oxygen chronic standard is a minimum daily average of 4.8 mg/L with allowable excursions (see Table 1-1) between 4.8 and 3.0 mg/L (chronic) but never less than 3.0 mg/L (acute).

Bacteria

Total and fecal coliform bacteria concentrations are the numerical standards that NYSDEC uses to establish whether a waterbody supports recreational uses. The numerical bacteria standards for Alley Creek (Class I) require that total coliform bacteria must have a monthly geometric mean of less than 10,000 per 100 mL from a minimum of five examinations. Fecal coliform (Class I) must have a monthly geometric mean of less than 2,000 per 100 mL from a minimum of five examinations. The numerical bacteria standards for Little Neck Bay (Class SB) require that total coliform have a monthly median less than 2,400 per 100 mL and



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Long-Term CSO Control Planning Procedures

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 1-3

Table 1-1. New York State Numerical Surface Water Quality Standards (Saline)

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

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

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

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

$$\sum_{i=1}^{n} \frac{t_i \ (actual)}{t_i \ (allowed)} < 1.0$$

(2) Acute standard (never less than 3.0 mg/L).
(3) Median most probable number (MPN) value in any series of representative samples.
(4) Monthly median value of five or more samples.
(5) Monthly 80th percentile of five or more samples.
(6) Monthly geometric mean of five or more samples.

that 80 percent of the measurements be less than 5,000 per 100 mL. Fecal coliform standards for Little Neck Bay require a monthly geometric mean less than 200 per 100 mL from a minimum of five samples Bathing is practiced within Little Neck Bay at the Douglas Manor Association Beach.

An additional NYSDEC standard for primary contact recreational waters such as Little Neck Bay (Class SB) is a maximum allowable enterococci concentration of a 30-day moving geometric mean of 35 per 100 mL for a representative number of samples. This standard, although not promulgated, is now an enforceable standard in New York State since the USEPA established January 1, 2005 as the date upon which the criteria must be adopted for all coastal recreational waters. The enterococcus standard does not apply to Alley Creek (or other Class I waters).

For designated bathing beach areas, the USEPA criteria require that an enterococcus reference level of 104 per 100 mL to be used by agencies for announcing bathing advisories or beach closings in response to pollution events. The Douglas Manor Association (DMA) is a private club given a permit to operate a beach by New York City Department of Health and Mental Hygiene (NYCDOHMH). NYCDOHMH uses a 30-day moving geometric mean (GM) of 35 enterococcus. If the geometric mean is greater than 35 enterococcus/100 mL, the beach is closed pending additional analysis. An enterococcus of 104 is an advisory upper limit. If beach enterococcus data are greater than 104 per 100 mL, a pollution advisory is posted on the web-site. Additional sampling is initiated and the advisory is removed when water quality is acceptable. Advisories are posted at the beach and on the agency web-site. In addition, there is a preemptive standing advisory for DMA Beach for no swimming for 48 hours after a rainfall of 0.2 inches in 2 hours or a rainfall of 0.4 inches in 24 hours.

For non-designated beach areas of primary contact recreation, which are used infrequently for primary contact, the USEPA criteria require that an enterococcus reference level of 501 per 100 mL be considered indicative of pollution events. Little Neck Bay is classified SB (primary contact recreation use). However, with the exception of the DMA Beach, Little Neck Bay is used infrequently for primary contact recreation. These reference levels, according to the USEPA documents, are not standards but are to be used as determined by the state agencies in making decisions related to recreational uses and pollution control needs. For bathing beaches, these reference levels are to be used for announcing beach advisories or beach closings in response to pollution events.

Narrative Standards

In addition to numerical standards, New York State also has narrative criteria to protect aesthetics in all waters within its jurisdiction, regardless of classification. These standards also serve as limits on discharges to receiving waters within the State. Unlike the numeric standards, which provide an acceptable concentration, narrative criteria generally prohibit quantities that would impair the designated use or have a substantial deleterious effect on aesthetics. Important exceptions include garbage, cinders, ashes, oils, sludge and other refuse, which are prohibited in any amounts. The term “other refuse” has been interpreted to include floatable materials such as street litter that find their way into receiving waters via uncontrolled CSO discharges. It should be noted that, in August 2004, USEPA Region II recommended NYSDEC “Revise the narrative criteria for aesthetics to clarify that these criteria are meant to protect the best use(s) of the water, and not literally require "none" in any amount, or provide a written clarification to this end." Table 1-2 summarizes the narrative water quality standards.

Table 1-2. New York State Narrative Water Quality Standards

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

1.2.4 Interstate Environmental Commission (IEC)

The States of New York, New Jersey, and Connecticut are signatory to the Tri-State Compact that designated the Interstate Environmental District and created the IEC. The Interstate Environmental District includes all tidal waters of greater New York City. Originally established as the Interstate Sanitation Commission, the IEC may develop and enforce waterbody classifications and effluent standards to protect waterbody uses within the Interstate Environmental District. The applied classifications and effluent standards are intended to be consistent with those applied by the signatory states. There are three waterbody classifications defined by the IEC, as shown in Table 1-3.

Table 1-3. Interstate Environmental Commission Numeric Water Quality Standards

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

In general, IEC water quality regulations require that all waters of the Interstate Environmental District are free from floating and settleable solids, oil, grease, sludge deposits, and unnatural color or turbidity to the extent necessary to avoid unpleasant aesthetics, detrimental impacts to the natural biota, or use impacts. The regulations also prohibit the presence of toxic or deleterious substances that would be detrimental to fish, offensive to humans, or unhealthful in biota used for human consumption. The IEC also restricts CSO discharges to within 24 hours of a precipitation event, consistent with the NYSDEC definition of a prohibited dry weather discharge. IEC effluent quality regulations do not apply to CSOs if the combined sewer system is being operated with reasonable care, maintenance, and efficiency. Although IEC regulations are intended to be consistent with state water quality standards, the three-tiered IEC system and the five New York State marine classifications in New York Harbor do not spatially overlap exactly. Alley Creek and Little Neck Bay are interstate waters and are regulated by IEC as Class A waters.

1.2.5 Administrative Consent Order

New York City's 14 SPDES permits contain conditions designed to comply with federal and state CSO requirements. NYCDEP was unable to comply with deadlines imposed in their 1988 permits for completion of four CSO abatement projects initiated in the early 1980s. As a result, NYCDEP entered into an Administrative Consent Order with NYSDEC on June 26, 1992 which was incorporated into the SPDES permits with a provision stating that the Consent Order governs NYCDEP obligations for its CSO program. It also required NYCDEP to implement CSO abatement projects in nine facility planning areas divided into two tracks: those areas where dissolved oxygen and coliform standards were being contravened (Track One), and those areas for which floatables control was necessary (Track Two). The 1992 Order was modified on September 19, 1996 to add catch basin cleaning, construction, and repair programs.

NYCDEP and NYSDEC negotiated a new Consent Order that was signed January 15, 2005. The 2005 CSO Consent Order supersedes the 1992 Order and its 1996 Modifications with the intent to bring all NYCDEP CSO-related matters into compliance with the provisions of the Clean Water Act and Environmental Conservation Law. The 2005 Order contains requirements to evaluate and implement CSO abatement strategies on an enforceable timetable for 18 waterbodies and, ultimately, for city-wide long-term CSO control in accordance with USEPA CSO Control Policy. This order was modified and the modification was executed on April 14, 2008. NYCDEP and NYSDEC also entered into a separate Memorandum of Understanding (MOU) to facilitate water quality standards reviews in accordance with the CSO Control Policy.

1.3 CITY POLICIES AND OTHER LOCAL CONSIDERATIONS

New York City's waterfront is approximately 578 miles long, encompassing 17 percent of the total shoreline of the State. This resource is managed through multiple tiers of zoning, regulation, public policy, and investment incentives to accommodate the diverse interests of the waterfront communities and encourage environmental stewardship. The local regulatory considerations are primarily applicable to proposed projects and, as such, do not preclude the existence of non-conforming waterfront uses. However, evaluation of existing conditions within the context of these land use controls and public policy can anticipate the nature of long-term growth in the watershed.

1.3.1 New York City Waterfront Revitalization Program

The New York City Waterfront Revitalization Program (WRP) is the City's principal coastal zone management tool and is implemented by the New York City Department of City Planning. The WRP establishes the City's policies for development and use of the waterfront and provides a framework for evaluating the consistency of all discretionary actions in the coastal zone with City coastal management policies. Projects subject to consistency review include any project located within the coastal zone requiring a local, state, or federal discretionary action, such as a Uniform Land Use Review Procedure (ULURP) or a City Environmental Quality Review (CEQR). An action is determined to be consistent with the WRP if it would not substantially hinder and, where practicable, would advance one or more of the ten WRP policies. The New York City WRP is authorized under the New York State Waterfront Revitalization and Coastal Resource Act of 1981 that, in turn, stems from the Federal Coastal Zone Management Act of 1972. The original WRP was adopted in 1982 as a local plan in accordance with Section 197-a of the City Charter, and incorporated the 44 state policies, added 12 local policies, and delineated a coastal zone to which the policies would apply. The program was revised in 1999, and the new WRP policies were issued in September 2002. The revised WRP condensed the 12 original policies into 10 policies: (1) residential and commercial redevelopment; (2) water-dependent and industrial uses; (3) commercial and recreational boating; (4) coastal ecological systems; (5) water quality; (6) flooding and erosion; (7) solid waste and hazardous substances; (8) public access; (9) scenic resources; and (10) historical and cultural resources.

1.3.2 New York City Comprehensive Waterfront Plan

The City's long-range goals are contained in the Comprehensive Waterfront Plan (CWP). The CWP identifies four principal waterfront functional areas (natural, public, working, and redeveloping) and promotes use, protection, and redevelopment in appropriate waterfront areas. The companion Borough Waterfront Plans (1993-1994) assess local conditions and propose strategies to guide land use change, planning and coordination, and public investment for each of the waterfront functional areas. The CWP has been incorporated into local law through land use changes, zoning text amendments, public investment strategies, and regulatory revisions, providing geographic specificity to the WRP and acknowledging that certain policies are more relevant than others on particular portions of the waterfront.

1.3.3 Department of City Planning Actions

The New York City Department of City Planning (NYCDCP) was contacted to identify any projects either under consideration or in the planning stages that could substantially alter the land use in the vicinity of Alley Creek and Little Neck Bay. NYCDCP reviews any proposal that would result in a fundamental alteration in land use, such as zoning map and text amendments, special permits under the Zoning Resolution, changes in the City Map, the disposition of city-owned property, and the siting of public facilities. In addition, NYCDCP maintains a library of City-wide plans, assessments of infrastructure, community needs evaluations, and land use impact studies. These records were reviewed and evaluated for their potential impacts to waterbody use and runoff characteristics, and the NYCDCP community district liaison for Queens Community Board 11 was contacted to determine whether any proposals in process that required NYCDCP review might impact this WB/WS Facility Plan.

1.3.4 New York City Economic Development Corporation

The New York City Economic Development Corporation (NYCEDC) was contacted to identify any projects either under consideration or in the planning stages that could substantially alter the land use in the vicinity of Alley Creek and Little Neck Bay. The NYCEDC is charged with dispensing City-owned property to businesses as a means of stimulating economic growth, employment, and tax revenue in the City of New York while simultaneously encouraging specific types of land use in targeted neighborhoods. As such, NYCEDC has the potential to alter land use on a large scale.

In addition, NYCEDC serves as a policy instrument for the Mayor's Office. For example, NYCEDC recently issued a white paper on industrial zoning intended to create and protect industrial land uses throughout the City (Office of the Mayor, 2005). The policy directs the replacement of the current In-Place Industrial Parks (IPIPs) with Industrial Business Zones (IBZs) that more accurately reflect the City's industrial areas. Policies of this nature can have implications on future uses of a waterbody as well as impacts to collection systems, so a thorough review of NYCEDC policy and future projects was performed to determine the extent to which they may impact the WB/WS Facility Plan.

1.3.5 Local Law

Local law is a form of municipal legislation that has the same status as an act of the State Legislature. The power to enact local laws is granted by the New York State Constitution, with the scope and procedures for implementation established in the Municipal Home Rule Law. In New York City, local laws pertaining to the use of City waterways and initiatives associated with aquatic health have been adopted beyond the requirements of New York State. Recent adoptions include Local Law 71 of 2005, which required the development of the Jamaica Bay Watershed Protection Plan (JBWPP), and Local Law 5 of 2008, which requires City-owned building or City-funded reconstruction to include certain sustainable practices, as well as requiring the City to draft a sustainable stormwater management plan by Oct. 1, 2008. These initiatives are discussed in Section 5 in detail.

1.3.6 Bathing Beaches

Local law includes the requirements for operation and maintenance and siting of bathing beaches. Therefore, siting requirements imposed by State and City codes must be considered to evaluate the potential use of a waterbody for primary contact recreation. These requirements include minimum distances from certain types of regulated discharges (such as CSO outfalls), maximum bottom slopes, acceptable bottom materials, minimum water quality levels, and physical conditions that ensure the highest level of safety for bathers.

Bathing beaches in New York City are regulated, monitored, and permitted by the City and State under Article 167 of the New York City Health Code and Section 6-2.19 of the New York City Sanitary Code. Douglas Manor Association Beach is a private beach within the Alley Creek and Little Neck Bay Assessment Area located on the southeast shore of Little Neck Bay on the Douglaston Peninsula.

1.4 REPORT DESCRIPTION

This report has been organized to clearly describe the proposed WB/WS Facility Plan that supports the Long-Term CSO Control Planning process and the environmental factors and engineering considerations that were evaluated in its development. The nine elements of long-term CSO control planning are listed in Table 1-4 along with relevant sections within the present document for cross-referencing. Section 1.0 presents general planning information and regulatory considerations that informed the WB/WS Facility Plan development. Sections 2.0, 3.0, and 4.0 describe the watershed characteristics, existing sewer system facilities and waterbody characteristics, respectively. Section 5.0 describes related waterbody improvement projects within the waterbody and the greater New York Harbor. Section 6.0 describes the public participation and agency interaction that went into the development of this WB/WS Facility Plan, as well as an overview of the NYCDEP public outreach program. Sections 7.0 and 8.0 describe the alternatives evaluation performed in the development of the recommended plan. Section 9.0 discusses the review and revision of water quality standards. The report concludes with references in Section 10.0 and a glossary of terms and abbreviations in Section 11.0. Attached for reference are the Wet Weather Operating Plans for the Tallman Island WPCP and the Alley Creek CSO Storage Facility, Tallman Island WPCP Schematics with and without the Alley Creek CSO Retention Tank, model alternative results, public opinion survey results, and Stakeholder Team meeting notes.

Table 1-4. Report Locations of the Nine Elements of Long-Term Control Planning

No.	Element	Location(s) within Report
1	Characterization of the Combined Sewer System	3.0
2	Public Participation	6.0
3	Consideration of Sensitive Areas	4.7
4	Evaluation of Alternatives	7.0
5	Cost/Performance Considerations	7.0
6	Operational Plan	8.0
7	Maximizing Treatment at the Existing WPCP	7.0 and 8.0
8	Implementation Schedule	8.0
9	Post-Construction Compliance Monitoring	8.0

2.0 Watershed Characteristics

The present-day Alley Creek and Little Neck Bay watershed (Figure 1-2) is urbanized and sub-urbanized. Although the watershed has undergone major changes, significant effort and interest by the citizens living in the area and New York City agencies has resulted in recognition of the ecological, environmental and educational value of Alley Creek and its tidal wetlands. In contrast to the filling in of wetlands and "hardening" of the shoreline with bulkheads that characterizes most of New York City's pre-colonial wetlands much of Alley Creek's wetlands and the Little Neck Bay wetlands in Udalls Cove are designated parks. The location of Alley Creek and Little Neck Bay in a highly urbanized city, however, has led to the creation of combined sewer systems and stormwater systems that discharge to the creek and bay.

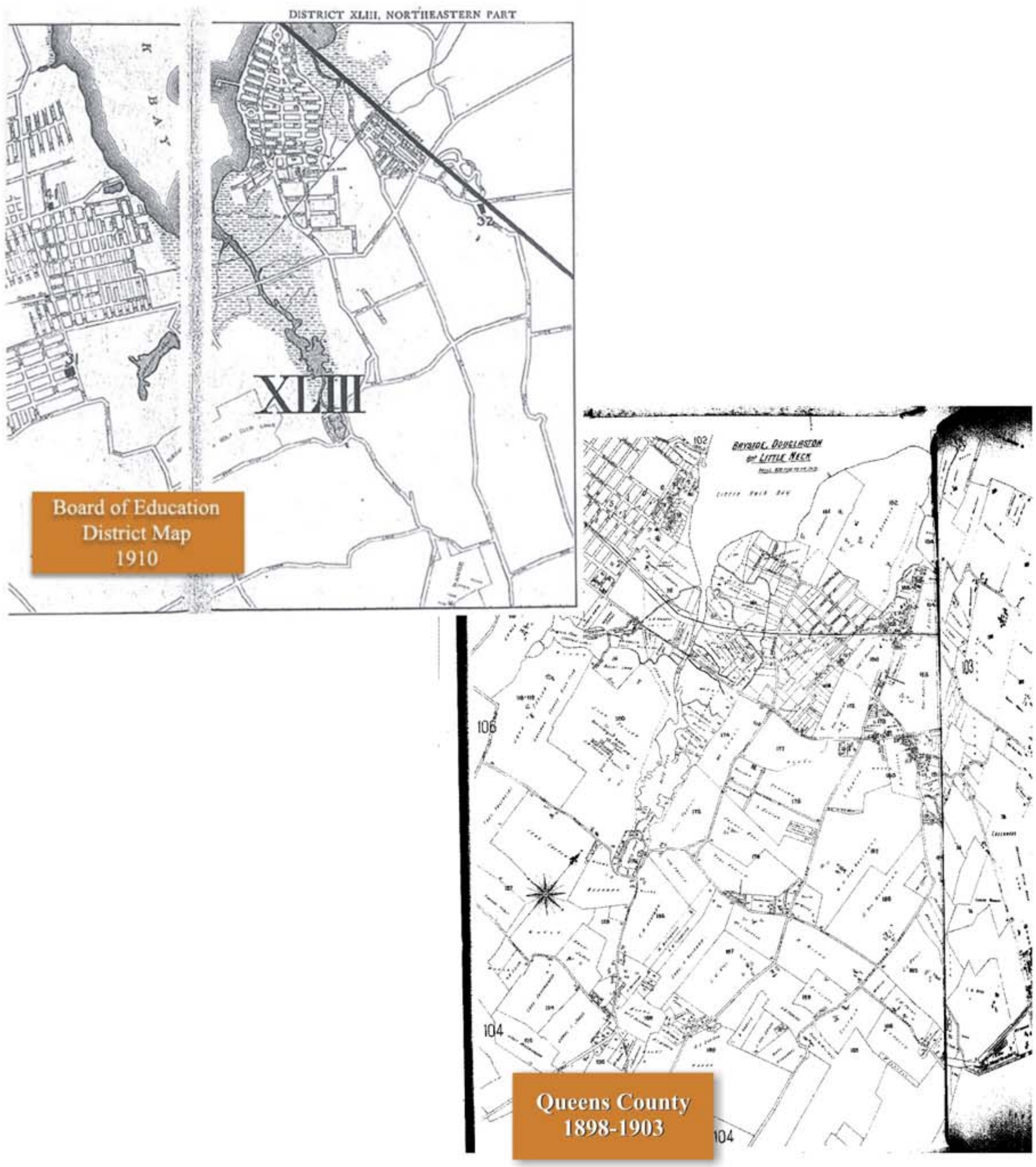
This section describes the history and urbanization of the watershed and other physical changes impacting the Alley Creek and Little Neck Bay. Information is also included related to existing and proposed land uses and zoning in the watershed and in the riparian areas surrounding Alley Creek and Little Neck Bay. This section also addresses possible landside pollutant sources from activities that have the potential to impact water quality in the creek and bay.

2.1 HISTORICAL CONTEXT OF WATERSHED URBANIZATION

The first inhabitants of the watershed were the Matinecock Indians, who thrived for centuries on Little Neck Bay's wealth of wampum shells and seafood. The Matinecocks called the bay Men-haden-Ock, which translated as "place of fish." However, in the 1630s through the 1650s, the native Americans were displaced by English and Dutch settlers. During the colonial period farming was the primary use of the land, with a few large families as the predominant land owners. There were also small "truck" farmers, artisans, merchants and oysterman. The commercial trading center for the area was the Alley Pond settlement, so-named after a farm pond on the creek upstream of its discharge to Little Neck Bay. (Bayside Historical Society, 1989; Newsday, 2005).

This pattern of development continued into the mid-19th century. In the early 19th century the construction of several turnpikes improved farmers' access to the urban markets in New York City. The 1850s and 1860s saw large numbers of working class German and Irish immigrants settle in the industrial sections of western Queens, while the northeastern neighborhoods near Little Neck began to be a suburban haven for the country homes of wealthy New Yorkers. Figure 2-1 includes sections of two historic early 20th century maps of Alley Creek and Little Neck Bay. The map of the study area dated from 1898 to 1903 shows large lots, farms and estates. Higher density housing areas and developed neighborhoods can be seen. (Douglaston/Little Neck Historical Society, 2005). The Board of Education Map from 1910 shows Alley Creek and Udalls Cove wetlands in addition to streets.

During the mid-1800s there was a thriving commercial shellfishery in Little Neck Bay, which was particularly known for the harvest of small hard clams commonly known both locally and outside the area as Little Neck clams. There was a local community of watermen who thrived on the harvest of oysters and clams. However, the developing suburban population



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Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Alley Creek and Little Neck Bay Watersheds, Early 1900s

FIGURE 2-1

in the adjacent watershed placed pollution pressures on the resource, and the condemnation of the shellfish beds due to pollution took place in 1909. (Federal Writers Project, 1939).

Continued development of the area as a commuter suburb of New York City had significant physical impacts on the waterbody, particularly as a biological habitat. The Cross Island Parkway, built in the late 1930s along the western shoreline of the Bay, radically transformed the previous natural shoreline habitat. Similarly, the Long Island Railroad, Northern Boulevard and the Long Island Expressway running along the east-west corridor disrupted wetland areas along either side of Alley Creek at the southern end of Little Neck Bay. (Bayside Historical Society, 1989). Figure 2-2 is a current aerial view of the assessment area showing the extent of development and urbanization.

However, since the 1960s there has been particular interest by local environmental groups and by various city, state and federal agencies to restore some of the natural wetland areas that were degraded by previous development. Two locations where significant restoration success has occurred and is continuing are the restoration of Aurora Pond on the Gabler's Creek tributary to Udalls Cove, on the east side of Little Neck Bay; and Alley Pond, a wetland that has been restored as part of Alley Park, at the southern end of the bay. (Udalls Cove Preservation Committee, 2005; Alley Pond Environmental Center, 2005.) In its Hudson-Raritan Estuary study, the US Army Corps of Engineers (USACE, 2004) cites Little Neck Bay as one of "the more ecologically significant areas within the Western Long Island Sound," citing its important northern quahog clam beds. The Alley Pond Park is identified as a priority ecosystem restoration site with potential salt marsh restoration of approximately 60 acres (USACE, 2004). In its Comprehensive Conservation and Management Plan (CCMP), the Long Island Sound Study identifies Alley Pond as one of its "Stewardship-in-depth" sites, citing its importance as an important winter waterfowl area and a very important Spring Striped Bass recreational fishery, (Long Island Sound Study, 2005). The national environmental conservation group, Trout Unlimited, cited Alley Creek as an "urban river success story," describing recent efforts to study and improve the fishery habitat and the potential for establishing an unusual coldwater brook trout fishery in this "periurban" environment. (Trout Unlimited, 2002).

2.2 LAND USE CHARACTERIZATION

2.2.1 Existing Land Uses

Alley Creek is a tributary of Little Neck Bay that converges with the Upper East River near Long Island Sound. Udalls Cove also feeds into Little Neck Bay, but shares a border with Nassau County. The creek and bay are located on the north shore of eastern Queens County, adjacent to the Nassau County border. The land surrounding Alley Creek is mostly parkland, while that surrounding Little Neck Bay is largely residential. Alley Creek flows in a generally south-to-north direction. Bay Terrace and Bayside border Little Neck Bay and Alley Creek to the west, while Douglas Manor and Douglaston lie to the east. Oakland Gardens is located to the southwest of Alley Creek and Alley Pond Park.

The existing land uses along Alley Creek, Little Neck Bay and Udalls Cove primarily consist of parkland and residential areas. Land immediately surrounding Udalls Cove is mostly open space, with a few small parks. Douglas Manor, abutting Nassau County, is almost completely residential, with single-family detached residences, except for a small inland park

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FIGURE 2-2

and a strip of parkland running the length of Douglas Manor's western shoreline. This parkland is a shorefront walkway developed for the use of all Douglas Manor property owners. South of Douglas Manor is Douglaston, where small parcels of vacant, commercial and low-density residential lands border Alley Pond Park, which surrounds Alley Creek on its eastern, western and southern shores. Long Island Railroad Northern Division, the Long Island Expressway, Northern Boulevard and the Cross Island Parkway all traverse Alley Pond Park, dividing it into separate parcels and limiting the movement of reptiles, amphibians and small mammals throughout the area.

North of Alley Pond Park, extending from 43rd Avenue to 24th Avenue, is a large residential area consisting of single family homes. Crocheron Park and John Golden Park lie halfway between 43rd and 24th Avenues. Immediately northeast of 24th Avenue is the Bay Terrace Shopping Center at 26th Avenue and Bell Boulevard. To the north of the shopping center existing land use is again residential, consisting of garden apartments, two-family homes and high-rise buildings.

The northernmost parcel of land bordering Little Neck Bay is Fort Totten, a United States Government Reservation, built in the mid- to late- 1800s to protect the eastern entrance of New York Harbor. It is zoned as a Special Natural Area District to protect the natural features should it be redeveloped for another use. The Cross Island Parkway contains a waterfront pedestrian/bike path (see Plate 2-1) extending from Fort Totten to Northern Boulevard that is accessible by pedestrian bridges over the roadway.

2.2.2 Land Use Zoning

Starting at the northeast edge of the waterbody within New York City, land immediately southeast of Udalls Cove is zoned C3 (commercial local retail), while surrounding land is zoned for low density residential, detached and attached (R1-2, R-2 and R3-1). The whole Douglas Manor peninsula is zoned for detached housing on large lots (R1-2). The land immediately surrounding Alley Creek is designated parkland. The residential area to the east of the creek is R1-2, while that to the west is R2. Residential land on the western shore, north of the railroad tracks is zoned R3-2 and R2. Moving north, Crocheron Park and John Golden Park are designated parkland. The area between John Golden Park and Fort Totten is known at Bayside. Previous zoning allowed R5 (mid-density, including multi-story rowhouses). The NYCDCP rezoned 350 blocks in the Bayside area of northeastern Queens, Community District 11 (CD11). Much of the area is now rezoned to contextual districts, permitting development of only one- and two-family homes, to maintain Bayside's longstanding neighborhood character. To curb recent development trends toward unusually large single-family houses in areas currently zoned R2, NYCDCP established a new low-density contextual zoning district, R2A. This new district limits floor area and height and other bulk regulations that are different from the former R2 district (NYCDEP website 2005). Fort Totten is zoned R3-1, C3 and NA-4. The NA-4 designation is a Special Natural Area District (SNAD). This protects the area by limiting modifications in topography, by preserving tree, plant and marine life, and natural water courses, and by requiring clustered development to maximize preservation of natural features.

Plate 2-1: Bike Path along western shoreline of Little Neck Bay near 35th Avenue, looking northwest

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Plate 2-1

Generalized land use within the New York City portion of the Alley Creek and Little Neck Bay assessment area and within the riparian area of 1/4 mile of Alley Creek and Little Neck Bay shoreline are shown on Figure 2-3a and Figure 2-3b. Land use within the Alley Creek, Little Neck Bay drainage area is summarized in Table 2-1. The main land use is residential with sizeable fractions of Open Space and Outdoor Recreation and Vacant Land. It should be noted that major sections of Vacant Land are parks (see * on Figure 2-3a) but are listed as vacant.

Table 2-1. Land Use Within the Alley Creek and Little Neck Bay Drainage Area

Land Use Category	Percent of Area (NYC)	
	Riparian Area (1/4 mile radius)	Drainage Area
Commercial	1%	4%
Industrial	0%	0%
Open Space & Outdoor Recreation	29%	15%
Mixed Use & Other	2%	3%
Public Facilities & Institutions	17%	7%
Residential	38%	62%
Transportation & Utility	2%	1%
Vacant Land	11%	8%

2.2.3 Proposed Land Uses

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

2.2.4 Neighborhood and Community Character

The land surrounding Udalls Cove, known as Udalls Cove Preserve, is open and undeveloped due to the efforts of a local grassroots community group dedicated to its preservation. Mapped as a New York City Park in 1972, it includes a 2.5 mile nature trail and park ranger tours. Douglas Manor is residential with houses on large landscaped lots. In 1997, the Landmark Preservation Commission (LPC) designated a Douglaston Historic District which covers 550 homes, all of Douglas Manor and part of Douglaston. The LPC designated the Douglaston Hill Historic District in 2004. The Douglas Manor shorefront walkway is intended for the use of residents. Douglaston Yacht Club lies at the end of Beverly Road and provides waterfront recreational activities including the DMA Beach. The Long Island Rail Road (LIRR) crosses Alley Creek just north of 43rd Avenue. The area south of this is Alley Pond Park. At 655 acres, the park is the second largest in Queens. Recreational activities are provided by 26 acres of playing fields, a nature train, and walking and bicycle paths. Educational programs and cultural events are held in the Alley Pond Environmental Center. Oakland Lake, a freshwater lake and wetlands area added to the park in 1990, features wildlife and bird habitat and a promenade.

The residential area northwest of Alley Pond Park is made up of single family homes on small lots, each having its own parking space. Crocheron Park and John Golden Park, north of the residential area, provide many recreational activities, such as Little League, baseball and tennis. The Cross Island Bike Path also begins in this area and travels north. Residential areas north of these two parks are small single-family homes, three-story rowhouses and small apartment buildings. The Bayside Marina (see Plate 2-2) is in this general area too. Fort Totten, with its south shore in Little Neck Bay and north shore in the East River, provides Little League, soccer and wildlife viewing areas. The recent rezoning of Bayside to limit the size and density of development is evidence of the neighborhood character desired by the residents (NYCDCP, 2005).

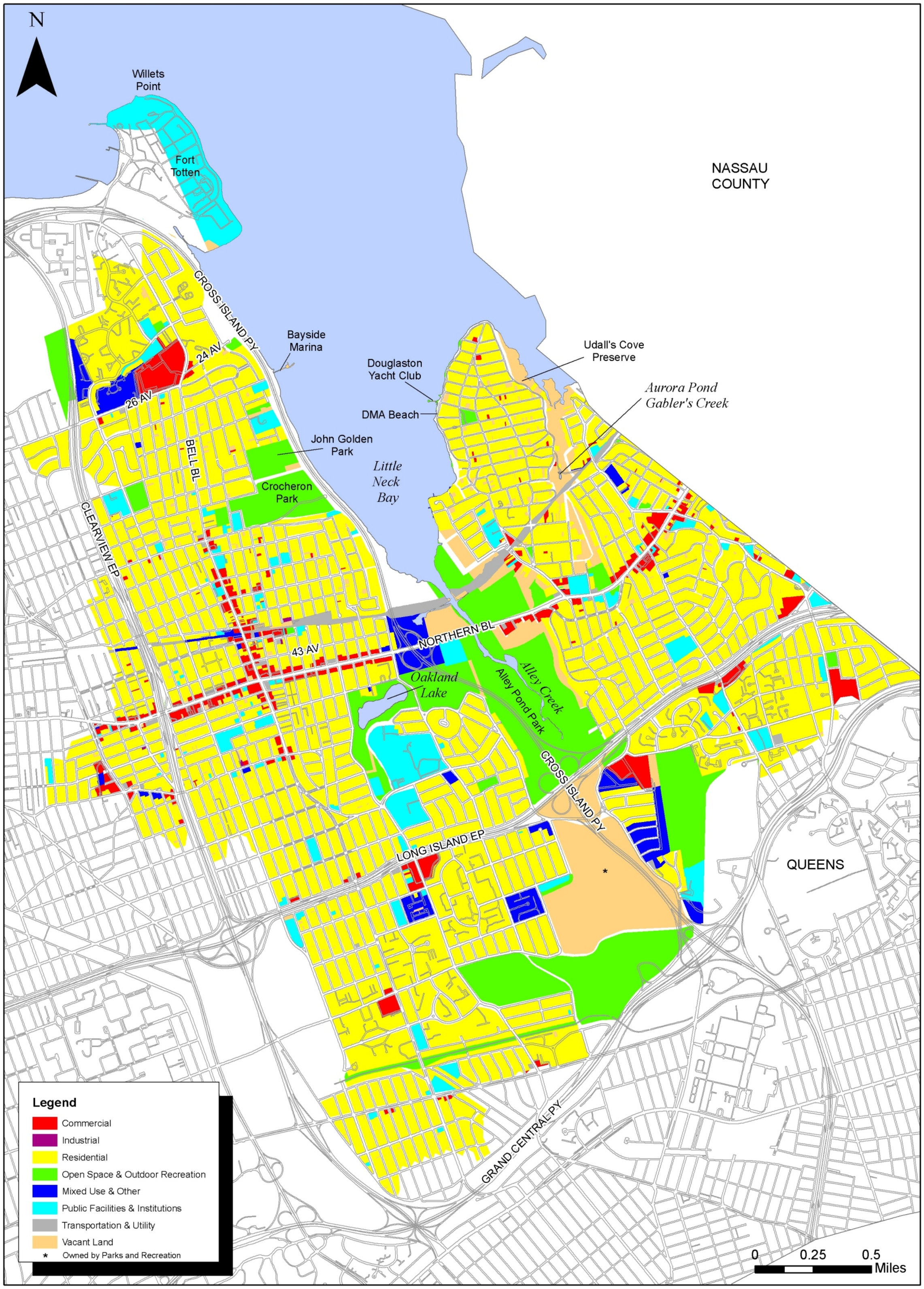
2.2.5 Consistency with the "Waterfront Revitalization Program" and "Comprehensive Waterfront Plan"

The Waterfront Revitalization Program (WRP) has designated Alley Pond Park, Udalls Cove and Ravine and Little Neck Bay as Special Natural Waterfront Areas (SNWA) and Significant Coastal Fish and Wildlife Habitats. The second designation arises from the locally rare natural habitats utilized by a diverse number of fauna. Tidal wetland habitats are found in Alley Creek, along the shoreline of Douglaston and Douglas Manor and in Udalls Cove and Ravine. Smaller pockets may be found along the eastern and southern shores of Fort Totten and the eastern edge of the Cross Island Parkway.

The existing as well as the proposed future land uses for Alley Creek and Little Neck Bay are generally consistent with the intent and goals of the WRP and the recommendations made in the Plan for the Queens Waterfront and the New York City CWP. There is a plan to acquire and transfer to NYCDPR a portion of land on the eastern side of Udalls Cove. This plan is consistent with the SNWA designation. Another plan includes exploring the feasibility of park use at Fort Totten and providing public access to Udalls Cove and Ravine to facilitate environmental education and passive recreation. As long as visitors are monitored or kept to certain natural areas, these plans would be in accordance with the WRP and CWP and would also take into account the SNWA and Significant Coastal Fish and Wildlife Habitat designations.

2.3 REGULATED SHORELINE ACTIVITIES

An investigation of selected existing federal and state databases was performed in an effort to gather information on potential land-side sites and/or activities that may have the potential to contribute to affect water quality within the Alley Creek Study area, including Little Neck Bay. The site area includes Alley Creek and Little Neck Bay to a point where it meets the East River. Only areas within the Queens County border were assessed. The study area limits generally encompassed the area immediately adjacent to and extending to the nearest adjacent mapped street to Alley Creek and Little Neck Bay. For the purposes of this assessment, sources that were reviewed for their potential affect upon surface waters included the existence of known contaminant spills, the existence of state or federal superfund sites, the presence of SPDES permitted discharges to these waterbodies, and other sources that may have the potential to adversely affect water quality.



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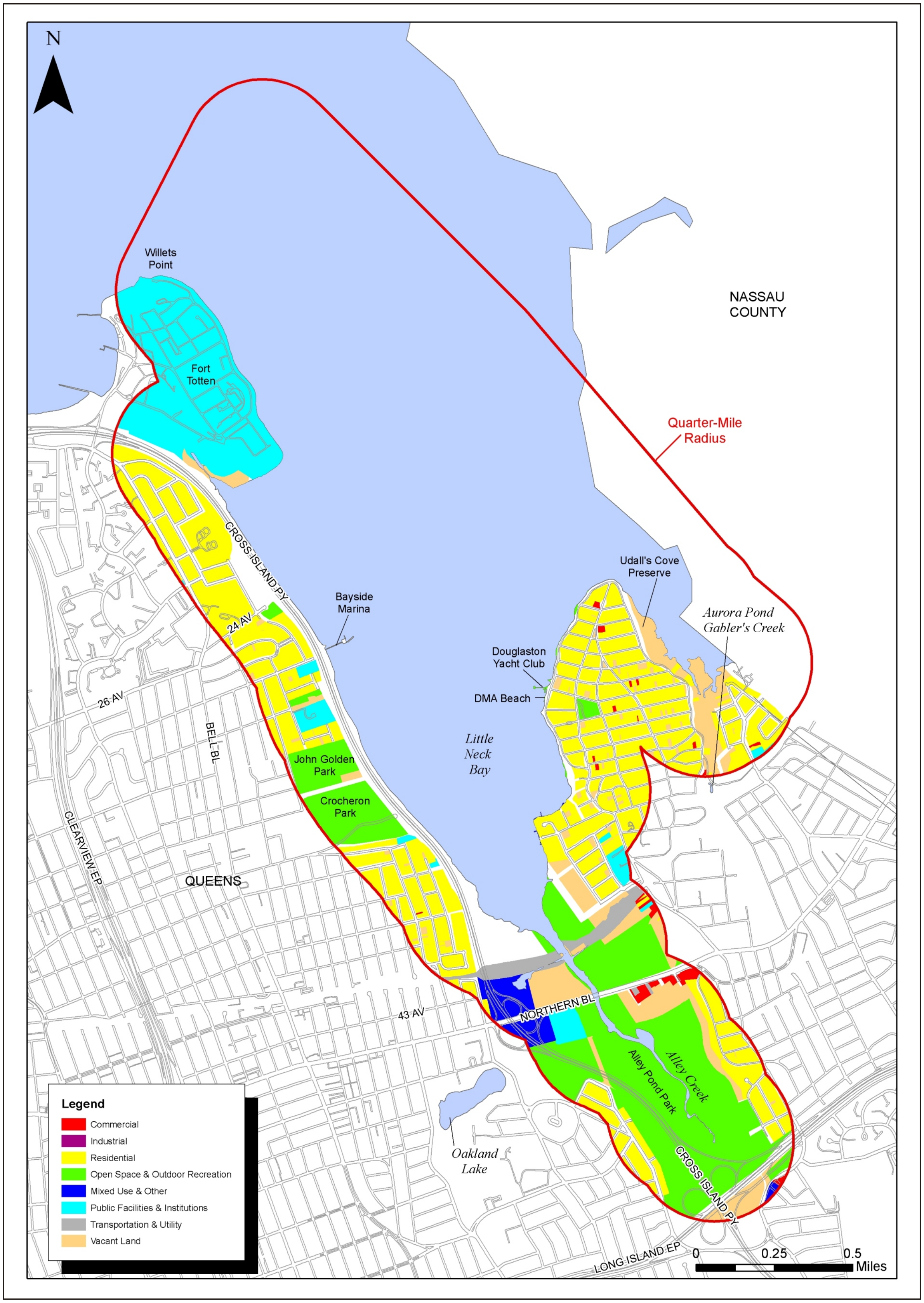
Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Alley Creek and Little Neck Bay Generalized Land Use Map (NYC)

FIGURE 2-3a



Alley Creek and Little Neck Bay Generalized Land Use Map (NYC) (1/4 Mile Radius)

Bayside Marina near 28th Avenue, looking west

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Plate 2-2

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

2.3.1 USEPA and NYSDEC Database Search Results

The USEPA Superfund Information System, which contains several databases with information on existing superfund sites, was reviewed. These databases included: the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS), Resource Conservation and Recovery Act Information (RCRAinfo), Brownfields Management System and the National Priorities List (NPL). In addition to these federal databases, several databases maintained by the NYSDEC were also reviewed. These included the NYSDEC Spill Incident and the Environmental Site Remediation databases, which allow searches of the NYSDEC brownfield cleanup, state superfund (inactive hazardous waste disposal sites), environmental restoration and voluntary cleanup programs and the Petroleum Bulk Storage program database.

A review of the USEPA Superfund Information System indicated that there are no federally listed sites located in proximity to Alley Creek or Little Neck Bay. A review of the NPL and Brownfields database indicated that there are no sites within the study area. The NYSDEC State Superfund Program indicates that an inactive hazardous waste disposal site is located within the Fort Totten Coast Guard property. Fort Totten is located immediately east of the Throgs Neck Bridge in the northwestern corner of Little Neck Bay at the mouth of the bay. A review of the RCRA database indicated that there is one large quantity generator, three small quantity generators, two conditionally-exempt, small quantity generators and three non-identified generator types within proximity of the study area. Under RCRA, a large quantity generator produces over 1,000 kilograms of hazardous waste or over 1 kilogram of acutely hazardous waste per month, while small quantity generators produce between 100 kilograms and 1,000 kilograms of waste per month. Conditionally-exempt, small quantity generators generate 100 kilograms or less per month of hazardous waste, or 1 kilogram or less per month of acutely hazardous waste. RCRA sites in proximity to the study area are listed in Table 2-2.

Table 2-2. RCRA Sites Located in the Vicinity of Alley Creek and Little Neck Bay

Site Name	Address
RCRA Large Quantity Generators	
NYCDOT Bridge BIN 2231900 – Fort Totten	Cross Island Parkway Bridge
RCRA Small Quantity Generators	
Perdido Prods Construction Shop	37-22 23rd Street GRD WHSE [1]
NYCDEP - New Douglaston Pump Station	Parkland North of Long Island Expressway
Best Way Cleaners Corporation	84-26 37th Avenue
RCRA Conditionally-Exempt Small Generator	
Exxon – Tsoukalas & Sons S/S # 7510	Northern Boulevard
Posterloid Corporation	43-01 22nd Street, 4th Floor [1]
Non-Identified RCRA sites [2]	
NOYE, Incorporated	77-05 37th Avenue [1]
NYCDOT BIN 2231870-Northern Boulevard	Northern Blvd over Cross Island Expressway
NYC Dept. of Sanitation Shea Stadium Garage	127-45 34th Avenue

(1) Address represents the address of the registered handler, not the facility.
(2) Indicates sites that do not have a specified handler type description.

The NYSDEC Petroleum Bulk Storage database identified several underground storage tanks (USTs) in the immediate vicinity of Alley Creek and Little Neck Bay. According to the database, there are a total of three (3) UST sites in proximity to the creek. These sites contain USTs that are either in service or closed. The storage capacities of these USTs range between 550 and 13,500 gallons and they store gasoline, No. 6 fuel oil, diesel, and other products. The UST sites and additional information are identified in Table 2-3. The NYSDEC Petroleum Bulk Storage database also revealed that there are no Major Oil Storage Facilities (MOSFs) in the vicinity of Alley Creek or Little Neck Bay.

Table 2-3. Underground Storage Tanks (UST) in Proximity to Alley Creek and Little Neck Bay

Site	Address	Tank Capacity	Product Stored	Number of Tanks	Status
John's Auto Service	231-06 Northern Blvd. Queens, NY	4,000 Gallons 550 Gallons	Gasoline	3 8	In Service Closed-Removed
Red's Service Inc.	233-02 Northern Boulevard Queens, NY	550	Other	12	Temporarily out of order
St. Mary's Hospital for Children	20-01 216th Street Queens, NY	13,500 1,500 2,000	#6 Fuel Oil Empty Diesel	1 2 1	In Service In Service In Service

Review of the remaining NYSDEC Environmental Site Remediation databases indicated that there are no brownfields or environmental restoration sites located in proximity to the Alley Creek and Little Neck Bay study area.

Review of the NYSDEC Spill Incident database indicated that there were 42 spills that have occurred within the past 10 years within one-block of Alley Creek and Little Neck Bay. These spills involved the discharge of materials including No. 2 fuel oil, waste oil/used oil, diesel, unknown petroleum, hydraulic oil, raw sewage, unknown hazardous materials, gasoline and dielectric fluid to surface waters, the municipal sewer system, soil and groundwaters. Of these 42 spills, four remain open as of April 2006 and are listed in Table 2-4. These spills affected soil and possible other resources that were not specified in the database. The largest of the open spills (NYSDEC Spill No. 9901942) occurred at a Burger King on Northern Boulevard in May 1999 and resulted in the release of 15 gallons of No. 2 fuel oil into the soil. The spill occurred less than one-quarter mile south of Alley Creek.

Table 2-4. NYSDEC Open Spills through April 2006 - Alley Creek, Little Neck Bay

Location	Date	Spill Number	Quantity	Material	Resource Affected	Spill Cause
Fort Totten	12/15/1995	9511691	< 1 Gallon	Waste Oil/ Used Oil	Soil	Tank Failure
Fort Totten, B-123	07/01/1996	9604364	< 1 Gallon	Waste Oil/ Used Oil	Soil	Tank Failure
Burger King 222-10 Northern Blvd.	05/20/1999	9901942	15 Gallons	No. 2 Fuel Oil	Soil	Unknown
Douglaston Pumping Station DEP-DDC	11/16/2004	0409033	Not Specified	Raw Sewage	Not Specified	Tank Overfill

2.3.2 NYSDEC Permitted Discharge

One SPDES discharge point was identified within the study area. The Belgrave WPCP, SPDES NY-0026841, located in Great Neck, Nassau County, discharges to the head of Udalls Cove (Little Neck Bay) near 34th Avenue and 255th Street. The Belgrave WPCP is a 2.0 MGD wastewater treatment facility discharging an average of 1.3 MGD of secondary treated, disinfected effluent.

2.3.3 Summary

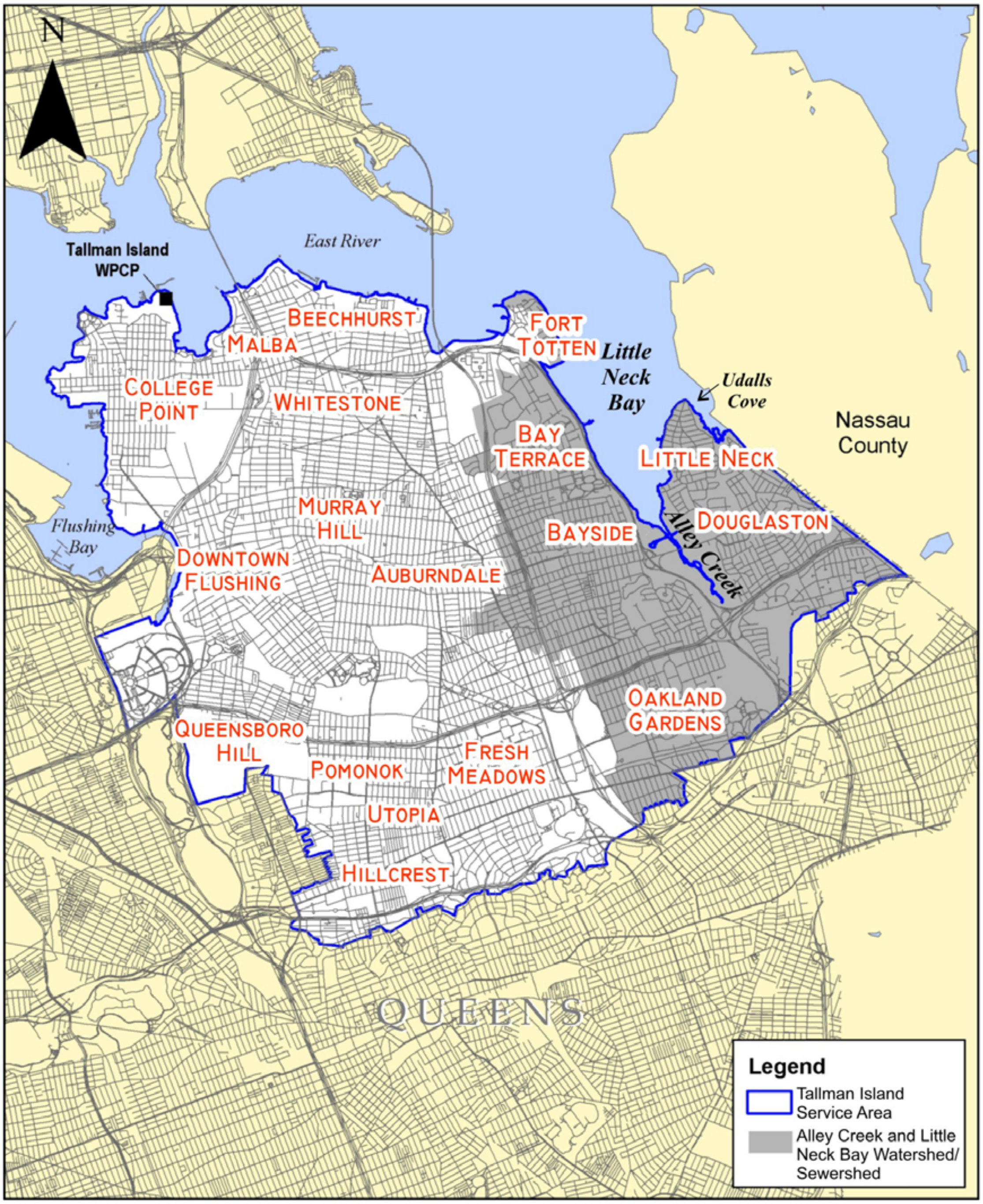
Based upon a review of available databases and other information, none of the potential sources of contamination discussed above are associated with existing or previous combined sewer overflows. These sources, however, have the potential to affect water quality within Alley Creek and Little Neck Bay. The Belgrave WPCP discharge is included in the Alley Creek and Little Neck Bay water quality analyses.

3.0 Existing Sewer System Facilities

The Alley Creek and Little Neck Bay watershed/sewershed is divided between two major political jurisdictions: the Queens Borough of New York City and Nassau County, Long Island, New York. Most of the Queens County portion of watershed is served by the Tallman Island WPCP and associated collection system, shown on Figure 3-1 and described in Section 3.1. The Douglaston neighborhood, on the east bank of Little Neck Bay in Queens Borough, is principally served by on-site septic systems. Wastewater management in the Nassau County portion of the watershed is accomplished by three sanitary sewer districts: 1) the Belgrave Water Pollution Control District, the Great Neck Water Pollution Control District and the Village of Great Neck. The treated effluent from the Belgrave WPCP discharges to Udalls Cove, on the east side of Little Neck Bay. The treatment plants for the other two districts discharge to Manhasset Bay on the east side of the Great Neck Peninsula. In addition, there are properties not in the service areas of these three sewer districts that use on-site septic systems. The locations of the three wastewater treatment facilities and the respective sewershed boundaries are shown in Figure 3-2 and described in Section 3.3.

3.1 TALLMAN ISLAND WPCP

The Tallman Island WPCP is permitted by the NYSDEC under SPDES permit number NY-0026239. The facility is located at 127-01 134th Street, College Point, NY, 11356 in the College Point section of Queens, on a 31-acre site adjacent to Powells Cove, leading into the Upper East River, and bounded by Powells Cove Boulevard. The Tallman Island WPCP serves a sewered area of approximately 12,925 acres in the northeast section of Queens, including the communities of Little Neck, Douglaston, Oakland Gardens, Bayside, Auburndale, Bay Terrace, Murray Hill, Fresh Meadows, Hillcrest, Utopia, Pomonok, Downtown Flushing, Malba, Beechhurst, Whitestone, College Point, and Queensboro Hill. The total sewer length, including sanitary, combined, and interceptor sewers, that feeds into the Tallman Island WPCP is 430 miles. The Tallman Island WPCP has been providing full secondary treatment since 1978. Processes include primary screening, raw sewage pumping, grit removal and primary settling, air-activated sludge capable of operating in the step aeration mode, final settling, and chlorine disinfection. The Tallman Island WPCP has a design dry weather flow (DDWF) capacity of 80 million gallons per day (MGD), and is designed to receive a maximum flow of 160 MGD (2 times DDWF) with 120 MGD (1.5 times DDWF) receiving secondary treatment. Flows over 120 MGD receive primary treatment and disinfection. Wet weather flows to the Tallman Island WPCP are limited to less than 2 times DDWF due to conveyance system limitations which are currently being addressed by NYCDEP. The Tallman Island WPCP 2007 wet weather average sustained flow is 142 MGD. The daily average flow during 2007 was 55.2 MGD, with a dry weather flow average of 53.9 MGD (NYCDEP, 2008). Table 3-1 summarizes the Tallman Island WPCP SPDES permit limits.



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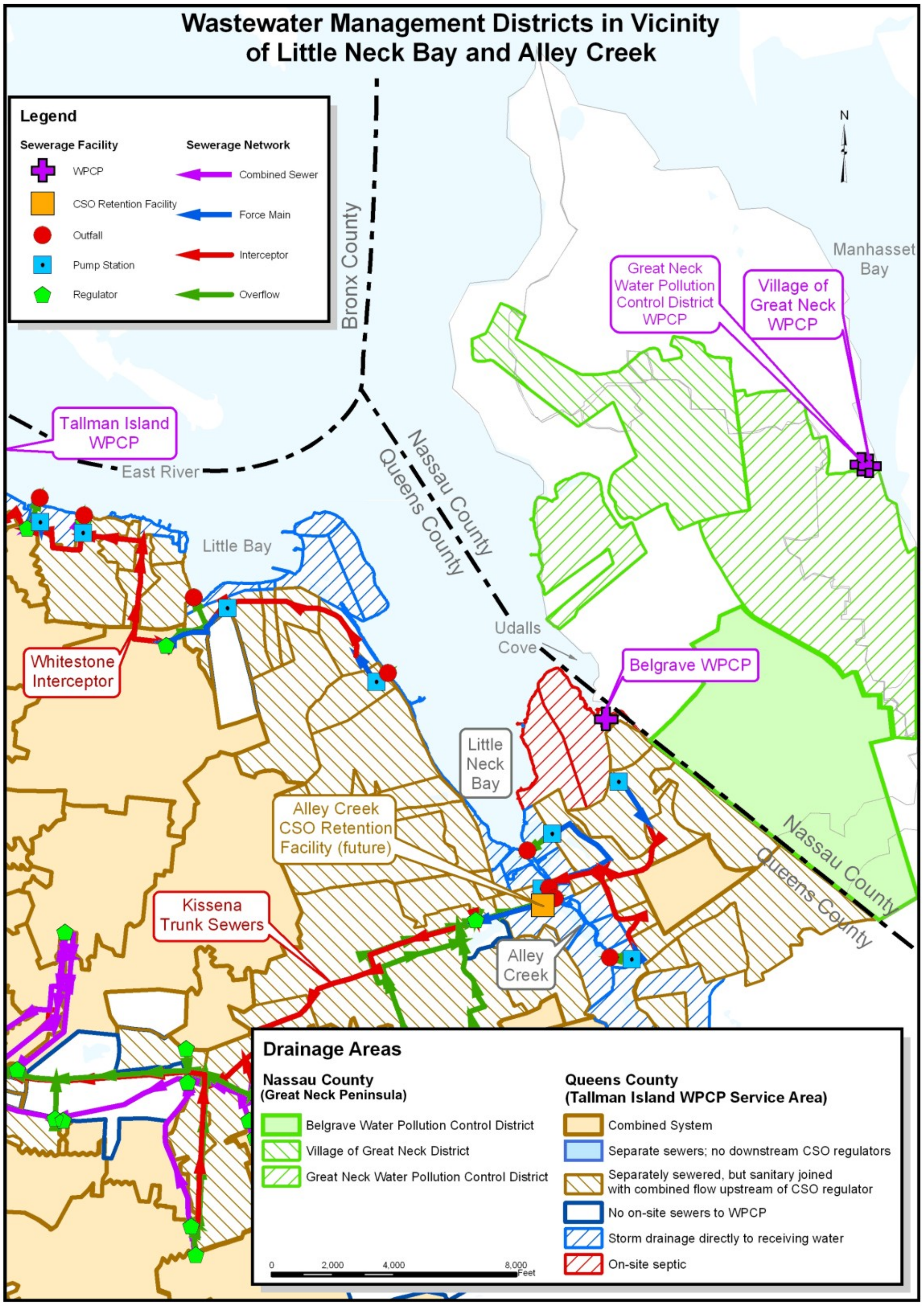
Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Alley Creek and Little Neck Bay Watershed/Sewershed and WPCP Service Areas

FIGURE 3-1



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Wastewater Management Districts in Vicinity of Little Neck Bay and Alley Creek

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 3-2

Table 3-1. Select Tallman Island WPCP Effluent Permit Limits

Parameter	Basis	Value	Units
Flow	DDWF Maximum secondary treatment Maximum primary treatment	80 120(1) 160	MGD
$CBOD_5$	Monthly average 7-day average	25 40	mg/L
TSS	Monthly average 7-day average	30 45	mg/L
Total Nitrogen	12-month rolling average	108,375(2)	lb/day

(1) 1.5 DDWF.
(2) Nitrogen limit for the Combined East River Management zone, calculated as the sum of the discharges from the four Upper East River WPCPs (Bowery Bay, Hunts Point, Wards Island, Tallman Island) and one quarter of the discharges from the 2 Lower East River WPCPs (Newtown Creek, Red Hook). This limit is effective through November 2009, then decreases stepwise until the limit of 44,325 lb/day takes effect in 2017.

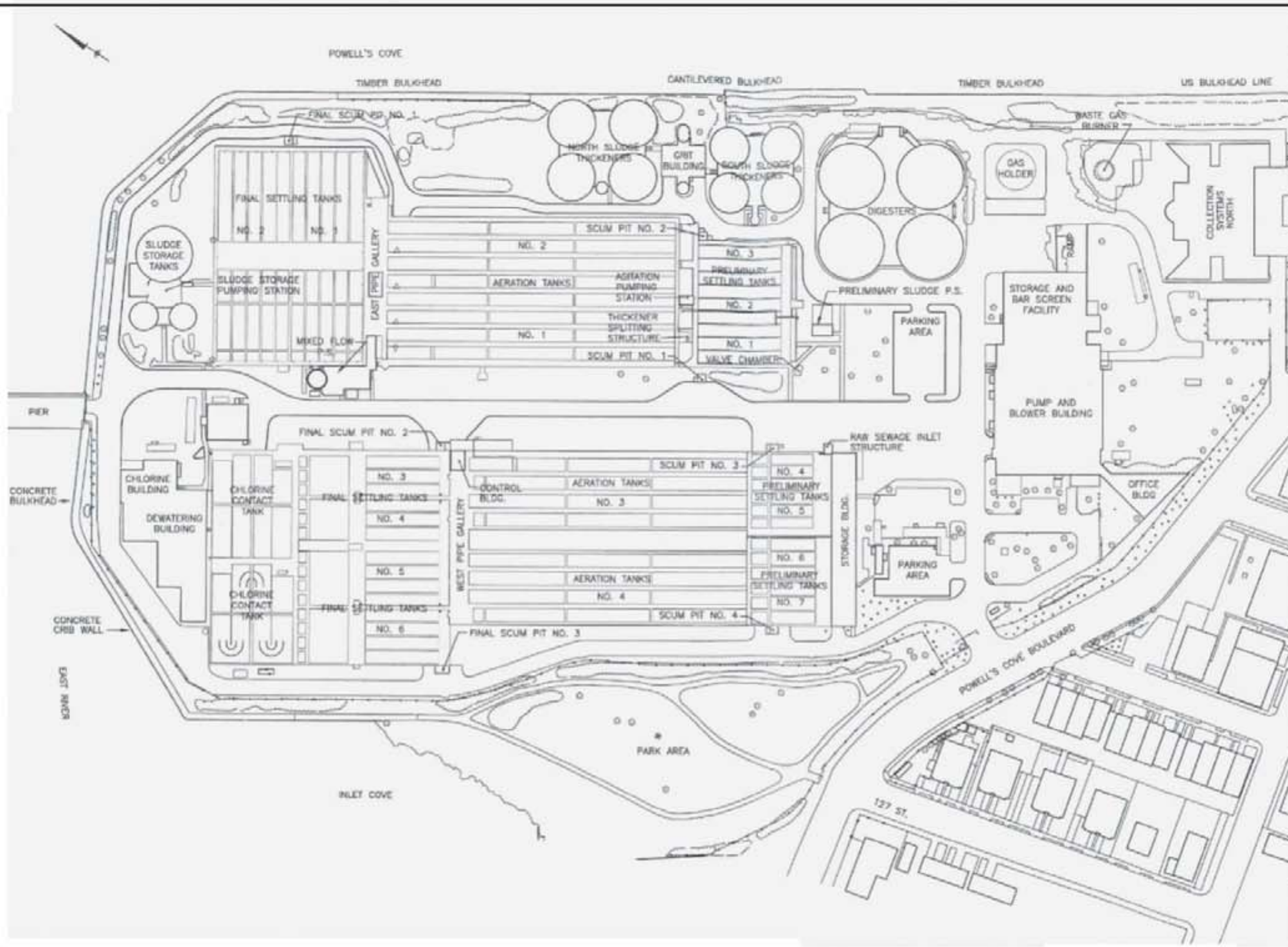
The original Tallman Island plant was designed in the early 1930s. The plant began operation to treat wastewater with a step aeration design capacity of 40 MGD in time for the 1939 World's Fair held at Flushing Meadows Park. The original plant was designed to serve an estimated 300,000 people. Several major expansions and upgrades were completed in 1964 (upgrade and expansion to 60 MGD) and 1979 (upgrade and expansion to 80 MGD). In April 1997, construction was completed for Basic Step Feed Biological Nitrogen Removal (BNR) retrofit at Tallman Island. This included the installation of baffles in each pass of the aeration tanks to create anoxic zones, submersible mixers in each anoxic zone to prevent solids settling, and froth-control chlorine spray hoods for filament suppression.

3.1.1 Tallman Island WPCP Process Information

Figure 3-3a shows the current layout of the Tallman Island WPCP and Figure 3-3b is an aerial view of the facility. The WPCP is located on a peninsula bounded by water. The landside adjacent to the WPCP is a residential neighborhood.

Wastewater from the Flushing Main Interceptor and Whitestone Interceptor discharges to a 7-foot by 7-foot combined sewer interceptor which conveys flow to the forebay of the Tallman Island WPCP. Upon entry to the screenings building, the flow passes through the four screening channels to the influent channel to the wet well. Each screening channel is provided with a hydraulically operated sluice gate used for channel isolation and throttling. There are four climber-type mechanical bar screens that are six feet wide with 1-inch openings. The screens are cleaned with a vertical climber rake and are designed to handle 53.3 MGD.

From the wet well, the main sewage pumps pump the flow into the pump discharge header. There are five vertical, centrifugal, mixed-flow, bottom-suction, flooded-suction, main sewage pumps, two rated at 55 MGD and three rated at 60 MGD. Each pump draws flow from the wet well via a 48-inch suction line and discharges via a 36-inch line that includes a cone check valve and a gate valve. The 36-inch line connects to a header that increases in size to 72-



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Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Tallman Island WPCP Site Layout

FIGURE 3-3a

New York City
Department of Environmental Protection

Tallman Island WPCP Aerial View

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 3-3b

inches. The header splits into two 54-inch force mains, each with a fabricated venturi meter, to convey the flow to primary settling tanks.

The Powells Cove Pump Station is a separate pump station located at the Tallman Island WPCP which receives flow from approximately 375 acres in College Point. This flow is conveyed to the treatment plant via the 36-inch College Point Interceptor sewer. The pump station consists of three vertical centrifuge pumps with a total capacity of 9.3 MGD with two pumps online and a single, manually cleaned bar screen. The Powells Cove Pump Station discharges to the Flushing Main Interceptor which discharges to the headworks of the plant.

Two batteries of primary clarifiers are provided with three settling tanks in the east battery and four settling tanks in the west battery, giving seven primary settling tanks in total. Flow is distributed to the seven primary settling tanks through 24-inch by 24-inch sluice gates. Each settling tank has six sluice gates. Primary effluent flows over weirs at the end of each tank into the primary settling tanks effluent channel. Scum is removed from each tank by a manually operated rotating scum collector and is temporarily stored in four scum concentration pits prior to off-site disposal. Each rectangular clarifier includes three longitudinal chain and flight collectors and a chain flight cross collector to direct sludge to a sludge pit. The sludge is then pumped to the primary sludge degritters. The total volume of the primary settling tanks is 3.5 million gallons (MG) with a surface overflow rate of 2,073 gallons per day per square foot (gpd/sf) at average design flow. The overflow rate at peak design flow is 4,000 gpd/sf.

From the primary settling tanks, primary effluent flows by gravity to the four aeration tanks for biological treatment, Tanks 1 and 2 in the east battery and Tanks 3 and 4 in the west battery. The total aeration tank volume is 14.8 MG and is aerated at 20,100 standard cubic feet per minute (scfm) through ceramic tube diffusers.

Aeration tank effluent is conveyed to the final settling tanks designed for 790 gpd/sf at 80 MGD. The plant has a total of six final settling tanks. The east plant final settling tanks receive flow directly from the aeration tank effluent channel and are comprised of two rectangular tanks with five bays. Each bay has a chain and flight mechanism that directs sludge to a cross-collector channel. Cross-collectors direct the sludge to an airlift pump chamber. Return activated sludge (RAS) is conveyed back to the aeration tanks by four airlift pumps. Waste activated sludge (WAS) is drawn off from the airlift pump chamber to the mixed flow pumping station. Effluent from the east battery final settling tanks is directed to the chlorine contact tanks.

In the west plant, aeration tank effluent is discharged from the 48-inch diameter aeration tank effluent pipe. The west plant has two rectangular final tanks, each with three bays, and two rectangular tanks, each with four bays. Each bay has a chain and flight mechanism that directs sludge to a cross-collector channel. Cross-collectors move the sludge to the airlift pit where RAS is pumped by four airlift pumps. WAS is removed by draw-off lines at waste sludge manholes. From the manholes, the WAS flows by gravity to the mixed flow pumping station. Effluent from the west battery final settling tanks is directed to the chlorine contact tanks.

The disinfection system consists of two 4-pass chlorine contact tanks, two sodium hypochlorite storage tanks, two metering pumps, and an automated control system. Sodium hypochlorite solution is pumped to the influent through diffusers. The two tanks have a total volume of 2.16 MG and a detention time of 19.4 minutes at peak design flow. Chlorinated effluent is discharged to the East River through a submerged outfall.

Primary sludge from both batteries is pumped through cyclone degritters to remove grit. The degritted sludge, along with WAS from the mixed flow pumping station, is discharged to the gravity thickeners. Grit flows to the grit classifiers/washers where the grit is washed and separated from liquid and stored in containers prior to off-site disposal.

Two sets of four circular, conical-bottomed gravity thickeners are used for sludge thickening. The north gravity thickeners are 60-feet in diameter and the south gravity thickeners are 50-feet in diameter. Each thickener contains a picket-type stirring mechanism that aids thickening and directs sludge to the center pit where it is pumped to anaerobic digesters. Each thickener has two plunger pumps directly below that send the sludge into the digester-heating loop.

Sludge is mixed within each digester by three draft tube mixers. To heat the digester contents, sludge is pumped from the digesters through external heat exchangers. Each digester has a dedicated heat exchanger. The main source of heat is the engine jacket cooling water system. Sludge is removed from each digester using four pipes at various depths and locations within the digester. The pipes are manifolded to four sludge transfer pumps. The pumps can either pump sludge to two of three storage tanks or return it to the digester for further digestion. Currently, the sludge is pumped from the storage tanks through two dedicated sludge pumps to two sludge centrifuges in the dewatering building. The dewatered sludge is then removed and trucked out of the plant. The centrate is returned to the head of the plant by gravity.

3.1.2 Tallman Island WPCP Wet Weather Operating Plan

NYCDEP is required by its SPDES permit to maximize the treatment of combined sewage at the Tallman Island WPCP. The permit requires treatment of flows of up to 120 MGD, 1.5 times the DDWF, through complete secondary treatment. Further, to maximize combined sewage treatment, the SPDES permit requires flows of up to 160 MGD (2 times DDWF) to be processed through all elements of the WPCP except the aeration basins and the final settling clarifiers.

New York State requires the development of a Wet Weather Operating Plan (WWOP) as one of the 14 BMPs for collection systems that include combined sewers. The goal of the WWOP is to maximize flow to the WPCP, one of the nine minimum control elements of long-term CSO control planning. NYCDEP has developed a WWOP for each of its 14 WPCPs, and Table 3-2 summarizes the requirements for the Tallman Island WPCP, and notes that flows beyond the maximum capacity of the aeration basins and final clarifiers (i.e., over 160 MGD) would cause damage to the WPCP by creating washout of biological solids and clarifier flooding. The WWOP therefore suggests that the facility is operating at or near its maximum capacity without being forced to shunt excess flow directly from the primary clarifiers to the chlorination basins. The WWOP for Tallman Island was submitted in May 2007, and is attached as Appendix A.

Table 3-2. Wet Weather Operating Plan for Tallman Island WPCP

Unit Operation	General Protocols	Rationale
Influent Gates and Screens	Leave gate in automatic position until wet well capacity is hit, plant flow approaches 160 MGD, or bar screens become overloaded. Maintain acceptable wet well level by throttling back on influent gates. Set additional screens into operation and set screen rakes to continuous operation in order to accommodate increased flow.	To protect the main sewage pumps from damage and allow the plant to pump the maximum flow through preliminary treatment without flooding bar screens, bar channels, screen room, and wet well.
Main Sewage Pumps	As wet well level rises, put off-line pumps in service and increase speed of pumps up to maximum capacity, leaving one pump out of service as standby.	Maximize flow to treatment plant and minimize need for flow storage in collection system and associated overflow from collection system into Long Island Sound.
Primary Settling Tanks	Check levels of primary tank influent channels and effluent weirs for flooding. Switch pumps in service as necessary.	Maximize the amount of flow that receives primary treatment, protect downstream processes from abnormal wear and solids overload/scum accumulation.
Bypass Channel	Visually monitor the bypass channel.	To relieve flow to the aeration system, avoid excessive loss of biological solids, relieve primary clarifier flooding, and prevent secondary system failure due to hydraulic overload.
Aeration Tanks	Keep all aeration tanks in operation using the step feed mode and adjust the airflow to maintain a dissolved oxygen greater than 2 mg/L. Adjust wasting rates if necessary.	To maintain a desired solids inventory in the aerators.
Final Settling Tanks	In case of a longitudinal collection failure, maintain final tanks in service. Balance flows to the tanks to keep blanket levels even.	To prevent solids washout in the clarifiers.
Chlorination	Check, adjust, and raise the hypochlorite feed rates to maintain adequate residual.	Hypochlorite demand will increase as flow rises and secondary bypasses occur.
Sludge Handling	Proceed as normal.	Uninfluenced by wet weather.

3.1.3 Other Operational Constraints

NYSDEC and NYCDEP entered into a Nitrogen Control Consent Order that updated the New York City SPDES permits to reduce nitrogen discharges to the Long Island Sound and Jamaica Bay to reduce the occurrence of eutrophic conditions and improve attainment of dissolved oxygen numerical criteria. The Consent Order was partly a result of the Long Island Sound Study, which recommended a 58.5 percent load reduction of nitrogen discharge. The Consent Order specified process modifications at the four WPCPs that discharge into the Upper East River (Bowery Bay, Hunts Point, Tallman Island, Wards Island) and one of the WPCPs that discharges to Jamaica Bay (26th Ward) for nitrogen removal. "The Modified Phase I BNR Facility Plan for the Upper East River and the 26th Ward Water Pollution Control Plants" was prepared by NYCDEP and submitted to NYSDEC in 2005. It outlines the modifications necessary to upgrade these five WPCPs. The critical BNR upgrade items for Phase I construction are as follows:

1. Aeration tank equipment modifications:
    - Baffles for the creation of anoxic/switch zones and pre-anoxic zones
    - Mixers in the anoxic zones
2. Process aeration system upgrades:
    - New blowers or retrofit of existing blowers
    - New diffusers (fine bubble)
    - Air distribution control equipment
    - Metering and dissolved oxygen (DO) monitoring and control
3. Return activated sludge (RAS) / Waste activated sludge (WAS) systems:
    - Expanded capacity or upgrade of existing RAS/WAS system, as applicable
4. Froth control system:
    - Implemented to prevent or control filamentous growth
5. Chemical addition facilities:
    - Sodium hypochlorite for froth control (RAS and surface chlorination)
    - Alkalinity addition for nitrification and pH buffering (except at Tallman Island)

NYCDEP has pledged to perform interim measures during the Phase I construction period to make best efforts to reduce the levels of nitrogen being discharged into the East River. These measures include:

1. Wards Island Battery E additional upgrades:
    - Enhanced flow control in the aeration tanks
    - Supplemental carbon addition facilities
    - Additional baffles to enhance flow distribution and settling in final settling tanks
2. The SHARON Process will be constructed at Wards Island including:
    - Reactor tanks with both aerated and anoxic zones;
    - Influent centrate pumping station and controls;
    - Blowers and process air piping, distribution grid and diffusers;
    - Mixers for the denitrification zone;
    - Alkalinity storage and pumping station;
    - Supplemental carbon storage and pumping station;
    - Recycle pumps;
    - Temperature control units; and
    - Electrical power substation.
3. Relocation of Bowery Bay and Tallman Island digested sludge and/or centrate via shipping with NYCDEP marine vessels or contract services. The NYCDEP can send this material to either a NYC facility or an out-of-city facility.

Concurrent with the BNR upgrades, the NYCDEP continues to perform extensive upgrade work as part of the Plant Upgrade (PU) Program at all WPCPs, including the five that are undergoing BNR retrofits. Plant upgrades are required to stabilize or replace equipment that has reached its intended design life to ensure reliable plant performance that is in compliance with the existing SPDES permits for each WPCP.

Upgrade of Tallman Island WPCP

The Tallman Island WPCP is scheduled to undergo a construction upgrade program to address the facility's critical needs and upgrade the aeration process to basic step-feed BNR process. This work is currently in progress and has a Consent Order completion date of December 31, 2010.

This section summarizes the major improvements to be implemented as part of the first phase of the Tallman Island WPCP Upgrade Program.

- Main Sewage Pumping Station – The existing main sewage pumps, suction, discharge piping and valves will be demolished and replaced with five new centrifugal-type pumps each capable of pumping 60 MGD. The facility will have the capability of pumping at least 160 MGD to the preliminary settling tanks during wet weather with three pumps in operation. During this work, a temporary pump around system will be installed in the influent channels following the primary screens. The temporary pumping system will be capable of pumping a maximum flow of 120 MGD. As a result, during and temporary pumping period, the Tallman Island WPCP will only be able to process a maximum wet weather flow of 120 MGD or 1.5 times the DDWF. The existing conveyor system for the Main Influent Screens will be demolished and replaced in-kind. This work should have no effect on the plant's ability to accept and treat wet weather flow.

  The Powells Cove Pumping Station, located in the plant Pump and Blower Building, will also be upgraded. The existing pumps and climber screen will be demolished and replaced with three new pumps each capable of 4 MGD and a new climber screen. Temporary pumping units capable of handling the entire Powells Cove Pumping Station flow will be provided during this phase of the work. As a result, this work will not impact the Plant ability to accept and/or treat wet weather flow.

- Primary Tanks – The Primary Tanks at the Tallman Island WPCP will be provided with new flights and chains as part of this construction contract. During this work, only one primary tank at a time will be taken out-of-service. As a result, the Tallman Island Primary Tanks should be able to process a maximum wet weather flow of 160 MGD without a reduction in permit performance during this phase of construction.

- Aeration Tanks – The aeration tanks at the Tallman Island WPCP will be modified to provide basic step-feed BNR. Baffles will be added to allow for separation of anoxic and aerobic treatment zones. Mixers will be provided in the anoxic zones to maintain the suspension of biomass. A new aeration system including fine bubble diffusers will be provided along with new centrifugal process air blowers. The existing air header will be rehabilitated to reduce air losses and a new dissolved oxygen (DO) control system will be provided. The existing spray water system will be demolished and replaced with a new system capable of providing full tank coverage. New influent gates will be added to the aeration tanks to allow for uniform flow distribution to each pass. Automation will be provided to allow storm flow to be sent to Pass D of each aeration tank so as to prevent biomass washout. Two froth control hoods will be added in both Pass A and B of each aeration tank to limit the generation of filamentous froth. Surface wasting will also be provided to maintain the solids residence time (SRT) and prevent nocardia and foam accumulation. Centrate from the dewatering building will be conveyed to Pass A of the aeration tanks by gravity. As with the primary tank work, only one aeration tank will be taken out of service by the contractor at any time. As a result, the system should be capable of processing a wet-weather flow of 120 MGD for short durations without a significant effect on overall treatment performance.

- RAS and WAS System – New submersible RAS pumps will be added to the system with the capacity of 64 percent of design dry weather flow. RAS chlorination will be provided to prevent sludge bulking. WAS will be conveyed from Pass A and B of the aeration tanks. Additional instrumentation will be provided to measure RAS flow and RAS total suspended solids (TSS) concentrations.

- Gravity Thickeners – The existing eight gravity thickeners will undergo complete rehabilitation. New mechanisms, drive units, over-flow piping and sludge pumps will be provided under this phase of the upgrade. Since six gravity thickeners are required by the plant at any time, the Contractors will be allowed to upgrade two gravity thickeners at a time, without affecting the plant's ability to process wet weather flows.

- Mixed Flow Pumping Station – The existing pumps in the mixed flow pump station will be demolished and replaced. Due to the current space limitations, the pumps will be replaced in-kind with new pumps of the same capacity. As part of this upgrade, the spray water system will also be replaced. The capacity of the spray water system will be increased, but only to the extent possible within the existing footprint of the mixed flow pumping station. Only one mixed flow pump will be taken out of service at any time. As a result, this work will not affect the plant's ability to treat wet weather flows.

- Sludge Digestion and Storage – The existing covers on the four digesters will be demolished and replaced. New gas piping will be provided from the digester tank covers to the gas compressor building. Gas compressors are required to mix the digester gas produced during anaerobic decomposition of the sludge with natural gas and boost the pressure for utilization in the engine drive units currently proposed to drive the main sewage pumps and process air blowers. New piping will be provided from the digester sludge transfer pumps to the existing sludge storage tanks located near the dewatering building.

- Miscellaneous Upgrade Improvements – Miscellaneous improvements included in this phase of the plant upgrade will include the rehabilitation of the existing boiler plant, the replacement of the existing grit cyclones and classifiers in kind and the addition of temporary personnel facilities including lockers, showers and administration area.

Concurrent with the BNR upgrades, the NYCDEP will continue to perform extensive upgrade work as part of the Plant Upgrade Program at the Upper East River WPCPs and the 26th Ward WPCP. Plant upgrades are required to stabilize or replace equipment that has reached its intended design life to ensure reliable plant performance that is in compliance with the existing SPDES permits for each WPCP.

3.2 TALLMAN ISLAND WPCP COLLECTION SYSTEM

The Tallman Island sewershed is comprised of both sanitary and combined sewersheds, as shown in Figure 3-4, and summarized below in Table 3-3.

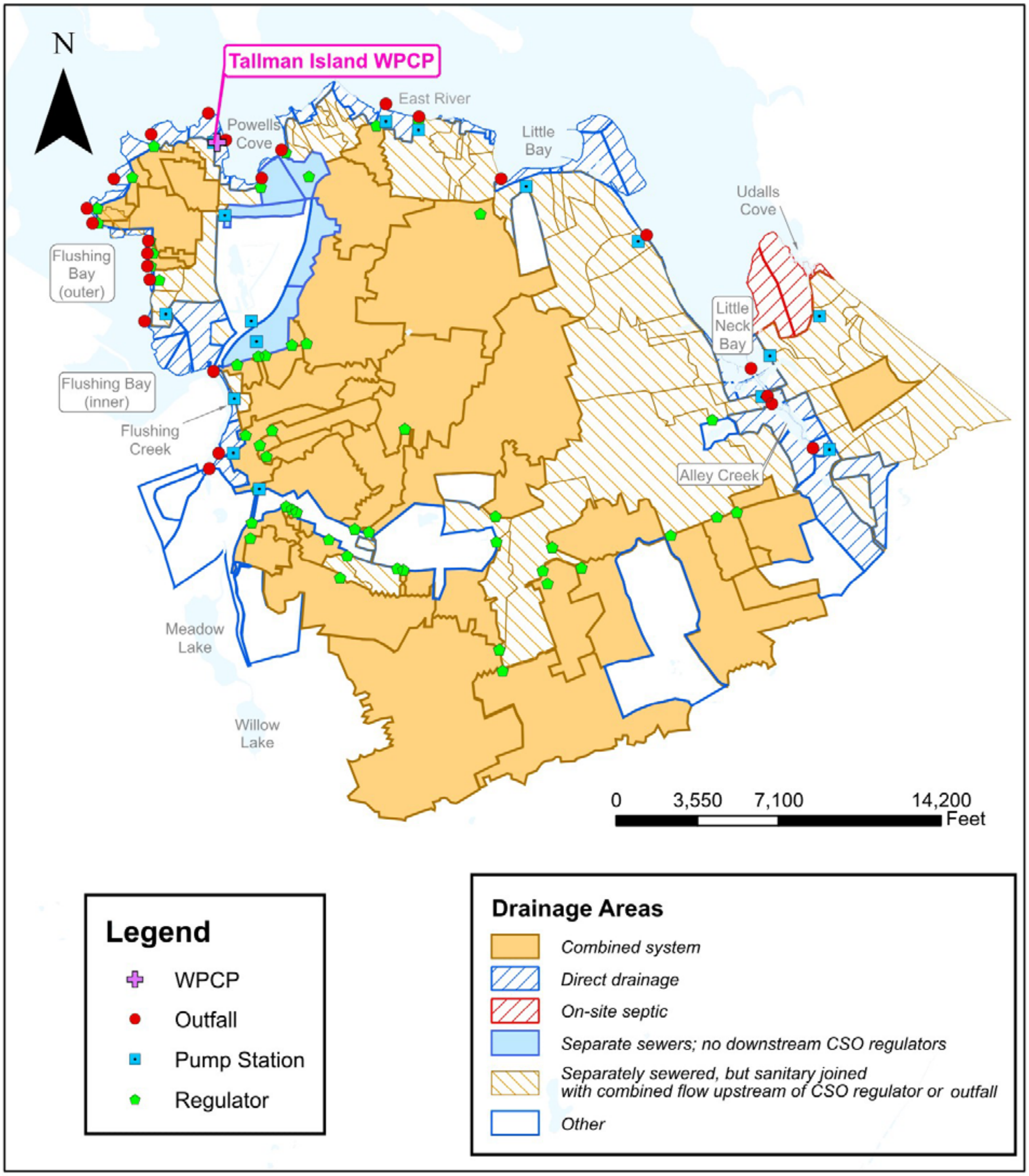
Table 3-3. Tallman Island WPCP Drainage Area: Acreage Per Sewer Category

Sewer Area Description	Area (acres)
Combined	**8,032**
Separate	**4,893**
Fully separated	(610 acres)
Watershed separately sewered, but with sanitary sewage subsequently flowing into a combined interceptor and stormwater subsequently either discharging directly to receiving water or into combined interceptor	(4,283 acres)
Other	**2,171**
Total WPCP Service Area	**15,096**
Note: An additional 1,483 acres of areas that do not contribute stormwater to the WPCP were modeled as well, including areas with direct drainage of stormwater to water courses via storm sewers, other areas not served by piped drainage systems (e.g., parks and cemeteries) and the "on-site" septic areas in Douglas Manor on Douglaston Peninsula.	

The Tallman Island WPCP collection system includes 430 miles of combined and sanitary sewers and interceptors varying in size from 10-inch diameter street laterals to 13-foot by 6-foot trunk and interceptor sewers. There are four principal interceptors in the collection system: the Main Interceptor, the College Point Interceptor, the Flushing Interceptor, and the Whitestone Interceptor.

- The Main Interceptor is directly tributary to the Tallman Island WPCP and picks up flow from the other three interceptors.
- The College Point Interceptor, which carries flow from sewersheds to the west of the treatment plant, discharges into the Powells Cove Pump Station, which discharges into the Main Interceptor.
- The Whitestone Interceptor discharges to the Main Interceptor shortly upstream of College Point input, via gravity discharge. The Whitestone conveys flow from the area east of the treatment plant along the East River.
- The Flushing Interceptor can be considered an extension of the Main Interceptor south of the Whitestone connection and serves most of the areas to the south in the system. The Flushing Interceptor also picks up flow from the southeast areas of the system, along the Kissena Corridor (via trunk sewers upstream of the TI-R31 regulator) and from the Douglaston area east of Alley Creek.

These principal sewers are mapped in Figure 3-5. The Tallman Island WPCP sewer system schematics with and without the Alley Creek Tank and Flushing Tank are included as Appendix E.



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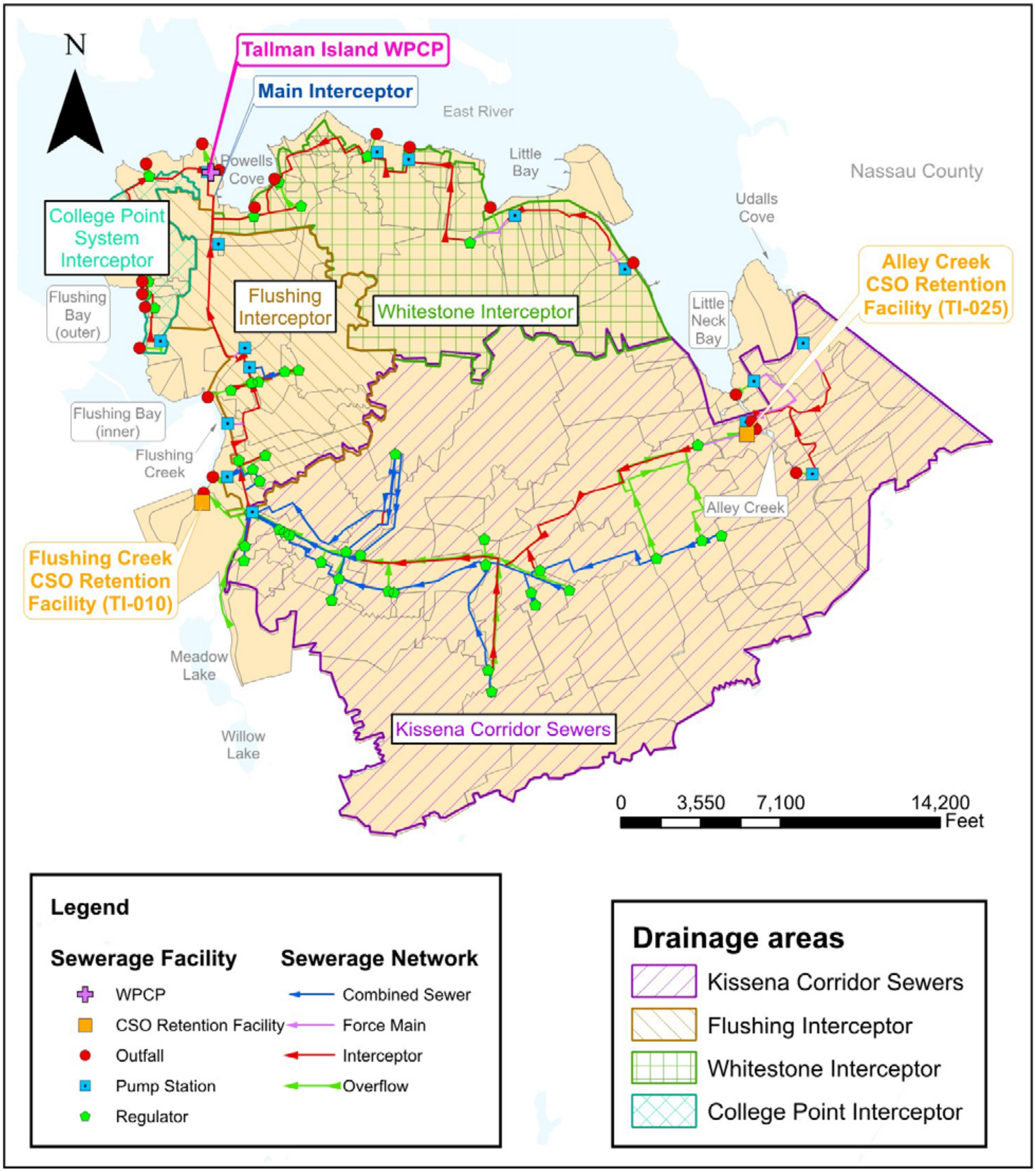
Tallman Island WPCP Sewersheds

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 3-4



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Tallman Island WPCP Principal Sewers

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 3-5

Other components of the system, also shown in Figures 3-5 and Exhibit 3-1, include the following:

- Sixteen pumping stations, five serving combined system areas, as listed in Table 3-4.
- Forty-nine combined sewer flow regulator structures, as listed in Table 3-5.
- Twenty-four CSO discharge outfalls (two of which are permanently bulkheaded), as listed in Table 3-6.

3.2.1 Combined Sewered Areas

As indicated above, the Tallman Island service area includes 8,032 acres that are served by combined sewers, plus 4,893 acres in which the sewershed is served by separate sanitary sewers and storm sewers. However, the functioning of the separately sewered systems is complicated by the configuration of the sewers downstream of the sewersheds. These systems are configured as follows:

- Flow from a relatively small portion of the separately sewered area (about 610 acres) fully maintains its separate character, with the sanitary sewage conveyed to the treatment plant without encountering intervening diversions and the stormwater discharging directly to a waterbody. These sewersheds are primarily in the area just south of Powells Cove.

- Several sewersheds along the Kissena Corridor are separately sewered inside the watershed, but the sanitary and storm sewers are then combined to be carried westward to the Flushing Interceptor at Regulator TI-R31.

- In most of the other separately sewered areas principally tributary to the Whitestone Interceptor and to the Old Douglaston Pump Station, the stormwater is conveyed directly to waterbody discharge via the municipal separate storm sewer system while the sanitary sewage is conveyed to treatment in combined trunk sewers and interceptors which have downstream overflows.

This demarcation of the separately sewered areas is depicted in Figure 3-4, and is allocated amongst the principal interceptors in Table 3-7. The Tallman Island SPDES permit CSO outfalls to Alley Creek are TI-007, TI-008, TI-009 and TI-024. CSO outfall TI-006 discharges to Little Neck Bay. The locations of Alley Creek and Little Neck Bay SPDES CSO outfalls are shown on Figure 3-6. It should be noted that TI-025 is the future CSO outfall for the Alley Creek CSO Retention Facility currently under construction.

Wet weather flows in the combined sewer system, with incidental sanitary and stormwater contributions as summarized above, results in overflows to the nearby waterbodies when the flows exceed the hydraulic capacity of the system, or the specific capacity of the local regulator structure.

Table 3-4. Tallman Island WPCP Collection System Pump Stations

	Pump Station Name	Address	Type	Cap. (MGD)	DWF (MGD)	No of Pumps	Bypass Outfall	Associated Interceptor
1	Lawrence & Peck	50-01 College Pt. Blvd.	Com.	14.00	7.10	3	None	Flushing
2	40th Road	40th Rd, West of College Pt. Blvd	San.	2.00	0.40	2	None	Flushing
3	Flushing Bridge	Lawrence St. & Northern Blvd.	San.	1.20	0.18	2	None	Flushing
4	Linden Place	Linden Pl/31st Rd.	Com.	5.00	1.89	3	None	Flushing
5	New York Times	Whitestone Exp. & Linden Place	San.	0.64		2	None	Flushing
6	122nd Street	122 St. & 28 Ave.	San.	1.50	0.31	2	TI-012; Flushing Creek	College Point
7	15th Avenue	15 Ave. & 131 St.	San.	2.90	0.22	2	None	Flushing
8	6th Road	6th Rd & 151 St.	San.	0.72	0.40	2	None	Whitestone
9	154th Street	Powells Cove Blvd. & 154 St.	Com.	2.30	0.61	3	None	Whitestone
10	Clearview	Willets Pt. Blvd, Cross-Isl. Pkwy	Com.	13.00	1.87	3	None	Whitestone
11	24th Avenue	24th Ave & 217th St.	San.	4.30	0.75	2	TI-006; Little Neck Bay	Whitestone
12	Little Neck	40th Ave. & 248th St	San.	1.40	0.26	2	None	Flushing (via Old Douglaston PS)
13	Douglaston Bay	41st Ave & 233rd St.	San.	1.00	0.07	2	TI-009; Alley Creek	Flushing (via Old Douglaston PS)
14	Old Douglaston	Parkland, Northern Blvd & 234 St.	San.	6.50	2.00	3	TI-007; Alley Creek	Flushing
15	New Douglaston	Parkland, North of LI Expressway, Cross-Isl. Pkwy	San.	3.30	0.34	2	TI-024; Alley Creek	Flushing (via Old Douglaston PS)
16	Powells Cove	Influent PS at WPCP(1)	Com.	9.3	1.00	3	None	WPCP(1)

(1) The Powells Cove Pump Station receives flow from the College Point Interceptor and pumps to the Main Interceptor. It is located on the WPCP site.

Table 3-5. Tallman Island WPCP Collection System Regulators

	Reg ID	Location	Outfall	Flow Compartment	Elev	Flow (MGD) Cap.	Flow (MGD) DWF
College Point Interceptor							
	TI-R01	College Point & 5th Ave	020	10"x10"	+ 0.47	1.93	0.24
	TI-R02	115th St & 9th Ave (Former WPCP bypass to Outfall TI-019, currently bulkheaded)					
	TI-R03	110th St & 14th Ave	018	Double 8"x 8"	- 0.75	0.74	0.11
	TI-R04	110th St & 15th Ave	017	Double 8"Dia	+ 0.35	0.73	0.05
	TI-R05	119th St & 20th Ave	016	12"x16"	- 2.20	5.84	0.67
	TI-R06	119th St & 22ndAve	015	Double 8"Dia	+ 5.18	0.81	0.09
	TI-R07	119th St & 23rd Ave	014	Double 8"Dia	+ 1.43	0.72	0.09
	TI-R08	119th St & 25th Ave	013	Double 8"Dia	+ 5.97	0.86	0.28
Whitestone Interceptor							
	TI-R10	138th St & 11th Ave (Bulkheaded; formerly 021)					
	TI-R10A	144th St & 7th Ave	003	12" Dia	+ 8.50	30.34	N/A
	TI-R10B	144th St E/O Malba Ave	003	18"x12"	+10.00	> 1.09	0.89
	TI-R11	151st St & 7th Ave	004	12"x12"	+17.50	4.47	0.27
	TI-R12	154th St & Powells Coge Ave	005		- 0.50	6.54	0.54
	TI-R13	15th Dr & Willets Point Blvd	023	24"x18"	+24.65	12.78	2.81
Flushing Interceptor							
	TI-R09	Linden Place & 32nd Ave	011	60"Dia.	+ 4.50	103.40	32.56
	TI-R51	Parsons Blvd & 32nd Ave	011	24"x24"	+16.35	5.12	1.72
	TI-R52	Union St & 32nd Ave	011	12"x12"	+ 8.00	1.78	0.16
	TI-R53	137th St & 32nd Ave	011	12"x12"	+ 2.75	2.41	0.54
	TI-R54	Downing St & 32nd Ave	011	12"x12"	+ 0.50	2.68	0.22
	TI-R55	College Pt Blvd & Roosevelt Ave	022	12"x12"	+10.80	2.89	0.70
	TI-R56	Main St & 40th Rd	022	24"x24"	+12.50	7.23	2.55
	TI-R57	41st Ave E/O Lawrence St	022	12"x12"	+ 8.72	1.34	0.41
	TI-R58	Sanford Ave & Frame St	022	15"x15"	+21.10	2.67	1.16
	TI-R59	58th Ave & Lawrence St	010	24"x36"	+14.68	29.71	0.27
	TI-R60	Booth Mem Pkwy & Lawrence St	010	Orifice	+13.00	27.47	0.64
Kissena Corridor Trunk Sewers Upstream of TI-R31							
	TI-R29	Oak Ave & Colden St	010	12"x12"	+ 5.50	3.74	2.80
	TI-R30	Quine Ave & Kissena Blvd	010	9"x 33"	+ 1.88	5.45	2.10
	TI-R31	Lawrence St & Blooson Ave	010	18"Dia	+12.00	113.19	N/A
	TI-R32	137th St & Peck Ave	010	8"Dia	+13.68	0.21	0.01
	TI-R33	138th St & Peck Ave	010	8"Dia	+13.68	0.72	0.03
	TI-R34	Main St S/O Peck Ave	010	8"Dia	+13.88	0.61	0.04
	TI-R35	56th Rd & 146th St	010	10"Dia	+21.25	6.74	0.06
	TI-R36	150th St & Booth Mem Pkwy	010	Orifice		> 3.47	2.34
	TI-R37	150th St & 60th Ave	010	24"Dia	+16.40	5.47	2.04
	TI-R38	Parsons Blvd & Booth Mem Pkwy	010	8"Dia	+18.66	N/A	0.02
	TI-R39	159th St & Booth Mem Pkwy	010	18"Dia	+20.25	6.71	0.12

Table 3-5. Tallman Island WPCP Collection System Regulators

	Reg ID	Location	Outfall	Flow Compartment	Elev	Flow (MGD)	
						Cap.	DWF
	TI-R40	Fresh Meadow La & Peck Ave	010	36"x28"	+19.05	24.31	5.00
	TI-R40A	Gladwin Ave & Fresh Meadow La	010	12"x12"	+34.10	3.57	0.04
	TI-R41	188th St & LIE (N.S.)	010	27"Dia	+24.75	7.79	0.91
	TI-R42	188th St & LIE (S.S.)		Orifice	+27.08	> 1.28	0.86
	TI-R43	192nd St & 56th Ave	010	36"Dia	+25.90	18.15	3.25
	TI-R44	Peck Ave & LIE (S.S.)	010		+31.00	3.09	0.30
	TI-R45	73rd Ave & Utopia Pkwy	010	Orifice	+25.00	12.62	1.33
	TI-R45A	69th Ave & Fresh Meadow La	010	Orifice		> 6.54	4.41
	TI-R46	210th St & LIE (N.S.)	008	30"Dia	+51.10	15.91	2.54
	TI-R47	218th St & LIE (N.S.)	008	Orifice	+69.40	12.48	0.61
	TI-R48	Springfield Blvd & LIE (S.S.)	Internal	12"Dia	+75.92	> 0.34	0.23
	TI-R49	220th Pl & 46th Ave	008	12"Dia	+44.50	1.57	0.23
	TI-R50	157th St & 43rd Ave	Internal	24" Dia	+24.50	4.97	2.56

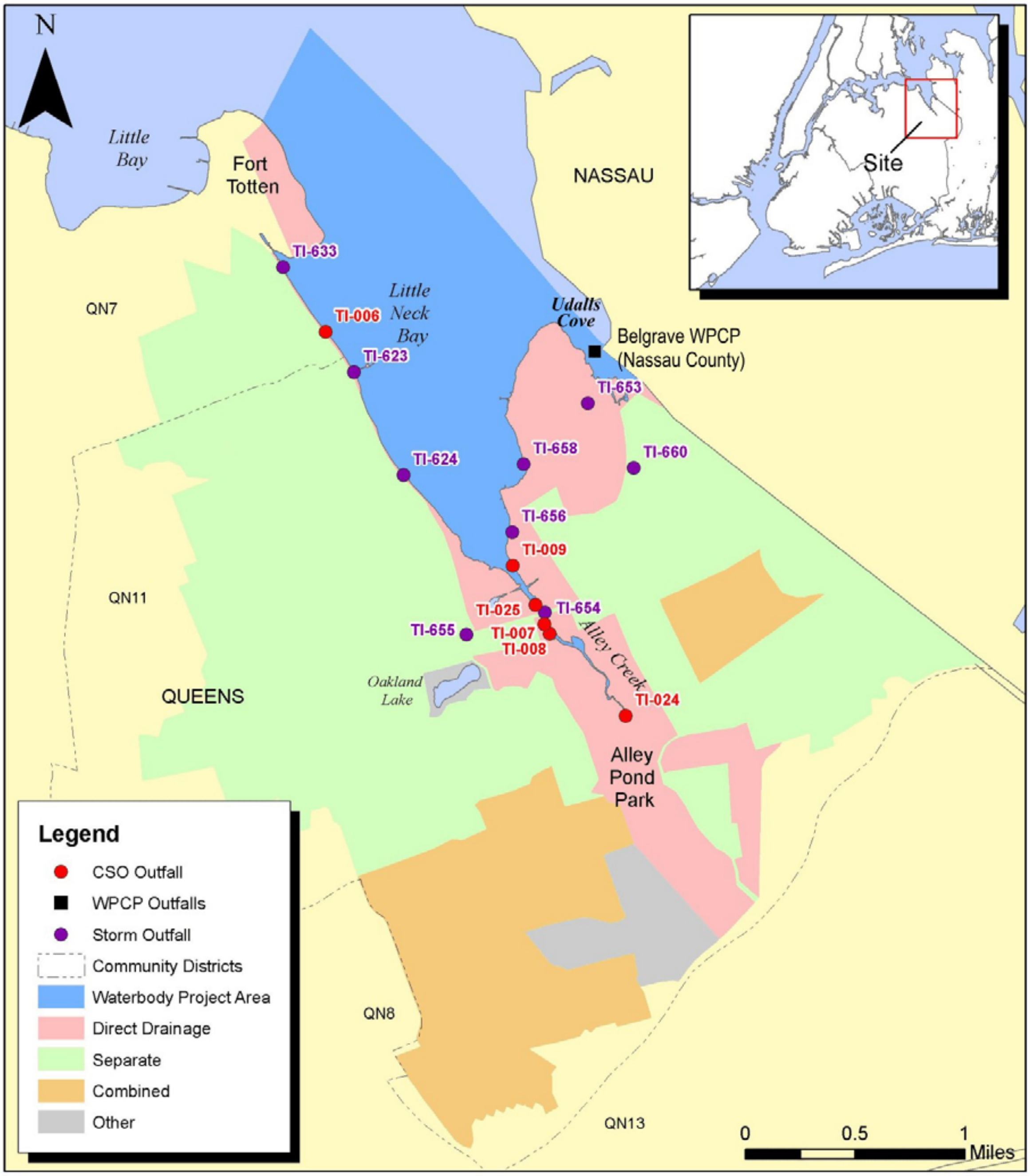
Table 3-6. Tallman Island WPCP Collection System Outfalls

Outfall	Location / (Regulator)	Size	Waterbody /Class	Comment
002	Treatment Plant Bypass	60" DIA	East River / SB	(Outfall bulkheaded, and outfall deleted from 2005 SPDES permit)
003	n/o 7th Ave. (REG #10A)	8'-0" x 8'-0"	Powells Cove / I	
004	151st Street (REG # 11)	72" DIA	East River / SB	
005	154th Street (REG # 12)	24" DIA	East River / SB	
006	24th Avenue	10'-0" x 7'-6"	Little Neck Bay /SB	24th Ave P.S. Bypass(1)
007	Northern Blvd (Old Douglaston. P.S.)	18" DIA	Alley Creek / I	Old Douglaston P.S. Bypass(1)
008	46th Ave. (REG# 46, 47, 48, 49)	10' x 7'-6"	Alley Creek / I	Telemetered (46, 47, & 49)
009	Douglaston Bay P.S	2x8"	Alley Creek / I	Douglaston Bay P.S. Bypass(1)
010	Pending Flushing Bay CSO Retention Facility, Roosevelt Ave. (REG #29-40, 40A, 41-45, 45A, 50, 59, 60, BB Reg #14, 15,27, 27A, 28)	3BL 18' x 10'	Flushing Creek / I	Telemetered (30, 40), Boom
011	32nd Ave. (REG # 9, 51 - 54)	DBL 8' x 8'	Flushing Creek / I	Telemetered (9), Net
012	29th Ave.	12" DIA	Flushing Creek / I	122nd P.S. Bypass(1)
013	25th Avenue (REG # 8)	18" DIA	Flushing Bay / I	
014	23rd Avenue (REG # 7)	12" DIA	Flushing Bay / I	
015	22nd Avenue (REG # 6)	1'-3" x 1'-10"	Flushing Bay / I	
016	20th Avenue (REG # 5)	60" DIA	Flushing Bay / I	
017	15th Avenue (REG # 4)	12" DIA	Flushing Bay / I	
018	14th Avenue (REG # 3)	1'-6" x 1'-2"	Flushing Bay / I	
019	9th Ave. (REG #2)	12" DIA	East River / I	
020	College Place (REG #1)	24" DIA	East River / I	
021	233rd Street (REG #10)	42" DIA	Powells Cove / I	(Connection from Reg #10 now bulkheaded; outfall deleted from 2005 SPDES permit as a CSO outfall)
022	40th Rd (REG #55-58)	7' x 6'-6"	Flushing Creek / I	Boom
023	Cryders Lane (REG #13)	13'6" x 8'	Little Bay / SB	Telemetered
024	61st Avenue	12' x 10' Box	Alley Pond / I	New Douglaston P.S. Bypass(1)
025	Alley Creek CSO Storage Facility (future)	52'6" x 7'6"	Alley Creek / I	

(1) SPDES permits list sanitary pump station bypasses as CSO outfalls. These outfalls only overflow during emergency situations and do not normally overflow.

Table 3-7. Interceptor Drainage Areas

Interceptor	Length (feet)	Total Area (acres)	Combined (acres)	Separate (acres)
Main *(receives flow from Flushing and Whitestone interceptors)*	2,238	76	0	76
Flushing *(receives flow from areas downstream and upstream of TI-R31 and from Old Douglaston Pump Station)*	79,422	10,001	6,616	3,384
Flushing downstream of TI-R31	*15,507*	*1,387*	*974*	*413*
Trunk Sewers upstream of TI-R31	*63,915*	*7,274*	*5,512*	*1,761*
Old Douglaston Pump Station (upstream of Trunk Sewers)	*N/A*	*1,340*	*130*	*1,210*
College Point	12,744	375	310	66
Whitestone	23,104	2,473	1,106	1,367
Interceptor Subtotal	117,508	12,925	8,032	4,893
Other	N/A	2,171	0	0
Total Tallman Island WPCP Drainage Area	**117,508**	**15,096**	**8,032**	**4,893**



New York City
Department of Environmental Protection

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Alley Creek/Little Neck Bay SPDES Permitted Outfalls

FIGURE 3-6

3.2.2 Stormwater Outfalls

The Tallman Island SPDES discharge permit includes a list of permitted stormwater outfalls for the WPCP. The outfalls specified in the permit are listed in Table 3-8.

The nine permitted stormwater outfalls discharging to Alley Creek and Little Neck Bay are TI-623, TI-624, TI-633, TI-653, TI-654, TI-655, TI-656, TI-658, and TI-660. The locations of these SPDES permit stormwater outfalls are shown in Figure 3-6. It should be noted that TI-006 and TI-024, although permitted as CSO outfalls, only discharge stormwater.

3.2.3 Non-sewered Areas

For several sections of the Tallman Island WPCP drainage area, stormwater drains directly to receiving waters without entering the combined sewer system. These areas are depicted as "Direct drainage" or "On-site septic" in Figure 3-4 and were delineated based on topography and the resultant direction of stormwater sheet flow in those areas. In general, shoreline areas adjacent to waterbodies comprise the direct drainage category. Significant "direct drainage" areas include Fort Totten, Douglaston Manor, and Alley Pond Park, all of which are tributary to the Alley Creek and Little Neck Bay waterbodies. In addition, the northern portion of Douglaston Peninsula, as indicated in Figure 3-4, is served by individual septic systems. These septic systems are a potential source of pollutants to adjacent Little Neck Bay waters.

"Other" areas are largely comprised of parkland, such as portions of Flushing Meadows Corona Park, Kissena, Cunningham, and Clearview Parks, and Mt. Hebron and Flushing Cemeteries. These areas are depicted as "other" drainage areas in Figure 3-4. The "other" category also includes special cases, such as the former Flushing Airport in College Point (now a commercial distribution center), where sanitary flow is conveyed to the WPCP and stormwater is most likely conveyed through stormwater collection systems to receiving waters. The named areas above are generally outside the Alley Creek and Little Neck Bay watershed. The "other" areas that are attributed to drain to Alley Creek, Oakland Lake and an area in the headwaters of Alley Creek, are shown in Figure 1-2.

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

3.3 NASSAU COUNTY DRAINAGE

Areas on the Great Neck Peninsula drain to Little Neck Bay and Manhasset Bay in Nassau County. The WPCP Districts located in Nassau County are shown in Figure 3-2. The Nassau County systems shown (Belgrave, Village of Great Neck and the Great Neck Water Pollution Control District) are separately sewered and therefore, no CSO is discharged. The stormwater from these districts drains to Little Neck Bay, the East River and Manhasset Bay as shown in Figure 3-7.

Table 3-8. Municipal Separate Storm Sewer System Outfalls

Outfall	Latitude	Longitude	Location	Size	Waterbody
601	40,45,46	73,50,05	Northern Blvd. (south side)	30" DIA	Flushing Creek
603	40,45,46	73,50,05	Northern Blvd. (north side)	27" DIA	Flushing Creek
605	40,45,54	73,50,28	300' w/o Whitestone Expwy.	6'9" x 4'11"	Flushing Creek
609	40,47,00	73,50,50	121st St.	36" DIA	East River
610	40,47,00	73,49,29	147th St.	48" DIA	East River
611	40,47,00	73,48,27	w/o 154th St.	48" DIA	East River
612	40,47,00	73,48,27	w.o 154th St.	48" DIA	East River
615	40,47,00	73,47,25	9th Ave.	12" DIA	Little Bay
616	40,47,29	73,47,43	12th Ave.	12" DIA	Little Bay
617	40,47,00	73,47,25	12th Rd.	12" DIA	Little Bay
618	40,47,33	73,47,25	14th Ave.	10" DIA	Little Bay
619	40,47,32	73,47,22	Cryders Lane	12" DIA	Little Bay
623*	40,46,45	73,46,05	28th Ave.	18" DIA	Little Neck Bay
624*	40,46,22	73,45,50	35th Ave.	11' x 3'4"	Little Neck Bay
631	40,46,02	73,50,24	31st Rd.	54" DIA	Flushing Creek
633*	40,47,11	73,46,28	s/o 17th Ave.	54" DIA	Little Neck Bay
634	40,47,32	73,47,05	Fort Totten South Jetty	18" DIA	Little Bay
653*	40,45,40	73,45,06	Sandhill Rd.	48" DIA	Udalls Cove
654*	40,45,48	73,45,07	20' n/o Northern Blvd.	36" DIA	Alley Creek
655*	40,45,52	73,45,06	223rd St. & Northern Blvd.	15" DIA	Alley Creek
656*	40,46,01	73,45,02	39th Ave.	36" DIA	Frank Turner Inlet
658*	40,46,01	73,45,02	233rd Place	40" DIA	Little Neck Bay
660*	40,46,23	73,44,39	39th Ave. & 248th St.	12" DIA	Udalls Cove
661	40,47,25	73,47,05	208th St.	30" DIA	Little Bay
665	40,46,22	73,45,15	131st St.	72" DIA	East River
666	40,47,24	73,51,18	9th Ave.	18" DIA	East River
669	40,50,46	73,51,05	15' s/o 31st Rd.	24" DIA	Flushing Creek
670	40,47,43	73,51,58	100' n/o North Shore M.T.S.	60" DIA	Flushing Bay
671	40,47,23	73,51,23	w/o 8th Ave.	36" DIA	East River
672	40,47,01	73,51,32	50' n/o 111th St.	30" DIA	Flushing Bay
* Discharge to Alley Creek or Little Neck Bay.					

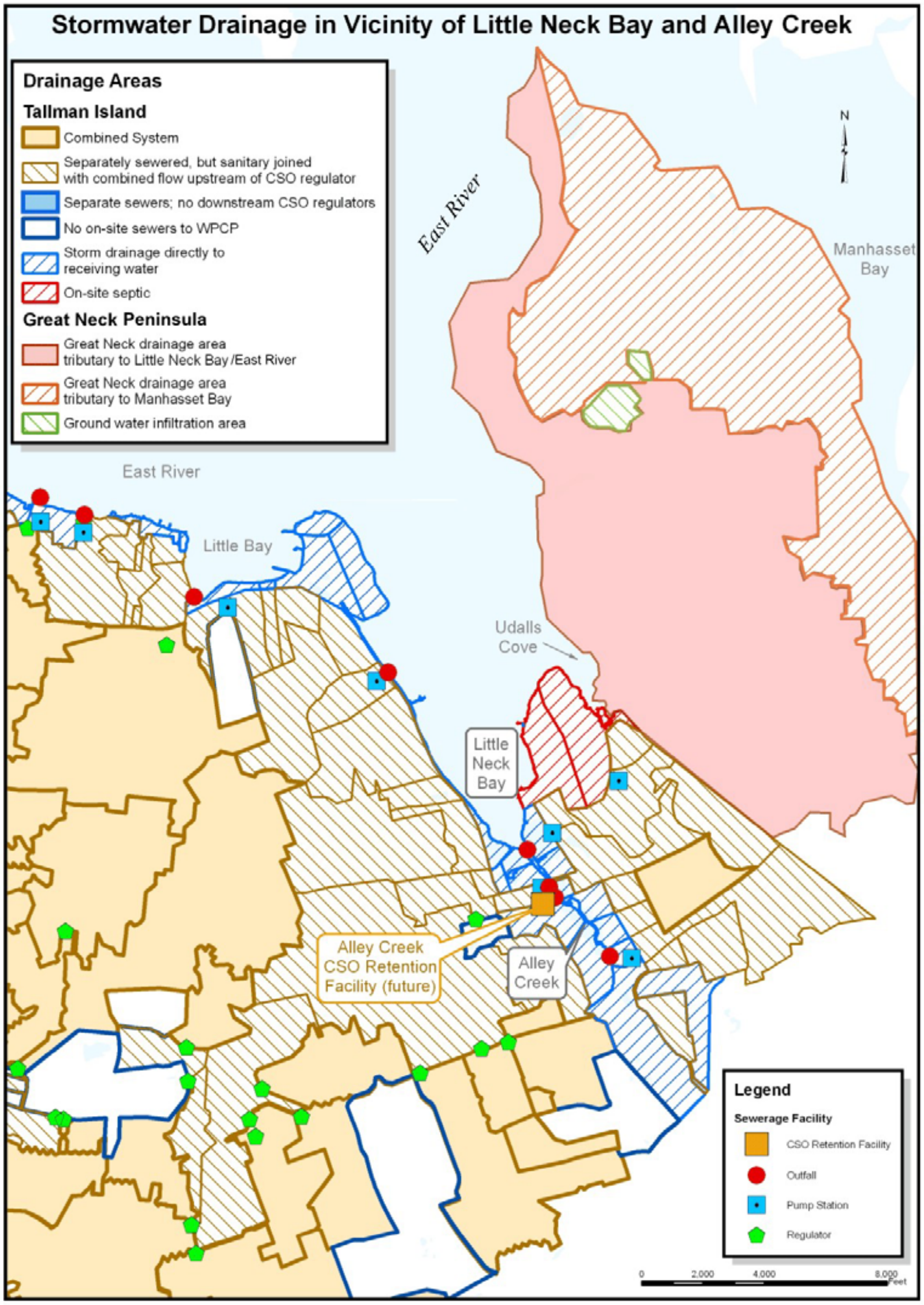
3.4 SEWER SYSTEM MODELING

Mathematical watershed models are used to simulate the hydrology (rainfall induced runoff) and hydraulics (sewer system responses) of a watershed, and are particularly useful in characterizing the sewer system conditions during wet weather and in evaluating engineering alternatives on a performance basis. In the hydrology portion of the model, climatic conditions (such as hourly rainfall intensity) and physical watershed characteristics (such as slope, imperviousness, and infiltration) are used to calculate rainfall-runoff hydrographs from individual smaller drainage areas (subcatchments) that drain runoff into catch basins. These runoff hydrographs are then applied at corresponding locations (manholes) in the sewer system as inputs to the hydraulic portion of the model. In the hydraulic portion, the resulting hydraulic grade lines and flows are calculated based on the characteristics and physical features of the sewer system, such as pipe sizes, pipe slopes, and flow-control mechanisms like weirs and pumping stations. Model output includes sewer system discharges which, when coupled with pollutant concentration information, provide the pollutant loadings necessary for receiving-water models to assess the water quality impacts. The following generally describes the tools employed to model the drainage areas tributary to Alley Creek and Little Neck Bay. A more detailed description of the model setup, calibration and model projection processes are provided under separate cover *City-Wide LTCP Landside Modeling Report, Tallman Island Water Pollution Control Plant (WPCP)*.

3.4.1 InfoWorks CS™ Modeling Framework

The hydraulic modeling framework used in this effort is a commercially available, proprietary software package called InfoWorks CS™, developed by Wallingford Software, U.K. InfoWorks CS™ is a hydrologic/ hydraulic modeling package capable of performing time-variant simulations in complex urban settings for either individual rain events or long-term periods comprising many rain events. The outputs include calculated hydraulic grade lines and flows within the sewer system network and at discharge points. InfoWorks CS™ solves the complete St. Venant hydraulic routing equations representing conservation of mass and momentum for sewer-system flow and accounts for backwater effects, flow reversals, surcharging, looped connections, pressure flow, and tidally affected outfalls. Similar in many respects to the USEPA Storm Water Management Model (SWMM), InfoWorks CS™ offers a state-of-the-art graphical user interface with greater flexibility and enhanced post-processing tools for analysis of the model generated outputs. In addition, InfoWorks CS™ utilizes a four-point implicit numerical solution technique that is generally more stable than the explicit solution procedure used in SWMM. The NYCDEP has chosen InfoWorks CS™ as the unified platform for developing urban drainage models for all the 14 WPCP drainage areas in the city.

Model input for InfoWorks CS™ includes watershed characteristics for individual subcatchments, including area, surface imperviousness and slope, as well as sewer-system characteristics such as information describing the network (connectivity, pipe sizes, pipe slopes, pipe roughness, etc.) and flow-control structures (pump stations, regulators, outfalls, and WPCP headworks). Hourly rainfall patterns and tidal conditions are also important model inputs. InfoWorks CS™ allows interface with geographic information system (GIS) data to facilitate model construction and analysis.



New York City Department of Environmental Protection

Great Neck Peninsula Drainage

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 3-7

Model output includes flow and hydraulic gradient line (HGL) at virtually any point in the modeled system and also at virtually any time during the modeled period. InfoWorks CS™ provides full interactive views of data using geographical plan views, longitudinal sections, spreadsheet-style grids and time-varying graphs. A three-dimensional junction view provides an effective visual presentation of hydraulic behavior in manholes during wet or dry weather periods. Additional post-processing of model output allows the user to view results in various ways as necessary to evaluate the system response, and also to visualize the improvements resulting from various engineering alternatives.

3.4.2 Application of the Model to Tallman Island Collection System

The InfoWorks CS™ model for the Tallman Island Collection System was constructed using information and data compiled from the NYCDEP inflow/infiltration drawings, as-built or construction drawings, WPCP data including wet well configuration, previous and ongoing planning projects, regulator improvement program reports, and inflow/ infiltration analyses in separately sewered portions of the drainage area. This information includes invert and ground elevations for manholes, pipe dimensions, pumping station characteristics, and regulator configurations and dimensions.

Model simulations include WPCP headworks, interceptors, branch interceptors, major trunk sewers, all sewers greater than 48-inches in diameter plus other smaller, significant sewers, and control structures such as pump stations, diversion chambers, tipping locations, reliefs, regulators, and tide gates. As presented in the LTCP Landside Modeling Report for Tallman Island drainage area, the model was calibrated and validated using flow and hydraulic-elevation data collected historically in this area. All CSO and stormwater outfalls permitted by the State of New York are represented in the model, with stormwater discharges from separately sewered areas simulated using separate models, as necessary. The runoff generated and discharged directly from areas adjoining the receiving waters (direct drainage) is modeled separately. Similarly, runoff generated and discharged directly from tributary areas not adjoining the receiving waters ("other") is also modeled separately.

Some portions in the eastern part of the Tallman Island drainage area have been designed to be separately sewered. The NYCDEP built sanitary sewers, and is building storm sewers as part of the on-going sewer master planning process. In the interim, seepage pits (consisting of a concrete cylinder inside 10-12 feet of graded sand layers) have been built in some areas to capture storm runoff. In other areas, catch basins have been temporarily connected to sanitary sewers to relieve street flooding while in other areas runoff flows along street curbs downgradient until it reaches a catch basin or a seepage pit. Although these features were not explicitly included in the model, the model calibration process accounted for runoff reductions expected from the seepage pits through adjustments to the impervious cover.

Conceptual alternative scenarios representing no-action (baseline) and other alternatives were simulated for the average year (1988 JFK rainfall). Tidal influence on the outfalls was explicitly modeled using the tidal boundary conditions and tide gates, where present. Depending on the number of regulators that contributed flows to each outfall, the discharges from those regulators were combined to develop the total discharges on a time-variable basis. The fractions of sanitary flows and storm water at each time-step were determined using the pollutant routing algorithm built in InfoWorks CS™. Pollutant concentrations selected from field data and best professional judgment were assigned to the sanitary and stormwater components of the combined sewer discharges to calculate variable pollutant loadings. Similar assignments were made for stormwater discharges in separated areas or to flows discharged from direct drainage and "other" areas. Discharges and pollutant loadings were then post-processed and used as inputs to the receiving-water model, described in Section 4.

3.4.3 Application of the Model to Nassau County

The drainage areas that contribute runoff from Nassau County, shown in Figure 3-6, were explicitly modeled in InfoWorks CS^{TM}, as separately sewered areas. Pollutant concentrations selected from field data and best professional judgment were assigned to Nassau County stormwater. Discharges and pollutant loadings were then post-processed and used as inputs to the receiving-water model, described in Section 4.

3.4.4 Baseline Design Condition

Watershed modeling can be an important tool in evaluating the impact of proposed physical changes to the sewer system and/or of proposed changes to the operation of the system. In order to provide a basis for these comparisons, a "Baseline Condition" was developed. For the Tallman Island Model, the Baseline Conditions parameters were as follows:

1. <u>Dry weather flow rates reflect year 2045 population projections, 60.2 MGD sanitary flow.</u>

   Establishing the future Tallman Island WPCP dry weather sewage flow is a critical step in the WB/WS Facility Planning analysis since one key element in the City's CSO control program is the use of WPCPs to reduce CSO events. Increases in sanitary sewage flows associated with increased populations will reduce the amount of CSO flow that can be treated at the existing WPCPs since the increased sewage flows will use part of the WPCP wet weather capacity.

   Dry weather sanitary sewage flows used in the baseline modeling were escalated from current levels to reflect anticipated growth within the City. The Mayor's Office and City Planning have made assessments of the growth and movement of the population between the year 2000 census and 2010 and 2030 (NYCDCP, 2006). This information is contained in a set of projections made for some 188 neighborhoods within the city. NYCDEP has escalated these populations forward to 2045 by assuming the rate of growth between 2030 and 2045 could be 50 percent of the rate of growth between 2000 and 2030 (NYCDCP, 2006). These populations were associated with each of the landside modeling sub-catchment areas tributary to each CSO regulator using GIS calculations. Dry sanitary sewage flows were then calculated for each of these sub-catchment areas by associating a conservatively high per capita sanitary sewage flow with the population estimate. The per capita sewage flow was established as the ratio of the year 2000 dry weather sanitary sewage flow and population for the Tallman Island WPCP service area.

   Increasing the dry weather sewage flows for the Tallman Island WPCP from the current (fiscal year 2005) flow of 53 MGD to a 2045 estimated flow of 60.2 MGD will properly account for the potential reduction in wet weather treatment capacity associated with projections of a larger population.

2. Tallman Island WPCP wet weather capacity of 122 MGD.

The baseline wet weather capacity for this and all other WB/WS Facility Plans has been set to the 2003 wet weather "average sustained flow" consistent with the calculations of wet weather capture and performance in the "White Paper" appended to the 2005 CSO Consent Order. The average sustained flow is the average of the largest, multi-hour flows that occurred during each of the top ten storm periods. The sustained flows are determined by averaging the hourly persistent maximum flow over the storm period. The average sustained flows are reported annually to NYSDEC in the Combined Sewer Overflow Best Management Practices (BMP) Annual Report. For the Tallman Island WPCP the average sustained 2003 wet weather flow is 122 MGD (NYCDEP, 2004).

3. Documented sedimentation in sewers.

Sediment was included in the Tallman Island collection system in recognition of the fact that operation without any sediment is not the reality of experience in the field. Therefore, sediment was included. The sediment does not represent a chronic condition in need of remediation but rather a normal condition. It should be noted that the same sedimentation is included in the alternatives evaluation scenarios. The sedimentation is the same in the Baseline and Facility Plan analyses.

4. Rainfall record is 1988 from JFK.

In addition to the above watershed/sewer system conditions, long-term meteorological (rainfall) conditions are necessary for comparing the benefits of various engineering alternatives in the Tallman Island drainage area. In accordance with the Federal CSO Control Policy, the concept of identifying an average rainfall year was used. Long-term rainfall records measured in the New York City metropolitan area were analyzed to identify potential rainfall design years to represent long-term, annual average conditions. Statistics were compiled to determine:

- Annual total rainfall depth
- Annual total number of storms
- Annual average storm volume
- Annual average storm intensity
- Annual total duration of storms
- Annual average storm duration, and
- Annual average time between storms

A more detailed description of the comparative rainfall analyses is provided in a previous report (HydroQual, 2004). Although no year was found having the long-term average statistics for all of these parameters, the rainfall record measured at the National Weather Service gage at John F. Kennedy (JFK) International Airport during calendar year 1988 is representative of the overall, long-term average conditions in terms of the annual total rainfall and storm duration. Table 3-9 summarizes some of the statistics for 1988 and a long-term (1970-2002) record at JFK. Furthermore, the JFK 1988 rainfall record also includes high-rainfall conditions during July (recreational) and November (shellfish) periods, which is useful for evaluating the potential CSO impacts on water quality during those stressing periods. As a result, the JFK 1988 rainfall record was selected as an appropriate design condition for which to evaluate the baseline and future sewer system responses to rainfall. The JFK 1988 record has also been adopted as design condition by the New York Harbor Estuary Program to evaluate water-quality conditions in the New York/New Jersey Harbor Estuary.

Table 3-9. Comparison of Annual 1988 and Long-Term Statistics JFK Rainfall Record (1970-2002)

Rainfall Statistic	1988 Statistics	Long-Term Median (1970-2002)
Annual Total Rainfall Depth (inches)	40.7	39.4
Return Period (years)	2.6	2.0
Average Storm Intensity (inch/hour)	0.068	0.057
Return Period (years)	11.3	2.0
Annual Average Number of Storms	100	112
Return Period (years)	1.1	2.0
Average Storm Duration (hours)	6.12	6.08
Return Period (years)	2.1	2.0

3.5 CHARACTERISTICS OF DISCHARGES TO ALLEY CREEK AND LITTLE NECK BAY

As indicated in Section 3.4, sewer-system modeling is useful to characterize flows and pollutant loads discharged from various outfalls in the drainage area. Because long-term monitoring of outfalls is difficult and expensive, and sometimes not accurate in tidally influenced or submerged outfalls, sewer-system models that have been calibrated to available measurements of water levels and flows can offer a useful characterization of the discharge quantities. Sewer system models can also be used to estimate the overflow quality through a variety of calculation methods. In this study, relative percentage of sanitary sewage and rainfall runoff discharged from a CSO point at any given time was used as a way to estimate the CSO quality during the continuous simulation period. This is particularly helpful when developing pollutant concentrations, since this sanitary/runoff split for discharge volume can be used to develop pollutant loadings based on concentrations associated with the sanitary and runoff volumes. Concentrations based on discharge fractions of sanitary versus runoff are somewhat more reliable than concentrations assigned based on pollutant concentrations measured in combined sewage (e.g., the event mean concentrations, EMC), which are particularly variable. Concentrations based on discharge fractions also allow for the dilution of sanitary sewage that is observed in CSO overflows during larger rainfall events.

Section 3.5.1 presents information related to the quantity (volume) discharged into the waterbody for the Baseline condition. Section 3.5.2 discusses the pollutant concentrations assigned to the storm and sanitary discharges. Section 3.5.3 summarizes the pollutant loadings discharged to Alley Creek and Little Neck Bay for the Baseline Condition. Section 3.5.4 discusses the potential for toxic discharges to Alley Creek and Little Neck Bay, and Section 3.5.5 provides an overview of the effect of watershed development and urbanization on discharges.

3.5.1 Characterization of Discharged Volumes, Baseline Condition

The calibrated watershed models described in Section 3-4 were used to characterize discharges to Alley Creek and Little Neck Bay for the Baseline Condition.

TI-006: As listed in Table 3-6, TI-006 is the 24th Avenue Pump Station bypass that discharges to Little Neck Bay. This bypass is rarely needed and the Tallman Island Model Baseline indicated no CSO flow from this outfall. However, stormwater from separately sewered areas enters the outfall pipe downstream of the pump station bypass and is discharged through TI-006. During the Baseline one-year simulation period, a total of 109 MG was calculated to overflow from this outfall. Although discharging from TI-006, this flow is stormwater and is designated as "Stormwater Discharge via CSO Outfall" to distinguish this source from stormwater discharged via stormwater outfalls, direct drainage and "other" areas.

TI-007: As listed in Table 3-6, TI-007 is the Old Douglaston Pump Station bypass that discharges into Alley Creek. This bypass is rarely needed and the Tallman Island Model Baseline indicated no CSO flow from CSO outfall TI-007. No stormwater is discharged from TI-007 during Baseline. This outfall is to be demolished during the Alley Creek project as mandated by NYSDEC, thus eliminating the emergency overflow from the Old Douglaston Pump Station. Collection System Operations will monitor from a telemetry system and respond to any alarms.

TI-009: As listed in Table 3-6, TI-009 is the Douglaston Bay Pump Station bypass that discharges into Alley Creek. This bypass is rarely needed and the Tallman Island Model Baseline indicated no CSO flow from CSO outfall TI-009. No stormwater is discharged from TI-009 during Baseline.

TI-024: As listed in Table 3-6, TI-024 is the new Douglaston Pump Station bypass that discharges into Alley Creek. This bypass is rarely needed and the Tallman Island Model Baseline indicated no CSO flow from CSO Outfall TI-024. Similarly to TI-006, TI-024 carries stormwater from separately sewered areas that enters the pipe downstream of the bypass and is discharged through the CSO outfall TI-024. This stormwater is designated as "Stormwater Discharge via CSO Outfall" to distinguish this source from stormwater discharged via stormwater outfalls, direct drainage and "other" areas. During the Baseline one-year simulation period, a total of 120 MG of stormwater was calculated to be discharged from this outfall.

TI-008: TI-008 is the CSO outfall for Regulators 46, 47, 48, and 49. TI-008 discharges to Alley Creek (Table 3-6). TI-008 discharges CSO from these regulators as well as stormwater from separately sewered areas. This stormwater becomes mixed with the CSO. A total of 517 MG of mixed CSO and stormwater is calculated to be discharged from TI-008 during the Baseline one-year simulation period. Of this total discharge, 58.8 MG is CSO, 4.4 MG sanitary component and 54.4 MG stormwater component. Downstream of the regulators an additional 458.6 MG of stormwater from separately sewered areas enters the pipe for discharge at TI-008, a total CSO of 517 MG.

Table 3-10 summarizes the results with statistics relating the annual CSO and stormwater discharges from each point-source outfall for the Baseline Condition from the Tallman Island CSO outfalls that discharge to Alley Creek and Little Neck Bay. About 69 percent of the total annual volume discharged from Tallman Island outfalls, under 1988 Baseline Conditions, is from combined sewer overflows (TI-008), and the remaining from stormwater outfalls (TI-006 and TI-024).

Table 3-10. Tallman Island CSO Outfall Discharge Summary for Baseline Condition for Alley Creek and Little Neck Bay(1)

Combined Sewer Outfall	Water Body	Stormwater Discharged via CSO Outfalls (MG) (2)	CSO Discharge Volume (MG)	% of Total Volume	Annual Frequency of CSO Discharge
TI-007	Alley Creek	0	0	0	-
TI-008	Alley Creek	0	517(3)	69	38
TI-009	Alley Creek	0	0	0	-
TI-024	Alley Creek	120	0	16	-
TI-006	Little Neck Bay	109	0	15	-
Totals		**229**	**517**	**100**	**38**

(1) Baseline condition reflects design precipitation record (JFK, 1988), projected sanitary flows for year 2045, Tallman Island WPCP capacity at 122 MGD.
(2) Discharge via CSO outfall that is only stormwater
(3) Includes 58.8 MG CSO and 458.6 MG stormwater.

Tallman Island Service Area Stormwater, Direct Drainage, and "Other" Drainage Discharges: The Tallman Island Model, as described above, was used to calculate discharge contributions from stormwater runoff sources for Baseline Condition. These flows are stormwaters that are discharged via stormwater outfalls or that flow directly to the waterbody. Drainage from "Other" areas is accounted for by including the flow in the stormwater outfalls to which it has been routed in the Tallman Island Model. For analysis purposes and in summary tables, Tallman Island service area stormwater, direct drainage and drainage from "other" areas are totaled and called "Stormwater and Direct Runoff." Tallman Island stormwater and direct drainage for Baseline is 321 MG into Alley Creek and 577 MG into Little Neck Bay for a total Baseline Condition of 898 MG (Stormwater and Direct Runoff).

Nassau County Flows: There are no CSO discharges from Nassau County WPCPs. The Nassau County areas that drain to Little Neck Bay contribute stormwater and direct runoff, but do not contribute CSOs. The Baseline Condition for Nassau County stormwater and direct runoff is 893 MG. In addition, the flow discharged by the Belgrave WPCP, 475 MG, is included in the Baseline Condition loading analysis. Table 3-11 summarizes all the sources of flow to Alley Creek and Little Neck Bay for the Baseline Condition year.

Table 3-11. Alley Creek and Little Neck Bay Discharge Flow Summary, Baseline Condition Year

Source	Discharge Volume (MG)	Percent of Total Volume
Tallman Island CSO	517[(1)]	17
Tallman Island Stormwater Discharged via CSO Outfalls	229	8
Tallman Island Stormwater Direct Drainage, Other	898	30
Nassau County Stormwater	893	30
Belgrave WPCP, Nassau County	475	15
Total	3,012 MG	100%

(1) Includes 58.8 MG of CSO and 458.6 MG of stormwater.

3.5.2 Characterization of Pollutant Concentrations, Baseline Condition

Pollutant concentrations associated with intermittent, wet weather-related discharges are highly variable. Some pollutants can exhibit first-flush behavior, with higher concentrations in the beginning of a storm and relatively constant concentrations later during the storm. Depending on the inter-event time between storms, certain pollutants exhibit different accumulation and wash-off rates. Many studies, including CSO control plan development in cities such as Washington, DC and the USEPA National Urban Runoff Program, have used the concept of event mean concentration (EMC) to characterize pollutant loads from CSO discharges (USEPA, 1983). Considering the variability in pollutant concentrations during rain events, the analyses documented in this report characterize discharged pollutants based on the relative portions of sanitary sewage and rainfall runoff in the discharged flows at any given point in time. Pollutant concentrations for sanitary sewage are attributed to the sanitary portion, and concentrations for stormwater are attributed to the rainfall runoff portion of the discharged flow volumes.

Tables 3-12 and 3-13 present the pollutant concentrations associated with the sanitary and stormwater components of discharges to Alley Creek and Little Neck Bay from Tallman Island and Nassau County, respectively. Sanitary concentrations were developed based on sampling of WPCP influent during dry-weather periods, as described elsewhere in more detail (HydroQual, 2005b). Stormwater concentrations were developed based on sampling conducted city-wide as part of the Inner Harbor Facility Planning Study (NYCDEP, 1994), and sampling conducted city-wide by NYCDEP for the USEPA Harbor Estuary Program (HydroQual, 2005a).

NYSDEC discharge monitoring reports (DMR) submitted by the Belgrave WPCP were reviewed to characterize the WPCP effluent for the Baseline Condition. The plant discharges an average 1.3 MGD. Average $CBOD_5$ and TSS concentrations are 10 mg/L. Total coliform, fecal coliform and enterococci are assumed to be negligible since the facility provides disinfection. Table 3-14 summarizes the Belgrave WPCP point source.

Table 3-12. Sanitary and Stormwater Discharge Concentrations, Tallman Island, Baseline Condition

Constituent	Sanitary Concentration	Stormwater Concentration
$CBOD_5$ (mg/L) [1]	140	15
TSS (mg/L) [1]	130	15
Total Coliform Bacteria (MPN/100mL) [2,3]	$25x10^6$	150,000
Fecal Coliform Bacteria (MPN/100mL) [2,3]	$4x10^6$	35,000
Enterococci (MPN/100mL) [2,3]	$1x10^6$	15,000

(1) HydroQual, 2005b.
(2) HQI Memo to NYCDEP, 2005a.
(3) Bacterial concentrations expressed as "most probable number" (MPN) of cells per 100 mL.

Table 3-13. Sanitary and Stormwater Discharge Concentrations, Nassau County, Baseline Condition

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

(1) HydroQual, 2005b.
(2) HQI Memo to NYCDEP, 2005a.
(3) Bacterial concentrations expressed as "most probable number" (MPN) of cells per 100 mL.

Table 3-14. Belgrave WPCP (Nassau County) Discharge Baseline Condition[1]

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

(1) NYSDEC, DMR data, 475 MG/yr.
(2) Disinfection practiced year-round.

3.5.3 Characterization of Pollutant Loads, Baseline Condition

Pollutant-mass loadings were calculated using the pollutant concentrations shown in Tables 3-12, 3-13 and 3-14 applied to the discharge volumes and sanitary/rainfall-runoff splits provided by the Tallman Island watershed model, as described above. Table 3-15 presents a summary of the annual discharges to Alley Creek and Little Neck Bay for the Baseline Condition from Tallman Island CSOs, Tallman Island stormwater discharged via CSO outfalls, Tallman

Island stormwater and direct runoff, Nassau County stormwater and direct runoff, and the Belgrave WPCP effluent discharge. The Baseline Condition CSO flow is approximately 17 percent of the total flow discharged to Alley Creek and Little Neck Bay. Approximately, 16 percent of the Baseline Condition volume discharged is from the Belgrave WPCP. Most of the flow (~70 percent) is stormwater discharge and direct runoff. The Belgrave source is constant, as contrasted to the CSO and stormwater sources that are wet weather discharges. The Belgrave WPCP represents 11 percent of the Baseline $CBOD_5$ and TSS discharged to the Alley Creek and Little Neck Bay. Tallman Island CSO and stormwater sources are 39 percent of the $CBOD_5$ and TSS loads. Nassau County stormwater is approximately 31 percent. In contrast, the Belgrave WPCP contributes negligible total coliform, fecal coliform and enterococcus. Tallman Island discharges represent 90 percent, 80 percent and 70 percent of the total loads of total coli, fecal coli and enterococcus. The remainder of the total is from Nassau stormwater. It should be noted that of the total loads of total coliform, fecal coliform and enterococcus, to the Alley Creek and Little Neck Bay waters, 46 percent, 37 percent and 29 percent, respectively, are discharged from TI-008. Figure 3-8 graphically presents the information in Table 3-15 as relative contributions of each source category to the total discharged to Alley Creek and Little Neck Bay.

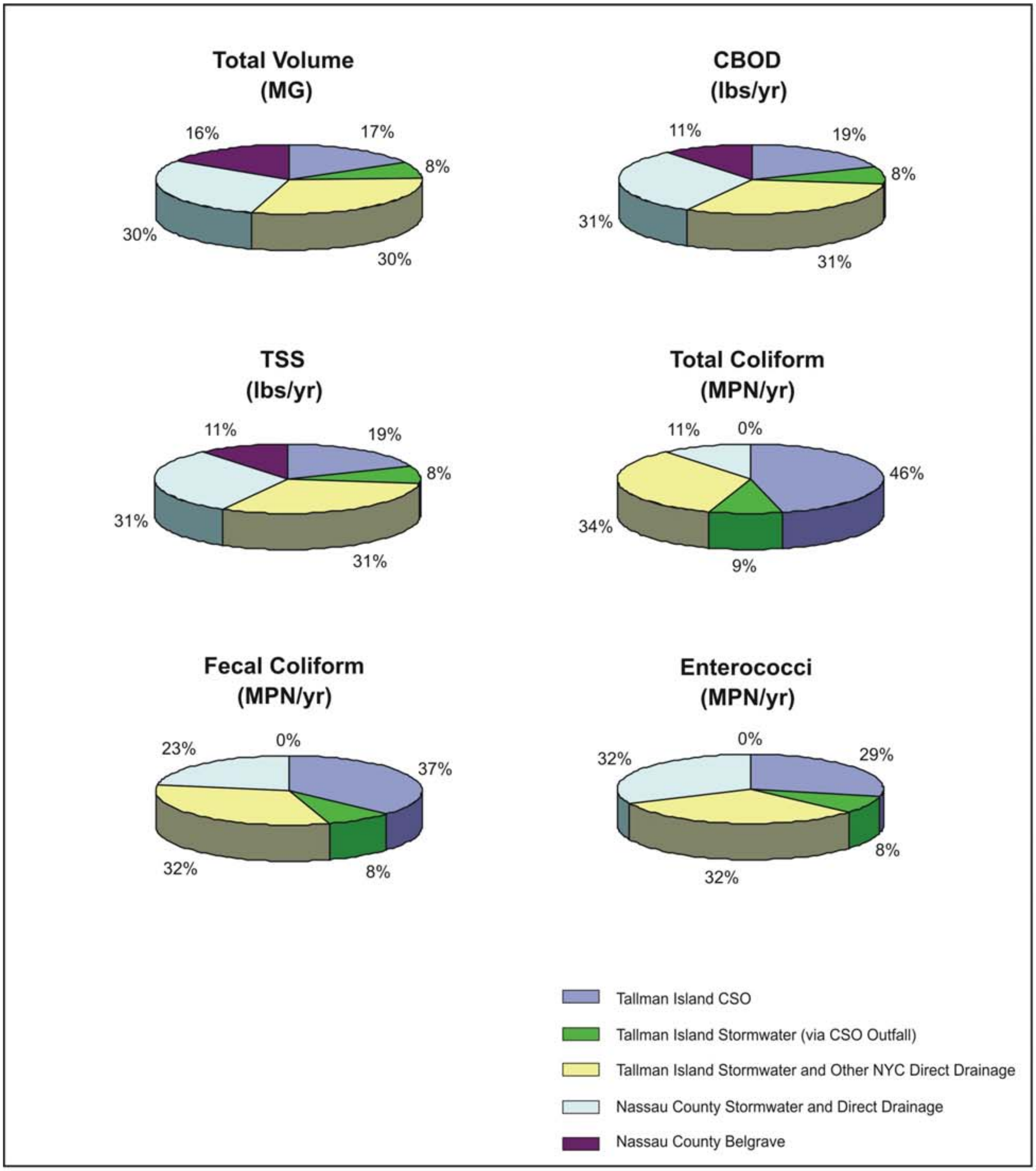
The Baseline Condition case did not include any localized sources of pathogens in the Douglaston Manor peninsula area that are known to impact Douglas Manor Association (DMA) Beach water quality and limit its use. The purpose of the Baseline is to evaluate the water quality improvement associated with CSO control alternatives. For long-term LTCP planning time horizons, the localized sources were assumed to have been eliminated.

The information summarized in Table 3-15 and Figure 3-8 was examined on the basis of loads entering Alley Creek and loads entering Little Neck Bay. Table 3-16 summarizes the sources to Alley Creek: CSO Loading, Stormwater Discharged via CSO Outfalls and Stormwater and Direct Runoff. All of the Alley Creek sources are from the Tallman Island WPCP area. Similarly, the Tallman Island (NYC) sources and Nassau County sources are presented for Little Neck Bay loads. There are no CSO loads to Little Neck Bay. Table 3-16 shows that the Alley Creek CSO from TI-008 is a significant portion of the loads to Alley Creek.

Table 3-15. CSO, Stormwater and Point Source Discharge Loadings - Baseline Condition

	Nassau County(1)			Tallman Island(1,2)		
Constituent	Belgrave WPCP	CSO Loading	Stormwater and Direct Runoff	CSO Loading(4)	Stormwater Discharge via CSO Outfall	Stormwater and Direct Runoff(3)
Volume (MG)	475	0	893	517	229	898
$CBOD_5$ (1000 lbs/yr)	40	0	112	69	29	112
TSS (1,000 lbs/yr)	40	0	112	69	29	112
Total Coliform Bacteria (org/yr)	$<.004 \times 10^{15}$	0	1.7×10^{15}	7.1×10^{15}	1.3×10^{15}	5.1×10^{15}
Fecal Coliform Bacteria (org/yr)	$<.004 \times 10^{15}$	0	0.8×10^{15}	1.3×10^{15}	0.3×10^{15}	1.2×10^{15}
Enterococci (org/yr)	$<.004 \times 10^{14}$	0	5.1×10^{14}	4.6×10^{14}	1.3×10^{14}	5.1×10^{14}

(1) Loadings represent annual total during Baseline simulation.
(2) Tallman Island Operating Capacity 122 MGD.
(3) Does not include stormwater discharged via CSO Outfalls.
(4) Only TI-008 discharges CSO; 58.8 MG CSO and 458.6 MG stormwater (see Table 3-10).



New York City
Department of Environmental Protection

Alley Creek and Little Neck Bay
Baseline Loading Sources

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 3-8

Table 3-16. CSO, Stormwater and Point Source Discharge Loadings to Alley Creek and Little Neck Bay - Baseline Condition

Constituent	Alley Creek			Little Neck Bay				
	Tallman Island(1,2)			Tallman Island(1,2)			Nassau County(1)	
	CSO Loading(4)	Stormwater Discharged via CSO Outfalls	Stormwater & Direct Runoff(3)	CSO Loading(5)	Stormwater Discharged via CSO Outfalls	Stormwater and Direct Runoff(3)	Belgrave WPCP	Stormwater & Direct Runoff
Volume (MG)	517	120	321	0	109	577	475	893
$CBOD_5$ (1,000 lbs/yr)	69	15	40	0	14	72	139	112
TSS (1000 lbs/yr)	69	15	40	0	14	72	139	112
Total Coliform Bacteria (6)	7.1×10^{15}	0.7×10^{15}	1.7×10^{15}	0	0.6×10^{15}	3.2×10^{15}	$<.004 \times 10^{15}$	1.7×10^{15}
Fecal Coliform Bacteria(6)	1.3×10^{15}	0.2×10^{15}	0.4×10^{15}	0	0.1×10^{15}	0.8×10^{15}	$<.004 \times 10^{15}$	0.8×10^{15}
Enterococci(6)	4.6×10^{14}	0.7×10^{14}	1.8×10^{14}	0	0.6×10^{14}	3.3×10^{14}	$<.004 \times 10^{14}$	5.1×10^{14}

(1)Loadings represent annual total during Baseline simulation.
(2)Tallman Island Operating Capacity 122 MGD.
(3)Does not include stormwater discharged via CSO Outfalls.
(4)Only TI-008 discharges CSO; 58.77 MG CSO and 458.6 MG stormwater.
(5)TI-006 (discharges only stormwater).
(6)Bacterial loadings expressed as most probable number (MPN).

Considering all of the 517 MG of flow from TI-008 as CSO, for the design year 1988 rainfall, Baseline CSO represents 54 percent of flow, 56 percent of the $CBOD_5$ and TSS load, 75 percent of total coliform load, 68 percent of fecal coliform load, and 65 percent of enterococcus load to Alley Creek.

3.5.4 Effects of Urbanization on Discharge

The urbanization of the Alley Creek and Little Neck Bay drainage area from a pastoral watershed to a developed urban/suburban sewershed is described in Section 2. The pastoral condition featured undeveloped uplands that provided infiltration of incident rainfall and contributed continuous freshwater inputs. Urbanization brought increased population, increased pollutants from sewage and industry, construction of sewer systems, and physical changes affecting the surface topography and imperviousness of the watershed. Increased surface imperviousness generates more runoff that is less attenuated by infiltration processes, and the sewer systems replaced natural overland runoff pathways with a conveyance system that routes the runoff directly to the waterbody without the attenuation formerly provided by surrounding wetlands. As a result, more runoff is generated, and it is conveyed more quickly and directly to the waterbody. These changes also affect how pollutants are transferred along with the runoff on its way to the waterbody. Furthermore, the urbanized condition also features additional sources of pollution from CSOs and industrial/commercial activities.

Urbanization of the watershed has altered its runoff yield tributary to Alley Creek and Little Neck Bay by increasing its imperviousness. Imperviousness is a characteristic of the ground surface that reflects the percentage of incident rainfall that runs off the surface rather than being absorbed into the ground. While natural areas typically exhibit imperviousness of 10 to 15 percent, imperviousness in urban areas can be significantly higher (60 to 90 percent).

In a pastoral condition, runoff from a watershed reaches the receiving waters through a combination of overland surface flow and subsurface transport, typically with ponding and other opportunities for retention and infiltration. The extensive tidal wetland areas previously surrounding Alley Creek and Little Neck Bay would have further attenuated wet-weather runoff and pollutant effects. However, the urbanization of Alley Creek and Little Neck Bay watershed reduced infiltration and natural subsurface transport and eliminated natural streams previously tributary to Alley Creek and Little Neck Bay. Runoff is transported via roof leaders, street gutters and catch basins into the combined and separate sewer system, which then discharges directly to Alley Creek and Little Neck Bay since the wetlands have been eliminated. Urbanization has thus simultaneously decreased retention and absorption of runoff during transport and decreased the travel time for runoff to reach the waterbody. When combined with the increased runoff due to increased imperviousness of the watershed, the end result is increased peak discharge rates and higher total discharge volumes to the waterbody during wet weather and lower freshwater flow volumes (groundwater) during dry weather periods resulting from reduced infiltration.

Urbanization has also altered the pollutant characteristics of wet-weather discharges from the watershed. The original rural landscape of forests, fields and wetlands represents pristine conditions with pollutant loadings resulting from natural processes (USEPA, 1997). These natural loadings, while having an impact on water quality in the receiving water, are subjected to natural attenuation process. For example, depending on the holding time, the volume of water in the wetland may go through nutrient attenuation or bacterial decay before discharging into the Alley Creek and Little Neck Bay. On the other hand, wet-weather discharges from urbanized areas have significantly higher pollutant concentrations than natural runoff. These pollutants include coliform bacteria, oxygen-demanding materials, suspended and settleable solids, floatables, oil and grease, and other materials.

A summary of the hydrologic changes caused by urbanization in the New York City portion of the Alley Creek and Little Neck Bay watershed is presented in Table 3-17. The pre-urbanized condition is assumed circa 1900. The runoff volume has increased. Runoff yield for an average precipitation year as calculated by the landside model has increased from approximately 500 MG of natural runoff to approximately 3,000 MG (see Table 3-11) discharged by combined and separate sewer systems to Alley Creek and Little Neck Bay, an increase of 600 percent. Significantly larger discharges are now made directly to the Alley Creek and Little Neck Bay at higher rates since they are no longer attenuated, filtered, and mitigated by "natural" overland mechanisms.

Table 3-17. Effects of Urbanization on Watershed Loading

Category	Pre-Urbanization(1)	Urbanized(2)	Change (%)
Runoff Volume (MG)	500	3000	+600%
Total Suspended Solids (TSS) Load [lbs/yr]	63,000	322,000	+500%
Biochemical Oxygen Demand (BOD) Load [lbs/yr]	63,000	322,000	+500%

(1) Circa 1900, using stormwater concentrations
(2) For an average precipitation year (JFK, 1988)

A pollutant loading comparison is summarized in Table 3-17 using typical pollutant concentrations from literature sources. The table compares pre-urbanized pollutant loadings of total suspended solids and biochemical oxygen demand to the existing urbanized condition. The annual volumes used for this table are taken from those in Table 3-15 assuming an average precipitation year. Typical stormwater concentrations are used for the pre-urbanized condition. The urbanized condition accounts for existing CSO and stormwater discharges. The table demonstrates that urbanization of the watershed has increased pollutant loadings to the Alley Creek and Little Neck Bay waters by a factor of approximately five.

3.5.5 Toxics Discharge Potential

Early efforts to reduce the amount of toxic contaminants being discharged to the New York City open and tributary waters focused on industrial sources and metals. For industrial source control of separate and combined sewer systems, the USEPA requires approximately 1,500 municipalities nationwide to implement Industrial Pretreatment Programs (IPPs). The intent of the IPP is to control toxic discharges to public sewers that are tributary to sewage treatment plants by regulating Significant Industrial Users (SIU). If a proposed IPP is deemed acceptable, USEPA will decree the local municipality a "control authority." NYCDEP has been a control authority since January 1987, and enforces the IPP through Chapter 19 of Title 15 of the Rules of the City of New York (Use of the Public Sewers), which specifies excluded and conditionally accepted toxic substances along with required BMPs for several common discharges such as photographic processing waste, grease from restaurants and other non-residential users, and perchloroethylene (PERC) from dry cleaning. The NYCDEP has been submitting annual reports on its activities since 1996. The 310 SIUs that were active citywide at the end of 2004 discharged an estimated average total mass of 38.2 pounds per day (lbs/day) of the following metals of concern: arsenic, cadmium, copper, chromium, lead, mercury, nickel, silver and zinc.

As part of the IPP, NYCDEP analyzed the toxic metals contribution of sanitary flow to CSOs by measuring toxic metals concentrations in WPCP influent during dry weather in 1993. This program determined that of the 177 lbs/day of regulated metals being discharged by regulated industrial users only 2.6 lbs/day (1.5 percent) were bypassed to CSOs. Of the remaining 174.4 lbs, approximately 100 lbs ended up in biosolids, and the remainder was discharged through the main WPCP outfalls. Recent data suggest even lower discharges. In 2003, the average mass of total metals discharged by all regulated industries to the New York City WPCPs was less than 39.1 lbs/day, which would translate into less than 1 lb/day bypassed to CSOs from year 2003 regulated industries if the mass balance calculated in 1993 is assumed to be maintained. A similarly developed projection was cited by the 1997 NYCDEP report on meeting the nine minimum CSO control standards required by federal CSO policy, in which NYCDEP considered the impacts of discharges of toxic pollutants from SIUs tributary to CSOs (NYCDEP, 1997a). The report, audited and accepted by USEPA, includes evaluations of sewer system requirements and industrial user practices to minimize toxic discharges through CSOs. It was determined that most regulated industrial users (of which SIUs are a subset) were discharging relatively small quantities of toxic metals to the NYC sewer system. There are no SIUs located in the Alley Creek and Little Neck Bay drainage area. In addition, NYSDEC has not listed Alley Creek and Little Neck Bay as being impaired by toxic pollutants. As such, metals and toxic pollutants are not considered to be pollutants of concern for the development of this Waterbody/Watershed Facility Plan.

4.0 Waterbody Characteristics

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

4.1 CHARACTERIZATION METHODOLOGY

The NYCDEP comprehensive watershed-based approach to long-term CSO control planning follows the USEPA guidance for monitoring and modeling (USEPA, 1999a). The watershed approach "represents a holistic approach to understanding and addressing all surface water, ground water, and habitat stressors within a geographically defined area, instead of addressing individual pollutant sources in isolation." (USEPA, 1999a) The guidance recommends identifying appropriate measures of success based on site-specific conditions to both characterize water quality conditions and measure the success of long-term control plans. The measures of success are recommended to be objective, measurable, and quantifiable indicators that illustrate trends and results over time. The recommended measures of success are administrative (programmatic) measures, end-of-pipe measures, receiving waterbody measures, and ecological, human health, and use measures. USEPA further states that collecting data and information on CSOs and CSO impacts, provides an important opportunity to establish a solid understanding of the "baseline" conditions and to consider what information and data are necessary to evaluate and demonstrate the results of CSO control. USEPA acknowledges that since CSO controls must ultimately provide for the attainment of water quality standards, the analysis of CSO control alternatives should be tailored to the applicable standards, such as those for dissolved oxygen and coliform bacteria. Since the CSO Control Policy recommends reviews and revision of water quality standards, as appropriate, investigations should reflect the site-specific wet weather impacts of CSOs. NYCDEP has implemented its CSO facility planning projects consistently with this guidance and has developed these categories of information on waterbodies such as Alley Creek and Little Neck Bay.

The waterbody/watershed assessment of Alley Creek and Little Neck Bay and its watershed, therefore, required a compilation of existing data, identification of data gaps, collection of new data, and cooperation with field investigations being conducted by other agencies. Waterbody/watershed characterization activities, where needed to fill in data gaps, were conducted following the NYCDEP Use and Standards Attainment (USA) Project Waterbody Work Plan. These efforts yielded valuable information in support of characterization, mathematical modeling and engineering efforts. The following describes the characterization activities.

4.1.1 Compilation of Existing Data

A comprehensive review of past and ongoing data collection efforts was conducted to identify programs focused on or including Alley Creek, Little Neck Bay and nearby waterbodies.

NYCDEP has conducted facility planning in Alley Creek and Little Neck Bay since 1988 as part of its East River CSO Facility Planning Project. Several additional parallel projects by NYCDEP and others have also been conducted. These efforts further contribute to the available data and are described below. NYCDEP continues to conduct investigative programs during the LTCP Project as data gaps are discovered during waterbody/watershed evaluations and WPCP collection system and landside modeling. Additional data are available for some of the waterbody/watershed assessment areas from other stakeholders in the New York Harbor such as the US Army Corps of Engineers (USACE). The USACE is conducting Ecosystem Restoration Projects throughout the Harbor area. An USACE project is being conducted within the Tallman Island WPCP service area in Flushing Bay.

Previously reported water quality field surveys of the Alley Creek and Little Neck Bay system are summarized below:

1. 1988-1989 - "East River CSO Facility Planning Project: Receiving Water Quality Modeling" (Lawler, Matusky & Skelly [LMS], 1992b). LMS conducted field sampling in 1988 and 1989 in the East River and several of its tributaries. These included two survey stations located in Little Neck Bay, one near the mouth of Alley Creek and the other mid-way between the Alley Creek mouth and the East River. These stations were sampled bi-weekly from May 1988 through August 1989. No sampling was performed during winter months. Four intensive surveys were performed with more frequent sampling. These intensive surveys included one dry weather survey (October 11-14, 1988) and three wet weather surveys (July 18-22, 1988; May 9-12, 1989; and September 14-20, 1989). Constituents analyzed in these surveys included temperature, conductivity, DO, total and fecal coliforms, 5-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), pH, secchi depth, enterococci, sulfide, nitrogen series, total phosphorus, volatile suspended solids (VSS), oil and grease, and chlorophyll-a. Additional special studies were done of sediment oxygen demand, solids settling and coliform die-off.

2. 1992 - "East River CSO Facility Planning Project: Water Quality Investigations of Little Neck Bay and Alley Creek" (Lawler, Matusky & Skelly, 1993). Additional sampling in support of the East River CSO Facility Planning Project was performed in 1992. This consisted of an intensive dry weather survey (October, 5-8, 1992), and two wet weather surveys (September 21-24, 1992; and November 2-5, 1992.) Samples were taken at 4-hour intervals at specific depths at five sample locations along a transect with two stations in Alley Creek, two in Little Neck Bay, and the fifth in the East River. The sample parameters were essentially the same as those listed above for the 1988-89 surveys. Special studies were also conducted of sediment oxygen demand, bathymetry, tidal stage, and current velocities. Data indicated that coliform standards were frequently not being met throughout the year, and that dissolved oxygen standards were not being met during the summer months. A shoreline survey in Alley Creek and along Douglaston Manor on the east shore of the Bay discovered previously undocumented stormwater outfalls in the creek area.

3. NYCDEP Harbor Survey. The Harbor Survey, an on-going monitoring of New York Harbor water quality has two stations in and around Little Neck Bay. Station E8 is in the East River, near the mouth of the Bay. Water quality sampling has been done at this station from 1914 through the present. Station E11 is located in the middle of the Bay, and was sampled from 1984 through 2000.

4. NYCDEP Sentinel Monitoring Program. The Sentinel Program, a targeted program to sample localized areas of high pathogen levels, collected samples for fecal coliform analysis from three Little Neck Bay stations during the period of 1999/2000 through early 2002. Station S01 (sampling dates quarterly June 6, 1999 through October, 2003) was located near the mouth of Alley Creek. Station S02 (same dates) was located on the east shore of the Bay, near the mouth of Udalls Cove. Station S64, located along the west shoreline of the Bay near Fort Totten Military Reservation, was sampled quarterly from October 2000 through October 2003.

5. Connecticut Department of Environmental Protection (CTDEP). CTDEP monitored one location in Little Neck Bay (CT211).

6. The NYC Department of Health and Mental Hygiene (NYCDOHMH) collects samples weekly during the summer months (May through the first week of September) in waters at the private Douglas Manor Association (DMA) Beach, located on the east shore of Little Neck Bay along the Douglaston peninsula. These samples are analyzed for sanitary indicator bacteria, total and fecal coliform (historically) and enterococcus (currently).

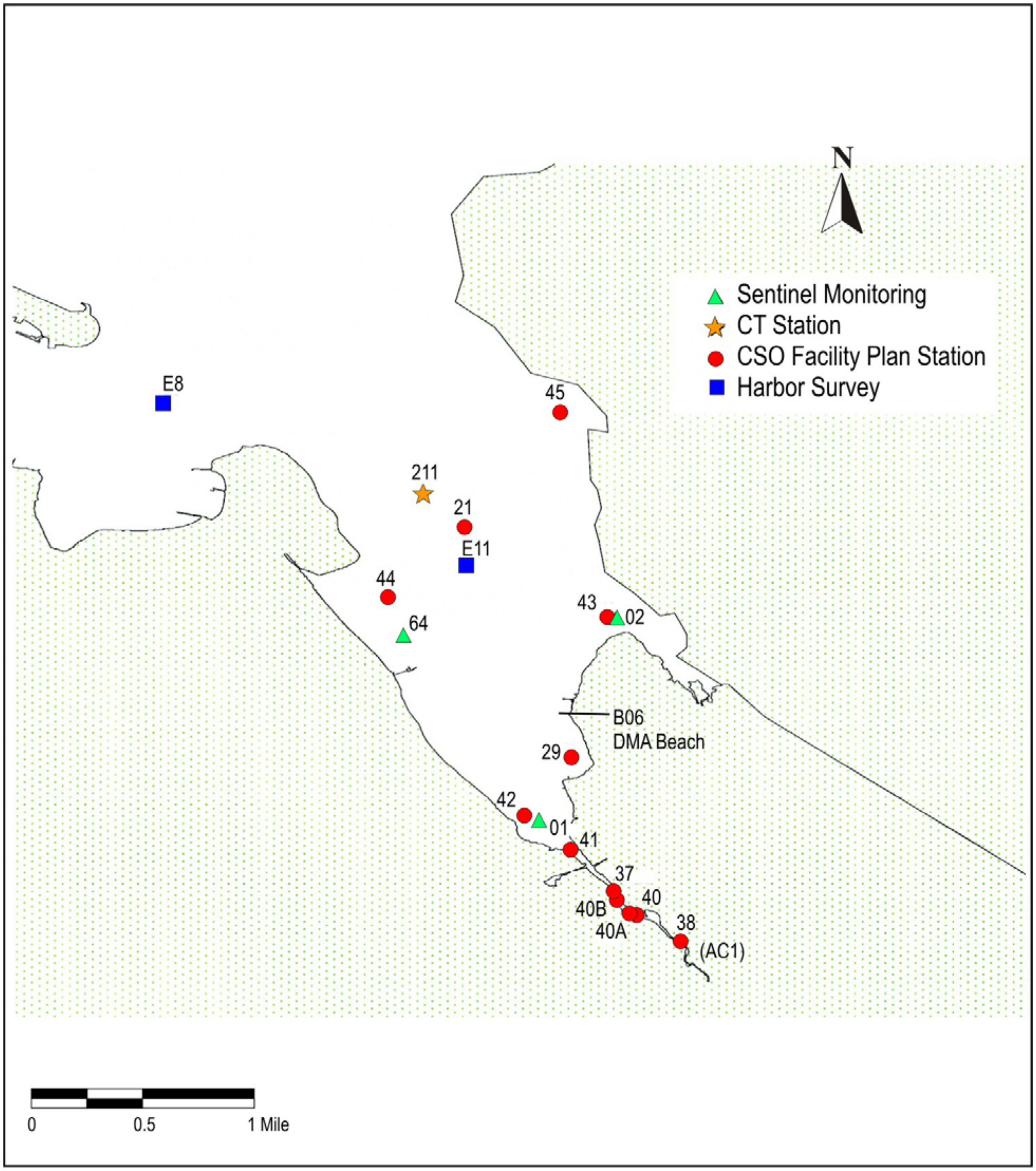
Locations of the historic East River CSO Facility Planning stations, NYCDEP Sentinel Monitoring and NYCDEP Harbor Survey monitoring stations are indicated in Figure 4-1.

4.1.2 Biological and Habitat Assessments

These field investigations were executed under a harbor-wide biological Field Sampling and Analysis Program (FSAP) designed to fill ecosystem data gaps in New York Harbor identified during the NYCDEP USA Project. The USA Project goal was to develop a comprehensive and integrated plan directed at improving local water quality that addressed regulatory requirements and reflected the priorities of residents and stakeholders. The USA Project has officially ended with the initiation of the Long-Term Control Project. The data collection efforts implemented during the USA Project are a major source of recent biological data on the LTCP waterbodies.

During USA, field and laboratory standard operating procedures (SOP) were developed and implemented for each element of the FSAP in conformance with USEPA Quality Assurance Project Plan guidance (USEPA, 1998, 2001a, 2001b), standard operation and procedure guidance (USEPA, 2001c) and in consultation with USEPA Division of Environmental Science and Assessment in Edison, NJ. The FSAPs collected information to identify uses and use limitations within waterbodies assessing aquatic organisms and factors that contribute to use limitations (dissolved oxygen, substrate, habitat, and toxicity). Some of these FSAPs were related to specific waterbodies; others to specific ecological communities or habitat variables throughout the harbor. In addition, there were FSAPs designed to answer specific questions about habitat and/or water quality effects on aquatic life.

The USA FSAPs recognized that fish and aquatic life use evaluations require identifying regulatory issues (aquatic life protection and fish survival), selecting and applying the appropriate criteria, and determining the attainability of criteria and, therefore, uses. According to guidance published by the Water Environment Research Foundation (Michael and Moore, 1997; Novotny et al, 1997), biological assessments of use attainability should include



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Historic CSO Facility Planning and On-Going Monitoring Locations

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-1

"contemporaneous and comprehensive" field sampling and analysis of all ecosystem components. These components include phytoplankton, macrophytes, zooplankton, benthic invertebrates, fish, and wildlife. The relevant environmental factors influencing aquatic ecosystem health include water column dissolved oxygen, habitat (substrate composition, organic carbon deposition, sediment pore water chemistry), and toxicity. Biological components and factors were prioritized during the USA project to determine the greatest need for contemporary information relative to existing data or information expected to be generated by other ongoing studies. Biotic communities were identified that would provide the most information relative to the definition of use classifications and the applicability of particular water quality criteria and standards. The biotic communities selected for sampling included sub-tidal benthic invertebrates (which, being largely sessile, have historically been used as indicators of environmental quality); epibenthic organisms colonizing standardized substrate arrays suspended in the water column (thus eliminating substrate type as a variable in assessing water quality); fish eggs and larvae (known collectively as ichthyoplankton, their presence is related to fish procreation); and juvenile and adult fish (their presence being a function of habitat preferences and/or dissolved oxygen tolerances).

Several FSAPs were conducted by NYCDEP during the USA Project that included investigations of Alley Creek and Little Neck Bay:

- Harbor-Wide Ichthyoplankton FSAP, 2001
- Harbor-Wide Epibenthic Recruitment and Survival FSAP, 2001
- East River Waterbody Biology FSAP, 2001
- Tributary Benthos Characterization FSAP, 2002
- Sub-Tidal Benthos and Ichthyoplankton Characterization FSAP, 2003

The "Harbor-Wide Ichthyoplankton Field Sampling and Analysis Program, Year 2001," dated April 2001 and revised April 24, 2001, was executed to identify and characterize ichthyoplankton communities in the open waters and tributaries of New York Harbor (HydroQual, 2001a). Information developed by this FSAP identified what species are spawning, as well as where and when spawning may be occurring in the Harbor waterbodies. The FSAP was executed on a harbor-wide basis so that evaluations would represent a comprehensive examination for all waterbodies during a single time period for the water quality conditions as measured. Sampling was performed at 50 stations throughout New York Harbor, its tributaries, and at reference stations outside the harbor complex. The locations of sampling stations are shown on Figure 4-2. One station was located in Little Neck Bay. Samples were collected using fine-mesh plankton nets with two replicate tows taken at 50 stations in March, May, and July 2001. In August 2001, 21 of the stations were re-sampled to evaluate ichthyoplankton during generally the worst-case temperature and dissolved oxygen conditions.

NYCDEP conducted the "Harbor-Wide Epibenthic Recruitment and Survival" FSAP in 2001 to characterize the abundance and community structure of epibenthic organisms in the open waters and tributaries of New York Harbor (HydroQual, 2001b). The recruitment and survival of epibenthic communities on hard substrates was evaluated because these sessile organisms are good indicators of long-term water quality. This FSAP provided a good indication of both intra- and inter- waterbody variation in organism recruitment and community composition. Artificial substrate arrays were deployed at 37 stations throughout New York Harbor, its tributaries, and at

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Harbor-Wide Ichthyoplankton Sampling Stations (2001)

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-2

reference stations outside the harbor complex. The locations of sampling stations are shown in Figure 4-3. One station was located in Little Neck Bay. The findings of previous waterbody-specific FSAPs indicated that six months was sufficient time to characterize the peak times of recruitment, which are the spring and summer seasons. Therefore, arrays were deployed in April 2001 at two depths (where depth permitted) and retrieved in September 2001.

The "East River Field Sampling and Analysis Program, Year 2001," was executed with a focus on identified data gaps related to invertebrate and fish utilization of the East River and its tributaries during the summer months (HydroQual, 2001c). Benthos samples were collected to characterize invertebrate community composition, species richness and diversity, as well as bottom sediment composition (grain size distribution and total organic carbon). Benthos sampling was conducted in July 2001 using a modified Young ponar grab with five replicate samples collected at 10 stations. Sampling stations were located in the open waters of the East River and in its tributaries including Flushing Bay, Alley Creek and Newtown Creek with a station in Manhasset Bay (a nearby, non-CSO waterbody) for comparative purposes. Relative abundances of fish populations were characterized by using an otter trawl and gill net with one replicate of each gear taken at 10 stations in July and August 2001. Stations were located in the open waters of East River and in its tributaries including Flushing Bay, Alley Creek, Newtown Creek, Bronx River, Westchester Creek, and the Hutchinson River. The locations of survey stations for this FSAP are shown in Figure 4-4. There was one station that was located in the middle of Little Neck Bay, at which samples were taken for benthos (by ponar dredge) and for fish (gill nets and trawls).

A special field investigation, "Tributary Benthos Characterization, Year 2002", was conducted during the summer of 2002 to evaluate benthic substrate characteristics in New York Harbor tributaries (HydroQual, 2002a). The goals of this FSAP were to assist in the assessment of physical habitat components on overall habitat suitability and water quality and provide data for the calibration of bottom sediment concentrations of total organic carbon (TOC), a component of USA water quality models. Physical characteristics of benthic habitat directly relate to the variety and abundance of benthic organisms. These benthic organisms represent a crucial component of the food web, and, therefore, the survival and propagation of fish. Sediment samples were collected from 103 stations in New York Harbor tributaries using in July 2002. Two samples from each station were tested for TOC, grain size and percent solids. The locations of sampling stations are shown in Figure 4-5. Three of the stations were located in Alley Creek.

In 2003, an additional FSAP, "Sub-tidal Benthos and Ichthyoplankton Characterization", was performed on Harbor tributaries (HydroQual, 2003b). One station for benthos and one station for ichthyoplankton were in Little Neck Bay as shown in Figure 4-6.

4.1.3 Receiving Water Quality Model

A mathematical model was developed and calibrated to simulate the influence of CSO and stormwater loads on water quality in the East River tributaries: Flushing Bay and Creek, Alley Creek and Little Neck Bay, the tidal portion of the Bronx River, Hutchinson River, Westchester Creek, and Alley Creek and Little Neck Bay.

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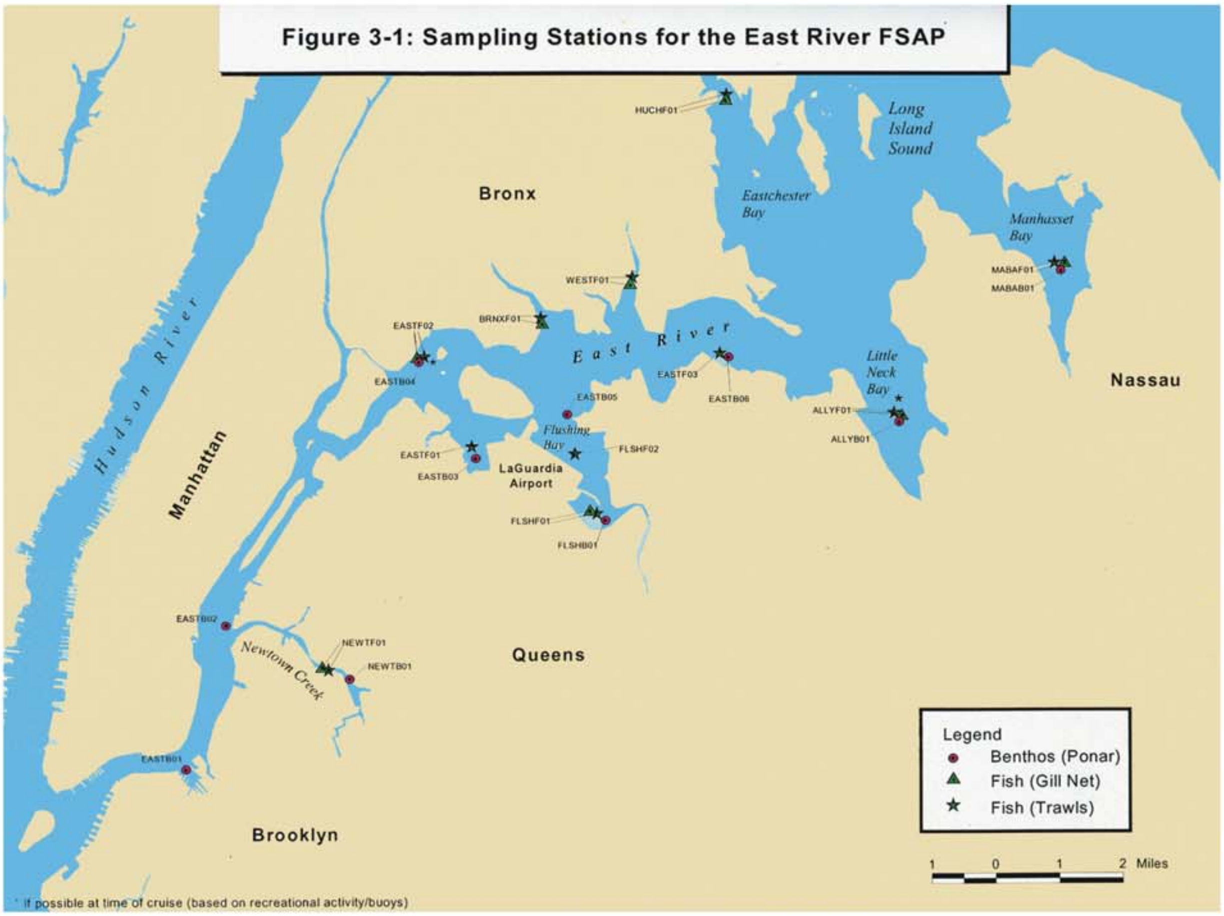
Harbor-Wide Epibenthic Recruitment and Survival Sampling Stations (2001)

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-3



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Sampling Stations for the East River FSAP

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-4

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Tributary Benthos Characterization Sampling Stations (2002)

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-5

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Sub-tidal Benthos and Ichthyoplankton Characterization Sampling Stations (2003)

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

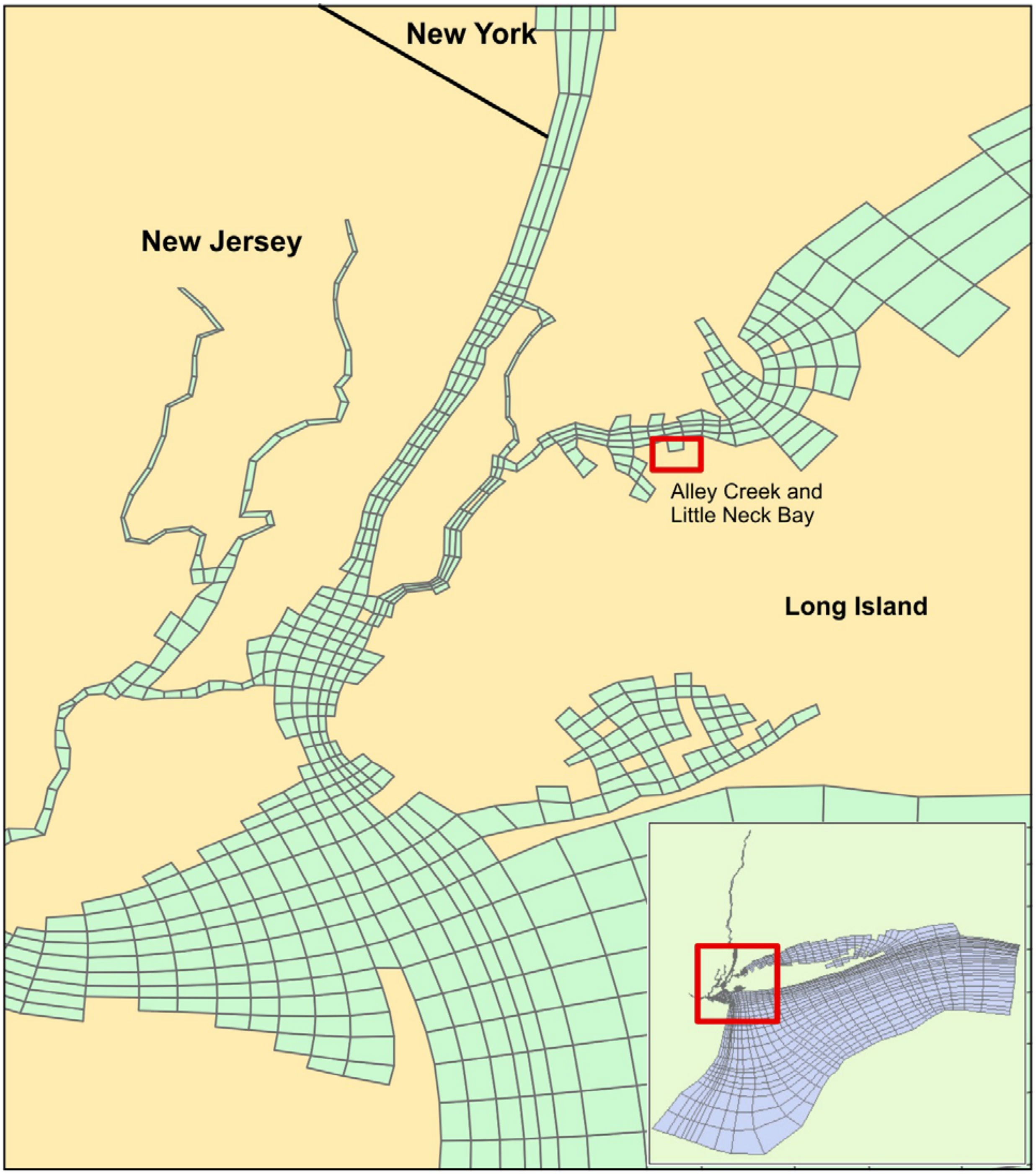
FIGURE 4-6

4.1.3.1 Model Framework

The spatial extent of the East River Tributaries Model (ERTM) encompasses the lower and upper East River and its principal tributaries and embayments, as well as part of western Long Island Sound. Hydrodynamic and water-quality information at the open boundaries of ERTM are provided by the larger-scale System-Wide Eutrophication Model (SWEM), which encompasses all of NY-NJ Harbor, the Hudson River to Albany, the East River, Long Island Sound, and the continental shelf of the New York-New Jersey Bight from Cape May, New Jersey, in the southwest to the Nantucket Shoals in the northeast (HydroQual, 2001d, 2001e, 2001f). Whereas SWEM's coarse-resolution grid provides basic hydrodynamic and water quality results in the open waters of the model's large domain, ERTM's finer-resolution grid was designed specifically to provide more detailed hydrodynamic and water quality results in the relatively smaller CSO-impacted New York City waterbodies tributary to the East River. ERTM and SWEM are both three-dimensional, time-variable, coupled hydrodynamic and water quality models based on finite-difference approximations. A variety of calibrated watershed/sewershed models (InfoWorks, XP-SWMM, RAINMAN, RRMP) were used to determine stormwater and CSO flows and loads to the receiving waters in different parts of the model domains. A schematic of the SWEM model segmentation is shown in Figure 4-7. The area of the SWEM model that represents Alley Creek and Little Neck Bay is indicated. The ERTM model grid domain and segmentation are presented in Figure 4-8a. ERTM model grids of Alley Creek and Little Neck Bay are shown in Figures 4-8b and 4-8c, respectively. The segmentation grid of ERTM represents Alley Creek with 5 segments and the Little Neck Bay portion of the model consists of 24 segments. The finer resolution of ERTM for Alley Creek and Little Neck Bay allows for the computation of water quality gradients that can result from the localized discharge of CSO and stormwater into the waterbodies.

The hydrodynamic component of ERTM solves the three-dimensional advection-diffusion equations for water motion and includes forcing due to winds, tides, surface heat flux, freshwater discharge, and other lateral boundary conditions. Vertical turbulent mixing is driven by a Mellor and Yamada (1982) level-2.5 turbulence closure scheme as modified by Galerpin et al. (1988). ERTM hydrodynamics include a "wetting and drying" algorithm that allows the model to simulate the emergence and submergence of extensive inter-tidal mudflats that occur in many of the East River tributaries and embayments.

