NYC Environmental Protection

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July 31, 2018

Joseph DiMura, P.E.
Director, Bureau of Water Compliance
New York State Department of Environmental Conservation
625 Broadway, 4th Floor
Albany, New York 12233-3506

Re: CSO Order on Consent (DEC Case No.CO2-20150529-1)

Appendix B, VIII. Newtown Creek CSO, A. Submit Approvable Drainage Basin Specific LTCP for Newtown Creek

Dear Mr. DiMura:

In accordance with Paragraph VIII.M. of the above referenced CSO Order, the New York City Department of Environmental Protection (DEP) submitted to the New York State Department of Environmental Conservation (DEC) the Newtown Creek Long Term Control Plan (LTCP) on June 30, 2017.

DEP received DEC's review comments on the LTCP on November 9, 2017. DEP's responses were sent January 8, 2018, and DEP provided a Technical Memorandum providing additional information on April 30, 2018. DEC approved the Newtown Creek LTCP on June 27, 2018, with the changes to the LTCP outlined in DEP's January 8, 2018 response letter and April 30, 2018 Technical Memorandum.

In discussions held with DEC subsequent to the June 27, 2018 approval letter, it was agreed that the additional information developed in response to DEC's comments on the June 30, 2017 LTCP would be incorporated into the LTCP through a Supplemental Documentation, which is attached hereto and shall be considered Attachment D to the June 30, 2017 Newtown Creek LTCP.

Please feel free to contact me at (718) 595-5972 should you have any questions regarding this submittal.

Sincerely,

Keith Mahoney

Keith Mahoney, P.E.
Acting LTCP Program Manager

Copy to:

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LTCP2: D. Walker, A. Boulet, P. Young

Environmental Protection

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

Combined Sewer Overflow Long Term Control Plan for Newtown Creek

Appendix D: Supplemental Documentation
July 2018

Keith Mahoney, P.E.
NY License No. 074169

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

Prepared by: AECOM USA, Inc.

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INTRODUCTION

On June 30, 2017, the New York City Department of Environmental Protection (DEP) submitted the Newtown Creek Long Term Control Plan (LTCP) to the New York State Department of Environmental Conservation (DEC). DEP received DEC's review comments on the LTCP on November 9, 2017. DEP and DEC technical staff discussed technical comments on December 19, 2017. DEP's responses were sent January 8, 2018, however, some of the comments required additional evaluation and technical analysis. DEP provided the requested information in a Technical Memorandum on April 30, 2018. DEC approved the Newtown Creek LTCP on June 27, 2018, with the changes to the LTCP outlined in DEP's January 8, 2018 response letter and April 30, 2018 Technical Memorandum. The DEC's June 27, 2018 approval letter further clarified that with regard to additional floatables control at outfalls BB-009 and NCQ-029, DEP shall submit an approvable floatables monitoring plan for these two outfalls as well as for floatables post-construction monitoring for CSO outfalls BB-026, NCQ-077, NCB-083 and NCB-015, by August 31, 2018. Based on the outcome of the floatables monitoring, DEC will determine if additional floatables control is justified at outfalls BB-009 and NCQ-029.

In discussions held with DEC subsequent to the June 27, 2018 approval letter, it was agreed that the additional information developed in response to DEC's comments on the June 30, 2017 LTCP would be incorporated into the LTCP through this Supplemental Documentation.

The information presented below is organized by LTCP section. All changes are highlighted in yellow. Deleted text is marked by strike-outs, and new text is underlined. DEP's January 8, 2018 response to DEC's November 9, 2017 comment letter on the Newtown Creek LTCP is included as Attachment 1. Attachment 2 provides responsiveness summaries to public comments received prior to and following the June 30, 2017 submittal of the LTCP to DEC.

EXECUTIVE SUMMARY EDITS

The following edits are hereby incorporated into the Executive Summary of the Newtown Creek LTCP:

Section 1 (Page ES-4)

On March 20, 2017, the City submitted extensive comments to EPA on the Draft RI Report. ~~The City concurs with comments from DEC, dated March 16, 2017, and from EPA, dated May 9, 2017, in which each stated that "[b]iological data from reference areas with CSO point source discharges indicate risk from CERCLA [chemicals of potential concern (COPCs)] as evaluated from these data could be significantly decreased to background (reference area) levels even with continuing CSO discharge during storm events." (EPA Comments at ES-3, Specific Comment 9; DEC Comments at 4, Specific Comment 1.g).~~

Section 1 (Page ES-5)

Table ES-2 is deleted, and replaced in its entirety by the following Table ES-2.

Table ES-2. 2008 Baseline CSO Volume and Overflows per Year – Newtown Creek CSOs

Waterbody/WWTP System	CSO	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)
Dutch Kills/BBL(1)	BB-004	0.1	1
	BB-009	43.0	34
Newtown Creek/BBL	BB-010	0.5	7
	BB-011	1.6	14
	BB-012	0.1	1
	BB-013	16.2	31
	BB-014	1.8	18
	BB-015	0.7	13
Dutch Kills/BBL	BB-026(3)	120	37
	BB-040	1.1	16
Newtown Creek/BBL	BB-042	1.5	22
	BB-043	9.4	32
English Kills/NCWWTP(2)	NCB-015(3)	321	31
Newtown Creek/NCWWTP	NCB-019	3.0	21
	NCB-021	0.0	0
	NCB-022	7.5	29
	NCB-023	0.5	8
	NCQ-029	18.7	40
Maspeth Creek/NCWWTP	NCQ-077(3)	300	41
Newtown Creek/NCWWTP	NCB-083(3)	314	42
	NCB-002(4)	N/A	N/A
Total		1,161	42 (max)

Notes:

(1) BBL = Bowery Bay Low Level Interceptor, to Bowery Bay WWTP
(2) NCWWTP = Newtown Creek WWTP system
(3) NCB-015 + NCB-083 + NCQ-077 + BB-026 = 91% of Total Annual Volume.
(4) NCB-002 is the Newtown Creek WWTP high relief outfall that discharges to Whale Creek Canal. This flow is treated before discharge.

Section 2 (Page ES-27)

The selection of the preferred alternative is based on multiple considerations including public input, environmental and water quality benefits, and costs. A traditional knee-of-the-curve (KOTC) analysis is presented in Section 8.5 of the LTCP. As described above, based on that analysis, a ~~24~~ 26 MGD expansion to the BAPS was identified as the most cost-effective alternative for reducing the frequency and volume of CSOs from Outfall BB-026 to Dutch Kills.

Section 2 (Page ES-30)

The implementation of the preferred alternative, which would include the storage tunnel for Outfalls NC-015, NC-083 and NC-077, plus the expansion of the BAPS to 26 MGD, has an estimated NPW ranging from $703M to $730M. This estimate reflects $5.0M of annual O&M over the course of 20 years, and an

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unescalated PBC ranging from $570M to $597M, depending on the final route to be determined in subsequent planning and design stages. Costs escalated to the assumed midpoint of construction would range from $1,275M to $1,335M. Note that these costs do not include costs for land acquisition, design and construction management.

As a supplemental evaluation, the feasibility of providing floatables control via underflow baffles at outfalls BB-009, BB-013, and NCQ-029 was assessed. This evaluation did not affect the cost, performance, or WQS attainment of the preferred alternative described above. The supplemental floatables control evaluation determined that modifications to the regulator structures associated with each of the three outfalls would be required in order to maintain hydraulic neutrality with the underflow baffles in place. At BB-009 and BB-013, raising and lengthening the static weir would be required, while at NCQ-029, lengthening the weir and providing a bending weir would be required. Based on a preliminary siting assessment, the modifications at BB-009 appear to be feasible, but siting limitations would make the regulator modifications needed at BB-013 infeasible. For NCQ-029, more detailed information on existing utilities in the vicinity of the regulator structure is required in order to confirm the feasibility of the required regulator modifications. The NPW of providing underflow baffles at BB-009 and NCQ-029 (if feasible) was estimated at $25.5M. This estimate reflects $36,400 of annual O&M cost over the course of 20 years, and an unescalated PBC of $25.0M.

Section 3 (Page ES-32)

Summary of Recommend Plan

Water quality for bacteria and dissolved oxygen in Newtown Creek is projected to be improved through the implementation of the following: (1) currently planned improvements including those recommended in the 2011 WWFP; (2) planned GI projects: and (3) the implementation of this recommended Newtown Creek LTCP alternative which calls for the design, construction, and operation of an expansion of the BAPS to 26 MGD to provide 75 percent control of the annual CSO volume at Outfall BB-026, and a CSO Storage Tunnel that will be sized to provide 62.5 percent control of Outfalls NC-015, NC-083 and NC-077. The final dimensions and route for the storage tunnel will be further evaluated and finalized during subsequent planning and design stages. A floatables monitoring program will be implemented to assess the need for providing floatables control at outfall BB-009 and potentially at outfall NCQ-029, if feasible. If the monitoring program supports the need for floatables control at those two outfalls, the feasibility of an underflow baffle and bending weir for floatables control at outfall NCQ-029 would need to be confirmed in design. The Dutch Kills aeration system could also be eliminated based on the baseline attainment of the Class SD DO criterion. These identified actions have been balanced with input from the public and awareness of the cost to rate payers.