The water-quality component of ERTM incorporates advection-diffusion and temperature-salinity results from the hydrodynamic models to solve three-dimensional coupled kinetic mass-balance equations describing the biochemical interactions between aquatic biota (phytoplankton, zooplankton and benthic bivalves), nutrients (nitrogen, phosphorus and silica), various forms of organic carbon, dissolved oxygen (DO), as well as special contaminants of interest (e.g., total and fecal coliforms and enterococci). A sediment-flux submodel couples water column biochemistry with sediment diagenesis, remineralization of settled particulate organic matter (POM), and the resultant uptake of near-bottom DO through sediment oxygen demand (SOD). Sources of nutrient and contaminant loads to the water quality models include wet and dry atmospheric deposition, rivers and creeks, stormwater, CSOs, and effluent from major municipal and industrial wastewater treatment plants. DO kinetics include surface reaeration, nitrification, photosynthesis, metabolic oxidation, and SOD. In-stream aeration can



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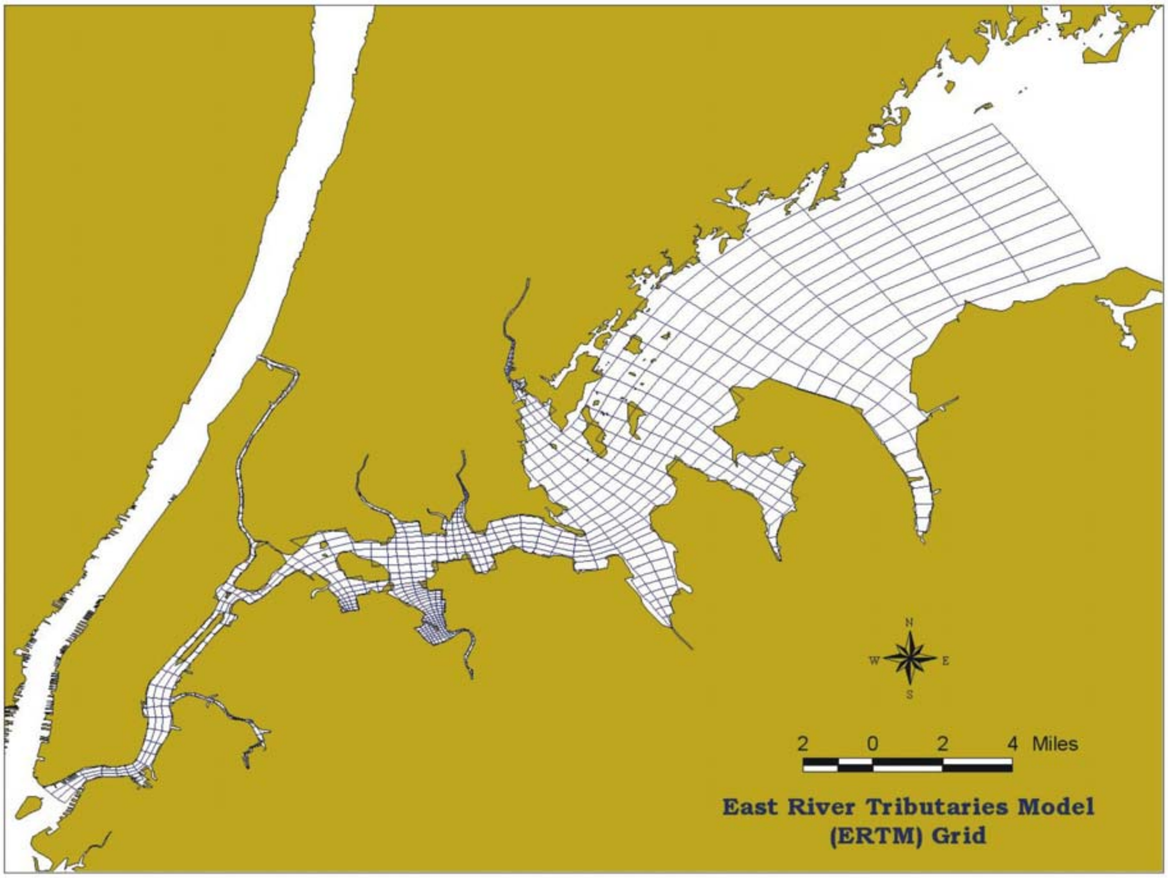
System-Wide Eutrophication Model (SWEM) Segmentation Grid

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-7



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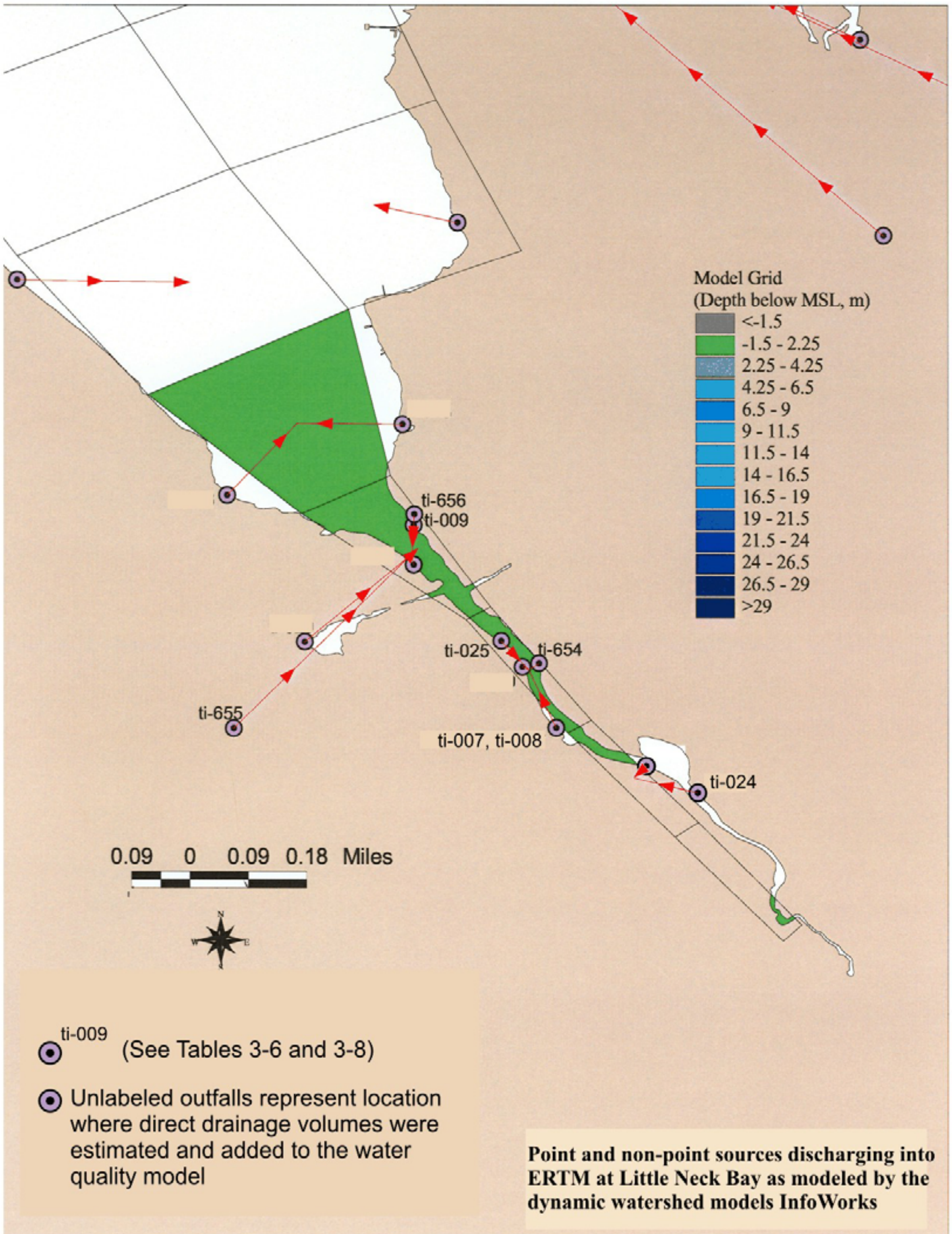
East River Tributaries Model (ERTM)

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-8a



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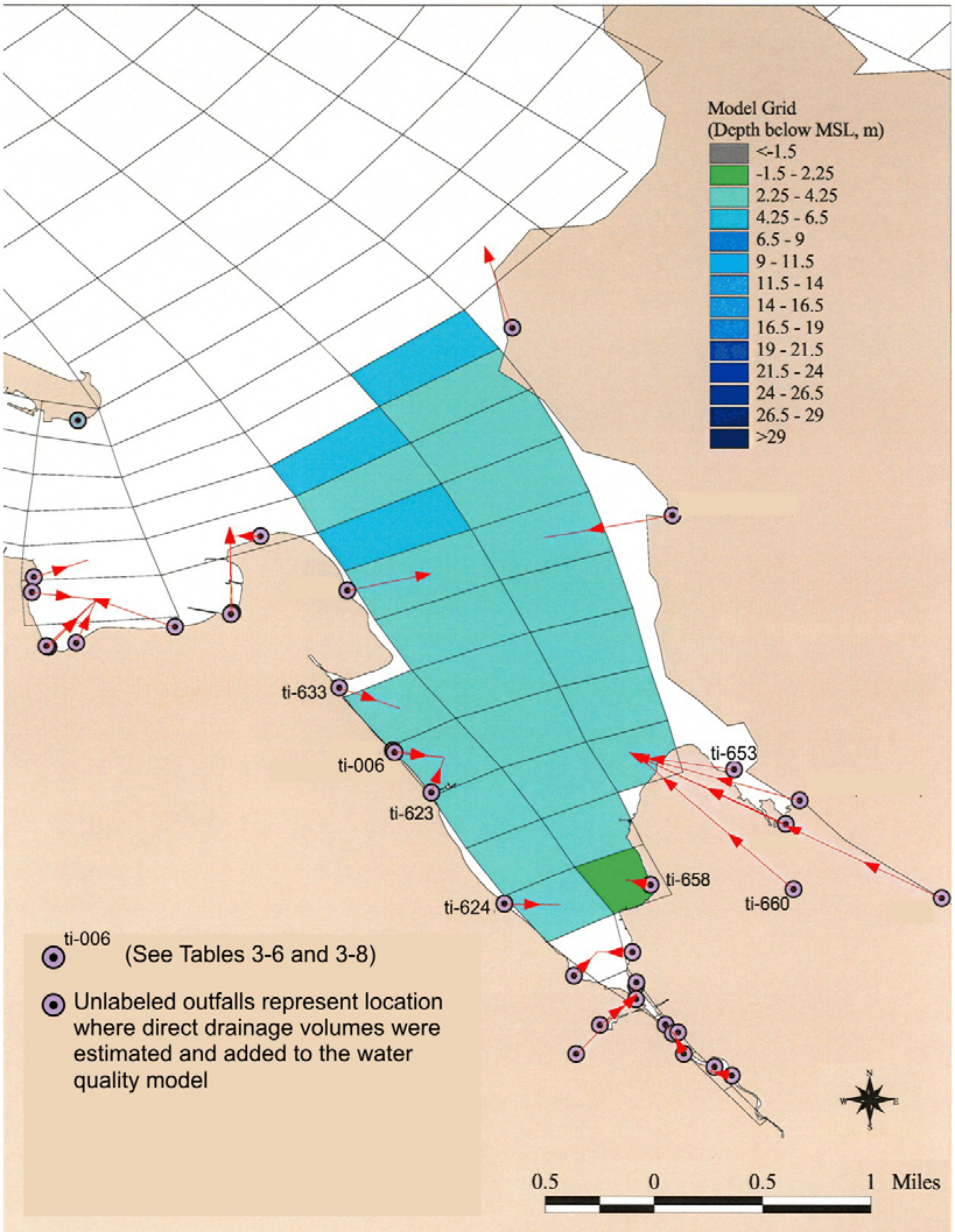
Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

East River Tributaries Model (ERTM) Alley Creek

FIGURE 4-8b



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East River Tributaries Model (ERTM)
Little Neck Bay

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-8c

be included in ERTM if that water quality improvement CSO control technology is being evaluated as an alternative suitable for that particular waterbody.

4.1.3.2 LTCP Baseline Condition

The SWEM-ERTM model system described above was used to establish the Baseline Condition against which all CSO control alternatives are compared for quantifying relative water quality benefits. Table 4-1 summarizes the assumptions used for the simulation of Baseline Condition.

Table 4-1. Baseline Water Quality Modeling Condition

Model Component	Model	Baseline Condition
Watershed Pollutant Flows and Loads	InfoWorks CS™, XP-SWMM, RRMP, RAINMAN	1988 JFK precipitation for wet weather flows; 2045 population projection for dry weather flows; wet weather capacity Tallman Island WPCP at 2003 wet weather average sustained flow with upgrades for BNR
Boundary Conditions	SWEM	1988 JFK precipitation, meteorological and tidal forcing, river and creek discharge, and insolation; nitrogen loads in Long Island Sound adjusted to meet Phase III TMDL requirements
Regional Water Quality	ERTM	1988 JFK precipitation, meteorological and tidal forcing, river and creek discharge, and insolation; 2045 projected WPCP loads
Receiving Water	ERTM for Alley Creek and Little Neck Bay	Calculated results

4.2 PHYSICAL WATERBODY CHARACTERISTICS

Alley Creek and Little Neck Bay are located in the northeastern corner of Queens near the Nassau County border. Alley Creek opens into the southeast end of Little Neck Bay. Little Neck Bay opens to the East River between Willets Point and Elm Point near the western portion of Long Island Sound. Udalls Cove, an embayment on the eastern shore of Little Neck Bay, spans the Queens, Nassau County border between Douglas Manor and Great Neck Estates. Plate 4-1 presents an aerial photo of Udalls Cove.

Alley Creek is located at the southern end of Little Neck Bay and is contained within Alley Pond Park. The tidal tributary runs northward and its mouth opens to Little Neck Bay. The 624-acre park contains forests, several ponds, facilities for active recreation, salt marshes and wetlands, and the creek itself. The creek constitutes one of the few remaining undisturbed marsh systems in the city. Alley Park is surrounded by residential and commercial development and traversed by the Grand Central Parkway, Long Island Expressway, Northern Boulevard, Cross Island Parkway, and the Long Island Railroad. The head of Alley Creek is near the intersection of the Cross Island Parkway and the Long Island Expressway. Freshwater flows to Alley Creek are stormwater and CSO discharge. Alley Creek water quality is also influenced by the saline water of Little Neck Bay.

Udall's Cove, on eastern shore of Little Neck Bay

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Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Plate 4-1

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

Udalls Cove is located in the northeastern corner of Queens and extends into Nassau County. The New York City portion comprises an area of approximately 52 acres, from Little Neck Bay to the vicinity of Northern Boulevard. Most of Udalls Cove is mapped as parkland and managed by the New York City Department of Parks and Recreation (NYCDPR) as the Udalls Cove Preserve.

Little Neck Bay, Alley Creek, and Udalls Cove are located within the Coastal Zone Boundary and within a Special Natural Waterfront Boundary as designated by the NYCDCP. All three waterbodies are also located within Significant Coastal Fish and Wildlife Habitats as designated by the New York State Department of State (NYSDOS). In addition, Alley Creek is located within the NYCDPR Alley Pond Park, and most of Udalls Cove is located within the NYCDPR Udalls Cove Preserve.

4.2.1 Shoreline Physical Characterization

Alley Creek is predominantly characterized by natural, vegetated shorelines, except for the footings of the bridges for the Long Island Railroad and Northern Boulevard. The waterbody is contained in Alley Pond Park, except for the eastern shore north of the Long Island Railroad.

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

Plate 4-2a, b, c show shoreline typical for the regions of the study area. Plate 4-2a shows the rip-rap that typically fortifies much of the western shoreline of Little Neck Bay. Plate 4-2b shows the varied types of bulkheading, rip-rap and natural shoreline found along the eastern shoreline of Little Neck Bay. Plate 4-2c shows the natural shorelines typical around the southern end of Little Neck Bay and Alley Creek.

Plate 4-2a: Western shoreline of Little Neck Bay near 27th Ave, looking west

Plate 4-2b: Eastern shoreline of Little Neck Bay near Shorecliff Place, looking west

Plate 4-2c: Shoreline of Alley Creek, looking north

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Plate 4-2

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

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

In Udalls Cove, from the Long Island Railroad in the south to north of Sandhill Road, Gablers Creek runs through the wetlands of Aurora Pond and the cove. The Gablers Creek in this area is contained within a cobble-lined ditch. Physical shoreline conditions and shoreline habitat are shown in Figure 4-9.

4.2.2 Shoreline Slope

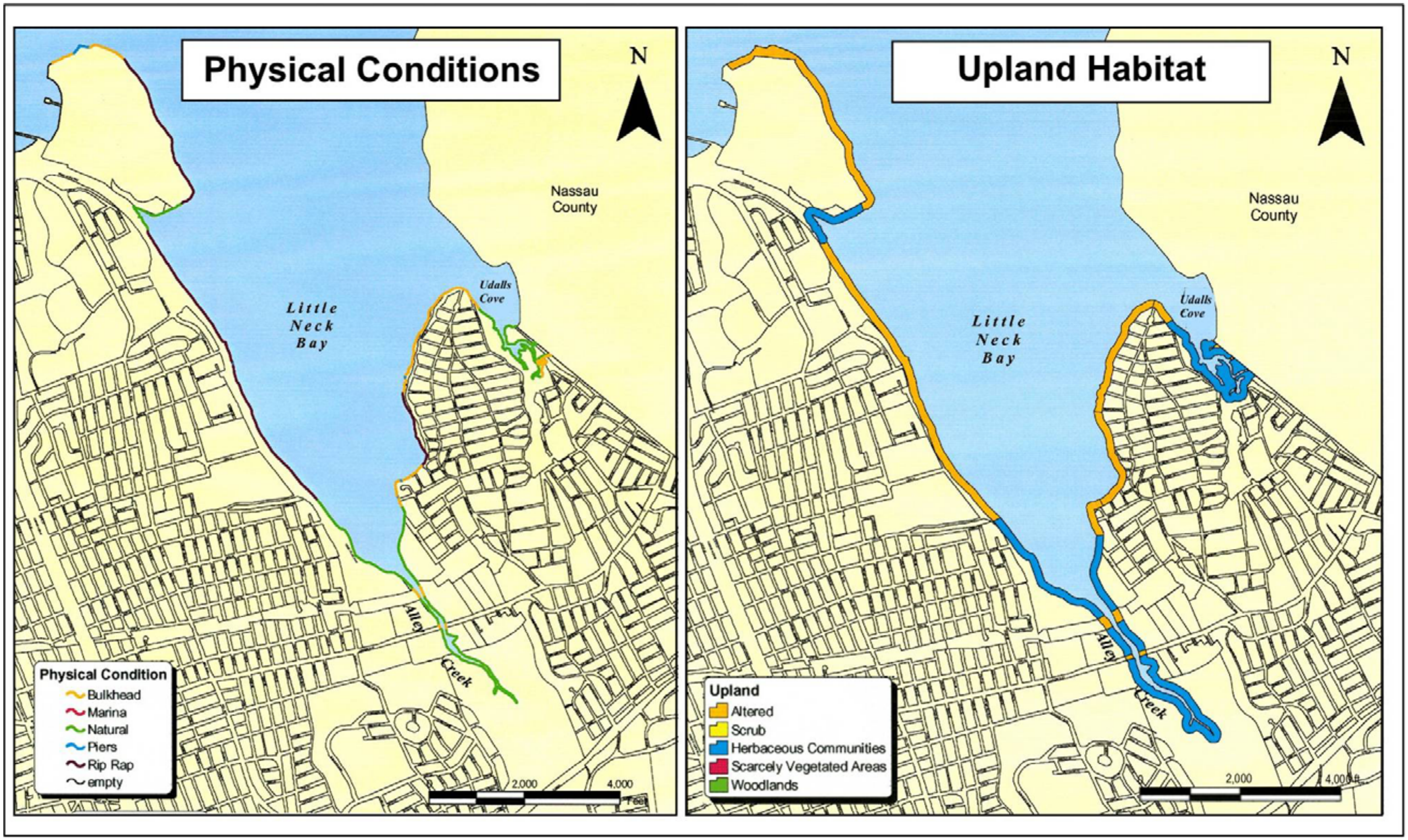
Shoreline slope has been qualitatively characterized along shoreline banks where applicable and where the banks are not channelized or otherwise developed with regard to physical condition. Steep is defined as greater than 20 degrees or 80-foot vertical rise for each 200-foot horizontal distance perpendicular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

Gentle and intermediate slopes characterize the shorelines of Little Neck Bay, Alley Creek and Udalls Cove. The slope of the eastern shoreline of Little Neck Bay is generally characterized as intermediate. The slope of the western shoreline is generally characterized as gentle, with an area of intermediate shoreline located along Fort Totten. The slope of both shorelines of Alley Creek are characterized as gentle. The slope of the eastern shoreline of Udalls Cove is characterized as gentle. The slope of the western shore is characterized as predominantly gentle, with one area of intermediate slope. The area of intermediate slope extends along the shoreline from Beverly Road to the mouth of the cove. Shoreline slopes are shown in Figure 4-10.

4.2.3 Waterbody Sediment Surficial Geology/Substrata

The waterbody bottom of Little Neck Bay is generally characterized as sand. The waterbody bottom of Alley Creek is generally characterized as mud/silt/clay. These classifications have been assigned based on the following two sediment sampling programs which analyzed sediment grain size: grab samples taken at one HydroQual, Inc. sampling station in 2001; and grab samples taken at three HydroQual sampling stations in 2002. For the purpose of defining surficial geology/substrata, those areas where bottom samples were more than 50 percent mud/silt/clay were designated as mud/silt/clay; those areas where bottom samples were more than 50 percent sand were designated as sand.

Based on one Little Neck Bay grab sample taken by HydroQual in February 2001, bottom mud/silt/clay composition was approximately 16.50 percent, while sand composition was 83.50 percent.



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Shoreline: Physical Conditions and Upland Habitat

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-9

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Alley Creek Exisiting Shoreline Slope

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-10

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

4.2.4 Waterbody Type

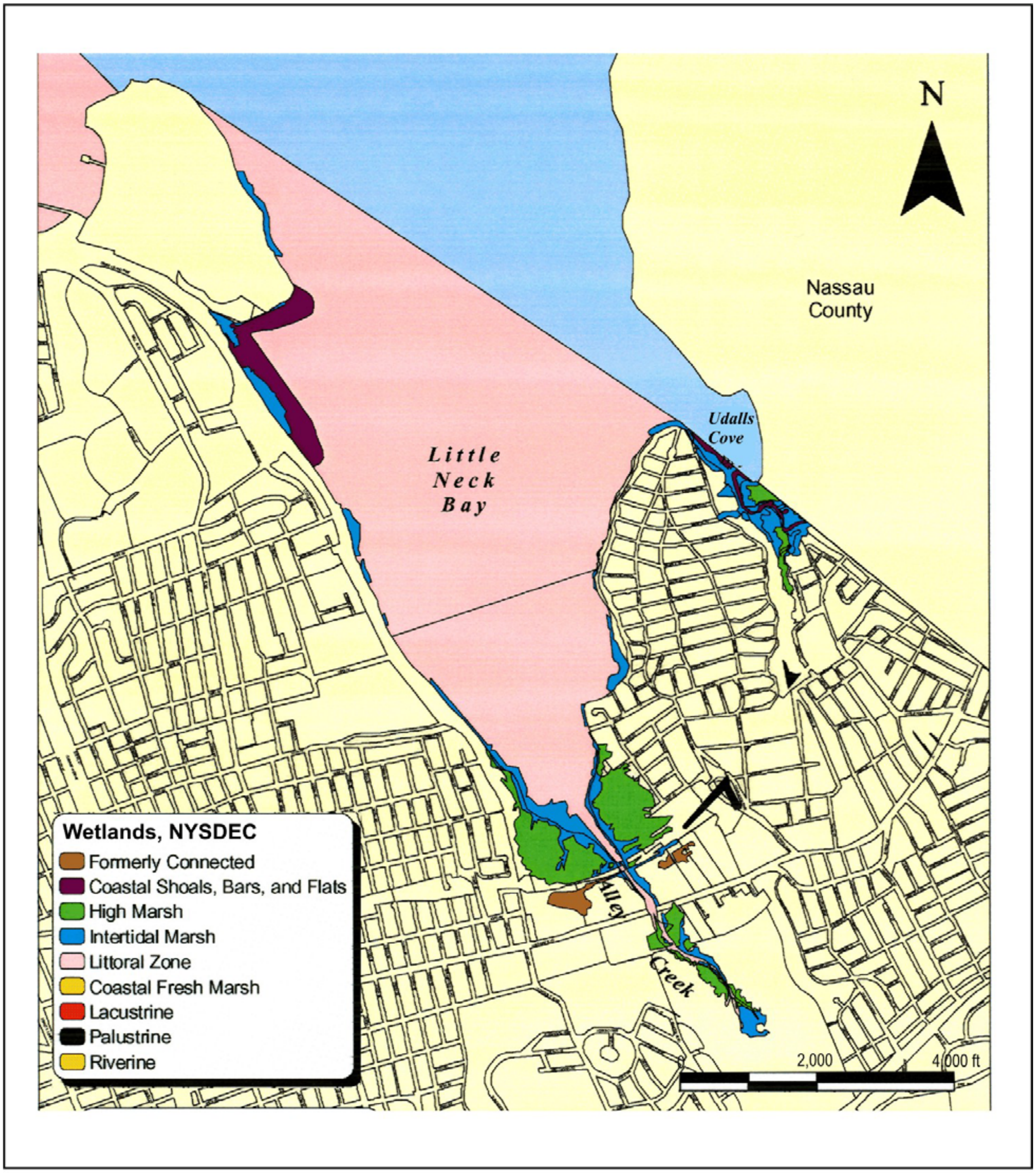
Little Neck Bay and the mouth of Udalls Cove are classified as embayments. Alley Creek and the portion of Udalls Cover south of Knollwood Avenue are classified as tidal tributaries. Freshwater sources to Udalls Cove are Gablers Creek, the Belgrave WPCP discharge and discharge from the freshwater wetlands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

4.2.5 Tidal / Estuarine Systems Biological Systems

4.2.5.1 Tidal/Estuarine Wetlands

Tidal/Estuarine generalized wetlands in the Alley Creek and Little Neck Bay watershed are shown in Figure 4-11 and are described in this section. According to the NYSDEC tidal wetlands maps, there are numerous designated wetlands mapped throughout the study area. The western and eastern shorelines of Little Neck Bay support many areas of inter-tidal marshes from Willets Point to the mouth of Alley Creek with an area of coastal shoals, bars and mudflats mapped to the south and southwest of Fort Totten. Extensive wetlands have been mapped by the NYSDEC on both shores of Little Neck Bay south of Parsons Beach and Crocheron Park and throughout Alley Creek. These extensive wetlands tend to be mapped with high marsh or salt meadow wetlands inland of inter-tidal marsh wetlands, and in some areas, most notably north of the Long Island Railroad and surrounding the mouth of Alley Creek, the wetland areas are mapped on the order of 1,000 feet wide. Formerly connected wetlands are also mapped immediately south of the Long Island Railroad, inland from Alley Creek. Udalls Cove, an embayment of Little Neck Bay also supports extensive wetlands, generally with inter-tidal marsh wetlands and high marsh or salt meadow wetlands mapped inland of coastal shoals, bars and mudflats. The open waters of Little Neck Bay are generally mapped as littoral zone. Plate 4-3 shows wetland areas in the Alley Creek and Little Neck Bay area.

The NYSDEC maps designate three discontinuous inter-tidal wetland areas along the western bank of Little Neck Bay and Alley Creek from roughly 1,500 feet southeast of Willets Point, along the east and south shorelines of Fort Totten, and south to 23rd Street. Three other areas of discontinuous inter-tidal marsh wetlands are mapped from 28th Road to Crocheron Park. A continuous inter-tidal wetland area is mapped from 35th Avenue to the Long Island Railroad. South of the Long Island Railroad, inter-tidal marshes are mapped roughly from 440 to 520 feet and 880 to 1,500 feet south of Northern Boulevard and 1,860 feet south of Northern Boulevard to the head of Alley Creek. High marsh or salt meadow wetlands are mapped from 37th Avenue to the Long Island Railroad and from roughly 120 to 1,520 feet south of Northern Boulevard.



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NYSDEC Existing Mapped Wetlands

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-11

Plate 4-3a: Wetlands in vicinity of Alley Creek- Spring/Summer

Plate 4-3b: Wetlands in vicinity of Alley Creek - Autumn

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Plate 4-3

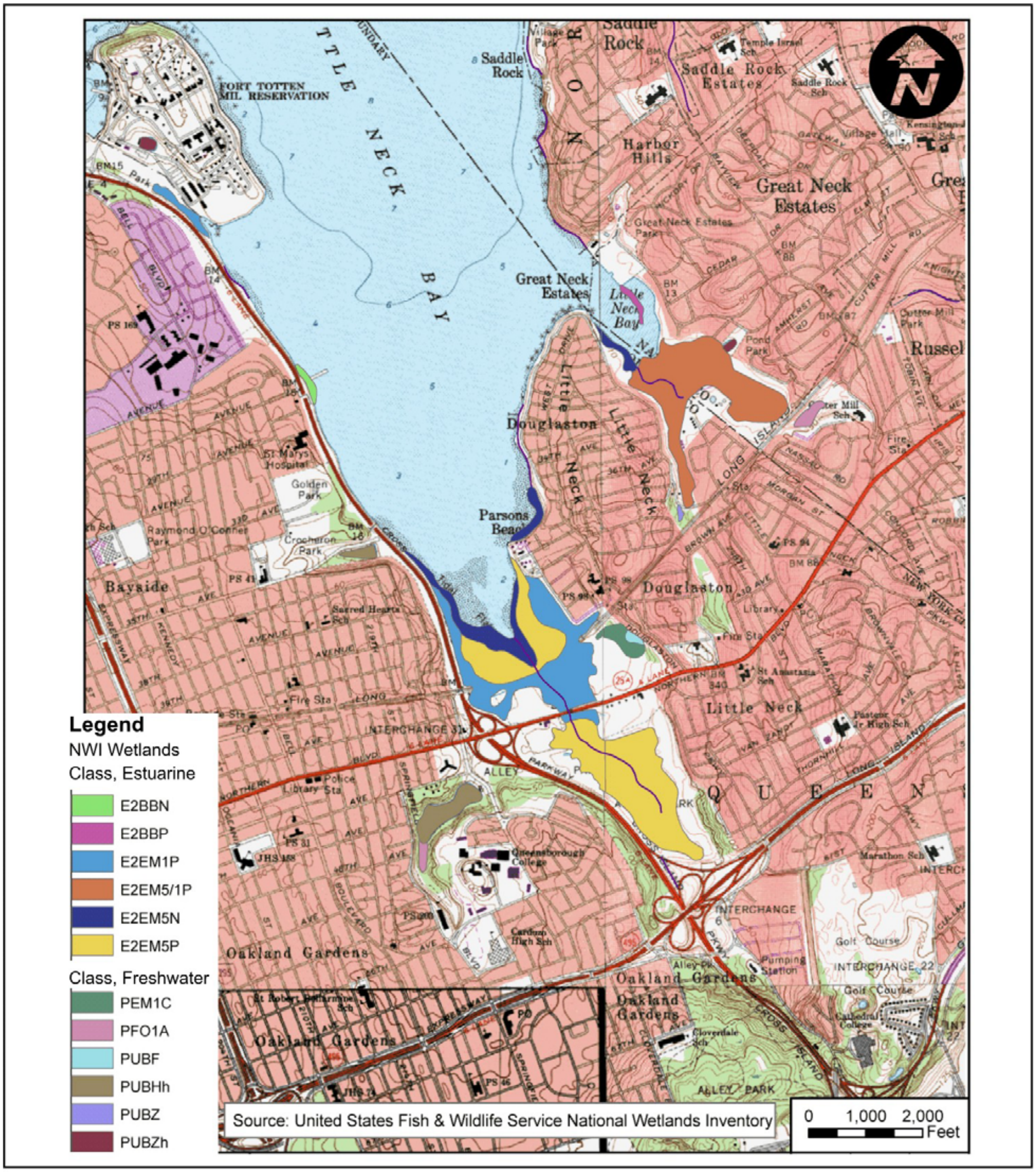
Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

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

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

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

The United States Fish and Wildlife Service National Wetlands Inventory (NWI) maps show extensive wetlands throughout the Little Neck Bay, Alley Creek, and Udalls Cove study area. The NWI mapped wetlands are shown in Figure 4-12. In the inlet between Forth Totten and Bay Terrace, three adjacent wetland areas - estuarine, inter-tidal, flat, regular (E2FLN); estuarine, inter-tidal, emergent persistent, irregular (E2EM1P); and palustrine, emergent, persistent, semi-permanent (PEM1F) - are mapped in series, stretching to the northwest from the mouth of the inlet on Little Neck Bay. Along the western shoreline of Little Neck Bay, two areas of estuarine, inter-tidal, beach/bar, regular (E2BBN) wetlands exist between 17th and 29th Avenues. Along the eastern shoreline of Little Neck Bay, the NWI has mapped E2BBN wetlands at 33rd Street, and estuarine, inter-tidal, emergent, narrow-leaved persistent, regular (E2EM5N) wetlands along Parsons Beach. South of Crocheron Park on the western shoreline of Little Neck Bay and Alley Creek and south of Parsons Beach on the eastern shoreline of the bay and creek, the NWI has mapped multiple wetland areas along both shorelines that span the waterbodies.



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National Wetlands Inventory (NWI) Wetlands

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-12

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

The NWI mapped multiple wetlands along the shorelines of Udalls Cove. The open waters of the cove are mapped as E10WL. Within the New York City study area of Udalls Cove, the western shoreline north of 28th Avenue is mapped as E2EM5N. South of 28th Avenue, both shorelines of Udalls Cove within the study area are mapped as estuarine, inter-tidal, emergent, narrow-leaved persistent / persistent, irregular (E2EM5/1P) wetlands. The NWI has mapped the waters as E2SBM where the cove's open waters narrow into a tidal river.

4.2.5.2 Aquatic and Terrestrial Communities

Based on the NYCDCP New York City Comprehensive Waterfront Plan: Plan for the Queens Waterfront, a full complement of wetland species can be found in and around the marshes at Alley Pond Park (NYCDCP, 1993). Probable or confirmed breeding bird species in the area include green-backed heron, black duck, mallard, Canada goose, clapper rail, common moorhen, killdeer, fish crow, marsh wren, red-winged blackbird, sharp-tailed sparrow and seaside sparrow. These and many other species of herons, waterfowl, shorebirds, raptors and passerines use the area as a stopover during spring and fall migrations. Concentrations of wintering waterfowl on Little Neck Bay, especially black duck, mallard and Canada goose, often feed in Alley Pond Park, depending on the extent of ice cover each year. Northern harriers also use the area as over wintering habitat. Other wildlife species in the area include raccoon, muskrat, opossum, diamondback terrapin, snapping turtle, garter snake, northern water snake, fowler's toad and the two-lined salamander. Alley Pond Park contains abundant shellfish and crustaceans, such as fiddler crab, horseshoe crab, ribbed mussel, hard clam and snails. Finfish species found in the tidal shallows and Alley Creek include bluefish, striped bass, Atlantic silverside, menhaden and winter flounder.

Based on the NYCDCP Plan for the Queens Waterfront, Little Neck Bay contains important open water fish and wildlife habitat and is one of Long Island's major waterfowl wintering areas. Wintering birds include scaup, canvasback and black ducks, and lesser numbers of mallard, Canada goose, common goldeneye and red-breasted merganser. Concentrations of waterfowl also occur during spring and fall migrations. In addition to waterfowl use, Little Neck Bay is a productive area for marine finfish and shellfish. The bay serves as an important nursery and feeding area for striped bass and numerous other species. Although its waters are not certified for commercial shellfishing, Little Neck Bay is a hard clam producing area.

Based on the NYCDCP Plan for the Queens Waterfront, shorebirds and wading birds use the Udalls Cove area extensively. Among the species observed are black-crowned night heron, snowy egret, least bittern, green heron, and marsh wren. Migrating ducks and geese use the cove as a stopover area. Various species of waterfowl spend the winter and nest in the vicinity. Nesting waterfowl include mallard, American black duck and wood duck. Muskrat, opossum and raccoon have also been observed. In addition to abundant crustaceans and shellfish species, finfish species found in the cove include winter flounder, striped bass, eel and killifish.

4.2.6 Freshwater Systems Biological Systems

Generalized freshwater wetlands areas are shown in Figure 4-11 and described in more detail in this section. The NYSDEC Freshwater Wetlands Maps show seven areas of freshwater wetlands in the study area. The areas are mapped in the inlet between Fort Totten and Bay Terrace extending along the Cross Island Parkway southeast of Totten Avenue; on the west shoreline of Alley Creek extending south along the Cross Island Parkway from the cloverleaf at Northern Boulevard to the creek roughly 800 feet south of Northern Boulevard; inland from the eastern shoreline of Alley Creek extending along the southern edge of the Long Island Railroad and the western edge of the Douglaston Parkway; in two discontinuous areas along both shorelines of Alley Creek from roughly 600 feet south of Northern Boulevard to the head of the creek; in Udalls Cove from Hollywood Avenue to Sandhill Road; and in Udalls Cove between Sandhill Road and the Long Island Railroad.

The NWI maps show three areas of freshwater (palustrine) wetlands in the Little Neck Bay, Alley Creek, and Udalls Cove study area, as indicated in Figure 4-12. In the inlet between Fort Totten and Bay Terrace, a palustrine, emergent, persistent, semi-permanent (PEM1F) wetland is mapped at the northeast edge of tidal wetlands, as described above. An area of palustrine, emergent, persistent, seasonal (PEM1C) is mapped inland of the eastern shore of Alley Creek adjacent to the southern edge of the Long Island Railroad, with an area of palustrine, open water/unknown bottom, intermittently exposed/permanent (POWF) wetlands adjacent to the PEM1C wetlands. In addition, an area of palustrine, open water/unknown bottom, intermittently exposed/permanent (POWZ) is mapped to the west of Udalls Cove between Sandhill Road and the Long Island Railroad.

4.2.7 Upland Habitat

The upland habitat of Little Neck Bay is generally classified as altered. Herbaceous communities exist in the upland surrounding the inlet of the bay to the southwest of Fort Totten. Except for the herbaceous community upland area that exists in Parsons Beach north of the Long Island Railroad, Alley Creek is characterized by herbaceous community upland habitat that is completely contained within Alley Pond Park. Udalls Cove has uplands of herbaceous communities south of Bayview Avenue.

Many of the upland areas in Udalls Cove border or contain residential development, and are natural in the sense that they lack structures or roads near the shoreline. Historical modification and current landscaping practices may have altered these areas from a truly natural state.

Based on the NYCDPR Udalls Park Preserve Natural Areas Management Plan, the upland of the preserve included 16 acres of herbaceous upland, 14 acres of closed forest/woodland including black willow, silver maple, box elder, and sycamore maple, 10 acres of inter-tidal areas, 8 acres of vineland (i.e., mostly wild grape), 0.5 acres of scrub, and 0.5 acres of aquatic plant (e.g., Phragmites and duckweed) (Natural Resources Group, 1990). Less than one acre of the preserve was designated as developed land or severely compacted/barren soil.

The preserve is divided into two sections, the Cove and the Ravine, separated by the Long Island Railroad. The uplands of each portion are described below.

The Cove is bordered on the south by the Long Island Railroad and to the north by Little Neck Bay. Its western border is outlined by Marinette Street and Douglas Road. The eastern side is bounded by smaller streets parallel to Little Neck Parkway and the sewer line from the Belgrave WPCP. Many small homes border the Cove; on the west side, some backyards abut the water's edge. A private playground and playing field are located along Marinette Street. Just south, the mugwort field is used as a playground, as well.

According to the Natural Areas Management Plan, Phragmites, saltwater marsh, and forested areas are the predominant cover types of the 32.5-acre Cove. The forested tracts have been severely disturbed. Silver maple dominates one-third of the area, growing in association with black locust, black willow, Ailanthus, Eastern cottonwood, Norway maple, and English ivy. Black locust and box elder are abundant in the upper canopies. Other trees include Norway maple, black willow, pin oak, black cherry, eastern cottonwood, hickory species, and black walnut. In addition to Phragmites, cool season grasses, mugwort, and Japanese knotweed are the predominant species in the 13-acre herbaceous community portion of the Cove. These herbaceous communities also include barnyard grass, mud plantain and jewelweed. The salt marsh contains spikegrass, salt meadow cordgrass, saltwater cordgrass, and marsh elder scrub. Other cover types include bittersweet vineland and a small patch of developed land or severely compacted/barren soil.

The Ravine in Udalls Cove is a 17-acre strip of land stretching from Northern Boulevard north to the LIRR. It is bounded by housing developments on its east and west sides, creating a narrow finger shaped by landfilled soil. A deep ravine begins close to the fire house at 44th Avenue and 244th Street and runs north ending near 43rd Avenue; beyond this, the landscape has been leveled by sewer construction (and associated landfill) running north-south beneath the surface. The steep grade of the ravine resumes again on the western slope just north of Depew Avenue.

According to the Natural Areas Management Plan, vines are abundant in Udalls Ravine; of the seven acres, wild grape is the most prominent species totaling nearly six acres. Other species include bittersweet, Japanese hops, kudzu, and porcelain betty. The five acres of woodland are composed primarily of box elder that grows by itself and in association with Ailanthus, black willow, silver maple, and hickory species. Other dominant trees include Norway maple, black locust and black cherry. The only semblance of natural forest is American beech and black cherry rowing with black oak, black locust, red oak, and sycamore maple. Mugwort dominates the three acres of herbaceous communities; other species include Japanese knotweed, thin-leaved sunflower, cool season grasses, and great ragweed. However, many forested areas are disturbed characterized by landfilled soils that support little groundcover and are susceptible to severe erosion.

Although many other wildlife species exist within the upland of Udalls Cove and Ravine, the following species were used by the Udalls Park Preserve Natural Areas Management Plan as indicators for habitat appraisals: gray squirrel, black-capped chickadee, yellow warbler, cottontail rabbit, ring-necked pheasant, and clapper rail.

Based on the NYCDPR Natural Areas Management Plan Alley Pond Park, Queens, the park covers 635 acres and 569 acres were mapped for the Natural Areas Management Plan. Of the mapped 569 acres, 274 acres were classified as closed forest/woodland including American beech, black birch and a variety of oak and hickory species, tulip tree, sweetgum, red maple and white ash; 199 acres were classified as herbaceous; 38 acres were classified as vineland; 36 acres were classified as desert (i.e., developed land or compacted or barren soil); 6 acres were classified as scrub, and 3 acres were classified as freshwater aquatic plants.

According to the Natural Areas Management Plan, Alley Pond Park has two distinct topographical settings: the northern lowland zone and a southern zone. The northern zone was once inter-tidal marshland but has undergone intensive filling. The northern zone is dominated by Phragmites, salt marsh and other herbaceous vegetation. The southern zone is of a higher elevation than the northern lowland, and the upland cover types differ between the two zones. The southern zone has remained relatively free of development, and mature forests are found there. Although many other wildlife species exist within the upland of Alley Pond Park, the following species were used by the Natural Areas Management Plan as indicators for habitat appraisals: gray squirrel, black-capped chickadee, yellow warbler, cottontail rabbit, ring-necked pheasant, and clapper rail.

4.3 EXISTING WATERBODY USES

Alley Creek is classified by NYSDEC as a Class I waterbody. The best use of Class I waters is defined by NYSDEC as "secondary contact recreation and fishing" and they "shall be suitable for fish, shellfish and wildlife propagation and survival." Alley Creek, its shoreline, areas immediately adjacent to the water, and much of the surrounding drainage area of the creek are within Alley Pond Park. Access to Alley Creek is provided for by the park but no facilities for primary contact recreation are available. The park does not provide any regular secondary contact recreation opportunities. However, the Urban Park Rangers do run structured programs (Plate 4-4). One such program, "Alley Pond Adventure" is an overnight, summer camping program that includes supervised canoeing (secondary contact recreation use) and fishing.

The major use of Alley Creek is passive, non-contact recreation. There are hiking trails that offer views of the water. Another significant, passive use of Alley Creek is for environmental education associated with wetlands habitat. The Alley Pond Environmental Center, located near the mouth of Alley Creek, offers an extensive naturalist program with outreach to schools throughout the city (see Plate 4-5).

Little Neck Bay is classified by NYSDEC as Class SB. The best uses of Class SB waters are defined by NYSDEC as "primary and secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish and wildlife propagation and survival." NYSDEC considers that Class SB satisfies the Clean Water Act goals of "fishable/swimmable". Swimming (primary contact recreation use) is an existing use in Little Neck Bay (see Plate 4-6). There is a privately owned bathing beach on the eastern shore of the bay at Douglaston Manor on the Great Neck Peninsula. The Douglas Manor Association (DMA) Beach is located approximately 0.7 miles north of the mouth of Alley Creek, and approximately 1.1 miles downstream from the principal CSO outfall on Alley Creek, TI-008. This beach is included in the NYCDOHMH regular beach surveys for indicator bacteria (enterococcus and coliform). NYCDOHMH beach monitoring is conducted weekly during the bathing season from May to September. In addition to the

Plate 4-4a: Urban Park Ranger camping program

Plate 4-4b: Urban Park Ranger canoeing program

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Plate 4-4

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

www.alleypond.com

Environmental education programs at Alley Pond Environmental Center

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Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Plate 4-5

Douglas Manor Association Beach, looking east

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Plate 4-6

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

supervised bathing at the Douglas Manor Association Beach, there is reported to be bathing from the boating docks along this shoreline but this swimming is not a sanctioned use.

On the western side of Little Neck Bay, access to the water is limited by the Cross Island Parkway that runs parallel to the shoreline. There is no major swimming noted along this shoreline. Access to the Bay for boating (secondary contact recreation use) is provided at the public marina in Bayside, operated under a concession from the NYCDPR. This facility is open seasonally between May 1 and October 31 and has accommodation for 150 boats. In addition, fishing is allowed from the docks for special events. Plate 4-7 shows fishing and boating uses at the marina.

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

4.4 OTHER POINT SOURCE LOADS

The Belgrave WPCP (SPDES NY-0026841), as described in Section 2.3.2, discharges into Udalls Cove, a tidal tributary of Little Neck Bay. The WPCP is located in Great Neck, Nassau County, and discharges to the head of Udalls Cove near 34th Avenue and 255th Street. The Belgrave WPCP is a 2.0 MGD wastewater treatment facility discharging an average of 1.3 MGD of secondary treated, disinfected effluent. Section 3.5 describes the relative contribution of this point source in terms of volume and pollutant loads as compared to CSO and stormwater sources.

4.5 CURRENT WATER QUALITY CONDITIONS

As discussed in Section 1.2.1 both Little Neck Bay and “Alley Creek/Little Neck Bay Tributary” are on the latest NYSDEC Section 303 (d) List of Impaired Waters. In 1998, NYSDEC listed Little Neck Bay as a high priority waterbody for TMDL development with its inclusion the Section 303(d) List. The source of pathogens was identified as CSO discharges and urban and storm runoff. Little Neck Bay continues to be listed on the 303(d) List for Pathogens through 2008 (most current list). Alley Creek/Little Neck Bay Tributary was listed for the first time on the 2004 Section 303(d) List and is included on the 2008 List for oxygen demand. The 2008 Section 303(d) List associates the sources of both pathogen impairment in Little Neck Bay and dissolved oxygen impairment in Alley Creek/Little Neck Bay Tributary as CSOs, urban runoff and stormwater. In the Final 2008 Section 303(d) List Little Neck Bay and Alley Creek/Little Neck Bay Tributary are listed on the 303(d) List in Part 3c – Waterbodies for which TMDL Development May be Deferred(Pending Implementation/Evaluation of Other Restoration Measures). “Impairments to these waterbodies are being addressed by the 2005 Order on Consent with NYS directing the city to develop and implement watershed and facility plans to address CSO discharges and bring New York City waters into compliance with the Clean Water Act (NYSDEC 2008).”

Plate 4-7a: Fishing at Bayside Marina on Little Neck Bay

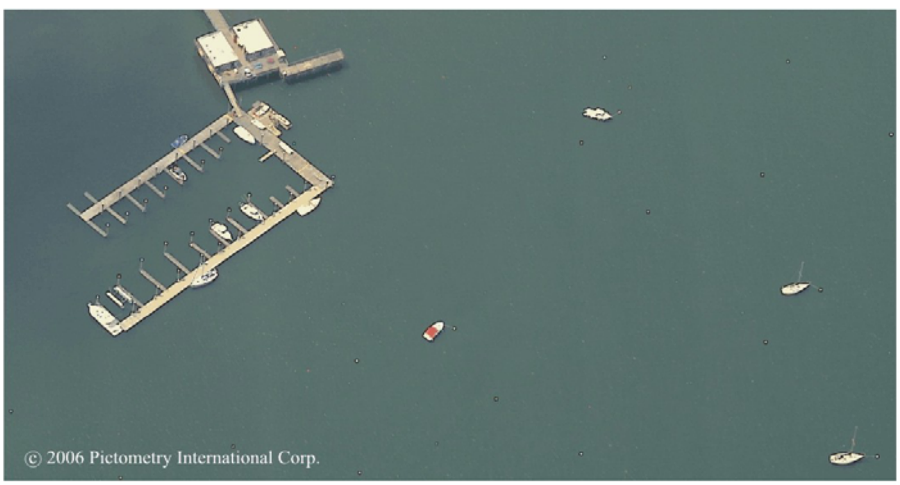

Plate 4-7b: Boating near Bayside Marina

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Plate 4-7

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Section 4.5 presents typical observed dissolved oxygen and pathogen data for Alley Creek and Little Neck Bay. A summary of DMA Beach monitoring results is included. In addition, ERTM Baseline Condition model results for dissolved oxygen and pathogens are presented.

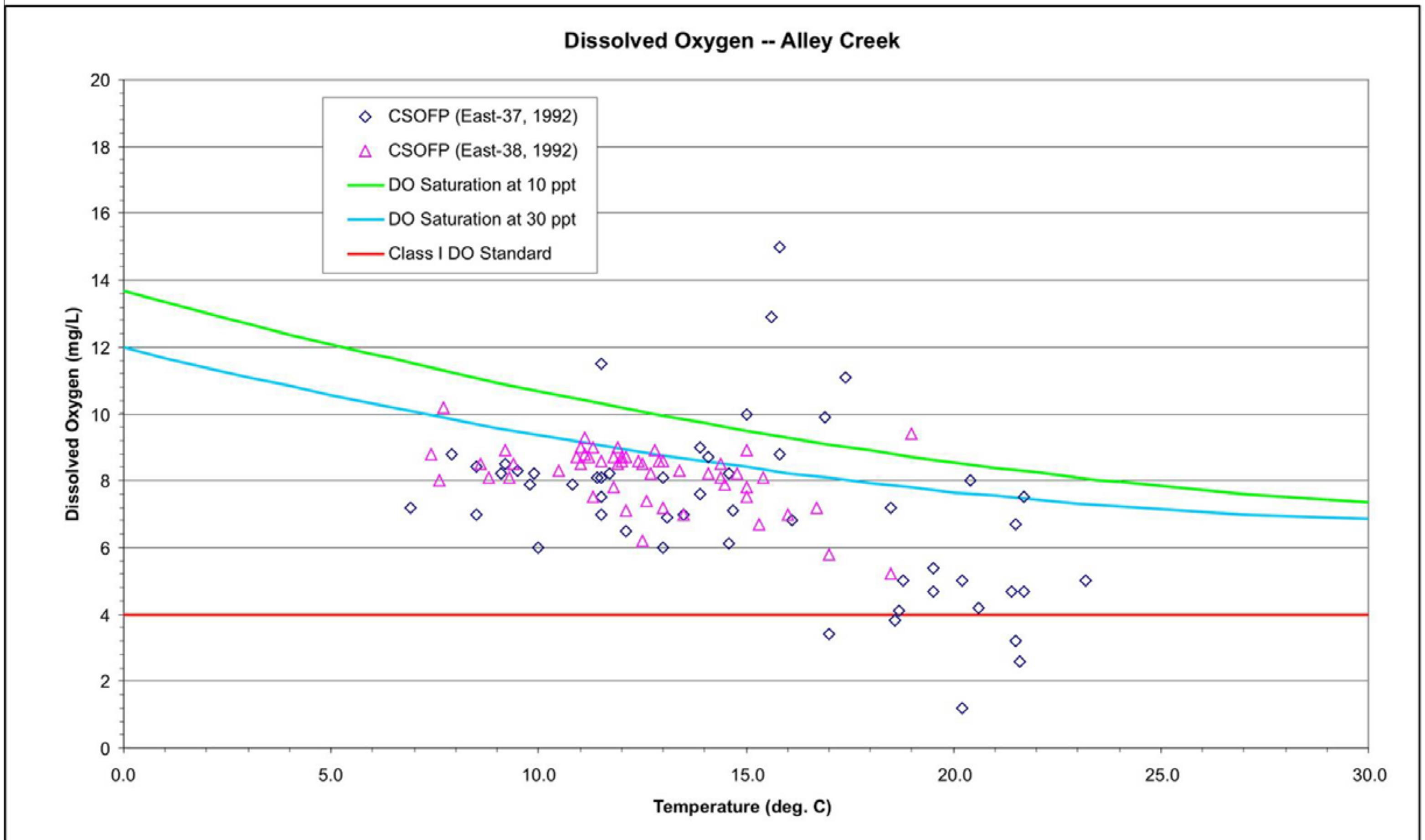
4.5.1 Dissolved Oxygen

Dissolved oxygen is the parameter used by NYSDEC to indicate if the designated aquatic life use of a waterbody is being protected. The existing dissolved oxygen standard for Alley Creek, Class I, is a minimum of 4.0 mg/L. The existing dissolved oxygen standard for Little Neck Bay, Class SB, was formerly a minimum of 5.0 mg/L, but has been changed recently (along with SA and SC) to include a chronic standard of daily average greater than or equal to 4.8 mg/L. The dissolved oxygen standard for SB also includes an acute standard of never less than 3.0 mg/L. In addition, the standard includes limited allowable excursions below 4.8 mg/L down to 3.0 mg/L. This is equivalent to a chronic exposure approach. Aquatic life use requires a minimum dissolved oxygen of 3.0 mg/L for fish survival. Dissolved oxygen less than 1.0 mg/L presents a severe stress to benthic organisms.

4.5.1.1 Dissolved Oxygen Data

The East River CSO Facility Plan Project collected data in Alley Creek to support water quality modeling and the evaluation of CSO control alternatives. Figure 4-1 indicates the location of several historic data stations and current NYCDEP Sentinel and Harbor Survey monitoring locations. Figure 4-13 is a plot of 1992 wet and dry surveys dissolved oxygen measured in Alley Creek at sampling station 38 (head of Alley Creek, Figure 4-1) and sampling station 37 (mid-way between Alley Creek head and mouth, Figure 4-1). The data are plotted versus temperature. Dissolved oxygen saturation as a function of temperature is also plotted for salinity values of 30 ppt and 10 ppt, representing the typical range of salinity observed in the creek. In addition, the NYSDEC Class I dissolved oxygen standard of a minimum of 4.0 mg/L is included for comparison. It can be seen that dissolved oxygen during colder periods is consistently above 6.0 mg/L. During warmer periods a portion of the dissolved oxygen measurements are less than 4.0 mg/L.

Figure 4-14 is a data plot of dissolved oxygen measured in Little Neck Bay during the USA Project from March to September 2001, with the majority of the data measured during the summer (see Station locations in Figures 4-3 through 4-6). The dissolved oxygen data are plotted as a function of temperature. Dissolved oxygen saturation curves as a function of temperature are presented for two salinity levels, 30 ppt and 10 ppt. In addition, the NYSDEC Class SB dissolved oxygen standard of 5.0 mg/L (standard at the time of data collection) is included for comparison. As in Alley Creek, dissolved oxygen is high in the colder periods. During the warmer conditions, however, a portion of the dissolved oxygen values is less than 4.8 mg/L, the current Class SB standard (as a daily average). No values less than 3.0 mg/L were observed.



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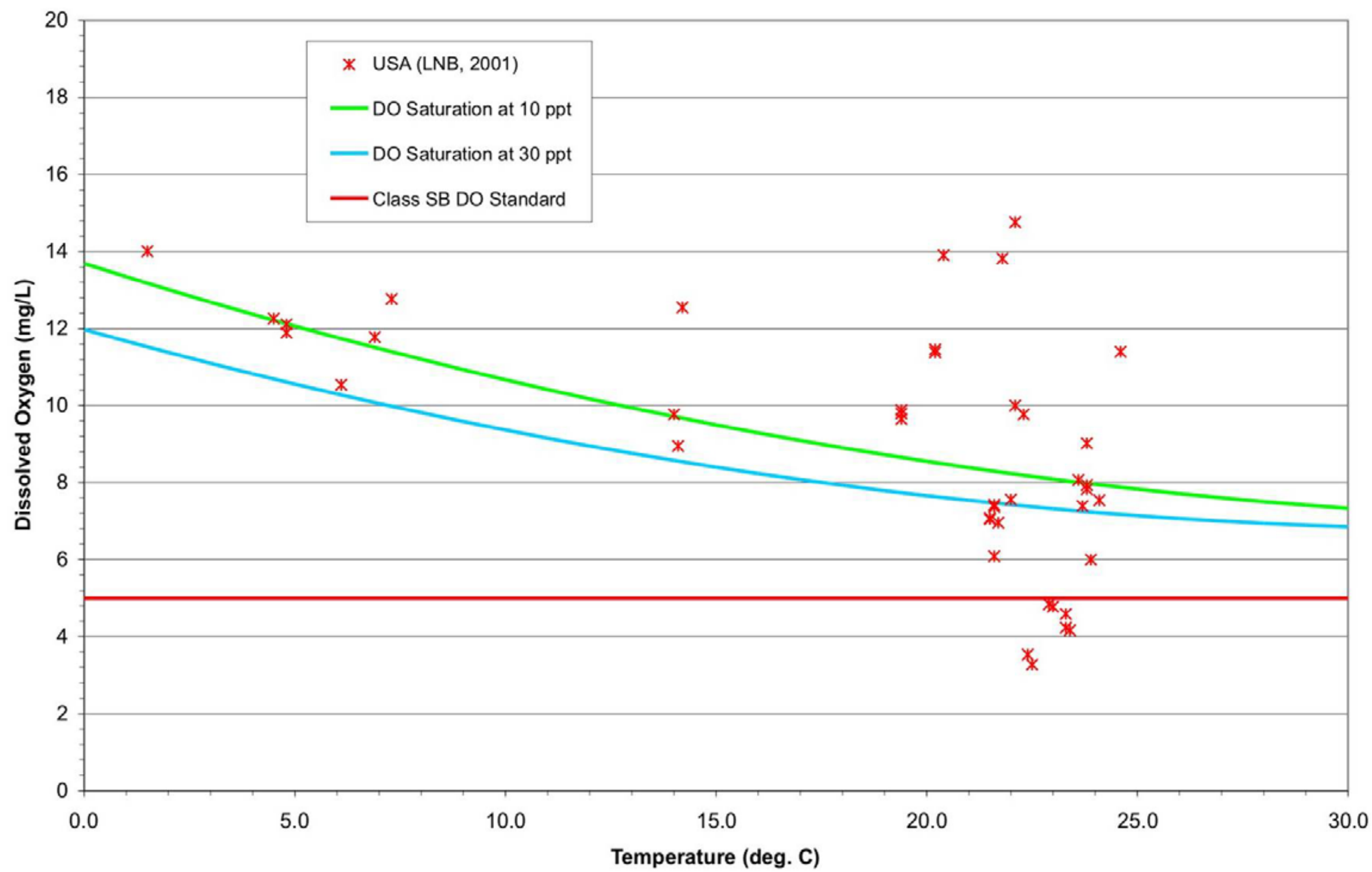
Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Alley Creek Dissolved Oxygen Data, 1992

FIGURE 4-13



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Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Little Neck Bay Dissolved Oxygen Data, 2001

FIGURE 4-14

4.5.1.2 Dissolved Oxygen, Baseline Conditions

The ERTM Model baseline water quality was calculated for the design year rainfall and loadings as described in Section 3.5. Table 4-2 is a summary of the Alley Creek and Little Neck Bay loads used for the Baseline Condition dissolved oxygen analysis.

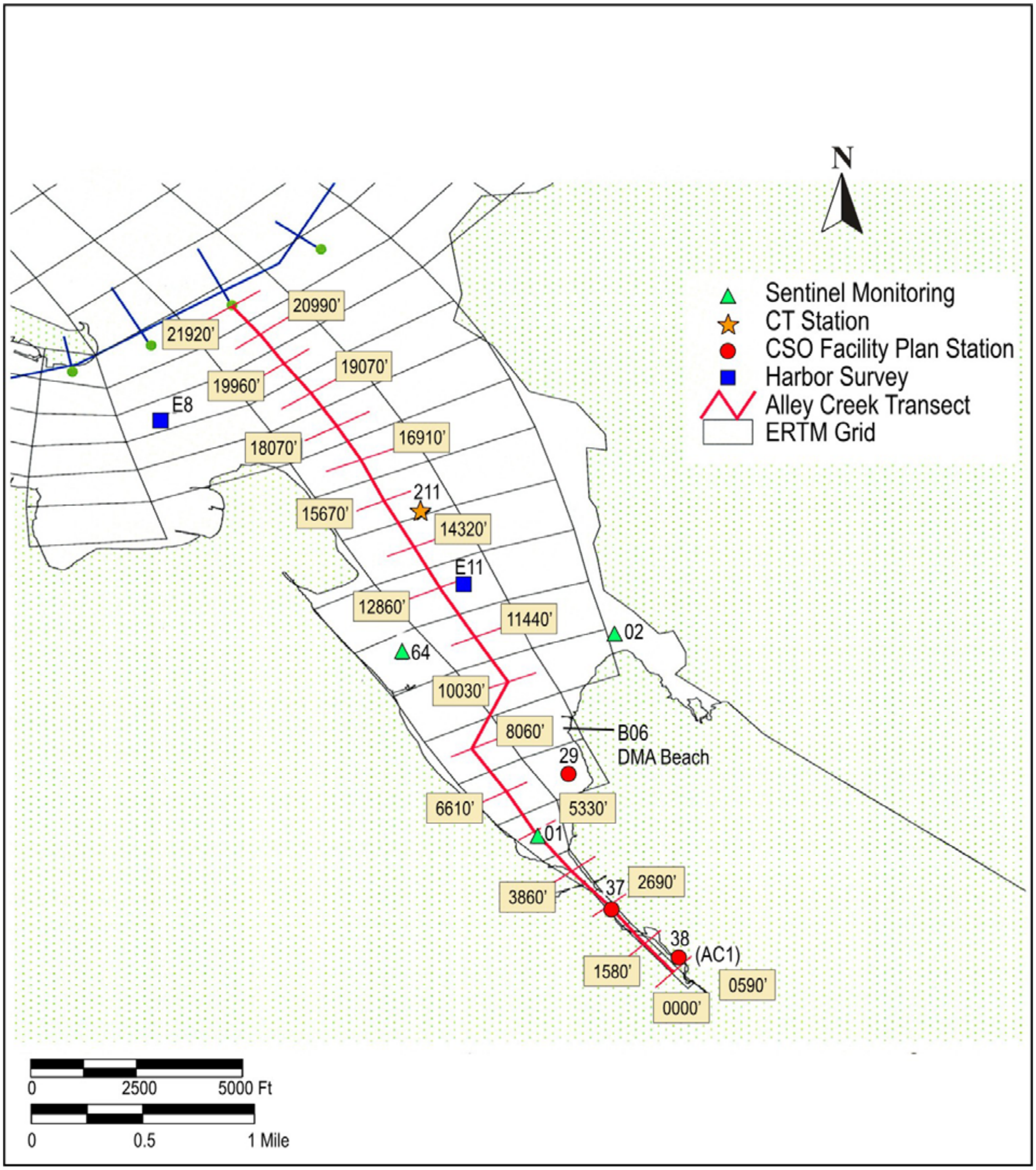
Table 4-2. CSO, Stormwater and Point Source Discharge Loadings - Baseline Condition

Constituent	Nassau County(1)			Tallman Island(1,2)		
	Belgrave WPCP	CSO Loading	Stormwater and Direct Runoff	CSO Loading(4)	Stormwater Discharge via CSO Outfall	Stormwater and Direct Runoff(3)
Volume (MG)	475	0	893	517	229	898
CBOD (1000 lbs/yr)	40	0	112	69	29	112
TSS (1000 lbs/yr)	40	0	112	69	29	112

(1) Loadings represent annual total during Baseline Condition simulation.
(2) Tallman Island Operating Capacity 122 MGD.
(3) Does not include stormwater discharged via a CSO Outfall.
(4) Only TI-008 discharges CSO; 58.8 MG CSO and 458.6 MG stormwater.

The model results are post-processed based on daily average and hourly average dissolved oxygen calculated throughout the year. Figure 4-15 is a location map of Alley Creek and Little Neck Bay with the ERTM model grid and selected historic and current sampling locations indicated. Figure 4-16 shows the range of hourly average dissolved oxygen values for the stations, 38 and 37 (Alley Creek), 29 (Little Neck Bay, near Douglaston), the Douglas Manor Association Beach (DMA), and a location in the middle of Little Neck Bay (CT211) shown in Figure 4-15. For each station model results are taken from the bottom water column layer, the location within the water that generally has the lowest dissolved oxygen. The top, middle, and bottom horizontal lines of each box represent the maximum, median, and minimum values, respectively. In addition, the top and bottom breaks in the vertical lines represent the 75th and 25th percentile values, respectively. The dissolved oxygen standards of a minimum of 4.0 mg/L in Alley Creek and daily average of 4.8 mg/L in Little Neck Bay have been included. The ERTM Baseline Condition results on Figure 4-16 are for the summer months of June through August. It can be seen that approximately 25 percent of the June through August hours are calculated, for this baseline condition, to be less than 4.0 mg/L at the head of Alley Creek. The minimum (absolute lowest value) calculated is 1.0 mg/L. The median, is 6.5 mg/L. The dissolved oxygen generally increases downstream along Alley Creek and into Little Neck Bay. It should be noted, however, that some dissolved oxygen values are calculated for Little Neck Bay that are less than 4.8 mg/L. Alley Creek is calculated to experience dissolved oxygen less than 4.0 mg/L occasionally during April through September of the Baseline Condition year. Similarly, Little Neck Bay is calculated to experience dissolved oxygen less than 4.8 mg/L occasionally during June through September.

Figure 4-17 presents dissolved oxygen results longitudinally along the transect depicted in Figure 4-15. The transect begins at the head of Alley Creek and distance from the head is presented. At a distance of 6,000 feet from the head of Alley Creek, Little Neck Bay begins. The transect continues through Little Neck Bay and for approximately 0.5 miles into the East River. Figure 4-17 presents a summary of dissolved oxygen results on an a summer basis. The left side



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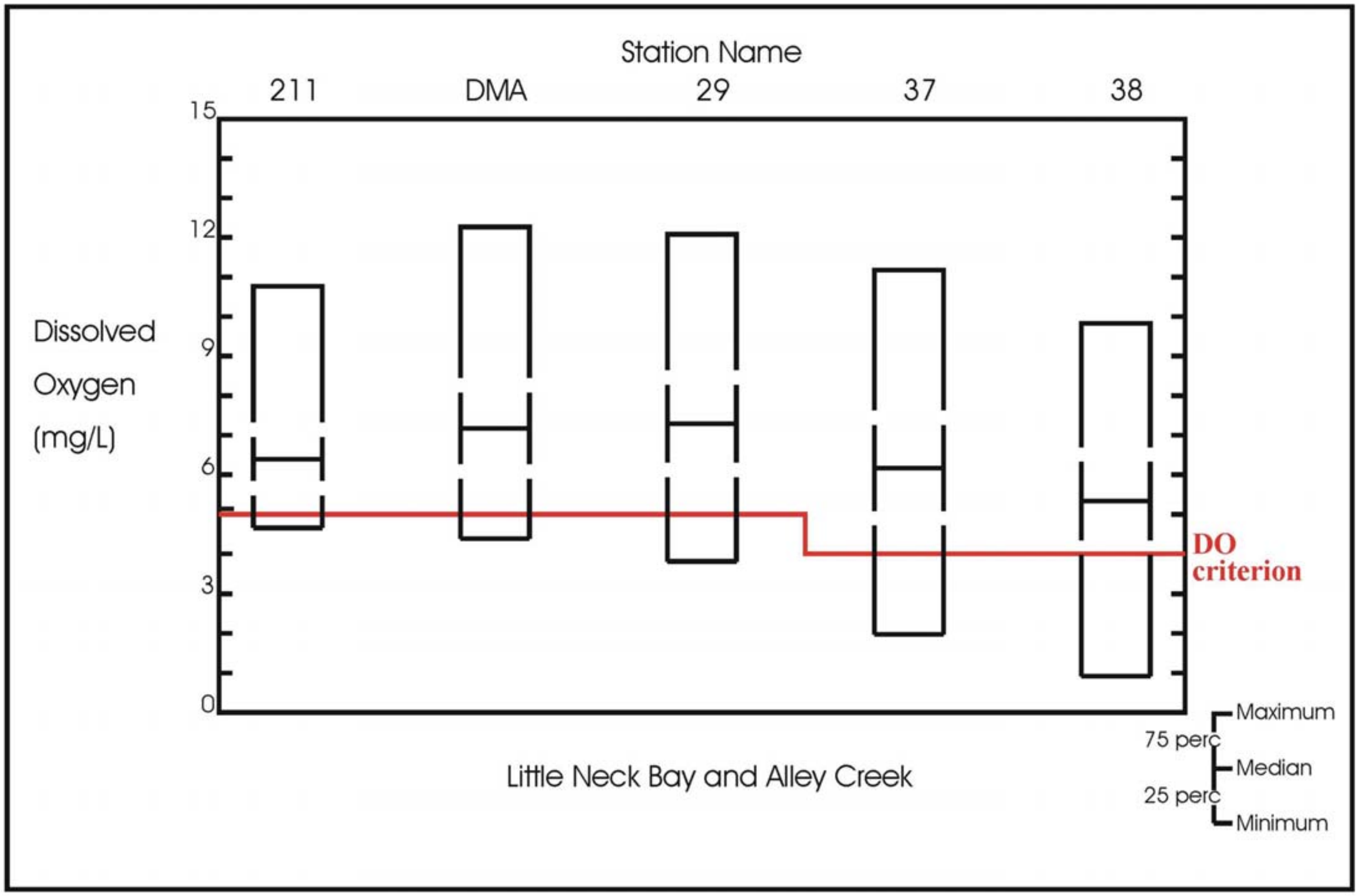
Alley Creek/Little Neck Bay
Transect and Selected Locations

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-15



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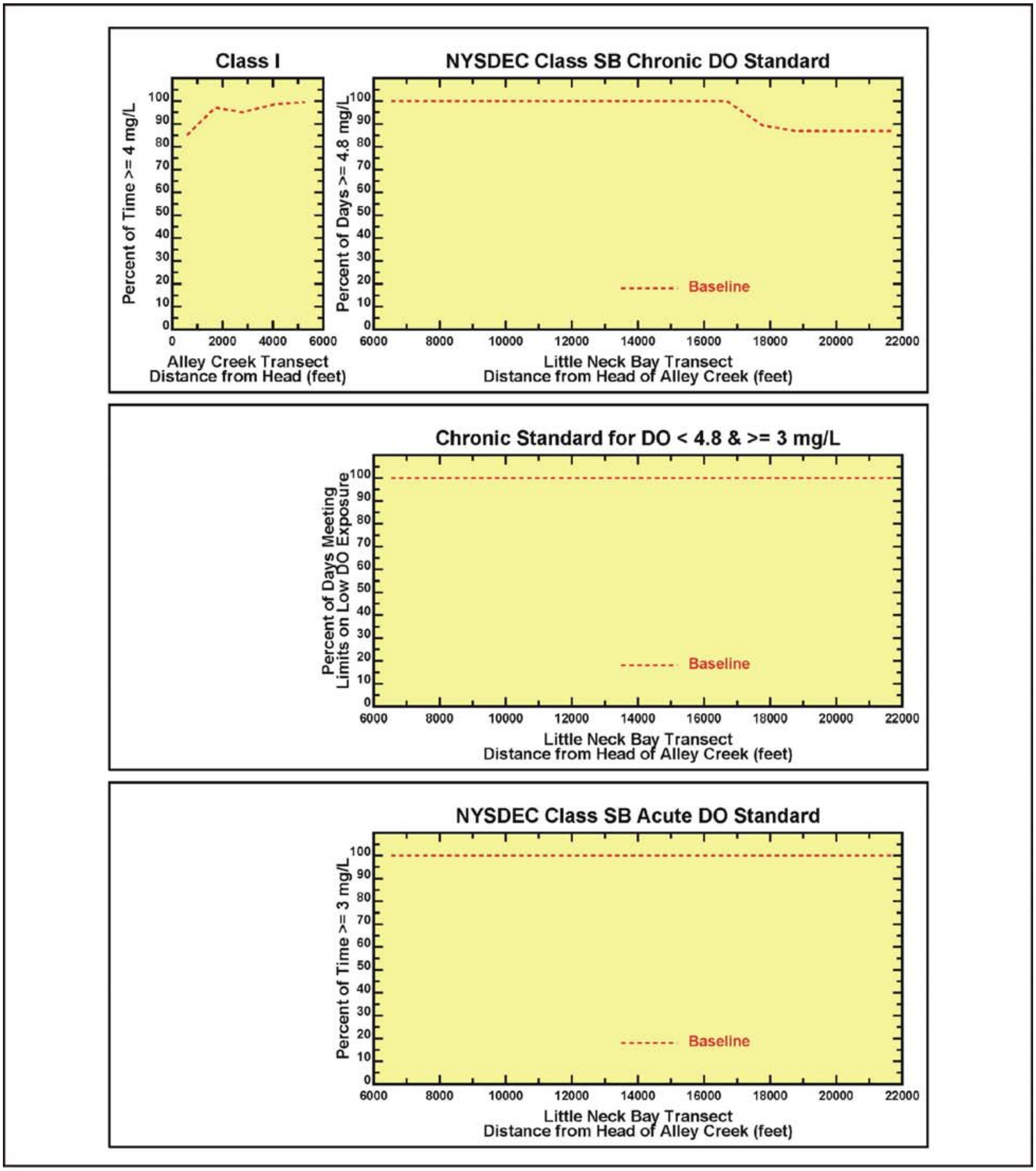
Calculated Dissolved Oxygen, Baseline Conditions Summer (June-August)

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-16



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Summer Dissolved Oxygen Baseline Condition, Alley Creek/Little Neck Bay Transect

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-17

panel presents the results for Alley Creek expressed as percent of the time the dissolved oxygen is greater than 4.0 mg/L. It can be seen that dissolved oxygen is greater than 4.0 mg/L 85 percent of the time at the head of Alley Creek. At the mouth of Alley Creek, dissolved oxygen is greater than or equal to 4.0 mg/L 100 percent of the time during the summer design year.

The right side panels in Figure 4-17 are the summer, June through August, dissolved oxygen results for Little Neck Bay. The top right-hand panel presents Little Neck Bay dissolved oxygen results expressed as percent of days that the average daily dissolved oxygen is greater than 4.8 mg/L, the NYSDEC chronic dissolved oxygen standard. Little Neck Bay daily average dissolved oxygen is greater than 4.8 mg/L throughout its length. Toward the East River, however, the percent of summer days calculated to be greater than 4.8 mg/L drops to 87 percent (80 days out of 92). The dissolved oxygen in the East River near the Little Neck Bay entrance is influenced by two major factors. The first is the bathymetry. The East River is deeper than Little Neck Bay. Lower dissolved oxygen concentrations are present in these deeper waters because they are cut off from re-supply of oxygen through atmospheric reaeration. The second factor is the influence of Long Island Sound. The upper East River is in relatively close proximity to the lower dissolved oxygen concentration water that characterizes the Western Long Island Sound, particularly during the summer months. These conditions do not exist in Little Neck Bay since the Bay is much shallower than the East River and the bottom waters of Little Neck Bay do not exchange with those in the East River. However, dissolved oxygen in the East River near Little Neck Bay is greater than the Class I Standard 4.0 mg/L essentially 100 percent of the time.

It is important to note that the dissolved oxygen results show that the East River appears to have minimal effect on Little Neck Bay dissolved oxygen. The lower dissolved oxygen calculated in August, for example, in the East River does not propagate into Little Neck Bay. Similarly, low dissolved oxygen calculated at the head of Alley Creek does not appear to influence dissolved oxygen into Little Neck Bay.

The middle panel of Figure 4-17 presents results of an additional evaluation for days that average less than 4.8 mg/L dissolved oxygen. This evaluation is based on USEPA work that demonstrated that populations of marine organisms could tolerate dissolved oxygen concentrations below 4.8 mg/L for short periods of time and that these excursions were unlikely to have a significant impact on populations of exposed organisms as measured by larval recruitment. To determine if a dissolved oxygen event less than 4.8 mg/L is protective of aquatic life, NYSDEC has proposed to apply the chronic exposure duration standard by counting the actual number of days within a specified time period (66 days) that the calculated dissolved oxygen lies within a NYSDEC-specified concentration interval (0.1 mg/L) divided by the allowable number of days for that same interval. The quotients of actual days/allowable days are then summed. If the total is less than 1.0, no violation of the standard has occurred. (NYSDEC, Div of Water, 2008). For the Baseline Condition, the summer low dissolved oxygen events (near the East River) do not violate the chronic standard. The exposure duration requirements to be protective of aquatic life are met. The bottom right-hand panel of Figure 4-17 presents Little Neck Bay results as percent of the time dissolved oxygen is greater than 3.0 mg/L, the NYSDEC acute dissolved oxygen standard.

For the Baseline Condition, Little Neck Bay summer dissolved oxygen is calculated to attain SB standards during the design year. Additional model dissolved oxygen results on a monthly basis are included in Appendix C.

4.5.2 Bacteria

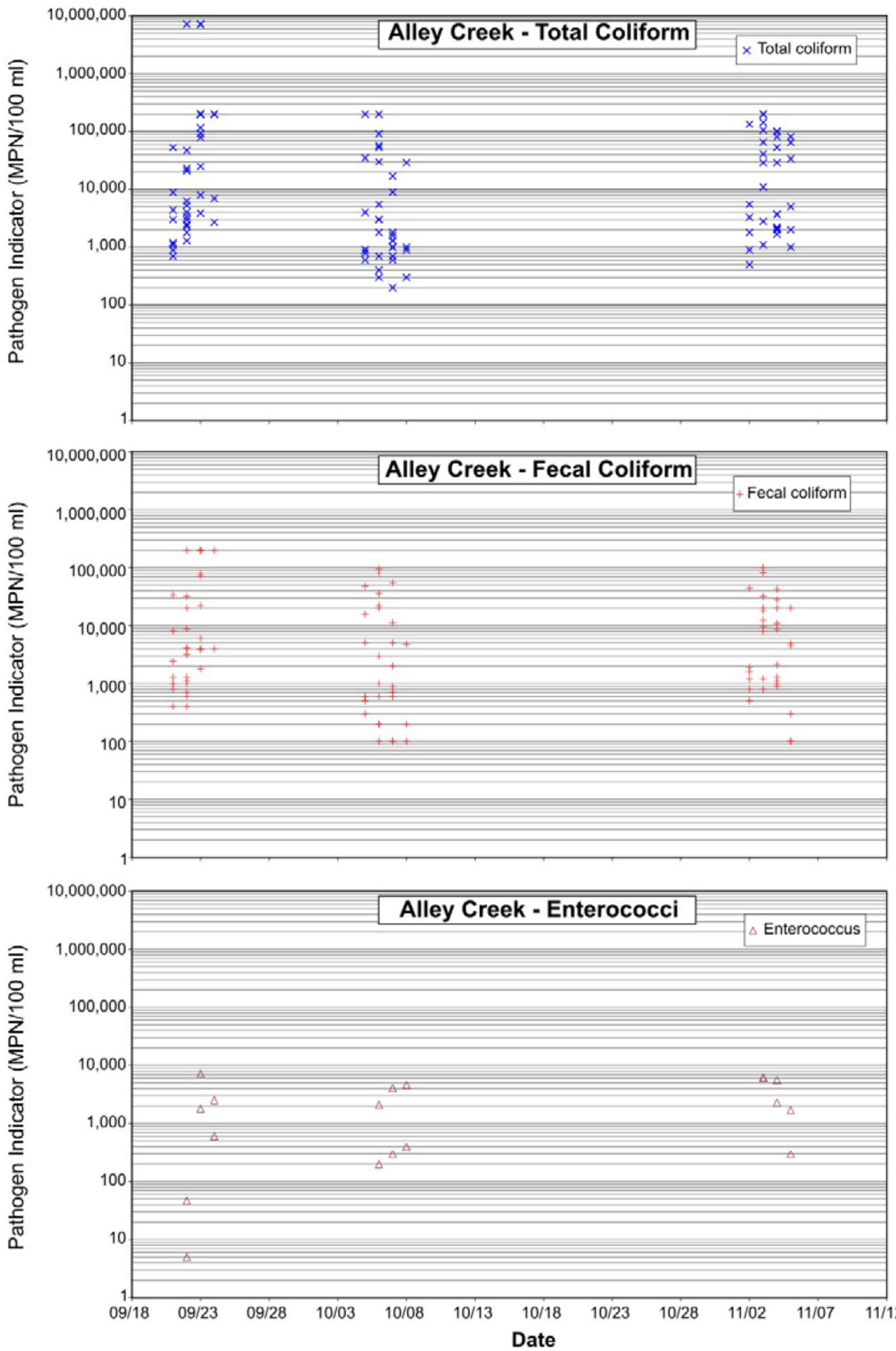
Bacteria, such as total coliform, fecal coliform and enterococcus, are the organisms used by NYSDEC to indicate if the designated primary or secondary contact recreation use of a waterbody is being protected. The numerical bacteria standards for Alley Creek (Class I) require that total coliform bacteria must have a monthly geometric mean of less than 10,000 per 100 mL from a minimum of five examinations. Fecal coliform (Class I) must have a monthly geometric mean of less than 2,000 per 100 mL from a minimum of five examinations. The numerical bacteria standards for Little Neck Bay (Class SB) require that total coliform have a monthly median less than 2,400 per 100 mL and that 80 percent of the measurements be less than 5,000 per 100 mL. Fecal coliform standards for Little Neck Bay require a monthly geometric mean less than 200 per 100 mL from a minimum of five samples.

An additional NYSDEC standard for primary contact recreational waters such as Little Neck Bay (Class SB) is a maximum allowable enterococci concentration of a geometric mean of 35 per 100 mL for a representative number of samples. This standard, although not yet promulgated by NYSDEC, is now an enforceable standard in New York State since USEPA established January 1, 2005, as the date upon which the criteria must be adopted for all coastal recreational waters. The enterococcus standard does not apply to Alley Creek or any other Class I waters.

The Douglas Manor Association bathing beach, licensed to operate as a beach by the NYCDOHMH, is located on Little Neck Bay. For designated bathing beach areas, the USEPA criteria require that an enterococcus reference level of 104 per 100 mL be used by state agencies for announcing bathing advisories or beach closings in response to pollution events. For non-designated beach areas of primary contact recreation, which are used infrequently for primary contact, the USEPA criteria require that an enterococcus reference level indicative of pollution events be considered to be 501 per 100 mL. Little Neck Bay is classified SB, primary contact recreation use. However, with the exception of the DMA Beach, Little Neck Bay is used infrequently for primary contact recreation. These reference levels, according to the USEPA documents, are not standards but are required to be used as determined by the state agencies in making decisions related to recreational uses and pollution control needs.

4.5.2.1 Bacteria Data

Alley Creek was monitored during the CSO Facility Planning period for total and fecal coliform and enterococcus. Figure 4-18 shows typical levels of bacteria measured during wet and dry surveys at Alley Creek stations 38 (head of Creek) and 37 (near mouth of Creek). The top panel presents total coliform data from both stations during wet and dry surveys in November 1992. It can be seen that approximately half of the total coliform are less than the secondary contact numerical criteria of 10,000 per 100 mL. The middle panel presents fecal coliform data from the same surveys. Approximately half of the fecal coliform measurements are less than the secondary contact numerical criteria of 2,000 per 100 mL. The bottom panel presents enterococcus data. Enterococcus range from 5 to 6,000 per 100 mL. It should be noted that Alley Creek (Class I) does not have enterococcus bacteria standards.



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Alley Creek Bacteria Data, 1992

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-18

Typical fecal coliform bacteria concentrations in Little Neck Bay are presented from the NYCDEP Sentinel Monitoring Program for Stations S01 near the mouth of Alley Creek, S02 at the mouth of Udalls Cove and S64 near Outfall TI-006 and the Bayside Marina (see Figure 4-15 for locations). Figure 4-19 shows these bacteria measurements available for 2001, 2002 and 2003. The fecal coliform numerical criteria for Class I waters is a monthly geometric mean less than 2,000 per 100 mL. The top panel of Figure 4-19 presents data at the mouth of Alley Creek. The fecal coliform data at that location were all less than 500 per 100 mL. The fecal coliform standard for a Class SB water is a monthly geometric mean less than 200 per 100 mL. Data from a location at the mouth of Udalls Cove (S02), the middle panel of Figure 4-19, and S64 in the vicinity of Bayside Marina, bottom panel in Figure 4-19, are all less than 200 per 100 mL with the exception of the maximum point at both locations in 2003. The overall geometric mean of the data is at least an order of magnitude lower than the 200 per 100 mL criterion.

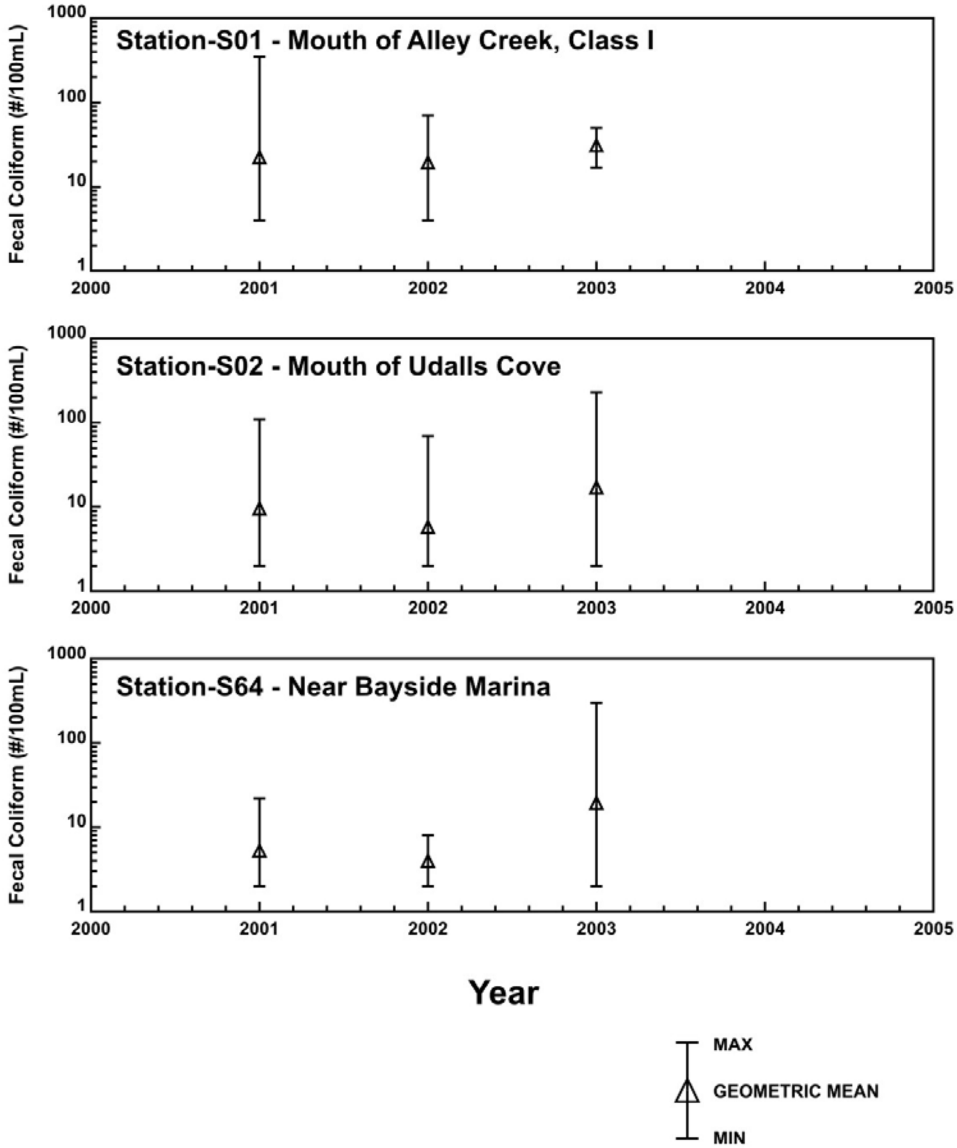
Douglas Manor Association Beach

Douglas Manor Association (DMA) Beach is monitored weekly by NYCDOHMH from May 1 through the first week in September. Enterococcus was the parameter most routinely measured within the last two years. Monitoring results of enterococcus, fecal coliform and total coliform for the summer of 2003 are presented in Figure 4-20. The top panel is the rainfall during this period. The next three panels are enterococcus, fecal coliform and total coliform, respectively. Multiple measurements were taken at each sampling event. For the enterococcus data, the standard of a geometric mean of 35 and reference value of 104 per 100 mL have been included. Similarly, 200 has been included on the fecal coliform plot and 2,400 and 5,000 have been included on the total coliform plots.

Figure 4-21a presents the enterococcus measurements at the DMA Beach for 2004 and 2005. The rainfall events are presented and the total summer rainfall, 19.8 inches for 2004 and 8.9 inches for 2005, is listed. As per the sampling protocol, several samples are taken for each sampling event. For these data, the 30-day geometric mean has been calculated as a moving geometric mean and is plotted as the red squares. The enterococcus standard of a geometric mean of 35 is included on the plots. It can be seen that the geometric mean is greater than 35 before June 20, 2004 and 2 or 3 times during July 2004. The single sample value of 104, not a standard but used as a guide for the regulatory agency, is also included. Similar NYCDOHMH enterococcus data for 2006 are shown in Figure 4-21b. NYCDOHMH provides an annual summary of beach enterococcus data. Table 4-3 summarizes the seasonal statistics of enterococcus measurements at DMA Beach for 2003 through 2006 (NYCDOHMH, 2003, 2004, 2005, 2006, 2007, 2008).

Table 4-3. Summary of Enterococcus Data for Douglas Manor Association Beach

Entrococcus Data	Bathing Season, June, July and August					
	2003	2004	2005	2006	2007	2008
Maximum, org/100 mL	10,500	200	720	4,000	965	360
Minimum, org/100 mL	10	4	4	4	7	4
Seasonal Geometric Mean, org/100 mL	97	19	19	27	44	29
Maximum 30-day Geometric Mean as posted by NYCDOHMH, org/100 mL		202	49	37	82	79
Monitoring Season: May 1 through first week of September Bathing Season: June, July and August						



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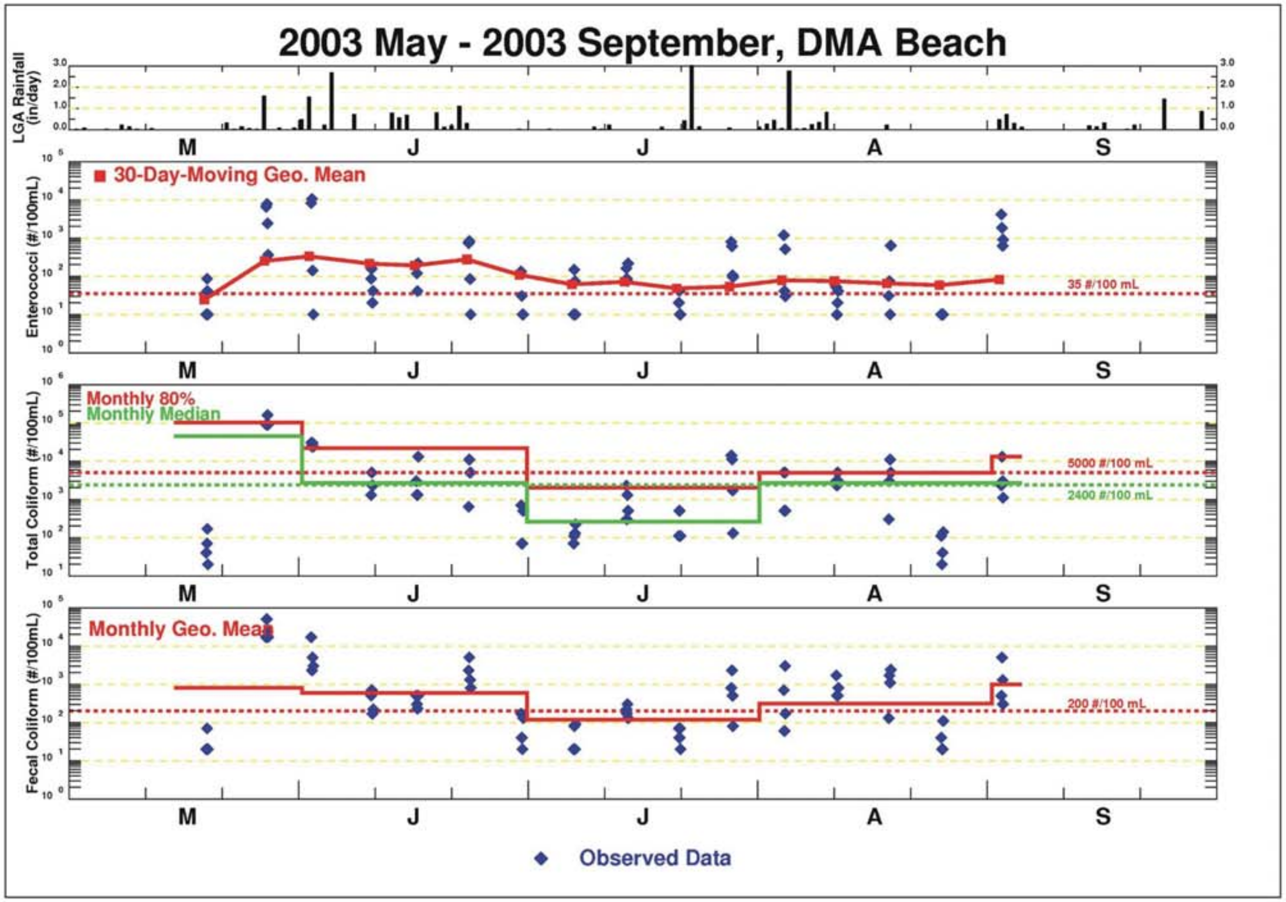
Little Neck Bay Fecal Coliform Data
NYCDEP Sentinel Monitoring

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-19



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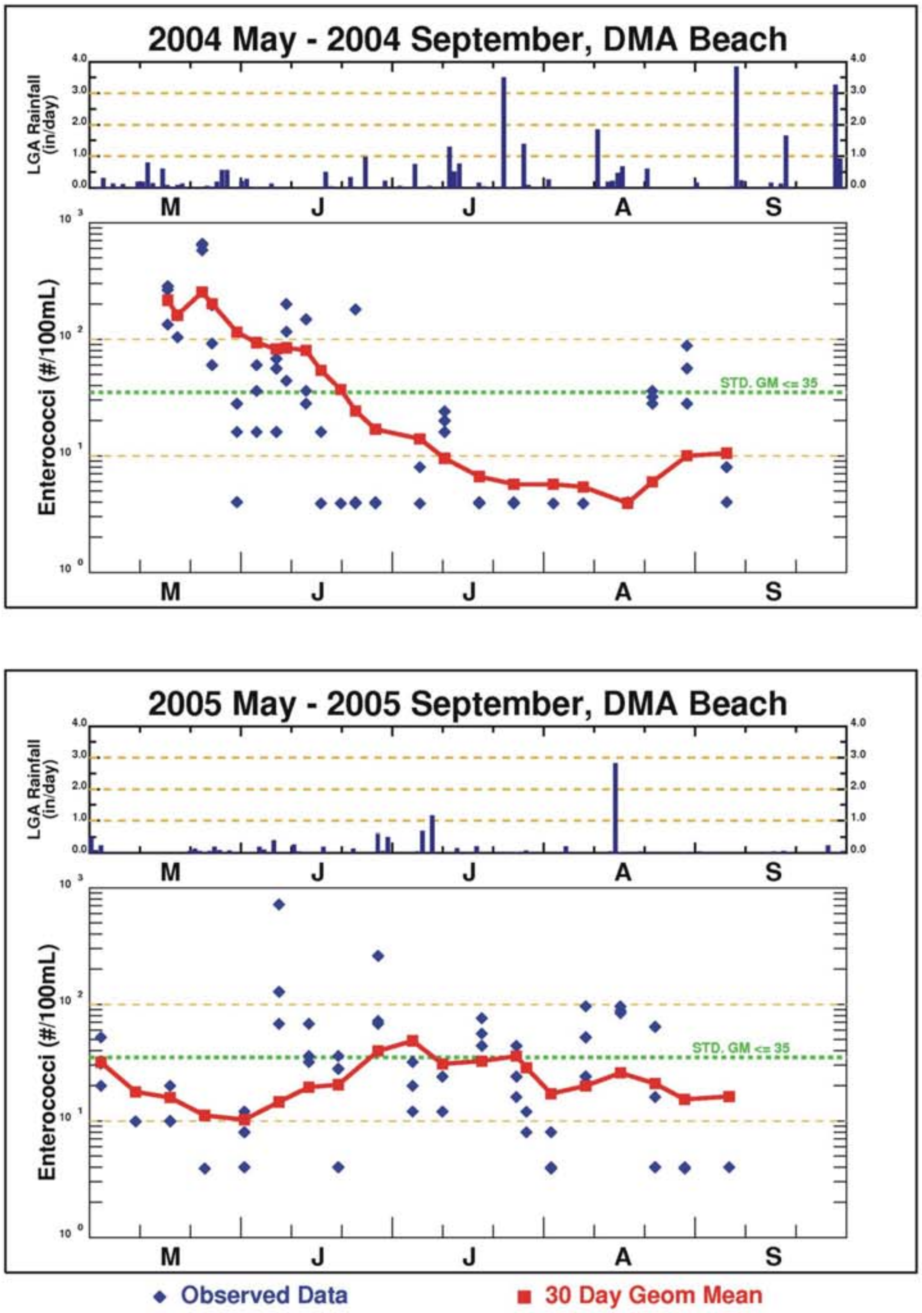
Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Douglas Manor Association Beach
Summer 2003 NYCDOHMH Monitoring Data

FIGURE 4-20



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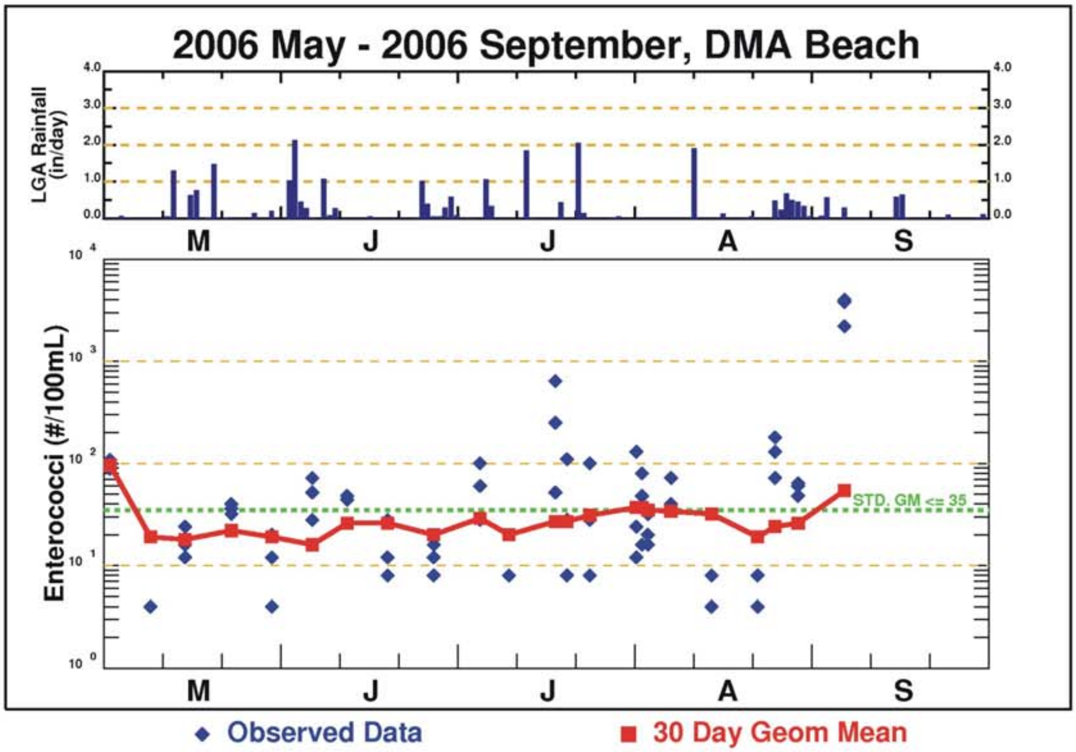
Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

DMA Beach
NYCDOHMH Enterococcus Data
2004 and 2005

FIGURE 4-21a



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Department of Environmental Protection

DMA Beach
NYCDOHMH Enterococcus Data, 2006

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-21b

This data is used by NYCDOHMH to make decisions regarding issuing advisories or closing a beach to swimming to protect swimmers. For all NYC beaches, public and private, NYCDOHMH has in place a "Wet Weather Advisory". This advisory differs as to the rainfall amount that triggers the Wet Weather Advisory for each beach. For DMA Beach, the public is advised to wait 48 hours to swim after a rainfall of 0.2 inches in 2 hours or 0.4 inches in 24 hours. If the beach enterococcus sampling data is greater than 104 per 100mL, a "Pollution Advisory" is posted on the NYCDOHMH web-site. Additional sampling is performed and the Pollution Advisory is removed with measurement of acceptable water quality. The 30-day moving geometric mean of enterococcus data is calculated. If the geometric mean is greater than 35 per 100 mL, the beach is closed to swimming pending additional analyses. The monitoring program begins on May 1 in order to have the data to calculate a moving 30 day geometric mean by the beginning of the Bathing Season, typically Memorial Day weekend. At the DMA Beach for 2005, the NYCDOHMH beach monitoring program (May through September) resulted in Wet Weather Advisories and Pollution Advisories for the 2005 Bathing Season (June through August). Six Wet Weather Advisories (12 days total) were issued. In addition, Pollution Advisories (enterococcus > 104 per 100 mL) were issued for a total of 19 days. There were no Beach Closures at DMA Beach during the 2005 Bathing Season. During the 2006 Bathing Season NYCDOHMH issued 24 days of Wet Weather Advisories, 8 days of Pollution Advisories and Closure for 2 days. The DMA Beach was closed 50 days in 2007 for confirmed enterococci exceedance. Wet Weather Advisories were issued a total of 10 days and Pollution Advisories for 23 days. During the 2008 Bathing Season the DMA Beach was closed 35 days for confirmed enterococci exceedance. Wet Weather Advisories were issued for an additional 38 days and a Pollution Advisory was issued for 2 days.

In 2002, NYCDOHMH assessed the DMA Beach using a form titled "Bathing Beach Risk Assessment Worksheet." The worksheet compiles information and observations regarding "Factors Potentially Impacting Beach" under categories such as rainfall, potential pollution sources, bather usage, water quality monitoring data, and public comment/perception. For the DMA Beach, failed septic systems and the large number of recreation boats with marine sanitation devices were the major factors listed by NYCDOHMH as potentially impacting the beach under the category of potential pollution. As indicated in Figure 3-2 and Figure 3-4 none of Douglaston Peninsula, the location of DMA Beach, is sewered. The area uses on-site septic systems. Birds in the water or adjacent to the beach and the average number of bathers at peak were also noted by NYCDOHMH as factors potentially impacting the beach pollution.

The NYCDEP's Bureau of Water and Sewer Operations, Connections Unit works closely with the Public Health Engineering (PHE) unit of NYCDOHMH and the Douglas Manor Homeowners Association to track and correct sewage-related complaints to abate these local public health concerns and make the beaches safer for bathers.

4.5.2.2 Bacteria, Baseline Conditions

The ERTM Model Baseline water quality was calculated for the design year, 1988 rainfall and loadings as described in Section 3.4.4 and 3.5. Table 4-4 is a summary of the Alley Creek and Little Neck Bay loads used for the Baseline Condition total and fecal coliform and enterococcus analysis. It should be noted that localized pathogen sources in the DMA Beach area have not been included in the Baseline Condition.

The model results are post-processed to calculate for an hourly instantaneous maximum concentration and 30-day moving geometric mean for enterococcus. The monthly median and an 80 percent value of concentrations on a monthly basis are determined for total coliform. A monthly geometric mean is determined for fecal coliform throughout the year. Figures 4-22, 4-23 and 4-24 present Baseline Condition results for Douglas Manor Association Beach, (B06 on Figure 4-15), S64 a location near the Bayside Marina and at the head of Alley Creek (AC1, 38 on Figure 4-15).

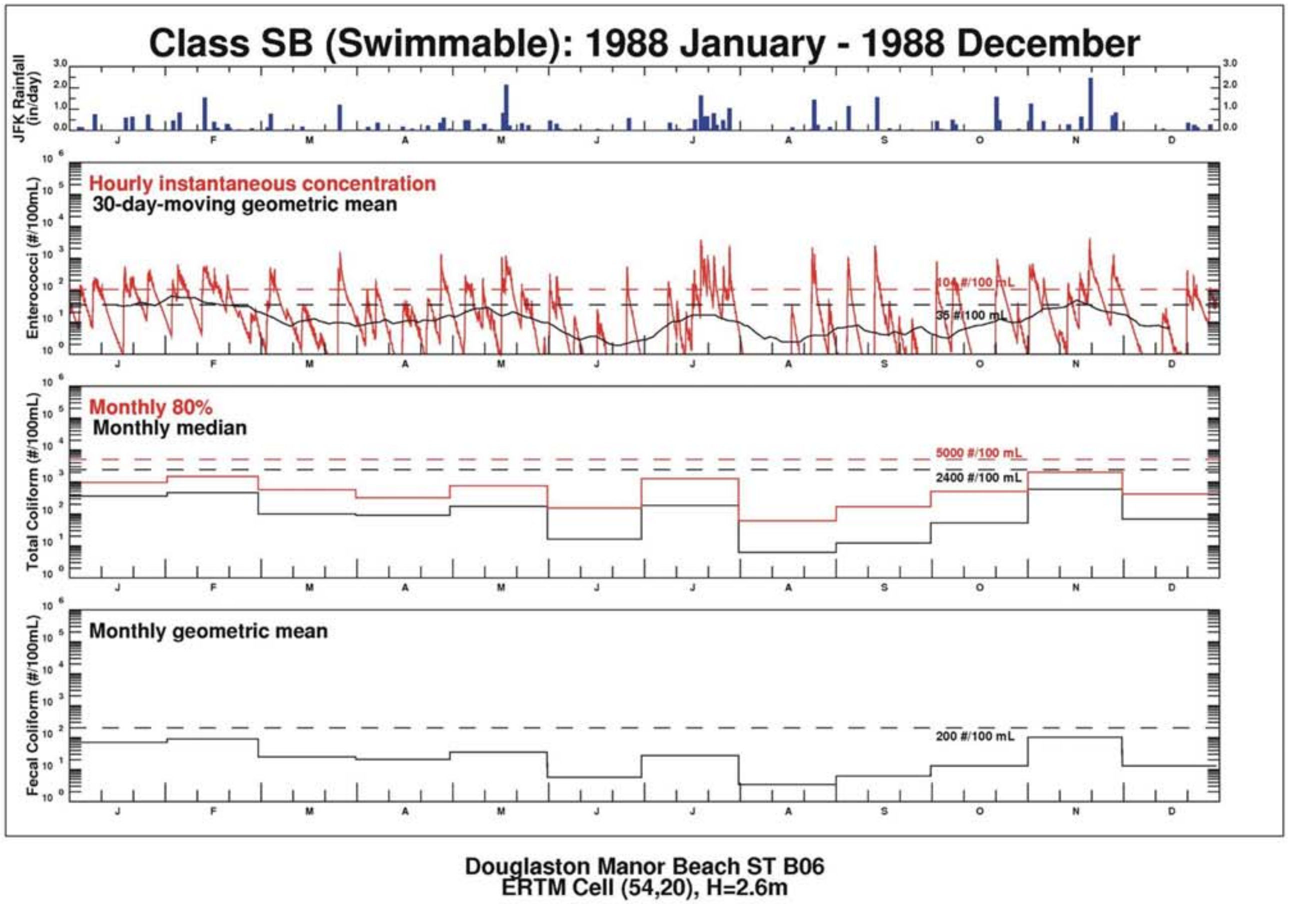
Table 4-4. CSO, Stormwater and Point Source Discharge Bacteria Loadings - Baseline Condition

Constituent	Nassau County[(1)]			Tallman Island[(1,2)]		
	Belgrave WPCP	CSO Loading	Stormwater and Direct Runoff	CSO Loading[(4)]	Stormwater Discharge via CSO Outfall	Stormwater and Direct Runoff[(3)]
Volume (MG)	475	0	893	517	230	898
Total Coliform Bacteria (#/yr)	$<.004x10^{15}$	0	1.7×10^{15}	7.1×10^{15}	1.3×10^{15}	5.1×10^{15}
Fecal Coliform Bacteria (#/yr)	$<.004x10^{15}$	0	0.8×10^{15}	1.3×10^{15}	0.3×10^{15}	1.2×10^{15}
Enterococcus (#/yr)	$<.004x10^{14}$	0	5.1×10^{14}	4.6×10^{14}	1.3×10^{14}	5.1×10^{14}

(1) Loadings represent annual total during Baseline Condition simulation.
(2) Tallman Island Operating Capacity 122 MGD.
(3) Does not include stormwater discharged via a CSO Outfall.
(4) Only TI-008 discharges CSO; 58.8 MG of CSO and 458.6 MG of stormwater.

Figure 4-22 presents results for the DMA Beach. The top panel is the JFK design year 1988 rainfall in inches per day. The second panel presents the enterococcus model results for the beach location. The 30-day moving geometric mean is shown for comparison with the 35 per 100 mL geometric mean standard for an SB water. The maximum instantaneous concentration on an hourly basis is also shown. The 104 per 100 mL action level (not a standard) is included for comparison. The baseline calculated geometric mean of enterococcus is less than the 35 per 100 mL standard throughout the bathing season, June through August. Geometric means greater than the 35 enterococcus are calculated for February and November. The third panel presents the total coliform Baseline Condition model results as a monthly median and the 80 percent value. The monthly median SB standard of 2,400 per 100 mL is included and all of the monthly medians are calculated to be below 2,400. The SB standard also requires that 80 percent of total coliform samples in a month be less than 5,000 per 100 mL. The 80 percent total coliform model calculated value, calculated on a monthly basis is less than 5,000 for all months. The bottom panel presents fecal coliform model results as a monthly geometric mean. The SB standard requires that the monthly geometric mean be less than 200 per 100 mL. All of the monthly geometric means of fecal coliform at the DMA Beach are calculated to be less than 200 per 100 mL.

Also, as indicated in Figure 4-22, instantaneous enterococci concentrations are calculated for the Baseline Condition to exceed the USEPA required action level of 104 per 100 mL at the DMA beach. The 104 per 100 mL action level is generally exceeded with rainfalls that are greater than 0.2 inches per event. As indicated previously, NYCDOHMH has a standing advisory related to warning the public not to swim at this location after rainfalls of 0.2 inches in 2 hours or 0.4 inches in 24 hours, indicating that the public should not swim in the waters within



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Douglas Manor Association Beach, Baseline Conditions
Enterococci, Total Coliform, Fecal Coliform

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-22

48 hours of such events. Although NYCDOHMH notes a variety of sources of pollution that could impact water quality at this beach, InfoWorks CS™ model results indicate that some elevated enterococci levels are, in fact, associated with rainfall events and associated collection system response.

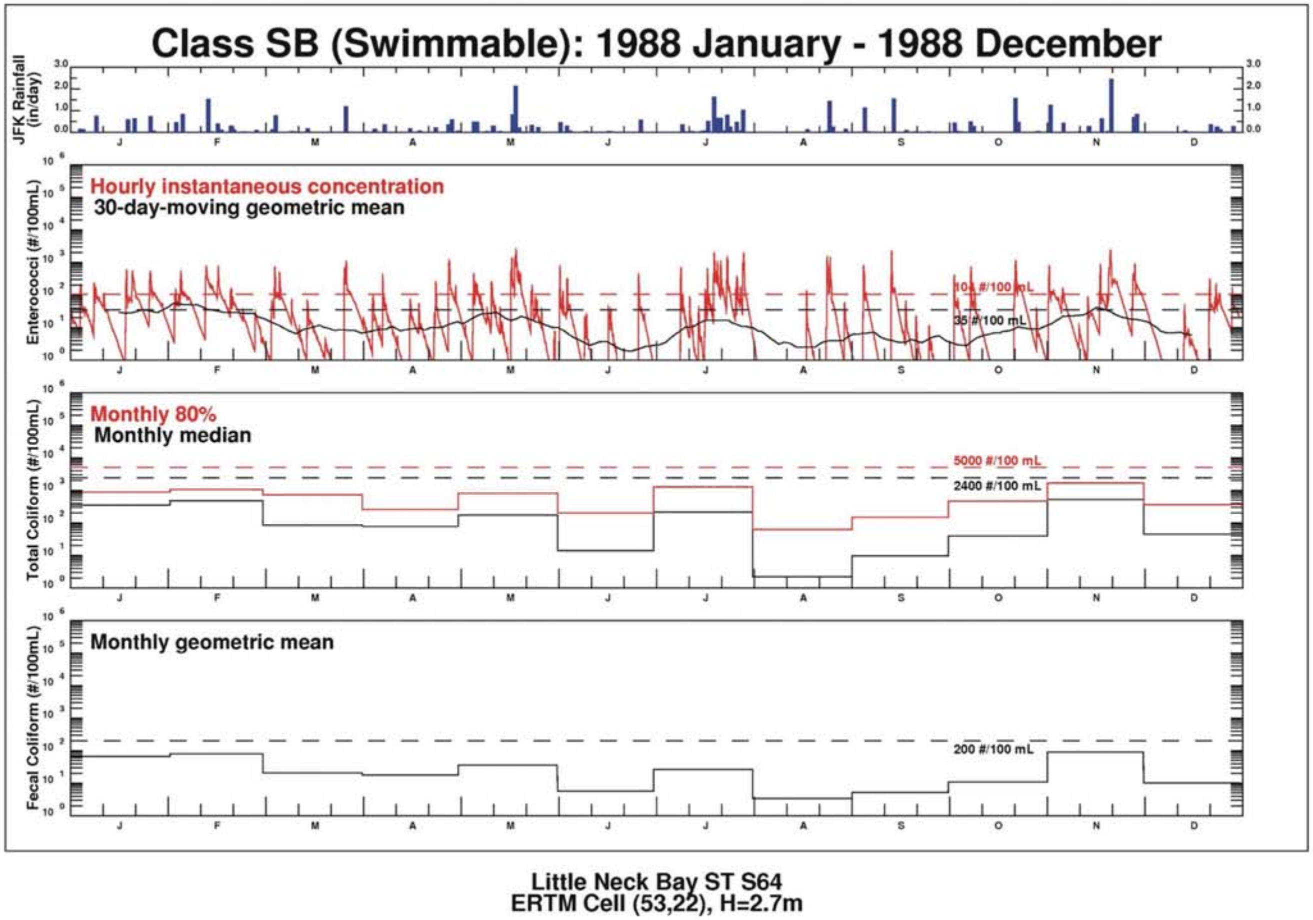
Figure 4-23 presents Baseline Condition bacteria results for S64, near Bayside Marina. The same model results post-processing as described for the DMA Beach results were performed for this location. The enterococcus 30-day moving geometric mean is less than the Class SB standard of 35 per 100 mL. The instantaneous hourly concentration values are shown with the 501 per 100 mL reference value (not a standard). This value was chosen for comparison because of the infrequent use of Little Neck Bay for primary contact recreation with the exception of the DMA Beach. The total coliform and fecal coliform Baseline Condition model results are presented in Figure 4-23. The total coliform SB monthly median standard of 2,400 per 100 mL and the monthly requirement that 80 percent of the total coliform measurements be less than 5,000 per 100 mL are included. The corresponding calculated monthly total coliform Baseline results are all less than the corresponding standard. The monthly geometric mean of the fecal coliform Baseline results are all less than the 200 per 100 mL SB standard.

Alley Creek Baseline bacteria results at the head of the creek (Station AC1, East 38) are shown in Figure 4-24. As a Class I water, best use secondary contact recreation, total coliform numerical, maximum monthly geometric mean of 10,000 per 100mL is included with the total coliform model results. All of the monthly geometric means are less than 10,000 per 100 mL. The monthly geometric means of fecal coliform Baseline Condition model results are presented on the bottom panel of Figure 4-24. All of the calculated values are less than the Class I standard of 2,000 per 100 mL. There is no enterococcus standard for Class I waters.

During the summer months of June through August, along the Little Neck Bay transect shown in Figure 4-15, enterococcus is less than 501 per 100 mL 90 percent of the time near the mouth of Alley Creek. Along the remainder of the transect all of the Baseline June through August enterococcus results are less than 501 per 100 mL. The transect lies along the center of Little Neck Bay. The Baseline Conditions results indicate that the hourly instantaneous concentrations of enterococcus are greater than 501 at times in the shoreline model segments (DMA Beach in Figure 4-22 and S64 in Figure 4-23), but are less than 501 in the middle of the bay. This suggests the influence of Alley Creek sources (CSO and stormwater) and Little Neck Bay sources (stormwater) do not impair most of Little Neck Bay for "infrequent" primary contact recreation use. All of the monthly geometric means of enterococcus from June through August at all Little Neck Bay locations are calculated as less than the standard of 35 per 100 mL. The Baseline Case bacteria model results are an indication of the importance of localized sources of pathogens, since measured enterococcus at DMA Beach are often in violation of NYCDOHMH bathing standards prompting beach closures.

4.6 ALLEY CREEK/LITTLE NECK BAY BIOLOGY

Alley Creek and Little Neck Bay (Alley Creek/Little Neck Bay when referred to collectively) support aquatic communities that are similar to those found throughout the NY/NJ Harbor in areas of similar water quality and sediment type. The aquatic communities of Alley Creek/Little Neck Bay contain typical estuarine species but have been highly modified by physical changes to the original watershed, shoreline, and to water and sediment quality. These



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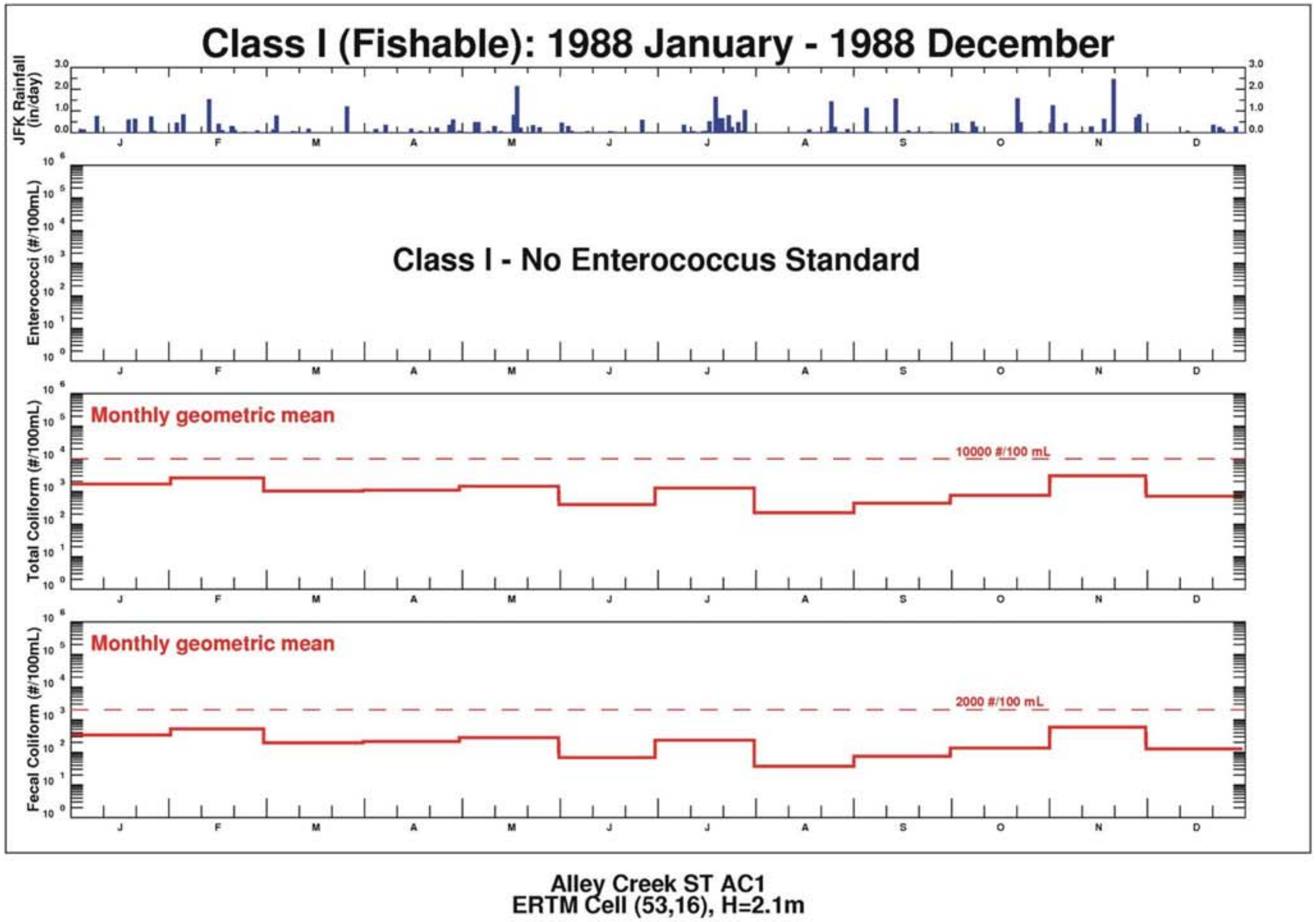
Little Neck Bay, S64 Vicinity of Bayside Marina, Baseline Conditions
Enterococci, Total Coliform, Fecal Coliform

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-23



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Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Head of Alley Creek, Baseline Conditions Enterococci, Total Coliform, Fecal Coliform

FIGURE 4-24

changes represent constraints on the creek and bay from reaching its full potential to support a diverse aquatic life community and to provide a fishery resource for anglers.

Adverse physical effects on aquatic habitats interact with degraded water and sediment quality to limit the diversity and productivity of aquatic systems. Water and sediment quality limit aquatic life when they are below thresholds for survival, growth and reproduction, but when these thresholds are reached or exceeded, physical habitat factors tend to be limiting to diversity and productivity. Improvements to water and sediment quality, as well as physical habitat, can enhance aquatic life use in degraded areas such as Alley Creek/Little Neck Bay, but major irreversible changes to the watershed and the waterbody place limits on the extent of these enhancements. In addition, because Alley Creek/Little Neck Bay is part of a much larger modified estuarine/marine system that is a major source of recruitment of aquatic life to Alley Creek/Little Neck Bay, its ability to attain use standards is closely tied to overall ecological conditions in NY/NJ Harbor.

This section describes existing aquatic communities in Alley Creek/Little Neck Bay and provides a comparison to those found in the nearby Flushing and Manhasset Bays, as well as the open waters of the East River. This baseline information, in conjunction with projections of water and sediment quality from modeling, technical literature on the water quality and habitat tolerances of aquatic life, long term baseline aquatic life sampling data from the Harbor and experience with the response of aquatic life to water quality and habitat restoration in the Harbor provides the foundation for assessing the response of aquatic life to CSO treatment alternatives for Alley Creek/Little Neck Bay.

Many of the biotic communities associated with Alley Creek/Little Neck Bay have been considerably altered over the centuries. For example, Alley Pond Park was substantially impacted by the construction of the Long Island Expressway and the Cross Island Parkway that included the placement of large quantities of road construction fill in the southern portion of the Park. Nevertheless, Alley Creek/Little Neck Bay still maintains a greater proportion of natural marsh habitat than other similar embayments of the Harbor. For example, nearby Flushing Bay and Creek have been heavily channelized and the marshes that formerly lined the natural shorelines have been almost entirely replaced with bulkheading. With the depletion of marshes there is a predictable reduction in wildlife. However, Alley Creek/Little Neck Bay supports a diverse ecosystem despite it being situated within a major metropolitan area.

To document the effects of urbanization on an estuarine ecosystem, sampling is required to understand the temporal and spatial distribution of aquatic life and seasonal patterns in habitat use. Few such studies have been conducted in Alley Creek/Little Neck Bay. While numerous inventories of fish and benthic invertebrates have been completed for the East River proper, only project specific studies were conducted in Alley Creek/Little Neck Bay or most other tributaries of interest to the LTCP. The descriptions of fish and aquatic life uses to follow draw primarily upon data generated by HydroQual (2002) for the NYCDEP USA Project. The goals of the USA Project are to define specific and comprehensive long-term beneficial use goals for New York City's waterbodies including habitat, wetlands, riparian and recreational goals, in addition to water quality goals. The USA Project FSAPs and Standard Operating Procedures manuals provide literature reviews and detailed information on methods and materials used in this report (HydroQual 2001a, 2001b, 2001c, 2002a, 2003a, 2003b).

4.6.1 Wetlands

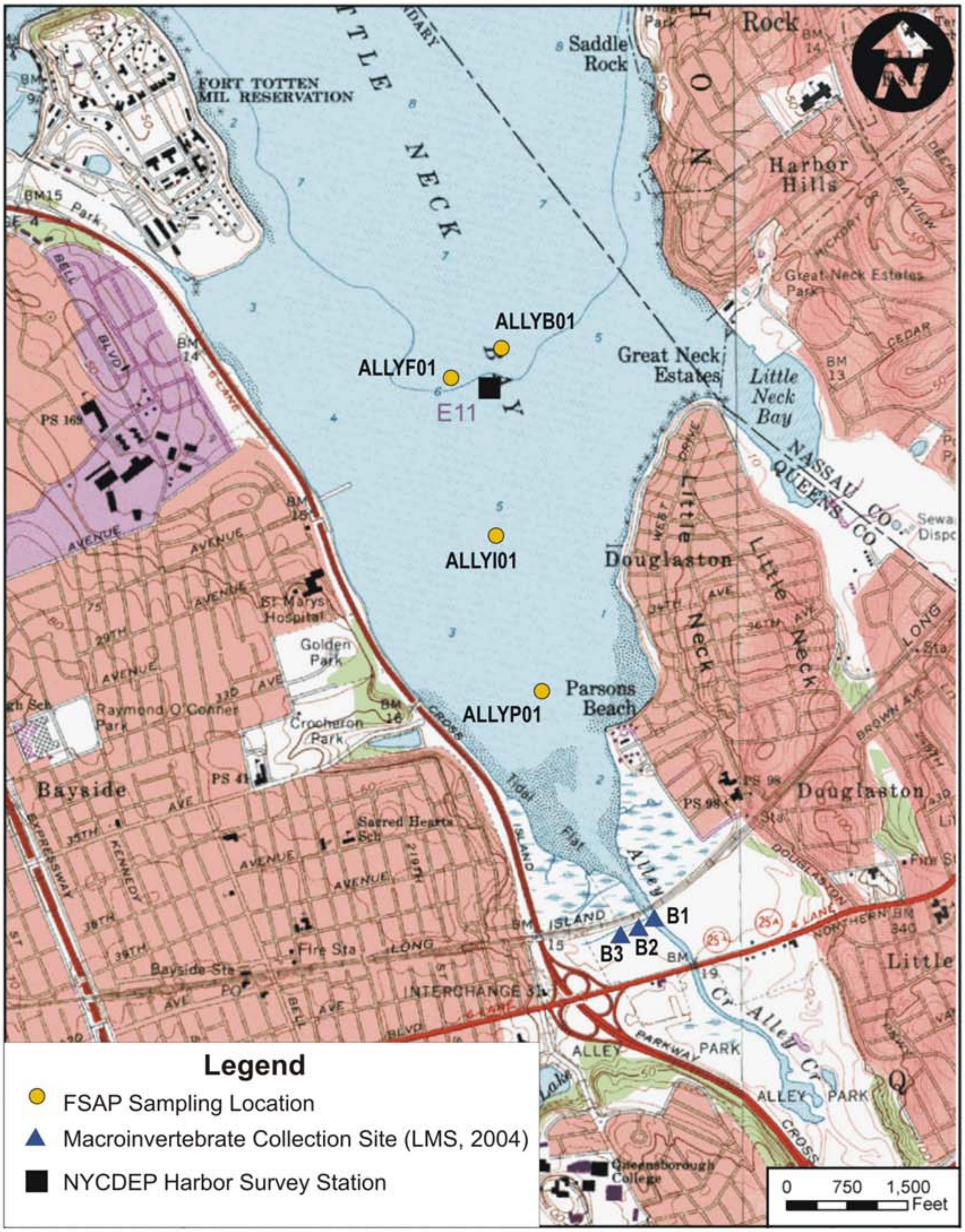
Current information on wetlands along Alley Creek/Little Neck Bay is based on a review of United States Fish and Wildlife Service National Wetland Inventory (NWI) wetland maps, shown in Figure 4-12. Cowardin (1979) developed the classification scheme used for these wetlands. The area surrounding Alley Creek/Little Neck Bay is predominantly classified as estuarine, inter-tidal, emergent, persistent, irregularly flooded wetlands (E2EM1P) from the mouth to the Long Island Expressway (approximately 50 acres total). Emergent vegetation of estuaries is characterized by erect, rooted, herbaceous hydrophytes (excluding mosses and lichens), dominated by perennial plants. Estuaries are typically highly productive ecological systems characterized by vegetated shorelines, sunlit shallows and tidal marshes. To the West, near 49th Street, there is a freshwater lake with a small (1.5 acre) broad-leaf deciduous forest (PFO1A). Similarly, to the east, near 49th Street, there is a small freshwater pond (PUBF) with approximately 4.6 acres of freshwater emergent wetland (PEM1C). All tidal wetlands are regulated by the NYSDEC. Figure 4-11 shows the significant tidal and freshwater NYSDEC mapped wetlands in the Alley Creek and Little Neck Bay assessment area.

4.6.2 Benthic Invertebrates

The benthic community consists of a wide variety of small aquatic invertebrates such as worms and snails that live burrowed into or in contact with bottom sediments. Benthic organisms cycle nutrients from the sediment and water column to higher trophic levels through feeding activities. Suspension feeders filter particles out of the water column and deposit feeders consume particles on or in the sediment. The sediment is modified by the benthos through bioturbation and formation of fecal pellets (Wildish and Kristmanson, 1997). Grain size, chemistry, and physical properties of the sediment are the primary factors determining which organisms inhabit a given area of the substrate. Because benthic organisms are closely associated with the sediment and have limited mobility, the benthic community structure reflects local water and sediment quality.

The sediments at Alley Creek/Little Neck Bay are typical of a community characterized by muddy sand and decaying vegetation substrates. These conditions promote the accumulation of detritus in the water column for bacteria, micro algae and benthos consumption (LMS, 2004). Due to the myriad of stresses (e.g. rapidly changing temperature, salinity, submergence) encountered in the tidal wetland portions of Alley Creek/Little Neck Bay, macroinvertebrate communities tend to exhibit low diversity (Olmstead and Fell, 1974). Alley Creek/Little Neck Bay has been impacted by urbanization, runoff from highways, and residential areas and CSO discharges. These factors further alter the species diversity and abundance of the benthic community.

Sampling to document the benthic community has been conducted in Alley Creek/Little Neck Bay as part of the East River Waterbody Biology Field Sampling and Analysis Program (HydroQual, 2001c). Benthic sampling was conducted in July 2001 using a modified Young Ponar® Grab with five replicate samples collected at one station (ALLYB01) located in Little Neck Bay as shown in Figure 4-25. In addition to benthic sampling, sediment samples were collected at the Little Neck Bay station for analysis of sediment grain size and total organic carbon (TOC) content.



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Biological Sampling Stations in Alley Creek/Little Neck Bay

FIGURE 4-25

The benthic fauna collected at the Little Neck Bay station (ALLYB01) consisted primarily of the mollusc *Nassarius obsoletus* (120/m^2). The mollusk *Mulinia lateralis,* and the arthropod *Crangon septemspinosa* were also present. *Nephtys* sp. were the most abundant polychaetes (72/m^2). Polychaete worms are generally pollution tolerant organisms and as such, they serve as important indicators of pollution levels because of their tolerance to organic enrichment (Gosner, 1978, Weiss, 1995).

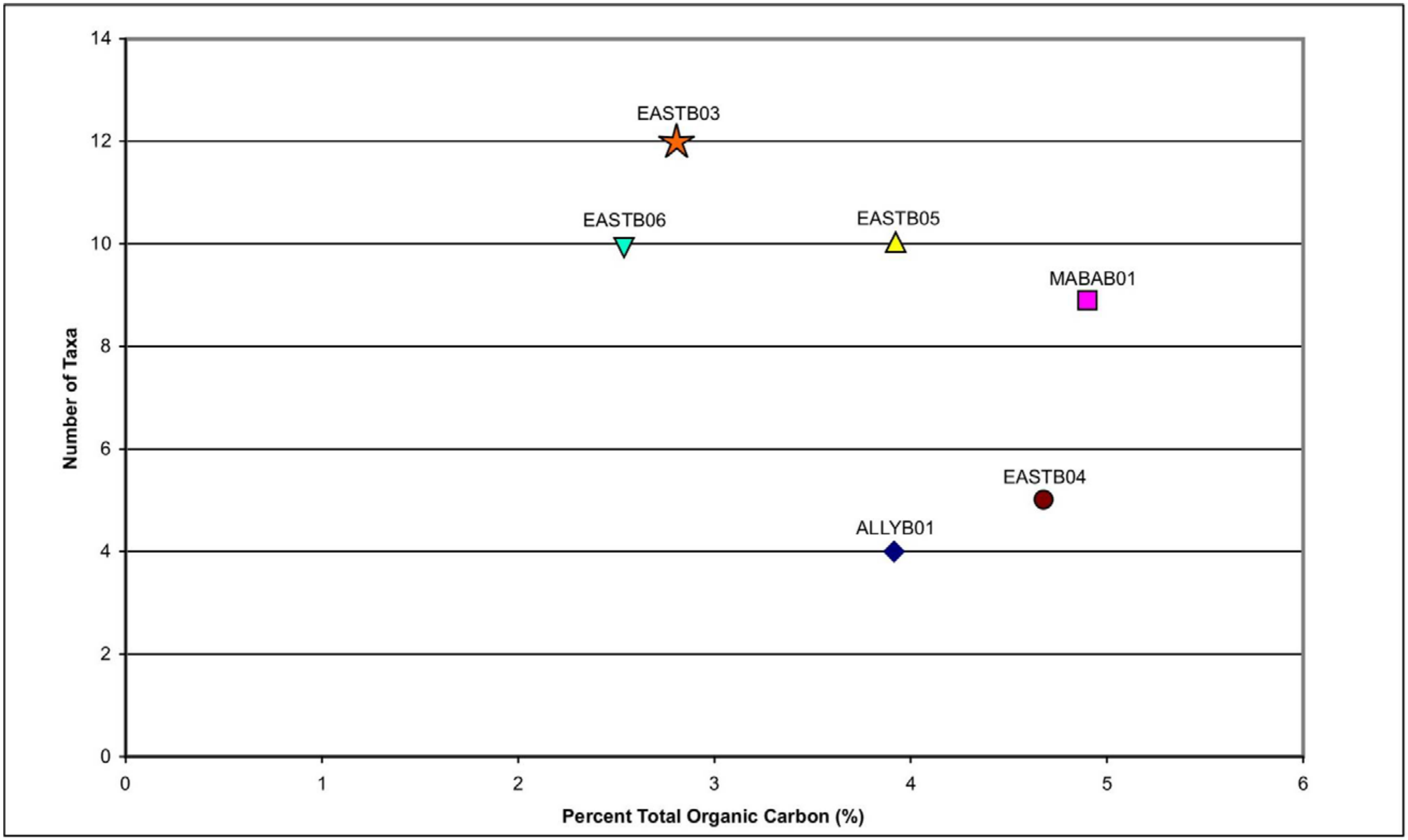
The benthic community in Alley Creek/Little Neck Bay was low in abundance and diversity compared to nearby areas of the East River as summarized in Table 4-5. The abundance and diversity of benthic species, in combination with their relative pollution tolerance, are indicators of habitat quality. While the abundance and diversity of benthic organisms was lowest at the Alley Creek/Little Neck Bay station, the relative proportion of pollution tolerant polychaetes was higher in all other East River stations, with the exception of Manhasset Bay. Polychaete density ranged from 51 percent to 97 percent at the East River stations. The low species diversity and high proportion of pollution tolerant organisms indicates degraded benthic habitat quality in Alley Creek/Little Neck Bay and other areas of the East River.

The low number of taxa at Alley Creek/Little Neck Bay reflects the relation between benthic community diversity and percent total organic carbon (TOC) presented in the Field Sampling and Analysis Program as shown in Figure 4-26. Station locations are shown in Figures 4-3 through 4-6. The station designation EAST is East River, ALLY is Alley Creek and MABA is Manhasset Bay. The sediments at the Alley Creek/Little Neck Bay station had a percent TOC of 3.94 percent. Increasing the inputs of organic matter to the benthic environment results in predictable changes to chemical, physical and biological factors that have direct and indirect effects on the benthic fauna (Pearson and Rosenberg, 1978). Increased organic loading tends to be associated with a shift in the substrate from sands to silts and clays. The substrate at Alley Creek/Little Neck Bay is dominated by fine-grained sediments and had high percent silt and clay (92.5 percent), and a total percent solids of 28.4 percent. The percentage of solids in sediment infers the amount of water retained, i.e., a higher percentage of solids retains less water. Of the six areas compared in Table 4-5 and Figure 4-26, the Alley Creek/Little Neck Bay station had the lowest overall species diversity (four taxa total). The other stations, while higher in overall diversity, had a far greater abundance of the opportunistic polychaete and oligochaete worms. Elevated TOC concentrations and contamination have been shown to co-occur with increased abundances of opportunistic benthic organisms (Steimle et. al., 1982, Thompson and Lowe, 2004).

In a 2004 sampling program Lawler, Matusky & Skelly Engineers LLP (LMS, 2004), collected nine benthic grab samples using a Petite Ponar grab from three stations (three replicate samples at each station) within Alley Creek and a side channel located just south of the Long Island Railroad as shown in Figure 4-25. Sixteen taxa of benthic macroinvertebrate fauna were collected at Alley Creek, consisting of worms (polychaetes and oligochaetes), amphipods, bivalves and gastropods. The majority of the taxa accounting for most of the abundance were polychaete worms. A total of five pollution tolerant species (*Oligochaeta*, *Capitellidae*, *Leitoscoloplos* sp., *Eteone* sp., *Streblospio benedicti*) were collected at all three stations and accounted for 95 percent of the total abundance. Two pollution sensitive species (*Nephtys* sp., *Mya arenaria*), comprising 0.3 percent of the total abundance, were found living in the sediment.

Table 4-5. Abundance (per m^2) of Benthic Organisms Collected from Alley Creek, Little Neck Bay and the East River

Phylum	Taxonomic Order	LNB/Alley Creek (ALLYB01)	Manhasset Bay (MABAB01)	Flushing Bay (EASTB05)	East River (EASTB06)	East River (EASTB03)	East River (EASTB04)
Nematoda	Unidentified Nematoda sp.	0	0	0	0	0	0
Annelida	Polygordius trieslinus	0	0	0	0	0	0
	Ampharetidae	0	0	0	0	0	0
	Arabella iricolor	0	0	0	0	0	0
	Capitellidae	0	8	392	696	200	488
	Capitella capitata	0	0	0	0	0	0
	Eteone sp.	0	0	0	0	0	0
	Eulalia sp.	0	0	0	0	0	0
	Glycera sp.	0	0	16	0	8	8
	Haploscoloplosus sp.	0	0	0	0	0	0
	Haploscoloplos robustus	0	0	56	72	56	56
	Lumbrineris acuta	0	0	0	0	0	0
	Nephtys sp.	72	16	56	0	48	64
	Nephtys incisa	0	16	0	0	0	0
	Nereis sp.	0	0	0	0	8	0
	Nereis succinea	0	0	0	0	0	0
	Orbiniidae	0	0	0	0	0	0
	Pectinaria gouldii	0	0	0	8	0	0
	Phyllodocidae	0	0	0	0	0	0
	Polychaeta	0	8	0	0	8	0
	Polydora Iigni	0	0	0	0	0	0
	Polydora sp.	0	0	0	0	0	0
	Sabella microphthalma	0	0	0	0	0	0
	Scolecolepides viridis	0	0	0	0	0	0
	Scoloplos sp.	0	0	0	0	0	0
	Spionidae sp.	0	0	16	0	0	0
	Streblospio benedicti	0	0	0	0	0	0
	Tharyx sp.	0	0	120	104	0	0
	Tharyx acutus	0	0	0	0	0	0
	Oligochaeta	0	0	0	0	0	0
Mollusca	Mulinia lateralis	8	480	48	16	56	0
	Spisula solidissima	0	0	0	0	0	0
	Tellina sp.	0	0	0	24	0	0
	Tellina agilis	0	0	0	0	0	0
	Yoldia sp.	0	0	0	0	0	0
	Melampus bidentatus	0	16	0	0	0	0
	Crepidula fornicata	0	0	8	0	0	0
	Gastropoda	0	0	224	0	200	16
	Bivalvia	0	8	8	0	0	0
	Mya arenaria	0	32	0	16	24	0
	Acteocina canaliculata	0	0	0	0	8	0
	Pandora gouldiana	0	0	0	16	0	0
	Nassarius trivittatus	0	0	0	88	16	0
	Nassarius obsoletus	120	0	0	0	8	0
Arthropoda	Ampelisca sp.	0	0	0	0	0	0
	Amphipoda	0	0	0	0	0	0
	Corophium sp.	0	0	0	0	0	0
	Lysianopsis alba	0	0	0	0	0	0
	Lysianassidae	0	0	0	0	0	0
	Microdeutopus gryllotalpa	0	0	0	0	0	0
	Paraphoxus epistomus	0	0	0	0	0	0
	Crangon septemspinosa	8	0	0	8	0	0
	Crago septemspinosus	0	8	0	0	0	0
	Pagurus sp.	0	0	0	0	0	0
	Sesarma sp.	0	0	0	0	0	0
	lnsecta sp.	0	0	0	0	0	0
Echinodermata	Asteroidea	0	0	0	0	0	0
	NUMBER OF SPECIES	**4**	**9**	**10**	**10**	**12**	**5**
	TOTAL INDIVIDUALS/m^2	**208**	**592**	**944**	**1048**	**640**	**632**



New York City
Department of Environmental Protection

Number of Taxa vs. Percent Total Organic Carbon (%TOC) at Alley Creek and East River Stations

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 4-26

Amphipods (*Gammarus* sp. and *Letocheirus* sp.) were present at one of the stations. These results are typical for urbanized estuaries and the findings are similar to studies conducted in New York Harbor (Iocco, et al., 2000, Zappala, 2001).

Alley Creek is a tidal waterbody and an ecologically valuable habitat because the macrobenthic community provides a food base for many commercially and recreationally important fish species. Polychaetes and oligochaetes are an important food source for various bottom feeding species of fish, such as spot and winter flounder. Amphipods and isopods, however, are also a generally important food source for mummichogs, winter flounder, and juvenile striped bass, but were only found in low numbers in Alley Creek/Little Neck Bay (LMS, 2004). While these invertebrates are recognized for their food value to fishes, their distribution and relative abundance found in these studies are indicative of a stressed aquatic ecosystem. The distribution of these invertebrates in Alley Creek/Little Neck Bay shows a pattern that is similar to other East River tributaries that are adversely affected by CSO discharges. However, within this general pattern there are individual stations that do no fit the pattern. The reasons for these situations are not clear.

During the 1830s, a shellfishing community developed around the docks at Oldhouse Landing Road (now Little Neck Parkway) and Sand Hill Road. The industry thrived as the demand for oysters and Little Neck Clams (*Venus mercenaria*) grew. But by 1893, the local shellfishing industry was destroyed by overharvesting, poaching and pollution (NYCDPR, 2005).

4.6.3 Epibenthic Communities

Epibenthos live on or move over the substrate surface. Epibenthic organisms include sessile suspension feeders (mussels and barnacles), free swimming crustaceans (amphipods, shrimp, and blue crabs) and tube-dwelling polychaete worms found around the base of attached organisms. Epibenthic organisms require hard substrate, as they cannot attach to substrates composed of soft mud and fine sands (Dean and Bellis, 1975). In general, the main factors that limit the distribution of epibenthic communities are: the amount of available hard surface for settlement, species interactions, and water exchange rates. In Alley Creek/Little Neck Bay, pier piles and bulkheads provide the majority of underwater substrates that can support epibenthic communities. The epibenthic communities living on underwater structures impact the ecology of the nearshore zone. Suspension feeding organisms continuously filter large volumes of water, removing seston (particulate matter which is in suspension in the water) and releasing organic particles to the sediment. This flux of organic particles (from feeding and feces) enriches the benthic community living in the sediment below piers and bulkheads (Zappala, 2001).

The epibenthic, or “fouling”, community was studied as part of the USA Project by suspending multiple-plate arrays of 8 inch by 8 inch synthetic plates in the water column (HydroQual 2003b, 2001b). This method was selected in order to eliminate the effect of substrate type on community composition since not all places of interest around the harbor have the same kinds of hard substrates (to which organisms cling or forage about). Epibenthic arrays were deployed three feet below mean low water level in April 2001 near the mouth of Alley Creek in Little Neck Bay at the location ALLYP01 in Figure 4-25. Plates were retrieved after three months of exposure. Upon retrieval, the arrays were inspected and weighed and motile organisms clinging to or stuck in the arrays (i.e., crabs and fish) were counted and identified.

At the Alley Creek station, the 7 taxa were identified on the top epibenthic array after 3 months exposure time are listed in Table 4-6. The major groups found, by weight, were hydroids and barnacles. Some annelids, mollusks and other arthropods were also collected to a lesser degree. The Alley Creek epibenthic collection did not have any bottom arrays (due to shallow depth) and no arrays were recovered for the six-month exposure period.

Table 4-6. Weight Units of Epibenthic Organisms Collected After 3 Months Exposure From Suspended Multi-plate Arrays (top only) Placed in Alley Creek, Flushing Bay and Manhasset Bay(1)

		Alley Creek (ALLYP01)	Flushing Bay (FLSHP01)	Manhasset Bay (MABAP01)
Phylum	**Lowest Taxonomic Level**			
Cnidaria	Hydroida	3.4	5.9	17.7
Annelida	*Sabella microphthalma*	0.0	0.0	0.1
	Nereis succinea	0.2	0.7	0.3
Mollusca	*Mytilus edulis*	0.2	0.0	0.0
	Onchidorididae	0.0	0.0	0.1
	Crepidula plana	0.0	0.3	0.0
	Mya arenaria	0.1	0.0	0.0
Arthropoda	*Balanus eburneus*	2.6	2.7	6.2
	Ampithoidae	0.1	0.0	0.0
	Gammarus oceanicus	0.1	0.3	0.1
	Panopeus herbstii	0.0	1.0	0.0
	Leptocheirus pinguis	0.0	0.1	0.0
	Pleustidae	0.0	0.1	0.0
Chordata	*Molgula manhattensis*	0.0	3.1	0.4
	Botryllus schlosseri	0.0	118.5	0.0
Crustacea	*Jassa falcata*	0.0	0.1	0.0
Total number of species		**7**	**11**	**7**

(1) Data were compiled from HydroQual USA 2002 database. Sampling was conducted by HydroQual in April 2001 as part of the Harbor-wide Epibenthic Recruitment and Survival Field Sampling and Analysis Program (HydroQual, 2001b).

4.6.4 Phytoplankton and Zooplankton

As part of the New York Harbor Water Quality Survey, NYCDEP collected phytoplankton and zooplankton samples at one station within Little Neck Bay proper, Station E11 in Figure 4-25, in the spring, summer and fall from 1991 to 2000 (NYCDEP 1997b, 1998, 1999, 2000). Ninety-five samples were collected during this time period. In addition, the phytoplankton and zooplankton communities of the lower East River were investigated in the 1980s as part of the Newtown Creek WPCP monitoring program (Hazen and Sawyer, 1981). Given that, by definition, planktonic community structure is governed by water movement (tides and wind), the plankton communities of the East River and Western Long Island Sound should be similar to those found in Alley Creek/Little Neck Bay.

Phytoplankton

Phytoplankton are the dominant primary producers in the East River. Factors that affect phytoplankton community structure include temperature, light, nutrients, and grazing by other organisms. Phytoplankton are also affected by all hydrodynamic forces in a waterbody. Resident times of phytoplankton species within the New York Harbor are short and these organisms move quickly through the system, limiting the time they are available to grazers (NYS DOT and MTA, 2004).

A total of 82 species of phytoplankton, listed in Table 4-7a, were collected at the Little Neck Bay sampling station over the course of the NYCDEP sampling program (NYCDEP 1997, 1998, 1999, 2000). Diatoms were the dominant class of phytoplankton, followed by dinoflagellates and green algae. The most frequently collected species were *Nannochloris atomus* (green algae), *Skeletonema costatum* (diatom), *Rhizosolenia delicatula* (diatom), *Thalassionema nitzchoides* (diatom), and *Prorocentrum redfieldii* (dinoflagellates).

The biological survey conducted by Hazen and Sawyer in 1980 for Newtown Creek WPCP concentrated its sampling stations near the plant outfall in the East River (Figure 4-25). Phytoplankton was sampled at 10 stations in the photic zone and 62 taxa were identified from the survey. The phytoplankton community was dominated by diatoms and *Skeletonema costatum* comprised 25 percent of the community in May, July, August, and September. *Navicula* sp. and *Cyclotella* sp. were dominant in June and October (Hazen and Sawyer, 1981).

Three toxic species of phytoplankton were collected in Little Neck Bay over the course of the NYCDEP sampling. *Pseudonitzchia pungens* (diatom) is associated with amnesic shellfish poisoning and was collected fourteen times. *Prorocentrum micans* (dinoflagellate) is associated with diarrhetic shellfish poisoning and was collected eight times. *Dinophysis caudata* (dinoflagellate) is associated with fish kills and diarrhetic shellfish poisoning and was collected once. The fact that some toxic species were collected, however, is not a sufficient indicator of habitat degradation per se. These species are generally always present in low abundance and only become problematic when conditions exist to promote their unmitigated growth (i.e. a bloom).

Zooplankton

The total of 15 species of zooplankton were collected at the Little Neck Bay sampling station over the course of the NYCDEP sampling program are listed in Table 4-7b. Protozoans and copepods comprised the zooplankton community. *Tintinnopsis* sp. (Protozoa) and copepod nauplii were the most frequently collected forms (NYCDEP 1997, 1998, 1999, 2000).

Hazen and Sawyer (1981) conducted a zooplankton survey for Newtown Creek WPCP at the same sampling stations used in the phytoplankton study. Overall, 26 species were identified. The zooplankton community was composed of three different groups based on biological and life cycle characteristics: holoplankton (organism's planktonic entire life cycle); meroplankton (free swimming larvae of benthic organisms) and tychoplankton (benthic organisms swept into the water column; Hazen and Sawyer, 1981). Holoplankton comprised about 70 percent of the abundance of the zooplankton community and was dominated by larval and adult forms of *Acartia clausi* and *A. tonsa* (Hazen and Sawyer, 1981). Barnacle larvae were dominant in the meroplankton. The tychoplankton was comprised of amphipods, isopods and benthic protozoans.

Table 4-7a. Phytoplankton Species Collected in Little Neck Bay[1]

Phylum	Species	Frequency of Collection (%)	Phylum	Species	Frequency of Collection (%)
Bacillariophyta (Diatoms)	*Skeletonema costatum*	78.9	Bacillariophyta (Diatoms)	*Navicula* sps	1.1
	Rhizosolenia delicatula	57.9		*Nitzschia bilobata*	1.1
	Thalassionema nitzchoides	44.2		*Thalassiothrix longissima*	1.1
	Thalassiosira nordenskioldii	36.8		*Bacteriastrum* sps	1.1
	Chaetoceros sps	34.7		*Coscinodiscus granii*	1.1
	Eucampia zoodiacus	26.3		*Diatoma* sps	1.1
	Nitzschia longissima	22.1		*Grammatophora* sps	1.1
	Asterionella japonica / Asterionella glaciallis	17.9		*Hemiaulus sinensis*	1.1
	Ditylum brightsellii	17.9		*Planktoniella* sps	1.1
	Nitzschia closterium	14.7		*Rhizosolenia fragilissima*	1.1
	Nitzschia pungens / Pseudo nitzchia	14.7		*Thalassiosira subtilis*	1.1
	Coscinodiscus sps	13.7		*Plagiogramma* sps	1.1
	Melosira sulcata	12.6	Chlorophyta (Green Algae)	*Nannochloris atomus*	96.8
	Pleorosigma sps	12.6		*Chlorella* sps	14.7
	Thalassiosira rotula	12.6		*Oocystis* sps	2.1
	Cyclotella sps	11.6		*Sphaerocystis* sps	2.1
	Nitzschia sps	10.5		*Crucigenia* sps	1.1
	Nitzschia delicatissima	7.4		*Hydrodictyon* sps	1.1
	Rhizosolenia alata	6.3		*Volvox* sps	1.1
	Amphirora sps	5.3	Cyanobacteria (Blue-green Algae)	*Anacystis* sps	9.5
	Biddulphia aurita	5.3		*Gomphophaeria* sps	2.1
	Chaetoceros vistualae	5.3		*Agmenellum* sps	1.1
	Lithodesmium undulatum	5.3		*Coccomyxis* sps	1.1
	Thalassiosira decipiens	5.3	Dinoflagellata (Dinoflagellates)	*Prorocentrum redfieldii*	42.1
	Lauderia borealis	5.3		*Peridinium* sps	41.1
	Chaetoceros debilis	4.2		*Peridinium trochoideum*	21.1
	Ceratulina bergonii / Certaulina pelagica	4.2		*Prorocentrum scutellum*	15.8
	Schroderella delicatula	4.2		*Prorocentrum micans*	8.4
	Stephanopyxis turris	4.2		*Olisthodiscus luteus*	8.4
	Guinardia flaccida	3.2		*Prorocentrum minimum*	8.4
	Surirella sps	3.2		*Massartia roundata / Katodinium rotundatum*	6.3
	Nitzschia paradoxa	3.2		*Prorocentrum* sps	5.3
	Rhizosolenia robusta	3.2		*Peridinium palatonium*	5.3
	Biddulphia longicruris	2.1		*Dinophysis* sps	4.2
	Biddulphia sps	2.1		*Helicostomella subulatta*	3.2
	Corethron hystrix	2.1		*Dinophysis acuta*	2.1
	Biddulphia alternans	1.1		*Dinophysis caudata*	1.1
	Climacodium frauenfeldianum	1.1		*Gymnodinium breve*	1.1
	Fragillaria sps	1.1	Chrysophyta (Golden Algae)	*Chroomonas* sps	8.4
	Hemiaulus sps	1.1		*Pyramimonas micron*	2.1
	Hemiaulus hauckii	1.1		*Ochromonas caroliniana*	1.1

(1) Data compiled from NYCDEP New York Harbor Water Quality Surveys, 1991-2000. Sampling was conducted in the spring, summer and fall at one station in Little Neck Bay from 1991-2000 (NYCDEP 1997, 1998, 1999, 2000)

Table 4.7b. Zooplankton Species Collected in Little Neck Bay(1)

Phylum	Species	Frequency of Collection (%)
Protozoa	*Tintinnopsis* sps	32.6
	Eutreptia sps	14.7
	Flavella sps	12.6
	Helicostomella sps	7.4
	Tintinnids sps	7.4
	Thalassicolla sps	5.3
	Acanthostomelia norvegica	4.2
	Hetrocapsa triquetra	4.2
	Euglena sps	3.2
	Strombidium sps	3.2
	Strombilidium sps	3.2
	Un spec. ciliate	2.1
Arthropoda	*Nauplius of copepods*	24.2
	Acartia sps	1.1
	Oithona similis	1.1

(1) Data compiled from NYCDEP New York Harbor Water Quality Surveys, 1991-2000. Sampling was conducted in the spring, summer and fall at one station in Little Neck Bay from 1991-2000 (NYCDEP 1997, 1998, 1999, 2000)

The difference in the composition of the zooplankton measured by the two studies may be due to the fact that the NYCDEP study was targeting phytoplankton, so zooplankton collections were incidental, whereas the study conducted by Hazen and Sawyer specifically targeted the zooplankton community.

4.6.5 Ichthyoplankton

Because the issue of fish propagation is integral to defining use classifications and attainment of associated water quality standards and criteria, ichthyoplankton sampling was conducted as part of the USA Project to identify any fish species spawning in Alley Creek/Little Neck Bay or using its waters during the planktonic larval stage (HydroQual 2003, 2001a, 2001c). Ichthyoplankton sampling was conducted at one station in Little Neck Bay proper in March, May, July, and August 2001, at ALLYI01 in Figure 4-25. March and May were chosen based on the spawning time of a variety of important species, and July and August were chosen to observe activity during anticipated worst case dissolved oxygen conditions.

The ichthyoplankton community found in Little Neck Bay varied seasonally. There was a shift from fourbeard rockling and herrings in March and May, to a community of Atlantic menhaden, bay anchovy and cunner in July and August. This shift in community structure follows species spawning activity is shown in Table 4-8. Menhaden and anchovy larvae were most abundant in Little Neck Bay during July, when bottom dissolved oxygen concentrations tend to be at their lowest. However, the larvae of these species were found in near-surface water where dissolved oxygen concentrations tend to be higher than in bottom waters.

Table 4-8. Seasonal Distribution of Fish Eggs (E) and Larvae (L) Collected in Little Neck Bay(1)

Lowest Taxonomic Level	Common Name	Date			
		March	May	July	August
Ammodytes americanus	American sand lace	L			
Anchoa	Anchovies			L	L
Brevoortia tyrannus	Atlantic menhaden			L	
Menidia menidia	Atlantic silverside		L		
Anchoa mitchelli	Bay anchovy		E	L	
Tautogolabrus adspersus	Cunner		E	E	E
Enchelyopus cimbrius	Fourbeard rockling	E	E, L		
Clupeidae	Herrings		E, L	L	
Myoxocephalus	Sculpin	L			
Tautoga onitis	Tautog		E, L		E
Gobiidae	True Gobies			L	
Scophthalmus aquosus	Windowpane		E, L		
Pseudopleuronectes americanus	Winter flounder	L			

(1) Data compiled from the HydroQual USA Project 2002 Database. Sampling was conducted by HydroQual in March, May, July, and August 2001 as part of the Harbor-wide Ichthyoplankton Field Sampling and Analysis program (HydroQual, 2001c).

Ichthyoplankton abundances were highest in March and May, when the majority of estuarine species are spawning. A total of 13 taxa listed in Table 4-9, were collected at the Little Neck Bay sampling station. In May, Little Neck Bay had a high concentration of herring (8960/1000m3), an economically important species. Additionally, Little Neck Bay had a high concentration of fourbeard rockling eggs (1586/1000m^3) in March. This member of the cod family spawns in the winter and spring. Its eggs are pelagic and are typically found throughout the East River and its tributaries.

Ichthyoplankton are planktonic (organisms drift in the water column) and some questions remain as to whether fish are spawning in Little Neck Bay or if fish are spawning in the East River with their eggs and larvae transported into the area by the tides. Because the duration of the egg stage is short (about two days after fertilization) compared to the larval stage (2-3 months depending on species) there is a relatively higher degree of confidence that an egg found in the Alley Creek/Little Neck Bay may have been spawned there. The majority of the eggs collected in Alley Creek/Little Neck Bay were of structure-oriented species such as cunner, tautog and fourbeard rockling. The majority of structure in Alley Creek/Little Neck Bay is probably provided by pier pilings, rather than natural structure such as rock piles and complex shorelines.

Table 4-9. Number of Fish Eggs and Larvae Collected from the Alley Creek (ALLYI01), Flushing Bay (FLSHI01), and Manhasset Bay (MABAI01) Stations(1)

Species	Common Name	Little Neck Bay/ Alley Creek	Flushing Bay/ Creek	Manhasset Bay
Ammodytes americanus	American sand lance	24	22	62
Anchoa	Anchovies	8	0	0
Anchoa mitchelli	Bay anchovy	36	48	60
Brevoortia tyrannus	Atlantic menhaden	70	15872	38
Clupeidae	Herrings	9190	90	4256
Enchelyopus cimbrius	Fourbeard rockling	1586	8	624
Gobiidae	True gobies	2	84	6
Menidia menidia	Atlantic silverside	56	0	0
Myoxocephalus	Sculpin	28	20	0
Pseudopleuronectes americanus	Winter flounder	316	22	122
Scophthalmus aquosus	Windowpane	54	72	48
Tautoga onitis	Tautog	148	734	108
Tautogolabrus adspersus	Cunner	120	108	32
Hypsoblennius hentzi	Feather blenny	0	4	0
Prionotus	North American searobins	0	6	0
Syngnathus fuscus	Northern pipefish	0	4	2
Pholis gunnellus	Rock gunnel	0	0	4
Total # of Taxa		**13**	**14**	**12**
Total Number		**11638**	**17094**	**5362**

(1) Data compiled from the HydroQual USA Project 2002 Database. Sampling was conducted by HydroQual in March, May, July, and August 2001 as part of the Harbor-wide Ichthyoplankton Field Sampling and Analysis program (HydroQual, 2001c).

4.6.6 Adult and Juvenile Finfish

The fish community of Alley Creek/Little Neck Bay was sampled as part of the USA Project in July and August 2001 (HydroQual 2003, 2001c), when bottom water dissolved oxygen concentrations are at their lowest, ALLYF01 in Figure 4-4 and Figure 4-25. Sampling was conducted with an otter trawl to catch bottom-oriented species and a gill net suspended in the water column to capture pelagic species.

A total of 8 taxa and 72 individuals were collected from the fish sampling station ALLYF01. The results are presented in Table 4-10. Yellowfin menhaden was the most abundant species collected in July, whereas Atlantic menhaden dominated catches in August. Winter flounder were present in relatively high numbers in July, but were not present in August. Summer flounder were in present in low numbers during August only.

The NYC chapter of Trout Unlimited has conducted a study of the upper reaches of Alley Creek in Alley Pond Park to determine the potential for restoring trout to the creek (New York City Trout Unlimited, 2002). They conducted electrofish sampling in 1999 and collected eels and killifish in the freshwater portion of the creek. This section of the creek is upstream of the area of the CSO outfall and would not be influenced by conditions in Lower Alley Creek and Little Neck Bay. Section 7.5.2 of this report entitled “Aquatic Life Use Assessment”, discusses in greater detail the Attainable Uses of Alley Creek/Little Neck Bay with regard to fish propagation and survival.

Table 4-10. Number of Juvenile and Adult Fish Collected from Alley Creek (ALLYF01), Manhasset Bay (MABAF01) and Flushing Bay (FLSHF01)(1)

Species	Common Name	Little Neck Bay	Manhasset Bay	Flushing Bay
Anguilla rostrata	American eel	0	0	2
Brevoortia tyrannus	Atlantic menhaden	27	3	73
Menidia menidia	Atlantic silverside	4	0	0
Anchoa mitchelli	Bay anchovy	0	0	12
Alosa aestivalis	Blueback herring	0	0	3
Pomatomus saltatrix	Bluefish	9	12	18
Peprilus triacanthus	Butterfish	0	0	1
Tautogolabrus adspersus	Cunner	0	0	1
Clupeidae	Herrings	0	0	6
Brevoortia	Menhaden	0	0	3
Prionotus carolinus	Northern searobin	0	3	0
Urophycis regia	Spotted hake	0	0	2
Morone saxatilis	Striped bass	0	0	67
Prionotus evolans	Striped searobin	3	0	0
Paralichthys dentatus	Summer flounder	2	0	0
Cynoscion regalis	Weakfish	6	39	308
Pseudopleuronectes americanus	Winter flounder	9	41	298
Brevoortia smithi	Yellowfin menhaden	12	15	3
Total # of Taxa		**8**	**6**	**14**
Total Number of Individuals		**72**	**113**	**797**

(1) Data compiled from the HydroQual USA Project 2002 Database. Sampling was conducted by HydroQual in July and August 2001 as part of the East River Field Sampling and Analysis Program (HydroQual, 2001a).

4.6.7 Inter-Waterbody Comparisons

The aquatic communities of Alley Creek/Little Neck Bay were compared with those found in the nearby Flushing and Manhasset Bays as well as the East River in order to further evaluate the potential of Alley Creek/Little Neck Bay to support fish propagation and survival, and to evaluate the interactions of the tributaries with the ecology of the East River/Western Long Island Sound. The FSAP conducted in 2001 included sampling stations located in the open waters of the East River and in its tributaries including these three waterbodies. This study characterized the existing water quality and aquatic communities of these three tributaries of the East River. The following sections briefly compare the results from these three tributaries.

The aquatic communities found in Alley Creek/Little Neck Bay are similar to those in Flushing and Manhasset Bays and the East River in terms of the species composition of the invertebrate and fish communities. However, the differences in water quality, available substrate, and food resources have resulted in differences in relative abundance and diversity of the aquatic communities in these areas of the NY/NJ Harbor.

As part of the FSAP, the benthic community was sampled to determine the community composition, number of species (richness), and the relation between the number of species and their relative abundance (diversity). Sediment sampling was also conducted in order to determine grain size distribution and percent TOC. Results of the FSAP showed that the benthic community in Alley Creek/Little Neck Bay had lower diversity and abundance than those of Flushing Bay, Manhasset Bay and other stations in the East River (Table 4-5). However, the benthos of Flushing, Manhasset Bay and East River stations were dominated by polychaetes and pollution tolerant organisms, unlike Alley Creek/Little Neck Bay.

The recruitment and survival of epibenthic communities on hard substrates was evaluated because these assemblages reflect the average water quality conditions of an area over an extended period of time (Day et. al., 1989). The epibenthic communities were compared among multi-plate arrays at Alley Creek/Little Neck Bay, Flushing Bay and Manhasset Bay. Because only a top plate was collected at Alley Creek/Little Neck Bay, only the top plates from Manhasset and Flushing Bays were used for comparison. A total of 20 epibenthic taxa were identified at these three sites and are listed in Table 4-6. Hydroids, barnacles and tunicates were the dominate organisms. Flushing Bay had the highest diversity and abundance of epibenthic organisms and Manhasset Bay had higher abundance than Alley Creek/Little Neck Bay, but less diversity. The differences in the epibenthic community between the three waterbodies may be due to differences in recruitment. Recruitment is affected by the presence of a spawning population, which is determined by availability of substrates, dissolved oxygen concentrations, temperature, and salinity (Dean and Bellis, 1975). Recruitment can also result from transport of planktonic life stages from other areas, and this may differ between the waterbodies as well.

The Alley Creek/Little Neck Bay ichthyoplankton community as presented in Table 4-9, was more diverse than the Manhasset Bay community, but less so than Flushing Bay. The abundance and diversity of an ichthyoplankton community is dependent on several factors (per HydroQual, 2001a):

- Spawning season
- Proximity to spawning areas;
- Type of eggs and larvae (demersal or pelagic); and
- Adult life stage habitat requirements.

The spawning season of a fish species will determine if water quality is a limiting factor in the potential survivability of the eggs and larvae. For example, winter flounder spawn in the winter and larvae are present in the spring, when hypoxia is infrequent. Based on the dissolved oxygen levels in Alley Creek/Little Neck Bay, winter flounder eggs and larvae would be able to survive there. However, winter flounder spawn on sandy substrates that would be a major factor in the occurrence and survivability of eggs and larvae. Among the bays, Flushing Bay has a higher proportion of fine grain sediments compared to Alley Creek/Little Neck Bay or Manhasset Bay. Thus, winter flounder eggs and larvae were collected in lesser numbers in Flushing Bay compared to Manhasset or Alley Creek/Little Neck Bay.

Bay anchovy spawn in the summer, when dissolved oxygen levels are at their lowest, but their eggs and larvae are found in surface waters. Bay anchovy eggs were present in Alley Creek/Little Neck Bay in May and bay anchovy larvae dominated the July collection. The highest abundance of bay anchovy was in Manhasset Bay, but the differences among the bays was relatively small. Anchovy larvae could be exposed to low dissolved oxygen conditions; their duration of exposure dependent upon the location of adult spawning and larval dispersal by tidal currents.

The development of the ichthyoplankton community is affected by the type of habitat present for juvenile and adult fish, the difference in habitat diversity, relative habitat quality and the type of bottom substrate. Based on the results of the FSAP, the eggs and larvae of structure-oriented species such as cunner and tautog were present in high numbers in Alley Creek/Little Neck Bay. The majority of structure in Alley Creek/Little Neck Bay is probably provided by pier pilings, rather than natural structure such as rock piles and complex shorelines.

Fish are motile organisms that can choose which habitats they enter and utilize. As such, their presence or absence can be used to evaluate water quality. Flushing Bay had the highest fish diversity and abundance among the three waterbodies, with large numbers of weakfish and winter flounder collected. There were no evident factors to account for the more robust fish community in Flushing Bay as compared to Alley Creek/Little Neck Bay and Manhasset Bay.

4.7 SENSITIVE AREAS

4.7.1 CSO Policy Requirements

Federal CSO Policy requires that the long-term CSO control plan give the highest priority to controlling overflows to sensitive areas. For such areas, the CSO Policy indicates the LTCP should: (a) prohibit new or significantly increased overflows; (b) eliminate or relocate overflows that discharge to sensitive areas if physically possible, economically achievable, and as protective as additional treatment, or provide a level of treatment for remaining overflows adequate to meet standards; and (c) provide reassessments in each permit term based on changes in technology, economics, or other circumstances for those locations not eliminated or relocated (USEPA, 1995a). The policy defines sensitive areas as:

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

The last item in the list was derived from the policy statement that the final determination should be the prerogative of the NPDES Permitting Authority. The Natural Resources Division of NYSDEC was consulted during the development of the assessment approach, and provided additional sensitive areas for CSO abatement prioritization based on local environmental issues. Their response listed the following: Jamaica Bay; Bird Conservation Areas; Hudson River Park; ‘important tributaries’ such as the Bronx River in the Bronx, and Mill, Richmond, Old Place, and Main Creeks in Staten Island; the Raritan Bay shellfish harvest area; waterbodies targeted for regional watershed management plans (Newtown Creek and Gowanus Canal).

4.7.2 General Assessment

An analysis of the waters of the Alley Creek and Little Neck Bay with respect to the CSO Policy was conducted and is summarized in Table 4-11.

Table 4-11. Sensitive Areas Assessment

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

(1) Classifications or Designations per CSO Policy
(2) As shown at http://www.sactuaries.noaa.gov/oms/omsmaplarge.html
(3) NYDOS Significant Coastal Fish and Wildlife Habitats website (http://nyswaterfronts.com/waterfront_natural_narratives.asp) (see Section 4.7.3).
(4) Existing uses include secondary contact recreation and fishing, Class I
(5) These waterbodies contain salt water

4.7.3 Waters with Threatened or Endangered Species or Their Habitat

Based on the Coastal Fish and Wildlife habitat rating form, the Northern harrier, a threatened (T) bird species over winters in Alley Pond Park. However, this species is a raptor whose diet consists strictly of land mammals (mice, voles and insects). The presence of the Northern harrier, is due to the relatively large protected wetlands in Alley Pond Park and not the waters or aquatic life of Alley Creek. The presence of the Northern harrier (T) does not, therefore, define Alley Creek as a sensitive area for threatened species according to Federal CSO Policy. There are no threatened or endangered species present in Udalls Cove or Little Neck Bay.

4.7.4 Waters with Primary Contact Recreation

There is a private beach, the Douglas Manor Association Beach, located on the western shore of the Douglaston Peninsula.

4.7.5 Findings

There is a sensitive area present within Little Neck Bay (presence of a permitted bathing beach) as defined by the USEPA Long Term CSO Control Plan Policy. The Waterbody/Watershed Facility Plan and LTCP will, therefore, address the USEPA 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 reassessments in each permit term based on changes in technology, economics, or other circumstances for those locations not eliminated or relocated (USEPA, 1995a).

5.0 Waterbody Improvement Projects

New York City is served primarily by a combined sewer system. Approximately 70 percent of the City is comprised of combined sewers totaling 4,800 miles within the five boroughs. The sewer system drains some 200,000 acres and serves a population of approximately 8 million New Yorkers. Approximately 450 outfalls are permitted to discharge during wet-weather through CSOs to the receiving waters of the New York Harbor. These discharges result in localized water-quality problems such as periodically high levels of coliform bacteria, nuisance levels of floatables, depressed dissolved oxygen, and, in some cases, sediment mounds and unpleasant odors.

The City of New York is committed to its role as an environmental steward of the New York Harbor and began addressing the issue of CSO discharges in the 1950's. To date, NYCDEP has spent or committed over $2.1 billion in its city wide CSO abatement program. As a result of this and other ongoing programs, water quality has improved dramatically over the past 30 years (NYCDEP Harbor Survey Annual Reports). Implementation of many of these solutions within the current NYCDEP 10-year capital plan will continue that trend as NYCDEP continues to address CSO-related water quality issues through its City-Wide CSO Floatables program, pump station and collection system improvements, and the ongoing analysis and implementation of CSO abatement solutions. The following sections present the history of NYCDEP CSO abatement and describe the current and ongoing programs in detail.

5.1 CSO PROGRAMS 1950 TO 1992

Early CSO assessment programs began in the 1950s and culminated with the 1972 construction of the Spring Creek Auxiliary Water Pollution Control Plant, a 12-million gallon CSO retention tank, constructed on a tributary to Jamaica Bay. This project was one of the first such facilities constructed in the United States. Shortly thereafter, New York City was designated by USEPA to conduct an Area-Wide Wastewater Management Plan authorized by Section 208 of the then recently enacted CWA. This plan was completed in 1979 and, in part, identified a number of urban tributary waterways throughout the City in need of CSO abatement. The City's fiscal crisis developed around that time, and resources were diverted from CSO abatement to wastewater treatment plant upgrades.

In 1983, NYCDEP re-invigorated its CSO facility-planning program in accordance with NYSDEC-issued SPDES permits for its wastewater treatment plants with a project in Flushing Bay and Creek. In 1985, a city-wide CSO Assessment was undertaken which assessed the existing CSO problem and established the framework for additional facility planning. From this program, the City was divided into eight areas, which together cover the entire harbor area. Four area-wide projects were developed (East River, Jamaica Bay, Inner Harbor and Outer Harbor) and four tributary project areas were defined (Flushing Bay, Paerdegat Basin, Newtown Creek, and the Jamaica tributaries). Detailed CSO Facility Planning Projects were conducted in each of these areas in the 1980s and early 1990s resulting in a series of detailed plans.

In 1989, NYCDEP initiated the City-Wide Floatables Study in response to a series of medical waste and floating material wash-ups and resulting bathing beach closures in New York and New Jersey in the late 1980s. This comprehensive investigation identified the primary sources of floatable materials in metropolitan urban area waters, aside from illegal dumping, as CSO and stormwater discharges. The study also concluded that street litter in surface runoff is the origin of floatable materials in these sources. The Floatables Control Program is discussed in Section 5.4.

5.2 1992 AND 2005 CONSENT ORDERS

In 1992, NYSDEC and NYCDEP entered into the original CSO Administrative Consent Order (1992 ACO). As a goal, the 1992 ACO required NYCDEP to develop and implement a CSO abatement program to effectively address the contravention of water quality standards for coliforms, dissolved oxygen, and floatables attributable to CSOs. The 1992 ACO contained compliance schedules for the planning, design and construction of the numerous CSO projects in the eight CSO planning areas.

The Flushing Bay and Paerdegat Basin CSO Retention Tanks were included in the 1992 ACO and are now under construction. In additional, two parallel tracks were identified for CSO planning purposes. Track 1 addressed dissolved oxygen (aquatic life protection) and coliform bacteria (recreation) issues. Track 2 addressed floatables, settleable solids and other water use impairment issues. The 1992 ACO also provided for an Interim Floatables Containment Program to be implemented consisting of a booming and skimming program in confined tributaries, skimming in the open waters of the harbor, and an inventory of street catch basins where floatable materials enter the sewer systems.

In accordance with the 1992 ACO, NYCDEP continued to implement its work for CSO abatement through the facility-planning phase into the preliminary engineering phase. Work proceeded on the planning and design of eight CSO retention tanks located on confined and highly urbanized tributaries throughout the City. The CSO retention tanks at Flushing Bay and Paerdegat Basin proceeded to final design. The Interim Floatables Containment Program was fully developed and implemented. The Corona Avenue Vortex Facility pilot project for the floatables and settleable solids control was designed and implemented. The City's 130,000 catch basins were inventoried and a re-hooding program for floatables containment was implemented and substantially completed. Reconstruction and re-hooding of the remaining basins (less than 4 percent) will be completed by 2010.

For CSOs discharging to the open waters of the Inner and Outer Harbors areas, efforts were directed to the design of sewer system improvements and wastewater treatment plant modifications to increase the capture of combined sewage for processing at the plants. For the Jamaica Tributaries, efforts focused on correction of illegal connections to the sewer system and evaluation of sewer separation as control alternatives. For Coney Island Creek, attention was directed to corrections of illegal connections and other sewer system/pumping station improvements. These efforts and the combination of the preliminary engineering design phase work at six retention tank sites resulted in changes to some of the original CSO Facility Plans included in the 1992 ACO and the development of additional CSO Facility Plans in 1999. The status of CSO projects currently under design or construction as of late 2008 are presented in Table 5-1.

Table 5-1. CSO Projects under Design or Construction

Planning Area	Project	Design Completion	Construction Completion
Alley Creek	Outfall & Sewer System Improvements	Mar2002	Dec 2006
	CSO Retention Facility	Dec 2005	Dec 2009
Outer Harbor	Regulator Improvements – Fixed Orifices	Apr 2005	Jul 2008
	Regulator Improvements – Automation	Nov 2006	Jun 2010
	Port Richmond Throttling Facility	Aug 2005	Dec 2008
Inner Harbor	Regulator Improvements – Fixed Orifices	Sep 2002	Apr 2006
	Regulator Improvements – Automation	Nov 2006	Jun 2010
	In-Line Storage	Nov 2006	Aug 2010
Paerdegat Basin	Influent Channel	Mar 1997	Feb 2002
	Foundations and Substructures	Aug 2001	Feb 2009
	Structures and Equipment	Nov 2004	May 2011
Flushing Bay	CS4-1 Reroute & Construct Effluent Channel	Sep 1994	Jun 1996
	CS4-2 Relocate Ball fields	Sep 1994	Aug 1995
	CS4-3 Storage Tank	Sep 1996	Aug 2001
	CS4-4 Mechanical Structures	Feb 2000	May 2007
	CS4-5 Tide Gates	Nov 1999	Apr 2002
	CD-8 Manual Sluice Gates	May 2003	Jun 2005
Jamaica Tributaries	Meadowmere & Warnerville DWO Abatement	May 2005	Jul 2009
	Expansion of Jamaica WPCP Wet Weather Capacity	Jun 2011	Jun 2015
	Destratification Facility	Dec 2007	Nov 2010
	Laurelton & Springfield Stormwater Buildout Drainage Plan	Jan 2008	
	Regulator Automation	Nov 2006	Jun 2010
Coney Island Creek	Avenue V Pumping Station Upgrade	Jan 2005	Apr 2011
	Avenue V Force Main	Sep 2006	Jun 2012
Newtown Creek	Aeration Zone I	Dec 2004	Dec 2008
	Aeration Zone II	Jun 2010	Jun 2014
	Relief Sewer/Regulator Modification	Jun 2009	Jun 2014
	Throttling Facility	Jun 2008	Dec 2012
	CSO Storage Facility	Nov 2014	Dec 2022
Westchester Creek	Phase 1 (Influent Sewers)	Jun 2010	Jun 2015
	CSO Storage Facility		Dec 2022
Bronx River	Floatables Control	Jul 2008	Jun 2012
Hutchinson River	Phase I of Storage Facility	Jun 2010	Jun 2015
	Future Phases		Dec 2023
Jamaica Bay	Spring Creek AWPCP Upgrade	Feb 2002	Apr 2007
	26th Ward Drainage Area Sewer Cleaning & Evaluation	Jun 2007	Jun 2010
	Hendrix Creek Dredging	Jun 2008	Dec 2011
	26th Ward Wet Weather Expansion	Jun 2010	Dec 2015

NYSDEC and NYCDEP negotiated the 2005 CSO Consent Order that was signed January 2005 and supersedes the 1992 Order and its 1996 Modifications. The intent of the 2005 CSO Consent Order is to bring all CSO-related matters into compliance with the provisions of the Clean Water Act and Environmental Conservation Law. The 2005 Order contains requirements to evaluate and implement CSO abatement strategies on an enforceable timetable for the 18 waterbodies and, ultimately, for City-wide long term CSO control in accordance with USEPA CSO Control Policy. NYCDEP and NYSDEC also entered into a separate Memorandum of Understanding (MOU) to facilitate water quality standards review in accordance with CSO Control Policy. The 2005 Consent Order was modified in 2008.

5.3 BEST MANAGEMENT PRACTICES (BMP)

The SPDES permits for all 14 WPCP in New York City require the NYCDEP to report annually on the progress of 14 BMPs related to CSOs. The BMPs are equivalent to the NMCs required under the USEPA National Combined Sewer Overflow policy, which were developed by the USEPA to represent best management practices that would serve as technology based CSO controls. They were intended to be “determined on a best professional judgment basis by the NPDES permitting authority” and to be best available technology based controls that could be implemented within two years by permittees. USEPA developed two guidance manuals that embodied the underlying intent of the NMCs for permit writers and municipalities, offering suggested language for SPDES permits and programmatic controls that may accomplish the goals of the NMCs (USEPA 1995a, 1995b).

A list of BMPs excerpted directly from the most recent SPDES permits follows, along with brief summaries of each BMP and their respective relationships to the federal NMCs. In general, the BMPs address operation and maintenance procedures, maximum use of existing systems and facilities, and related planning efforts to maximize capture of CSO and reduce contaminants in the combined sewer system, thereby reducing water quality impacts. Through the CSO BMP Annual Reports, which were initiated in 2004 for the reporting year 2003, NYCDEP provides brief descriptions of the city-wide programs and any notable WPCP drainage area specific projects that address each BMP (NYCDEP,2008, NYCDEP, 2009).

5.3.1 CSO Maintenance and Inspection Program

This BMP addresses NMC 1 (Proper Operations and Maintenance of Combined Sewer Systems and Combined Sewer Overflow Outfalls) and NMC 9 (Monitoring to Characterize CSO Impacts and the Efficacy of CSO Controls). Through regularly scheduled inspection of the CSOs and the performance of required repair, cleaning, and maintenance, dry weather overflows and leakage can be prevented and maximization of flow to the WPCP can be ensured. Specific components of this BMP include:

- Inspection and maintenance of CSO tide gates;
- Telemetering of regulators;
- Reporting of regulator telemetry results;
- Recording and reporting of rain events that cause dry weather overflows; and
- NYSDEC review of inspection program reports.

NYCDEP reports on the status of the City-wide program components and highlights specific maintenance projects, such as the Enhanced Beach Protection Program, where additional inspections of infrastructure in proximity to sensitive beach areas was performed. Activities related to CSO Maintenance and Inspection that occurred during CY 2007 in the Alley Creek and Little Neck Bay sewershed included clearing blockages from TI-007 and TI-025, tide gate cleaning and lubrication, and chloride runs conducted to determine tide gate performance for Tallman Island. The chloride data indicated a slight increase in inflow volume as compared to CY2006. One CSO alarm, discovered through the CSO telemetry system, occurred in the sewershed in February of CY2007 at TI-009, the Douglaston Bay Pump Station bypass. Melting snow caused the bypass. It was able to be reduced by NYCDEP personnel responding to the alarm. The bypass was reported to NYSDEC.

5.3.2 Maximum Use of Collection System for Storage

This BMP addresses NMC 2 (Maximum Use of the Collection System for Storage) and requires the performance of cleaning and flushing to remove and prevent solids deposition within the collection system as well as an evaluation of hydraulic capacity so that regulators and weirs can be adjusted to maximize the use of system capacity for CSO storage and thereby reduce the amount of overflow. NYCDEP provides general information describing the status of City-wide SCADA, regulators, tide gates, interceptors, and collection system cleaning in the BMP Annual Report.

During 2007, in the Tallman Island collection system, 4,750 ft of the Flushing North Interceptor was cleaned (160 yd^3 removed) and 1,807 ft of the Flushing Kissena Corridor Branch Interceptor was TV inspected and cleaned (60 yd^3 removed).

5.3.3 Maximize Flow to WPCP

This BMP addresses NMC 4 (Maximizing Flow to the Publicly Owned Treatment Works) and reiterates the WPCP operating targets established by the SPDES permits with regard to the ability of the WPCP to receive and treat minimum flows during wet weather. The collection systems are required to deliver and the WPCPs are required to accept the following flows for the associated levels of treatment:

- Receipt of flow through the headworks of the WPCP: 2xDDWF;
- Primary treatment capacity: 2xDDWF; and
- Secondary treatment capacity: 1.5xDDWF.

The 2008 Modified Consent Order added the following to the Order: “The Tallman Island WPCP and associated sewer system are capable of delivering, accepting and treating influent at or above twice the plant’s design flow during any storm event,” with milestones including construction completion by July 2015. During 2007, the Tallman Island WPCP attained a flow rate of 160 MGD (2xDDWF) for a total of five hours. This project was added to the CSO Order due to recent hydraulic analyses and sewer system modeling projects that have indicated that additional interceptor capacity and modifications to a few regulators are required to improve the ability of the interceptors to deliver 160 MGD on a sustained basis. NYCDEP completed facility planning activities in 2005. In 2004 and 2005, NYCDEP developed plans for and designed modifications to Regulator TI-R09 that could allow it to deliver more wet-weather flow to the WPCP. The construction work for this action was completed in mid-2006, inclusive of a SCADA project to monitor dry weather flow. A contract for the design of additional collection system conveyance capacity (interceptor capacity) was registered in 2007. Design work has begun and is expected to be complete in late 2009. The Tallman Island Wet Weather Operating Plan (WWOP) is a draft currently under review by NYSDEC. (See Appendix A)

The BMP also refers to the establishment of collection system control points in the system's Wet Weather Operating Plan as required in BMP 4, and requires the creation of a capital compliance schedule within six months of the NYSDEC approval of the Wet Weather Operating Plan should any physical limitations in flow delivery be detected.

In addition to describing WPCP upgrades and efforts underway to ensure appropriate flows to all 14 WPCPs, the BMP Annual Report provides analysis of the largest ten storms of the year and WPCP flow results for each of these storms. This analysis provides an indication of how much flow the WPCPs take during periods with sufficient rainfall that flows should attain twice design dry-weather flow at the WPCP. For the Tallman Island WPCP, wet-weather inflows during the top-ten storms have generally increased or remained relatively steady since 2005, as described in NYCDEP's CSO BMP Annual Report for calendar years 2005 to 2008 (NYCDEP, 2009).

5.3.4 Wet Weather Operating Plan

In order to maximize treatment during wet weather events, WWOPs are required for each WPCP drainage area. Each WWOP should be written in accordance with the NYSDEC publication entitled *Wet Weather Operations and Wet Weather Operating Plan Development for Wastewater Treatment Plants*, and should contain the following components:

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

This BMP addresses NMC 1 (Proper Operations and Maintenance of Combined Sewer Systems and Combined Sewer Overflow Outfalls) and NMC 4 (Maximizing Flow to the Publicly Owned Treatment Works). The NYCDEP provides a schedule of plan submittal dates as part of the BMP Annual Report. The WWOP required for the Alley Creek CSO Tank was originally submitted during 2007 as part of the Tallman Island WPCP WWOP along with the Flushing Tank WWOP. The WWOP currently under review by NYSDEC, is included with this report as Appendix A.

5.3.5 Prohibition of Dry Weather Overflow

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

As presented in the 2007 CSO BMP Annual Report, the 24th Avenue Pump Station bypassed flow for 0.25 hrs discharging 0.008 MG. The cause was 3A-Electrical Equipment Failure of distribution equipment. In addition, TI Regulator-09 bypassed flow for 1.5 hours discharging 0.190 MG. The cause was blocking in the branch interceptor from melting snow and is referred to as the Douglaston Bay PS bypass event.

5.3.6 Industrial Pretreatment

This BMP addresses three NMCs: NMC 3 (Review and Modification of Pretreatment Requirements to Determine Whether Nondomestic Sources are Contributing to CSO Impacts); NMC 7 (Pollution Prevention Programs to Reduce Contaminants in CSOs); and NMC 9 (Monitoring to Characterize CSO Impacts and the Efficacy of CSO Controls). By regulating the discharges of toxic pollutants from unregulated, relocated, or new SIUs tributary to CSOs, this BMP addresses the maximization of persistent toxics treatment from industrial sources upstream of CSOs. Specific components of this BMP include:

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

The BMP Annual Report addresses the components of the industrial pretreatment BMP through a description of the City-wide program. The program has been successful, especially in the reduction of metals being discharged by industrial users of the municipal sewer system. Recent improvements to the Industrial Pretreatment Program have included a requirement in new and renewal permits that significant industrial users hold their process wastewater and non-contact cooling water to the maximum extent practicable during heavy rain events. It is noted that for all WPCP service areas in New York City, the industrial flow contributions to the plant flows (including Tallman Island) are less than one percent.

5.3.7 Control of Floatable and Settleable Solids

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

- Catch Basin Repair and Maintenance: This practice includes inspection and maintenance scheduled to ensure proper operation of basins;
- Catch Basin Retrofitting: By upgrading basins with obsolete designs to contemporary designs with appropriate street litter capture capability. This program is intended to increase the control of floatable and settleable solids City-wide.
- Booming, Skimming and Netting: This practice establishes the implementation of floatables containment systems within the receiving waterbody associated with applicable CSO outfalls. Requirements for system inspection, service, and maintenance are established, as well; and
- Institutional, Regulatory, and Public Education - A one-time report must be submitted examining the institutional, regulatory, and public education programs in place City-wide to reduce the generation of floatable litter. The report must also include recommendations for alternative City programs and an implementation schedule that will reduce the water quality impacts of street and toilet litter.