SECTION 1 EDITS

The following edits are hereby incorporated into Section 1 of the Newtown Creek LTCP:

Section 1.2 (Page 1-4)

On March 20, 2017, the City submitted extensive comments to EPA on the Draft RI Report. ~~The City concurs with comments from DEC, dated March 16, 2017, and from EPA, dated May 9, 2017, in which each stated that "[biological data from reference areas with CSO point source discharges indicate risk from CERCLA [chemicals of potential concern (COPCs)] as evaluated from these data could be significantly decreased to background (reference area) levels even with continuing CSO discharge during storm events." (EPA Comments at ES-3, Specific Comment 9; DEC Comments at 4, Specific Comment 1.g).~~

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SECTION 2 EDITS

The following edits are hereby incorporated into Section 2 of the Newtown Creek LTCP:

Section 2.1.b (Page 2-16)

Figure 2-8 is deleted, and replaced in its entirety by the following Figure 2-8.

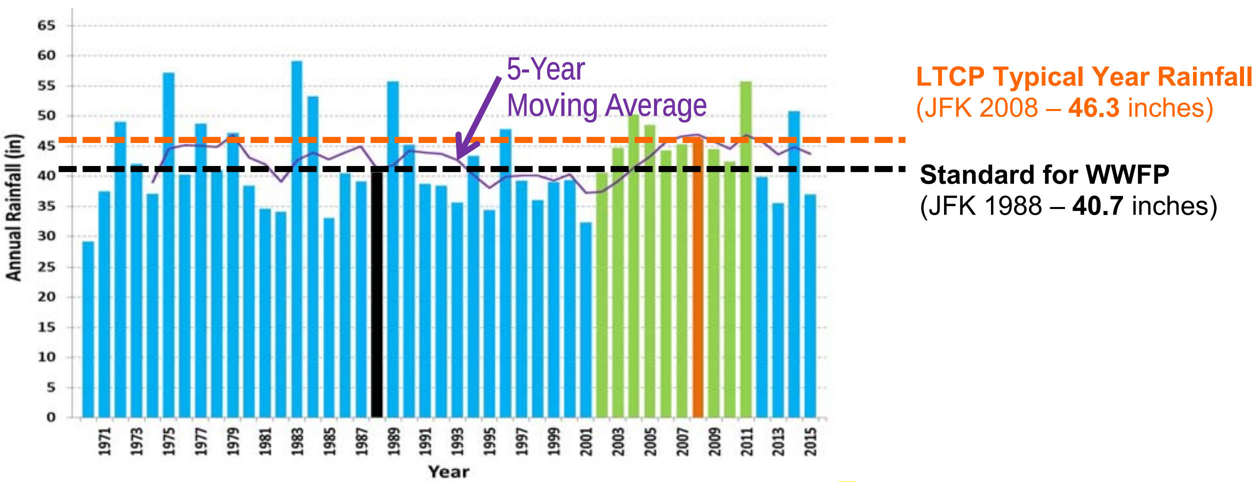

Figure 2-8. Annual Rainfall Data and Selection of the Typical Year

Section 2.1.c (Page 2-17)

Table 2-4 is deleted, and replaced in its entirety by the following Table 2-4.

Table 2-4. Bowery Bay WWTP and Newtown Creek WWTP Sewersheds Tributary to Newtown Creek: Acreage Per Sewer Category

Sewer Area Description	Area (acres)
Combined	**4,642**
Separate MS4	**665**
Direct Drainage	**585**
Other(1)	**923**
Total	**6,815**

Notes: (1) "Other" acreage includes cemeteries and the Amtrak Sunnyside rail yard.

SECTION 6 EDITS

The following edits/underlined text are hereby incorporated into Section 6 of the Newtown Creek LTCP:

Section 6.2 (Page 6-9)

Baseline volumes of CSO to Newtown Creek for each outfall for the 2008 typical year are summarized in Table 6-2, and baseline volumes at East River CSOs associated with the Newtown Creek and Bowery Bay WWTP systems are summarized in Table 6-2a. The total baseline volumes of CSO, stormwater, and direct drainage to Newtown Creek along with the associated fecal coliform, Enterococci, and BOD annual loadings are summarized in Table 6-3. The specific SPDES permitted outfalls associated with these sources are shown in Figure 6-1. Additional tables that summarize annual volumes and loadings can be found in Appendix A.

Table 6-2a. 2008 Baseline CSO Volume and Overflows per Year – East River CSOs Associated with Newtown Creek WWTP and Bowery Bay WWTP Systems

Waterbody/WWTP System	CSO	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)
East River/BBL(1)	BB-016	1.8	17
	BB-017	1.7	20
	BB-018	1.1	17
	BB-021	23.4	34
	BB-022	1.0	12
	BB-023	16.4	30
	BB-024	36.4	28
	BB-025	11.0	30
	BB-027	6.1	27
	BB-028	352	44
	BB-029	105	32
	BB-030	27.6	43
	BB-031	3.9	18
	BB-032	1.9	17
	BB-033	6.1	28
	BB-034	202	57
	BB-035	3.9	32
	BB-036	8.9	30
	BB-037	0.6	8
Steinway Creek/BBL	BB-041	84.2	61
East River/BBL	BB-045	0.04	1
	BB-046	7.0	33
	BB-047	2.0	21
Subtotal BBL		**904**	**61 (max)**
East River/NCWWTP(2)	NC-003	0.4	10
	NC-004	15.9	36
	NC-006	92.2	42
	NC-007	7.5	31
	NC-008	21.6	32

Table 6-2a. 2008 Baseline CSO Volume and Overflows per Year – East River CSOs Associated with Newtown Creek WWTP and Bowery Bay WWTP Systems

Waterbody/WWTP System	CSO	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)
	NC-010	0.0	0
	NC-012	30.8	15
	NC-013	58.3	28
Wallabout Channel/NCWWTP	NC-014	607	27
East River/NCWWTP	NC-024	0.0	0
	NC-025	0.5	10
	NC-026	0.3	7
	NC-027	13.3	31
	NC-082	0.6	10
Subtotal NCWWTP		**848**	**42 (max)**
Total		**1,752**	**61 (max)**

Notes:
(1) BBL = Bowery Bay Low Level Interceptor, to Bowery Bay WWTP
(2) NCWWTP = Newtown Creek WWTP system

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SECTION 8 EDITS

Given the number of edits to Section 8, the entire Section 8 is presented below. All changes are highlighted in yellow, with new text underlined, and deleted text shown with strike-out.

8.0 EVALUATION OF ALTERNATIVES

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

This section contains the following information:

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

As presented in Section 6.2, Table 6-4, three sets of WQS, including fecal coliform and *Enterococci* bacteria WQ criteria and DO criteria, were used to evaluate CSO control alternatives and their corresponding levels of attainment. These evaluations include both existing and possible future WQ criteria.

It should be noted that while this LTCP focuses on attaining WQS in accordance with the CWA and New York State Environmental Conservation Law, EPA is also evaluating the presence of hazardous substances in Newtown Creek in accordance with CERCLA. A draft Remedial Investigation Report was submitted to EPA on November 15, 2016 by the non-City PRPs and is under EPA review. EPA is currently overseeing the performance of a Feasibility Study, also by the non-City PRPs, to evaluate potential remedies for Newtown Creek based on data collected during the Remedial Investigation, as well as on additional sampling and studies. EPA expects to issue a ROD for Newtown Creek, which will set forth EPA's selected remedy for Newtown Creek, in 2020, and it is possible that the ROD may include a CSO mitigation component.

8.1 Considerations for LTCP Alternatives under the Federal CSO Policy

This LTCP addresses the water quality objectives of the CWA and the New York State Environmental Conservation Law. This LTCP also builds upon the conclusions presented in DEP's June 2011 Newtown Creek WWFP. As required by the 2012 CSO Order, when the proposed alternative set forth in the LTCP will not achieve Existing WQ Criteria or the Section 101(a)(2) goals, a Use Attainability Analysis (UAA)

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must be prepared. A UAA is the mechanism to examine whether applicable waterbody classifications, criteria, or standards should be adjusted by the State. If deemed necessary, the UAA would assess compliance with the next higher classification that the State would consider in adjusting WQS and developing waterbody-specific criteria. The remainder of Section 8.1 discusses the development and evaluation of CSO control measures and watershed-wide alternatives to comply with the CWA in general, and with the CSO Control Policy in particular. This section describes the evaluation factors considered for each alternative and a description of the process for evaluating the alternatives.

8.1.a Performance

A summary of the IW model output data for volume and frequency of discharge of the CSO outfalls to Newtown Creek and its tributaries is provided in Table 8-1. The locations of these outfalls are shown in Figure 8-1.