The Annual CSO BMP Report provides summary information regarding the status of the catch basin and booming, skimming, and netting programs City-wide. Also included is a thorough reporting of the public education, institutional and regulatory programs conducted by the City.

In response to NYSDEC questions, the CY2008 CSO BMP Annual Report, currently under NYSDEC review, used the updated 2008 catch basin database to provide a detailed accounting of basins in need of retrofitting or reconstruction. The city-wide total of 8,203 catch basins needing retrofit or reconstruction for hoods in 1999 has been reduced to 616 as of 2008. All of these basins require reconstruction. (NYCDEP, 2009). The number of catch basins requiring reconstruction in the Tallman Island WPCP drainage area is 42 with 22 of these located in the Alley Creek and Little Neck Bay watershed/sewershed. Based on these numbers, out of the total Alley Creek and Little Neck Bay catch basins, 3,549 (Tallman Island WPCP total is 13,465), the hooding coverage is 92 percent. This high percentage of hooding coverage is a result of NYCDEP's hood inspection and replacement program in accordance with its SPDES permits.

5.3.8 Sewer System Replacement

This BMP addresses NMC 1 (Proper Operations and Maintenance of Combined Sewer Systems and Combined Sewer Overflow Outfalls), requiring all combined sewer replacements to be approved by the NYSDOH and to be specified within the NYCDEP Master Plan for Sewage and Drainage. Whenever possible, separate sanitary and storm sewers should be used to replace combined sewers. The BMP Annual Report describes the general, City-wide plan and addresses specific projects occurring in the reporting year. No projects are reported for the Tallman Island WPCP service area in the Best Management Practices 2008 Annual Report.

5.3.9 Combined Sewer/Extension

In order to minimize storm water entering the combined sewer system, this BMP requires combined sewer extensions to be accomplished using separate sewers whenever possible. If separate sewers must be extended from combined sewers, analysis must occur to ensure that the sewage system and treatment plant are able to convey and treat the increased dry weather flows with minimal impact on receiving water quality.

This BMP addresses NMC 1 (Proper Operations and Maintenance of Combined Sewer Systems and Combined Sewer Overflow Outfalls) and a brief status report is provided in the Best Management Practices 2008 Annual Report, although no combined sewer extension projects were completed during that year.

5.3.10 Sewer Connection and Extension Prohibitions

This BMP addresses NMC 1 (Proper Operations and Maintenance of Combined Sewer Systems and Combined Sewer Overflow Outfalls) and prohibits sewer connections and extensions that would exacerbate recurrent instances of either sewer back-up or manhole overflows. Wastewater connections to the combined sewer system downstream of the last regulator or diversion chamber are also prohibited. The BMP Annual Report contains a brief status report for this BMP and provides details pertaining to chronic sewer back-up and manhole overflow notifications submitted to NYSDEC when necessary.

For the 2007 calendar year, no letter of notification was received from NYSDEC concerning chronic sewer backups or manhole overflows which would prohibit additional sewer connections or sewer extensions.

5.3.11 Septage and Hauled Waste

The discharge or release of septage or hauled waste upstream of a CSO (i.e., scavenger waste) is prohibited under this BMP. Scavenger wastes may only be discharged at designated manholes that never drain into a CSO, and only with a valid permit. This BMP addresses NMC 1 (Proper Operations and Maintenance of Combined Sewer Systems and Combined Sewer Overflow Outfalls). The 2008 CSO BMP Annual Report summarizes the three scavenger waste acceptance facilities controlled by NYCDEP and the regulations governing discharge of such material at the facilities. The facilities are located in the Hunts Point, Oakwood Beach and 26th Ward WPCP service areas. All of the designated manholes for receiving scavenger waste are downstream of CSO regulators.

5.3.12 Control of Runoff

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

The 2008 CSO BMP Annual Report refers to the NYCDEP permit regulations required of new development and sewer connections.

5.3.13 Public Notification

This BMP requires easy-to-read identification signage to be placed at or near CSO outfalls with contact information for NYCDEP to allow the public to report observed dry weather overflows. All signage information and appearance must comply with the Discharge Notification Requirements listed in the SPDES permit. This BMP also requires that a system be in place to determine the nature and duration of an overflow event, and that potential users of the receiving waters are notified of any resulting, potentially harmful conditions. The BMP does allow NYCDOHMH to implement and manage the notification program. Accordingly, the Wet Weather Advisories, Pollution Advisories and Closures are tabulated for all NYC public and private beaches. The DMA Beach, a private beach on Little Neck Bay, was issued Wet Weather Advisories for 10 days, Pollution Advisories for 23 days and Beach Closure for 50 days during the 2007 bathing season.

BMP 13 addresses NMC 8 (Public Notification) as well as NMC 1 (Proper Operations and Maintenance of Combined Sewer Systems and Combined Sewer Overflow Outfalls) and NMC 9 (Monitoring to Characterize CSO Impacts and the Efficacy of CSO Controls). All of the Tallman Island CSOs have signs as summarized in the Best Management Practices 2007 Annual Report. The 2007 list of those former CSO outfalls that no longer require signs includes TI013, located on the East River which has been bulkheaded. NYCDEP is currently developing improvements to the CSO signs to increase their visibility and to include information relative to wet-weather warnings as required by the USEPA CSO Policy. In addition, descriptions of new educational signage and public education-related partnerships are described. The New York City Department of Health CSO public notification program is also summarized.

5.3.14 Annual Report

This BMP requires that an annual report summarizing implementation of the BMPs, including lists of all existing documentation of implementation of the BMPs, be submitted by April 1st of each year. This BMP addresses all nine minimum controls. As of June 2009, the most recent CSO BMP Annual Report submitted covers calendar year 2008.

5.4 CITY-WIDE CSO PLAN FOR FLOATABLES ABATEMENT

NYCDEP developed a floatables abatement plan for the CSO areas of New York City in June 1997. An update of the Comprehensive Plan was subsequently drafted in 2004 and further modified in 2005 (City-Wide Comprehensive CSO Floatables Plan, Modified Facility Planning Report, July 2005) to reflect the completion of some proposed action elements, as well as changes appurtenant to SPDES permits and modifications of regional Waterbody/Watershed Facility Plans and CSO Facility Plans. The objectives of this plan are to provide substantial reductions in floatables discharges from CSOs throughout the City and to provide for compliance with appropriate NYSDEC and IEC requirements pertaining to floatables.

5.4.1 Program Description

The City-Wide CSO Floatables Abatement Plan consists of the following action elements:

- Monitor city-wide street litter levels and inform New York City Department of Sanitation (DSNY) and/or the New York City Mayor's Office of Operations when changes in litter levels are observed or when City policies would potentially result in increased discharges of CSO floatables;

- Continue the three-year cycle to inspect catch basins city-wide for missing hoods and to replace missing hoods to prevent floatables from entering the sewer system. In addition, proceed with the retrofit, repair, or reconstruction of catch basins requiring extensive repairs or reconstruction to accommodate a hood;

- Maximize collection system storage and capacity;

- Maximize wet-weather flow capture at WPCPs;

- Capture floatables at wet-weather CSO storage/treatment facilities;

- Capture floatables at end-of-pipe and in-water facilities, including the Interim Floatables Containment Program (IFCP);

- Continue the Illegal Dumping Notification Program (IDNP) in which NYCDEP field personnel report any observed evidence of illegal shoreline dumping to the Sanitation Police section of DSNY, who have the authority to arrest dumpers who, if convicted, are responsible for proper disposal of the material;

- Engage in public outreach programs to increase public awareness of the consequences of littering and the importance of conserving water;

- As new floatables-control technologies emerge, continue to investigate their applicability, performance and cost-effectiveness in New York City; and

- Conduct a floatables-monitoring program to track floatables levels in the Harbor and address both short- and long-term floatables control requirements.

The Floatables Plan is a living program that will undergo various changes over time in response to ongoing assessment of the program itself as well as changing facility plans associated with other ongoing programs. A key part of the Floatables Plan is a self-assessment component including a new floatables-monitoring program to evaluate the effectiveness of Plan elements and to provide for actions to address both short- and long-term floatables control requirements (see Section 8.5.3). Evidence of increasing floatables levels that impede uses could require the addition of new floatables controls, expansion of BMPs, and modifications of Waterbody/Watershed Facility Plans and/or drainage-basin specific LTCPs, as appropriate. Overall, the Comprehensive Plan is expected to control approximately 96 percent of the floatable street litter generated in New York City.

5.4.2 Pilot Floatables Monitoring Program

In late 2006, work commenced to develop the Floatables-Monitoring Program to track floatables levels in New York Harbor (HydroQual, 2007a). This pilot work which was performed to develop a monitoring procedure and an associated visual floatables rating system based on a five-point scale (very poor, poor, fair, good, very good), involved observations at a number of different sites. At each site, observations were made for up to three categories: on the shoreline, in the water near the shoreline; and in the water away from the shoreline.

Among the various pilot program sites were two locations in the Alley Creek and Little Neck Bay area: one in Douglaston at the DMA Beach on Little Neck Bay (New York City Beach Survey station BS14) and one near the mouth of Alley Creek (New York City Beach Survey station BS34). By August of 2007, a total of 19 observations were recorded for the open water, near shore water and shoreline at these three locations. The scores from the reported observations at the DMA Beach station were consistently good (25%) to very good (75%) for both of the water locations and shoreline. The Alley Creek station observations were more variable. The open water rated very good (30%) and good (70%). The near shore water rated very good (25%), good (50%) and fair (25%). The shoreline rated good (20%), fair (70%) and poor (10%).

5.4.3 Shoreline Cleanup Program

As part of the Environmental Benefit Program (EBP) established under the Long Island Sound (LIS) Nitrogen Consent Judgment, the NYCDEP has implemented a beach cleanup program to improve shorelines at locations where floatables are known to chronically accumulate due to CSO overflows as well as careless behaviors and illegal dumping. This Nitrogen EBP project, was undertaken in connection with the settlement of an enforcement action taken by New York State and NYSDEC for violations of New York State law and NYSDEC regulations. NYCDEP existing floatables collection program addresses CSO and storm outfalls, which have boom and netting containment facilities. This project addresses CSO and storm outfall locations which do not have containment facilities and based on inspection, warrant a manual clean up effort to remove near-shore floatables and trash on an as-needed basis throughout the year. NYCDEP has identified several specific areas as examples of areas that may benefit from these efforts including

- Coney Island Creek, Brooklyn
- Kaiser Park, Brooklyn
- Sheepshead Bay, Brooklyn
- Cryders Lane, Queens
- Flushing Bay, Queens and
- Owls Head, Brooklyn.

These cleanup efforts consist of three primary methods.

- Mechanical cleanup -Where debris is caught up in riprap on the shoreline, a high-pressure pump is used to spray water onto the shoreline to dislodge the debris and floatables and flush them out of the rip-rap back into the water. Once in the water, a skimmer vessel gathers the debris. A containment boom is placed in the water surrounding the skimmer vessel and the riprap area being cleaned to hold the debris for removal by the skimmer vessel.

- Workboat assisted cleanup – At a few locations where the shoreline is not readily accessible from the landside, a small workboat with an operator and two crewmembers collect debris by hand or with nets and other tools. The debris is placed onto the workboat for transport to a skimmer boat for ultimate disposal.

- Manual cleanup- At some locations simple raking and hand cleaning is the cleanup method of choice. Debris is removed and placed into plastic garbage bags or containers and transported in a pickup truck for disposal.

NYCDEP is currently planning on performing three cleanups each year for a four-year period at each of the above locations. Pending the outcome of this program, as well as the findings of the floatables monitoring program, an evaluation will be made of how NYCDEP will proceed in the future. None of the sites for the Nitrogen EBP Shoreline Cleanup Program is in the Alley Creek and Little Neck Bay area.

5.5 LONG-TERM CSO CONTROL PLANNING

In June 2004 NYCDEP authorized the LTCP Project. This work will integrate all Track 1 and Track II CSO Facility Planning Projects and the Comprehensive City-wide Floatables Abatement Plan, incorporating on-going USA Project work in the remaining waterbodies, and developing Watershed/Waterbody Facility Plan reports and the LTCP for each waterbody area. The LTCP Project monitors and assures compliance with applicable Administrative Consent Orders. The present document is a work product of the LTCP Project.

5.6 EVALUATION OF CSO TECHNOLOGIES

NYCDEP also has a demonstrated commitment to evaluating state-of-the-art alternatives that have the potential to provide cost-effective solutions with maximum water quality benefits. The Corona Avenue Vortex Facility has been constructed in the Corona section of Queens to evaluate the effectiveness of three different vortex technologies for settleable solids and floatables removal. NYCDEP has installed inflatable dams in the Soundview section of the Bronx for the purpose of demonstrating this technology for real time control and in-line storage. The NYCDEP is also investigating supplemental aeration in Newtown Creek as a method of improving dissolved oxygen conditions. At the time of the writing of this report, Shellbank Basin Destratification Facility is in operation, a facility designed to enhance water quality through destabilizing water column stratification. The NYCDEP has been in the forefront of abating floatables discharges by conducting several floatables investigations, pilot testing floatables controls, and implementing control programs in catch basins, sewer systems, at the ends of pipes, and in receiving waters.

5.7 ALLEY CREEK CSO RETENTION FACILITY (EXISTING CSO FACILITY PLAN)

In 1984 the NYCDEP initiated the East River Combined Sewer Overflow (ERCSO) Facilities Planning Project to address CSO abatement in one of the four principal CSO planning areas that was defined in the 208 Study. The ERCSO project was to increase, to an extent reasonably feasible and practical, compliance with NYSDEC water quality standards in the East River and its principal tributaries, including Alley Creek and Little Neck Bay. This study included a series of field investigations, modeling of both the landside and receiving water processes, and development of abatement alternatives. This planning process resulted in a recommendation for construction of a 5 MG capacity retention facility and construction of a new outfall to abate flows from the largest contributing CSO outfall to Alley Creek, TI-008, which is located approximately 0.4 miles upstream from the outlet of Alley Creek into Little Neck Bay (URS, 2003).

The 5 MG Alley Creek CSO Retention Facility is designed to store and capture combined sewage and pass up to a peak design flow of approximately 1,980 cfs or 1,300 MGD. The new CSO outfall sewer and CSO retention facility have been designed to operate passively during wet weather events. CSO volumes in excess of the storage capacity of the conduit (5 MG) will overflow the crest of a 120 ft long fixed weir at the terminus of the new outfall sewer and discharge to Alley Creek through the new outfall, TI-025. The retention facility receives CSO flows from Chamber No. 6, a new facility located near the intersection of 223rd St. and Cloverdale Boulevard. It will receive the flows from Regulator Nos. 46, 47, 49, and Chamber 48. Chamber 6 is designed with a weir to divert all of the flow to the new retention facility that currently discharges from the existing 10 ft by 7.5 ft CSO Outfall TI-008. During storms which exceed a five-year return period as defined by NYCDEP, the portion of the CSO flow that exceeds the 1,300 MGD hydraulic capacity of the new CSO retention facility and the new TI-025 outfall sewer will overflow a fixed weir at Chamber No. 6 and be conveyed through the existing sewer and discharge through CSO Outfall TI-008.

The Alley Creek CSO retention facility is being implemented by NYCDEP as one element in a larger phased project to provide drainage relief and CSO abatement for sewer service areas on the west side of Alley Creek. The location of the drainage areas that are part of the project, and the location of the retention facility are shown in Figure 5-1. The project is being implemented in multiple contracts under the following phases.

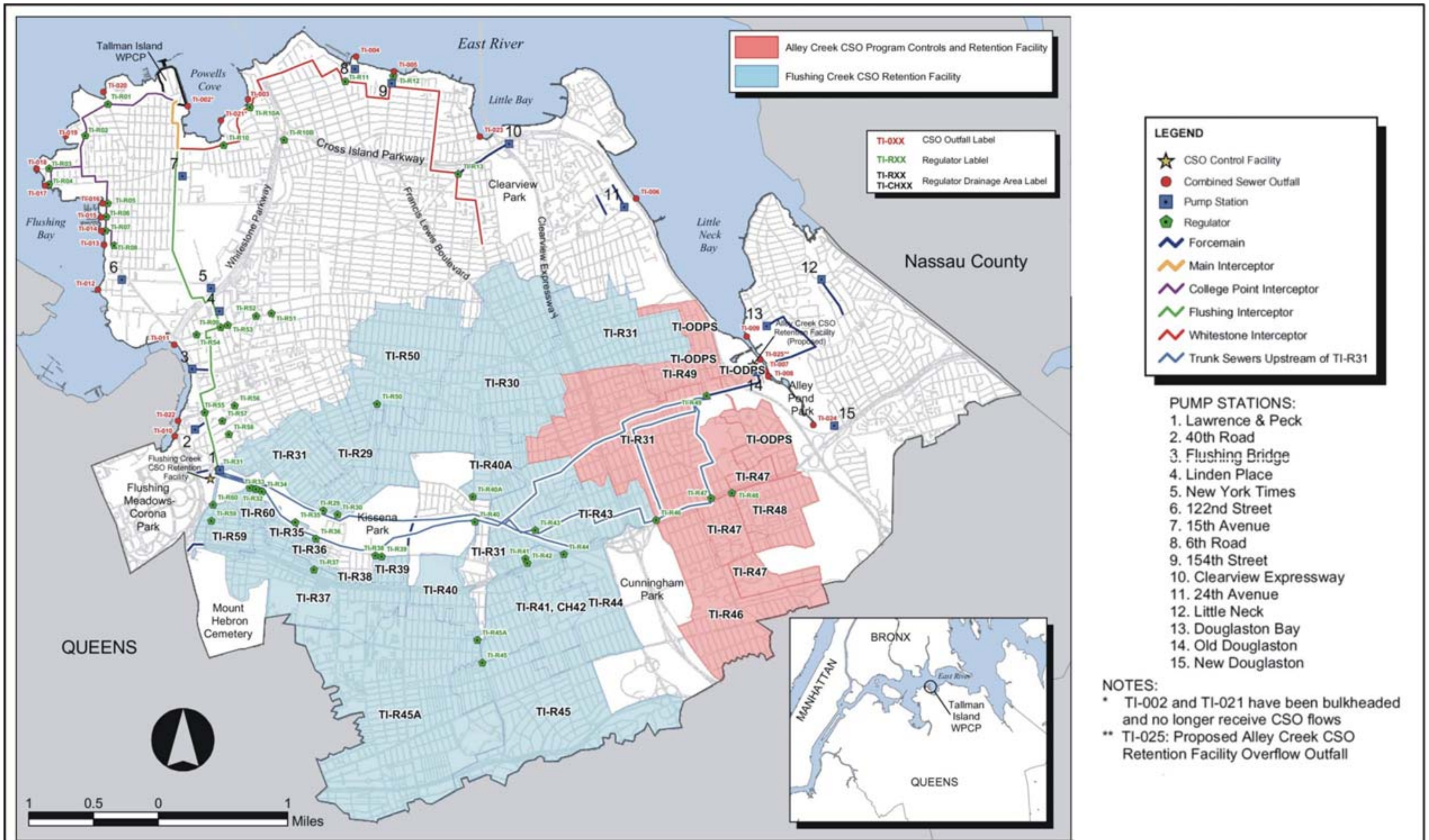
- Phase I, Stage 1 – Alley Creek Drainage Area Improvements - This stage of the project provides drainage relief through the construction of a number of storm and combined sewer relief lines at various locations shown in Figure 5-2. Most relevant to the CSO abatement is the construction of a new outfall conduit and storage facility to which will divert most of the stormwater and CSO flows that had been previously discharged through Outfall TI-008.

  These drainage improvements have been constructed under Contract ER-AC1. Cost apportionment under this contract have been estimated at approximately $100,000,000 for general sewer system improvements and for CSO abatement. These costs include change orders experienced on the project through late 2006. Drainage elements and CSO facility elements are summarized as follows:

  Drainage and CSO Facility Elements

  1. Approximately 1,200 feet of a 11'-0" W x 9'-0" H combined sewer and chambers constructed parallel to the existing 6'0" W x 8'-0" H combined sewer along 46th Avenue between Springfield Boulevard and 223rd Street.

  2. Approximately 1,400 feet of a 11'-0" W x 8'-0" H combined sewer and chambers constructed along Springfield Boulevard between 51st Avenue and 47th Avenue to replace an existing 66-inch diameter combined sewer.



New York City
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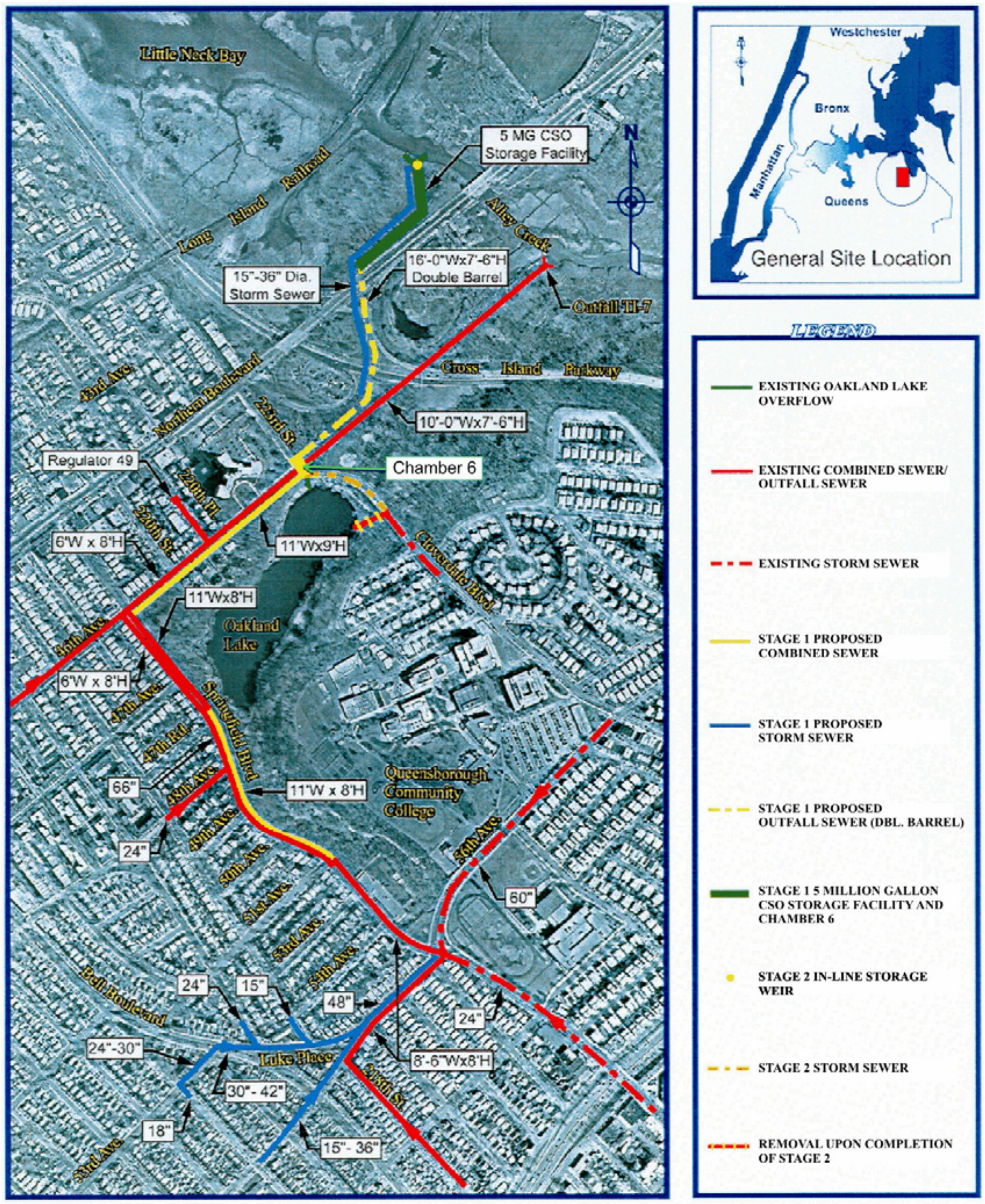
Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Flushing Creek and Alley Creek Drainage Areas and CSO Program Controls

FIGURE 5-1



New York City
Department of Environmental Protection

Alley Creek CSO Retention Facility
Stage 1 and Stage 2 Construction

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 5-2

3. Approximately 3,000 feet of storm sewers varying in diameter from 15 inches through 48 inches and manholes installed along reaches of 53rd Avenue, 56th Avenue, 214th Street, 216th Street, 217th Street, Bell Boulevard, and Luke Place.
4. Approximately 1,700 feet of new storm sewer, located along the north side of the new outfall sewer, ranging in diameter from 15 to 36 inches to serve the Cross Island Parkway catch basins located north of the new outfall sewer.
5. New catch basins installed along Springfield Boulevard, 46th Avenue, 53rd Avenue, 56th Avenue, 214th Street, 216th Street, 217th Street, Bell Boulevard, Luke Place, Northern Boulevard, and the Cross Island Parkway.

   A multi-barrel outfall sewer and chambers constructed from near the intersection of 47th Avenue and 223rd Street, extending easterly/northeasterly across Alley Park to the new outfall on Alley Creek; this outfall sewer begins as a double barrel (each barrel 16'-0" W x 7'-6" H) sewer and extends approximately 1,475 feet to a point on the north side of Northern Boulevard where the outfall sewer increases to a double barrel (each barrel 20'-0" W x 7'-9" H) sewer extending approximately 650 feet to the outfall on Alley Creek.
6. A CSO storage facility to be located north of Northern Boulevard along both sides of the 20'-0" W by 7'-9" H (average height) double barrel outfall sewer, with approximate dimensions of 120 feet wide by 600 feet long, with depths ranging from approximately 9 to 12 feet. During Phase I, Stage I, temporary bulkheads will be constructed on the side overflow weir walls between the outfall conduit and storage tanks.
7. A 24-inch diameter gravity drain for the outfall sewer and a 36-inch diameter gravity drain for the CSO storage facility, extending from the 20'-0" W x 7'-9" H (average height) double barrel outfall sewer and CSO storage facility, respectively, to the Old Douglaston Pumping Station, and crossing under Northern Boulevard.
8. Approximately 2,350 feet of a 20-inch diameter force main extending generally along the south side of the new outfall sewer/CSO storage facility from the Old Douglaston Pumping Station to the general vicinity of the intersection of 46th Avenue and 223rd Street; the new force main replaces a section of an existing 20-inch diameter force main.
9. An outfall structure with tide gates located on Alley Creek at the downstream end of the 20'-0" W x 7-9" H (average height) double barrel outfall sewer and CSO storage facility, including scour protection measures to prevent scouring of the creek bed and restoration of the disturbed creek bed with riprap.

- <u>Phase I, Stage 2 – Alley Creek CSO Abatement Facilities</u> – Construction of these elements needed for activation of the wet weather flow storage facility is being accomplished under contract ER-AC2. Construction has been initiated at approximately $30,000,000 for general sewer system improvements and for CSO abatement. Work will include:

1. Modifications to the Old Douglaston Pumping Station to transfer captured combined sewage from the 5 MG storage facility to the Tallman Island WPCP for treatment. The capacity of the pumping station is sufficient for this transfer of stored combined sewage; however, a full upgrade of the station will be included in the project to increase the station's reliability. The upgrade will include the air treatment facilities as described below, replacement of all pumps, new controls, improvements to the electrical and HVAC systems, and installation of new instrumentation and telemetry. The CSO outfall TI-007, the Old Douglaston PS emergency bypass, is being demolished as per NYSDEC mandate. Collection System Operations will monitor from the telemetry system and respond to any alarms.

2. An air treatment system installed within the fence line at the Old Douglaston Pumping Station to treat exhaust air from the CSO storage facility and the wet well of the pumping station. The air treatment system will reduce hydrogen sulfide concentrations in the inlet air to at least 1 parts per billion (ppb) at the nearest sensitive receptor, the Alley Pond Environmental Center. This criterion satisfies the NYCDEP's air quality requirements.

3. A fixed weir constructed within the new outfall sewer TI-025 at the downstream end to induce storage of combined sewage in the storage facility during rain events.

4. A baffle constructed within the outfall sewer immediately upstream of the fixed weir to minimize floatables from entering Alley Creek.

5. Ten (10) Hydroself Flushing Gates installed within the CSO storage facility with five (5) gates located at each end of the facility. These gates will be used to flush the storage facility after each rain event.

6. Activation of the storage facility by removal of knockout blocks installed under Stage 1.

The overflow weir from the conveyance/storage sewer will be equipped with a baffle to hold back some of the floatables from overflow discharge, but the facility will be equipped with no other treatment processes for reducing the concentration of contaminants in the overflow and no specific treatment levels are envisioned (NYCDEP, 2003). The city's permit application for the facility specifically addresses the question of disinfection of facility overflow discharge. The Facility Plan notes that space could be provided for sodium hypochlorite disinfection equipment; however, disinfection is not recommended based on the following issues:

- chlorine demand that varies randomly within the events, and the large volumes and application rates of chlorine that would be required,
- the need to de-chlorinate and the inability to meet NYSDEC receiving water residual chlorine water quality standards,
- the unknown implications of future TMDL requirements, and

- the effectiveness of disinfecting the retention facility effluent in the presence of untreated and un-disinfected CSOs which will enter Alley Creek.

On balance it was judged that effective control of the chlorine residual discharge to the environment would be very difficult, and that the likely adverse ecological impacts associated with high chlorine residuals or depleted oxygen content from excessive addition of dechlorination chemicals would outweigh the desired public health objectives.

- Phase I, Stage 3 – Alley Pond Park Environmental Restoration – As mitigation for the disturbance due to the construction activities, permanent environmental restoration of approximately 23.5 acres within the Park will be performed under Contract ER-AC3, Alley Pond Park Environmental Restoration. This environmental restoration will take place on both the northern and southern sides of Northern Boulevard, east of 223rd Street. A location map of the restoration is shown in Figure 5-3.

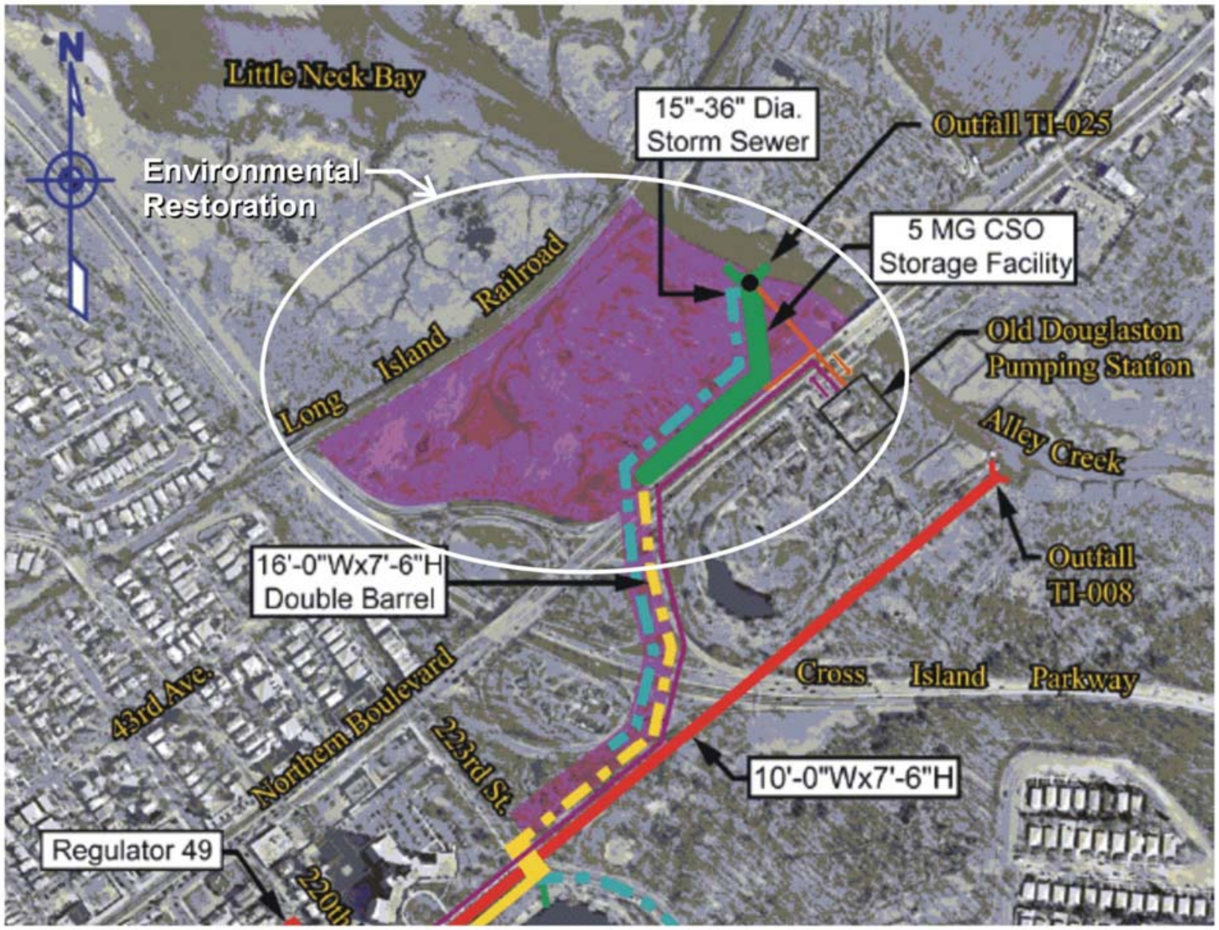
  On the north side of Northern Boulevard, the restored area consists of approximately 17.2 acres, and is bounded by the boulevard to the south, Alley Creek to the east, Long Island Railroad to the north, and Cross Island Parkway to the west. The restoration in this northern area includes restoring existing/creating new wetlands (salt marsh), totaling approximately 8.2 acres, consisting of approximately 0.9 acre of open water and 7.3 acres of low marsh planted primarily with *Spartina Alterniflora*. The remaining 9 acres of restoration in this northern area consists of providing 8 acres of an upland/parkland community planted with a wildflower mixture, trees, shrubs and herbaceous plants native to the area, and 1 acre of a paver block roadway planted with native grasses. This roadway is needed for NYCDEP personnel to access the outfall sewer, storage facility and outfall structure for maintenance purposes.

  The area of restoration on the south side of Northern Boulevard consists of approximately 6.3 acres along the route of the double barrel outfall sewer between 223rd Street to the west and the boulevard to the east. In this southern area, restoration consists of providing 5.9 acres of an upland/parkland community planted with trees, shrubs and herbaceous plants native to the area, and 0.4 acre of a paver block roadway planted with native grasses. This project is not a CSO abatement project.

- Phase II – Oakland Ravine Stormwater – A wetlands stormwater treatment system is planned to manage stormwater flows from the Oakland Ravine. This flow will then be routed to Oakland Lake, and from there to Alley Creek via Outfall TI-008. This project is not a CSO abatement project.

5.8 NEW YORK CITY SUSTAINABILITY INITIATIVES

Sustainable stormwater management usually involves replicating the natural water balance and stormwater dynamics through the design of natural ecological processes and functions, and controlling stormwater at the source. The technologies that serve this goal are referred to as stormwater best management practices (BMPs), and include a wide range of techniques that can capture stormwater, remove urban pollutants, reduce runoff volumes and



New York City
Department of Environmental Protection

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

General Location of Alley Park Environmental Restoration

FIGURE 5-3

peak flows, and return stormwater to the landscape and subsurface in a manner beneficial to the environment (see Section 7.3.2). Low-impact development (LID) refers to the land use approach that integrates various stormwater management practices in an attempt to minimize the changes to the natural environment that the built environment has, and has alternately been referred to as Green Site Design (GSD) or more generically as simply "green solutions." Distributive by design, stormwater BMPs must be applied over a large area in order to achieve significant runoff attenuation. In densely developed ultra-urban cities such as New York City, it is easiest to incorporate green solutions into redevelopment and new construction.

Green solutions, including various BMPs and feasible implementation strategies, are currently being evaluated through the NYCDEP Bureau of Environmental Planning and Assessment and the Mayor's Office of Long-Term Planning and Sustainability. The Mayor's Office established the BMP Interagency Task Force to incorporate BMPs into the design and construction of projects as part of PlaNYC 2030. The Interagency Task Force assisted the development of the Sustainable Stormwater Management Plan, a comprehensive analysis of the costs and benefits of source controls, which was submitted to City Council in December 2008 per Local Law 5. NYCDEP participated in the Interagency Task Force and substantially supported the development of the Stormwater Management Plan. NYCDEP is also evaluating regulatory changes that could require BMPs for new development, and will have a contractor on board in 2009 to design and construct BMP pilot projects, evaluate watershed specific BMP effects, and develop a New York City specific urban BMP design manual (see Section 5.8.2). The following subsections detail these and other stormwater management initiatives the City has recently undertaken. Although several initiatives explicitly identify specific areas for targeted pilot programs, the remaining projects have broad implications within the Alley Creek and Little Neck Bay watershed as the City continues to refine its policies and practices pertaining to stormwater management.

5.8.1 Jamaica Bay Watershed Protection Plan (JBWPP)

On June 30, 2005, the New York City Council passed Local Law 71 (LL 71) of 2005 to require the development of a watershed protection plan for Jamaica Bay. The legislation required NYCDEP to "assess the technical, legal, environmental and economical feasibility" of a variety of protection measures as part of the Jamaica Bay Watershed Protection Plan (JBWPP) development process, the objective of which is to restore and maintain the water quality and ecological integrity of the Bay though a comprehensive watershed approach. The Final JBWPP was submitted to the City Council on October 1, 2007, and annual JBWPP updates are expected in October of 2008 and 2010.

The JBWPP included a myriad of ecological restoration and water quality improvement strategies, and new and emerging techniques previously unaddressed, such as stream bank protection, stream buffers, other BMPs, enforcement, access and use restrictions, freshwater ponds, urban runoff management, and expansion of community use and participation. A set of recommendations for restoring and protecting desired uses of Jamaica Bay and its watershed were generated. Collectively, these pilot studies, regulatory initiatives, public outreach efforts, and technical innovations will begin to address water quality and ecological issues facing Jamaica Bay, promoting sustainability in New York City based on sound development and infrastructure practices at multiple levels. Many of the recommendations in the JBWPP are outside NYCDEP's authority or mission, and NYCDEP's support for these projects must be considered in the context of other agency mandates. The financial plan for the Bay has not been fully developed.

The first JBWPP update was submitted to City Council in October 2008 and included status reports on the implementation of many strategies identified in the JBWPP and the status information presented below for stormwater BMPs.

5.8.2 BMP Pilots, Design Manual and Watershed Planning

Following the development of the JBWPP, NYCDEP developed a contract to implement BMP strategies throughout the City. A significant portion of the contract, which commenced in April 2009, includes multiple stormwater BMP pilot projects that will be used to evaluate the efficacy of each BMP, maintenance needs, schedules, and uncertainties associated New York City-specific climate and site conditions (local geology, cold weather limitations, construction costs, maintenance requirements, etc.). The results of these pilots will be used to guide future development practices, and the development of a BMP design manual and watershed planning analyses. The specific pilots in the contract included:

- Three locations in the Bronx at which stormwater BMP retrofits for open space and other land uses will be evaluated;
- New York City Housing Authority (NYCHA) complexes will test the ability to redirect runoff to existing pervious surfaces and encourage on-site stormwater infiltration;
- A porous pavement pilot to investigate different types of porous pavement and potential maintenance issues associated with the use of porous pavement;
- Two locations in southeast Queens along North and South Conduit Avenues that will be used to quantify the benefits of tree plantings and other BMPs for stormwater management;
- Two 10,000 square-foot, publicly owned rooftops will be retrofitted with blue roofs to evaluate retrofitting existing structures;
- The distribution of 1,000 55-gallon capacity rain barrels to gauge public acceptance of and interest in this technology, with focused distribution in the Jamaica Bay watershed (250 of which were distributed during the spring and summer of 2007).

The BMP Design Manual to be developed under the same contract, will provide specific guidance for designing and constructing BMPs, based on New York City conditions and the regulatory environment. The BMP Design Manual will identify specifically how to design and install effective BMPs in New York City, addressing different land use and building classifications, local climate conditions, and the regulatory environment. The manual will include the pilot and demonstration projects as examples and is anticipated to have an online, interactive access portal that can be used to tailor a stormwater control to specific site conditions.

Another noteworthy component of the contract is the development of watershed plans for up to four watersheds that will be based on a comprehensive water quality and ecological approach. These watershed plans will identify BMP, restoration, and other low impact/ decentralized strategies for addressing multiple water quality and ecosystem goals. As of the date of this report, the four watersheds are the Bronx River, Flushing Bay and Creek, Gowanus Canal, and Newtown Creek; however, this list is subject to modification as new information arises and priorities evolve.

5.8.3 PlaNYC 2030

On Earth Day in 2007, Mayor Bloomberg announced a comprehensive City-wide set of initiatives focused on environmental stewardship called PlaNYC 2030. By dividing the urban environment into its fundamental components (land, water, transportation, energy, and air), PlaNYC enabled New York City to identify and execute actions that would lead to a more sustainable city. PlaNYC identified specific initiatives to promote BMP implementation, including the formation of an interagency BMP Task Force, development of pilot projects for promising BMPs, and providing incentives for green roofs. The BMP Interagency Task Force met regularly during 2007 and 2008 to discuss feasible mechanisms for distributed stormwater control through the design and construction of different agency projects within the City's right of-way, open space, and public and private developments. The Task Force held several public meetings to receive the input of diverse stakeholders citywide. The pilot projects identified in PlaNYC (e.g., improved tree pit design and roadway vegetated swales) will be implemented by NYCDEP along with other stormwater BMP pilot projects as part of several contracts described below. Finally, the State Legislature recently approved a green roof tax abatement program (Bill Number A11226) to encourage construction and maintenance of green roofs in the City. The amount of the abatement would be $4.50 per square foot of green roof, limited to the lesser of $100,000 or the buildings tax liability for the year in which the abatement is taken. The bill was officially written as law in fall 2008 and with a sunset date of March 15, 2013.

5.8.4 Sustainable Stormwater Management Plan

The City Council passed Local Law 5 in 2008 requiring the Mayor's Office of Long-Term Planning and Sustainability to develop a City-wide Sustainable Stormwater Management Plan, the goals of which are to reduce stormwater volume, improve water quality, and enhance the use and enjoyment of the city's waterbodies for recreational activities. The specific requirements of the plan focus on defining cost-effective stormwater management measures, for different types of properties or areas in the city, along with a prioritization of measures and timeline for implementation. A substantial public participation and public education program obtained public input during the development of the plan. Specific requirements for signage, public notification for location and occurrence of CSOs, and other education activities are also included. The draft plan was issued as required on October 1, 2008 to the mayor, speaker of the council, and the public; the final was issued December 1, 2008. The Plan provides a framework for testing, assessing, and implementing pilot installations to control stormwater at its source, as well as strategies to supplement existing stormwater control efforts, develop innovative and cost effective source controls, and secure funding for future implementation. NYCDEP lent substantial support to the development of the Plan. The law expects a four-year review cycle, with reports every other October beginning in 2010.

5.8.5 NYCDEP Environmental Benefit Projects

In connection with the settlement of an enforcement action taken by New York State and DEC for violations of New York State law and DEC regulations, NYCDEP submitted a Nitrogen Consent Judgment Environmental Benefit Project (EBP) Plan to NYSDEC in January 2007 that proposed a stormwater pilot study in the Jamaica Bay drainage area. This project will use Nitrogen Consent Judgment EBP funds to conduct a three year pilot study program to implement and monitor several stormwater treatment technologies and volume reduction stormwater BMPs for potential application within the Jamaica Bay watershed. The goals of Jamaica Bay Watershed Stormwater Pilot Project include documenting the quality of New York City stormwater and refining the specific capture rates and treatment efficiencies that may be expected locally. Once this information has been gathered, effective Green Site Design stormwater strategies would be developed for potential future applications.

The project is expected to cost approximately $1.75 million and will include infiltration swales for street-side and parking lot applications, parking lot curb water capture systems, enhanced tree pits, and a commercial green roof / blue roof comparison installation. The EBP is being conducted through an innovative collaborative effort between NYCDEP and the Gaia Institute. NYCDEP entered into a contract with the Gaia Institute to complete the pilot study. The Gaia Institute is a 501(c)3 not-for-profit corporation located on City Island in the Bronx that explores how human activities can be attenuated to increase ecological productivity, biodiversity, environmental quality, and economic well being.

In connection with the settlement of an enforcement action taken by New York State and DEC for violations of New York State law and DEC regulations, NYCDEP also submitted a CSO EBP Plan for NYSDEC approval in March 2008 that is expected to partially reduce the rate and volume of stormwater that enters the combined sewer system through stormwater BMP implementation in select drainage areas. Practices such as bioinfiltration swales, enlarged street tree pits with underground water storage, constructed wetlands, and others would be evaluated. The CSO EBP Plan proposes pilots in the Bronx, Flushing, and Gowanus watersheds which were selected in part to be representative of the range of watersheds encountered in New York City so that pilot results may be applied Citywide. NYSDEC approved the EBP Plan in April 2008.

5.8.6 BMP Code Review Task Force

A detailed review of New York City's existing codes and regulations is being performed in an attempt to identify potential code revisions that could be recommended to promote BMP implementation. NYCDEP convened various staff from different bureaus and offices within the agency (Bureaus of Environmental Planning and Analysis, Water and Sewer Operations, Legal Affairs, and the Office of Strategic Projects) and other City agencies (Department of Buildings, Law Department and Mayor's Office of Long-Term Planning and Sustainability) to conduct the review. The Task Force identified opportunities for revisions that would encourage BMP installation based on a review of BMP regulations and practices in other urban municipalities such as Portland, Philadelphia, Chicago, and Seattle. As described in the Mayor's Sustainable Stormwater Management Plan, new stormwater requirements are anticipated by the end of 2009.

6.0 Public Participation and Agency Interaction

One of the nine elements of a long-term control plan is a public participation and agency interaction process that actively involves the affected public and regulators in decision-making to select long-term CSO controls. USEPA guidance states that establishing early communications with both the public and regulatory agencies is an important first step in the long-term planning approach and crucial to the success of a CSO control program (USEPA, 1995a). The NYCDEP is committed to involving the public and regulators early in the planning process by describing the scope and goals of its facility planning projects and continuing public involvement during its development, evaluation, and selection of plan elements.

The CSO Control Policy emphasizes that state water quality standards authorities, state permitting authorities, USEPA regional offices, and permittees should meet early and frequently throughout the long-term planning process. It also describes several issues involving regulatory agencies that could affect the development of the long-term control plan, including the review and appropriate revision of water quality standards and agreement on the data, analyses, monitoring, and modeling necessary to support the development of the long-term control plan toward that end. A Harbor-Wide Government Steering Committee was convened by the NYCDEP consisting of city, state, interstate, and federal stakeholders representing regulatory, planning, and public concerns in the New York Harbor watershed.

The NYCDEP has also formed local and city-wide citizen advisory committees and has involved other municipal officials, local community government representatives, permitting agencies, and the general public in its planning process. Public meetings were conducted to present technical information and obtain input from interested individuals and organizations. Potential CSO alternatives, costs (to the NYCDEP and to the public via water usage rates) and benefits were discussed before completing engineering evaluations. Comments are sought regarding the selection of a recommended plan. This process has been executed by the NYCDEP during the East River Combined Sewer Overflow Facility Planning Project. The NYCDEP regularly met with its Advisory Committee on Water Quality to discuss the goals, progress and findings of its ongoing planning projects such as the waterbody/watershed assessment of Alley Creek. A local stakeholder team was specifically convened by the NYCDEP to participate in the waterbody/watershed assessment of Alley Creek and Little Neck Bay.

The following section describes the formation and activities of the NYCDEP Harbor-Wide Government Steering Committee, the Citizens Advisory Committee on Water Quality, and the Alley Creek and Little Neck Bay Waterbody/Watershed Stakeholder Team that represented the NYCDEP public participation and agency interaction components of its waterbody/watershed assessment of Alley Creek and Little Neck Bay.

6.1 HARBOR-WIDE STEERING COMMITTEE

The NYCDEP convened a Harbor-Wide Government Steering Committee to ensure overall program coordination and integration of management planning and implementation activities by holding quarterly meetings for exploring regulatory issues, prioritizing planning and goals, developing strategies, reviewing and approving assessment-related work plans, and coordinating actions. A Steering Committee was comprised of city, state, interstate, and federal stakeholders representing regulatory, planning and public concerns in the New York Harbor Watershed. The Citizens Advisory Committee on Water Quality (CAC), which reviews and comments on NYCDEP water quality improvement programs, is represented on the Steering Committee and separately monitors and comments on the progress of CSO projects, among other NYCDEP activities.

Federal government members of the Harbor-Wide Government Steering Committee included representatives of the USEPA, USACE and the National Park Service. The Deputy Director and the Water Quality Standards Coordinator represented USEPA Region 2. The USACE was represented by its Chief of the Technical Support Section, Planning Division, New York District. The National Park Service member was a representative of its Division of Natural Resources at the Gateway National Recreational Area.

The State of New York was represented by the central and regional offices of the NYSDEC. The Central Office of the NYSDEC in Albany was represented by its Associate Director of the Division of Water, the Director of the Bureau of Water Permits in the Division of Water, the Director of the Bureau of Water Assessment and Management Branch of the Division of Water and the Director of the Bureau of Water Compliance in the Division of Water. The Region II office of the NYSDEC was represented by the Regional Engineer for the Region II Water Division.

Several departments of the City of New York were represented on the Harbor-Wide Government Steering Committee. The Deputy Commissioner of the Bureau of Environmental Engineering and its Director of Planning and Capital Budget represented the NYCDEP. The Department of City Planning was represented by its Director of Waterfront/Open Space. The New York City Department of Parks and Recreation was represented by the Chief of the Natural Resources Group.

Public interests were represented on the Steering Committee by the General Counsel of Environmental Defense Fund at the New York headquarters and the Real Estate Board of New York. These two members also co-chaired the Citizens Advisory Committee on Water Quality.

Interstate interests were represented by the Executive Director and Chief Engineer of the IEC, a joint agency of the states of New York, New Jersey and Connecticut. The IEC was established in 1936 under a Compact between New York and New Jersey and approved by Congress. The State of Connecticut joined the IEC in 1941. The mandates of the IEC are governed by the Tri-State Compact, Statutes and the IEC Water Quality Regulations. Its responsibilities and programs include activities in areas such as air pollution, resource recovery facilities and toxics. However, the IEC's continuing emphasis is on water quality, an area in which the IEC is a regulatory and enforcement agency. The IEC area of jurisdiction runs west from Port Jefferson, NY and New Haven, CT on Long Island Sound, from Bear Mountain on the Hudson River down to Sandy Hook, New Jersey (including Upper and Lower New York Bays, Newark Bay, Arthur Kill and Kill Van Kull), the Atlantic Ocean out to Fire Island Inlet on the southern shore of Long Island, and the waters abutting all five boroughs of New York City.

The Steering Committee is responsible for reviewing the methodology and findings of NYCDEP water quality-related projects, and to offer recommendations for improvement. The Steering Committee reviewed and approved the waterbody work plan developed by the USA

Project (HydroQual, 2001), and was fully briefed on the on-going assessments and analyses for each waterbody. Among the recommendations provided by the Steering Committee was the investigation of cost-effective engineering alternatives that improve water quality conditions to remove Harbor waters from the State of New York 303(d) List, to pursue ecosystem water quality restoration actions with USACE, and to coordinate use attainment evaluations with the NYSDEC. Representatives of the NYSDEC reported that its agency will use findings of the NYCDEP waterbody/watershed assessments to help complete the 303(d) evaluations.

6.2 EAST RIVER COMBINED SEWER OVERFLOW FACILITY PLANNING PROJECT

The East River CSO Facility Planning Project included a full-scale public participation program that was coordinated by NYCDEP. The program followed USEPA public participation guidelines and was designed to provide a solid foundation for informed citizen input to agency decision making. The Alley Creek CSO Retention Facility was one of the major CSO Control facilities that came out of the East River Project. During the planning process on-going dialogue was encouraged by providing the public with up-to-date project information, engaging in open and ongoing communication and facilitating timely receipt of informed public input to be used in planning. The East River Project was initiated in April 1988 and an Introductory public meeting was held on November 17, 1988. A comprehensive, detailed description of the public participation program is presented in a Final Summary Report (URS, 1996). The specific activities within the East River Project Public Participation Program: formation of a Citizens Advisory Committee (CAC), formal public meetings and hearings, meetings with Community Boards, informal group meetings and dissemination of technical reports, executive summaries and responsiveness summaries through local repositories and direct mailings. Table 6-1 lists the highlights of this extensive program.

Table 6-1. Public Participation Activities, East River Facility Plan

Mechanisms	Dates
Citizens Advisory Committee (CAC) Meetings	Bi-monthly during first year on an as-needed basis focusing on local proposed CSO Facilities 10/19/88, 11/17/88, 1/19/89, 3/27/89, 10/26/89, 3/29/90, 6/7/90, 6/14/90, 10/18/90, 3/21/91, 5/16/91, 11/7/91, 2/5/92, 5/7/92, 10/26/94
Press Releases	Several over Project Period
Public Meetings and Hearings	11/17/88 Introductory Meeting 9/19/91 Alternatives Meeting 6/18/92 Public Hearing 1/9/95 Public Hearing on Alley Creek
Other Meetings and Presentations, Queens and Bronx	9/23/91, 9/30/91, 10/2/91, 10/9/91, 10/29/91, 11/13/91, 12/9/91, 1/15/92, 10/21/94
Major Mailing List Distributions	500 individuals: residents, representatives of environmental, professional and civic groups, academia, public officials, Community Boards, federal, state and local agencies, business, and the media
Repositories (12)	Technical reports, narrative and graphic materials for convenient access

Table 6-1. Public Participation Activities, East River Facility Plan

Mechanisms	Dates
Narrative and Graphic Materials (English/Spanish)	Included fact sheets, executive summaries, meeting reports, maps, glossary, project schedules, and responsiveness summaries
Notifications	Newspaper ad, City Record, NYSDEC Environmental Bulletin, press releases, letters to mailing list
Responsiveness Summaries	Records of public and agency comments and recommendations, and included questions raised with responses to those question

As mentioned above, there have been several iterations in the Alley Creek CSO Facility Plan since the plan was accepted by NYSDEC in 1994. Table 6-2 summarizes the Alley Creek CSO Plan portion of the East River CSO Abatement Facilities Plan through September 2000. The design has been further refined into the CSO Facility Plan approved by NYSDEC, as described in Section 5.7 and that currently is being constructed.

Table 6-2. East River CSO Abatement Facilities Plan – Alley Creek Report Summary (URS, April 2003)

Report	Date	Status	Comment
East River Combined Sewer Overflow Facility Planning Project, Task 8.0 Plan Selection	June 1994	Approved by NYSDEC	9 MG CSO Storage Tank located at Cross Island Parkway Site
East River Combined Sewer Overflow Facility Planning Project, Facilities Plan	February 1996	Accepted by NYCDEP	7 MG CSO Storage Tank located at Cross Island Parkway Site
Status Report on the New York City Combined Sewer Overflow Program	February 1999	Accepted by NYCDEP	3 MG CSO Storage Conduit with inflatable dams located in Alley Park east of the intersection of 46th Avenue and 223rd Street
September 2000 Facilities Plan(1)	September 2000	Accepted by NYCDEP	5 MG CSO Storage Conduit with inflatable dams located in Alley Park east of the intersection of 46th Avenue and 223rd Street

(1)A facilities plan was not submitted at a meeting held at the NYCDEP offices on September 20, 2000, the CSO storage volume was increased from 3 MG to 5 MG.

The public participation program begun in 1988 was continued throughout this time period. NYCDEP attended meetings of Community Board (CB) 11 to update the CB on plans for the Alley Creek CSO Retention Facility, solicit input from the CB and answer citizen questions. The public participation program activities of public hearings and presentations, mailings, press releases, use of the repository sites, and meetings with local political leaders were continued on a regular basis through the adoption of the final design and throughout the construction of this facility.

In January 1995, the Citizens Advisory Committee expressed support for the Facility Plan that had been developed for Alley Creek. The major component of the plan was a 7 MG storage tank. It should be noted that the Alley Creek CSO Retention Facility has undergone several changes from 1996 to the current CSO Facility Plan.

6.3 PUBLIC OPINION SURVEY SUMMARY

The NYCDEP performed a telephone survey in order to assess and measure the use of waterbodies in New York City, and obtain feedback from New York City residents about their attitudes towards the water resources in their community and elsewhere throughout the city. Surveys, conducted by RoperASW, addressed city-wide issues as well as those for local waterbodies. Primary and secondary waterbody survey results (dependent on residential location within watersheds) were analyzed discretely and summarized to provide additional insight into the public's waterbody uses and goals in addition to those identified via other public participation programs run by the NYCDEP.

Survey interviews were conducted using Computer Assisted Telephone Interviews (CATI) among residents of the five New York City boroughs that were 18 years or older. Residents were asked about specific waterways depending on their zip code. Questionnaire development involved a pre-test prior to the full field application of the survey to ensure that the survey covered all relevant issues and was presented in a way that would be clear to all respondents. The pre-test was conducted via a series of five focus groups representing residents of each of the five New York City boroughs. Final presentation of results involved editing, cleaning, and weighting collected data. The weights were applied to the data to correct for unequal probability of household selection due to households with more than one telephone number, and different numbers of individuals available to be interviewed at different households. Post-stratification weighting was also applied for each waterbody to balance the sample data to 2000 U.S. Census population data that takes into account household composition (single adult, 2 adults and households with children), age within gender, and race/ethnicity. The survey data was then projected to actual population counts from the 2000 U.S. Census so that areas could easily be combined to yield an appropriate weighted sample for all five boroughs of New York City.

The telephone survey included 7,424 interviews with New York City residents. A minimum of 300 interviews for each of the 26 watersheds was included within the scope of the USA project. The survey was analyzed to quantify the extent of existing uses of the waterbody and riparian areas, and to record interest in future uses. Elements of the survey focused on awareness of the waterbody, uses of the waterbody and riparian areas, recreational activities involving these areas and how enjoyable these activities were, reasons why residents do not partake in recreational activities in or around the waterbody, overall perceptions of New York City waterbodies; and what improvements have been recognized or are desired. It should be noted that the survey was focused on Alley Creek only, not Alley Creek and Little Neck Bay. The results of the survey for Alley Creek are included as Appendix B and are highlighted below.

6.3.1 Waterbody Awareness

Approximately 41 percent of the Alley Creek area residents that participated in the survey were aware of Alley Creek but only one percent identified Alley Creek as their primary waterbody without prompting or aid in their response. On an unaided basis, area residents most often mentioned the Little Neck Bay as the waterway closest to their home. Combining awareness of Little Neck Bay with awareness of Alley Creek puts the respondents near the average observed throughout the city.

6.3.2 Water and Riparian Uses

Approximately 17 percent of the Alley Creek area residents that participated in the survey visit waterbodies in their communities or elsewhere in New York City on a regular basis and 42 percent say that they visit waterbodies occasionally. The remaining percentage of area residents are divided as those who rarely visit waterbodies (26 percent) or not at all (14 percent). This is about the same as New York City residents in general. Fifty-nine percent of the Alley Creek area residents regularly or occasionally visit city waterbodies compared to 60 percent of all New York City residents. Sixteen percent of area residents have visited Alley Creek at some point and nine percent have done so in the prior 12 months. Those who have visited the Alley Creek within the prior 12 months responded that they visit an average of two times. This is lower than the city-wide median of four visits per year. Among those area residents who are aware of Alley Creek but have never visited the Bay, 60 percent responded that there was no particular reason for not doing so, 13 percent cited waterbody conditions and eight percent cited riparian conditions.

The number of area residents that have participated in water-related activities in Alley Creek represents two percent of those who have ever visited Alley Creek. The survey interpretation of this result is to use it with caution. One reason for not participating in water-related activities could be the lack of opportunities to do so offered by Alley Pond Park. The focus of the park is habitat preservation and education. The most common activity cited by those that have visited Alley Creek was walking or strolling (22 percent). This was followed by sports (16 percent). Again this is encouraged at the Park by providing and maintaining 26 acres of playing fields. None of the respondents cited in-water activities such as canoeing, kayaking, jet skiing, swimming, and wading as reasons for visiting Alley Creek. Riparian-based activities are the only use of the creek mentioned in the survey. Thirty-eight percent of area residents that have participated in land activity say that those activities were “extremely enjoyable”. Another 53 percent rated the experience as “somewhat enjoyable”. The scenery was cited most often (27 percent) as the reason for the enjoyment. The people there (21 percent) and being with family and friends (17 percent) were the next two reasons given for the enjoyment of the land activities followed by eating/dining, listening to music and enjoying nature/wildlife/bird watching.

6.3.3 Improvements Noted

Approximately 49 percent of area residents indicated that they have noticed improvements in New York City waterways in general in the past five years and two percent have noticed improvements specifically at Alley Creek. These numbers are very similar to city-wide responses (48 percent) regarding a noting improvement in NYC waterways. Improvements in the water (quality, appearance and color) of New York City waterways were most frequently noted by area residents (23 percent). If funds were available, area residents would most like to see improvements to the water (quality, appearance and odor) in Alley Creek. Thirty-eight percent of the area residents who identified the improvement that they would most like to see in Alley Creek say that improvement is “extremely important” and another 27 percent say it is “somewhat important”. Specifically, among those area residents who identified water quality improvements as the improvements they would like to Alley Creek, 42 percent reported that they would be willing to pay between $10 and $25 a year for that improvement while 19 percent indicated that would not be willing to pay anything for improvements. The report again cautions use of the cost responses because there was a small base. When asked which waterway should be improved if funds were available to improve only one New York City waterway, 7 percent of area residents cited Alley Creek as the waterway to be improved. In comparison, approximately 18 percent of New York City residents cited the waterbody in their own assessment area as the one that should be improved. Other waterbodies named by Alley Creek residents as the waterbody to be improved if funds were available for only one were: Hudson River (19 percent), East River (13 percent) and Long Island Sound (6 percent). The responses throughout the city were similar in that these same waterbodies were selected by approximately the same percentages of residents participating in the survey.

6.4 ADMINISTRATIVE CONSENT ORDER

The Administrative Consent Order (ACO) was published for public comment on September 8, 2004, as part of the overall NYSDEC responsiveness effort. The public comment period, originally limited to 30 days, was extended twice to November 15, 2004, to allow for additional commentary. Comments were received from public agencies, elected officials, private and non-profit organizations, and private individuals. In total, NYSDEC received more than 600 official comments via letter, facsimile, or e-mail during the comment period. All comments received were carefully reviewed and evaluated, then categorized by NYSDEC according to similar thematic elements. Each set of similar comments received a specific focused response. Many of the comments received, although differing in detail, were able to be categorized or grouped into topics such as NYSDEC and NYCDEP efforts toward CSO abatement, water quality issues, water quality standards, and regulatory requirements.

None of the comments received changed the terms of the ACO, but the volume of commentary was interpreted by NYSDEC to indicate that "NYC citizenry places CSO abatement as a high ongoing priority" (NYSDEC, 2005). The terms of the ACO include numerous opportunities for public participation and input for future CSO abatement measures and regulatory decisions, and therefore fulfill the requirement to comply with federal CSO policy with regard to public participation during facility plan development.

6.5 PUBLIC PARTICIPATION WITHIN THE LTCP PROCESS

A stakeholder team for Alley Creek and Little Neck Bay, consisting of community and environmental leaders and citizens from Queens Community Board 11 (CB11), was assembled in 2006. The participants represented CB11, Alley Pond Environmental Center (APEC), Udalls Cove Preservation Committee, NYCDPR (head of Queens parks), and local residents who are long-time volunteers in environmental issues.

6.5.1 Introduction to LTCP and Waterbody/Watershed Facility Plan Process – Meeting 1

The first stakeholder meeting was held on April 4, 2006, at the Alley Creek CSO Retention Tank Construction Field Office located at 38-44 Regatta Place, Douglaston. The meeting was attended by approximately 15 stakeholders. Many of the stakeholders were active during the CSO Facility Plan development and were familiar with the CSO planning process that resulted in the Alley Creek CSO Facility Plan, the retention tank that is currently under construction.

The initial part of the meeting was a review of the NYCDEP LTCP project noting its goal to improve the quality of the city's open waters and tributaries by developing a long-term plan to invest in infrastructure that will reduce the number of CSO events, and to reduce the volume of those events that do occur. The definition and location of CSOs in New York City, CSO regulation, waterbody monitoring and modeling, and the public participation in the LTCP through the stakeholder team process were reviewed. The development and evaluation of the CSO Facility Plan and alternative facility, maintenance, and operations plans was explained. The evaluations include performance, water quality improvement and cost. It was noted that, in general, water quality in New York City, including in Alley Creek, is better than it has been in a generation.

As an introduction to the waterbody/watershed, water quality issues, waterbody NYSDEC classifications and water quality standards and known impairments were presented. The presence of Douglas Manor Association Beach means additional consideration of Little Neck Bay as a sensitive area.

The operation and anticipated performance of the 5 MG Alley Creek storage tank in reducing the number and volume of CSO events by catching by holding the first 5 million excess gallons during wet weather events was explained. The tank will overflow through outfall TI-025 for storm events yielding more than 5 million gallons. However, the tank will provide treatment of the CSO flow by capturing floatables and allowing some solids settling.

A lively question and answer session and discussions took place. Stakeholder concerns were listed and described in Meeting Notes. In response to Stakeholder questions, the project team was tasked to address the following issues:

- Status and schedule of the current Alley Creek Tank construction project, including anticipated schedule of traffic diversions.
- Verification of the site, area and scope of the Alley Creek Environmental Restoration of current project.
- Update on catch basin programs in the Alley Creek watershed, including maintenance schedules for catch basins.

Stakeholder team members were encouraged to visit the password-protected website to download background material on the LTCP including the PowerPoint presentation given at the meeting. The Meeting Notes, approved by the Stakeholders, are included in Appendix E.

6.5.2 Presentation of Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan – Meeting 2

The second NYCDEP Alley Creek and Little Neck Bay Stakeholder Team meeting of the Long Term Control Plan was held on July 26, 2006, at the Alley Creek NYCDEP Field Office. The purpose of the meeting was to present the draft WB/WS Facility Plan for Alley Creek and Little Neck Bay.

To follow-up from the previous meeting the Alley Creek Project Phases were described: Phase I, including drainage area improvements, the construction of a CSO storage tank, and the 23.5 acre Alley Park Environmental Restoration, was ongoing. Phase II will see the design and construction of the Oakland Ravine Wetland System for improved stormwater management. The Oakland Ravine project is not a CSO Facility Plan element.

The progress of the ongoing CSO floatables abatement program included the installation of 890 catch basin hoods bringing the total of hooded catch basins to 2,860 (84 percent of 3,400 within the Alley Creek and Little Neck Bay drainage area).

The team spoke about the next steps of the WB/WS Facility Plan that involves report submission to the NYSDEC. After the NYSDEC review, the public has an opportunity to comment and there may be a public hearing. Mark Klein, Chief of NYCDEP Division of Water Quality Improvement, noted that that the NYCDEP meets regularly with NYSDEC to coordinate and thus avoid the need for large changes in the plan during the review process.

The watershed and sewershed were described showing the separately sewered areas, combined sewer areas, direct drainage, and CSO overflow sites. Of the five outfalls classified as CSOs that discharge to Alley Creek, three discharge only stormwater and two are CSOs: TI-008 and TI-025, at the site of the new tank. The single CSO outfall to Little Neck Bay (TI-006) discharges only stormwater. The 5MG tank will significantly reduce the volume of CSO discharged to Alley Creek and reduce the number of CSO events. All flow through the tank will receive a level of treatment from the removal of floatable materials by baffles and some settling of solids. The modeling data suggests that overflows at TI-008 will occur roughly four times a year when the flow-through capacity of the tank is exceeded. The stakeholders said that when the plan was previously presented, it was stated that all CSO volume would be treated in the tank. It was explained that the calculation of overflow events was generated by a newer, more accurate model applied in the LTCP; but in any case more than 96 percent of the CSO volume would be treated in the tank.

The evaluation of alternatives included modeling to develop a baseline of information against which to compare the different alternatives. Baseline Condition water quality was less than 4.0 mg/L of DO at the head of Alley Creek and DO was calculated to be generally greater than 5.0 mg/L in Little Neck Bay. The calculated Baseline Condition pathogens met all of the waterbody existing standards. The Alley Creek CSO Facility Plan (5 MG tank) and other ongoing projects and improvements were added to the Baseline and alternatives then evaluated. Those alternatives included a modification of the dewatering procedure at Alley Creek Tank to initiate pumping of flow to the Tallman Island WPCP as soon as flow enters the tank and installation of bendable weirs at TI-025 and at Chamber 6 to reduce TI-008 CSO discharge. Alternatives that would remove increments of up to 100 percent of CSOs, as prescribed by the federal LTCP guidance; 15 MG, 25 MG, and 30 MG capacity tanks were also tested in the models.

The percent of CSO reduction, CSO capture, number of CSO events, water quality benefits, and costs were compared for each alternative to arrive at the WB/WS Facility Plan. The goal of the proposed plan is to meet water quality standards in a cost-effective manner. The data suggests that the combination of a) the construction of the CSO retention tank, b) the catch basin hooding project, underway, and c) the wet weather operation of the tank to maximize CSO capture and treatment by pumping out the tank as soon as the flow arrives are the most cost-effective in reducing the volume and number of CSO events. The plan is expected to improve DO levels and reduce enterococcus, and fecal and total coliform counts by reducing CSO volume by 57 percent and treating 96 percent of CSOs. As such, these measures will be put forward as the Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan. The WB/WS Facility Plan includes a post-construction monitoring of tank performance and receiving water quality.

The stakeholders asked why bending weirs had been discarded as an option, since the data indicates that they are cost-effective and would eliminate the projected 4 CSO events per year at TI-008. The bending weirs, however, provide no additional benefit in meeting water quality standards. Stakeholders also stated that the bendable weir would improve the overall water quality and further reduce floatables, especially at the Alley Park Environmental Center. The project team said that these stakeholder comments would be part of the project record, that the team would review the evaluation of the alternatives and that the recommended course of action would be communicated in the distribution of the meeting notes.

Update on Action Items; NYCDEP August 13, 2006:

- The stakeholders recommended that the plan should include a bendable weir at Chamber 6 to eliminate CSO events at TI-008. As noted above, it was stated that the retention tank project, when first presented to the community, claimed to eliminate all CSO events at TI-008; the updated analytic model used in the LTCP indicated that there would be four CSO events per year at TI-008. As a follow-up to the meeting, the project team reviewed the alternatives analysis and determined that the four CSO events per year predicted by the LTCP model was a finding within the margin of error of the model. The NYCDEP project team recommends that the Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan be submitted as originally proposed, noting that the required post-construction monitoring will pay close attention to the reported performance of the tank and overflow events at TI-008. If necessary, a bendable weir can be installed as a retrofit to improve actual observed performance.

Meeting Notes from the July 26, 2006, Alley Creek and Little Neck Bay Stakeholder Team Meeting are included in Appendix E.

6.5.3 Presentation of Revised Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan – Meeting 3

The third Stakeholder team meeting of the LTCP was held on October 18, 2006, at 6:30 p.m. at the Alley Creek NYCDEP Field Office. Changes to the plan presented on July 26, 2006 had occurred. The revised Alley Creek and Little Neck Bay WB/WS Facility Plan as it will be submitted to NYSDEC was presented at this meeting. The July 26th meeting notes and stakeholder letters, two arguing for a bending weir at Chamber 6 to reduce CSO at TI-008 and the other concerning water quality at the bathing beaches were all discussed.

The primary water quality issues, low dissolved oxygen in Alley Creek and pathogens in Little Neck Bay, were reviewed. The watershed/sewershed of the waterbodies is engineered and does not reflect the natural drainage area. The WB/WS Facility Plan focuses on the two (out of 6) CSO outfalls that actually discharge CSO: TI-008, the CSO outfall on Alley Creek, and TI-025, a new outfall being created at the Alley Creek Tank.

The process of developing a WB/WS Facility Plan began with landside and water quality models to develop a baseline condition against which to measure improvement. Alley Creek and

Little Neck Bay meet water quality standards at the baseline. The Alley Creek CSO Storage Tank now under construction holds 5 MG of CSO. Volumes greater than 5 MG will pass through the tank and overflow at CSO outfall TI-025. If there is a very large storm volume that may exceed the hydraulic capacity of the tank, flow will bypass over a stationary weir in Chamber 6 (located at the head of the tank) to overflow at TI-008, thus preventing a back up in the sewer system and into basements. All overflows at TI-025 will have received preliminary treatment in the tank; the solids will settle out and baffles will remove floatables. At TI-008, however, CSO overflow will be untreated.

The CSO control alternatives evaluated and their costing, presented in detail at the July 26th meeting, were reviewed. Alternatives considered include: the tank at Alley Creek (CSO Facility Plan alternative), called out in the latest CSO Consent Order with construction nearly complete; a modification of the dewatering procedure; bendable weirs at TI-025 and TI-008; and a series of larger holding tanks, which were included in the analysis to capture increments from 85 percent CSO volume up to 100 percent CSO volume

There were two major changes in the Alley Creek and Little Neck Bay WB/WS Facility Plan presented at the July 26th stakeholder meeting. The bendable weir at Chamber 6 to minimize CSO from TI-008 is now included in the plan, provided that it is approved by the NYCDEP Design and Operation Bureaus. This change is based on stakeholder response. The stakeholders had noted that the weir was a low-cost alternative with significant benefits.

The bending weir at Chamber 6 will be placed on top of the rigid weir being constructed. The bending weir will allow for bypass of the tank via TI-008 outflow if the volume level is excessive and risks damaging the equipment and backing up sewage. The bending weir will eliminate TI-008 outflows in design year conditions but CSO may be discharged at TI-008 during particularly heavy storms or during unusual patterns of storms. In addition, stormwater (not CSO) that enters the TI-008 outfall pipe downstream of Chamber 6 will continue to be discharged at TI-008. Construction of the bending weir is subject to approval of the NYCDEP Bureau of Wastewater Treatment (BWT) and the Bureau of Water and Sewer Operations (BWSO). The internal NYCDEP approval process will involve a pilot project conducted by BWT to test the bending weir technology, as New York City has not yet used bending weirs. Bending weirs are used in other cities, however, and are under consideration in draft WB/WS Facility Plans for other LTCP waterbody assessment areas.

The second change in the WB/WS Facility Plan presented at the October 18, 2006 meeting involves the early dewatering of the tank. The early dewatering of the Alley Creek Tank, which begins conveying CSO to the treatment plant during wet weather, has been removed as a WB/WS Facility Plan element. Subsequent to the July 26th Stakeholder meeting, NYCDEP Facility Operations reviewed the plan. The Early Dewatering Alternative was not included in the WB/WS Facility Plan because an increase in CSO discharge from the Alley Creek Tank to the Flushing Creek Tank during rainfall events reduces the Tallman Island WPCP ability to take in combined sewage from other CSOs not receiving control. Thus there is no net reduction in the percent of untreated CSO discharged to Alley Creek and Little Neck Bay under USEPA protocols. As such, NYCDEP did not feel that it was appropriate to put early dewatering into an enforceable WB/WS Facility Plan as it is conceivable that they will be unable to comply. Issues of concern to the operators included potential increase in CSOs at the Flushing Tank and lack of interceptor capacity. Early dewatering of the Alley Creek Tank will be considered during the post-construction monitoring. The stakeholders requested that the WB/WS Facility Plan report state that early dewatering procedures for the Alley Creek Tank is an option that will be considered in post-construction monitoring period. They also requested that the Community Board 11 receive yearly reports during the post-construction monitoring phase.

The elements of the WB/WS Facility Plan include: the retention tank, the bending weir at Chamber 6, the wet weather operations of the tank, post-construction monitoring, and continuation of programmatic controls. In LTCP design year conditions, 100% of CSO will receive primary treatment, CSOs at TI-025 will increase from the previous draft WB/WS Facility Plan but will all be treated, and CSO from TI-008 will be eliminated during design year conditions. Changes in water quality improvements from the initial plan are small, as the change in volume was small in the overall watershed.

A stakeholder stated that he is pleased with the plan, particularly as most of the outflow will receive preliminary treatment. The cost-benefit analysis results were reviewed, looking at the relationship of cost to parameters such as CSO volume, dissolved oxygen levels, enterococcus reduction at the DMA Beach and Little Neck Bay, total coliform reduction, and fecal coliform reduction. The presence of DMA Beach gives Little Neck Bay "sensitive area" designation according to federal CSO Policy. Acknowledging the comments of a stakeholder, it is important to look at the impact of the water quality improvements on the beaches. The current standing wet weather advisories against swimming after a rainfall may change with the implementation of the LTCP plan. The NYCDEP post-construction monitoring will not include the DMA Beach but that the NYCDOHMH monitors the beaches for pathogens. The stakeholders requested that, during the post-construction monitoring phase, NYCDEP coordinate with the NYCDOHMH to receive their data for inclusion in the Alley Creek reports to NYSDEC.

Meeting Notes from the October 18, 2006 Alley Creek and Little Neck Bay Stakeholder Team Meeting are included in Appendix E. The stakeholders requested that the Community Board be notified by NYSDEC when the plan report is available and be sent copies in paper and electronic form. The NYCDEP's BEDC LTCP Design Team will report back to Community Board 11 by no later than September 2007 with a status of the Alley Creek and Little Neck Bay Plan and present a draft schedule of the Plan approval timeline and bending weir technology pilot testing timeline.

6.6 SPDES PERMITTING AUTHORITY

Any facilities built as a part of this Waterbody/Watershed Facility Plan or water quality standards revision would be subject to the modifications of the Tallman Island WPCP SPDES permit and as such would be subject to a formal public review process.

6.7 NEW YORK STATE PUBLIC NOTIFICATION

Subsequent to the October 18, 2006 Stakeholder Team Meeting, the Alley Creek and Little Neck Bay WB/WS Facility Plan report was submitted to NYSDEC. The report, dated September 2007, was made available to the public after NYCDEP incorporated NYSDEC's June 15, 2007 comments on the draft and prior to Meeting 4.

Following NYSDEC review of the Alley Creek and Little Neck Bay Waterbody/ Watershed Facility Plan the NYCDEP and NYSDEC solicited additional public comment through a public notice and a public information and comment process. The revised Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan was presented at Meeting 4, which was held in May 2008.

NYSDEC will solicit additional public comment through public notice and a public information and comment process for the Alley Creek and Little Neck Bay Long Term Control Plan which will follow the WB/WS Facility Plan Report.

6.7.1 Presentation of Revised Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan – Meeting 4

In accordance with the NYSDEC public notification requirements, NYSDEC posted a notice in the Environmental Notice Bulletin (ENB) of a meeting held jointly between NYCDEP and NYSDEC to provide the public with updates on the Alley Creek and Little Neck Bay WB/WS FP process and a forum in which to ask questions and provide feedback. This meeting was held on Wednesday, May 21, 2008 at 6:30 pm at the NYCDEP Alley Creek Construction Field Office, Queens, NY. A copy of the PowerPoint presentations (NYSDEC and NYCDEP) shown at this meeting, and a summary of questions asked at the meeting and during the Official 30 Day Public Comment Period following the meeting and the Responsiveness Summary, are provided in Appendix F.

The Alley Creek and Little Neck Bay Stakeholders have requested that NYSDEC provide a hard copy and electronic file of the NYSDEC-approved Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan and the NYSDEC-approved Alley Creek and Little Neck Bay Long Term Control Plan to Community Board 11. The Annual Post-Compliance Monitoring Report and the DMA Beach Assessment Report are also requested.

7.0 Evaluation of Alternatives

CSO pollution control alternatives are developed and analyzed in this section with the goals of improving water quality within Alley Creek and Little Neck Bay and providing compliance with existing water quality standards. Each alternative is evaluated considering several parameters, including: feasibility of construction and implementation; improvements to the waterbody in terms of water quality parameters (dissolved oxygen, total coliform, fecal coliform and enterococcus) and aesthetics (floatables); significant reductions in the number of CSO events and annual CSO volume; and construction costs. At the conclusion of this section, a waterbody/watershed plan is selected that optimizes the above parameters cost-effectively, thus providing a higher quality water than is currently present in Alley Creek and Little Neck Bay.

In 1998, NYSDEC listed Little Neck Bay as a high priority waterbody for TMDL development with its inclusion the Section 303(d) List. The cause of the listing was pathogens due to CSO discharges and urban and storm runoff. Little Neck Bay continues to be listed on the 303(d) List for Pathogens through 2008 (most current list). "Alley Creek/Little Neck Bay Tributary" was listed for the first time on the 2004 Section 303(d) List as a high priority waterbody for oxygen demand. Sources of both pathogen impairment in Little Neck Bay and dissolved oxygen (DO) impairment in Alley Creek/Little Neck Bay Tributary are CSOs, urban runoff and stormwater. The Alley Creek and Little Neck Bay waters are included in Part 3c of the 2008 List. Part 3c lists "Waterbodies for which TMDL Development May be Deferred (Pending Implementation/Evaluation of Other Restoration Measures)." The Alley Creek/Little Neck Bay Tributary and Little Neck Bay are specifically noted that "Impairments to these waters are being addressed by 2005 Order on Consent with NYC directing the city to develop and implement watershed and facility plans to address CSO discharges and bring New York City waters into compliance with the Clean Water Act. This may include a revision of water quality standards based on a Use Attainability Analysis if fishable/swimmable goals of the CWA are not attainable. NYSDEC remains committed to the development of harbor-wide TMDLs for nutrients, pathogens and toxins. However, it is appropriate to defer development of separate TMDLs for these individual CSO-impacted waterbodies in light of the enforceable requirements of the NYC CSO Consent Order." (NYSDEC, 2008).

Alley Creek and Little Neck Bay have a history of CSO Facility Plan development as part of the East River CSO Facility Plan. As discussed in Section 5.0, CSO Facility Planning efforts were initiated in 1988 prior to issuance of the 1994 USEPA CSO Control Policy. The approach to improving water quality followed during the East River CSO Facility Planning, however, meets many of the CSO Policy requirements including an active public participation program and a rigorous evaluation that considered "a reasonable range of alternatives…sufficient to make a reasonable assessment of cost and performance" (59 FR 18692), although at the time there was no requirement for NYCDEP to develop a LTCP for Alley Creek and Little Neck Bay.

The requirement to develop a LTCP was introduced into the Tallman Island WPCP SPDES permit when the permit was modified in 2003. At that time, NYCDEP was well along in the planning and design of the recommended CSO Facility Plan. The initial Alley Creek CSO Facility Plan, accepted by NYSDEC in 1994, had undergone several modifications and has evolved into the current 2003 Alley Creek CSO Facility Plan (URS, 2003). The existing CSO

Facility Plan is described in detail in Section 5.7. Further, in January 2005, the CSO Order on Consent required that the City complete the construction of various aspects of the 2003 Alley Creek CSO Facility Plan recommendations.

This WB/WS Facility Plan, therefore, is based on the 2003 Alley Creek CSO Facility Plan recommendations as the starting point for assessing water quality and the evaluation of CSO control alternatives in the Alley Creek and Little Neck Bay assessment area. This WB/WS Plan examines controls beyond those provided in this CSO Facility Plan to determine if additional controls are required to comply with existing water quality standards. A WB/WS Plan is recommended in accordance with the USEPA CSO Policy requirements.

7.1 EVALUATION OF CSO CONTROL ALTERNATIVES IN THE ALLEY CREEK CSO FACILITY PLAN

NYCDEP submitted the East River CSO Facility Planning Project, Facility Plan Report to NYSDEC in 1996 (NYCDEP, 1996) The report describes the process used to screen and select CSO control alternatives for each of the East River WPCPs and tributary waterbodies. The approach first considered all reasonable measures for reducing CSO discharges to the East River, then reduced the comprehensive list of alternatives to those that had potential application in the tributary areas of the Tallman Island, Bowery Bay, Hunts Point, and Wards Island WPCPs given the nature of the waterbodies, tributary area, and the sewerage and collection facilities for each of the WPCPs. The options with the highest potential were fully developed and analyzed based on the following criteria:

- Attaining water quality goals;
- Public acceptance;
- Effective cost expenditures;
- Reliable operation;
- Regulatory concurrence; and
- Compatibility with other WPCPs under NYCDEP operation.

Numerous CSO control alternatives were considered during development of the 1994 Alley Creek CSO Facility Plan that became the 2003 CSO Facility Plan currently under construction. Many of the CSO control technologies considered were capable of being implemented in combination. As summarized in Table 7-1, the alternatives generally fell into four categories: source load reduction, storage, treatment, and waterbody measures. Issues of scaling (i.e., optimizing the utility of a particular alternative) were addressed only for those alternatives determined to have high potential for applicability during the preliminary screening.

This preliminary screening analysis highlighted necessary system improvements in addition to reducing the number of viable alternatives considerably. Improvements in the conveyance system capacity and improvements at the Tallman Island WPCP that would reduce CSO discharge were identified. Those alternatives that were not addressed in detail were generally dismissed based on a combination of cost and control limitations. In general, reasonable changes to land use, land use restrictions, and watershed BMPs were not expected to result in substantial pollutant discharge reduction within a timeframe suitable for facility planning.

Table 7-1. 1994 Alley Creek CSO Facility Plan, Preliminary Alternatives Screening

CSO Abatement Category	Alternative	Retained for Consideration at Tallman Island
Source Load Reduction	Infiltration/Inflow Control	No
	Pump Station Modification	No
	Regulator Maintenance/Modification	Yes
	Street Sweeping/Washing	No
	Public Education	Yes
Storage	Interceptors	Yes
	Trunk Sewers	No
	Storm Sewers	No
	Augmented Sewers	No
	Lined/Earthen Basin	No
	Concrete/Steel Tank	Yes
	Underground Silo	Yes
	Deep Tunnel	Yes
	Flow Balancing Method	No
Treatment	Treatment at WPCP Sites	Yes
	Flocculation/Sedimentation	No
	Swirl Concentrator	No
	Plate/Tube Settler	No
	Chlorination/Disinfection	Yes
Water Body Measures	In-Stream Aeration	Yes
	Dredging	No

CSO control alternatives retained from the preliminary screening process were considered further under a secondary screening process. The CSO control alternative that appeared to be the most favorable for CSO control in Alley Creek was storage. Disinfection by chlorination was also considered as a potential method for CSO control and was recommended for further evaluation in subsequent analyses.

The initial 1994 Alley Creek CSO Facility Plan recommended design and construction of a 9 MG underground tank sited within the cloverleaf of the southbound Cross Island Expressway's Northern Boulevard Exit. Flows in excess of the tank capacity were to be disinfected and discharged to Alley Creek through a new outfall, TI-025. The stored CSO would be pumped to the Tallman Island WPCP after the rainfall. Emergency bypass of the tank would be directed to TI-008. In addition, removal of floatables and settleables from TI-008 overflows was included.

7.2 HISTORICAL DEVELOPMENT OF THE ALLEY CREEK CSO FACILITY PLAN

As described in Section 5.1, the NYCDEP has been conducting CSO Facility Planning for several decades. Section 7.1 describes the initial Alley Creek CSO Facility Plan developed in 1994 as part of the East River CSO Project. The purpose was to develop a cost-effective and environmentally sound plan to improve the water quality in the East River and its tributaries including Alley Creek. The 1994 Alley Creek CSO Facility Plan has undergone several revisions prior to finalization of the Alley Creek CSO Facility Plan that is currently being implemented.

The major milestone plans are summarized in this section. Throughout the CSO planning process each plan has focused on (1) evaluation of water quality in comparison to State WQSs; (2) implementation of the nine minimum controls as per the USEPA CSO Control Policy; and (3) identification of required CSO control systems, and recommendations for implementation to meet NYSDEC water quality standards and address the USEPA CSO Control Policy.

7.2.1 1996 Alley Creek CSO Facility Plan

In February 1996, NYCDEP submitted to NYSDEC an updated CSO Facility Plan Report to present a comprehensive "stand alone" facilities plan for improving the water quality of all of the tributaries of the East River requiring CSO abatement. Water quality modeling performed subsequent to the 1994 Plan had indicated that the CSO discharges from TI-008 are a significant cause of the water quality degradation observed in Alley Creek and to a lesser extent Little Neck Bay. The 1996 report recommended a 7 MG tank based on a "knee of the curve" analysis predicated on the upgrade of Alley Creek to a Class SB water.

7.2.2 Development of September 2000 Alley Creek CSO Facility Plan

Subsequent to 1996, further analyses were performed using a more detailed receiving water model. To meet existing Alley Creek Class I water quality standards, upon reevaluation and further "knee of the curve" analyses, a 3 MG storage facility utilizing a new outfall sewer for in-line storage was recommended and proposed to NYSDEC. After further discussions between NYCDEP and NYSDEC it was agreed to increase the storage volume to 5 MG. The general concept of using an oversized outfall sewer for the dual purposes of augmenting hydraulic capacity of achieving CSO storage was accepted by NYCDEP and NYSDEC as the most feasible approach and was adopted as the design basis. The facility was a 5 MG Storage Conduit with inflatable dams.

7.2.3 Development of April 2003 Alley Creek CSO Facility Plan

Subsequent to 2000 and as a result of NYSDEC review and final NYCDEP input, the current, April 2003 Alley Creek CSO Facility Plan was developed (URS, 2003). This 2003 plan reflects the project currently under construction. The 5 MG storage is achieved with a fixed dam/storage conduit being constructed under two stages. The 5 MG is being constructed under Stage 1 and will be activated under Stage 2. Activation will consist of construction of the fixed weir within the outfall sewer at the downstream end near the outfall (TI-025) and removal of knock-out walls to allow flow over side weirs located along both sides of the outfall sewer. The new outfall sewer will function as part of the CSO storage facility.

The CSO capture characteristics of the 5 MG Alley Creek CSO Facility Plan included 54 percent CSO volume reduction, 70 percent TSS loading reduction and 66 percent reduction in BOD discharged to Alley Creek. Dissolved oxygen improvement was predicted for Alley Creek. These performance and water quality results were calculated from the analysis at that time. A detailed description of the elements of the CSO Facility Plan and Alley Creek CSO contract Phases and Stages is presented in Section 5.7.

7.3 ANALYSIS OF ADDITIONAL CSO CONTROL TECHNOLOGIES

A wide range of CSO control technologies was considered for application to New York City's Combined Sewer System (CSS). The technologies are grouped into the following general categories:

- Source Control
- Inflow Control
- Sewer System Optimization
- Sewer Separation
- Storage
- Treatment, and
- Receiving Water Improvement

Each technology is described below along with a discussion of the suitability of implementing it as a control technology for Alley Creek and Little Neck Bay. Table 7-2 lists the various CSO control technologies typically included within each of the general categories. Information is provided regarding implementation and operational factors that should be considered when evaluating the control technologies for a given locale. The table also indicates the general effectiveness of each control technology for four performance criteria including CSO volume reduction, bacteria reduction, floatables capture, and suspended solids reduction. It should be noted that a technology receiving "low" or "none" for some performance parameters does not preclude that technology from being considered for Alley Creek and Little Neck Bay. There are other areas where the control technology could be effective, such as improving dissolved oxygen in the waterbody, or the technology could be utilized in conjunction with another control technology.

7.3.1 Source Control

To control pollutants at their source, management practices can be applied where pollutants accumulate. Source management practices are described below:

- Public Education – Public education programs can be aimed at reducing (1) littering by the public and the potential for litter to be discharged to receiving waters during CSO events and (2) illegal dumping of contaminants in the sewer system that could be discharged to receiving waters during rain events. Public education programs cannot reduce the volume, frequency or duration of CSO overflows, but can help improve CSO quality by reducing floatable debris in particular. Public education and information is an integral part of any LTCP. Public Education is also an ongoing activity within NYCDEP (New York City Floatable Litter Reduction: Institutional, Regulatory and Public Education Programs, City of New York, Department of Environmental Protection, April 29, 2005).

Table 7-2. Assessment of CSO Control Technologies

CSO Control Technology	Performance: CSO Volume	Performance: Bacteria	Performance: Floatables	Performance: Suspended Solids	Implementation and Operational Factors
Source Control					
Public Education	None	Low	Med.	Low	Cannot reduce the volume, frequency or duration of CSO overflows.
Street Sweeping	None	Low	Med.	Med.	Effective at floatables removal, cost-intensive O&M. Ineffective at reducing CSO volume, bacteria and very fine particulate pollution.
Construction Site Erosion Control	None	Low	Low	Med.	Reduces sewer sediment loading, enforcement required. Contractor pays for controls.
Catch Basin Cleaning	None	Very Low	Med.	Low	Labor intensive, requires specialized equipment.
Industrial Pretreatment	Low	Low	Low	Low	There is limited industrial activity in and out of combined sewer area.
Inflow Control					
Storm Water Detention	Med.	Med.	Med.	Med.	Requires large area in congested urban environment, potential siting difficulties and public opposition, construction would be disruptive to affected areas, increased O&M.
Street Storage of Storm Water	Med.	Med.	Med.	Med.	Potential flooding and freezing problems, public opposition, low operational cost.
Water Conservation	Low	Low	Low	Low	Potentially reduces dry weather flow making room for CSO, ancillary benefit is reduced water consumption
Inflow/Infiltration Control	Low	Low	Low	Low	Infiltration usually lower volume than inflow, infiltration can be difficult to control
Green Solutions	Low.	Med.	Low	Med.	Site specific, requires widespread application across city to be effective, potential to be cost intensive in some areas.
Sewer System Optimization					
Optimize Existing System	Med.	Med.	Med.	Med.	Low cost relative to large scale structural BMPs, limited by existing system volume and dry weather flow dam elevations.
Real Time Control	Med.	Med.	Med.	Med.	Highly automated system, increased O&M, increased potential for sewer backups.
Sewer Separation					
Complete Separation	High	Med.	Low	Low	Disruptive to affected areas, cost intensive, potential for increased stormwater pollutant loads, requires homeowner participation.
Partial Separation	High	Med.	Low	Low	Disruptive to affected areas, cost intensive, potential for increased stormwater pollutant loads.
Rain Leader Disconnection	Med.	Med.	Low	Low	Low cost, requires home and business owner participation, potential for increased storm water pollutant loads.
Storage					
Closed Concrete Tanks	High	High	High	High	Requires large space, disruptive to affected area, cost intensive, aesthetically acceptable.

Table 7-2. Assessment of CSO Control Technologies

CSO Control Technology	Performance: CSO Volume	Performance: Bacteria	Performance: Floatables	Performance: Suspended Solids	Implementation and Operational Factors
Storage Pipelines/Conduits	High	High	High	High	Disruptive to affected areas, potentially expensive in congested urban areas, aesthetically acceptable, provides storage and conveyance.
Tunnels	High	High	High	High	Non-disruptive, requires little area at ground level, capital intensive, provides storage and conveyance, pump station required to lift stored flow out of tunnel.
Treatment					
Screening/ Netting Systems	None	None	High	None	Controls only floatables.
Primary Sedimentation[(1)]	Low	Med.	High	Med.	Limited space at WPCP, difficult to site in urban areas.
Vortex Separator (includes Swirl Concentrators)	None	Low	High	Low	Variable pollutant removal performance. Depending on available head, may require foul sewer flows to be pumped to the WPCP and other flow controls with increased O&M.
High Rate Physical/Chemical Treatment[1]	None	Med.	High	High	Limited space at WPCP, requires construction of extensive new conveyance conduits, high O&M costs.
Disinfection	None	High	None	None	Cost Intensive/Increased O&M.
Expansion of WPCP	High	High	High	High	Limited by space at WPCP, increased O&M.
Receiving Water Improvement					
Outfall Relocation	High	High	High	High	Relocates discharge to different area, requires the construction of extensive new conveyance conduits.
In-stream Aeration	None	None	None	None	High O&M, only effective for increasing DO, limited effective area.
Maintenance Dredging	None	None	None	None	Removes deposited solids after build-up occurs.
Solids and Floatables Controls					
Netting Systems	None	None	High	None	Easy to implement, potential negative aesthetic impact
Containment Booms	None	None	High	None	Simple to install, difficult to clean, negative aesthetic impact
Skimming Vessels	None	None	High	None	Easy to implement but limited to navigable waters
Manual Bar Screens	None	None	High	None	Prone to clogging, requires manual maintenance
Weir Mounted Screens	None	None	High	None	Relatively low maintenance, requires suitable physical configuration, must bring power to site
Fixed baffles	None	None	High	None	Low maintenance, easy to install, requires proper hydraulic configuration
Floating Baffles	None	None	High	None	Moving parts make them susceptible to failure
Catch Basin Modifications/Hooding	None	None	High	None	Requires suitable catch basin configuration and increases maintenance efforts

(1) Process includes pretreatment screening and disinfection

- Street Sweeping – The major objectives of municipal street cleaning are to enhance the aesthetic appearance of streets by periodically removing the surface accumulation of litter, debris, dust and dirt, and to prevent these pollutants from entering storm or combined sewers. Common methods of street cleaning are manual, mechanical and vacuum sweepers, and street flushing. Studies on the effect of street sweeping on the reduction of floatables and pollutants in runoff have been conducted. New York City found that street cleaning can be effective in removing floatables. Increasing street cleaning frequency from twice per week to six times per week reduced floatables by about 42 percent on an item count basis at a very high cost. A significant quantity of floatables was found to be located on sidewalks that were not cleanable by conventional equipment. (HydroQual, 1995). However, in spite of these limitations, the Department of Sanitation of New York City (DSNY) does have a regular street sweeping program targeting litter reduction. The DSNY also has an aggressive enforcement program targeting property owners to minimize the amount of litter on their sidewalks. These programs are elements of New York City's City-Wide Comprehensive CSO Floatables Plan (City-Wide Comprehensive CSO Floatables Plan, Modified Facility Planning Report, City of New York, Department of Environmental Protection, July 2005)

  Studies, funded by the National Urban Renewal Program (NURP) during the late 1970s to the early 1980s, reported that street sweeping was generally ineffective at removing pollutants and improving the quality of urban runoff (MWCOG, 1983 and USEPA, 1983). The principal reason for this is that mechanical sweepers, employed at the time, could not pick up the finer particles (diameter < 60 microns). Studies have shown that these fine particles contain a majority of the target pollutants on city streets that are washed into sewer systems (Sutherland, 1995). In the early 1990s new vacuum-assisted sweeper technology was introduced that can pick up the finer particles along city streets. A recent study showed that these vacuum-assisted sweepers have a 70 percent pickup efficiency for particles less than 60 microns (Sutherland, 1995).

  Street sweeping only affects the pollutant concentration in the runoff component of combined sewer flows. Thus, a street sweeping program is ineffective at reducing the volume and frequency of CSO events. Furthermore, the total area accessible to sweepers is limited. Areas such as sidewalks, traffic islands, and congested street parking areas cannot be cleaned using this method. Although a street sweeping program employing high efficiency sweepers could reduce the concentrations of some pollutants in CSOs, bacteriological pollution originates primarily from the sanitary component of sewer flows. Thus, minimal reductions in fecal coliform and e. coli concentrations of CSOs would be expected.

- Construction Site Erosion Control – Construction site erosion control involves management practices aimed at controlling the washing of sediment and silt from disturbed land associated with construction activity. Erosion control has the potential to reduce solids concentrations in CSOs and reduce sewer cleanout O&M costs.

- Catch Basin Cleaning – The major objective of catch basin cleaning is to reduce conveyance of solids and floatables to the combined sewer system by regularly removing accumulated catch basin deposits. Methods to clean catch basins include manual, bucket, and vacuum removal. Cleaning catch basins can only remove an average of 1-2 percent of the BOD_5 produced by a combined sewer watershed (USEPA, 1977). As a result, catch basins cannot be considered an effective pollution control alternative for BOD removal. While catch basins can be effective in reducing floatables in combined sewers, catch basin cleaning does not necessarily increase floatables retention in the catch basin.

New York City has an aggressive catch basin hooding program to contain floatables within catch basins and remove the material through catch basin cleaning (City-Wide Comprehensive CSO Floatables Plan, Modified Facility Planning Report, City of New York, Department of Environmental Protection, July 2005).

- Industrial Pretreatment – Industrial pretreatment programs are geared toward reducing potential contaminants in CSO by controlling industrial discharges to the sewer system.

Summary of Source Control Technologies

The City already has myriad source-control programs in place. Public education and outreach with information are on-going NYCDEP activities. The City's CEQR program addresses construction site erosion control. The City-wide Comprehensive CSO Floatables Plan features both street sweeping and catch basin cleaning as source control elements. Finally, the City's successful industrial pretreatment program has been in place since 1987. Therefore, source controls are being effectively implemented to a satisfactory level.

7.3.2 Inflow Control

Inflow control involves eliminating or retarding storm water inflow to the combined sewer system, lowering the magnitude of the peak flow through the system, and thereby reducing overflows. Methods for inflow control are described below:

- Storm Water Detention – Storm water detention utilizes a surface storage basin or facility to capture storm water before it enters the combined sewer system. Typically, a flow restriction device is added to the catch basin to effectively block storm water from entering the basin. The storm water is then diverted along natural or man-made drainage routes to a surface storage basin or "pond-like" facility where evaporation and/or natural soil percolation eventually empties the basin. Such systems are applicable for smaller land areas, typically up to 75 acres, and are more suitable for non-urban areas. Such a system is not considered viable for a highly congested urban area such as New York City. Storm water blocked from entering catch basins would be routed along streets to the detention pond which would be built in the urban environment. Extensive public education and testing is required to build support for this control and to address public concerns such as potential unsafe travel conditions, flood damage, and damage to roadways.

- Street Storage of Stormwater – Street storage of storm water utilizes the City's streets to temporarily store storm water on the road surface. Typically, the catch basin is modified to include a flow restriction device. This device limits the rate at which surface runoff enters the combined sewer system. The excess stormwater is retained on the roadway entering the catch basin at a controlled rate. Street storage can effectively reduce inflow during peak periods and can decrease CSO volume. It also can promote street flooding and must be carefully evaluated and planned to ensure that unsafe travel conditions and damage to roadways do not occur. For these reasons, street storage of stormwater is not considered a viable CSO control technology in New York City.

- Water Conservation, Infiltration/Inflow (I/I) Reduction - Water conservation and infiltration control are both geared toward reducing the dry weather flow in the system, thereby allowing the system to accommodate more CSO. Water conservation includes measures such as installing low flow fixtures, public education to reduce wasted water, leak detection and correction, and other programs. The City of New York has an on-going water conservation and public education program. The NYCDEP's ongoing efforts to save water include: installing home meters to encourage conservation; use of sonar equipment to survey all water piping for leaks; replacement of approximately 70 miles of old water supply pipe a year; and equipping fire hydrants with special locking devices. These programs in conjunction with other on-going water conservation programs have resulted in the reduction of water consumption by approximately 200 MG per day over a 12 year period.

  Infiltration is groundwater that enters the collection system through leaking pipe joints, cracked pipes, manholes, and other similar sources. Excessive amounts of infiltration can take up hydraulic capacity in the collection system. In contrast, inflow in the form of surface drainage is intended to enter the CSS. For combined sewer communities, sources of inflow that might be controlled include leaking or missing tide gates and inflow in the separate sanitary system located upstream of the CSS. New York City has achieved significant reductions in wastewater flow through its existing water conservation program.

- Green Solutions/Low Impact Development – For the purposes of this Waterbody/Watershed Facility Plan, "green solutions" encompasses a range of techniques that includes stormwater best management practices (BMPs) and low-impact development (LID). The goal of green solutions is to mimic predevelopment site hydrology to capture, infiltrate, evaporate, and detain runoff to reduce both the volume of stormwater generated by a site and its peak overflow rate, thereby improving the quality of the stormwater. Green solutions are promising, and their potential benefits extend beyond stormwater management to include habitat restoration, heat island mitigation, and urban aesthetics.

  Data are available to assess the cost and benefits of green solutions to undeveloped sites. However, few studies have been conducted for applying green solutions to urban areas such as New York City, where high-density development, existing infrastructure, and land acquisition issues tend to counterbalance the environmental benefits of implementation. In addition, input and acceptance by numerous City agencies will be necessary, including the Department of Parks and Recreation, the Department of Transportation, and the Department of Buildings.

  Common green solutions are described below:

  - Bioretention (rain garden) – a planting bed or landscaped area used to hold runoff and to allow it to infiltrate.

- Filter Strips – a band of vegetation located between the runoff location and the receiving channel or waterbody. Overland flow over the filter strip allows infiltration and filtering of storm water.

- Vegetated Buffers – a strip of vegetation around such areas as water bodies to provide a means to rain to infiltrate into the soil. This slows and disperses storm water and allows some trapping of sediment.

- Grassed Swales – depressions designed to collect, treat, and retain runoff from a storm event. Swales can be designed to be dry or wet (with standing water) between rain events. Wet swales typically contain water tolerant vegetation and use natural processes to remove pollutants.

- Rain Barrels – a barrel placed at the end of a roof downspout to capture and hold runoff from roofs. The water in the barrel must be manually emptied onto the ground, or it can be put to beneficial use to water vegetation. The barrel top typically has a completely sealed lid and a downspout diverter to direct overflow back to the roof leader.

- Cisterns – an oversized or underground tank that stores rain water from roofs for nonpotable reuse.

- Subsurface Open Bottom Detention Systems – an excavated trench backfilled with stone, perforated pipes or manufactured storm chambers to create a subsurface basin or trench that provides storage for water, allows stormwater to infiltrate, and releases water to the sewer system at a controlled rate.

- Blue Roofs – the practice of constructing rooftop detention to temporarily store and gradually drain rainwater off a building's rooftop via a controlled flow roof drain.

- Rooftop Green Roofs – the practice of constructing pre-cultivated vegetation mats on rooftops to capture rainfall, thereby reducing runoff and CSO.

- Increased Tree Cover – planting trees in the City to capture a portion of rainfall.

- Permeable Pavements – a type of surface material that reduces runoff by allowing precipitation to infiltrate through the paving material and into the earth.

Green solutions are distributive in nature (i.e., constructed within individual properties or in right-of-ways). The time necessary for enough of these source control measures to be in place and to have a substantial impact on stormwater inflows to the combined sewers is significantly longer than implementing more traditional CSO abatement approaches. In urban areas, it is not reasonable to demolish existing development or infrastructure just for the purpose of green solutions alone. It is generally accepted that green solutions are reasonable to apply with new development or construction within an urban area. Trenches excavated for street and sidewalk construction allow substantial BMP construction cost savings. Municipal codes or rules for new development may allow green solutions to be incorporated as part of site plans and building design and minimize potential economic hardship for property owners. In the case of existing development, significant participation and cooperation of business and private property owners as well as additional evaluations are necessary.

NYCDEP and other agencies, as described in the Mayor's Sustainable stormwater Management Plan, plan to conduct a number of pilot studies to assess the effectiveness of BMPs in New York City's urban environment. While there are numerous published studies about stormwater BMPs from other municipalities, various public agencies, and environmental organizations, there is a critical data gap of specific information related to the effectiveness and appropriateness of the use of these technologies within New York City.

The pilot projects are intended to fill that data gap through the conduction of multi-year studies to implement and monitor innovative stormwater treatment and volume reduction BMP technologies. The pilot projects will include the design, construction and monitoring of various BMPs to reduce runoff and associated stormwater pollutant loadings into the City's combined and storm sewers. Runoff will be directed into swales, wetlands, and BMPs rather than to combined and storm sewers discharging to waterbodies. As part of the pilot studies, stormwater capture volume and pollutant removal rates of each of the technologies will be documented. Once these technologies are proven to be effective, a wider citywide application of these technologies would be evaluated. See Section 5.8 for more detailed information about current NYCDEP pilot projects and evaluations of green solutions.

The anticipated environmental benefits of identifying Green Site Design (GSD) or BMPs for use in New York City can be grouped into three categories. The first category relates to the capture of the "first flush" of stormwater that contains the highest concentration of nitrogen, other nutrients and urban pollutants and reduce these discharges to the City's sewer system and surrounding waterbodies. The second category relates to reducing the volume of stormwater entering the combined sewer system. A reduction in the volume of stormwater entering the combined sewer system will also increase the ability of the City's WPCPs to properly treat a greater volume of sanitary wastewater and reduce the volume of sanitary wastewater discharged in CSOs. The third category relates to returning stormwater to the landscape and subsurface environments in order to benefit ecological communities and provide opportunities for open space.

The timeline for the study and evaluation of the green solutions further described in Section 5.8 will extend beyond the Consent Order milestones for delivery of approvable Waterbody/Watershed Facility Plans to NYCDEC; as a result, further evaluation of Source or Inflow Controls in the Gowanus Canal Waterbody/Watershed Facility Plan is not possible. However, green solutions will continue to undergo the rigorous level of evaluation necessary for programmatic implementation by the City of New York through parallel planning efforts as described in detail in Section 5. NYCDEP plans to provide updates on these evaluations and incorporate the most promising technologies into the CSO program where possible, cost-effective, and environmentally beneficial. Any solution satisfying these criteria could be included through a future modification when the WB/WS plan is converted to a Drainage Basin Specific Long Term Control Plan, a 5-

year update of a Drainage Basin Specific Long Term Control Plan or in the subsequent City-Wide Long Term Control Plan.

Summary of Inflow Control Technologies

Stormwater storage and detention are not viable options for the City of New York because of its highly urbanized character and the need for conveyance infrastructure to divert stormwaters from the combined sewers to the detention site. Further, any above-ground infrastructure would introduce public safety concerns associated with flooding, traffic and standing water health issues. In contrast, the remaining inflow control technologies have been successfully implemented by the City of New York. As noted above green solutions will continue to undergo the rigorous level of evaluation necessary for programmatic implementation by the City through parallel planning efforts. The NYCDEP's ongoing efforts in water conservation include home metering, sonar leak detection surveys, annual replacement of approximately 70 miles of old water supply piping, locking fire hydrants, and an ongoing public education program. These conservation efforts have collectively resulted in the reduction of water consumption by approximately 200 MGD over a 12 year period. Based on the fact that these technologies for storage and detention are either unfeasible or have been implemented to a satisfactory degree, inflow control is not retained for further consideration in the Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan.

7.3.3 Sewer System Optimization

This CSO control technology involves making the best use of existing facilities to limit overflows. The techniques are described below:

- Optimize Existing System – This approach involves evaluating the current standard operating procedures for facilities such as pump stations, control gates, inflatable dams, and treatment facilities to determine if improved operating procedures can be developed to provide benefit in terms of CSO control.

  As described in Section 5, previous and ongoing NYCDEP projects routinely consider alternatives to operating procedures to optimize the existing system. The operating procedures are satisfactorily implemented under the existing system. 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 in light of the unacceptably high risk that these alternatives would pose to flooding in the community. However, as the Alley Creek project is implemented and the existing system changes, NYCDEP will continue to look for new opportunities to optimize the system.

- Real Time Control (RTC) – RTC is any response, manual or automatic, made in response to changes in the sewer system condition. For example, sewer level and flow data can be measured in "real time" at key points in the sewer system and transferred to a control device such as a central computer where decisions are made to operate control components (such as gates, pump stations or inflatable dams) to maximize use of the existing sewer system and to limit overflows. Data monitoring need not be centralized since local dynamic controls can be used to control regulators to prevent localized flooding. However, system-wide dynamic controls are typically used to implement control objectives such as maximizing flow to the WPCP or transferring flows from one portion of the CSS to another to fully utilize the system. Predictive control, which incorporates use of weather forecast data is also possible, but is complex and requires sophisticated operational capabilities.

RTC can reduce CSO volumes where in-system storage capacity is available. In-system storage is a method of using excess sewer capacity by containing combined sewage within a sewer and releasing it to the WPCP after a storm event when capacity for treatment becomes available. Methods of equipping sewers for in-system storage include inflatable dams, mechanical gates and increased overflow weir elevations. RTC is being developed in other cities such as Louisville, Kentucky; Cleveland, Ohio; and Quebec, Canada. Refer to Figure 7-1 for a diagram of an example inflatable dam system. New York City has conducted an extensive pilot study of the use of inflatable dams (O'Brien & Gere, 2004) within the City's combined sewers. This pilot study involved the use of inflatable dams and RTC to control them at two locations in the Bronx: Metcalf Avenue and Lafayette Avenue. Through this study, the City found that the technology was feasible for further consideration. However, widespread application of inflatable dams and RTC is limited in NYC as it does not provide for the following: (1) storage of large enough volumes of combined sewage; (2) areas where tributary water quality is degraded, and; (3) adequate improvements in water quality. In addition to these factors, the City has considerable doubts about the viability of inflatable dams. At other locations in the city where inflatable dam systems were being designed, acquiring a bidder was difficult. Historically, there were only two manufacturers of inflatable dam systems. One no longer manufactures the dams and the other has curtailed service in the United States market. This creates a problem purchasing the system and does not ensure a reliable supply of replacement parts. While the use of dams may be manageable for a limited number of facilities, wide-spread application of dams may lead to ineffective operation creating a massive maintenance and operation issue and possible flooding due to malfunctions. The inflatable dams at Metcalf Avenue and Lafayette have been decommissioned and removed.

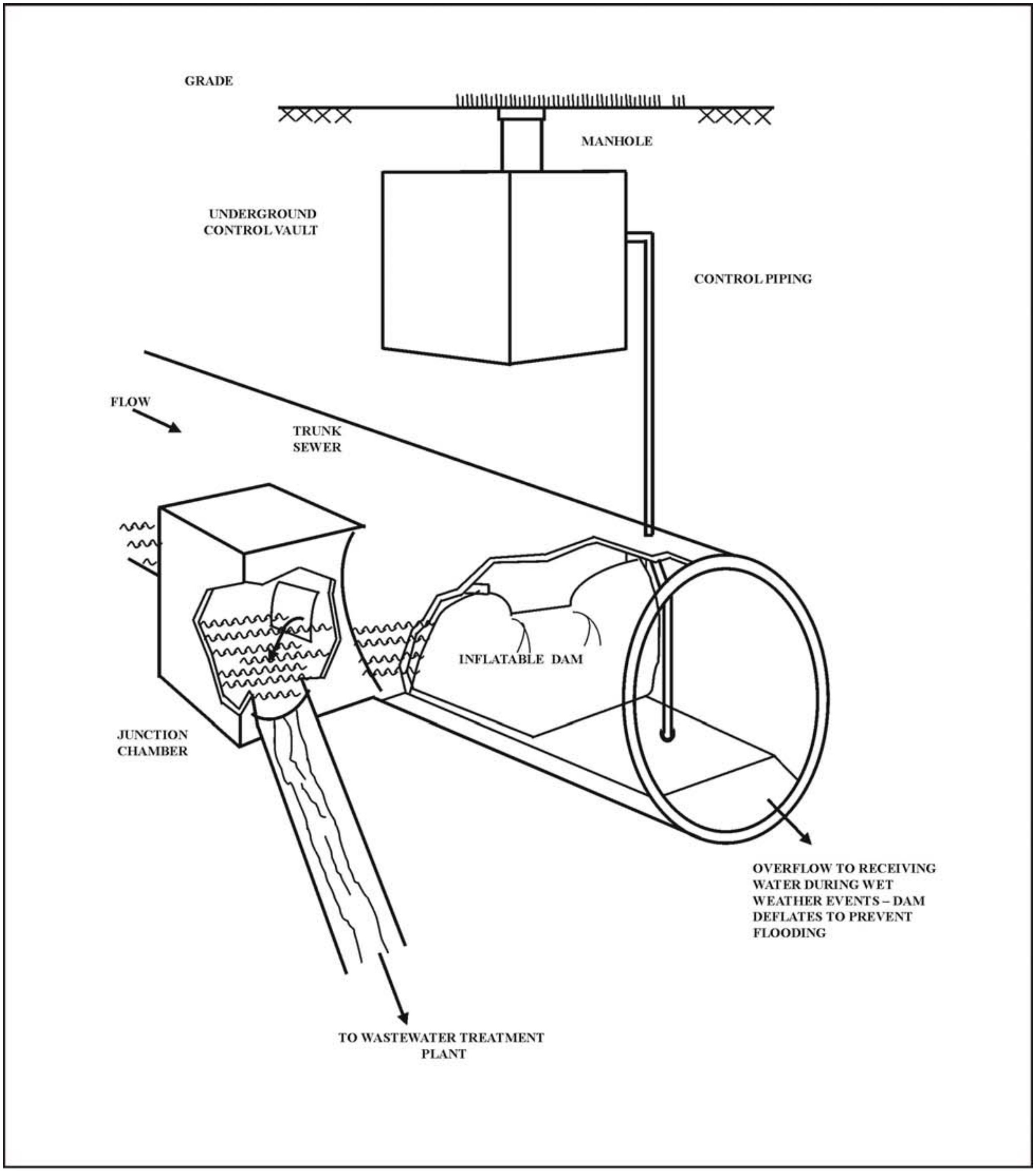
Real time control will not be retained for further consideration when evaluating potential alternatives for CSO control in Alley Creek.

Summary of Sewer System Optimization Technologies

The optimization of the sewer system through RTC of in-line technologies is not feasible within the Alley Creek and Little Neck Bay portion of the Tallman Island WPCP and was therefore eliminated from further consideration in the Waterbody/Watershed Facility Plan.

7.3.4 Sewer Separation

Sewer separation is the conversion of a combined sewer system into a system of separate sanitary sewers and storm sewers. This alternative prevents sanitary wastewater from being discharged to receiving waters. However, when combined sewers are separated, storm sewer discharges to the receiving waters will increase since storm water will no longer be captured and



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Inflatable Dam System

FIGURE 7-1

treated in the combined sewer system. Loading of some pollutants, such as floatables, would increase with sewer separation because concentrations of these pollutants are higher in storm water than in sanitary sewage. In addition, this alternative involves substantial excavation that would exacerbate street disruption problems within the City.

Varying degrees of sewer separation could be achieved as described below and illustrated in Figure 7-2. The simplest is to disconnect rain leaders from the combined sewer system and divert the stormwater elsewhere, such as a dry well, vegetation bed, lawn, storm sewer, or the street depending on the location. Partial separation can be accomplished separating the combined sewers only in the streets or other public rights-of way. This is accomplished by constructing either a new sanitary wastewater system or a new stormwater system. Complete separation**, i**n addition to separation of sewers in the streets, stormwater runoff from private residences or buildings (i.e. rooftops and parking lots) is also separated.

Complete separation is almost impossible to attain in New York City since it requires re-plumbing of apartment buildings, office buildings and commercial buildings where roof drains are interconnected to the sanitary plumbing inside the building and requires construction of a new conduit to convey stormwater to an appropriate destination or end use. In urban areas there is a lack of pervious areas to disperse the storm runoff into the ground, leading to nuisance flooding, and wet foundations and basements. These risks have led to the prohibition of stormwater disconnections from the combined sewers in the City Building Code. In addition, the widespread excavation and lengthy timeframes required to broadly implement separation would lead to unacceptable street disruptions and may not be feasible in areas with dense buried infrastructure.

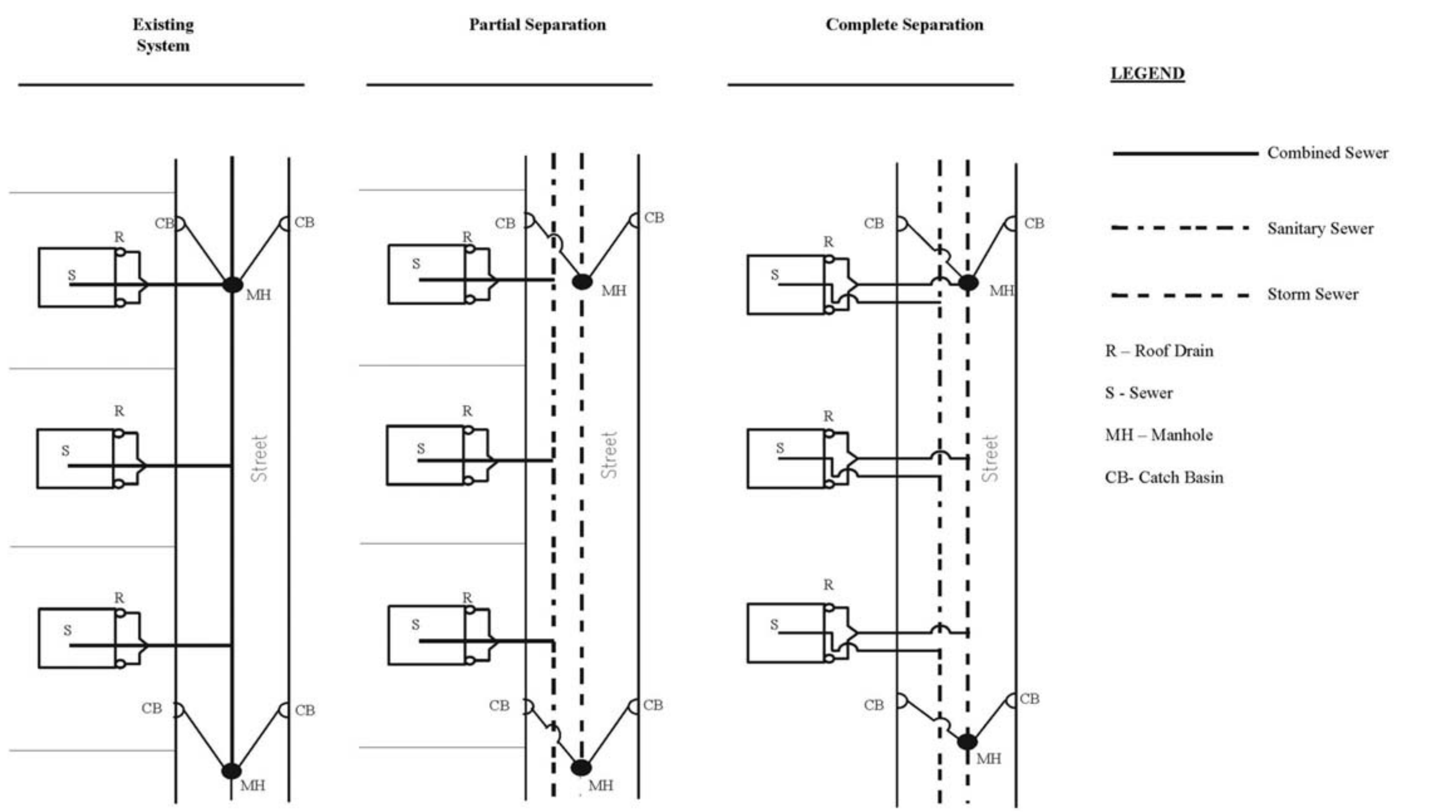
In areas that are adjacent to the waterbody, partial separation can be accomplished through construction of high level storm sewers (HLSS). This is a potentially feasible alternative that is featured in the New York City Mayor's "PlaNYC 2030" initiative, and is being implemented by NYCDEP in select locations throughout the City undergoing new development.

Summary of Sewer Separation

In the Alley Creek and Little Neck Bay watershed, most of the non-parkland sewered areas adjacent to the waterbodies are already separately sewered (see Figure 1-2). Therefore, although NYCDEP will continue to promote and support opportunities for local partial separation through the construction of HLSS as new development continues into the future, partial separation will not be retained as an alternative for the Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan.

7.3.5 Storage

The objective of retention basins (also referred to as off-line storage) is to reduce overflows by capturing combined sewage in excess of WPCP capacity during wet weather for controlled release into wastewater treatment facilities after the storm. Retention basins can provide a relatively constant flow into the treatment plant and thus reduce the size of treatment facilities required.



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Sewer Separation Alternatives

FIGURE 7-2

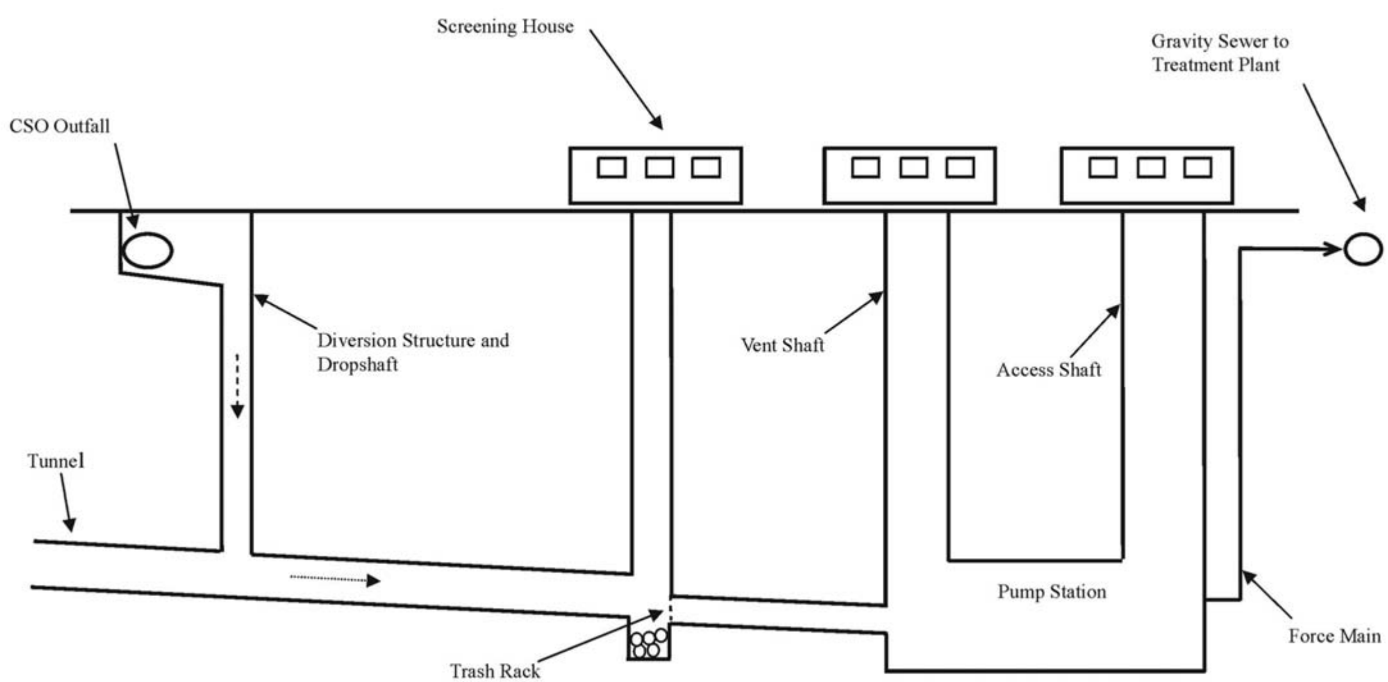
Retention basins have had considerable use and their performance is well documented. Retention facilities can be located at overflow points or near dry weather or wet weather treatment facilities. A major factor determining the feasibility of using retention basins is land availability. Operation and maintenance costs are generally small, typically requiring only collection and disposal cost for residual sludge solids, unless inlet or outlet pumping is required. Many demonstration projects have included storage of peak storm water flows, including those in Richmond, VA; Chippewa Falls, WI; Boston, MA; Milwaukee, WI; and Columbus, OH.

The following subsections discuss the most common types of CSO retention facilities:

- <u>Closed Concrete Tanks</u> – Closed concrete tanks are similar to open tanks except that the tanks are covered and include mechanical facilities to minimize their aesthetic and environmental impact. Closed concrete tanks typically include odor control systems, washdown/solids removal systems and access for cleaning and maintenance. Closed concrete tanks have been constructed below grade such that the overlying surface can be used for parks, playgrounds, parking or other light public uses.

- <u>Storage Pipelines/Conduits</u> – Large diameter pipelines or conduits can provide significant storage in addition to the ability to convey flow. The pipelines are fitted with some type of discharge control to allow flow to be stored within the pipeline during wet weather. After the rain event, the contents of the pipeline are allowed to flow by gravity along its length. A pipeline has the advantage of requiring a relatively small right-of-way for construction. The primary disadvantage is that it takes a relatively large diameter pipeline or cast-in-place conduit to provide the volume required to accommodate large periodic CSO flows. This is a greater construction effort than a pipeline used only for conveyance. For large CSO areas, pipeline size requirements may be so large that construction of a tunnel is more feasible.

- <u>Tunnels</u> – Tunnels are similar to storage pipelines in that they can provide both significant storage volume and conveyance capacity. Tunnels have the advantage of causing minimal surface disruption and of requiring little right-of-way for construction. Excavation to construct the tunnel is carried out deep beneath the city and therefore does not impact traffic. The ability to construct tunnels at a reasonable cost depends on the geology. Tunnels have been used in many CSO control plans including Chicago, Illinois; Rochester, New York; Cleveland, Ohio; Richmond, Virginia; and Toronto, Canada, among others. A schematic diagram of a typical storage tunnel system is shown in Figure 7-3. The storage tunnel stores flow and then conveys it to a tunnel dewatering station where floatables are removed at a screening house. Then flows are pumped for conveyance to the WPCP.



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Storage Tunnel Schematic

FIGURE 7-3

- Weirs – Bending weirs and static weirs such as stop logs are used to increase pre-overflow water levels, typically in interceptors and trunk sewers. Increased water levels in these applications provide additional interceptor flow capacity as well as storage of sewage and CSO. The bending weirs can be installed in both new and existing regulators. When installed in new regulators, the bending weir flow characteristics permit shorter weir lengths and thus an overall smaller structure. When installed in an existing regulator, often the bending weir can be installed directly onto the existing weir. Some modification to the structure is required to support the vertical end sections of the weir components. Reduction in CSO volume can only be evaluated, however, on a case-by-case basis.

  For the Alley Creek Waterbody/Watershed Facility Plan alternatives, weirs were investigated for increased storage when applied to Chamber 6, the chamber that directs CSO to the Tank and at the end of the tank itself. A general schematic of a bending weir is shown in Figure 7-4.

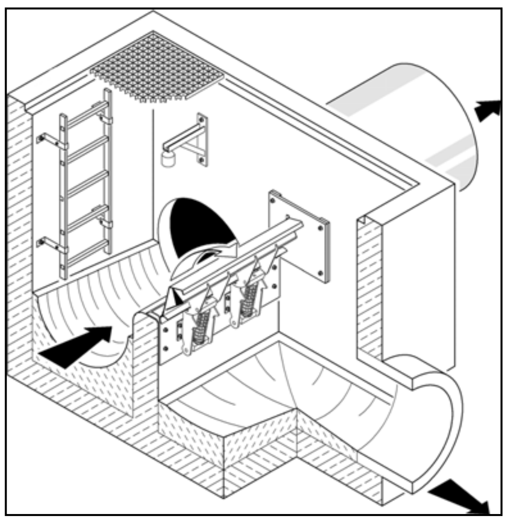


Figure 7-4. Bending Weir Schematic

Summary of Storage

Storage is the CSO control category selected and being implemented for Alley Creek and Little Neck Bay Facility Plan. Storage is the CSO control category selected for alternatives required to achieve a high degree of CSO reduction resulting in small numbers of overflow events and the achievement of total CSO reduction resulting in the elimination of overflow events. The Waterbody/Watershed storage technology selected was tanks, since there was only one location where storage was needed. In addition, the inclusion of weirs as an option to the Alley Creek Retention Facility already under construction was evaluated. Tunnels were not retained for further consideration in the Alley Creek and Little Neck Bay alternatives evaluation.

7.3.6 Treatment

Treatment alternatives include technologies intended to separate solids and/or floatables from the combined sewage flow, disinfect for pathogens treatment, or provide secondary treatment for some portion of the combined flow. The following are types of treatment technologies:

- Screening;
- Primary Sedimentation;
- Vortex Separation;
- High-rate Physical/Chemical Treatment;
- Disinfection; and
- Expansion of WPCP Treatment

The City of New York has experience with each of these treatment alternatives to varying degrees.

- Screening – The major objective of screening is to provide high rate solids/liquid separation for combined sewer floatables and debris thereby preventing floatables from entering receiving waters. Removal of solid material from a waste stream depends on the spacing or opening size of the screening barrier. Flow passes through the openings and solids are retained on the screen surface. The categories of screens applicable to CSO outfall applications can be in the shape of a rotary drum or linearly horizontal or vertically positioned.

  Trash racks are screens intended to remove large objects from overflow and have a clear spacing between approximately 1.5 to 3.0 inches. Manually cleaned bar racks are similar and have clear spacing between 1.0 to 2.0 inches. Both trash racks and bar racks must be either manually raked and the screenings allowed to drain before disposal, or cleaned with a Vactor truck. Mechanically cleaned bar screens typically have clear spacing between 0.25 and 1.0 inches. Bars are mounted 0 to 39 degrees from the vertical and rake mechanisms periodically remove material trapped on the bar screen. Facilities are typically located in a building to house collected screenings after a CSO events and then transported to a landfill.

  Fine screens in CSO facilities typically follow bar screens and have openings between 0.010 and 0.5 inches. Proprietary screens such as ROMAG have been specifically designed for wet weather applications. These screens retain solids on the dry weather side of the system so they can be conveyed to the wastewater treatment plant with the sanitary wastewater thereby minimizing the need for manual collection of screenings. Depending on the type of screening technology used, facilities may require a building to house the screens and store the retained screenings that then must be collected after each CSO event and transported to a landfill.

Manually cleaned screens for CSO control at remote locations have not been widely applied due to the need to clean screens, and the potential to cause flooding if screens blind. Mechanically cleaned screens have had much greater application at CSO facilities. Due to the widely varying nature of CSO flow rates, even mechanically cleaned screens are subject to blinding under certain conditions. In addition, the screening must be housed in a building to address aesthetic concerns and may require odor facilities as well. Fine screens have had more limited application for CSOs in the United States. ROMAG reports that over 250 fine screens have been installed in Europe and several screens have been installed in the United States (USEPA, 1999a).

- Primary Sedimentation – The objective of sedimentation is to produce a clarified effluent by gravitational settling of the suspended particles that are heavier than water. It is one of the most common and well-established unit operations for wastewater treatment. Sedimentation tanks also provide storage capacity, and disinfection can occur concurrently in the same tank. It is also very adaptable for chemical additives, such as lime, alum, ferric chloride, and polymers, which provide higher suspended solids and BOD_5 removal. Many CSO control demonstration projects have included sedimentation. These include Dallas, Texas; Saginaw, Michigan; and Mt. Clements, Michigan (USEPA, 1978). Studies on existing storm water basins indicate suspended solids removals of 15 to 89 percent; BOD_5 removals of 10 to 52 percent (USEPA, 1978, Fair and Geyer, 1965, Ferrara and Witkowski, 1983, Oliver and Gigoropolulos, 1981).

  The NYCDEP's WPCPs are designed to accept their respective 2×DDWF for primary treatment during wet weather events. As such, NYC already controls a significant portion of combined sewage through the use of this technology.

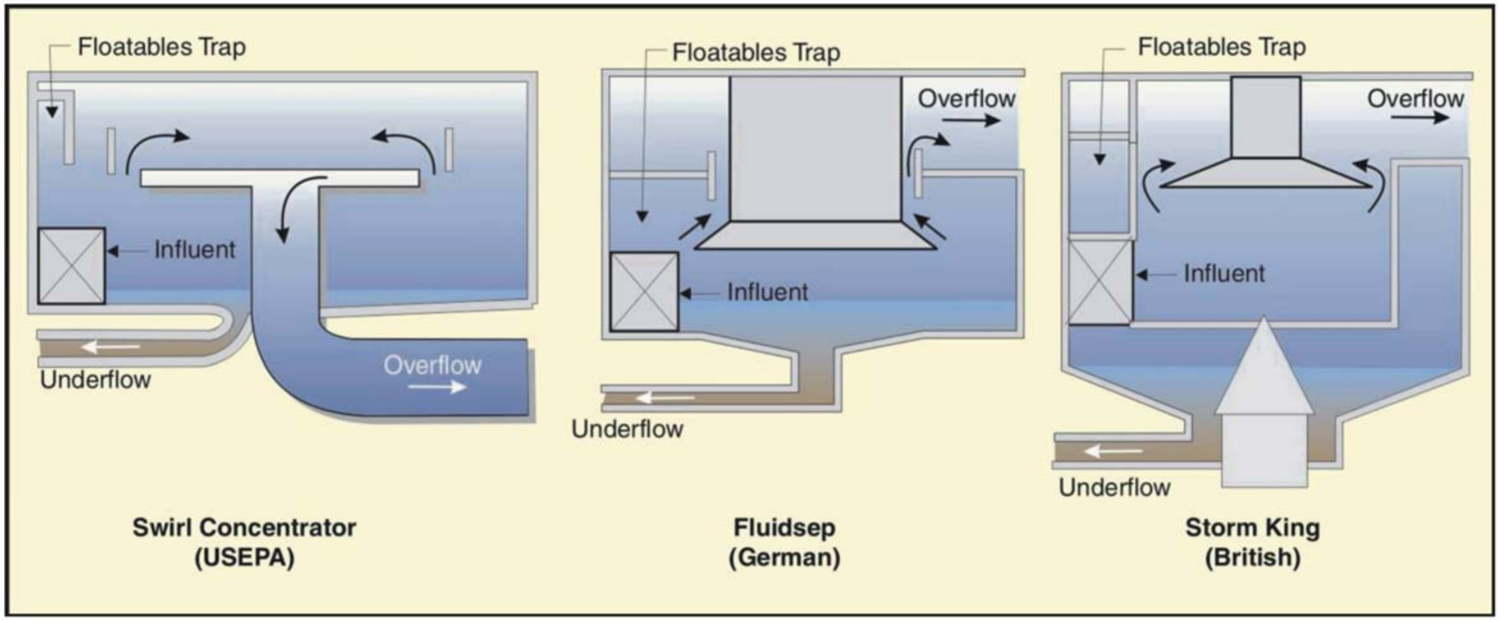
- Vortex Separation – Vortex separation technologies currently marketed include: USEPA Swirl Concentrator, Storm King Hydrodynamic Separator of British design, and the FluidSep vortex separator of German design. Although each of the three is configured somewhat differently, the operation of each unit and the mechanisms for solids separation are similar. Flow enters the unit tangentially and is directed around the perimeter of a cylinder, creating a swirling, vortex pattern. The swirling action causes solids to move to the outside wall and fall toward the bottom, where the solids concentrated flow is conveyed through a sewer line to the WPCP. The overflow is discharged over a weir at the top of the unit. Various baffle arrangements capture floatables that are subsequently carried out in the underflow. Principal attributes of the vortex separator are the ability to treat high flows in a very small footprint, and a lack of mechanical components and moving parts, thereby reducing operation and maintenance.

  Vortex separators have been operated in a number of cities, including Decatur, Illinois, Columbus, Georgia, Syracuse and Rochester, New York, Lancaster, Pennsylvania, West Roxbury, Massachusetts, Indianapolis, Indiana; and Toronto, Ontario, Canada. Vortex separator prototypes have achieved suspended solids removals of 12 to 86 percent in Lancaster, 18 to 55 percent in Syracuse and 6 to 36 percent in West Roxbury. BOD_5 removals from 29 to 79 percent have been achieved with the swirl concentrator prototype in Syracuse(Alquier, 1982).

New York City evaluated the performance of three swirl/vortex technologies at a full-scale test facility (133 MGD each) at the Corona Avenue Vortex Facility (see Figure 7-5). The purpose of the test was to demonstrate the effectiveness of the vortex technology for control of CSO pollutants, primarily floatables, oil and grease, settleable solids and total suspended solids. The two-year testing program, initiated in late 1999, evaluated the floatables removal performance of the facility for a total of 22 wet weather events. Overall, the results indicated that the vortex units provided an average floatables removal of approximately 60 percent during the tested events. Based on the results of the testing, NYCDEP concluded that widespread application of the vortex technology is not effective for control of settleable solids and was not a cost effective way to control floatables. As such, the application of this technology will be limited and other methods to control floatable discharges into receiving waters will need to be assessed.

Also, the performance of vortex separators has been found to be inconsistent in other demonstrations. A pilot study in Richmond, Virginia showed that the performance of two vortex separators was irregular and ranged from <0 percent to 26 percent with an average removal efficiency of about 6 percent (Greeley and Hansen, 1995). The performance of vortex separators is also a strong function of influent TSS concentrations. A high average influent TSS concentration will yield a higher percent removal. As a result, if influent CSO is very dilute with storm water, the overall TSS removal will be low. Suspended solids removal in the beginning of a storm may be better if there is a pronounced first flush period with high solids concentrations (City of Indianapolis, 1996). Removal effectiveness is also a function of the hydraulic loading rate with better performance observed at lower loading rates. Furthermore, one of the advantages of vortex separation, the lack of required moving parts, requires sufficient driving head. Based on the poor results of the testing at the Corona Vortex Facility (NYCDEP, 2003b; HydroQual, 2005e), and the general lack of available head, vortex separators have been removed from further consideration in New York City.

<u>High Rate Physical/Chemical Treatment (HRPCT)</u> – High rate physical/chemical treatment is a traditional gravity settling process enhanced with flocculation and settling aids to increase loading rates and improve performance. The pretreatment requirements for high rate treatment are screening and degritting, identical to that required prior to primary sedimentation. The first stage of HRPCT is coagulant addition, where ferric chloride, alum or a similar coagulant is added and rapidly mixed into solution. Degritting may be incorporated into the coagulation stage with a larger tank designed for gravity settling of grit material. The coagulation stage is followed by a flocculation stage where polymer is added and mixed to form floc particles that will settle in the following stage. Also in this stage recycled sludge or micro sand from the settling stage is added back in to improve the flocculation process. Finally, the wastewater enters the gravity settling stage that is enhanced by lamella tubes or plates. Disinfection, which is not part of the HRPCT process, typically is performed on the HRPCT effluent. Sludge is collected at the bottom of the clarifier and either pumped back to the flocculation stage or wasted periodically when sludge blanket depths become too high.



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Schematic Diagrams of the Three Vortex Technologies Tested at CAVF

FIGURE 7-5

Pilot testing of HRPCT was performed from May through August 1999 at the 26th Ward WPCP in Brooklyn. Equipment from three leading HRPCT manufacturers: the Ballasted Floc Reactor™ from Microsep/US Filter, the Actiflo™ from Kruger and the Densadeg 4D™ from Infilco Degremont was tested. Pilot testing suggested good to excellent performance on all units, often in excess of 80 percent for TSS and 50 percent for BOD_5. However, operational challenges suggested the need for further testing, which was to be performed in a demonstration-scale facility to be located at the Port Richmond WPCP on Staten Island. Subsequent facility planning did not result in any opportunities to apply this technology for CSO abatement in New York City. Consequently, the demonstration project has been indefinitely postponed.

- Disinfection – The major objective of disinfection is to control the discharge of pathogenic microorganisms in receiving waters. Disinfection of combined sewer overflow is included as part of many CSO treatment facilities, including those in Washington, D.C.; Boston, Massachusetts; Rochester, New York; and Syracuse, New York. The disinfection methods considered for use in combined sewer overflow treatment are chlorine gas, calcium or sodium hypochlorite, chloride dioxide, peracetic acid, ozone, ultraviolet radiation, and electron beam irradiation (USEPA, 1999b and 1999c).

  Three disinfection technologies, chlorine, ozone and ultraviolet radiation were preliminarily evaluated by NYCDEP for the Paerdegat Basin LTCP based on technical feasibility, effectiveness, adverse side effects (e.g. residuals) and comparative cost (NYCDEP, 2005b). Chlorination has greater applicability to CSO than the others on a scale necessary. Chlorination was determined to be by far the most cost effective of the three technologies and to have the advantage of NYCDEP experience. Chlorine disinfection using sodium hypochlorite was considered the preferred option for Paerdegat. However, the results of water quality modeling indicated that the chlorine residual concentrations at the head end of the basin would exceed the NYSDEC acute toxicity standard routinely and the spatial extent of the standard contravention included a substantial portion of the waterbody. Thus the aquatic life use would be impaired for a marginal improvement in bacteria.

  These results were considered to be applicable to Alley Creek because of the similar physical characteristics (narrow tributary, little mixing). Because of the ecosystem risk, the absence of any resultant primary contact use and the operational challenges associated with the highly variable nature of CSOs and water quality (i.e. chlorine demand), disinfection was precluded from consideration in the Paerdegat Basin LTCP. Since the marginal benefit to primary contact recreation expected does not justify the ecosystem risk, disinfection was not included as a control alternative in the Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan analyses.

- Expansion of WPCP Treatment– NYCDEP developed the WWOP Tallman Island WPCP (see Appendix A) per NYSDEC requirements. The WWOP, which is currently under NYSDEC review, provides recommendations for maximizing treatment of flow during wet weather events. The report outlines three primary objectives in maximizing treatment for wet-weather flows: (1) maximize plant wet-weather inflows to prevent overflows from the collection system regulators and provide primary treatment and disinfection to up to 2xDDWF; (2) provide secondary treatment for wet-weather flows up to 1.5xDDWF to maximize pollutant removal during wet-weather events; and (3) maintain reasonably high effluent quality during wet weather while allowing for a subsequent, stable recovery to dry-weather operations. With this WWOP implemented, NYCDEP is implementing this alternative at the Tallman Island WPCP.

Planned upgrades for the Tallman Island WPCP, necessary to comply with the Nitrogen Control Consent Order and address the facility's critical needs, are detailed in Section 3.1.3. Additional treatment plant upgrades and/or expansion of the WPCP were not considered to be feasible CSO alternatives principally due to the site's physical constraints. The WPCP site is bounded on three sides by water and an adjacent residential neighborhood on the fourth side.

Summary of Treatment Technologies

None of the treatment technologies were retained for the Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan alternatives evaluation.

7.3.7 Receiving Water Improvement

Receiving waters such as Alley Creek and Little Neck Bay can also be treated directly with various technologies that improve water quality. These include outfall relocation, aeration, use of flushing water, and dredging.

- Outfall Relocation – Outfall relocation involves moving the combined sewer outfall to another location. For example, an outfall may be relocated away from a sensitive area to prevent negative impacts to that area. Since there is a beach on Little Neck Bay, the bay is a sensitive area. Outfall relocation was considered indirectly when the water quality impact of 100 Percent CSO Reduction was analyzed.

- Aeration – Aeration improves the dissolved oxygen content of the river by adding air directly to the waterbody ("in-stream aeration"). Air could possibly be added in large enough volumes to increase dissolved oxygen in the waterbody to meet the ambient water quality standards. However, shallow water-column depths and soft substrates can limit the effectiveness and applicability of in-stream aeration. Furthermore, depending on the amount of air that would be required to be transferred into the water column, the facilities necessary and the delivery systems could be extensive and impractical. An alternative would be to deliver a lower volume of air and control short term anoxic conditions that may result from intermittent wet weather overflows. NYCDEP has investigated in-stream aeration as a method of meeting dissolved oxygen standards and will be conducting pilot tested this technology within Newtown Creek over the next few years.

  There are several possible disadvantages to installing in-stream aeration in Alley Creek. In addition to the possible logistical problems associated with the infrastructure requirements, vandalism, operation/maintenance and the effectiveness of a forced air diffusion system in a particular application can be difficult to predict. Aeration systems can result in unintended consequences such as an increase in odors, as gasses are stripped and sediment is disturbed. In some cases, dredging is required to establish a sufficient depth for the transfer of oxygen into the water representing a disturbance to bottom habitat. Alley Creek is a narrow, shallow, tidal creek. The headwater riparian area is within Alley Pond Park. In-stream aeration is not applicable in a shallow waterbody. Dredging is not being considered for Alley Creek.

Based upon the above discussion, aeration is not considered to be a feasible alternative for Alley Creek. However, should the pilot testing of this technology in Newtown Creek indicate applicability at a site such as Alley Creek, aeration could be re-evaluated at a future date.

- Flushing Water – The addition of flushing water at the head end of dead-end waterbodies improves circulation, purging pollutant-laden water from the water body while bringing in cleaner water with higher dissolved oxygen. The Gowanus Canal Flushing Tunnel, which was initially completed in 1911, is an existing example of this technology.

- Dredging - Maintenance dredging technology is essentially the dredging of settled CSO solids from the bottom of waterbodies on an interim basis. The settled solids would be dredged from the receiving waterbody as needed to prevent use impairments such as access by recreational boater/kyackers and/or abate nuisance conditions such as odors. The concept would be to conduct dredging periodically or routinely to prevent the use impairment/nuisance conditions from occurring. Dredging would be conducted as an alternative to structural CSO controls such as storage. Bottom water conditions between dredging operations would likely not comply with dissolved oxygen standards and bottom habitat would degrade following each dredging.

Summary of Receiving Water Improvement Technologies

The receiving water improvement methods discussed above: outfall relocation, aeration, introduction of flushing water and dredging, were not retained for consideration in the development of Alley Creek and Little Neck Bay Waterbody/Watershed alternatives.

7.3.8 Solids and Floatables Control

Technologies that provide solids and floatables control do not reduce the frequency or magnitude of CSO overflows, but can reduce the presence of aesthetically objectionable items such as plastic, paper, polystyrene and sanitary “toilet litter” matter, etc. These technologies include both end-of-pipe technologies such as netting and screens, as well as BMPs such as catch basin modifications and street cleaning which could be implemented upstream of outfalls in the drainage area. Each of these technologies is summarized below:

- Netting Devices **-** Netting devices can be used to separate floatables from CSOs by passing the flow through a set of netted bags. Floatables are retained in the bags, and the bags are periodically removed for disposal. Netting systems can be located in-water at the end of the pipe, or can be placed in-line to remove the floatables before discharge to the receiving waters. NYCDEP has installed a floating end of pipe netting system at CSO TI-023 located in Little Bay.

- Containment Booms - Containment booms are specially fabricated floatation structures with suspended curtains designed to capture buoyant materials. They are typically anchored to a shoreline structure and to the bottom of the receiving water. After a rain event, collected materials can be removed using either a skimmer vessel or a land-based vacuum truck. A 2-year pilot study of containment booms was conducted by New York City in Jamaica Bay. An assessment of the effectiveness indicated that the containment booms provided a retention efficiency of approximately 75 percent.

  As part of its Interim Floatables Containment Program (IFCP), NYCDEP currently operates floatables booms at various locations city-wide. There are no IFCP booms in Alley Creek or Little Neck Bay.

- Skimmer Vessels – Skimmer vessels remove materials floating within a few inches of the water surface and are being used in various cities, including New York. The vessels range in size from less than 30 feet to more than 100 feet long. They can be equipped with moving screens on a conveyor belt system to separate floatables from the water or with nets that can be lowered into the water to collect the materials. Skimmer vessels are typically effective in areas where currents are relatively slow-moving and can also be employed in open-water areas where slicks from floatables form due to tidal and meteorological conditions. New York City currently operates skimmer vessels to service containment boom sites and to conduct open-water operations.

- Screens – As discussed previously, several types of screens have utility in CSO abatement, although floatables capture efficiency varies. Manually cleaned bar screens can be located within in-line CSO chambers or at the point of outfall to capture floatables. The configuration of the screen would be similar to that found in the influent channels of small wastewater pumping stations or treatment facilities. In CSO applications very high maintenance requirements and a propensity for clogging may limit their application. Horizontal weir mounted, mechanically cleaned screens use electric motors or hydraulic power packs to power a rake mechanism that is triggered by a float switch in the influent channel. The screened materials are returned to the interceptor sewer. Various screen configurations and bar openings are available depending on the manufacturer. Horizontal screens can be installed in new overflow weir chambers or retrofitted into existing structures if adequate space is available. Electric power service must be brought to each site.

- Baffles - A transverse baffle mounted in front of and typically perpendicular to the overflow pipe can be used to prevent the discharge of floatables by blocking their path to the overflow pipe. As the storm subsides, the floatables are conveyed to downstream facilities by the dry weather flow in the interceptor sewer. The applicability and effectiveness of the baffle depends on the configuration and hydraulic conditions at the regulator structure. Fixed underflow baffles are the simplest type and are basically rigid walls that cross the water surface. A variation on the fixed underflow baffle is the floating underflow baffle developed in Germany. By allowing the baffle to float, a greater range of hydraulic conditions can be accommodated. This technology has not yet been demonstrated in the United States; however, there are operating units in Germany. A hinged baffle with a bending weir offers an additional level of safety through an emergency release mechanism that eliminates emergency by-pass and power requirements thereby resulting in low operation and maintenance costs.

Baffles are being used in CSO applications in several locations including Boston, Massachusetts and Louisville, Kentucky. However, the typical regulator structures in New York City are not amenable to fixed baffle retrofits.

- Catch Basin Modifications - Catch basin modifications consist of various devices to prevent floatables from entering the CSS. Inlet grates and closed curb pieces reduce the amount of street litter and debris that enters the catch basin. Catch basin modifications such as hoods, submerged outlets, and vortex valves, alter the outlet pipe conditions and keep floatables from entering the CSS. Catch basin hoods are similar to the underflow baffle concept described previously for installation in regulator chambers. These devices also provide a water seal for containing sewer gas. The success of a catch basin modification program is dependent on having catch basins with sumps deep enough to accommodate hood-type devices. A potential disadvantage of catch basin outlet modifications and other insert-type devices is the fact that retained materials could clog the outlet if cleaning is not performed frequently enough. This could result in backup of storm flows and increased street flooding. New York City has moved forward with a program to hood all of its catch basins.

Summary of Floatables Control Technologies

Table 7-3 provides a comparison of the floatables control technologies discussed above in terms of implementation effort, required maintenance, effectiveness and relative cost. For implementation effort and required maintenance, technologies that require little to low effort are preferable to those requiring moderate or high effort. When considering effectiveness, a technology is preferable if the rating is high.

Table 7-3. Comparison of Solids and Floatables Control Technologies

Technology	Implementation Effort	Required Maintenance	Effectiveness	Relative Capital Cost
Public Education	Moderate	High	Variable	Moderate
Street Cleaning	Low	High	Moderate	Moderate
Catch Basin Modifications	Low	Moderate	Moderate	Low
Weir-Mounted Screens	Low	Moderate	High	Moderate
Screen with Backwash	High	Low	High	High
Fixed Baffles	Low	Low	Moderate	Low
Floating Baffles	High	Low	Moderate	Moderate
Bar Screens - Manual	Low	High	Moderate	Low
In-Line Netting	High	Moderate	High	High
End-of-Pipe Netting	Moderate	Moderate	High	Moderate
Containment Booms	Moderate	Moderate	Moderate	Moderate

Public education, street cleaning and catch basin modifications are already being implemented in Alley Creek and Little Neck Bay. The Alley Creek CSO Tank, currently under construction, is equipped with a fixed baffle at the downstream end of the tank such that floatables are removed from the tank overflow.

7.3.9 Initial Screening of CSO Control Technologies

Table 7-4 presents a tabular summary of the results of the initial technology screening discussed in the previous sections. Technologies that will advance to the alternatives development screening are noted under the column entitled "Retain for Consideration". These technologies have proven experience and have the potential for producing some level of CSO control.

Other technologies were considered as having a positive effect on CSOs but either could only be implemented to a certain degree or could only provide a specific benefit level and, therefore, would have a variable effect on CSO overflow. For instance, NYCDEP has implemented a water conservation program which, to date, has been largely effective. This program, which will be maintained in the future, directly affects dry weather flow since it pertains to water usage patterns. As such, technologies included in this category provide some level of CSO control but in-and-of-themselves do not provide the level of control sought by this program.

Technologies included under the heading "Consider Combining with Other Control Technologies" are those that would be more effective if combined with another control or would provide an added benefit if coupled with another control technology.

The last classification is for those technologies that did not advance through the initial screening process. In the case of technologies such as infiltration/inflow, the NYCDEP has implemented a program in accordance with federal and state laws that has effectively reduced infiltration/inflow. Inclusion of this control technology in the CSO control program would not provide further tangible benefits. Other technologies like complete sewer separation are simply not feasible in an urban area as extensively built-out as New York City.

Table 7-4. Initial Screening of CSO Control Technologies

CSO Control Technology	Retain for Consideration	Being Implemented	Combine with Other Technologies	Eliminate from Further Consideration
Source Control				
Public Education		X		
Street Sweeping		X		
Construction Site Erosion Control		X		
Catch Basin Cleaning		X		
Industrial Pretreatment		X		
Inflow Control				
Stormwater Detention				X
Street Storage of Stormwater				X
Water Conservation		X		
Infiltration/Inflow Reduction				X

Table 7-4. Initial Screening of CSO Control Technologies

CSO Control Technology	Retain for Consideration	Being Implemented	Combine with Other Technologies	Eliminate from Further Consideration
Green Solutions – See Section 5		X		
Sewer System Optimization				
Optimize Existing System		X		
Real Time Control				X
Sewer Separation				
Complete Separation				X
Partial Separation				X
Rain Leader Disconnection				X
Storage				
Closed Concrete Tanks	X			
Storage Pipelines/Conduits	X	X		
Tunnels				X
Treatment				
Screening				X
Primary Sedimentation		X		
Vortex Separator				X
High-rate Physical/Chemical Treatment				X
Disinfection				X
Expansion of WPCP		X		
Receiving Water Improvement				
Outfall Relocation		X		
In-stream Aeration				X
Maintenance Dredging				X
Solids and Floatable Controls				
Netting Systems				X
Containment Booms				X
Skimming				X
Manual Bar Screens				X
Weir Mounted Screens				X
Fixed baffles		X		
Floating Baffles				X
Catch Basin Modifications		X		

7. 4 ALLEY CREEK AND LITTLE NECK BAY CSO CONTROL ALTERNATIVES

This list of feasible alternatives retained from the preliminary screening as shown in Table 7-4 represents a toolbox from which a suitable technology may be applied to a particular level of CSO abatement. As suggested in USEPA guidance for long-term CSO control plans, water quality modeling was performed for a “reasonable range” of CSO volume reductions, from no reduction up to 100 percent CSO abatement. The technology employed at each level of this range was selected based on engineering judgment and established principles. For example, any of the storage technologies may be employed to achieve a certain reduction, but the water quality response would be the same, so the manner of achieving that level of control is a matter of balancing cost-effectiveness and feasibility. In that sense the alternatives discussed below each represents an estimate of the optimal manner of achieving that particular level of control. All costs presented in this section are in November 2008 dollars.

Storage was the only CSO control technology retained for the development of Alley Creek and Little Neck Bay alternatives. All three technologies considered under this category remain feasible alternatives based on cost-effectiveness and NYCDEP experience, and all three can be combined with other technologies. Closed concrete tanks, such as the storage facilities at Spring Creek, Paerdegat Basin, and Flushing Creek, tend to be more cost-effective for smaller volumes. In-line storage has potential based on review of the sewer system layout, as-builts, contract drawings, other documents, and drainage calculations. Deep storage tunnels are not usually as cost-effective as tanks, but have an advantage where siting issues present a major challenge, such as in an urban environment. For very large volumes, they are often the only feasible approach. The Alley Creek CSO Storage Tank is already under construction, so additional storage was considered in order to achieve CSO volume and overflow event reduction goals.

USEPA CSO Control Policy acknowledges the utility and supports the use of mathematical modeling analyses to improve understanding of waterbody response to CSO controls and other factors affecting the waterbody. The two modeling tools used are the Tallman Island Landside Model and the Alley Creek and Little Neck Bay domain of the East River Tributaries Model.

- Tallman Island Landside Model - The tool used for the evaluation of the effectiveness (reduction in CSO discharge volume and reduction of overflow events) of Alley Creek and Little Neck Bay CSO control alternatives is the Tallman Island InfoWorks CS™ Model (TI Model). This tool was used in an interactive way to both evaluate alternatives and to also develop alternatives as evaluations of technologies were performed. The TI Model was required for the WB/WS Facility Plan alternatives evaluation for both, the Alley Creek and Little Neck Bay and the Flushing Bay and Creek assessment areas. The effects that an alternative for one assessment area had and the other were noted for all analyses. This was particularly important for the Alley Creek and Little Neck Bay since it is located "upstream" of the Flushing Bay CSO Retention Tank. A successful alternative in reducing CSO to Alley Creek could negatively impact results in Flushing Bay. The Alley Creek and Little Neck Bay and Flushing Bay WB/WS Facility Plans were therefore, necessarily developed in close coordination.

  The TI Model also provided the loads for input to the water quality model, ERTM. The loads are calculated by assigning pollutant concentrations to sanitary flow and stormwater. The TI Model calculates the fraction of CSO that is sanitary flow and the fraction that is stormwater for each rainfall/CSO overflow event. Thus the load can be determined using the unique mixture of sanitary and stormwater that comprises each overflow. The TI Model has also been adapted to determine stormwater runoff and loads from non-CSO areas as input to ERTM. In addition, the flow and pollutant loading from the Belgrave WPCP was included.

- Alley Creek and Little Neck Bay Water Quality Model - A modeling framework, described in Section 4.1.3, was constructed and used to simulate water quality in Alley Creek and Little Neck Bay in response to landside discharges of CSO and stormwater along with other inputs. The modeling was developed, calibrated and validated using field data collected during facility planning and other studies. A Baseline Condition was developed so that the impacts of various engineering alternatives could be assessed and compared for a typical precipitation year and for population/wastewater flow projections that are consistent with the planning period. Full-year model simulations were performed for each engineering alternative and the results were compared to those for the Baseline Condition to determine the relative benefit of the engineering alternatives. As suggested in USEPA guidance for long-term CSO control plans, water quality modeling was performed for a host of alternatives providing a reasonable range of CSO volume and frequency reduction and attainment of goals for water-quality and uses.

7.4.1 Alternative 1: Baseline Condition

To properly assess the performance and efficacy of the projected alternatives to achieve the desired water quality and use goals, all model simulations were performed using the same conditions as established for the Baseline Condition to isolate the effects and impacts of each assessed alternative. In this way, all evaluated alternatives were compared on the same basis. The specific design conditions established for the Baseline scenario are discussed in Section 3.4.4 and Section 4.1.3.2. The Baseline Condition represents the state and operation of the sewer system and other facilities in a manner that predates implementation of any long-term CSO abatement plans, but does include implementation of the CSO Policy nine minimum controls and existing permit requirements regarding system wet-weather capacity, and a projected future condition with regard to population and water use. Briefly, the Baseline Condition represents the following:

- Typical annual precipitation data (1988 JFK Airport) having long-term average total rainfall volume and storm duration;

- Dry-weather flow rates reflect year 2045 projections for the Tallman Island WPCP (60.2 MGD);

- Tallman Island WPCP wet-weather capacity of 122 MGD (average sustained flow in 2003, see 3.4.4); Tallman Island WPCP treatment includes the upgrades for BNR.

- Documented sedimentation in sewers; and

- Other environmental conditions (meteorology, tidal conditions, water temperature, salinity, winds, etc.) corresponding to the 1988 calendar year discussed above.

Wet weather flows to the Tallman Island WPCP are limited to less than 2 times DDWF due to conveyance system limitations. These problems were comprehensively examined in the *Facility Plan for Delivery of Wet Weather Flow to the Tallman Island WPCP* (HydroQual, 2005b), and NYCDEP is currently addressing them. Of the recommended measures in the facility plan, modifications to Regulator TI-R09 (increase open area of side-overflow windows, raise weir) and removal of Regulator TI-R10 replacing it with a section of pipe have already been implemented and thus were incorporated into the Tallman Island Model Baseline Conditions. Conveyance Enhancements (CEs) as described in Section 7.4.2 below, were not included in the Baseline. The Alley Creek and Little Neck Bay Baseline Condition is described above for the Tallman Island WPCP and the sewer system. Baseline CSO discharge, stormwater discharge and runoff, and point source (Belgrave WPCP) volumes and pollutant loads to Alley Creek and Little Neck Bay for the one-year Baseline Condition simulation period are described in Section 3. TI Model results for CSOs are summarized below.

Tallman Island WPCP Model Results for Alley Creek and Little Neck Bay CSOs

CSO outfall TI-006, the only CSO outfall discharging to Little Neck Bay, is listed in the Tallman Island SPDES Permit as a CSO outfall because it is the emergency bypass for the 24th Avenue Pump Station (PS). All pump station emergency bypass outfalls are defined by NYSDEC in WPCP SPDES permits as CSO outfalls. A pump station bypass is an emergency relief that protects the pump station in the event of a malfunction and only discharges CSO under unusual operational circumstances such as power failures, extreme flood events, or other conditions that impede pump station operation. The Baseline Condition TI Model results, however, indicate that TI-006, discharges 109 MG/yr of stormwater described in this WB/WS Facility Plan report as "Stormwater Discharge via CSO Outfall". This description serves to differentiate stormwater that is discharged from a permitted stormwater outfall from stormwater that enters a CSO outfall pipe downstream of a regulator or pump station and is discharged through a CSO outfall such as is the case with TI-006.

There are five CSO outfalls that discharge to Alley Creek: TI-024, TI-007, TI-009, TI-008 and the new Alley Creek Tank outfall, TI-025. Similarly to TI-006, Alley Creek CSO outfall TI-024 is the emergency bypass for the New Douglaston PS. TI-024 does not discharge CSO but discharges 120 MG/yr of stormwater as "Stormwater Discharge via CSO Outfall."

The Baseline Condition TI Model results also indicate that Alley Creek TI-007, the Old Douglaston PS bypass, and TI-009, the Douglaston Bay PS bypass do not discharge any flow. TI-006, TI-024, TI-007, and TI-009 were not impacted by any of the alternatives evaluated for Alley Creek and Little Neck Bay. For the Baseline and all alternatives, TI-006 and TI-024 discharged 109 MG/yr and 120 MG/yr, respectively, of Stormwater Discharge via CSO Outfall. For the Baseline and all alternatives, TI-007 and TI-009 had no discharge.

For the Baseline Condition, the Alley Creek Tank and its outfall, TI-025 are not included in the TI Model. For the Baseline Condition, TI-008 discharges CSO. However, the CSO flow from the regulator is commingled with stormwater that enters the outfall downstream of the regulator. The Alley Creek Tank Facility Plan includes a new chamber (Chamber 6) that directs CSO to the tank and to TI-008 if the hydraulic capacity of the tank is being exceeded. Chamber 6 is located downstream of the regulator and downstream of the entry of stormwater to the TI-008 outfall pipe. When the tank is activated, the flow from TI-025 and TI-008 will be tank effluent and tank by-pass, respectively. Each alternative affected only TI-025 and TI-008 because these are the only the two outfalls discharging CSO.

7.4.2 Alternative 2: CSO Facility Plan (FP)

The CSO Facility Plan alternative for the Tallman Island WPCP system includes the Flushing Bay CSO Retention Facility and the Alley Creek CSO Retention Facility, as described previously in Section 5. The CSO Facility Plan alternative also includes improvements to the sewer system that are covered as the non-CSO stormwater and non-CSO drainage improvements in the Alley Creek Facility Plan. The CSO Facility Plan Alternative also included Tallman Island system conveyance enhancements (CE). Conveyance enhancements are the recommendations from the *Facility Plan for Delivery of Wet Weather Flow to the Tallman Island WPCP* (HydroQual, 2005b) that are those sewer system changes now embodied into the CSO Consent Order for Flushing Bay and previously part of the Omni IV Order. The end result of these CEs is "Tallman Island WPCP and associated sewer systems are capable of delivering, accepting and treating influent at or above twice the plant design flow during any storm event." These CEs as set forth in the 2008 CSO Order Modification Agreement have milestones of design completion, notice to proceed to construction and construction completion with milestone schedule dates of December 2010, December 2011 and July 2015, respectively.

The Baseline Condition calculations indicate that during runoff events during the design year 517 MG of CSO is generated in the Alley Creek and Little Neck Bay area. The presence of the Alley Creek Tank and its diversion Chamber 6 does not affect the volume of CSO generated. Chamber 6 directs the CSO to the tank and overflows CSO to TI-008 when the tank hydraulic capacity is exceeded. In the design year, 499 MG of the 517 MG generated enters the tank. Of this, 244 MG is captured by the tank for treatment at the Tallman Island WPCP. A volume of 255 MG flows through the tank where settling of solids occurs and floatables are removed prior to discharge at the downstream end of the tank through TI-025. Of the total CSO generated, only 18 MG is discharged as untreated CSO through TI-008. The primary settling tanks at the Tallman Island WPCP operate with a surface overflow rate of 4,000 gpd/sf at peak design flow, similar to all other NYCDEP WPCPs. The Alley Creek Tank surface area is 72,000 sf (600 ft by 120 ft). Therefore, overflows from the tank at rates of less than 288 MGD (12 MG/hr) receive preliminary treatment. An examination of the TI Model output for the WB/WS Facility Plan indicated that essentially all of the hours of discharge from the tank were less than the 12 MG/hr (288 MGD) rate and therefore, receive preliminary treatment. The Alley Creek Tank provides preliminary treatment to 96.5 percent of the CSO flow in the 1988 rainfall design year simulation.

All flows through the Alley Creek Tank are considered to receive preliminary treatment through solids settling and floatables removal with the tank baffle. The tank, therefore, provides a significant reduction of untreated CSO volume discharged to Alley Creek as shown on Table 7-5.

Table 7-5. Alley Creek and Little Neck Bay
Alternatives Performance Summary

CSO Control Alternatives	CSO Outfalls	CSO Volume (MG)	# CSO Events	Percent Reduction of Untreated CSO from Baseline(1)
1. Baseline Condition	TI-008 TI-025	517(1) NA	38 NA	0
2. CSO Facility Plan (FP)	TI-008 TI-025	18 255(2)	4 27	96.5
3. FP + DW Early	TI-008 TI-025	18 201(2)	4 22	96.5
Weir Alternatives				
1. FP + Weir @ TI-025	TI-008 TI-025	19 207(2)	4 24	96.5

Table 7-5. Alley Creek and Little Neck Bay
Alternatives Performance Summary

CSO Control Alternatives	CSO Outfalls	CSO Volume (MG)	# CSO Events	Percent Reduction of Untreated CSO from Baseline(1)
2. FP + Weir @ Chamber 6	TI-008 TI-025	0(3) 256(2)	0 27	100
3. FP + Weir @ TI-025+Weir @ Chamber 6	TI-008 TI-025	0(3) 208(2)	0 24	100
Storage Tank Alternatives				
1. 15 MG Tank	TI-008 TI-025	18 93(2)	3 10	96.5
2. 25 MG Tank	TI-008 TI-025	18 34(2)	3 5	96.5
3. 30 MG Tank + Weir @ Chamber 6 + Weir @ TI-025	TI-008 TI-025	0(3) 0	0 0	100

(1) Baseline discharge is 58.8 MG CSO and 458.6 MG stormwater.
(2) TI-025 overflows receive preliminary treatment.
(3) TI-008 is discharging stormwater only.

It should be noted that, in mid-2006, a change order was approved by NYCDEP to update the design of the Alley Creek Tank and implement the approved changes in construction. The update included raising the elevation of the top of the overflow weir at the downstream end of the tank from +1.46 ft to +2.00 ft to account for a recently determined mean high water (MHW) elevation of +1.70 ft. This change was incorporated into the TI Model to update the CSO Facility Plan Alternative. The effect of the new weir elevation is to increase the volume of the tank slightly from 5 MG to 5.2 MG. The larger volume was used herein.

7.4.3 Alternative 3: Dewater Tank During Storms (DW Early)

The Wet Weather Operating Plan (WWOP) for the Alley Creek CSO Retention Facility (URS, 2003b) provides for the start of tank dewatering 4 hours after the end of a storm. The initiation of dewatering as soon as the tank receives CSO was evaluated. This change in operating procedure resulted in a 54 MG reduction in annual CSO discharge for the one year simulation period and a decrease in CSO events from 27 to 22 as summarized in Table 7-5.

The DW Early Alternative was evaluated as to its impact on performance of the Flushing Bay CSO Retention Facility. An increase in CSO discharged from Flushing Creek outfalls TI-010 and TI-011 (4 MG and 6 MG, 1 percent and 2.5 percent, respectively) was calculated but no increase in the number of CSO events resulted.

Upon NYCDEP review and consideration, the Early Dewatering Alternative was not included in the WQ/WS Facility Plan for the following reasons:

- Increase in CSO overflow from Flushing Creek Tank
- The pumped flow occupies interceptors and impacts the Tallman Island WPCP ability to take in combined sewage from other CSOs not receiving CSO control

- Early dewatering does not decrease the volume of untreated CSO discharged to Alley Creek and Little Neck Bay.

7.4.4 Weir Alternatives

Weir Alternative 1: Bending Weir at TI-025 (Weir @TI-025)

To increase the storage capacity of the tank, an alternative including a bending weir at the end of the Alley Creek tank retrofitted on top of the existing weir (at elevation +2.00) was evaluated. The purpose of this weir is to increase storage capacity and thus reduce CSO to Alley Creek through TI-025 and increase overall CSO capture at the Tallman Island WPCP. Figure 7-6 slows the location of the weir.

Weir Alternative 2: Bending Weir at Chamber 6 (Weir @Chamber 6)

The fixed weir at Chamber 6 serves as the relief for the Alley Creek Tank when flows exceed its hydraulic capacity. The purpose of the bending weir at Chamber 6 is to reduce CSO flow to TI-008. Flow from TI-008 has not gone through the tank and therefore has not had any of the potential solids and floatables removal provided by the retention facility. The Chamber 6 Bending Weir is a retrofit on top of the existing fixed weir. Figure 7-7 shows the location of the weir.

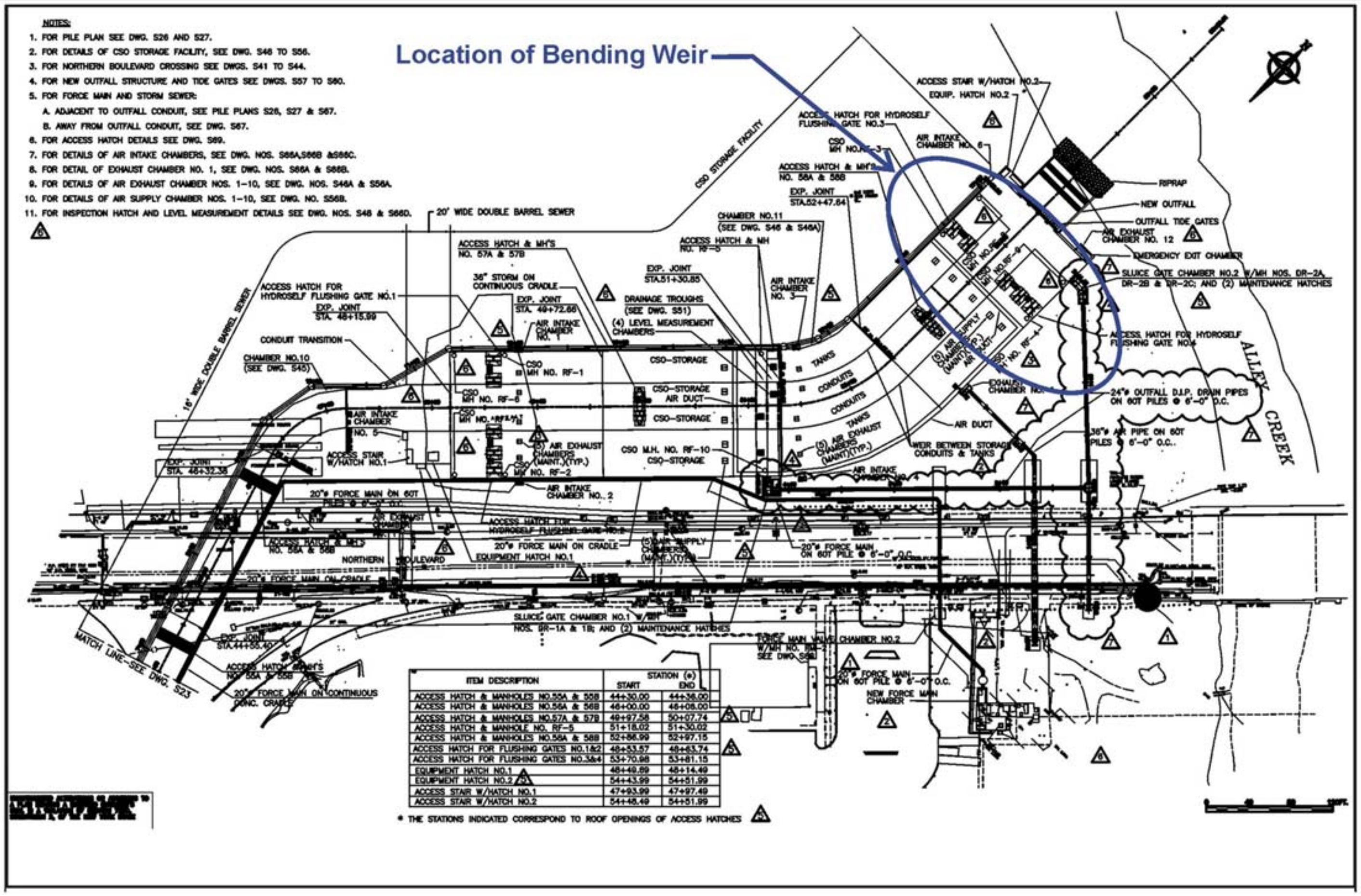
Weir Alternative 3: Bending Weir at TI-025 + Bending Weir at Chamber 6 (Weir @TI-025 + Weir @Chamber 6)

This alternative evaluates the increased capacity of the tank resulting from the bending weir at TI-025 in combination with a bending weir at Chamber 6 to reduce TI-008 discharge.

7.4.5 Storage Tank Alternatives

The alternatives that included weir(s) provided additional CSO reduction at TI-008 but overall, additional CSO reductions and decreases in CSO events were minor. In order to achieve greater reductions, large volume storage alternatives were evaluated. Tanks were selected as the CSO storage technology appropriate for the Alley Creek and Little Neck Bay WB/WS assessment area. All of the CSO discharged to Alley Creek and Little Neck Bay is collected at one location, Chamber 6, and is either captured by the CSO Retention Facility, discharges at TI-025 after passage through the tank or is discharged untreated through TI-008. Providing the storage large enough to substantially reduce or eliminate CSO was evaluated by running the TI Model with larger tanks at TI-025.

The tanks were assumed to occupy larger footprints of the Alley Creek 5.2 MG facility at the same location. Overflow weir elevations at Chamber 6 and at the downstream end of the tanks were assumed to be the same as the current CSO Facility Plan. Three storage tank alternatives were evaluated. These alternatives were developed through a sensitivity analysis of TI Model system responses to tank size to achieve target CSO reductions and overflow events. Tank sizes of 15 MG (Storage Tank Alternative 1), 25 MG (Storage Tank Alternative 2) and 30 MG (Storage Tank Alternative 3) were evaluated.

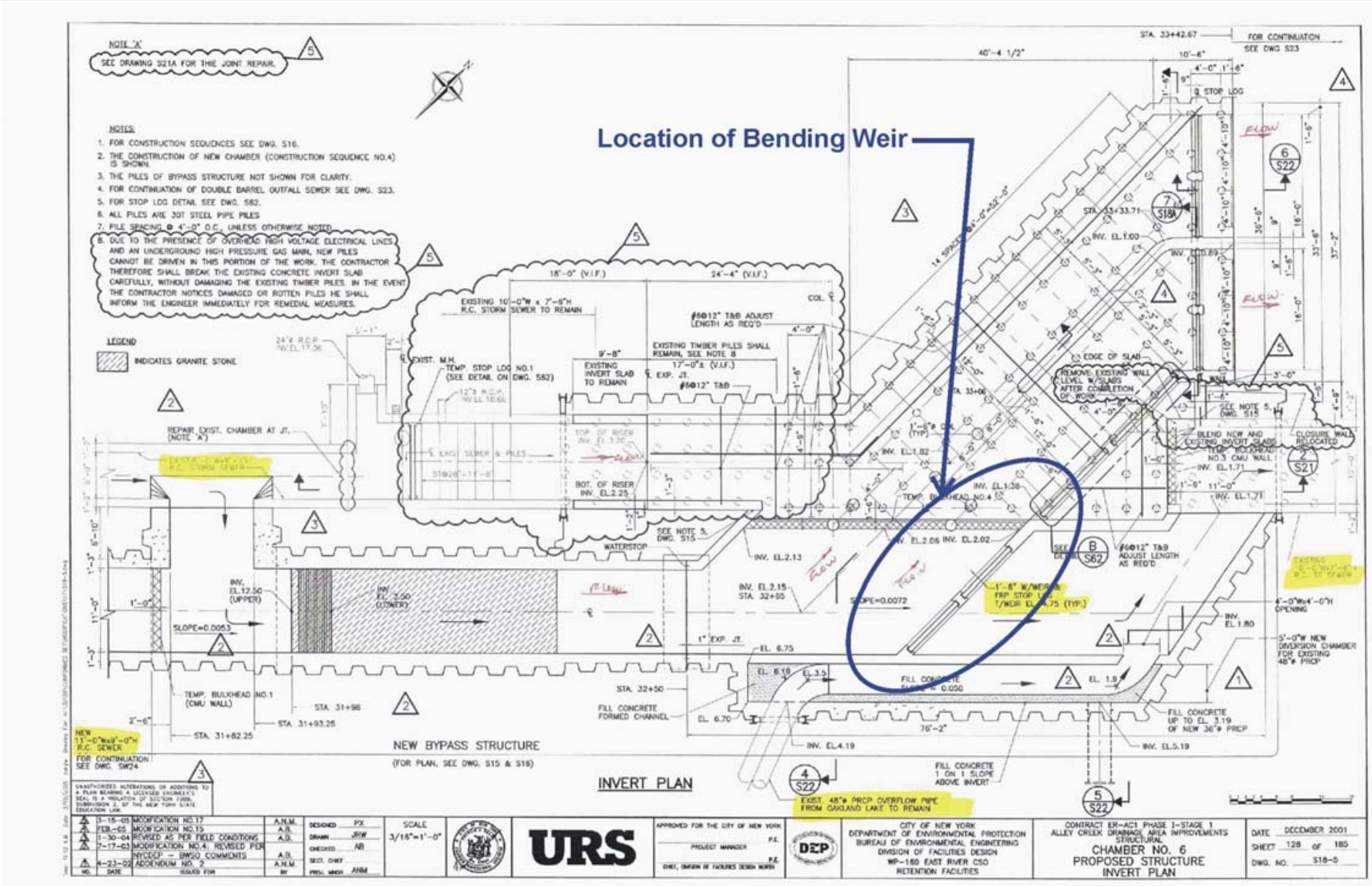


New York City
Department of Environmental Protection

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Location of Bending Weir at TI-025

FIGURE 7-6



New York City
Department of Environmental Protection

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Location of Bending Weir at Chamber #6

FIGURE 7-7

A 30 MG tank was required in order to achieve 100 percent reduction of Alley Creek and Little Neck Bay CSO discharge and zero CSO events at TI-025. The 30 MG tank also needed to include raising the fixed weir elevation at Chamber 6 by 0.75 ft plus using a bending weir at Chamber 6. These additional controls (designated as ++) were required to eliminate CSO discharge from TI-008, the CSO relief at Chamber 6. This alternative is also referred to as the 100 Percent CSO Reduction Case.

7.4.6 Summary of Performance for Alley Creek and Little Neck Bay CSO Control Alternatives

Table 7-5 summarizes performance results of Baseline, Updated Alley Creek CSO Facility Plan (FP), the three weir alternatives (Weir Alternative 1 - FP + Weir @ TI-025, Weir Alternative 2 - FP + Weir @ Chamber 6 and Weir Alternative 3 – FP + Weir @ TI-025 + Weir @ Chamber 6) and the three large storage tank alternatives (15 MG Tank, 25 MG Tank and 30MG Tank++). The CSO from TI-008 and TI-025 for each alternative is included with the number of CSO events and percent reduction of untreated CSO volume for the alternative when compared to the Baseline Condition.

The performance of the CSO control alternatives will be discussed in relation to the resultant water quality improvement and benefit to waterbody uses in Section 7.5 and cost in Section 7.6.

7.5 ALLEY CREEK AND LITTLE NECK BAY ALTERNATIVES, RESULTANT WATER QUALITY

The TI Model calculates pollutant loads for the CSO, stormwater, direct runoff and Tallman Island WPCP discharge sources for each of the Alley Creek and Little Neck Bay CSO Control Alternatives. The TI Model loads are then used as input to the ERTM water quality model that is described in Section 4.1.3. Comparison of the resultant water quality associated with the Alley Creek and Little Neck Bay Alternatives to Baseline Condition and CSO Facility Plan water quality and waterbody use targets are the key in the Alternatives Evaluation.

Alley Creek and Little Neck Bay existing conditions were described in Section 4 based on available data. However, as an LTCP Project methodology, to evaluate Alley Creek and Little Neck Bay alternatives, Baseline Condition water quality for each waterbody is established as an initial point of comparison. Baseline Condition for dissolved oxygen and pathogens were presented in Section 4. Resultant water quality in Alley Creek and Little Neck Bay Alternatives will be compared to Baseline.

The 100 percent CSO Removal Alternative (best case scenario) is defined in the LTCP Project as the removal of the CSO flow and load discharged to Alley Creek and Little Neck Bay and calculation of the resultant water quality. The CSO flow and its associated load (discharged from TI-008) were taken out of the ERTM Model for the analysis of the 100 Percent CSO Removal scenario. A comparison of resultant water quality from Alley Creek and Little Neck Bay Alternatives to the 100 Percent CSO Removal scenario as a “best case” scenario and CSO Facility Plan is also relevant.