Table 8-1. CSO Discharges Tributary to Newtown Creek (2008 Typical Year)

Combined Sewer Outfalls	Receiving Waters	Discharge Volume (MGY)	No. of Discharges	Percentage of Total CSO Discharge to Newtown Creek
BB-026	Dutch Kills	120	37	10.3%
NC-077	Maspeth Creek	300	41	25.8%
NC-083	East Branch	314	42	27.0%
NC-015	English Kills	321	31	27.7%
Subtotal - Four Largest Outfalls	**Newtown Creek and Tributaries**	**1,055**	**42 (max.)**	**90.9%**
BB-004	Dutch Kills	0	1	
BB-009	Dutch Kills	43	34	3.7%
BB-040	Dutch Kills	1	16	<1.0%
BB-010	Newtown Creek	1	7	<1.0%
BB-011	Newtown Creek	2	14	<1.0%
BB-012	Newtown Creek	0	1	<1.0%
BB-013	Newtown Creek	16	31	1.4%
BB-014	Newtown Creek	2	18	<1.0%
BB-015	Newtown Creek	1	13	<1.0%
BB-042	Newtown Creek	2	22	<1.0%
BB-043	Newtown Creek	9	32	<1.0%
BB-049	Newtown Creek	0	0	0.0%
NCB-019	Newtown Creek	3	21	<1.0%
NCB-021	Newtown Creek	0	0	0.0%
NCB-022	Newtown Creek	7	29	<1.0%
NCB-023	Newtown Creek	0	8	<1.0%
NCQ-029	Newtown Creek	19	40	1.6%
Subtotal – Other Outfalls	**Newtown Creek and Dutch Kills**	**106**	**40 (max.)**	**9.1%**
Total CSO	**Newtown Creek and Tributaries**	**1,161**	**42 (max.)**	**100%**