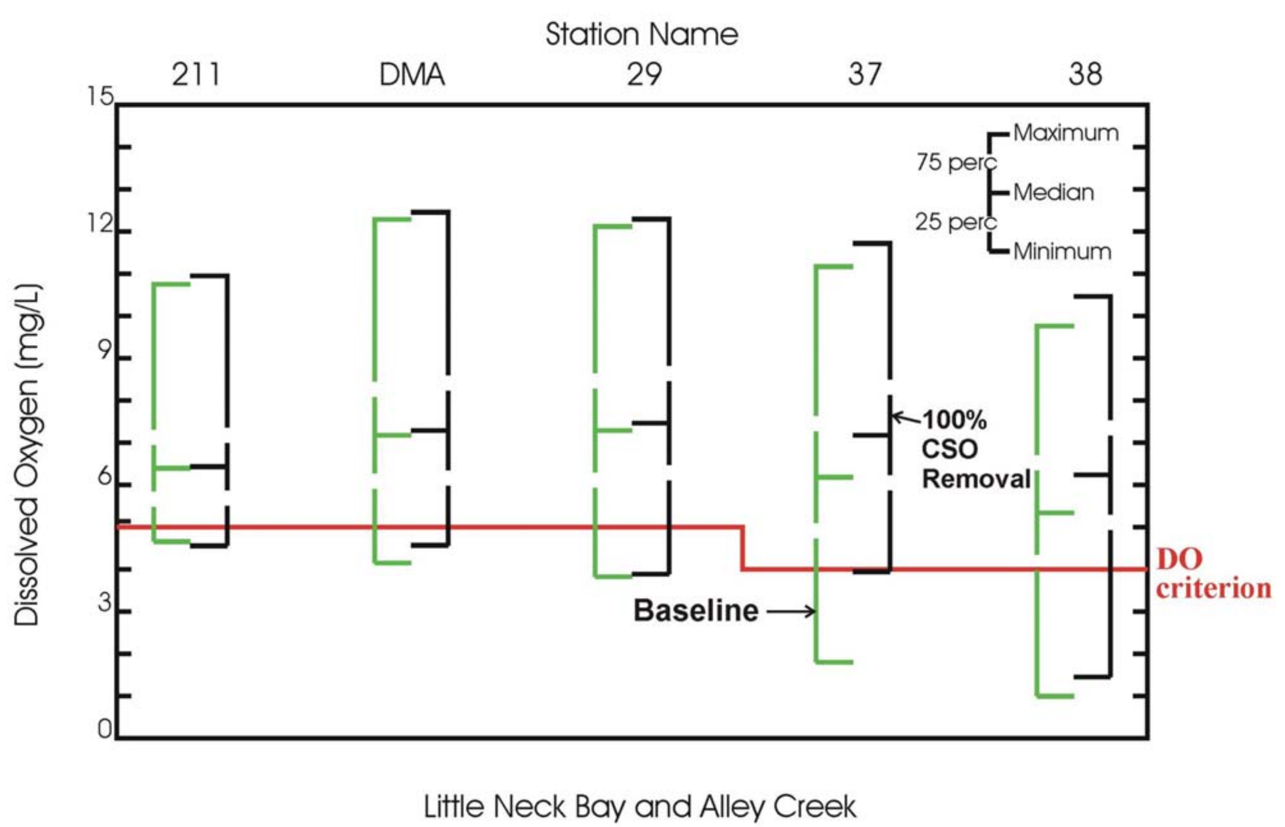
7.5.1 Dissolved Oxygen

The dissolved oxygen results for the Baseline Condition case are compared with the 100 Percent CSO Removal scenario on Figure 7-8 for the Summer season, June through August. Figure 4-15 is a location map of Alley Creek and Little Neck Bay with the ERTM model grid and selected historic and current sampling locations indicated.

The ERTM model results for the one-year simulation period are post-processed based on hourly average and daily average dissolved oxygen calculated throughout the year. The range and statistics of hourly average dissolved oxygen calculated during Summer (June-August) are shown in Figure 7-8. The stations selected are Station 38 (head of Alley Creek), Station 37 (near the mouth of Alley Creek), Station 29 (Little Neck Bay, near Douglaston), the Douglas Manor Association Beach (DMA), and a location in the middle of Little Neck Bay (Station 211). For each station, model results are taken from the bottom water column layer, the location within the water that generally has the lowest dissolved oxygen. The top, middle, and bottom horizontal lines of each box represent the maximum, median, and minimum values, respectively. In addition, the top and bottom breaks in the vertical lines represent the 75^{th} and 25^{th} percentile values, respectively. The dissolved oxygen standards of a minimum of 4.0 mg/L in Alley Creek and daily average 4.8 mg/L in Little Neck Bay have been included. The left side of the box plot at each station is the Baseline. The right side at each location is the 100 Percent CSO Removal scenario.

For the Summer months (June through August), it can be seen that in Little Neck Bay the results indicate that the dissolved oxygen calculated for the Baseline Condition and 100 Percent CSO Removal is essentially the same. The “minimum” in both cases is less than the 4.8 mg/L dissolved oxygen standard at these Little Neck Bay locations. It should be noted that well over 75 percent of the dissolved oxygen results are greater than 4.8 mg/L. In Alley Creek, the 100 Percent CSO Removal results in essentially all summer hours being greater than 4.0 mg/L at the mouth of creek. This is in comparison to the Baseline minimum of 2.0 mg/L. Calculated dissolved oxygen results are more than 1.0 mg/L higher at the 75^{th} percentile, median and 25^{th} percentile values. At the head of Alley Creek (Station 38), the increase in calculated dissolved oxygen between Baseline and 100 Percent CSO Removal is on the order of that calculated at the mouth of Alley Creek. At the head of Alley Creek the minimum dissolved oxygen for both cases, however, is less than 2.0 mg/L.

On a monthly basis, Alley Creek is calculated to experience dissolved oxygen less than 4.0 mg/L during some of the hours of the months of April through September of the Baseline Condition year. For the 100 Percent CSO Removal scenario, dissolved oxygen is calculated to be less than 4.0 mg/L during some of the hours for the months of May through September. Similarly, on a monthly basis, Little Neck Bay is calculated to experience dissolved oxygen less than 4.8 mg/L during some of the hours of the months June through September for both the Baseline Condition case and 100 Percent CSO Removal scenario.



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Comparison of 100% CSO Removal with Baseline Summer (June-August)- Dissolved Oxygen

FIGURE 7-8

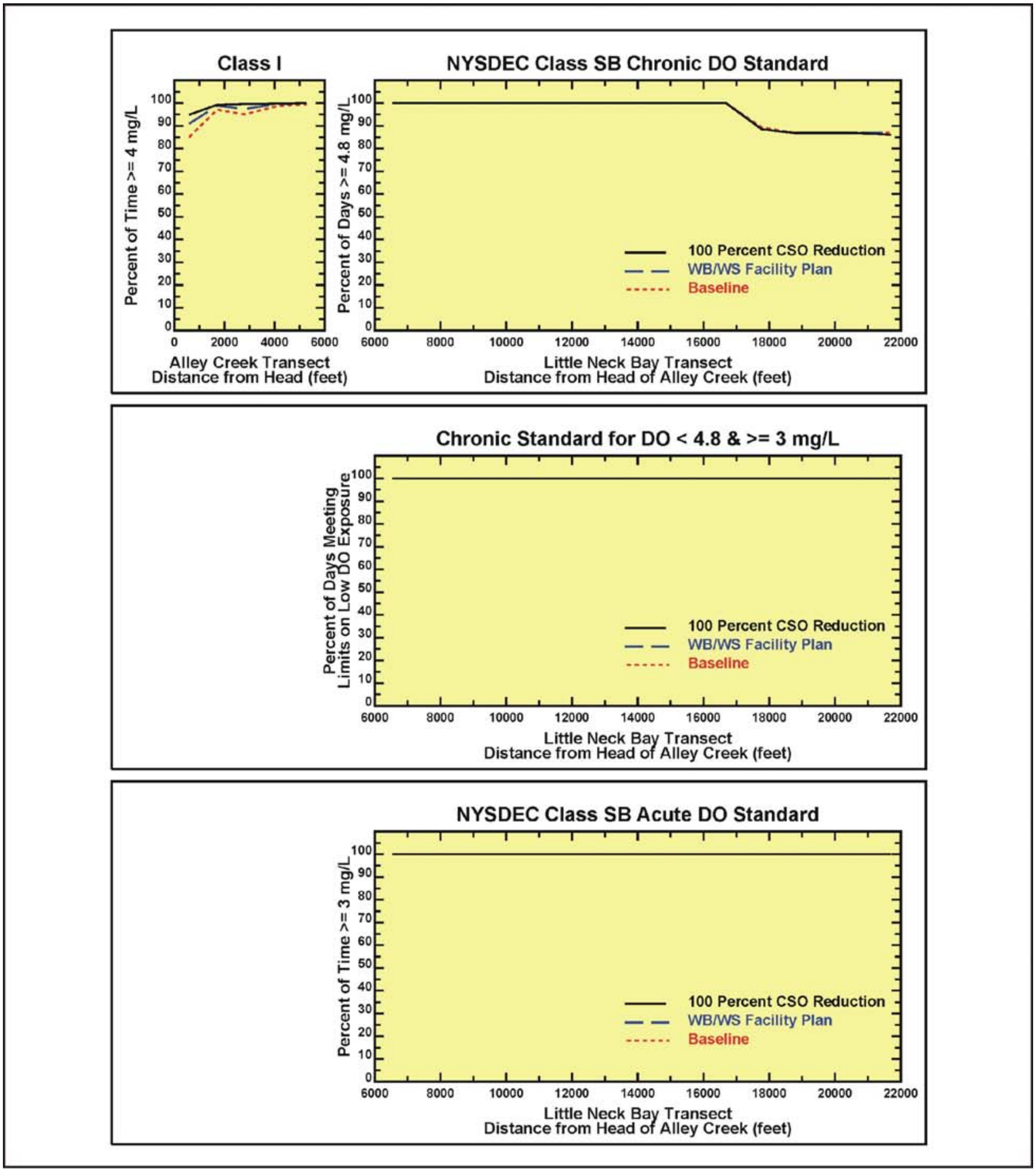
7.5.1.1 Component Analysis of Dissolved Oxygen Impairment

The comparison of dissolved oxygen results for the Baseline and 100 Percent CSO Removal scenario on Figure 7-8 indicates that the dissolved oxygen in Little Neck Bay is not impacted by CSO loads. The results from both cases are essentially the same throughout the bay. Removal of the CSO does not change dissolved oxygen significantly. During the Summer months when the Baseline calculated dissolved oxygen is less than 4.8 mg/L for some of the summer hours, removal of the CSO load does not increase the dissolved oxygen. Dissolved oxygen less than 4.8 mg/L is not the result of CSO. The likely cause of dissolved oxygen less than 4.8 mg/L is the stormwater load. Dissolved oxygen impairment in Little Neck Bay, although relatively small as measured by the percent of time dissolved oxygen is less than 4.8 mg/L, is the result almost exclusively of stormwater.

In contrast, the dissolved oxygen in Alley Creek is impacted by CSO as shown in Figure 7-8. Removal of the CSO load results in increased dissolved oxygen in the creek. At the mouth (Station 37), the dissolved oxygen improvement is evidenced by the minimum values above 4.0 mg/L during Summer (and Autumn) for the 100 Percent CSO Removal scenario. At that location, therefore, all of the dissolved oxygen impairment is due to CSO. At the head of Alley Creek, the dissolved oxygen is influenced by CSO load; however, the dissolved oxygen increase resulting from the CSO removal is not sufficient to raise the minimum above 4.0 mg/L at the head of Alley Creek at all times. The stormwater load to Alley Creek continues to cause low dissolved oxygen after 100 percent of the CSO is removed. During the summer the dissolved oxygen is less than 4.0 mg/L approximately 25 percent of the time. Removing CSO reduces the amount of time that dissolved oxygen is less than 4.0 mg/L to approximately 10 percent of the time. The dissolved oxygen impairment at the head of Alley Creek is therefore, caused roughly 60 percent by CSO to 40 percent by stormwater.

7.5.1.2 Alley Creek Dissolved Oxygen for Alternatives

Alley Creek and Little Neck Bay dissolved oxygen was determined for the alternatives. Figure 7-9 is a spatial presentation of dissolved oxygen results for Baseline, CSO Facility Plan, and 100 Percent CSO Removal Alternatives along the transect depicted on Figure 4-15. The transect begins at the head of Alley Creek. At a distance 6,000 feet from the head of Alley Creek, Little Neck Bay begins. The transect continues through Little Neck Bay and for approximately 0.5 miles into the East River. Figure 7-9 is a summary of dissolved oxygen results on a summer season (June through August) basis. The left side panel presents the results for Alley Creek expressed as percent of the time the dissolved oxygen is greater than 4.0 mg/L. At the head of Alley Creek, for the Baseline Condition, dissolved oxygen is greater than 4.0 mg/L 85 percent of the time during the summer. On a summer season basis, the dissolved oxygen is greater than 4.0 mg/L 91 percent of the time for the WB/WS Facility Plan and 95 percent of the time for the 100 Percent CSO Removal case. Therefore, at the head of Alley Creek, 100 Percent CSO Removal does not result in achieving 4.0 mg/L all of the time. At the mouth of Alley Creek all of the alternatives are the same with dissolved oxygen greater than 4.0 mg/L for 100 percent of the time.



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Summer Dissolved Oxygen for Alternatives Comparison, Alley Creek/Little Neck Bay Transect

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 7-9

7.5.1.3 Little Neck Bay Dissolved Oxygen for Alternatives

The right side panels on Figure 7-9 present the dissolved oxygen results for Little Neck Bay. The top panel expresses as percent the days that the daily average dissolved oxygen is greater than or equal to 4.8 mg/L, the NYSDEC Class SB dissolved oxygen chronic standard. All of the alternatives evaluated were calculated to have daily average dissolved oxygen of 4.8 mg/L, 100 percent of the summer days at the head of the bay. As Little Neck Bay transitions to the East River at the mouth, however, daily average dissolved oxygen is greater than or equal to 4.8 mg/L for 87 percent of the summer days.

The middle panel on Figure 7-9 presents the chronic dissolved oxygen portion of the SB standard. For the summer days when the daily average dissolved oxygen was calculated by the model to be less than 4.8 mg/L but greater than 3.0 mg/L, the cumulative fractions of allowable days of low dissolved oxygen exposure for the next 66 days were calculated. A cumulative sum of fractions less than 1.0 means that the chronic dissolved oxygen standard was achieved with respect to allowable periods of exposure to low dissolved oxygen. For the Baseline in Little Neck Bay, 100 percent of summer days meet the allowable limits on low dissolved oxygen exposure (100 percent of the fractions calculated were less than 1.0), The WB/WS Facility Plan and 100 Percent CSO Removal cases also meet chronic dissolved oxygen limits 100 percent for the summer of the design year. Thus even though there were days when the average daily dissolved oxygen was less than 4.8 mg/L, (as shown on the top right panel, near the East River), the juvenile fish survival use was protected.

The bottom right hand panel of Figure 7-9 presents the percent of time that dissolved oxygen is greater than or equal to 3.0 mg/L, the NYSDEC acute dissolved oxygen standard for SB waters. All cases were calculated to be greater than 3.0 mg/L for Little Neck Bay, during the summer season of the design year.

7.5.2 Aquatic Life Use Assessment

The water quality model results indicate that the Class SB aquatic life use is being achieved in Little Neck Bay. Aquatic life use is not being impaired by CSO. Daily average dissolved oxygen is calculated to be below 4.8 mg/L, Class SB standard near the East River but the periods of exposure to dissolved oxygen less than 4.8 mg/L did not result in an aquatic life use impairment. Removal of 100 percent of the CSO, however, did not result in any significant change from Baseline Condition. The CSO Control alternatives evaluated produced essentially the same dissolved oxygen concentrations as Baseline and 100 Percent CSO Removal in Little Neck Bay. The aquatic life use of Little Neck Bay is being achieved as determined from the dissolved oxygen analysis.

Alley Creek dissolved oxygen Baseline Condition indicates that some of the time during the months of April through September, dissolved oxygen is calculated to be below 4.0 mg/L. At the mouth of the creek, however, dissolved oxygen is calculated to be greater than 4.0 mg/L 100 percent of the time. At the head of the creek, dissolved oxygen median is calculated to be generally 1.0 mg/L less than at the mouth. The minimum dissolved oxygen is also generally less at the head than at the mouth of Alley Creek. In Alley Creek, improvement in dissolved oxygen is calculated to occur under the 100 Percent CSO Removal scenario. The median dissolved oxygen in Alley Creek improves on the order of 1.0 mg/L. This improvement, however, is not sufficient to result in dissolved oxygen that is always greater than 4.0 mg/L. The CSO Facility Plan Alternative increased dissolved oxygen in Alley Creek to varying degrees along the creek as shown on Figure 7-8 and Figure 7-9. Although the dissolved oxygen in Alley Creek is not greater than 4.0 mg/L at all times, the model results indicate that the dissolved oxygen is greater than 3.0 mg/L essentially at all times. Thus a fish survival use is being achieved.

7.5.3 Bacteria and Recreation Use

Alley Creek

The bacteria results for Baseline Condition indicate that Alley Creek has a monthly geometric mean total coliform of less than 10,000 per 100 mL for all months of the year. The monthly geometric mean fecal coliform, similarly, is less than 2,000 per 100 mL for the entire year. There is no enterococcus standard for Class I waterbodies. The monthly geometric mean total coliform of 10,000 and monthly geometric mean fecal coliform of 2,000 per 100 mL are the bacteria water quality standards for secondary contact recreation although bacteria standards are not applicable to Alley Creek. The Baseline bacteria load from all sources, including CSO, does not result in any secondary contact use impairment. Recall that the opportunities for secondary contact recreation in Alley Creek are very limited because water-based contact recreation is not provided by Alley Pond Park.

DMA Beach

As described in Section 4, the Baseline Condition loads of pathogens consisted of CSO and stormwater discharges to Alley Creek and Little Neck Bay. Localized sources associated with potentially failing septic systems, water fowl, etc. were not included in the Baseline Condition or Alternatives analysis. The DMA Beach location for Baseline Condition was calculated to have a 30 day moving geometric mean of enterococcus less than the 35 per 100 mL Class SB standard during the months of June through August, the NYCDOHMH bathing season. The number of hours for Baseline with enterococcus greater than 104 per 100 mL was 220 out of a total of 2,208 hours. All months at the DMA Beach location calculated monthly median and monthly 80 percent total coliform less than 2,400 and 5,000 per 100mL, respectively. The monthly geometric mean of fecal coliform was less than 200 per 100 mL. The designated use and existing use at the DMA Beach is primary contact recreation, swimming. The 100 Percent CSO Removal scenario reduces total and fecal coliform at the DMA Beach somewhat. The hours of enterococcus greater than 104 per 100 mL (guidance value, not a standard) decreased from 220 to 140. Similar results for enterococcus, total and fecal coliform were calculated for the CSO Facility Plan and Weir Alternatives as compared to the Baseline.

Bayside Marina

The bacteria Baseline results for location S64, near the Bayside Marina, were similar to results at DMA Beach. All months of total coliform monthly median, total coliform 80 percent and fecal coliform monthly geometric means are less than 2,400, 5,000 and 200 per 100 mL. The 30-day moving geometric mean of enterococcus is less than 35 per 100 mL. The number of hours of enterococcus greater than 501 per 100 mL was 63 for the Baseline. The 100 Percent CSO Removal scenario hours greater than 501 per 100 mL was 40. The influence of CSO bacteria load is not as evident at this location because of the relatively long distance from the

CSO outfall in Alley Creek. The stormwater loads are responsible for the overall level of enterococcus, total coliform and fecal coliform calculated in Little Neck Bay.

The designated recreation use at this location as well as all of Little Neck Bay, Class SB, is primary contact. The enterococcus of 501 per 100 mL for alternatives evaluation at this location, however, reflects the existing level of primary contact use as infrequent. Secondary contact recreation opportunities are provided in Little Neck Bay by the public marina at Bayside and fishing along the shoreline walkway and bikeway located along the Bay's western shore.

7.6 COST ESTIMATES FOR ALLEY CREEK AND LITTLE NECK BAY ALTERNATIVES

General costing estimates for many of the CSO control technologies under consideration for the LTCP Project were developed as part of the project in order to standardize the cost estimating procedure. Based on previous costing experience and following estimating assumptions used in previous projects for the NYCDEP (URS Construction Services, 2004), Hard Costs, Soft Costs and Ancillary Costs for each CSO control technology were combined into the Probable Total Project Cost (PTPC). For cost comparison in this section and Section 8, the costs developed in 2005, included in prior submittals, have been escalated to November 2008 values.

The major feature of the Alley Creek CSO Facility Plan is the 5.2 MG Tank now under contract and construction. The bid price cost of the CSO control elements provided by URS, lead construction consultant and escalated to November 2008 is $31.3 million. As described in Section 5.7 the CSO Control elements in the Alley Creek project are part of a larger drainage improvement project. The bid price for AC-1 (upstream sewers and tank construction) was $93.1 million, AC-2 (pump station upgrade and activation of tank) was $29.9 million and AC-3 (wetlands restoration) was $12.7 million, a total project cost of $136 million.

7.6.1 Weir Costs

PTPCs (2005 costs) were developed for bending weirs using manufacturer's specifications and the length of weir required at Chamber 6 and at CSO outfall TI-025. Model FSK700 Hydrovex flap spring-loaded weirs, manufactured by John Meunier, Inc. (St-Laurent, Quebec) were simulated in the Tallman Island WPCP InfoWorks model by using head to discharge relationships provided by the manufacturer.

The bending weir for Chamber 6 was assumed to be a retrofit on top of the existing weir in Chamber 6 that provides the relief for the Alley Creek CSO Tank by directing CSO to TI-008. The weir is a 1.5 ft. high spring loaded bending weir installed in four sections, two 8 ft. long sections and two 10 ft. long sections. Similarly, the bending weir at TI-025 is a 1.5 ft. high spring loaded bending weir installed in 12 sections, each 10 ft. long. The PTPC for the bending weir at Chamber 6, escalated to November 2008, is $504,000 and for the bending weir at TP-025 is $1,570,000. These costs were used for all Weir Alternatives and were considered conservative if static weirs were used, not bending weirs.

7.6.2 Tank Costs

Costs for the large tanks that were evaluated as Alley Creek and Little Neck Bay CSO Control Alternatives were based on general cost curves as a function of tank size. This set of curves also includes consideration of a cost factor associated with construction as a function of site characteristics. Costs of tanks under construction and/or planned throughout NYC were used as input for the curves. The Alley Creek and Little Neck Bay CSO Storage Tank alternatives costs were based on "moderate" site conditions. The costs of the 15 MG Tank, 25 MG Tank and 30 MG Tank are $369M, $503M and $558M, respectively, in November 2008 dollars. The costs of additional features such as bending weirs, and raised weir height at Chamber 6 necessary in conjunction with the 30 MG tank to achieve elimination of CSO for TI-008, were considered negligible in relation to the basic tank.

The costs of the Alley Creek and Little Neck Bay tanks estimated by this method are necessarily very rough estimates. However, any CSO Control Alternative for Alley Creek, developed to achieve 80 to 100 percent CSO reduction and elimination of CSO events needed to be large and therefore, costly. The rough estimate for tank costs is sufficient to evaluate costs of the large tanks relative to the CSO Facility Plan and Weir Alternatives. Table 7-6 is a summary of the cost for each of the Alley Creek and Little Neck Bay Alternatives.

Table 7-6. Performance and Cost Summary of Alternatives

Alley Creek and Little Neck Bay CSO Control Alternative	Alternative Total				
	CSO Discharge (MG)	# CSO Events	Percent CSO Reduction from Baseline	Percent Reduction of Untreated CSO(1)	Cost (Millions)
1. Baseline Condition	517(2)	38	0	0	NA
2 CSO Facility Plan (FP)	273	27	47	96.5	$31.3
Weir Alternatives					
1. FP + Weir @ TI-025	226	24	56	96.5	$32.9
2. FP + Weir @ Chamber 6	256	27	51	100	$31.8
3. FP + Weir @ TI-025 + Weir @ Chamber 6	208	24	60	100	$33.4
Storage Tank Alternatives					
1. 15 MG Tank	111	10	79	96.5	$369
2. 25 MG Tank	52	5	90	96.5	$503
3. 30 MG Tank +Weir @ TI-025 + Weir @ Chamber 6	0	0	100	100	$558

(1) TI-025 overflows receive preliminary treatment.
(2) Includes 58.8 MG of CSO and 458.6 MG of stormwater.

Table 7-6 summarizes the weir alternatives and storage tank sizes that were evaluated, the percentage of CSO volume reduction that each alternative would provide, the number of CSO events that would occur, and the PTCP cost (November 2008) for each alternative.

7.7 ALLEY CREEK AND LITTLE NECK BAY ALTERNATIVES EVALUATION RESULTS

The CSO Policy (USEPA, 1994a) requires that long-term CSO control planning "will consider a reasonable range of alternatives" that would achieve a range of CSO control levels, up to 100 percent CSO capture. The policy further states that the "analysis of alternatives should be sufficient to make a reasonable assessment of cost and performance" and that the selected alternative must provide "the maximum pollution reduction benefits reasonably attainable."

In addition, the presence of the DMA Beach in Little Neck Bay, defines Little Neck Bay as a sensitive area. Federal CSO Policy requires that the long-term CSO control plan give the highest priority to controlling overflows to sensitive areas. For such areas, the CSO Policy indicates the LTCP should: (a) prohibit new or significantly increased overflows; (b) eliminate or relocate overflows that discharge to sensitive areas if physically possible, economically achievable, and as protective as additional treatment, or provide a level of treatment for remaining overflows adequate to meet standards; and (c) provide reassessments in each permit term based on changes in technology, economics, or other circumstances for those locations not eliminated or relocated (USEPA, 1995b).

The performance of each of the Alley Creek and Little Neck Bay Alternatives in the reduction of untreated CSO volume and reducing the number of CSO events (see Section 7.4), resultant water quality (see Section 7.5) and cost of each alternative (see Section 7.6) were reviewed to assist in selection of an alternative as the Alley Creek and Little Neck Bay WB/WS Facility Plan that meets the overall CSO Policy requirements and those requirements specific to the sensitive DMA Beach, Little Neck Bay area.

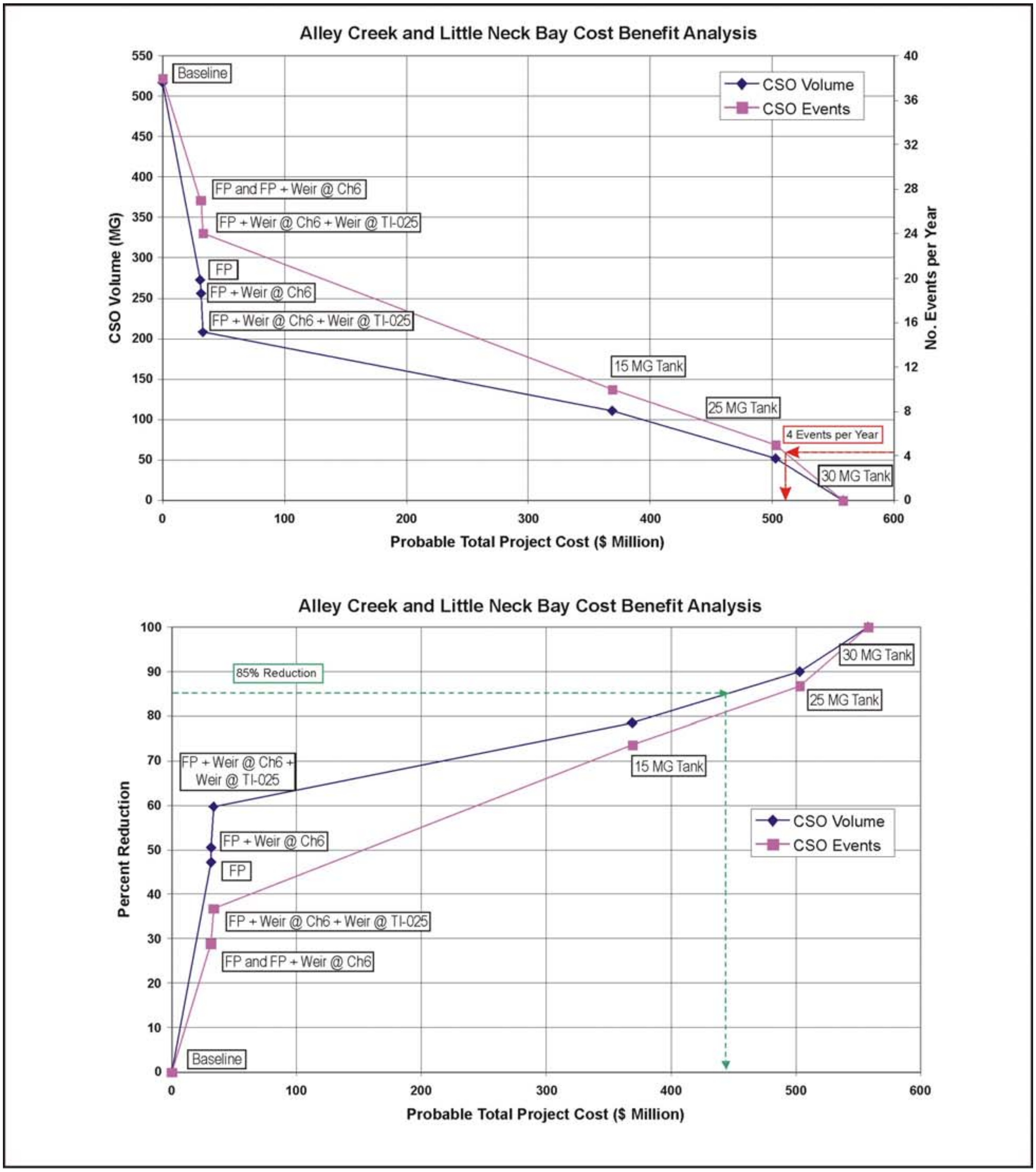
7.7.1 Performance Evaluation Results

The performance of each of the alternatives as a function of cost is presented on Figure 7-10. The top panel of the figure shows CSO volume (annual discharge during Baseline Condition year) and number of CSO events. The CSO Facility Plan alternative and weir alternatives range in cost from $31.3M to $33.4M. The larger tanks needed to reduce CSO events to 10 (15 MG), 5 (25 MG) and 0 (30 MG) cost $369M, $503M, and $558M, respectively. To reduce the number of CSO events to 4 per year would require more than 25 MG of storage at a cost of more than $510M. The bottom panel of Figure 7-10 expresses performance as percent reduction of Baseline CSO volume and percent reduction in Baseline CSO events as a function of cost. To reduce CSO volume by 85 percent needs more than 20 MG of storage at a cost of approximately $430M.

All of the flow through the tank, captured and overflow receives preliminary treatment through settling of solids. Floatables removal is accomplished via the baffle at the end of the tank. The CSO Facility Plan, therefore, reduces the untreated CSO discharge by 96.5 percent.

7.7.2 Dissolved Oxygen Evaluation Results

The water quality results for the Alley Creek CSO Alternates were expressed as a function of cost in order to define the relationship of cost to resultant water quality benefit. Figure 7-11 presents the dissolved oxygen results. Probable Total Project Cost is on the horizontal axis. Percent of time that dissolved oxygen is greater than 4.0 mg/L is presented on a



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CSO Discharge Reduction vs. Costs for Evaluated Alternatives

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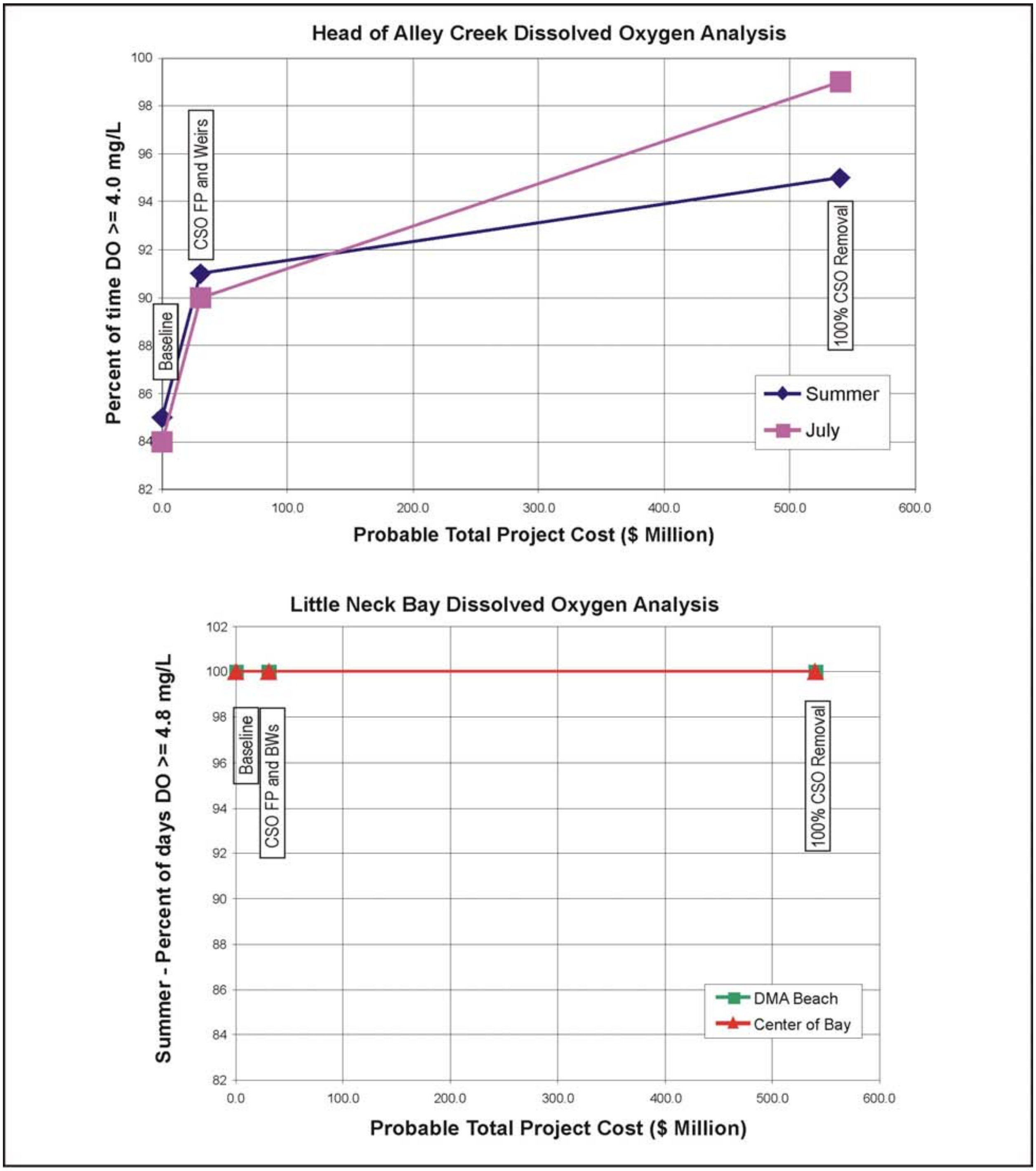
FIGURE 7-10



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Alley Creek and Little Neck Bay Dissolved Oxygen, Cost-Benefit

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 7-11

summer season basis and for the month of July, the critical summer month. The percent of time dissolved oxygen is greater than 4.0 mg/L increases for the CSO Facility Plan and Weir alternatives as compared to the Baseline on a summer season basis. The minimum calculated dissolved oxygen values increase for the CSO Facility Plan and Bending Weir alternatives compared to the Baseline Condition. This increase at a cost of $31.8M to $33.4M is one half of the improvement that 100 Percent CSO Removal provides over Baseline. The CSO Facility Plan and Weir alternates represent the level of dissolved oxygen improvement and cost which is the “knee of the curve”. Further dissolved oxygen improvement is minimal and is only achieved at significant cost.

The water quality results for Little Neck Bay as a function of cost are presented on the bottom panel of Figure 7-11. Cost of alternative is the horizontal axis with percent of summer days that daily average dissolved oxygen is greater than 4.8 mg/L as the vertical axis. The results of alternatives at two locations are shown, DMA Beach and near the center of the bay. The center of the bay results indicate that for all of the alternatives, including Baseline, the daily average dissolved oxygen is greater than 4.8 mg/L 100 percent of the time during the summer. The conclusion for Little Neck Bay is that the summer daily average dissolved oxygen is always greater than 4.8 mg/L. The CSO Facility Plan and Weir Alternatives and 100 Percent CSO Removal may improve the dissolved oxygen in Little Neck Bay compared to Baseline but that cannot be expressed in terms of percent of summer days greater than 4.8 mg/L. The dissolved oxygen benefit and cost for Alley Creek and Little Neck Bay alternatives are summarized on Table 7-7.

Table 7-7 - Alternatives Evaluation, Dissolved Oxygen Benefit and Cost

Probable Total Project Cost	Alley Creek and Little Neck Bay Alternative	Head of Alley Creek				Little Neck Bay	
		Percent of Time DO >4.0 mg/L		Percent of Time DO >3.0 mg/L		Summer Percent of Days DO >4.8 mg/L	
		Summer	July	Summer	July	DMA Beach	Center of Bay
$0	Baseline Condition	85	84	100	100	100	100
$31.3M	CSO Facility Plan	91	90	100	100	100	100
$31.8M	FP + Weir @ Chamber 6	91	90	100	100	100	100
$32.9M	FP + Weir @ TI-025	91	90	100	100	100	100
$558M	100 Percent CSO Removal	95	98	100	100	100	100

7.7.3 Bacteria Evaluation Results

Enterococcus

The water quality enterococcus results were evaluated for Little Neck Bay at DMA Beach and near the Bayside Marina. To provide an evaluation comparison for the CSO control alternatives, a summary of hours with enterococcus concentrations greater than 104 and 501 per 100 mL for each alternative is presented in Table 7-8 and shown on Figure 7-12. The head of Alley Creek, DMA Beach and Bayside Marina locations were selected as representative of Alley

Table 7-8. Alternatives Evaluation, Pathogens Benefit and Cost

Enterococcus (Entero)

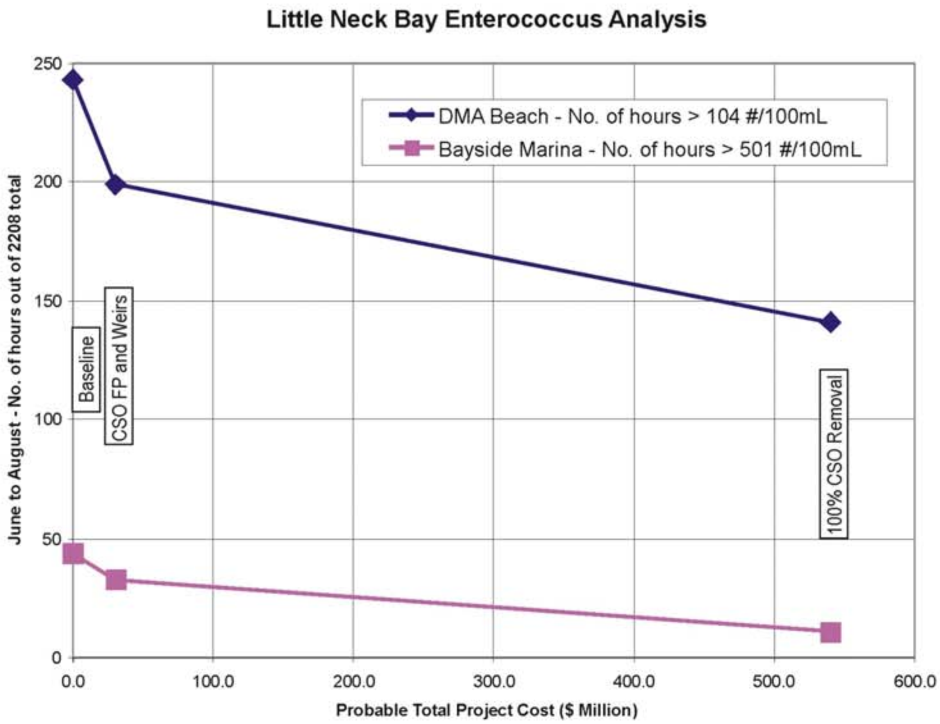
Probable Total Project Cost	Alternative	Location				
		DMA Beach		**Bayside Marina**		**Head of Alley Creek**
		Standard: 30 Day Moving GM <35/100 mL	**Standard: 30 Day Moving GM <35/100 mL**	**Standard: 30 Day Moving GM <35/100 mL**		**No Standard for Class I**
		June, July, August Max. Geometric Mean Entero org/100 mL	**Number of June, July, August Hours (Out of 2,208 hrs) Entero > 104 org/100 mL**	**June, July, August Max. Geometric Mean Entero org/100 mL**	**Number of June, July, August Hours (Out of 2,208 hrs) Entero > 501 org/100 mL**	
$0	Baseline	17	243	17	44	NA
$31.3M	CSO FP	12	199	13	33	NA
$558M	100 Percent CSO Removal	10	141	12	11	NA

Total Coliform (TC)

Probable Total Project Cost	Alternative	Location				
		DMA Beach		**Bayside Marina**		**Head of Alley Creek**
		Standard: Monthly Median ≤ 2,400/100 mL	**Standard: 80 Percent Monthly Values ≤ 5,000/100 mL**	**Standard: Monthly Median ≤2,400/100 mL**	**Standard: 80 Percent Monthly Values ≤ 5,000/100 mL**	**Standard: Monthly Geometric Mean <10,000/100mL**
		July Median TC / 100 mL	**Percent of time July TC <5,000**	**July Median TC / 100 mL**	**Percent of Time July TC <5,000**	**July Geometric Mean TC / 100 mL**
$0	Baseline	190	92	215	94	1,280
$31.3M	CSO FP	90	95	140	95	900
$558M	100 Percent CSO Removal	80	99	115	96	400

Fecal Coliform (FC)

Probable Total Project Cost	Alternative	Location		
		DMA Beach	**Bayside Marina**	**Head of Alley Creek**
		Standard: Geometric Mean ≤ 200/100 mL	**Standard: Geometric Mean ≤ 200/100 mL**	**Standard: Geometric Mean ≤ 2,000/100 mL**
		July Geometric Mean FC (org/100 mL)	**July Geometric Mean FC (org/100 mL)**	**July Geometric Mean FC (org/100 mL)**
$0	Baseline	29	21	210
$31.3M	CSO FP	19	14	190
$558M	100 Percent CSO Removal	18	13	110



CSO FP and Weirs:
Alley Creek Tank and
Weir Alternates

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Douglas Manor Association Beach and Little Neck Bay, Enterococcus Cost-Benefit

FIGURE 7-12

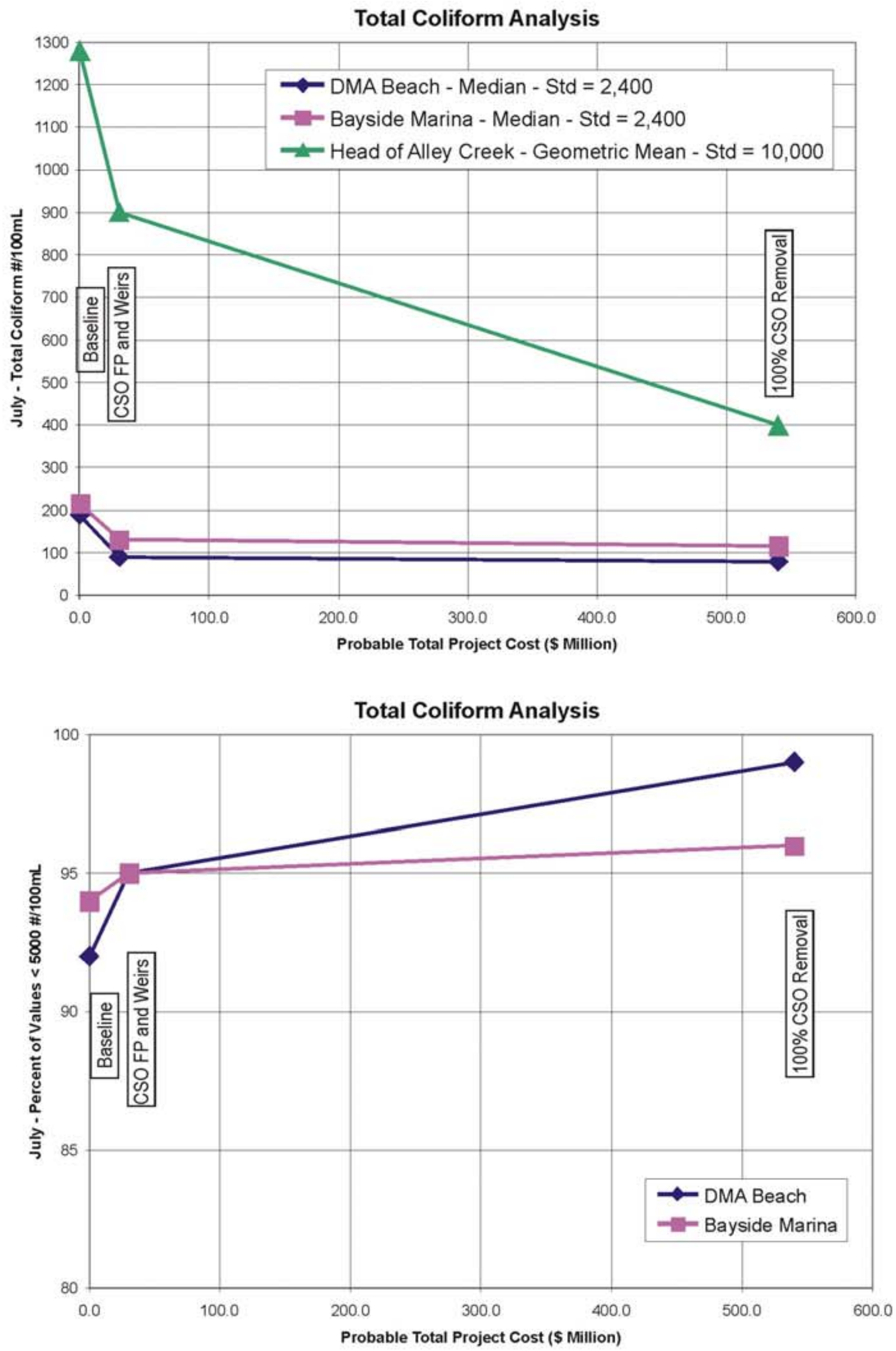
Creek, the important, "sensitive area" beach location and an area of access to the secondary contact recreation opportunities in Little Neck Bay, respectively. For all of the alternatives including Baseline, the 30-day moving geometric mean was less than 35 per 100mL in Little Neck Bay during the June through August bathing season. The maximum value of the 30-day moving geometric mean enterococcus is presented on Table 7-8 at DMA Beach and Bayside Marina. It can be seen that the maximum value decreases by approximately one-third for the 100 Percent CSO Removal case compared to Baseline. This indicates that at these locations for the design year calculation CSO represents one-third of the source and stormwater two-thirds. As noted in Section 4.5.2.1, localized sources of pathogens such as potential failing septics, recreational boat discharges, and water fowl are likely significant pathogen sources. These localized sources, however, are not included in the ERTM model which performs calculations at a spatial scale appropriate for CSO and stormwater evaluation.

The number of hours during the summer bathing season June through August (out of a total of 2208 hours) is presented as a function of cost on Figure 7-12. The enterococcus results for the DMA Beach are number of bathing season hours that enterococcus is greater than 104 per 100 mL. The Baseline number of 243 is reduced to 199 for the CSO Facility Plan alternative and reduced to 141 with 100 Percent CSO Removal, at associated costs of $31.3M and $558M, respectively. Similarly, the number of bathing season hours greater than 501 per 100 mL is presented for the location near Bayside Marina. The 63 hours at Baseline is reduced to 54 hours and 40 hours for the CSO Facility Plan alternative and 100 Percent CSO Removal, respectively. The conclusion for enterococcus for the DMA Beach is that 100 Percent CSO Removal does not result in the enterococcus being less than 104 per 100 mL at all times during the summer bathing season. Further reduction in the hours with enterococcus greater than 104 per 100 mL, could only be accomplished by addressing bacteria sources other than CSO. However, more than half of the potential reduction in hours with enterococcus greater than 104 per 100 mL that was calculated for 100 Percent CSO Removal when compared to Baseline, can be achieved with the CSO Facility Plan and Weir Alternatives.

Similarly, in the remainder of Little Neck Bay where primary contact recreation is infrequent, the CSO Facility Plan alternative achieves a reduction in bathing season hours with enterococcus greater than 501 per 100 mL almost one-half the reduction expected from 100 Percent CSO Removal compared to Baseline. The CSO Facility Plan and Weir Alternatives represent the enterococcus reduction and cost which is the "knee of the curve." Further enterococcus improvement is minimal and is only achieved at significant cost.

Total Coliform

Total coliform results relating cost of CSO control alternatives to total coliform improvement in July are presented on Figure 7-13 and summarized in Table 7-8. The top panel includes results from the Little Neck Bay locations at DMA Beach and near Bayside Marina and the head of Alley Creek. July total coliform per 100mL for the Little Neck Bay locations are the median. The total coliform standard in Little Neck Bay, Class SB, is a monthly median less than 2,400 per 100 mL. All monthly medians in Little Neck Bay calculated for the one year simulation period were well below 2,400 per 100 mL. It can be seen that July monthly median total coliform Baseline at DMA Beach, 190 per 100 mL, could be reduced to 80 with 100 Percent CSO Removal. However, a reduction to 90 is calculated for the CSO Facility Plan



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Douglas Manor Association Beach, Little Neck Bay and Alley Creek, Total Coliform Cost-Benefit

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 7-13

alternative at a cost of $31.3M compared to $558M for 100 Percent CSO Removal. Results are similar for the Bayside Marina location.

The total coliform monthly geometric mean in Alley Creek is less than the Class I standard of 10,000 per 100 mL for all alternatives at all times. The Baseline July geometric mean, 1,280 per 100 mL, is calculated to be reduced to 900 per 100 mL for the CSO Facility Plan alternative and 400 per 100 mL for 100 Percent CSO Removal.

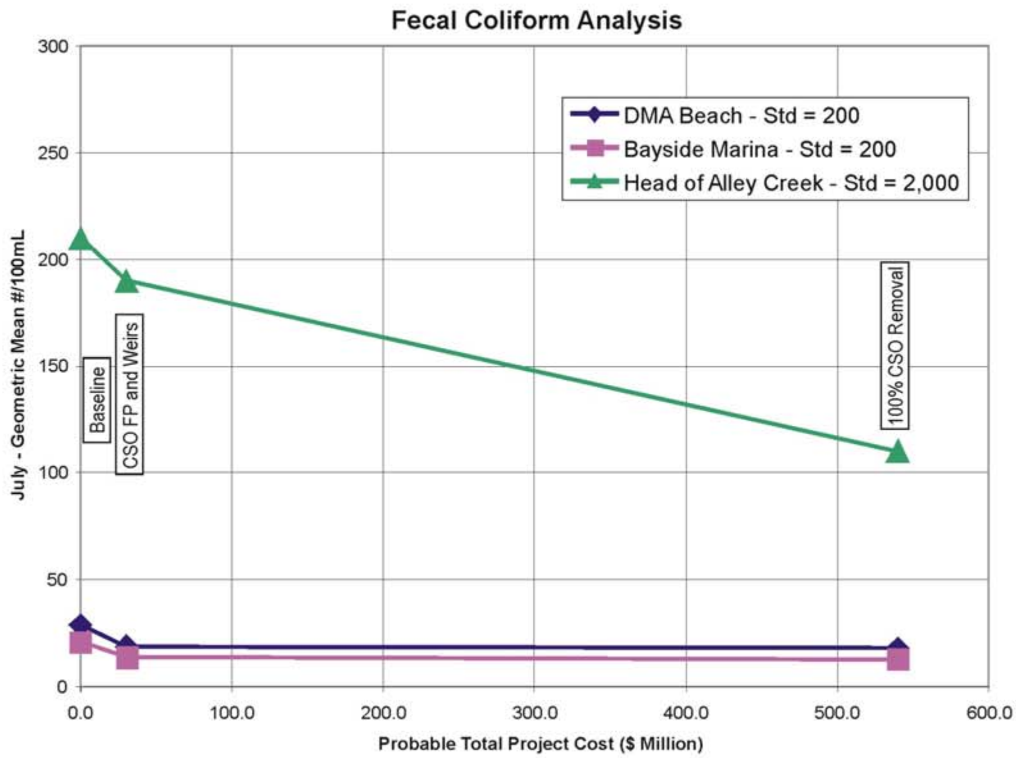
The bottom panel of Figure 7-13 presents the percent of total coliform less than 5,000 per 100 mL for July for the Little Neck Bay locations. It should be noted that all Little Neck Bay locations had at least 80 percent, of monthly total coliform less than 5,000 per 100 mL, the Class SB standard. At the DMA Beach and the location near Bayside Marina, the percent of July total coliform less than 5,000 per 100 mL increase slightly from the Baseline percentage for both the CSO Facility Plan and 100 Percent CSO Removal alternatives. The CSO Facility Plan alternate represents the reduction in total coliform (improvement greater than meeting standards) and cost which is the “knee of the curve”. Further total coliform reduction is minimal and is only achieved at significant cost.

Fecal Coliform

Results for fecal coliform cost-benefit analysis are presented on Figure 7-14 and summarized in Table 7-8. The July geometric mean of fecal coliform in Alley Creek, at DMA Beach and Bayside Marina for CSO Control alternatives is shown as a function of cost. All monthly fecal coliform geometric means were less than 2,000 per 100 mL for Alley Creek and less than 200 per 100 mL for Little Neck Bay. It can be seen from Figure 7-14 that the CSO Facility Plan alternative results in a decrease in the July geometric mean of fecal coliform. The 100 Percent CSO Removal scenario results in only slightly lower values. Fecal coliform results are presented for Alley Creek. Similarly to enterococcus and total coliform evaluations, the CSO Facility Plan alternative represents the reduction in fecal coliform (improvement greater than meeting standards) and cost which is the “knee of the curve”. Further reduction in fecal coliform is minimal and is only achieved at significant cost.

7.8 RECOMMENDED WATERBODY/WATERSHED FACILITY PLAN

The resultant water quality results discussed in Section 7.6 in conjunction with the performance vs. cost comparison leads to the selection of the alternative that includes the Alley Creek Tank and a static weir to raise the bypass fixed weir at Chamber 6 as the Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan. The static weir at Chamber 6 will further reduce CSO discharge from TI-008. A recent hydraulic analysis of the tank and Chamber 6 indicated that a static weir can provide the equivalent CSO reduction to TI-008 as the bending weir without an increased risk of upstream flooding (HydroQual 2008). Therefore, the Waterbody/Watershed Facility Plan includes the use of a stop log to raise the elevation of the Chamber 6 fixed overflow weir to TI-008 from +4.75 ft to +5.75 ft in lieu of a 1.5 ft high bending weir. The hydraulic analyses also concluded that addition of more stop logs to further increase the fixed weir overflow height was not required to achieve TI-008 CSO reduction goals. However, NYCDEP Bureau of Water and Sewer Operation (BWSO) is evaluating whether a second stop log or portion of a second stop log can safely be added at this location. Upon approval by BWSO, a second stop log will be added.



CSO FP and Weirs:
Alley Creek Tank and
Weir Alternates

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Douglas Manor Association Beach, Little Neck Bay and Alley Creek, Fecal Coliform Cost-Benefit

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 7-14

7.9 PROTECTION OF A SENSITIVE AREA, DMA BEACH IN LITTLE NECK BAY

There is a sensitive area present in Little Neck Bay (a permitted bathing beach) as defined by the USEPA Long Term CSO Control Plan Policy. The Waterbody/Watershed Facility Plan and LTCP will, therefore, address the USEPA 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 reassessments in each permit term based on changes in technology, economics, or other circumstances for those locations not eliminated or relocated (USEPA, 1995a).

"(a) Prohibit new or significantly increased overflows,"

There will be no new or significantly increased overflows in the immediate vicinity of the DMA beach. The WB/WS Facility Plan reduces CSO volume by 51 percent and reduces CSO overflow events.

"(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;"

The Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan reduces CSO volume by 51 percent and reduces untreated CSO volume by 100 percent for the design year.

The alternatives analyses concluded that elimination (or relocation) of CSO overflows is not economically achievable and that elimination of CSOs does not result in water quality that meets water quality standards at DMA Beach at all times. The remaining CSOs were shown to have relatively little influence on DMA Beach water quality. The WB/WS Facility Plan provides water quality improvements in dissolved oxygen and it is calculated that daily average dissolved oxygen meets chronic and acute standards 100 percent of the time during the critical summer period. The 30-day geometric mean enterococcus is calculated to be less than 35 per 100 mL at all times. The WB/WS Facility Plan monthly median total coliform is less than 2,400 per 100 mL at all times. The percent of total coliform concentrations that are less than 5,000 per 100 mL is greater than 80 percent for all months at DMA Beach. The monthly geometric mean of fecal coliform levels is less than 200 per 100 mL at all times. The water quality improvements resulting from the WB/WS Facility Plan compared to Baseline are similar to improvements expected to result from 100 Percent CSO Removal. The determination of pollutant loads into Alley Creek and Little Neck Bay (Section 3) and the CSO control alternatives evaluation (Section 7) indicate that stormwater control is required for additional water quality improvement and the control of localized pathogen sources from the DMA Beach area is needed for non-impaired swimming use.

"(c) Provide reassessments in each permit term based on changes in technology, economics, or other circumstances for those locations not eliminated or relocated."

The Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan includes provisions for the reassessment of CSOs TI-025 and TI-008 for their impact on DMA Beach water quality and the opportunity to further reduce CSO overflows to Alley Creek and Little Neck Bay (Section 8.5). CSO Outfalls TI-006, TI-007, TI-009, and TI-024 were calculated to have no CSO discharge during the 1988 one year simulation. Should CSO discharge at these outfalls, the impact on DMA Beach will be evaluated. (Note: TI-007 to be eliminated as per NYSDEC mandate.)

Available NYCDOHMH DMA Beach Monitoring data will be reviewed in conjunction with the LTCP post-construction monitoring program data, and beach advisories and closures will be included in the DMA Beach assessment report.

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8.0 Waterbody/Watershed Facility Plan

The Waterbody/Watershed Facility Plan for Alley Creek and Little Neck Bay has been developed by NYCDEP as an approach to achieve the current water quality standards in Alley Creek and Little Neck Bay and in accordance with the LTCP requirements. NYCDEP CSO Control Facility Planning for these waterbodies, however was begun in 1984 predating the current LTCP program. The Alley Creek CSO Facility Plan was accepted by NYSDEC in 2000. The principal facility of the 2003 Alley Creek CSO Facility Plan is a 5 MG CSO Retention Tank and its new CSO outfall TI-025 to Alley Creek. The Alley Creek Tank CSO Facility Plan is the final product of an extensive planning process that parallels the current federal requirements for Long-Term Control Planning. In addition, the Alley Creek Tank is a requirement of the Consent Order (see Section 5.2). The implementation of the elements of the Alley Creek and Little Neck Bay Waterbody/ Watershed Facility Plan is well underway. The construction completion milestone for the Alley Creek CSO Retention Facility and new outfall, TI-025, is December 2009. The estimated cost for all CSO-related elements is $31.3 million. (November 2008 dollars). The Alley Creek CSO project is a portion of a larger drainage improvement and restoration project that totals $136 million.

Each of the analyzed CSO control alternatives developed and evaluated started with the Alley Creek CSO Retention Tank as the basic element. In accordance with USEPA policy, the alternatives were developed and evaluated on the basis of resulting water quality improvement beyond that resulting from the CSO Facility Plan Tank. In addition, alternatives were evaluated to assess the USEPA mandated benchmarks such as 70, 80, 90 percent wet weather control or 10-12, 6-8, 4, and 0 events of untreated overflows. Based on the above, the Alley Creek and Little Neck Bay WB/WS Facility Plan is the Alley Creek CSO Facility Plan, the Alley Creek Tank and outfall TI-025 and a static weir (stop log) on top of the Chamber 6 concrete weir that is the CSO Retention Facility bypass. The total cost of the WB/WS Facility Plan is $31.8M (November 2008 dollars).

Public participation and agency interaction took place during the Waterbody/Watershed Facility Plan process. The Alley Creek and Little Neck Bay Stakeholders have requested that NYSDEC provide Community Board 11 with the NYSDEC approved Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan (hard copy and electronic file).

The subsections that follow present the recommended CSO controls in a Waterbody/Watershed (WB/WS) Facility Plan needed to attain current water quality standards and achieve waterbody uses. It is recognized in the WB/WS Facility Plan that achieving water quality objectives will require more than a reduction in CSO discharges. This is shown when the 100 Percent CSO Reduction scenarios were evaluated. Remaining non-attainment of standards is caused by stormwater, a source not specifically addressed in the LTCP process. In addition, non-impaired swimming at DMA Beach will require elimination of localized sources (non-CSO) of pathogens in the beach vicinity. The WB/WS Facility Plan incorporates cost-effective engineering with demonstrable water quality improvements including increased dissolved oxygen in Alley Creek and pathogen reduction in Alley Creek and Little Neck Bay Post-construction compliance monitoring and modeling, discussed in detail in Subsection 8.5, is an integral part of the WB/WS Facility Plan and provides the basis for adaptive management for Alley Creek and Little Neck Bay.

8.1 PLAN COMPONENTS

The Alley Creek CSO retention facility is being implemented by NYCDEP as one element in a larger phased project to provide drainage relief and CSO abatement for sewer service areas on the west side of Alley Creek. The complete project is described in Section 5. The components of the Waterbody/Watershed Facility Plan for Alley Creek and Little Neck Bay are summarized as follows:

- Continued implementation of programmatic controls;
- Complete and Operate the Alley Creek CSO Retention Facility
  - CSO Retention Facility, 5.2 MG Alley Creek Tank with new Chamber 6 to direct CSO to Alley Creek Tank and provide tank bypass to TI-008
  - Static weir (1 to 2 ft stop log) at Chamber 6 to eliminate to the extent possible the bypass of untreated CSO to TI-008
  - New CSO outfall, TI-025, for discharge from the Alley Creek Tank
  - Upgrade of Old Douglaston Pumping Station to empty tank
  - Fixed baffle at TI-025 for floatables retention
- Sustainable Stormwater Management

8.1.1 Continued Implementation of Programmatic Controls

As discussed in detail in Section 5.0, NYCDEP currently operates several programs designed to reduce CSO to a minimum and provide treatment levels appropriate to protect waterbody uses. As the effects of the LTCP become understood through long-term monitoring, ongoing programs will be routinely evaluated based on receiving water quality considerations. Floatables reduction plans, targeted sewer cleaning, real-time level monitoring, and other operations and maintenance controls and evaluations will continue, in addition to the following:

- The 14 BMPs for CSO control required under the City's 14 SPDES permits. In general, the BMPs address operation and maintenance procedures, maximum use of existing systems and facilities, and related planning efforts to maximize capture of CSO and reduce contaminants in the combined sewer system, thereby reducing water quality impacts.
- The City-Wide Comprehensive CSO Floatable Plan (HydroQual, 2005b and 2005c) provides substantial control of floatables discharges from CSOs throughout the City and provides for compliance with appropriate NYSDEC and IEC requirements. The Floatables Plan is an ongoing program that is expected to change over time based on continual assessment and changes in related programs.

8.1.2 Complete and Operate the Alley Creek CSO Retention Facility

The 5.2 MG Alley Creek CSO Retention Facility is designed to store and capture combined sewage at a peak design flow of approximately 1,980 cfs or 1,300 MGD. A CSO storage facility, 120 feet wide by 600 feet long, with depths ranging from approximately 9 to 12 feet, is located along both sides of the new 20'-0" W by 7'-9" H (average height) double barrel outfall sewer. The retention facility will receive CSO flows from Chamber No. 6. The CSO outfall sewer and CSO retention facility have been designed to operate passively during wet weather events. CSO volumes in excess of the storage capacity of the conduit will overflow the crest of a 120 ft. long fixed weir at the terminus of the new outfall sewer and discharge to Alley Creek through the new outfall, TI-025.

Chamber 6 is a new facility located near the intersection of 223rd St. and Cloverdale Boulevard that will receive the flows from Regulator Nos. 46, 47, 49, and Chamber 48. All of that flow currently discharges through the existing outfall sewer and the existing CSO outfall TI-008. During storms which exceed a five-year return period as defined by NYCDEP, the portion of the CSO flow that exceeds the hydraulic capacity of the new CSO retention facility and the new TI-025 outfall sewer will overflow a fixed weir at Chamber No. 6 and be conveyed through the existing sewer and discharge through CSO outfall TI-008.

The static weir to raise the elevation of the fixed weir at Chamber 6 to reduce and/or eliminate untreated CSO discharge from TI-008 is included as an element of the WB/WS Facility Plan.

The outfall structure for TI-025 includes tide gates located on Alley Creek at the downstream end of the outfall sewer and CSO storage facility, including scour protection measures to prevent scouring of the creek bed and restoration of the disturbed creek bed with riprap. This new outfall is located approximately 400 ft. downstream of CSO outfall TI-008.

The Old Douglaston Pumping Station will be modified to transfer captured combined sewage from the 5.2 MG storage facility to the Tallman Island WPCP for treatment. The capacity of the pumping station is sufficient for this transfer of stored combined sewage. However, a full upgrade of the station will be included in the project to increase the station reliability. The upgrade will include air treatment facilities, replacement of all pumps, new pump controls, improvements to the electrical and HVAC systems, and installation of new instrumentation and telemetry.

The CSO Facility Plan includes emptying of the Alley Creek CSO Retention Facility after the end of the storms, during dry weather conditions. The Old Douglaston Pumping Station will have a 9.5 MGD capacity. Given the average dry weather flow, the tank can be emptied in approximately 36 hours. The dewatering schedule will be coordinated with the available hydraulic capacity in the existing collection system and at the Tallman Island WPCP.

A baffle will be constructed within the TI-025 outfall sewer immediately upstream of the fixed weir to minimize floatables entering Alley Creek. The 10 Hydroself Flushing Gates installed within the Alley Creek CSO Tank will be used to clean debris from the floor of the tank after each rain event. All of the flow through the tank will receive preliminary treatment for floatables removal and solids settling.

8.1.3 Sustainable Stormwater Management

The NYCDEP will continue to develop green solutions for stormwater management and the programmatic implementation of sustainable stormwater practices in parallel to the CSO planning process and in cooperation with other City agencies and the Mayor's Office of Long-Term Planning and Sustainability. As information on sustainable practices becomes available, the NYCDEP will incorporate the findings of these programs in the Alley Creek and Little Neck Bay drainage basin-specific LTCP.

8.2 ANTICIPATED WATER QUALITY IMPROVEMENTS

Implementing the Waterbody/Watershed Facility Plan will have both sewer system performance benefits, as well as water quality benefits. The calculated performance of the Alley Creek and Little Neck Bay Facility Plan for reduction of CSO discharge and CSO events is summarized in Table 8-1. The various components of the Plan will reduce CSO discharges, improve aesthetic conditions, and enhance habitat to levels consistent with regulatory and stakeholder use goals.

Table 8-1. Waterbody/Watershed Facility Plan Performance

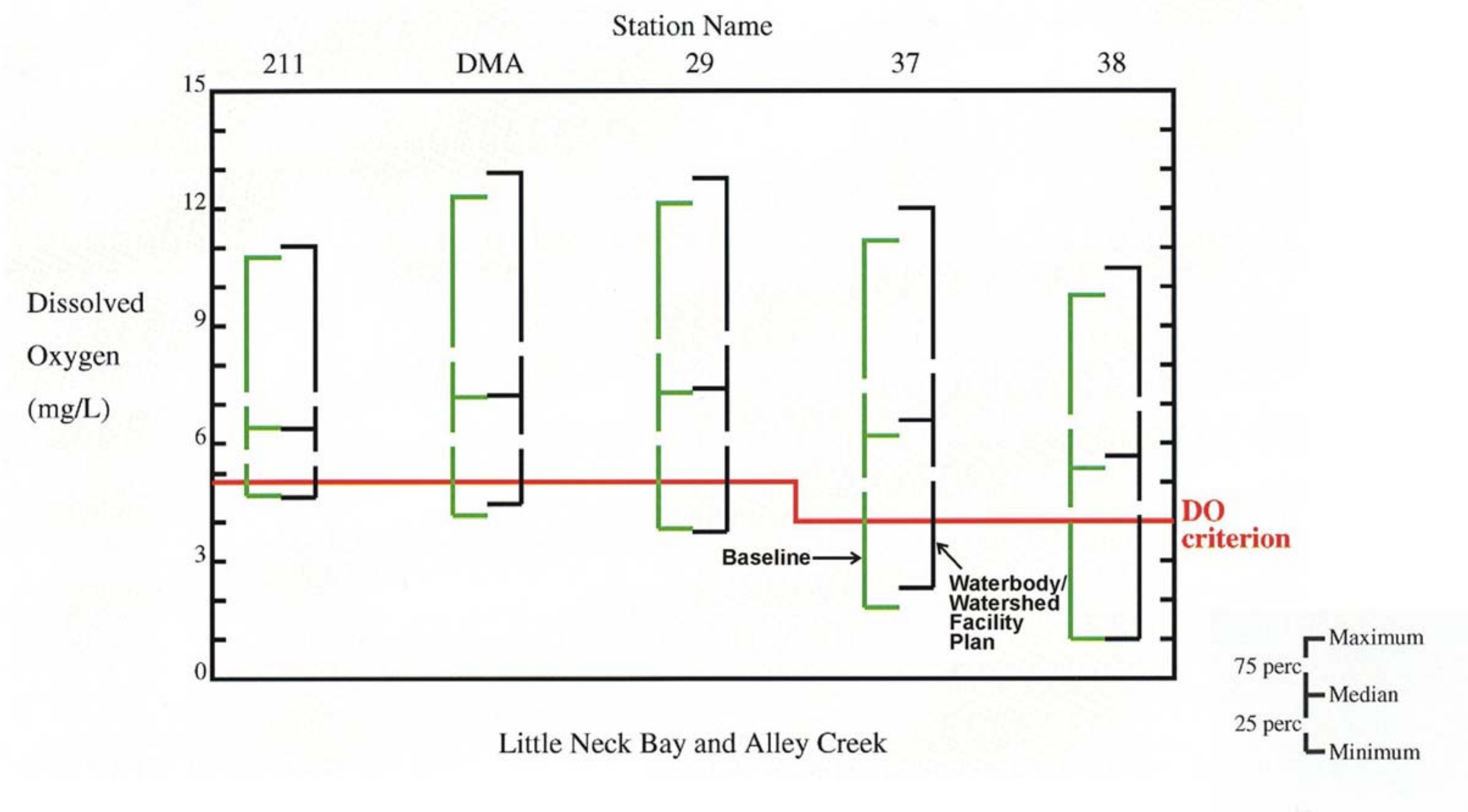
	Baseline	WB/WS FP	WB/WS FP Reduction from Baseline
CSO Volume Discharged (MG)	517(1)	256	51%
Untreated CSO Volume Discharged (MG)	517(1)	0	100%
Number of CSO Events	38	27	29%
(1) Includes 58.77 MG of CSO and 458.6 MG of stormwater.			

8.2.1 Waterbody/Watershed Facility Plan Dissolved Oxygen Improvements

Water-quality dissolved oxygen improvements projected with implementation of the Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan are presented in Figures 8-1a and 8-1b for the summer season, June through August and in Appendix C. As shown on Figure 8-1a, the WB/WS Facility Plan is projected to increase the absolute minimum dissolved oxygen as well as increasing the overall statistics of median, 75th and 25th percent dissolved oxygen levels. The improvement is greater in Alley Creek than in Little Neck Bay. Although some dissolved oxygen is calculated to be below 4.0 mg/L, the Class I standard for Alley Creek, 100 percent of the dissolved oxygen concentrations are calculated to be greater than 3.0 mg/L. This assures an aquatic life survival use.

Alley Creek Summer Dissolved Oxygen

Figure 8-1b is a spatial presentation of dissolved oxygen results for Baseline, CSO Facility Plan, and 100 Percent CSO Removal Alternatives along the transect depicted on Figure 4-15. The transect begins at the head of Alley Creek. At a distance 6,000 feet from the head of Alley Creek, Little Neck Bay begins. The transect continues through Little Neck Bay and for approximately 0.5 miles into the East River. Figure 8-1b is a summary of dissolved oxygen results on a summer season (June through August) basis. The left side panel presents the results



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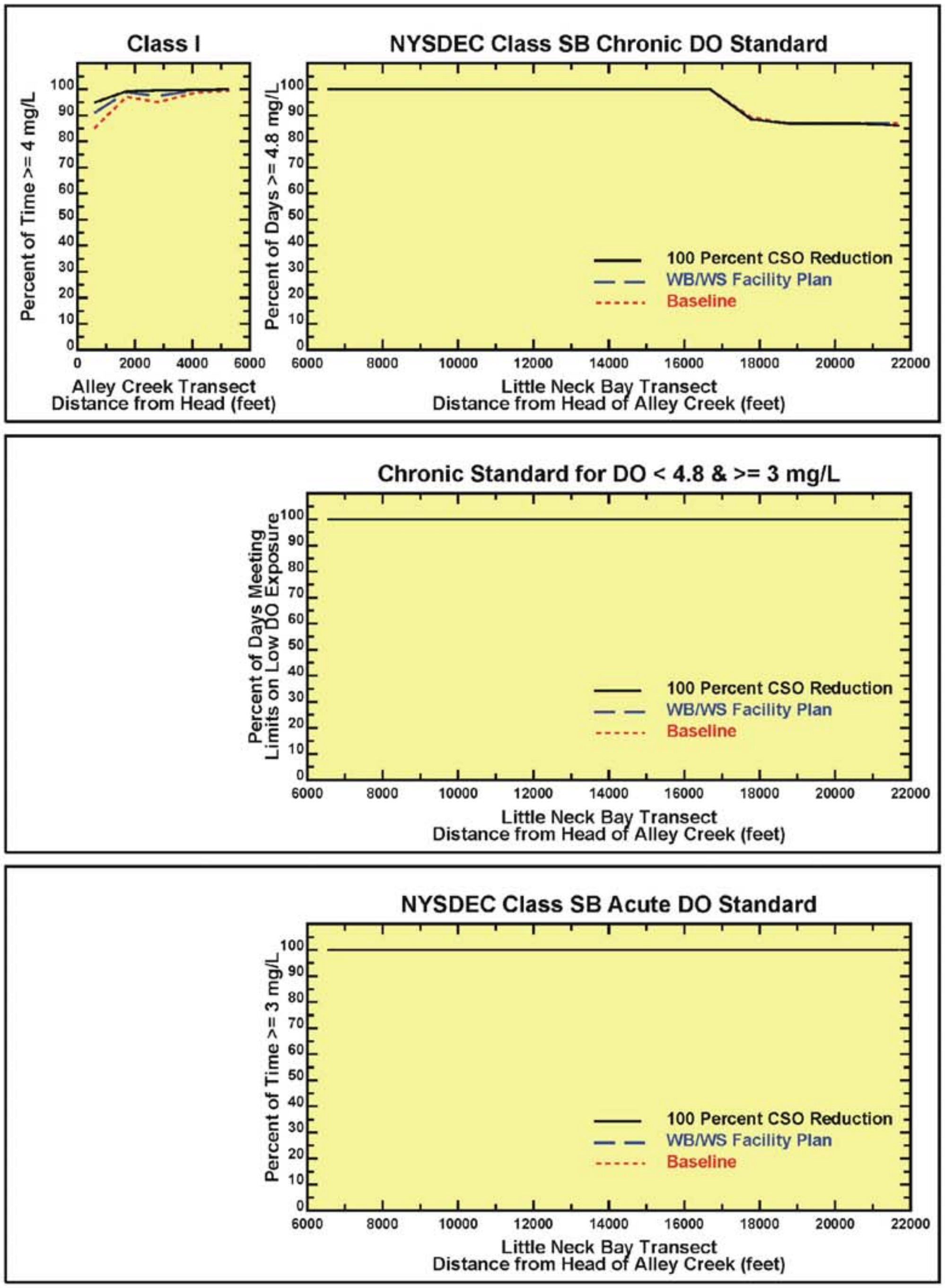
Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Alley Creek and Little Neck Bay
Summer Dissolved Oxygen
Waterbody/Watershed Facility Plan

FIGURE 8-1a



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Summer Dissolved Oxygen for Alley Creek/Little Neck Bay Transect

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 8-1b

for Alley Creek expressed as percent of the time the dissolved oxygen is greater than 4.0 mg/L. At the head of Alley Creek the dissolved oxygen is greater than 4.0 mg/L 91 percent of the time for the WB/WS Facility Plan. This is compared to 85 percent for the Baseline and 94 percent for the 100 Percent CSO Removal case. Therefore, at the head of Alley Creek, 100 Percent CSO Removal does not result in achieving 4.0 mg/L all of the time as the result of remaining stormwater load. At the mouth of Alley Creek the WB/WS Facility Plan results in dissolved oxygen greater than 4.0 mg/L for 100 percent of the time.

Little Neck Bay Summer Dissolved Oxygen

The right side panels on Figure 8-1b present the summer dissolved oxygen results for Little Neck Bay. The top panel expresses as percent, the days that the daily average dissolved oxygen is greater than or equal to 4.8 mg/L, the NYSDEC Class SB dissolved oxygen chronic standard. The WB/WS Facility Plan is calculated to have daily average dissolved oxygen of 4.8 mg/L, 100 percent of the summer days at the head of the bay. As Little Neck Bay transitions to the East River at the mouth, however, daily average dissolved oxygen is greater than or equal to 4.8 mg/L for 87 percent of the summer days.

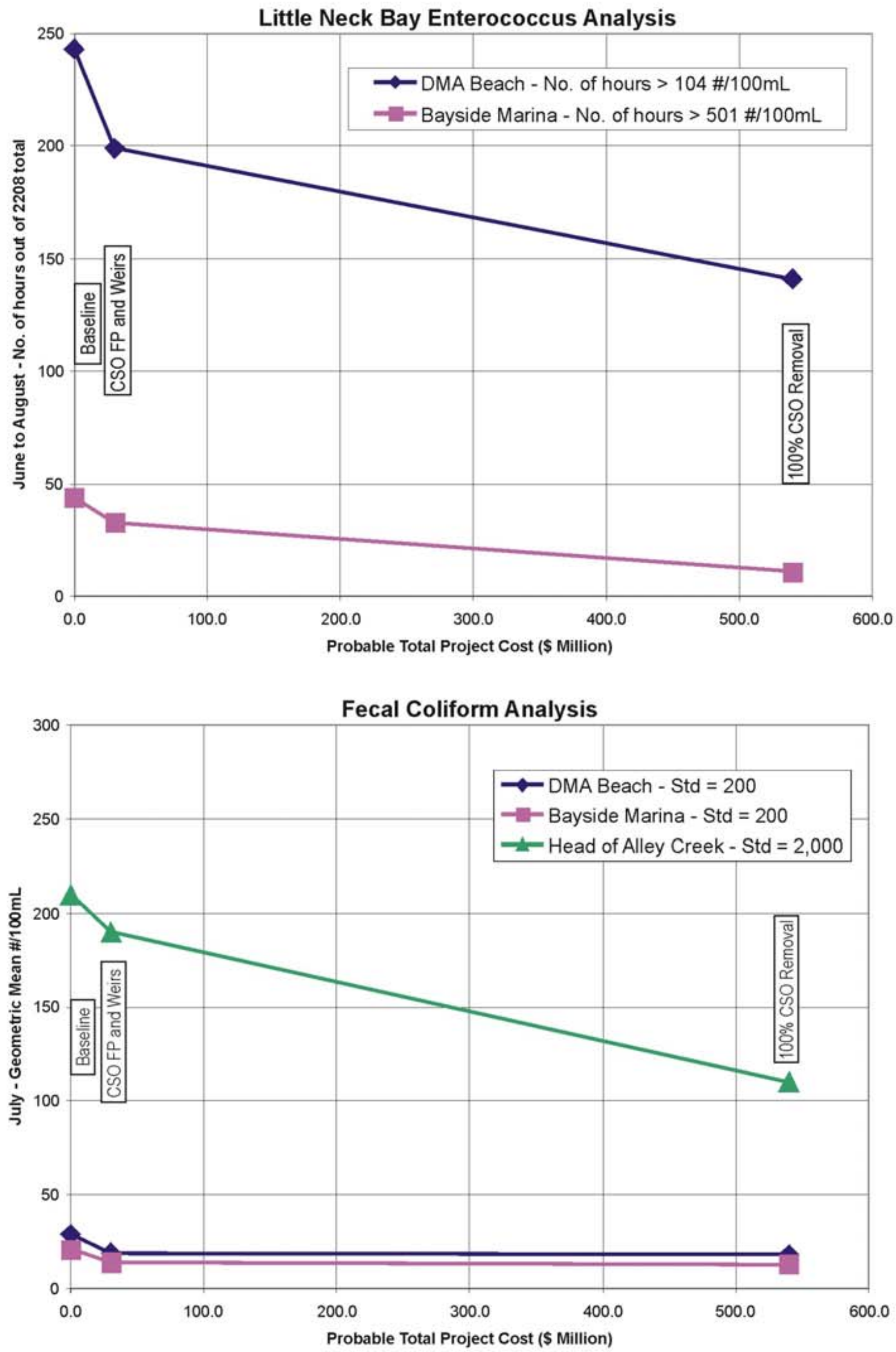
The middle right panel on Figure 8-1b presents the chronic dissolved oxygen portion of the SB standard for the summer days when the daily average dissolved oxygen was calculated by the model to be less than 4.8 mg/L but greater than 3.0 mg/L, For the WB/WS Facility Plan in Little Neck Bay, 100 percent of summer days meet the allowable limits on low dissolved oxygen exposure in the design year. Thus even though there were days when the average daily dissolved oxygen was less than 4.8 mg/L, (as shown on the top right panel, near the East River), the juvenile fish survival use was protected.

The bottom right hand panel of Figure 8-1b presents the percent of time that dissolved oxygen is greater than or equal to 3.0 mg/L, the NYSDEC acute dissolved oxygen standard for SB waters. The dissolved oxygen for the WB/WS Facility Plan is calculated to be greater than 3.0 mg/L 100 percent of the time for Little Neck Bay, during the summer season of the design year.

8.2.2 Waterbody/Watershed Facility Plan Improvement in Bacteria, DMA Beach

The benefit of the WB/WS Facility Plan in terms of enterococcus and fecal coliform is shown on Figure 8-2. The top panel presents the number of hours during the bathing season of June through August (2208 hours total), that DMA Beach is less than 104 per 100mL, the swimming reference level, and the hours that Little Neck Bay near Bayside Marina is less than 501 per 100mL, the level of concern for areas where there is infrequent primary contact recreation use. It should be noted that the Class SB standard of a 30-day geometric mean less than 35 per 100mL is met at Baseline at the DMA Beach and throughout Little Neck Bay. The WB/WS Facility Plan improves the water quality with respect to enterococcus levels with a cost-effective plan that approaches the improvement noted for 100 Percent CSO Removal. It should be noted, however, that primary contact recreation use at DMA Beach is currently impaired by localized pathogen sources such as failing septic systems, etc. For Alley Creek, a Class I water, there is no enterococcus standard.

The bottom panel presents the improvement in July fecal coliform resulting from the WB/WS Facility Plan at the DMA Beach and Bayside Marina in Little Neck Bay and at the head



Enterococcus and Fecal Coliform Benefit of Waterbody/Watershed Facility Plan to Douglas Manor Association Beach, Little Neck Bay and Alley Creek

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Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 8-2

of Alley Creek. The monthly geometric mean standard of less than 200 per 100mL in Little Neck Bay is met for Baseline and the WB/WS Facility Plan at all locations, for all months. Similarly, the Class I bacteria standards are met in Alley Creek, 100 percent of the time. In order to evaluate improvement the calculated July geometric mean is compared for the WB/WS Facility Plan, Baseline and 100 Percent CSO Removal cases. The fecal coliform results show the decrease in the July monthly geometric mean for the WB/WS Facility Plan at levels approaching 100 percent CSO Removal. The Plan approximately halves the July fecal coliform geometric mean.

The water quality model results from the LTCP project analyses for Alley Creek generally confirm the earlier facility planning projections of water quality improvements from the Alley Creek Tank. Water quality calculated at the DMA Beach generally meets water quality standards for dissolved oxygen and pathogens during the Baseline Conditions. Enterococcus (30-day geometric mean), total coliform and fecal coliform meet the Class SB standards for primary contact, swimming, at DMA Beach for Baseline Conditions. Hours during June through August of enterococcus greater than 104 per 100mL decrease with the Alley Creek Tank. Similar results are noted for the remainder of Little Neck Bay with enterococcus hours greater than 501 per 100mL decreasing with the Tank. Water quality improvements in Little Neck Bay are not as large as those calculated in Alley Creek for two reasons. First is that the only CSO in the Alley Creek and Little Neck Bay waterbodies is discharged into Alley Creek. Second is that the influence of CSO on Little Neck Bay water quality is not as strong as Alley Creek. It should be noted that in Alley Creek, Little Neck Bay and at DMA Beach further water quality improvements will require abatement of stormwater, the largest remaining pollutant source and the abatement of localized pathogen sources on Douglaston Peninsula to improve DMA Beach.

8.3 OPERATIONAL PLAN

USEPA guidance specifies that municipalities should be required to develop and document programs for operating and maintaining the components of their combined sewer systems (USEPA, 1995a). Once a long-term control plan has been approved, the municipality's operation and maintenance program should be modified to incorporate the facilities and operating strategies associated with selected controls.

The major component of the Waterbody/Watershed Facility Plan, the Alley Creek CSO Retention Facility, is currently under construction with a completion milestone date of December 2009. A draft Wet Weather Operating Plan (WWOP), Alley Creek CSO Retention Facility was prepared by the design engineers (URS June 2003, revised December 2003). This draft WWOP was included in the NYCDEP Tallman Island Water Pollution Control Plant Wet Weather Operating Plan (NYCDEP, May 2007) submitted to NYSDEC. The Alley Creek CSO Retention Facility WWOP is included as Appendix A as part of the latest Tallman Island WWOP.

Upon implementation of the Waterbody/Watershed Facility Plan elements, NYCDEP intends to operate the facilities as designed. However, it is both environmentally responsible and fiscally prudent to be responsive to changing and unforeseen limitations and conditions. An adaptive management approach will be employed to provide flexibility in the operation of the tank to achieve optimal performance of the Tallman Island system. Among the operation procedures that will be optimized is the point in time during and/or after rainfall events when pumping to dewater the tank will start. The Stakeholders have requested that dewatering of the tank during rainfall events (DW Early, see Section 7.4.3) be an option tested. Early dewatering will be a scenario for consideration by BWT during the post-construction monitoring. Post-construction compliance monitoring (described in Section 8.5) may trigger a sequence of more detailed investigations that, depending on the findings, could culminate in corrective actions. During the first nine post-construction years, the analysis will ultimately determine whether the performance of the CSO controls was adequate. If the performance is unacceptable, the finding will be verified, the causes will be identified, and reasonable corrective actions will be taken. Modifications and retrofits that are implemented and demonstrate improvement will be documented through the issuance of an LTCP update, subject to NYSDEC approval.

8.4 IMPLEMENTATION SCHEDULE

Figure 8-3 shows the implementation schedule for the WB/WS Facility Plan, along with relevant aspects of the programmatic controls and post-construction compliance monitoring schedules. It should be noted that elements shown in this schedule address the implementation of the recommended Waterbody/Watershed Facility Plan elements only. As noted in the Order on Consent (Section III.C.2) "once the Department approves a Drainage Specific LTCP, the approved Drainage Specific LTCP is hereby incorporated by reference, and made an enforceable part of this Order". As such, a schedule will be incorporated by reference only when this Waterbody/Watershed Facility Plan is further developed and submitted as an LTCP in accordance with dates presented in Appendix A of the CSO Consent Order.

8.5 POST-CONSTRUCTION COMPLIANCE MONITORING

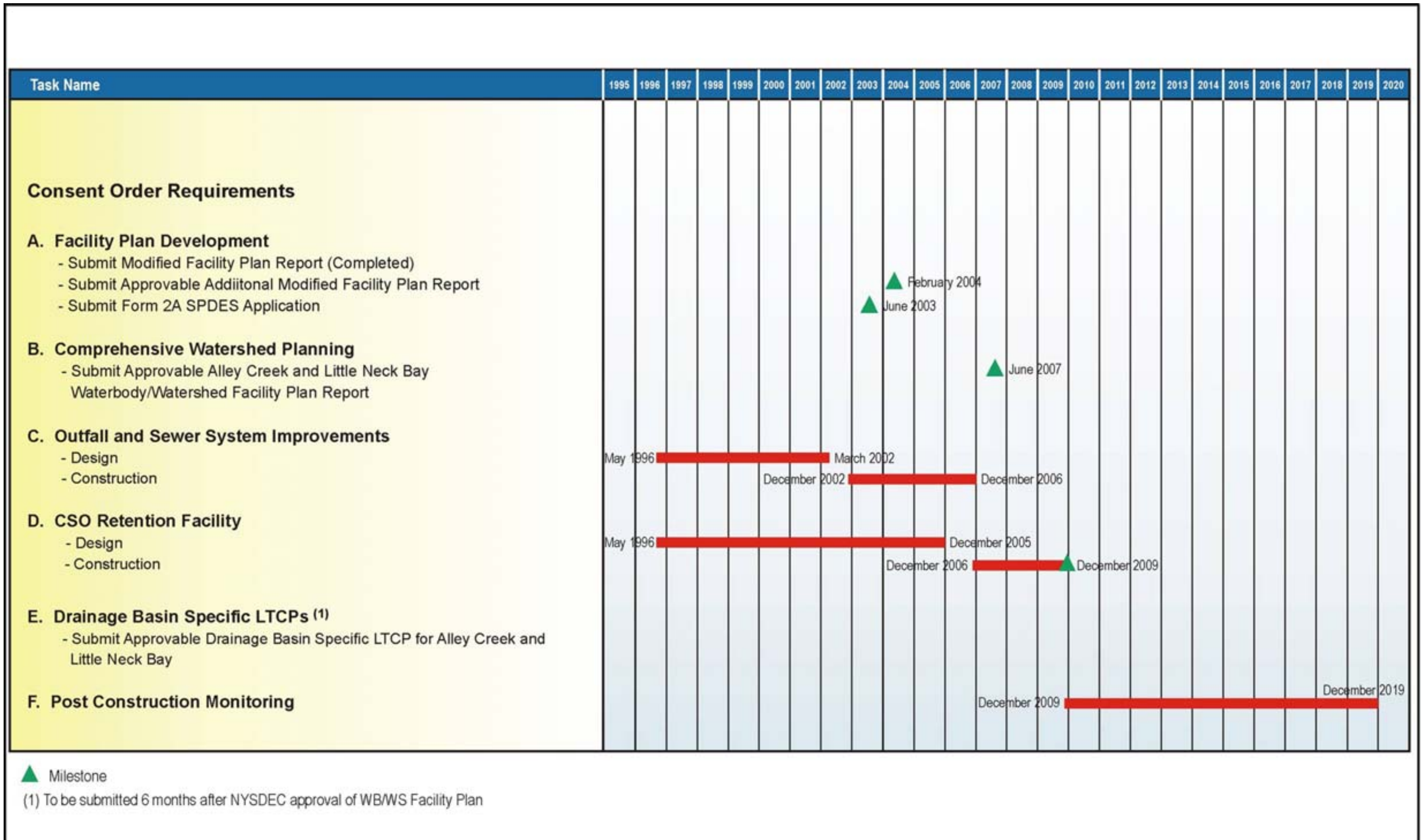
The Post-Construction Compliance Monitoring Program will be integral to the optimization of the Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan, providing data for model validation, feedback to facility operations, and an assessment metric for the effectiveness of these facilities. Each year's data set will be compiled and evaluated to refine the understanding of the interaction between Alley Creek, Little Neck Bay, and the Alley Creek CSO Retention Facility, with the ultimate goal of fully attaining compliance with current water quality standards or for supporting a UAA to revise such standards. The data collection monitoring will contain three basic components:

1. The Alley Creek CSO Retention Facility monitoring requirements contained in the Tallman Island WPCP SPDES permit;

2. Receiving water data collection in Alley Creek and Little Neck Bay using existing NYCDEP Harbor Survey locations and adding stations as necessary; and

3. Modeling of the associated receiving waters to characterize water quality.

Interim Post-Construction Compliance Monitoring Programs were developed for Flushing Bay, Flushing Creek, and Spring Creek waterbodies in 2008, and monitoring in accordance with those plans preceded those submittals, beginning prior to Summer 2007 when facilities associated with those waterbodies were placed into service. The PCM described herein conforms to the Interim Post-Construction Compliance Monitoring Programs approved by NYSDEC. The full details of the program are being developed under the City-Wide LTCP, including monitoring and laboratory protocols, QA/QC, and other aspects, to ensure adequate spatial coverage, consistency, and a technically sound sampling program for the entire New York



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Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

Alley Creek and Little Neck Bay Project Schedule

FIGURE 8-3

Harbor. The details provided herein are limited to the Alley Creek and Little Neck Bay Post-Construction Compliance Monitoring Program and may be modified as the City-Wide program takes form. Any further modifications to the Monitoring Program will be submitted to NYSDEC for review and approval as part of the drainage basin specific LTCPs.

8.5.1 SPDES Facility Monitoring Requirements

The Tallman Island WPCP SPDES Permit is expected to be modified to require monitoring of certain effluent overflow parameters at the Alley Creek CSO Retention Facility. Such monitoring results will be reported on a monthly basis as an addendum to the Tallman Island WPCP monthly operating report, and on an annual basis in the CSO BMP report. Sampling results and summary statistics will be provided in the monthly operating report, including the number of overflow events, the volume of overflow during each event, and the volume retained and pumped to the Tallman Island WPCP. Table 8-2 summarizes the relevant permit-required parameters from the current SPDES permit for the Flushing Tank.

Table 8-2. SPDES Permit Monitoring Parameters

Parameter	Report	Units	Frequency	Type	Note
Overflow Volume	Event total	MG	Per event	Calculated	-
Retained Volume	Monthly total	MG	Per month	Totalized	Flow to WPCP
BOD, 5-day	Event average	mg/L	Per event-day	Composite	Every 4 hr
TSS	Event average	mg/L	Per event-day	Composite	Every 4 hr
Settleable Solids	Event average	ml/L	Per event-day	Grab	Every 4 hr when manned
Oil & Grease	Event average	mg/L	Per event-day	Grab	When manned
Screenings	Monthly total	cu. yd	---	Calculated	-
Fecal Coliform	Event geo. mean	No/100mL	Per event-day	Grab	Every 4 hr when manned
Precipitation	Event total	inches	Hourly	Rain Gauge	-

See most recent Tallman Island WPCP SPDES Permit (NY0026239) for exact descriptions and definitions.

8.5.2 Receiving Water Monitoring

The post-construction compliance monitoring program will continue along the protocols of the New York City Harbor Survey initially, including laboratory protocols listed in Table 8-3. This program primarily measures four parameters related to water quality: dissolved oxygen, fecal coliform, chlorophyll “a”, and secchi depth. These parameters have been used by the City to identify historical and spatial trends in water quality throughout New York Harbor. Secchi depth and chlorophyll “a” have been monitored since 1986; DO and fecal coliform have been monitored since before 1972. Recently, enterococci analysis has been added to the program. Except for secchi depth and pathogens, each parameter is collected and analyzed at surface and bottom locations, which are three feet from the surface and bottom, respectively, to eliminate influences external to the water column chemistry itself, such as wind and precipitation influences near the surface or benthic and near-bottom suspended sediments and aquatic vegetation near the bottom. Pathogens are analyzed in surface samples only. NYCDEP regularly samples 33 open water stations annually, which is supplemented each year with approximately

20 rotating tributary stations or periodic special stations sampled in coordination with capital projects, planning, changes in facility operation, or in response to regulatory changes.

Table 8-3. Current Harbor Survey Laboratory Protocols

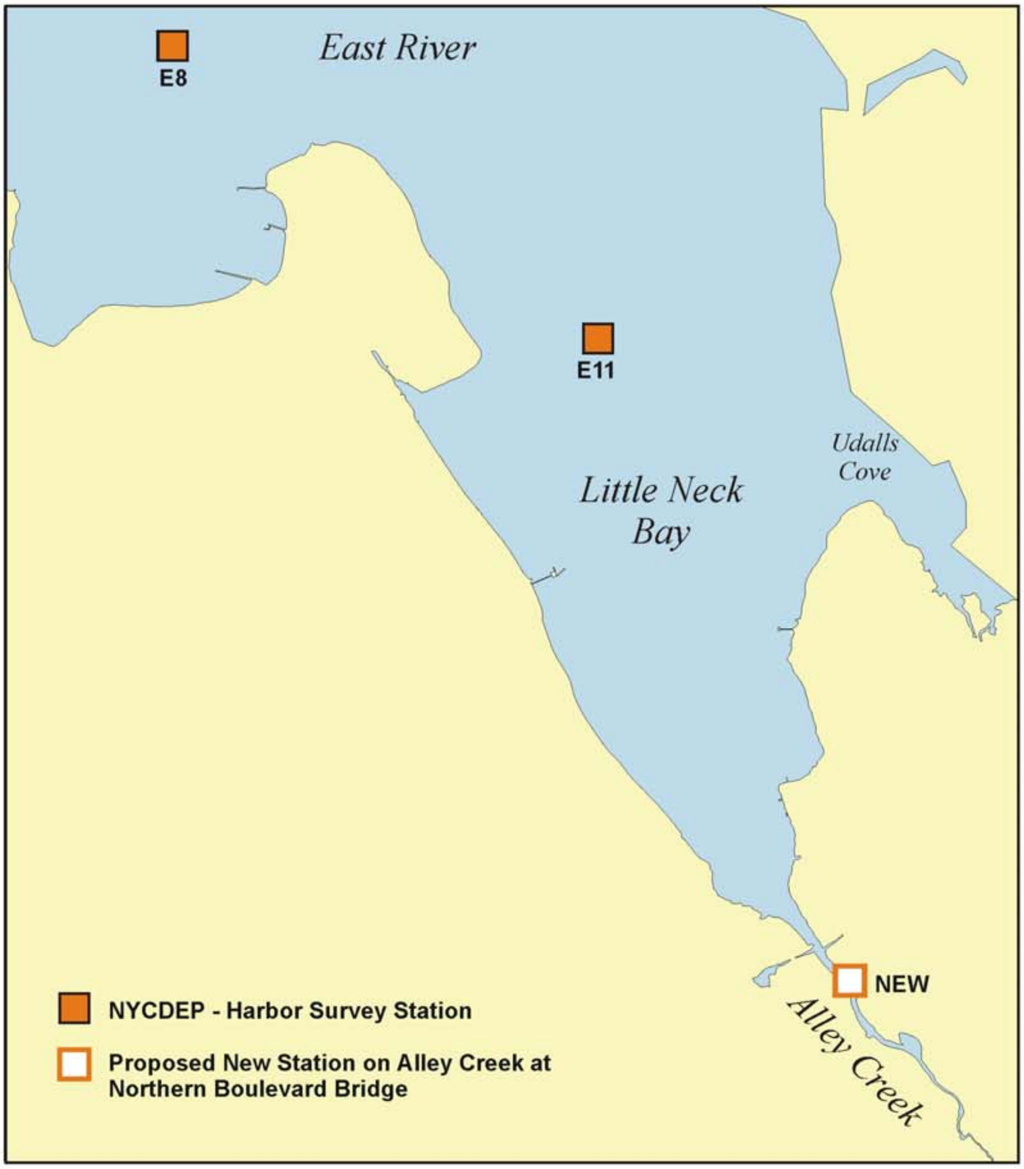
Parameter	Method
Ammonia (as N)	EPA 350.1
Chlorophyll 'a'	EPA 445.0, modified for the Welschmeyer Method
Dissolved Oxygen	SM 4500-O C, Azide Modification (Winkler Method)
Dissolved Silica	SM 18-19 4500-Si D or USGS I-2700-85
Enterococcus	EPA Method 1600, Membrane Filter
Fecal Coliform	SM 18-20 9222D, Membrane Filter
Nitrate (as N)	EPA 353.2 or SM 18-20 4500-NO3 F
Orthophosphate (as P)	EPA 365.1
pH	SM 4500-H B, Electrometric Method
Total Kjeldahl Nitrogen	EPA 351.2
Total Phosphorus	EPA 365.4
Total Suspended Solids	SM 18-20 2540D

Notes: SM – Standard Methods for the Examination of Water and Wastewater; EPA – EPA's Sampling and Analysis Methods. Field instrumentation also includes an SBE 911 Sealogger CTD which collects salinity, temperature, and conductivity, among other parameters.

For the purposes of the post-construction monitoring of Alley Creek and Little Neck Bay, sampling will be conducted at three locations as shown on Figure 8-4: from the northern side of the Northern Boulevard Bridge; existing Harbor Survey Station E11 in Little Neck Bay; and existing Station E9, a location in the East River that is expected to be remote from the influences of Alley Creek. All stations related to the Post-Construction Monitoring Program will be sampled a minimum of twice per month from May through September and a minimum of once per month during the remainder of the year. If sampling stations are covered with ice during cold weather, NYCDEP personnel will not be engaging in sampling.

Data collected during this program will be used primarily to verify the Model that will be used to demonstrate relative compliance levels in the Alley Creek and Little Neck Bay. Therefore, during each annual cycle of compliance monitoring, the calibrated East River Tributaries Model (ERTM) will be used to measure compliance, and will be verified annually with the post-construction compliance monitoring data collected.

Because the data will be used in this manner, the data collected will be evaluated for its utility in model verification during each annual cycle of compliance monitoring, and stations may be added, eliminated, or relocated depending on this evaluation. Similarly, the parameters measured will be evaluated for their utility and appropriateness for verifying the receiving water model calibration. At a minimum, the program will collect those parameters with numeric WQS (i.e., DO, fecal coliform, and enterococci). In addition, moored instrumentation may be added or substituted at one or more of these locations if continuous monitoring is determined to be beneficial to model verification, or if logistical considerations preclude the routine operation of the program (navigational limits, laboratory issues, etc.).



New York City
Department of Environmental Protection

Post Construction Monitoring Receiving Water Stations

Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan

FIGURE 8-4

8.5.3 Floatables Monitoring

This Waterbody/Watershed Plan incorporates by reference the City-Wide Comprehensive CSO Floatables Plan Modified Facility Planning Report (HydroQual, 2005a) and Addendum 1 – Pilot Floatables Monitoring Program (December 2005) to the Floatables Plan. These documents contain a conceptual framework for the monitoring of floatables conditions in New York Harbor and a workplan for the ongoing program to develop and test the monitoring methodology envisioned in the framework. The objectives set forth in both the Floatables Plan and the program workplan provide a metric for LTCP performance. The full scale Floatables Monitoring Program will be implemented in Alley Creek and Little Neck Bay in conjunction with the Post-Construction Compliance Monitoring Program. The floatables ratings will be conducted during the PCM water quality sampling activities that will be initiated upon the completion of the Alley Creek CSO Retention Facility. The program will include the collection of basic floatables presence/absence data from monitoring sites throughout the harbor that will be used to rate and track floatables conditions, correlate rating trends to floatables control programs where applicable, and trigger investigations into the possible causes of consistently poor ratings should they occur. Actions based on the floatables monitoring data and investigations could include short term remediation in areas where monitored floatables conditions create acute human or navigation hazards and, as appropriate, longer term remediation actions and modifications to the Waterbody/Watershed Facility Plan if monitored floatables trends indicate impairment of waters relative to their intended uses.

The City of New York also engages in several best management practices that reduce the amount of floatables discharged to Alley Creek, many of which are described in the City-Wide Comprehensive CSO Floatables Plan, Modified Facility Planning Report, July 2005. Such activities include catch basin hooding, reconstruction, and maintenance; maximization of combined sewage flow to the WPCP; illegal dumping notification programs; and street litter control. Street litter control practices carried out in the drainage area include street sweeping, enforcement of New York City Department of Sanitation trash and recycling set out and sidewalk sweeping regulations, public litter basket service, New York City Department of Parks and Recreation cleanup days, and public outreach programs. These programs are tracked, in part, through the Scorecard Litter Rating street cleanliness rating system.

8.5.4 Meteorological Conditions

The performance of any CSO control facility cannot be fully evaluated without a detailed analysis of precipitation, including the intensity, duration, total rainfall volume, and precipitation event distribution that led to an overflow or, conversely, the statistical bounds within which the facility may be expected to control CSO completely. NYCDEP has established 1988 as representative of long-term average conditions and therefore uses it for analyzing facilities where "typical" conditions (rather than extreme conditions) serve as the basis for design. The comparison of rainfall records at JFK airport from 1988 to the long-term rainfall record is shown in Table 8-4, and includes the return period for 1988 conditions.

Table 8-4. Rainfall Statistics, JFK Airport, 1988 and Long-Term Average

Statistic	1970-2002 Median	1988 Value	1988 Return Period (years)
Total Volume (inches)	39.4	40.7	2.6
Intensity, (in/hr)	0.057	0.068	11.3
Number of Storms	112	100	1.1
Storm Duration (hours)	6.08	6.12	2.1

In addition to its aggregate statistics indicating that 1988 was representative of overall long-term average conditions, 1988 also includes critical rainfall conditions during both recreational and shellfishing periods. Further, the average storm intensity for 1988 is greater than one standard deviation from the mean so that using 1988 as a design rainfall year would be conservative with regard to water quality impacts since CSOs and stormwater discharges are driven primarily by rainfall intensity. However, considering the complexity and stochastic nature of rainfall, selection of any year as "typical" is ultimately qualitative, and performance is not expected to simply correlate to annual rainfall volume or any other single statistic. The performance of the Alley Creek CSO Retention Facility and the response of Alley Creek and Little Neck Bay with respect to widely varying precipitation conditions will be evaluated with respect to observed rainfall, and will be summarized in a manner similar to that shown in Table 8-4.

Multiple sources of rainfall data will be compiled as part of the final City-Wide Post-Construction Monitoring Program. On an interim basis, however, the primary source of rainfall data will be from nearby airports (JFK, LGA, and EWR), the Central Park NOAA gauge, and from any NYCDEP gauges that may be available in the vicinity of Alley Creek. The use of NEXRAD cloud reflectivity data will be limited to testing implementation techniques until its utility is fully understood. Any data sets determined to be of limited value in the analysis of compliance may be discontinued.

8.5.5 Analysis

The performance of the Alley Creek and Little Neck Bay WB/WS Facility Plan will be evaluated on an annual basis using InfoWorks, a landside computer model approved by NYSDEC (HydroQual, 2004). The InfoWorks model will be updated/verified every two years. Rather than rely on a high spatial sampling program that would be unable to account for temporal variability, performance will be analyzed using a calibrated modeling system verified with data from a more limited field sampling program. The InfoWorks collection system model has historically been used in Alley Creek facility planning and will serve as the basis for future model-related activities.

CSO volumes will be quantitatively analyzed on a monthly basis to isolate any periods of non-compliance or performance issues and their impact on water quality. Water quality modeling re-assessments will be conducted every two years, based on the previous two years of collected water quality field data. Water quality modeling conditions will be based on the hydrodynamic and meteorological conditions for the study year, documented operational issues that may have impacted the facility performance, and water quality boundary conditions measured in the Upper East River as part of the Harbor Survey. Results will be compared to relevant post-construction monitoring (Harbor Survey) data to validate the modeling system, and the performance will be expressed in a quantitative compliance level for applicable standards. Should this analysis indicate that progress towards the desired results is not being made, the analysis will:

- Re-verify all model inputs, collected data and available QA/QC reports;
- Consult with operations personnel to ensure unusual operational problems (e.g. screening channel overload/shutdown, pump repair, etc.) were adequately documented;
- Evaluate specific periods of non-compliance to identify attributable causes;
- Confirm that operational protocols were implemented and that these protocols are sufficient to avoid operationally-induced underperformance;
- Re-evaluate protocols as higher frequency and routine problems reveal themselves; and, finally,
- Revise protocols as appropriate, and if necessary, conduct a Use Attainability Analysis (UAA) during long-term control planning.

Because of the dynamic nature of water quality standards and approaches to non-compliance conditions, a period of ten years of operation will be necessary to generate the minimal amount of data necessary to perform meaningful statistical analyses for water quality standards review and for any formal use attainability analysis (UAA) that may be indicated. Following completion of the tenth annual report containing data during facility operation, a more detailed evaluation of the capability of the Alley Creek and Little Neck Bay Long Term Control Plan to achieve the desired water quality goals will take place, with appropriate weight given to the various issues New York City identified during the evaluations documented in the annual reports. If it is determined that the desired results are not achieved, NYCDEP will revisit the feasibility of cost-effective improvements. Alternately, the water quality standards revision process may commence with a UAA that would likely rely in part on the findings of the post-construction compliance monitoring program. The approach to future improvements beyond the 10-year post-construction monitoring program will be dictated by the findings of that program as well as the input from NYSDEC SPDES permit and CSO Consent Order administrators. This schedule is not intended to contradict the 5-year cycle used for updating SPDES permits.

8.5.6 Reporting- General

Post-construction compliance monitoring will be appended to the annual BMP report submitted by NYCDEP in accordance with their SPDES permits. The monitoring report will provide summary statistics on rainfall, the amount of combined sewage, and the fraction of the generated volume of combined sewage that discharged to Alley Creek. Verification and refinement of the landside and water quality models will be documented as necessary, and modeling results will be presented to assess water quality effects, and other conditions affecting water quality impacts will also be included in the BMP report.

In addition to the information to be provided in the Annual BMP Report, NYCDEP will submit a summary of the monitoring and modeling, including the data, once every five years. NYSDEC has acknowledged that the variability in precipitation dynamics may require more than five successive years of data to statistically validate the models used for evaluating compliance, but have nonetheless stated that this information will be used to identify areas of significant water quality non-compliance and gaps in the water quality modeling, and measure progress with the LTCP goals.

8.5.7 Reporting – DMA Beach, Sensitive Area

In addition, due to the presence of the DMA Beach that defines a sensitive area in Little Neck Bay, during each SPDES permit term a report will be prepared to provide reassessments based on changes in technology, economics, or other circumstances for those CSO outfall locations not eliminated or relocated (USEPA, 1995a). The evaluations and reassessments will be performed for TI-025 and TI-008, CSO outfalls discharging CSO. TI-006, TI-009, and TI-024 will also be evaluated if monitoring indicates that these outfalls are discharging CSO (TI-007 eliminated as per NYSDEC mandate). This report will also include the available DMA Beach monitoring data collected by NYCDOHMH. NYCDOHMH monitors DMA Beach from May 31 through the first week in September. Data, beach advisories and closures are available from the NYCDOHMH web site.

8.6 CONSISTENCY WITH FEDERAL CSO POLICY

The Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan was developed so that it satisfies the requirements of the federal CSO Control Policy generally and specifically the requirements for the sensitive area designation for DMA Beach. In addition, the WB/WS Facility Plan qualifies as a demonstration approach to meet water quality standards and waterbody uses. Since there is a 96.5 percent reduction in untreated CSO with all of the flow either captured for treatment at the Tallman Island WPCP or discharged by the tank receiving the preliminary treatment of solids settling and floatables removal, the WB/WS Facility Plan achieves a greater CSO reduction than the federal CSO policy target that allows permittees to presume that water quality goals are being met. Inclusion of the weir at Chamber 6 in the WB/WS Facility Plan will further reduce the discharge of untreated CSO from TI-008. The weir at Chamber 6 is calculated to eliminate the discharge of untreated CSO during the LTCP design year conditions.

8.6.1 LTCP CSO Elements

Through extensive water quality and sewer system modeling, data collection, community involvement, and engineering analysis, the NYCDEP has adopted a plan that incorporates the findings of over a decade of inquiry to achieve the highest reasonably attainable use of Alley Creek, Little Neck Bay. This Waterbody/Watershed Facility Plan addresses each of the nine elements of long-term CSO control as defined by federal policy and shown in Table 8-5.

Table 8-5. Nine Elements of Long-Term CSO Control

Element	WB/WS Report Section	Summary
1. Characterization, Monitoring, and Modeling of the Combined Sewer System	3.0	Addressed during East River CSO Facility Plan (1993), Facility Plan for the Delivery of Wet Weather Flow to the Tallman Island WPCP (August, 2005), USA Project (1999-2004), and Waterbody/Watershed Facility Plan development (2005-2007).
2. Public Participation	6.0	The Alley Creek CSO Facility Plan was developed with active involvement from the affected public and other stakeholders. A stakeholder team was established during this project.
3. Consideration of Sensitive Areas	4.7, 7.0 8.2.2, 8.5.7, 8.6.3	DMA Beach is a sensitive area identified in Little Neck Bay that is impacted by CSO discharges.
4. Evaluation of Alternatives	7.0	Detailed evaluations conducted during facility planning projects and herein clearly establish the combination of alternatives that comprise the Waterbody/Watershed Facility Plan.
5. Cost/Performance Considerations	7.0	Both CSO facility planning and Waterbody/Watershed Plan alternatives evaluations of cost suggest that the highest-level controls (100% CSO Removal, sewer separation) provide insignificant additional water quality benefits despite inordinate costs.
6. Operational Plan	8.0	NYCDEP will continue to satisfy the operational requirements of the 14 BMPs for CSO control, including the Tallman Island WPCP Wet Weather Operating Plans, as required under the City SPDES permits. The BMPs satisfy the nine minimum control requirement of federal CSO policy. NYCDEP will also continue implementation of other programmatic controls. The Alley Creek Tank will be operated according to its operating plan.
7. Maximizing Treatment at the Existing WPCP	7.0	A summary of upgrades designed to maximize treatment at the Tallman Island WPCP and a summary of the WWOP for the WPCP are included in the Waterbody/Watershed Plan. TI upgrades and WWOP elements were included in the alternatives developed and evaluated.
8. Implementation Schedule	8.0	Construction of the Alley Creek Tank was underway at the time of the writing of this report. Construction activity is anticipated to conclude in 2009.
9. Post-Construction Compliance Monitoring	8.0	Post-construction monitoring will be performed per CSO Control Policy requirements: receiving water will be monitored per Harbor Survey protocols at one station in Little Neck Bay and one station within Alley Creek. Tank performance monitoring data will be used to assess compliance, to optimize facility performance, and to trigger adaptive management alternatives. Sensitive area DMA Beach NYCDOHMH data will be evaluated with the WB/WS Facility Plan monitoring program results.

8.6.2 Waterbody/Watershed Facility Plan Meets Demonstration Approach

Demonstration Approach

The CSO Policy allows a permittee to demonstrate that the selected control program is adequate to meet the water quality-based requirements of the CWA. To be a successful demonstration, the permittee should demonstrate each of the following:

(i) The planned control program is adequate to meet WQS and protect designated uses, unless WQS or uses cannot be met as a result of natural background conditions or pollution sources other than CSOs.

As indicated in Section 7.6, even 100 percent CSO control will not improve upon water quality benefits derived from the implementation of the Alley Creek and Little Neck Bay CSO Facility Plan as stormwater (Section 3.5.5) is the major source of pollutants after implementation of the WB/WS Facility Plan (Figure 3-8). In addition, the swimming use at DMA Beach may not be substantially improved because of the non-CSO localized sources of pathogens present near the beach.

(ii) Where water quality standards and designated uses are not met in part because of natural background conditions or pollution sources other than CSOs, a total maximum daily load, including a wasteload allocation and a load allocation, or other means should be used to apportion pollutant loads.

The CSO discharges remaining after implementation of the planned control program will not preclude the attainment of WQS or the receiving waters' designated uses or contribute to their impairment.

(iii) The planned control program will provide the maximum pollution reduction benefits reasonably attainable.

As indicated in Figures 7-10 through 7-14, the selected plan represents the point of diminishing return for CSO load reduction and water quality improvement and hence is the most cost-effective scenario.

(iv) The planned control program is designed to allow cost-effective expansion or cost-effective retrofitting if additional controls are subsequently determined to be necessary to meet WQS or designated uses.

This criterion does not apply since it has been demonstrated that additional CSO control beyond the selected alternative will not improve water quality.

8.6.3 Protection of Sensitive Area, DMA Beach in Little Neck Bay

There is a sensitive area present in Little Neck Bay (a permitted bathing beach) as defined by the USEPA Long Term CSO Control Plan Policy. The Waterbody/Watershed Facility Plan and LTCP will, therefore, address the USEPA 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 reassessments in each permit term based on changes in technology, economics, or other circumstances for those locations not eliminated or relocated (USEPA, 1995a).

(a) Prohibit new or significantly increased overflows,

There will be no new or significantly increased overflows in the immediate vicinity of the DMA Beach. The WB/WS Facility Plan reduces CSO volume by 51 percent and reduces CSO overflow events.

(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;

The Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan reduces CSO discharge by 51 percent and reduces untreated CSO volume by greater than 96 percent.

The alternatives analyses concluded that elimination (or relocation) of CSO overflows is not economically achievable and that elimination of CSOs does not result in water quality that meets water quality standards at DMA Beach at all times. The remaining CSOs were shown to have relatively little influence on DMA Beach water quality. The WB/WS Facility Plan provides water quality improvements in dissolved oxygen and it is calculated that dissolved oxygen meets chronic and acute standards 100 percent of the time during the critical summer period. The 30-day geometric mean enterococcus is calculated to be less than 35 per 100 mL at all times. The WB/WS Facility Plan monthly median total coliform is less than 2,400 per 100 mL at all times. The percent of total coliform concentrations that are less than 5,000 per 100 mL is greater than 80 percent for all months at DMA Beach. The monthly geometric mean of fecal coliform levels is less than 200 per 100 mL at all times. The water quality improvements resulting from the WB/WS Facility Plan compared to Baseline are similar to improvements expected to result from 100 Percent CSO Removal. The determination of pollutant loads into Alley Creek and Little Neck Bay (Section 3) and the CSO control alternatives evaluation (Section 7) indicate that stormwater control is required for additional water quality improvement and the elimination of localized pathogen sources from the DMA Beach area is needed for non-impaired swimming use.

(c) Provide reassessments in each permit term based on changes in technology, economics, or other circumstances for those locations not eliminated or relocated.

The Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan includes provisions for the reassessment of CSOs TI-025 and TI-008 for their impact on DMA Beach water quality and the opportunity to further reduce CSO overflows to Alley Creek and Little Neck Bay (Section 8.5). CSO Outfalls TI-006, TI-007, TI-009, and TI-024 were calculated to have no CSO discharge during the 1988 one year simulation. Should CSO discharge at these outfalls, the impact on DMA Beach will be evaluated.

Available NYCDOHMH DMA Beach Monitoring data will be reviewed in conjunction with the LTCP post-construction monitoring program data, and beach advisories and closures will be included in the DMA Beach assessment report.

9.0 Water Quality Standards Review

The Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan is a component of the New York City Department of Environmental Protection's Combined Sewer Overflow Long-Term Control Plan. This Plan is being prepared in a manner fully consistent with USEPA's CSO Control Policy, the Wet Weather Water Quality Act of 2000 and applicable USEPA guidance.

As noted in Section 1.2 and as stated in the CWA, it is a national goal to achieve "fishable/swimmable" water quality in the nation's waters wherever attainable. The CSO Policy also reflects the CWA's objectives to achieve water quality standards by controlling CSO impacts, but the Policy recognizes the site-specific nature of CSOs and their impacts and provides the necessary flexibility to tailor controls to local situations. The key principles of the CSO Policy were developed to ensure that CSO controls are cost-effective and meet the objectives of the CWA. In doing so, the Policy provides flexibility to municipalities to consider the site-specific nature of CSOs and to determine the most cost-effective means of reducing pollutants and meeting CWA objectives and requirements. The Policy also provides for the review and revision, as appropriate, of water quality standards when developing CSO control plans to reflect the site-specific wet weather impacts of CSOs.

In 2001, USEPA published guidance for coordinating CSO long-term planning with water quality standards reviews. This guidance re-affirmed that USEPA regulations and guidance provide States with the opportunity to adapt their WQS to reflect site-specific conditions related to CSOs. The guidance encouraged the States to define more explicitly their recreational and aquatic life uses and then, if appropriate, modify the criteria accordingly to protect the designated uses.

The Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan was developed in a manner consistent with the CSO Policy and applicable guidance. Specifically, cost-effectiveness and knee-of-the-curve evaluations were performed for CSO load reduction evaluations using long-term rainfall records. Baseline and Waterbody/Watershed Facility Plan receiving water impact evaluations were performed for average annual rainfall conditions consistent with CSO Policy guidance. The plan resulting from following USEPA regulations and guidance results in substantial benefits. However, it does not fully attain the "fishable/swimmable" goal. When the planning process has this result, the national policy calls for a review and, where appropriate, a revision to water quality standards. The purpose of this section therefore is to address the water quality standards review and revision guidance applicable to the CSO Policy.

9.1 WATER QUALITY STANDARDS REVIEW

9.1.1 Numeric Water Quality Standards

New York State waterbody classifications and numerical criteria which are or may become applicable to Alley Creek and Little Neck Bay are shown in Table 9-1.

Table 9-1. New York State Numeric Surface Water Quality Standards (Saline)

Class	DO (mg/L)	Bacteria (Pathogens) Total Coliform(1) (per 100 mL)	Fecal Coliform(2) (per 100 mL)	Enterococci(3) (per 100 mL)
I	≥4.0	≤10,000	≤2,000	NA
SB, SC	≥4.8(4) ;≥3.0(5)	≤2,400; ≤5,000	≤200	≤35

Notes:
(1) Total coliform criteria are based on monthly geometric means for Class I, and on monthly medians for Classes SB and SC; second criterion for SC and SB is for 80% of samples.
(2) Fecal coliform criteria are based on monthly geometric means.
(3) The enterococci standard is based on a 30-day moving geometric mean per the USEPA Bacteria Rule and applies to the bathing season for SB and SC. The enterococci coastal recreation water infrequent use reference level (upper 95% confidence limit) = 501/100 mL
(4) Chronic standard based on daily average. The DO concentration may fall below 4.8 mg/L for a limited number of days, as defined by the formula:

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

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

$$\sum_{i=1}^{n} \frac{t_i\ (actual)}{t_i\ (allowed)} < 1.0$$

(5) Acute standard never less than 3.0 mg/L.

Alley Creek is classified as Class I at present with best usages of secondary contact recreation and fishing. Although this classification and the dissolved oxygen criterion of never-less-than 4.0 mg/L is also considered to be suitable for fish, shellfish and wildlife propagation and survival, a goal of the CWA, the recreational classification of secondary contact is not consistent with the “swimmable” or primary contact use goal. Satisfaction of this goal would require reclassification of Alley Creek to Class SB or SC which are suitable for primary contact recreation. Reclassification of Alley Creek to the fishable/swimmable Class SB/SC requires more stringent numerical coliform bacteria criteria and also changes the minimum daily average dissolved oxygen requirement to 4.8 mg/L(Chronic) from never less than 4.0 mg/L. Little Neck Bay is classified as Class SB with best usages of primary and secondary contact recreation and fishing. Class SB waters shall also be suitable for fish, shellfish and wildlife propagation and survival. The Class SB waterbody classification is fully consistent with the “fishable/swimmable” goals of the CWA.

The Interstate Environmental Commission waterbody classifications applicable to waters within the Interstate Environmental District are shown in Table 9-2. The Upper East River and its tidal tributaries including Alley Creek and Little Neck Bay are classified as Class A with best intended uses of primary and secondary contact recreation and fish propagation.

Table 9-2. Interstate Environmental Commission Classification, Criteria and Best Uses

Class	Dissolved Oxygen	Best Intended Use
A	$\geq$5.0 mg/L	Suitable for all forms of primary and secondary contact recreation and for fish propagation. In designated areas, they also shall be suitable for shellfish harvesting.
B-1	$\geq$4.0 mg/L	Suitable for fishing and secondary contact recreation. They shall be suitable for the growth and maintenance of fish life and other forms of marine life naturally occurring therein, but may not be suitable for fish propagation.
B-2	$\geq$3.0 mg/L	Suitable for passage of anadromous fish and for the maintenance of fish life in a manner consistent with the criteria established in Sections 1.01 and 1.02 of these regulations.

IEC bacterial standards apply to effluent discharges from municipal and industrial wastewater treatment plants and not to receiving waters.

9.1.2 Narrative Water Quality Standards

The New York State narrative water quality standards which are applicable to Alley Creek and Little Neck Bay and all waterbody classifications are shown in Table 1-2 and restated here in Table 9-3.

Table 9-3. New York State Narrative Water Quality Standards

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

It is noted that, in all cases, the narrative water quality standards apply a limit of “no” or “none” and only for selected parameters are these restrictions conditioned on the impairment of waters for their best usages.

The IEC narrative water quality regulations which are applicable to Alley Creek and Little Neck Bay and all waters of the Interstate Environmental District are shown in Table 9-4.

Table 9-4. Interstate Environmental Commission Narrative Regulations

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

9.1.3 Attainability of Water Quality Standards

Section 8.2 summarizes water quality modeling analyses which were performed to evaluate attainability of water quality standards under Baseline and WB/WS Facility Plan conditions. The results of these analyses are summarized graphically in Appendix C and in tabular form in Table 9-5 through Table 9-16 for the various numerical criteria for dissolved oxygen and bacteria for current and fishable/swimmable classifications for both Alley Creek and Little Neck Bay.

Attainability of Currently Applicable Standards

Alley Creek

Table 9-5 summarizes the projected summer (June, July, August) percentage attainability of dissolved oxygen for current Class I and IEC Class A criteria for Baseline and WB/WS Facility Plan conditions at the head end, mid-creek and mouth of Alley Creek. For Class I, the WB/WS Facility Plan attainment at the head end is 91 percent and 100 percent attainment at the mouth. The WB/WS Facility Plan attains the IEC Class A criterion approximately 67 to 100 percent of the time during the summer along the length of Alley Creek.

Table 9-5. Summer Attainability of Existing Dissolved Oxygen Criteria for Design Year – Alley Creek

Location	Class I (≥4.0 mg/L) Percent Attainment		IEC Class A (≥5.0 mg/L) Percent Attainment	
	Baseline	WB/WS FP	Baseline	WB/WS FP
Head End	85	91	52	67
Mid-Creek	95	97	77	87
Mouth	100	100	>98	>99

Table 9-6 summarizes the projected percentage annual attainability of total coliform for the Class I secondary contact recreation criterion. As shown, the secondary contact recreation criterion is expected to be fully attained under both Baseline and WB/WS Facility Plan conditions on an annual basis.

Table 9-6. Annual Attainability of Existing Total Coliform Criteria for Design Year – Alley Creek

Location	Class I GM ≤10,000/100 mL Percent Attainment	
	Baseline	WB/WS FP
Head End	100	100
Mid Creek	100	100
Mouth	100	100

Table 9-7 shows similar conditions for fecal coliform. The current Class I secondary contact criterion is expected to be completely attained in Alley Creek annually under both Baseline and WB/WS Facility Plan conditions.

Table 9-7. Annual Attainability of Existing Fecal Coliform Criteria for Design Year – Alley Creek

Location	Class I GM ≤2,000/100 mL Percent Attainment	
	Baseline	WB/WS FP
Head End	100	100
Mid Creek	100	100
Mouth	100	100

Little Neck Bay

Table 9-8 summarizes the projected percentage annual attainability of dissolved oxygen for current Class SB and IEC Class A criteria for Baseline and WB/WS Facility Plan conditions at a number of locations throughout Little Neck Bay: Head of Bay (the confluence with Alley Creek); DMA (near the Douglas Manor Association private beach); Bay Center (near CT station

211); and ER Confluence (the bay's confluence with the East River). As shown, full summer attainment of the dissolved oxygen criteria is projected for all bay stations except at the East River confluence, where 87 percent attainment is expected. The depression of dissolved oxygen in the East River is not CSO related but due to the eutrophication in western Long Island Sound.

Table 9-8. Summer Attainability of Dissolved Oxygen Criteria for Design Year – Little Neck Bay

Location	Class SB, Chronic (see Table 9-1) Percent Attainment		IEC Class A (≥5.0 mg/L) Percent Attainment	
	Baseline	WB/WS FP	Baseline	WB/WS FP
Head of Bay	100	100	99	>99
DMA Beach	100	100	98	98
Bay Center	100	100	>99	>99
ER Confluence	87	87	69	69

Table 9-9 summarizes the projected percentage annual attainability of total coliform for Class SB primary contact recreation criteria. As shown, complete attainment is expected annually throughout Little Neck Bay under both Baseline and WB/WS Facility Plan conditions. Table 9-10 indicates similar results for the Class SB fecal coliform primary contact criterion.

Table 9-9. Annual Attainability of Total Coliform Criteria for Design Year – Little Neck Bay

Location	Class SB/SC Percent Attainment			
	Median ≤2,400/100 mL		80% ≤5,000/100 mL	
	Baseline	WB/WS FP	Baseline	WB/WS FP
Head of Bay	100	100	100	100
DMA Beach	100	100	100	100
Bay Center	100	100	100	100
ER Confluence	100	100	100	100

Table 9-10. Annual Attainability of Fecal Coliform Criteria for Design Year – Little Neck Bay

Location	Class SB/SC GM ≤200/100 mL Percent Attainment	
	Baseline	WB/WS FP
Head of Bay	100	100
DMA Beach	100	100
Bay Center	100	100
ER Confluence	100	100

Table 9-11 summarizes the projected attainability of enterococci criteria which are applicable to Little Neck Bay for primary contact water use. It is noted that the attainment values shown on Table 9-11 are for the three month period of June, July and August as the enterococci criteria were developed specifically for the bathing season. The table shows that the seasonal geometric mean enterococci criterion is expected to be fully attained under both Baseline and WB/WS Facility Plan conditions. Also, the moving average 30-day geometric mean enterococci concentration is expected to be below the criterion of 35 at the private Douglas Manor Association (DMA) Beach. Bay-wide, the infrequent use coastal recreation water reference level (upper 95 percent confidence limit) is attained at a high level. At DMA Beach, the bathing water reference level of 104 is expected to be achieved more than 90 percent of the time during the recreation season under WB/WS Facility Plan conditions.

Table 9-11. Recreation Season Attainability of Enterococci Bacteria for Design Year – Little Neck Bay

Location	Standard 30-Day Moving Geometric Mean ≤35/100 mL		Infrequent Use Reference Level ≤501/100 mL	
	Baseline	WB/WS FP	Baseline	WB/WS FP
Head of Bay	100	100	93	95
DMA Beach[1]	100	100	97	98
Bay Center	100	100	>99	100
ER Confluence	100	100	100	100

[1] For DMA Beach, the moving average 30-day geometric mean <35
For DMA Beach: Baseline <104 is 89 percent; WB/WS FP <104 is 91 percent

Attainability of Potential Future Standards

Alley Creek

NYSDEC considers Class I dissolved oxygen standards supportive of aquatic life uses and consistent with the "fishable" goal of the CWA. Therefore, a standards reclassification would not be necessary for full use attainment in Alley Creek. However, the Class I secondary contact use is not considered consistent with the "swimmable" goal. To revise the classification of Alley Creek to be fully supportive of primary contact uses, it would be necessary to attain the Class SB/SC criteria for total and fecal coliform, and the enterococci criterion and reference level established by USEPA. Table 9-12 through Table 9-16 summarize projected percentage annual and recreation season attainability of these potential criteria.

Table 9-12 presents the annual attainability of Class SB/SC primary contract criteria for total coliform. As shown, the monthly median value is expected to be attained under both Baseline and WB/WS Facility Plan conditions. The attainability of the upper limit criterion is expected to be improved to greater than 75 percent by the WB/WS Facility Plan. Table 9-13 shows monthly attainment during the recreation season, the three summer months of June, July, August which encompasses the official public bathing season at New York City's seven public bathing beaches. The WB/WS Facility Plan achieves attainment of the upper limit criterion for two of the three summer months during the recreation season. Similar results are evident for fecal coliform as shown in Table 9-14 and Table 9-15: the WB/WS Facility Plan is expected to achieve attainment during the summer months except near the head end, and improves attainment from the Baseline but does not achieve full attainment as determined on an annual basis. It is noted that modeling projects that not even 100 percent elimination of all CSO discharges to Alley Creek would attain the primary contact fecal coliform criterion on an annual basis due to the presence of stormwater discharges.

Table 9-12. Annual Attainability of SB/SC Total Coliform Criteria – Alley Creek

Location	Class SB/SC Percent Attainment			
	Median ≤2,400/100 mL		80% ≤5,000/100 mL	
	Baseline	WB/WS FP	Baseline	WB/WS FP
Head End	100	100	75	92
Mid-Creek	100	100	57	75
Mouth	100	100	92	100

Table 9-13. Recreation Season Attainability of SB/SC Total Coliform Criteria – Alley Creek

Location	Class SB/SC Percent Attainment			
	Median ≤2,400/100 mL		80% ≤5,000/100 mL	
	Baseline	WB/WS FP	Baseline	WB/WS FP
Head End	100	100	100	100
Mid-Creek	100	100	67	67
Mouth	100	100	100	100

Table 9-14. Annual Attainability of SB/SC Fecal Coliform Criteria – Alley Creek

Location	Class SB/SC GM ≤200/100 mL Percent Attainment	
	Baseline	WB/WS FP
Head End	25	50
Mid-Creek	50	75
Mouth	83	100

Table 9-15. Recreation Season Attainability of SB/SC Fecal Coliform Criteria – Alley Creek

Location	Class SB/SC GM ≤200/100 mL Percent Attainment	
	Baseline	WB/WS FP
Head End	67	67
Mid-Creek	67	100
Mouth	100	100

Table 9-16 summarizes the projected attainability of potential enterococci criteria which could be applied to Alley Creek for primary contact water use. The attainment values shown on Table 9-16 are for the three month period of June, July and August. The table shows that 100 percent attainment of the seasonal geometric mean throughout Alley Creek is expected under both Baseline and WB/WS Facility Plan conditions. The infrequent use coastal recreation water reference level (upper 95 percent confidence limit) is not projected to be completely achieved but is attained at a high level, greater than 90 percent of the time. As with fecal coliform, modeling projects that 100 percent elimination of CSO discharges to Alley Creek would not completely attain the infrequent use reference level due to the continuing stormwater discharges.

Table 9-16. Recreation Season Attainability of Enterococci Bacteria for Design Year – Alley Creek

Location	Standard 30-Day Moving Geometric Mean ≤35/100 mL		Infrequent Use Reference Level ≤501/100 mL	
	Baseline	WB/WS FP	Baseline	WB/WS FP
Head End	100	100	94	96
Mid-Creek	100	100	86	91
Mouth	100	100	93	95

9.1.4 Attainment of Narrative Water Quality Standards

Table 9-3 summarizes NYSDEC narrative water quality standards which are applicable to Alley Creek and Little Neck Bay and all waters of the state. The existing CSO discharges to the area and the stormwater discharge some amounts of materials which affect some of the listed parameters to some degree; some amounts of oil and floating substances and floatable materials (refuse) are discharged.

The WB/WS Facility Plan will not completely eliminate, but will greatly reduce, the discharge of these materials to Alley Creek and Little Neck Bay. The Alley Creek CSO Retention Facility, and sewer system and pumping station improvements will reduce the discharge of the parameters of concern by at least 51 percent from Baseline conditions based on volumetric capture. Heavy solids that would settle near the CSO outfalls will be virtually eliminated and floatable materials will be substantially reduced. In addition, floatable materials to Alley Creek will be further retained by the fixed baffling system in the new CSO outfall from the Retention Facility. Consequently, the adverse impacts of the current CSO discharges will be substantially diminished although not completely eliminated as required by the narrative standards. Additionally, best management practices applied to the separate stormwater discharges also can not completely eliminate impacts from that source but will reduce loadings to the extent feasible.

The WB/WS Facility Plan, although not completely eliminating all of the parameters of concern, will eliminate odors, reduce the deposition of organic solids and floatable materials and restore the aesthetic uses of Alley Creek to the maximum extent practicable.

9.1.5 Water Uses Restored

Fish and Aquatic Life Protection Use

Table 9-5 presents the expected improvements in dissolved oxygen in Alley Creek to be attained by the WB/WS Facility Plan as compared to Baseline conditions for current NYSDEC and IEC dissolved oxygen criteria. The plan is expected to achieve between 91 to 100 percent attainment for the current Class I criterion and 67 to >99 percent attainment with the IEC Class A criterion on a summer basis. The projected area of excursion from the current NYSDEC criterion is projected to be confined mostly to the upper 2,000 ft of Alley Creek. Table 9-8 indicates that 100 percent attainment of the Class SB dissolved oxygen criterion is expected in Little Neck Bay during the summer. This is considered to be a high level of attainment in terms of the protection of fish and aquatic life, most of which spawn during the summer months.

Primary and Secondary Contact Recreation Use

Table 9-6 and Table 9-7 present the expected attainment of current secondary contact recreation criteria in Alley Creek and Table 9-9 through Table 9-11 show projected attainment of current primary contact recreation criteria for Little Neck Bay. As shown, full annual compliance is expected for all bacteriological criteria. In the upper reaches of Little Neck Bay and at DMA Beach, the enterococci reference levels are not completely attained, but are expected to be achieved at a high level.

Table 9-12 through Table 9-16 present the expected attainability of potential Class SB/SC primary contact criteria in Alley Creek. As shown in the tables, complete compliance with primary contact recreation criteria is not projected annually for WB/WS Facility Plan conditions. However, on the basis of the results presented in Table 9-13, Table 9-15, and Table 9-16, it is considered that the WB/WS Facility Plan may achieve a level of bacteriological water quality during the summer recreation period sufficient to satisfy the numerical criteria supportive of primary contact for two of the three summer recreation period months.

Aesthetic Use

As discussed in Section 9.1.4, the WB/WS Facility Plan will not completely eliminate all regulated parameters in the NYSDEC narrative water quality standards to zero discharge levels, but will significantly reduce the volumetric discharge of such substances. Settleable solids will be substantially reduced by the CSO Retention Facility and related improvements. The effect of floatable materials from CSOs will be curtailed by the proposed positive floatables controls and the effect of narrative materials from stormwater inputs will be reduced to the maximum extent practicable. Accordingly, the aesthetic conditions in Alley Creek should improve to a level consistent with the other attained water uses and the nature of the adjacent shoreline uses.

9.1.6 Practical Considerations

The previous section describes the improvement in the level of summer attainment of the NYSDEC Class I and IEC Class A dissolved oxygen criteria which is expected to result from the WB/WS Facility Plan. As noted, the annual attainment is expected to be very high in Alley Creek and full attainment is expected throughout Little Neck Bay. Modeling shows that not even 100 percent elimination of all CSO discharges would attain the dissolved oxygen criteria at all times due to continuing stormwater discharges.

For the majority of months, complete attainment throughout the project area is expected. In the other months where some limited criterion excursions are expected in the upper reach of Alley Creek and portions of Little Neck Bay, it should be noted that any adverse impact on fish larval propagation may be limited. Fish larvae spawning in Alley Creek will be exchanged with, and transported to, Little Neck Bay waters where dissolved oxygen will be greater. The organisms will therefore not be continuously exposed to Alley Creek dissolved oxygen which may be depressed below the criterion. Consequently, the impact on larval survival will be less than expected based on laboratory studies where organisms are confined and exposed continuously to the same depressed dissolved oxygen level. Because of the significant amount of larval transport which occurs in Alley Creek and Little Neck Bay, and the exposure of the organisms to continuously varying, rather than static, dissolved oxygen concentrations, it is considered to be reasonable to view the ecosystem in its entirety rather than by individual tributary or sub-region for purposes of fish and aquatic life protection.

The area of Alley Creek that does not achieve 100 percent summer compliance with Class I dissolved oxygen criteria is generally the upstream 2000 ft. Since the Creek is relatively narrow and shallow in the headwaters area, this represents a very small percentage of the entire Alley Creek and Little Neck Bay ecosystem. In addition, while the dissolved oxygen is periodically less than 4.0 mg/L, the dissolved oxygen is always greater than 3.0 mg/L. This supports juvenile fish survival and therefore a fish survival use is supported in Alley Creek.

For these reasons, it is considered that, for practical purposes, conditions in Alley Creek and Little Neck Bay would be supportive of the fishable goal of the CWA.

Section 9.1.5 also notes that during the summer recreation season, water quality in Alley Creek may be supportive of numerical criteria for the swimmable (primary contact recreation) goal of the CWA during two of the three summer recreation season months. However, swimming should not be considered as a best use in this waterbody due to periodic overflows from the WB/WS Facility, other regional CSO discharges and continuing stormwater discharges.

9.2 WATER QUALITY STANDARDS REVISION

9.2.1 Overview of Use Attainability and Recommendations

Section 9.1 summarizes the existing and potential water quality standards for Alley Creek and Little Neck Bay and expected levels of attainment based on modeling calculations. For aquatic life protection, the attainment of the water use can be expected to be greater than that suggested by the attainability of numerical criteria during the summer period due to the limited larval residence time in Alley Creek, organism transport to Little Neck Bay and beyond and the appropriateness of considering the ecosystem, both open waters and tributary, in its entirety rather than as individual components.

For recreational activity, the currently designated uses of secondary contact recreation in Alley Creek and primary contact recreation in Little Neck Bay are expected to be fully attained under WB/WS Facility Plan conditions. Further, numerical water quality conditions suitable to support primary contact may be attained possibly during most of the summer recreation season in Alley Creek for all relevant bacteriological indicators, although bathing and swimming activities would not be considered the best use.

As a result of the water quality conditions and uses expected to be attained in Alley Creek and Little Neck Bay as a result of the WB/WS Facility Plan, it is recommended that the current waterbody classifications, Class I in Alley Creek and Class SB in Little Neck Bay, be retained at this time. The water use goals for the Class I classification in Alley Creek are expected to be achieved, either numerically or for practical purposes, once the WB/WS Facility Plan is constructed and operational except periodically following overflows from the Alley Creek CSO Retention Facility after heavy rainfall events. However, the attainment of the designated uses, while expected, should be demonstrated from long-term post construction water quality monitoring data and numerical modeling.

As noted previously, expected levels of water quality criteria compliance are based on modeling calculations which are subject to some level of uncertainty. In addition, calculations are based on a typical year with an average amount of annual rainfall. Therefore, it is recommended that the actual improvements in water quality conditions resulting from the WB/WS Facility Plan be assessed from the multi-year long-term post construction monitoring program described elsewhere in the WB/WS Facility Plan report. The monitoring program will document the actual attainment of uses: whether the current Class I and Class SB uses are attained as expected; whether other levels of usage are actually achieved supporting a waterbody reclassification, for example, Class SC in Alley Creek; or whether CWA "fishable/swimmable" goals are not attained therefore requiring a Use Attainability Analysis and subsequent water quality standards revision.

As described in this report, modeling calculations indicate that complete attainment throughout the Alley Creek area of some of the Class I water quality criteria and all of the Class SB/SC criteria on a summer basis, both numerical and narrative, would require 100 percent retention of the area CSO discharges. Further, even 100 percent CSO reduction will not achieve the Class I dissolved oxygen criterion during the summer nor potential Class SB/SC fecal coliform criteria annually in Alley Creek due to stormwater discharges to that area. This water quality based effluent limit (WQBEL) of zero annual overflows is not cost-effective nor consistent with the CSO Control Policy. Therefore, until the long-term post-construction monitoring program is completed for Alley Creek and Little Neck Bay to document conditions actually attained, it is recommended that a variance to the WQBEL be applied for, and approved, for the Alley Creek and Little Neck Bay WB/WS Facility Plan for appropriate effluent variables.

9.2.2 NYSDEC Requirements for Variances to Effluent Limitations

The requirements for variances to water quality based effluent limitations are described in Section 702.17 of NYSDEC's Water Quality Regulations. The following is an abbreviated summary of the variance requirements which are considered applicable to Alley Creek and Little Neck Bay. The lettering and numbering are those used in Section 702.17.

(a) The department may grant, to a SPDES permittee, a variance to a water quality-based effluent limitation included in a SPDES permit.

(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.

(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.

(b) A variance may be granted if the requester 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 754.1(a)(1) and (2) of this Title would result in substantial and widespread economic and social impact.

(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.

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

(1) 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 is subdivision (c) of this section.

(e) Where a request for a variance satisfies the requirements of this section, the department shall authorize the variance through the SPDES permit. The variance request shall be available to the public for review during the public notice period for the permit. The permit shall contain all conditions needed to implement the variance. Such conditions shall, at minimum, include:

(1) Compliance with an initial effluent limitation that, at the time the variance is granted represents the level currently achievable by the requestor, and that is no less stringent than that achieved under the previous permit where applicable.

(2) that reasonable progress be made toward achieving the effluent limitations based on the standard or guidance value, including, where reasonable, an effluent limitation more stringent than the initial effluent limitations;

(3) Additional monitoring, biological studies and pollutant minimization measures as deemed necessary by the department.

(4) when the duration of a variance is shorter than the duration of a permit, compliance with an effluent limitation sufficient to meet the underlying standard or guidance value, upon the expiration of the variance; and

(5) A provision that allows the department to reopen and modify the permit for revisions to the variance.

(g) A variance may be renewed, subject to the requirements of this section. As part of any renewal application, the permittee shall again demonstrate that achieving the effluent limitation is not feasible based on the requirements of this section.

(i) The department will make available to the public a list of every variance that has been granted and that remains in effect.

9.2.3 Manner of Compliance with the Variance Requirements

Subdivision (a) authorizes NYSDEC to grant a variance to a "water quality based effluent limitation…included in a SPDES permit." It is understood that the Alley Creek and Little Neck Bay WB/WS Facility Plan, when referenced in the Tallman Island WPCP SPDES permit along with other presumed actions necessary to attain water quality standards, can be interpreted as the equivalent of an "effluent limitation" in accordance with the "alternative effluent control strategies" provision of Section 302(a) of the CWA.

Subdivision (a)(1) indicates that a variance will apply only to a specific permittee, in this case, NYCDEP, and only to the pollutant specified in the variance. It is understood that "pollutant" can be interpreted in the plural, and one application and variance can be used for one or more relevant pollutants. In Alley Creek and Little Neck Bay, a variance would be needed for the following pollutants: oxygen demanding substances (BOD for dissolved oxygen attainability in Alley Creek), and effluent constituents covered by narrative water quality standards (suspended, colloidal and settleable solids; oil and floating substances). A variance for bacteriological criteria would not be requested as the Alley Creek and Little Neck Bay WB/WS Facility Plan is expected to attain Class I and Class SB requirements within the constraints of modeling uncertainty.

Subdivision (b) requires the permittee to demonstrate that achieving the water quality based effluent limitation is not feasible due to a number of factors. It is noted that these factors are the same as those in 40 CFR 131.10(g) which indicate federal requirements for a Use Attainability Analysis. As with the federal regulations, it is assumed that any one of the six factors is justification for the granting of a variance. The Alley Creek and Little Neck Bay Use Attainability Evaluation report in the Appendix documents the applicability of two of the six factors cited in Subdivision (b): (3) human caused conditions and (4) hydrologic modifications.

Subdivision (c) requires the applicant to demonstrate to the department 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, the variance application is needed 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. Further, as described above in Section 9.1.4, a 51 percent volumetric reduction is expected from Baseline CSO loadings to Alley Creek, with additional capture of floatables from the fixed baffling system in the new outfall. As summarized above in Section 9.1, the Alley Creek and Little Neck Bay WB/WS Facility Plan is expected to achieve the current Class I secondary contact recreation and Class SB primary contact criteria in Alley Creek and Little Neck Bay, respectively. Therefore, no variance is requested for bacteriological conditions. The Alley Creek and Little Neck Bay WB/WS Facility Plan will achieve a relatively high level of attainment of the current Class I DO criterion in Alley Creek, and for the reasons described above in Section 9.1.5 and Section 9.1.6, very limited risk to the environment is expected absent attainment of the standard.

Subdivision (d) of the variance regulations requires that the requestor submit a written application for a variance to NYSDEC which includes all relevant information pertaining to Subdivisions (b) and (c). NYCDEP will submit a variance application for the Alley Creek and Little Neck Bay WB/WS Facility Plan to NYSDEC six months before the plan is placed in operation. The application will be accompanied by the Alley Creek and Little Neck Bay WB/WS Facility Plan report, the Alley Creek and Little Neck Bay Use Attainability Evaluation, and all other supporting documentation pertaining to Subdivisions (b) and (c) and as required by any other subdivisions of the variance requirements.

Subdivision (e) stipulates that approved variances be authorized through the appropriate SPDES permit, be available to the public for review and contain a number of conditions:

- It is assumed that the initial effluent limitation achievable by the permittee at the time the variance becomes effective, after WB/WS Facility Plan construction, will be based upon the performance characteristics of the WB/WS Facility Plan as agreed upon between NYSDEC and NYCDEP. These interim operational conditions will be based on the WB/WS Facility Plan's design specifications. It is expected that a fact sheet outlining the basis for the WQBEL and interim operational conditions will be appended to the SPDES permits.

- It is assumed that the requirement for demonstration of reasonable progress after construction as required in the permit will include NYCDEP activities such as implementation of the long-term monitoring program and additional waterbody improvement projects as delineated in Section 5 of this WB/WS Facility Plan report. Such actions and projects include: 14 best management practices, the City-wide CSO plan for floatables abatement, other long-term CSO control planning activities which may affect Alley Creek and Little Neck Bay, various East River water quality improvement projects, and various ecosystem restoration activities. These activities are also required under section (3) of the Subdivision.

- It is assumed that the SPDES permits authorizing the Alley Creek and Little Neck Bay WB/WS Facility Plan variance will contain a provision that allows the department to reopen and modify the permit for revisions to the variance.

Subdivision (g) indicates that a variance may be renewed. It is anticipated that a variance for the Alley Creek and Little Neck Bay WB/WS Facility Plan would require renewals to allow for sufficient long-term monitoring to assess the degree of water quality standards compliance. As appropriate, a variance renewal application will be submitted 180 days before SPDES permit expiration.

At the completion of the variance period(s), it is expected that the results of the long-term monitoring program will demonstrate each of the following:

- The degree to which the WB/WS Facility Plan attains the current Class I and Class SB classification water quality criteria and uses;

- The degree to which the WB/WS Facility Plan achieves water quality criteria consistent with the fishable/swimmable goals of the CWA, whether any new cost-effective technology is available to enhance the WB/WS Facility Plan performance, if needed, whether Alley Creek should be reclassified, or whether a Use Attainability Analysis should be approved.

In this manner, the approval of a WQBEL variance for Alley Creek and Little Neck Bay together with an appropriate long-term monitoring program can be considered as a step toward a determination of the following:

- Can Alley Creek be reclassified in a manner which is wholly or partially compatible with the fishable/swimmable goals of the Clean Water Act or

- Is a Use Attainability Analysis needed for Alley Creek and for which water quality criteria?

Although Alley Creek's current waterbody classification, Class I, is not wholly compatible with the goals of the Clean Water Act and would normally require reclassification or a UAA in the State's triennial review obligation, it is considered to be more appropriate to proceed with the more deliberative variance approval/monitoring procedure outlined above. The recommended procedure will determine actual improvements resulting from WB/WS Facility Plan implementation, enable a proper determination for the appropriate waterbody classification for Alley Creek and perhaps avoid unnecessary, repetitive and possibly contradictory rulemaking.

9.2.4 Future Considerations

Urban Tributary Classification

The possibility is recognized that the long-term monitoring program recommended for Alley Creek and Little Neck Bay, and ultimately for other confined waterbodies throughout the City, may indicate that the highest attainable uses are not compatible with the use goals of the Clean Water Act and State Water Quality Regulations. It is therefore recommended that consideration be given to the development of a new waterbody classification in NYSDEC Water Quality Regulations, that being "Urban Tributary."

The Urban Tributary classification would have the following attributes:

- Recognition of wet weather conditions in the designation of uses and water quality criteria.

- Application to urban confined waterbodies which satisfy any of the UAA criteria enumerated in 40CFR131.10(g).

- Definition of required baseline water uses

- Fish and aquatic life survival (if attainable)

- Secondary contact recreation (if attainable)

Other attainable higher uses would be waterbody specific and dependent upon the effectiveness of the site-specific CSO WB/WS Facility Plan /LTCP based upon knee-of-the-curve considerations, technical feasibility and ease of implementation.

The Urban Tributary classification could be implemented through the application of a generic UAA procedure for confined urban waterbodies based on the criteria of 40CFR131.10(g). This procedure could avoid the necessity for repeated UAAs on different waterbodies with similar characteristics. Those waterbodies which comply with the designation criteria can be identified at one time, and the reclassification completed in one rulemaking.

If either of the designated baseline uses of fish and aquatic life survival and secondary contact recreation did not appear to be attainable in a particular setting, then a site-specific UAA would be required.

Narrative Criteria

The recommendation for a WQBEL variance for the Alley Creek and Little Neck Bay WB/WS Facility Plan would apply with regard to the narrative water quality criteria previously cited as well as to the Class I water quality criterion for dissolved oxygen. However, a broad issue remains with the practical ability to attain the requirements of the narrative criteria in situations where wet weather discharges are unavoidable and will occasionally occur after controls. Therefore, it is recommended that NYSDEC review the application of the narrative criteria, provide for a wet weather exclusion with demonstrated need, or make all narrative criteria conditional upon the impairment of waters for their best usage.

Synopsis

Although this WB/WS Facility Plan is expected to result in improvements to the water quality in Alley Creek and Little Neck Bay, it is not expected to completely attain all applicable water quality criteria. As such, the SPDES Permit for the Tallman Island WPCP may require a WQBEL variance for the Alley Creek and Little Neck Bay WB/WS Facility Plan if contravention of some criteria continues to occur. If water quality criteria are demonstrated to be unrealistic after a period of monitoring, NYCDEP would request reclassification of portions of Alley Creek based on a Use Attainability Analysis (UAA). Until the recommended UAAs and required regulatory processes are completed, the current NYSDEC classification of Alley Creek, Class I, and Little Neck Bay, Class SB, should be retained.

10.0 References

Adams, D.A., J.S. O'Connor and S.B. Weisberg, October 1996. Draft Final Report Sediment Quality of the NY/NJ Harbor System: An Investigation Under the Regional Environmental Monitoring and Assessment Program (R-EMAP). Prepared for the United States Environmental Protection Agency.

Aliquier, M. et al., 1982. "Improvement of Swirl Concentrator", Journal of the Environmental Engineering Division, ASCE, Vol. 108, No. EE2, April 1982.

Alley Pond Environmental Center. http://www.alleypond.com/home.html.

Bayside Historical Society. http://www.baysidehistorical.org.

Blasland, Bouck and Lee/TAMS, 2003. Tallman Island WPCP Wet Weather Operating Plan. Prepared for New York City Department of Environmental Protection, WP-249, June 2003.

Breitberg, D.L., 1994. Behavioral Response of Fish Larvae to Low Dissolved Oxygen Concentrations in a Stratified Water Column. Marine Biology 120: 615-625.

City of Indianapolis, 1996. Implementation of Early Action CSO Control Projects: Pilot Facilities for In-System Storage and Solids/Floatables Control.

Cowardin, L.M., V. Carter, F. Golet, and E. LaRoe, 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service. 103 pp.

Davis, W.R., A.F.J. Draxler, J.F. Paul and J.J. Vitalianol, 1998. Benthic Biological Processes and E_H as a Basis for a Benthic Index. Environ. Mon. and Assess. 51: 259-268.

Day, J.W., C.A.S. Hall, W.M. Kemp and A. Yanez-Aranciba, 1989. Estuarine Ecology. John Wiley & Sons, New York, NY, USA. 558 pp.

Dean, T.A. and V.J. Bellis, 1975. Seasonal and Spatial Distribution of Epifauna in the Pamlico River Estuary, North Carolina. Journal of Elisha Mitchell Scientific Society 91(1): 1-12.

Diaz, R.J. and R. Rosenberg, 1995. Marine Benthic Hypoxia: A Review of Its Ecological Effects and Behavioral Responses of Benthic Macrofauna. Oceanog. and Mar. Biol.: An Annual Review. 33: 245-303.

Fair, G. and J. Geyer, 1965. Elements of Water Supply and Wastewater Disposal. John Wiley & Sons, Inc. New York.

Federal Writers Project in New York City, 1939. New York City Guide. New York Random House.

Ferrara, R. A. and P. Witkowski, 1983. Stormwater Quality Characteristics in Detention Basins. Journal of Environmental Engineering ASCE, Vol. 109, No. 2.

Galperin, B., L. Kantha, S. Hassid, A. Rosati. 1988. A. Quasi-equilibrium Turbulent Energy Model for Geophysical Flows. Journal of the Atmospheric Sciences, v. 45, No. 1, pp. 55-62.

Gosner, K.L., 1978. A Field Guide to the Atlantic Seashore. Peterson Field Guides. Houghton Mifflin Company. New York.

Greeley and Hansen, 1995. Memorandum Report on CSO Swirl Concentrator Facility (Vortex Separator) Testing Program.

Hagstrom Map Company, Inc., 1998. New York City 5 Borough Atlas. 5th Edition. Maspeth, NY: The Langenscheidt Publishing Group.

Hazen and Sawyer Engineers, 1981. Newtown Creek Water Pollution Control Plant Final Report Monitoring program (May – October 1980). Prepared for the New York City Department of Environmental Protection.

Hazen and Sawyer Engineers, 1985. Regulator and Outfall Tables; NYC Regulator Improvement Program. Prepared for New York City Department of Environmental Protection. April 1985.

HydroQual Environmental Engineers & Scientists, P.C., 1993. Final Report - Sources, Fate and Control of Floatable Materials in New York Harbor. Prepared for the City of New York Department of Environmental Protection, Bureau of Environmental Engineering, December 1993.

HydroQual Environmental Engineers & Scientists, P.C., 1995a. Floatables Pilot Program, Final Report - Evaluation of Non-Structural Methods to Control Combined and Storm Sewer Floatable Materials. Prepared for the City of New York Department of Environmental Protection, Bureau of Environmental Engineering, January 1995.

HydroQual Environmental Engineers & Scientists, P.C., 1995b. City-Wide Floatables Study. Department of Environmental Protection, Bureau of Environmental Engineering, Division of Water Quality Improvement, New York City.

HydroQual Environmental Engineers & Scientists, P.C., 1997. City-Wide CSO Floatables Plan, Draft. Prepared for The City of New York Department of Environmental Protection, Bureau of Environmental Engineering, June 1997.

HydroQual Environmental Engineers & Scientists, P.C., 2001. Use and Standards Attainment Project, Waterbody Work Plan. Prepared for The City of New York Department of Environmental Protection, Bureau of Environmental Engineering, January 2001.

HydroQual Environmental Engineers & Scientists, P.C., 2001a. Use and Standards Attainment Project, Harbor-Wide Ichthyoplankton Field Sampling and Analysis Program Year 2001. Prepared for The City of New York Department of Environmental Protection, Bureau of Environmental Engineering, April 2001.

HydroQual Environmental Engineers & Scientists, P.C., 2001b. Use and Standards Attainment Project, Harbor-Wide Epibenthic Recruitment and Survival Field Sampling and Analysis Program Years 2001-2002. Prepared for The City of New York Department of Environmental Protection, Bureau of Environmental Engineering, April 2001.

HydroQual Environmental Engineers & Scientists, P.C., 2001c. Use and Standards Attainment Project, East River Field Sampling and Analysis Program Year 2001. Prepared for The City of New York Department of Environmental Protection, Bureau of Environmental Engineering, May 2001.

HydroQual Environmental Engineers & Scientists, P.C., 2001d. Newtown Creek Water Pollution Control Project East River Water Quality Plan, Task 10.0 System-Wide Eutrophication Model, Sub-Task 10.1 Construct SWEM. Prepared for The City of New York Department of Environmental Protection, under subcontract to Greeley and Hansen, April 2001.

HydroQual Environmental Engineers & Scientists, P.C., 2001e. Newtown Creek Water Pollution Control Project East River Water Quality Plan, Task 10.0 System-Wide Eutrophication Model, Sub-Task 10.2 Obtain and Reduce Loading/Water Quality Data. Prepared for The City of New York Department of Environmental Protection, under subcontract to Greeley and Hansen, April 2001.

HydroQual Environmental Engineers & Scientists, P.C., 2001f. Newtown Creek Water Pollution Control Project East River Water Quality Plan, Task 10.0 System-Wide Eutrophication Model, Subtask 10.4 Calibrate SWEM Water Quality and Subtask 10.6 Validate SWEM Water Quality. Prepared for The City of New York Department of Environmental Protection, under subcontract to Greeley and Hansen, April 2001.

HydroQual Environmental Engineers & Scientists, P.C., 2002a. Use and Standards Attainment Project, Tributary Benthos Characterization Field Sampling and Analysis Program Year 2002. Prepared for The City of New York Department of Environmental Protection, Bureau of Environmental Engineering, June 2002.

HydroQual Environmental Engineers & Scientists, P.C., 2002b. Specification for Preparing Wet Weather Operating Plans for New York City Wastewater Pollution Control Plants.

HydroQual Environmental Engineers & Scientists, P.C., 2003a. Field and Laboratory Standard Operating Procedures (SOP) Revision No. 3. Use and Standards Attainment Project. Prepared for City of New York Department of Environmental Protection, Bureau of Environmental Engineering.

HydroQual Environmental Engineers & Scientists, P.C., 2003b. Use and Standards Attainment Project, Year 2003 Subtidal Benthos and Ichthyoplankton Characterization Field

Sampling and Analysis Program. Prepared for The City of New York Department of Environmental Protection, Bureau of Environmental Engineering, April 2003.

HydroQual Environmental Engineers & Scientists, P.C., 2005a. NY/NJ Harbor Estuary Program Model Applications of Stormwater Sampling Results, Memorandum to C. Villari, NYCDEP from C. Dujardin and W. Leo, May 4, 2005.

HydroQual Environmental Engineers & Scientists, P.C. in Association with Greeley and Hansen/O'Brien & Gere/Hazen and Sawyer Joint Venture, 2005b. Facility Plan for Delivery of Wet Weather Flow to the Tallman Island WPCP for the New York City Department of Environmental Protection, Bureau of Environmental Engineering, August 2005.

HydroQual Environmental Engineers & Scientists, P.C., 2006. Technical Memorandum: Annual Report on Best Management Practices for CSOs, Maximize Flow to the WPCPs, Catch Basin Repair and Maintenance, Booming, Skimming and Netting for New York City Department of Environmental Protection, Bureau of Engineering Design and Construction, March 29, 2006.

HydroQual Environmental Engineers & Scientists, P.C., 2008. Technical Memorandum: Alley Creek Retention Facility Stop Logs/Bending Weirs at Chamber 6 to Minimize Bypass of Untreated CSO to Outfall TI-008, September, 2008.

Hyland, J., I. Karakassis, P. Magni, A. Petrov, and J. Shine, 2000. Ad hoc Benthic Indicator Group – Results of Initial Planning Meeting. Intergovernmental Oceanographic Commission (IOC) Technical Series No. 57. SC-2000/WS/60. United Nations Educational, Scientific and Cultural Organization (UNESCO), Paris, France.

Iocco, L.E., P. Wilber, R.J. Diaz, D.G. Clarke, and R.J. Will, 2000. Benthic Habitats of New York/New Jersey Harbor: 1995 Survey of Jamaica, Upper, Newark, Bowery, and Flushing Bays. NOAA Coastal Services Center and US Army Corps of Engineers.

Interstate Environmental Commission, A Tri-State Water and Air Pollution Control Agency, 2000. Organization and Regulations, Revised October 27, 2000.

Lawler, Matusky & Skelly Engineers, 1989. Evaluation of Tidal Inflow into Regulators in Bowery Bay and Tallmans Island. Prepared for New York City Department of Environmental Protection as part of Flushing Bay Water Quality Facility Plan, December 1989.

Lawler, Matusky & Skelly Engineers, 1991. Field Investigation of the East River and its Tributaries: Task 2.4 Data Report. Prepared for New York City Department of Environmental Protection as part of East River Water Quality Facility Plan, July 1991.

Lawler, Matusky & Skelly Engineers, 1992a. Landside Modeling: Stormwater Management and Abatement Modeling of Combined Sewer Overflows. Prepared for New York City Department of Environmental Protection as part of East River Water Quality Facility Plan, January 1992.

Lawler, Matusky & Skelly Engineers LLP, 1992b. East River CSO Facility Planning Project: Receiving Water Quality Modeling. Prepared for New York City Department of Environmental Protection, East River Water Quality Facility Plan, May 1992.

Lawler, Matusky & Skelly Engineers LLP, 1993. East River CSO Facility Planning Project: Water Quality Investigations of Little Neck Bay and Alley Creek. Task 14.3 Prepared for New York City Department of Environmental Protection as part of East River Water Quality Facility Plan, April 1993.

Lawler, Matusky & Skelly Engineers LLP, 2004. Benthic Macroinvertebrate Investigation Report for the Proposed Alley Park Environmental Restoration. New York City Department of Environmental Protection.

Long Island Sound Study, 2005. Stewardship Initiatives. http://www.longislandsoundstudy.net/events/stewardship_sites.htm.

Mellor, G. and T. Yamada. 1982. Development of a Turbulance Closure Model for Geophysical Fluid Problems. Rev. Geophys. Space Phys., 20, pp. 851-875.

Metropolitan Council of Governments (MWCOG), 1983. Urban Runoff in the Washington Metropolitan Area, Final Report, Washington, D.C. Area, Urban Runoff Project, U.S. EPA Nationwide Urban Runoff Program, Water Resources Planning Board.

Michael, Gene Y. and Timothy F. Moore, 1997. A Suggested Framework for Conducting UAAs and Interpreting Results. Project 91-NPS-1. Prepared for the Water Environment Research Foundation, 1997.

Miranda, Jim, 2005. Bayside Marina operations manager, telephone conversation on October 14, 2005.

Natural Resources Group, 1990. Udalls Park Preserve Natural Areas Management Plan, NYCDPR.

New York City Department of City Planning. http://www.nyc.gov/html/dcp/html/douglaston.

New York City Department of City Planning, 1986. Coastal Zone Boundary.

New York City Department of City Planning, July 1990. Zoning Handbook, A Guide to New York City's Zoning Resolution.

New York City Department of City Planning, 1992. New York City Comprehensive Waterfront Plan: Reclaiming the City's Edge.

New York City Department of City Planning, 1993. Plan for the Queens Waterfront, New York City Comprehensive Waterfront Plan.

New York City Department of City Planning, City Planning Commission, 1994, continuously updated. Zoning Resolution, The City of New York.

New York City Department of City Planning, in conjunction with the Department of Citywide Administrative Services, November 2002. Gazetteer of City Property 2002.

New York City Department of City Planning, 2005. Strategic Plan.

New York City Department of City Planning. 2006. New York City Population Projections by Age/Sex and Borough, 2002-2003, Report, December 2006. www.nyc.gov.

New York City Department of Environmental Protection, 1994. Inner Harbor CSO Facility Planning Project. Facilities Planning Report: prepared for NYCDEP by Hazen and Sawyer, P.C. and HydroQual environmental Engineers and Scientists, P.C.

New York City Department of Environmental Protection, 1996. Regulator Improvement Program: Analysis of Regulators Dry Weather Bypassing; Annual Report, 1996.

New York City Department of Environmental Protection, 1997a. CSO Abatement in the City of New York: Report on Meeting the Nine Minimum CSO Control Standards, January 1997.

New York City Department of Environmental Protection, 1997b. New York Harbor Water Quality Survey 1997. Bureau of Wastewater Pollution Control, Marine Sciences Section.

New York City Department of Environmental Protection, 1998. New York Harbor Water Quality Survey 1998. Bureau of Wastewater Pollution Control, Marine Sciences Section.

New York City Department of Environmental Protection, 1999. New York Harbor Water Quality Survey 1999. Bureau of Wastewater Pollution Control, Marine Sciences Section.

New York City Department of Environmental Protection, 2000. New York Harbor Water Quality Survey 2000. Bureau of Wastewater Pollution Control, Marine Sciences Section.

New York City Department of Environmental Protection, 2001. *Negative Declaration: Notice of Determination of Non-Significance*. CEQR No. 95DEP225Q. Alley Creek CSO Abatement Facilities Project, July 6, 2001.

New York City Department of Environmental Protection, 2001. New York Harbor Water Quality Survey 2001. Bureau of Wastewater Pollution Control, Marine Sciences Section.

New York City Department of Environmental Protection, Application Form NY-2A Supplement for Regional Treatment (CSO Retention) Facilities – Alley Creek CSO Retention Facility August 2003.

New York City Department of Environmental Protection, 2004. Combined Sewer Overflow Best Management Practices: Annual Report – 2003. April 2004.

New York City Department of Environmental Protection, 2005a. New York City Floatable Litter Reduction: Institutional, Regulatory and Public Education Programs, April 29, 2005.

New York City Department of Environmental Protection, 2005b. City-Wide Comprehensive CSO Floatables Plan, Modified Facility Planning Report, July 2005.

New York City Department of Environmental Protection, Bureau of Wastewater Treatment, October 2007. Tallman Island Water Pollution Control Plant Wet Weather Operating Plan.

New York City Department of Environmental Protection, 2008a. Post-Construction Compliance Monitoring and CSO Retention Facility Overflow Summary. March 2008.

New York City Department of Environmental Protection, 2008b. Combined Sewer Overflow Best Management Practices: Annual Report – 2007. April 2008.

New York City Department of Environmental Protection, 2009. Combined Sewer Overflow Best Management Practices: Annual Report – 2008. April 2009.

New York City Department of Health and Mental Hygiene, http://www.nyc.gov/html/beach/beach_adv.shtml.

New York City Department of Health and Mental Hygiene, Office of Public Health Engineering, Bureau of Environmental Health Science and Engineering, 2005. 2005 NYC Beach Surveillance and Monitoring Program Summary.

New York City Department of Health and Mental Hygiene, Office of Public Health Engineering, Bureau of Environmental Health Science and Engineering, 2006. 2006 NYC Beach Surveillance and Monitoring Program Summary.

New York City Department of Health and Mental Hygiene, Office of Public Health Engineering, Bureau of Environmental Health Science and Engineering, 2007. 2007 NYC Beach Surveillance and Monitoring Program Summary.

New York City Department of Health and Mental Hygiene, Office of Public Health Engineering, Bureau of Environmental Health Science and Engineering, 2008. 2008 NYC Beach Surveillance and Monitoring Program Summary.

New York City Department of Parks and Recreation, http://www.nycgovparks.org/

New York State Department of Environmental Conservation, 1974. Tidal Wetland Maps.

New York State Department of Environmental Conservation, 1975. Freshwater Wetland Maps, Flushing, N.Y., Central Park, N.Y., and Mount Vernon, N.Y.

New York State Department of Environmental Conservation, NYSDEC TOGS 1.1.1, Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitation, updated 1998, 1999 and 2000.

New York State Department of Environmental Conservation, 1999, 2008 6 NYCRR Part 703, Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations, Subsection 703.2 Narrative Water Quality Standards, September 1999. Subsection 703.3 Water Quality Standards for pH, Dissolved Oxygen, Dissolved Solids, Odor, Color, Turbidity, September 1991, 2008 Subsection 703.4 Water Quality Standards for Coliform, January 1994.

New York State Department of Environmental Conservation, 1999. 6 NYCRR Part 701, Classifications – Surface Waters and Groundwaters.

New York State Department of Environmental Conservation, 2002. The 2000 Atlantic Ocean Long Island Sound Basin Waterbody Inventory and Priority Waterbodies List. Volume 1: New York City Metropolitan Waters, April 2002.

New York State Department of Environmental Conservation, 2004. The 2002 Atlantic Ocean Long Island Sound Basin Waterbody Inventory and Priority Waterbodies List. Volume 1: New York City Metropolitan Waters.

New York State Department of Environmental Conservation, 2005. The 2004 Atlantic Ocean Long Island Sound Basin Waterbody Inventory and Priority Waterbodies List. Volume 1: New York City Metropolitan Waters.

New York State Department of Environmental Conservation, 2005. SPDES Discharge Permit, Tallman Island Water Pollution Control Plant, draft, February 2005.

New York State Department of Environmental Conservation, 2008. The 2008 Atlantic Ocean Long Island Sound Basin Waterbody Inventory and Priority Waterbodies List. Volume 1: New York City Metropolitan Waters.

New York State Department of Environmental Conservation, Division of Water, 2008. Draft, Technical and Operational Guidance Series (TOGS) 1.1.6, Interpretation Guidance for Marine Dissolved Oxygen (DO) Standard, Feb 2008.

New York State Department of Health, 2000. New York State Sanitary Code, Section 6-2.19 - Bathing Beach Design Standards.

New York State, Department of State, Division of Coastal Resources Web-site for Coastal Fish and Wildlife Habitat Rating: Alley Pond Park, Little Neck Bay, Udalls Cove: http//www.nyswaterfronts.com/waterfront_natural_narratives.asp.

New York State Department of Transportation and NY MTA, 2004. Second Avenue Subway in the Borough of Manhattan, New York County, NY. Final Environmental Impact Statement. Chapter 15.

Northern Ecological Associates, Inc., 2002a. Final Benthic Report. Flushing Bay and Creek Ecological Restoration Project.

Northern Ecological Associates, Inc., 2002b. Final Finfish Report. Flushing Bay and Creek Ecological Restoration Project.

Novotny, Vladimir, et al., 1997. A Comprehensive UAA Technical Reference. Project 91-NPS-1. Prepared for the Water Environment Research Foundation, 1997.

Oliver, L.J. and S.G. Grigoropoulos, 1981. Control of Storm Generated Pollution Using a Small Urban Lake, Journal WPCF, Vol. 53, No. 5, May 1981.

Olmstead, Nancy and Paul Fell, 1974. Tidal Marsh Invertebrates of Connecticut. Connecticut Arboretum. No. 20.

Pearson, T.H. and R. Rosenberg, 1978. Macrobenthic succession in relation to organic enrichment and pollution of the marine environment. Oceanography and Marine Biology Annual Review 16: 229-311.

Pictometry International Corp. 2006.

Sanborn Map Company, Inc., 1974. *Land Use Maps, New York*. Prepared for the New York City Department of City Planning, New York City Planning Commission.

Steimle, F., J. Caracciolo and J.B. Pearce, 1982. Impacts of dumping on New York Bight Apex benthos. In Ecological Stress and the New York Bight: Science and Management. G.F. Mayer, ed. Proceedings of a symposium on the Ecological Effects of Environmental Stress, New York, NY, June 10-15, 1979.

Sutherland, R., 1995. Street Sweeper Pick-up Performance. Kurahashi and Associates, Inc., Seattle, WA. http://www.worldsweeper.com/Street/Studies/KurahashiStudy/index.html.

Thompson, B. and S. Lowe, 2004. Assessment of macrobenthos response to sediment contamination in the San Francisco Estuary, California, USA. Environmental Toxicology and Chemistry 23 (9): 2178-2187.

Trout Unlimited, 2002a. Alley Creek Habitat Study, Long Island Sound Study Grant Project.

Trout Unlimited, 2002b. City Streams Trout Unlimited Urban River Success Stories.

Udalls Cove Preservation Committee, http://www.littleneck.net/udallscove.

U.S. Army Corps of Engineers, New York District, http://www.nan.usace.army.mil/

U.S. Army Corps of Engineers, 2004. Harlem River/East River/Western Long Island Sound Study Area Report – part of Hudson-Raritan Estuary Environmental Restoration Feasibility Study, 2004.

U.S. Environmental Protection Agency (EPA), 1977. Municipal Environmental Research Laboratory, Office of Research and Development. Catchbasin Technology Overview and Assessment, EPA-600/2/-77.051, May 1977.

U.S. Environmental Protection Agency (EPA), 1978. Construction Costs for Municipal Wastewater Treatment Plants 1973-1977. EPA 430/9-77-013.

U.S. Environmental Protection Agency (EPA), 1983a. Results of the Nationwide Urban Runoff Program, Executive Summary, Water Planning Division, December 1983.

U.S. Environmental Protection Agency, 1983b. Technical Support Manual: Waterbody Surveys and Assessments for Conducting Use Attainability Analyses. EPA 440-4-86-037, November 1983.

U.S. Environmental Protection Agency, 1986a. Ambient Water Quality Criteria for Bacteria - 1986. EPA 440/5-84-002, January 1986.

U.S. Environmental Protection Agency, 1986b. Technical Support Manual: Waterbody Surveys and Assessments for Conducting Use Attainability Analyses, Volume II: Estuarine Systems. EPA 440-4-86-038, 1986.

U.S. Environmental Protection Agency, 1994a. Combined Sewer Overflow (CSO) Control Policy. EPA 830-B-94-001, April 1994.

U.S. Environmental Protection Agency, 1994b. Water Quality Standards Handbook: Second Edition. EPA 823-B-94, August 1994.

U.S. Environmental Protection Agency, 1995a. Combined Sewer Overflows - Guidance for Long-Term Control Plan. EPA 832-B-95-002, September 1995.

U.S. Environmental Protection Agency, 1995b. Combined Sewer Overflows - Guidance for Permit Writers. EPA 832-B-95-008, September 1995.

U.S. Environmental Protection Agency, 1997. Technical Guidance Manual for Developing Total Maximum Daily Loads, Book 2: Streams and Rivers, Part 1: Biochemical Oxygen Demand/Dissolved Oxygen and Nutrients/Eutrophication. EPA 823-B-97-002, March 1997.

U.S. Environmental Protection Agency, 1998. EPA Guidance for Quality Assurance Project Plans, EA QA/G-5. EPA/600/R-98/018, February 1998.

U.S. Environmental Protection Agency, 1999a. Combined Sewer Overflows - Guidance for Monitoring and Modeling. EPA 832-B-99-002, January 1999.

U.S. Environmental Protection Agency, 1999b. Combined Sewer Overflow Control Fact Sheet – Screens. EPA 832-F-99-040.

U.S. Environmental Protection Agency, 1999c. Combined Sewer Overflow Control Fact Sheet – Chlorine Disinfection. EPA 832-F-99-034.

U.S. Environmental Protection Agency, 1999d. Combined Sewer Overflow Control Fact Sheet – Alternative Disinfection Methods. EPA 832-F-99-033.

U.S. Environmental Protection Agency, 2000a. Ambient Aquatic Life Water Quality Criteria for Dissolved Oxygen (Saltwater): Cape Code to Cape Hatteras. EPA-822-R-00-012, November 2000.

U.S. Environmental Protection Agency, 2000b. Wet Weather Water Quality Act of 2000. H. Rept. 106-943.

U.S. Environmental Protection Agency, 2001a. EPA Requirements for Quality Management Plans, EPA QA/R-2. EPA/240/B-01/002, March 2001.

U.S. Environmental Protection Agency, 2001b. EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5. EPA/240/B-01/003, March 2001.

U.S. Environmental Protection Agency, 2001c. Guidance for Preparing Standard Operating Procedures (SOPs), EPA QA/G-6. EPA/240/B-01/004, March 2001.

U.S. Environmental Protection Agency, 2001d. Guidance: Coordinating CSO Long-Term Planning With Water Quality Standards Reviews. EPA-833-R-01-002, July 31, 2001.

U.S. Fish and Wildlife Service, 1977. National Wetland Inventory (NWI) Maps - Queens, N.Y.

U.S. Fish and Wildlife Service, 1977. National Wetland Inventory (NWI) Maps - Jersey City, N.J.

URS Company, 1986. Infiltration/Inflow Analysis, Tallman Island WPCP; Task 1. Prepared for New York City Department of Environmental Protection as part of Flushing Bay Water Quality Facility Plan, September 1986.

URS Construction Services, 2004. Basis of Estimates and Estimating Assumptions in Comprehensive Jamaica Water Quality Plan, BNR Upgrades, Project Cost Estimate, October 2004.

URS Consultants, Inc., 1990. East River Combined Sewer Overflow Facility Planning Project: Background Data and Analysis of Existing Conditions. Prepared for New York City Department of Environmental Protection, March 1990.

URS Consultants, Inc., 1992. East River Combined Sewer Overflow Facility Planning Project: Task 8.0 Plan Selection. Prepared for New York City Department of Environmental Protection, May 1996.

URS Consultants, Inc., 1994. East River Combined Sewer Overflow Facility Planning Project, Task 8.0 Report – Plan Selection for the New York City Department of Environmental Protection, June 1994.

URS Consultants, Inc. with Lawler, Matusky & Skelly Engineers, 1996a. East River Combined Sewer Overflow Facility Planning Project, Facilities Plan for the New York City Department of Environmental Protection, February 1996.

URS Consultants, Inc., 1996b. Hydraulic Modeling of Interceptor Systems; Bowery Bay, Hunts Point, Tallman Island and Wards Island WPCPs; Technical Memorandum Task 11.5. Prepared for New York City Department of Environmental Protection, May 6, 1996.

URS Corporation, 2003a. East River CSO Abatement Facilities Plan – Alley Creek, Final Engineering Report Summary of Facilities Plan Development for New York City Department of Environmental Protection, Bureau of Environmental Engineering, April 2, 2003.

URS Corporation, 2003b. Wet Weather Operating Plan Alley Creek CSO Retention Facility, Draft. New York City Department of Environmental Protection, Bureau of Environmental Engineering, June 2003, Revised December 2003.

URS Corporation and Helen Neuhaus & Assoc., 1996a. East River CSO Facility Planning Project Public Participation Program, Final Summary Report for the New York City Department of Environmental Protection, March 1996.

University of Michigan, 2006, (Northern harrier), http://animaldiversity.ummz.umich.edu/site/accounts/information/circus_cyane.us.html.

Weiss, H.M., 1995. Marine Animals of Southern New England and New York. State Geological and Natural History Survey of Connecticut. Department of Environmental Protection

Wildish, David and D. Kristmanson, 1997. Benthic Suspension Feeders and Flow. Cambridge University Press:NY.

Zappala S., 2001. Growth and Development of Epibenthic and Benthic Communities Associated with Waterfront Shipping Piers of the Upper Bay of New York Harbor. Masters Thesis.

11.0 Glossary and Abbreviations

A Posteriori Classification: A classification based on the results of experimentation.

A Priori Classification: A classification made prior to experimentation.

ACO: Administrative Consent Order

Activated Sludge: The product that results when primary effluent is mixed with bacteria-laden sludge and then agitated and aerated to promote biological treatment, speeding the breakdown of organic matter in raw sewage undergoing secondary waste treatment.

Acute Toxicity: The ability of a substance to cause severe biological harm or death soon after a single exposure or dose. Also, any poisonous effect resulting from a single short-term exposure to a toxic substance (see chronic toxicity, toxicity).

Administrative Consent Order (ACO): A legal agreement between a regulatory authority and an individual, business, or other entity through which the violator agrees to pay for correction of violations, take the required corrective or cleanup actions, or refrain from an activity. It describes the actions to be taken, may be subject to a comment period, applies to civil actions, and can be enforced in court.

Administrative Law Judge (ALJ): An officer in a government agency with quasi-judicial functions including conducting hearings, making findings of fact, and making recommendations for resolution of disputes concerning the agency's actions.

Advanced Treatment: A level of wastewater treatment more stringent than secondary treatment; requires an 85-percent reduction in conventional pollutant concentration or a significant reduction in non-conventional pollutants. Sometimes called tertiary treatment.

Advanced Wastewater Treatment: Any treatment of sewage that goes beyond the secondary or biological water treatment stage and includes the removal of nutrients such as phosphorus and nitrogen and a high percentage of suspended solids. (See primary, secondary treatment.)

Advection: Bulk transport of the mass of discrete chemical or biological constituents by fluid flow within a receiving water. Advection describes the mass transport due to the velocity, or flow, of the waterbody. Example: The transport of pollution in a river: the motion of the water carries the polluted water downstream.

ADWF: Average Dry Weather Flow

Aeration: A process that promotes biological degradation of organic matter in water. The process may be passive (as when waste is exposed to air), or active (as when a mixing or bubbling device introduces the air). Exposure to additional air may be by means of natural of engineered systems.

Aerobic: Environmental conditions characterized by the presence of dissolved oxygen; used to describe biological or chemical processes that occur in the presence of oxygen.

Algae: Simple rootless plants that live floating or suspended in sunlit water or may be attached to structures, rocks or other submerged surfaces. Algae grow in proportion to the amount of available nutrients. They can affect water quality adversely since their biological activities can appreciably affect pH and low dissolved oxygen of the water. They are food for fish and small aquatic animals.

Algal Bloom: A heavy sudden growth of algae in and on a body of water which can affect water quality adversely and indicate potentially hazardous changes in local water chemistry. The growth results from excessive nutrient levels or other physical and chemical conditions that enable algae to reproduce rapidly.

ALJ: Administrative Law Judge

Allocations: Allocations are that portion of a receiving water's loading capacity that is attributed to one of its existing or future sources (non-point or point) of pollution or to natural background sources. (Wasteload allocation (WLA) is that portion of the loading capacity allocated to an existing or future point source and a load allocation (LA) is that portion allocated to an existing or future non-point source or to a natural background source. Load allocations are best estimates of the loading, which can range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting loading.)

Ambient Water Quality: Concentration of water quality constituent as measured within the waterbody.

Ammonia (NH_3): An inorganic form of nitrogen, is contained in fertilizers, septic system effluent, and animal wastes. It is also a product of bacterial decomposition of organic matter. NH3-N becomes a concern if high levels of the un-ionized form are present. In this form NH3-N can be toxic to aquatic organisms.

Anaerobic: Environmental condition characterized by zero oxygen levels. Describes biological and chemical processes that occur in the absence of oxygen. Anoxia. No dissolved oxygen in water.

Anthropogenic: Pertains to the [environmental] influence of human activities.

Antidegradation: Part of federal water quality requirements. Calls for all existing uses to be protected, for deterioration to be avoided or at least minimized when water quality meets or exceeds standards, and for outstanding waters to be strictly protected.

APEC: Alley Pond Environmental Center

Aquatic Biota: Collective term describing the organisms living in or depending on the aquatic environment.

Aquatic Community: An association of interacting populations of aquatic organisms in a given waterbody or habitat.

Aquatic Ecosystem: Complex of biotic and abiotic components of natural waters. The aquatic ecosystem is an ecological unit that includes the physical characteristics (such as flow or velocity and depth), the biological community of the water column and benthos, and the chemical characteristics such as dissolved solids, dissolved oxygen, and nutrients. Both living and nonliving components of the aquatic ecosystem interact and influence the properties and status of each component.

Aquatic Life Uses: A beneficial use designation in which the waterbody provides suitable habitat for survival and reproduction of desirable fish, shellfish, and other aquatic organisms.

Assemblage: An association of interacting populations of organisms in a given waterbody (e.g., fish assemblage or benthic macro-invertebrate assemblage).

Assessed Waters: Waters that states, tribes and other jurisdictions have assessed according to physical, chemical and biological parameters to determine whether or not the waters meet water quality standards and support designated beneficial uses.

Assimilation: The ability of a body of water to purify itself of pollutants.

Assimilative Capacity: The capacity of a natural body of water to receive wastewaters or toxic materials without deleterious efforts and without damage to aquatic life or humans who consume the water. Also, the amount of pollutant load that can be discharged to a specific waterbody without exceeding water quality standards. Assimilative capacity is used to define the ability of a waterbody to naturally absorb and use a discharged substance without impairing water quality or harming aquatic life.

Attribute: Physical and biological characteristics of habitats which can be measured or described.

Average Dry Weather Flow (ADWF): The average non-storm flow over 24 hours during the dry months of the year (May through September). It is composed of the average dry weather inflow/infiltration.

Bacteria: (Singular: bacterium) Microscopic living organisms that can aid in pollution control by metabolizing organic matter in sewage, oil spills or other pollutants. However, some types of bacteria in soil, water or air can also cause human, animal and plant health problems. Bacteria of the coliform group are considered the primary indicators of fecal contamination and are often used to assess water quality.
Measured in number of bacteria organisms per 100 milliliters of sample (No./ml or #/100 ml).

BASINS: Better Assessment Science Integrating Point and Non-point Sources

BEACH: Beaches Environmental Assessment and Coastal Health

Beaches Environmental Assessment and Coastal Health (BEACH): The BEACH Act requires coastal and Great Lakes States to adopt the 1986 USEPA Water Quality Criteria for Bacteria and to develop and implement beach monitoring and notification plans for bathing beaches.

Benthic: Refers to material, especially sediment, at the bottom of an aquatic ecosystem. It can be used to describe the organisms that live on, or in, the bottom of a waterbody.

Benthic Macroinvertebrates: See benthos.

Benthos: Animals without backbones, living in or on the sediments, of a size large enough to be seen by the unaided eye, and which can be retained by a U.S. Standard No. 30 sieve (28 openings/in, 0.595-mm openings). Also referred to as benthic macroinvertebrates, infauna, or macrobenthos.

Best Available Technology (BAT): The most stringent technology available for controlling emissions; major sources of emissions are required to use BAT, unless it can be demonstrated that it is unfeasible for energy, environmental, or economic reasons.

Best Management Practice (BMP): Methods, measures or practices that have been determined to be the most effective, practical and cost effective means of preventing or reducing pollution from non-point sources.

Better Assessment Science Integrating Point and Non-point Sources (BASINS): A computer tool that contains an assessment and planning component that allows users to organize and display geographic information for selected watersheds. It also contains a modeling component to examine impacts of pollutant loadings from point and non-point sources and to characterize the overall condition of specific watersheds.

Bioaccumulation: A process by which chemicals are taken up by aquatic organisms and plants directly from water as well as through exposure via other routes, such as consumption of food and sediment containing the chemicals.

Biochemical Oxygen Demand (BOD): A measure of the amount of oxygen per unit volume of water required to bacterially or chemically breakdown (stabilize) the organic matter in water. Biochemical oxygen demand measurements are usually conducted over specific time intervals (5,10,20,30 days). The term BOD generally refers to a standard 5-day BOD test. It is also considered a standard measure of the organic content in water and is expressed as mg/L. The greater the BOD, the greater the degree of pollution.

Bioconcentration: A process by which there is a net accumulation of a chemical directly from water into aquatic organisms resulting from simultaneous uptake (e.g., via gill or epithelial tissue) and elimination. In other words, the accumulation of a chemical in tissues of a fish or other organism to levels greater than the surrounding medium.

Biocriteria: A combination of narrative and numerical measures, such as the number and kinds of benthic, or bottom-dwelling, insects living in a stream, that describe the biological condition (structure and function) of aquatic communities inhabiting waters of a designated aquatic life use. Biocriteria are regulatory-based biological measurements and are part of a state's water quality standards.

Biodegradable: A substance or material that is capable of being decomposed (broken down) by natural biological processes.

Biodiversity: Refers to the variety and variability among living organisms and the ecological complexes in which they occur. Diversity can be defined as the number of different items and their relative frequencies. For biological diversity, these items are organized at many levels, ranging from complete ecosystems to the biological structures that are the molecular basis of heredity. Thus, the term encompasses different ecosystems, species and genes.

Biological Assemblage: A group of phylogenetically (e.g., fish) or ecologically (e.g., benthic macroinvertebrates) related organisms that are part of an aquatic community.

Biological Assessment or Bioassessment: An evaluation of the condition of a waterbody using biological surveys and other direct measures of the resident biota of the surface waters, in conjunction with biological criteria.

Biological Criteria or Biocriteria: Guidelines or benchmarks adopted by States to evaluate the relative biological integrity of surface waters. Biocriteria are narrative expressions or numerical values that describe biological integrity of aquatic communities inhabiting waters of a given classification or designated aquatic life use.

Biological Indicators: Plant or animal species or communities with a narrow range of environmental tolerances that may be selected for monitoring because their absence or presence and relative abundances serve as barometers of environmental conditions.

Biological Integrity: The condition of the aquatic community inhabiting unimpaired waterbodies of a specified habitat as measured by community structure and function.

Biological Monitoring or Biomonitoring: Multiple, routine biological surveys over time using consistent sampling and analysis methods for detection of changes in biological condition.

Biological Nutrient Removal (BNR): The removal of nutrients, such as nitrogen and/or phosphorous during wastewater treatment.

Biological Oxygen Demand (BOD): An indirect measure of the concentration of biologically degradable material present in organic wastes. It usually reflects the amount of oxygen consumed in five days by biological processes breaking down organic wastes.

Biological Survey or Biosurvey: Collecting, processing and analyzing representative portions of an estuarine or marine community to determine its structure and function.

Biological Magnification: Refers to the process whereby certain substances such as pesticides or heavy metals move up the food chain, work their way into rivers and lakes, and are eaten by aquatic organisms such as fish, which in turn are eaten by large birds, animals or humans. The substances become concentrated in tissues or internal organs as they move up the food chain. he result of the processes of bioconcentration and bioaccumulation by which tissue concentrations of bioaccumulated chemicals increase as the chemical passes up through two or more trophic levels in the food chain. (See bioaccumulation.)

Biota: Plants, animals and other living resources in a given area.

Biotic Community: A naturally occurring assemblage of plants and animals that live in the same environment and are mutually sustaining and interdependent.

BMP: Best Management Practice

BNR: Biological Nutrient Removal

BOD: Biological Oxygen Demand; Biochemical Demand

Borrow Pit: See Subaqueous Borrow Pit.

Brackish: Water with salt content ranging between that of sea water and fresh water; commonly used to refer to Oligohaline waters.

Brooklyn Sewer Datum (BSD): Coordinate system and origins utilized by surveyors in the Borough of Brooklyn, New York City.

BSD: Brooklyn Sewer Datum

CAC: Citizens Advisory Committee

Calcareous: Pertaining to or containing calcium carbonate; Calibration; The process of adjusting model parameters within physically defensible ranges until the resulting predictions give a best possible fit to observed data.

Calibration: The process of adjusting model parameters within physically defensible ranges until the resulting predictions give a best possible fit to observed data.

CALM: Consolidated Assessment and Listing Methodology

Capital Improvement Program (CIP): A budget and planning tool used to implement non-recurring expenditures or any expenditure for physical improvements, including costs for: acquisition of existing buildings, land, or interests in land; construction of new buildings or other structures, including additions and major alterations; construction of streets and highways or utility lines; acquisition of fixed equipment; landscaping; and similar expenditures.

Capture: The total volume of flow collected in the combined sewer system during precipitation events on a system-wide, annual average basis (not percent of volume being discharged).

Catch Basin: (1) A buried chamber, usually built below curb grates seen at the curbline of a street, to relieve street flooding, which admits surface water for discharge into the sewer system and/or a receiving waterbody. (2) A sedimentation area designed to remove pollutants from runoff before being discharged into a stream or pond.

Carbonaceous Biochemical Oxygen Demand ($CBOD_5$): The amount of oxygen required to oxidize any carbon containing matter present in water in five days.

CATI: Computer Assisted Telephone Interviews

CB: Community Board

$CBOD_5$: Carbonaceous Biochemical Oxygen Demand

CCMP: Comprehensive Conservation Management Plan

CD: Community District

CEA: Critical Environmental Area

CEQR: City Environmental Quality Review

CERCLIS: Comprehensive Environmental Response, Compensation and Liability Information System

CFR: Code of Federal Regulation

Channel: A natural stream that conveys water; a ditch or channel excavated for the flow of water.

Channelization: Straightening and deepening streams so water will move faster or facilitate navigation - a tactic that can interfere with waste assimilation capacity, disturb fish and wildlife habitats, and aggravate flooding.

Chemical Oxygen Demand (COD): A measure of the oxygen required to oxidize all compounds, both organic and inorganic, in water.

Chlorination: The application of chlorine to drinking water, sewage, or industrial waste to disinfect or to oxidize undesirable compounds. Typically employed as a final process in water and wastewater treatment.

Chrome+6 (Cr+6): Chromium is a steel-gray, lustrous, hard metal that takes a high polish, is fusible with difficulty, and is resistant to corrosion and tarnishing. The most common oxidation states of chromium are +2, +3, and +6, with +3 being the most stable. +4 and +5 are relatively rare. Chromium compounds of oxidation state 6 are powerful oxidants.

Chronic Toxicity: The capacity of a substance to cause long-term poisonous health effects in humans, animals, fish and other organisms (see acute toxicity).

CIP: Capital Improvement Program

Citizens Advisory Committee (CAC): Committee comprised of various community stakeholders formed to provide input into a planning process.

City Environmental Quality Review (CEQR): CEQR is a process by which agencies of the City of New York review proposed discretionary actions to identify the effects those actions may have on the environment.

Clean Water Act (CWA): The Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972), Public Law 92-500, as amended by Public Law 96-483 and Public Law 97-117, 33 U.S.C. 1251 et seq. The CWA contains a number of provisions to restore and maintain the quality of the nation's water resources. One of these provisions is section 303(d), which establishes the Total maximum Daily Load (TMDL) program.

Coastal Waters: Marine waters adjacent to and receiving estuarine discharges and extending seaward over the continental shelf and/or the edge of the U.S. territorial sea.

Coastal Zone Boundary (CZB): Generally, the part of the land affected by its proximity to the sea and that part of the sea affected by its proximity to the land as the extent to which man's land-based activities have a measurable influence on water chemistry and marine ecology. Specifically, New York's Coastal zone varies from region to region while incorporating the following conditions: The inland boundary is approximately 1,000 feet from the shoreline of the mainland. In urbanized and developed coastal locations the landward boundary is approximately 500 feet from the mainland's shoreline, or less than 500 feet where a roadway or railroad line runs parallel to the shoreline at a distance of under 500 feet and defines the boundary. In locations where major state-owned lands and facilities or electric power generating facilities abut the shoreline, the boundary extends inland to include them. In some areas, such as Long Island Sound and the Hudson River Valley, the boundary may extend inland up to 10,000 feet to encompass significant coastal resources, such as areas of exceptional scenic value, agricultural ore recreational lands, and major tributaries and headlands.

Coastal Zone: Lands and waters adjacent to the coast that exert an influence on the uses of the sea and its ecology, or whose uses and ecology are affected by the sea.

COD: Chemical Oxygen Demand

Code of Federal Regulations (CFR): Document that codifies all rules of the executive departments and agencies of the federal government. It is divided into fifty volumes, known as titles. Title 40 of the CFR (references as 40 CFR) lists most environmental regulations.

Coliform Bacteria: Common name for Escherichia coli that is used as an indicator of fecal contamination of water, measured in terms of coliform count. (See Total Coliform Bacteria)

Coliforms: Bacteria found in the intestinal tract of warm-blooded animals; used as indicators of fecal contamination in water.

Collection System: Pipes used to collect and carry wastewater from individual sources to an interceptor sewer that will carry it to a treatment facility.

Collector Sewer: The first element of a wastewater collection system used to collect and carry wastewater from one or more building sewers to a main sewer. Also called a lateral sewer.

Combined Sewage: Wastewater and storm drainage carried in the same pipe.

Combined Sewer Overflow (CSO): Discharge of a mixture of storm water and domestic waste when the flow capacity of a sewer system is exceeded during rainstorms. CSOs discharged to receiving water can result in contamination problems that may prevent the attainment of water quality standards.

Combined Sewer Overflow Event: The discharges from any number of points in the combined sewer system resulting from a single wet weather event that do not receive minimum treatment (i.e., primary clarification, solids disposal, and disinfection, where appropriate). For example, if a storm occurs that results in untreated overflows from 50 different CSO outfalls within the combined sewer system (CSS), this is considered one overflow event.

Combined Sewer System (CSS): A sewer system that carries both sewage and storm-water runoff. Normally, its entire flow goes to a waste treatment plant, but during a heavy storm, the volume of water may be so great as to cause overflows of untreated mixtures of storm water and sewage into receiving waters. Storm-water runoff may also carry toxic chemicals from industrial areas or streets into the sewer system.

Comment Period: Time provided for the public to review and comment on a proposed USEPA action or rulemaking after publication in the Federal Register.

Community: In ecology, any group of organisms belonging to a number of different species that co-occur in the same habitat or area; an association of interacting assemblages in a given waterbody. Sometimes, a particular subgrouping may be specified, such as the fish community in a lake.

Compliance Monitoring: Collection and evaluation of data, including self-monitoring reports, and verification to show whether pollutant concentrations and loads contained in permitted discharges are in compliance with the limits and conditions specified in the permit.

Compost: An aerobic mixture of decaying organic matter, such as leaves and manure, used as fertilizer.

Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS): Database that contains information on hazardous waste sites, potentially hazardous waste sites and remedial activities across the nation. The database includes sites that are on the National Priorities List or being considered for the List.

Comprehensive Waterfront Plan (CWP): Plan proposed by the Department of City Planning that provides a framework to guide land use along the city's entire 578-mile shoreline in a way that recognizes its value as a natural resource and celebrates its diversity. The plan presents a long-range vision that balances the needs of environmentally sensitive areas and the working port with opportunities for waterside public access, open space, housing and commercial activity.

Computer Assisted Telephone Interviews (CATI): CATI is the use of computers to automate and control the key activities of a telephone interview.

Conc: Abbreviation for “Concentration”.

Concentration: Amount of a substance or material in a given unit volume of solution. Usually measured in milligrams per liter (mg/l) or parts per million (ppm).

Consolidated Assessment and Listing Methodology (CALM): EPA framework for states and other jurisdictions to document how they collect and use water quality data and information for environmental decision making. The primary purposes of these data analyses are to determine the extent that all waters are attaining water quality standards, to identify waters that are impaired and need to be added to the 303(d) list, and to identify waters that can be removed from the list because they are attaining standards.

Contamination: Introduction into the water, air and soil of microorganisms, chemicals, toxic substances, wastes or wastewater in a concentration that makes the medium unfit for its next intended use.

Conventional Pollutants: Statutorily listed pollutants understood well by scientists. These may be in the form or organic waste, sediment, acid, bacteria, viruses, nutrients, oil and grease, or heat.

Cost-Benefit Analysis: A quantitative evaluation of the costs, which would be incurred by implementing an alternative versus the overall benefits to society of the proposed alternative.

Cost-Share Program: A publicly financed program through which society, as a beneficiary of environmental protection, allocates project funds to pay a percentage of the cost of constructing or implementing a best management practice. The producer pays the remainder of the costs.

Cr+6: Chrome +6

Critical Condition: The combination of environmental factors that results in just meeting water quality criterion and has an acceptably low frequency of occurrence.

Critical Environmental Area (CEA): A CEA is a specific geographic area designated by a state or local agency as having exceptional or unique environmental characteristics. In establishing a CEA, the fragile or threatened environmental conditions in the area are identified so that they will be taken into consideration in the site-specific environmental review under the State Environmental Quality Review Act.

Cross-Sectional Area: Wet area of a waterbody normal to the longitudinal component of the flow.

Cryptosporidium: A protozoan microbe associated with the disease cryptosporidiosis in man. The disease can be transmitted through ingestion of drinking water, person-to-person contact, or other pathways, and can cause acute diarrhea, abdominal pain, vomiting, fever and can be fatal. (See protozoa).

CSO: Combined Sewer Overflow

CSS: Combined Sewer System

Cumulative Exposure: The summation of exposures of an organism to a chemical over a period of time.

Clean Water Act (CWA): Federal law stipulating actions to be carried out to improve water quality in U.S. waters.

CWA: Clean Water Act

CWP: Comprehensive Waterfront Plan

CZB: Coastal Zone Boundary

DDWF: design dry weather flow

Decay: Gradual decrease in the amount of a given substance in a given system due to various sink processes including chemical and biological transformation, dissipation to other environmental media, or deposition into storage areas.

Decomposition: Metabolic breakdown of organic materials; that releases energy and simple organics and inorganic compounds. (See Respiration)

Degradable: A substance or material that is capable of decomposition; chemical or biological.

Delegated State: A state (or other governmental entity such as a tribal government) that has received authority to administer an environmental regulatory program in lieu of a federal counterpart.

Demersal: Living on or near the bottom of a body of water (e.g., mid-water and bottom-dwelling fish and shellfish, as opposed to surface fish).

Department of Sanitation of New York (DSNY): New York City agency responsible for solid waste and refuse disposal in New York City

Design Capacity: The average daily flow that a treatment plant or other facility is designed to accommodate.

Design Dry Weather Flow (DDWF): The flow basis for design of New York City wastewater treatment plants. In general, the plants have been designed to treat 1.5 times this value to full secondary treatment standards and 2.0 times this value, through at least primary settling and disinfection, during stormwater events.

Designated Uses: Those water uses specified in state water quality standards for a waterbody, or segment of a waterbody, that must be achieved and maintained as required under the Clean Water Act. The uses, as defined by states, can include cold-water fisheries, natural fisheries, public water supply, irrigation, recreation, transportation, or mixed uses.

Deoxyribonucleic Acid (DNA): The genetic material of living organisms; the substance of heredity. It is a large, double-stranded, helical molecule that contains genetic instructions for growth, development, and replication.

Destratification: Vertical mixing within a lake or reservoir to totally or partially eliminate separate layers of temperature, plant, or animal life.

Deterministic Model: A model that does not include built-in variability: same input will always equal the same output.

Die-Off Rate: The first-order decay rate for bacteria, pathogens, and viruses. Die-off depends on the particular type of waterbody (i.e. stream, estuary , lake) and associated factors that influence mortality.

Dilution: Addition of less concentrated liquid (water) that results in a decrease in the original concentration.

Direct Runoff: Water that flows over the ground surface or through the ground directly into streams, rivers, and lakes.

Discharge Permits (NPDES): A permit issued by the USEPA or a state regulatory agency that sets specific limits on the type and amount of pollutants that a municipality or industry can discharge to a receiving water; it also includes a compliance schedule for achieving those limits. It is called the NPDES because the permit process was established under the National Pollutant Discharge Elimination System, under provisions of the Federal Clean Water Act.

Discharge: Flow of surface water in a stream or canal or the outflow of ground water from a flowing artesian well, ditch, or spring. It can also apply to discharges of liquid effluent from a facility or to chemical emissions into the air through designated venting mechanisms.

Discriminant Analysis: A type of multivariate analysis used to distinguish between two groups.

Disinfect (Disinfected): A water and wastewater treatment process that kills harmful microorganisms and bacteria by means of physical, chemical and alternative processes such as ultraviolet radiation.

Disinfectant: A chemical or physical process that kills disease-causing organisms in water, air, or on surfaces. Chlorine is often used to disinfect sewage treatment effluent, water supplies, wells, and swimming pools.

Dispersion: The spreading of chemical or biological constituents, including pollutants, in various directions from a point source, at varying velocities depending on the differential instream flow characteristics.

Dissolved Organic Carbon (DOC): All organic carbon (e.g., compounds such as acids and sugars, leached from soils, excreted from roots, etc) dissolved in a given volume of water at a particular temperature and pressure.

Dissolved Oxygen (DO): The dissolved oxygen freely available in water that is vital to fish and other aquatic life and is needed for the prevention of odors. DO levels are considered a most important indicator of a water body's ability to support desirable aquatic life. Secondary and advanced waste treatments are generally designed to ensure adequate DO in waste-receiving waters. It also refers to a measure of the amount of oxygen available for biochemical activity in a waterbody, and as an indicator of the quality of that water.

Dissolved Solids: The organic and inorganic particles that enter a waterbody in a solid phase and then dissolve in water.

DMA Beach: Douglas Manor Association Beach

DMR: discharge monitoring report

DNA: deoxyribonucleic acid

DO: dissolved oxygen

DOC: Dissolved Organic Carbon

Drainage Area or Drainage Basin: An area drained by a main river and its tributaries (see Watershed).

Dredging: Dredging is the removal of mud from the bottom of waterbodies to facilitate navigation or remediate contamination. This can disturb the ecosystem and cause silting that can kill or harm aquatic life. Dredging of contaminated mud can expose biota to heavy metals and other toxics. Dredging activities are subject to regulation under Section 404 of the Clean Water Act.

Dry Weather Flow (DWF): Hydraulic flow conditions within a combined sewer system resulting from one or more of the following: flows of domestic sewage, ground water infiltration, commercial and industrial wastewaters, and any other non-precipitation event related flows (e.g., tidal infiltration under certain circumstances).

Dry Weather Overflow: A combined sewer overflow that occurs during dry weather flow conditions.

DSNY: Department of Sanitation of New York

DWF: Dry weather flow

Dynamic Model: A mathematical formulation describing the physical behavior of a system or a process and its temporal variability. Ecological Integrity. The condition of an unimpaired ecosystem as measured by combined chemical, physical (including habitat), and biological attributes.

E. Coli: Escherichia Coli.

Ecoregion: Geographic regions of ecological similarity defined by similar climate, landform, soil, natural vegetation, hydrology or other ecologically relevant variables.

Ecosystem: An interactive system that includes the organisms of a natural community association together with their abiotic physical, chemical, and geochemical environment.

Effects Range-Low: Concentration of a chemical in sediment below which toxic effects were rarely observed among sensitive species (10th percentile of all toxic effects).

Effects Range-Median: Concentration of a chemical in sediment above which toxic effects are frequently observed among sensitive species (50th percentile of all toxic effects).

Effluent: Wastewater, either municipal sewage or industrial liquid waste that flows out of a treatment plant, sewer or outfall untreated, partially treated, or completely treated.

Effluent Guidelines: Technical USEPA documents which set effluent limitations for given industries and pollutants.

Effluent Limitation: Restrictions established by a state or USEPA on quantities, rates, and concentrations in wastewater discharges.

Effluent Standard: See effluent limitation.

EIS: Environmental Impact Statement

EMAP: Environmental Monitoring and Assessment Program

EMC: Event Mean Concentration

Emergency Planning and Community Right-to-Know Act of 1986, The (SARA Title III): Law requiring federal, state and local governments and industry, which are involved in either emergency planning and/or reporting of hazardous chemicals, to allow public access to information about the presence of hazardous chemicals in the community and releases of such substances into the environment.

Endpoint: An endpoint is a characteristic of an ecosystem that may be affected by exposure to a stressor. Assessment endpoints and measurement endpoints are two distinct types of endpoints that are commonly used by resource managers. An assessment endpoint is the formal expression of a valued environmental characteristic and should have societal relevance. A measurement endpoint is the expression of an observed or measured response to a stress or disturbance. It is a measurable environmental characteristic that is related to the valued environmental characteristic chosen as the assessment endpoint. The numeric criteria that are part of traditional water quality standards are good examples of measurement endpoints.

Enforceable Requirements: Conditions or limitations in permits issued under the Clean Water Act Section 402 or 404 that, if violated, could result in the issuance of a compliance order or initiation of a civil or criminal action under federal or applicable state laws.

Enhancement: In the context of restoration ecology, any improvement of a structural or functional attribute.

Enteric: Of or within the gastrointestinal tract.

Enterococci: A subgroup of the fecal streptococci that includes S. faecalis and S. faecium. The enterococci are differentiated from other streptococci by their ability to grow in 6.5% sodium chloride, at pH 9.6, and at 10°C and 45°C. Enterococci are a valuable bacterial indicator for determining the extent of fecal contamination of recreational surface waters.

Environment: The sum of all external conditions and influences affecting the development and life of organisms.

Environmental Impact Statement (EIS): A document required of federal agencies by the National Environmental Policy Act for major projects or legislative proposals significantly affecting the environment. A tool for decision making, it describes the positive and negative effects of the undertaking and cites alternative actions.

Environmental Monitoring and Assessment Program (EMAP): The Environmental Monitoring and Assessment Program (EMAP) is a research program to develop the tools necessary to monitor and assess the status and trends of national ecological resources. EMAP's goal is to develop the scientific understanding for translating environmental monitoring data from multiple spatial and temporal scales into assessments of current ecological condition and forecasts of future risks to our natural resources.

Epibenthic: Those animals/organisms located at the surface of the sediments on the bay bottom, generally referring to algae.

Epibenthos: Those animals (usually excluding fishes) living on the top of the sediment surface.

Epidemiology: All the elements contributing to the occurrence or non-occurrence of a disease in a population; ecology of a disease.

Epifauna: Benthic animals living on the sediment or on and among rocks and other structures.

EPMC: Engineering Program Management Consultant

ERTM: East River Tributaries Model, mathematical model used to evaluate Alley Creek and Little Neck Bay water quality.

Escherichia Coli: A subgroup of the fecal coliform bacteria. E. coli is part of the normal intestinal flora in humans and animals and is, therefore, a direct indicator of fecal contamination in a waterbody. The O157 strain, sometimes transmitted in contaminated waterbodies, can cause serious infection resulting in gastroenteritis. (See Fecal coliform bacteria)

Estuarine Number: Nondimensional parameter accounting for decay, tidal dispersion, and advection velocity. Used for classification of tidal rivers and estuarine systems.

Estuarine or Coastal Marine Classes: Classes that reflect basic biological communities and that are based on physical parameters such as salinity, depth, sediment grain size, dissolved oxygen and basin geomorphology.

Estuarine Waters: Semi-enclosed body of water which has a free connection with the open sea and within which seawater is measurably diluted with fresh water derived from land drainage.

Estuary: Region of interaction between rivers and near-shore ocean waters, where tidal action and river flow mix fresh and salt water. Such areas include bays, mouths of rivers, salt marshes, and lagoons. These brackish water ecosystems shelter and feed marine life, birds, and wildlife (see wetlands).

Eutrophication: A process in which a waterbody becomes rich in dissolved nutrients, often leading to algal blooms, low dissolved oxygen and changes in the composition of plants and animals in the waterbody. This occurs naturally, but can be exacerbated by human activity which increases nutrient inputs to the waterbody.

Event Mean Concentration (EMC): Input data, typically for urban areas, for a water quality model. EMC represents the concentration of a specific pollutant contained in stormwater runoff coming from a particular land use type within a watershed.

Existing Use: Describes the use actually attained in the waterbody on or after November 28, 1975, whether or not it is included in the water quality standards (40 CFR 131.3).

Facility Plan: A planning project that uses engineering and science to address pollution control issues and will most likely result in the enhancement of existing water pollution control facilities or the construction of new facilities.

Facultative: Capable of adaptive response to varying environments.

Fecal Coliform Bacteria: A subset of total coliform bacteria that are present in the intestines or feces of warm-blooded animals. They are often used as indicators of the sanitary quality of water. They are measured by running the standard total coliform test at an elevated temperature (44.5EC). Fecal coliform is approximately 20 percent of total coliform. (See Total Coliform Bacteria)

Fecal Streptococci: These bacteria include several varieties of streptococci that originate in the gastrointestinal tract of warm-blooded animals such as humans (Streptococcus faecalis) and domesticated animals such as cattle (Streptococcus bovis) and horses (Streptococcus equinus).

Feedlot: A confined area for the controlled feeding of animals. The area tends to concentrate large amounts of animal waste that cannot be absorbed by the soil and, hence, may be carried to nearby streams or lakes by rainfall runoff.

FEIS: Final Environmental Impact Statement

Field Sampling and Analysis Program (FSAP): Biological sampling program undertaken to fill-in ecosystem data gaps in New York Harbor.

Final Environmental Impact Statement (FEIS): A document that responds to comments received on the Draft EIS and provides updated information that has become available after publication of the Draft EIS.

Fish Kill: A natural or artificial condition in which the sudden death of fish occurs due to the introduction of pollutants or the reduction of the dissolved oxygen concentration in a waterbody.

Floatables: Large waterborne materials, including litter and trash, that are buoyant or semi-buoyant and float either on or below the water surface. These materials, which are generally man-made and sometimes characteristic of sanitary wastewater and storm runoff, may be transported to sensitive environmental areas such as bathing beaches where they can become an aesthetic nuisance. Certain types of floatables also cause harm to marine wildlife and can be hazardous to navigation.

Flocculation: The process by which suspended colloidal or very fine particles are assembled into larger masses or floccules that eventually settle out of suspension.

Flux: Movement and transport of mass of any water quality constituent over a given period of time. Units of mass flux are mass per unit time.

FOIA: Freedom of Information Act

Food Chain: A sequence of organisms, each of which uses the next, lower member of the sequence as a food source.

Freedom of Information Act (FOIA): A federal statute which allows any person the right to obtain federal agency records unless the records (or part of the records) are protected from disclosure by any of the nine exemptions in the law.

FSAP: Field Sampling and Analysis Program

gallons per day per foot (gpd/ft): unit of measure

Gastroenteritis: An inflammation of the stomach and the intestines.

General Permit: A permit applicable to a class or category of discharges.

Geochemical: Refers to chemical reactions related to earth materials such as soil, rocks, and water.

Geographical Information System (GIS): A computer system that combines database management system functionality with information about location. In this way it is able to capture, manage, integrate, manipulate, analyze and display data that is spatially referenced to the earth's surface.

Giardia lamblia: Protozoan in the feces of humans and animals that can cause severe gastrointestinal Ailments. It is a common contaminant of surface waters. (See protozoa).

GIS: Geographical Information System

Global Positioning System (GPS): A GPS comprises a group of satellites orbiting the earth (24 are now maintained by the U.S. Government) and a receiver, which can be highly portable. The receiver can generate accurate coordinates for a point, including elevation, by calculating its own position relative to three or more satellites that are above the visible horizon at the time of measurement.

GPD: Gallons per Day

gpd/ft: gallons per day per foot

gpd/sq ft: gallons per day per square foot

GPS: Global Positioning System

GSD: Green Site Development

Gradient: The rate of decrease (or increase) of one quantity with respect to another; for example, the rate of decrease of temperature with depth in a lake.

Groundwater: The supply of fresh water found beneath the earth's surface, usually in aquifers, which supply wells and springs. Because groundwater is a major source of drinking water, there is growing concern over contamination from leaching agricultural or industrial pollutants and leaking underground storage tanks.

H_2S: Hydrogen Sulfide

Habitat Conservation Plans (HCPs): As part of the Endangered Species Act, Habitat Conservation Plans are designed to protect a species while allowing development. HCP's give the U.S. Fish and Wildlife Service the authority to permit "taking" of endangered or threatened species as long as the impact is reduced by conservation measures. They allow a landowner to determine how best to meet the agreed-upon fish and wildlife goals.

Habitat: A place where the physical and biological elements of ecosystems provide an environment and elements of the food, cover and space resources needed for plant and animal survival.

Halocline: A vertical gradient in salinity.

HCP: Habitat Conservation Plan

Heavy Metals: Metallic elements with high atomic weights (e.g., mercury, chromium, cadmium, arsenic, and lead); can damage living things at low concentrations and tend to accumulate in the food chain.

HGL: hydraulic gradient line

High Rate Treatment (HRT): A traditional gravity settling process enhanced with flocculation and settling aids to increase loading rates and improve performance.

Holding Pond: A pond or reservoir, usually made of earth, built to store polluted runoff.

Holoplankton: An aggregate of passively floating, drifting or somewhat motile organisms throughout their entire life cycle; Hot spot locations in waterbodies or sediments where hazardous substances have accumulated to levels which may pose risks to aquatic life, wildlife, fisheries, or human health.

HRT: High Rate Treatment

Hydrogen Sulfide (H_2S): A flammable, toxic, colorless gas with an offensive odor (similar to rotten eggs) that is a byproduct of degradation in anaerobic conditions.

Hydrology: The study of the distribution, properties, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Hypoxia: The condition of low dissolved oxygen in aquatic systems (typically with a dissolved oxygen concentration less than 3.0 mg/L).

Hypoxia/Hypoxic Waters: Waters with dissolved oxygen concentrations of less than 2 ppm, the level generally accepted as the minimum required for most marine life to survive and reproduce.

I/I: Inflow/Infiltration

Index of Biotic Integrity: A fish community assessment approach that incorporates the zoogeographic, ecosystem, community and population aspects of fisheries biology into a single ecologically-based index of the quality of a water resource.

IBI: Indices of Biological Integrity

IDNP: Illegal Dumping Notification Program

IEC: Interstate Environmental Commission

IFCP: Interim Floatables Containment Program

Illegal Dumping Notification Program (IDNP): New York City program wherein the NYCDEP field personnel report any observed evidence of illegal shoreline dumping to the Sanitation Police section of DSNY, who have the authority to arrest dumpers who, if convicted, are responsible for proper disposal of the material.

Impact: A change in the chemical, physical or biological quality or condition of a waterbody caused by external sources.

Impaired Waters: Waterbodies not fully supporting their designated uses.

Impairment: A detrimental effect on the biological integrity of a waterbody caused by an impact.

Impermeable: Impassable; not permitting the passage of a fluid through it.

In situ: Measurements taken in the natural environment.

in.: Abbreviation for "Inches".

Index Period: A sampling period, with selection based on temporal behavior of the indicator(s) and the practical considerations for sampling.

Indicator Organism: Organism used to indicate the potential presence of other (usually pathogenic) organisms. Indicator organisms are usually associated with the other organisms, but are usually more easily sampled and measured.

Indicator Taxa or Indicator Species: Those organisms whose presence (or absence) at a site is indicative of specific environmental conditions.

Indicator: Measurable quantity that can be used to evaluate the relationship between pollutant sources and their impact on water quality. Abiotic and biotic indicators can provide quantitative information on environmental conditions.

Indices of Biological Integrity (IBI): A usually dimensionless numeric combination of scores derived from biological measures called metrics.

Industrial Pretreatment Programs (IPP): Program mandated by USEPA to control toxic discharges to public sewers that are tributary to sewage treatment plants by regulating Significant Industrial Users (SIUs). NYCDEP enforces the IPP through Chapter 19 of Title 15 of the Rules of the City of New York (Use of Public Sewers).

Infauna: Animals living within submerged sediments. (See benthos.)

Infectivity: Ability to infect a host. Infiltration. 1. Water other than wastewater that enters a wastewater system and building sewers from the ground through such means as defective pipes, pipe joints, connections or manholes. (Infiltration does not include inflow.) 2. The gradual downward flow of water from the ground surfaces into the soil.

Infiltration: The penetration of water from the soil into sewer or other pipes through defective joints, connections, or manhole walls.

Infiltration/Inflow (I/I): The total quantity of water entering a sewer system from both infiltration and inflow.

Inflow: Water other than wastewater that enters a wastewater system and building sewer from sources such as roof leaders, cellar drains, yard drains, foundation drains, drains from springs and swampy areas, manhole covers, cross connections between storm drains and sanitary sewers, catch basins, cooling towers, stormwaters, surface runoff, street wash waters or drainage. (Inflow does not include infiltration.)

Influent: Water, wastewater, or other liquid flowing into a reservoir, basin, or treatment plant.

InfoWorks CS™ Model: Watershed/sewershed model software program.

Initial Mixing Zone: Region immediately downstream of an outfall where effluent dilution processes occur. Because of the combined effects of the effluent buoyancy, ambient stratification, and current, the prediction of initial dilution can be involved.

Insolation: Exposure to the sun's rays.

Instream Flow: The amount of flow required to sustain stream values, including fish, wildlife, and recreation.

Interceptor Sewers: Large sewer lines that, in a combined system, collect and carry sewage flows from main and trunk sewers to the treatment plant for treatment and discharge. The sewer has no building sewer connections. During some storm events, their capacity is exceeded and regulator structures relieve excess flow to receiving waters to prevent flooding basements, businesses and streets.

Interim Floatables Containment Program (IFCP): A New York City Program that includes containment booms at 24 locations, end-of-pipe nets, skimmer vessels that pick up floatables and transports them to loading stations.

Interstate Environmental Commission (IEC): The Interstate Environmental Commission is a joint agency of the States of New York, New Jersey, and Connecticut. The IEC was established in 1936 under a Compact between New York and New Jersey and approved by Congress. The State of Connecticut joined the Commission in 1941. The mission of the IEC is to protect and enhance environmental quality through cooperation, regulation, coordination, and mutual dialogue between government and citizens in the tri-state region.

Intertidal: The area between the high- and low-tide lines.

IPP: Industrial Pretreatment Programs

Irrigation: Applying water or wastewater to land areas to supply the water and nutrient needs of plants.

JABERRT: Jamaica Bay Ecosystem Research and Restoration Team

Jamaica Bay Ecosystem Research and Restoration Team (JABERRT): Team established by the Army Corps of Engineers to conduct a detailed inventory and biogeochemical characterization of Jamaica Bay for the 2000-2001 period and to compile the most detailed literature search established.

Jamaica Eutrophication Model (JEM): Model developed for Jamaica Bay in 1996 as a result of a cost-sharing agreement between the NYCDEP and US Army Corps of Engineers.

JEM: Jamaica Eutrophication Model

JFK: John F. Kennedy International Airport

Karst Geology: Solution cavities and closely-spaced sinkholes formed as a result of dissolution of carbonate bedrock.

Knee-of-the-Curve: The point where the incremental change in the cost of the control alternative per change in performance of the control alternative changes most rapidly.

Kurtosis: A measure of the departure of a frequency distribution from a normal distribution, in terms of its relative peakedness or flatness.

LA: Load Allocation

Land Application: Discharge of wastewater onto the ground for treatment or reuse. (See irrigation)

Land Use: How a certain area of land is utilized (examples: forestry, agriculture, urban, industry).

Landfill: A large, outdoor area for waste disposal; landfills where waste is exposed to the atmosphere (open dumps) are now illegal; in constructed landfills, waste is layered, covered with soil, and is built upon impermeable materials or barriers to prevent contamination of surroundings.

lb/day/cf: pounds per day per cubic foot

lbs/day: pounds per day

LC: Loading Capacity

Leachate: Water that collects contaminants as it trickles through wastes, pesticides, or fertilizers. Leaching can occur in farming areas, feedlots, and landfills and can result in hazardous substances entering surface water, groundwater, or soil.

Leaking Underground Storage Tank (LUST): An underground container used to store gasoline, diesel fuel, home heating oil, or other chemicals that is damaged in some way and is leaking its contents into the ground; may contaminate groundwater.

LID: Low Impact Development

LID-R: Low Impact Development - Retrofit

Limiting Factor: A factor whose absence exerts influence upon a population or organism and may be responsible for no growth, limited growth (decline) or rapid growth.

LIRR: Long Island Railroad

Littoral Zone: The intertidal zone of the estuarine or seashore; i.e., the shore zone between the highest and lowest tides.

Load Allocation (LA): The portion of a receiving water's loading capacity that is attributed either to one of its existing or future non-point sources of pollution or to natural background sources. Load allocations are best estimates of the loading, which can range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. Wherever possible, natural and non-point source loads should be distinguished. (40 CFR 130.2(g))

Load, Loading, Loading Rate: The total amount of material (pollutants) entering the system from one or multiple sources; measured as a rate in mass per unit time.

Loading Capacity (LC): The greatest amount of loading that a water can receive without violating water quality standards.

Long Term Control Plan (LTCP): A document developed by CSO communities to describe existing waterway conditions and various CSO abatement technologies that will be used to control overflows.

Low-Flow: Stream flow during time periods where no precipitation is contributing to runoff to the stream and contributions from groundwater recharge are low. Low flow results in less water available for dilution of pollutants in the stream. Due to the limited flow, direct discharges to the stream dominate during low flow periods. Exceedences of water quality standards during low flow conditions are likely to be caused by direct discharges such as point sources, illicit discharges, and livestock or wildlife in the stream.

Low Impact Development (LID): A sustainable storm water management strategy implemented in response to burgeoning infrastructural costs of new development and redevelopment projects, more rigorous environmental regulations, concerns about the urban heat island effect, and the impacts of natural resources due to growth and development. The LID strategy controls water at the source—both rainfall and storm water runoff—which is known as 'source-control' technology. It is a decentralized system that distributes storm water across a project site in order to replenish groundwater supplies rather than sending it into a system of storm drain pipes and channelized networks that control water downstream in a large storm water management facility. The LID approach promotes the use of various devices that filter water and infiltrate water into the ground. It promotes the use of roofs of buildings, parking lots, and other horizontal surfaces to convey water to either distribute it into the ground or collect it for reuse.

Low Impact Development – Retrofit (LID-R): Modification of an existing site to accomplish LID goals.

LPC: Landmark Preservation Commission

LTCP: Long-Term CSO Control Plan

LUST: leaking underground storage tank

Macrobenthos: Benthic organisms (animals or plants) whose shortest dimension is greater than or equal to 0.5 mm. (See benthos.)

Macrofauna: Animals of a size large enough to be seen by the unaided eye and which can be retained by a U.S. Standard No. 30 sieve (28 meshes/in, 0.595-mm openings).

Macro-invertebrate: Animals/organism without backbones (Invertebrate) that is too large to pass through a No. 40 Screen (0.417mm) but can be retained by a U.S. Standard No. 30 sieve (28 meshes/in, 0.595-mm openings). The organism size is of sufficient size for it to be seen by the unaided eye and which can be retained

Macrophytes: Large aquatic plants that may be rooted, non-rooted, vascular or algiform (such as kelp); including submerged aquatic vegetation, emergent aquatic vegetation, and floating aquatic vegetation.

Major Oil Storage Facilities (MOSF): Onshore facility with a total combined storage capacity of 400,000 gallons or more of petroleum and/or vessels involved in the transport of petroleum on the waters of New York State.

Margin of Safety (MOS): A required component of the TMDL that accounts for the uncertainty about the relationship between the pollutant loads and the quality of the receiving waterbody (CWA section 303(d)(1)(C)). The MOS is normally incorporated into the conservative assumptions used to develop TMDLs (generally within the calculations or models) and approved by EPA either individually or in state/EPA agreements. If the MOS needs to be larger than that which is allowed through the conservative assumptions, additional MOS can be added as a separate component of the TMDL (in this case, quantitatively, a TMDL = LC = WLA + LA + MOS).

Marine Protection, Research and Sanctuaries Act of 1972, The Ocean Dumping Act: Legislation regulating the dumping of any material in the ocean that may adversely affect human health, marine environments or the economic potential of the ocean.

Mass Balance: A mathematical accounting of substances entering and leaving a system, such as a waterbody, from all sources. A mass balance model for a waterbody is useful to help understand the relationship between the loadings of a pollutant and the levels in the water, biota and sediments, as well as the amounts that can be safely assimilated by the waterbody.

Mass Loading: The quantity of a pollutant transported to a waterbody.

Mathematical Model: A system of mathematical expressions that describe the spatial and temporal distribution of water quality constituents resulting from fluid transport and the one, or more, individual processes and interactions within some prototype aquatic ecosystem. A mathematical water quality model is used as the basis for wasteload allocation evaluations.

Mean Low Water (MLW): A tidal level. The average of all low waters observed over a sufficiently long period.

Median Household Income (MHI): The median household income is one measure of average household income. It divides the household income distribution into two equal parts: one-half of the cases fall below the median household income, and one-half above it.

Meiofauna: Small interstitial; i.e., occurring between sediment particles, animals that pass through a 1-mm mesh sieve but are retained by a 0.1-mm mesh.

Memorandum of Understanding (MOU): **A**n agreement between two or more public agencies defining the roles and responsibilities of each agency in relation to the other or others with respect to an issue over which the agencies have concurrent jurisdiction.

Meningitis: Inflammation of the meninges, especially as a result of infection by bacteria or viruses.

Meroplankton: Organisms that are planktonic only during the larval stage of their life history.

Mesohaline: The estuarine salinity zone with a salinity range of 5-18-ppt.

Metric: A calculated term or enumeration which represents some aspect of biological assemblage structure, function, or other measurable characteristic of the biota that changes in some predictable way in response to impacts to the waterbody.

mf/L: Million fibers per liter – A measure of concentration.

MG: Million Gallons – A measure of volume.

mg/L: Milligrams Per Liter – A measure of concentration.

MGD: Million Gallons Per Day – A measure of the rate of water flow.

MHI: Median Household Income

Microgram per liter (ug/L): A measure of concentration

Microorganisms: Organisms too small to be seen with the unaided eye, including bacteria, protozoans, yeasts, viruses and algae.

milligrams per liter (mg/L): This weight per volume designation is used in water and wastewater analysis. 1 mg/l=1 ppm.

milliliters (mL): A unit of length equal to one thousandth (10^{-3}) of a meter, or 0.0394 inch.

Million fibers per liter (mf/L): A measure of concentration.

million gallons (MG): A unit of measure used in water and wastewater to express volume. To visualize this volume, if a good-sized bath holds 50 gallons, so a million gallons would be equal to 20,000 baths.

million gallons per day (MGD): Term used to express water-use data. Denotes the volume of water utilized in a single day.

Mitigation: Actions taken to avoid, reduce, or compensate for the effects of environmental damage. Among the broad spectrum of possible actions are those which restore, enhance, create, or replace damaged ecosystems.

Mixing Zone: A portion of a waterbody where water quality criteria or rules are waived in order to allow for dilution of pollution. Mixing zones have been allowed by states in many NPDES permits when discharges were expected to have difficulty providing enough treatment to avoid violating standards for the receiving water at the point of discharge.

mL: milliliters

MLW: mean low water

Modeling: An investigative technique using a mathematical or physical representation of a system or theory, usually on a computer, that accounts for all or some of its known properties. Models are often used to test the effect of changes of system components on the overall performance of the system.

Monitoring: Periodic or continuous surveillance or testing to determine the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, plants, and animals.

Monte Carlo Simulation: A stochastic modeling technique that involves the random selection of sets of input data for use in repetitive model runs. Probability distributions of receiving water quality concentrations are generated as the output of a Monte Carlo simulation.

MOS: Margin of Safety

MOSF: major oil storage facilities

MOU: Memorandum of Understanding

MOUSE: Computer model developed by the Danish Hydraulic Institute used to model the combined sewer system.

MPN: most probable number, a measure of bacteria

MS4: municipal separate storm sewer systems

Multimetric Approach: An analysis technique that uses a combination of several measurable characteristics of the biological assemblage to provide an assessment of the status of water resources.

Multivariate Community Analysis: Statistical methods (e.g., ordination or discriminant analysis) for analyzing physical and biological community data using multiple variables.
municipal separate storm sewer systems.

Municipal Separate Sewer Systems (MS4): A conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, storm drains) that is 1) Owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage districts, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges to waters of the United States; 2) Designed or used for collecting or conveying stormwater; 3) Which is not a combined sewer; and 4) Which is not part of a publicly owned treatment works.

Municipal Sewage: Wastes (mostly liquid) originating from a community; may be composed of domestic wastewater and/or industrial discharges.

National Estuary Program: A program established under the Clean Water Act Amendments of 1987 to develop and implement conservation and management plans for protecting estuaries and restoring and maintaining their chemical, physical, and biological integrity, as well as controlling point and non-point pollution sources.

National Marine Fisheries Service (NMFS): A federal agency - with scientists, research vessels, and a data collection system - responsible for managing the nation's saltwater fish. It oversees the actions of the Councils under the Fishery Conservation and Management Act.

National Pollutant Discharge Elimination System (NPDES): The national program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 402, 318, and 405 of the Clean Water Act. The program imposes discharge limitations on point sources by basing them on the effluent limitation capabilities of a control technology or on local water quality standards. It prohibits discharge of pollutants into water of the United States unless a special permit is issued by EPA, a state, or, where delegated, a tribal government on an Indian reservation.

National Priorities List (NPL): EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund. The list is based primarily on the score a site receives from the Hazard Ranking System. EPA is required to update the NPL at least once a year. A site must be on the NPL to receive money from the Trust Fund for remedial action.

National Wetland Inventory (NWI): The National Wetlands Inventory (NWI) of the U.S. Fish & Wildlife Service produces information on the characteristics, extent, and status of the Nation's wetlands and deepwater habitats. The National Wetlands Inventory information is used by Federal, State, and local agencies, academic institutions, U.S. Congress, and the private sector. Congressional mandates in the Emergency Wetlands Resources Act requires the Service to map wetlands, and to digitize, archive and distribute the maps.

Natural Background Levels: Natural background levels represent the chemical, physical, and biological conditions that would result from natural geomorphological processes such as weathering or dissolution.

Natural Waters: Flowing water within a physical system that has developed without human intervention, in which natural processes continue to take place.

Navigable Waters: Traditionally, waters sufficiently deep and wide for navigation; such waters in the United States come under federal jurisdiction and are protected by the Clean Water Act.

New York City Department of City Planning (NYCDCP): New York City agency responsible for the city's physical and socioeconomic planning, including land use and environmental review; preparation of plans and policies; and provision of technical assistance and planning information to government agencies, public officials, and community boards.

New York City Department of Environmental Protection (NYCDEP): New York City agency responsible for addressing the environmental needs of the City's residents in areas including water, wastewater, air, noise and hazmat.

New York City Department of Parks and Recreation (NYCDPR): The New York City Department of Parks and Recreation is the branch of government of the City of New York responsible for maintaining the city's parks system, preserving and maintaining the ecological diversity of the city's natural areas, and furnishing recreational opportunities for city's residents.

New York City Department of Transportation (NYCDOT): New York City agency responsible for maintaining and improving New York City's transportation network.

New York City Economic Development Corporation (NYCEDC): City's primary vehicle for promoting economic growth in each of the five boroughs. NYCEDC works to stimulate investment in New York and broaden the City's tax and employment base, while meeting the needs of businesses large and small. To realize these objectives, NYCEDC uses its real estate and financing tools to help companies that are expanding or relocating anywhere within the city.

New York District (NYD): The local division of the United States Army Corps of Engineers,

New York State Code of Rules and Regulations (NYCRR): Official statement of the policy(ies) that implement or apply the Laws of New York.

New York State Department of Environmental Conservation (NYSDEC): New York State aagency that conserves, improves, and protects New York State's natural resources and environment, and controls water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well being.

New York State Department of State (NYSDOS): Known as the "keeper of records" for the State of New York. Composed of two main divisions including the Office of Business and Licensing Services and the Office of Local Government Services. The latter office includes the Division of Coastal Resources and Waterfront Revitalization.

NH_3: Ammonia

Nine Minimum Controls (NMC): Controls recommended by the USEPA to minimize CSO impacts. The controls include: (1) proper operation and maintenance for sewer systems and CSOs; (2) maximum use of the collection system for storage; (3) review pretreatment requirements to minimize CSO impacts; (4) maximize flow to treatment facility; (5) prohibit combines sewer discharge during dry weather; (6) control solid and floatable materials in CSOs; (7) pollution prevention; (8) public notification of CSO occurrences and impacts; and, (9) monitor CSOs to characterize impacts and efficacy of CSO controls.

NMC: nine minimum controls

NMFS: National Marine Fisheries Service

No./mL (or #/mL): number of bacteria organisms per milliliter – measure of concentration

Non-Compliance: Not obeying all promulgated regulations, policies or standards that apply.

Non-Permeable Surfaces: Surfaces which will not allow water to penetrate, such as sidewalks and parking lots.

Non-Point Source (NPS): Pollution that is not released through pipes but rather originates from multiple sources over a relatively large area (i.e., without a single point of origin or not introduced into a receiving stream from a specific outlet). The pollutants are generally carried off the land by storm water. Non-point sources can be divided into source activities related to either land or water use including failing septic tanks, improper animal-keeping practices, forest practices, and urban and rural runoff. Common non-point sources are agriculture, forestry, urban, mining, construction, dams, channels, land disposal, saltwater intrusion, and city streets.

NPDES: National Pollution Discharge Elimination System

NPL: National Priorities List

NPS: Non-Point Source

Numeric Targets: A measurable value determined for the pollutant of concern which is expected to result in the attainment of water quality standards in the listed waterbody.

Nutrient Pollution: Contamination of water resources by excessive inputs of nutrients. In surface waters, excess algal production as a result of nutrient pollution is a major concern.

Nutrient: Any substance assimilated by living things that promotes growth. The term is generally applied to nitrogen and phosphorus in wastewater, but is also applied to other essential and trace elements.

NWI: National Wetlands Inventory

NYCDCP: New York City Department of City Planning

NYCDEP: New York City Department of Environmental Protection

NYCDOT: New York City Department of Transportation

NYCDPR: New York City Department of Parks and Recreation

NYCEDC: New York City Economic Development Corporation

NYCRR: New York State Code of Rules and Regulations

NYD: New York District

NYSDEC: New York State Department of Environmental Conservation

NYSDOS: New York State Department of State

O&M: Operation and Maintenance

Oligohaline: The estuarine salinity zone with a salinity range of 0.5-5-ppt.

ONRW: Outstanding National Resource Waters

Operation and Maintenance (O&M): Actions taken after construction to ensure that facilities constructed will be properly operated and maintained to achieve normative efficiency levels and prescribed effluent eliminations in an optimum manner.

Optimal: Most favorable point, degree, or amount of something for obtaining a given result; in ecology most natural or minimally disturbed sites.

Organic Chemicals/Compounds: Naturally occurring (animal or plant-produced or synthetic) substances containing mainly carbon, hydrogen, nitrogen, and oxygen.

Organic Material: Material derived from organic, or living, things; also, relating to or containing carbon compounds.

Organic Matter: Carbonaceous waste (organic fraction) that includes plant and animal residue at various stages of decomposition, cells and tissues of soil organisms, and substances synthesized by the soil population originating from domestic or industrial sources. It is commonly determined as the amount of organic material contained in a soil or water sample.

Organic: (1) Referring to other derived from living organisms. (2) In chemistry, any compound containing carbon.

Ortho P: Ortho Phosphorus

Ortho Phosphorus: Soluble reactive phosphorous readily available for uptake by plants. The amount found in a waterbody is an indicator of how much phosphorous is available for algae and plant growth. Since aquatic plant growth is typically limited by phosphorous, added phosphorous especially in the dissolved, bioavailable form can fuel plant growth and cause algae blooms.

Outfall: Point where water flows from a conduit, stream, or drain into a receiving water.

Outstanding National Resource Waters (ONRW): Outstanding national resource waters (ONRW) designations offer special protection (i.e., no degradation) for designated waters, including wetlands. These are areas of exceptional water quality or recreational/ecological significance. State antidegradation policies should provide special protection to wetlands designated as outstanding national resource waters in the same manner as other surface waters; see Section 131.12(a)(3) of the WQS regulation and EPA guidance (Water Quality Standards Handbook (USEPA 1983b), and Questions and Answers on: Antidegradation (USEPA 1985a)).

Overflow Rate: A measurement used in wastewater treatment calculations for determining solids settling. It is also used for CSO storage facility calculations and is defined as the flow through a storage basin divided by the surface area of the basin. It can be thought of as an average flow rate through the basin. Generally expressed as gallons per day per square foot (gpd/sq.ft.).

Oxidation Pond: A relatively shallow body of wastewater contained in an earthen basin; lagoon; stabilization pond.

Oxidation: The chemical union of oxygen with metals or organic compounds accompanied by a removal of hydrogen or another atom. It is an important factor for soil formation and permits the release of energy from cellular fuels.

Oxygen Demand: Measure of the dissolved oxygen used by a system (microorganisms) in the oxidation of organic matter. (See also biochemical oxygen demand)

Oxygen Depletion: The reduction of dissolved oxygen in a waterbody.

PAH: Polycyclic Aromatic Hydrocarbons

Partition Coefficients: Chemicals in solution are partitioned into dissolved and particulate adsorbed phase based on their corresponding sediment-to-water partitioning coefficient.

Parts per Million (ppm): The number of "parts" by weight of a substance per million parts of water. This unit is commonly used to represent pollutant concentrations. Large concentrations are expressed in percentages.

Pathogen: Disease-causing agent, especially microorganisms such as bacteria, protozoa, and viruses.

PCBs: Polychlorinated biphenyls

PCS: Permit Compliance System

PE: Primary Effluent

Peak Flow: The maximum flow that occurs over a specific length of time (e.g., daily, hourly, instantaneous).

Pelagic Zone: The area of open water beyond the littoral zone.

Pelagic: Pertaining to open waters or the organisms which inhabit those waters.

PERC: perchloraethylene, a dry cleaning chemical

Percent Fines: In analysis of sediment grain size, the percent of fine (.062-mm) grained fraction of sediment in a sample.

Permit Compliance System (PCS): Computerized management information system which contains data on NPDES permit-holding facilities. PCS keeps extensive records on more than 65,000 active water-discharge permits on sites located throughout the nation. PCS tracks permit, compliance, and enforcement status of NPDES facilities.

Permit: An authorization, license, or equivalent control document issued by EPA or an approved federal, state, or local agency to implement the requirements of an environmental regulation; e.g., a permit to operate a wastewater treatment plant or to operate a facility that may generate harmful emissions.

Petit Ponar Grab Sampler: Dredge designed to take samples from all types of benthos sediments on all varieties of waterbody bottoms, except those of the hardest clay. When the jaws contact the bottom they obtain a good penetration with very little sample disturbance. Can be used in both fresh and salt water.

pH: An expression of the intensity of the basic or acid condition of a liquid. The pH may range from 0 to 14, where 0 is most acid, 14 most basic and 7 neutral. Natural waters usually have a pH between 6.5 and 8.5.

Phased Approach: Under the phased approach to TMDL development, load allocations (LAs) and wasteload allocations (WLAs) are calculated using the best available data and information recognizing the need for additional monitoring data to accurately characterize sources and loadings. The phased approach is typically employed when non-point sources dominate. It provides for the implementation of load reduction strategies while collecting additional data.

Photic Zone: The region in a waterbody extending from the surface to the depth of light penetration.

Photosynthesis: The process by which chlorophyll-containing plants make carbohydrates from water, and from carbon dioxide in the air, using energy derived from sunlight.

Phytoplankton: Free-floating or drifting microscopic algae with movements determined by the motion of the water.

Point Source: (1) A stationary location or fixed facility from which pollutant loads are discharged. (2) Any single identifiable source of pollutants including pipes, outfalls, and conveyance channels from either municipal wastewater treatment systems or industrial waste treatment facilities. (3) Point sources can also include pollutant loads contributed by tributaries to the main receiving water stream or river.

Pollutant: Dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. (CWA Section 502(6)).

Pollution: Generally, the presence of matter or energy whose nature, location, or quantity produces undesired environmental effects. Under the Clean Water Act, for example, the term is defined as the man-made or man-induced alteration of the physical, biological, chemical, and radiological integrity of water.

Polychaete: Marine worms of the class Polychaeta of the invertebrate worm order Annelida. Polychaete species dominate the marine benthos, with dozens of species present in natural marine environments. These worms are highly diversified, ranging from detritivores to predators, with some species serving as good indicators of environmental stress.

Polychlorinated Biphenyls (PCBs): A group of synthetic polychlorinated aromatic hydrocarbons formerly used for such purposes as insulation in transformers and capacitors and lubrication in gas pipeline systems. Production, sale and new use was banned by law in 1977 following passage of the Toxic Substances Control Act. PCBs have a strong tendency to bioaccumulate. They are quite stable, and therefore persist in the environment for long periods of time. They are classified by EPA as probable human carcinogens.

Polycyclic Aromatic Hydrocarbons (PAHs): A group of petroleum-derived hydrocarbon compounds, present in petroleum and related materials, and used in the manufacture of materials such as dyes, insecticides and solvents.

Population: An aggregate of interbreeding individuals of a biological species within a specified location.

POTW: Publicly Owned Treatment Plant

pounds per day per cubic foot: lb/day/cf

pounds per day: lbs/day; unit of measure

ppm: parts per million

Precipitation Event: An occurrence of rain, snow, sleet, hail, or other form of precipitation that is generally characterized by parameters of duration and intensity (inches or millimeters per unit of time).

Pretreatment: The treatment of wastewater from non-domestic sources using processes that reduce, eliminate, or alter contaminants in the wastewater before they are discharged into Publicly Owned Treatment Works (POTWs).

Primary Effluent (PE): Partially treated water (screened and undergoing settling) passing from the primary treatment processes a wastewater treatment plant.

Primary Treatment: A basic wastewater treatment method, typically the first step in treatment, that uses skimming, settling in tanks to remove most materials that float or will settle. Usually chlorination follows to remove pathogens from wastewater. Primary treatment typically removes about 35 percent of biochemical oxygen demand (BOD) and less than half of the metals and toxic organic substances.

Priority Pollutants: A list of 129 toxic pollutants including metals developed by the USEPA as a basis for defining toxics and is commonly referred to as “priority pollutants”.

Probable Total Project Cost (PTPC): Represents the realistic total of all hard costs, soft costs, and ancillary costs associated with a particular CSO abatement technology per the definitions provided in memorandum entitled “Comparative Cost Analysis for CSO Abatement Technologies – Costing Factors” (O’Brien & Gere, April 2006). All PTPCs shown in this report are adjusted to July 25 dollars (ENR CCI = 11667.99).

Protozoa: Single-celled organisms that reproduce by fission and occur primarily in the aquatic environment. Waterborne pathogenic protozoans of primary concern include Giardia lamblia and Cryptosporidium, both of which affect the gastrointestinal tract.

PS: Pump Station or Pumping Station

Pseudoreplication: The repeated measurement of a single experimental unit or sampling unit, with the treatment of the measurements as if they were independent replicates of the sampling unit.

PTPC: Probable Total Project Cost – represents the realistic total of all hard costs, soft costs, and ancillary costs associated with a particular CSO abatement technology per the definitions provided in O’Brien & Gere, April 2006. All PTPCs shown in this report are adjusted to July 2005 dollars (ENR CCI = 11667.99).

Public Comment Period: The time allowed for the public to express its views and concerns regarding action by USEPA or states (e.g., a Federal Register notice of a proposed rule-making, a public notice of a draft permit, or a Notice of Intent to Deny).

Publicly Owned Treatment Works (POTW): Any device or system used in the treatment (including recycling and reclamation) of municipal sewage or industrial wastes of a liquid nature that is owned by a state or municipality. This definition includes sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment.

Pump Station or Pumping Station: Sewer pipes are generally gravity driven. Wastewater flows slowly downhill until it reaches a certain low point. Then pump, or "lift," stations push the wastewater back uphill to a high point where gravity can once again take over the process.

Pycnocline: A zone of marked density gradient.

Q: Symbol for Flow (designation when used in equations)

R.L: Reporting Limit

Rainfall Duration: The length of time of a rainfall event.

Rainfall Intensity: The amount of rainfall occurring in a unit of time, usually expressed in inches per hour.

RAINMAN: Watershed/sewershed model software program.

Raw Sewage: Untreated municipal sewage (wastewater) and its contents.

RCRAInfo: Resource Conservation and Recovery Act Information

Real-Time Control (RTC): A system of data gathering instrumentation used in conjunction with control components such as dams, gates and pumps to maximize storage in the existing sewer system.

Receiving Waters: Creeks, streams, rivers, lakes, estuaries, groundwater formations, or other bodies of water into which surface water and/or treated or untreated waste are discharged, either naturally or in man-made systems.

Red Tide: A reddish discoloration of coastal surface waters due to concentrations of certain toxin producing algae.

Reference Condition: The chemical, physical or biological quality or condition exhibited at either a single site or an aggregation of sites that represents the least impaired condition of a classification of waters to which the reference condition applies.

Reference Sites: Minimally impaired locations in similar waterbodies and habitat types at which data are collected for comparison with test sites. A separate set of reference sites are defined for each estuarine or coastal marine class.

Regional Environmental Monitoring and Assessment Program (REMAP): The Environmental Monitoring and Assessment Program (EMAP) is a research program to develop the tools necessary to monitor and assess the status and trends of national ecological resources. EMAP's goal is to develop the scientific understanding for translating environmental monitoring data from multiple spatial and temporal scales into assessments of current ecological condition and forecasts of future risks to our natural resources.

Regulator: A device in combined sewer systems for diverting wet weather flows which exceed downstream capacity to an overflow.

REMAP: Regional Environmental Monitoring and Assessment Program

Replicate: Taking more than one sample or performing more than one analysis.

Reporting Limit (RL): The lowest concentration at which a contaminant is reported.

Residence Time: Length of time that a pollutant remains within a section of a waterbody. The residence time is determined by the streamflow and the volume of the river reach or the average stream velocity and the length of the river reach.

Resource Conservation and Recovery Act Information (RCRAinfo): Database with information on existing hazardous materials sites. USEPA was authorized to develop a hazardous waste management system, including plans for the handling and storage of wastes and the licensing of treatment and disposal facilities. The states were required to implement the plans under authorized grants from the USEPA. The act generally encouraged "cradle to grave" management of certain products and emphasized the need for recycling and conservation.

Respiration: Biochemical process by means of which cellular fuels are oxidized with the aid of oxygen to permit the release of the energy required to sustain life; during respiration, oxygen is consumed and carbon dioxide is released.

Restoration: Return of an ecosystem to a close approximation of its condition prior to disturbance. Re-establishing the original character of an area such as a wetland or forest.

Riparian Zone: The border or banks of a stream. Although this term is sometimes used interchangeably with floodplain, the riparian zone is generally regarded as relatively narrow compared to a floodplain. The duration of flooding is generally much shorter, and the timing less predictable, in a riparian zone than in a river floodplain.

Ribonucleic acid (RNA): RNA is the generic term for polynucleotides, similar to DNA but containing ribose in place of deoxyribose and uracil in place of thymine. These molecules are involved in the transfer of information from DNA, programming protein synthesis and maintaining ribosome structure.

Riparian Habitat: Areas adjacent to rivers and streams with a differing density, diversity, and productivity of plant and animal species relative to nearby uplands.

Riparian: Relating to or living or located on the bank of a natural watercourse (as a river) or sometimes of a lake or a tidewater.

RNA: ribonucleic acid

RTC: Real-Time Control

Runoff: That part of precipitation, snow melt, or irrigation water that runs off the land into streams or other surface water. It can carry pollutants from the air and land into receiving waters.

Safe Drinking Water Act: The Safe Drinking Water Act authorizes EPA to set national health-based standards for drinking water to protect against both naturally occurring and man-made contaminants that may be found in drinking water. USEPA, states, and water systems then work together to make sure these standards are met.

Sanitary Sewer Overflow (SSO): When wastewater treatment systems overflow due to unforeseen pipe blockages or breaks, unforeseen structural, mechanical, or electrical failures, unusually wet weather conditions, insufficient system capacity, or a deteriorating system.

Sanitary Sewer: Underground pipes that transport only wastewaters from domestic residences and/or industries to a wastewater treatment plant. No stormwater is carried.

Saprobien System: An ecological classification of a polluted aquatic system that is undergoing self-purification. Classification is based on relative levels of pollution, oxygen concentration and types of indicator microorganisms; i.e., saprophagic microorganisms – feeding on dead or decaying organic matter.

SCADA: Supervisory Control and Data Acquisition

scfm: standard cubic feet per minute

Scoping Modeling: Involves simple, steady-state analytical solutions for a rough analysis of the problem.

Scour: To abrade and wear away. Used to describe the weathering away of a terrace or diversion channel or streambed. The clearing and digging action of flowing water, especially the downward erosion by stream water in sweeping away mud and silt on the outside of a meander or during flood events.

Secchi Disk: Measures the transparency of water. Transparency can be affected by the color of the water, algae and suspended sediments. Transparency decreases as color, suspended sediments or algal abundance increases.

Secondary Treatment: The second step in most publicly owned waste treatment systems in which bacteria consume the organic parts of the waste. It is accomplished by bringing together waste, bacteria, and oxygen in trickling filters or in the activated sludge process. This treatment removes floating and settleable solids and about 90 percent of the oxygen-demanding substances and suspended solids. Disinfection is the final stage of secondary treatment. (See primary, tertiary treatment.)

Sediment Oxygen Demand (SOD): A measure of the amount of oxygen consumed in the biological process that breaks down organic matter in the sediment.

Sediment: Insoluble organic or inorganic material often suspended in liquid that consists mainly of particles derived from rocks, soils, and organic materials that eventually settles to the bottom of a waterbody; a major non-point source pollutant to which other pollutants may attach.

Sedimentation: Deposition or settling of suspended solids settle out of water, wastewater or other liquids by gravity during treatment.

Sediments: Soil, sand, and minerals washed from land into water, usually after rain. They pile up in reservoirs, rivers and harbors, destroying fish and wildlife habitat, and clouding the water so that sunlight cannot reach aquatic plants. Careless farming, mining, and building activities will expose sediment materials, allowing them to wash off the land after rainfall.

Seiche: A wave that oscillates (for a period of a few minutes to hours) in lakes, bays, lagoons or gulfs as a result of seismic or atmospheric disturbances (e.g., "wind tides").

Sensitive Areas: Areas of particular environmental significance or sensitivity that could be adversely affected by discharges, including Outstanding National Resource Waters, National Marine Sanctuaries, waters with threatened or endangered species, waters with primary contact recreation, public drinking water intakes, shellfish beds, and other areas identified by State or Federal agencies.

Separate Sewer System: Sewer systems that receive domestic wastewater, commercial and industrial wastewaters, and other sources but do not have connections to surface runoff and are not directly influenced by rainfall events.

Separate Storm Water System (SSWS): A system of catch basin, pipes, and other components that carry only surface run off to receiving waters.

Septic System: An on-site system designed to treat and dispose of domestic sewage. A typical septic system consists of a tank that receives waste from a residence or business and a system of tile lines or a pit for disposal of the liquid effluent (sludge) that remains after decomposition of the solids by bacteria in the tank; must be pumped out periodically.

SEQRA: State Environmental Quality Review Act

Settleable Solids: Material heavy enough to sink to the bottom of a wastewater treatment tank.

Settling Tank: A vessel in which solids settle out of water by gravity during drinking and wastewater treatment processes.

Sewage: The waste and wastewater produced by residential and commercial sources and discharged into sewers.

Sewer Sludge: Sludge produced at a Publicly Owned Treatment Works (POTW), the disposal of which is regulated under the Clean Water Act.

Sewer: A channel or conduit that carries wastewater and storm-water runoff from the source to a treatment plant or receiving stream. “Sanitary” sewers carry household, industrial, and commercial waste. “Storm” sewers carry runoff from rain or snow. “Combined” sewers handle both.

Sewerage: The entire system of sewage collection, treatment, and disposal.

Sewershed: A defined area that is tributary to a single point along an interceptor pipe (a community connection to an interceptor) or is tributary to a single lift station. Community boundaries are also used to define sewer-shed boundaries.

SF: Square foot, unit of area

Significant Industrial User (SIU): A Significant Industrial User is defined by the USEPA as an industrial user that discharges process wastewater into a publicly owned treatment works and meets at least one of the following: (1) All industrial users subject to *Categorical Pretreatment Standards* under the Code of Federal Regulations - Title 40 (40 CFR) Part 403.6, and CFR Title 40 Chapter I, Subchapter N-Effluent Guidelines and Standards; and (2) Any other industrial user that discharges an average of 25,000 gallons per day or more of process wastewater to the treatment plant (excluding sanitary, non-contact cooling and boiler blowdown wastewater); or contributes a process waste stream which makes up 5 percent or more of any design capacity of the treatment plant; or is designated as such by the municipal Industrial Waste Section on the basis that the industrial user has a reasonable potential for adversely affecting the treatment plants operation or for violating any pretreatment standard or requirement.

Siltation: The deposition of finely divided soil and rock particles upon the bottom of stream and river beds and reservoirs.

Simulation Models: Mathematical models (logical constructs following from first principles and assumptions), statistical models (built from observed relationships between variables), or a combination of the two.

Simulation: Refers to the use of mathematical models to approximate the observed behavior of a natural water system in response to a specific known set of input and forcing conditions. Models that have been validated, or verified, are then used to predict the response of a natural water system to changes in the input or forcing conditions.

Single Sample Maximum (SSM): A maximum allowable enterococci or E. Coli density for a single sample.

Site Spill Identifier List (SPIL): Federal database with information on existing Superfund Sites.

SIU: Significant Industrial User

Skewness: The degree of statistical asymmetry (or departure from symmetry) of a population. Positive or negative skewness indicates the presence of a long, thin tail on the right or left of a distribution respectively.

Slope: The degree of inclination to the horizontal. Usually expressed as a ratio, such as 1:25 or 1 on 25, indicating one unit vertical rise in 25 units of horizontal distance, or in a decimal fraction (0.04); degrees (2 degrees 18 minutes), or percent (4 percent).

Sludge: Organic and Inorganic solid matter that settles to the bottom of septic or wastewater treatment plant sedimentation tanks, must be disposed of by bacterial digestion or other methods or pumped out for land disposal, incineration or recycled for fertilizer application.

SNAD: Special Natural Area District

SNWA: Special Natural Waterfront Area

SOD: Sediment Oxygen Demand

SOP: Standard Operating Procedure

Sorption: The adherence of ions or molecules in a gas or liquid to the surface of a solid particle with which they are in contact.

SPDES: State Pollutant Discharge Elimination System

Special Natural Waterfront Area (SNWA): A large area with concentrations of important coastal ecosystem features such as wetlands, habitats and buffer areas, many of which are regulated under other programs.

SPIL: Site Spill Identifier List

SRF: State Revolving Fund

SSM: single sample maximum

SSO: Sanitary Sewer Overflow

SSWS: Separate Storm Water System

Stakeholder: One who is interested in or impacted by a project.

Standard Cubic Feet per Minute (SCFM): A standard measurement of airflow that indicates how many cubic feet of air pass by a stationary point in one minute. The higher the number, the more air is being forced through the system. The volumetric flow rate of a liquid or gas in cubic feet per minute. 1 CFM equals approximately 2 liters per second.

State Environmental Quality Review Act (SEQRA): New York State program requiring all local government agencies to consider environmental impacts equally with social and economic factors during discretionary decision-making. This means these agencies must assess the environmental significance of all actions they have discretion to approve, fund or directly undertake. SEQR requires the agencies to balance the environmental impacts with social and economic factors when deciding to approve or undertake an action.

Standard Operating Procedure (SOP): Document describing a procedure or set of procedures to perform a given operation or evolutions or in reaction to a given event.

State Pollutant Discharge Elimination System (SPDES): New York State has a state program which has been approved by the United States Environmental Protection Agency for the control of wastewater and stormwater discharges in accordance with the Clean Water Act. Under New York State law the program is known as the State Pollutant Discharge Elimination System (SPDES) and is broader in scope than that required by the Clean Water Act in that it controls point source discharges to groundwaters as well as surface waters.

State Revolving Fund (SRF): Revolving funds are financial institutions that make loans for specific water pollution control purposes and use loan repayment, including interest, to make new loans for additional water pollution control activities. The SRF program is based on the 1987 Amendments to the Clean Water Act, which established the SRF program as the CWA's original Construction Grants Program was phased out.

Steady-State Model: Mathematical model of fate and transport that uses constant values of input variables to predict constant values of receiving water quality concentrations.

Storage: Treatment holding of waste pending treatment or disposal, as in containers, tanks, waste piles, and surface impoundments.

STORET: U.S. Environmental Protection Agency (EPA) national water quality database for STORage and RETrieval (STORET). Mainframe water quality database that includes physical, chemical, and biological data measured in waterbodies throughout the United States.

Storm Runoff: Stormwater runoff, snowmelt runoff, and surface runoff and drainage; rainfall that does not evaporate or infiltrate the ground because of impervious land surfaces or a soil infiltration rate lower than rainfall intensity, but instead flows onto adjacent land or waterbodies or is routed into a drain or sewer system.

Storm Sewer: A system of pipes (separate from sanitary sewers) that carries waste runoff from buildings and land surfaces.

Storm Sewer: Pipes (separate from sanitary sewers) that carry water runoff from buildings and land surfaces.

Stormwater: The portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, channels or pipes into a defined surface water channel, or a constructed infiltration facility.

Stormwater Management Models (SWMM): USEPA mathematical model that simulates the hydraulic operation of the combined sewer system and storm drainage sewershed.

Stormwater Protection Plan (SWPP): A plan to describe a process whereby a facility thoroughly evaluates potential pollutant sources at a site and selects and implements appropriate measures designed to prevent or control the discharge of pollutants in stormwater runoff.

Stratification (of waterbody): Formation of water layers each with specific physical, chemical, and biological characteristics. As the density of water decreases due to surface heating, a stable situation develops with lighter water overlaying heavier and denser water.

Stressor: Any physical, chemical, or biological entity that can induce an adverse response.

Subaqueous Burrow Pit: An underwater depression left after the mining of large volumes of sand and gravel for projects ranging from landfilling and highway construction to beach nourishment.

Substrate: The substance acted upon by an enzyme or a fermenter, such as yeast, mold or bacteria.

Subtidal: The portion of a tidal-flat environment that lies below the level of mean low water for spring tides. Normally it is covered by water at all stages of the tide.

Supervisory Control and Data Acquisition (SCADA): System for controlling and collecting and recording data on certain elements of WASA combined sewer system.

Surcharge Flow: Flow in which the water level is above the crown of the pipe causing pressurized flow in pipe segments.

Surface Runoff: Precipitation, snow melt, or irrigation water in excess of what can infiltrate the soil surface and be stored in small surface depressions; a major transporter of non-point source pollutants in rivers, streams, and lakes.

Surface Water: All water naturally open to the atmosphere (rivers, lakes, reservoirs, ponds, streams, impoundments, seas, estuaries, etc.) and all springs, wells, or other groundwater collectors directly influenced by surface water.

Surficial Geology: Geology relating to surface layers, such as soil, exposed bedrock, or glacial deposits.

Suspended Loads: Specific sediment particles maintained in the water column by turbulence and carried with the flow of water.

Suspended Solids or Load: Organic and inorganic particles (sediment) suspended in and carried by a fluid (water). The suspension is governed by the upward components of turbulence, currents, or colloidal suspension. Suspended sediment usually consists of particles <0.1 mm, although size may vary according to current hydrological conditions. Particles between 0.1 mm and 1 mm may move as suspended or bedload. It is a standard measure of the concentration of particulate matter in wastewater, expressed in mg/L. Technology-Based Standards. Minimum pollutant control standards for numerous categories of industrial discharges, sewage discharges and for a growing number of other types of discharges. In each industrial category, they represent levels of technology and pollution control performance that the EPA expects all discharges in that category to employ.

SWEM: System-wide Eutrophication Model

SWMM: Stormwater Management Model

SWPP: Stormwater Protection Plan

System-wide Eutrophication Model (SWEM): Comprehensive hydrodynamic model developed for the New York/New Jersey Harbor System.

Taxa:

TC: Total coliform

TDS: Total Dissolved Solids

Technical and Operational Guidance Series (TOGS): Memorandums that provide information on determining compliance with a standard.

Tertiary Treatment: Advanced cleaning of wastewater that goes beyond the secondary or biological stage, removing nutrients such as phosphorus, nitrogen, and most biochemical oxygen demand (BOD) and suspended solids.

Test Sites: Those sites being tested for biological impairment.

Threatened Waters: Water whose quality supports beneficial uses now but may not in the future unless action is taken.

Three-Dimensional Model (3-D): Mathematical model defined along three spatial coordinates where the water quality constituents are considered to vary over all three spatial coordinates of length, width, and depth.

TKN: Total Kjeldahl Nitrogen

TMDL: Total Maximum Daily Loads

TOC: Total Organic Carbon

TOGS: Technical and Operational Guidance Series

Topography: The physical features of a surface area including relative elevations and the position of natural and man-made features.

Total Coliform Bacteria: A particular group of bacteria, found in the feces of warm-blooded animals, that are used as indicators of possible sewage pollution. They are characterized as aerobic or facultative anaerobic, gram-negative, nonspore-forming, rod-shaped bacteria which ferment lactose with gas formation within 48 hours at 35°. Note that many common soil bacteria are also total coliforms, but do not indicate fecal contamination. (See also fecal coliform bacteria)

Total Coliform (TC): The coliform bacteria group consists of several genera of bacteria belonging to the family *enterobacteriaceae*. These mostly harmless bacteria live in soil, water, and the digestive system of animals. Fecal coliform bacteria, which belong to this group, are present in large numbers in the feces and intestinal tracts of humans and other warm-blooded animals, and can enter water bodies from human and animal waste. If a large number of fecal coliform bacteria (over 200 colonies/100 milliliters (ml) of water sample) are found in water, it is possible that pathogenic (disease- or illness-causing) organisms are also present in the water. Swimming in waters with high levels of fecal coliform bacteria increases the chance of developing illness (fever, nausea or stomach cramps) from pathogens entering the body through the mouth, nose, ears, or cuts in the skin.

Total Dissolved Solids (TDS): Solids that pass through a filter with a pore size of 2.0 micron or smaller. They are said to be non-filterable. After filtration the filtrate (liquid) is dried and the remaining residue is weighed and calculated as mg/L of Total Dissolved Solids.

Total Kjeldahl Nitrogen (TKN): The sum of organic nitrogen and ammonia nitrogen.

Total Maximum Daily Load (TMDL): The sum of the individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for non-point sources and natural background, and a margin of safety (MOS). TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measures that relate to a state's water quality standard.

Total Organic Carbon (TOC): A measure of the concentration of organic carbon in water, determined by oxidation of the organic matter into carbon dioxide (CO_2). TOC includes all the carbon atoms covalently bonded in organic molecules. Most of the organic carbon in drinking water supplies is dissolved organic carbon, with the remainder referred to as particulate organic carbon. In natural waters, total organic carbon is composed primarily of nonspecific humic materials.

Total P: Total Phosphorus

Total Phosphorus (Total P): A nutrient essential to the growth of organisms, and is commonly the limiting factor in the primary productivity of surface water bodies. Total phosphorus includes the amount of phosphorus in solution (reactive) and in particle form. Agricultural drainage, wastewater, and certain industrial discharges are typical sources of phosphorus, and can contribute to the eutrophication of surface water bodies. Measured in milligrams per liter (mg/L).

Total Suspended Solids (TSS): See Suspended Solids Toxic Substances. Those chemical substances which can potentially cause adverse effects on living organisms. Toxic substances include pesticides, plastics, heavy metals, detergent, solvent, or any other materials that are poisonous, carcinogenic, or otherwise directly harmful to human health and the environment as a result of dose or exposure concentration and exposure time. The toxicity of toxic substances is modified by variables such as temperature, chemical form, and availability.

Total Volatile Suspended Solids (VSS): Volatile solids are those solids lost on ignition (heating to 550 degrees C.) They are useful to the treatment plant operator because they give a rough approximation of the amount of organic matter present in the solid fraction of wastewater, activated sludge and industrial wastes.

Toxic Pollutants: Materials that cause death, disease, or birth defects in organisms that ingests or absorbs them. The quantities and exposures necessary to cause these effects can vary widely.

Toxicity: The degree to which a substance or mixture of substances can harm humans or animals. Acute toxicity involves harmful effects in an organism through a single or short-term exposure. Chronic toxicity is the ability of a substance or mixture of substances to cause harmful effects over an extended period, usually upon repeated or continuous exposure sometimes lasting for the entire life of the exposed organism.

Treated Wastewater: Wastewater that has been subjected to one or more physical, chemical, and biological processes to reduce its potential of being a health hazard.

Treatment Plant: Facility for cleaning and treating freshwater for drinking, or cleaning and treating wastewater before discharging into a water body.

Treatment: (1) Any method, technique, or process designed to remove solids and/or pollutants from solid waste, waste-streams, effluents, and air emissions. (2) Methods used to change the biological character or composition of any regulated medical waste so as to substantially reduce or eliminate its potential for causing disease.

Tributary: A lower order stream compared to a receiving waterbody. "Tributary to" indicates the largest stream into which the reported stream or tributary flows.

Trophic Level: The functional classification of organisms in an ecological community based on feeding relationships.

The first trophic level includes green plants; the second trophic level includes herbivores; and so on.

TSS: Total Suspended Solids

Turbidity: The cloudy or muddy appearance of a naturally clear liquid caused by the suspension of particulate matter. It can be measured by the amount of light that is scattered or absorbed by a fluid.

Two-Dimensional Model (2-D): Mathematical model defined along two spatial coordinates where the water quality constituents are considered averaged over the third remaining spatial coordinate. Examples of 2-D models include descriptions of the variability of water quality properties along: (a) the length and width of a river that incorporates vertical averaging or (b) length and depth of a river that incorporates lateral averaging across the width of the waterbody.

U.S. Army Corps of Engineers (USACE): The United States Army Corps of Engineers, or USACE, is made up of some 34,600 civilian and 650 military men and women. The Corps' mission is to provide engineering services to the United States, including: Planning, designing, building and operating dams and other civil engineering projects ; Designing and managing the construction of military facilities for the Army and Air Force; and, Providing design and construction management support for other Defense and federal agencies

United States Environmental Protection Agency (USEPA): The Environmental Protection Agency (EPA or sometimes USEPA) is an agency of the United States federal government charged with protecting human health and with safeguarding the natural environment: air, water, and land. The USEPA began operation on December 2, 1970. It is led by its Administrator, who is appointed by the President of the United States. The USEPA is not a cabinet agency, but the Administrator is normally given cabinet rank.

U.S. Fish and Wildlife Service (USFWS): The United States Fish and Wildlife Service is a unit of the United States Department of the Interior that is dedicated to managing and preserving wildlife. It began as the U.S. Commission on Fish and Fisheries in the United States Department of Commerce and the Division of Economic Ornithology and Mammalogy in the United States Department of Agriculture and took its present form in 1939.

U.S. Geological Survey (USGS): The USGS serves the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

UAA: Use Attainability Analysis

UAE: Use Attainability Evaluation

ug/L: Microgram per liter – A measure of concentration

Ultraviolet Light (UV): Similar to light produced by the sun; produced in treatment processes by special lamps. As organisms are exposed to this light, they are damaged or killed.

ULURP: Uniform Land Use Review Procedure

Underground Storage Tanks (UST): Buried storage tank systems that store petroleum or hazardous substances that can harm the environment and human health if the USTs release their stored contents.

Uniform Land Use Review Procedure (ULURP): New York City program wherein a standardized program would be used to publicly review and approve applications affecting the land use of the city would be publicly reviewed. The program also includes mandated time frames within which application review must take place.

Unstratified: Indicates a vertically uniform or well-mixed condition in a waterbody. (See also Stratification)

Urban Runoff: Storm water from city streets and adjacent domestic or commercial properties that carries pollutants of various kinds into the sewer systems and receiving waters.

Urban Runoff: Water containing pollutants like oil and grease from leaking cars and trucks; heavy metals from vehicle exhaust; soaps and grease removers; pesticides from gardens; domestic animal waste; and street debris, which washes into storm drains and enters receiving waters.

USA: Use and Standards Attainment Project

USACE: United States Army Corps of Engineers

Use and Standards Attainment Project (USA): A NYCDEP program that supplements existing Harbor water quality achievements. The program involves the development of a four-year, expanded, comprehensive plan (the Use and Standards Attainment or "USA" Project) that is to be directed towards increasing water quality improvements in 26 specific bodies of water located throughout the entire City. These waterbodies were selected by DEP based on the City's drainage patterns and on New York State Department of Environmental Conservation (NYSDEC) waterbody classification standards.

Use Attainability Analysis (UAA): An evaluation that provides the scientific and economic basis for a determination that the designated use of a water body is not attainable based on one or more factors (physical, chemical, biological, and economic) proscribed in federal regulations.

Use Designations: Predominant uses each State determines appropriate for a particular estuary, region, or area within the class.

USEPA: United States Environmental Protection Agency

USFWS: U.S. Fish and Wildlife Service

USGS: United States Geological Survey

UST: underground storage tanks

UV: ultraviolet light

Validation (of a model): Process of determining how well the mathematical representation of the physical processes of the model code describes the actual system behavior.

Verification (of a model): Testing the accuracy and predictive capabilities of the calibrated model on a data set independent of the data set used for calibration.

Viewsheds: The major segments of the natural terrain which are visible above the natural vegetation from designated scenic viewpoints.

Virus: Submicroscopic pathogen consisting of a nucleic acid core surrounded by a protein coat. Requires a host in which to replicate (reproduce).

VSS: Total Volatile Suspended Solids

Wasteload Allocation (WLA): The portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. WLAs constitute a type of water quality-based effluent limitation (40 CFR 130.2(h)).

Wastewater Treatment Plant (WWTP): A facility that receives wastewaters (and sometimes runoff) from domestic and/or industrial sources, and by a combination of physical, chemical, and biological processes reduces (treats) the wastewaters to less harmful byproducts; known by the acronyms, STP (sewage treatment plant), POTW (publicly owned treatment works), WPCP (water pollution control plant) and WWTP.

Wastewater Treatment: Chemical, biological, and mechanical procedures applied to an industrial or municipal discharge or to any other sources of contaminated water in order to remove, reduce, or neutralize contaminants.

Wastewater: The used water and solids from a community (including used water from industrial processes) that flows to a treatment plant. Stormwater, surface water and groundwater infiltration also may be included in the wastewater that enters a wastewater treatment plant. The term sewage usually refers to household wastes, but this word is being replaced by the term wastewater.

Water Pollution Control Plant (WPCP): A facility that receives wastewaters (and sometimes runoff) from domestic and/or industrial sources, and by a combination of physical, chemical, and biological processes reduces (treats) the wastewaters to less harmful byproducts; known by the acronyms, STP (sewage treatment plant), POTW (publicly owned treatment works), WWTP (wastewater treatment) and WPCP.

Water Pollution: The presence in water of enough harmful or objectionable material to damage the water's quality.

Water Quality Criteria: Levels of water quality expected to render a body of water suitable for its designated use. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, fish production, or industrial processes.

Water Quality Standard (WQS): State or federal law or regulation consisting of a designated use or uses for the waters of the United States, water quality criteria for such waters based upon such uses, and an antidegradation policy and implementation procedures. Water quality standards protect the public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act. Water Quality Standards may include numerical or narrative criteria.

Water Quality: The biological, chemical, and physical conditions of a waterbody. It is a measure of a waterbody's ability to support beneficial uses.

Water Quality-Based Limitations: Effluent limitations applied to discharges when mere technology-based limitations would cause violations of water quality standards.

Water Quality-Based Permit: A permit with an effluent limit more stringent than technology based standards. Such limits may be necessary to protect the designated uses of receiving waters (e.g., recreation, aquatic life protection).

Waterbody Inventory/Priority Waterbody List (WI/PWL): The WI/PWL incorporates monitoring data, information from state and local communities and public participation. The Waterbody Inventory portion refers to the listing of all waters, identified as specific individual waterbodies, within the state that are assessed. The Priority Waterbodies List is the subset of waters in the Waterbody Inventory that have documented water quality impacts, impairments or threats.

Waterbody Segmentation: Implementation of a more systematic approach to defining the bounds of individual waterbodies using waterbody type, stream classification, hydrologic drainage, waterbody length/size and homogeneity of land use and watershed character as criteria.

Waterfront Revitalization Program (WRP): New York City's principal coastal zone management tool. As originally adopted in 1982 and revised in 1999, it establishes the city's policies for development and use of the waterfront and provides the framework for evaluating the consistency of all discretionary actions in the coastal zone with those policies. When a proposed project is located within the coastal zone and it requires a local, state, or federal discretionary action, a determination of the project's consistency with the policies and intent of the WRP must be made before the project can move forward.

Watershed Approach: A coordinated framework for environmental management that focuses public and private efforts on the highest priority problems within hydrologically-defined geographic area taking into consideration both ground and surface water flow.

Watershed: A drainage area or basin that drains or flows toward a central collector such as a stream, river, estuary or bay: the watershed for a major river may encompass a number of smaller watersheds that ultimately combined at a common point.

Weir: (1) A wall or plate placed in an open channel to measure the flow of water. (2) A wall or obstruction used to control flow from settling tanks and clarifiers to ensure a uniform flow rate and avoid short-circuiting.

Wet Weather Flow: Hydraulic flow conditions within a combined sewer system resulting from a precipitation event. Flow within a combined sewer system under these conditions may include street runoff, domestic sewage, ground water infiltration, commercial and industrial wastewaters, and any other non-precipitation event related flows. In a separately sewered system, this type of flow could result from dry weather flow being combined with inflow.

Wet Weather Operating Plan (WWOP): Document required by a permit holder's SPDES permit that optimizes the plant's wet weather performance.

Wetlands: An area that is constantly or seasonally saturated by surface water or groundwater with vegetation adapted for life under those soil conditions, as in swamps, bogs, fens, marshes, and estuaries. Wetlands form an interface between terrestrial (land-based) and aquatic environments; include freshwater marshes around ponds and channels (rivers and streams), brackish and salt marshes.

WI/PWL: Waterbody Inventory/Priority Waterbody List

WLA: Waste Load Allocation

WPCP: Water Pollution Control Plant

WQS: Water Quality Standards

WRP: Waterfront Revitalization Program

WWOP: Wet Weather Operating Plan

WWTP: Wastewater Treatment Plant

XP-SWMM: USEPA watershed/sewershed model software program.

Zooplankton: Free-floating or drifting animals with movements determined by the motion of the water.

APPENDIX A

WET WEATHER OPERATING PLAN
TALLMAN ISLAND WPCP

October 22, 2007

Mr. Robert Elburn, P.E.
Regional Water Engineer
New York State Department of
Environmental Conservation
Division of Water, Region 2
47-40 21st Street - 1st Floor
Long Island City, NY 11101-5407

Re: Tallman Island WPCP, Alley Creek CSO Retention Facility & Flushing Bay CSO Facility
SPDES No. NY0026239
Wet Weather Operating Plan – Response to Questions

Dear Mr. Elburn:

Attached to this letter, please find for your review and consideration a set of responses to your comments from the August 3rd, 2007 correspondence regarding the updated wet weather operating plan (WWOP) for the Tallman Island Water Pollution Control Plant (WPCP), the Alley Creek Combined Sewer Overflow (CSO) Retention Facility and the Flushing Bay CSO Retention Facility. The comments have been individually addressed to provide clarification.

Please keep in mind the consistent level of performance the NYCDEP WPCPs have maintained with respect to our SPDES permits. We stand committed to providing innovative, yet practical approaches to meeting our new wet weather requirements. Part of this commitment also entails updates on changes in process protocols as well as future revisions of the WWOP's in response to post upgrade conditions.

The NYCDEP appreciates your assistance in providing comments to the WWOPs and looks forward to your response. Should you have any questions regarding this submission, please do not hesitate to contact Mr. Allen Deur, P.E., Division Chief of Operations Support at (718) 595-4295.

Very truly yours,

Vincent Sapienza, P.E.
Deputy Commissioner

KC/tn

enc: NYCDEP Response to NYSDEC Comments dated 8/3/07

xc: DEC-Albany: Bureau of Water Permits
J. DiMura

BWT: Greeley, Sapienza, Petito, Quinn, Hammerman, LaGrotta, Massaro, Deur, Cataldo, Pianelli, Giorlandino, Norris
Legal: Eckels

NYCDEP Response to NYS DEC Comments received on 8/3/07

We have received and reviewed DEC's technical comments forwarded to NYCDEP via letter dated August 3rd, 2007 on the Tallman Island Wet Weather Operation Plan, Alley Creek CSO Retention Facility & Flushing Bay CSO Retention Facility. The following attachment individually addresses each point of concern.

TALLMAN ISLAND WPCP

1. *Comment:* *The WWOP contains procedures to be implemented during wet weather, however neither guidance to determine if a wet weather event is imminent, nor a definition of a wet weather event, is provided. Is the WPCP operator required to check the weather to determine if a precipitation event is imminent? What level of flow would be considered a wet weather event?*

   Response: Yes. The operator's general practice is to monitor weather conditions. Wet weather flow is typically any flow that is over the diurnal flow curve.

2. *Comment:* *Page 18-22 of the WWOP guidance discuss the guidelines for wet weather operation and maintenance of the collection system. How was system storage evaluated during development of the WWOP? Is any part of the sewer system flushed after wet weather events to maintain capacity of sewers and regulators chambers? How frequently are emergency generators and automatic transfer switches tested and exercised?*

   Response: System storage was evaluated during the planning phase for the CSO long term control plan. System storage is also managed under the Best Management Practices (BMP) for Combined Sewer Overflows, Section VIII of the SPDES permits. The work related to this BMP is reported to DEC in our BMP Annual Report and it includes a description of our interceptor cleaning program. The sewer system is not regularly flushed because wet weather flows provide the necessary velocities to flush sewer lines.

   The emergency generator is run and tested every week. The auto transfer switch is only on the influent gate actuators and is not tested.

3. *Comment:* *The level of the sludge blanket in the primary settling tanks should be monitored and, if necessary, lowered in preparation for a wet weather event.*

   Response: DEP WPCPs do not carry a primary sludge blanket; therefore, a sludge blanket level is not applicable. Additionally, the Tallman Island WPCP has fixed primary pumps that run at a constant rate. The primary sludge is very dilute, and is degritted via cyclone degritters, which, according to the manufacture's recommendation, need a steady flow for maintaining proper operation. Fluctuations in flow and the resulting variations of velocities, pressures, and centrifugal forces would vary the sieve sizes of grit captured and would potentially impact down-stream equipment.

   Aside from grease removal, flooding of weirs and launders in the primary tanks is not an operational problem during wet weather events. (The performance stays relatively consistent).

4. *Comment:* *The WWOP does not contain procedures for reducing return activated sludge rates during wet weather although the WWOP guidance discusses this option on page 32. Please explain why this option was not considered.*

Response: NYC WPCPs typically operate with sludge blankets in the final tanks that are less than one-foot deep. Tallman Island's return sludge rate is fixed at approximately 30%. RAS rates are typically set by using mass balances. Altering RAS rates in response to every wet weather event would also result in a poor control of wasting accuracy due to the subsequent fluctuations in concentration.

5. *Comment:* *Are there any changes to the rates of polymer addition during wet weather to improve settling?*

Response: Tallman Island does not add polymer in order improve settling. The plant typically meets SPDES permit effluent limits during wet and dry weather conditions without polymer.

6. *Comment:* *No changes are made to the digester or dewatering operations during wet weather. Please evaluate the benefits of reducing the quantity of stored solids in thickeners and digesters prior to wet weather, as discussed on page 40 of the WWOP guidance.*

Response: Typically, sludge treatment is not effected by wet weather flow. Sludge blankets are monitored twice a shift in the thickeners, and sludge pumping is adjusted accordingly. Again, sludge handling maintains a steady operation during wet weather events. There would be no benefit of reducing stored solids in the system prior to a wet weather event.

<u>ALLEY CREEK CSO RETENTION FACILITY</u>

1. *Comment:* *Please include a list of critical equipment in the Alley Creek WWOP.*

Response: The WWOP includes a summary of equipment and systems on page 1-4, 1-5 and the report has been modified. We note that "Critical Equipment" is a defined term in all of the SPDES permits for DEP WPCPs. As set forth in the "Reliability and Engineering Operations" section of each permit, "critical equipment" includes all wastewater treatment equipment required to achieve a minimum of primary treatment and disinfection up to two times the permitted flow. The Alley Creek CSO retention facility does not provide any treatment of wastewater nor is any of the equipment at the facility "required to achieve a minimum of primary treatment and disinfection up to two times the permitted flow," thus none of the equipment at such facility qualifies as critical equipment as that term is defined.

The list of systems / equipment is as follows:

1. CSO Retention Facility (CSORF) Sluice Gate Drainage System – Stage II
2. CSORF conduit flushing System – Stage II
3. CSORF Drainage Control Structure

4. Two (2) Open-Channel Sewage Grinders at Influent to Old Douglaston Pumping Station (ODPS) – Stage II
5. Four (4) Main Sewage Pumps with Pump Control Discharge Cone Valves at ODPS – Stage II
6. Air Treatment System for CSORF and ODPS – Stage II

2. *Comment:* *Please update the WWOP to reflect the completion of construction of Stage 1 and details of the Stage 2 construction currently underway.*

Response: The WWOP will be updated to reflect the outfall and sewer system improvements were completed by December 2006, the new final completion date of June 30, 2008 for Stage 1 and the projected substantial completion date of December 31, 2009 for Stage 2 of the CSO Retention Facility pursuant to the CSO Consent Order milestone.

3. *Comment:* *Section 2-1. The Alley Creek WWOP describes a pumping and cleaning sequence to be initiated after a wet weather event. Please describe the details of operating the pumping and cleaning equipment. Is it manual or automatic?*

Response: The Cleaning Sequence is part of the overall Pumpback Sequence, which is an automatic operation, that is initiated manually by an Operator at the Tallman Island Water Pollution Control Plant (TI-WPCP). Following is a generalized description of the Pumpback and Cleaning sequence.

1. Operator at TI-WPCP manually initiates the stored CSO Pumpback Sequence following a wet weather event.
2. The levels within the CSORF Flushing Water Storage Areas (FWSA's) are automatically checked as part of the Pumpback Sequence. If supplemental flushing (cleaning) water is needed, it is delivered to the respective FWSA through the Flushing Water Feed System, which draws stored CSO from the double barrel outfall sewer above.
3. Once the FWSA's are confirmed to be filled, drainage of the CSORF storage cells to the ODPS commences.
4. Upon completion of the drainage of the CSORF storage cells, and as selected by the Operator, one or more sequences of the CSORF Flushing System are automatically run to wash the bottom of the CSORF storage cells.
5. Upon completion of the CSORF Flushing System Sequence, drainage of the double barrel CSO outfall conduit to the ODPS commences.
6. When the Pumpback Sequence is complete, all equipment is automatically returned to their respective pre-operation positions.

4. *Comment:* *Section 2-2. The items to be found on Figure 1-2 are referenced, but these items do not appear there.*

Response: Attached Figure 1-2 has been updated to include the items referenced in Section 2-2.

5. *Comment:* *How are floatables captured in the facility and how are they collected and disposed of?*

Response: Two (2) means of floatables control are provided as follows:

1. CSORF – Two (2) trash racks are provided, each with 6” clear spacing between the bars. The first rack is located upstream of the sluice gate that drains the CSORF storage cells, and the second is located upstream of the sluice gate that drains the double barrel CSO outfall conduit. The trash racks are provided to protect the sluice gates and downstream pinch valve from damage by any large objects that may be stored within the CSORF. Debris collected behind the trash racks will be removed manually.
2. ODPS – A new underground structure has been added upstream of the wet well for the ODPS, which will house two (2) open-channel sewage grinders. All flow (sanitary & combined) will pass through these grinders prior to entering the wet well and being pumped out to the interceptor system for conveyance to the TI-WPCP.

6. Comment: *Please clarify whether operations are manual or automatic. It seems that some of the actions noted in the WWOP are manually operated, which is a concern since the facility is not manned.*

Response: Once initiated, the stored CSO Pumpback Sequence will continue automatically until completion; however, the actual initiation of the Pumpback Sequence is a manual operation that must be started by an operator at the TI-WPCP (See response to Comment No. 3).

7. Comment: *How will the available hydraulic capacity of the collection system and the Tallman Island WPCP be monitored so the operator can determine if it is safe to discharge wastewater from the Alley Creek retention facility? Please incorporate this determination into the actions to be taken after a wet weather event.*

Response: Level detection and flow devices are located at the TI-WPCP, and at key locations along the Flushing Interceptor at the following locations:

1. Chamber No. 2 adjacent to the Flushing Bay CSORF
2. Regulator No. 9 at the intersection of Linden Place and 31st Street, Flushing, NY
3. Junction Chamber of the Flushing and Whitestone Interceptors at the intersection of 11th Avenue and 130th Street, College Point, NY

The flow in Chamber No. 2 is measured and monitored so that the carrying capacity of the Flushing Interceptor does not exceed 58 MGD at that point. The flow in Regulator No. 9 is measured and monitored so that the carrying capacity of the Flushing Interceptor does not exceed 65 MGD at that point. In addition, the flow at the TI-WPCP is measured and monitored so that it does not exceed 80 MGD during the Pumpback Sequence. All of the above measuring and monitoring functions are performed automatically.

8. Comment: *Please describe how the pump out of the Alley Creek CSO retention facility will be coordinated with sewer system monitoring stations, the operation of the Flushing Bay CSO retention facility, and the operation of the Tallman Island WPCP. Will the Facility Monitoring and Control System at the*

Flushing Bay CSO retention facility also monitor the Alley Creek CSO retention facility?

Response: The Operator at the TI-WPCP will be responsible for monitoring water levels in the critical Regulators and Chambers listed in the response to Comment No. 7. The Operator will also be responsible for initiating the Pumpback Sequence, and will have the override capability of terminating the Pumpback Sequence if it becomes necessary.

Once the Pumpback Sequence for the Alley Creek CSORF is initiated, the CSORF will begin draining, and the ODPS will begin pumping at a constant rate of approximately 8.5 MGD. The level detection system within the TI-WPCP interceptor system will detect this additional flow from the Alley Creek CSORF, and send a signal to the Pumpback System for the Flushing Bay CSORF. This signal will be processed by the Pumpback System's variable frequency drives (VFDs), and the pumpback rate for the Flushing Bay CSORF will be automatically adjusted to insure that none of the preset levels within the key Regulators and Chambers are exceeded.

In addition to the on-site locations at the ODPS and the CSORF, and the two (2) locations at the TI-WPCP, provisions are also being made at the following facilities for monitoring the progress of the Alley Creek CSORF Pumpback Sequence:

1. Avenue V Pumping Station Crew Quarters or potential alternate location once Avenue V Pumping Station is vacated for contruction.
2. Flushing Bay CSO Retention Facility

9. Comment: Please explain how flow will be calculated (or measured) for purposes of permit monitoring.

Response: During the first two years that follow final acceptance of Alley Creek Contract ER-AC2; velocity, level, and rainfall data will be collected and used to calibrate a hydraulic model of the tributary combined sewer system and the CSORF. At the end of the two-year monitoring period, the final calibrated hydraulic model, in conjunction with collected rainfall data, will be used to determine the volume of combined sewage that discharges into Alley Creek through new Outfall TI-025 and through existing Outfall TI-008. The equipment to be used for data collection will be installed under Contract ER-AC2; the locations and types of equipment are as follows:

<u>Measurement of CSO Through Outfall TI-025</u>

- Level sensor located overtop of the fixed end weir, at the downstream end of the new double barrel outfall sewer and CSORF.
- Velocity meter located within the limits of the new double barrel outfall sewer, upstream of the fixed end weir.

<u>Measurement of CSO Through Outfall TI-008</u>

- Level sensor located overtop of the emergency overflow relief weir, within Chamber No. 6.

Measurement of Stored Volume within the New Double Barrel Outfall Sewer and CSORF

- Double Barrel Outfall Sewer – Two (2) Level sensors; one located within the northern barrel, and one located within the southern barrel.
- CSO Storage Cells – Two (2) Level sensors; one located within the northern section of the CSORF, and one located within the southern section of the CSORF.

Rainfall Measurement

- Rain gauge located within the secure fenced-in area of the ODPS.

This equipment will all be removed at the completion of the two-year monitoring period, with the exception of: the rain gauge, which provides the input rainfall data for the hydraulic model; and the four (4) level sensors within the new double barrel outfall sewer and CSORF, which provide the data necessary for the calculation of the stored volume of CSO.

FLUSHING BAY CSO RETENTION FACILITY

1. *Comment:* *Appendix B. The Flushing Bay CSO retention facility was entered into the WWOP binder backwards. Please correct*

   Response: This will be corrected.

2. *Comment:* *Page 1 -1. The Flushing Bay WWOP states that the minimum storage capacity is approximately 43.4 million gallons; about 28.4 million gallons in basin storage and about 15 million gallons of in-line storage. However, the Application Form NY-2A Supplement for Regional Treatment Facilities that was submitted to the Department in August 2003 lists the facility design retention volume as 28.4 million gallons. Please complete the enclosed NY-2A supplement with corrected information and submit it with the revised WWOP.*

   Response: The NY-2A application has been revised to reflect capacity of 43.4 MGD. (See attachment)

3. *Comment:* *Please provide a list of critical equipment in the Flushing Bay CSO retention facility WWOP.*

   Response: The WWOP includes a summary list of equipment and systems on page 1-14 and the report has been modified. We note that "Critical Equipment" is a defined term in all of the SPDES permits for DEP WPCPs. As set forth in the "Reliability and Engineering Operations" section of each permit, "critical equipment" includes all wastewater treatment equipment required to achieve a minimum of primary treatment and disinfection up to two times the permitted flow. The Flushing Bay CSO retention facility does not provide any treatment of wastewater nor is any of the equipment at the facility "required to achieve a minimum of primary treatment and disinfection up to two times the permitted flow," thus none of the equipment at such facility qualifies as critical equipment as that term is defined.

4. Comment: *The odor control system should be included on the above list of critical equipment. A section for wet weather operations for the odor control system should be added to the WWOP.*

Response: The air treatment system is included in the summary list of equipment listed on page 1-14 of the WWOP. See also Air Treatment System. The following section will be added to WWOP Section 2.5:

Air Treatment System

1. General Description.

The purpose of the Air Treatment System is to continuously collect and treat odorous air, sewage gases and vapors. Control of odors will provide facility personnel with a safe working environment by removing obnoxious odors and harmful gases from areas where they perform their daily work routines. Odor treatment will also prevent community odor nuisances by reducing odors and gases to a safe, inoffensive state prior to atmosphere discharge.

The Flushing Bay CSO Retention Facility has been provided with a wet scrubber air treatment system to prevent any odors produced in the facility from becoming a nuisance to either workers in the facility, or to the surrounding community. Possible odor sources within the facility include the influent channels, the screening area, the wet well, and the storage cells. The total ventilation required for these areas is approximately 180,000 cubic feet per minute (cfm).

The Air Treatment System is designed to remove 99.9 percent of the incoming hydrogen sulfide in an air stream of 180,000 scfm with a maximum hydrogen sulfide concentration of 10 ppm.

2. Process Description.

The unit process for the treatment of odorous air is known as chemical absorption. In this process, air is washed or "scrubbed" by being brought into contact with a chemical scrubbing solution of water, sodium hydroxide (NaOH) and sodium hypochlorite (NaOCl). This contact is achieved by blowing the air upward through a scrubber vessel filled with a bed of plastic packing media. The chemical scrubbing solution is sprayed into the scrubber above the packing media and flows downward against the air flow in what is known as counter–current flow. The scrubbing solution and air come into contact with each other as they flow in opposite directions, and odor producing substances in the air are absorbed into the liquid stream and removed from the air. The odorous compounds react with the scrubbing solution to create soluble non–odorous compounds. The treated air passes through a demister, and droplets and moisture are removed from the air stream before it is discharged to the atmosphere.

Scrubbing solution that has passed down through the packing bed of a scrubber flows by gravity to a sump at the bottom of the scrubber vessel. The collected scrubbing solution is recycled continuously from the sump back to the top of the scrubber vessel by recirculating pumps. The sump overflows continuously, discharging the products of reaction with the scrubbing chemicals. Over time, as the scrubber solution reacts with contaminants in the air stream, it becomes less reactive and requires the addition of chemicals to restore its strength. NaOH and NaOCl are added to the sump underflow by chemical feed pumps. The addition of NaOH is regulated by a pH control system, and the addition of NaOCl is regulated by an Oxidation Reduction Potential (ORP) control system. The two control systems ensure that the odor removal effectiveness of the scrubbing solution is always at its maximum.

Odorous air is collected from the bar screen influent channels, screenings area, wet well and storage cells. The total ventilation required for these areas is approximately 180,000 cfm.

Fresh air is supplied to the influent channel, screening area, wet well and storage cells. The volume of supply air is six percent less than the exhaust air volume, ensuring negative pressure in the odorous areas.

Four (4) air treatment modules, each rated at 45,000 cfm are provided to treat odorous air. Each scrubber is provided with a blower, and two recirculation pumps. One recirculation pump serves as a standby unit. Sodium hydroxide (NaOH) and sodium hypochlorite (NaOCl) are added to the scrubber sump to maintain the pH in the sump between 10 and 13, and maintain a clear solution in the sump. Chemicals feed concentrations are 25 percent NaOH, and 15 percent NaOCl.

NaOH and NaOCl are stored in separate tanks. Three (3) tanks are used to store NaOCl; two (2) tanks are used to store NaOH.

3. System Performance.
The Air Treatment System demonstrates the following performance when operating under design flow conditions listed above.

Air Treatment System Performance

Inlet	**Outlet**
0-10 ppm H_2S 11-50 ppm H_2S	<10 ppb H_2S 99.9% Removal H_2S

5. Comment: *Page 1 -7. The Flushing Bay CSO retention facility WWOP states that dry weather infiltration and inflow enters the facility. Please estimate the volume of this flow and describe any impact this may have on maintaining the volume of the facility for CSO capture.*

Response: In the Spring of 1992, URS examined the main lines of Kissena Corridor and Park Drive East Storm Lines via an Internal Walking Inspection. Flow measurements and sampling (BOD, TSS, Fecal Coliform) were conducted. The survey found that there was a total of 484,000 gpd of dry weather flow of which 142,000 gpd were from sanitary connections while the remaining 342,000 were from infiltration. The sanitary connections locations were reported to NYC DEP for enforcement (assume an 8% success rate) and an analysis showed that 25% of the infiltration may be cost effective to remove. Therefore, the estimated future dry weather flow is:

0.20 x 142,000 gpd = 28,400 gpd

0.75 x 342,000 gpd = 256,500 gpd

Therefore, 284,900 gpd (or~200 gpm) dry weather flow is collected through the facility influent channels and is directed to the facility secondary wet well. Two (2) secondary (dry pit submersible type) pumps @ 875 gpm are provided to pump out the dry weather flow from the secondary wet well to the interceptor that discharges to the Tallman Island WPCP. The water surface level in the secondary wet well shall also be monitored to ensure that the secondary wet well is emptied out in a timely fashion and especially before a storm event. This process of emptying the secondary wet well will potentially eliminate any impact on the facility storage capacity. In the future, the actual dry weather flow will be measured and recorded using the flowmeter in the discharge line of the secondary pumps.

6. *Comment:* *Page 1-12. Pumping back the retained wastewater to the treatment plant is described. This section should discuss the reasons that pump back is limited to nighttime hours. Please evaluate how CSO could be pumped back to the wastewater treatment facility more quickly and include information about pump capacity, interceptor limitations, and wastewater treatment plant design flow. Can the CSO from Flushing Bay CSO retention facility be pumped back quicker if only primary treatment and disinfection are provided at the 26th Ward WPCP (DEP NOTES: Reference is to Tallman Island WPCP)?*

Response: The pump-back should not be and is not limited at nighttime. The intent is to pump-back the stored CSO whenever there is available capacity at the Tallman Island WPCP and also in the Flushing Interceptor at Chamber No. 2 and Regulator No. 9.

The stored CSO in the storage cells and in-line is drained to the wet wells and pumped out utilizing four (4) variable speed primary pumps (one as stand-by) of 6,500 – 15,500 gpm capacity each and two (2) secondary pumps (one as stand-by) of 875 gpm each to the chamber No.2 which is located in the Flushing Interceptor that discharges to the Tallman Island WPCP.

The flow in Chamber No. 2 is measured and monitored so that the carrying capacity of the Interceptor does not exceed 58 MGD at that point. The flow at the Regulator No. 9 is also measured and monitored so that the carrying capacity of the Interceptor does not exceed 65 MGD at that point. In addition, the flow at the Tallman Island WPCP is measured and monitored so that it does not exceed 80 MGD during pump-back. All the above flow measuring/monitoring functions and the pump-back are performed automatically.

The stored CSO will be pumped back to the Tallman Island WPCP at a rate so the incoming flow to the plant does not exceed the plant design flow of 80 MGD. The pump-back will be quicker if the capacity at the Tallman Island WPCP is increased beyond 80 MGD by providing only primary treatment and disinfection to the incoming flow, although better overall treatment is accomplished if pump-back is run through full secondary treatment as well.

7. *Comment:* *Page 2-1. It is noted in the Flushing Bay CSO retention facility WWOP that the WWOP was prepared when the facility was under final construction. Now that construction is complete, the WWOP should reflect the current situation.*

Response: As the Facility is operational, we agree to remove the sentence from p. 2-1: "At the time this protocol was being prepared, the Flushing Bay CSO Retention Facility was under final construction, and maybe subject to revisions by the time the Facility is in operation. This protocol will be revised as appropriate when installation of the unit processes is completed"
In addition, the WWOP will be modified to reflect current operational conditions.

8. *Comment:* *Section 2. The Flushing Bay CSO retention facility WWOP is meant to contain "the wet weather operating protocols" that operators of the facility should follow before, during and after wet weather events. However, much of the section describes the design and automatic operations of the facility (see page 2-3, paragraph 3, for example). While it is useful for the operator to be aware of these, the purpose of the WWOP is to provide guidance to operators. Please modify the WWOP so that Section 1 contains information regarding the automatic operations and Section 2 contains operating protocols for before, during, and after an event; triggers for those actions; a section on why the protocol is undertaken; and a section on what could go wrong (and how the operator should deal with it). Please rewrite all sentences that begin with "In case" as they are not clear.*

Response: We recommend that the description of the design and automatic operations of the facility remain a part of this section (Section 2) as it will be easier for the facility operator to understand the design intent.

Sentences that begin with "In case" are replaced as follows:
"If during a storm event, the water level rises in the Bulkhead Chamber and the gates do not open, there is a potential of water backing up in the upstream sewer lines. An alarm is transmitted to the Control Room prompting the operator to open the gates manual."

9. *Comment:* *Section 2-3. Manual operations are discussed. Since the facility is not intended to be manned 24 hours a day, please explain how these manual operations will be performed.*

Response: At the present time, under the construction contract, the facility is manned 24 hours a day. An operating plan will be developed based on the experience gained from the 1-year demonstration by the consultant for operation of the facility during the day shift only.

10. *Comment:* *Page 2-8. Please provide the size of the pumps.*

Response:
1. Primary pumps capacity: 6,500 – 15,500 gpm each
2. Secondary pumps capacity: 875 gpm each

11. Comment: *Page 2-21. The Hydroself flushing gate system is described. The filling of the storage reservoir if the floor is not clean and the need for additional flushing is discussed. How will it be determined that the floor is not clean?*

Response: The facility personnel shall physically inspect the storage cells after each storm to assess the number of times the flushing sequence needs to be repeated to achieve satisfactory results. The data from various storm events shall be collected and analyzed to determine an average number of flushing cycles to use after a storm event. This will eliminate the need for inspection after each storm.

12. Comment: *Page 2-23, paragraph 2. Please provide more detail regarding the sediment flushing bucket and how or when the valve pump closes. Include a section about what can go wrong.*

Response: Paragraph 2 will be replaced as follows:
"During the rainstorm, the storage cell and buckets are filled with water. When the storage cell is emptied, and the water surface falls below the buckets, the buckets flip and release their water content. In order to refill the buckets and initiate the flushing sequence, water is supplied to the buckets by the SFT flushing water pumps at a rate of 100 gpm. The capacity of each flushing bucket is 1,000 gallons and there are three (3) buckets in storage cell No. 2.

The SFT flushing water pumps discharge to a common header which subsequently divides into three (3) discharge lines that supply water to the flushing buckets. Each discharge line is provided with a motor-operated valve. The flushing sequence is initiated by opening the valve and when the bucket is in the upright position. Water is supplied to one bucket at a time. A flowmeter installed at the common header measures the flow rate and will signal the motor-operated valve to close once the bucket receives 1,000 gallons. The bucket then tips, releasing its water and the flushing cycle is automatically repeated for the second bucket by opening the corresponding valve and finally for the third bucket after the flushing cycle of the second bucket is completed.

What can go wrong?
If the flushing water pump does not work the stand-by pump will start. If the automatic mode is not functioning, the system will be operated in manual or "Alternate" mode. The alternate mode is described in detail in the Flushing Bay CSO O&M manual Chapter VIII, Section B-6. This mode of operation should be used for testing and maintenance. The SFT feed pumps operation is available from the local control station and from the valve local control stations."

13. Comment: *Page 2-24 (Chemical Feed and Storage System). A section titled "During Normal Operation" is included. Please explain what normal operation is in the context of the WWOP, include procedures for before, during, and after wet weather events and describe when the chemical feed system is started. (DEP NOTES: Comment refers to page 2-27 not 2-24)*

Response: The addition of chemicals to the scrubbing solution is continuous because the air treatment system operates on a continuous basis therefore the procedures for before, during, and after wet weather events are the same. NaOH and NaOCl are added to the sump underflow by chemical feed pumps. The addition of NaOH is regulated by a pH control system, and the addition of NaOCl is regulated by an Oxidation Reduction Potential (ORP) control system.

14. Comment: Page 2-27. A method of calculating overflow volume and retained volume is defined. This method differs from the hydraulic model required in the permit. However, monitoring is preferred over modeling of permit parameters. Thus, the permit will be modified to reflect the actual measurement methods

Response: The permit will need to be modified to reflect the actual measurement methods.

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

Tallman Island
Water Pollution Control Plant
Wet Weather Operating Plan

Prepared by:
The New York City Department of Environmental Protection
Bureau of Wastewater Treatment

October 2007

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1.0 INTRODUCTION

The Nitrogen Administrative Order on Consent, DEC Case # CO2-20010131-7 ("the Order") entered into by the City of New York ("City") and the New York State Department of Environmental Conservation ("DEC") was effective as of April 22, 2002. This Order has been superseded by a Consent Judgment, Index No. 04-402174 (Supreme Court of New York County, Feinman, J.) effective Feb. 1, 2006 (the "Judgment"). Pursuant to Appendix A of the Order: "Upper East River WPCPs Upgrade Schedule and Compliance Deadlines", the City submitted a Wet Weather Operating Plan (WWOP) for the Tallman Island Water Pollution Control Plant (WPCP) July 20, 2003. Pursuant to the Order, the WWOP describes procedures to maximize treatment during wet weather events while the Tallman Island WPCP is under construction. The WWOP specifies procedures for the operation of each unit process to treat maximum flows, without materially diminishing effluent quality or destabilizing treatment upon return to dry weather operation. The WWOP establishes process control procedures and set points to maintain stability and efficiency of the biological nutrient removal (BNR) process. The WWOP specifies the treatment facilities that will be available during the construction period. The WWOP is based on operations of process units that are available during the construction period operated at their peak hydraulic loading rate. The actual process control set points are established by the WWOP. Pursuant to the Judgment, upon completion of construction, the WWOP shall be revised to reflect the operation of the fully upgraded Facility. The revised WWOP for Tallman Island shall be submitted to DEC within 18 months of the completion of the construction at the Facility.

The Tallman Island WPCP WWOP has been prepared by Blasland, Bouck & Lee, Inc./ TAMS Consultants, Inc. (BBL/TAMS) in accordance with the specifications and guidelines provided in the *Specification For Preparing Wet Weather Operating Plans for New York City Wastewater Pollution Control Plants* (HydroQual, Inc., 2002). This WWOP is intended to be a living document and will be revised as required or needed to reflect modifications in operating procedure, construction activities and/or equipment replacements.

Below is a description of the Tallman Island WPCP including the following items:

- Facility background;
- Effluent Permit Limits;
- Performance goals for wet weather events; and
- Purpose of this WWOP
- Using this WWOP
- Revisions to this WWOP

1.1 FACILITY BACKGROUND

The New York City Department of Environmental Protection (NYCDEP) owns and operates the Tallman Island WPCP located in the College Point section of the Borough of Queens. The facility serves a drainage area of approximately 17,100 acres and an estimated population of nearly 400,000 residents in the northeast portion of the Borough of Queens.

The New York City Department of Public Works designed the original Tallman Island WPCP in the early 1930s. The plant began operations in time to treat wastewater from the 1939 World's Fair held at Flushing Meadows Park. The original plant was designed to serve an estimated population of 300,000 people with a wastewater flow of 40 million gallons per day (MGD). Several major expansions and upgrades were completed in 1964 and 1979. The plant now consists of two parallel treatment batteries (East and West) and is designed to treat an average flow of 80 MGD, a peak primary treatment capacity of 160 MGD and a peak secondary treatment capacity of 120 MGD. The capacity of the secondary treatment bypass channel is 68 MGD. The maximum capacity of the interceptors delivering flow to the plant has been estimated at approximately 200 MGD. This estimate may be revised since modeling of the drainage area is currently being performed (by others) to determine the capacity of interceptor to the plant.

During dry weather conditions wastewater is collected by the combined and sanitary sewers and transported by gravity or pump stations through the regulators and interceptors to the plant for treatment and subsequent discharge into the Long Island Sound. During wet weather, storm water runoff combines with the wastewater in the combined collection system, producing an increase in flow. The Tallman Island WPCP is designed, and required by its SPDES permit, to process up to 160 MGD during wet weather, which is twice its design dry weather flow (DDWF). Flow in excess of 160 MGD is discharged through combined sewer outfalls (CSO). The amount of flow discharged through the CSO's is controlled by the regulators and is dependent upon interceptor capacities, WPCP operations and rainfall characteristics (intensity, duration and location).

While the Tallman Island WPCP has a twice design capacity of 160 MGD for wet weather flow, the plant operators can control the amount of flow received by the plant through use of the plant's influent throttling gates. The plant operators use the throttling gates to maintain reliable plant performance during and after a wet weather event. The objective of this Wet Weather Operating Plan is to establish an operating procedure that will maximize treatment of wet weather flows, and if possible, consistently achieve or exceed two times DDWF. The current unit processes include screening, preliminary settling, grit removal, activated sludge treatment (step aeration), final settling and chlorination. Sludge treatment includes gravity thickening, anaerobic digestion, and sludge dewatering with off-site disposal of the dewatered sludge. Figure 1-1 presents aerial view of the Tallman Island WPCP.

1.1.1 Drainage Area

The drainage area tributary to the Tallman Island WPCP is estimated to be approximately 17,100 acres and is generally bounded by Flushing Bay, Nassau County Line, Grand Central Parkway, and the East River. Figure 1-2 presents the plant location, drainage area, and locations of major elements of the collection system.

The total drainage area is divided into three smaller areas served by an interceptor collection system which include:

- Flushing Main Interceptor-Collector (13,300 acres);
- Whitestone Interceptor-Collector (3,300 acres); and
- College Point Interceptor (500 acres).

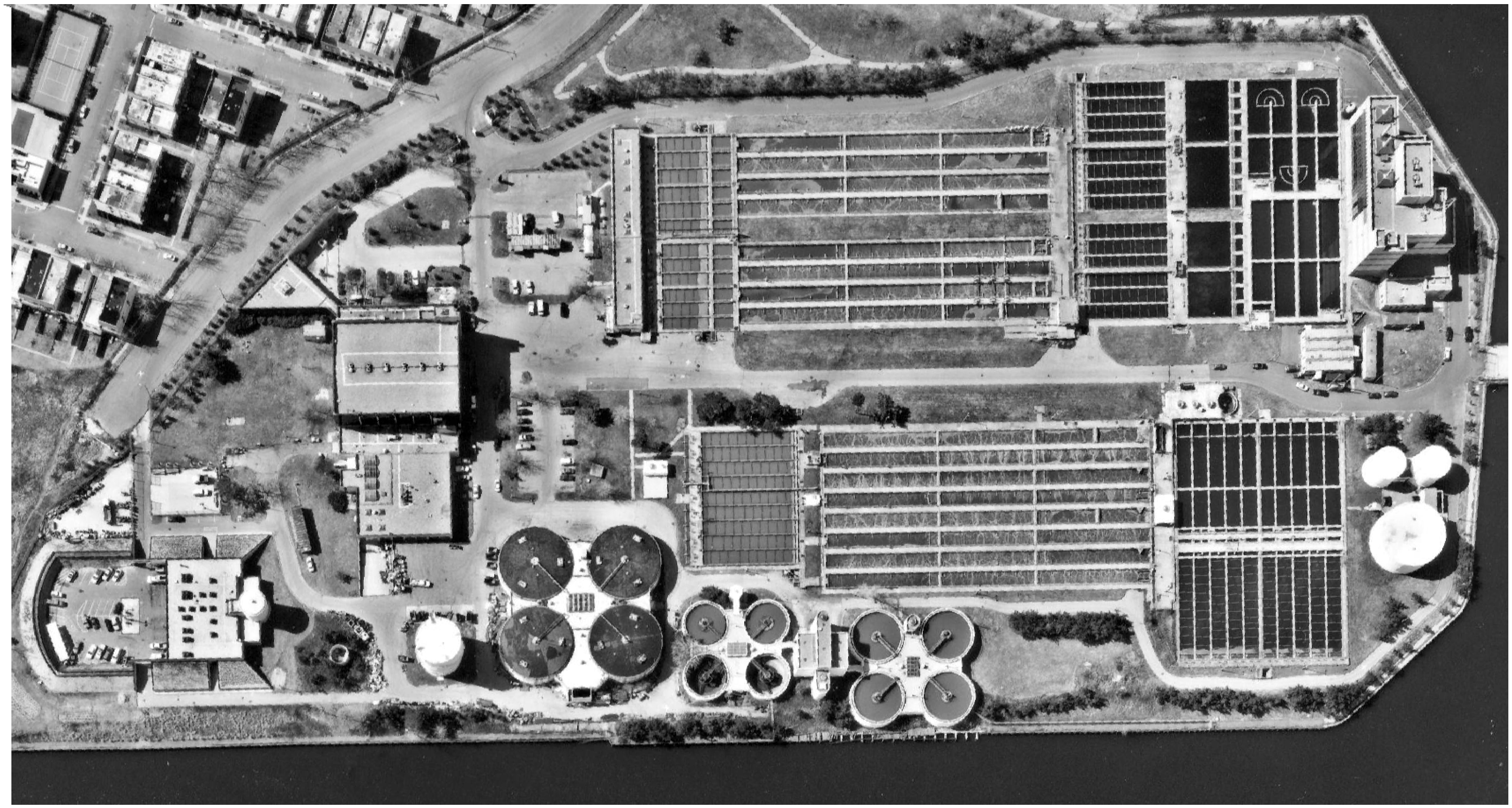

FIGURE 1-1

AERIAL VIEW OF
TALLMAN ISLAND
WPCP

NEW YORK CITY DEPARTMENT OF
DEP
ENVIRONMENTAL PROTECTION

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists / TAMS TAMS Consultants, Inc.

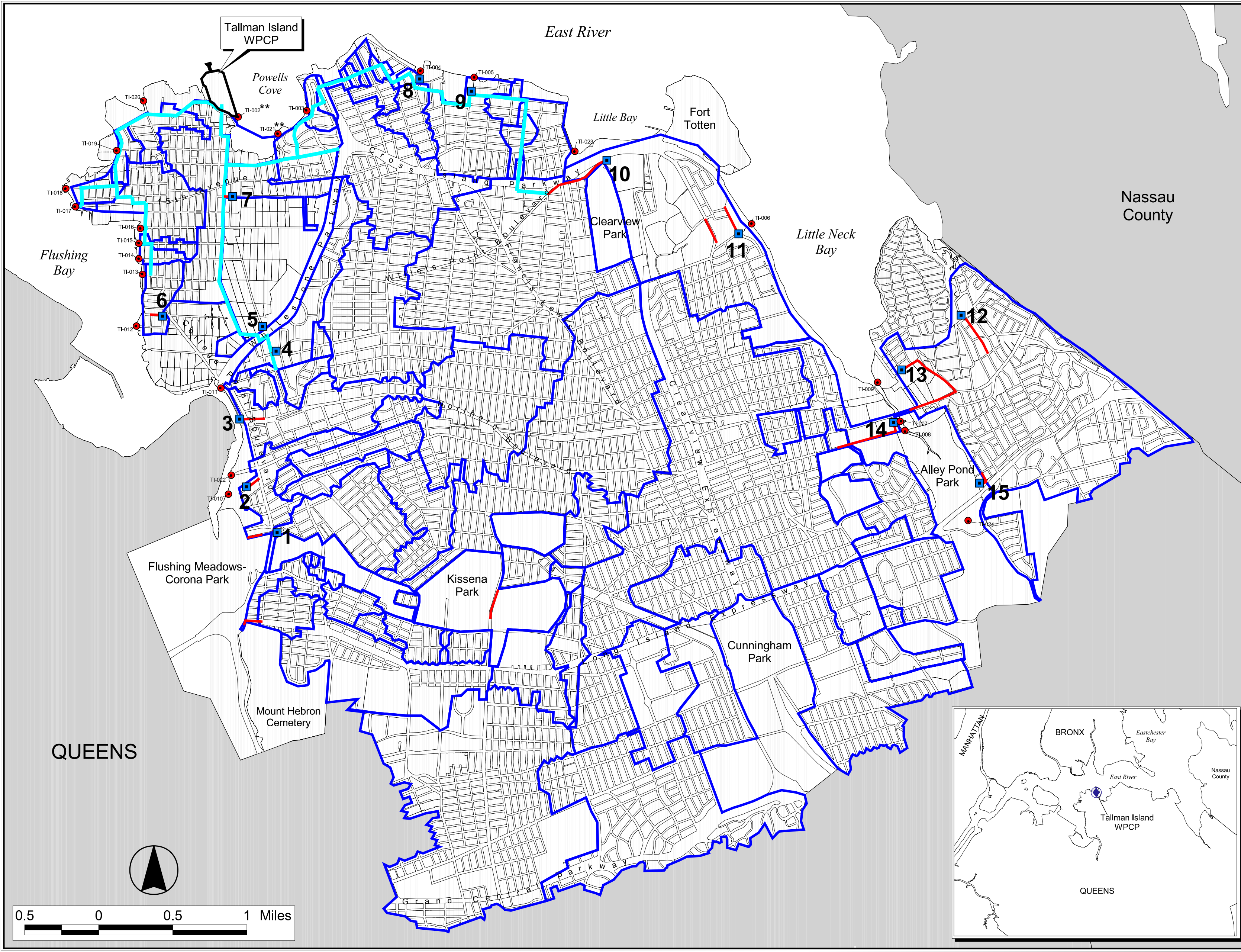

Figure 1-2

System Components

New York City Department of Environmental Protection

Comprehensive Plan for Floatables and Settleable Solids

Tallman Island WPCP Drainage Area

LEGEND

- Combined Sewer Outfall
- Pump Station
- Interceptor
- Force Main
- Regulator Drainage

PUMP STATIONS:
1. Lawrence & Peck
2. 40th Road
3. Flushing Bridge
4. Linden Place
5. New York Times
6. 122nd Street
7. 15th Avenue
8. 6th Road
9. 154th Street
10. Clearview Expressway
11. 24th Avenue
12. Little Neck
13. Douglaston Bay
14. Old Douglaston
15. New Douglaston

NOTES:
** TI-002 and TI-021 have been bulkheaded.

BBL Blasland, Bouck & Lee, Inc. engineers & scientists / TAMS Consultants, Inc.

There are 15 pumping stations within the area tributary to the Tallman Island WPCP, not including the Powell's Cove Station which is located onsite in the Pump and Blower Building and pumps the flow from the College Point Interceptor to the plant headworks. Five of the 15 pumping stations have three pumps each, and the remaining stations have two pumps each. Table 1-1 provides a listing of all the pumping stations within the Tallman Island WPCP tributary and their rated pump capacity.

Table 1-1. Location of Pump Stations

Pump Station	Pump Station Location	Type	Capacity (MGD)
Clearview	Willets Point. Boulevard. Cross-Island Parkway & Roe Place, Bayside, NY 11368	Combined	13.00
24th Avenue	NE corner of 24th Avenue & 217th Street, Bayside, NY 11360	Sanitary	4.30
New Douglaston	Parkland North of LIE, Cross-Island Parkway, Douglaston, NY 11362	Sanitary	3.30
Doug Bay	41st Avenue & 233rd Street, Douglaston, NY 11364	Sanitary	1.00
Linden Place	NE Corner of Linden Place & 31st Road, Flushing, NY 11356	Combined	5.00
6th Road	6th Road & 151st Street, Whitestone, NY 11357	Sanitary	0.72
15th Avenue	SW Corner of 15 Avenue & 131 Street, College Point, NY 11356	Sanitary	2.90
Old Douglaston	Parkland, Northern Boulevard & 234 Street, Douglaston, NY 11362	Sanitary	6.50
Little Neck	40th Avenue & 248th Street	Sanitary	1.40
122nd Street	S-E Corner of 122 Street & 28 Avenue, College Point, NY 11354	Sanitary	1.50
Flushing Bridge.	Lawrence Street & Northern Boulevard., Flushing, NY 11354	Sanitary	1.20
40th Road	40th Road, West of College Point Boulevard, Flushing, NY 11354	Sanitary	2.00
154th Street	Powell Cove's Boulevard. & 154th Street, Whitestone, NY 11357	Combined	2.30
Lawrence & Peck	50-01 College Point Boulevard., Flushing, NY 11355	Combined	14.00
New York Times	Whitestone Expressway West Service Road N/O Linden Place	Sanitary	0.64

There are 61 regulators in the combined sewer system within the area tributary to the Tallman Island WPCP. Forty-four regulators use diversion weirs, 11 use hydraulic sluice gates, 5 use manual sluice gates, and 1 uses an adjustable hydraulic weir gate to regulate flow to the plant. The purpose of the regulators is to allow all dry weather flow to reach the plant, but to limit the amount of flow entering the plant during wet weather conditions. Table 1-2 provides a listing of all regulators and outfall locations within the Tallman Island WPCP drainage area.

Table 1-2. Location of Regulators and Outfalls

Regulator No.	Regulator Location	Outfall Location	Outfall Size (W x H)
1	120th Street and 5th Avenue.	College Place and East River	24" dia.
2	115th Street and 9th Avenue	9th Avenue and East River	12" dia.
3	110th Street and 14th Avenue	14th Avenue and Flushing Bay	1'-6" x 1'-2"
4	110th Street and 15th Avenue	15th Avenue and Flushing Bay	12" dia.

Table 1-2. Location of Regulators and Outfalls

Regulator No.	Regulator Location	Outfall Location	Outfall Size (W x H)
5	119th Street and 20th Avenue	20th Avenue and Flushing Bay	60" dia.
6	119th Street and 22nd Avenue	22^{nd} Avenue and Flushing Bay	1'-3" x 1'-10"
7	119th Street and 23rd Avenue	23rd Avenue and Flushing Bay	12" dia.
9	Linden Place and 32nd Avenue	32^{nd} Avenue and Flushing Bay	8'-0" x 8'-0"
10	138th Street and 11th Avenue	None	N/A
10A	144th Street and 7th Avenue	W/O 7th Avenue and East River	8'-0" x 8'-0"
10B	144th Street E/O Malba Drive	None	N/A
11	151st Street and 7th Avenue	151st Street and East River	72" dia.
12	154th Street and Powell's Cove Blvd.	154th Street and East River	24" dia.
13	15th Drive and Willets Pt. Boulevard	9th Avenue and Little Bay	13'-6" x 8'-0"
14	162nd Street and Cryders Lane	None	N/A
15	162nd Street and 10th Avenue	None	N/A
16	162nd Street and Powell's Cove Blvd.	None	N/A
17	157th Street and Powell's Cove Blvd.	None	N/A
18	150th Place and 6th Avenue	None	N/A
19	150th Street and 6th Avenue	None	N/A
20	150th Street S/O 5th Avenue	None	N/A
21	150th Street S/O 3rd Avenue	None	N/A
22	149th Place and 3rd Avenue	None	N/A
23	149th Street and 3rd Avenue	None	N/A
24	148th Street and 3rd Avenue	None	N/A
25	147th Place and 3rd Avenue	None	N/A
26	147th Street and 3rd Avenue	None	N/A
27	3rd Avenue E/O Parsons Boulevard	None	N/A
28	Parsons Boulevard and 5th Avenue	None	N/A
29	Oak Avenue and Colden Street	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
30	Quince Avenue and Kissena Boulevard	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
31	Lawrence Street and Blossom Avenue	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
32	137th Street and Peck Avenue	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
33	138th Street and Peck Avenue	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
34	Main Street S/O Peck Avenue	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
35	56th Road and 146th Street	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
36	150th Street and Booth Memorial Parkway.	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
37	150th Street and 60th Avenue	Roosevelt Avenue and Flushing	18'-6" x 10'-0"

Table 1-2. Location of Regulators and Outfalls

Regulator No.	Regulator Location	Outfall Location	Outfall Size (W x H)
		River	
38	Parsons Boulevard. and Booth Memorial Parkway.	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
39	159th Street and Booth Memorial Parkway.	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
40	Fresh Meadow Lane and Peck Avenue	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
40A	Gladwin Avenue and Fresh Meadow Lane.	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
41	188th Street and LIE (N.S.)	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
43	192nd Street and 56th Avenue	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
44	Peck Avenue and LIE (S.S.)	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
45	73rd Avenue and Utopia Parkway.	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
45A	69th Avenue and Fresh Meadow Lane	None	N/A
46	210th Street and LIE (N.S.)	46th Avenue and Alley Creek	10'-0" x 7'-6"
47	218th Street and LIE (N.S.)	46th Avenue and Alley Creek	10'-0" x 7'-6"
48	Springfield Boulevard and LIE (S.S.)	46th Avenue and Alley Creek	10'-0" x 7'-6"
49	220th Place and 46th Avenue	46th Avenue and Alley Creek	10'-0" x 7'-6"
50	157th Street and 43rd Avenue	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
51	Parsons Boulevard and 32nd Avenue	32nd Street and Flushing Bay	8'-0" x 8'-0"
52	Union Street and 32nd Avenue	32nd Street and Flushing Bay	8'-0" x 8'-0"
53	137th Street and 32nd Avenue	32nd Street and Flushing Bay	8'-0" x 8'-0"
54	Downing Street and 32nd Avenue	32nd Street and Flushing Bay	8'-0" x 8'-0"
55	College Pt. Blvd. and Roosevelt Avenue	40th Road. and Flushing River	7'-0" x 6'-6"
56	Main Street and 40th Road	40th Road and Flushing River	7'-0" x 6'-6"
57	41st Avenue E/O Lawrence Street	40th Road and Flushing River	7'-0" x 6'-6"
58	Sanford Avenue and Frame Place	40th Road and Flushing River	7'-0" x 6'-6"
59	58th Avenue and Lawrence Street	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"
60	Booth Memorial Parkway. and Lawrence Street	Roosevelt Avenue and Flushing River	18'-6" x 10'-0"

The Tallman Island WPCP drainage area has two in-line CSO storage facilities – the Alley Creek Retention Facility and the Flushing Creek Retention Facility. The Alley Creek CSO Retention Facility was designed to capture and store 5 MG of combined sewage at peak design flow; flows in excess of this will be discharged to Alley Creek via outfall TI-008. The WWOP for the Alley Creek facility is in Appendix A. Alley Creek Retention Facility is under construction pursuant to the CSO Order, DEC case# C02-20000107-8 (the "CSO Order"). The Flushing Creek CSO Retention Facility is a 43.4 MG storage facility with flow-through capacity. The facility is comprised of a 28.4 MG CSO storage tank and a 15 MG in-line storage component. It captures and stores the combined sewage that normally overflows to outfall TI-010. The WWOP for the Flushing Creek facility is in Appendix B. These WWOPs present anticipated operating procedures that will be modified and optimized as Tallman Island WPCP and the CSO facility operating staff gain experience in the operation and maintenance of the facilities as each facility is completed and put into operation.

1.1.2 Influent Flow Control Structures

The Tallman Island WPCP was designed with the following influent flow control structures:

- Four automated sluice gates to regulate influent flow to the screen channels;
- Four heavy duty, front raked, mechanically cleaned, non-jamming bar screens provided with shear pins and motor overload protection, automatic timing devices and alarms to warn of high water in the screen channels or screen malfunction;
- Four manually operated screen channel velocity gates that are used to regulate the velocity of the wastewater flow in the screen channels; and
- Four automated effluent gates to isolate the screens and to permit cleaning of individual channels.

Figure 1-3 presents the floor plan of the influent chamber throttling gates and screening facility.

1.1.3 Facility Description

The following describes major treatment components at the Tallman Island WPCP. A schematic of the Tallman Island WPCP process is provided on Figure 1-4, and the site plan is provided on Figure 1-5. Table 1-3 lists the unit process equipment available for service and the corresponding maximum hydraulic capacity associated with the equipment.

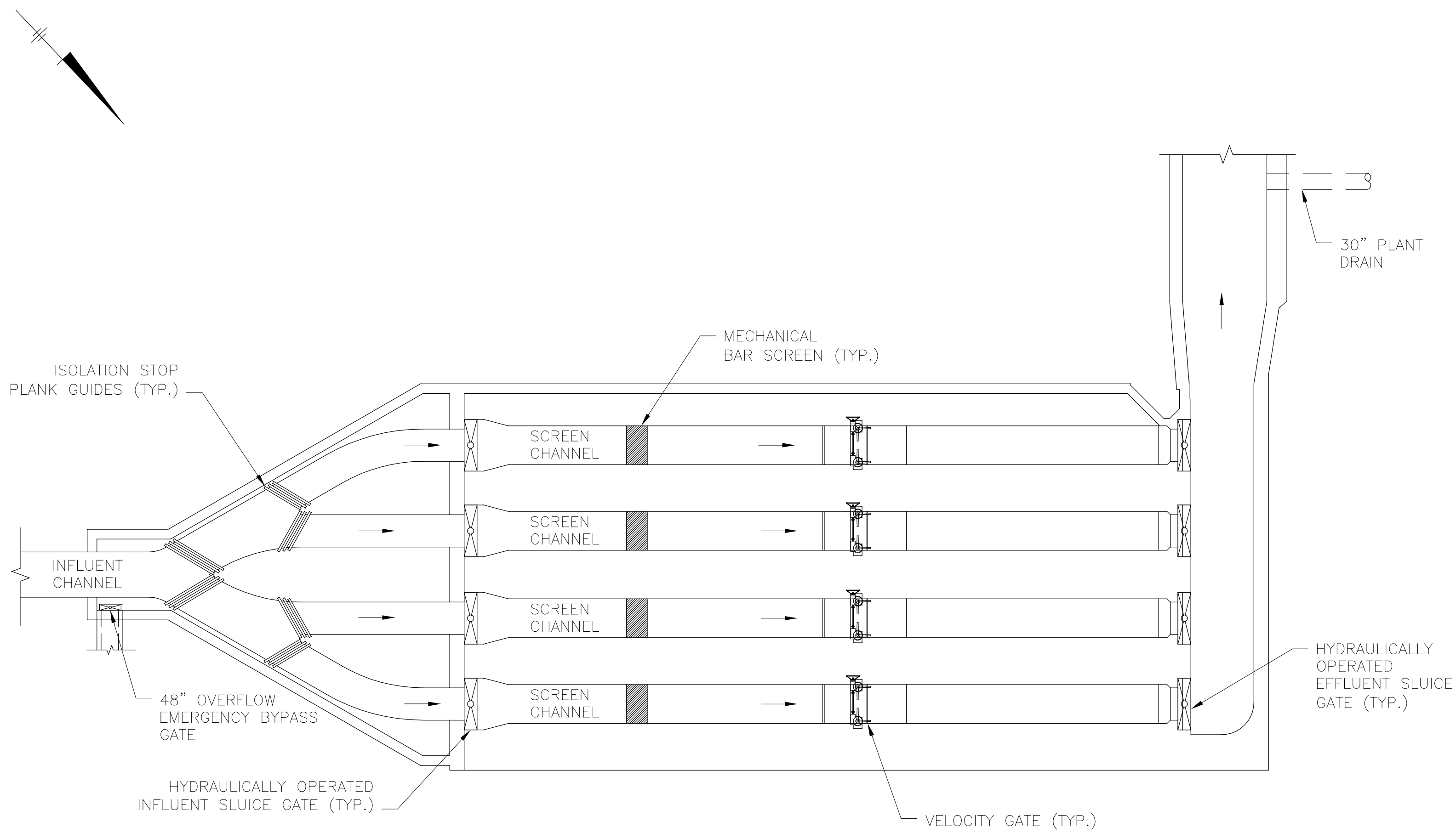

FIGURE 1-3

TALLMAN ISLAND
WPCP
INFLUENT CHAMBER
THROTTLING GATES
AND SCREENING
FACILITY

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

BBL / TAMS
BLASLAND, BOUCK & LEE, INC. engineers & scientists
TAMS Consultants, Inc.

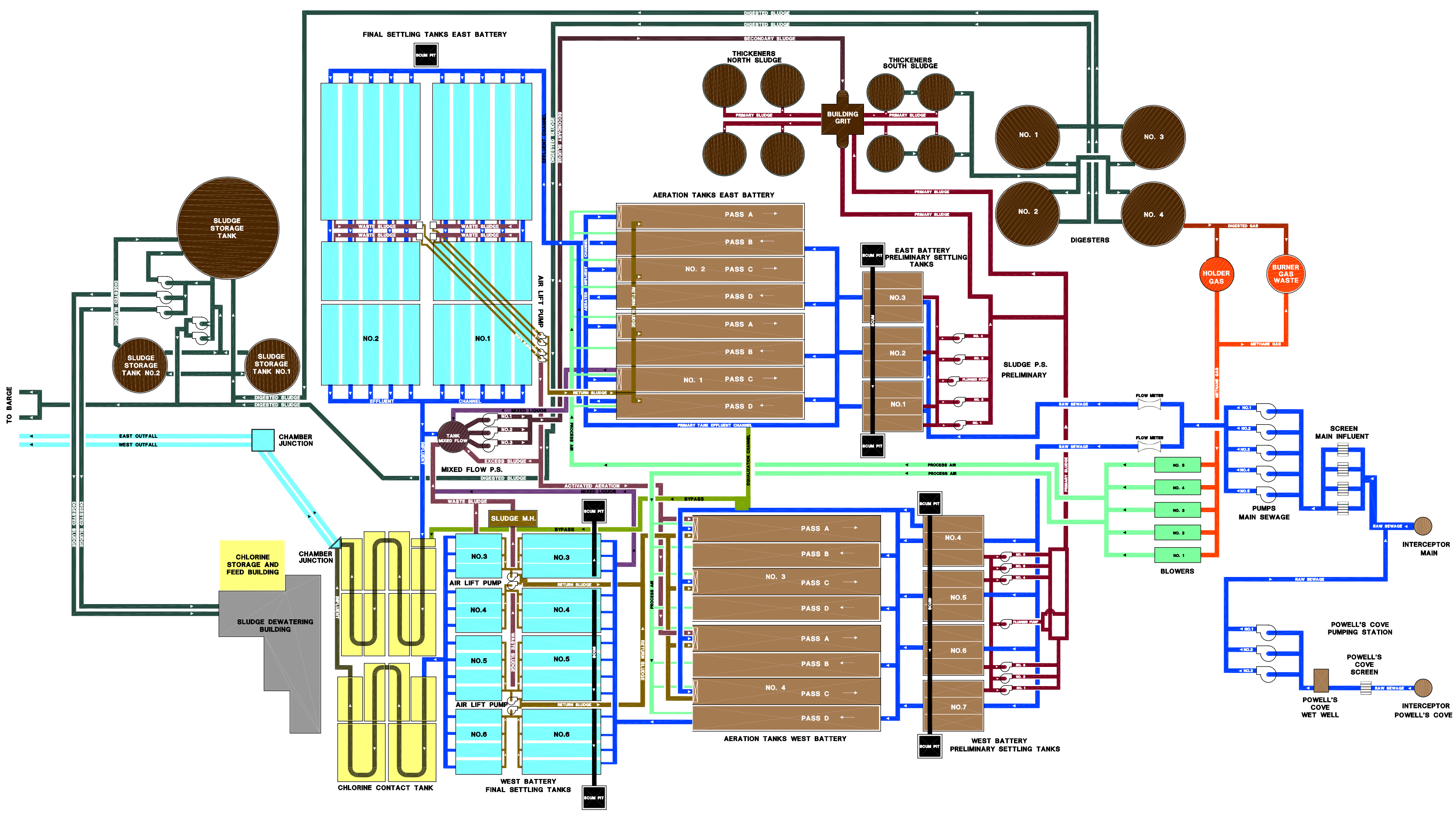

FIGURE 1-4

TALLMAN ISLAND WPCP PROCESS FLOW DIAGRAM

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

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BLASLAND, BOUCK & LEE, INC. engineers & scientists
TAMS Consultants, Inc.

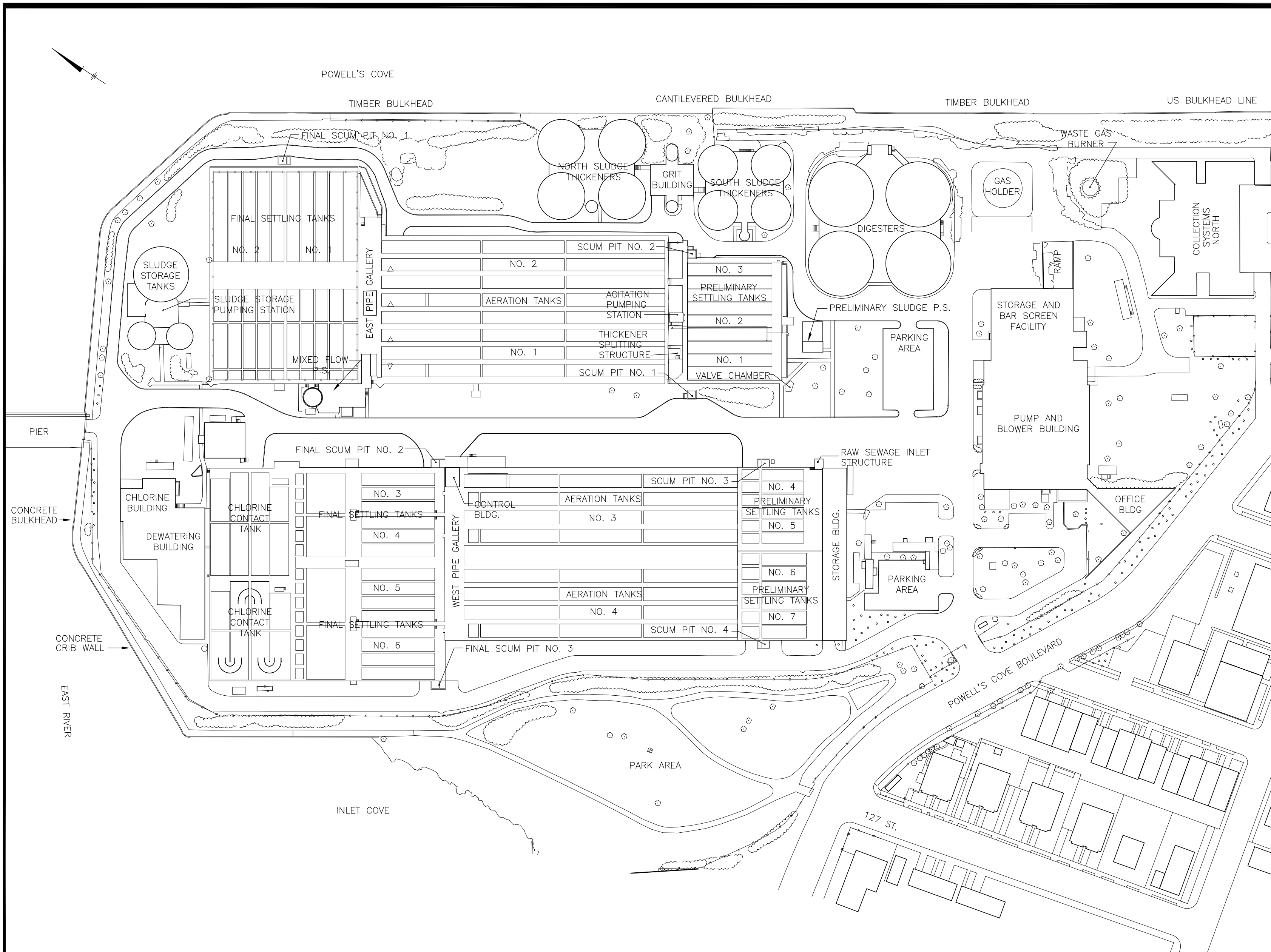

FIGURE 1-5

TALLMAN ISLAND WPCP SITE PLAN

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists / TAMS TAMS Consultants, Inc.

Table 1-3. Maximum Hydraulic Capacity of Equipment

Process Equipment	Number of Units in Service		Maximum Plant Influent Flow	Maximum Secondary Treatment Flow
Screens	4		160 MGD	
	3		160 MGD	
	2		110 MGD	
Main Sewage Pumps	3		160 MGD	
	2		100 MGD	
Primary Settling Tanks	East Battery	West Battery		
	3	4	160 MGD	
	2	4	160 MGD	
	3	3	160 MGD	
	2	3	160 MGD	
	1	3	120 MGD	
	2	2	120 MGD	
Aeration Tanks	2	2		120 MGD
	2	1		90MGD
	1	2		90 MGD
Final Settling Tanks	2	4		120 MGD
	2	3		120 MGD
	1	4		90 MGD
Chlorine Contact Tanks	2			160 MGD
	1			80 MGD

1.1.3.1 Plant Influent

Wastewater from the Flushing Main Interceptor-Collector and the Whitestone Interceptor-Collector discharges to the plant influent channel by gravity while wastewater from the College Point Interceptor discharges to the Powell's Cove Pumping Station which is located within the Tallman Island WPCP in the Pump and Blower Building. In the Powell's Cove Pumping Station, raw wastewater passes through a mechanically cleaned bar screen channel before discharging to the interceptor before the wet-well. The bar screen channel is a concrete pit approximately 20 feet below grade. From the wet-well, the wastewater is pumped through a 24-inch diameter cast iron force main to the plant main interceptor by three variable-speed centrifugal pumps.

1.1.3.2 Screening

Raw wastewater from the three interceptors enters the Tallman Island WPCP through a set of four mechanically cleaned bar screens located in the lower level of the Pump and Blower Building. Hydraulically operated influent sluice gates regulate flow to the four bar screen influent channels. The velocity through each channel is controlled by manually operated velocity gates. These gates are locked in a fixed position and do not affect the plant's ability to achieve 2xDDWF. The screened wastewater then passes through automated sluice gates to the main sewage pumping wet-well. Mechanical scrapers remove the screenings from the bar screens to a belt conveyor on the ground floor of the Bar Screen Building for storage in containers prior to off-site disposal.

1.1.3.3 Main Sewage Pumping Station

Following the bar screens, the wastewater flows by gravity to the main sewage pumping station wet-well. The main sewage pumping station consists of five variable-speed centrifugal pumps. Three of the pumps have a maximum capacity of 60 MGD each and the other two have a maximum capacity of 55 MGD each. Each pump is driven by direct drive, dual-fuel engine.

Wastewater is pumped from the wet-well to a 72-inch-diameter force main. The 72-inch-diameter force main splits into two separate 54-inch-diameter force mains that serve the East and West Batteries. Each force main has a fabricated venturi meter to measure flow.

1.1.3.4 Preliminary Settling Tanks

There are seven preliminary settling tanks: four on the West Battery and three on the East Battery. Two West Battery preliminary tanks are 96 ft. long by 50 ft. wide and the other two are 96 ft. long by 54 ft. wide. The East Battery consists of three identically sized preliminary settling tanks 124 ft. long by 50 ft. wide. Flow is distributed to the seven preliminary settling tanks through 24-inch by 24-inch sluice gates. Each settling tank has six sluice gates. Primary effluent flows over weirs at the end of each tank into the preliminary settling tanks effluent channel. Scum is removed from each tank by a manually operated rotating scum collectors and is temporarily stored in four scum concentration pits prior to off-site disposal.

Each preliminary settling tank has a chain and flight mechanism to direct settled sludge to the cross-collector channel at the bottom of the influent end of the settling tank. Cross-collectors direct the sludge to a sludge pit and it is then pumped to the primary sludge degritters. Sludge is pumped from the East Battery via four variable-speed torque flow pumps. Sludge is pumped from the West Battery via six variable-speed torque flow pumps. In addition, each battery has a triplex plunger pump for auxiliary service.

Primary sludge from both batteries is pumped through cyclone degritters to remove grit. The degritted sludge is discharged to the gravity thickeners. Grit flows to the grit classifiers/washers where the grit is washed and separated from liquid and stored in containers prior to be disposed of off-site.

The primary effluent from both batteries are connected with an equalization channel that can equalize the flow between the two batteries. The equalization channel is separated from the secondary bypass channel by precalibrated weirs to engage the secondary bypass channel when the plant flow reaches 1.5xDDWF. The secondary bypass channel can accept a maximum flow of 68 MGD.

1.1.3.5 Aeration

From the preliminary settling tanks, the wastewater flows by gravity to the aeration tanks for secondary or biological treatment. The East and West Batteries both have two aeration tanks, each with four passes (A through D). Primary effluent from the East Battery flows into the East Battery aeration tanks through inlet conduits. Wastewater can be fed to the influent of each of the four passes. In passes A and C, primary effluent enters through 48-inch by 36-inch sluice gates. Passes B and C have 30-inch-diameter sluice gates. Return Activated Sludge (RAS) can be conveyed to passes A and/or C through 18-inch-diameter telescoping valves. At the end of pass D, mixed liquor overflows into weir troughs to an effluent channel, which leads directly to the final settling tanks influent channel.

Primary effluent from the West Battery flows into the West Battery aeration tanks through 48-inch by 48-inch sluice gates at the beginning of each pass. RAS is conveyed to the beginning of pass A through 24-inch by 24-inch sluice gates. At the end of pass D, effluent overflows to weir troughs that discharge into 48-inch-diameter effluent pipe. The effluent pipe connects to the final settling tank influent channel.

1.1.3.6 Final Settling Tanks

In the East Battery, aeration tank effluent enters the final settling tank influent channel directly from the aeration tank effluent channel. The East Battery has two rectangular final settling tanks each with five bays. Each bay has a chain and flight mechanism that directs sludge to a cross-collector channel. Cross-collectors direct the sludge to an airlift pump chamber. RAS is conveyed back to the aeration tanks by four airlift pumps. Waste activated sludge (WAS) is drawn off from the airlift pump chamber to the mixed flow pumping station. Effluent from the East Battery is directed to the chlorine contact tanks.

In the West Battery, aeration tank effluent discharges to the final settling tank influent channel from the 48-inch-diameter aeration tank effluent pipe. The West Battery has two rectangular final settling tanks each with three bays, and two rectangular final settling tanks, each with four bays. Each bay has a chain and flight mechanism that directs sludge to a cross-collector channel. Cross-collectors move the sludge to the airlift pit where RAS is pumped by four airlift pumps. WAS is removed by draw-off lines at waste sludge manholes. From the manholes, the WAS flows by gravity to the mixed flow pumping station. Effluent from the West Battery is directed to the chlorine contact tanks.

1.1.3.7 Chlorination

Effluent from the East and West Battery final tanks discharge to two chlorine contact tanks. Each tank consists of four bays of approximately 25 feet in width and 10 feet in depth. The East Battery tank is 143 feet long and the West Battery is 130 feet long. Sodium hypochlorite solution is pumped to the influent through diffusers. A detention time of approximately 37 minutes is provided in both tanks under dry-weather design flow conditions. Baffles just downstream of the diffusers promote mixing of the sodium hypochlorite and the wastewater. Flow into each tank is controlled through influent sluice gates and stop planks. Effluent then flows by gravity into the plant outfall.

1.1.3.8 Gravity Sludge Thickening

The Tallman Island WPCP has two sets of four (8 total) circular, conical-bottomed gravity thickeners. The north gravity thickeners are 60 feet in diameter and the south gravity thickeners are 50 feet in diameter. Each thickener contains a picket-type stirring mechanism that aids thickening and directs sludge to the center pit where it is pumped to anaerobic digesters. For each thickener, two plunger pumps directly below the tank pump the sludge into the digester-heating loop.

1.1.3.9 Sludge Digestion

The Tallman Island WPCP sludge digestion facilities consist of four fixed-cover digesters, heat exchangers, draft tube mixers, gas flare, sludge and gas storage facilities, and ancillary equipment.

Thickened sludge is pumped into the heat exchanger return line to the digesters. Sludge is mixed within each digester by three draft tube mixers. To heat the digester contents, sludge is pumped from the digesters through external heat exchangers. Each digester has a dedicated heat exchanger. The main heat source for the heat exchangers is the engine jacket cooling water system.

Sludge is removed from each digester using four pipes at various depths and locations within the digester. The pipes are manifolded to four sludge transfer pumps. The pumps can either pump sludge to two of the three storage tanks or return it to the digester for further digestion.

Currently the sludge is pumped from the storage tanks through two dedicated sludge pumps to two sludge centrifuges in the dewatering building. The dewatered sludge is then removed and trucked out of the plant. The centrate is returned to the head of the plant by gravity.

1.2 EFFLUENT PERMIT LIMITS

The Tallman Island WPCP effluent discharge requirements are regulated under SPDES Permit No. NY002 6239. The permit requirements as of April 2007 are summarized on Table 1-4.

Table 1-4. Effluent Permit Limits

Parameter	Limit
Dry Weather Flow, 30-day arithmetic mean	80 mgd
BOD5, 30-day arithmetic mean	30 mg/l (1,2)
	20,016 lb/day (1,2)
BOD5, 7-day arithmetic mean	45 mg/l (2)
	30, 024 lb/day (2)
BOD5, 6-consecutive-hour average	50 mg/l (2)

Table 1-4. Effluent Permit Limits

Parameter	Limit
TSS, 30-day arithmetic mean	30 mg/l (1,2)
	20,016 lb/day (1,2)
TSS, 7-day arithmetic mean	45 mg/l (2)
	30, 024 lb/day (2)
TSS, 6-consecutive-hour average	50 mg/l (2)
Effluent Disinfection	All Year (2)
Fecal Coliform, 30-day arithmetic mean	200/100 ml
Fecal Coliform, 7-day arithmetic mean	400/100 ml
Fecal Coliform, 6-hour geometric mean	800/100 ml
Total Chlorine Residual, daily maximum	2.0 mg/l (3)
pH, range	6.0 to 9.0 SU

(1) Effluent values shall not exceed 15 percent of influent values
(2) During periods of wet weather influence, it is recognized that permittee may not be able to meet BOD5 and suspended solids limits for effluent concentrations and mass loadings. Relief from these requirements shall be granted if permittee can demonstrate that treatment is being maximized while up to treatable flow is being accepted.
(3) During periods of wet weather influence, in order to achieve proper fecal coliform kill it may be necessary to exceed chlorine residual limit. Relief shall be granted if permittee can demonstrate that such exceedances are necessary in order to provide optimum disinfection.

1.3 PERFORMANCE GOALS FOR WET WEATHER EVENTS

The goal of this WWOP is to maximize the treatment of wet weather flows at the Tallman Island WPCP and reduce the volume of Combined Sewer Overflows (CSO) released to the East River and Flushing Bay.

There are three primary objectives in maximizing treatment for wet weather flows including:

- Consistently achieve primary treatment and disinfection standards for wet weather flows up to 160 Million Gallons per Day (MGD). In doing so, this plant will satisfy the level of treatment required under the State Pollution Discharge Elimination System (SPDES) permit.
- Consistently provide secondary treatment for wet weather flows up to 120 MGD before bypassing the secondary treatment system in order to satisfy the level of treatment required under the SPDES permit.
- Consistently maintain effluent water quality standards upon return to dry weather operations.

1.4 PURPOSE OF THIS WWOP

The purpose of this WWOP is to provide a set of operating guidelines to assist Tallman Island WPCP staff in making operational decisions which will best meet the performance goals stated in Section 1.3 and the requirements of the SPDES discharge permit. During a wet weather event, numerous operational decisions must be made to effectively manage and optimize treatment of wet weather flows. Plant flow is controlled through influent pump operations and adjustment of the four main interceptor-throttling gates. Flow rates at which the secondary bypass is used are dependant upon a complex set of factors, including conditions within specific treatment processes and anticipated storm intensity and duration. Each storm event produces a unique combination of flow patterns and plant conditions. No WWOP can describe the decision making process for every possible wet weather scenario which will be encountered at the Tallman Island WPCP. This WWOP can, however, serve as a useful reference that operators can utilize during wet weather events. The manual can be useful in preparing for a coming wet weather event, a source of ideas for controlling specific processes during the storm, and a checklist to avoid missing critical steps in monitoring and controlling processes during wet weather.

1.5 USING THE WWOP

This manual is designed to allow use as a reference during wet weather events. Section 2 is broken down into sub-sections that cover major unit processes at the Tallman Island WPCP. Each protocol for the unit process includes the following information:

- List of unit processes and equipment covered in the section;
- Steps to take before a wet weather event and who is responsible for these steps;
- Steps to take during a wet weather event and who is responsible for these steps;
- Steps to take after a wet weather event and who is responsible for these steps;
- Discussion of why the recommended control steps are performed;
- Identification of specific circumstances that trigger the recommended changes; and
- Identification of things that can go wrong with the process.

The WWOP is a living document. Users of the WWOP are encouraged to identify new steps, procedures, and recommendations to further the objectives of the manual. Modifications which improve the procedures outlined in this WWOP are encouraged. With continued input from the experienced operations staff, this WWOP will become a useful and effective tool.

1.6 REVISIONS TO THIS WWOP

In addition to the revisions based on plan operating experience, this manual will be revised as upgrade work is completed that affects the plants ability to treat wet weather flows. The TI WPCP is currently undergoing a BNR upgrade pursuant to the Judgment. As required, a revised WWOP will be issued for operating procedures during construction. Also, a final revised WWOP, including specific procedures based on actual operating experiences of the upgraded WPCP, will be issued after the completion of the construction.

2.0 UNIT PROCESS OPERATIONS

The following section presents equipment summaries and wet weather operating protocols for each major unit process at the Tallman Island WPCP. This evaluation includes descriptions of associated equipment, basis for protocols, and events or observations that trigger the protocol. Operating protocols are divided into tasks to be completed before, during, and after wet weather conditions.

2.1 HEADWORKS

2.1.1 Equipment

Unit Processes	Equipment
Powell's Cove Pumping Station Influent Gates	1- Motorized Influent Sluice Gate
Powell's Cove Influent Screen	1- Manually Cleaned Bar Screen 1- Mechanically Cleaned Bar Screen
Plant Influent Gates	4- Automated Influent Sluice Gates
Plant Influent Screens	4- Bar Screens 4- Motorized Effluent Sluice Gates 4- Velocity Gates 1- Belt Conveyor 10 Cubic Yard Screenings Containers

2.1.2 Wet Weather Operation Protocol

WHO DOES IT?		WHAT DO WE DO?
SUPERVISORY	IMPLEMENTATION	
Before Wet Weather Event		
SEE	SSTW/STW	• Powell's Cove Influent Gate is left fully open. • Powell's Cove screen is in service and manually cleaned as necessary. • The Plant Influent Gates are typically in automatic mode where the gate bottom is submerged approximately two inches below the water surface elevation to keep gas and odor in the interceptor. • Typically, two of the four Plant Influent Gates are in operation during dry weather and prior to wet weather conditions. The shift supervisor decides the specific gates and channels in use. • Evaluate the need for maintenance or repair of the throttling gates and associated equipment. • Bar screen mechanism is set for both time and level differential. Visually inspect screen to confirm proper operation.
SEE	SSTW/STW	• Rotate screen operation to ensure that all available screens and associated components are in working order. • Evaluate the need for maintenance or repair of the bar rakes and associated equipment. Make sure empty screenings containers are available. • Replace 10 cubic yard containers as needed.

During Wet Weather Event		

SEE	SSTW/STW	• Leave gate in automatic position until:
		  ○ Plant flow approaches 160 MGD; or
		  ○ Wet-well level exceeds maximum level; or
		  ○ Bar screens become overloaded with debris; or
		  ○ Conditions warrant going to manual ex. high wet well levels could cause the gates to close under automatic operation.
		• Maintain acceptable wet-well level during throttling gate operation.
		• Record all throttling adjustments on the Sluice Gate Log.
		• If all channels are in service and channel flow continues to rise, constrict the influent sluice gates as necessary to keep channels from flooding.
		• Visually monitor the screen channel flow. If the channel level is rising put another screen in service.
		• If screen blinding occurs, place another screen in service.
		• If the screening conveyor fails, direct the screen chute to the 1 cubic yard container and as each 1 yard container gets full, empty screenings into 10 cubic yard containers.
		• Switch bar rakes to continuous cleaning mode.
		• Evaluate the need for maintenance or repair of the bar rakes and associated equipment.
		• Replace 10 cubic yard containers as needed.

After Wet Weather Event		
SEE	SSTW/STW	• If the main Influent Sluice Gates are controlling flow, return them to the fully open position to receive all backed up floatables. Return gates to automatic mode once backed up floatables have been cleared. • Evaluate the need for maintenance or repair of the throttling gate and associated equipment. • As channel flow height continues to lower, determine when gates may be fully closed and channels taken off-line to return to normal operation of two gates/channels.
SEE	SSTW/STW	• Switch bar rakes from continuous cleaning to automatic cleaning (differential elevation or timer control mode). • Shovel screenings that may have overflowed back into the container. • Evaluate the need for maintenance and repair the bar rakes and associated screening equipment as necessary. • Replace 10 cubic yard containers as needed.
Why Do We Do This?		
• Bar screens prevent damage to downstream wastewater pumps by removing large debris from the raw wastewater stream. Bar rakes clear debris from the bar screen continuously during wet weather flow to prevent bar screen blinding. Elevated levels of debris are observed during wet weather conditions. • The influent sluice gate is adjusted to maximize flow into the WPCP without flooding bar screens, bar channels, screen room, and wet well. Flooding of these areas will reduce plant performance and decrease plant stability and could result in damage to the main sewage pumps.		
What Triggers the Change?		

- Auxiliary bar screens are put into service to accommodate high flows during wet weather conditions. Bar rakes operate continuously during wet weather conditions to prevent increased debris from blinding bar screens.
- High flow rates, wet well level, and rising level of flow in bar screen channels indicate that throttling with the sluice gate is necessary.

What Can Go Wrong?
• Blinding of bar screens. • Sluice gate failure.

2.2 INFLUENT WASTEWATER PUMPING

2.2.1 Equipment

Unit Processes	Equipment
Powell's Cove Pumping Main Wet-Well Equipment	3- Main Sewage Pumps (3 @ 4,200gpm) 2- Float Level Sensor in Wet Well
Main Sewage Pumping Equipment	5- Main Sewage Pumps (2 @ 55MGD and 3 @ 60MGD) 5- Engine Drive Units 5- Cone Check Valves 1- Wet Well Level Sensor 2- Venturi Flow Meters

2.2.2 Wet Weather Operation Protocol

WHO DOES IT?		WHAT DO WE DO?
SUPERVISORY	IMPLEMENTATION	
Before Wet Weather Event		
SEE	SSTW/STW	• For Powell's Cove Pump Station during dry weather, 1 pump is generally in service and 2 spare pumps are available. At the Plant during dry weather, 1 or 2 main sewage pumps are in service and at least 3 pumps may be on standby. • All pumps are generally cycled to ensure all pumps are in working order. • Check that all wet well level monitors are functional. • Number and speed of pumps in service are selected and manually adjusted by operator in the pump control room. • Adjustments are made based on maintaining wet well level. • Monitor pumped flow based on wet well level, number of pumps in service and read-outs from Venturi meters. • Repair pumps and associated equipment as necessary.
During Wet Weather Event		
SEE	SSTW/STW	• Monitor wet well elevation. • As wet well level rises, put off-line pumps in service as necessary. • Pump to maximum plant capacity during wet weather event and when possible leave one pump available as standby. • All adjustments are made manually by operators based on maintaining wet well level within desired operating range. • Restrict flow through influent gates if pumping rate is maximized and wet well level continues to rise.

After Wet Weather Event		
SEE	SSTW/STW	• Maintain pumping rate as required to keep wet well level in operating range. • If influent gates have been throttled, maintain maximum pumping rate until all previously constricted influent gates are returned to normal operating position, flow begins to decrease lowering wet well level and flow stored in collection systems is brought to the Plant.
SEE	SSTW/STW	• Reduce number of pumps in service to maintain wet well level and return to dry weather operation. • Investigate pump malfunctions and repair pumps and associated equipment as necessary.
Why Do We Do This?		
• Maximize flow to treatment plant, and minimize need for flow storage in collection system and associated storm overflow from collection system into Long Island Sound. • To allow the plant to pump the maximum flow through the preliminary treatment tanks without flooding the wet well or bar screen channels.		
What Triggers the Change?		
• Rises and falls in wet-well water level control the number of pumps online.		
What Can Go Wrong?		
• Pump fails to start. • Pump fails while running. • Pump engine failure. • Cone check valve failure.		

2.3 PRELIMINARY SETTLING TANKS

2.3.1 Equipment

Unit Processes	Equipment
East and West Battery Preliminary Settling Tanks	7- Preliminary Settling Tanks (4 in West Battery, 3 in East Battery) 12- Primary Sludge Transfer Pumps (7 in East Battery, 5 in West Battery) 4- Scum Pits (2 in each Battery) with clamshell hoisting equipment 21- Longitudinal Collectors (3 per PST) 7- Sludge Trough Cross-Collector (1 per PST) 42- Influent Sluice Gates (6 per PST) 21- Rotating Scum Collectors (3 per PST)

2.3.2 Wet Weather Operation Protocol

WHO DOES IT?		WHAT DO WE DO?
SUPERVISORY	IMPLEMENTATION	
Before Wet Weather Event		
SEE	SSTW/STW	• All 7 settling tanks are normally in operation during dry weather conditions. • Check the sludge collector operation and inspect tanks for broken flights. • Check surface scum collection system operation and remove scum as necessary. • Check primary sludge pump operation.
SEE	SSTW/STW	• Maintain scum pits by cleaning regulary • Repair primary sludge pumps and associated equipment as necessary.
During Wet Weather Event		
SEE	SSTW/STW	• One primary sludge pump is in service for each tank with adequate standby pumps available. • Watch water surface elevations at the weirs for flow imbalances. • Check the level of both preliminary tank influent channels. • Check the effluent weirs and, if flooding is occurring, notify supervisor. • Check primary sludge pumps for proper operation. Switch pumps in service as necessary. If the sludge pump suction line appears clogged, shut the pump and back flush. • If the tank cross collector fails, remove the tank from service. • In case of longitudinal collector failure, maintain final tank in service. Balance flows to the tanks to keep the blanket levels even.
After Wet Weather Event		
SEE	SSTW/STW	• Repair equipment failures as necessary. • Check tank collectors for normal operation. Notify supervisor of sheared pins, broken chain or chains off the sprocket. • Remove scum from preliminary tanks as necessary. • Maintain scum pits by cleaning regularly
Why Do We Do This?		
• Preliminary settling tanks protect downstream mechanical equipment and pumps from abrasion and accompanying abnormal wear, and prevent accumulation of grit in aeration tanks and downstream processes. • To maximize the amount of flow that receives primary treatment. • To protect downstream processes from solids overload and scum accumulation.		
What Triggers the Change?		
• Excessive flow and consequent increased grit accumulations.		
What Can Go Wrong?		
• Tank collection system failure • Primary sludge pump failure • Grease carryover to the aeration tanks.		

2.4 GRIT REMOVAL

2.4.1 Equipment

Unit Process	Equipment
Grit Removal	4- Cyclone Sludge Degritters 4- Grit Classifiers 6 cubic yard Containers 1- Mechanically Cleaned Secondary Bar Screen

2.4.2 Wet Weather Operation Protocol

WHO DOES IT?		WHAT DO WE DO?
SUPERVISORY	IMPLEMENTATION	
Before Wet Weather Event		
SEE	SSTW/STW	• Secondary bar screen is in operation. • One grit cyclone feeding one grit classifier is the normal operation. All 4 units are in service. • Verify that empty grit containers are available. If not, contact the supervisor to bring empties and remove full containers. • Repair any equipment failure as necessary.
During Wet Weather Event		
SEE	SSTW/STW	• No changes are made during wet weather event.
After Wet Weather Event		
SEE	SSTW/STW	• No changes are made after wet weather event.
Why Do We Do This?		
• To protect the downstream equipment from abnormal wear and to prevent accumulation of grit in the aeration tanks and digesters.		
What Triggers the Change?		
• No changes are made.		
What Can Go Wrong?		
• Grit cyclones can clog. • Grit classifier failure. • Accumulation of grit in aeration tanks.		

2.5 SECONDARY SYSTEM BYPASS

2.5.1 Equipment

Unit Processes	Equipment
Bypass Channel	1- Venturi Flow Meter (not in service) 2- Fine Tune Gates (with actuators not in service) 8- Fixed Weirs (stop planks)

2.5.2 Wet Weather Operation Protocol

WHO DOES IT?		WHAT DO WE DO?
SUPERVISORY	IMPLEMENTATION	
Before Wet Weather Event		
SEE	SSTW/STW	• No changes are made before a wet weather event.

During Wet Weather Event		
SEE	SSTW/STW	• Visually monitor the bypass channel.
After Wet Weather Event		
SEE	SSTW/STW	• No changes are made after a wet weather event.
Why Do We Do This?		
• The bypass channel is used to relieve flow to the aeration system, to avoid excessive loss of biological solids, and to relieve primary clarifier flooding. • To prevent secondary system failure due to hydraulic overload.		
What Triggers the Change?		
• No changes are made.		
What Can Go Wrong?		
• N/A		

2.6 AERATION TANKS

2.6.1 Equipment

Unit Processes	Equipment
Aeration Tanks	4- Aeration tanks (2 in each Battery) 5- Blowers 16- Influent Sluice Gates 4- Telescoping Valves (East Battery) 4- Return Sludge Sluice Gates (West Battery) 37- Mixers 4- Dissolved Oxygen Probes (1 per tank) 4- Spray Water Pumps Diffusers

2.6.2 Wet Weather Operation Protocol

WHO DOES IT?		WHAT DO WE DO?
SUPERVISORY	IMPLEMENTATION	
Before Wet Weather Event		
SEE	SSTW/STW	• All aeration tanks are in operation during dry weather conditions. • The plant operates in a step feed mode, which requires even air distribution to each pass.
SEE	SSTW/STW	• Check the dissolved oxygen (DO) levels and control airflow to maintain at least 2 mg/L (with an average of 4 mg/L) DO in the aeration tanks. • Check telescoping valves for clogging with rags and other debris and temporarily lower valve (1 minute or so) to increase flow and flush debris then return to normal level. • Check damage to air piping system and repair as necessary.
During Wet Weather Event		
SEE	SSTW/STW	• No changes are made during a wet weather event.

After Wet Weather Event		
SEE	SSTW/STW	• No changes are made after a wet weather event.
Why Do We Do This?		
• Wasting is adjusted to maintain steady aeration tank inventory. • Aeration tank operations do not change between dry and wet weather flows.		
What Triggers the Change?		
• There are no significant changes to the aeration tank operations during wet weather.		
What Can Go Wrong?		
• Dissolved Oxygen drops below 2 mg/L. • Mixed flow sludge pump failure. • No return sludge.		

2.7 FINAL SETTLING TANKS

2.7.1 Equipment

Unit Processes	Equipment
Final Settling Tanks	6- Final Settling Tanks (2 in the East Battery, 4 in the West battery) 8- RAS Pumps (4 in each Battery) 3- Wasting Pumps 44- Inlet Sluice Gates 44- Longitudinal Collectors 6- Sludge Trough Cross Collectors 26- Rotating Scum Collectors 3- Scum Pits 8- Telescoping weirs (West Battery) 1- Gate (East Battery)

2.7.2 Wet Weather Operation Protocols

WHO DOES IT?		WHAT DO WE DO?
SUPERVISORY	IMPLEMENTATION	
Before Wet Weather Event		
SEE	SSTW/STW	• All final settling tanks are in service during dry weather conditions. • Skim tanks as necessary. • Check the flow balance to all tanks in service. • Observe effluent quality. • Check RAS/WAS pumps in service for proper operation. • Check tank collectors for proper operation. • Check the effluent quality. Notify the supervisor if solids are washing out over the weirs. • Check the RAS/WAS pump flow rate. • If tank cross collector fails, remove tank from service.
During Wet Weather Event		
SEE	SSTW/STW	• In case of longitudinal collector failure, maintain final tank in service. Balance flows to the tanks to keep the blanket levels even.

After Wet Weather Event		
SEE	SSTW/STW	• Modify the sludge wasting based on MLSS levels and recommendation from Process Engineer. • Observe effluent clarity. • Skim the clarifiers if needed. • Repair equipment failures as necessary.
Why Do We Do This?		
• To prevent solids washouts from secondary clarifiers.		
What Triggers the Change?		
• Rising sludge blankets that cannot be controlled • Flooding of weirs		
What Can Go Wrong?		
• RAS/WAS pump failure. • Solids washout at the final effluent weirs. • Broken sludge collection equipment. • Secondary clarifier weirs are flooded.		

2.8 SLUDGE THICKENING, DIGESTION, STORAGE AND DEWATERING

2.8.1 Equipment

Unit Processes	Equipment
Sludge Thickening	8- Gravity Thickeners 16- Thickened Sludge Pumps
Anaerobic Digestion	4- Digesters (1 used as Sludge Storage Tank) 4- Heat Exchangers 2- Engine Jacket Cooling Water Pumps 8- Sludge Recirculation Pumps 4- Sludge to Storage Pumps
Sludge Storage	1- Sludge Mixing/Sludge to Barge Pump 3- Sludge Storage Tanks 2- Sludge Dewatering Pumps 1- Pump Back/Sump Pump
Dewatering	2- Centrifuges 3- Mixed Polymer Storage Tanks 2- Polymer Feed Pumps 2- Polymer Transfer Pumps 1- Bulk Polymer Storage Tank 1- Hypochlorite Storage Tank 4- Hypochlorite Feed Pump 1- Hypochlorite Gravity Feed Piping 1- Caustic Storage Tank 4- Caustic Feed Pumps 1- Ferric Chloride Storage Tank Hoppers with screens 1- Ferric Chloride Feed Pump 3- Dilution Water Pumps

2.8.2 Wet Weather Operation Protocols

WHO DOES IT?		WHAT DO WE DO?
SUPERVISORY	IMPLEMENTATION	
Before Wet Weather Event		
SEE	SSTW/STW	• Five gravity thickeners are in operation during dry weather conditions. • Five thickened sludge pumps are in operation during dry weather conditions. • One sludge to storage pump is in operation during dry weather conditions. • One sludge dewatering is in operation during dry weather conditions. • One or two centrifuges are in operation five days a week. • One polymer feed pump is in operation during dry weather conditions. • One or two polymer transfer pumps are in operation as needed during dry weather conditions.
SEE	SSTW/STW	• Thickener Pump timer settings are adjusted if necessary based on solids inventory in the tank.
During Wet Weather Event		
SEE	SSTW/STW	• No changes are currently made during wet weather.
After Wet Weather Event		
SEE	SSTW/STW	• Repair equipment failures as necessary. • The thickened sludge pumping rate may require adjustment due to a reduction in wasting following a wet weather event.
Why Do We Do This?		
• No changes are made during wet weather conditions.		
What Triggers the Change?		
• No changes are made during wet weather conditions.		
What Can Go Wrong?		
• Thickened collector mechanism failure • Thickened sludge pump failure • Sludge recirculation pump failure • Sludge to storage pump failure • Centrifuge failure • All chemical transfer and feed pump failure • Sludge Mixing pump failure • Sludge Dewatering pump failure		

2.9 EFFLUENT CHLORINATION

2.9.1 Equipment

Unit Processes	Equipment
Effluent Chlorination	2- Chlorine Contact Tanks 3- Sodium Hypochlorite Storage Tanks 3- Hypochlorite Feed Pumps 3- Dilution Water Pumps 3- Effluent Water Pumps 4- Chlorine Residual Analyzers with control system 4- Effluent Ultrasonic Flow Meters 1- Influent Gate 1- Duplex Strainer

2.9.2 Wet Weather Operation Protocol

WHO DOES IT?		WHAT DO WE DO?
SUPERVISORY	IMPLEMENTATION	
Before Wet Weather Event		
SEE	SSTW/STW	• Make sure chlorine contact tanks are in service. • Make sure there are sufficient chlorine residual test kit supplies. • Check and maintain hypochlorite tank levels. If low, isolate the tank and place a different tank on-line. Request delivery if necessary. • Check operation of sodium hypochlorite feed pump and dilution water pump. • Check and adjust hypochlorite feed rates to maintain adequate residual. • Clean duplex strainer as necessary.
During Wet Weather Event		
SEE	SSTW/STW	• Check and adjust hypochlorite feed rates to maintain adequate residual. • Increase the chlorine residual measurements to hourly.
After Wet Weather Event		
SEE	SSTW/STW	• Check and adjust hypochlorite feed rates to maintain adequate residual. • Check and maintain hypochlorite tank levels. Request delivery if necessary. • Repair equipment failures as necessary. • Clean duplex strainer as necessary.
Why Do We Do This?		
• During wet weather conditions, hypochlorite demand may change (increase or decrease). Need to adjust hypochlorite feed in order to maintain adequate disinfection of effluent.		
What Triggers the Change?		
• High flows and secondary bypasses may increase hypochlorite demand.		
What Can Go Wrong?		
• Failure of a hypochlorite feed pump • Failure of a dilution water pump • Failure of a check valve on hypochlorite feed pump piping • Clogging of duplex strainer		

3.0 PLANNED PLANT UPGRADE

The Tallman Island WPCP is scheduled to undergo a construction upgrade program to address the facility's critical needs and upgrade the aeration process for BNR pursuant to the Judgment.