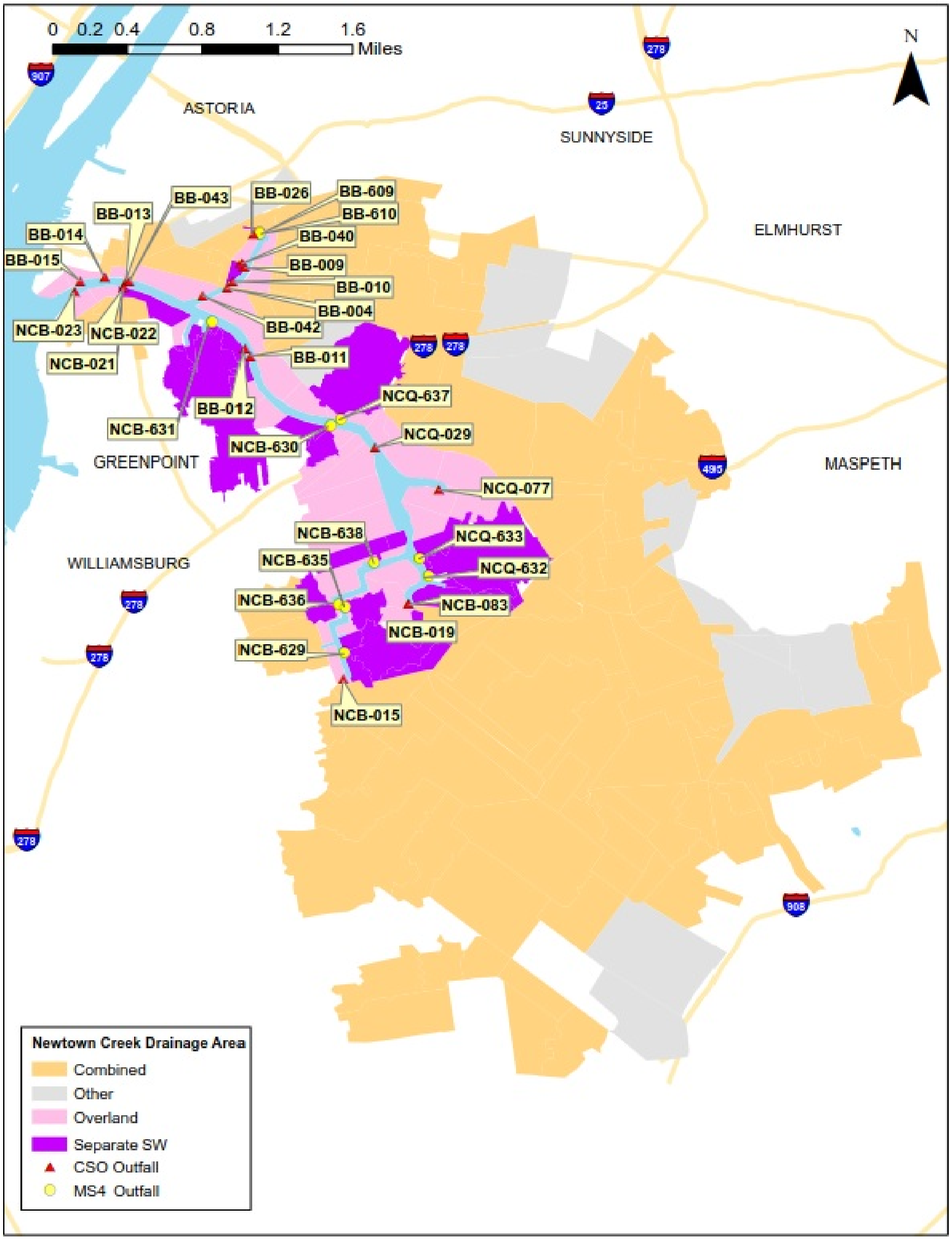

Figure 8-1. CSO Discharges to Newtown Creek

As indicated in Table 8-1, four CSO outfalls - BB-026, NCQ-077, NCB-083 and NCB-015 - generate 91 percent of the total annual CSO discharge volume. None of the other outfalls contributes more than four percent of the total, and most contribute less than one percent of the total. The four outfalls that generate the largest volumes are located at the head ends of four Newtown Creek tributaries: Dutch Kills, Maspeth Creek, East Branch and English Kills, respectively. Because of their headwater locations, the water quality impacts of the loadings from the four largest outfalls are generally measurable throughout the Creek.

To determine the influence of CSO control on the attainment of existing and future WQ criteria, a Performance Gap Analysis was performed. The results of the analysis are summarized in Section 6.3. The evaluations concluded that a performance gap exists because both the Primary Contact WQ Criteria for fecal coliform bacteria and the Class SD DO criterion will not be attained under baseline conditions. As a result, the evaluation of performance for the Newtown Creek alternatives related to bacteria focused on improving the attainment of Primary Contact Bacteria WQ criteria and the designated Class SD DO criterion (>3.0 mg/L). The alternatives evaluations also considered the level of control necessary to achieve the DEC goal for a time to recovery of less than 24 hours after a wet-weather event. Additionally, improvements to the attainment of Potential Future WQ Criteria (RWQC) and the Class SC DO criterion that would be realized by the selected CSO mitigation alternatives have been evaluated and reported.

The analyses in Section 6 showed that under baseline conditions, annual attainment with Existing WQ Criteria for bacteria ranged from 42 to 83 percent, with lower attainment projected towards the head end. While 100 percent CSO control would improve overall annual attainment with Existing WQ Criteria for bacteria, modeling still projected non-attainment in English Kills and East Branch, with an annual attainment of 83 percent. Under baseline conditions during the recreational season (May 1st through October 31st), attainment with Existing WQ Criteria for bacteria ranged from 67 to 100 percent, with lower attainment projected towards the head end. With 100 percent CSO control, projected recreational season (May 1st through October 31st) attainment with Existing WQ Criteria for bacteria was projected to be 100 percent. Overall, the dissolved oxygen had a projected annual attainment with the Existing Class SD WQ Criterion for DO between 90 and 100 percent under baseline conditions that includes seasonal aeration in English Kills and East Branch. Dutch Kills without aeration was projecting an annual attainment with the Existing WQ Criterion for DO between 98 and 99.9 percent.

The primary goals for the development and evaluation of control alternatives are the ability to achieve bacteria load reduction and to attain applicable water quality criteria. The control of floatables is also an important goal and is a consideration for all alternatives. The evaluation of control alternatives typically follows a two-step process. First, based upon IW watershed model runs for the typical year rainfall (2008), the level of CSO control of each alternative is established, including the reduction of CSO volume, fecal coliform and *Enterococci* loading. The second step uses the estimated levels of CSO control to project levels of attainment in the receiving waters. This latter step uses the Newtown Creek Receiving Water Quality Model (NCRWQM). LTCPs are typically developed with alternatives that span a range of CSO volumetric (and loadings) reductions. Accordingly, this LTCP includes alternatives that consider a wide range of reductions in CSO loadings - up to 100 percent CSO control - including investments in green and grey infrastructure. Intermediate levels of CSO volume control, approximately 25, 50 and 75 percent, are typically also evaluated. Table 8-2 provides a summary of the required storage volume and associated peak flow rates that would have to be diverted from the outfalls for each of these levels of CSO control for the four largest CSO outfalls.

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Table 8-2. Summary of Storage and Peak Flow Rates Required for Each Level of CSO Control for the Four Largest Outfalls

Required Capacity	25% CSO Control	50% CSO Control	75% CSO Control	100% CSO Control
Storage Capacity (MG)	11	30	59	138
Diverted Peak Flow (MGD)(1)	67	165	343	1,833

Note:
(1) Peak flow that would have to be conveyed to storage or treatment to provide the targeted level of CSO control.

Figures 8-2 and 8-3 show plots of the required volumes and flow rates for these four large outfalls.

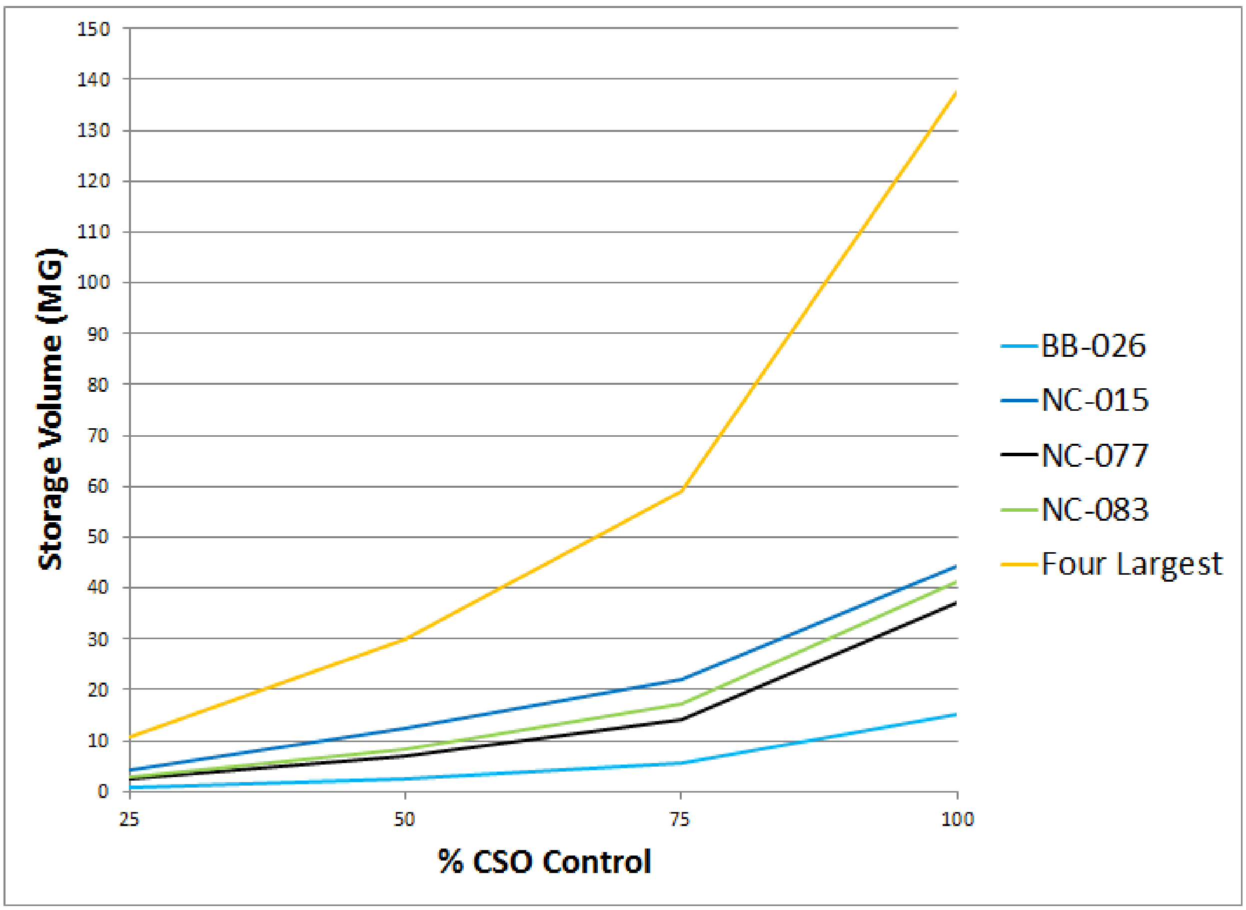

Figure 8-2. Required Storage Volume for Various Levels of CSO Control for Four Largest Outfalls