This section summarizes the major improvements anticipated to be implemented as part of the first phase of the Plant Upgrade Program.

3.1 MAIN SEWAGE PUMPING STATION

The existing main sewage pumps, suction, discharge piping and valves will be demolished and replaced with five new centrifugal-type pumps each capable of pumping 60 MGD. The facility will have the capability of pumping at least 160 MGD to the preliminary settling tanks during wet weather with three pumps in operation. During this work, a temporary pump around system will be installed in the influent channels following the primary screens. The temporary pumping system will be capable of pumping a maximum flow of 120 MGD. As a result, during and temporary pumping period, the Tallman Island WPCP will only be able to process a maximum wet weather flow of 120 MGD or 1.5 x the design dry weather flow (DDWF). The existing conveyor system for the Main Influent Screens will be demolished and replaced in-kind. This work should have no effect of the Plant's ability to accept and treat wet weather flow.

The Powells Cove Pumping Station, located in the plant's Pump and Blower Building, will also be upgraded. The existing pumps and climber screen will be demolished and replaced with three new pumps each capable of 4 MGD and a new climber screen. Temporary pumping units capable of handling the entire Powells Cove Pumping Station flow will be provided during this phase of the work. As a result, this work will not impact the Plant's ability to accept and/or treat wet weather flow.

3.2 AERATION TANKS

The aeration tanks at the Tallman Island WPCP will be modified to provide basic step-feed BNR. Baffles will be added to allow for anoxic and oxic treatment zones. Mixers will be provided in the anoxic zones to maintain the suspension of biomass. A new aeration system including fine bubble diffusers will be provided along with new centrifugal process air blowers. The existing air header will be rehabilitated to reduce air losses and a new dissolved oxygen (DO) control system will be provided. The existing spray water system will be demolished and replaced with a new system capable of providing full tank coverage. New influent gates will be added to the aeration tanks to allow for uniform flow distribution to each pass. Automation will need to be provided to allow storm flow to be sent to Pass D of each aeration tank so as to prevent biomass washout. Two froth control hoods will be added in Pass A and B to reduce sludge bulking. Surface wasting will also be provided to maintain the SRT and prevent nocardia and foam accumulation. Centrate from the dewatering building will be conveyed to Pass A of the aeration tanks by gravity. As with the preliminary tank work, only one aeration tank will be allowed to be taken out of service by the contractor at any time. As a result, the system should be capable of processing a wet-weather flow of 120 MGD for short durations without a significant effect on overall treatment performance.

3.3 RAS AND WAS SYSTEM

New submersible RAS pumps will be added to the system with the capacity of 50 to 60 percent of design dry weather flow. This is the currently recommended RAS rate from the Comprehensive Nitrogen Management Team (CNMT). RAS chlorination will be provided to prevent sludge bulking. WAS will be conveyed from Pass A and B of the aeration tanks. Additional instrumentation will be provided to measure RAS flow and RAS total suspended solids (TSS) concentrations.

3.4 GRAVITY THICKENERS

Four of the existing eight gravity thickeners will undergo complete rehabilitation. New mechanisms, drive units, over-flow piping and sludge pumps will be provided under this phase of the upgrade. Only five gravity thickeners are required by the plant at any time. As a result, the Contractor will be allowed to upgrade two gravity thickeners at any time, and should have no effect on the plant's ability to process wet weather flows.

3.5 MIXED FLOW PUMPING STATION

The existing pumps in the mixed flow pump station will be demolished and replaced. Due to the current space limitation, the pumps will be replaced in-kind with new pumps of the same capacity. As part of this upgrade, the spray water system will also be replaced. The capacity of the spray water system will be increased, but only to the extent possible within the existing foot print of the mixed flow pumping station. Only one mixed flow pump will be allowed to be taken out of service at any time. As a result, this work will have no effect on the plant's ability to treat wet weather flows.

3.6 SLUDGE DIGESTION AND STORAGE

The existing covers on the four digesters will be demolished and replaced. New gas piping will be provided from the digester tank covers to the gas compressor building. New piping will be provided from the digester sludge transfer pumps to the existing sludge storage tanks located near the dewatering building.

APPENDIX A

ALLEY CREEK CSO RETENTION FACILITY WWOP

Alley Creek CSO Retention Facility
Bayside, New York

Wet Weather Operating Plan
Alley Creek CSO Retention Facility

Prepared for:
The New York City Department of Environmental Protection
Bureau of Engineering, Design and Construction

Prepared by:
URS Corporation
Paramus, New Jersey

June 2003
(Revised December 2003)
(Revised October 2007)

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LIST OF FIGURES

1. INTRODUCTION

The purpose of a wet weather operating plan (WWOP) is to provide a set of operating guidelines to assist operating personnel in making operational decisions that will best meet the wet weather operating performance goals. The WWOP is also a SPDES requirement for the Alley Creek Combined Sewer Overflow (CSO) Retention Facility (CSO storage facility) as well as for the Tallman Island Water Pollution Control Plant (WPCP) as the CSO storage facility is tributary to the WPCP.

During wet weather events, numerous operational decisions must be made to effectively manage and optimize treatment of wet weather flows and CSOs. This WWOP is intended to provide a basis for consistent wet weather operating practices, and to maximize the utility of the Alley Creek CSO Retention Facility during wet weather conditions. The WWOP provides for a consistent and documentable method of approach for various situations.

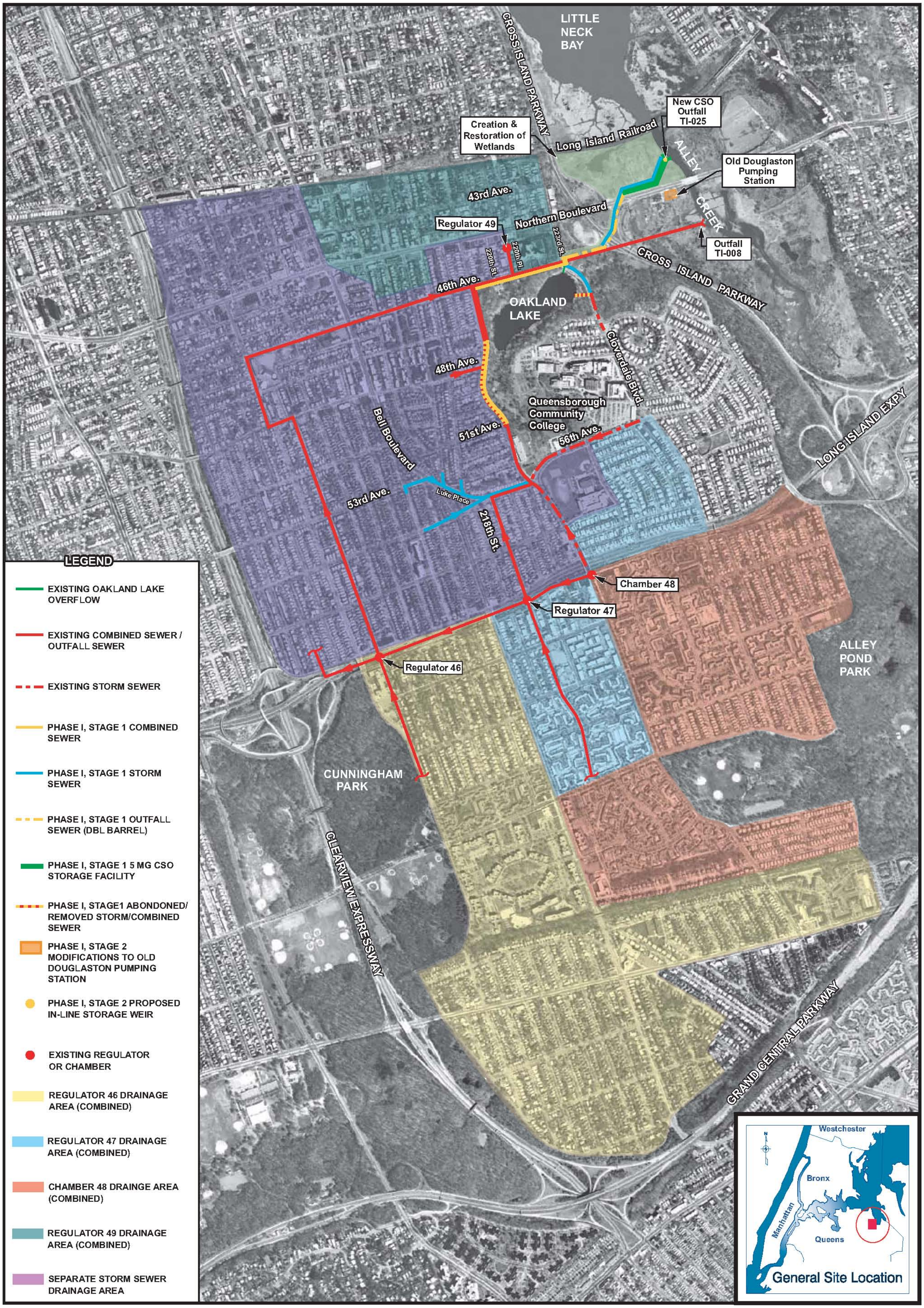
Each rain storm produces a unique combination of flow patterns and facility conditions. Therefore, no plan or manual can provide specific, step-by-step procedures for every possible wet weather scenario. The procedures presented in this WWOP are conceptual in nature, and will be modified as necessary based on experience operating the CSO storage facility.

The construction of the Alley Creek CSO Retention Facility is scheduled to be complete in December 2009.

1.1 Background

The Alley Creek CSO Retention Facility Project has been planned and designed by the New York City Department of Environmental Protection (NYCDEP) to: (1) alleviate surcharging of sewers and subsequent street flooding within areas located immediately west and north of Oakland Ravine and Lake and Alley Park along Springfield Boulevard and 46th and 56th Avenues; and (2) reduce CSOs discharged into Alley Creek through existing Outfall TI-008 (SPDES No. NY0026239), a 10'-0" W x 7'-6" H (inner dimensions) conduit. The Alley Creek CSO Retention Facility is designed as a flow-through retention facility to store and capture up to 5 million gallons (MG) of combined sewage, and return the captured combined sewage to the existing combined sewer system to be conveyed to the Tallman Island WPCP for treatment.

The Alley Creek CSO Retention Facility is being constructed in an area within Alley Park in the Bayside section of Queens, New York, north of Northern Boulevard and across from the Alley Pond Environmental Center. Figure 1-1 shows the site location of the Alley Creek CSO Retention Facility, and the principal elements associated with the facility. The CSO storage facility is being constructed in two stages.



WET WEATHER OPERATING PLAN - ALLEY CREEK
FACILITY SITE LOCATION; FACILITY FEATURES; AND DRAINAGE AREA

FIGURE 1-1

Storage\lorenzo\TI_Schematic plan_8.5x11_6.02.03.ai

The first stage, Stage 1, of the project includes the construction of a new CSO outfall sewer and storage conduit with a combined storage capacity of approximately 5 million gallons (MG), and improvements within the combined sewer system upstream of existing Outfall TI-008. Under Stage 2, a fixed overflow weir will be constructed within the outfall sewer at its downstream end near the new outfall (TI-025), and concrete block walls will be removed to allow flow to discharge over side overflow weirs into the CSO storage conduit constructed along both sides and underneath the new outfall sewer. This additional construction will activate the operation of the CSO storage conduit. The new outfall sewer will also function as part of the CSO storage facility after construction of the fixed overflow weir.

The second stage, Stage 2, of the project includes activation of the 5 MG CSO storage facility, upgrading the Old Douglaston Pumping Station (ODPS) to enhance the station's reliability to pump the captured combined sewage to the combined sewer system for conveyance to the Tallman Island WPCP for treatment, rehabilitation of the Outfall TI-008 structure, and restoration of a 1.51-acre area surrounding Outfall TI-008 to include restoration/creation of wetlands and replacement of invasive vegetation with indigenous plantings as mitigation for the area disturbed as a result of rehabilitation of the outfall structure. As part of Stage 2, an air treatment system will be installed at the ODPS to treat exhaust air from the CSO storage facility, and the wet well and grinder room of the pumping station. The air treatment system will consist of a one-stage, dual-bed carbon adsorption system to reduce hydrogen sulfide concentrations in the inlet air to at least 1 ppb at the nearest sensitive receptor, the Alley Pond Environmental Center. This criterion satisfies the NYCDEP's air quality requirements.

Construction of Stage 2 was initiated in December 2006, with completion of construction scheduled for December 2009.

1.1.1 Drainage Area

Outfall TI-008 discharges to Alley Creek at a location south of Northern Boulevard on the west bank of the Creek. This outfall, which was found to be a significant component of water quality degradation in Alley Creek, consists of a 10'-0" W x 7'-6" H (inner dimensions) outfall sewer serving an overall wet-weather drainage area of approximately 1,975 acres within the Tallman Island WPCP service area. The drainage area of Outfall TI-008 is shown on Figure 1-1. This same drainage area will be served by the new outfall sewer and CSO storage conduit.

1.1.2 Wet Weather Flow Control

The Alley Creek CSO Retention Facility is designed to store and capture approximately 5 MG of combined sewage at a peak design flow of approximately 1,980 cfs or 1,300 million gallons per day (mgd). The new outfall sewer and CSO storage conduit are designed to operate completely passively during wet weather events. Combined sewage volumes in excess of the CSO storage facility capacity of 5 MG will overflow the crest of the fixed weir at the terminus of the new outfall sewer, and discharge to Alley Creek through new Outfall TI-025. During storms which exceed a five-year return period as defined by the NYCDEP, the portion of CSO flow that exceeds the 1,300 mgd hydraulic capacity of the outfall sewer will overflow a fixed weir at a chamber located near the intersection of 223rd Street and Cloverdale Boulevard (Chamber No. 6), and be conveyed through the existing 10'-0" W x 7'-6" H outfall sewer to discharge into Alley Creek through existing Outfall TI-008.

Captured CSO will be drained by gravity to the wet well of the ODPS following wet weather events, provided that there is adequate hydraulic capacity in the Tallman Island WPCP combined sewer system and at the plant. From the ODPS, the captured CSO will be pumped through a new 20-inch diameter force main to the existing combined sewer system for conveyance to the Tallman Island WPCP.

1.1.3 Alley Creek CSO Retention Facility Description

The Alley Creek CSO Retention Facility will provide approximately 5 MG of in-line storage volume to decrease the frequency and severity of CSO discharges to Alley Creek. The hydraulic capacity of the existing Outfall TI-008 outfall sewer, which extends from the intersection of 223rd Street and 46th Avenue through Alley Park south of Northern Boulevard, will be utilized during extreme storm events that exceed the capacity of the proposed structures. During dry and wet weather, the overflow from Oakland Lake will continue to discharge to the existing outfall sewer into Alley Creek through Outfall TI-008, as under existing conditions. CSO entering the CSO storage facility will be captured and stored behind the fixed overflow weir that will be constructed at the terminus of the new outfall sewer.

During dry weather, the overall Alley Creek CSO Retention Facility will drain by gravity to the wet well of the ODPS through a 24-inch diameter sewer that will extend from the facility, cross under Northern Boulevard, and terminate at a new junction chamber that will route the flow into an existing sewer that discharges to the pumping station wet well. The ODPS will pump sanitary sewage and captured CSO into the new 20-inch diameter force main that will terminate in the general vicinity of 46th Avenue and 223rd Street, discharging into the existing Tallman Island WPCP combined sewer system.

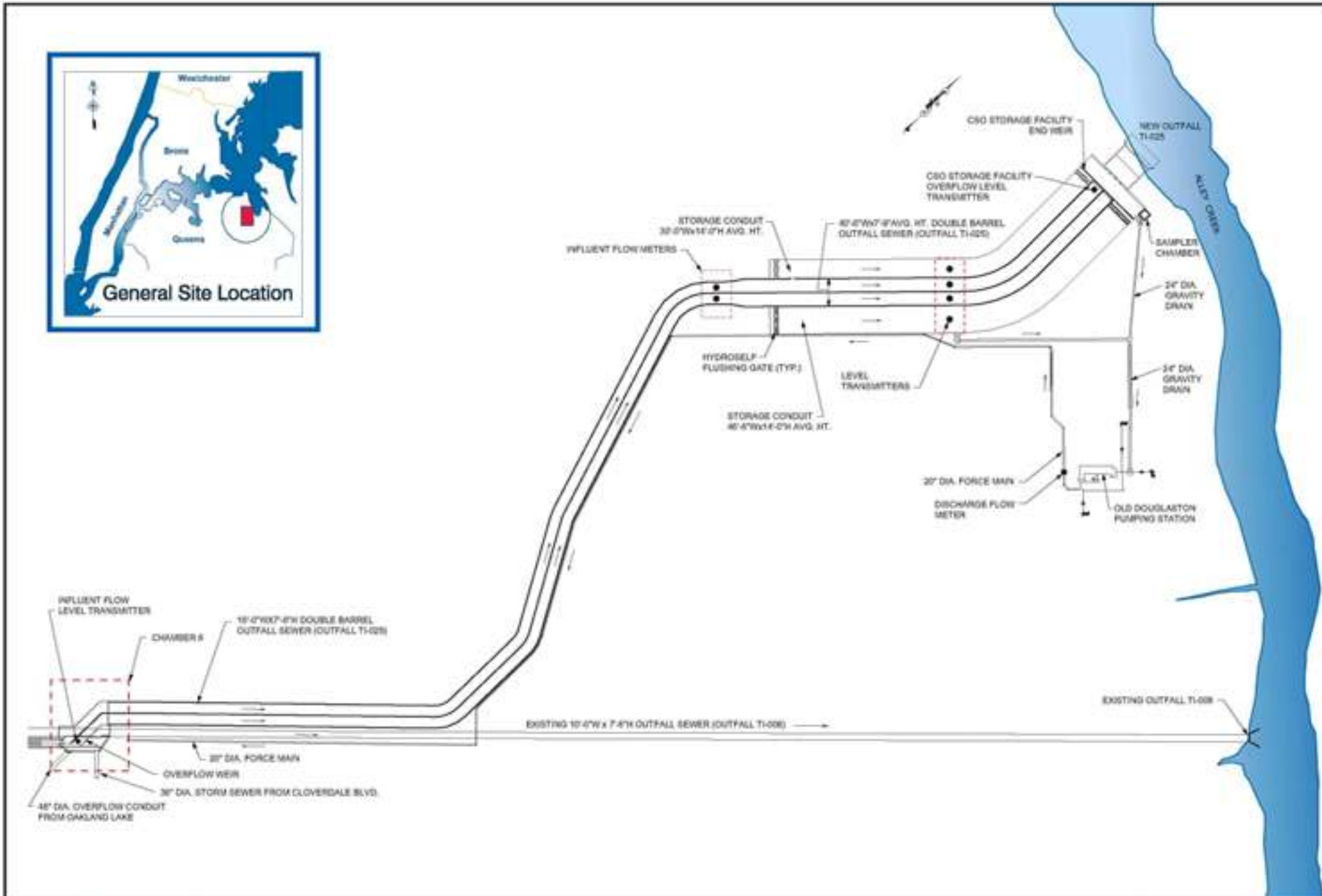
Flow and level monitoring equipment will be installed to allow the determination of the volume of combined sewage that is captured and pumped back to the Tallman Island WPCP, the volume of combined sewage that flows through the CSO storage facility during storms, and the volume of combined sewage that bypasses the storage facility during those storms which generate CSO volumes and flow rates in excess of the CSO storage facility volume and hydraulic capacity. The flow and level monitoring equipment provided will be able to operate over the range of tidal conditions typical for Alley Creek. Figure 1-2 shows a schematic plan of the Alley CSO Retention Facility with flow and level monitoring locations, and Figure 1-3 provides a flow diagram of the facility also with flow and level monitoring locations. Flow and level monitoring locations are as follows:

- Influent Flow Monitoring - CSO storage facility influent flow will be determined by measuring flow velocity and level in the 16'-0" W x 7'-6" H double barrel outfall sewer downstream of Chamber No. 6.
- Facility Overflow (Flow-Through) Monitoring - CSO storage facility flow-through volumes will be determined by registering and totalizing the measured influent flow when flow over the overflow weir located at the terminus of the new outfall sewer begins in combination with the readings at the level transmitter installed at the crest of the weir. When the measured level at the overflow weir decreases to an elevation below the weir crest, registering and totalizing of flow will cease.
- Outfall TI-008 - Influent flow through existing Outfall TI-008 will be determined based on the readings at the level transmitter installed at the crest of the overflow weir in Chamber No. 6. Flow monitoring will be performed only when level monitoring indicates that the overflow weir within Chamber No. 6 has been crested.
- Old Douglaston Pumping Station - The flow of captured CSO pumped back from the wet well through the new 20-inch diameter force main from the ODPS will be monitored and recorded by an ultrasonic flow meter.

A listing of systems/equipment included in the Alley Creek CSO Retention Facility is as follows:

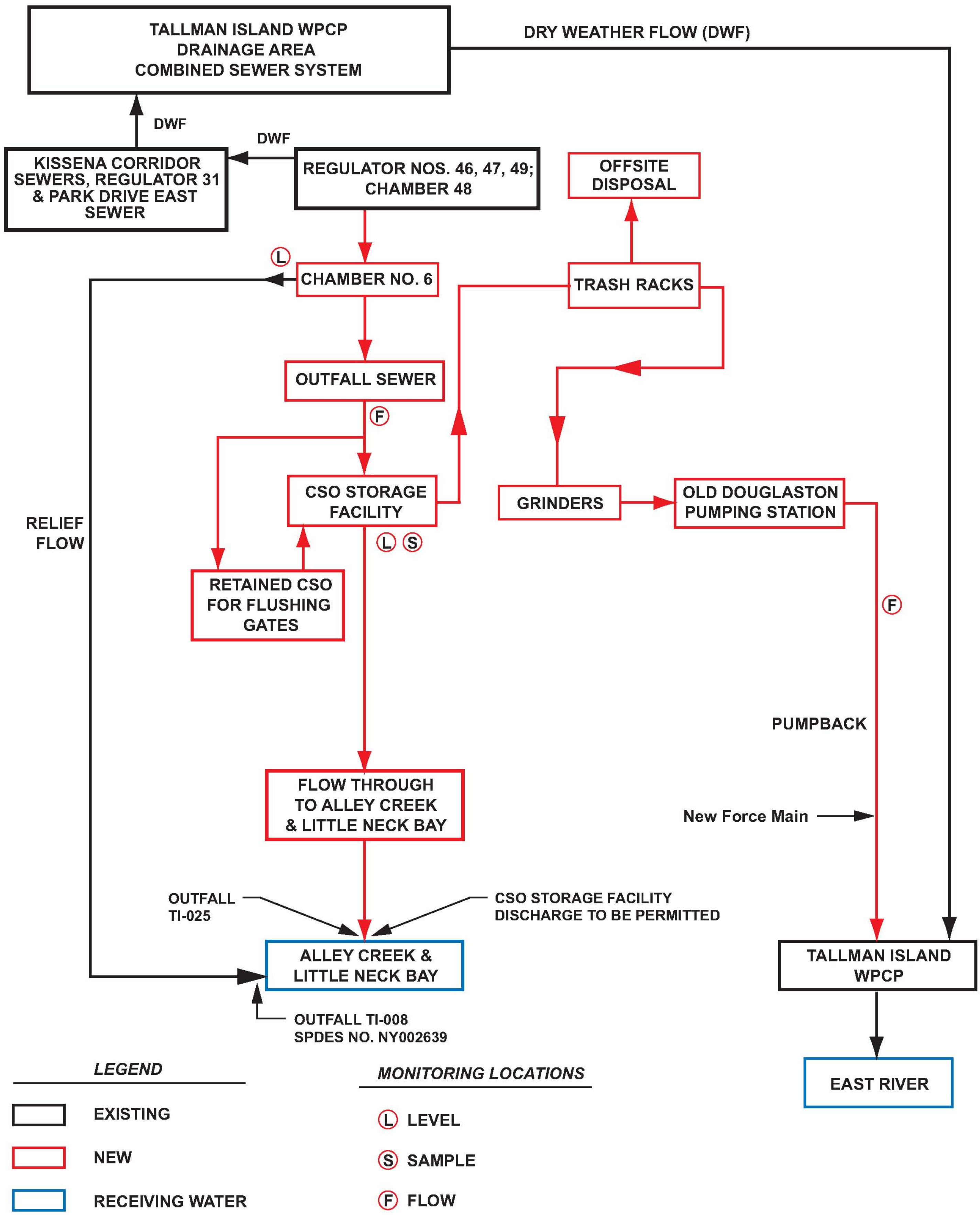
- CSO storage facility sluice gate drainage system;
- CSO storage facility drainage control structure housing the pinch valve;
- CSO storage conduit flushing system;
- CSO storage facility and ODPS air treatment system;
- Two open-channel sewage grinders at influent to ODPS; and
- Four main sewage pumps with pump control discharge cone valves at ODPS.

The operation of the Alley Creek CSO Retention Facility will be coordinated with the operation of the Flushing Bay CSO Retention Facility to ensure that dry-weather overflows are not induced, and that treatment capabilities of the Tallman Island WPCP will not be exceeded during periods of pumping operations. Control of the pumping from the ODPS will be based on flow and level monitoring at key locations within the combined sewer system upstream of the Tallman Island WPCP as well as at the influent to the plant as discussed in Section 2.2.



WET WEATHER OPERATING PLAN - ALLEY CREEK
RETENTION FACILITY SCHEMATIC AND MONITORING LOCATIONS

FIGURE 1-2



NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

WET WEATHER OPERATING PLAN - ALLEY CREEK
CSO RETENTION FACILITY SCHEMATIC FLOW DIAGRAM

FIGURE 1-3

L:\32159\WWOP\figures\figure1-3a-ac schematic flow diagram 10.03.07.ai

1.2 Performance Goals for Wet Weather Events

The primary goals of the Alley Creek CSO Retention Facility are to reduce the volume of combined sewer overflows into Alley Creek, and improve the water quality of the Creek.

The CSO storage facility is designed to provide 100 percent capture of combined sewage generated by all storms up to about 0.46 inch total precipitation, or approximately 70 percent of the storms that occur on an annual basis in the Outfall TI-008 drainage area. Receiving water computer modeling projections indicate that the overall volume of CSOs discharged to Alley Creek will be reduced by about 54 percent; total suspended solids (TSS) loading will be reduced by about 70 percent; and the biochemical oxygen demand (BOD) loading will be reduced by about 66 percent. In addition, the amount of floatables and settleable solids discharged into Alley Creek will decrease.

1.3 Purpose of this Plan

The purpose of this plan is to provide a set of general operating guidelines to assist the DEP operations staff in making operational decisions for the Alley Creek CSO Retention Facility, which will best meet the performance goals stated in Section 1.2 and the requirements of the SPDES discharge permit.

1.4 Using the Plan

This plan is designed for use as a general reference during wet weather events, and is meant to supplement the Alley Creek CSO Retention Facility operation and maintenance manual. It is broken down into sections that cover operation of the Alley Creek CSO Retention Facility. The following information is included:

- Steps to take before, during and after a wet weather event;
- Discussion of why the recommended control steps are performed;
- Identification of specific circumstances that trigger the recommended changes; and
- Identification of things that can go wrong with the equipment.

This plan is a living document. Users of the plan are encouraged to identify new steps, procedures, and recommendations to further the objectives of the plan. Modifications, which improve upon the plan’s procedures, are encouraged. With continued input from the plant’s experienced operations staff, this plan will become a useful and effective tool.

2. CSO STORAGE FACILITY OPERATION

This section presents equipment summaries and wet weather operating protocols for the major unit operations of the Alley Creek CSO Retention Facility. The protocols are divided into steps to be followed before, during and after a wet weather event. The protocols also address the basis for the protocol (Why do we do this?), events or observations that trigger the protocol (What triggers the change?), and discussions of what can go wrong. The following information and protocols apply to proposed unit processes. At the time this protocol was being prepared, the Alley Creek CSO Retention Facility was under construction, and is subject to revisions by the time the facility is in operation. These protocols will be revised as appropriate when construction of the CSO storage facility is complete.

2.1 CSO Storage Conduit and Outfall Sewer (CSO Storage Facility)

Before Wet Weather Event

1. Under normal conditions the CSO storage conduit and new outfall sewer will be in service.
2. Check to ensure flow and level monitoring equipment are operational.
3. Make sure that the sluice gates for the drain lines to the ODPS are completely closed.
4. Check that tide gates at Outfall TI-025 are sealed completely.

During Wet Weather Event

1. Check water surface elevations at the overflow weirs for flooding and flow imbalances.

After Wet Weather Event

1. Open sluice gates for the drain lines to the ODPS to allow combined sewage from the storage conduit and the outfall sewer to drain into the ODPS wet well for conveyance to the Tallman Island WPCP for treatment.

2 Initiate CSO storage facility pumpback/cleaning sequence as appropriate.

3 Clean the overflow weirs if needed.

4 Repair any malfunctioning operations or equipment out of service.

5 Remove floating debris retained in the storage conduit and outfall sewer

The CSO storage facility pumpback sequence is initiated manually by an operator at the Tallman Island WPCP; however, once initiated the pumpback sequence will continue automatically until completion. The CSO storage conduit cleaning sequence is part of the overall pumpback sequence. Following is a generalized description of the pumpback/cleaning sequence:

1. An operator at the Tallman Island WPCP manually initiates the CSO storage facility pumpback sequence following a wet weather event.

2. The water levels within the CSO storage conduit flushing water storage areas are automatically checked as part of the CSO pumpback sequence. If supplemental flushing (cleaning) water is needed, this supplemental water is delivered to the respective flushing water storage area through the flushing water feed system, which draws stored combined sewage from the outfall sewer located above the CSO storage conduit.

3. Once the flushing water storage areas are confirmed to be filled, drainage of the CSO storage conduit cells to the ODPS commences.

4. Upon completion of the drainage of the CSO storage conduit, and as selected by the operator at the Tallman Island WPCP, one or more sequences of the CSO storage conduit flushing system are automatically run to wash the invert of the CSO storage conduit cells.

5. Upon completion of the CSO storage conduit flushing system sequence, drainage of the CSO outfall sewer to the ODPS commences.

6. When the pumpback sequence is complete, all equipment is automatically returned to their respective pre-operation positions.

During the draining of the CSO storage facility and the pumpback sequence, there are two means of floatables control for the facility as follows:

1. Two trash racks are provided, each with 6-inch clear spacing between the bars. The first rack is located in Chamber No. 1 upstream of the sluice gate that drains the CSO storage conduit cells, and the second rack is located in Chamber No. 2 upstream of the sluice gate that drains the CSO outfall sewer. The trash racks are provided to protect the sluice gates and downstream pinch valve from damage by any large objects that may be collected within the CSO storage facility. Debris collected behind the trash racks will be removed manually.
2. A new underground structure has been added upstream of the wet well for the ODPS, which will house two open-channel sewage grinders. All flow (sanitary and combined) will pass through these grinders prior to entering the wet well and being

pumped out to the combined sewer system for conveyance to the Tallman Island WPCP.

Why Do We Do This?

Combined sewage flows and levels need to be monitored in the CSO storage conduit and outfall sewer for the following reasons:

1. Prevent premature overflow weir flooding and discharge into Alley Creek.

2. Prevent short circuiting.

3. Prevent excessive sludge and grit accumulation.

4. Prevent dry-weather discharges during facility pumpback and cleaning sequences.

What Triggers The Change?

Wet weather events above a certain intensity will cause CSO discharges from the regulators serving the Outfall TI-008 drainage area, Regulators TI-R46, TI-R47, and TI-R49. The Alley Creek CSO Retention Facility is designed to reduce the frequency and severity of CSO discharges into Alley Creek during rain events. During dry weather events, the CSO storage facility will drain to the ODPS wet well for conveyance to the Tallman Island WPCP for treatment.

What Can Go Wrong?

Despite potential failures in flow, level, and sediment control equipment, the Alley Creek CSO Retention Facility is designed to allow the passive storage and capture of combined sewage during wet weather events. During intense storms, the water surface in the new outfall sewer and CSO storage conduit can rise above the crest of the fixed overflow weir at the downstream end of the new outfall sewer and discharge into Alley Creek. In addition, combined sewage can also be relieved via Chamber No. 6 to discharge to Alley Creek though Outfall TI-008 during extreme wet weather events.

2.2 CSO Pumping – Old Douglaston Pumping Station

The ODPS will be modified to accept flow drained from the CSO storage facility. After storms, during dry-weather conditions, when there is available hydraulic capacity in the existing combined sewer system and at the Tallman Island WPCP, the outfall sewer and CSO storage conduit will be drained to the wet well of the pumping station.

Flow and level monitoring equipment will be installed to allow the determination of the volume of combined sewage that is captured and pumped back to the Tallman Island WPCP, the volume of combined sewage that flows through the CSO storage facility during storms, and the volume of combined sewage that bypasses the storage facility during those storms which generate CSO volumes and flow rates in excess of the CSO storage facility volume and hydraulic capacity. The flow and level monitoring equipment provided will be able to operate over the range of tidal conditions typical for Alley Creek. Figure 1-2 shows a schematic plan of the Alley CSO Retention Facility with flow and level monitoring locations as follows:

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- Facility Overflow (Flow-Through) Monitoring - CSO storage facility flow-through volumes will be determined by registering and totalizing the measured influent flow when flow over the overflow weir located at the terminus of the new outfall sewer begins in combination with the readings at the level transmitter installed at the crest of the weir. When the measured level at the overflow weir decreases to an elevation below the weir crest, registering and totalizing of flow will cease.
- Outfall TI-008 - Influent flow through existing Outfall TI-008 will be determined based on the readings at the level transmitter installed at the crest of the overflow weir in Chamber No. 6. Flow monitoring will be performed only when level monitoring indicates that the overflow weir within Chamber No. 6 has been crested.
- Old Douglaston Pumping Station - The flow of captured CSO pumped back from the wet well through the new 20-inch diameter force main from the ODPS will be monitored and recorded by an ultrasonic flow meter.

The ODPS will have a capacity of approximately 8.5 mgd after it is modified. Given the average dry-weather flow for the pumping station drainage area, the pumping station will have the capacity, approximately 3.3 mgd, to pump out the Alley Creek CSO Retention Facility in approximately 36 hours.

The operation of the Alley Creek CSO Retention Facility will be coordinated with the operation of the Flushing Bay CSO Retention Facility to ensure that dry-weather overflows are not induced, and that the treatment capabilities of the Tallman Island WPCP will not be exceeded during periods of pumping operations. The actual rate of pumping from the ODPS at any time will depend on the available hydraulic capacity of the Flushing Interceptor, and the available hydraulic and treatment capacity of the Tallman Island WPCP. By coordinating pumping rates with the available capacities in the Flushing Interceptor and the Tallman Island WPCP, dry-weather overflows will not be induced, and the WPCP will meet its SPDES permit limits.

In conjunction with the pumping rate from the Flushing Bay CSO Retention Facility, the control of the pumping rate from the ODPS will be based on flow meter readings located at the influent to the Tallman Island WPCP and on level transmitter readings located at the following two locations along the Flushing Interceptor, with all measuring and monitoring functions being performed automatically:

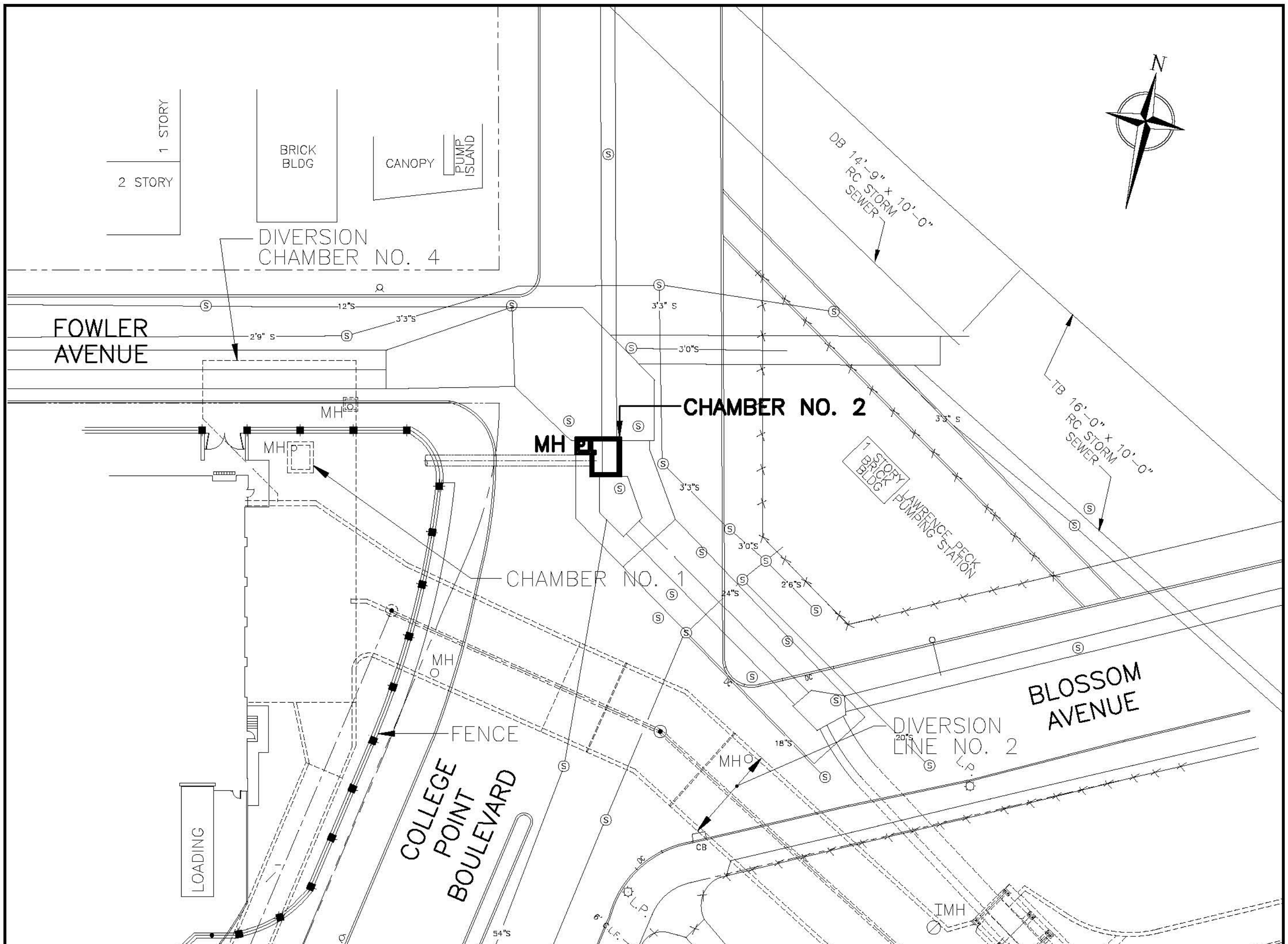
- Chamber No. 2 located at the intersection of College Point Boulevard and Fowler Avenue, Flushing, NY, as shown on Figure 2-1; and
- Regulator No. 9 located at the intersection of Linden Place and 32nd Avenue, Flushing, NY, as shown on Figure 2-2.

The combined pumping rates from the Alley Creek CSO Retention Faciilty and the Flushing Bay CSO Retention Facility, during the pumpback sequence will be controlled so that the flow at the influent to the Tallman Island WPCP does not exceed 80 mgd, the flow in the Flushing Interceptor at Chamber No. 2 does not exceed 58 mgd, and the flow in the Flushing Interceptor at Regulator No. 9 does not exceed 65 mgd.

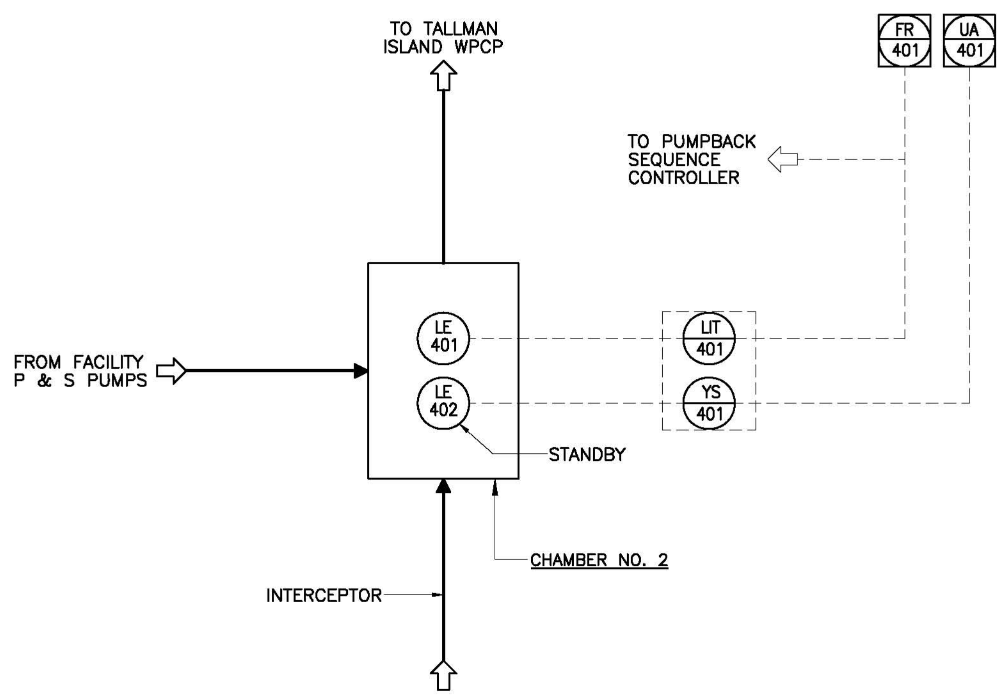
An operator at the Tallman Island WPCP will be responsible for monitoring flow at the influent to the WPCP and water levels in Chamber No. 2 and Regulator No. 9. As discussed in Section 2.1, an operator at the WPCP will manually initiate the pumpback sequence for the Alley Creek CSO Retention Facility, and will also have manual override capability of terminating the pumpback sequence if it becomes necessary due to flows/levels exceeding preset limits at any of the three key monitoring locations. Once the pumpback sequence for the Alley Creek CSO Retention Facility is initiated, the CSO storage facility will begin draining, and the ODPS will begin pumping at a constant rate of approximately 8.5 mgd. The flow/level monitoring system at the influent to the Tallman Island WPCP and within the Flushing Interceptor will detect this additional flow from the Alley Creek CSO Retention Facility, and send a signal to the pumpback system for the Flushing Bay CSO Retention Facility. This signal will be processed by the pumpback system's variable frequency drives, and the pumpback rate for the Flushing Bay CSO Retention Facility will be automatically adjusted to ensure that the preset flows/levels are not exceeded at the influent to the Tallman Island WPCP, at Chamber No. 2, or at Regulator No. 9.

In addition to the flow meters and level transmitters located at the three key monitoring locations indicated above, flow meters will be installed within the Junction Chamber of the Flushing and Whitestone Interceptors located at the intersection of 11th Avenue and 130th Street, College Point, NY as shown on Figure 2-2. The purpose for these flow meters is to collect flow data to be used for future planning of facilities within the combined sewer system tributary to the Tallman Island WPCP.

Furthermore, in addition to the on-site pumpback sequence monitoring locations at the ODPS and at the Flushing Bay CSO Retention Facility, as well as the two locations at the Tallman Island WPCP, provisions will also be provided for monitoring the progress of the Alley Creek CSO Retention Facility pumpback sequence at the Avenue V Pumping Station Crew Quarters, Brooklyn, NY.



LOCATION PLAN

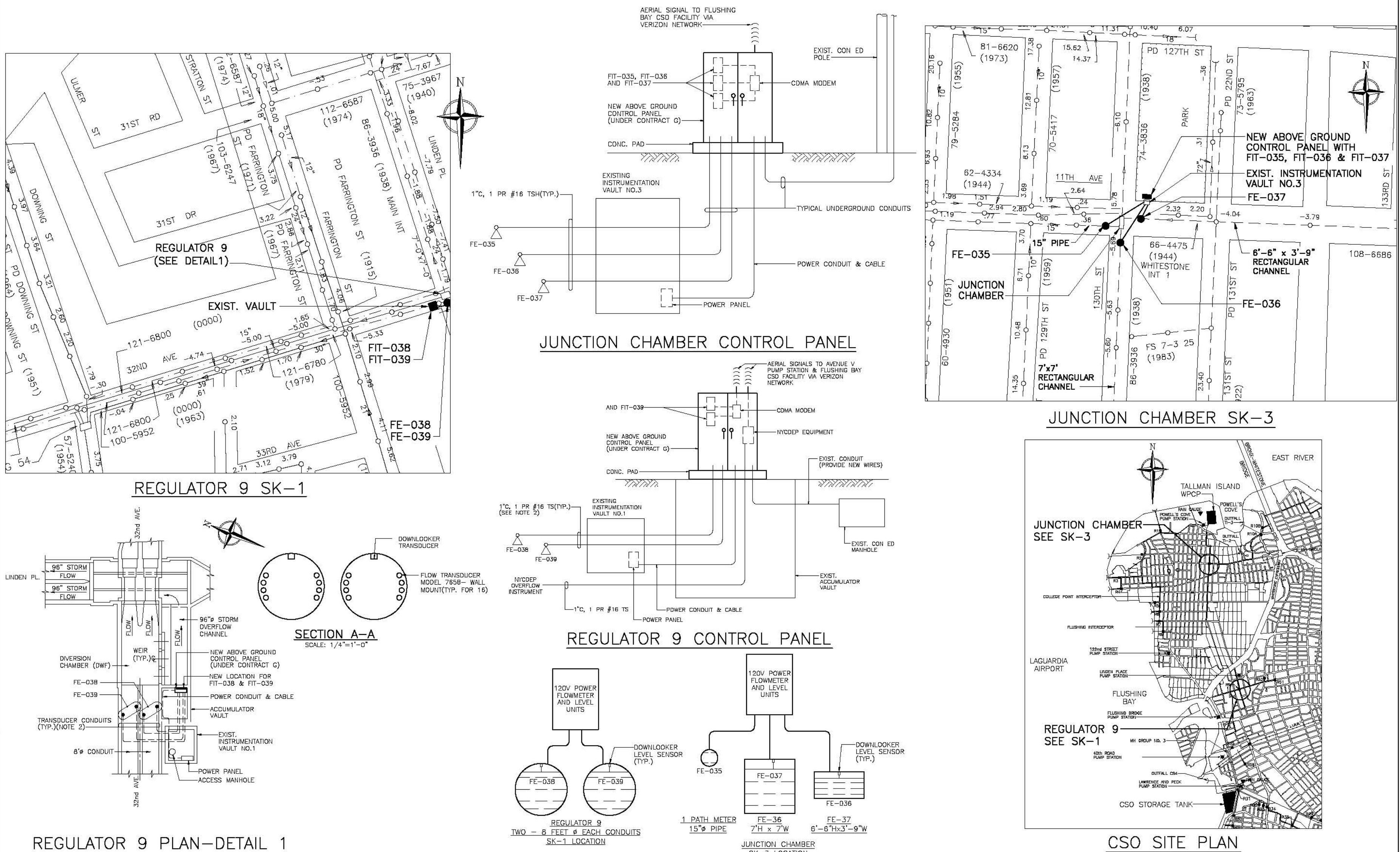


NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION DEP

WET WEATHER OPERATING PLAN – ALLEY CREEK
CHAMBER NO. 2
LOCATION PLAN AND SCHEMATIC

FIGURE 2–1

Time: 2:48 P.M. Date: 10/10/2007 joe_pizappi Drawing File: H:\32159\WWOP\FIGURES\FIGURE 2-2.dwg



WET WEATHER OPERATING PLAN-ALLEY CREEK
REGULATOR NO. 9 AND JUNCTION CHAMBER
LOCATION PLANS, SCHEMATICS AND DETAILS

FIGURE
2-2

Before Wet Weather Event

1. Check that pumps and sewage grinders at the ODPS are in working order.
1. Check that wet well monitors at the ODPS are functional.
2. Check that sluice gates for the drain lines to the ODPS from the outfall sewer and CSO storage conduit are closed.

During Wet Weather Event

2. Continue to cycle pumps at the ODPS to ensure that all available pumps are in working order.
3. Check that wet well monitors at the ODPS are functional.
4. Monitor water level in the CSO storage conduit.

After Wet Weather Event

1. Open sluice gates for the drain lines to the ODPS to allow combined sewage from the CSO storage conduit and the outfall sewer to drain into the ODPS wet well for conveyance to the Tallman Island WPCP for treatment.
2. Adjust number of pumps in operation at the ODPS so as to maintain safe water levels in the ODPS wet well and the Flushing Interceptor.

Why Do We Do This?

The pump operating strategy after wet weather events is to maintain a safe water level in the ODPS wet well and to prevent dry-weather overflows. This is accomplished by using a pinch valve to control the combined sewage flow draining from the CSO storage facility, and monitoring the available hydraulic capacity in the Flushing Interceptor located upstream of the Tallman Island WPCP and at the Tallman Island WPCP.

What Triggers The Change?

The number of pumps online at the ODPS, and the operation of the pinch valve used to control the draining of the CSO storage facility are controlled by the ODPS wet well water level, the available capacity within the Flushing Interceptor located upstream of the Tallman Island WPCP, the available capacity of the Tallman Island WPCP, and pumping operations at the Flushing Bay CSO Retention Facility.

If any one of the following events occurs, the sluice gates located at the Alley Creek CSO Retention Facility will shut down and will not allow additional CSO to drain to the ODPS:

- The sanitary sewer interceptor that drains from the east into the ODPS has surcharged.

- The Main Interceptor that discharges to the Tallman Island WPCP has surcharged.

- The Whitestone Interceptor has surcharged, i.e. the water surface level at Regulator No. 10 is unacceptably high.

- A dry weather bypass may be induced at Regulator No. 9. A high water level within the regulator has been reached.

- The Tallman Island WPCP has reached its hydraulic design capacity.

- The ODPS is unable to handle the existing flow; the high water alarm in the wet well is activated.

What Can Go Wrong?

If the sluice gates, pinch valve and pumps are not operating properly, water levels in the wet well at the ODPS will vary significantly and flooding could occur. System monitoring instrumentation may fail or give false, misleading readings. Uncontrolled or excessive pumping could induce dry-weather overflows at downstream regulators and sewer surcharging.

2.3 Hydroself Flushing Gates

Hydroself Flushing Gates will be provided to flush and clean settled solids and debris from the invert of the CSO storage conduit. The Hydroself Flushing Gates will use the combined sewage captured during rainstorms. Each gate will be equipped with its own hydraulic operator; and the gates will be activated one at a time.

Before Wet Weather Event

- Make sure flushing gates are locked in the closed position.

- Make sure all instruments are operational.

During Wet Weather Event

- Make sure flushing gates remain in the closed position.

- Make sure all instruments are operational.

After Wet Weather Event

- Initiate CSO storage facility draining, cleaning and pumping operations sequence.

- Make sure that flushing gates are properly reseated and locked in the closed position.

Why Do We Do This?

Proper functioning and operation of the Hydroself Flushing Gates is necessary for the proper cleaning of the CSO storage conduit. Proper cleaning of the CSO storage conduit is necessary to prevent the build-up of solids that could cause undesirable odors, and diminish the volumetric capacity of the CSO storage facility.

What Triggers The Change?

The onset of a wet weather event of sufficient magnitude will cause the overflow of the regulators in the Outfall TI-008 drainage area, and the CSO storage facility will collect and store combined sewage. This will also cause the reservoirs behind the Hydroself Flushing Gates to fill. After the wet weather event is over, the stored combined sewage will be used to flush the CSO storage conduit.

What Can Go Wrong?

The Hydroself Flushing Gates can become inoperative, or get stuck in either the open or closed positions. These conditions will not allow for the collection of water for flushing purposes during a wet weather event, or allow for proper cleaning of the CSO storage conduit following a wet weather event.

2.4 Air Treatment System

The Alley Creek CSO Retention Facility will be provided with an air treatment system to ensure the elimination of nuisance odors at nearby sensitive receptors. The nearest sensitive receptor is the Alley Pond Environmental Center located on Northern Boulevard adjoining the property line of the ODPS. The air treatment system will consist of a one-stage, dual-bed carbon adsorption system to reduce hydrogen sulfide concentrations in the inlet air from the CSO storage facility, and the wet well and grinder room of the pumping station to at least 1 ppb at the Alley Pond Environmental Center. This criterion satisfies the NYCDEP's air quality requirements.

Before, During and After Wet Weather Events

The air treatment system operates in a continuous manner, regardless of whether it is before, during or after a wet weather event. The dampers for the air treatment system are balanced to draw the desired amount of odorous air from the CSO storage facility and the wet well and grinder room of the ODPS, and remain in their positions on a continuous basis, unless an emergency condition arises.

Why Do We Do This?

Proper functioning and operation of the air treatment system is necessary to treat odorous air that is generated by operation of the CSO storage facility and/or the ODPS.

What Triggers the Change?

The air treatment system operates in a continuous manner, regardless of whether it is before, during or after a wet weather event. There is no difference between the operations strategy during dry weather and during wet weather.

What Can Go Wrong?

Possible emergency situations and how they are handled are described below:

- Should smoke be detected within the influent ductwork, the system blower will automatically shut down and an alarm will be sent to all monitoring stations. These monitoring stations are located at the ODPS, Alley Creek CSO Retention Facility, Flushing Bay CSO Retention Facility, Tallman Island WPCP, and Avenue V Pumping Station Crew Quarters.

- If the preset value of the differential pressure between the inlet and the outlet of the air treatment system is exceeded, the system blower will automatically shut down and an alarm will be sent to all monitoring stations.

- If the temperature within either of the carbon beds exceeds the preset value, the system blower will automatically shut down and an alarm will be sent to all monitoring stations.

2.5 Permit Monitoring

During the first two years that follow completion of construction of the Alley Creek CSO Retention Facility and final acceptance of Alley Creek Contract ER-AC2, velocity, level and rainfall data will be collected and used to calibrate a hydraulic model of the CSO storage facility tributary combined sewer system and the CSO storage facility. At the end of the two-year monitoring period, the final calibrated hydraulic model, in conjunction with collected rainfall data, will be used to determine the volume of combined sewage that discharges into Alley Creek through new Outfall TI-025 and through existing Outfall TI-008. The equipment to be used for data collection will be installed under Contract ER-AC2 with the locations and types of equipment as follows:

Measurement of CSO Through Outfall TI-025

- Level transmitter installed over the crest of the fixed overflow weir, located at the downstream end of the new outfall sewer.

- Flow meters located within the limits of the outfall sewer, upstream of the fixed overflow weir.

Measurement of CSO Through Outfall TI-008

- Level transmitter located over the crest of the overflow weir, within Chamber No. 6.

Measurement of Stored Volume within the CSO Storage Facility

- CSO Outfall Sewer - Two level transmitters; one located within the northern barrel, and one located within the southern barrel of the outfall sewer.

- CSO Storage Conduit - Two level transmitters; one located within the northern section of the storage conduit, and one located within the southern section of the storage conduit.

Rainfall Measurement

- Rain gauge located within the secure fenced-in area of the ODPS.

This equipment will all be removed at the completion of the two-year monitoring period, with the exception of: the rain gauge, which provides the input rainfall data for the hydraulic model; and the four level transmitters within the CSO outfall sewer and CSO storage conduit, which provide the data necessary for the calculation of the stored volume of CSO.

APPENDIX B

FLUSHING BAY CSO RETENTION FACILITY WWOP

Flushing Bay CSO Retention Facility

Queens, New York

Wet Weather Operating Plan

Prepared for:

The New York City Department of Environmental Protection

Bureau of Engineering, Design and Construction (BEDC)

Prepared By:

URS Corporation

Paramus, New Jersey

June 2003

(Revised December 2003)

(Revised April 2007)

(Revised October 2007)

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1. INTRODUCTION

The purpose of a wet weather operating plan (WWOP) is to provide a set of operating guidelines to assist personnel in making operational decisions that will best meet the wet weather operating performance goals. The WWOP is also a SPDES requirement for the Flushing Bay CSO Retention Facility as well as for the Tallman Island Water Pollution Control Plant (TI WPCP).

During wet weather events, numerous operational decisions must be made to effectively manage and optimize treatment of wet weather flows and CSOs. This WWOP is intended to provide a basis for consistent wet weather operating practices, and to maximize the utility of the Flushing Bay CSO Retention Facility during wet weather conditions.

Each rain storm produces a unique combination of flow patterns and Facility conditions. Therefore, no plan or manual can provide specific, step-by-step procedures for every possible wet weather scenario. The procedures presented in this WWOP are preliminary in nature, and will be refined as necessary based upon operating experience. However, the WWOP can provide a consistent method of approach for various situations.

The construction of the Flushing Bay CSO Retention Facility has been substantially completed and the Facility is operational as of May 17, 2007.

1.1 BACKGROUND

The Flushing Bay CSO Retention Facility, is a 43.4 million gallon (MG) storage Facility with flow-through capacity. The Facility is comprised of a 28.4 MG CSO storage tank, and a 15 MG in-line storage component. The Flushing Bay CSO Retention Facility is designed to capture and store the combined sewage that normally overflows to Outfall No. TI-010, an 18'-6" W x 10'-0" H (inner dimensions) triple barrel (TB) conduit. New diversion structures and influent conduits constructed as part of the overall facilities will convey CSOs into the storage tank. The Facility design flow is 316 MGD with a peak flow of 1,400 MGD.

The CSO storage tank is located below-grade at the Avery Avenue Ballfields in Flushing Meadow - Corona Park in the Borough of Queens, New York City in a triangular area bounded by Fowler Avenue on the north, College Point Boulevard on the East, and the Van Wyck Expressway on the West. Figure 1-1 shows the project site location for the Flushing Bay CSO Retention Facility.

The Flushing Bay CSO Retention Facility Tank is comprised of two (2) “trains” of storage cells in a parallel arrangement; there are a total of fifteen (15) storage cells. Storage cells Nos. 1 through 7 comprise the north train; cells Nos. 8 through 15 comprise the south train.

DEP	WET WEATHER OPERATING PLAN - FLUSHING BAY **SITE LOCATION**	**FIGURE 1-1**

L:\32174\site selection\figure1 project site location 3.18.03.ai

During rain events, the Diversion Chambers will divert the CSO to the facility five (5) influent channels. Each influent channel is provided with mechanically cleaned bar screens. The screened flow is routed to the two trains which supply CSO to the North and South side storage cells. In case the incoming flow exceeds the capacity of the storage tank, the additional flow will overflow the Storage Cells Nos 7 and 15 effluent weirs and discharge into the effluent channel. The effluent channel is equipped with tide gates to protect the storage tank against high tide. The effluent channel is connected to the existing Fowler Avenue TB (12'-6" W x 10'-0"H) CSO line. The Fowler Avenue and the Avery Avenue CSO lines combine at a mixing chamber to form a TB CSO (18'-6" W x 10'-0"H) which in turn discharges to Flushing Bay through Outfall TI-010. This TB CSO outfall is also equipped with tide gates.

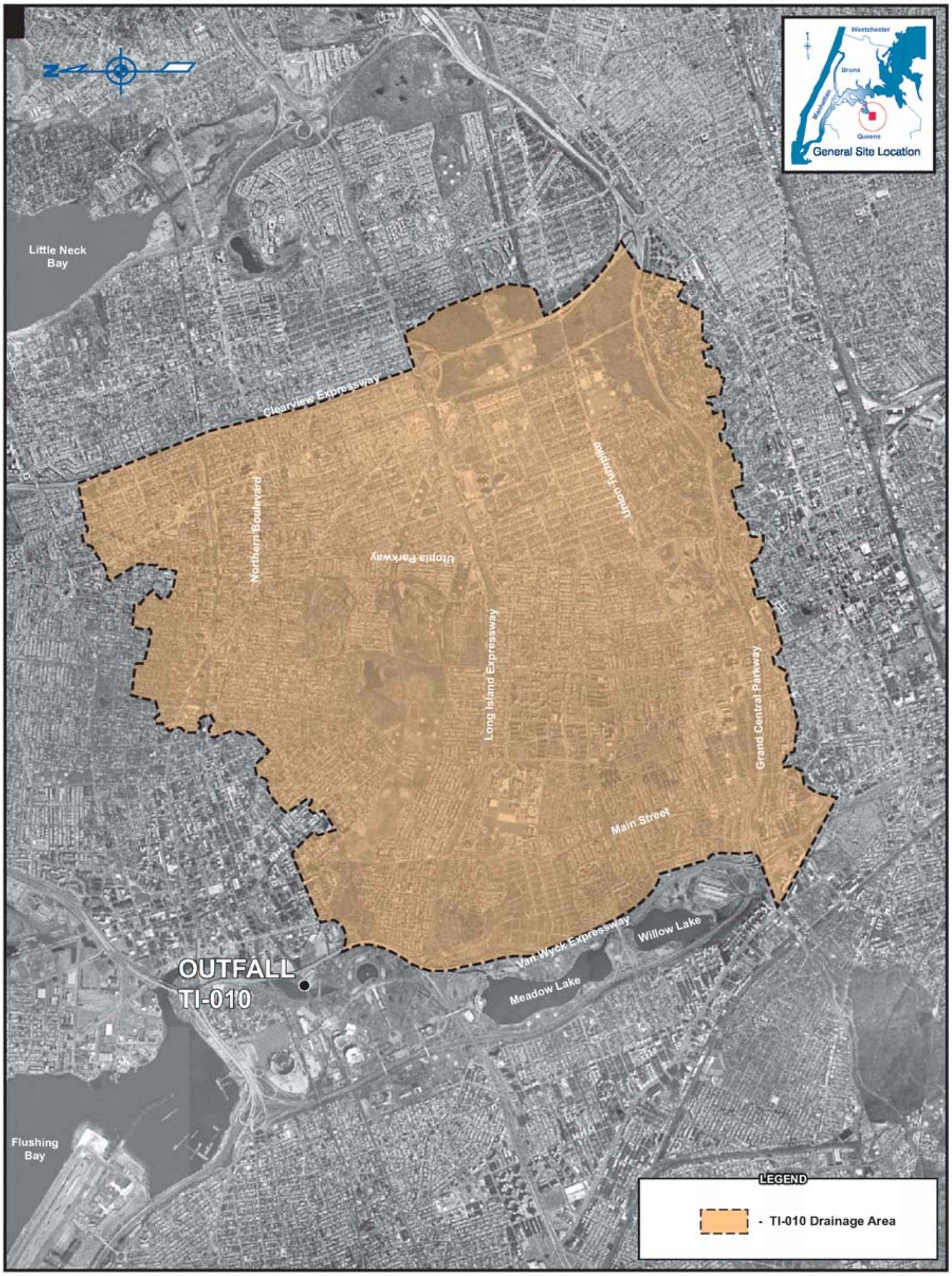
After storms, the CSO stored in the storage tank and the combined sewer system (in-line storage) will drain by gravity to the Primary wet well. The drained CSO into the Primary wet well will then be pumped to the Flushing Interceptor for conveyance to the TI WPCP for treatment. The Facility is also designed to collect dry weather infiltration into the secondary wet well and subsequently pump it to the Flushing Interceptor on a continuous basis during dry weather.

The Facility has been designed to achieve approximately one hundred percent CSO capture for approximately 90 percent of the rainstorms that occur in New York City on an average annual basis. At peak flow, with the storage tank initially empty, up to a one-month return period storm can be fully captured in the Flushing Bay CSO Retention Facility. During storms that generate CSOs in excess of the volumetric capacity of the retention Facility, combined sewage will flow through the CSO storage tank, undergo a degree of sedimentation, and discharge to Flushing Bay through Outfall TI-010. During infrequent, intense storms, portions of the CSOs will overflow the diversion/bypass weirs, bypass the storage tank, and discharge to Flushing Bay through Outfall TI-010.

The multiple overflow consisting of retention tank overflow weirs, and an influent channel side overflow relief weir can convey peak storm flows of about 1,400 MGD through the CSO storage tank (10-month return period storm; tank empty at onset of storm), and bypass about 590 MGD to Outfall TI-010 (10-month return period storm; tank empty at onset of storm).

1.1.1 Drainage Area

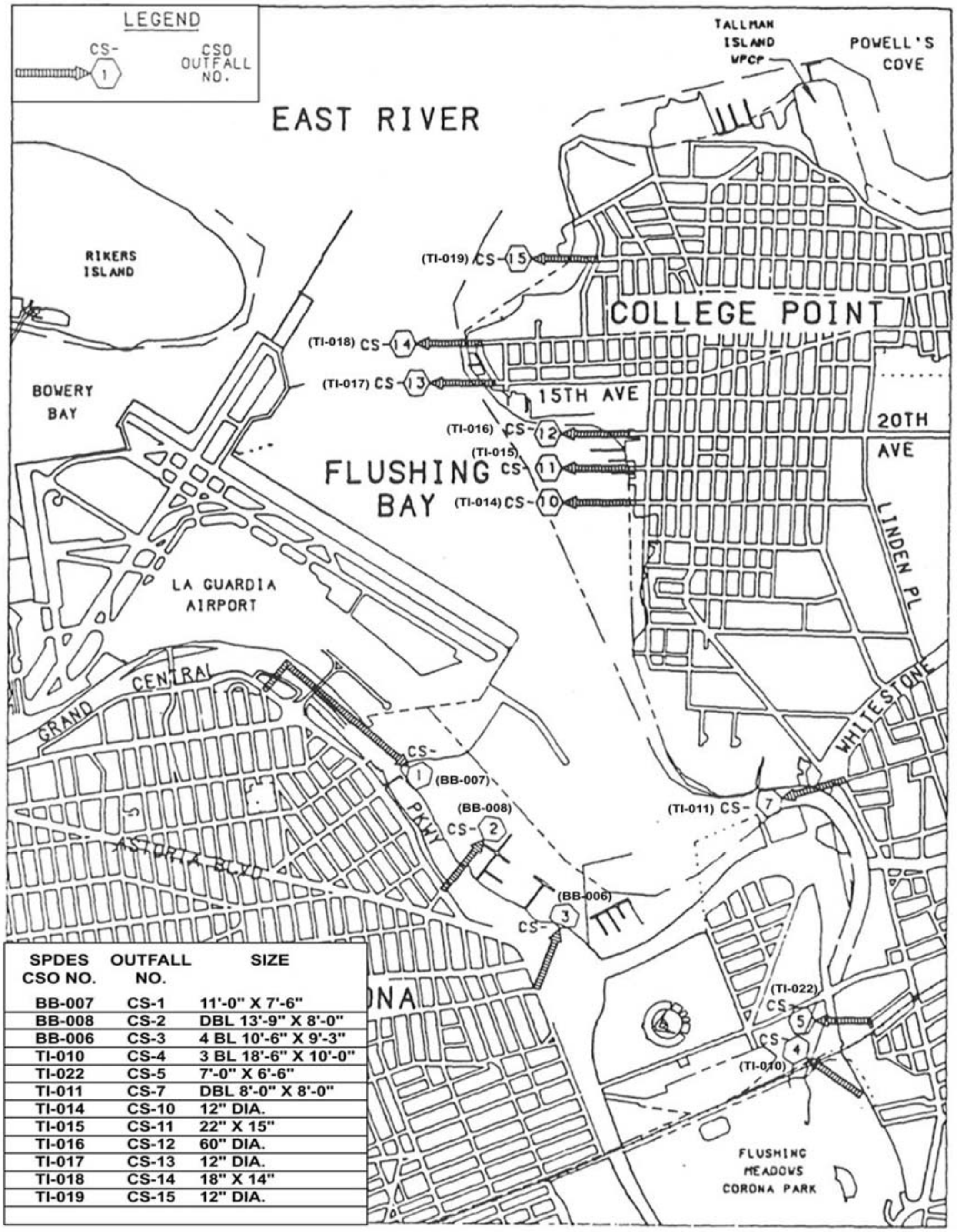
The outfall TI-010 drainage area consists of 7,400 acres of north central Queens within the TI WPCP service area, and discharges to the upstream end of Flushing Bay. Sewers originating at different sections of the drainage area as storm sewers, collect and carry storm water from catch basins and inlets. However, in this system, these storm sewers also carry combined sewage discharged as Combined Sewer Overflows (CSO) from upstream regulators during wet weather. Outfall TI-010 contributes approximately 60 percent of the total CSO discharge and pollutant loading to Flushing Bay. The drainage area tributary to outfall TI-010 is shown on Figure 1-2. The locations of outfalls discharging into Flushing Bay are shown in Figure 1-3.



WET WEATHER OPERATING PLAN - FLUSHING BAY

OUTFALL TI-010 DRAINAGE AREA

FIGURE 1-2



SPDES CSO NO.	OUTFALL NO.	SIZE
BB-007	CS-1	11'-0" X 7'-6"
BB-008	CS-2	DBL 13'-9" X 8'-0"
BB-006	CS-3	4 BL 10'-6" X 9'-3"
TI-010	CS-4	3 BL 18'-6" X 10'-0"
TI-022	CS-5	7'-0" X 6'-6"
TI-011	CS-7	DBL 8'-0" X 8'-0"
TI-014	CS-10	12" DIA.
TI-015	CS-11	22" X 15"
TI-016	CS-12	60" DIA.
TI-017	CS-13	12" DIA.
TI-018	CS-14	18" X 14"
TI-019	CS-15	12" DIA.

WET WEATHER OPERATING PLAN - FLUSHING BAY

OUFALL LOCATIONS

FIGURE 1-3

L:\32174\WWOP\FIGURES\OUTFALL LOCATIONS_4-09-07.ai

1.1.2 Facility Wet Weather Flow Control Description

During wet weather events, combined sewage from the Kissena Corridor and Park Drive East storm sewers, and overflow from Regulator 31 will be diverted into the Screening Area of the retention Facility through a diversion structure. The Screening Area is equipped with five (5) Influent Sluice Gates; five (5) Mechanical Bar Screens; one (1) Collecting Belt Conveyor; one (1) Reversing Belt Conveyor; ten (10) 1–CY Self–Dumping Containers; two (2) 30–CY Roll–off Containers; influent level and flow measuring devices and Gas Detection Equipment. The Screening Area is also equipped with Four (4) Influent Channel Sluice Gates that control the flow to the storage cells.

Diversion weirs constructed across the CSO lines are 7 ft high providing 3 ft clearance to the crown of the CSO line and will allow relief of flows in excess of the Facility hydraulic capacity to discharge to the existing CSO conduits that presently convey combined sewage to Outfall TI-010. Relief flow will only be discharged over the diversion weirs during infrequent, intense storms otherwise the CSO shall be continuously diverted to the Facility. The overflow weir at the Influent Channel is approximately 100 feet long; the relief weir located in Diversion Chamber No. 2 is approximately 10 feet long; the relief weir located in the Bulkhead Chamber is approximately 48 feet long.

The Bulkhead Chamber consists of three (3) 16'Wx7'H slide gates installed in each CSO line. Normally, these gates will act as a weir to divert the CSO into the Facility. In case the storage cells are filled and the water surface rises beyond the set point, at EL. 8.00±, the gates shall open to permit unobstructed flow conditions through the CSO line.

The influent flow first passes through five motor operated influent sluice gates. After passing through the sluice gates, the combined sewage will flow through five (5) mechanically cleaned climber-type, single front raked bar screens. The mechanical bar screens will remove any solids larger than 1.25" which have passed through the bar racks, and provide additional protection for other downstream equipment, especially the pumps used for emptying the retention Facility after rainstorms.

After passing through the mechanical bar screens, the combined sewage will flow to the storage tank through two influent channels, Influent Channel Nos. 1 and 2. Influent Channel No. 1 routes flow to tank cell Nos. 1 through 7; Influent Channel No. 2 routes flow to tank cell Nos. 8 through 15. Flow to the two influent channels is regulated by four motor operated sluice gates. Each influent channel is served by two gates.

Solids collected on the mechanical bar screens will be raked off and discharged onto a longitudinal belt conveyor. The longitudinal belt conveyor will discharge the screenings onto a bidirectional cross belt conveyor, which can discharge the collected solids to either of two 30 cubic yard dumpsters. In the event that either belt conveyor is inoperable, mechanical arrangements have been provided to allow each mechanical bar screen to discharge solids into a 1 cubic yard wheeled container. After storms, stored CSO will be pumped to the Flushing Interceptor which conveys flow to the TI WPCP. The storage cells will be automatically washed down with stored strained CSO after each storm. The air from the tank, screenings and wet well areas will be treated using wet scrubbers before being exhausted.

The Facility Monitoring and Control System (FMCS) consists of distributed Programmable Logic Controllers (PLC) based system with local Input/Output (I/O) located in the process dedicated control panels. The distributed PLCs are networked with the Operator Interface Computer Stations located in the Facility Main Control Room and in the TI WPCP Control Room. In general, automatic control functions shall be implemented in software at the Programmable Logic Controllers (PLC) level located in associated Control Panels (CP).

For "normal operation", Facility operators have the ability to start and stop equipment, open and close valves, and adjust process set points and other tuning parameters from the Operator Interface Computer Station (OICS) located in the Main Control Room, and selectively in the TI WPCP. Local Control Stations (LCS) at the equipment will be provided for maintenance purposes only, and are not intended to be used during normal operation.

1.1.3 Flushing Bay CSO Retention Facility Description

The Flushing Bay CSO Retention Facility is provided with a pumping station to pump out captured combined sewage to the 78” Flushing Interceptor, where it is conveyed to the TI WPCP after rainstorms. The pumping station is also designed to pump dry weather infiltration and inflow influent to the tank from the Kissena Corridor to the Flushing Interceptor on a continuous basis during dry weather.

The Pumping Station is provided with a wet well that is divided into two sections, the primary wet well, and the secondary wet well. A weir wall separates the two sections of the wet well. The primary wet well is 27’ wide and 54'–6” long; its bottom elevation is -45.00. The secondary wet well is 27’ wide and 18’–6” long with a bottom elevation of -49.00.

The wet well is filled when pumping operations (Pumpback) are initiated after rainstorms, provided that treatment capacity is available at the TI WPCP and conveyance capacity is available in the Flushing Interceptor. The wet well is filled by draining the tank storage cells by opening the cell drain valves. Captured combined sewage is drained from the cells and conveyed to the wet well through a 48” diameter drain line. This drain line terminates at the southeastern corner of the wet well. Flow discharges from the drain line into a weir trough which conveys flow to the secondary wet well. High flow rates that cause the weir trough to overflow, fill the primary wet well. During typical draining operations, the primary and secondary wet wells will fill simultaneously.

During dry weather, the secondary wet well accepts dry weather flow through a 12” diameter dry weather flow pipe. This dry weather flow will consist of infiltration and inflow to the Kissena Corridor sewers. This pipe originates from the dry weather flow channel located in the Screenings Area immediately upstream of the Influent Channel Sluice Gates. The dry weather flow channel redirects the relatively low dry weather flow before it can flow into the tank. A flap gate on the end of the dry weather flow pipe prevents back flow from the wet wells to the tank influent channel.

In the Spring of 1992, URS examined the main lines of Kissena Corridor and Park Drive East Storm Lines via an Internal Walking Inspection. Flow measurements and sampling (BOD, TSS, Fecal Coliform) were conducted. The survey found that there was a total of 484,000 gpd of dry weather flow of which 142,000 gpd were from sanitary connections while the remaining 342,000 were from infiltration. The sanitary connections locations were reported to NYC DEP for enforcement (assume an 8% success rate) and an analysis showed that 25% of the infiltration may be cost effective to remove. As a result, the estimated future dry weather flow is:

0.20 x 142,000 gpd = 28,400 gpd

0.75 x 342,000 gpd = 256,500 gpd

Therefore, 284,900 gpd (or~200 gpm) dry weather flow is collected through the facility influent channels and is directed to the facility secondary wet well. Two (2) secondary (dry pit submersible type) pumps @ 875 gpm are provided to pump out the dry weather flow from the secondary wet well to the interceptor that discharges to the Tallman Island WPCP. The water surface level in the secondary wet well shall also be monitored to ensure that the secondary wet well is emptied out in a timely fashion and especially before a storm event. This process of emptying the secondary wet well will potentially eliminate any impact on the facility storage capacity. In the future, the actual dry weather flow will be measured and recorded using the flowmeter in the discharge line of the secondary pumps.

The secondary wet well is also used to pump down the primary wet well after the water surface in this wet well has reached a set elevation during pumpback operations. Water in the primary wet well flows to the secondary wet well through a flap gate embedded in the weir wall separating the two wet wells. This flap gate prevents the contents of the secondary wet well from flowing to the primary wet well during dry weather flow.

The Pumping Station, Tank Drain System, and Flushing Water System work together in an integrated, coordinated fashion during the automatic operating sequence called "Pumpback Sequence". Pumpback is the process by which the stored combined sewage is drained from the tank cells to the pumping station wet well. The captured combined sewage is then pumped to the Flushing Interceptor and to the Flushing Water Storage Tank. Stored water in the Flushing Water Storage Tank is used to flush and clean the emptied cells. Spent flushing water drains to the pumping station wet well, and is also pumped to the Flushing Interceptor. Figure 1-4 shows a schematic plan of the Facility.

The actual rate of pumping at any time will depend on the available hydraulic capacity of the Flushing Interceptor, and the available hydraulic and treatment capacity of the TI WPCP. By coordinating pumping rates with the available capacities in the Flushing Interceptor and the TI WPCP, dry-weather overflows will not be induced, and the TI WPCP will meet its SPDES permit limits.

The monitoring and control system will monitor in “real time” the available treatment capacity at the TI WPCP, and the available hydraulic capacity at key locations within the TI WPCP collection system; the pumpback rate will be varied to ensure the prevention of dry weather overflows and overloading the WPCP. The flow and level monitoring stations that will be located with the TI WPCP collection system will be used to control the rate of pumpback as shown in Figure 1-5 and Figure 1-6. The schematic flow diagram of the Facility is shown in Figure 1-7. The flow in Chamber No. 2 is measured and monitored so that the carrying capacity of the Interceptor does not exceed 58 MGD at that point. The flow at the Regulator No. 9 is also measured and monitored so that the carrying capacity of the Interceptor does not exceed 65 MGD at that point. In addition, the flow measured at the Tallman Island WPCP is also monitored at the Flushing Bay CSO Facility so that it does not exceed the TI WPCP capacity (80 MGD) during Pumpback. All the above flow measuring/monitoring functions and the Pumpback are performed automatically. The initial plan of operation is to set the actual pumping rate so that it would be the lowest of the following three values up to a maximum of 32 MGD:

- The spare hydraulic capacity of the TI WPCP. computed as follows:

  Set Point = 80 (+) Pumping Rate (-) Measured TI WPCP Influent Flow. For example, if the rate of pumping is zero, and measured flow is 50 MGD, then the set point would be 30 MGD. The set point will vary with changes in the measured TI WPCP influent flow. The influent flow at the TI WPCP will be provided to the Flushing Bay CSO Retention Facility through a dedicated telephone communication link.

  In the equation above, 80 MGD is a constant that represents the actual plant average dry weather capacity. This maximum value is Operator adjustable dependent upon conditions at the TI WPCP.

- The available hydraulic capacity of the Flushing Interceptor (Chamber No. 2) computed as follows:

  Set Point = 58 (+) Pumping Rate (-) Measured Flow in the Flushing Interceptor Chamber No. 2. For example, if the rate of pumping is zero, and measured flow in Chamber No.2 is 10 MGD, then the set point would be 48 MGD.

- The available hydraulic capacity of TI WPCP collection system Regulator No. TI-R9 (or Regulator No. 9) computed as follows:

  Set Point = 65 (+) Pumping Rate (-) Measured Flow at Tallman Island Regulator No. 9 (Regulator No. TI-R9). For example, if the rate of pumping is zero, and measured flow at Regulator No. TI-R9 is 20 MGD, then the set point would be 45 MGD.

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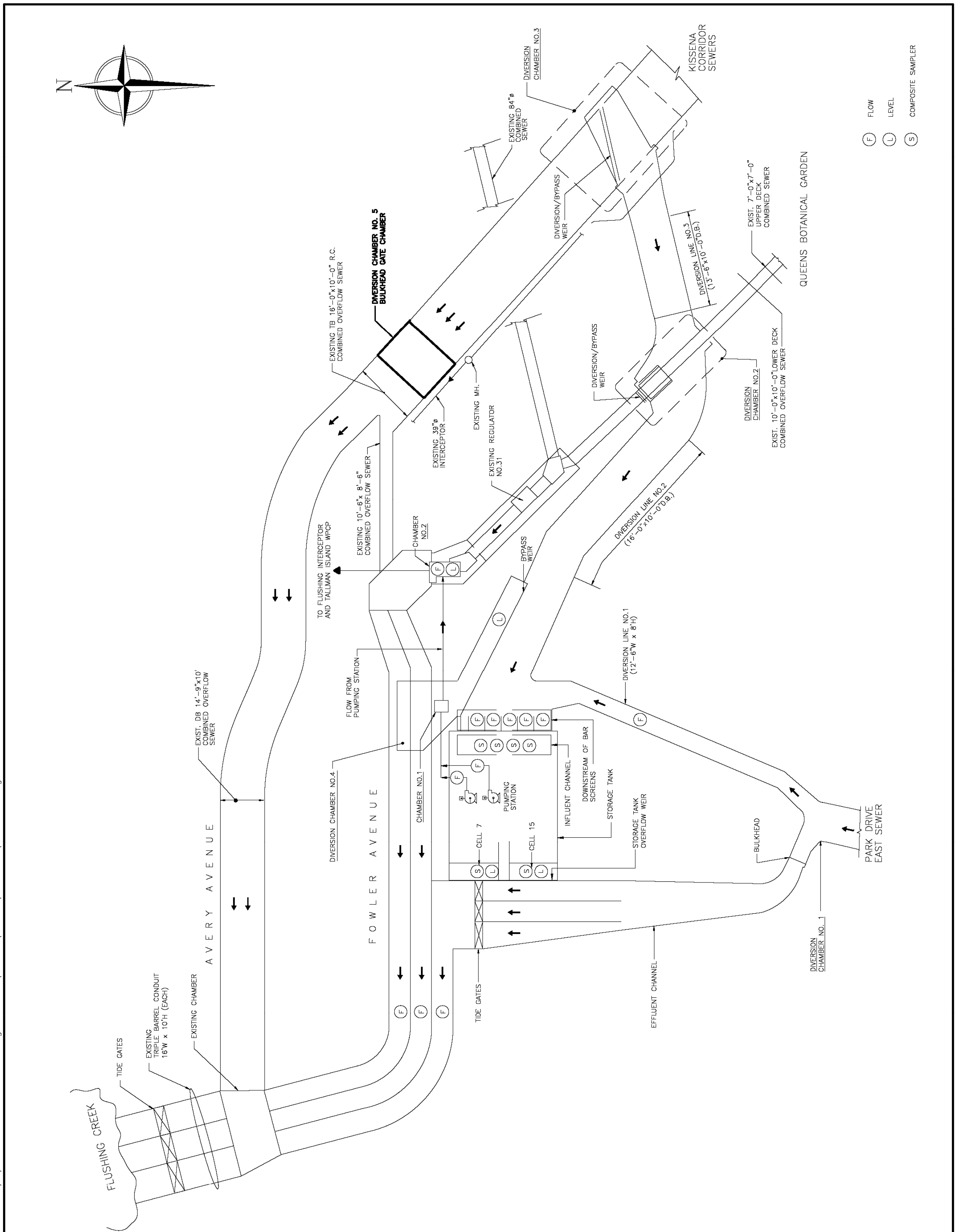
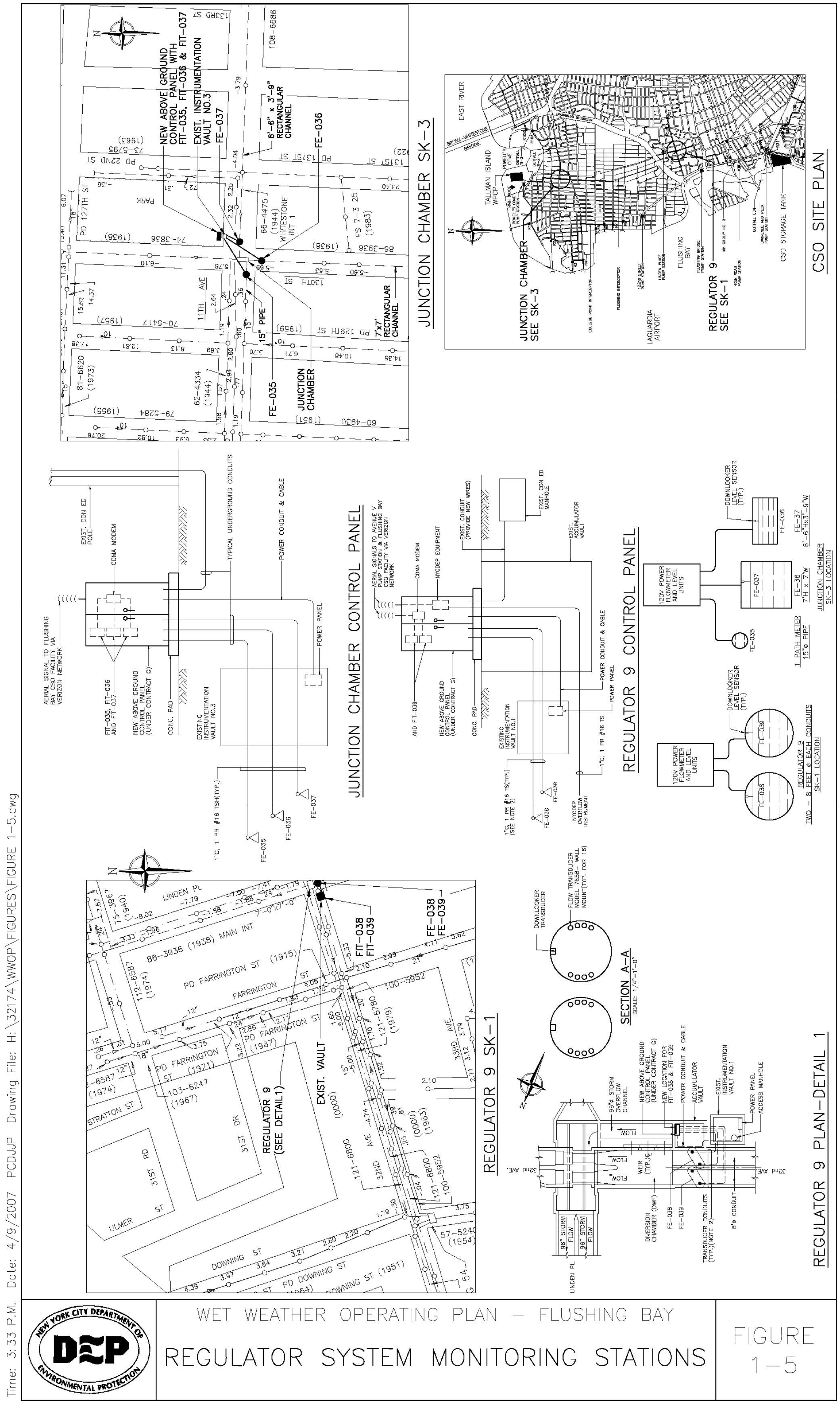


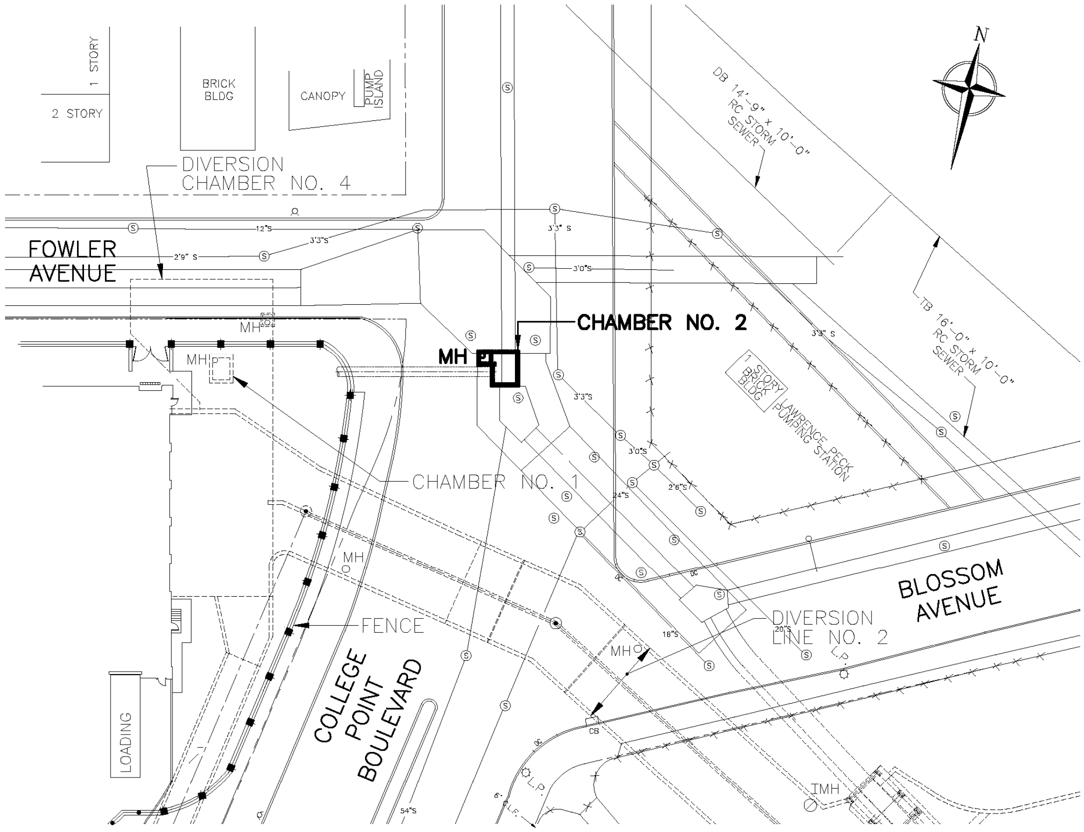
NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION — DEP

WET WEATHER OPERATING PLAN – FLUSHING BAY

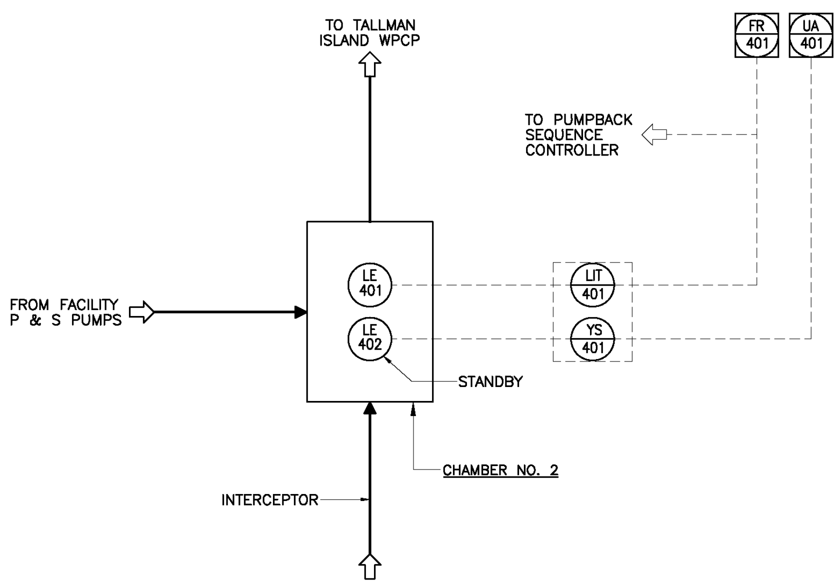
RETENTION FACILITY MONITORING STATIONS

FIGURE 1–4


Time: 3:33 P.M. Date: 4/9/2007 PCDJJP Drawing File: H:\32174\WWOP\FIGURES\FIGURE 1-5.dwg
JUNCTION CHAMBER SK-3
CSO SITE PLAN
JUNCTION CHAMBER CONTROL PANEL
REGULATOR 9 CONTROL PANEL
REGULATOR 9 SK-1
SECTION A-A
REGULATOR 9 PLAN-DETAIL 1
JUNCTION CHAMBER SEE SK-3
REGULATOR 9 SEE SK-1
LAGUARDIA AIRPORT
FLUSHING BAY
TALLMAN ISLAND WPCP
EAST RIVER
CSO STORAGE TANK
NEW ABOVE GROUND CONTROL PANEL WITH FIT-035, FIT-036 & FIT-037
EXIST. INSTRUMENTATION VAULT NO.3
FE-035
FE-036
FE-037
FE-038
FE-039
FIT-038
FIT-039
JUNCTION CHAMBER
15" PIPE
6'-6" x 3'-9" RECTANGULAR CHANNEL
7'x7' RECTANGULAR CHANNEL
REGULATOR 9 (SEE DETAIL1)
EXIST. VAULT
WET WEATHER OPERATING PLAN – FLUSHING BAY
REGULATOR SYSTEM MONITORING STATIONS
FIGURE 1–5
NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DEP



LOCATION PLAN



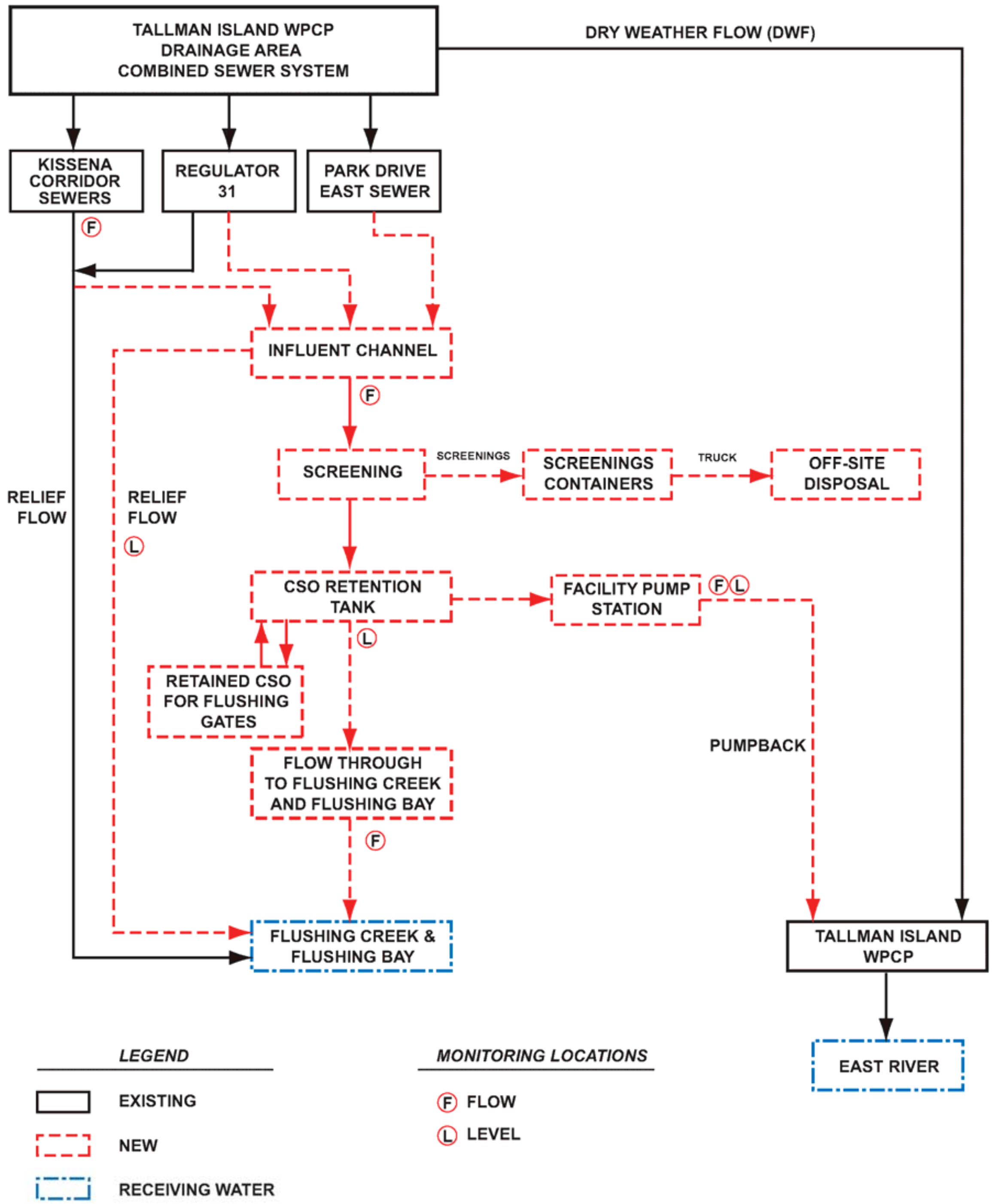
Time: 2:60 P.M. Date: 10/10/2007 joe_pizappi Drawing File: H:\32174\WWOP\FIGURES\1-6.dwg

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

WET WEATHER OPERATING PLAN – FLUSHING BAY

CHAMBER NO. 2
LOCATION PLAN AND LEVEL SENSORS
P & I DIAGRAM

FIGURE 1–6



WET WEATHER OPERATING PLAN - FLUSHING BAY
CSO RETENTION FACILITY SCHEMATIC FLOW DIAGRAM

FIGURE 1-7

In addition to the above logic, pumpback flow setpoint can be controlled through an available option in software by the rate of level change (increase) at Tallman Island Junction Chamber. If the rate of change of water surface elevation exceeds the predetermined amount, the setpoint will decrease inversely proportionally to the rate of change. If the level is still rising after reasonable time of expected correction (initial setting of the lag time is 30 minutes) the pumps will shut down. Pumps will automatically resume their operation when the water surface elevation in the junction chamber falls below the maximum allowed level.

The Pumpback is not limited to nighttime or to dry weather periods following rainfall and CSO capture. The intent is to pumpback the stored CSO whenever there is available capacity at the TI WPCP and also in the Flushing Interceptor at Chamber No. 2 and Regulator No. 9. The Pumpback can be faster if the capacity at the TI-WPCP increases beyond the present capacity 80 MGD providing that the flow rate does not exceed the maximum capacities at Chamber No. 2 (58 MGD) and Regulator No. 9 (65 MGD) as described above. The set point for the rate of pumping out the Facility is adjustable, and would likely be modified in the future based on operator experience, and actual operating conditions.

The facility was designed to be manned 24 hours a day. The pumpback normally occurs during the graveyard shift because this is when the diurnal low flow occurs. So whether the facility is in full automatic mode or in manual, personnel should be on site to run or monitor the equipment status.

A list of the systems/equipment of the Flushing Bay CSO Retention Facility is summarized as follows:

- Mechanically Cleaned Bar Screens, Belt Conveyors and Screenings Containers
- Primary Pumps with Variable Frequency Drives
- Secondary Pumps
- Flushing Water Pumps
- Seal Water System
- Sediment Flushing Gates and associated Hydraulic Power Pack and Control Panels
- Air Handling Units supplying air to the Screening Area, Storage Cells and Wet Wells
- Air Treatment System: Air Blowers, Scrubber Vessels, Recirculation Pumps and Controls and also Chemicals (Caustic and Hypo) and Chemical Feed Pumps

1.2 PERFORMANCE GOALS FOR WET WEATHER EVENTS

The primary goal of the Flushing Bay CSO Retention Facilities is to reduce the frequency and volume of CSOs through Outfall TI-010 into Flushing Bay. With this, the quality of the receiving waters will ultimately be improved by increasing dissolved oxygen (DO) levels, decreasing coliform levels, and decreasing discharges of floatables and settleable solids.

The new influent channels, in-line storage and the CSO storage tank that comprise the Flushing Bay CSO Retention Facility will provide the following pollution control functions:

- CSO Retention Tank with 28.4 MG of storage capacity.
- In-line CSO storage of up to 15 MG in the combined sewers and influent channels upstream of the retention tank.
- Full capture of storm events up to 43.4 MG with subsequent pumping (pumpback) of the retained CSOs to the Flushing Interceptor after storms for conveyance to the TI WPCP where it will be treated.
- Screening of debris and floatables from all CSO passing through the Facility.
- Cleaning of the tank after each storm upon the completion of pumpback operations. Stored combined sewage will be used for this purpose.
- Multiple overflow paths consisting of retention tank overflow weirs, and an influent channel side overflow relief weir to convey peak storm flows of about 1,400 million gallons per day (MGD) through the CSO storage tank (for a 10-month storm; tank empty at onset of storm), and bypass about 590 MGD to Outfall TI-010 (for a 10-month storm; tank empty at onset of storm).

The CSO storage Facility will provide 100 percent capture of combined sewage generated by approximately 90 percent of the storms that occur on an annual basis in the Outfall CS-4 drainage area. Receiving water computer modeling projections indicate that the overall volume of CSOs discharged to Flushing Bay will be reduced; total suspended solids (TSS) loading will be reduced by 77 percent; and the biochemical oxygen demand (BOD) loading will be reduced by 73 percent. In addition, the amount of floatables and settleable solids discharged into Flushing Bay will decrease.

1.3 PURPOSE OF THIS MANUAL

The purpose of this manual is to provide a set of operations the Flushing Bay CSO Retention Facility will undergo in order to best meet the performance goals stated in Section 1.2 and the requirements of the New York SPDES discharge permit. Each storm event produces a unique combination of flow patterns and conditions. No manual can describe every action the Facility will have during every possible wet weather scenario. This manual can, however, serve as a useful reference which both new and experienced operators can utilize during wet weather events, and in preparing for wet weather events.

1.4 USING THE MANUAL

This manual is designed to allow use as a reference during wet weather events, and is meant to supplement the Facility operation and maintenance manual with which operating personnel should be familiar. This manual is broken down into sections that cover operation of the Flushing Bay CSO Retention Facility. The following information is included:

- Facility operations that will occur before, during and after a wet weather event;
- Discussion of why these operations occur;
- Identification of specific circumstances that trigger the recommended changes; and
- Identification of things that can go wrong with the equipment

This manual is a living document. Users of the manual are encouraged to identify new steps, procedures, and recommendations to further the objectives of the manual. Modifications, which improve upon the manuals procedures, are encouraged. With continued input from the Facility's operations staff, this manual will become a useful and effective tool.

2. UNIT PROCESS OPERATIONS

This section presents equipment summaries and wet weather operating protocols for each major unit operation of the Flushing Bay CSO Retention Facility. The protocols are divided into steps to be followed before, during and after a wet wea ther event. The protocols also address the basis for the protocol, events or observations that trigger the protocol and a discussion of what can go wrong. The following information and protocols apply to proposed unit processes.

2.1 BULKHEAD CHAMBER AND DIVERSION CHAMBERS

Diversion chambers are provided to divert the CSO flow from the CSO lines to the Facility influent structures. Park Drive East CSO line flow is entirely diverted into the Facility through the Diversion Chamber No. 1. Chamber No. 2, on the Kissena Corridor double deck sewer, diverts the flow from the lower deck (10' x 10') CSO line into the Facility. A 7' high weir is constructed across the CSO line. Diversion Chamber No. 3 which is located on the Kissena Corridor Triple Barrel (16' x 10' each barrel) CSO line, diverts the CSO flow into the Facility. A bulkhead chamber is constructed downstream of the Diversion Chamber No. 3. The Bulkhead Chamber (Chamber No. 5) as illustrated in Figure 2-1, includes slide gates (16' x 7') installed in each channel which divert the CSO flow through the Diversion Chamber No. 3.

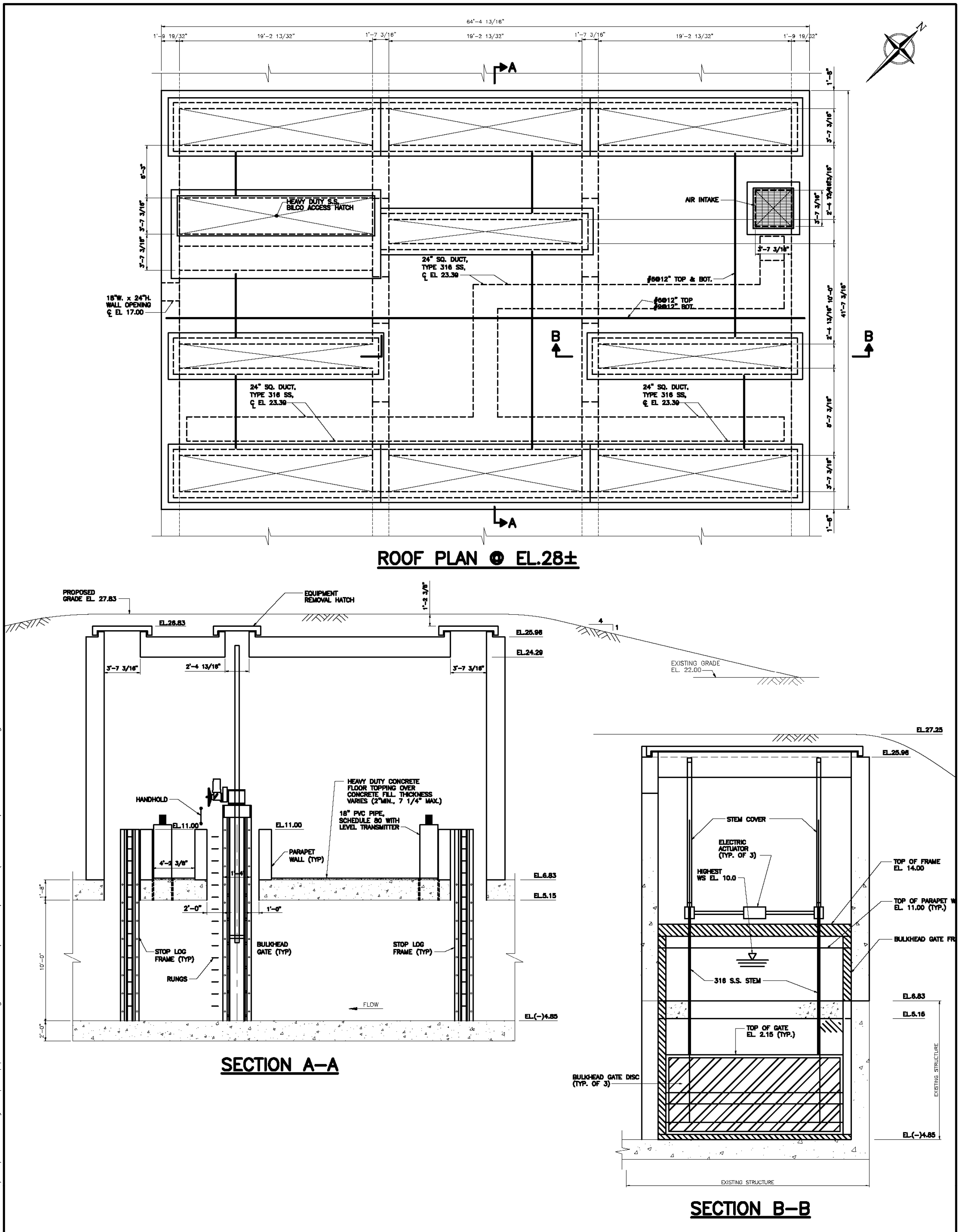
Before Wet Weather Event

1. Dry weather conditions (Infiltration and Inflow) are not expected to produce high volume of flow. Dry weather flow is diverted to the Facility by means of weirs and slide gates constructed across the CSO lines.

During Wet Weather Event

1. Diversion Chamber No. 1 (Park Drive East CSO lines). The entire CSO flow is diverted to the Facility

2. Diversion Chamber No. 2 (Kissena Corridor: Lower Deck and Double Deck storm sewers). A 7' high weir constructed across the CSO line of the Lower Deck, diverts the flow to the Facility. During the storm event, the CSO flow is diverted to the Facility. In case the water surface level exceeds the 7' height of the weir the CSO overflows to the outfall TI-010.



Time: 2:25 P.M. Date: 10/10/2007 joe_pizappi Drawing File: H:\32174\WWOP\FIGURES\FIGURE 2-1.dwg

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION — DEP

WET WEATHER OPERATING PLAN – FLUSHING BAY

BULKHEAD CHAMBER NO. 5
ROOF PLAN AND SECTIONS

FIGURE 2-1

3. Bulkhead Chamber. The triple barrel is equipped with a 7' high slide gate across each CSO line. During a storm event, the CSO flow is diverted through the Diversion Chamber No. 3 to the Facility. In case the water surface level exceeds the 7' height of the slide gate, CSO overflows to the outfall TI-010. In case the water surface level in the Flushing Bay and in the Bulkhead Chamber exceeds the set point of EL. 7.00±, the slide gates will open up automatically to provide unobstructed flow through the CSO lines and a signal will be sent to the control room indicating the position of the gates.

After Wet Weather Event

1. Check for any debris formation effecting the operation of the slide gates

2. Report any failures of the gates

Why do we do this?

1. Divert the CSO flow into the Facility

2. The slide gates in the CSO lines open to eliminate the potential of the flooding in the upstream sewer lines along the Kissena Corridor.

What can go wrong?

1. If, during a storm event, the water level rises in the Bulkhead Chamber and the gates do not open, an alarm will be transmitted to the Control Room prompting the operator to open the gates manually.

2.2 SLUICE GATES AND MECHANICAL BAR SCREENS

The Screening Area of the Flushing Bay CSO Retention Facility has been provided to remove and collect for disposal floatables, large solids and trash such as wood, rocks and other bulky debris that would adversely affect the operation and maintenance of the storage tank and downstream equipment, particularly pumps.

Unit Process	Screening Area Equipment
Screening	Five (5) Influent Sluice Gates; Five (5) Mechanical Bar Screens; One (1) Collecting Belt Conveyor; One (1) Reversing Belt Conveyor; Ten (10) 1–CY Self–Dumping Containers; Two (2) 30–CY Roll–off Containers; Influent level and flow measuring devices; Gas Detection Equipment; Four (4) Influent Channel Sluice Gates

Before Wet Weather Event

1. Dry weather flows (infiltration and inflow) are not expected to be great enough to initiate the operation of the screens when they are in the automatic operating sequence. However, the removal of solids and debris that may build up on the screens as a result of dry weather flow may be necessary. Therefore, a control strategy shall be provided to allow the periodic EXERCISE operation of the screens during dry weather.

2. This feature will ensure that the mechanical bar screens remain well lubricated and do not "freeze up" after extended periods of dry weather and inactivity. The control strategy for the bar screens shall initiate the EXERCISE routine based on the "elapsed off-timer." The "elapsed off–timer" will start whenever a bar screen is in the automatic operation sequence and the water surface elevation in the Influent Channel is insufficient to initiate operation of the screens.

3. The "elapsed off–timer" will start the bar screens at a set interval and run them for a set duration. The time interval shall be soft-programmed and therefore be operator selectable. The time interval and run duration will be set based on operating experience and judgment. The "elapsed off–timer" shall reset to zero when a bar screen starts. When set up in this fashion, the screen shall not operate unnecessarily. The EXERCISE feature will operate in either the "TIMER" or "CONTINUOUS" sequence of the automatic operation setting. The exercise program will automatically start cross conveyor 1812–00 which will start

longitudinal conveyor 1806–00 which will in turn start the bar screens (Refer to DWG G401 in Appendix A).

4. Under normal operations the mechanical bar screens should be in service.

5. Rotate screen operation to ensure that all screens are in working order.

6. Make sure empty screenings containers are available.

7. During normal operating conditions and provided that there is power to the operator and explosive gases are not present in concentrations above the lower explosive limit (LEL), the control strategy will automatically maintain all the sluice gates in a fully open position at all times to accept incoming flow.

8. Influent Channel No.1 & No.1 Sluice Gates are capable of manual positioning from 0-100% of full open position. Manual gate positioning is required to enhance the flow distribution to the selected cells. Manual positioning will be available from local control station or from the control room SCADA (Refer to DWG G401 in Appendix A).

During Wet Weather Event

1. When the water surface elevation in the channel rises to EL. -4.60 (4.0 ft. channel depth), the belt conveyors and bar screens will start. The equipment will continue to run until the water surface elevation falls to EL. -5.60. At EL. -5.60, the bar screens will stop and the belt conveyors will continue to operate for a set time duration (0–30 min.) and then stop.

2. If the water surface elevation in the channel rises to EL. 6.00, an emergency high level shutdown will occur. At EL. 6.00, the bar screens will stop and the conveyors will continue to operate for a set time duration (0–30 min.) and then stop.

3. When the level falls to EL. 4.00, the conveyors and bar screens will be restarted by the PLC–BS logic control in the CP–BS. If the level rises back up to EL. 6.00, this shutdown cycle will be repeated. When the level falls to EL. -5.60, the bar screens will stop and the belt conveyors will continue to operate for a set time duration (0–30 min.) and then stop.

4. The belt conveyors are interlocked with the bar screens when operated in the "Automatic" mode. In the "Automatic" mode, the conveyors will start at a set water surface elevation in any screening channel. A level sensor will automatically start cross conveyor No. 1812–00 which will start longitudinal conveyor No. 1806–00 which in turn will start the bar screens (Refer to DWG G401 in Appendix A).

After Wet Weather Event

1. Remove screenings for disposal.

2. Repair any failures.

Why Do We Do This?

1. Preventative maintenance on the bar screens will increase the efficiency of the mechanical bar screens by minimizing the floatables discharging into Flushing Creel through Outfall TI-010.

What Can Go Wrong?

In the event of extreme high-flow events, or the failure of equipment that would lead to high water surface levels, such as the blinding of the mechanically cleaned bar screens, the Flushing Bay CSO Retention Facility is designed to passively bypass excess flows over fixed diversion/bypass weirs, and discharge into Flushing Bay. Specific failure possibilities are outlined below:

1. In the event that either belt conveyor fails or shuts down, all bar screens operating in the automatic position will also shut down. The bar screens will restart automatically after the belt conveyors are repaired, operational and running.

2. When it is planned to start the screens during the failure or stoppage of either of the belt conveyors, the Facility Operators should first position the bypass plates on the bar screens so that collected screenings are deposited into the one cubic yard containers, and then start the bar screens manually in the "HAND" position remotely or locally.

3. If the belt conveyors are not operational, then the bar screens can be operated in the automatic position in whichever sequence, "CONTINUOUS" or "TIMER" has been selected provided that the "Belt Conveyors"/"Bypass Chute" selector switch is in the "Bypass Chute" position. The "Belt Conveyors"/"Bypass Chute" selector switch is located in the CP–BS panel

4. The alarm status of the following conditions will be displayed on the CP–BS and OICS. A common malfunction alarm light is also provided on the LCS. The bar screen will shut down and alarm if any of the following conditions exist:

    a. Torque overflow (torque retreat)

    b. Thermal overload

    c. High brake temperature

    d. High Influent level condition (EL. 6.00)

e. Either of the two belt conveyors failed and "Belt Conveyors"/"Bypass Chute" selector switch is not in the "Bypass Chute" position

5. When the safety pull cord is pulled, the belt conveyors and all bar screens will immediately shut down. In order to be restarted, the reset at the LCS must be manually initiated

6. Each belt conveyor is provided with a zero speed switch. Should the zero speed switch indicate the loss of motion to either of the belt conveyors beyond the starting time delay setting, the belt conveyors and bar screens will immediately shut down. In order to be restarted, the reset at the LCS must be manually initiated.

7. Each conveyor is provided with motor overload protection. Should a motor overload condition occur, the belt conveyors and bar screens will immediately shut down. In order to be restarted, the reset at Motor Control Center (MCC) and at the LCS must be manually initiated. Alarm status of the following conditions will be displayed on CP–BS and OICS. A common malfunction alarm light is also provided on the LCS. The belt conveyor will shutdown and alarm if any of the following conditions exist:

   a. Safety pull cord activation

   b. Belt Zero speed switch activation

   c. Motor overload

   d. High Influent level condition (EL. 6.00)

8. If explosive gases are detected in concentrations above the lower explosive limit (LEL), the control strategy will automatically close all influent sluice gates, regardless of the selected mode(s).

9. If a sluice gate local/remote selector switch is left in Local Mode (maintenance position) and is not fully open, the control strategy will initiate an alarm "INFLUENT SLUICE GATE NO. # is not in auto mode" after a time interval (initially set to 60 minutes).

10. If two or more gates are partially or fully closed and the control strategy is unable to automatically raise the gates after the selected time interval, then an alarm condition will be indicated, "More than one gate disabled" on the CP–BS and OICS.

2.3 CSO PUMPING

Unit Process	Screening Area Equipment
Pumping	**PRIMARY PUMPS** Four (4) Primary Pumps and Motors. Capacity: 6,500 – 15,500 gpm each One (1) Primary Pump with motor (spare pump) Four (4) Variable Frequency Drives **SECONDARY PUMPS** Two (2) secondary pumps with motors. Capacity: 875 gpm each One (1) secondary pump with motor (spare pump).

Before Wet Weather Event

1. Pumps are generally cycled to ensure all available pumps are in working order.
2. Check that the wet well monitors are functional.

During Wet Weather Event

1. Continue to cycle pumps to ensure that all available pumps are in working order.
2. Check that the wet well monitors are functional.
3. Monitor water level in the CSO lines.

After Wet Weather Event

1. Tank cells are drained to the primary wet well by the opening of motor operated valves.

2. The Facility Control System monitors the available treatment capacity at the TI WPCP. The actual pumping rate set point is the lowest of three calculated values up to a maximum of 32 MGD. The pumping rate set point is operator-adjustable, and may be changed in the future based on operating experience and future conditions. These three calculated values are dependent on the measured TI WPCP influent flow, available capacity at the Chamber No. 2, and the available capacity at the Tallman Island Regulator No. 9.

3. The primary wet well level will be monitored by an "open diaphragm type" level indicating transmitter LIT–403 (Refer to DWG G403 in Appendix A). Signals from this level transmitter will be used by the PLC–PS to perform the following tasks and logic:

   a. Indicate and record the wet well water surface elevation through the Facility Distributed Control System.

   b. STOP the primary pumping operation when the wet well water surface elevation falls below EL. -35.50.

   c. Enable the primary pumping operation and activate the permissive when the wet well water surface elevation rises to EL.-34.50.

4. The secondary wet well water surface elevation will be monitored by an "open diaphragm type" level indicating transmitter LIT–503 (Refer to DWG G403 in Appendix A). The signal from this level transmitter will be used by PLC–PS to perform the following tasks and logic:

   a. Indicate and record the wet well water surface elevation throughout the Facility control system.

   b. STOP the secondary pumping operation when the wet well level falls below EL. -45.50.

   c. START the secondary pumps when the wet well water surface elevation rises to EL. -44.00.

   d. STOP the secondary pumps when the wet well water surface elevation rises above EL. -33.00.

5. The sensing element of the transmitter will be installed on the west wall of the primary pumps dry well at EL. -48.00. The sensing element (diaphragm) is equipped with a flushing connection which will be activated automatically once every 24 hours for the duration of 3 minutes. This flushing sequence prevents clogging of the area surrounding the diaphragm.

Why do we do this?

1. The pumping operation after wet weather events maintains a safe water level in the pumping station wet wells and prevents dry-weather overflows. This flushing sequence prevents the Facility from flooding.

What triggers the change?

1. The pumping rates and set point trigger the pumpback operation. Pumping rate set points are driven by the measured TI WPCP influent flow, available capacity at the Chamber No. 2, and the available capacity at the Tallman Island Regulator No. 9.

What can go wrong?

1. An alarm will activate if “NO FLOW THROUGH” conditions exist when the transmitter flushing sequence is activated.

2. The maximum water surface elevation in the Facility is EL. 10.00. If the output of the transmitter falls below 4 mA DC (milliampere), then an alarm "Loss of Signal" will be activated.

2.3.1 Primary Pumps

The Primary Pumps are each operated from dedicated Local Control Stations (LCS) adjacent to the pumps. The pumps are controlled and monitored by PLC–PS. The operating control logic and interlocks strategy will be part of PLC–PS program. The Facility SCADA system will provide supervisory control, data monitoring, alarming and reporting (Refer to DWG G403 in Appendix A). The primary pumps each have a capacity of 11,000 gpm at their rating point, are 215 hp, and have variable frequency drive.

Before Wet Weather Event

1. To operate the primary pumps automatically:

    a. Set the Local/Remote selector switch on LCS to the "REMOTE" position.

    b. Set the HAND/OFF/AUTO (HOA) selector switches for all available pumps to the "AUTO" position.

    c. Set the HAND/OFF/AUTO (HOA) selector switches for all available cone valves to "AUTO" position.

d. Select desired "LEAD/LAG/2ND–LAG/STANDBY" configuration by rotating the 6–position "SEQUENCE" selector switch on the front of the panel.

During Wet Weather Event

1. Make sure primary pumps are being operated in automatic mode.

After Wet Weather Event

1. The selected LEAD pump will start provided that all of the following conditions are met:

   a. Wet well level at, or above EL. -34.50

   b. Intake isolation valve is fully open

   c. Discharge isolation valve is fully open

   d. Discharge cone valve is in "AUTO" position and is fully closed

   e. Local/Remote selector switch at LCS in "R" position

   f. Resulting flow set point is at least FIVE (5) MGD

   g. No Alarm conditions exist

   h. Neither secondary pump is in use

2. When the LEAD pump has started, its speed will be automatically controlled by PLCs Proportional Integral (PI) flow controller.

3. If the LEAD pump is at the maximum allowed speed, and flow demand (set point) cannot be met, then the first LAG pump will start. The PI (Proportional Integral) controller will vary the LAG pump speed while the LEAD pump is at its maximum allowed speed. The LAG pump will run at least 50%.

4. If LEAD and LAG pumps are at the maximum allowed speed, and flow demand (set point) cannot be met, then a second LAG pump will start. The PI controller will vary the second LAG pump speed, while maintaining the LEAD and the first LAG pumps at the maximum allowed speed. The second LAG pump will run at least 50% speed.

5. Decrease in the flow demand will cause the output of the PI controller to adjust (lower) the speed of the last pump started. When the LEAD, first LAG and second LAG pumps are running, and the second LAG pump speed drops to 50% (minimum), if the pumped flow is greater than the set point, then the second LAG pump will stop.

6. When the LEAD and first LAG pumps are running, and the speed of both pumps drops to 50% (minimum), if the pumped flow is greater then the set point, then the first LAG pump will stop.

7. When the LEAD pump is running and the pump speed is 50% (minimum), and the pumped flow is greater then the set point, then the LEAD pump will stop.

8. The PLC program will allow for adjustable time delays prior to executing the above conditions. The time delay will be operator selectable and will be determined during start up (initial setting is 120 seconds).

Why do we do this?

1. The pumping operation after wet weather events maintains a safe water level in the pumping station wet wells and prevent dry-weather overflows. This flushing sequence prevents the Facility from flooding.

What triggers the change?

1. The pumping rate and set points trigger the pumpback operation. Pumping rate set points are driven by the measured TI WPCP influent flow, available capacity at the Chamber No. 2, and the available capacity at the Tallman Island Regulator No. 9.

What can go wrong?

1. If during normal operation any pump fails, then the STANDBY pump will automatically start in place of the failed pump.

2.3.2 Secondary Pumps

The Secondary Pumps are operated from dedicated Local Control Stations (LCS) adjacent to the pumps. The pumps will be controlled and monitored by PLC–PS. The operating control logic and interlocks strategy will be part of PLC–PS program. The Facility SCADA system will provide supervisory control, data monitoring, alarming and reporting (Refer to DWG G403 in Appendix A). The secondary pumps each have a capacity of 875 gpm at their rating point, and are 30 hp

Before Wet Weather Event

1. To operate secondary pumps automatically:

    a. Set the Local/Remote selector switch on the LCS to the "REMOTE" position.

    b. Set the HAND/OFF/AUTO (HOA) selector switches for both cone valves to the "AUTO" position.

c. Set the Local/Remote selector switch for both intake and discharge valves to the "REMOTE" position (these valves will be normally open).

d. Set the HAND/OFF/AUTO (HOA) selector switches for both pumps to the "AUTO" position.

During Wet Weather Event

1. Check that secondary pumps are set to automatic.

After Wet Weather Event

1. When in "AUTO", the control logic will automatically alternate the Lead/Standby pump assignment. The Lead function will be assigned to the pump which has less runtime. Logic will compare the runtime values only when both pump "HOA" selector switches are set to the "AUTO" position; or one pump "HOA" switch is set to the "AUTO" position for time longer then 30 seconds (operator selectable).

2. The Lead pump will start provided that the following conditions are met:

   a. Secondary wet well level at, or above EL. -44.00

   b. Secondary wet well level not above EL. -32.50

   c. Secondary wet well level not below EL. -45.70

   d. No Primary pump in service

   e. Intake isolation valve is fully open

   f. Discharge isolation valve is fully open

   g. Discharge cone valve is in "AUTO" position and is fully closed

   h. Local/Remote selector switch at LCS in "R" position

   i. No Alarm conditions exist

3. The Lead or Standby pump will stop automatically if any of the following conditions exist:

   a. Secondary wet well level falls below EL. -45.70

   b. Secondary wet well level rises above EL.-33.00

   c. Any Primary pump starts (in any mode)

   d. Cone Valve malfunction

e. Isolation valves are not open

f. Pump malfunction

4. The PLC program will allow for adjustable time delays prior to executing the above conditions. The time delay, operator selectable, is determined during start up (initial setting is 30 seconds).

Why do we do this?

1. The pumping operation after wet weather events maintains a safe water level in the pumping station wet wells. This flushing sequence prevents the Facility from flooding.

What triggers the change?

1. The pumping rates and set point trigger the pumpback operation. Pumping rate set points are driven by the measured TI WPCP influent flow, available capacity at the Flushing Interceptor, and the available capacity at the Tallman Island Regulator No. 9.

What can go wrong?

1. If during normal operation any pump fails, then the STANDBY pump will automatically start in place of the failed pump. The standby pump will start immediately upon failure of the Lead pump.

2.4 FLUSHING WATER SYSTEM

Unit Process Components	Equipment
Sediment Flushing Gates (HFG System)	a. Three (3) sediment flushing gates also called Hydroself Flushing Gates complete with anchoring systems for each storage cell, a total of forty-two (42) gates. b. Eight (8) hydraulic power packs complete with junction box, solenoid valves, pumps, reservoir, motors, control panel(s), etc. c. Three (3) flushwater storage area adjustment pipes for each storage cell, a total of forty-two (42) pipes. d. All necessary hydraulic tubing, the conduits for tubing, the conduit anchors. e. Eight (8) (minimum) Local Control Panels. f. Three (3) level sensors including cable up to Hydraulic Power Rack Control Panel for each storage cell or a total of forty-two (42) sensors.
Sediment Flushing Buckets (SFT System)	Three (3) Sediment Flushing Bucket systems in Storage Cell No. 2.
Flushing Water Feed System	a. Water Storage Tank b. Flushing water feed pumps c. Valves d. Flow measurement e. Local control panel

How does it work?

1. A Flushing Water System has been provided to wash down the storage cell(s). Storage cells are flushed with an application of Hydroself Flushing Gate System after a storage cell has been drained. Settled solids on the tank cell floor will be carried to drain. Stored combined sewage from one of the last cells filled or any selected cell(s) will be stored and used as wash down water to clean all of the other cell(s). Each cell can be drained and washed down independently of any of the other cells.

2. The Flushing Water Feed System will pump the stored water from the Flushing Water Storage Tank into Hydroself Flushing System (HFG) storage reservoir as required. Cell No. 2 is washed using the Sediment Flushing Bucket (SFT) system. The flushing Water Feed Pumps pump water stored in the Flushing Water Storage Tank to the storage cell cleaning system (Refer to DWG G405 & G406 in Appendix A).

Why do we do this?

1. Following each rainfall event, combined sewage stored in the storage cells will be drained into the wet well and pumped to the Flushing Interceptor. This is done in order to keep the tank storage cells clean and free from solids deposition, and to minimize the potential for odors.

What triggers the change?

1. Storage Cell Level, Flushing Water Storage Tank Level, Flushing Water Feed Header Pressure and Flow are the main parameters that activate the control logic for the system to operate.

Before Wet Weather Event

1. The Flushing Water System main function is to drain the combined sewage stored in the storage cells therefore before a wet weather event the system should be ready to store CSO and cells should have been emptied after the previous wet weather event.

2. Make sure all the indicators and recorders are operational.

During Wet Weather Event

1. During a wet weather event, the cells should be filling and the flushing water system must be set to start operation after the wet weather event

2. Make sure all instruments are operational.

After Wet Weather Event

Storage Cell Level Measurement (Refer to DWG G402 in Appendix A):

1. Each cell is monitored by an "open diaphragm type" Level Indicating Transmitter (LIT). The signal from the level transmitter will be used by PLC–FS, which is located in the Flushing System Control Panel. The PLC–FS will be programmed to perform the following tasks and logic:

   a. Indicate and record cell levels throughout the Facility distributed control system.

   b. Enable the flushing water supply pumping operation and activate the permissive in the last cell identified to have a water surface elevation of at least EL.-5.00. (Pumping control strategy is explained below in section "Flushing Water Supply Pump Control").

   c. STOP the flushing water supply pumping operation when the water surface level of the selected cell falls below EL.-10.50.

Flushing Water Storage Tank Level Measurement (Refer to DWG G402 in Appendix A):

1. The Flushing Water Storage Tank (FWST) stores combined sewage that has been gravity fed from a selected cell. Stored water will be used to automatically clean cells in the sequence described below. The FWST level is monitored by an "open diaphragm type" Level Indicating Transmitter (LIT). The signal from the level transmitter is used by PLC–FS, which is located in the Flushing System Control Panel. The PLC–FS performs the following tasks and logic:

   a. Indicates and records the FWST level throughout the Facility distributed control system.

   b. Alarm when the water surface level is below EL. -23.00, or rises above EL. -13.00.

   c. Controls the operation of the alternate (City Water) supply in case of emergencies. A motor operated valve on the City water supply line will respond (Open or Close) to tank level demand. The valve will enable its manual operation when the tank water surface level falls below EL. -18.00, and close (if was opened) when the level rises above EL. -14.00.

Flushing Water Feed Header Pressure and Flow Measurement (Refer to DWG G406 in Appendix A):

1. A Pressure Indicating Transmitter PIT–300 will be provided and installed on the flushing feed header.

2. The signal from the transmitter will be used by the single loop Pressure Indicating Controller PIC–300 as a process variable (PV). The output of the PIC will vary the speed of the Flushing Water Feed Pumps during the cell washing sequence. The PIC default set point will be initially set to 65 psig. The derivative portion of the controller will be turned off. The set point may be adjusted (supervisory control though SCADA) to meet required pressure and flow based on various field conditions.

3. The PLC logic will maintain the pressure set point (SP) for Flushing Water Feed Pumps(s).

What Can Go Wrong?

1. The sensing element of the transmitter is installed on one of the cell drain lines in the operating gallery at EL. -20.00. The maximum Facility water surface is EL. 10.00, therefore the maximum static pressure that the diaphragm will sense is 30 feet. Programable Logic Controler (PLC) will alarm the loss of signal when the output of the transmitter falls below 4 mA DC.

2. The sensing element of the transmitter is installed on the west wall of the storage tank at EL. -27.50, as shown on the Contract Drawings. The tank overflows into the Wet Well, when the water surface level reaches EL. 7.00. The maximum static pressure that the diaphragm will sense is 35 feet. The PLC will alarm the loss of signal, when the output of the transmitter falls below 4 mA DC.

3. Flushing water feed flow will be measured by a flow meter (FIT–301), installed on the discharge of the flushing water feed pumps. Initiate an alarm if flow during the pumping rises above 90% of flowmeter capacity AND the header pressure falls below 10%. This situation may indicate major leakage and therefore flushing water feed pumps will be stopped. Initiate alarm "FLUSHING WATER FEED SYSTEM LEAKAGE"

2.4.1 Flushing Water Feed System

How Does it Work?

1. The Flushing Water Feed Pumps are operated from dedicated Local Control Stations (LCS) adjacent to the pumps. The pumps will be controlled and

monitored by PLC–FS. The operating control logic and interlocks strategy will be part of PLC–FS program. The Facility SCADA system will provide supervisory control, data monitoring, alarming and reporting.

Before Wet Weather Event

1. Make sure that flow meter (FIT) is working properly (Refer to DWG G405 in Appendix A).

2. Make sure Flushing Water Feed Pumps are operational.

During Wet Weather Event

1. Make sure that flow meter (FIT-301) is working properly (Refer to DWG G406 in Appendix A).

2. Make sure Flushing Water Feed Pumps are operational.

After Wet Weather Event

1. Flushing water feed flow is measured by a flow meter (FIT–301), installed on the discharge of the flushing water feed pumps (Refer to DWG G406 in Appendix A).

2. To operate the Flushing Water Feed Pumps automatically:

    a. Set the Local/Remote selector switch on LCS to the "REMOTE" position.

    b. Set the Local/Remote selector switch for both intake valves to the "REMOTE" position.

    c. Set the HAND/OFF/AUTO (HOA) selector switches for cell selection to the "AUTO" position.

    d. Switch the Pressure Indicating Controller (PIC–300) to Auto Mode, so that the Pressure Set Point will be generated based on the actual header condition.

    e. Set the HAND/OFF/AUTO (HOA) selector switches for every available pump to the "AUTO" position

3. There are three pumps Lead, Lag and Standby. When in "AUTO", the control logic will automatically alternate the initial Lead/Lag/Standby pump assignment. The Lead function will be assigned to the pump which has less runtime. Logic will compare the runtime values only when all pumps are OFF. The standby pump starts immediately upon failure of either Lead or Lag pump.

4. The Lead pump starts automatically provided that all of the following conditions are met:

a. "Pumpback" sequence is initiated

b. Cell has completely drained as measured by Cell level transmitter.

c. Flushing storage tank level above EL. -14.00

d. Cell selector HOA switch is in "AUTO" position

e. Selected Cell valve is fully open

f. Pump intake isolation valve is fully open

g. HFG is closed and level behind the gate is low.

h. No Alarm conditions exist

5. The pump speed is controlled by Pressure Indicating Controller PIC–300. This Proportional Integral (PI) controller will maintain the speed of the pump(s) to maintain the pressure in the flushing feed header 60 PSIG.

6. Start the Lag pump if the Lead pump is at maximum speed for longer then 30 seconds, and the header pressure is still below the set point. At this time both pumps will share the load and operate at the same expected speed. However, if both pumps ramped to 100% speed and the pressure set point could not be reached, or flow is above expected within next 60 seconds both pumps will stop. This condition may have resulted from discharge pipe rupture.

7. If Lead and Lag pumps are sharing the load and the Set Point and flow is maintained within expected limits, stop the Lag pump if both pumps ramped their speed down below 1300 RPM.

8. The lead pump stops automatically when:

a. Cell flushing sequence is competed (Operator selectable time duration)

b. Cell has completely drained as measured by Cell level transmitter.

c. Flushing storage tank level below EL. -18.00

d. Selected Cell valve is not fully open

e. Pump intake isolation valve is not fully open

f. Any alarm conditions exist.

9. Upon completion of the Cell flushing cycle (Operator selectable time duration) the PLC program will stop Flushing Water Feed Pump(s), close both drain valves and initiate flushing sequence for next available Cell.

10. The facility personnel shall physically inspect the storage cells after each storm to assess the number of times the flushing sequence needs to be repeated to achieve satisfactory results. The data from various storm events shall be collected and analyzed to determine an average number of flushing cycles to use after a storm event. This will eliminate the need for inspection after each storm.

What Can Go Wrong?

1. An alarm will initiate if flow during the pumping rises above 90% of flowmeter capacity and the header pressure falls below 10%. This situation may indicate major leakage and therefore flushing water feed pumps will be stopped. Provide time delay (initial setting 60 sec.) for flow and pressure to stabilize.

2.4.2 Hydroself Flushing Gate System

After all of the tank cells are drained, and pumpback operations have been completed, tank flushing operations will begin.

Sediment flushing gates (HFG [Hydroself Flushing Gate] system) will be used to flush and clean settled solids and debris from the floor of storage cells. The system will use the volume of water captured during rainstorms to effectively flush each tank cell. The gates are designed, constructed and installed to completely clean cell floor with one flush when filled with five (5) feet of water above the bottom of the gate opening. In case the storage cell floor is not clean and additional flushing is required the storage reservoir can be filled by Flushing Water Feed Pumps.

The HFG Control Panel controls the operation of the three (3) flushing gates (typical for all cells except No.2). Each gate is equipped with its own hydraulic operator (integral part of the flushing gate). The gates will be flushed one at a time. Each gate will be furnished with a solenoid control valve. The solenoid valves will be attached to the manifold located on the top of the oil reservoir. The pump is also attached to the top of the oil reservoir. The reservoir, manifold, solenoids, pump and motor will be housed in their own enclosure, within the manually the Control Panel (Refer to DWG G404 & G406 in Appendix A)

Before Wet Weather Event

1. Make sure flushing gates are locked in the closed position

2. Make sure all instruments are operational.

During Wet Weather Event

1. During rainstorm the three flushing water storage areas (FWSAs) will fill, and the flushing gates will remain in the locked and closed position until all the water is drained from the Storage Cell. Once the Cell is drained, upon the initiation of a flushing sequence signal, the water stored in the FWSAs is sequentially released to flush each one of the three bays within the Storage Cell. This sequence will be adjustable so as to allow the drainage of the end sump between each flush. Once all the bays are flushed, the system will return to its initial state (all gates are Closed and hydraulic system is Off).

After Wet Weather Event

The operation of the system will be regulated based on signals received from three (3) Level switches, which are provided by HFG vendor.

1. The PLC logic will monitor, control and execute a round–robin wash cycle of the selected cells. When cell is called to be washed, the PLC will perform the following sequence:

    a. Verify that there are no other cells are being washed, and if not then

    b. Open both drain valves and verify that the cell is drained, as measured by the cell level transmitter.

    c. Verify that the three flushing storage areas are filled as measured by level transmitters. If the levels in the storage area(s) are not sufficient, then logic will open motor operated fill valve and fill the storage areas as necessary. The valve will close when the level reaches the desired value as registered by float switch.

    d. Activate hydraulic cylinder for the Gate, causing it to open and stay open for predetermined time and until the cell is completely drained.

    e. Activate hydraulic cylinder for the second gate, causing it to open and stay open for predetermined time and until the cell is completely drained.

    f. Activate hydraulic cylinder for the third Gate, causing it to open and stay open for predetermined time and until the cell is completely drained.

    g. Close drain valves and proceed with washing of the next scheduled cell.

What Can Go Wrong?

1. PLC and SCADA monitors the performance of the gates system, gate status, and alarms and display these parameters on SCADA screens. When alarm conditions

cause the cell wash cycle to halt, the logic will abort the wash of the current cell, re–schedule the wash, and proceed with washing of the next cell.

2.4.3 Sediment Flushing Bucket

How Does it Work?

1. Storage cell No. 2 is the only cell equipped with Sediment flushing buckets. The buckets have been provided to test this type of tank cleaning technology, and are operated on the principal of counterweight off-balance. When filled with water to a certain level bucket will flip and release the stored water into the cell bay. Buckets will operate operating one at a time.

After Wet Weather Event

1. During the rainstorm, the storage cell and buckets are filled with water. When the storage cell is emptied, and the water surface falls below the buckets, the buckets flip and release their water content. In order to refill the buckets and initiate the flushing sequence, water is supplied to the buckets by the SFT flushing water pumps at a rate of 100 gpm. The capacity of each flushing bucket is 1,000 gallons and there are three (3) buckets in storage cell No. 2.

2. The SFT flushing water pumps discharge to a common header which subsequently divides into three (3) discharge lines that supply water to the flushing buckets. Each discharge line is provided with a motor-operated valve. The flushing sequence is initiated by opening the valve and when the bucket is in the upright position. Water is supplied to one bucket at a time. A flowmeter installed at the common header measures the flow rate and will signal the motor-operated valve to close once the bucket receives 1,000 gallons. The bucket then tips, releasing its water and the flushing cycle is automatically repeated for the second bucket by opening the corresponding valve and finally for the third bucket after the flushing cycle of the second bucket is completed.

What Can Go Wrong?

1. If the SFT flushing water pump does not work the stand-by pump will start (DWG G405 in Appendix A). If the automatic mode is not functioning, the system will be operated in manual or "Alternate" mode. The alternate mode is described in detail in the Flushing Bay CSO O&M manual Chapter VIII, Section B-6. This mode of operation should be used for testing and maintenance. The SFT feed pumps operation is available from the local control station and from the valve local control stations.

2.5 AIR TREATMENT SYSTEMS

The Flushing Bay CSO Retention Facility is been provided with wet scrubber air treatment system to prevent any odors produced in the Facility from becoming a nuisance to either workers in the facility, or to the surrounding community. Possible odor sources within the facility include the influent channels, the screening area, the wet well, and the storage cells. The total ventilation required for these areas is approximately 180,000 cubic feet per minute (cfm). The air treatment system is designed to remove 99.9 percent of the incoming hydrogen sulfide in an air stream of 180,000 scfm with a maximum hydrogen sulfide concentration of 10 ppm

How does it work?

The unit process for the treatment of odorous air is known as chemical absorption. Air is washed or "scrubbed" by being brought into contact with a chemical scrubbing solution of water, sodium hydroxide (NaOH) and sodium hypochlorite (NaOCl). This contact is achieved by blowing the air upward through a scrubber vessel filled with a bed of plastic packing media. The chemical scrubbing solution is sprayed into the scrubber above the packing media and flows downward against the air flow in what is known as counter–current flow. The odorous compounds react with the scrubbing solution to create soluble non–odorous compounds. The treated air passes through a demister, and droplets and moisture are removed from the air stream before it is discharged to the atmosphere (Refer to DWG G409 in Appendix A).

Unit Process Components	Equipment
Air Treatment System (Chemical Absorption)	1. A total of four (4) scrubbers at 45,000 cfm each. 2. Two (2) Recirculating Pumps or a total of eight (8) pumps. 3. A total of four (4) fans. 4. One (1) Booster Fan (Blower). 5. Dampers. 6. Static mixers and other appurtenances. 7. Miscellaneous ducts, inlet boxes, connections, gaskets, and other items required to make the system fully operational.

Four (4) air treatment modules, each rated at 45,000 cfm are provided to treat odorous air. Odorous air is collected from the bar screen influent channels, screenings area, wet well and storage cells. The total ventilation required for these areas is approximately 180,000 cfm. Fresh air is supplied to the influent channel, screening area, wet well and storage cells. The volume of supply air is six percent less than the exhaust air volume, ensuring negative pressure in the odorous areas.

During Normal Operation

During normal conditions, three out of the four modules serving the Facility Air Treatment process will be in operation; the fourth module serves as a standby unit which will activate automatically upon the failure of any of the three working modules. The module "Stand–by" assignment selector switch will be provided on the CP–AT. This 5–position selector switch assigns the Automatic stand-by function as shown in the Table on DWG No. G432-1 in Appendix A.

During normal operation the STANDBY module will start in place of the failed module. Each module consists of various equipment as described below:

1. Modules 3 and 4 are used primarily for the storage cells. If the operation of one of these modules should become compromised because of malfunctions of the Supply Fans, and the lack of adequate supply air to the storage cells, then the following interlocks will be performed by the PLC logic:

    a. If both modules are "ON", the unit which has more accumulated runtime in hours will be shut down.

    b. If modules 1, 2, 3 are "ON", AND Module 4 is "OFF", then Module 3 will shut down.

    c. If modules 1, 2, 4 are "ON", AND Module 3 is "OFF", then Module 4 will shut down.

2.5.1 Scrubbers

Each of the four (4) scrubbers is provided with a blower, and two recirculation pumps. One recirculation pump serves as a standby unit. Sodium hydroxide (NaOH) and sodium hypochlorite (NaOCl) are added to the scrubber sump to maintain the pH in the sump between 10 and 13, and maintain a clear solution in the sump. Chemicals feed concentrations are 25 percent NaOH, and 15 percent NaOCl. Over time, as the scrubber solution reacts with contaminants in the air stream, it becomes less reactive and requires the addition of chemicals to restore its strength. NaOH and NaOCl are added to the sump underflow by chemical feed pumps. The addition of NaOH is regulated by a pH control system, and the addition of NaOCl is regulated by an Oxidation Reduction Potential (ORP) control system. The two control systems ensure that the odor removal effectiveness of the scrubbing solution is always at its maximum.

How Does the Booster Blower Work?

1. A booster blower is provided to increase the rate of air exhausted from storage cells during maintenance activities, and when Facility personnel are present in any of the cells.

During Normal Operation

1. To operate Blower automatically:

    a. Set the Local/Remote selector switch on LCS–SB to the "REMOTE" position.

    b. Set the HAND/OFF/AUTO (HOA) selector switch to the "AUTO" position.

    c. Check that the module is not selected as "STANDBY".

How Do the Recirculation Pumps Work?

1. The eight Scrubber Recirculation Pumps are integral components of the four Air Treatment Modules. Each module is served by two recirculation pumps. Each pump can be operated from a dedicated Local Control Station located adjacent to it. The pumps can also be operated from the Control Panel Air Treatment (CP–AT), and the Operator Interface Computer Station (OICS), both of which are located in the Main Control Room.

During Normal Operation

1. To operate the pumps automatically:

    a. Set the Local/Remote selector switch on LCS to the "Remote" position.

    b. Set the HAND/OFF/AUTO (HOA) selector switch to the "Auto" position.

2. When in "AUTO," the control logic will automatically alternate the Lead/Stand–by pump assignment. The lead function will be assigned to the pump which has less runtime. The cumulative runtime values will be compared only when both pumps are operating in the automatic mode with their "HOA" selector switches set to the "AUTO" position; or one pump "HOA" switch is set to the "AUTO" position for a time period longer than 30 seconds (operator adjustable). The standby pump will start immediately upon failure of the lead pump.

3. The Lead pump will start provided that the following conditions are met:

a. Scrubber sump water surface level minimum 18”.

b. NO Alarm conditions exist.

c. The associated module is not selected as a "STANDBY."

4. The Lead or Standby pump will stop automatically if any of the following conditions occur:

   a. Low scrubber sump level.

   b. Pump discharge pressure greater then 30 psig.

   c. Seal water pressure falls below 10 psig.

   d. Recirculation flow rate dropped below 500 gpm.

   e. Pump malfunction.

5. The PLC program will allow for adjustable time delays prior to executing the above conditions. The time delay will be operator selectable and will be determined during start–up (initial setting is 30 seconds).

6. It should be noted that the air treatment system operates on a continuous basis therefore the procedures for before, during, and after wet weather events are the same.

2.6 CHEMICAL FEED AND STORAGE SYSTEM

The Scrubber Chemical Feed Pumps are integral components of the Air Treatment Modules. The purpose of these pumps is to maintain the desired levels of pH and ORP in the scrubber sump solution. The pumps are equipped with variable stroke drive, integral to the units. The pump stroke is adjusted automatically by the Analytical Indicating Controller (AIC) located in the CP–AT panel. The AIC is a Proportional Integral Derivative single loop controller, and automatically maintains pH at 10, and ORP at 600 (set point is operator selectable) (Refer to DWG G410 & G434 in Appendix A).

Unit Process Components	Equipment
Chemical Feed & Storage System	1. Ten (10) including two (2) as spare, metering pumps for sodium hydroxide solution (50% concentration). Each pump will be provided with electronic DLC stroke length positioners/ controllers. 2. Ten (10) including two (2) as spare, metering pumps for sodium hypochlorite solution (15% concentration). Each pump will be provided with electronic DLC stroke length positioners/controllers. 3. Backpressure valves, calibration columns, pulsation dampeners and other appurtenances. 4. All anchor bolts and other hardware required for the complete installation. a. Three (3) Sodium hypochlorite storage tanks. b. Two (2) Sodium hydroxide storage tanks. c. Chemical fill stations and other appurtenances. d. One safety and eyework area shower. e. All anchor bolts and other hardware required for complete installation.

How Does it Work?

1. Scrubbing solution that has passed down through the packing bed of a scrubber flows by gravity to a sump at the bottom of the scrubber vessel. The collected scrubbing solution is recycled continuously from the sump back to the top of the scrubber vessel by recirculating pumps.

2. The sump overflows continuously, discharging the products of reaction with the scrubbing chemicals. Over time, as the scrubber solution reacts with contaminants in the air stream, it becomes less reactive and requires the addition of chemicals to restore its strength. NaOH and NaOCl are added to the sump underflow by chemical feed pumps. NaOH and NaOCl are stored in separate tanks. Three (3) tanks are used to store NaOCl; two (2) tanks are used to store NaOH.

3. The addition of NaOH is regulated by a pH control system, and the addition of NaOCl is regulated by an Oxidation Reduction Potential (ORP) control system. The two control systems ensure that the odor removal effectiveness of the scrubbing solution is always at its maximum. Make–up water is fed continuously from the City water supply system to replace water lost through the continuous overflow. The sump overflow is piped to the Facility chemical drain system. The Facility chemical drain system discharges to secondary wet well of the pumping station.

4. The pumps are operated from dedicated, controls integral to the pumps. The pumps can also be operated from the Control Panel Air Treatment (CP–AT), and Operator Interface Computer Stations (OICS) both of which are located in the Main Control Room.

During Normal Operation

1. To operate the pumps automatically:

    a. Set the Local/Remote selector switch on integral LCS to the "Remote" position.

    b. Set the HOA selector switch on the AIC to the "Auto" position.

    c. Set the pump HAND/OFF/AUTO (HOA) selector switch to the "Auto" position.

2. When the pump is in the "Auto" position the control logic will automatically alternate the Lead/Stand–by pump assignment. The lead function will be assigned to the pump which has less runtime. The Runtime values will be compared only when both pumps "HOA" selector switches are set to the "AUTO" position; or one pump "HOA" switch is set to "AUTO" position for a time period longer than 30 seconds (operator adjustable). The standby pump will start immediately upon failure of the lead pump.

3. The lead pump will start provided the following conditions are met:

    a. Recirculation flow exists, as determined by FIT.

    b. Chemical storage tank level is not LOW.

    c. NO alarm conditions exist.

    d. ORP or pH requirements are not met.

4. The lead or standby pump will stop automatically if one of the following conditions exists:

    a. No Recirculation Flow

b. Low chemical storage tank level

c. Pump discharge pressure greater then 60 psig

d. Discharge relief line is active, as sensed by flow switch on the relief line

e. pH or ORP is above set point, and pump stroke is at its minimum for 10 minutes continuously

f. Pump malfunction

5. The PLC program will allow for adjustable time delays prior to executing the above conditions. The time delay will be operator selectable and will be determined during start–up (initial setting is 30 seconds).

2.7 SAMPLING & ANALYSIS

2.7.1 Monitoring Requirements

Beginning with the completion of construction, the following effluent overflow parameters, listed in Table 2.1, shall be monitored and the sampling results shall be reported on the monthly operating report.

Table 2 - 1. SPDES Monitoring Requirements for CSO Regional Facilities

OVERFLOW PARAMETER	REPORT	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
Overflow Volume	total, per event (7)	MG	See Footnote 5	Calculated	(1) (4)
Retained Volume	total, per month	MG	See Footnote 5	Recorded, Totalized	(8)
BOD, 5-day	average, per event	mg/l	1 / Each day of event	Composite	(2)
Total Suspended Solids	average, per event	mg/l	1 / Each day of event	Composite	(2)
Settleable Solids	average, per event	ml/l	1 / Each day of event	Grab	(3)
Oil & Grease	average, per event	mg/l	1 / Each day of event	Grab	(6)
Screenings	total, per month	cu. yds.	---	Calculated	
Fecal Coliform	geometric mean, per event	No./100ml	1 / Each day of event	Grab	(3)
Precipitation	total, per event	inches	Hourly / Each day of event	Auto, Recording Gauge within drainage area	

FOOTNOTES:

(1) Flows refers to effluent overflows associated with the design storm for the CSO retention facility.
(2) Composite sample shall be a composite of grab samples, one taken every four hours during each overflow event.
(3) When the facility is manned, grab samples are to be taken every four hours during each overflow event.
(4) Effluent overflow shall be calculated using a hydraulic model of the sewer system that is approved by the DEC. The permittee shall submit a report, with the first annual CSO BMP

report, explaining the hydraulic model calibration of the combined sewer drainage system tributary to the facility for DEC approval.

(5) In addition to the data supplied on the monthly operating report, the permittee shall provide a summary of the required monitoring to be submitted annually as part of the CSO BMP report required in CSO BMP #14 of this permit. The report shall tabulate sampling results, summarize the number of overflow events, the volume during each event, volume retained and pumped to the WPCP, and the peak flow rate (a calculated number) during each event, and provide an evaluation of the performance of the facility.

(6) Only when the CSO retention facility is manned.

(7) An event starts once overflow out of the CSO retention facility begins, and ends once the overflow stops and the pumpback to the associated wastewater treatment plant has finished.

(8) The permittee shall measure and record the total volume of flow retained and returned to the WPCP each month.

SPECIAL CONDITIONS FOR OPERATION OF THE CSO RETENTION FACILITY

1. The facilities shall be operated in conjunction with the tributary system, pump stations and the WPCP to maximize CSO capture.
2. Upon completion of construction of the retention facility and associated pumping station and conveyances, the permittee shall divert rain induced combined sewage flow to the facility in accordance with the design criteria and the WWOP. The permittee shall notify the Department in writing in accordance with 6 NYCRR Part 750-2 of any changes in the operation due to construction.
3. The permittee shall not discharge from the CSO retention facility unless the tank volume is full to the estimated 28 MG of facility storage and 15 MG of inline storage and/or the facility cannot accept additional wastewater.
4. The contents of the CSO retention facility, (i.e. captured wastewater) shall not be delivered to the WPCP at a rate which would exceed the peak flow or loading as determined by the CSO BMP#4. The WWOP will detail operating conditions of the CSO retention facility.
5. Flow shall not be delivered to the WPCP at a rate that will cause an upset as defined 6 NYCRR Part 750-1.2(a)(94).
6. If a new CSO retention facility is constructed in the drainage basin of the WPCP, a NY-2A application, as well as the NY-2A Supplement for the Control Facilities, must be submitted to the Department, and the permit modified to include the facility, before construction can commence. In addition, DEP shall modify the WWOP in CSO BMP#4 to reflect the changes required for the new facility.

2.7.2 Monitoring Performed

All samples must be taken in conformance with the permit, and are to be taken and preserved according to all regulatory guidelines.

1. <u>Overflow Volume.</u> Effluent overflow is defined as the CSO volume discharged to the facility's effluent channel over the effluent weir in storage cells No. 7 and No. 15 during a storm event. The total effluent overflow volume (MG) per event shall be monitored and reported. The SPDES permit states that the overflow volume shall be calculated using a hydraulic model of the sewer system that is approved by the DEC.

In the Flushing Bay CSO Retention Facility, the overflow volume is calculated as the difference between the incoming flow to the facility and the pumpback flow to the Tallman Island WPCP for the duration of the overflow event. Incoming flow to the facility is monitored and recorded by means of velocity/depth profile measurement downstream of the bar screens. Pumpback flow is measured by magnetic flowmeters.

2. Retained Volume. Stored CSO is pumped to Tallman Island WPCP after a storm event is over and there is adequate capacity in the Interceptor and the Tallman Island WPCP. The Retained Volume is defined as the total CSO volume that is stored in the Retention Facility during a storm event and is equal to the total volume pumped to the treatment facility during the pumpback operation. The SPDES permit states that the total Retained Volume shall be measured, recorded and totalized for each month. Overflow Volume and Retained Volume shall also be submitted annually as part of the CSO BMP report.

   The Pumpback flow is measured, recorded and totalized directly by using magnetic flowmeters on the discharge lines of the Primary and Secondary pumps.

3. BOD, 5-Day, Total Suspended Solids. BOD, 5-day and Total Suspended Solids (TSS) composite samples shall be taken from the facility's effluent channel and shall be reported as average per event. The composite samples shall be a composite of grab samples from the effluent channel taken every 4 hours during each overflow event. BOD, 5-day and TSS samples are collected every 4 hours from a point in cell No. 7 and cell No. 15 near to the effluent weir.

4. Settleable Solids. Settleable Solids grab samples shall be taken from the facility's effluent channel and shall be reported as average per event. When the facility is manned grab samples shall be taken every 4 hours during each overflow event.

5. Oil & Grease. When the facility is manned, Oil & Grease grab samples shall be taken from the facility's effluent channel and shall be reported as average per event.

6. Screenings. Screenings shall be calculated and reported as total per month. Screenings are collected in the screenings containers and reported as total per month.

7. Fecal Coliform. Fecal Coliform grab samples shall be taken from the facility's effluent channel and shall be reported as the geometric mean per event. When the facility is manned grab samples shall be taken every 4 hours during each overflow event.

8. Precipitation. SPDES permit states that precipitation data (in inches of rain) shall be acquired hourly for each day of event and shall be reported as total per event. Precipitation data are obtained from the local weather station in LaGuardia airport.

APPENDIX A

Process and Instrumentation Drawings

LIST OF DRAWINGS

INSTRUMENT SYMBOLS AND IDENTIFICATION:

INSTRUMENT IDENTIFICATION LEGEND					
	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS,		ALARM		
B	BURNER FLAME		NOT USED	NOT USED	NOT USED
C	CONDUCTIVITY (ELECTRICAL)			CONTROL	CLOSED
D	DENSITY (MASS) OR SPECIFIC GRAVITY	DIFFERENTIAL			
E	VOLTAGE (EMF)		PRIMARY ELEMENT		
F	FLOW RATE	RATIO (FRACTION)			
G	GAGING (DIMENSIONAL)		GLASS GAGE (UNCALIBRATED)		
H	HAND (MANUALLY INITIATED)				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME OR TIME SCHEDULE			CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	MOISTURE OR HUMIDITY				MIDDLE OR INTERMEDIATE
N	NOT USED		NOT USED	NOT USED	NOT USED
O	NOT USED		ORIFICE (RESTRICTION)		OPEN
P	PRESSURE OR VACUUM		POINT (TEST CONNECTION)		
Q	QUANTITY	INTEGRATE OR TOTALIZE			
R	RADIOACTIVITY		RECORD OR PRINT		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION			VALVE, DAMPER OR LOUVER	
W	WEIGHT OR FORCE		WELL		
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT STATUS	Y AXIS		RELAY OR COMPUTE	
Z	POSITION			DRIVE, ACTUATE OR UNCLASSIFIED FINAL CONTROL ELEMENT	

"E" INDICATES EXISTING DEVICE.
"*" INSTRUMENT SUPPLIED BY EQUIPMENT VENDOR.

FLOW INDICATING TRANSMITTER FIELD MOUNTED. POWER SUPPLY REQUIRED LOCALLY WHERE SHOWN. SEE THIS DWG. FOR DETAILS OF INSTRUMENT TAG NUMBERING SYSTEM.

FR & AR ARE TWO INSTRUMENTS AS PART OF ONE UNIT. SEE BELOW FOR PROCESS ANALYSES (XX).

- FL – FLUORIDE CONCENTRATION
- TCl_2 – TOTAL CHLORINE RESIDUAL
- FCl_2 – FREE CHLORINE RESIDUAL
- DO – DISSOLVED OXYGEN
- $FeCl_3$ – FERRIC CHLORIDE
- H_2S – HYDROGEN SULFIDE
- H_3PO_4 – PHOSPHORIC ACID
- H_2SO_4 – SULFURIC ACID
- MN – MANGANESE CONCENTRATION
- NH_3 – AMMONIA
- O_2 – OXYGEN
- ORP – OXIDATION REDUCTION POTENTIAL
- pH – HYDROGEN ION CONCENTRATION ($-LOG_{10}$)
- PO_4 – PHOSPHATE
- PC – PARTICLE COUNTER
- TRB – TURBIDITY

ALARM POINT IN UNIT ANNUNCIATOR WITH OPERATING CONTACT CONNECTION (A) & REPEAT CONTACT CONNECTION (B).

POINT FOR SHARED VIDEO DISPLAY FUNCTIONS IN LOGIC CONTROLLER. SEE BELOW FOR (X)

- Δ DIFFERENCE
- > HIGH SELECTOR
- < LOW SELECTOR
- S/I FREQUENCY/CURRENT
- I/I CURRENT/CURRENT
- Σ SUMMATION
- PID PROPORTIONAL INTEGRAL DERIVATIVE
- % RATIO

AS ABOVE WITH LIMITED ACCESS; ANNUNCIATOR OR ALARM MESSAGE DISPLAY

COMPUTER SOFTWARE LOGIC FUNCTIONS
# INDICATES DESCRIPTIVE INTERLOCK NOTE

ELECTRICAL HARD WIRED LOGIC FUNCTIONS
# INDICATES DESCRIPTIVE INTERLOCK NOTE

INLINE FLOW INDICATOR

TURBINE OR PROPELLER ELEMENT

SONIC ELEMENT
M – MICROWAVE
U – ULTRASOUND
R – RADAR

FLOAT SWITCH

INLINE FLOWMETER
M – MAGMETER
V – VORTEX
C – CORIOLIOUS
T – TETMAL DISPERSION

VALVES AND PIPING SPECIALTIES

- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- DIAPHRAGM VALVE
- BUTTERFLY VALVE
- PLUG VALVE
- PINCH VALVE
- NEEDLE VALVE
- CHECK VALVE
- DETECTOR CHECK VALVE
- 3-WAY VALVE
- PRESSURE REGULATING VALVE
- BACK PRESSURE REGULATING VALVE
- CONE VALVE
- DAMPER
  NO – NORMALLY OPEN
  NC – NORMALLY CLOSED
- PULSATION DAMPENER
- INLINE STRAINER
- DRAIN
- CHLORINE EJECTOR
- METERING COLUMN
- INLINE MIXER
- BACKFLOW PREVENTER
- RELIEF VALVE VACUUM OR PRESSURE
- DIAPHRAGM SEAL WITH ISOLATION VALVE
- EYE WASH AND DRENCH EMERGENCY SHOWER HEAD
  FP – FROST PROOF

GATES AMD WEIRS

- SLIDE GATE
- SLUICE GATE
- WEIR TYPE SLIDE GATE
- FLAP GATE

PUMPS AND EQUIPMENT

- CENTRIFUGAL PUMP
- METERING PUMP WITH:
  VI – VARIABLE SPEED DRIVE
  MS – MANUAL STROKE
  VS – VARIABLE STROKE
  FB – FEED BACK
- ROTARY GEAR PUMP
- BLOWER, COMPRESSOR
- SUBMERSIBLE PUMP
- SUMP PUMP

ACTUATORS

- ELECTRIC MOTOR ACTUATOR
- DIAPHRAGM AIR ACTUATOR
- HYDRAULIC CYLINDER ACTUATOR
- SOLENOID ACTUATOR
  MO – MANUAL OVERRIDE
  SPRING OR WEIGHT
- ELECTRIC ACTUATOR WITH
  ZT – POSITION TRANSMITTER
  HK – O/S/C PUSHBUTTONS
  HS – L/R SELECTOR
  ZS – LIMIT SWITCHES
- ELECTROHYDRAULIC ACTUATOR

PUSH BUTTONS AND LIGHTS:

HAND SELECTOR SWITCH OR PUSHBUTTON:

FUNCTION SUBSCRIPTS:

- ACK ACKNOWLEDGE (BLACK)
- FSR FORWARD–STOP–REVERSE
- HOA HAND–OFF–AUTO
- OAC OPEN–AUTO–CLOSE
- LR LOCAL–REMOTE
- OC OPEN–CLOSE (GREEN–BLUE)
- OSC OPEN–STOP–CLOSE (GREEN–GREEN–BLUE)
- POT SPEED POTENTIOMETER
- PTT PUSH–TO–TEST (BLACK)
- RS RESET (BLACK)
- ES EMERGENCY STOP (RED)
- SS START–STOP (RED–GREEN)
- LOS LOCKOUT STOP (GREEN)
- SA START–ABORT SEQUENCE
- COC CLOCKWISE–OFF–COUNTERCLOCKWISE

INDICATING LIGHT UNIT, SEE COLOR CODE (XX)
A – AMBER (ALARM CONDITION)
G – GREEN (OFF, STOP, VALVE CLOSED, CIRCUIT BREAKER OPEN)
R – RED (RUN, START, VALVE OPEN, CIRCUIT BREAKER CLOSED)
W – WHITE (POWER AVAILABLE, 86 RELAY STATUS)
B – BLUE (EQUIPMENT IN REMOTE MODE)
F – FLUSHING

STROBE OR ROTATING BEACON, SEE COLOR CODE (XX)
A – AMBER
W – WHITE
R – RED
C – CLEAR
G – GREEN

ALARM HORN   ALARM SIREN

FRONT PANEL MOUNTED PUSHBUTTON

FRONT PANEL MOUNTED INDICATOR LIGHT

FRONT PANEL MOUNTED SELECTOR SWITCH

FRONT PANEL MOUNTED PUSHBUTTON WITH INTEGRAL INDICATOR LIGHT

120 VAC INSTRUMENT POWER SUPPLY, REQUIRES LOCAL DISCONNECT (TYP) PROVIDED BY CONTRACT CS4–4E.

LINE TYPE DESIGNATION

- EXISTING
- ELECTRIC SIGNAL
- COMMUNICATION LINK
- SOFTWARE LINK
- STRUCTURE OR VESSEL
- MAIN PROCESS LINE
- AUXILIARY SYSTEMS
- PNEUMATIC SIGNAL
- CAPILLARY LINE
- HYDRAULIC SIGNAL
- HEAT TRACED AND INSULATED

PROCESS FLOW LINE CONTINUED:
– REFER TO ANOTHER DRAWING
A – MATCH LETTER IF MORE THEN ONE REFERENCE

PROCESS FLOW LINE CONTINUED OUTSIDE SCOPE OF DRAWINGS

AUXILIARY SYSTEM FLOW

I/O TAG NUMBERING SYSTEM

DISCRETE INPUT / OUTPUT

UNIQUE SEQUENTIAL I/O NUMBER
ANALOG INPUT / OUTPUT

BINARY CODED DEVICE INPUT REQUIRES EIGHT DISCRETE INPUTS

EQUIPMENT NUMBERING SYSTEM

SYSTEM DESCRIPTION (TABLE 1)	SYSTEM CODE	PROCESS CODE
INFLUENT SLUICE GATES; INFLUENT CHANNEL SLUICE GATES; FLAP GATES	1300–1399	13
ELECTRICAL DISTRIBUTION	1500–1549	15
INSTRUMENTATION AND CONTROL PANELS	1550–1599	15
PRIMARY & SECONDARY PUMPS	1600–1619	16
TANK DRAIN VALVES	1620–1650	16
BAR SCREENS, BELT CONVEYORS, CONTAINERS, BAR RACKS	1800–1899	18
FLUSHING WATER SYSTEM INCLUDING VALVES, PUMPS, HFG, & SFT EQUIPMENT	1900–1919	19
FLUSHING WATER SUPPLY VALVES	1920–1939	19
FLUSHING WATER FEED VALVES	1940–1999	19
SERVICE WATER, SEAL WATER AND WASH WATER SYSTEMS	2000–2099	20
SUBMERSIBLE MIXERS	2100–2149	21
HYPOCHLORITE FEED AND STORAGE	4200–4299	42
AIR TREATMENT SYSTEM	4400–4499	44
STORAGE CELL AIR SUPPLY SYSTEM	4500–4599	45
CAUSTIC FEED AND STORAGE	4700–4799	47
AIR SUPPLY VALVES FOR STORAGE CELLS	4800–4899	48
SPARE PARTS	6000–6999	60
BOILER	7200–7299	72
HVAC SYSTEM	7300–7399	73
PLANT AIR, SERVICE AIR, AUXILIARY AIR, VACUUM PRIMING SYSTEMS	7400–7499	74
CITY (POTABLE WATER) SYSTEM	7600–7699	76
FACILITY DRAINAGE SYSTEM INCLUDING PUMPS AND DRAINS	7700–7799	77
ELEVATORS, HOISTS, VEHICLES, CELL ACCSESS DOORS	7800–7899	78
FIRE FIGHTING EQUIPMENT, PAGING & INTERCOM	8400–8499	84
GAS MONITORING EQUIPMENT	8600–8699	86

INSTRUMENT TAG NUMBERING SYSTEM

INSTRUMENT IDENTIFICATION REFER TO ISA STANDARD 5.4 — FIT 1 1 2 A — LOOP NUMBER

NOTE:
1. INSTRUMENT TAG NUMBER DOES NOT CHANGE IF SIGNAL IS BROUGHT TO ANOTHER CONTRACT AREA.

EQUIPMENT TAG NUMBERING SYSTEM

SEQUENTIAL NUMBER UNDER PARTICULAR CODE
PROCESS CODE (SEE TABLE 1)
EQUIPMENT ASSOCIATED WITH MAJOR EQUIPMENT
RESERVED
1601–A0

VALVE TAG NUMBERING SYSTEM

VALVE DIAMETER IN INCHES
PROCESS CODE (SEE TABLE 1)
SEQUENTIAL NUMBER
18–02.75–001

GENERAL NOTES:

1. FOR EQUIPMENT AND VALVE TAGS NOT INCLUDED ON THE P&ID (400 SERIES) DDRAWINGS, SEE MECHANICAL (300 SERIES) DRAWINGS.
2. FOR CONTROL PANEL SCHEDULE SEE SPECIFICATIONS SECTION D–3.4.
3. FOR INSTRUMENT AND I/O SCHEDULES SEE SPECIFICATIONS SECTION D–3.12.

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION — DEP

REVISIONS: NO. | DATE | DESCRIPTION | APPRD.

CAPITAL PROJECT NAME & NO.: FLUSHING BAY WATER QUALITY IMPROVEMENT PROJECT WP–169

CONTRACT NAME & NO.: FLUSHING BAY CSO RETENTION FACILITY STORAGE FACILITY CONTRACT NO. CS4–4

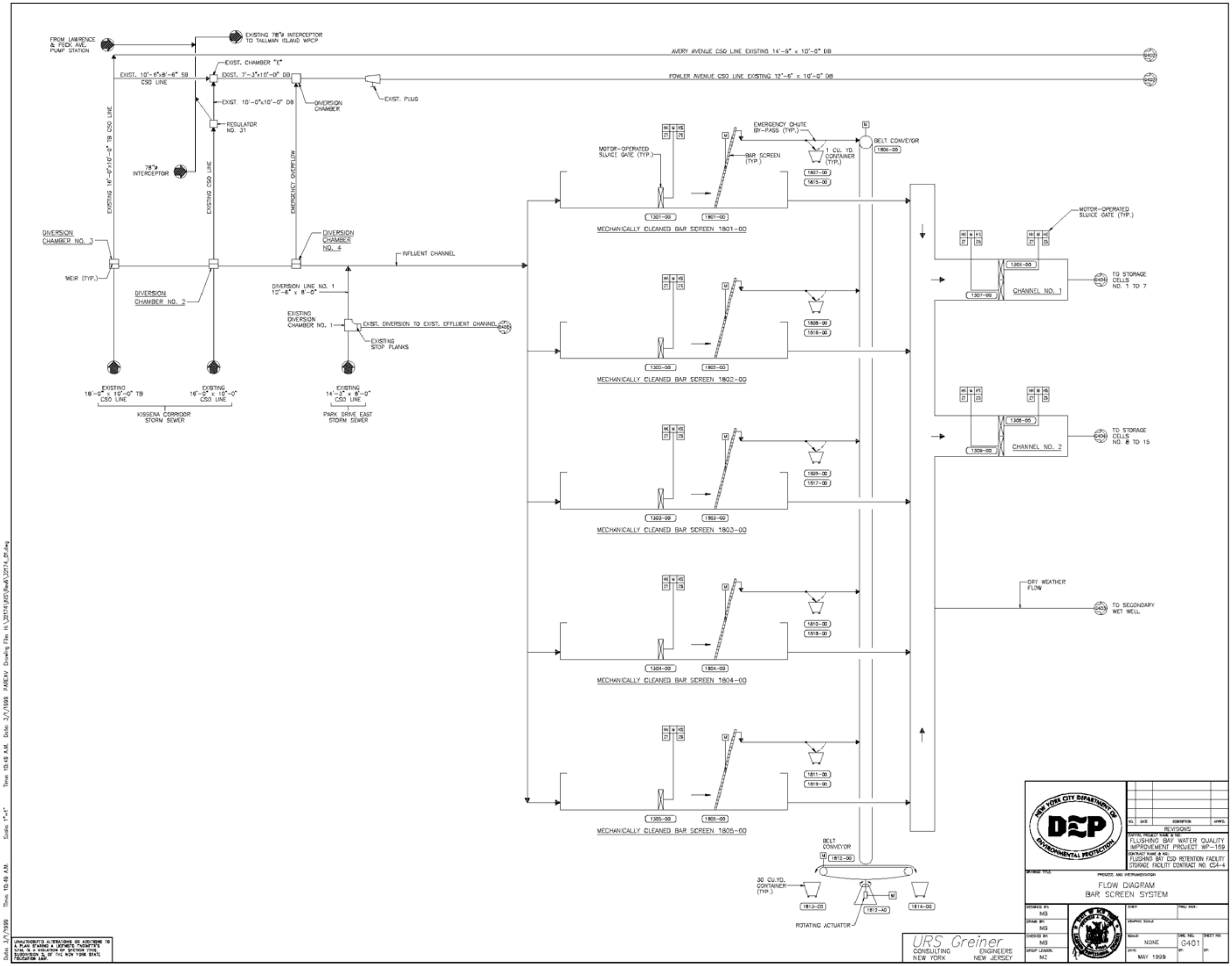
DRAWING TITLE: PROCESS AND INSTRUMENTATION

LEGEND AND SYMBOLS

DESIGNED BY: MB · DRAWN BY: MB · CHECKED BY: MB · GROUP LEADER: MZ

SCALE: NONE · DATE: MAY 1999 · DWG. NO. G400

URS Greiner
CONSULTING ENGINEERS
NEW YORK · NEW JERSEY



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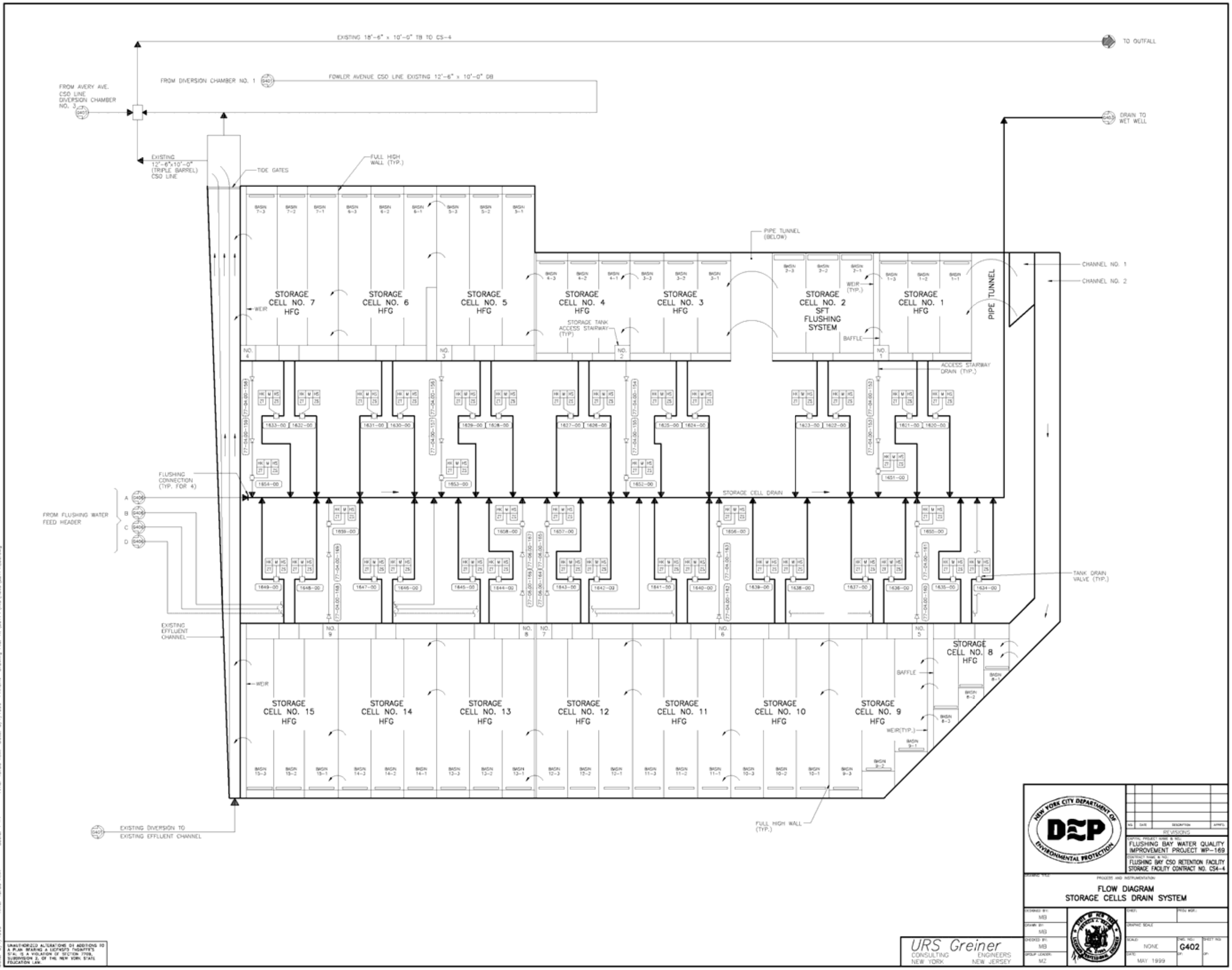

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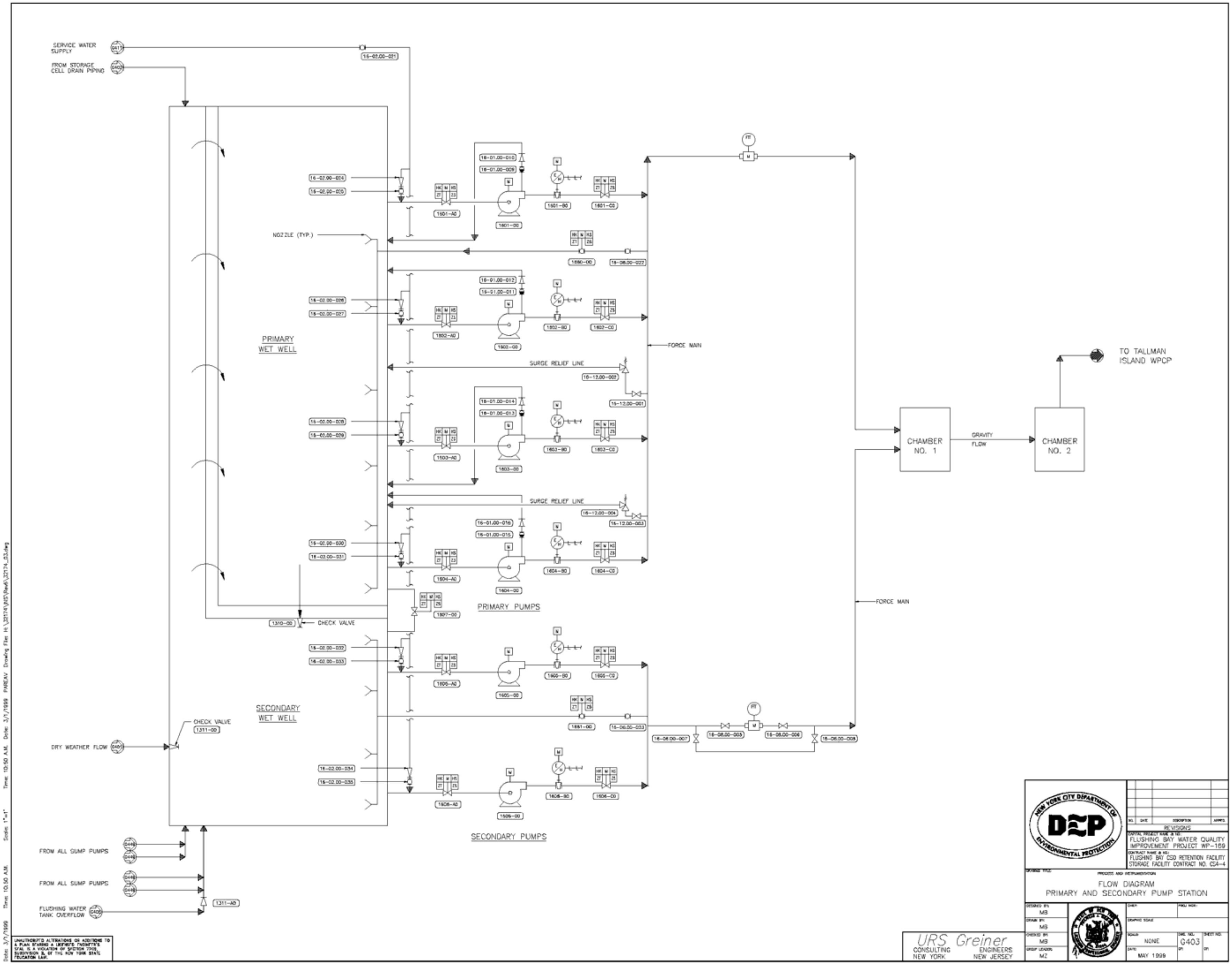

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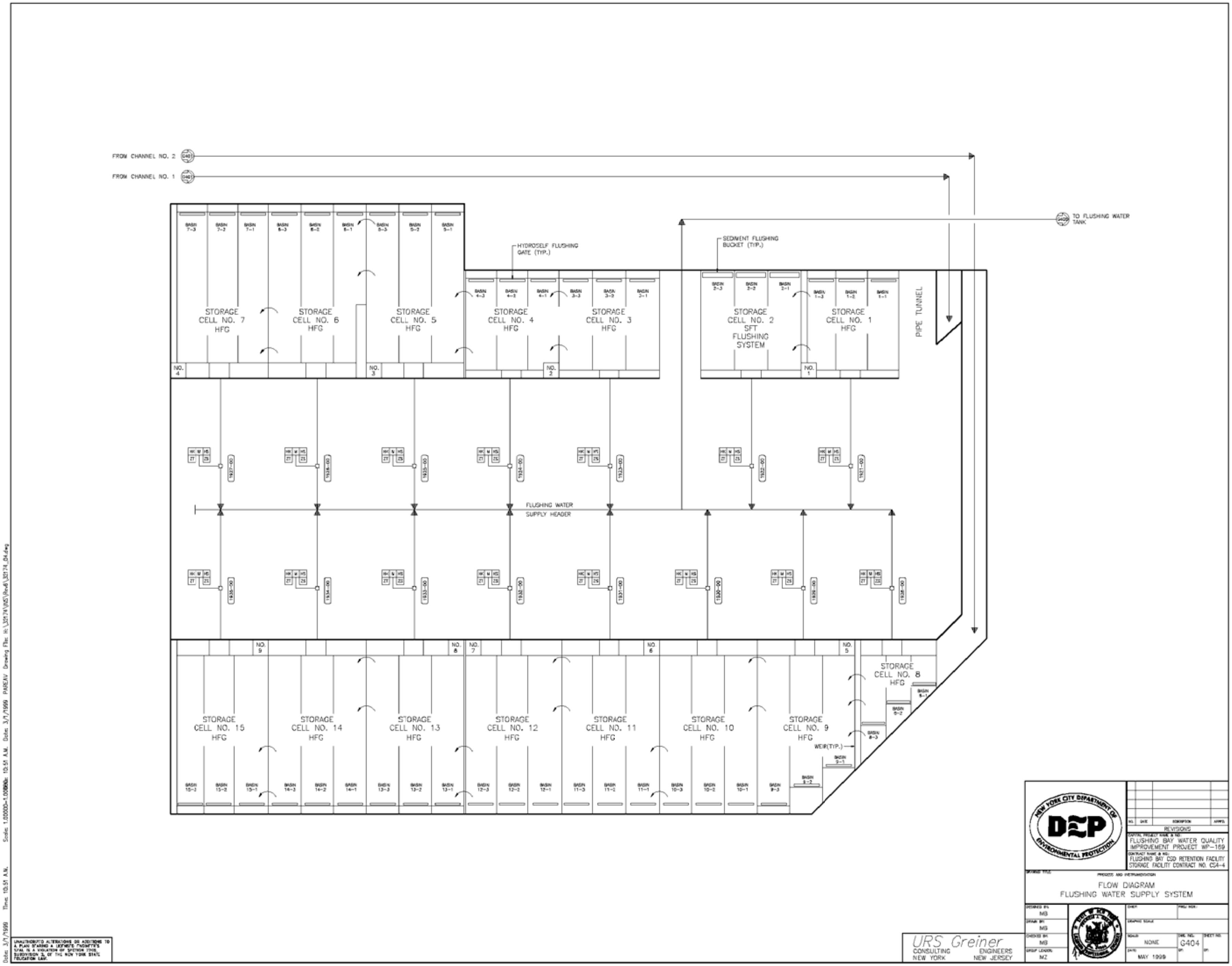
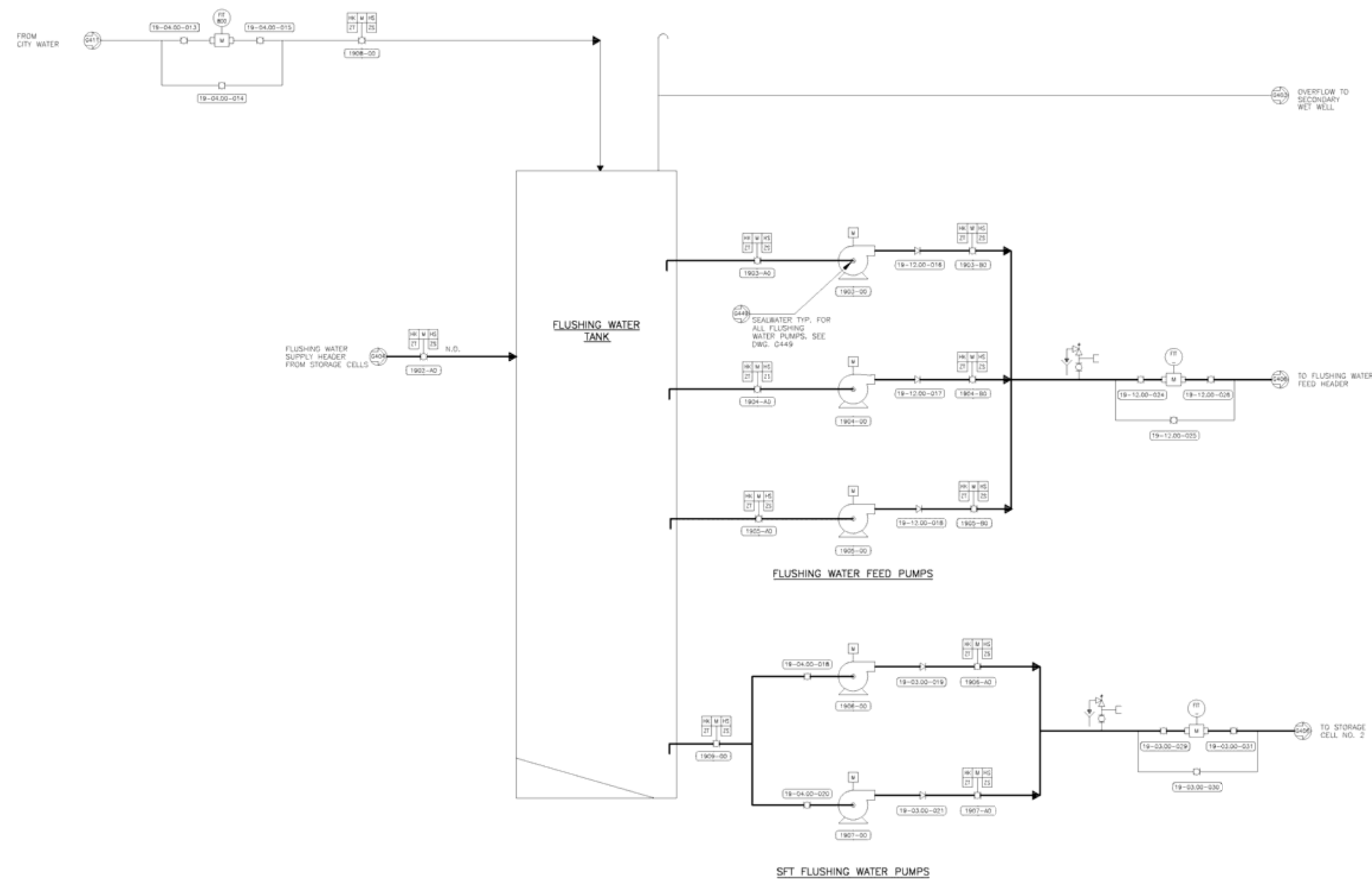

FROM CHANNEL NO. 2
FROM CHANNEL NO. 1
TO FLUSHING WATER TANK
HYDROSELF FLUSHING GATE (TYP.)
SEDIMENT FLUSHING BUCKET (TYP.)
PIPE TUNNEL
STORAGE CELL NO. 7 HFG
STORAGE CELL NO. 6 HFG
STORAGE CELL NO. 5 HFG
STORAGE CELL NO. 4 HFG
STORAGE CELL NO. 3 HFG
STORAGE CELL NO. 2 SFT FLUSHING SYSTEM
STORAGE CELL NO. 1 HFG
FLUSHING WATER SUPPLY HEADER
STORAGE CELL NO. 15 HFG
STORAGE CELL NO. 14 HFG
STORAGE CELL NO. 13 HFG
STORAGE CELL NO. 12 HFG
STORAGE CELL NO. 11 HFG
STORAGE CELL NO. 10 HFG
STORAGE CELL NO. 9 HFG
STORAGE CELL NO. 8 HFG
WEIR(TYP.)
REVISIONS
FLUSHING BAY WATER QUALITY IMPROVEMENT PROJECT WP-169
FLUSHING BAY CSO RETENTION FACILITY STORAGE FACILITY CONTRACT NO. CS4-4
FLOW DIAGRAM
FLUSHING WATER SUPPLY SYSTEM
URS Greiner
CONSULTING ENGINEERS
NEW YORK NEW JERSEY
NONE
G404
MAY 1999
UNAUTHORIZED ALTERATIONS OR ADDITIONS TO A PLAN BEARING A LICENSED ENGINEER'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.



NOTES:

1. FOR FLUSHING WATER FEED PUMPS P&ID AND SEAL WATER CONTROLS SEE DRAWINGS G428.
2. FOR SFT FLUSHING WATER PUMPS P&ID AND SEAL WATER CONTROLS SEE DRAWINGS G429.

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEP

REVISIONS

FLUSHING BAY WATER QUALITY IMPROVEMENT PROJECT WP-169

FLUSHING BAY CSO RETENTION FACILITY STORAGE FACILITY CONTRACT NO. CS4-4

PROCESS AND INSTRUMENTATION

FLOW DIAGRAM
FLUSHING WATER PUMPING SYSTEM

DESIGNED BY:	MB
DRAWN BY:	MB
CHECKED BY:	MB
GROUP LEADER:	MZ
SCALE:	NONE
DWG. NO.:	G405
DATE:	MAY 1999

URS Greiner
CONSULTING ENGINEERS
NEW YORK NEW JERSEY

UNAUTHORIZED ALTERATIONS OR ADDITIONS TO A PLAN BEARING A LICENSED ENGINEER'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.

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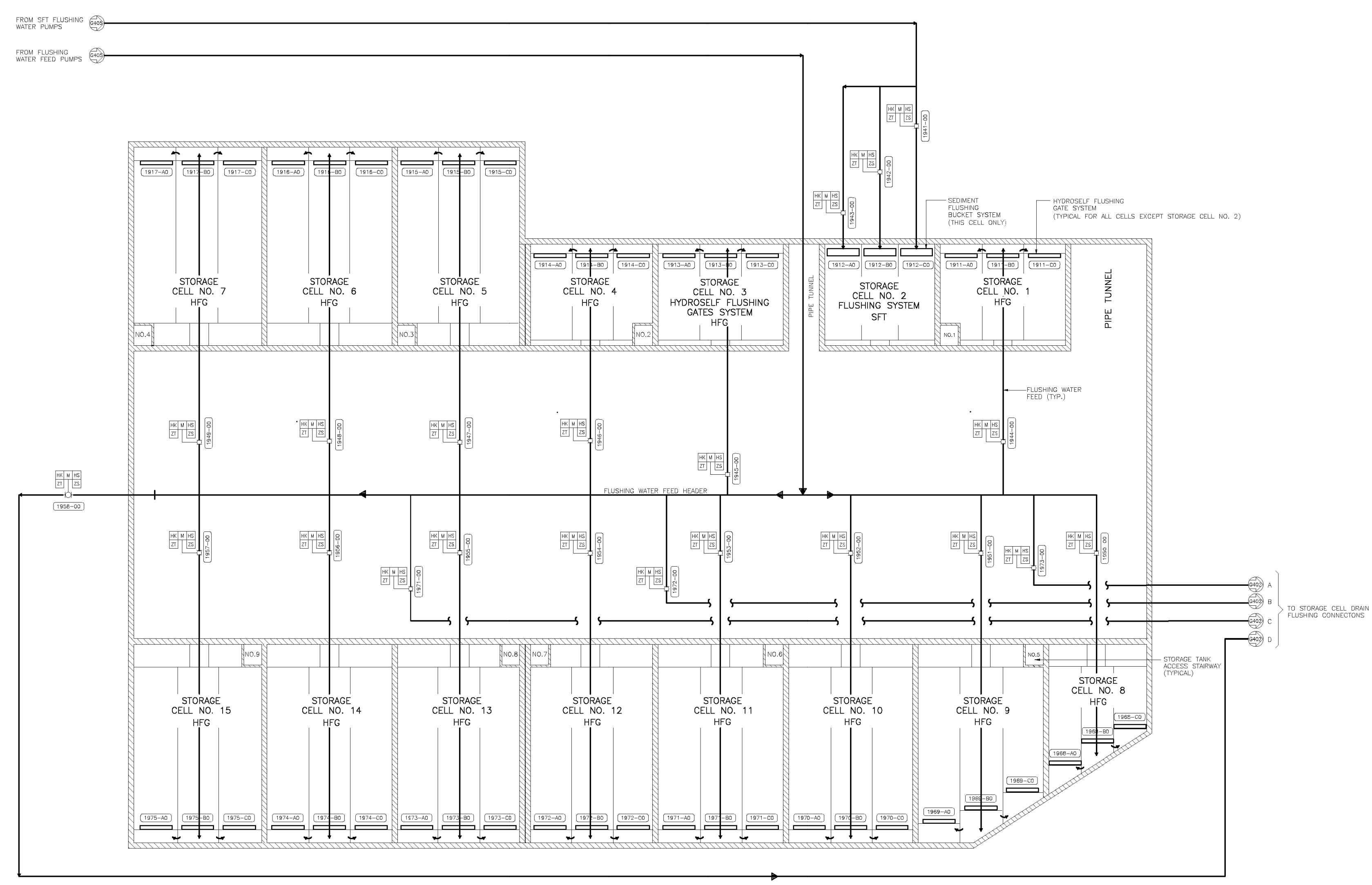


NOTES:

1 FOR HFG AND SFT NUMBERING REFER TO DRAWING G408.

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEP

REVISIONS

CAPITAL PROJECT NAME & NO.: FLUSHING BAY WATER QUALITY IMPROVEMENT PROJECT WP-169

CONTRACT NAME & NO.: FLUSHING BAY CSO RETENTION FACILITY STORAGE FACILITY CONTRACT NO. CS4-4

DRAWING TITLE: PROCESS AND INSTRUMENTATION

FLOW DIAGRAM FLUSHING WATER FEED SYSTEM

DESIGNED BY: MB

DRAWN BY: MB

CHECKED BY: MB

GROUP LEADER: MZ

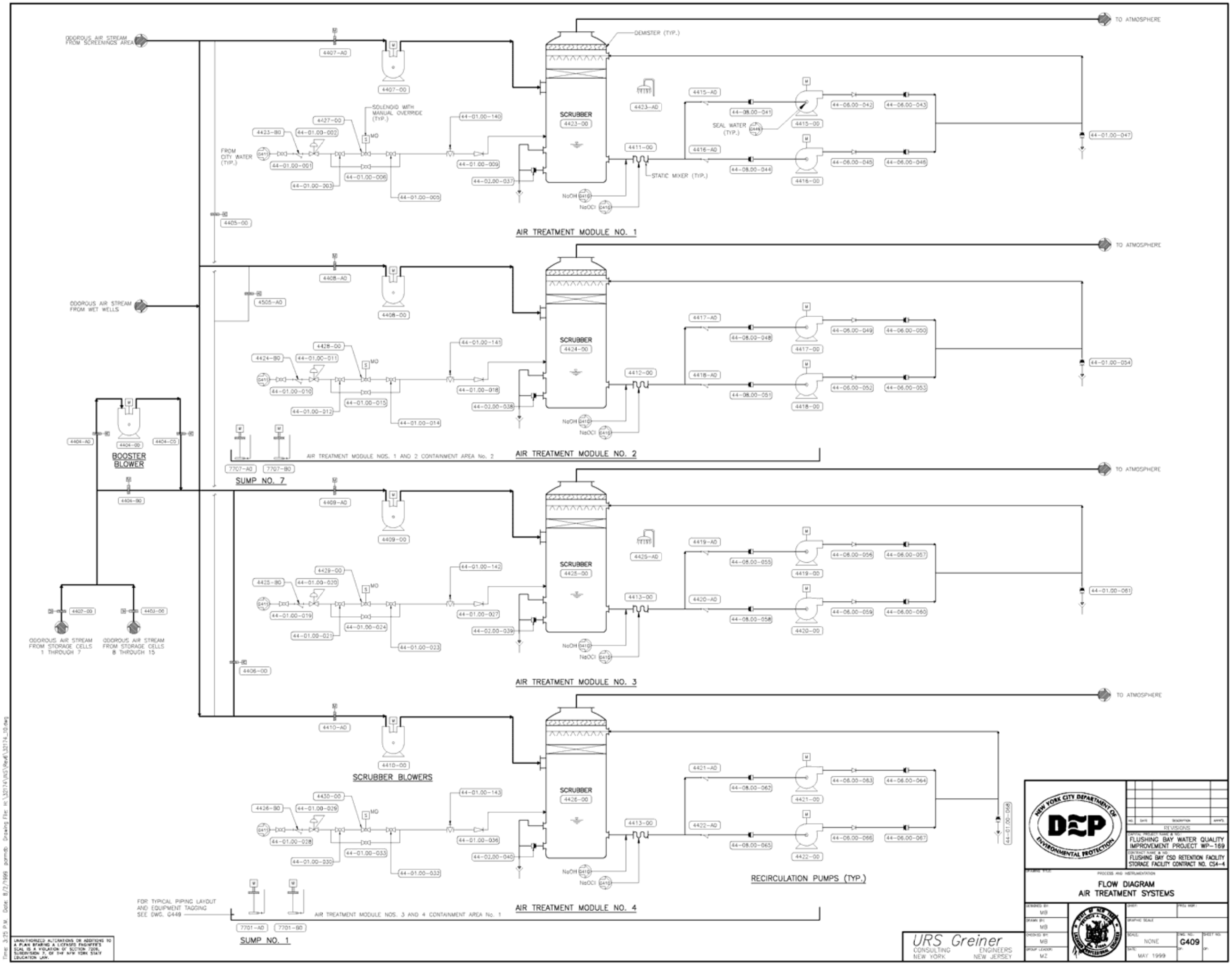
SCALE: NONE

DWG. NO.: G406

DATE: MAY 1999

URS Greiner CONSULTING ENGINEERS NEW YORK NEW JERSEY

Date: 3/1/1999 Time: 10:52 A.M. Scale: 1.00000=1.00000 Date: 3/1/1999 PAREAV Drawing File: H:\32174\INS\Rev6\32174_06.dwg


ODOROUS AIR STREAM FROM SCREENINGS AREA
ODOROUS AIR STREAM FROM WET WELLS
ODOROUS AIR STREAM FROM STORAGE CELLS 1 THROUGH 7
ODOROUS AIR STREAM FROM STORAGE CELLS 8 THROUGH 15
BOOSTER BLOWER
SCRUBBER BLOWERS
TO ATMOSPHERE
DEMISTER (TYP.)
SCRUBBER
4423-00
4424-00
4425-00
4426-00
SOLENOID WITH MANUAL OVERRIDE (TYP.)
FROM CITY WATER (TYP.)
SEAL WATER (TYP.)
STATIC MIXER (TYP.)
NaOH
NaOCl
AIR TREATMENT MODULE NO. 1
AIR TREATMENT MODULE NO. 2
AIR TREATMENT MODULE NO. 3
AIR TREATMENT MODULE NO. 4
AIR TREATMENT MODULE NOS. 1 AND 2 CONTAINMENT AREA No. 2
AIR TREATMENT MODULE NOS. 3 AND 4 CONTAINMENT AREA No. 1
SUMP NO. 7
SUMP NO. 1
RECIRCULATION PUMPS (TYP.)
FOR TYPICAL PIPING LAYOUT AND EQUIPMENT TAGGING SEE DWG. G449
UNAUTHORIZED ALTERATIONS OR ADDITIONS TO A PLAN BEARING A LICENSED ENGINEER'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.
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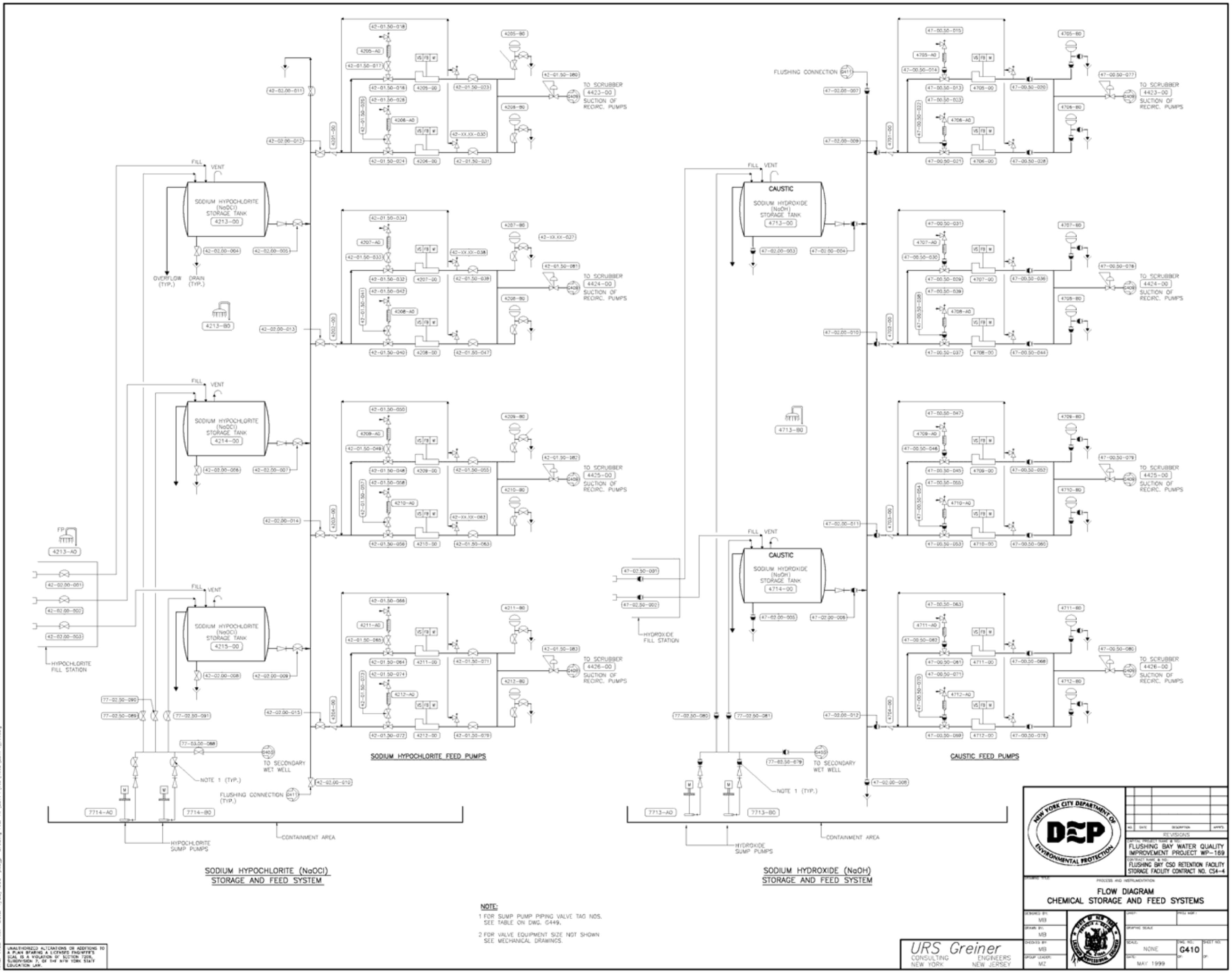
DEP
REVISIONS
FLUSHING BAY WATER QUALITY IMPROVEMENT PROJECT WP-169
FLUSHING BAY CSO RETENTION FACILITY STORAGE FACILITY CONTRACT NO. CS4-4
PROCESS AND INSTRUMENTATION
FLOW DIAGRAM
AIR TREATMENT SYSTEMS
DESIGNED BY MB
DRAWN BY MB
CHECKED BY MB
GROUP LEADER MZ
SCALE NONE
DATE MAY 1999
G409
Time: 3:25 P.M. Date: 8/2/1999 parmdb Drawing File: H:\32174\INS\Rev6\32174_10.dwg



SODIUM HYPOCHLORITE (NaOCl) STORAGE AND FEED SYSTEM
SODIUM HYPOCHLORITE FEED PUMPS
SODIUM HYPOCHLORITE (NaOCl) STORAGE TANK 4213-00
SODIUM HYPOCHLORITE (NaOCl) STORAGE TANK 4214-00
SODIUM HYPOCHLORITE (NaOCl) STORAGE TANK 4215-00
HYPOCHLORITE FILL STATION
HYPOCHLORITE SUMP PUMPS
SODIUM HYDROXIDE (NaOH) STORAGE AND FEED SYSTEM
CAUSTIC FEED PUMPS
CAUSTIC
SODIUM HYDROXIDE (NaOH) STORAGE TANK 4713-00
SODIUM HYDROXIDE (NaOH) STORAGE TANK 4714-00
HYDROXIDE FILL STATION
HYDROXIDE SUMP PUMPS
FILL
VENT
OVERFLOW (TYP.)
DRAIN (TYP.)
TO SCRUBBER 4423-00 SUCTION OF RECIRC. PUMPS
TO SCRUBBER 4424-00 SUCTION OF RECIRC. PUMPS
TO SCRUBBER 4425-00 SUCTION OF RECIRC. PUMPS
TO SCRUBBER 4426-00 SUCTION OF RECIRC. PUMPS
TO SECONDARY WET WELL
FLUSHING CONNECTION
FLUSHING CONNECTION (TYP.)
NOTE 1 (TYP.)
CONTAINMENT AREA
NOTE:
1 FOR SUMP PUMP PIPING VALVE TAG NOS. SEE TABLE ON DWG. G449.
2 FOR VALVE EQUIPMENT SIZE NOT SHOWN SEE MECHANICAL DRAWINGS.
UNAUTHORIZED ALTERATIONS OR ADDITIONS TO A PLAN BEARING A LICENSED ENGINEER'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.
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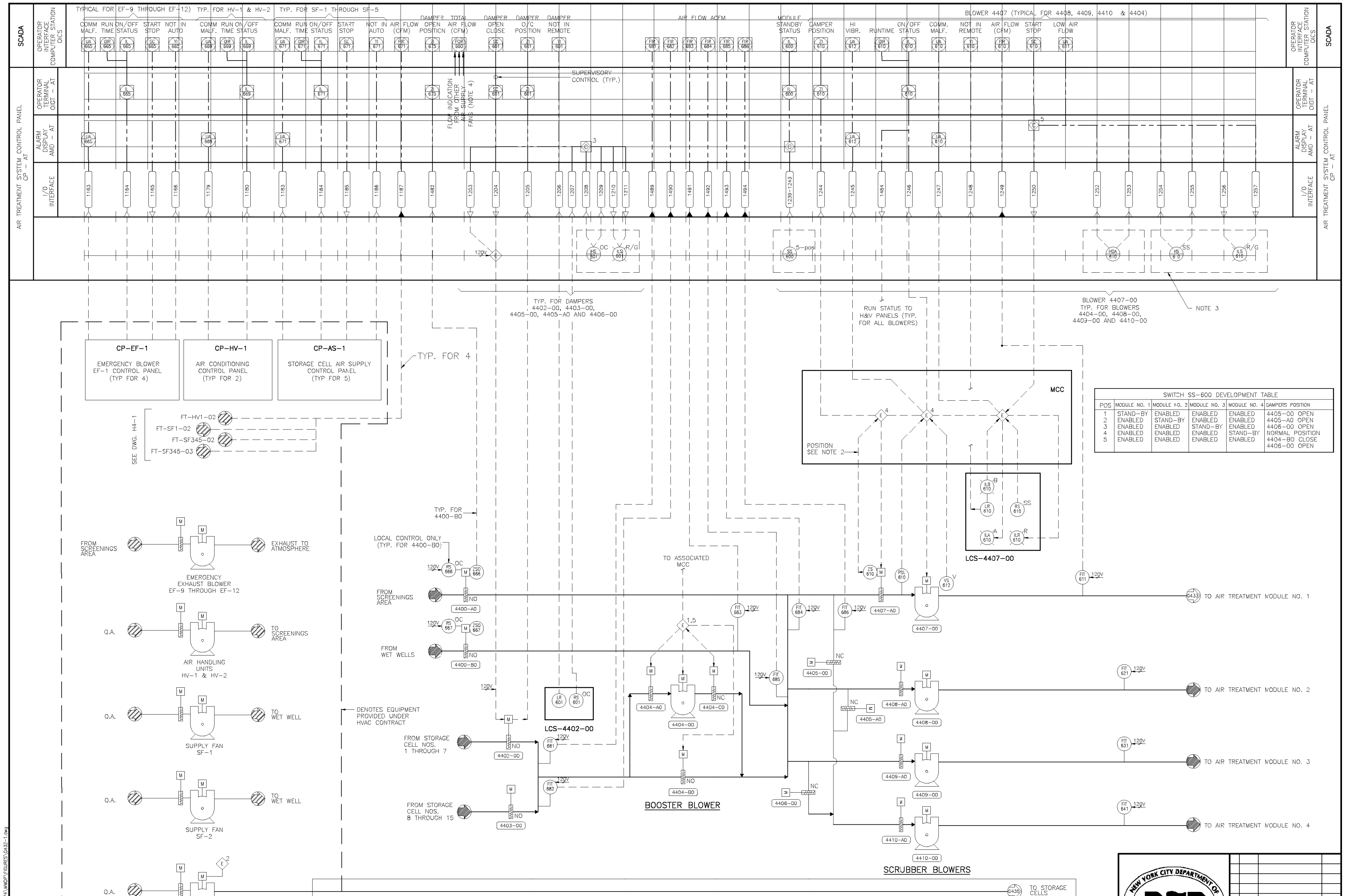
NEW YORK NEW JERSEY
NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DEP
REVISIONS
FLUSHING BAY WATER QUALITY IMPROVEMENT PROJECT WP-169
FLUSHING BAY CSO RETENTION FACILITY STORAGE FACILITY CONTRACT NO. CS4-4
PROCESS AND INSTRUMENTATION
FLOW DIAGRAM
CHEMICAL STORAGE AND FEED SYSTEMS
DESIGNED BY: MB
DRAWN BY: MB
CHECKED BY: MB
GROUP LEADER: MZ
SCALE: NONE
DATE: MAY 1999
G410
Time: 7:22 A.M. Date: 4/25/1999 prdjp Drawing File: H:\32174\INS\Red\32174_I7.dwg



SWITCH SS-600 DEVELOPMENT TABLE					
POS	MODULE NO. 1	MODULE NO. 2	MODULE NO. 3	MODULE NO. 4	DAMPERS POSITION
1	STAND-BY	ENABLED	ENABLED	ENABLED	4405-00 OPEN
2	ENABLED	STAND-BY	ENABLED	ENABLED	4405-A0 OPEN
3	ENABLED	ENABLED	STAND-BY	ENABLED	4406-00 OPEN
4	ENABLED	ENABLED	ENABLED	STAND-BY	NORMAL POSITION 4404-B0 CLOSE 4406-00 OPEN
5	ENABLED	ENABLED	ENABLED	ENABLED	

INTERLOCK NOTES:

1 STARTING OF EITHER OF THE TWO BLOWERS FROM THE GROUP OF SF-2 THROUGH SF-5 ENABLES THE CONTROL FOR THE BOOSTER BLOWER. SEE TABLE (THIS DWG.) FOR DAMPER POSITIONS.

2 LOGIC SHALL PERMIT STARTING OF MORE THEN ONE "STORAGE CELL SUPPLY BLOWER" IF THE FOLLOWING CONDITIONS ARE MET:
A. AIR SUPPLY VALVES TO ALL CELLS BUT ONE ARE CLOSED – "MAINTENANCE MODE";
B. WATER LEVEL IN THE SELECTED FOR MAINTENANCE TANK DOES NOT EXCEED EL. 3.00
C. BOOSTER BLOWER DOES NOT REPORT MALFUNCTION.
D. MINIMUM OF TWO SCRUBBERS ARE OPERATIONAL.

3 LOGIC SHALL PERMIT STARTING OF ANY "STORAGE CELL AIR SUPPLY BLOWER" IF MINIMUM OF SIX AIR SUPPLY VALVES ARE OPEN.

4 LOGIC SHALL OPEN INLET DAMPER WHEN ASSOCIATED BLOWER STARTS, AND CLOSE WHEN IT STOPS.

5 LOGIC SHALL OPEN DAMPERS 4404-A0 & 4404-C0, CLOSE DAMPER 4404-B0 WHEN BLOWER STARTS; REVERSE SEQUENCE WHEN BLOWER STOPS.

NOTES:

1 FOR PANEL AND LCS LAYOUT SEE DWGS. G438 & G442.

2 DAMPER LIMIT SWITCHES SHALL BE WIRED DIRECTLY TO MOTOR STARTER LOGIC. TYP. FOR DAMPERS 4404-A0, B0, & C0, 4407-A0, 4408-A0, 4409-A0 & 4410-A0. ALL DAMPERS SHALL REPORT OPEN/CLOSE POSITION TO OIGT AND SCADA SCREENS.

3 TYPE CMC ILLUMINATED SWITCH, MOMENTARY START AND PUSH TO STOP.

4 CALCULATE SUM OF AIR FLOW SUPPLIED BY SF-2, 3, 4 AND 5.

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CONSULTING ENGINEERS
NEW YORK NEW JERSEY

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION — DEP

NO.	DATE	DESCRIPTION	APPR'D.

REVISIONS

CAPITAL PROJECT NAME & NO.: FLUSHING BAY WATER QUALITY IMPROVEMENT PROJECT WP-169

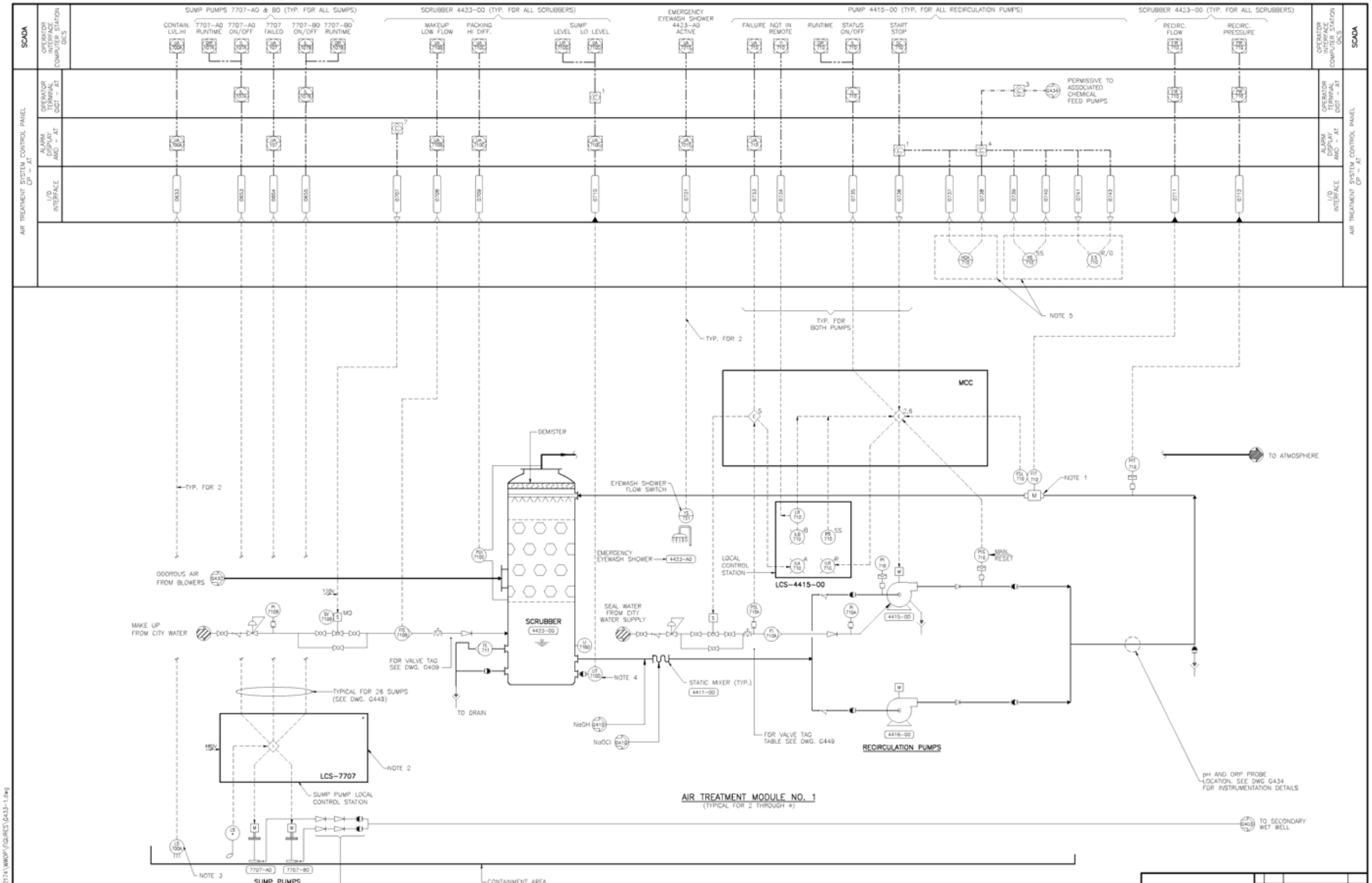
CONTRACT NAME & NO.: FLUSHING BAY CSO RETENTION FACILITY STORAGE FACILITY CONTRACT NO. CS4-4

DRAWING TITLE: PROCESS AND INSTRUMENTATION

P & ID
AIR TREATMENT SYSTEM – AIR BLOWERS

DESIGNED BY: MB
DRAWN BY: MB
CHECKED BY: MB
GROUP LEADER: MZ
CHIEF:
PROJ MGR.:
GRAPHIC SCALE
SCALE: NONE
DATE: JULY 2004
DWG. NO.: G432-1
SHEET NO:

Time: 10:53 A.M. Date: 4/4/2007 PCGRMD Drawing File: H:\32174\WMDP\FIGURES\G432-1.dwg



INTERLOCK NOTES:

1. LOW SCRUBBER SUMP LEVEL INHIBITS START FOR BOTH RECIRCULATION PUMPS.
2. PUMP SHUTS DOWN ON HIGH DISCHARGE PRESSURE; RESET REQUIRES RESTARTING THE PUMP.
3. PERMISSIVE TO CHEMICAL FEED PUMPS.
4. SCRUBBER AIR FLOW ENABLES RECIRCULATION PUMPS CONTROL. FIRST PUMP SELECTED "AUTO" POSITION ASSUMES THE "LEAD" MODE. OTHER PUMP BECOMES AUTOMATIC STANDBY. NORMAL SHUTDOWN OF THE "LEAD" PUMP SHALL NOT START STANDBY, NOR ALTER THE MODE.
5. SEAL WATER FLOW STARTS WHEN THE PUMP IS STARTED, AND STOPS WHEN THE PUMP IS STOPPED.
6. PROVIDE TIME DELAY IN START CIRCUITRY TO ALLOW FOR SEAL WATER PRESSURE TO BUILD & RECIRC. FLOW TO BE DETECTED.
7. SOLENOID OPENS WHEN EITHER RECIRCULATION PUMP STARTS.

NOTES:

1. REQUIRES MIN. 10DIA. UPSTREAM & 5DIA. DOWNSTREAM.
2. LOCAL CONTROL STATION FOR DUPLEX SUMP PUMP SHALL BE PROVIDED BY SUMP PUMP VENDOR (TYPICAL FOR 24).
3. FOR LEAK SENSOR PROBE INSTALLATION DETAIL SEE DWG. G447.
4. FOR OPEN FLANGE LEVEL TRANSMITTER INSTALLATION DETAILS SEE DWG. G447.
5. TYPE CMC ILLUMINATED SWITCH, MOMENTARY START AND PUSH TO STOP.

URS Greiner
CONSULTING ENGINEERS
NEW YORK / NEW JERSEY

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

NO.	DATE	DESCRIPTION	APPR'D

REVISIONS

CAPITAL PROJECT NAME & NO.: FLUSHING BAY WATER QUALITY IMPROVEMENT PROJECT WP-169

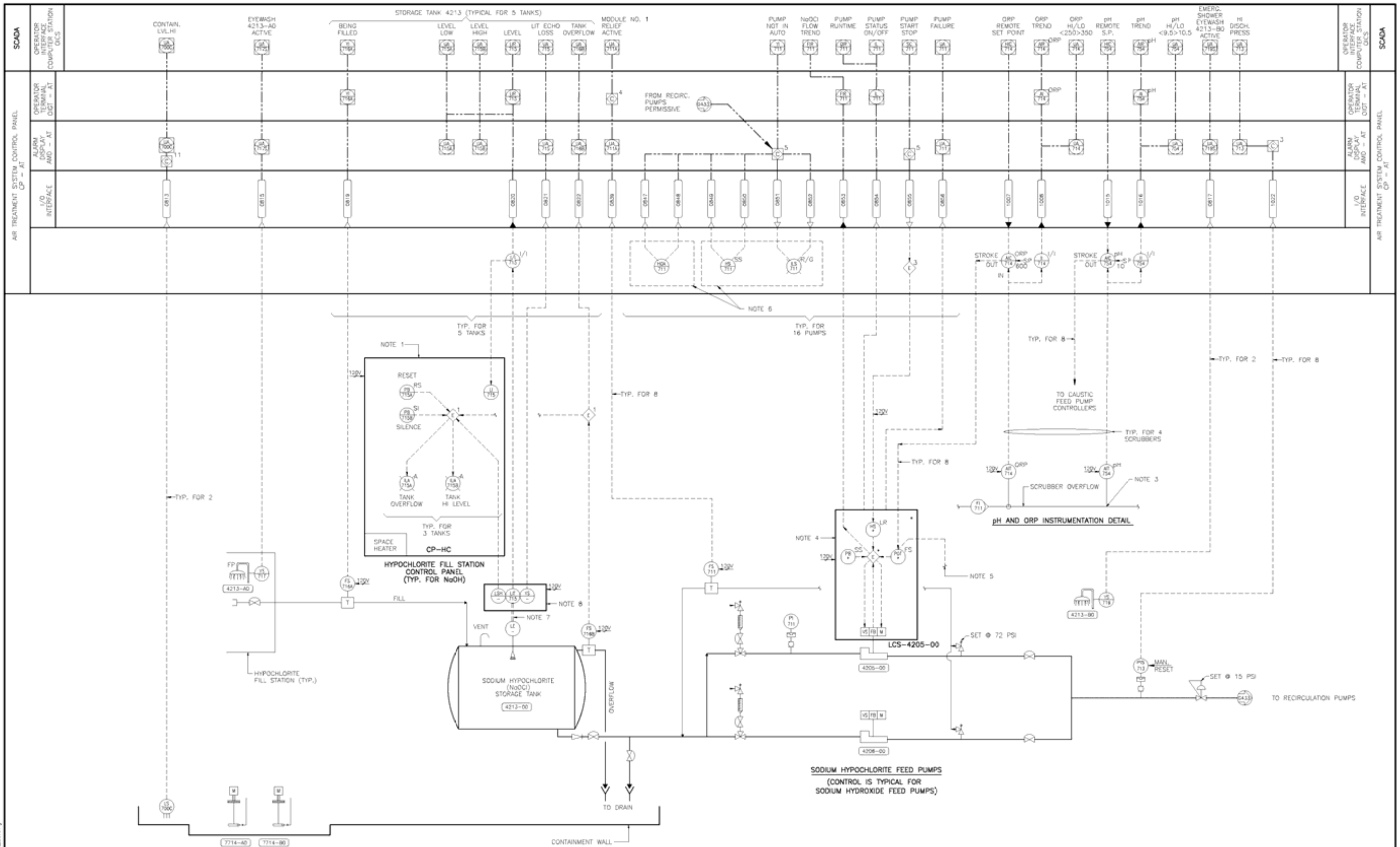
CONTRACT NAME & NO.: FLUSHING BAY CSO RETENTION FACILITY STORAGE FACILITY CONTRACT NO. CS4-4

DRAWING TITLE: PROCESS AND INSTRUMENTATION

P & ID
AIR TREATMENT SYSTEM – SCRUBBERS

DESIGNED BY:	MB
DRAWN BY:	MB
CHECKED BY:	MB
GROUP LEADER:	MZ
SCALE:	NONE
DATE:	MAY 1999
DWG. NO.:	G433-1

Time: 10:43 A.M. Date: 4/4/2007 PCGRMD Drawing File: H:\32174\WMOP\FIGURES\G433-1.dwg



INTERLOCK NOTES:

1 HIGH TANK LEVEL, OR TANK OVERFLOW INITIATES ALARM.

2 LOW TANK LEVEL IN ALL THREE TANKS SHALL INHIBIT START OF EVERY SODIUM HYPOCHLORITE FEED PUMP.

3 PUMP SHUTS DOWN ON HIGH DISCHARGE PRESSURE; RESET REQUIRES RESTARTING THE PUMP.

4 PUMP SHUTS DOWN ON RELIEF DETECTION; RESET REQUIRES TO RESTARTING THE PUMP.

5 PUMP CONTROLS ENABLE ONLY WHEN ONE OF THE ASSOCIATED RECIRCULATION PUMPS IS ON. FIRST PUMP PLACED IN "AUTO", ASSUMES "LEAD" MODE. OTHER PUMP BECOMES AUTOMATIC STANDBY. NORMAL SHUTDOWN OF "LEAD" PUMP SHALL NOT START STANDBY, NOR ALTER THE MODE.

NOTES:

1 FOR PANEL LAYOUT AND ELEMENTARY DIAGRAM SEE DWGS. G436 & G437.

2 NOT USED

3 FOR PROBE INSTALLATION DETAIL SEE DWG. G447

4 PUMP CONTROLLER SHALL BE PROVIDED BY THE PUMP VENDOR, AND SHALL PERFORM FUNCTIONS AS SPECIFIED IN SECTION D-3.4

5 SIGNAL SHALL DAISY CHAIN THROUGH PUMP 4205-00 AND 4206-00 STROKE CONTROLLERS (SHARED OUTPUT).

6 TYPE CMC ILLUMINATED SWITCH, MOMENTARY START AND PUSH TO STOP.

7 TRANSDUCER CABLE SHALL BE PROVIDED BY LEVEL TRANSMITTER MANUFACTURER.

8 FOR LEVEL TRANSMITTER ENCLOSURE LAYOUT SEE DWG. G436

9 "*" – EQUIPMENT PROVIDED AS PART OF ASSOCIATED EQUIPMENT.

10 SODIUM HYPOCHLORITE FEED PUMPING IS SHOWN AND IS TYPICAL FOR CAUSTIC FEED PUMPING.

11 INHIBIT AUTOMATIC OPERATION OF SUMP PUMPS IF LEAK DETECTOR IS ACTIVE.

UNAUTHORIZED ALTERATIONS OR ADDITIONS TO A PLAN BEARING A LICENSED ENGINEER'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.

URS Greiner
CONSULTING ENGINEERS
NEW YORK NEW JERSEY

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

NO.	DATE	DESCRIPTION	APPR'D.

REVISIONS

CAPITAL PROJECT NAME & NO.: FLUSHING BAY WATER QUALITY IMPROVEMENT PROJECT WP–169

CONTRACT NAME & NO.: FLUSHING BAY CSO RETENTION FACILITY STORAGE FACILITY CONTRACT NO. CS4–4

DRAWING TITLE: PROCESS AND INSTRUMENTATION

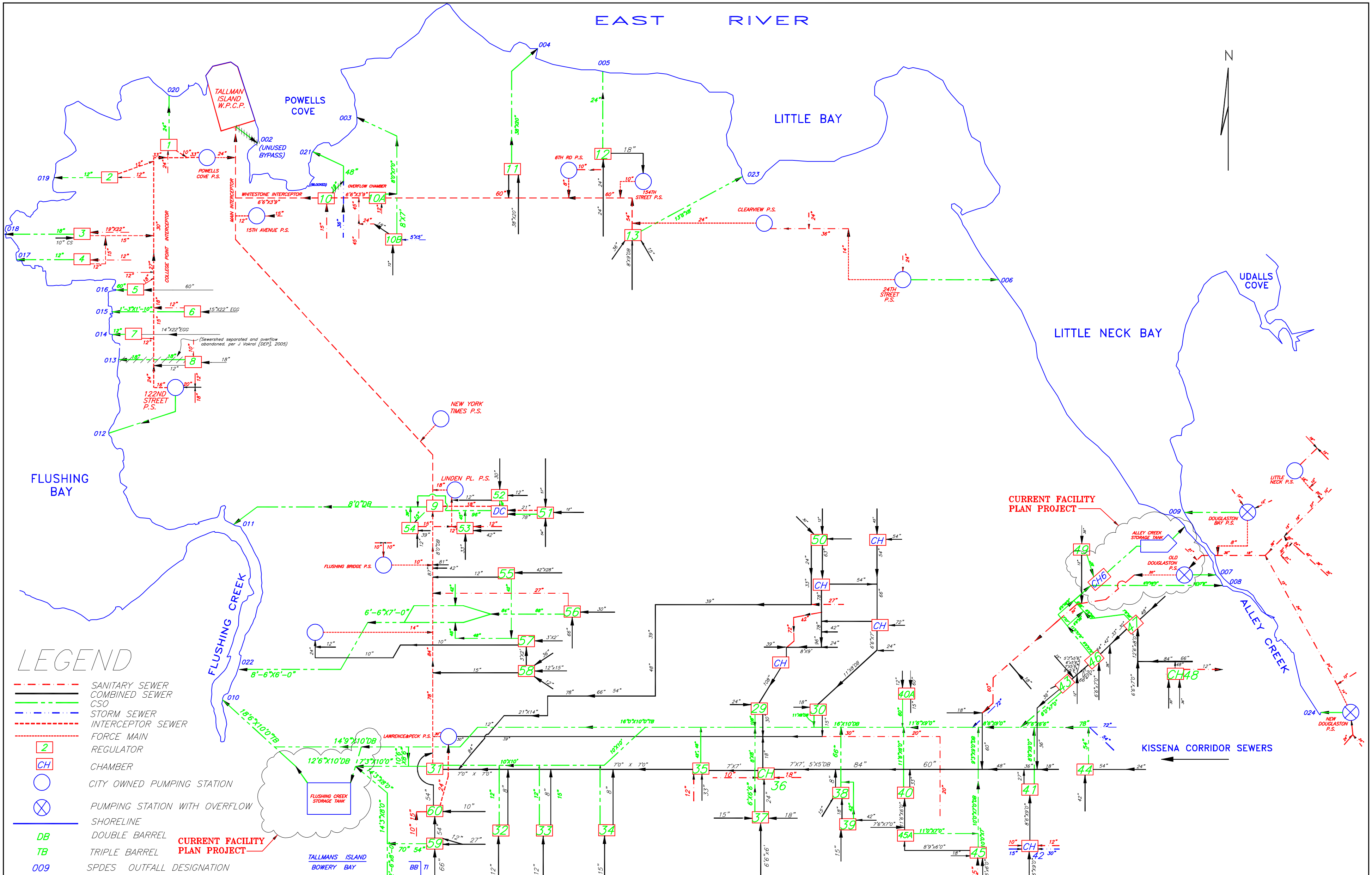
P & ID
AIR TREATMENT CHEMICAL SYSTEM

DESIGNED BY: MB
DRAWN BY: MB
CHECKED BY: MB
GROUP LEADER: MZ
SCALE: NONE
DATE: MAY 1999
DWG. NO.: G434

Time: 3:24 P.M. Date: 8/2/1999 psmedb Drawing File: H:\32174\INS\Red\32174_20.dwg

APPENDIX B

TALLMAN ISLAND WPCP SCHEMATICS CURRENT AND WITH CSO FACILITY PLAN



NO.	DATE	DESCRIPTION	APPR'D.
3	12/05	ADDITION OF FLUSHING AND ALLEY CREEK STOR. TANK-SEWER SYSTEM	G. WELTER
2	3/05	OBG CORRECTIONS	
1	1/05	HYDROQUAL CORRECTIONS	

REVISIONS

ZINOVY KAGAN
DRAWN

ALLA SHULIM P.E.
CHECKED

SCALE
NONE

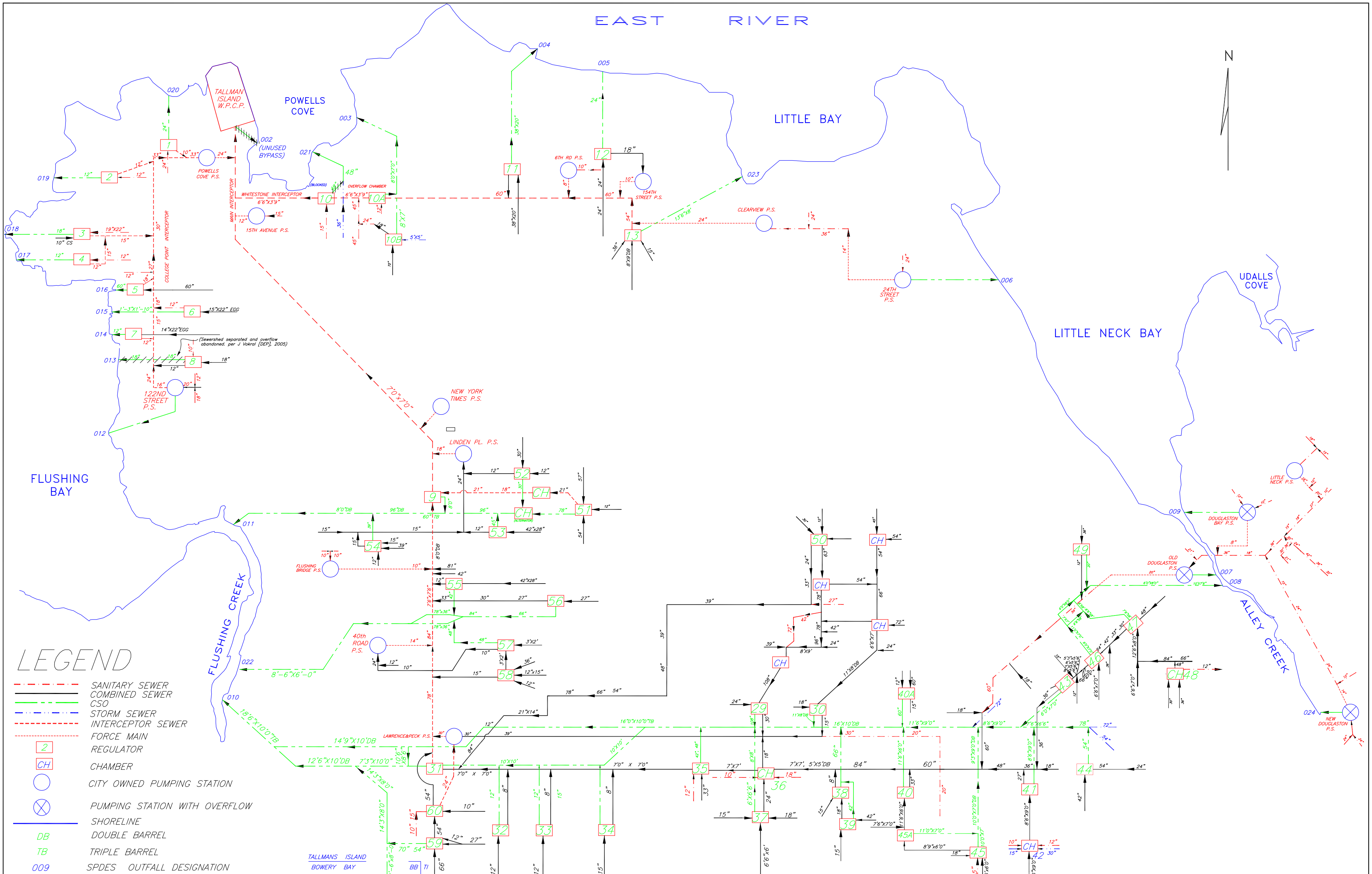
MELVIN JONES
CHIEF OF SECTION

STELLA ROZELMAN, P.E.
CHIEF OF DIVISION

CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTEWATER POLLUTION CONTROL
COLLECTION FACILITIES ANALYSIS SECTION

TALLMANS ISLAND WPCP
DRAINAGE AREA FLOW SCHEMATIC

DATE OCTOBER 1997
SHEET 1
OF 1



NO.	DATE	DESCRIPTION	APPR'D.
2	3/05	OBG CORRECTIONS	
1	1/05	HYDROQUAL CORRECTIONS	

REVISIONS

ZINOVY KAGAN
DRAWN
ALLA SHULIM P.E.
CHECKED

SCALE
NONE

MELVIN JONES
CHIEF OF SECTION
STELLA ROZELMAN, P.E.
CHIEF OF DIVISION

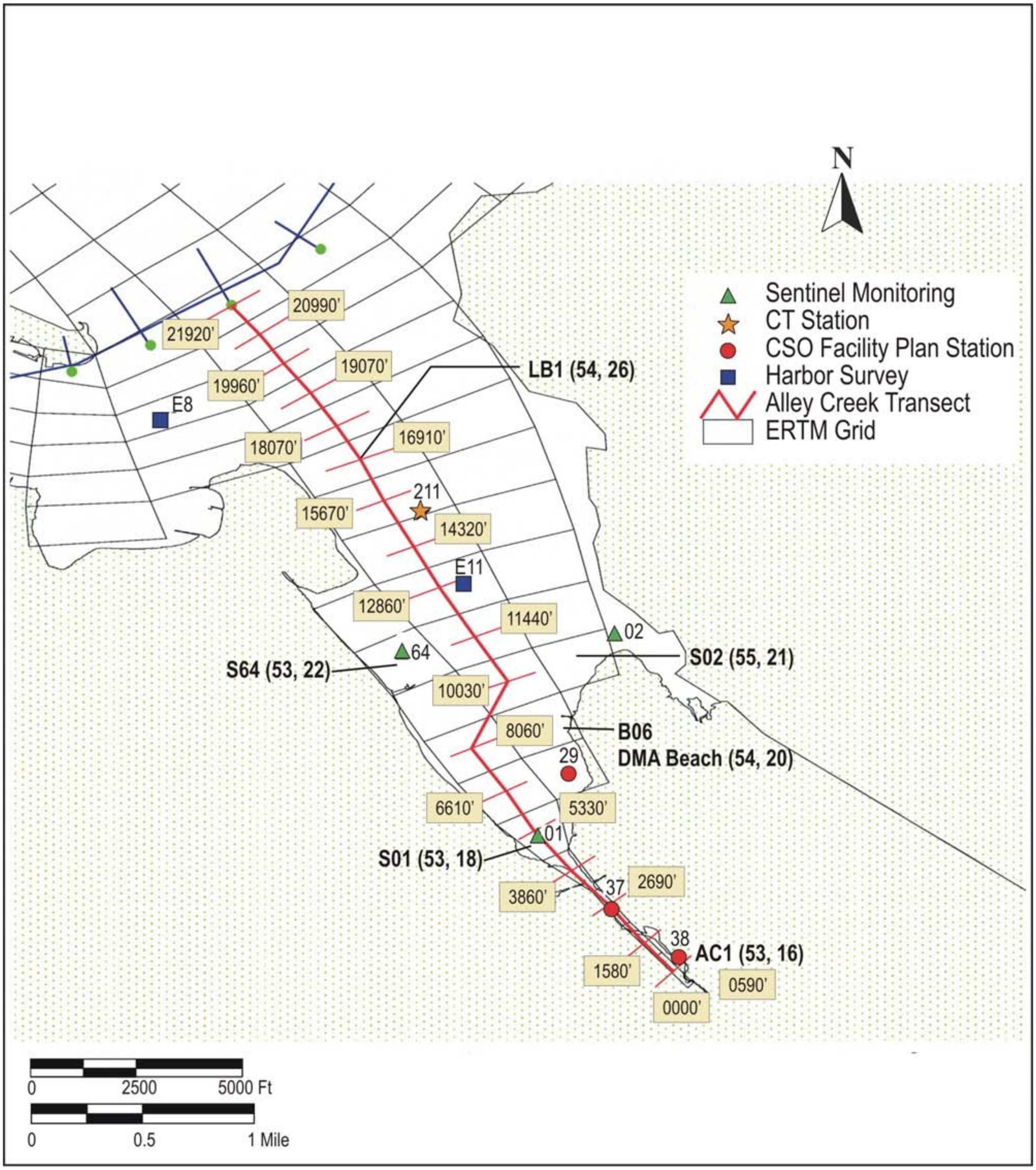
CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTEWATER POLLUTION CONTROL
COLLECTION FACILITIES ANALYSIS SECTION

TALLMANS ISLAND WPCP
DRAINAGE AREA FLOW SCHEMATIC

DATE OCTOBER, 1997
SHEET 1
OF 1

APPENDIX C

FIGURES FOR ALTERNATIVE ANALYSIS



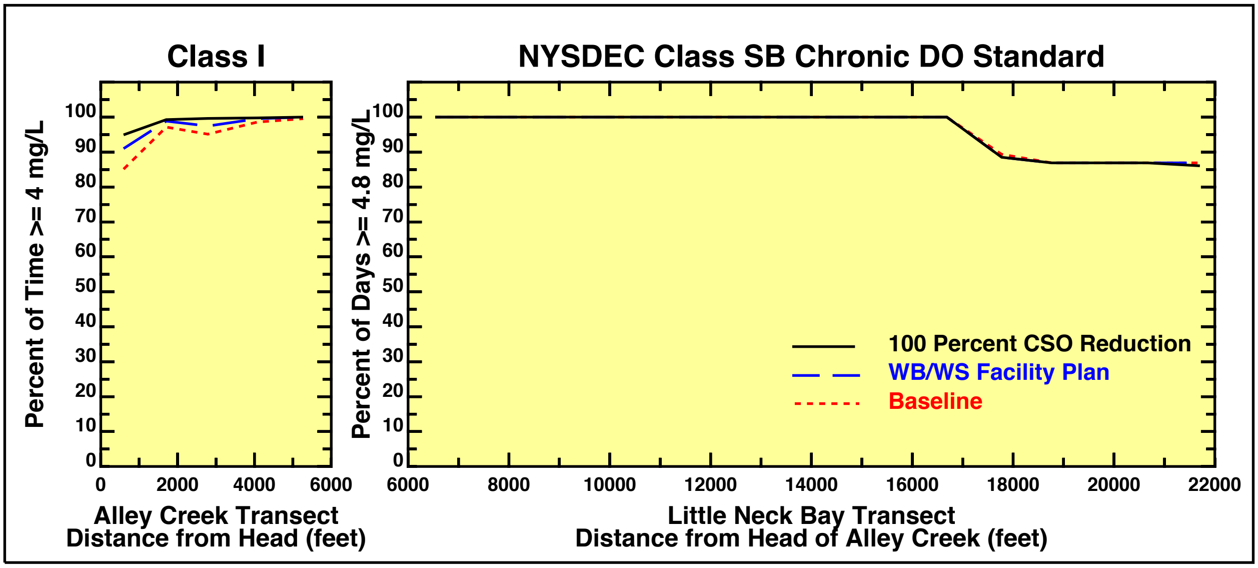
New York City
Department of Environmental Protection

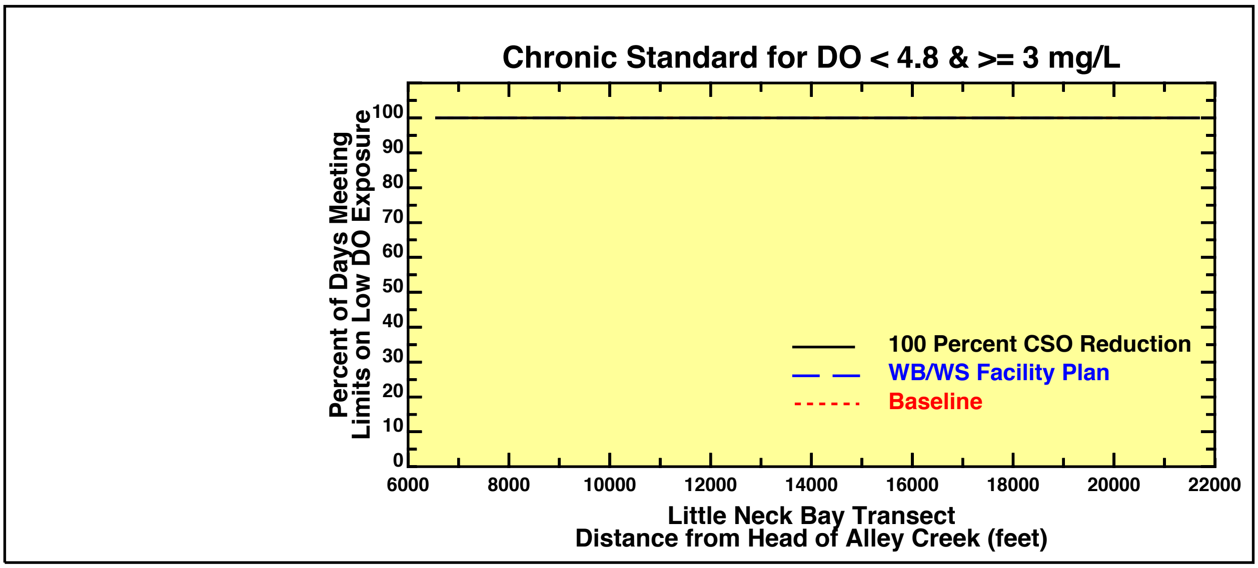
Alley Creek/Little Neck Bay Transect and Selected Locations

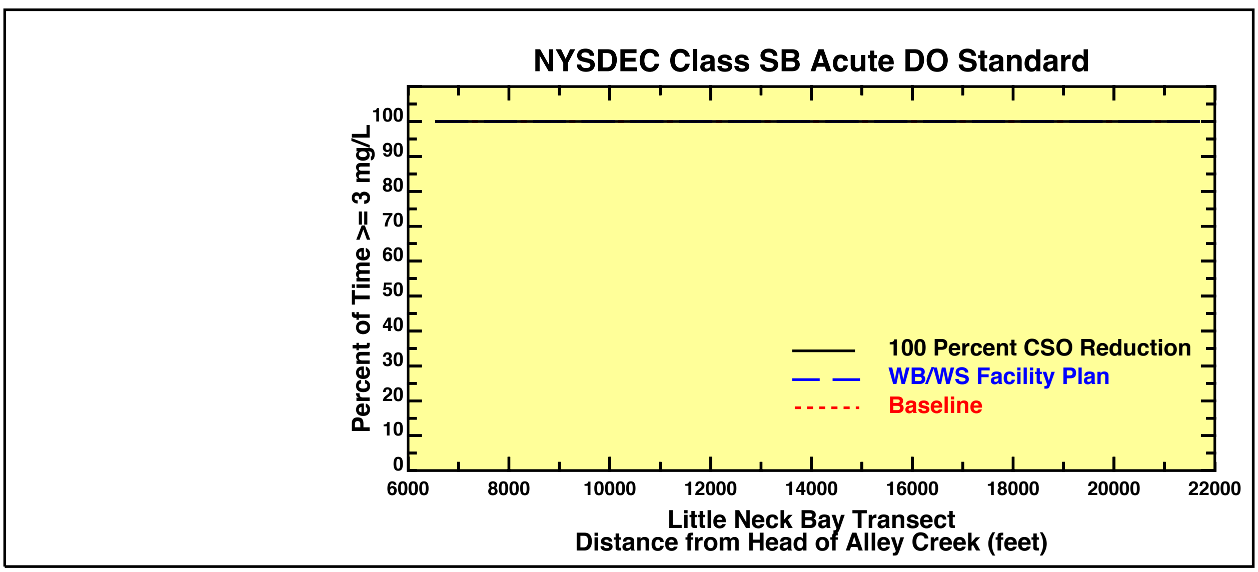
DISSOLVED OXYGEN PROJECTIONS

COMPARISON OF
BASELINE, 100 PERCENT CSO REDUCTION
AND WATERBODY/WATERSHED FACILITY PLAN

- **CURRENT NYSDEC STANDARDS, SUMMER AND MONTHLY**
- **COMPARISON IN ALLEY CREEK WITH SB CHRONIC AND ACUTE STANDARD, SUMMER AND MONTHLY**

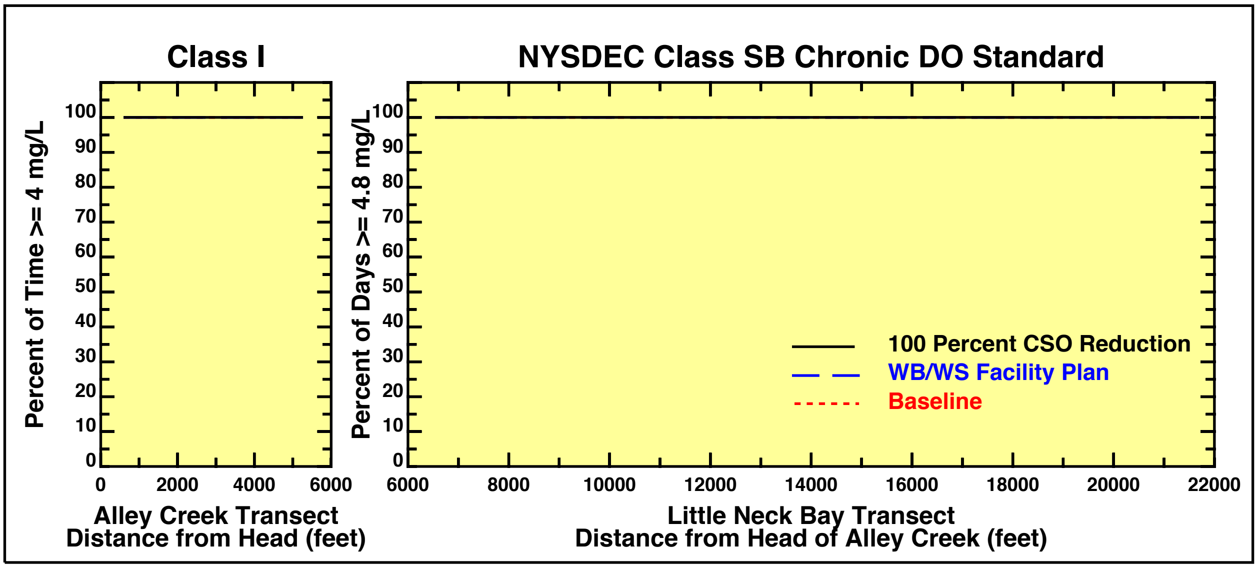


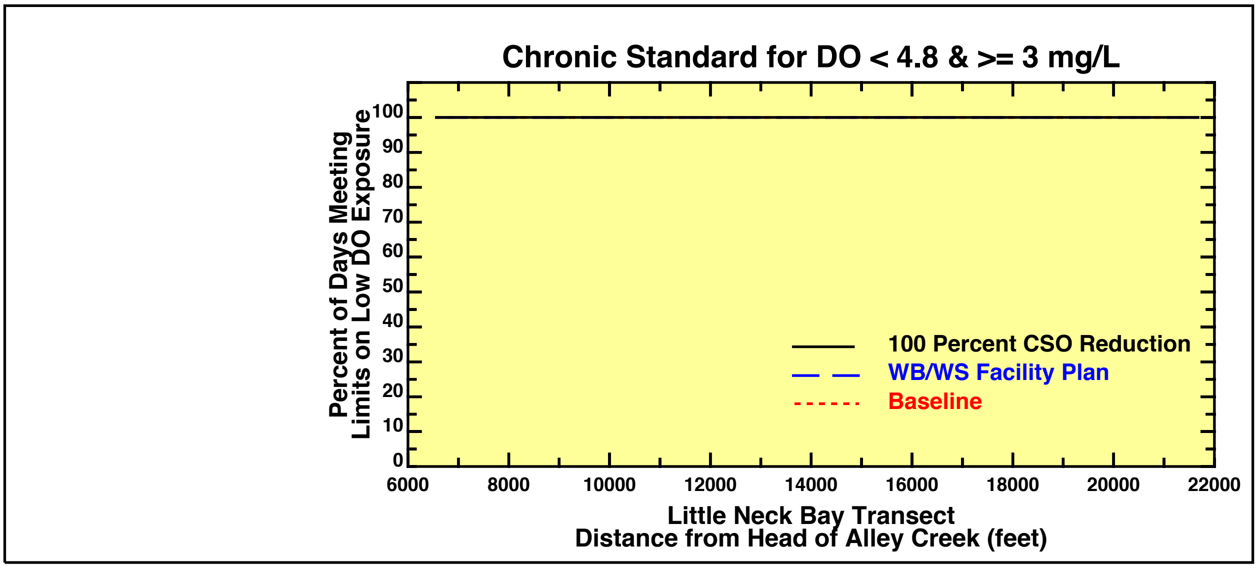


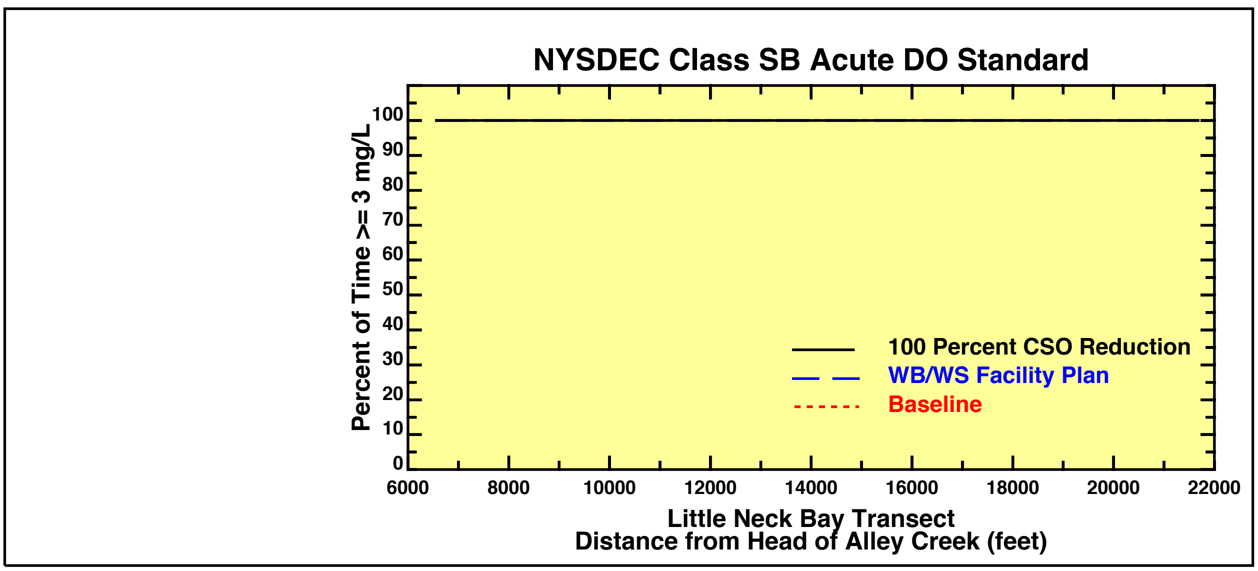


Dissolved Oxygen Alternatives Comparison for Summer
Alley Creek and Little Neck Bay Transect

3case_spat01.gdp
GOHJ0010
November 4, 2008

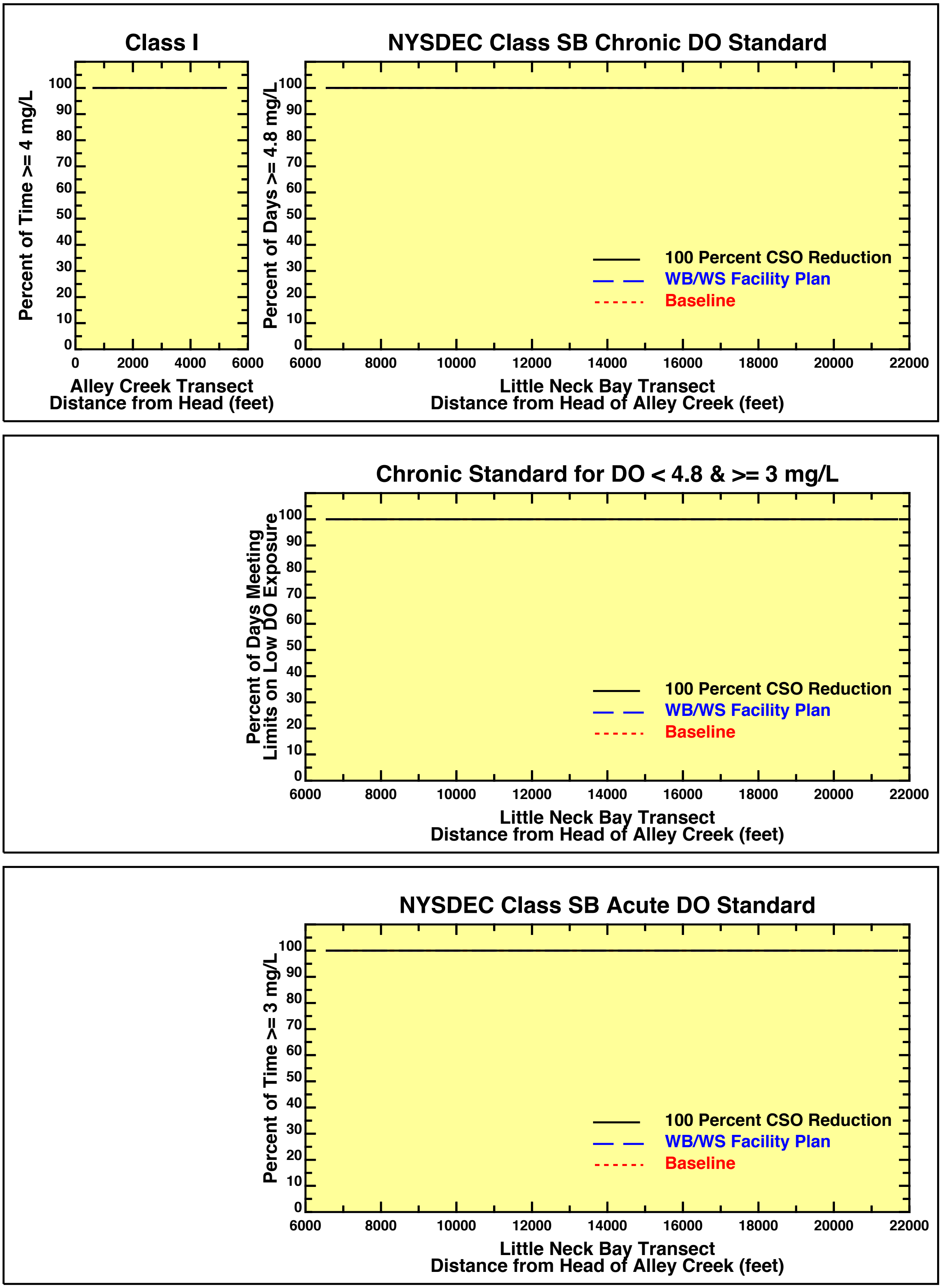






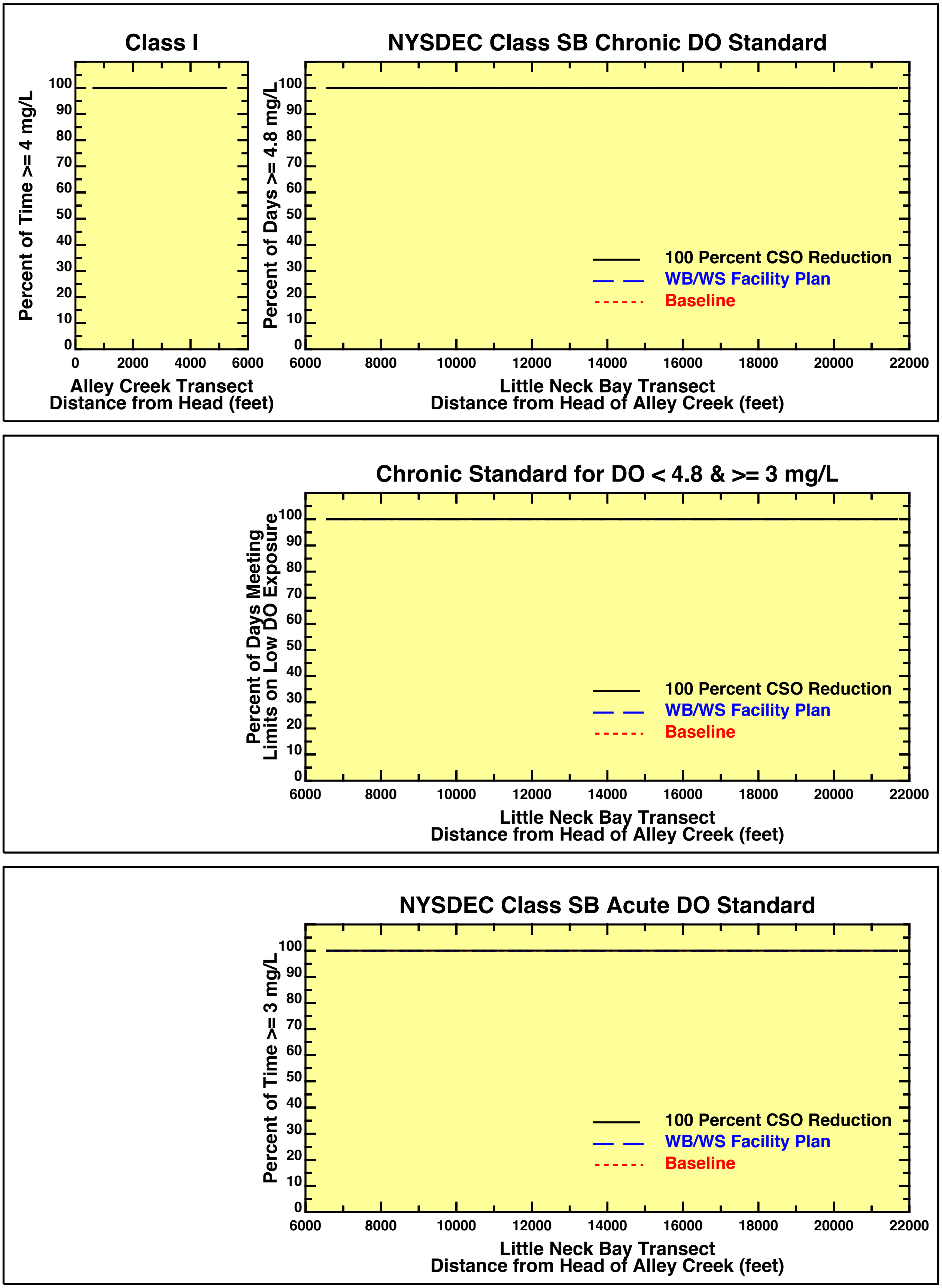
Dissolved Oxygen Alternatives Comparison for January
Alley Creek and Little Neck Bay Transect

3case_spat01.gdp
GOHJ0010
November 4, 2008



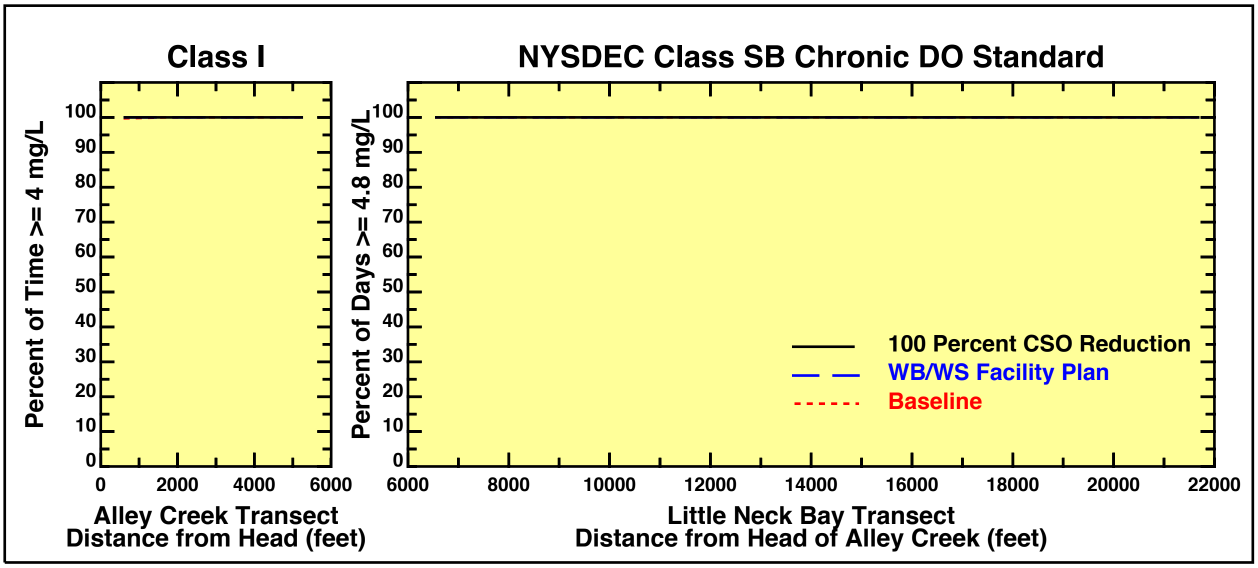
Dissolved Oxygen Alternatives Comparison for Febuary
Alley Creek and Little Neck Bay Transect

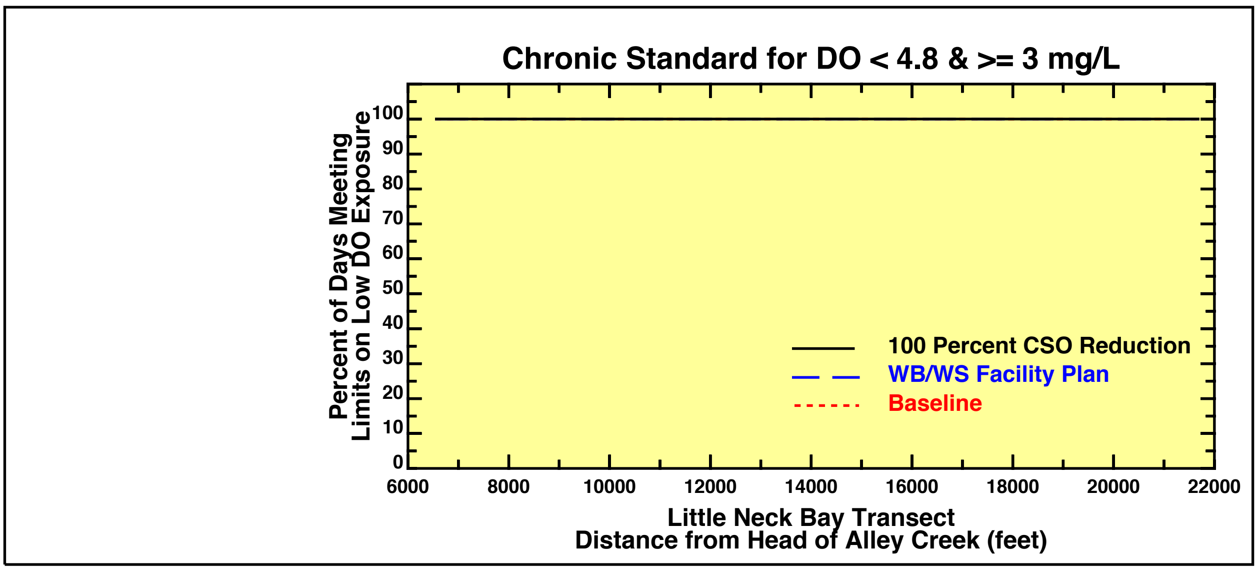
3case_spat01.gdp
GOHJ0010
November 4, 2008

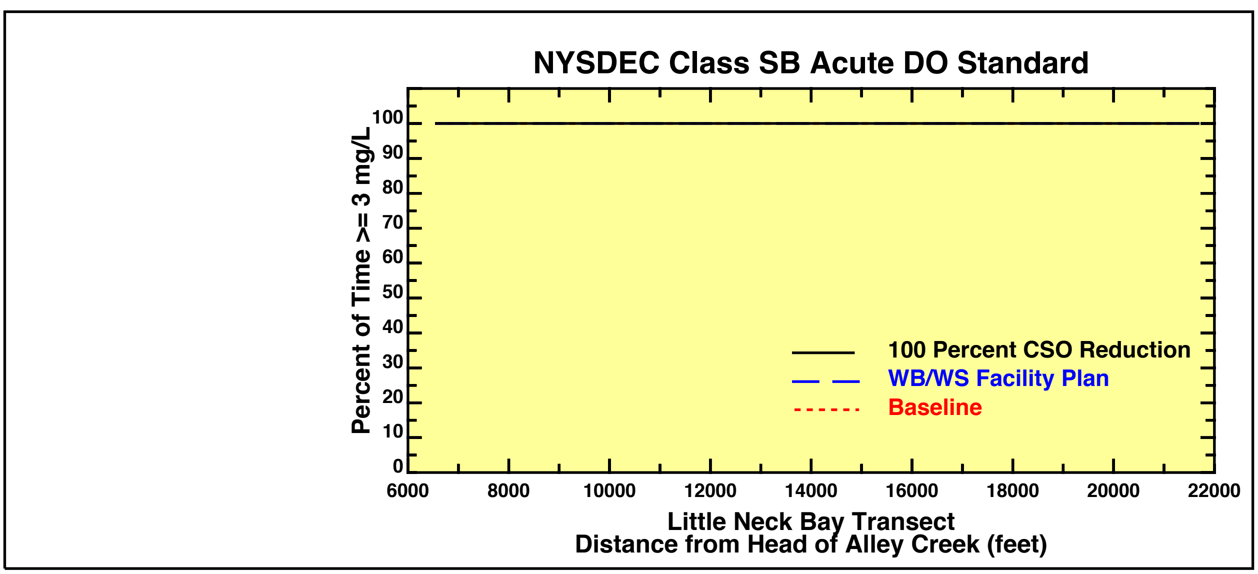


Dissolved Oxygen Alternatives Comparison for March
Alley Creek and Little Neck Bay Transect

3case_spat01.gdp
GOHJ0010
November 4, 2008

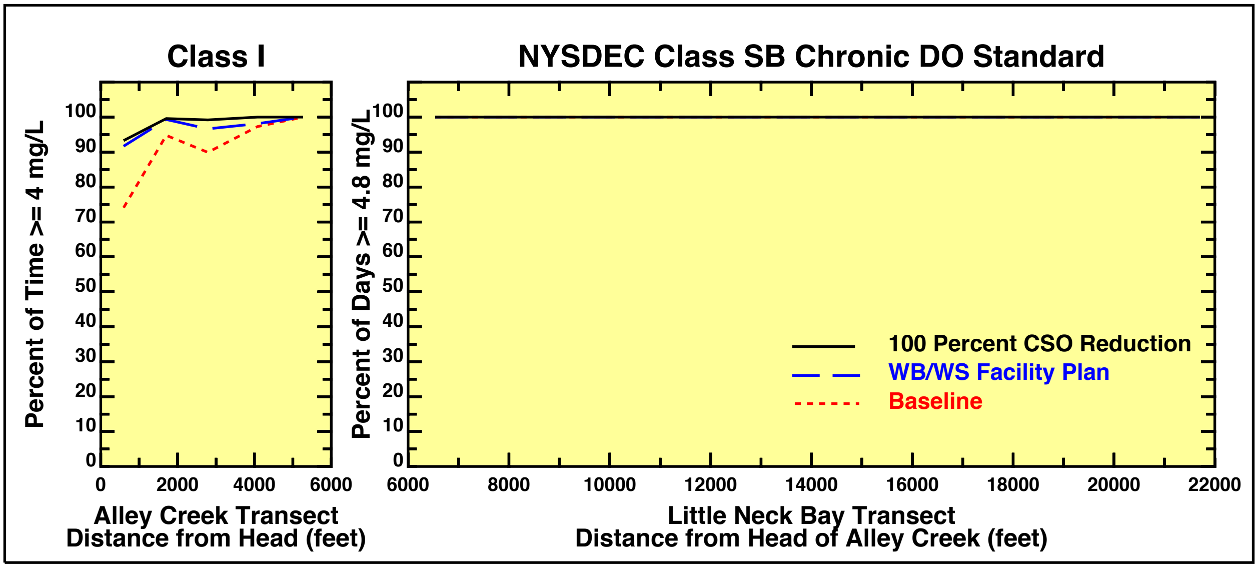


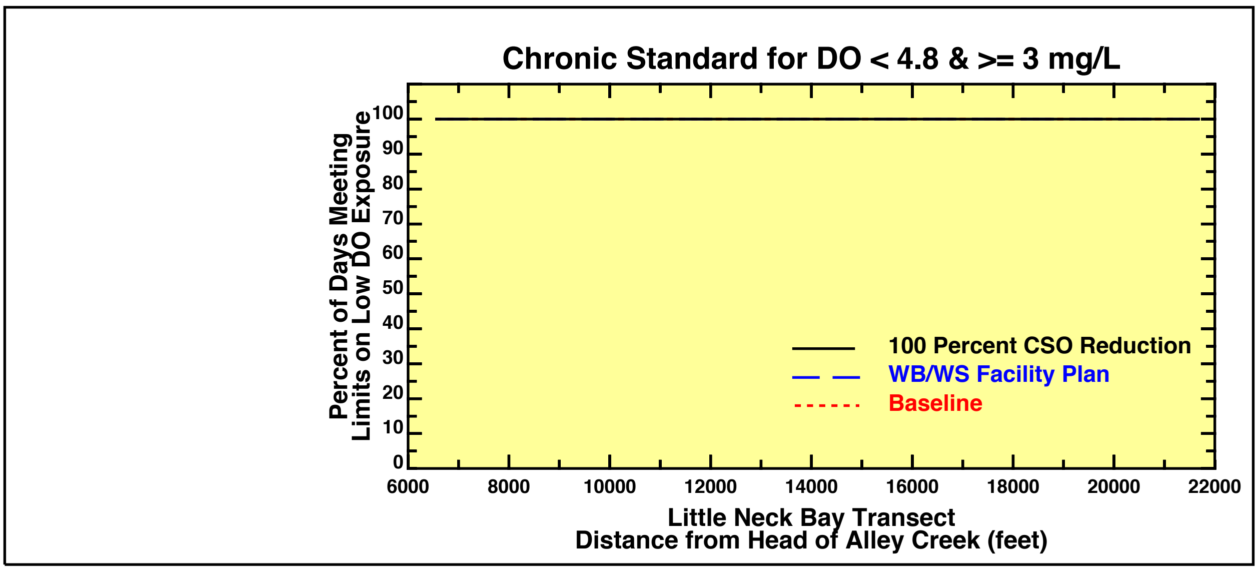


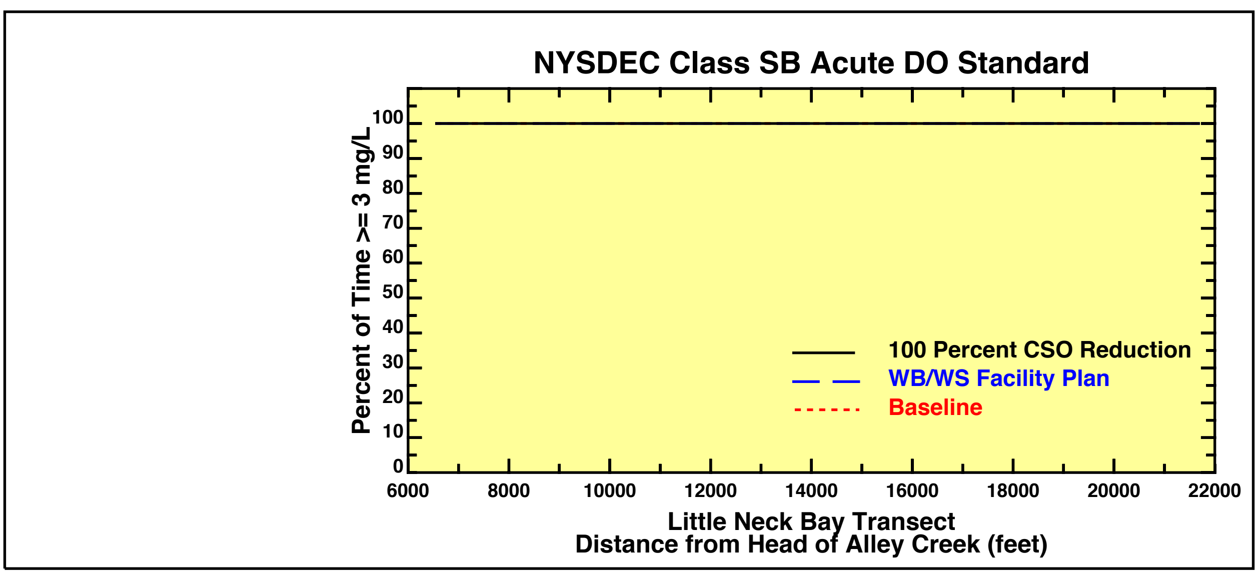


Dissolved Oxygen Alternatives Comparison for April
Alley Creek and Little Neck Bay Transect

3case_spat01.gdp
GOHJ0010
November 4, 2008

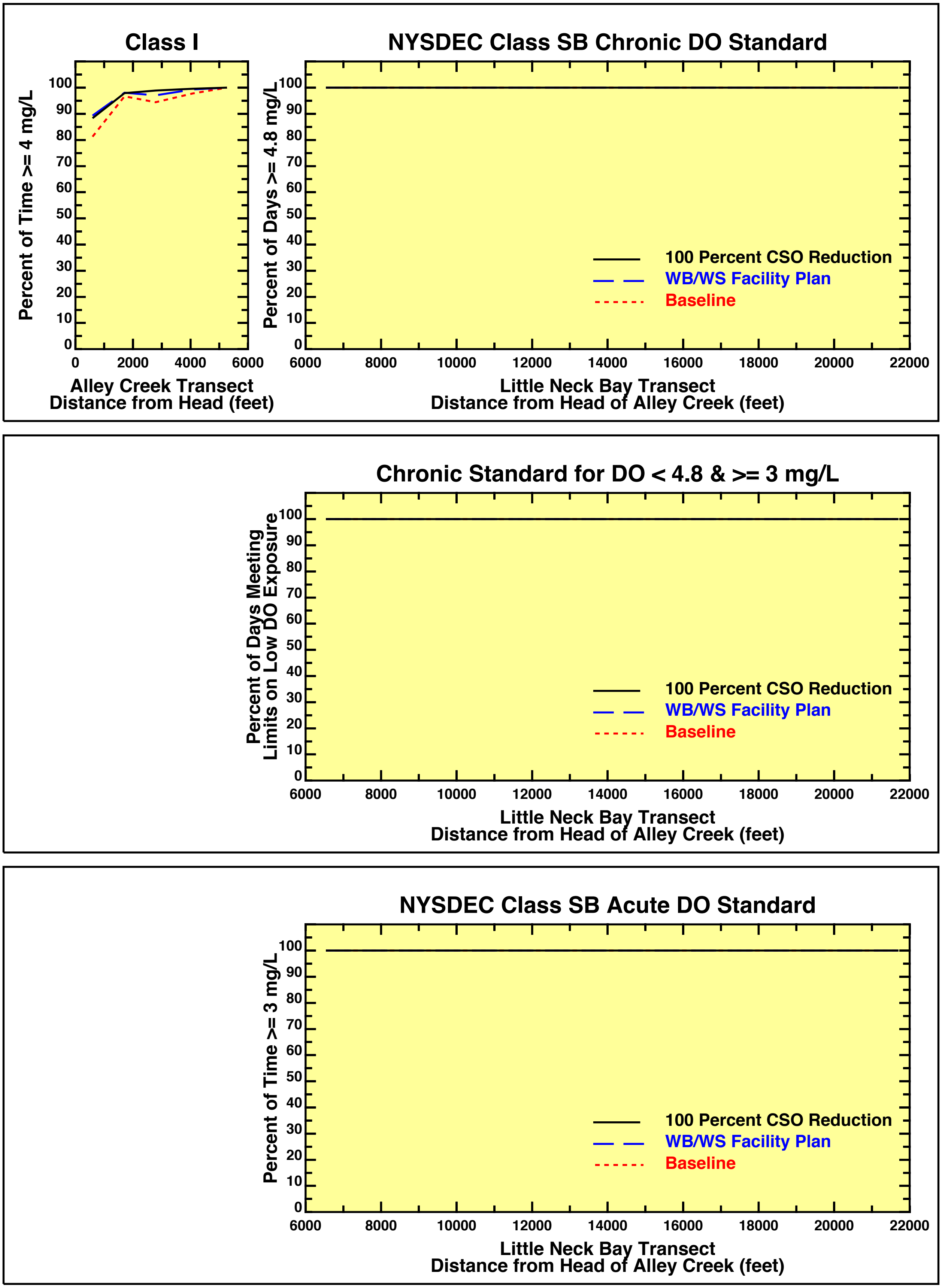






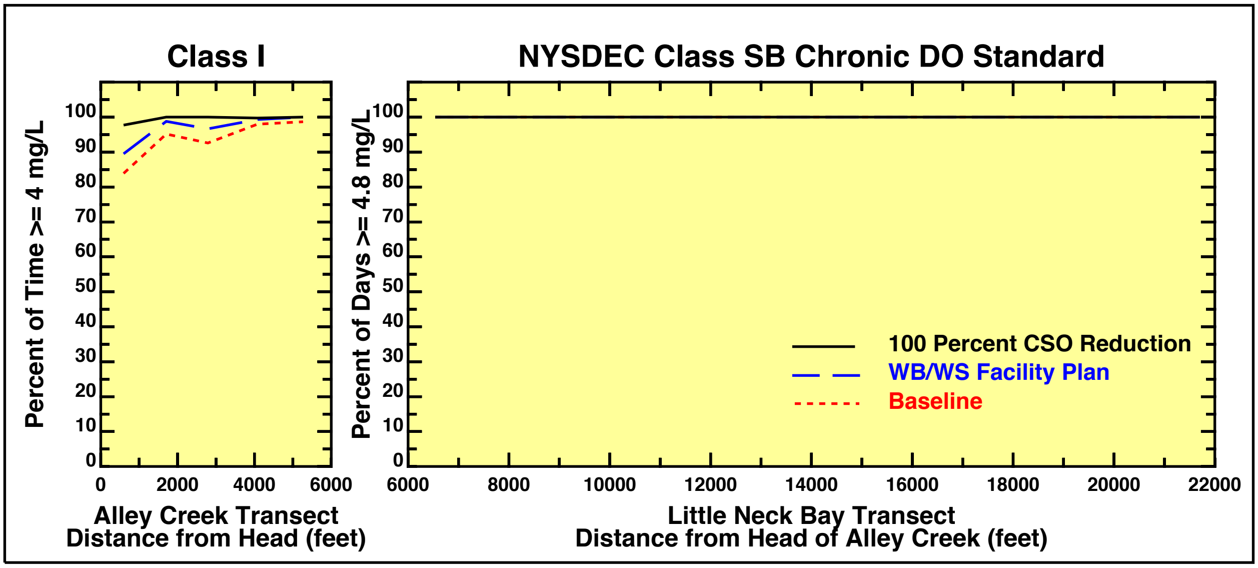
Dissolved Oxygen Alternatives Comparison for May
Alley Creek and Little Neck Bay Transect

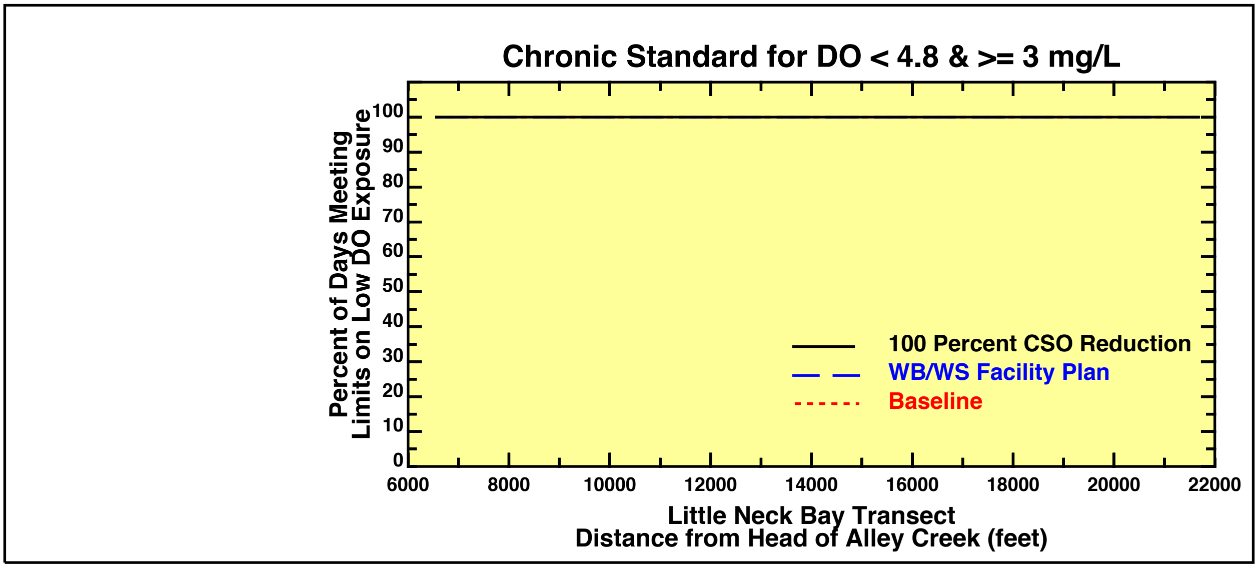
3case_spat01.gdp
GOHJ0010
November 4, 2008

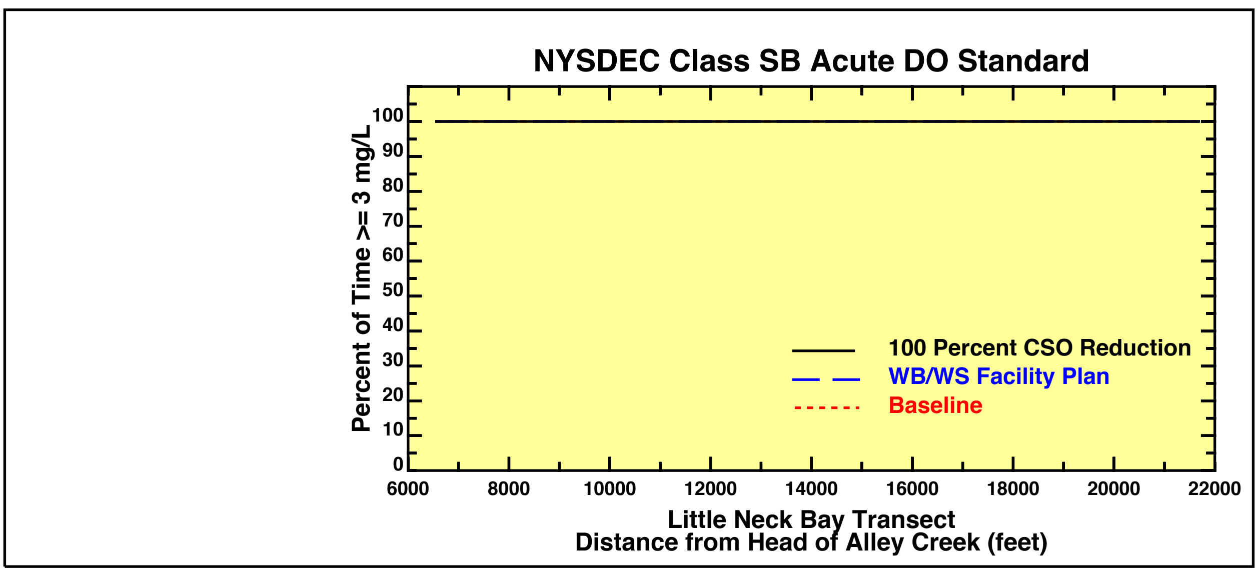


**Dissolved Oxygen Alternatives Comparison for June
Alley Creek and Little Neck Bay Transect**

3case_spat01.gdp
GOHJ0010
November 4, 2008







Dissolved Oxygen Alternatives Comparison for July
Alley Creek and Little Neck Bay Transect

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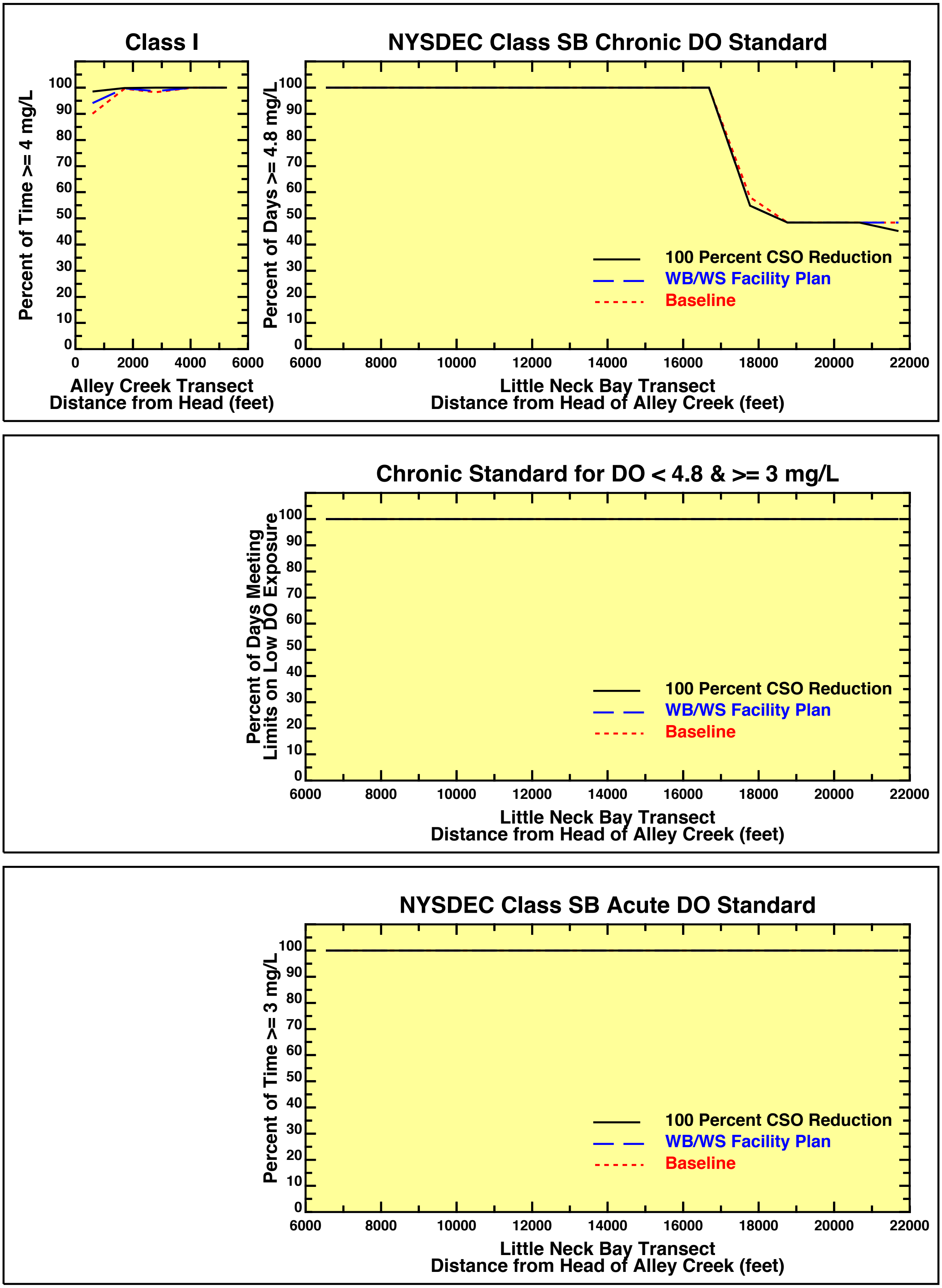
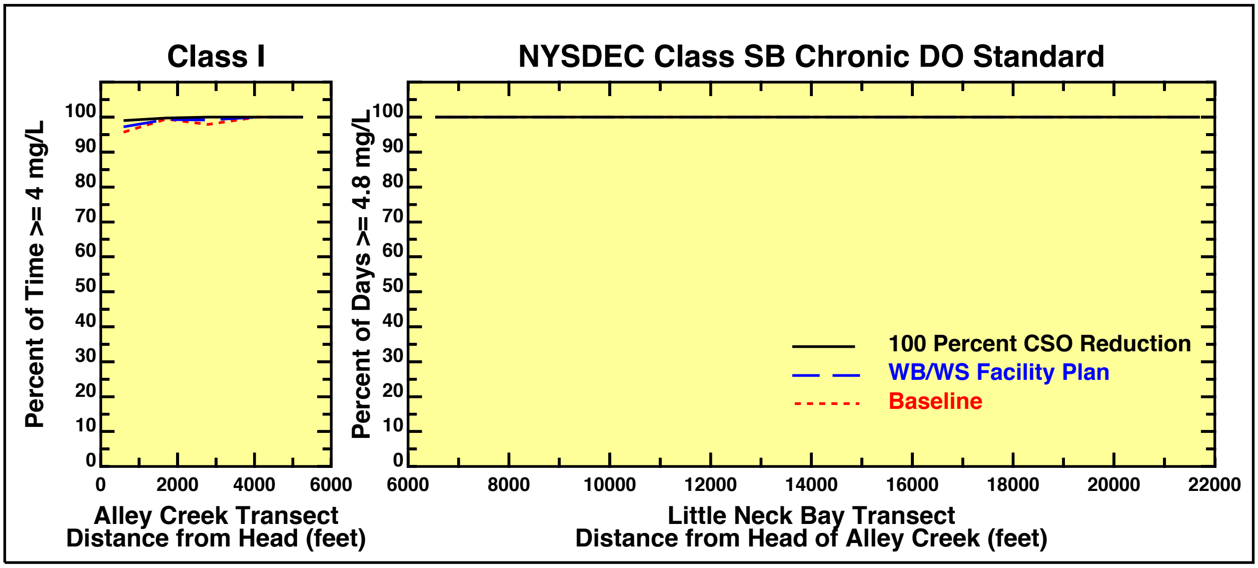
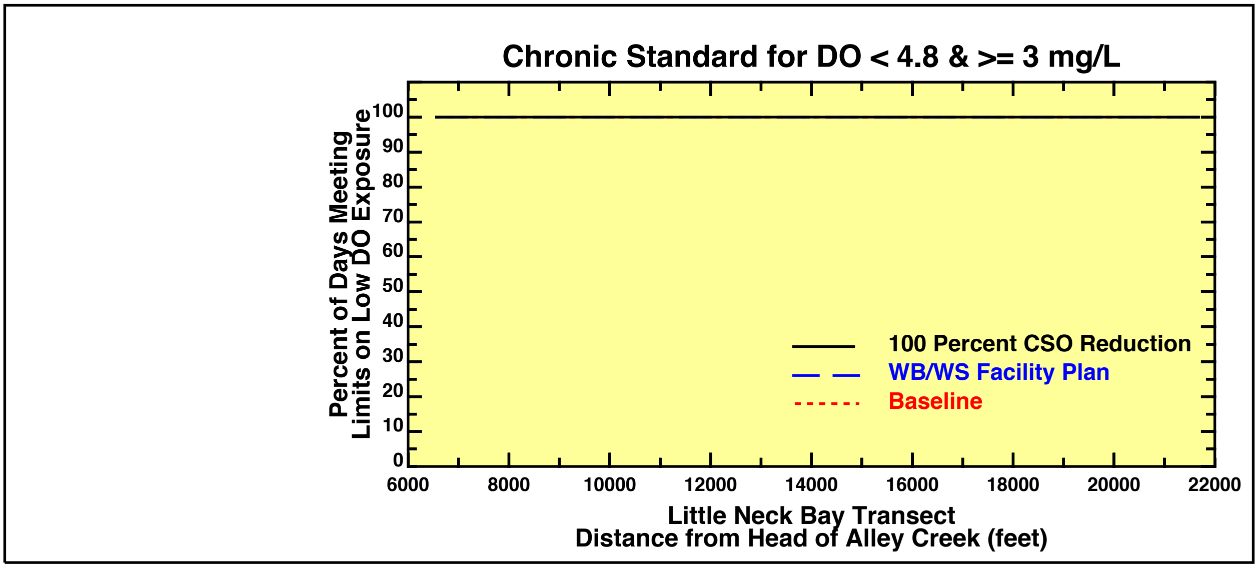
GOHJ0010
November 4, 2008

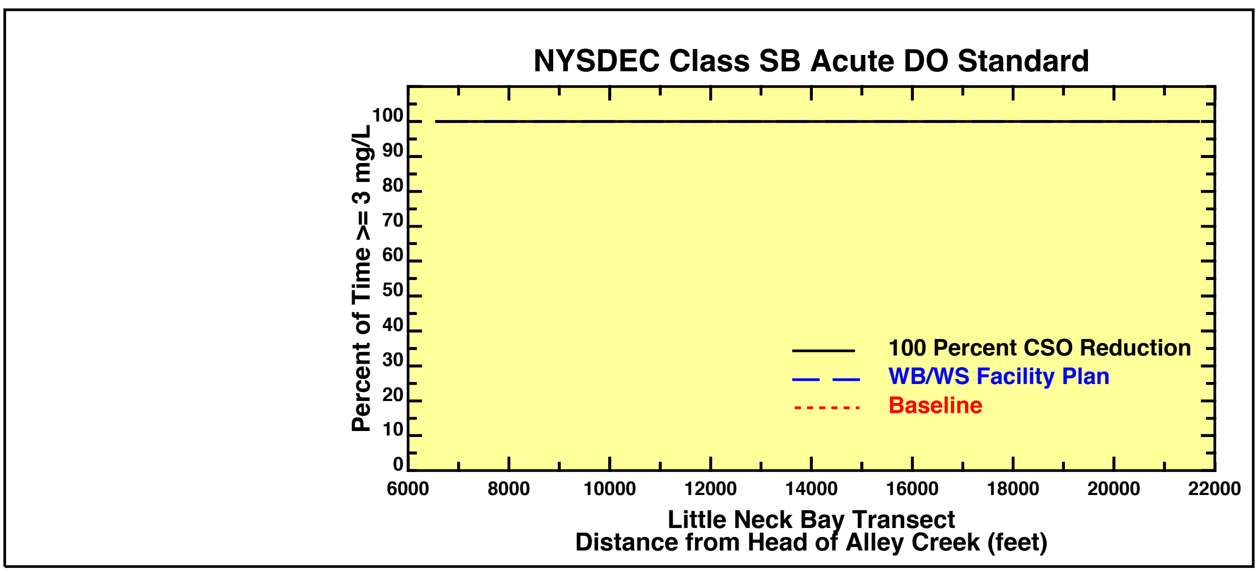


Dissolved Oxygen Alternatives Comparison for August
Alley Creek and Little Neck Bay Transect

3case_spat01.gdp
GOHJ0010
November 4, 2008







Dissolved Oxygen Alternatives Comparison for September
Alley Creek and Little Neck Bay Transect

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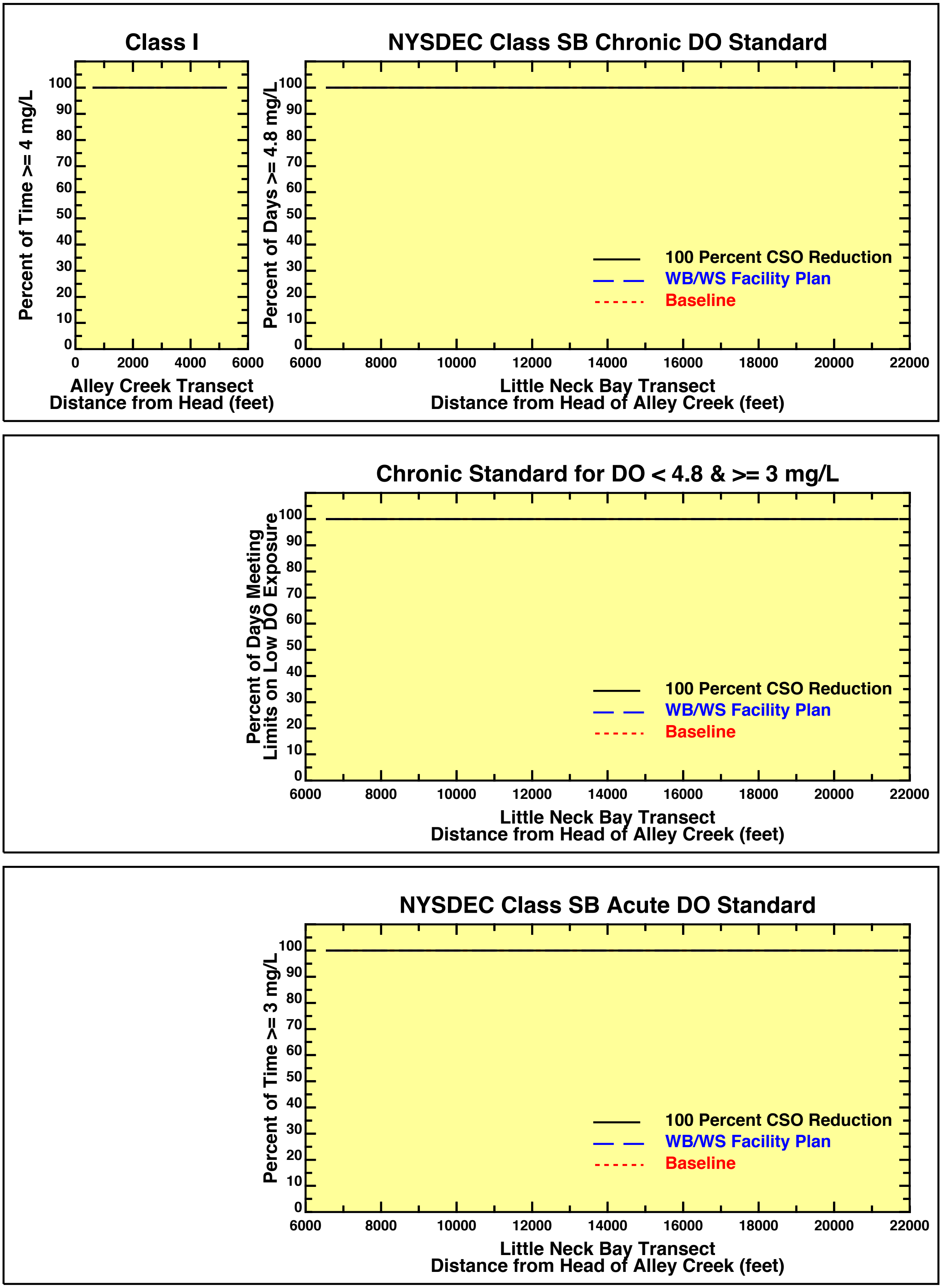
GOHJ0010
November 4, 2008



Dissolved Oxygen Alternatives Comparison for October
Alley Creek and Little Neck Bay Transect

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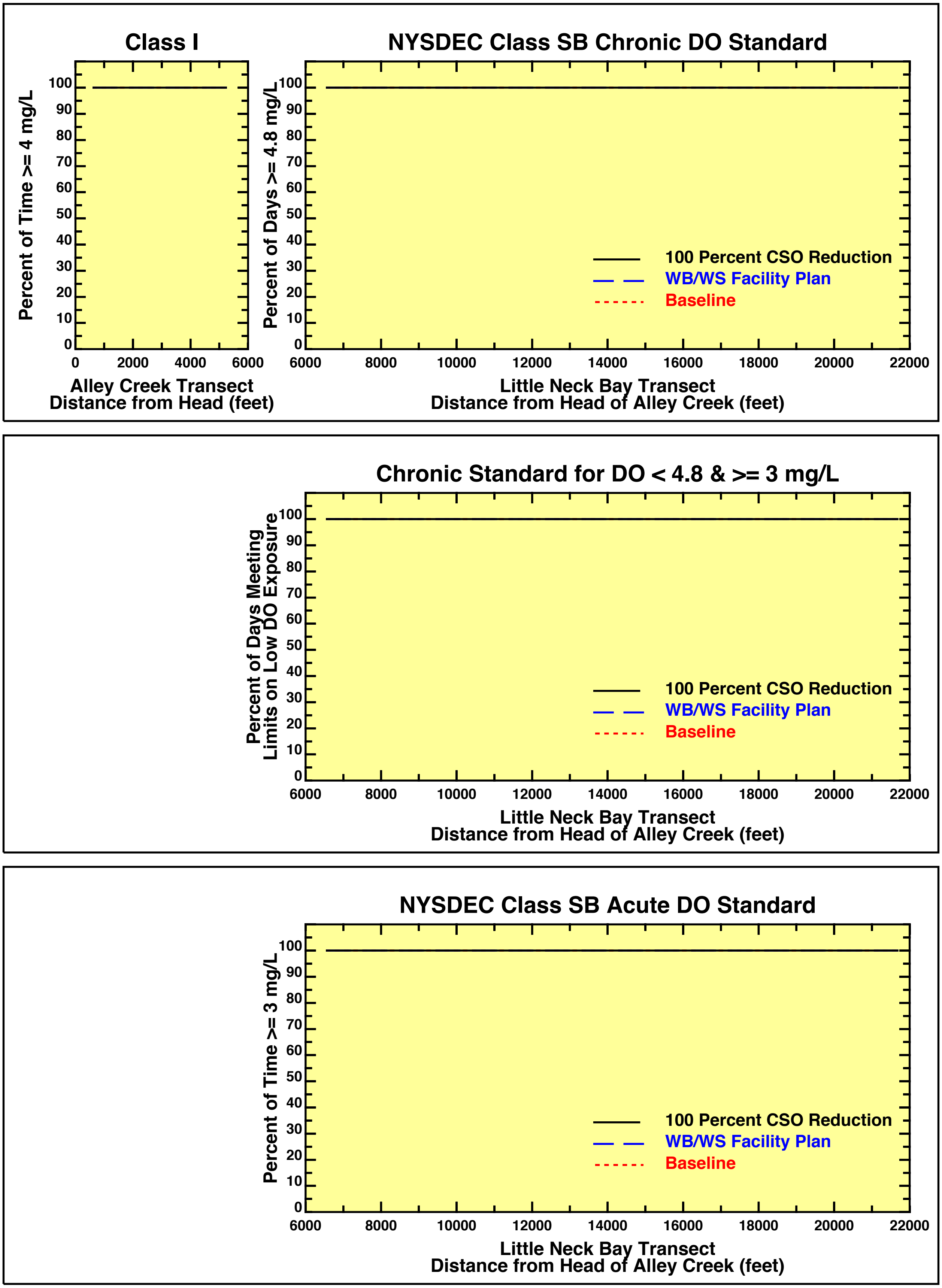
GOHJ0010
November 4, 2008



Dissolved Oxygen Alternatives Comparison for November
Alley Creek and Little Neck Bay Transect

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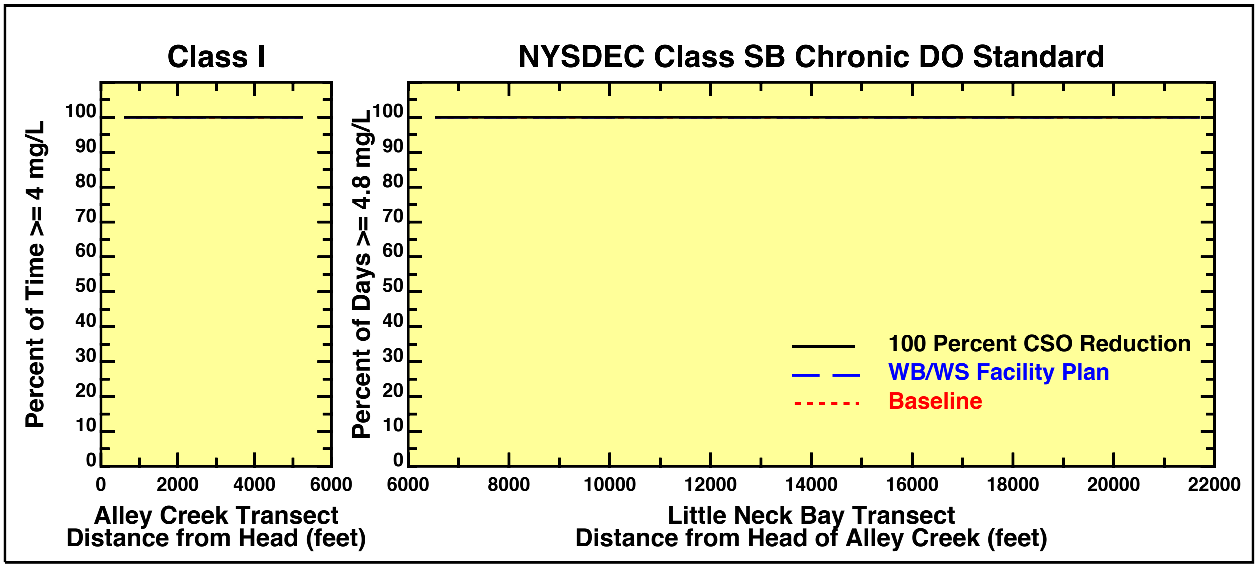
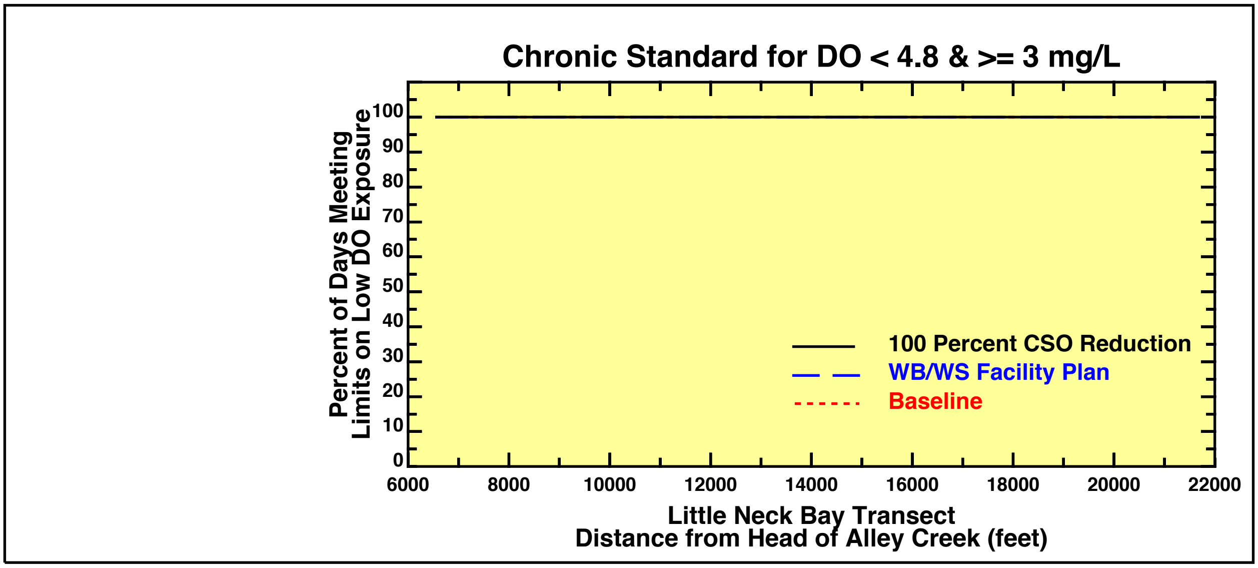
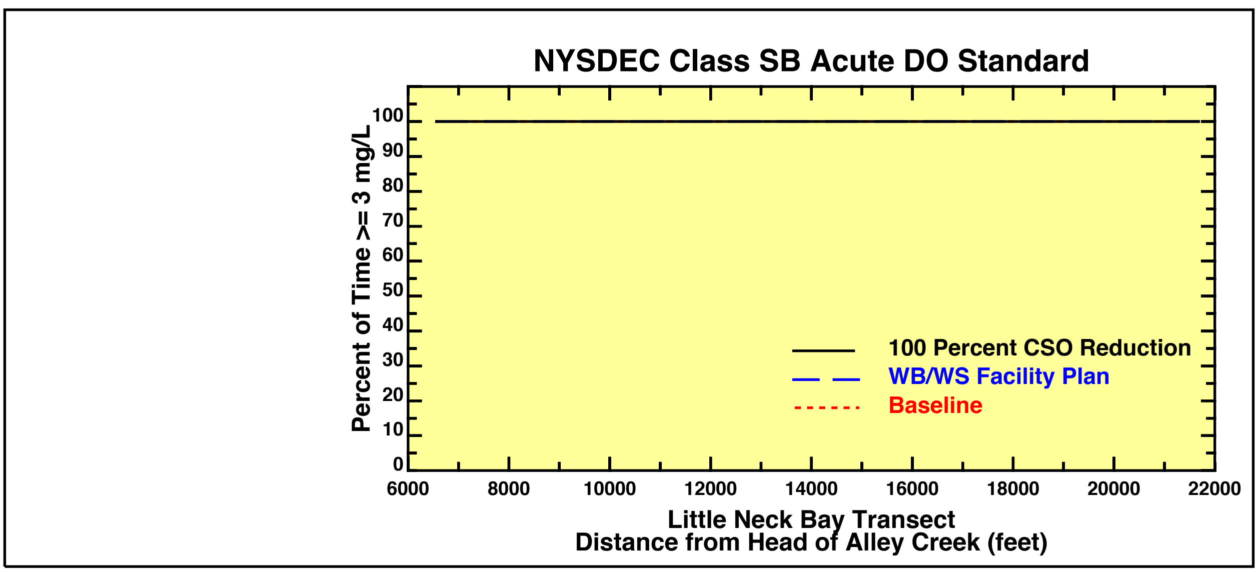
November 4, 2008

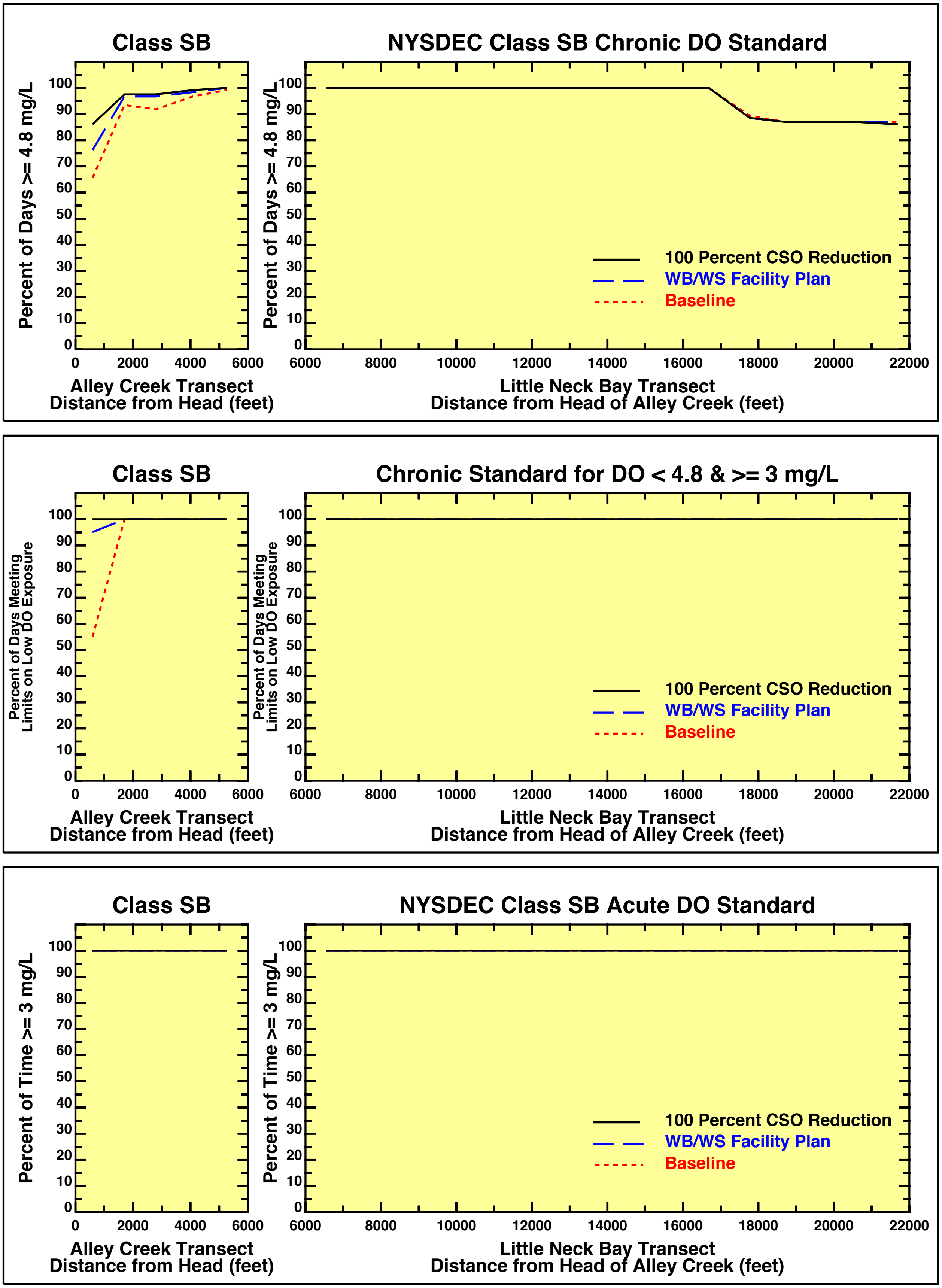






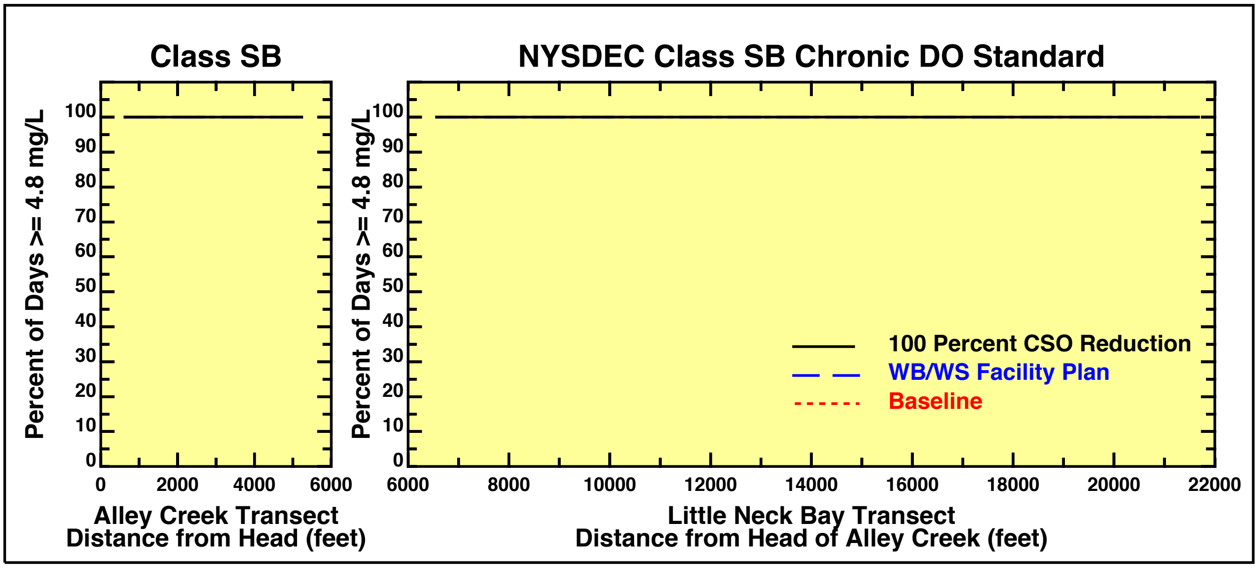
Dissolved Oxygen Alternatives Comparison for December
Alley Creek and Little Neck Bay Transect

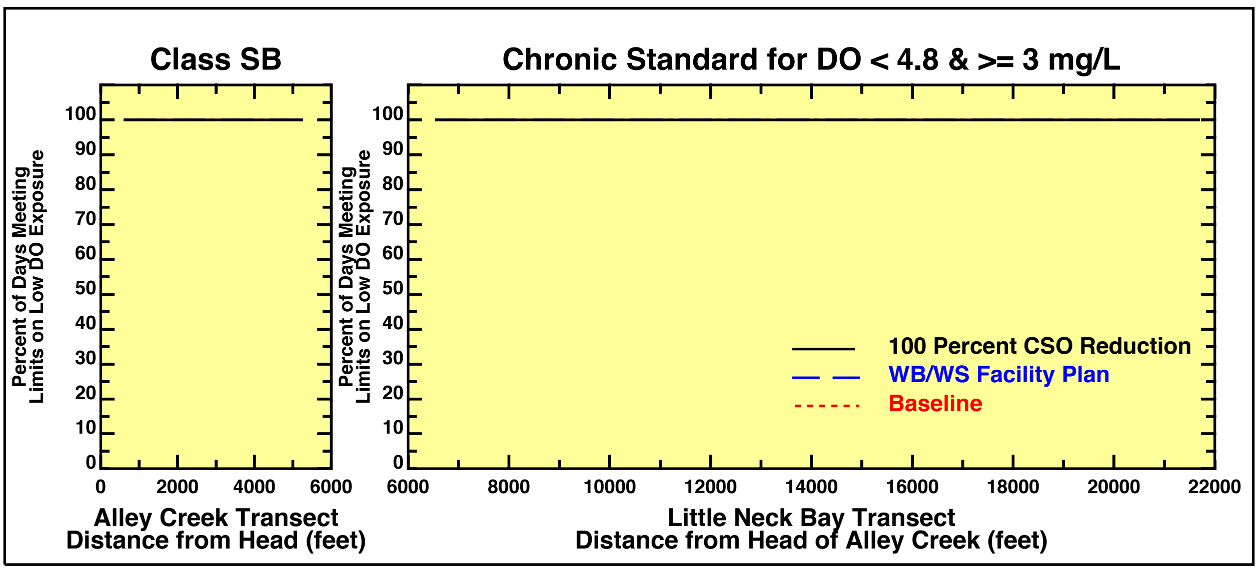
3case_spat01.gdp
GOHJ0010
November 4, 2008

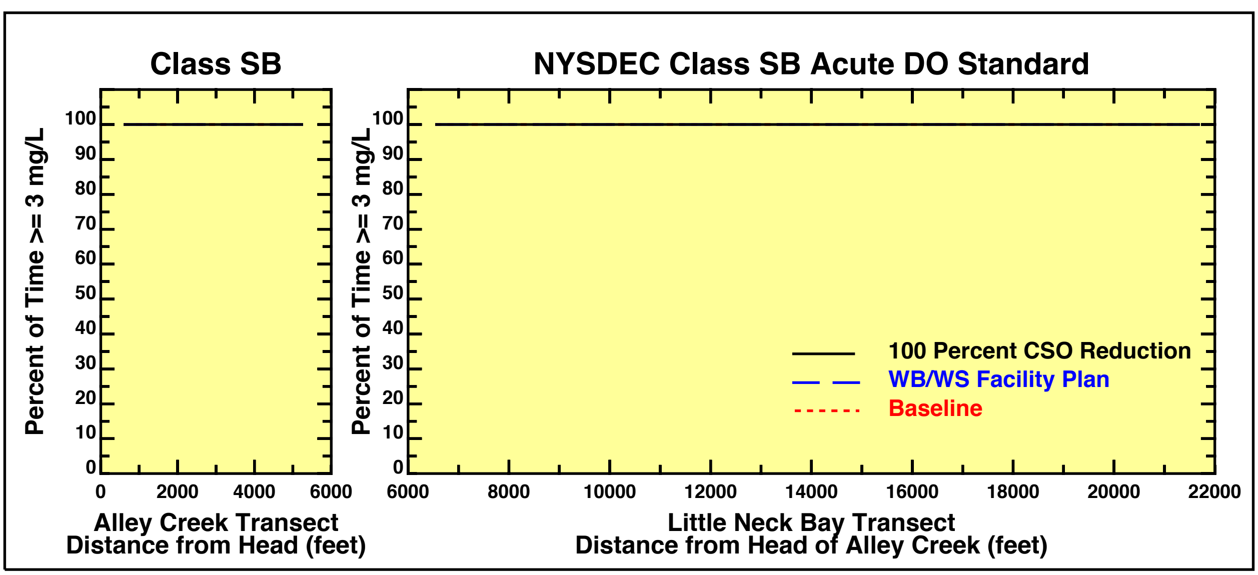


Dissolved Oxygen Alternatives Comparison for Summer
Alley Creek (Class SB) and Little Neck Bay Transect

3case_spat02.gdp
GOHJ0010
November 26, 2008

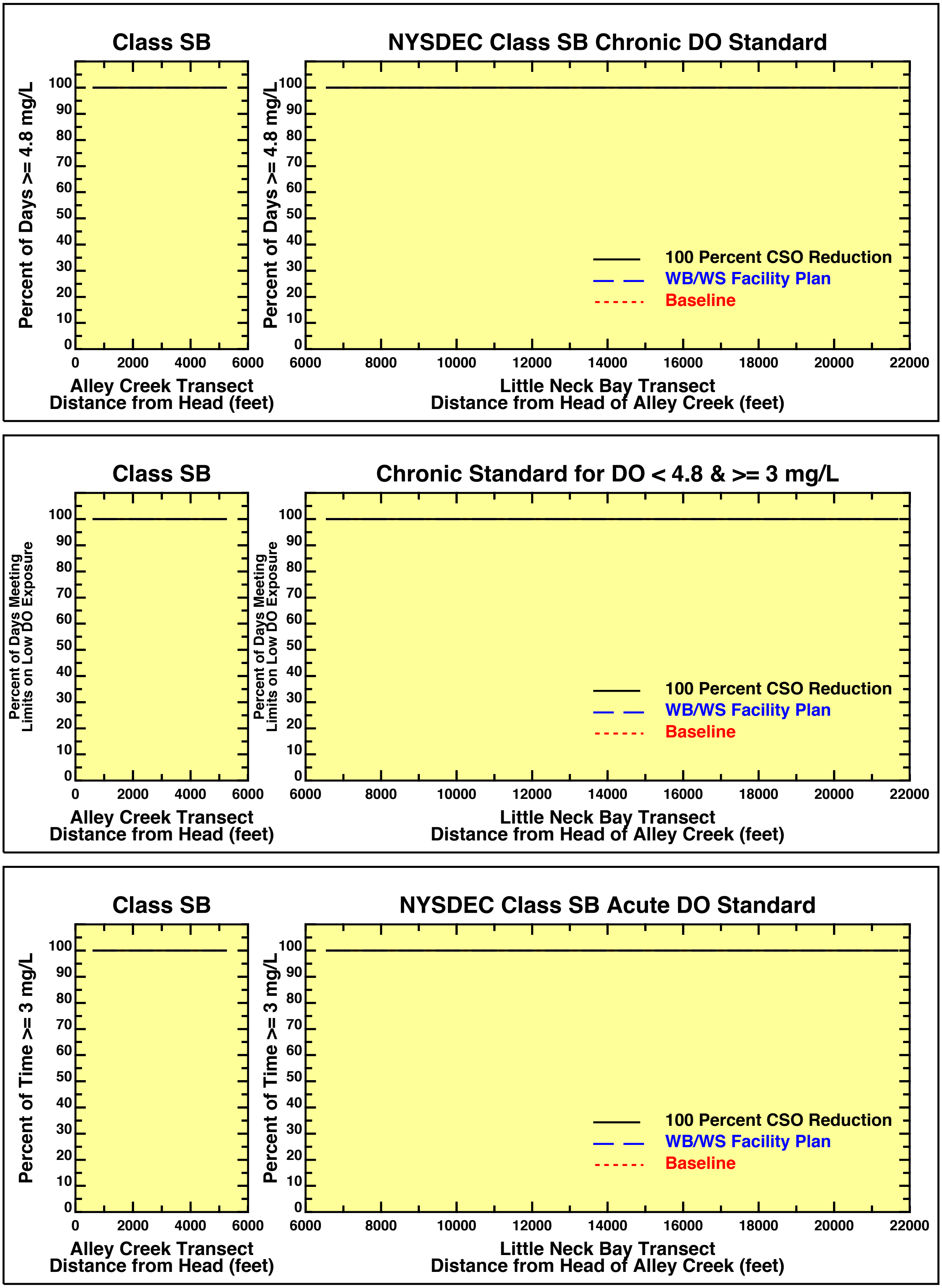






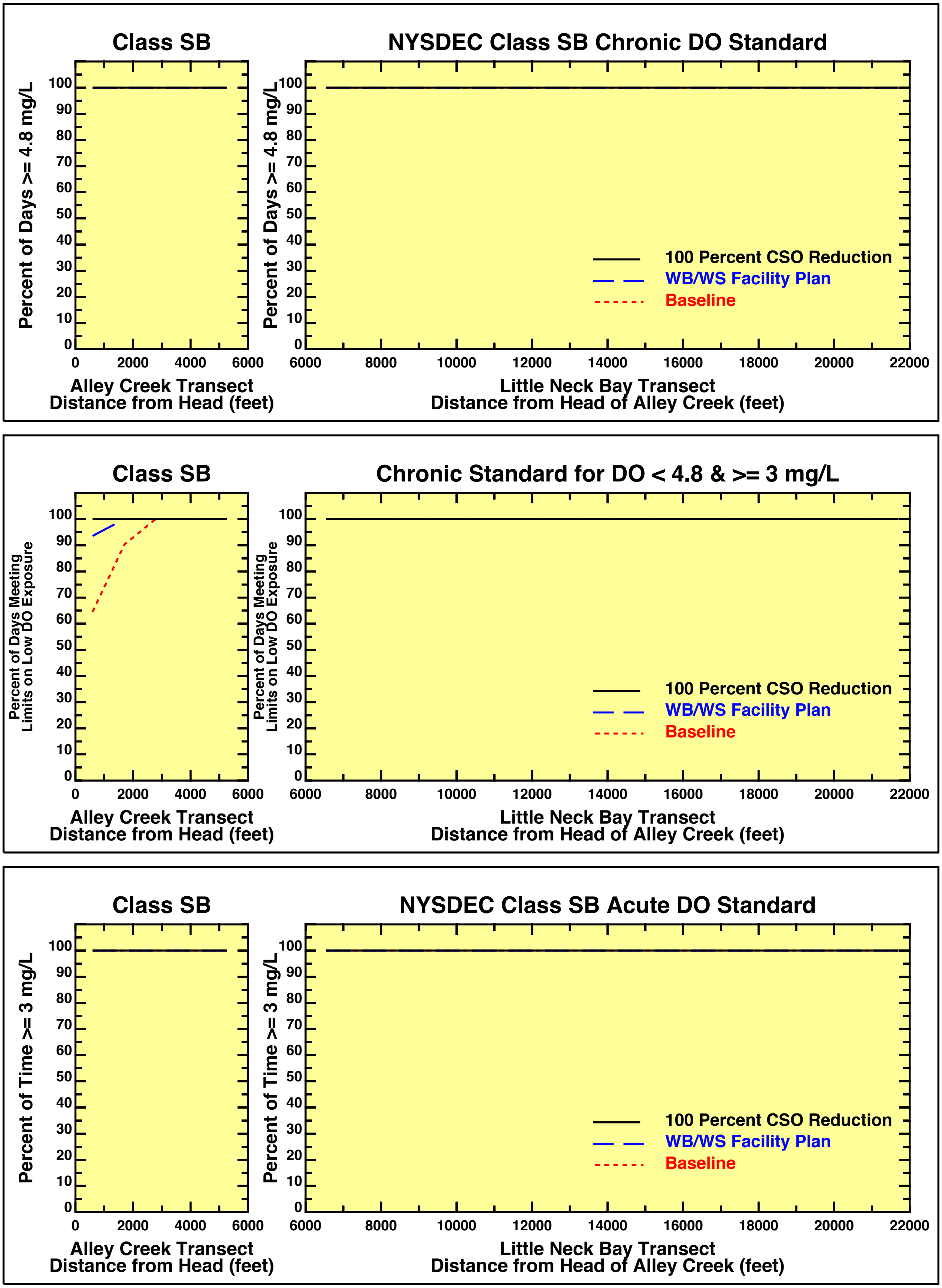
Dissolved Oxygen Alternatives Comparison for January
Alley Creek (Class SB) and Little Neck Bay Transect

3case_spat02.gdp
GOHJ0010
November 26, 2008



Dissolved Oxygen Alternatives Comparison for Febuary
Alley Creek (Class SB) and Little Neck Bay Transect

3case_spat02.gdp
GOHJ0010
November 26, 2008



Dissolved Oxygen Alternatives Comparison for March
Alley Creek (Class SB) and Little Neck Bay Transect

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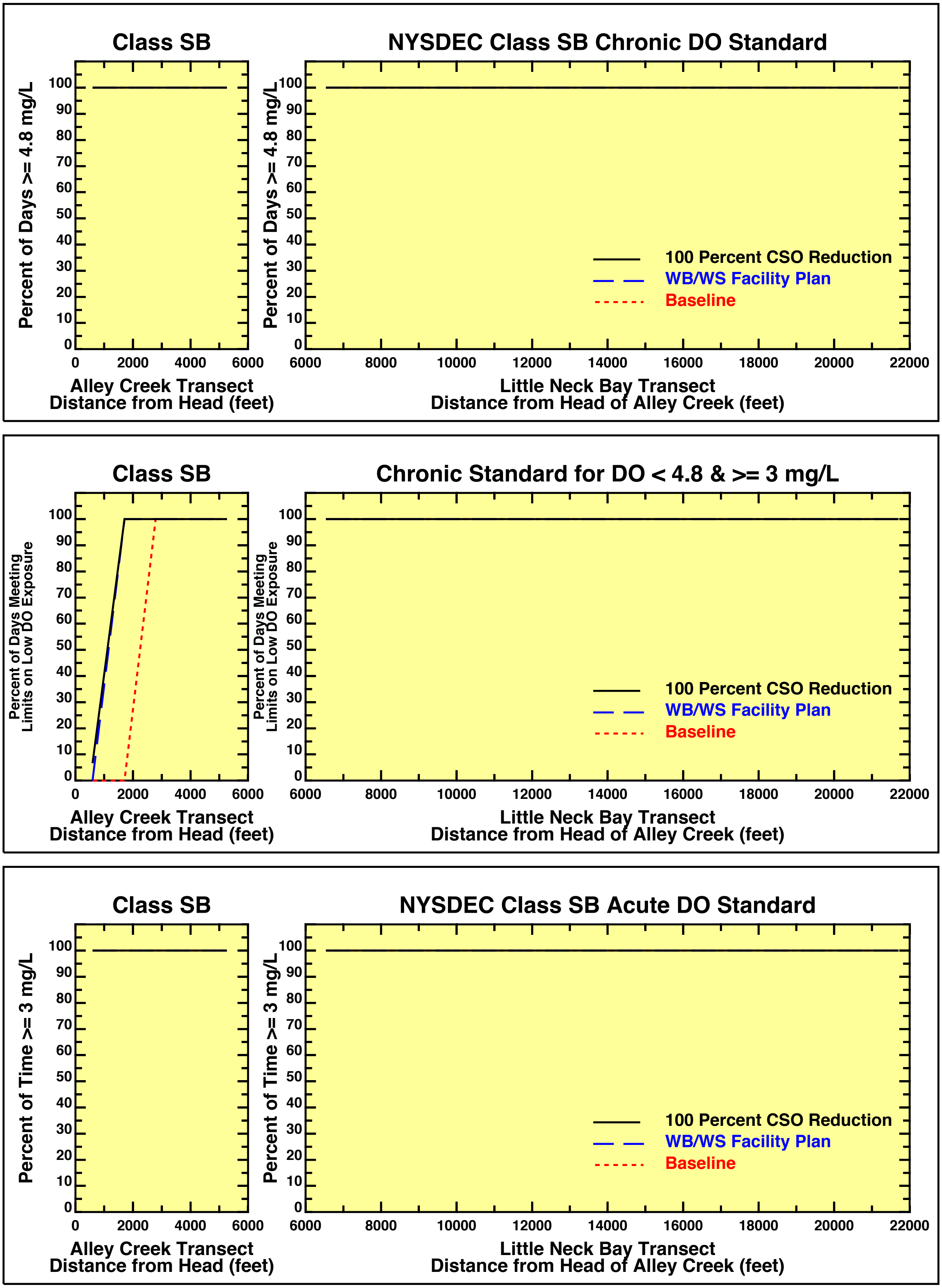
November 26, 2008



Dissolved Oxygen Alternatives Comparison for April
Alley Creek (Class SB) and Little Neck Bay Transect

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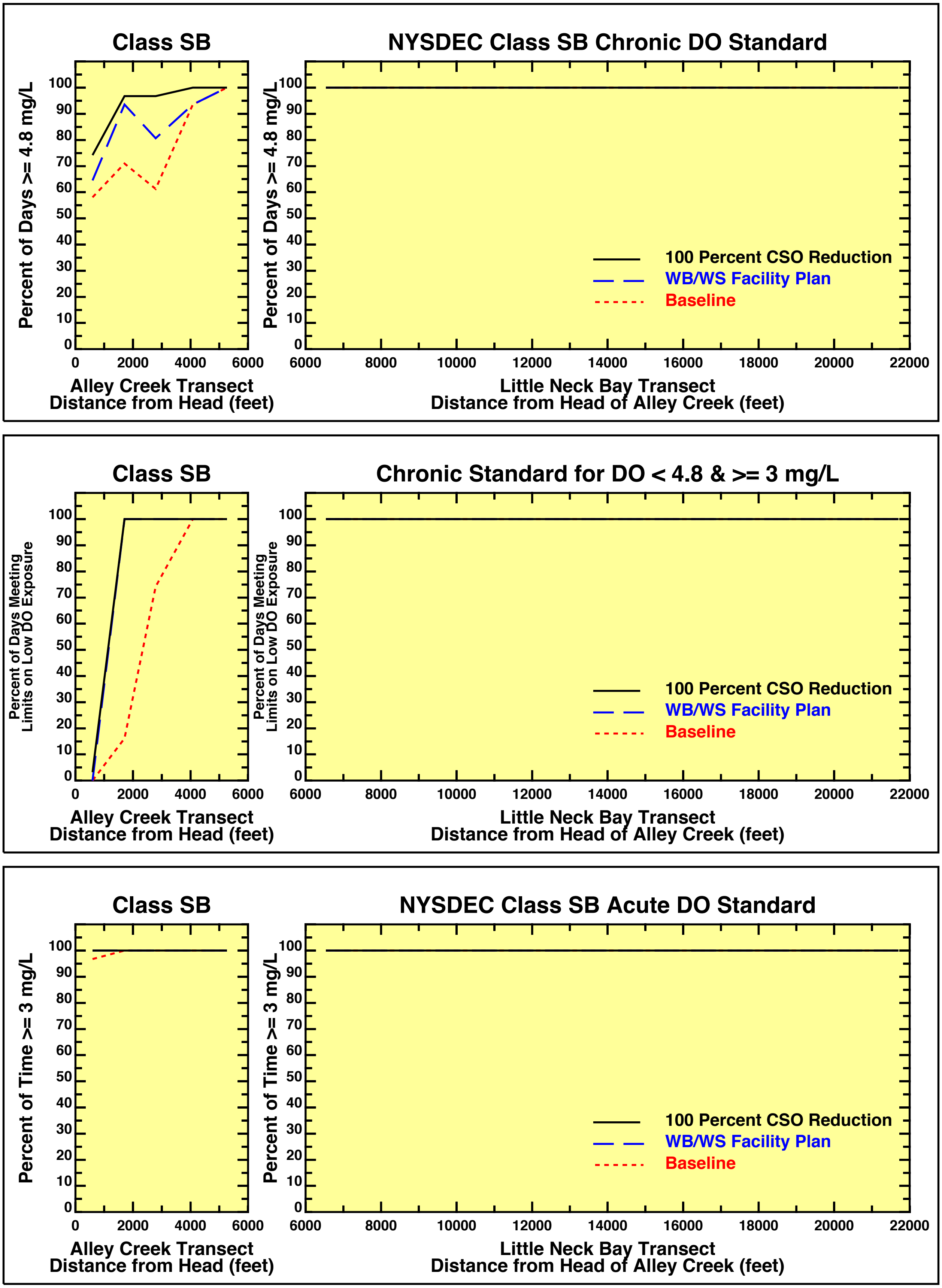
November 26, 2008



Dissolved Oxygen Alternatives Comparison for May
Alley Creek (Class SB) and Little Neck Bay Transect

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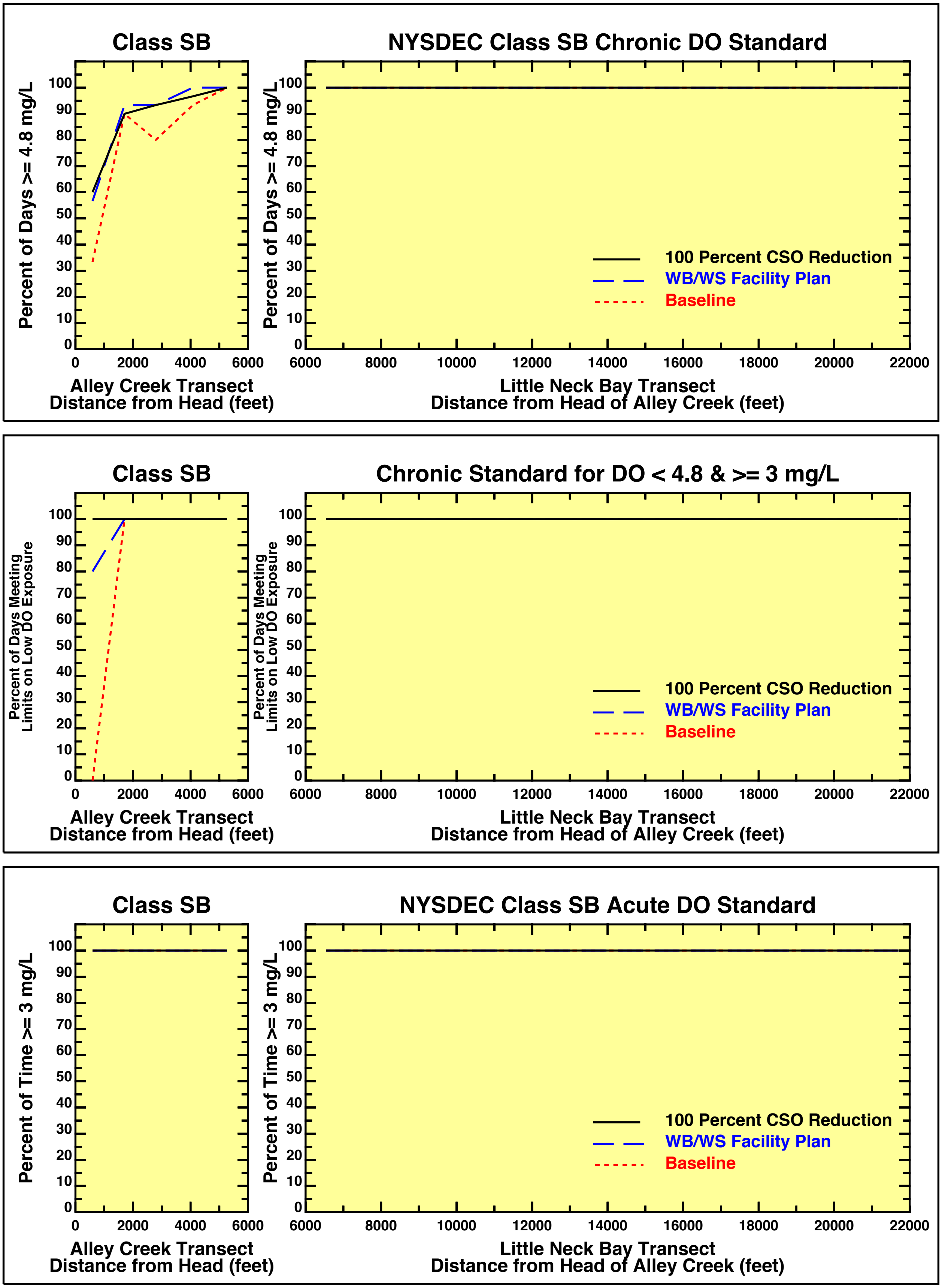
November 26, 2008



Dissolved Oxygen Alternatives Comparison for June
Alley Creek (Class SB) and Little Neck Bay Transect

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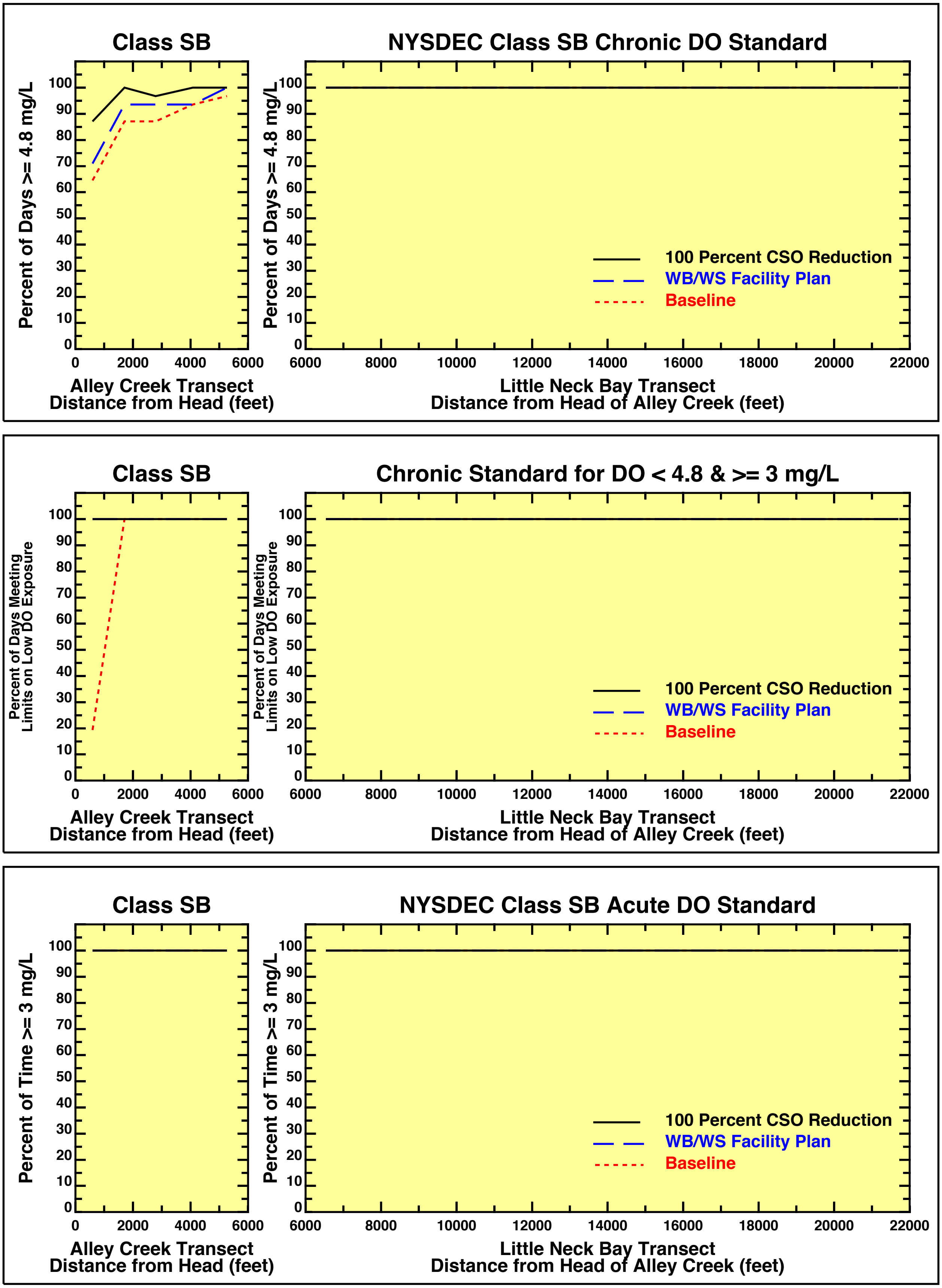
November 26, 2008



Dissolved Oxygen Alternatives Comparison for July
Alley Creek (Class SB) and Little Neck Bay Transect

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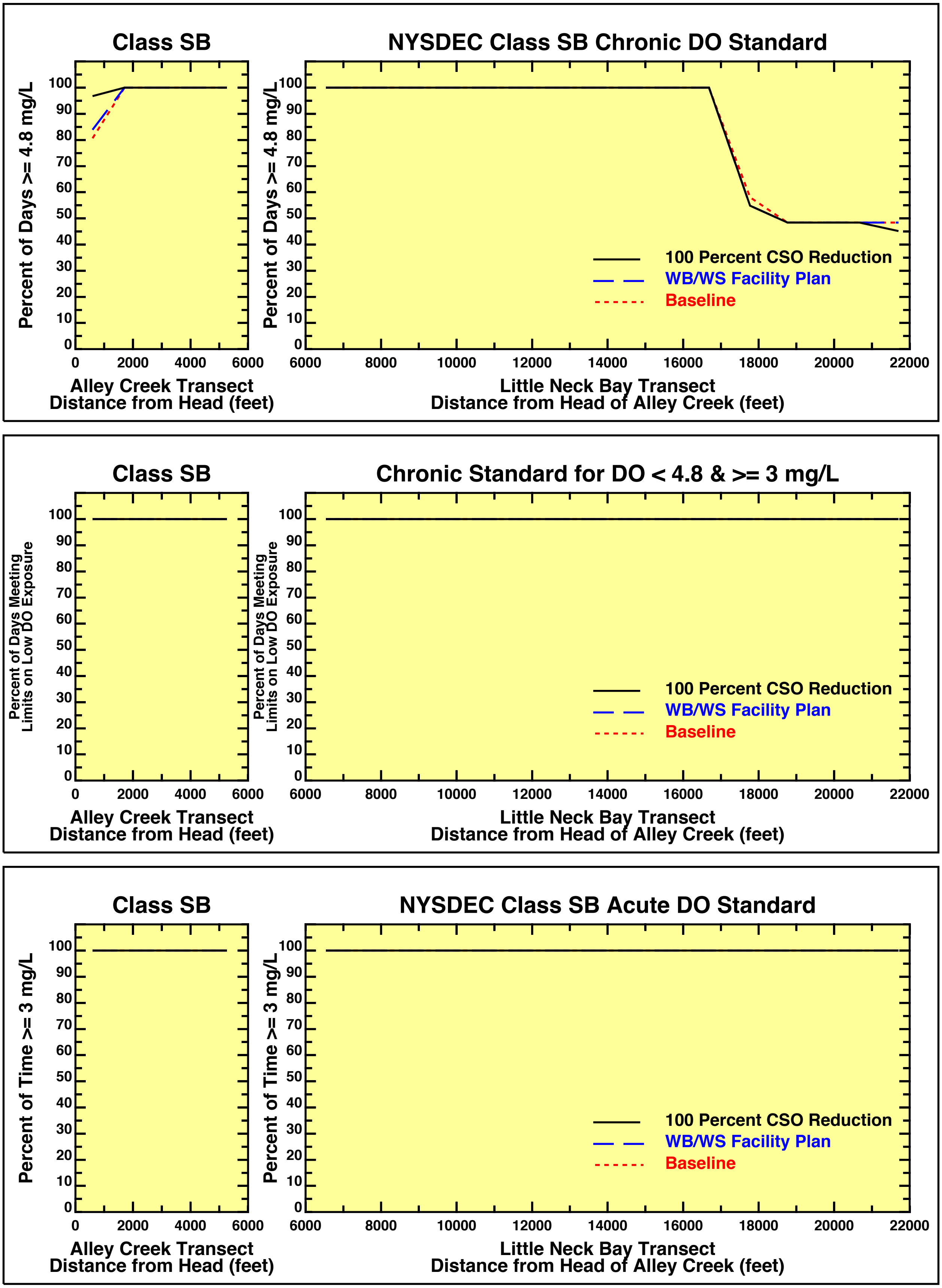
November 26, 2008



Dissolved Oxygen Alternatives Comparison for August
Alley Creek (Class SB) and Little Neck Bay Transect

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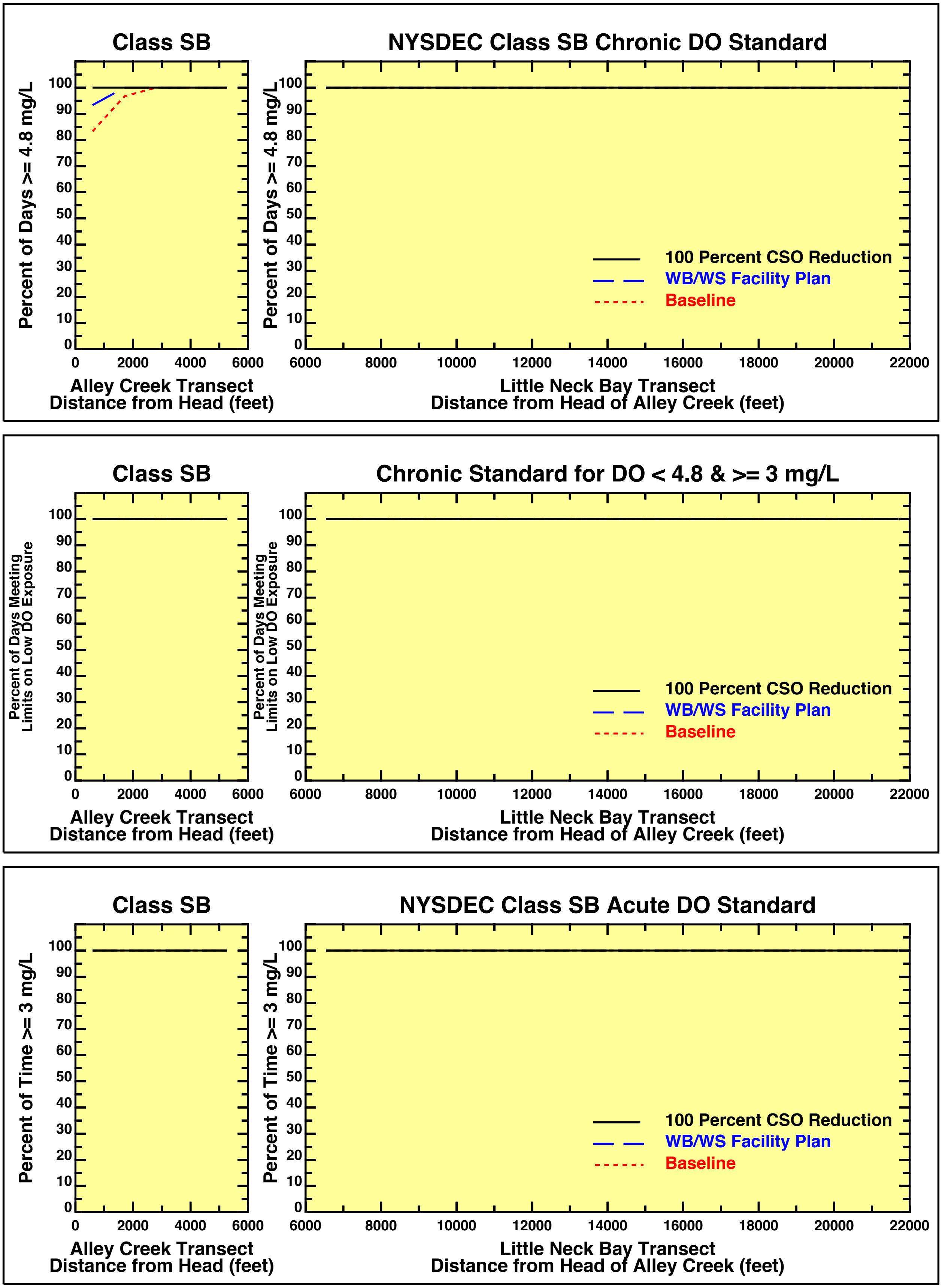
November 26, 2008



Dissolved Oxygen Alternatives Comparison for September
Alley Creek (Class SB) and Little Neck Bay Transect

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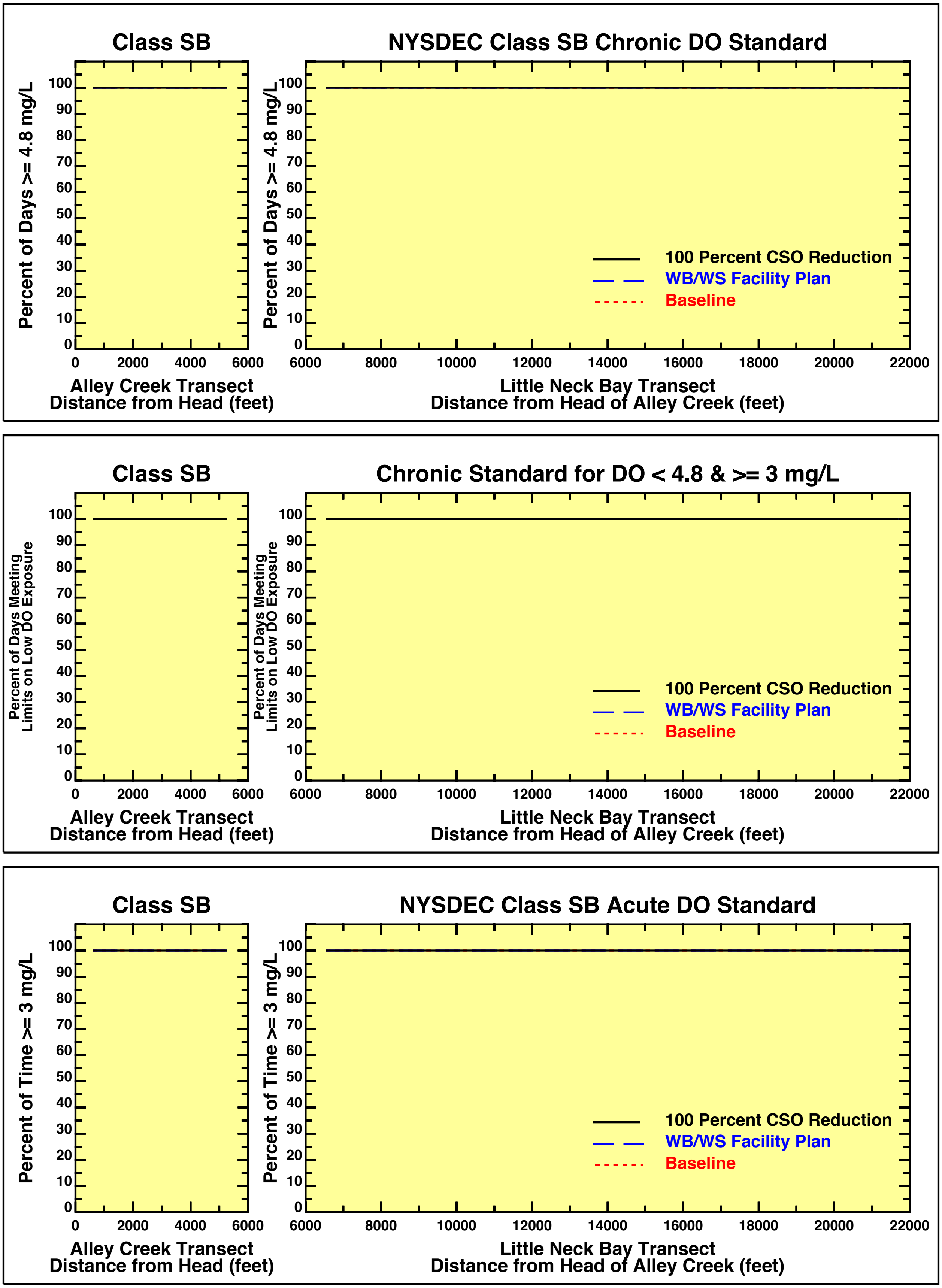
November 26, 2008



Dissolved Oxygen Alternatives Comparison for October
Alley Creek (Class SB) and Little Neck Bay Transect

3case_spat02.gdp
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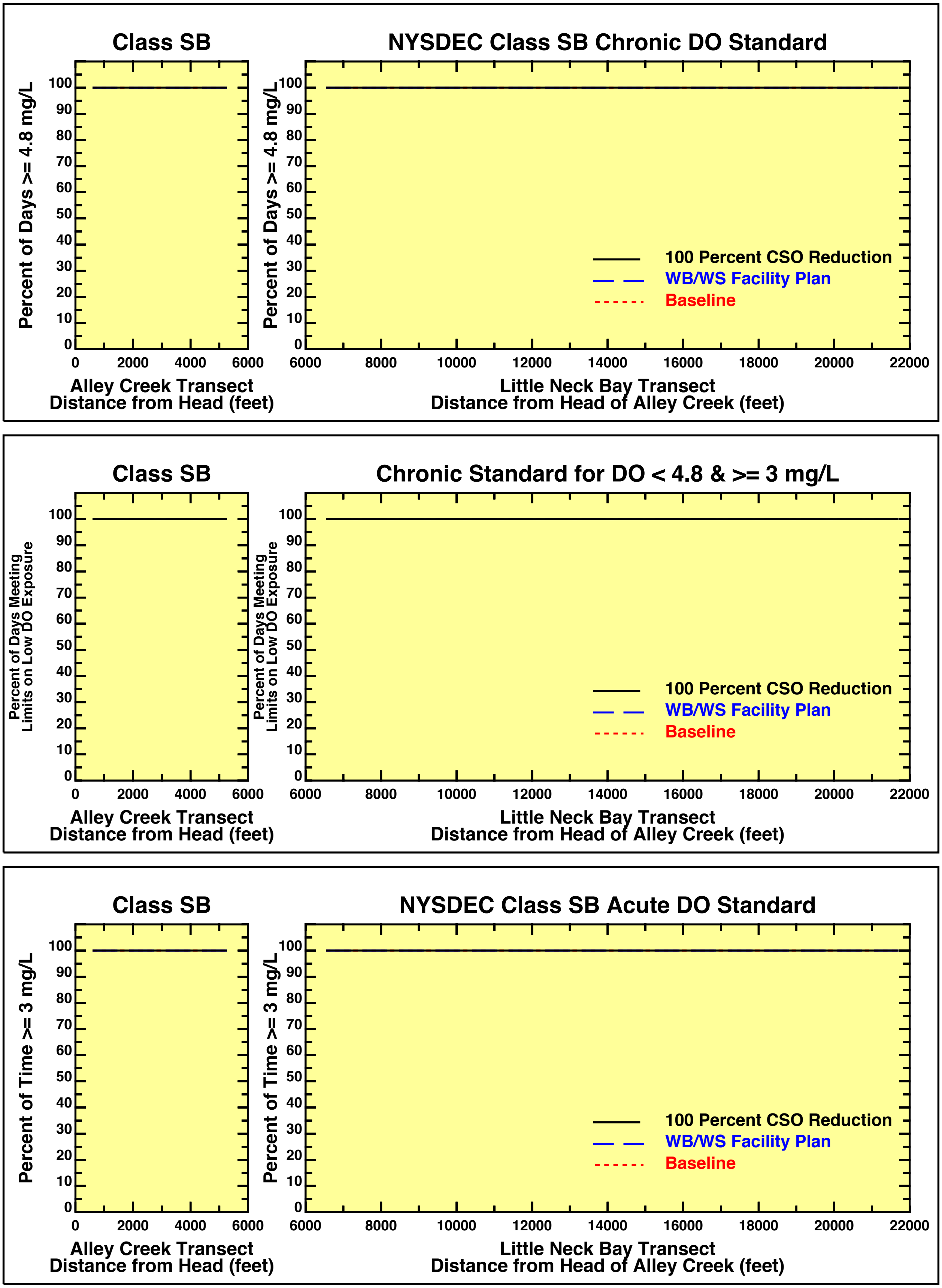
November 26, 2008



Dissolved Oxygen Alternatives Comparison for November
Alley Creek (Class SB) and Little Neck Bay Transect

3case_spat02.gdp
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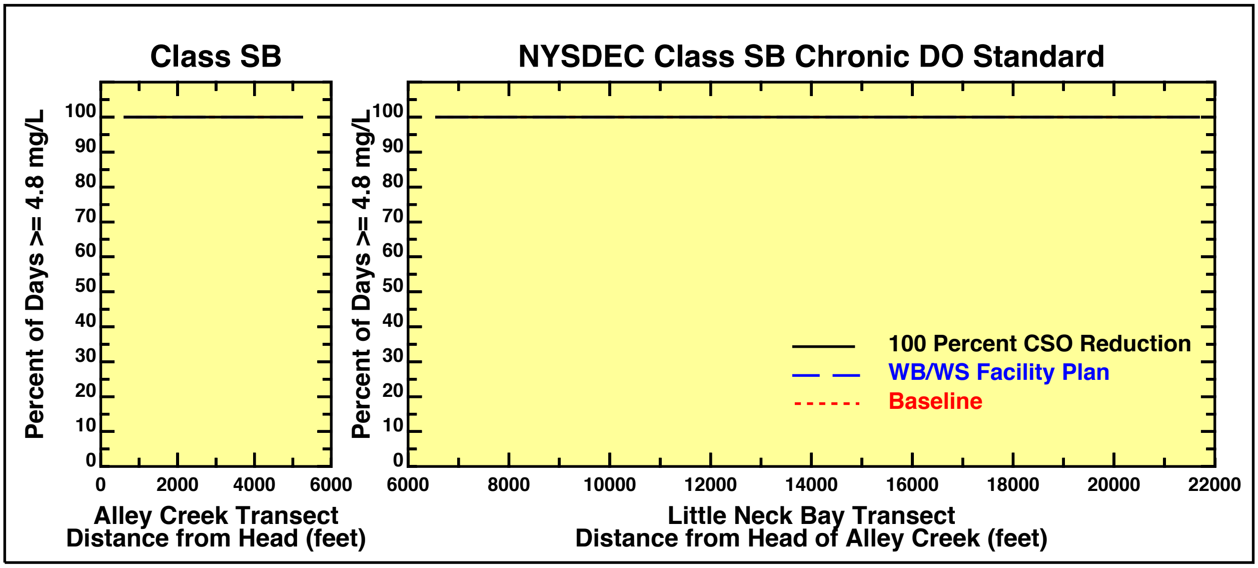
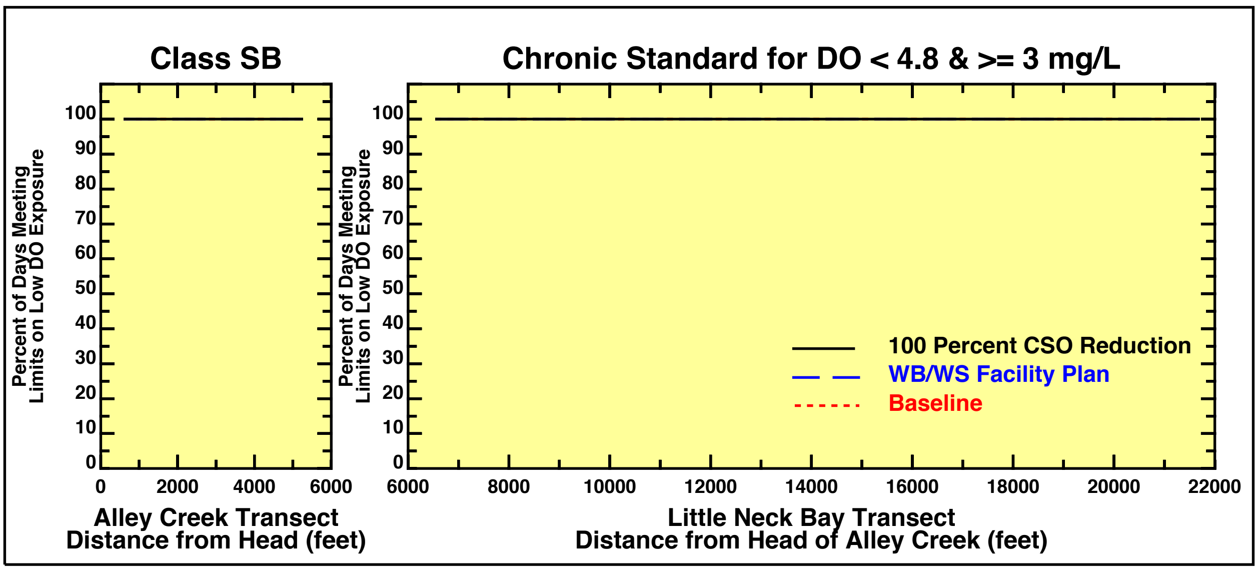
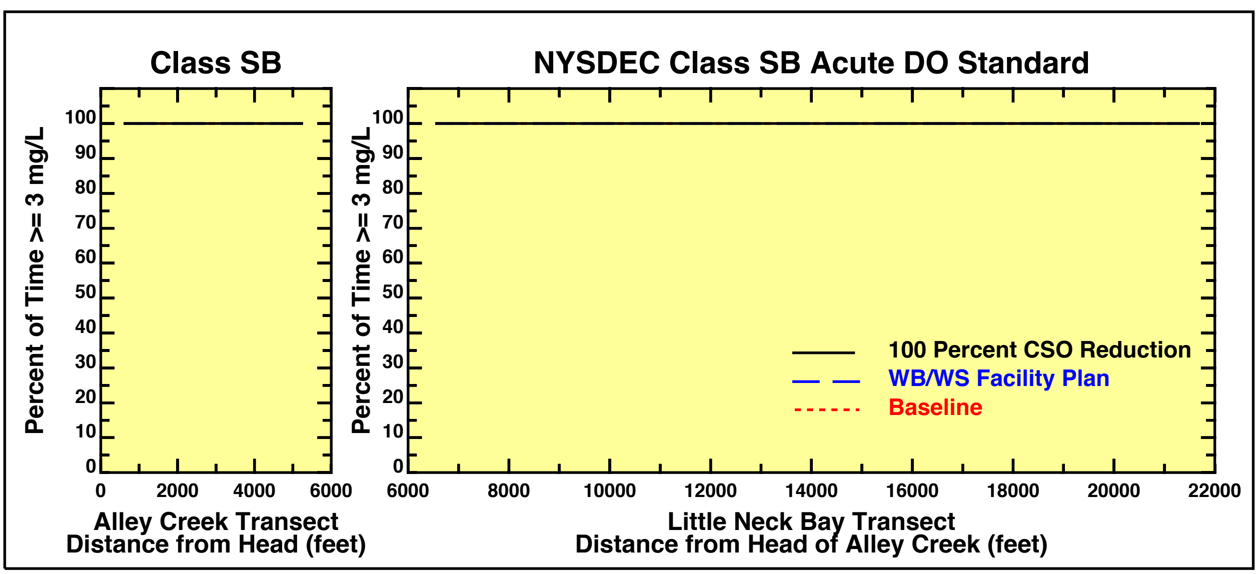
November 26, 2008





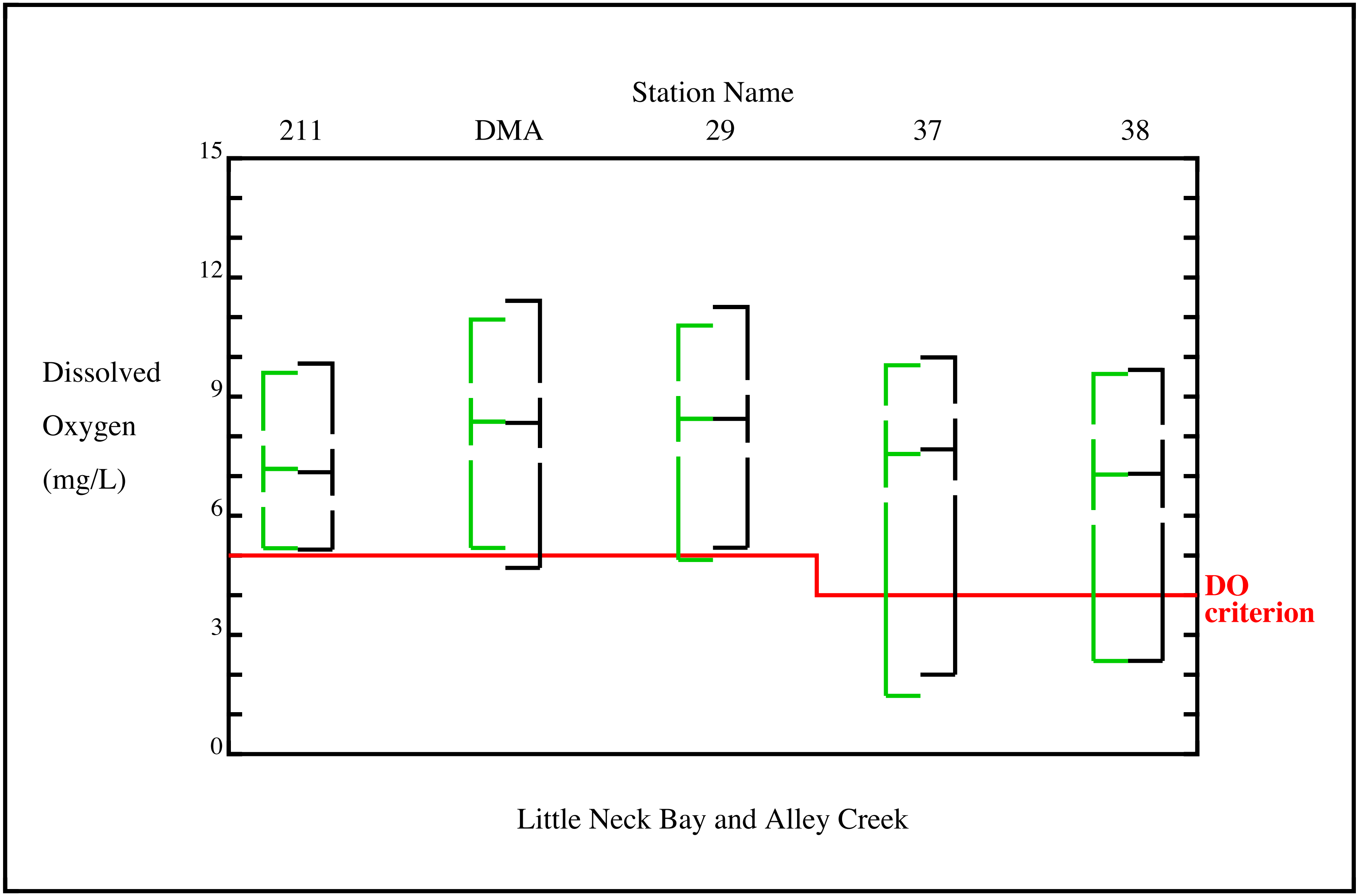


Dissolved Oxygen Alternatives Comparison for December
Alley Creek (Class SB) and Little Neck Bay Transect

3case_spat02.gdp
GOHJ0010
November 26, 2008

DISSOLVED OXYGEN PROJECTIONS

SEASONAL COMPARISON OF WATERBODY/WATERSHED FACILITY PLAN WITH BASELINE



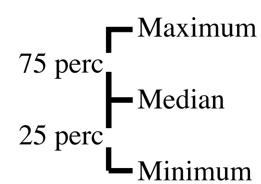
Autumn (September-November), comparison based on hourly average DO

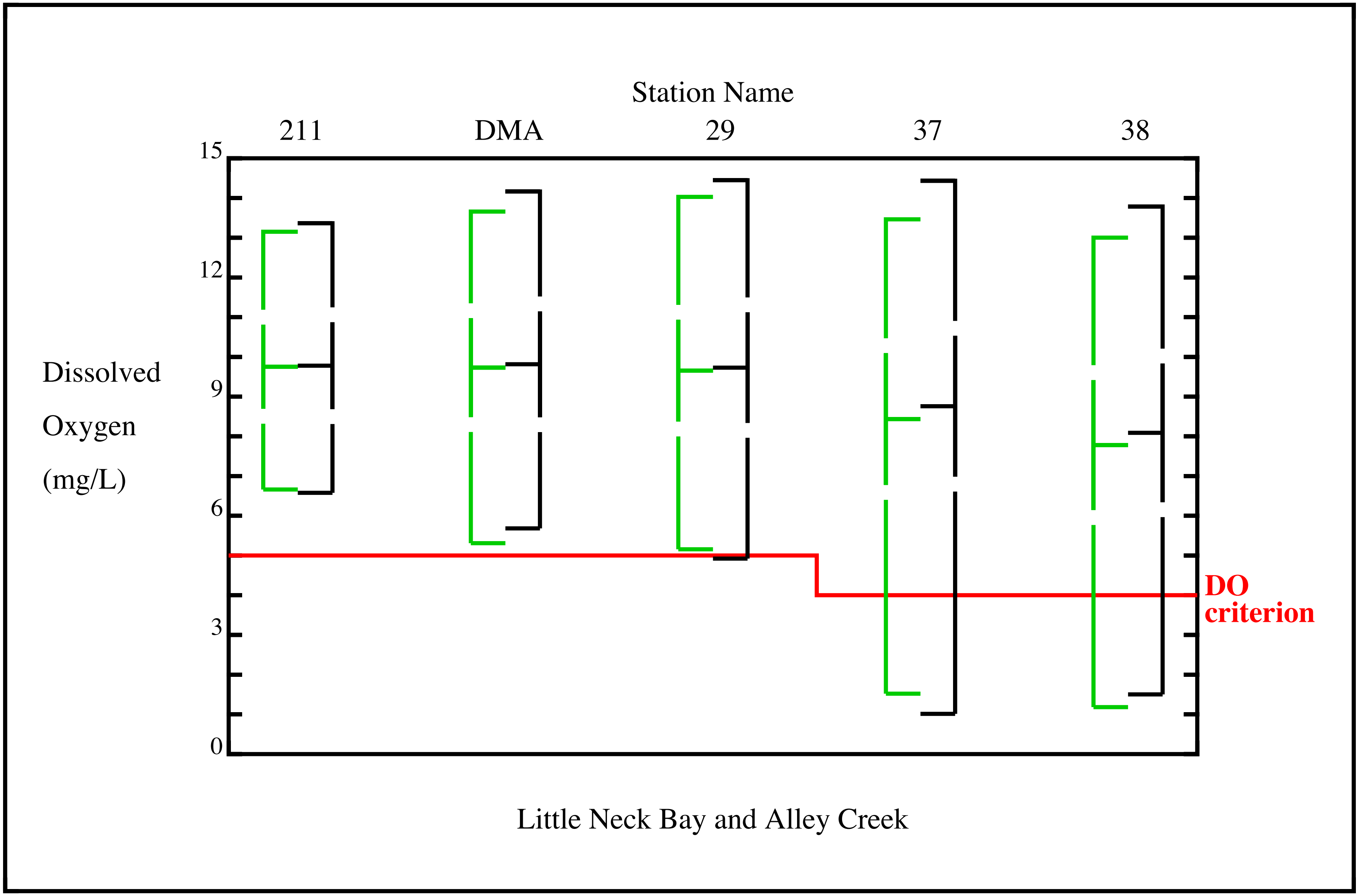
ERTM RUN88-T4-06-01 YR5 vs ERTM RUN88-B2-06-02 YR5

BLACK ERTM LTCP-T4 (AC Run33), NAPOC5-BASED FL XR=2.75+,EZ8,100xRXY,ER1KEB,0.2BB,HYDR5,DDAC,RIV5-2,VSt,SKEOC=1.5e-3

GREEN ERTM LTCP-B2 (New BS), NAPOC5-BASED FL XR=2.75+,EZ8,100xRXY,ER1KEB,0.2BB,HYDR4,DDAC,RIV5-2,VSt,SKEOC=1.5e-3

DATE: 9/26/2006 TIME: 9: 3:24





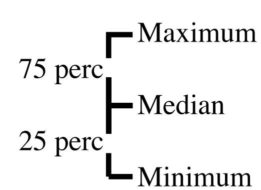
Spring (March-May), comparison based on hourly average DO

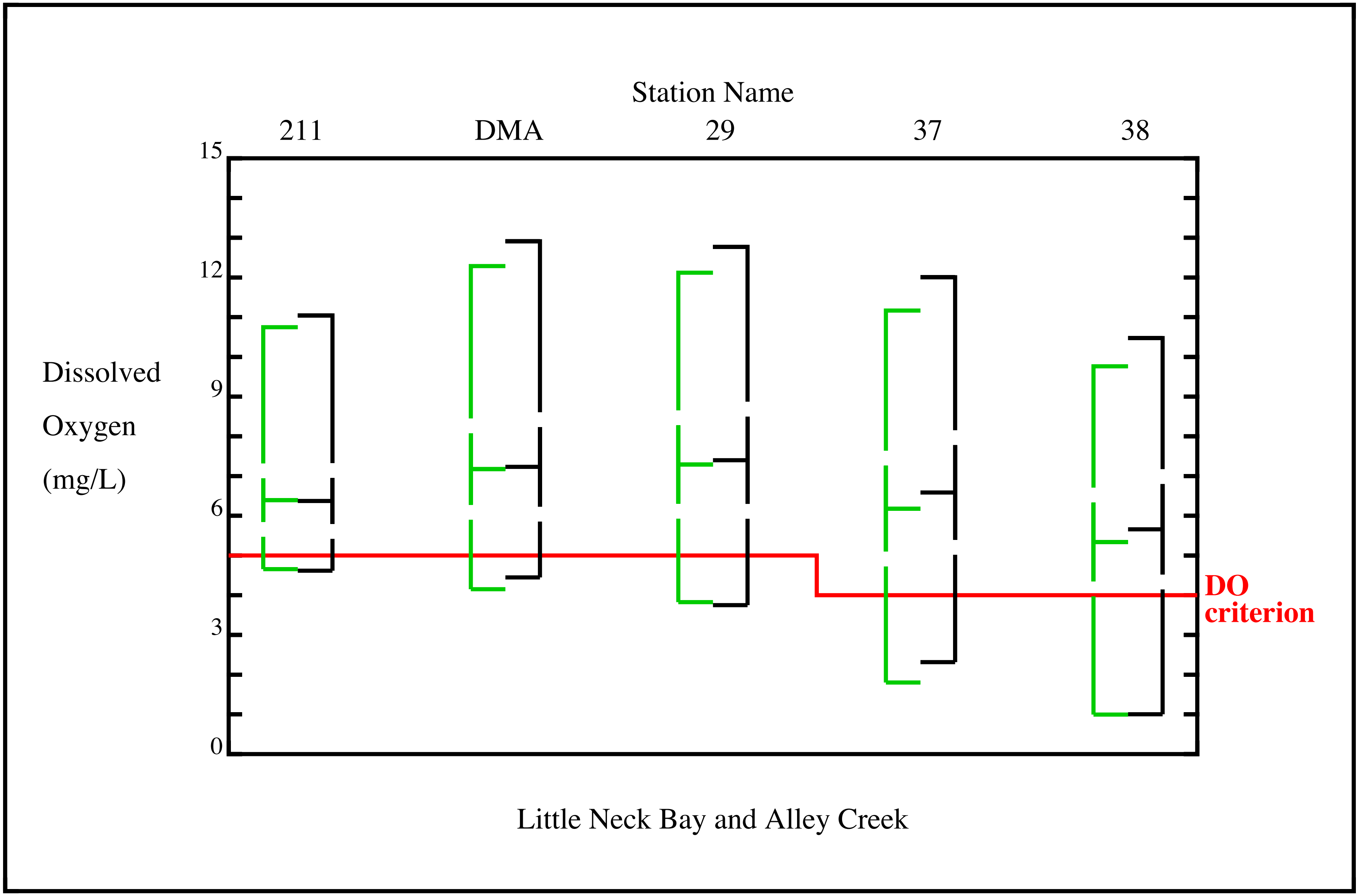
ERTM RUN88-T4-06-01 YR5 vs ERTM RUN88-B2-06-02 YR5

BLACK ERTM LTCP-T4 (AC Run33), NAPOC5-BASED FL XR=2.75+,EZ8,100xRXY,ER1KEB,0.2BB,HYDR5,DDAC,RIV5-2,VSt,SKEOC=1.5e-3

GREEN ERTM LTCP-B2 (New BS), NAPOC5-BASED FL XR=2.75+,EZ8,100xRXY,ER1KEB,0.2BB,HYDR4,DDAC,RIV5-2,VSt,SKEOC=1.5e-3

DATE: 9/26/2006 TIME: 9: 2:50





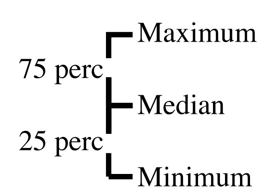
Summer (June-August), comparison based on hourly average DO

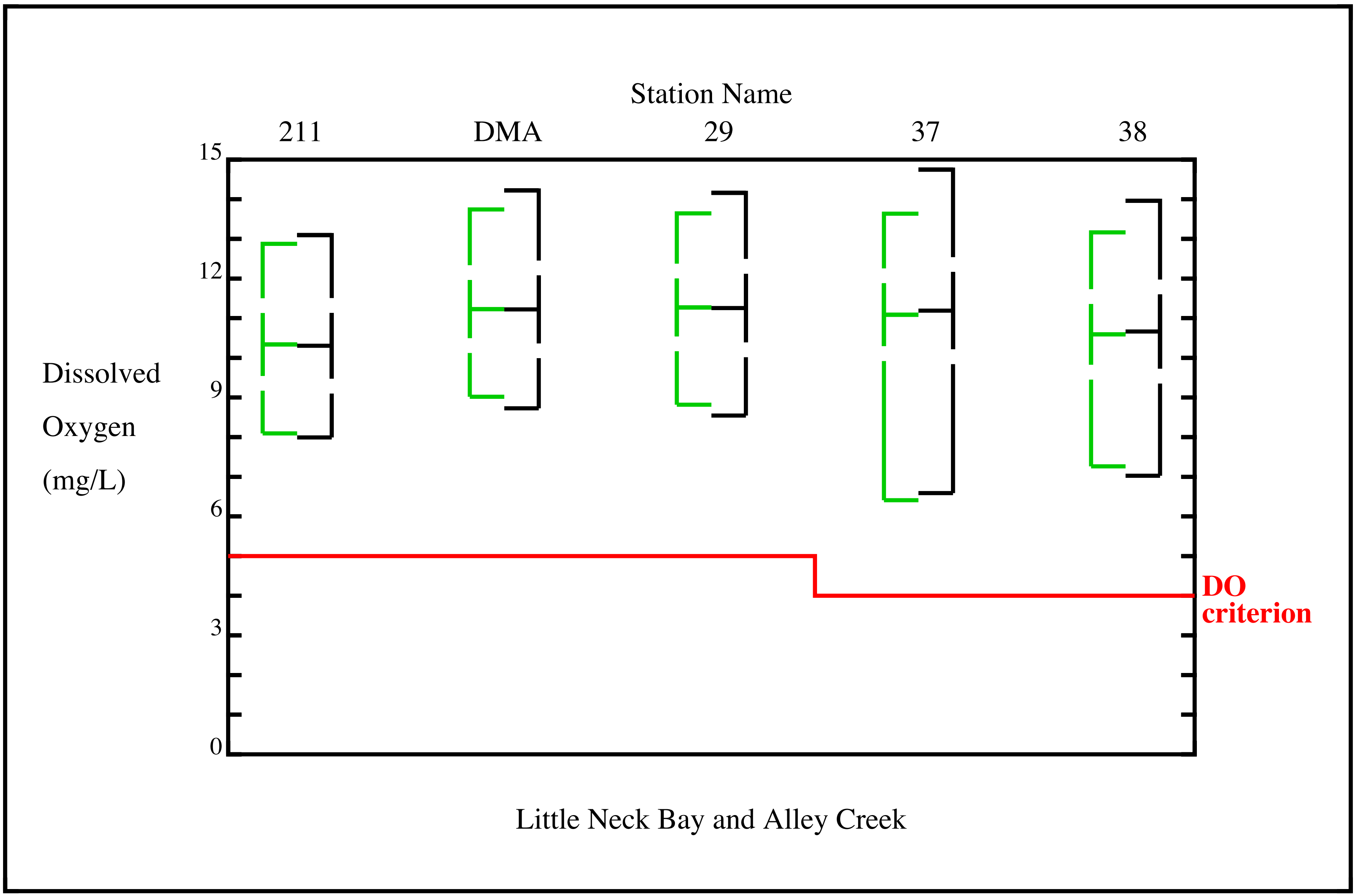
ERTM RUN88-T4-06-01 YR5 vs ERTM RUN88-B2-06-02 YR5

BLACK ERTM LTCP-T4 (AC Run33), NAPOC5-BASED FL XR=2.75+,EZ8,100xRXY,ER1KEB,0.2BB,HYDR5,DDAC,RIV5-2,VSt,SKEOC=1.5e-3

GREEN ERTM LTCP-B2 (New BS), NAPOC5-BASED FL XR=2.75+,EZ8,100xRXY,ER1KEB,0.2BB,HYDR4,DDAC,RIV5-2,VSt,SKEOC=1.5e-3

DATE: 9/26/2006 TIME: 9: 3: 7





Winter (December-February), comparison based on hourly average DO

ERTM RUN88-T4-06-01 YR5 vs ERTM RUN88-B2-06-02 YR5

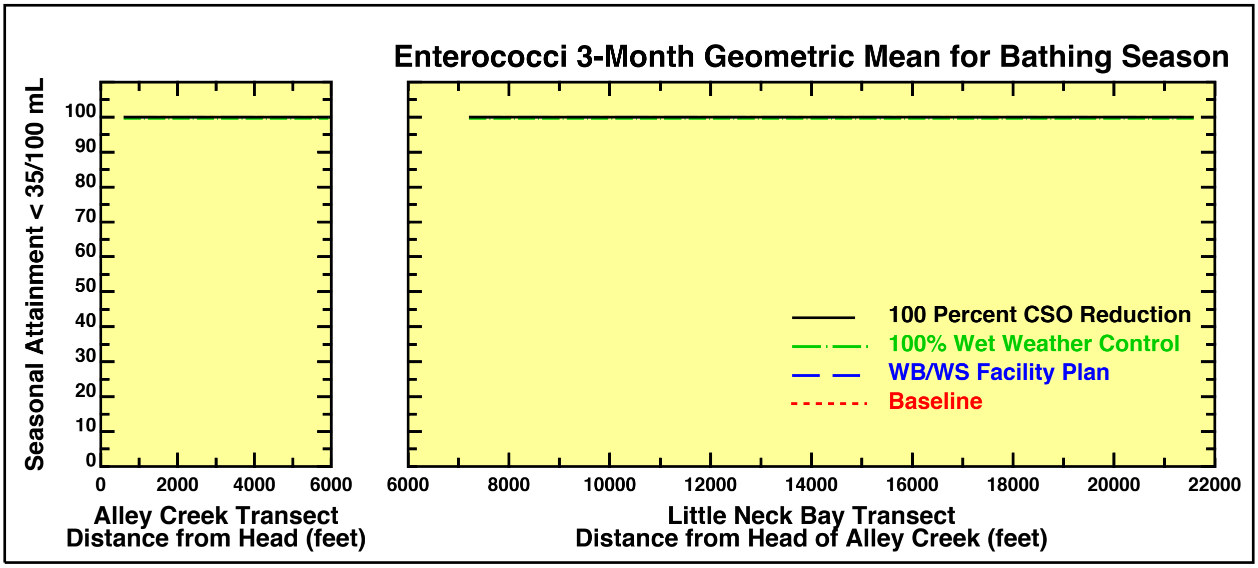
BLACK ERTM LTCP-T4 (AC Run33), NAPOC5-BASED FL XR=2.75+,EZ8,100xRXY,ER1KEB,0.2BB,HYDR5,DDAC,RIV5-2,VSt,SKEOC=1.5e-3

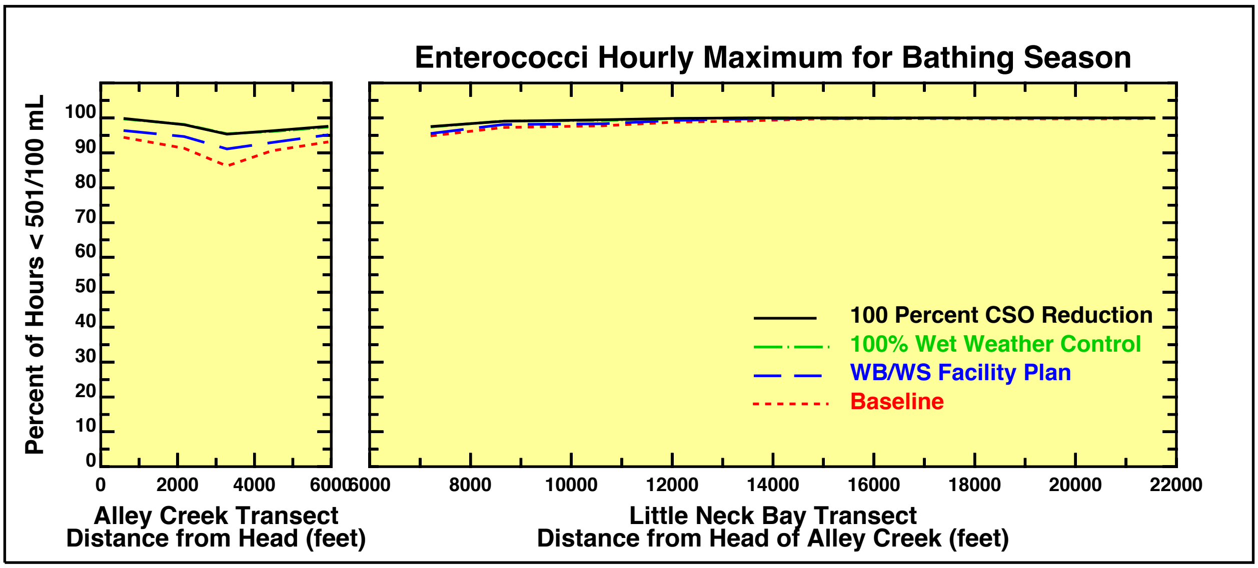
GREEN ERTM LTCP-B2 (New BS), NAPOC5-BASED FL XR=2.75+,EZ8,100xRXY,ER1KEB,0.2BB,HYDR4,DDAC,RIV5-2,VSt,SKEOC=1.5e-3

DATE: 9/26/2006 TIME: 9: 2:32

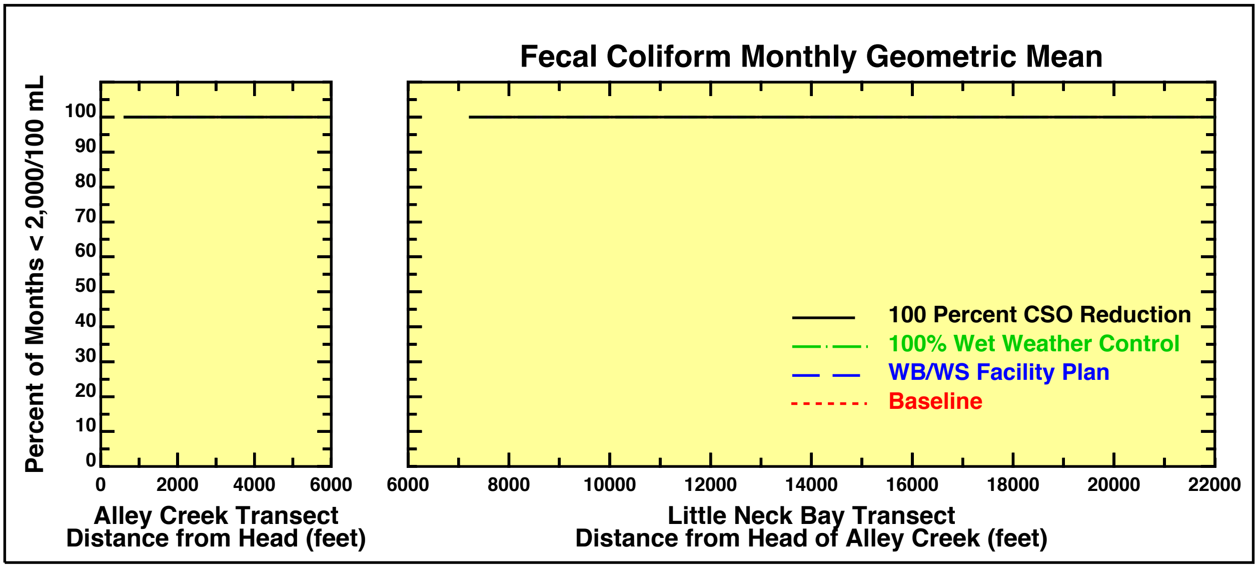
SPATIAL PATHOGEN RESULTS

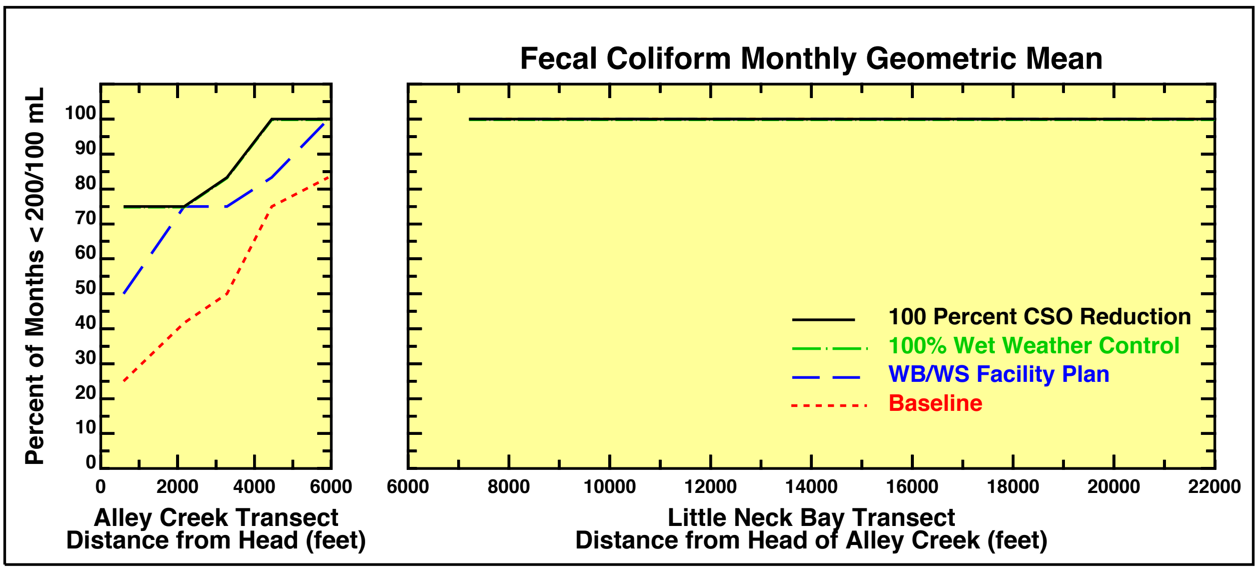
BATHING SEASON AND
ANNUAL COMPARISON OF BASELINE,
100 PERCENT CSO REDUCTION AND
WATERBODY/WATERSHED FACILITY PLAN



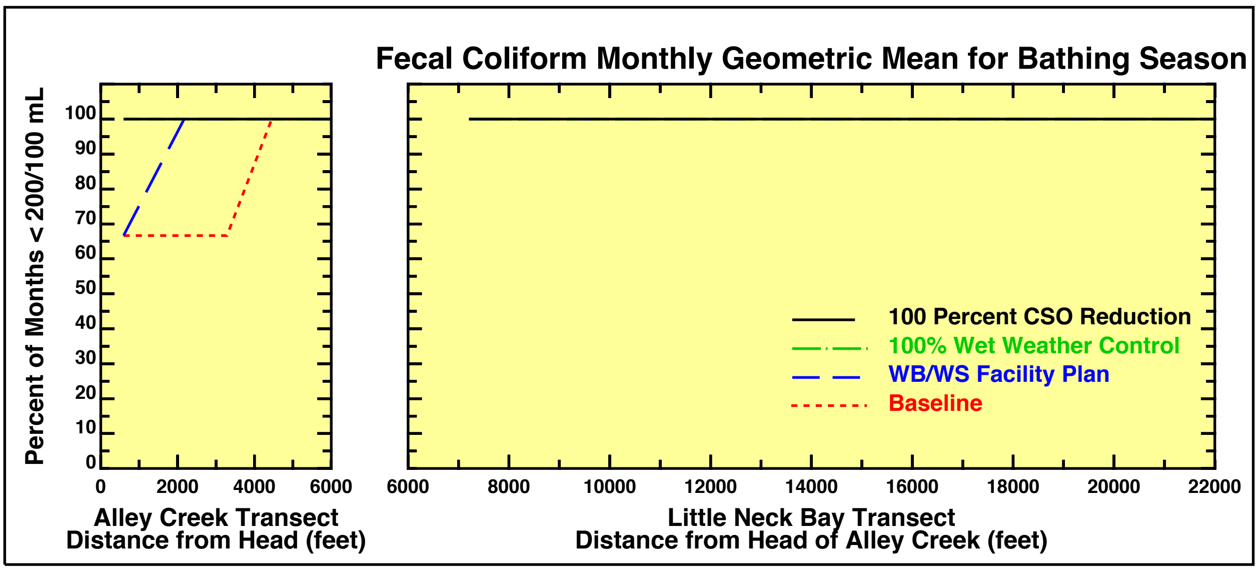


Alley Creek and Little Neck Bay Enterococci Bathing Season Projections

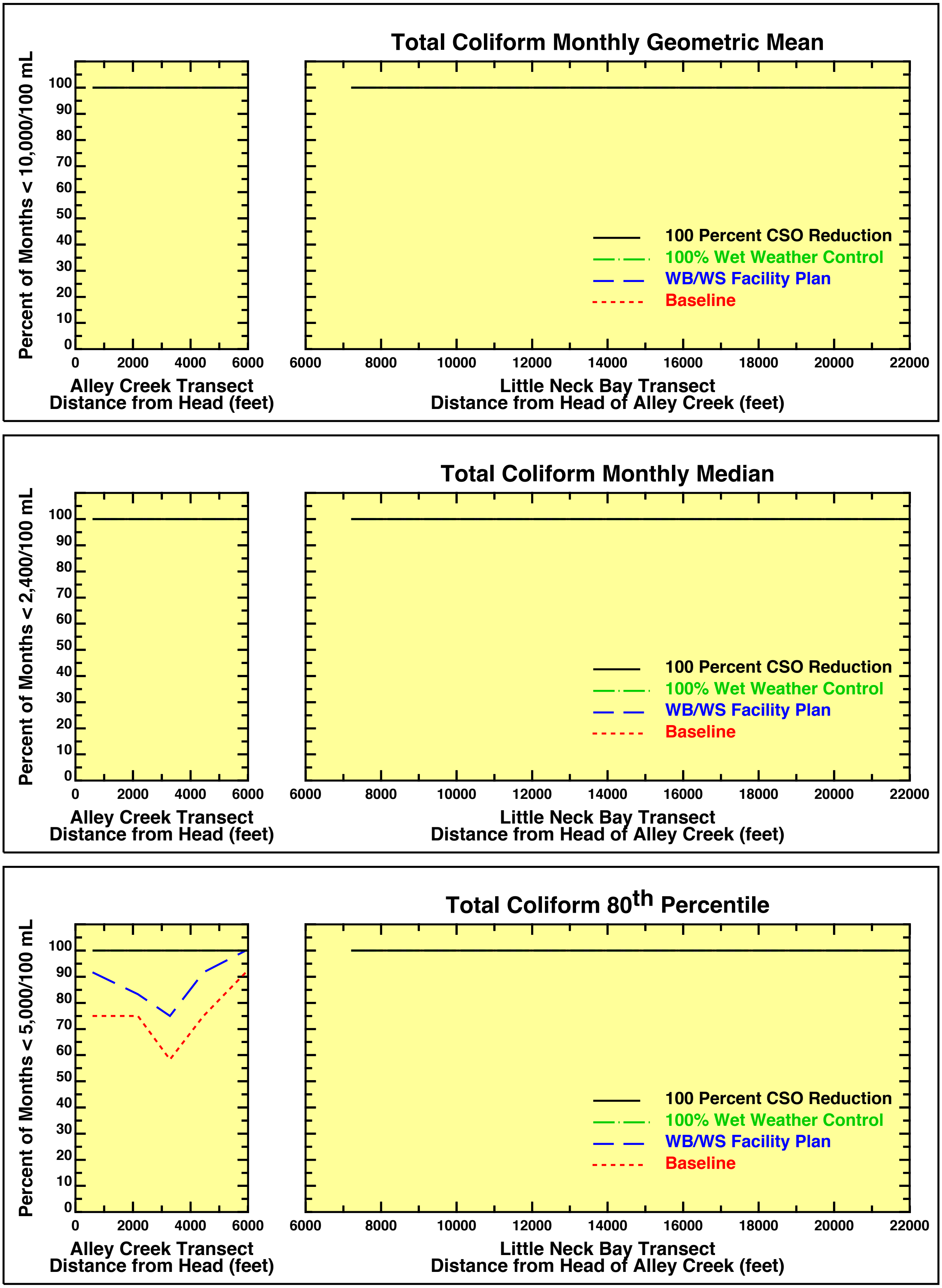




Alley Creek and Little Neck Bay Fecal Coliform Annual Projections

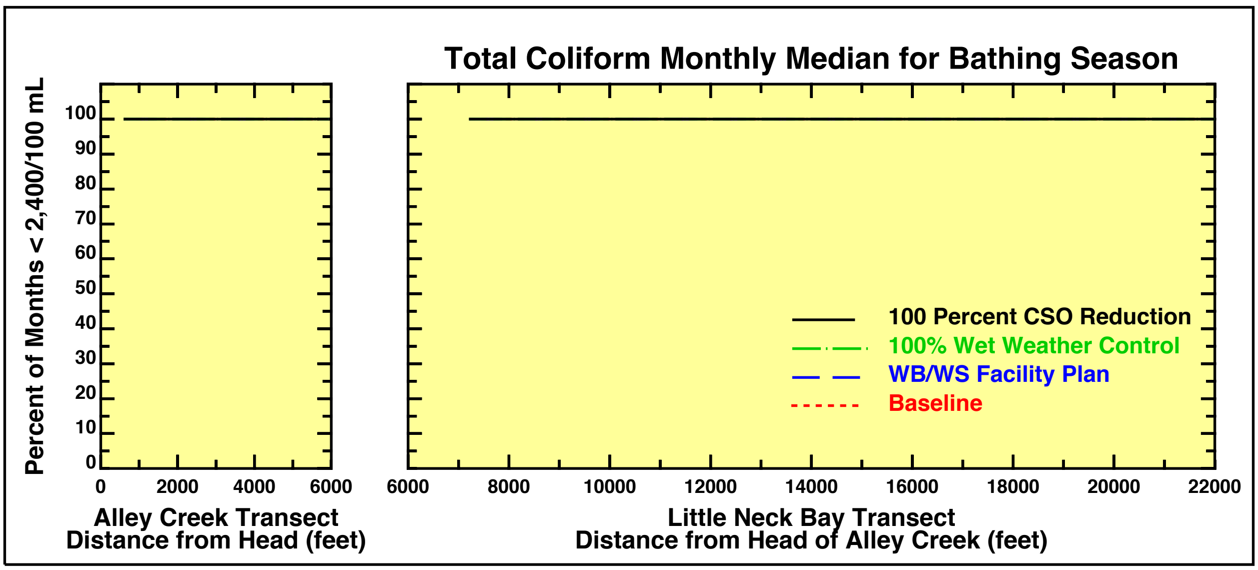


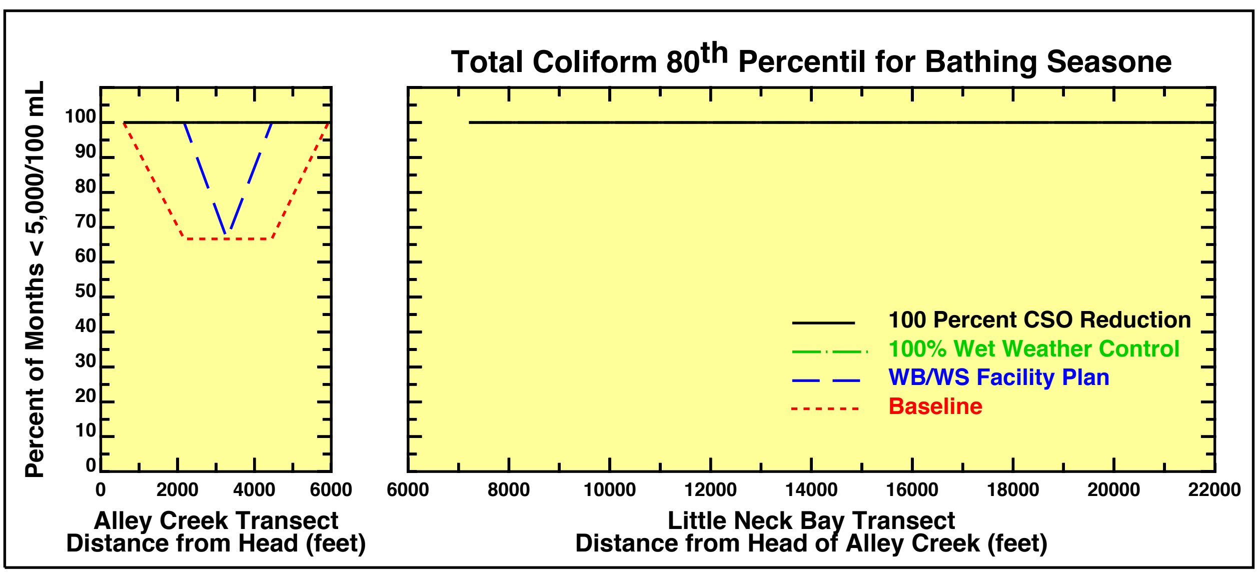
Alley Creek and Little Neck Bay Fecal Coliform Bathing Season Projections



Alley Creek and Little Neck Bay Total Coliform Annual Projections

November 7, 2006
GOHJ0010





Alley Creek and Little Neck Bay Total Coliform Bathing Season Projections

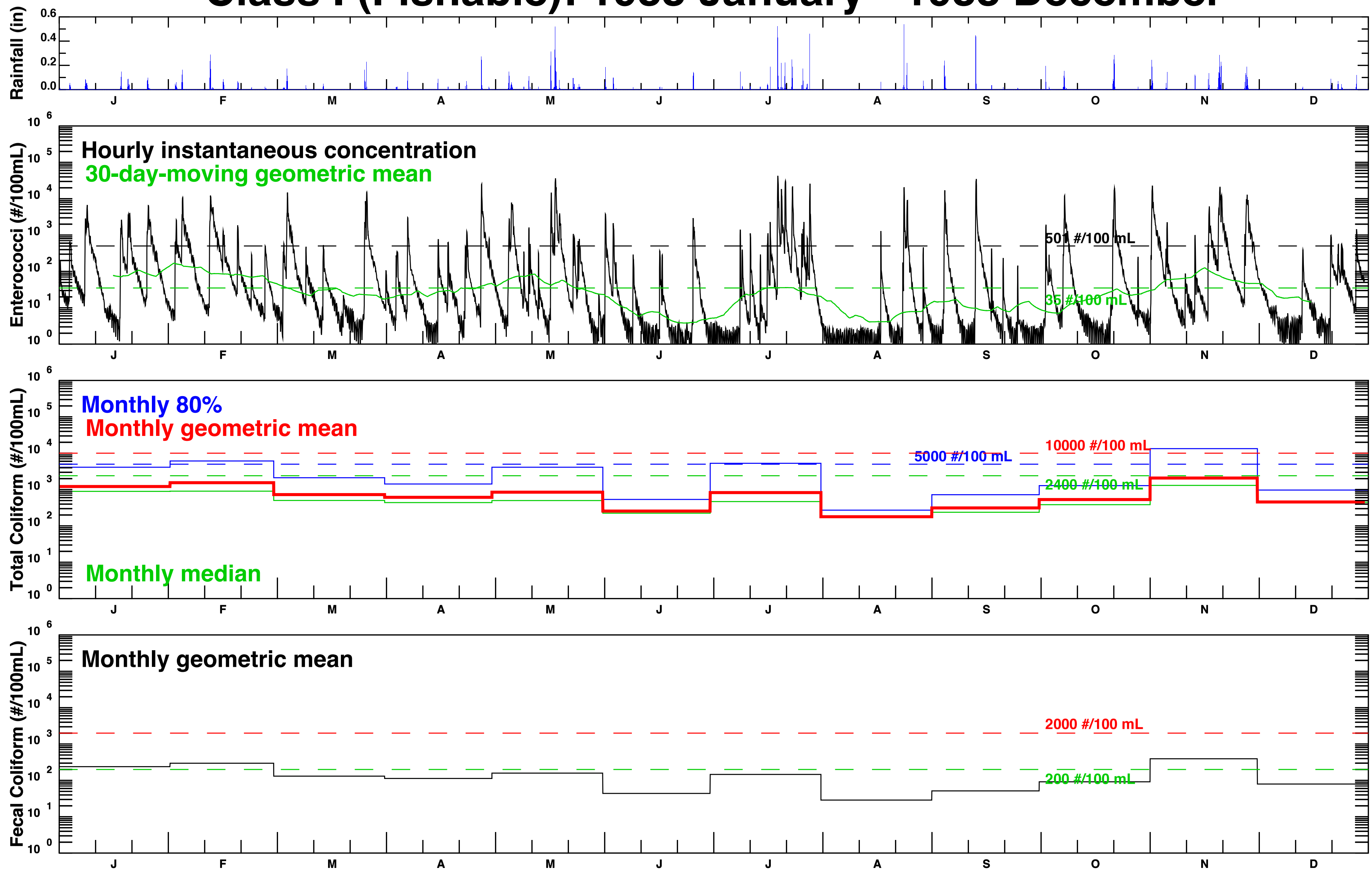
November 7, 2006
GOHJ0010

PATHOGEN PROJECTIONS

TEMPORAL RESULTS AT KEY LOCATIONS

- HEAD END OF ALLEY CREEK
- MOUTH OF ALLEY CREEK
- DMA BEACH
- NEAR BAYSIDE MARINA
- UDALLS COVE
- OPEN WATER OF LITTLE NECK BAY

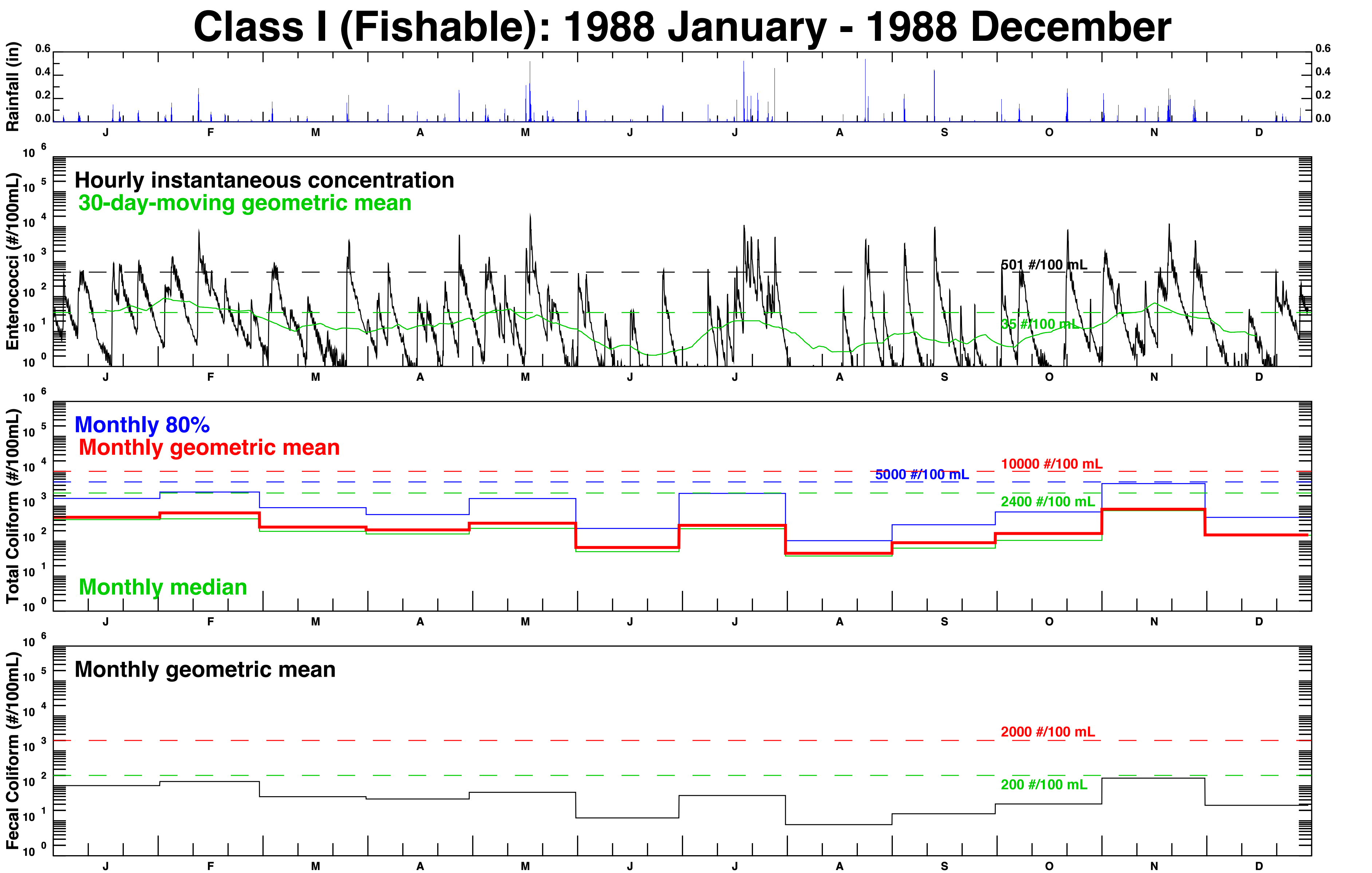
Class I (Fishable): 1988 January - 1988 December



Alley Creek ST AC1
ERTM Cell (53,16), H=2.1m

ERTM 1988 Facility Plan, RUN 197 (88-T4_AC33)

DATE: 10/03/2006 TIME: 9:38:10

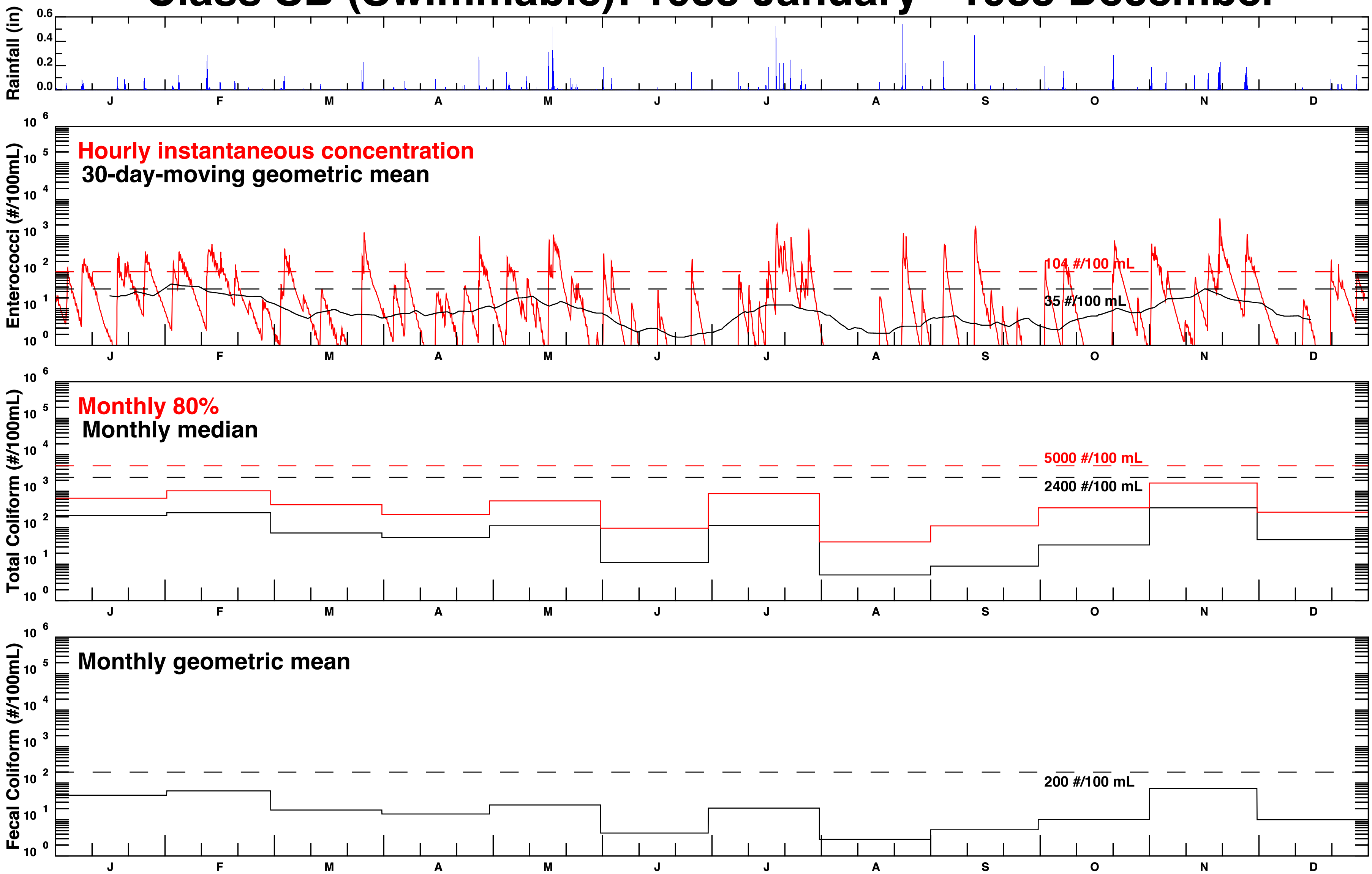


Alley Creek ST S01
ERTM Cell (53,18), H=2.2m

ERTM 1988 Facility Plan, RUN 197 (88-T4_AC33)

DATE: 10/03/2006 TIME: 9:38: 7

Class SB (Swimmable): 1988 January - 1988 December

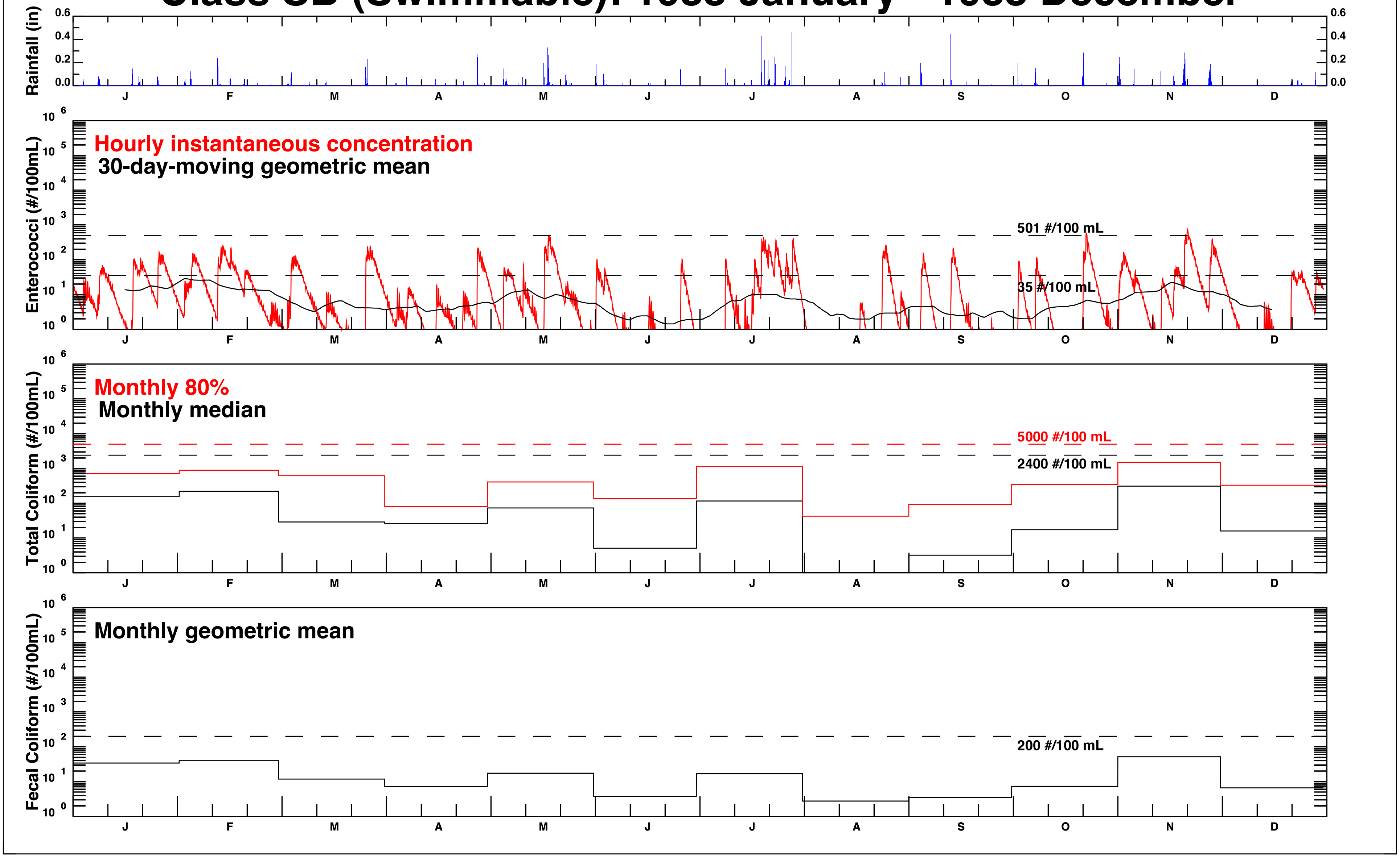


Douglaston Manor Beach ST B06
ERTM Cell (54,20), H=2.6m

ERTM 1988 Facility Plan, RUN 197 (88-T4_AC33)

DATE: 10/03/2006 TIME: 9:38:12

Class SB (Swimmable): 1988 January - 1988 December

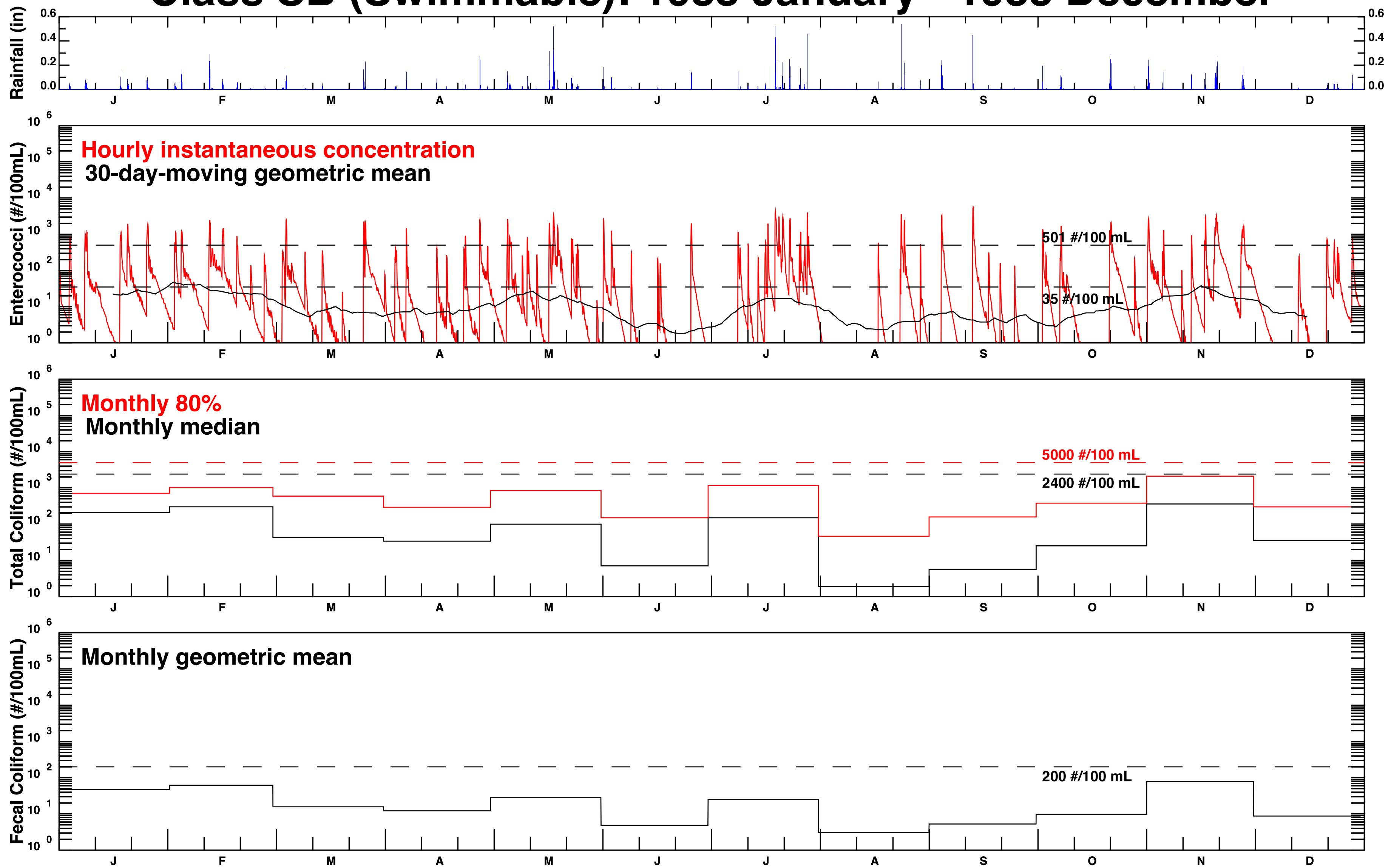


Little Neck Bay ST LB1
ERTM Cell (54,26), H=4.3m

ERTM 1988 Facility Plan, RUN 197 (88-T4_AC33)

DATE: 10/03/2006 TIME: 9:38:14

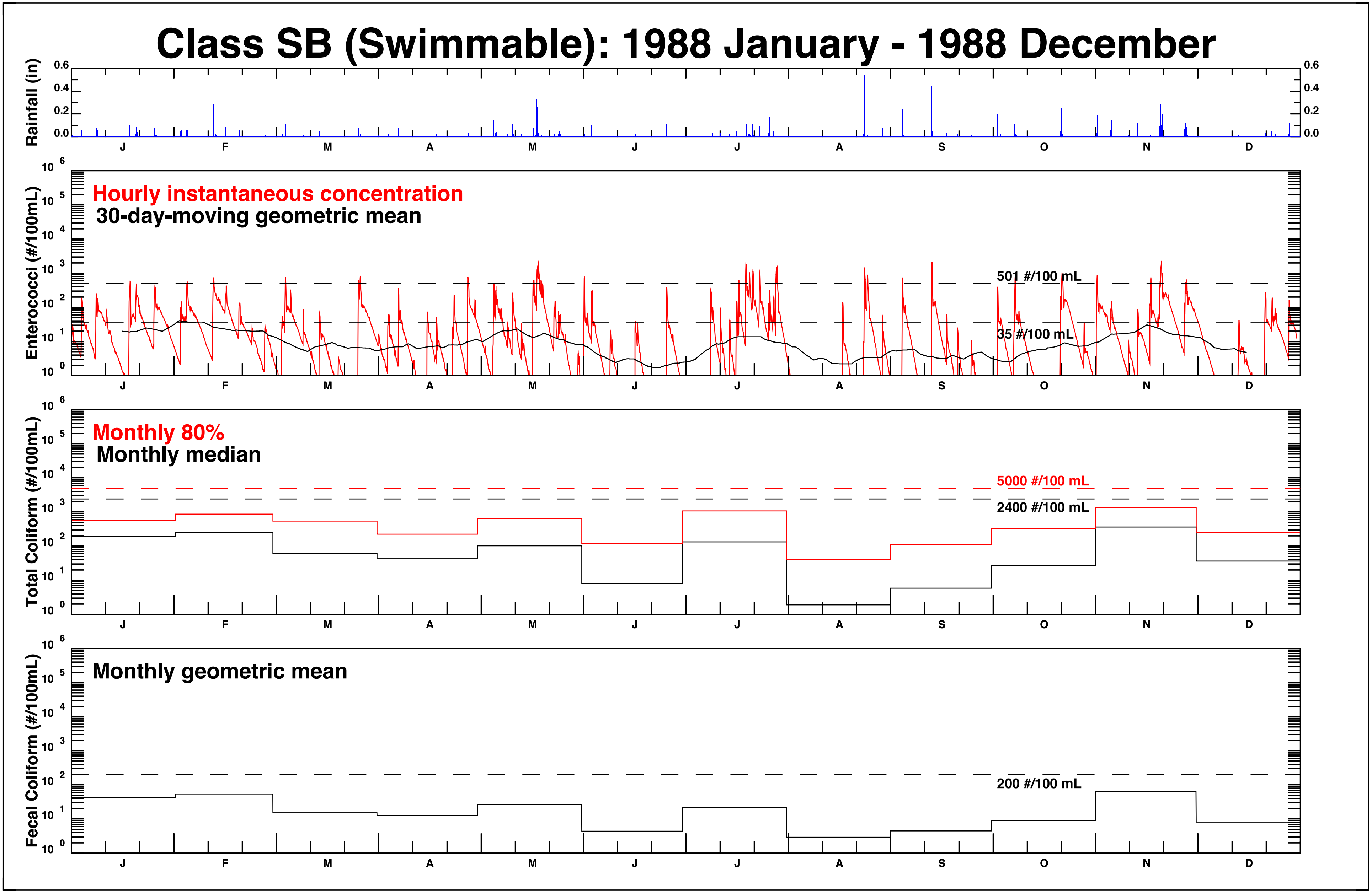
Class SB (Swimmable): 1988 January - 1988 December



Little Neck Bay ST S02
ERTM Cell (55,21), H=2.8m

ERTM 1988 Facility Plan, RUN 197 (88-T4_AC33)

DATE: 10/03/2006 TIME: 9:38:15



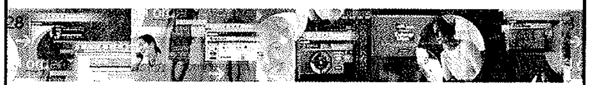
Little Neck Bay ST S64
ERTM Cell (53,22), H=2.7m

ERTM 1988 Facility Plan, RUN 197 (88-T4_AC33)

DATE: 10/03/2006 TIME: 9:38:17

APPENDIX D

PUBLIC OPINION SURVEYS



New York City Waterways Study

Alley Creek

Fall 2003

Purpose and Objectives

The overall purpose of the study was to measure New York City residents' use of and attitudes toward the water resources in their community and elsewhere. The research covered many different areas relevant to this overall purpose. Among the key topics included were:

- New Yorkers' awareness of the major New York City waterways;
- Their use of the water and the land areas alongside the water for recreational use for various waterways;
- The recreational activities they have participated in and how enjoyable they found these activities;
- If they have not used the various waterways for recreational purposes, the reasons why not;
- Their attitudes toward New York City waterways on a variety of aspects;
- The improvements they have seen in New York City waterways and their desired future improvements.

Method

Interviews were conducted via CATI (Computer Assisted Telephone Interviews) among 18+ year old residents of the five boroughs of New York City.

The sample design for the study was as follows:

- HydroQual selected 26 New York City "primary waterways" to be studied. The specific waterways respondents were asked about were determined by their zip code.
- The sample size for each waterway was to be 300.
- However, because some zip codes are proximate to more than one primary waterway, respondents in those zip codes were asked about two and sometimes three primary waterways. As a result, the number of responses for some individual waterways is greater than 300. In turn, a total of 7,424 interviews were conducted which yielded a total of 8,031 responses to questions about primary waterways.

Method (cont'd)

- Of the total of 7,424 interviews, 5,488 interviews (74%) were conducted using a RDD (random digit dial) sample of the five boroughs.
- The balance of 1,936 interviews was conducted using listed sample specific to the zip codes for those waterways with remaining sample assignments, (i.e., for those assessment areas where an RDD method would have been disproportionately expensive due to the relatively low incidence of people living in the areas.)
- Within each household, whether from the RDD or the listed sample, the specific individual interviewed was selected at random from all 18+ year old residents at home.

A list of the 26 primary waterways studied is provided in Appendix A.

Method (cont'd)

As a first step in the questionnaire development process a series of 5 focus groups was conducted among residents of the five boroughs (one in each borough) to ensure that the questionnaire for the telephone survey covered all the relevant issues, and did so in a way that would be clear to respondents.

The questionnaire was then designed in close consultation with HydroQual and NYC DEP senior personnel. A copy is appended at the end of this report.

The interviews, which averaged about 18 minutes in length, were conducted as follows:

- Written instructions regarding the correct administration of the questionnaire were provided and all field supervisors and interviewers were briefed on the study prior to conducting any interviews.
- A pre-test was conducted prior to the full field to ensure that the questionnaire would be clearly understood by respondents.
- The full fieldwork was conducted from late June until early September. Interviewing hours throughout the period were weekday evenings and during both the day and evening on the weekend.

Method (cont'd)

The data were edited and cleaned prior to tabulation. In addition, "other specify" responses to all pre-coded answer list questions were examined and where a sufficient number of responses clustered around a general theme (at least 2% of responses), a code for those responses was added to the pre-coded list in tabulating the data

The final data were weighted as follows:

- Weights were applied to correct for:
  - The unequal probability of household selection due to households with more than one voice telephone number; and
  - The unequal probability of selection of the individual selected for the interview due to different numbers of individuals being available to be interviewed in different households.

Method (cont'd)

Alley Creek Assessment Area

- In addition, post-stratification weighting was applied separately for each of the 26 primary waterways to balance the sample data to 2000 U.S. Census Data for:
  - The composition of the household -- Single adult (18+) households vs. 2+ adult with children households vs. 2+ adult without children households;
  - Age within gender; and
  - Race/ethnicity.
- Data for each waterbody area were projected to actual population counts from the 2000 Census, so that the areas could be easily combined to yield an appropriately weighted sample of all adults 18+ in the five boroughs of New York City.

Organization of the Report

Alley Creek Assessment Area

A separate report is provided for each of the 26 primary waterways included in the study. In each report, the results for the subject primary waterway is compared to the average for all 26 waterways. (A separate report of the findings on a city-wide basis has also been prepared.)

The findings for each individual waterway are organized as follows:

- Awareness of primary waterways
- Visiting primary waterways
- Participation in recreational activities and attitudes toward primary waterways
- Improvements to primary waterways -- past and desired in the future
- Demographic and other profile information.

Glossary and Other Reading Notes

Alley Creek Assessment Area

- **Area residents** -- live in one of the zip codes that define the subject primary waterway
- **Total NYC residents** -- all respondents
- **Primary waterway** – one of the 26 New York City waterways for which respondents were asked their use of and attitudes toward
- **Other NYC waterways** – other New York City waterways respondents volunteered in response to various questions
- **Unaided awareness** -- a mention of a NYC waterway without prompting or aiding the respondent
- **Total awareness** -- a combination of unaided awareness and aided awareness. i.e., the respondent is given the name and asked if they have ever heard of that waterway
- **Visiting a waterway** -- spending recreational or leisure time in or on the waterway or the land alongside those waters
- **On water activities** – boating/speed boating, canoeing, cruising/tour boat, ferryboat ride (for leisure), kayaking, sailing.
- **In water activities** – jet skiing, surfing, swimming, wading.

Glossary and Other Reading Notes (cont'd)

Alley Creek Assessment Area

All base sizes shown are the actual number of people who were asked the question, prior to projecting them to the population of New York City.

As mentioned earlier, two base sizes are shown for the total for New York City residents depending on the question:

- A base of 8,031 for all questions that are specific to a primary waterway; and
- A base of 7,424 for all questions that are not specific to a primary waterway.

Glossary and Other Reading Notes (cont'd)

Alley Creek Assessment Area

Comparisons of the findings for the subject waterway are made to all New York City residents in two ways:

- An average of the values for all 26 primary waterways; and
- A median value for the 26 waterways -- the value at the mid-point of the values for the 26 waterways, that is, there are an equal number of values above and below the median value.

The median value is shown whenever extremely high values for a few waterways tend to distort the average. In these cases, the median value is more helpful than the average in placing where the subject waterway stands relative to all the other waterways.

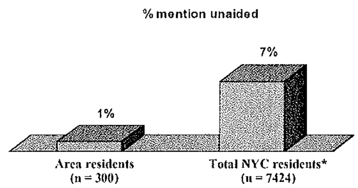
Awareness of Primary Waterway

Alley Creek

Total Unaided Awareness of Primary Waterway

Alley Creek Assessment Area

- 1% of area residents mention Alley Creek on an unaided basis.
  - The average for unaided awareness for all the primary waterways is 13%.
  - The median value for unaided awareness for all the primary waterways is 7%. (See page 11.)

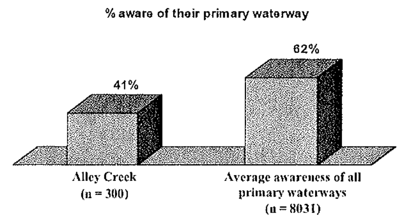


* Median

Total Awareness of Primary Waterway

Alley Creek Assessment Area

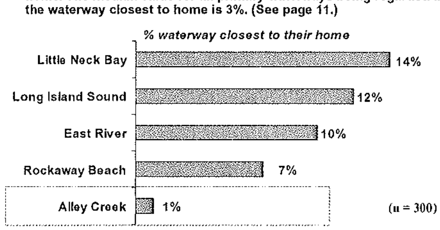
- In total, 41% of Alley Creek area residents are aware of Alley Creek on a combined unaided and aided basis.
  - Average total awareness of all primary waterways among NYC residents is 62%.



Waterway Closest to Home (Unaided)

Alley Creek Assessment Area

- On an unaided basis, area residents most often mention Little Neck Bay as the waterway closest to their home.
  - 1% of area residents mention Alley Creek unaided as the waterway closest to their home.
  - On average, 10% of NYC residents mention unaided the primary waterway in their assessment area as the waterway closest to their home. The median value for all primary waterways being regarded as the waterway closest to home is 3%. (See page 11.)



Awareness Summary

Alley Creek Assessment Area

	Area Residents %	NYC Residents %
Total unaided awareness of primary waterway	1	13*
Total awareness of primary waterway	41	62
Primary waterway is waterway closest to home	1	10**

* Median is 7%
** Median is 3%

Visiting Primary Waterway

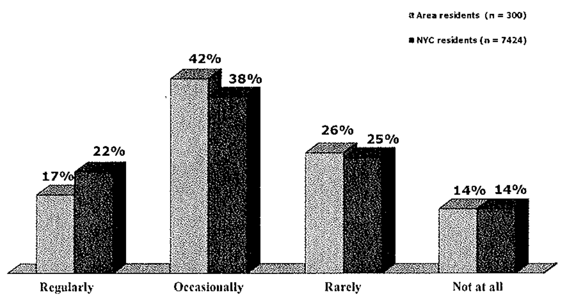
Alley Creek

How Often Visit NYC Waterways Generally

Alley Creek Assessment Area

- 17% of area residents say they visit the waterways in their community or elsewhere in the city on a regular basis. 42% say they visit them occasionally.
  - 22% of all NYC residents say they visit the city's waterways regularly while 38% say they visit them occasionally.

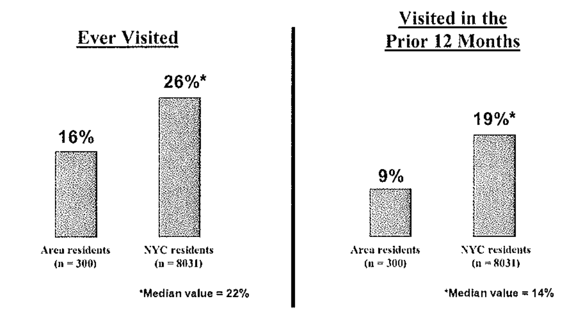
How Often Visit NYC Waterways Generally
Alley Creek Assessment Area



Ever Visited Primary Waterway and Visited Prior 12 Months
Alley Creek Assessment Area

- 16% of area residents have visited Alley Creek at some point.
  - On average, 26% of NYC residents have visited the primary waterway in their assessment area. The median value is 22%.
- 9% of area residents report visiting Alley Creek in the prior 12 months.
  - On average, 19% of NYC residents visited the primary waterway in their assessment area in the prior 12 months. The median value is 14%.

Ever Visited Primary Waterway and Visited Prior 12 Months
Alley Creek Assessment Area



Number of Visits in Prior 12 Months to Primary Waterway
Alley Creek Assessment Area

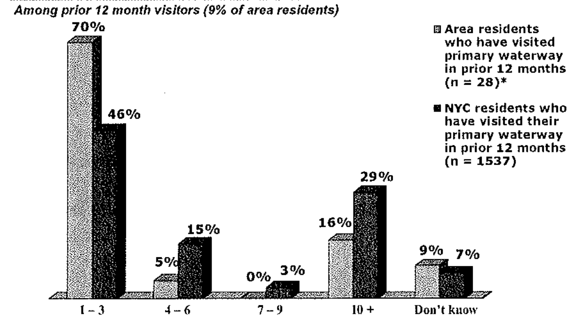
- Among prior 12 month visitors to Alley Creek, the median number of visits made is 2.*
  - For all NYC primary waterway visitors, the median number of visits made in the prior 12 months is 4.

Median number of visits to Alley Creek: 2*
Average number of visits to Alley Creek: 12*
Median number of visits to each NYC primary waterways: 4
Average number of visits to each NYC primary waterways: 25

* Small base; use data with caution

Number of Visits in Prior 12 Months to Primary Waterway
Alley Creek Assessment Area

Among prior 12 month visitors (9% of area residents)



* Small base; use data with caution

Reasons for Never Visiting Primary Waterway
Alley Creek Assessment Area

Among those aware of primary waterway but never visited (25% of area residents)

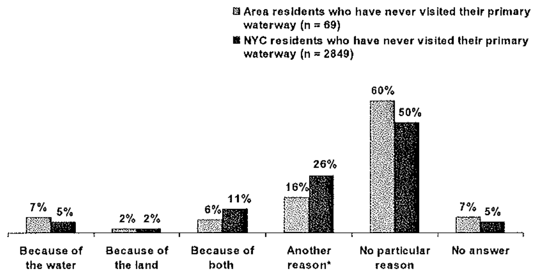
- 60% of area residents who have never visited Alley Creek, but who are aware of it, say there is no particular reason for not visiting. 13% say they have never visited because of the water, and 8% say they've never visited because of the land.*
  - 50% of all NYC residents who have never visited their primary waterway, though aware, say there is no particular reason for not visiting. 16% say they have never visited because of the water and 13% say they have never visited because of the land.*

* These percentages include those who said only water or only land as well as those who said both water and land reasons.

Reasons for Never Visiting Primary Waterway

Alley Creek Assessment Area

Among those aware of primary waterway but never visited (25% of area residents)



* Further details not available

Water Reasons for Never Visiting Primary Waterway

Alley Creek Assessment Area

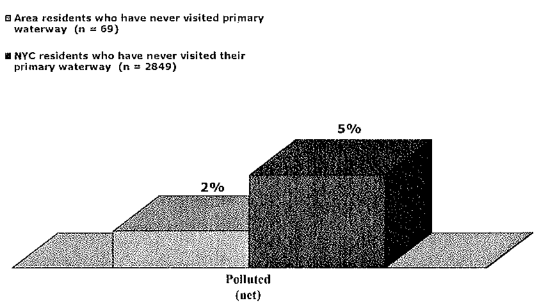
Among those aware of primary waterway but never visited (25% of area residents)

- When area residents cite negatives about the water as the reason for never having visited Alley Creek, no specific issue was mentioned by at least 5%.
- When NYC residents cite water negatives as the reason for never having visited the primary waterway in their assessment area, the specific issue most often mentioned is pollution (5%).

Water Reasons for Never Visiting Primary Waterway

Alley Creek Assessment Area

Among those aware of primary waterway but never visited (25% of area residents)



Land Reasons for Never Visiting Primary Waterway

Alley Creek Assessment Area

Among those aware of primary waterway but never visited (25% of area residents)

- When area residents cite negatives about the land as a reason for never having visited Alley Creek, no specific issue was mentioned by at least 5%.
- When NYC residents cite land negatives as a reason for never having visited the primary waterway in their assessment area, no specific issue was mentioned by at least 5%.

Visiting Summary

Alley Creek Assessment Area

	Area Residents %	NYC Residents %
Visit NYC waterways regularly/occasionally	59	60
Ever visited primary waterway	16	26*
Visited prior 12 months	9	19**
Median number of visits to primary waterway in prior 12 months	2	4
Haven't visited because of water (among aware never visitors)(Net)	13	16
Pollution	2	5
Haven't visited because of land (among aware never visitors)(Net)	8	13

* Median is 22%
** Median is 14%

Participation in Recreational Activities at and Attitudes Toward Primary Waterway

Alley Creek

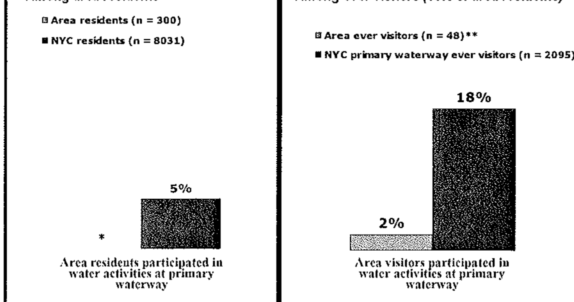
Participation in Water Activities at Primary Waterway
Alley Creek Assessment Area

- 2% of area residents who have visited Alley Creek have participated in water activities there.* (16% of area residents have visited Alley Creek so that, in total, less than 0.5% of area residents have participated in water activities there.)
  - 18% of NYC residents who have visited the primary waterway in their assessment area have participated in water activities there.

Note: Due to the small base sizes, no data are shown for this waterway area regarding how enjoyable water activities were or what made water activities enjoyable/not enjoyable.

* Small base; use data with caution

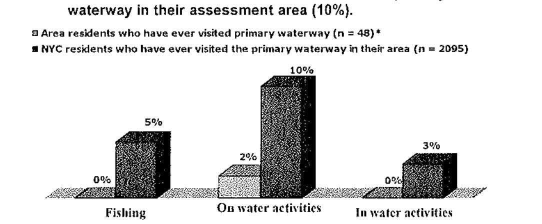
Participation in Water Activities at Primary Waterway
Alley Creek Assessment Area



* Less than 0.5% ** Small base; use data with caution

Most Frequent Water Activities Participated in at Primary Waterway
Alley Creek Assessment Area

- On water activities is the most frequent water activity among those who have ever visited Alley Creek -- 2%.* (16% of area residents have visited.)
  - On water activities are the most frequent type of water activity for all NYC residents who have ever visited the primary waterway in their assessment area (10%).



* Small base; use data with caution

Why Never Participated in Water Activities at Primary Waterway
Alley Creek Assessment Area

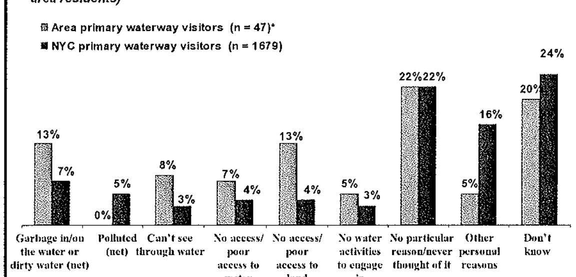
Among primary waterway visitors who never participated in water activities there (16% of area residents)

- 22% of area visitors who have never participated in any water activities at Alley Creek say that there is no particular reason for their not participating. 13% mention garbage in/on the water or the water being dirty and 13% say that no access/poor access to land was the reason.*
  - 22% of NYC primary waterway visitors who have never participated in water activities say that there is no particular reason for their not participating. 16% say they did not participate for various personal reasons.

* Small base; use data with caution

Why Never Participated in Water Activities at Primary Waterway
Alley Creek Assessment Area

Among primary waterway visitors who never participated in water activities there (16% of area residents)



* Small base; use data with caution

Participation in Land Activities at Primary Waterway
Alley Creek Assessment Area

- 63% of area residents who have visited Alley Creek have participated in land activities there.* (16% of area residents have visited Alley Creek so that, in total, 10% of area residents have participated in land activities there.)
  - 53% of NYC residents who have visited the primary waterway in their assessment area have participated in land activities there.

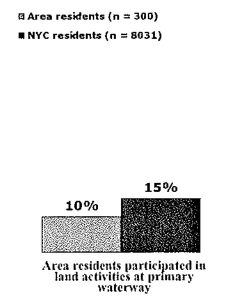
Note: Due to the small base size, no data are shown for this waterway area regarding reasons area residents never participated in any land activities when visiting this waterway.

* Small base; use data with caution

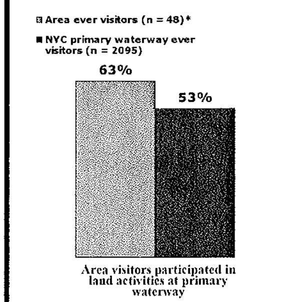
Participation in Land Activities at Primary Waterway

Alley Creek Assessment Area

Among area residents



Among ever visitors (16% of area residents)



* Small base; use data with caution

Most Frequent Land Activities Participated in at Primary Waterway

Alley Creek Assessment Area

Among primary waterway visitors (16% of area residents)

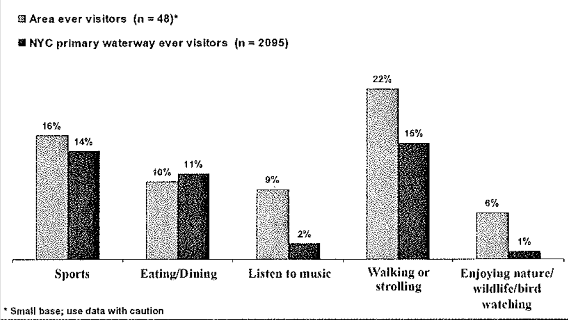
- The most popular land activity at Alley Creek among area visitors is walking or strolling (22%); the second most popular is sports (16%).*
  - Walking or strolling (15%) and sports (14%) are the most popular land activities among all NYC residents who have ever visited the primary waterway in their assessment area.

* Small base; use data with caution

Most Frequent Land Activities Participated in at Primary Waterway

Alley Creek Assessment Area

Among primary waterway visitors (16% of area residents)



* Small base; use data with caution

How Enjoyable Land Activities Were at Primary Waterway

Alley Creek Assessment Area

Among those who participated in land activities at primary waterway (10% of area residents)

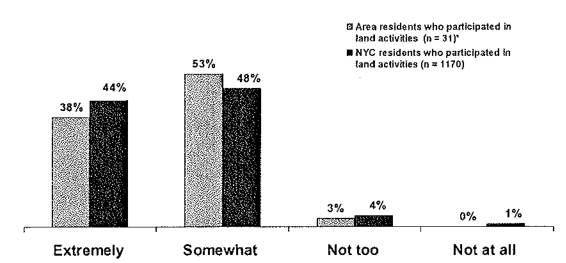
- 38% of area residents who have participated in a land activity at Alley Creek say those activities were "extremely enjoyable." Another 53% say they found their activities to be "somewhat enjoyable."*
  - 44% of NYC residents who participated in a land activty at the primary waterway in their assessment area say those activities were "extremely enjoyable," while another 48% rated them "somewhat enjoyable."

* Small base; use data with caution

How Enjoyable Land Activities Were at Primary Waterway

Alley Creek Assessment Area

Among those who participated in land activities at primary waterway (10% of area residents)



Note: Differences from 100% due to no answers
* Small base; use data with caution

Most Frequent Mentions of What Made Land Activities Enjoyable

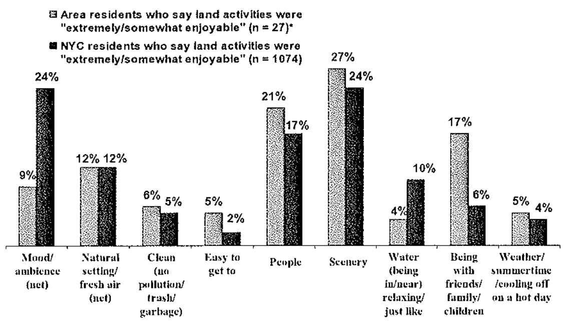
Alley Creek Assessment Area

- 27% of those who participated in a land activity and rated it "extremely/somewhat enjoyable" say that the scenery made it so. The people is cited by 21% of area residents who have participated in a land activity and rated it "extremely/somewhat enjoyable." Other mentions include being with family, friends and children (17%).*
  - 24% of NYC residents who participated in a land activity at the primary waterway in their assessment area and rated it "extremely/somewhat enjoyable" say the scenery made it so. Other mentions include the mood/ambience (24%) and the people there (17%).

* Small base; use data with caution

Most Frequent Mentions of What Made Land Activities Enjoyable

Alley Creek Assessment Area



* Small base: use data with caution

Water Activities Participation Summary

Alley Creek Assessment Area

	Area Residents %	NYC Residents %
Participated in water activities at primary waterway (among area visitors)	2	18
Participated in water activities at primary waterway (among area residents)	0.3	5
On water activities is most frequent water activity at primary waterway (among area visitors)	2	10
No particular reason is given for why never participated in water activities at primary waterway (among primary waterway visitors who never participated in water activities there)	22	22

Land Activities Participation Summary

Alley Creek Assessment Area

	Area Residents %	NYC Residents %
Participated in land activities at primary waterway (among area visitors)	63	53
Participated in land activities at primary waterway (among area residents)	10	15
Walking/strolling is most frequent land activity at primary waterway (among area visitors)	22	15
Rate land activities "extremely/somewhat enjoyable" (among those who participated at primary waterway)	91	92
"Scenery" most frequent reason cited for why enjoyable (among those who rated "extremely/somewhat enjoyable")	27	24

Improvements to Primary Waterways

Alley Creek

Improvements Noticed in Past Five Years in NYC Waterways

Alley Creek Assessment Area

- **49% of area residents say they have noticed improvements in NYC waterways in general in the past five years. 2% have noticed improvements specifically at Alley Creek.**
  - 48% of NYC residents say that they have noticed improvements in NYC waterways in general in the past five years. On average, 6% of NYC residents have noticed improvements at the primary waterway in their assessment area. The median value for those who have noticed improvements at the primary waterway in their assessment area is 3%. (See page 11.)
- **Improvements in the water (quality, appearance, color) are the most frequently mentioned improvement in NYC waterways in general noticed by area residents in the past five years (23%).**
  - Improvements in the water are the most frequently mentioned improvement noticed in NYC waterways in general among all NYC residents (21%).

Improvements Noticed in Past Five Years in NYC Waterways

Alley Creek Assessment Area

	Area Residents (n = 300) %	NYC Residents (n = 7424) %
Have noticed improvements at NYC waterways (net)	49	48
Water mentions (quality, appearance, odor)	23	21
Cleaner/better (net)*	15	13
Haven't seen improvements	27	31
Don't know	24	22

* Cleanliness/sanitation/better maintenance

Improvement Would Most Like in Primary Waterway if Funds Available *Alley Creek Assessment Area*

Among those aware of their primary waterway (41% of area residents)

- **If funds were available, improvements in the water (quality, appearance, odor) are the aspect that area residents would most like to see improved at Alley Creek (35% of those aware of Alley Creek).**
  - If funds were available, improvements in the water at their primary waterway are the most frequently cited desired improvement among all NYC residents (38% of those aware of the primary waterway in their assessment area).

Improvement Would Most Like in Primary Waterway if Funds Available *Alley Creek Assessment Area*

Among those aware of their primary waterway (41% of area residents)

	Area Residents (n = 117) %	NYC Residents (n = 4944) %
Access to shoreline	5	3
Water mentions (quality, appearance, odor)	35	38
Cleaner/better (net)*	7	11
More park areas/greenery/ nature preserves	6	3
Don't know	22	24

* Cleanliness/sanitation/better maintenance

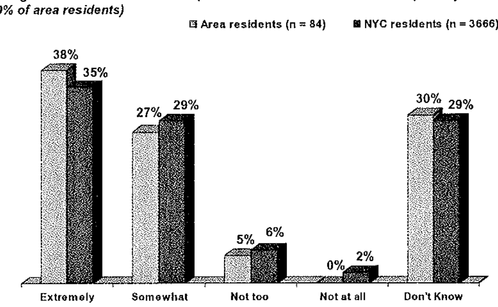
Importance of Most Desired Improvement at Primary Waterway *Alley Creek Assessment Area*

Among those who identified the improvement would most like at their primary waterway (29% of area residents)

- **38% of area residents who identified the improvement they would most like to see in Alley Creek, if funds were available, say that that improvement is "extremely important" and another 27% say it is "somewhat important."**
  - 35% of NYC residents who identified the improvement they would most like to see in the primary waterway in their assessment area say that, if funds were available, that improvement is "extremely important" and an additional 29% say it is "somewhat important."

Importance of Most Desired Improvement at Primary Waterway *Alley Creek Assessment Area*

Among those who identified the improvement would most like at their primary waterway (29% of area residents)



Importance of Water Improvements at Primary Waterway *Alley Creek Assessment Area*

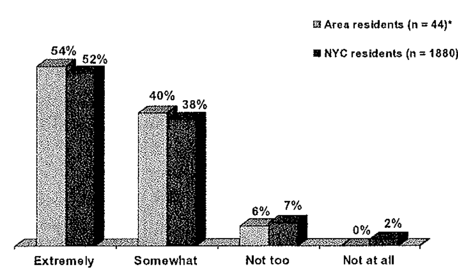
Among those for whom it is the most important improvement at their primary waterway (14% of area residents)

- **Specifically among those area residents who identified improving the water quality, appearance and/or odor as the improvement they would most like to be made to Alley Creek, 54% consider it "extremely important."***
  - 52% of NYC residents who identified improvements in water quality, appearance and/or odor in the primary waterway in their assessment area as the improvement they would most like to see in the primary waterway in their assessment area say this improvement is "extremely important."

* Small base; use data with caution

Importance of Water Quality Improvements at Primary Waterway *Alley Creek Assessment Area*

Among those for whom it is the most important improvement at their primary waterway (14% of area residents)



* Small base; use data with caution

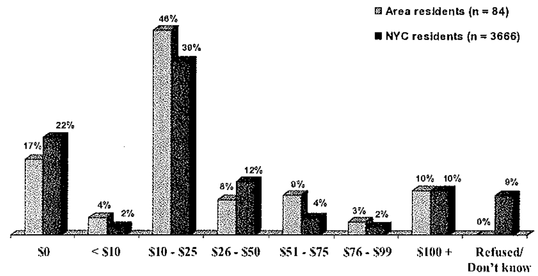
Amount Say Willing to Pay Per Year for Most Desired Improvement at Primary Waterway — *Alley Creek Assessment Area*

Among those who identified the improvement would most like at their primary waterway (29% of area residents)

- **46% of area residents who identified the improvement they would most like to see in Alley Creek say they would be willing to pay between $10 and $25 a year for that improvement.**
- **17% say they would not be willing to pay anything.**
  - 39% of NYC residents who identified the improvement they would most like to see in the primary waterway in their assessment area say they would be willing to pay between $10 and $25 a year for that improvement.
  - 22% say they would not be willing to pay anything.

Amount Say Willing to Pay Per Year for Most Desired Improvement at Primary Waterway — *Alley Creek Assessment Area*

Among those who identified an improvement would most like at their primary waterway (29% of area residents)



Amount Say Willing to Pay Per Year for Water Quality Improvements at Primary Waterway — *Alley Creek Assessment Area*

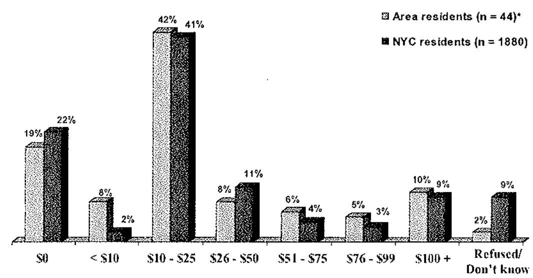
Among those for whom it is the most desired improvement at their primary waterway (14% of area residents)

- **Specifically among those area residents who identified water quality improvements as the improvement they most like made to Alley Creek, 42% say they would be willing to pay between $10 and $25 per year for that improvement.***
- **19% are not willing to pay anything for water quality improvements to Alley Creek.***
  - 41% of NYC residents who identified water quality improvements as the improvement they most like made to the primary waterway in their assessment area say they would be willing to pay between $10 and $25 each year for that improvement.
  - 22% are not willing to pay anything for water quality improvements to the primary waterway in their assessment area.

* Small base; use data with caution

Amount Say Willing to Pay Per Year for Water Quality Improvements at Primary Waterway — *Alley Creek Assessment Area*

Among those for whom it is the most desired improvement at their primary waterway (14% of area residents)



* Small base; use data with caution

Waterway Most Want Improved if Funds Available for Only One — *Alley Creek Assessment Area*

- **If funds were available to improve only one NYC waterway, 7% of area residents would like it to be Alley Creek.**
  - On average, 18% of NYC residents would like the primary waterway in their assessment area to be the one to be improved.

Waterway Most Want Improved if Funds Available for Only One — *Alley Creek Assessment Area*

	Area Residents (n = 300) %	NYC Residents (n = 7424) %
Alley Creek	7	**
The East River	13	18
The Hudson River	19	22
Rockaway Beach*	9	3
Long Island Sound*	6	1
Don't know	23	17

* Not one of the 26 primary waterways studied.
** Less than 0.5%

Improvements Summary

Alley Creek Assessment Area

	Area Residents	NYC Residents
	%	%
Noticed improvements in NYC waterways in past 5 years	49	48
Noticed improvements in primary waterway in past 5 years	2	6*
Improvements in water improvement most frequently noticed (at NYC waterways)	23	21
Improvements in water most desired improvement at primary waterway (among those aware of primary waterway)	35	38

*Median is 3%.

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Improvements Summary (cont'd)

Alley Creek Assessment Area

	Area Residents	NYC Residents
	%	%
Percent rating most desired improvement "extremely/ somewhat important" (among those who identified improvement would most like at primary waterway)	65	64
Percent rating water improvements "extremely/ somewhat important" (among those for whom it is the most desired improvement at primary waterway)	94	90
Would pay $10-$25 annually for most desired improvement (among those who identified improvement would most like at primary waterway)	46	39
Would pay $10-$25 annually for water improvements (among those for whom it is the most desired improvement at primary waterway)	42	41
Primary waterway is one most want improved	7	18

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Demographics

Alley Creek

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Demographics

Alley Creek Assessment Area

	Alley Creek	Total NYC Residents
Gender	%	%
Male	46	46
Female	54	54
Age		
18-34	28	36
18-24	12	14
25-34	16	21
35-54	40	37
35-44	23	22
45-54	17	15
55+	31	26
55-64	14	13
65+	17	13

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Demographics

Alley Creek Assessment Area

	Alley Creek	Total NYC Residents
Children Under 18 in HH	%	%
Yes	37	37
1	18	17
2	13	11
3	4	5
4	1	2
5	2	1
6+	0	1
No	62	62
Ethnicity/Race		
African-American	16	21
Asian	17	10
Hispanic	9	22
White	44	35
Other	14	12

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Demographics

Alley Creek Assessment Area

	Alley Creek	Total NYC Residents
Education	%	%
H.S. or less	24	33
Grammar school or less	1	3
Some high school	2	6
High school graduate	21	24
Some College or More	74	65
Some college/ technical school	25	24
College graduate	35	28
Some/completed postgraduate	14	14

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Demographics

Alley Creek Assessment Area

	Alley Creek	Total NYC Residents
Income	%	%
<$35,000	12	27
$35,000 to <$50,000	15	16
$50,000 to <$75,000	20	17
$75,000 to <$100,000	21	12
$100,000+	18	13
Refused	14	15
Own or Rent		
Rent	26	62
Own	72	36

Other Characteristics

Alley Creek Assessment Area

Ever volunteer to clean NYC parks/waters	Alley Creek %	Total NYC Residents %
Yes	10	13
No	89	86
Member of NYC boating/ canoeing/kayaking club		
Yes	2	2
No	97	97

Other Characteristics

Alley Creek Assessment Area

Water activities enjoy *	Alley Creek %	Total NYC Residents %
Boating/speed boating	25	22
Canoeing	5	5
Fishing	18	17
Kayaking	3	4
Sailing	6	5
Swimming	64	58
Water/jet skiing	7	7
None	19	18

* Not added until after field had begun so not everyone was asked this question.

Appendix

Alley Creek

NYC Primary Waterways Included in Study

Alley Creek Assessment Area

Alley Creek	Jamaica Bay
Arthur Kill	Kill Van Kull
Bergen Basin	Lower New York Bay
Bronx River	Mill Basin
Coney Island Creek	Newtown Creek
East River	Paedergat Basin
Flushing Bay	Raritan Bay
Fresh Creek	Sheepshead Bay
Gowanus Canal	Shellbank Basin
Harlem River	Spring Creek
Hendrix Creek	Thurston Basin
Hudson River	Upper New York Bay
Hutchinson River	Westchester Creek

Questionnaire

NOTE: Final copies of each report will contain a copy of the questionnaire.

APPENDIX E

STAKEHOLDER MEETING MINUTES
APRIL 4, 2006
JULY 26, 2006
OCTOBER 18, 2006

Long Term Control Plan
Alley Creek/Little Neck Bay Stakeholder Team
Meeting No. 1
April 4, 2006

The first Alley Creek/Little Neck Bay Stakeholder team meeting of the Long Term Control Plan (LTCP) of the NYC Department of Environmental Protection (DEP) was held on April 4, 2006, at 6:30 p.m. at the Alley Creek DEP Field Office. The purpose of the meeting was to introduce the Long Term Control Plan project and discuss the implications for Alley Creek and Little Neck Bay

Stephen Whitehouse, a subconsultant facilitating the project's public participation, opened the meeting. He described the structure of the project team (engineering firms O'Brien and Gere, Hazen & Sawyer, and Greeley and Hansen, as well as several other subconsultants) and then introductions were made around the room. Stakeholders ranged from longtime residents of the area to engineers to community and environmental advocates.

Steve explained that the purpose of the LTCP project is to improve the quality of the city's open waters and tributaries by developing a long-term plan to invest in infrastructure that will reduce the number of combined sewer overflow (CSO) events, and to reduce the volume of those events that do occur. He reviewed the definition and location of CSOs in New York City, how CSO's are regulated, and noted that city ratepayers fund water quality infrastructure improvements. He explained that, through the LTCP project, waterbodies would be monitored and modeled; the public would be consulted through this stakeholder team process; and alternative facility, maintenance, and operations plans would be developed and evaluated in terms of costs and performance. He noted that both the 1992 and 2004 consent orders required tank construction and floatables controls; the 2004 consent order also includes wet weather capacity upgrades and sewer system improvements. He pointed out that, in general, water quality in New York City, including in Alley Creek, is better than it has been during our lifetimes.

Patricia Kehrberger, HydroQual, discussed the study area's water quality issues. She described Alley Creek as a Class I waterbody, which means its waters should support fishing, and Little Neck Bay as a Class SB waterbody, which means its waters should support swimming. The primary water quality issues in the study area include occasional low dissolved oxygen in Alley Creek, pathogens in Little Neck Bay, and reported septic tank discharges at Douglaston Manor Association Beach. Pat pointed out that waterbodies are classified and planned for holistically, by the quality of the waterbody as a whole rather than by the water quality at any one point (including a CSO discharge point).

Steve and Pat explained that the 5 million gallon Alley Creek storage tank (now under construction) will help reduce the number and volume of CSO events by catching and holding the first 5 million excess gallons during wet weather events. In the event of storm events yielding more than 5 million gallons, the flow will go through and overflow the tank. Some settling of CSO solids will occur and the tank will capture floatables by means of baffles. No further treatment such as disinfection of the CSO is planned. The tank is a passive facility, designed to work during storm events without personnel present.

Alley Creek Stakeholders voiced their concerns and questions, including:

- How is it acceptable to prohibit water contact (swimming, for example) but still allow people to fish? Pat explained that the pathogens from CSO events that preclude swimming are rarely the cause of toxicity in fish, which is more commonly due to metals and other pollution addressed by programs other than the LTCP.
- The figure given for the size of the building site and restoration area (21 acres) seems high, even considering nearby wetlands.
- Several stakeholders identified floatables prevention as a significant issue. Stakeholders noted that additional maintenance is needed beyond that provided by the city or volunteers. Stakeholders wanted to know what the maintenance procedures are, if there are adequate maintenance vehicles available for the study area, and how often the catch basins are cleaned. The question was raised of whether catch basins in Alley Creek have hoods and, if so, how many? Catch basin hoods, if not already in place, should be considered.
- One stakeholder expressed concern that, with the diversion from CSO TI-008, the CSO will closer to sensitive public uses. It was noted that because the tank will catch the first five million gallons of overflow and provide some treatment of all flows through the tank, CSO events will be reduced in volume and frequency resulting in a water quality benefit.
- A stakeholder requested more information on the duration and extent of the construction, in particular on the effects on traffic flow and lane closures.
- One stakeholder pointed out that many of the decisions concerning Alley Creek seem to be made already, and asked whether there are decisions not yet made that the public can influence. Steve explained that each tributary study area is at a different stage in the planning and implementation of CSO controls, and that the 2004 Consent Order with State DEC mandates a specific project for Alley Creek as well as the development of the LTCP; while CSO controls for Alley Creek are in progress, public input can still influence decisions affecting the waterbody. Pat explained that the alternatives suggested by public input will be modeled, but they will be evaluated in terms of feasibility, performance, water quality benefit, and cost.
- Since water quality standards are tied to how the waterbody is used, it is important that the reported uses are accurate; identified uses of the water body should be verified.

- Is it possible to coordinate planning with other municipalities (especially in Nassau County)? Pat recognized that considering water quality issues in a regional context is useful, and noted that the hydrologic modeling takes into account flows from Nassau County.
- Is it possible to predict (through modeling or other means) whether Alley Creek waters will meet standards on completion of the Alley Creek project? Pat replied that modeling will predict the degree of compliance, but the verification of standards will be determined by post-construction compliance monitoring, as required by the LTCP.

Administration
The next meeting will occur in approximately eight weeks. Meeting notes will be made available through the study area web site. Stakeholder team members were encouraged to visit the password-protected web site to download background material on the LTCP in the meantime.

Action Items
In response to Stakeholder questions, the project team will return at the next meeting to address the following issues:

- Status and schedule of the current construction project, including anticipated schedule of traffic diversions.
- Verification of area and scope of site restoration of current project.
- Update on catch basin programs in the Alley Creek watershed, including operational (maintenance) schedules for catch basins.

The meeting adjourned at 9:10 p.m.

Long Term Control Plan
Alley Creek/Little Neck Bay Stakeholder Team
Meeting No. 2
July 26th, 2006

The second Alley Creek/Little Neck Bay Stakeholder team meeting of the Long Term Control Plan (LTCP) of the NYC Department of Environmental Protection (NYCDEP) was held on July 26th 2006, at 6:30 p.m. at the Alley Creek NYCDEP Field Office. The purpose of the meeting was to present the draft Waterbody /Watershed Plan (WB/WS) for Alley Creek and Little Neck Bay

Stephen Whitehouse, NYCDEP's consultant for public participation from Starr Whitehouse, opened the meeting and introduced the team. Patricia Kehrberger, from HydroQual, followed up on questions asked at the previous meeting. Patricia went through the schedule of the Alley Creek CSO Facility Plan. She said that Phase I, including drainage area improvements, the construction of a CSO storage tank, and environmental restoration, was ongoing. Phase II will see the design and construction of the Oakland Ravine Wetland System for improved stormwater management. One stakeholder asked for more information on the conceptual design of the 23.5 acre Alley Park Environmental Restoration. Stephen suggested that Community Board 11 request a presentation from the NYC Department of Parks and Recreation, who is implementing the environmental restoration plan within Alley Park, to review the schedule and schematic design.

Patricia spoke about the ongoing CSO floatables abatement program, describing a project to put hoods on the catch basins to trap floatables. In the ongoing program, 890 hoods have been installed bringing the total of hooded catch basin to 2860 (84% of 3400 within the Alley Creek/Little Neck Bay drainage area) . The remaining 540 basins require varying levels of reconstruction to allow them to receive a hood. In addition to retrofitting, the project calls for continuous inspection and repair.

The team spoke about the next steps of the WB/WS plan. Stephen described the staggered submission deadline schedule to the New York State Department for Environmental Conservation (NYSDEC) for review and added that all 16 city plans would be completed and submitted by June 2007. After the NYSDEC review, the public has an opportunity to comment and there may be a public hearing. A stakeholder asked about the likelihood of a large change during the review process. Mark Klein, Chief of NYCDEP Division of Water Quality Improvement, noted that that the NYCDEP meets regularly with NYSDEC to avoid this problem. He added that they have included a pre-review in order to have time to bring such changes back to the stakeholder team.

Patricia presented general information about the waterbody. She said that Alley Creek and Little Neck Bay are unique waterbodies within New York City because most of the coastline remains natural, not bulkheaded, and large areas of wetlands have been preserved and/or restored. In addition, there is an officially designated swimming beach on Little Neck Bay. Next, Patricia reviewed the water quality standards for Alley Creek and Little Neck Bay and spoke about testing efforts for dissolved oxygen (DO); total and fecal coliform; and enterococci, which is expected to become the new indicator organism for determining the suitability of water for human contact. She reviewed the primary water quality issues as defined by NYSDEC on their 2004 List of Impaired Waters (303(d) List) : occasional low DO in Alley Creek and pathogens in Little Neck Bay. She explained at all NYC beaches (including Douglas Manor Association (DMA) Beach, that the pathogens are tested by NYC Department of Health and Mental Hygiene and reported as a 30 day moving geometric mean. When asked to identify the source of bacteria, Patricia observed that it has been difficult to determine. Anecdotal evidence suggests that failing septic tanks are the source of the bacteria. However, there is no regular pattern. One stakeholder suggested that geese may be the cause. Another stakeholder asked how frequently the testing took place at the beach. Patricia answered all beaches are tested once a week from May until after Labor Day.

Patricia described the watershed and sewershed, showing the separately sewered areas, combined sewer areas, direct drainage, and CSO overflow sites. Of the five outfalls classified as CSOs that discharge to Alley Creek, three discharge only stormwater and two are CSOs: TI-008 and TI-025, at the site of the new tank. The single CSO outfall to Little Neck Bay (TI-006) discharges only stormwater.

Patricia described the Alley Creek CSO Storage Tank that is under construction. The 5MG of storage volume will significantly reduce the volume of CSO discharged to Alley Creek and reduce the number of CSO events. All flow through the tank will receive a level of treatment from the removal of floatable materials by baffles and some settling of solids. The modeling data suggests that overflows at TI-008 will occur roughly four times a year when the flow-through capacity of the tank is exceeded. The stakeholders said that when the plan was previously presented, it was stated that all CSO volume would be treated in the tank. Patricia explained that the calculations of overflow events was generated by a newer, more accurate model applied in the LTCP; she stressed that almost all annual rain events would be processed in the tank.

Next, Patricia went over the analyses that were used to evaluate the CSO facility plan. She explained how the team used modeling to develop a baseline of information against which they can compare the different alternatives. She said that the baseline water quality was less than 4.0 mg/L of DO at the head of Alley Creek and DO was calculated to be generally greater than 5.0 mg/L in Little Neck Bay.

The Alley Creek CSO Facility Plan (5 MG tank) and other ongoing project, and improvements were added to the baseline. Proposed CSO Control alternatives were then evaluated. Those alternatives included a modification of the dewatering procedure at Alley Creek Tank to initiate pumping of flow to the Tallman Island WPCP as soon as flow enters the tank and installation of bendable weirs at TI-025 and at Chamber 6 to reduce TI-008 CSO. Patricia said that the team looked at alternatives that would remove increments of up to 100% of CSOs, as prescribed by the federal LTCP guidance. These consisted of 15MG, 25MG, and 30MG capacity tanks. Patricia summarized the effect of all of the alternatives, looking to three indicators: the percent of CSO reduction, increased CSO capture against increased storage volume and water quality benefits.

Patricia presented the cost of the different alternatives and stressed that the end goal of the proposal WB/WS plan was to meet water quality standards in a cost-effective plan. She showed graphs of reduction in CSO volume against the total project cost. The data suggests that the combination of a) the construction of the CSO retention tank, b) the catch basin hooding project, underway, and c) the wet weather operation of the tank to maximize CSO capture and treatment are the most cost-effective in reducing the volume and number of CSO events. The plan would improve DO levels, enterococcus, and fecal and total coliform counts by reducing CSO volume by 57% and treating 96% of CSOs. As such, these measures will be put forward as the WB/WS plan. Patricia added that the Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan includes a post-construction monitoring of tank performance and receiving water quality.

A stakeholder asked whether the water quality standards could be upgraded for Little Neck Bay. Stephen answered that the LTCP, pursuant to the 2004 consent order, is charged with meeting the current water quality standards. Separately from the requirements of the consent order, NYSDEC could determine that an upgrade of water quality standards for Little Neck Bay is feasible.

A stakeholder asked why bending weirs had been discarded as an option, since the data indicates that they are cost-effective and would eliminate the projected 4 CSO events per year at TI-008. Patricia said that the bending weirs provided no additional benefit in meeting water quality standards. A stakeholder noted that the bendable weir would improve the overall water quality. Another stakeholder noted that a bendable weir at Chamber 6 to eliminate CSO at TI-008, also the site of the Alley Pond Park Nature Interpretation Center, will reduce the discharge of floatables, which, if a large CSO event coincided with a rising tide, would be scattered upstream into the Alley Creek wetland system. The project team said that these stakeholder comments would be part of the project record, that the team would review the evaluation of the alternatives and that the recommended course of action would be communicated in the distribution of the meeting notes.

The meeting concluded at 9:00 p.m. Meeting notes will be provided to the stakeholder group in three to four weeks after which they will have a window of one month to provide comments.

Update on Action Items

1. The stakeholders recommended that the plan should include a bendable weir at Chamber 6 to eliminate CSO events at TI-008. As noted above, it was stated that the retention tank project, when first presented to the community, claimed to eliminate all CSO events at TI-008; the updated analytic model used in the LTCP indicated that there would be four CSO events per year at TI-008. As a follow-up to the meeting, the project team reviewed the alternatives analysis and determined that the four CSO events per year predicted by the LTCP model was a finding within the margin of error of the model. The project team recommends that the draft Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan be submitted as originally proposed, and that the required post-construction monitoring pay particular attention to the performance of the tank and overflow events at TI-008. If necessary, a bendable weir can be installed as a retrofit to improve actual observed performance.

Long Term Control Plan
Alley Creek/Little Neck Bay Stakeholder Team
Meeting No. 3
October 18th, 2006

The third Alley Creek and Little Neck Bay Stakeholder team meeting of the Long Term Control Plan (LTCP) of the NYC Department of Environmental Protection (NYCDEP) was held on October 18, 2006, at 6:30 p.m. at the Alley Creek NYCDEP Field Office. Stephen Whitehouse, Starr Whitehouse, began the meeting. He explained that there had been changes to the plan presented on July 26, 2006 and that NYCDEP felt that it was important to return to the stakeholders to present the revised Alley Creek and Little Neck Bay Waterbody/Watershed Facility Plan (WB/WS Plan) as it will be submitted to New York State Department of Environmental Conservation (NYSDEC). Stephen reviewed the July 26th meeting notes. He acknowledged the receipt of three letters, two arguing for a bending weir at Chamber 6 to reduce CSO at TI-008 and the other concerning water quality at the bathing beaches.

Pat Kehrberger, HydroQual, briefly reviewed the primary water quality issues, including low dissolved oxygen in Alley Creek and pathogens in Little Neck Bay. She described the watershed/sewershed which is engineered and does not reflect the natural drainage area. Pat said that the WB/WS Plan focuses on the two (out of 6) CSO outfalls that actually discharge CSO: TI-008, the CSO outfall on Alley Creek, and TI-025, a new outfall being created at the Alley Creek Tank.

Pat went on to describe the process of developing a WB/WS Plan. She described how the team used landside and water quality models to develop a baseline condition against which to measure improvement. She noted that Alley Creek and Little Neck Bay meet water quality standards at the baseline. A stakeholder asked how well the computer model reflected real life conditions. Pat responded that the model is calibrated against years of sampling data. Another stakeholder asked where dissolved oxygen samples were taken on the water column. Pat said that they were taken typically top, mid-depth and at the bottom depending on the overall water depth. Water quality model results from the bottom, however, are used for comparison with dissolved oxygen standards since the bottom typically has the lowest dissolved oxygen.

Pat described the Alley Creek CSO Storage Tank which will hold 5 million gallons (MG) of CSO. She said that volumes greater than 5 MG would pass through the tank and overflow at CSO outfall TI-025. If there is a very large storm volume that may exceed the hydraulic capacity of the tank, flow will by-pass over a stationary weir in Chamber 6 (located at the head of the tank) to overflow at TI-008, thus preventing a back up in the sewer system and into basements. She noted that all overflow at TI-025 will have received the equivalent of primary treatment in the tank; the solids will settle out and baffles will remove floatables. This is not the case at TI-008, where CSO overflow will be untreated. Pat noted that all wastewater treatment plants and CSO control facilities (such as tanks) have Wet Weather Operating Plans to maximize operations during storms. She said that, after a storm event, volume in the tank will be pumped to the Tallman Island Water Pollution Control Plant. A stakeholder asked whether the WB/WS Plan looks at problems of flow or problems of treatment. Pat said that the evaluation of CSO control alternatives includes both the capacity of the treatment plant and the sewer system conveyance problems. Treatment plant and sewer system improvements to which NYCDEP is committed are included in the baseline with LTCP CSO control alternatives considered to be additional. A stakeholder asked whether there was a plan for cleaning out the tank. Pat affirmed that the tank is equipped with 10 Hydroself Flushing Gates, 5 at each end of the tank. These gates will be used to flush the tank after each rain event. In addition, data will be collected during post-construction monitoring to ensure the functioning of the tank. A stakeholder asked how the plan would affect the salinity of the water. There may be a change in the microenvironment around the outfall, along with an improvement in pathogen levels.

Pat reviewed the different CSO control alternatives evaluated and their costing, which was presented in detail at the July 26th meeting. Alternatives considered include: the tank at Alley Creek (CSO Facility Plan alternative), called out in the latest CSO Consent Order with construction nearly complete; a modification of the dewatering procedure; bendable weirs at TI-025 and TI-008; and a series of larger holding tanks, which were included in the analysis to capture increments from 85% CSO volume up to 100% CSO volume. A stakeholder asked if there was a linear relationship between the size of a tank and its cost. Pat said that the relationship is not linear, particularly since large tanks have different, and more expensive, engineering implications. Additionally, the LTCP costing team has examined site specific issues that add to cost and included cost data from tanks in NYC already in construction. Another stakeholder asked if there were large tanks in New York. Pat described the Flushing CSO Retention Tank, at 30MG with a holding capacity of 20 MG in the pipeline. It will be online before the end of the year and cost over $300M.

Pat described the changes in the Alley Creek and Little Neck Bay WB/WS Facility Plan since the July 26th stakeholder meeting. The bendable weir at Chamber 6 to minimize CSO from TI-008 is now included in the plan, provided and subject to approval of the NYCDEP Bureau of Water and Sewer Operations (BWSO) and the Bureau of Wastewater Treatment (BWT) and a successful device pilot test. This change is based on stakeholder response. The stakeholders had noted that the weir was a low cost alternative with significant benefits. The early dewatering of the Alley Creek Tank, which begins conveying CSO to the treatment plant during wet weather, has been removed as a WB/WS Plan element. Subsequent to the July 26th Stakeholder meeting, NYCDEP Facility Operations reviewed the plan. The Early Dewatering Alternative was not included in the WB/WS Facility Plan for the following reasons: increase in CSO overflow from the Flushing Creek Tank, impact to the Tallman Island WPCP ability to take in combined sewage from other

CSOs not receiving CSO control as the pumped flow occupies interceptors and lack of reduction in the percent of untreated CSO discharged to Alley Creek and Little Neck Bay. As such, they did not feel that it was appropriate to put early dewatering into an enforceable WB/WS Plan as it is conceivable that they will be unable to comply. Issues of concern to the operators included potential increase in CSOs at the Flushing Tank and lack of interceptor capacity. A stakeholder asked whether early dewatering will be revisited in the plan and when. Pat said it could likely be revisited after the Flushing and Alley Creek Tanks are online, in 2009. This desire is noted and will be brought to the attention of the BWT. This suggested mode of operation will be included in the WB/WS Facility Plan report section on post-construction monitoring as a "scenario for consideration" during the monitoring period. It is a community request through Community Board 11 that the NYCDEP BWT report back to CB11 on their final decision regarding early dewatering of the Alley Creek tank. Another change that will improve the potential for an early dewatering procedure is the planned increase in capacity at the Tallman Island Plant to two times design dry weather flow. At that point, there will be an updated Wet Weather Operating Plan for the Tallman Island Plant and early dewatering of the Alley Creek Tank may be considered. The stakeholders requested that the report state that early dewatering procedures for the Alley Creek Tank is an option that will be considered in post-construction monitoring period. They also requested that the Community Board 11 receive yearly reports during the post-construction monitoring phase so that the stakeholders can follow the performance of the tank and the quantity of CSO from TI-025 and TI-008, if any.

Pat spoke about the addition of the bending weir at Chamber 6. It will be placed on top of the rigid weir being constructed. The bending weir will allow for by-pass of the tank via TI-008 outflow if the volume level is excessive and risks damaging the equipment and backing up sewage. The bending weir will eliminate TI-008 outflows in design year conditions but Pat stressed that there may be CSO discharged at TI-008 during particularly heavy storms or during unusual patterns of storms. In addition, stormwater (not CSO) that enters the TI-008 outfall pipe downstream of Chamber 6 will continue to be discharged at TI-008. She reminded all that the construction of the bending weir is subject to the approval of the NYCDEP BWSO and BWT and a successful device pilot test by BWT, who will consider engineering "operation and maintenance issues." The internal NYCDEP plan approval process (by BWSO) will involve a pilot project by BWT to test the bending weir technology, as New York City has not yet used bending weirs. Bending weirs are used in other cities, however, and are under consideration in draft WB/WS Plans for other LTCP waterbody assessment areas.

Pat reviewed the elements that will be included in the WB/WS Facility Plan: the retention tank, the bending weir at Chamber 6 (subject to the conditions stated above), the wet weather operations of the tank, post-construction monitoring, and continuation of programmatic controls. She then presented the water quality effects of the new plan. She said that, in LTCP design year conditions, 100% of CSO will receive primary treatment, CSOs at TI-025 will increase from the previous draft WB/WS Plan but will all be treated, and CSO from TI-008 will be eliminated during design year conditions. She said that there were no changes in water quality improvements from the initial plan, as the change in volume was small in the overall watershed. Pat then showed the water quality improvements for different plans. A stakeholder asked for more information about Bending Weir Alternative #3, which includes a weir at TI-025 as well as TI-008. Pat said that the addition of the weir at TI-025 resulted in little water quality improvements, particularly as the outflow will have received primary treatment. A stakeholder asked for the WB/WS Plan report to state that the additional bending weir at TI-025 would provide negligible water quality improvements against high costs and, on that basis, was not included in the plan. He argued that stating that there are no water quality improvements stemming from the implementation of the TI-025 bending weir was erroneous. Pat said that the report shows the performance benefit of the TI-025 bending weir (reduced CSO volume discharged, reduced CSO events, etc.). The report also states that the bending weir at TI-025 will not impact compliance with water quality standards.

A stakeholder stated that he is pleased with the plan, particularly as most of the outflow will receive primary treatment. Pat then reviewed the cost-benefit analysis, looking at the relationship of cost to parameters such as CSO volume, dissolved oxygen (DO) levels, enterococcus reduction at the DMA Beach and Little Neck Bay, total coliform reduction, and fecal coliform reduction. The presence of DMA Beach gives Little Neck Bay "sensitive area" designation according to federal CSO Policy. Acknowledging the comments of a stakeholder, received after the last meeting, she said it is important to look at the impact of the water quality improvements on the beaches. Pat suggested that the current standing wet weather advisories against swimming after a rainfall may change with the implementation of the LTCP plan. She said that the post-construction monitoring will not include the DMA Beach but that the NYC Department of Health and Mental Hygiene (NYCDOHMH) monitors the beaches for pathogens. The stakeholders requested that, during the post-construction monitoring phase, NYCDEP coordinate with the NYCDOHMH to receive their data for inclusion in the annual Alley Creek report to NYSDEC.

Going forward, the Alley Creek and Little Neck Bay WB/WS Plan report will be submitted to NYSDEC as a draft plan. After NYSDEC comments on, and/or determines the report is approvable, the final report will be available to the public (after NYCDEP has incorporated NYSDEC comments on the draft). The stakeholders requested that the Community Board be notified by NYSDEC when the report is available and be sent copies in paper and electronic form. They asked for the time schedule for the approval of the bending weir at Chamber 6. Pat said that the NYCDEP approval process has been initiated. It should be noted that the Bureau of Engineering Design and Construction (BEDC) LTCP Design Team will report back to CB11 by no later than September 2007 with the Plan report status and a draft schedule of the plan approval timeline and bending weir pilot testing timeline.

One stakeholder expressed concern that the Health Department's testing for pathogens at Douglas Manor Association Beach occurs at low tide and on the wharf side, which are not swimmable conditions. NYCDOHMH sampling protocols are outside of NYCDEP responsibility. The stakeholder also felt it important to locate a rain collection device on the roof of Alley Pond Environmental Center (APEC) to measure localized rainfall. The group agreed that it was a good idea and would provide valuable data.

Meeting minutes will be available in three to four weeks. Stakeholders will be notified by e-mail. The Alley Creek and Little Neck Bay WB/WS Facility Plan report will be submitted to NYSDEC by the end of October 2006 and that the LTCP report would be prepared for NYSDEC six months after the approval of the WB/WS Plan.

APPENDIX F

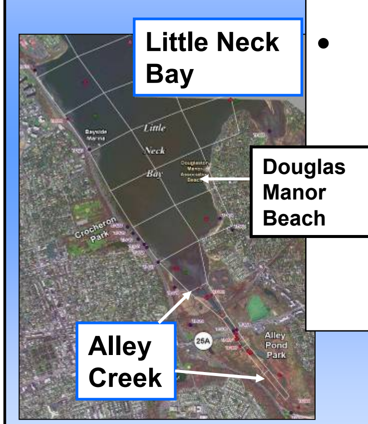
NYCDEP AND NYSDEC PRESENTATION SLIDES – MAY 21, 2008 ALLEY CREEK AND LITTLE NECK BAY WB/WS FACILITY PLAN MEETING

RESPONSIVENESS SUMMARY TO QUESTIONS AND COMMENTS ON THE ALLEY CREEK AND LITTLE NECK BAY WB/WS FACILITY PLAN

New York City Department of Environmental Protection
Alley Creek and Little Neck Bay
Waterbody/Watershed Facility Plan

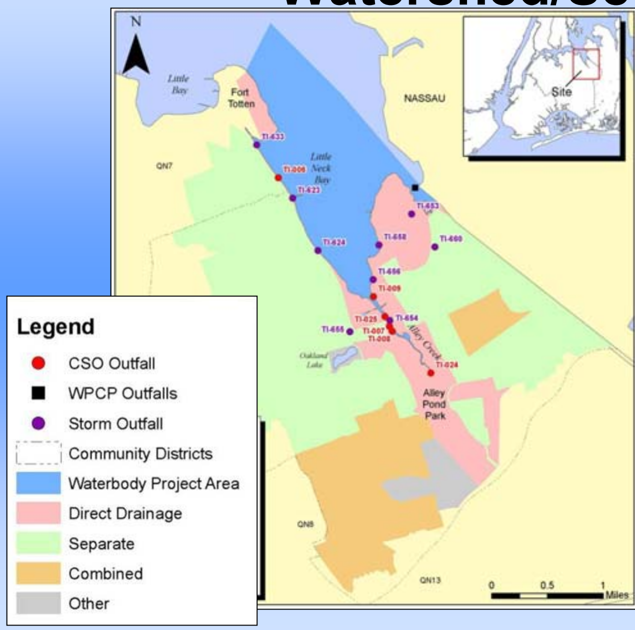
Keith Mahoney, P.E.
Chief, Process Evaluations and Design
May 21, 2008

Waterbody Introduction



- Tributary to the East River / Long Island Sound
- Little Neck Bay - Class SB Bathing Beach on Little Neck Bay
- Alley Creek – Class I
- Alley Creek Headwaters are in Alley Pond Park

Watershed/Sewershed



- Separately Sewered
- CSO Areas
- Direct Drainage
- Other (Parks etc.)
- CSO Outfalls and Stormwater Outfalls

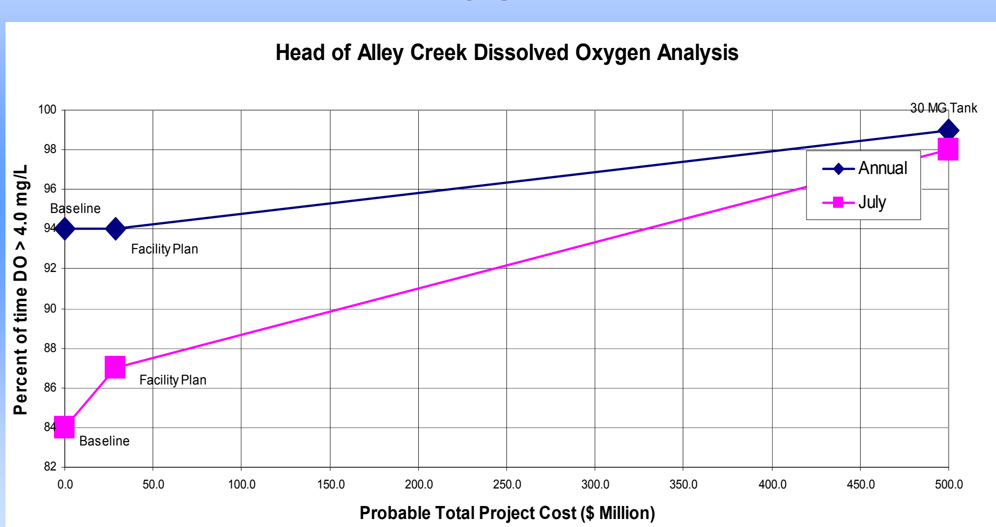
Baseline Water Quality

- Dissolved Oxygen
  - Alley Creek, some values less than 4.0 mg/L
  - Little Neck Bay, essentially all values greater than 5.0 mg/L
- Pathogens
  - DMA Beach – Class SB Standards Met
  - Little Neck Bay – Class SB Standards Met
  - Alley Creek – Class I Standards are Met

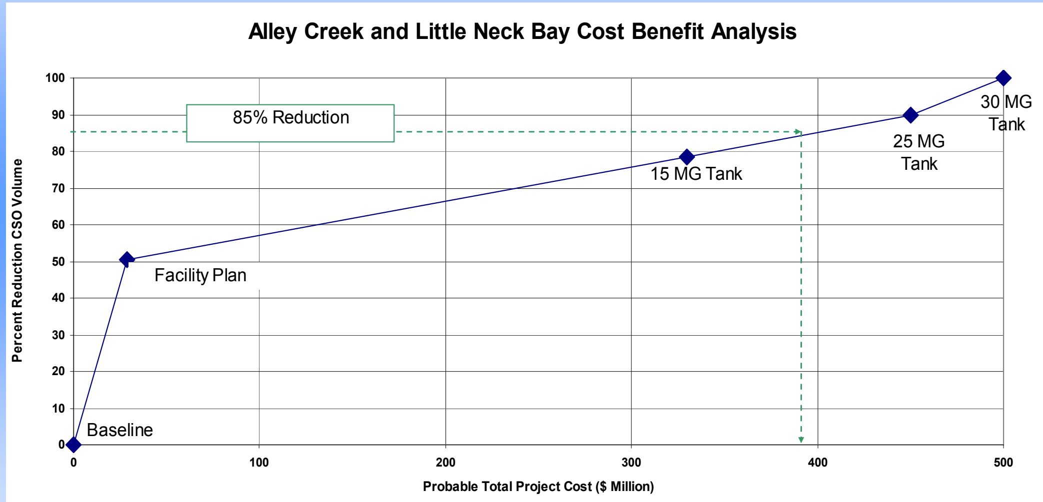
CSO Control Alternatives Evaluated

- Alley Creek Tank Dewatering Procedure
- Use of Bendable Weirs
  - At TI-025
  - At Chamber 6 to Reduce TI-008 CSO
- CSO Storage Tanks
  - 5 MG
  - 15 MG & 25 MG
  - 30 MG, Required for 100% CSO Reduction

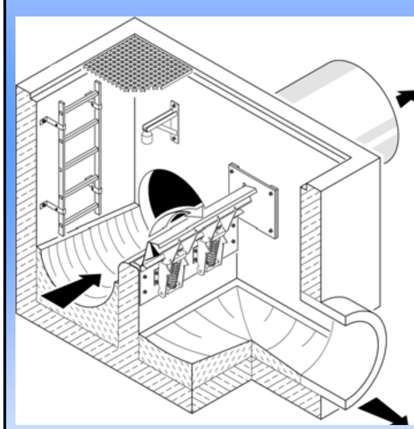
Dissolved Oxygen Compliance



CSO Alternatives Evaluation



Bending Weir



Evaluation

Based on stakeholders' input:

- As-Built Drawings reviewed to determine beneficial use of bending weir
- Hydraulic calculations performed

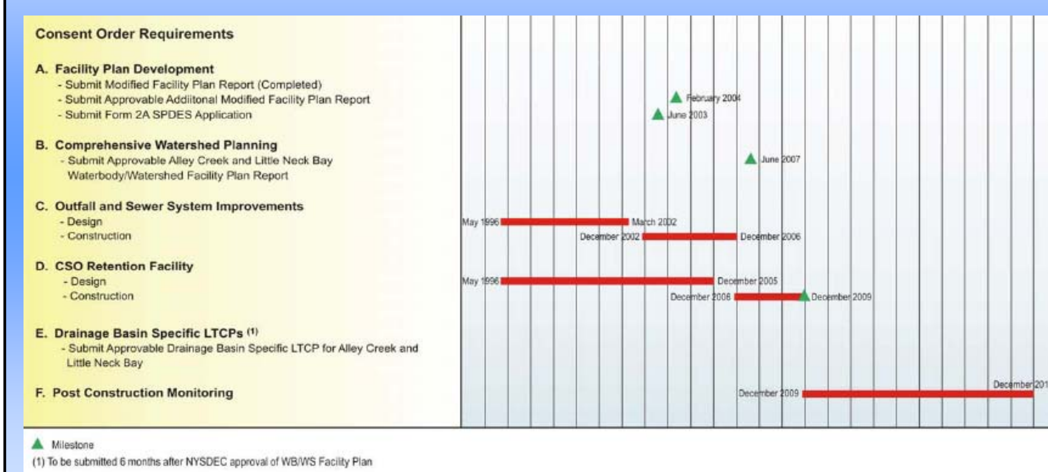
Status

- **Pending discussions with NYSDEC**
- **Bending weir will be investigated at other possible locations in NYC**

Alley Creek and Little Neck Bay WB/WS Facility Plan

- Alley Creek CSO Retention Tank, TI-025
- Wet Weather Operation of Tank to Maximize CSO Capture and Treatment
- Bending Weir (Still under evaluation)
- Post Construction Monitoring
  - Tank Performance
  - Alley Creek – 2 Stations
  - Little Neck Bay – 1 Station
- Continuation of Programmatic Controls

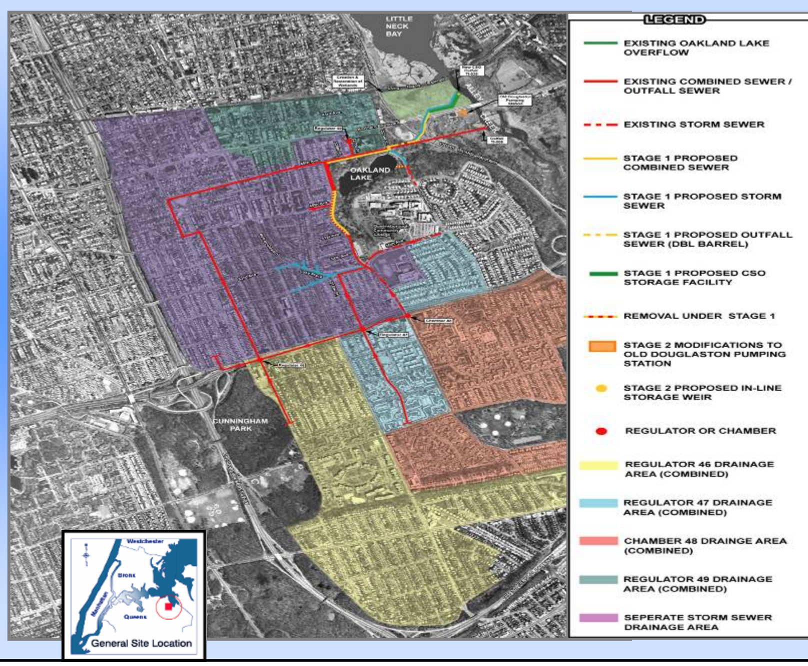
Alley Creek WB/WS Facility Plan Schedule



Alley Creek WB/WS Schedule

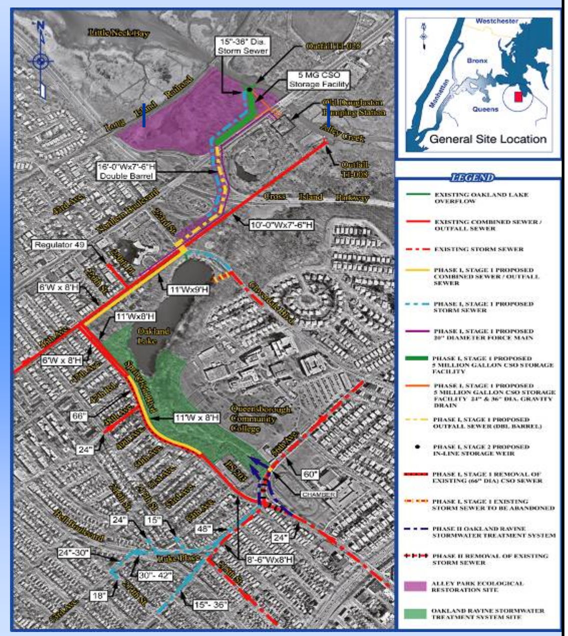
Consent Order Requirements	Milestone Date	
A. Facility Plan Development		
1. Submit Modified Facility Plan Report	Completed	*(Milestone Met)*
2. Submit Approvable Additional Modified Facility Plan Report	February 2004	*(Milestone Met)*
3. Submit Form 2A SPDES Application	June 2003	*(Milestone Met)*
B. Comprehensive Watershed Planning		
1. Submit Approvable Alley Creek WB/WS Facility Plan Report	June 2007	*(Milestone Met)*
2. Submit Approvable East River WB/WS Facility Plan Report	June 2007	*(Milestone Met)*
C. Outfall and Sewer System Improvements		
1. Initiate Final Design	May 1996	*(Milestone Met)*
2. Final Design Completion Including CPM Analysis	March 2002	*(Milestone Met)*
3. Notice to Proceed to Construction	December 2002	*(Milestone Met)*
4. Construction Completion	December 2006	*(Milestone Met)*
D. CSO Retention Facility		
1. Initiate Final Design	May 1996	*(Milestone Met)*
2. Final Design Completion Including CPM Analysis	December 2005	*(Milestone Met)*
3. Notice to Proceed to Construction	December 2006	*(Milestone Met)*
4. Construction Completion	December 2009	*Future Milestone*
E. Drainage Basin Specific LTCPs		
1. Submit Approvable Drainage Basin Specific LTCP for Alley Creek	6 months after approval of B.1.	*Future Milestone*
2. Submit Approvable Drainage Basin Specific LTCP for East River	6 months after approval of B.1.	*Future Milestone*

Overview of the Alley Creek



Scope of Work for Stage 1

- Upstream Improvements
  - Storm Sewers
  - Combined Sewers
  - New Outfall Sewer
- CSO Retention Facility Structure
- Other Improvements
  - New 20" Dia. Force Main
  - New Storm Drainage System for Cross Island Parkway



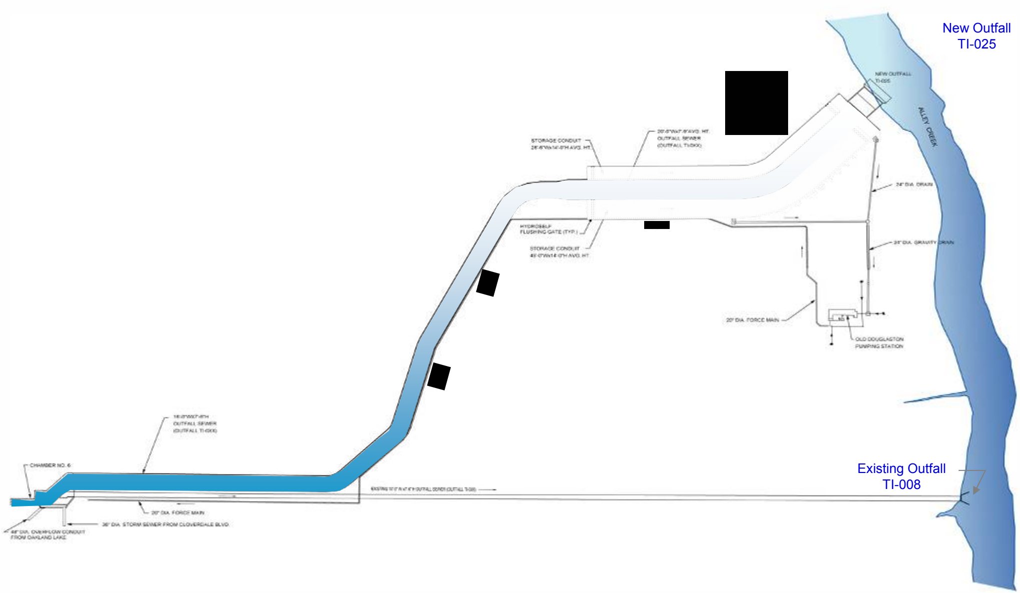
LOOKING WEST AT PROJECT SITE BEYOND CHAMBER NO. 11

20'- 0"W x 7'- 6" OUTFALL SEWER

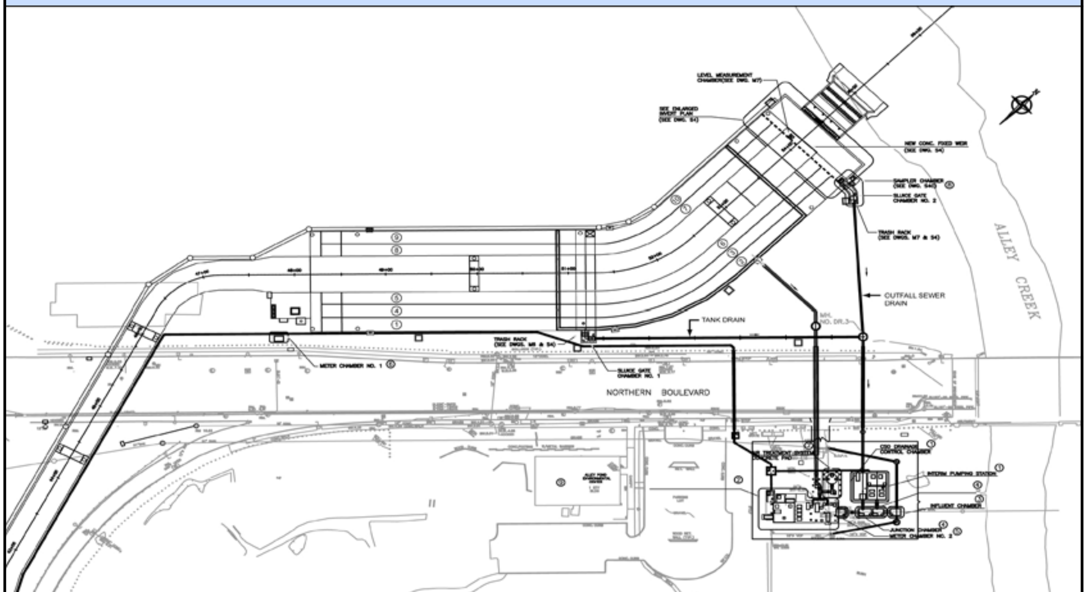
DOUBLE BARREL 20'- 0"W x 7'- 6"

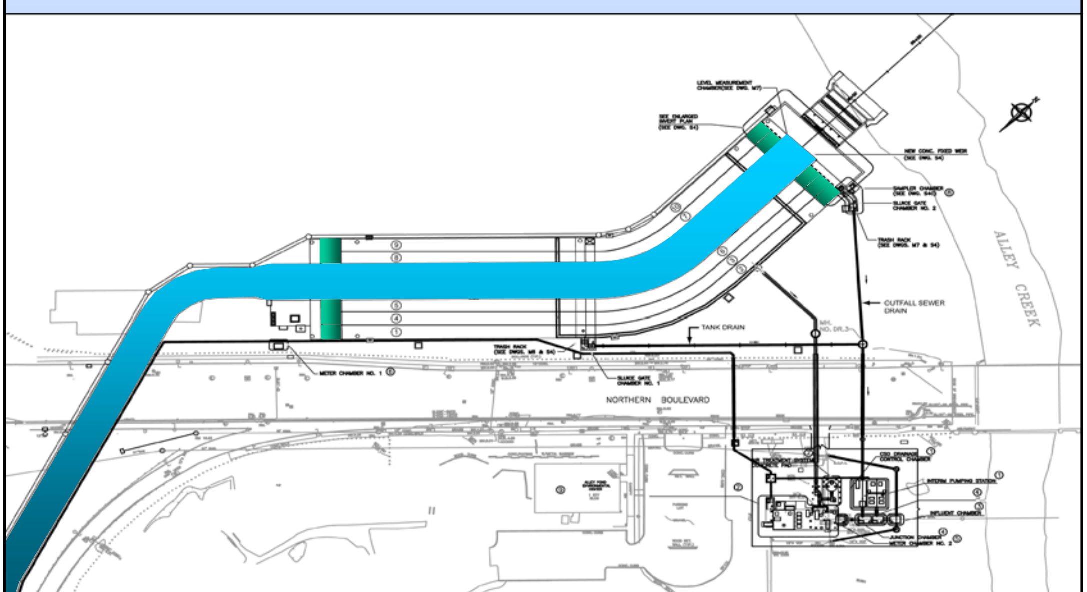
OLD DOUGLASTON PUMPING STATION MODIFICATIONS (STAGE 2)

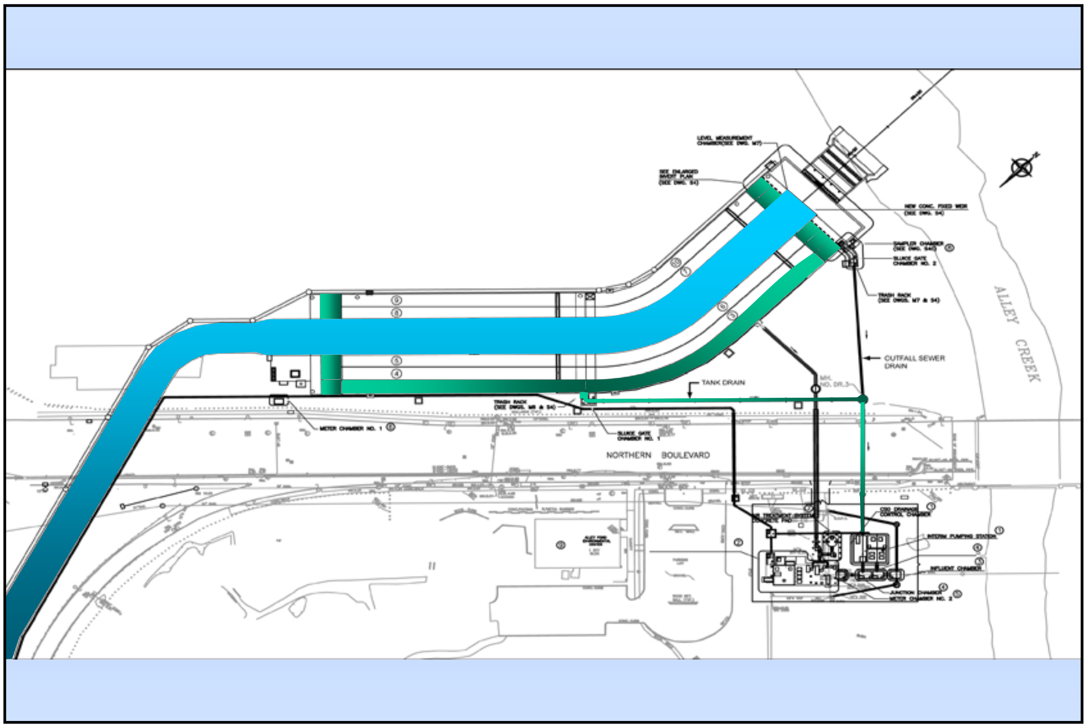
ALLEY CREEK CSO ABATEMENT FACILITY – PHASE I, STAGE 2

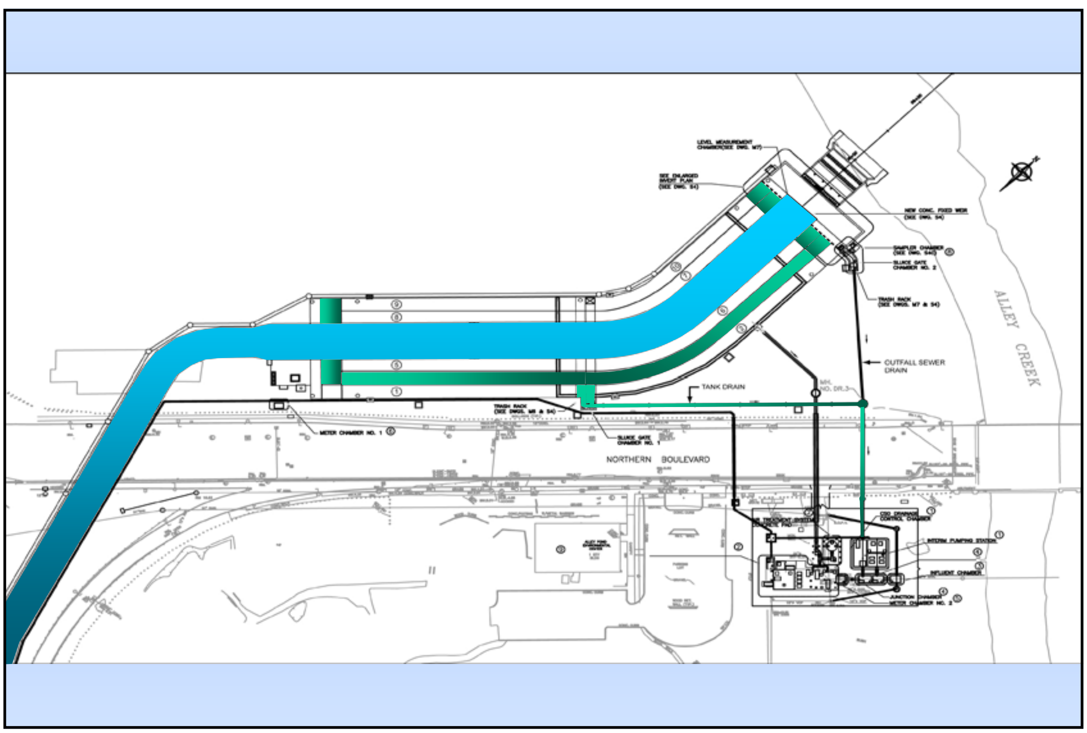


DRAINING CYCLE FOR CSO RETENTION FACILITY






ALLEY CREEK
OUTFALL SEWER
DRAIN
TANK DRAIN
NORTHERN BOULEVARD


ALLEY CREEK
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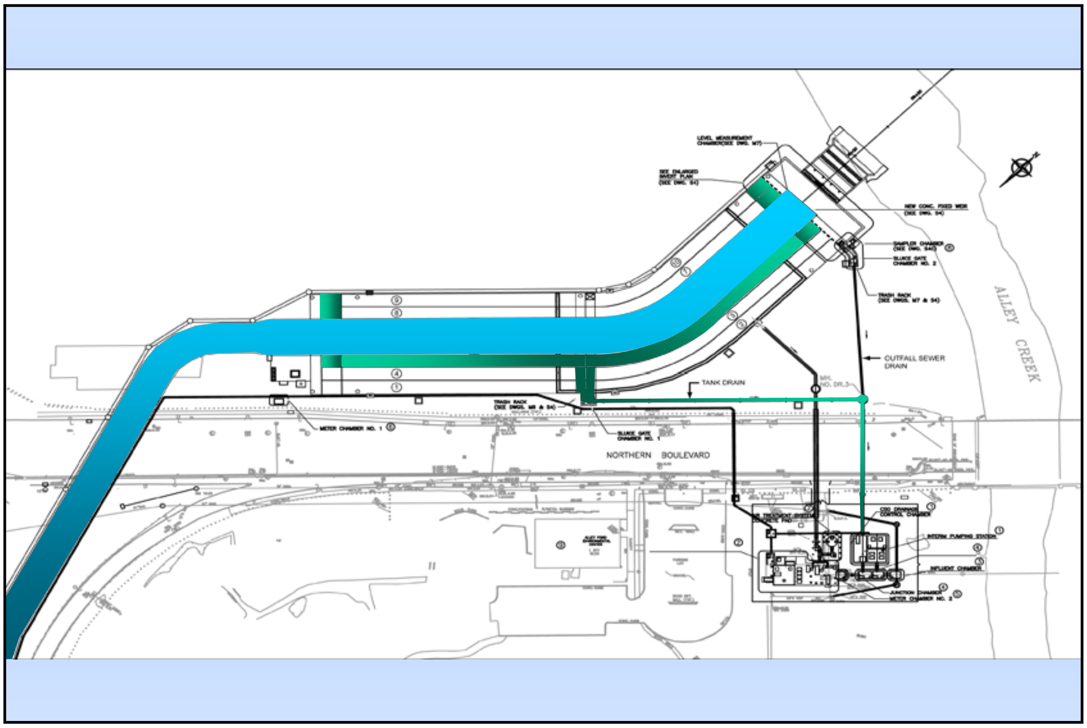
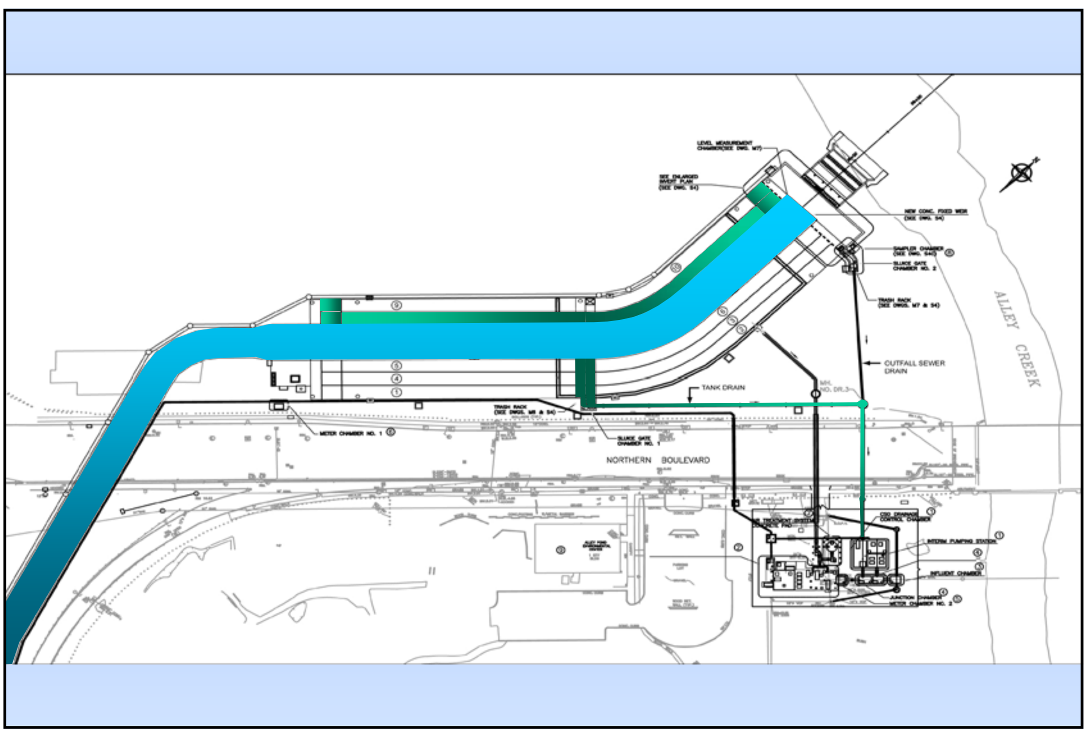

LEVEL MEASUREMENT CHAMBER(SEE DWG. M7)
NEW CONC. FIXED WEIR (SEE DWG. S4)
SLUICE GATE CHAMBER NO. 2
TRASH RACK (SEE DWGS. M7 & S4)
ALLEY CREEK
CUTFALL SEWER DRAIN
TANK DRAIN
MH. NO. DR.3
SLUICE GATE CHAMBER NO. 1
NORTHERN BOULEVARD
INTERIM PUMPING STATION
INFLUENT CHAMBER
JUNCTION CHAMBER
METER CHAMBER NO. 2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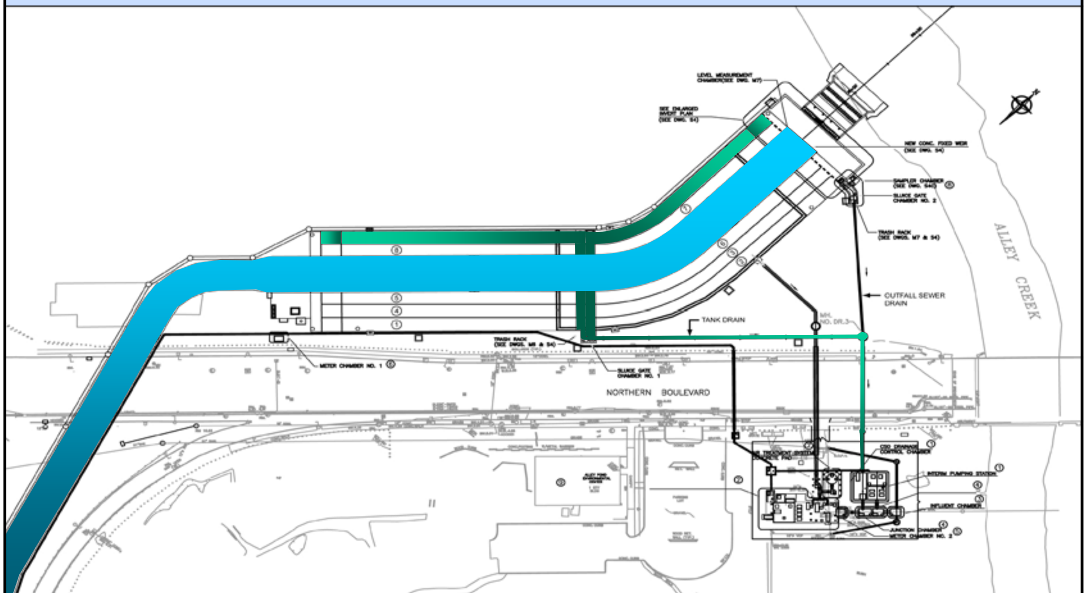
ALLEY CREEK
CUTFALL SEWER DRAIN
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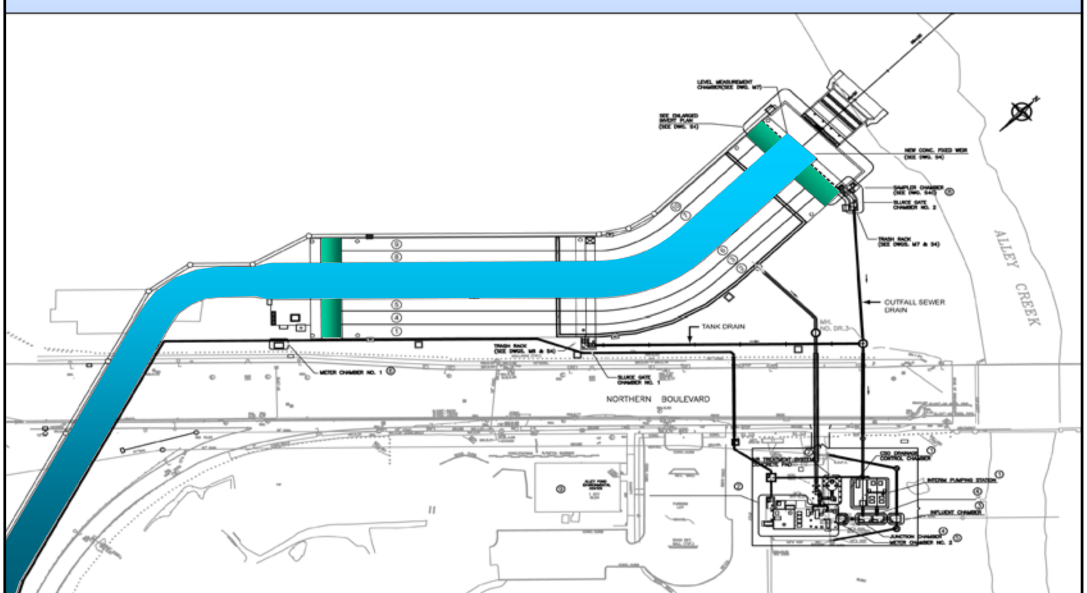
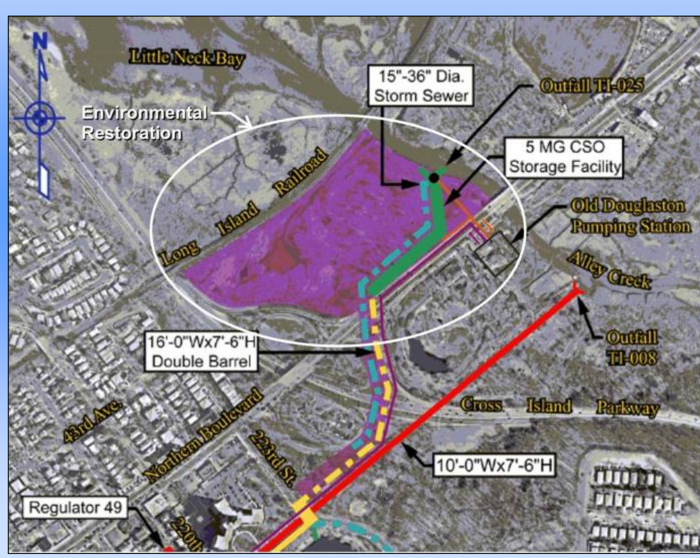

ALLEY CREEK
CUTFALL SEWER DRAIN
TANK DRAIN
NORTHERN BOULEVARD

Ongoing DEP Projects

Alley Park Environmental Restoration



- 23 Acres
- Wetland restoration
- North of Northern Blvd.

Environmental Restoration

FINAL GRADING PLAN

Ongoing DEP Projects

Bluebelt Improvements at Oakland Lake

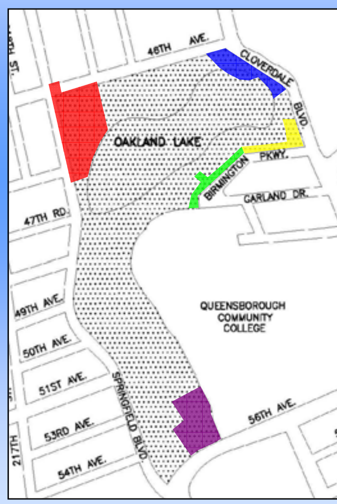
Site No. 1

Site No. 2

Site No. 3

Site No. 4

Site No. 5



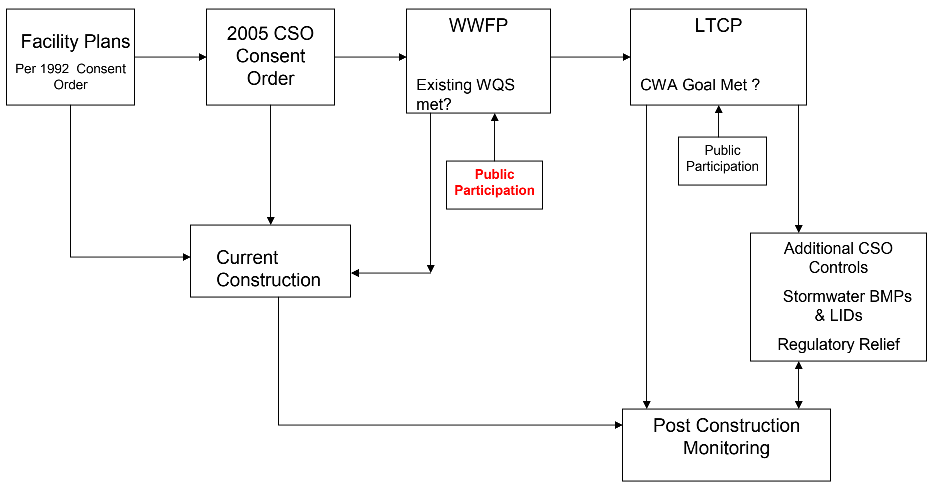
Key Components

- Restoration of area around outlet structure
- Landscaping Improvements and Beautification
- Restoration of erosion gullies
- Retrofitting catch basins
- Replacement of curb, fence, and pathway
- Restoration of swale
- Construction of rain garden

Next Steps for NYCDEP

- Continue Implementation of Alley Creek CSO Facility Plan Elements
- Prepare LTCP Report for NYSDEC and Submit 6 Months after Approval of WB/WS Facility Plan
- Implement Post-Construction Monitoring
- Combine Individual LTCPs into a Comprehensive NYC LTCP

CSO Long Term Control Plan Process



Waterbody/Watershed Facility Plan (WWFP) Current Document Review

- Identify and Evaluate
  - Cost effective CSO controls to meet or exceed current WQS
  - 100% CSO abatement
  - The highest reasonably attainable uses of the water body
  - Acts as a foundation for future long term control planning
- Public Participation
  - Draft Alley Creek and Little Neck Bay WWFP provided to the public after DEC's initial review
  - Public information meeting held by DEC/DEP – 5/21/08
  - 30 day public comment period closes 6/20/08 with published responsiveness summary to follow

Long Term Control Plan

- Evaluation of anticipated WQ (post-WWFP implementation) vs. CWA Goals - The "Gap"
- Identification of cost-effective alternatives and feasibility analysis of additional CSO abatement to meet CWA Goals
- Inclusion of Stormwater BMPs and LIDs
- Looking for
  - Incremental WQ improvements over time (20-30 years)
  - Ways to bridge the "Gap"
    - 9 Minimum Controls
    - Source Control – Stormwater BMPs & LIDs
    - Additional cost-effective CSO reduction
    - Variance – allows operation to verify effectiveness through post construction monitoring
    - Use Attainability Analysis (UAA)

Long Term Control Plan

- Public Participation
  - Draft Alley Creek and Little Neck Bay LTCP provided to the public after DEC's initial review
  - Public information meeting will be held by DEC/DEP
  - 30 day public comment period with responsiveness summary
- 5-Year review cycle to correspond with SPDES Renewal
- Alley Creek and Little Neck Bay LTCP due 6 months after DEC approval of WWFP – anticipated early 2009
- City-Wide LTCP – compilation of all 12 LTCPs – due 12/31/2017

Post Construction Monitoring

- Data to be used in re-evaluation of the LTCP every 5 years upon SPDES permit renewal
  - May identify additional CSO controls
  - Evaluation and implementation of BMPs & LIDs as appropriate
  - LTCPs are "living documents"

Alley Creek and Little Neck Bay WWFP

- DEC and EPA support core components
- Implementation will be a major step in incremental WQ improvement:
  - Alley Creek = Class I Standards
    - DO = 94%; FC = 100%; TC = 100%
  - Little Neck Bay (DMA Beach) = Class SB Standards
    - DO = >99%; Entero = 100%; FC = 100%; TC = 100%
- DEC expects additional incremental improvements through the LTCP process

Contact Information

- Please send questions and comments by June 20, 2008 to:

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New York State Dept. of Environmental Conservation
625 Broadway
Albany, NY 12233-3506
sdmccorm@gw.dec.state.ny.us
Fax: 518-402-9029
Phone: 518-402-8199

11/21/2008

Responsiveness Summary
To Questions and Comments Presented to the
New York State Department of Environmental Conservation and the
New York City Department of Environmental Protection
On the Alley Creek and Little Neck Bay
Waterbody/Watershed Facility Plan

A. QUESTIONS BY ATTENDEES AT PUBLIC MEETING HELD WEDNESDAY, MAY 21, 2008 AT DEP ALLEY CREEK CONSTRUCTION FIELD OFFICE, QUEENS, NY

A.1. QUESTIONS ON GENERAL DEP STANDARD PRACTICE

A.1.a) Does the DEP recirculate storm water in facilities that they are building in and around Alley Creek? What happens to the stormwater around DEP facilities? Is there any capture?

DEP does not have any facilities that recirculate stormwater. However, DEP is currently piloting several stormwater management technologies to test for feasibility, including inflatable dams, pervious pavements, rain barrels, green roofs, and blue roofs. DEP facilities are constructed in accordance with all building code requirements for stormwater management.

A.2. SPECIFIC ALLEY CREEK CSO RETENTION TANK QUESTIONS

A.2.a) In spite of the relatively low cost of installing a bending weir at Chamber 6, and the previous inclusion of this selected alternative in the Alley Creek and Little Neck Bay WB/WS Facility Plan, why hasn't the bending weir alternative been finalized? Would the bending weir or fixed weir eliminate all CSO discharges to TI-008?

A recent hydraulic analysis determined that the bending weir may not be necessary because the existing static weir can be adjusted with stop logs to perform like the proposed bending weir. Both weir alternatives are projected to completely abate CSO overflows to TI-008 during the design year. DEC has determined that the stop logs will provide equivalent flow diversion as the bending weir would and therefore, DEC has directed DEP to install the stop logs. DEP is currently evaluating optimum stop log configurations to optimize CSO reductions.

A.2.b) Is the method of utilizing inline storage being implemented?

There is no inline storage for this project other than the double barrel sewer that is part of the storage tank.

A.2.c) Is there a mechanism for shutting off the air filtration system at the Old Douglaston Pumping Station due to energy consumption concerns?

The system is both a ventilation and odor control system. The odor control system can be turned off if it is found that odors are not an issue. If the odor control system is turned off, the ventilation system will need to be operated for health and safety reasons while personnel are in the facility.

A.2.d) Will there be an on-site crew at the Alley Creek Facilities?

There will be no permanent on-site crew at these facilities. Continuous monitoring of the facility will be via a telemetry system.

A.2.e) What is the schedule to get the Alley Creek CSO Retention Facility online?

Are there any penalties for the DEP or construction companies finishing late?

The milestone date for construction completion is December 2009 pursuant to the 2005 CSO Consent Order for both the pump station and the tank. The DEP is working to meet this milestone but has encountered construction delays due to unanticipated field conditions. DEP has notified DEC about the delays in accordance with the provisions of the Order and is working to mitigate the delays and recover time. There are provisions in the Order that could trigger imposition of penalties for finishing late but the accrual of such penalties, if any, is dependant upon the cause of the delay and DEC's determination of related claims.

A.3. QUESTIONS ON ALLEY CREEK RESTORATION PROJECTS

A.3.a) Under the Alley Park Environmental Restoration Project, how is the DEP going to cover the large CSO retention tanks?

The tanks will be covered with topsoil, grass, wildflowers, etc., except in the immediate vicinity of access manholes, which will not be landscaped and will remain exposed concrete to allow access and other maintenance-related activities.

A.3.b) Will there be public access to the land under the Alley Park Environmental Restoration? Will any restoration be done in the area of TI-008?

Determination of access opportunities to the areas of the Alley Park Environmental Restoration is the responsibility of the NYC Department of Parks and Recreation. In the area of TI-008 the tidal wetlands will be planted with more of the original plant species. In addition, a bird watching platform will be constructed on top of the outfall.

A.3.c) Will there be any masking of the outfall for aesthetic purposes?

No, however scour protection measures have been implemented to prevent scouring of the Creek bed. There are also baffle blocks on the bottom of the outfall that serve to reduce the velocity of the discharge into the Creek as well as planting of native species along the Creek and up to the outfall.

A.4. MISCELLANEOUS QUESTIONS

A.4.a) Does the DEC ever receive or evaluate floatables data that are collected?

DEC receives an Annual Report on CSO Best Management Practices submitted by DEP. Floatables data and floatables control are included as a chapter in the report along with other information required in SPDES permits for the 14 DEP Water Pollution Control Plants. This report is reviewed and commented on by the DEC.

B. QUESTIONS AND COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

B.1. BMPs / LOW-IMPACT DEVELOPMENT / "GREEN" INFRASTRUCTURE

B.1.a) The WB/WS Facility Plan does not adequately include BMPs for source control. It was recommended that the Plan be revised to include a deadline for completing source control modeling efforts and incorporating BMP modeling into the schedule were raised. Analyses of alternatives that increase separate stormwater (e.g. sewer separation) should not assume that the full volume of stormwater will be discharged without the application of any BMPs to reduce pollutant loadings "to the maximum extent practicable". It was suggested that all costs and benefits of BMPs be included in the CSO Alternatives evaluation. The City should begin implementing CSO source control measures immediately into city projects. The lead agency on a project could be required to consult with DEP's Bureau of Environmental Planning and Assessment as part of CEQR/SEQRA documentation.

DEP focused its alternatives analysis on technologies that showed promise in attaining the goals of the study in cost-effective, timely, measurable ways. Stormwater BMPs and other "green solutions" are promising, and their potential benefits extend beyond stormwater management to include habitat restoration, heat island mitigation, and urban aesthetics, but could not be retained as alternatives for inclusion in the WB/WS Facility Plan because of uncertainties related to cost-effectiveness, timeliness, and measurability. DEP is undertaking a number of BMP pilot projects to address these uncertainties with a particular focus on New York City-specific climate and site conditions. The findings of these evaluations will be incorporated into the City's CSO abatement program where possible, cost-effective, and environmentally beneficial. Any solution satisfying these criteria would be included through a future modification when the WB/WS plan is converted to a Drainage Basin Specific Long Term Control Plan or in the subsequent City-Wide Long Term Control Plan or when the Long Term Control Plan is updated every five years as a part of the SPDES permit renewal process.

B.2. QUESTIONS ON WATER-QUALITY STANDARDS

B.2.a) All analyses of primary contact standards should include both the average and enterococci single-sample maximum standards to address short-term "spikes" in pollution levels that can be missed when considering only averages.

The NYSDEC surface water quality standards and classifications were used for evaluation of CSO Control Alternatives. The enterococci single sample maximum is not a *standard but rather a guidance value for use in consideration of further testing and/or beach closures. Similarly, for standards compliance purposes, the calculated fecal coliform and total coliform concentrations were analyzed in a manner consistent with the numerical standard's applicable statistic (mean, geometric mean, monthly maximum, etc.). These statistics were established by EPA based on epidemiological studies that use these statistical measures to account for health impacts of variable pathogen concentrations in natural surface waters. Focusing on the spikes does not indicate compliance with standards and is not appropriate for the planning-level analyses contained in the WB/WS Facility Plan. Though extreme conditions are not explicitly relevant to these standards, frequency, duration and magnitude are accounted for indirectly in the statistical measures. These results are presented graphically in Sections 7 and 8, as well as in Appendix C of the WB/WS Facility Plan.*

The NYSDEC Class I dissolved oxygen standard applicable to Alley Creek is expressed as a "never-less-than" single value so that any one location not meeting that value during any hour of the year represents a contravention of the water-quality standard. In February 2008, NYSDEC adopted acute and chronic dissolved oxygen standards based on a November 2000 USEPA publication in which exposure to low dissolved oxygen over time was used to establish protection limits for different life stages, rather than a single absolute value. For SA, SB, and SC waters, the chronic standard is a minimum daily average of 4.8 mg/L. The standard also states that "the DO may fall below 4.8 mg/L for a limited number of days" but "shall not fall below the acute standard of 3.0 mg/L at any time." The allowable duration of time between 4.8 and 3.0 mg/L depends on the duration and intensity of the low DO condition. This standard is applicable in Little Neck Bay.

B.3. QUESTIONS AND COMMENTS ON FUTURE DEVELOPMENT / POST-CONSTRUCTION MONITORING / CLIMATE CHANGE

B.3.a) Modeling should be based on quantitative assumptions that are consistent with other planning contexts. The WWFPs and LTCPs must account for the likely range of dry weather sewage flows, based on agreed-upon long-term projections of land use and water use, which would be based in turn on long-term socio-economic projections of households, economic activity and carrying capacity.

The projection of dry-weather future sanitary flows considered development in the watershed by using sanitary sewage flow estimates extrapolated to the year 2045. Estimates of 2030 population were developed by the NYC Department of City Planning for each of the 188 neighborhood areas in New York City using practices consistent with U.S. Census Bureau methodology. In consultation with City Planning, DEP further projected neighborhood populations to year 2045 to provide a more suitable and conservative projection point for long-term infrastructure planning. An additional conservative assumption was made that per capita water consumption in 2045 would be the same as it was in 2000, which ignores the substantial and ongoing reductions in water usage resulting from various DEP programs such as metering and low-flow toilets. Thus, the assessment of various engineering alternatives examined under the Alley Creek and Little Neck Bay WB/WS Facility Plan includes the expected impact of future growth and development and an additional margin of safety.

B.3.b) Multiple comments were received questioning the use of the JFK 1988 precipitation year. The analysis should account for the likelihood of increased rainfall and model for a range of rainfall conditions rather than a single year. In addition, other Harbor-wide projects have included other rainfall years.

In accordance with EPA CSO Policy, DEP analyses are based upon long-term average conditions rather than extreme event conditions. DEP analyzed over 50 years of rainfall in the metropolitan area to identify a rainfall record that represents long-term average hydraulic conditions, thus satisfying the EPA requirement. The study of rainfall records has found that, while CSO response to precipitation is complicated, rainfall intensity has a greater influence on CSO than total annual rainfall volume. For example, simulations for another project that used records from 2003, a recent "wet year" (in terms of total annual rainfall), produced less CSO volume than the rainfall pattern selected to evaluate alternatives and project water quality for the WB/WS Facility Plan and LTPCP analyses.

B.3.c) Climate change affects the likely range of water levels in open waters and of storm surge events. WWFP and LTCP plans should be based on long-term projections of the local impacts of climate change, including type, frequency and intensity of extreme events consistent with other related plans.

DEP has begun a study of the potential impacts of climate change and sea-level rise on predicted rainfall patterns, sewer capacity, and wastewater treatment capacity. Sea-level rise and storm surges are expected to reduce CSOs, since higher water levels in the receiving waters tend to hold back the tide gates and maximize the storage of combined sewage within the sewer system. The first part of the study, The NYCDEP Climate Change Program Assessment and Action Plan (May 2008), addressed planning efforts across the Department to integrate potential risks of climate change and greenhouse gas (GHG) emissions management in future in DEP operations and mitigation strategies. The Action Plan is complete and is available on DEP's website at

http://home2.nyc.gov/html/dep/html/news/climate_change_report_05-08.shtml

As part of a request for proposals (RFP) recently released by DEP, DEP will assess whether a different rainfall pattern based on potential future volumes, intensities and return frequencies should be adopted for future analyses of drainage, sewer and wastewater treatment infrastructure. As described above, the selected 1988 rainfall pattern complies with EPA's CSO policy and is suitable for comparing the performance of infrastructure improvements to one another to develop the most cost-effective CSO abatement alternatives. The post construction monitoring plans will provide DEP with additional data to evaluate impacts of climate change and rainfall variability on attaining water quality standards and this will further be addressed via subsequent LTCPs.

B.3.d) The WWFP should be revised to address the CSO Control Policy requirement that, if using the demonstration approach (as the city is here), a municipality must ensure that its plan is "designed to allow cost-effective expansion or cost-effective retrofitting if additional controls are subsequently determined to be necessary to meet water quality standards or designated uses".

The Post-Construction Monitoring Plan data and information will be used to evaluate the success of the Alley Creek Tank. If tank performance and water quality standards attainment are inadequate, the Plan will be modified to achieve water quality goals.

B.4. MISCELLANEOUS QUESTIONS AND COMMENTS

B.4.a) Several comments addressed the methodology of alternative evaluations. One comment suggested that the evaluation should consider existing CSO discharge volumes in addition to the hypothetical "2045 Baseline." There was a question of whether the Plan satisfies EPA's demonstration approach requirement to achieve the "maximum pollution reduction benefits reasonably attainable." Another comment claimed that the conclusion that more CSO reduction would not improve water quality was unsubstantiated. One comment recommended not including any costs for work that would or should have been done anyway.

The hypothetical "Baseline" is established to compare alternatives to one another using conservative assumptions about future conditions. The Baseline condition represents a future typical year without implementing any further controls but with the added pressure of increased population. Each alternative in comparison results in a CSO reduction that can be attributed entirely to that alternative, and its implementation cost can be understood in terms of reduction value to CSO abatement. In contrast, existing CSO discharges can be misleading (see answer to B.3.b). The Alley Creek WB/WS Facility Plan report describes the range of water-quality benefits attainable through CSO control, and assesses the cost-effectiveness of the required controls, yielding a reasonable course of action that is expected to result in attainment of current water quality standards. This is the overarching goal of a waterbody/watershed facility plan. In contrast, the subsequent LTCP will attempt to attain the fishable/swimmable goals of the Clean Water Act, which the Plan currently shows as not reasonably attainable due to the marginal cost benefits of additional controls. This evaluation is consistent with the EPA CSO Control Policy, which allows cost/benefit analysis to be used in the selection of alternatives. Costs were developed based only on elements related to CSO abatement or water quality improvement, and were compared on a net present value basis per standard engineering practice.

Performance of the Alley Creek WB/WS Facility Plan was evaluated using the reduction in the annual number of CSO events and annual discharge volume. The Plan is projected to reduce the number of events by 30%, from 38 to 27. The net CSO reduction for the Alley Creek WB/WS Facility Plan is 50% (from Baseline conditions), from 517 MG/year to 256 MG/year. Of the remaining 256 MG, no CSO will be discharged at TI-008. It will discharge through the tank and out TI-025, thus receiving preliminary treatment. The remainder of the CSO, 261 MG/year, is captured and pumped to the Tallman Island WPCP where it will receive full secondary treatment and disinfection under most conditions.

B.4.b) DEC should require the city to provide a model sensitivity analysis before approving this or other WWFPs, which rely very heavily on modeling to support their analyses. This is particularly important where, as noted in DEC's comments to the city on the Nov. 2006 draft of Alley Creek, DEC has raised questions about the models "parameters and assumptions" in light of conflicting empirical water quality monitoring data. Provide clearer and more detailed analysis of the role of non-CSO sources since NYCDEP asserts

that sources other than CSOs are to blame for a significant portion of the pollution in Alley Creek and Little Neck Bay. Moreover, to the extent that other water pollution sources such as leaking septic systems are at issue, the NYCDEP should detail its plans to abate such pollution.

The Alley Creek water quality modeling analyses, which includes the 100 percent CSO removal scenario, indicates that existing problems at DMA Beach are not CSO-related. The post-construction monitoring program referenced in Section 8 of the WB/WS Plan is necessary to validate the projections and determine the overall attainment with water quality standards once the proposed Plan is fully implemented. The East River Tributaries Model (ERTM) performs calculations at a spatial scale appropriate for CSO and stormwater source evaluations. Calibration of the East River and Open Waters to data in those locations are very consistent. However, the model does not include localized sources such as: recreational boat discharges from local yacht clubs, potential failing septics in the Douglas Manor community and waterfowl, all of which have been identified as potentially significant at the DMA Beach. In addition, the processes for these sources such as pathogen re-growth in beach sand are not well understood.

The WB/WS Facility Plan models project full primary contact use for June, July and August as evaluated for CSO and stormwater impacts. The uncertainty associated with the pathogen concentrations at DMA Beach noted by DEC highlights the importance of the NYCDOHMH beach monitoring program and the need to identify and eliminate localized pathogen sources. Although not in the scope of this WB/WS or LTCP, an ongoing investigation is being coordinated with multiple City Agencies, along with local elected officials to track water pollution sources.

B.4.c) Explain and correct, as needed, apparent discrepancy in Baseline CSO volumes. A table provided by DEP, dated 9/29/04 and attributed to HydroQual, indicates that currently 76 million gallons (MG) of CSO discharge flows annually into Alley Creek. However, the WWFP states that under 2045 "baseline" conditions there would be only 59 million gallons of CSO discharge How is this possible? DEP must explain what modeling assumptions have changed to account for this decrease. The final WWFP should present a modeled projection of CSO volumes (and frequency) under <u>current</u> baseline conditions, not only 2045 baseline conditions.

The landside models of the NYCDEP sewershed/watershed, including the Tallman Island Model, are evolving tools that are being updated and evaluated on a continuing basis. The latest Tallman Island Model output available at the time of the Alley Creek analyses was used. Comparison with older model output is not useful unless there is a significant change or an unexpected model response. The difference in Baseline annual volumes (76 MG vs 59 MG) is typical of ongoing model development and is likely the result of updates and "modeling noise". Further, neither volume cited was intended to represent current or existing conditions: as noted in the answer to B.3.b above, CSO response to precipitation is complicated, and attempts to model current conditions can be extremely misleading.

B.4.d) Table 8-1 explains that the 517 MG of discharge under baseline 2045 conditions actually consists of 59 MG of CSO, which is mixed with 459 MG of stormwater from a separated sewer system drainage area, it does not explain how the projected "with plan" 256 MG of discharge breaks down between CSO and stormwater.

As explained in the WB/WS Report, the 517 MG projected for Baseline includes 59 MG of combined sewage and 459 MG of stormwater. The stormwater enters the discharge pipe for CSO outfall TI- 008 downstream of the regulator, but is nonetheless contributing to the discharge from TI-008. By virtue of the fact that the stormwater is mixed with CSO, the entire 517 MG that discharges from TI-008 is considered to be CSO. Upon implementation of the Alley Creek WB/WS Facility Plan, no CSO will discharge from TI-008 in a typical year, and all CSO will be diverted to the tank. The 256 MG that overflows from the tank receives preliminary treatment before being discharged out of the new CSO outfall TI-025, and the remainder of the 517 MG Baseline CSO is captured and pumped to the Tallman Island WPCP.

B.4.e) The "ERTM" water quality modeling report projects that separate stormwater discharges would decrease in the "100% CSO reduction" scenario. This scenario is stated to reflect complete sewer separation. If the combined sewers were replaced with separate sewers, the stormwater portion of the CSOs would be discharged simply as stormwater, thereby significantly <u>increasing</u> the separate stormwater discharges for this scenario as compared to baseline.

The reduction in stormwater when comparing Baseline to 100% CSO reduction is a result of the Alley Creek Tank. Both the WB/WS Facility Plan and 100 Percent Reduction scenarios include the Tank. However, whereas the WB/WS Facility Plan leaves 18 MG of stormwater discharging from TI-008, the 100 Percent CSO Removal scenario captures all stormwater at TI-008. This is a conservative analysis in that the load removed from the system is more than just CSO.

B.4.f) The Alley Creek WWFP states that Douglas Manor Association ("DMA") beach is a "sensitive area," pursuant to the EPA CSO Control Policy. However, the report does not adequately address the requirements for sensitive areas (a) prohibiting "new or significantly increased overflows" and (b) eliminating or relocating overflows that discharge to these areas, unless this is proven to be physically impossible or economically unachievable. The WWFP does not propose either to "eliminate or relocate" overflows nor does the report demonstrate that this would be "physically impossible or economically unachievable."

The WB/WS Facility Plan identifies the primary contact recreation use at the DMA Beach as a sensitive area, and provides an analysis of protecting it. No "new or significantly increased overflows" will occur. In fact, for the design year condition, the WB/WS Facility Plan is expected to provide a 51% reduction in CSO overflows to the Alley Creek system. Eliminating overflows to these areas was analyzed by examining the 100% CSO Reduction Case, which would require a 30 MG tank to accomplish. This alternative was proven to be both physically impossible (too large to be sited in the Alley Creek vicinity due to the presence of extensive wetlands and lack of available land) and economically unachievable: the estimated cost of $558,000,000 (November 2008 dollars) *was determined to be unreasonable given the lack of any significant water quality improvement at the DMA Beach.*

B.4.g) Questions were raised pertaining to the schedule of compliance with Local Law 5 of 2008, to create the stormwater management plan and to develop a system for notifying the public of the occurrence and location of CSO events and the period of time during which contact with affected waterbodies may pose health risks.

The City Council passed Local Law 5 of 2008 requiring the Mayor's Office of Long-Term Planning and Sustainability to develop a City-wide Sustainable Stormwater Management Plan, the goals of which are to reduce stormwater volume, improve water quality, and enhance the use and enjoyment of the city's waterbodies for recreational activities. A substantial public participation and public education program has obtained public input during the development of the plan. Specific requirements for signage, public notification for location and occurrence of CSOs, and other education activities are also included. The Mayor's Office established the BMP Interagency Task Force to address this directive, and NYCDEP is lending substantial support. NYCDEP is also evaluating regulatory changes that could require BMPs for certain development, and will have a contractor on board in 2009 to construct BMP pilot projects and a New York City specific urban BMP design manual.

NYC's Sustainable Stormwater Management Plan, was released as a Draft Plan on October 1, 2008. The Mayor's Office of Long-Term Planning and Sustainability accepted public comments until October 31. Feedback will be incorporated into the Final Plan, which will be released on December 1. A copy of the October 2008 draft plan can be found at: http://www.nyc.gov/html/planyc2030/downloads/pdf/Draft_Sustainable_Stormwater_Management_Plan_October_2008.pdf