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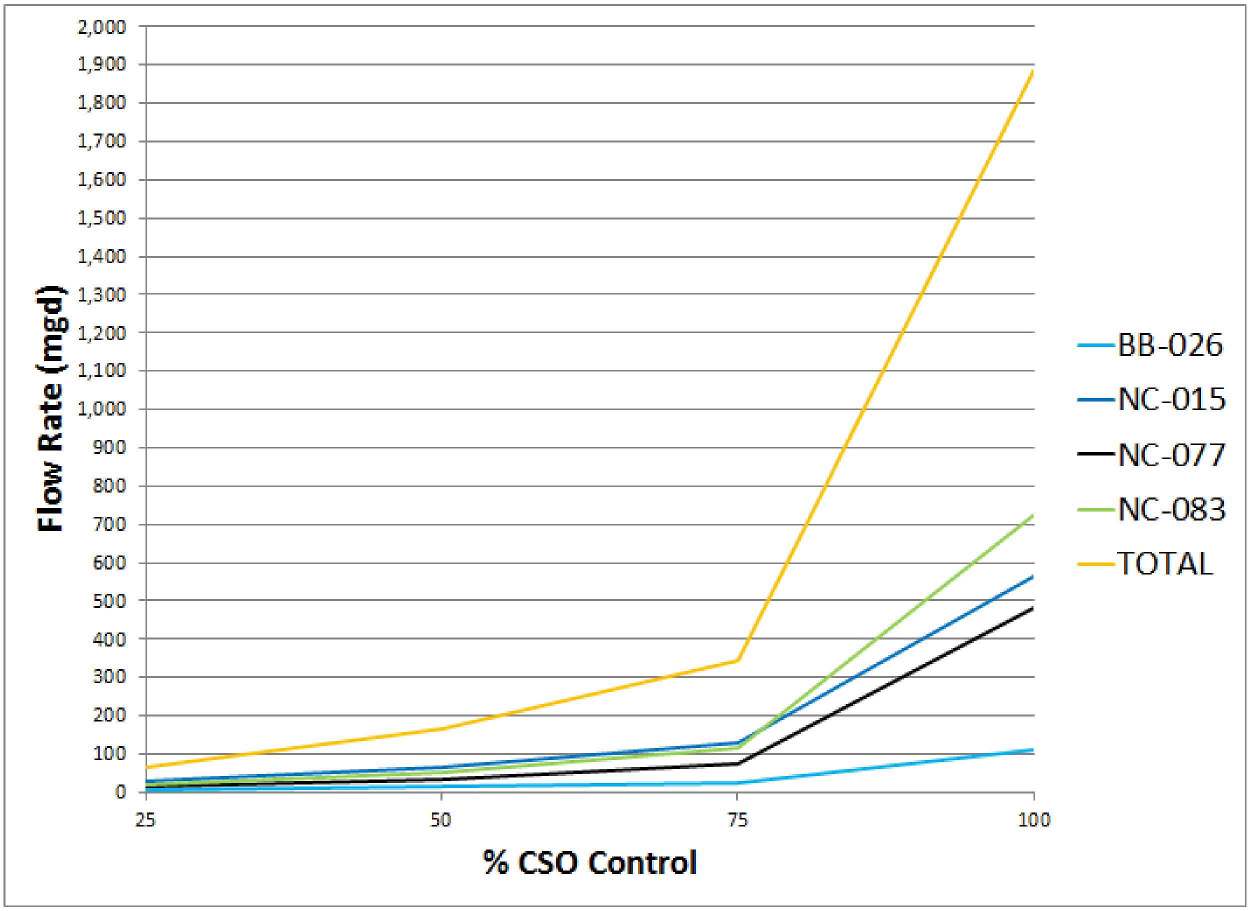

Figure 8-3. Required Diverted Peak Flow for Various Levels of CSO Control for the Four Largest Outfalls

8.1.b Impact on Sensitive Areas

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

8.1.c Cost

Cost estimates for the alternatives were computed using a costing tool based on parametric costing data. This approach provides an AACE Class 5 estimate (accuracy range of minus 20 to 50 percent to plus 30 to 100 percent), which is typical and appropriate for this type of planning evaluation. For the purpose of this LTCP, all costs are in February 2017 dollars.

For the LTCP alternatives, Probable Bid Cost (PBC) was used as the estimate of the construction cost. Annual operation and maintenance costs were then used to calculate the total or net present worth (NPW) over the projected useful life of the project. In general, a lifecycle of 20 years and an interest rate of 3.0 percent were assumed resulting in a Present Worth Factor of 14.877. However, for tunnel

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alternatives, which provide longer service, a 100-year lifecycle was considered and a corresponding Present Worth Factor of 31.599 was used.

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

8.1.d Technical Feasibility

Several factors were considered when evaluating technical feasibility, including:

- Effectiveness for controlling CSO
- Reliability
- Implementability

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

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

8.1.e Cost-Effective Expansion

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

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

As regulatory requirements change, other water quality improvements may be required. The ability of a CSO control technology to be retrofitted to address additional pollutant parameters or more stringent discharge limits strengthens the case for application of that technology.

8.1.g Long Term Phased Implementation

Recommended LTCP implementation steps associated with the preferred alternative are typically structured in a way that makes them adaptable to change by expansion and modification resulting from possible new regulatory and/or local drivers. If applicable, the project(s) would be implemented over a multi-year schedule. Because of this, permitting and approval requirements must be identified prior to selection of the alternative. With the exception of GI, which is assumed to occur on both private and public property, most of the CSO grey technologies target municipally owned property and right-of-way-acquisitions. DEP will work closely with other NYC agencies and, as necessary, with NYS, to ensure proper coordination with other government entities.

8.1.h Other Environmental Considerations

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

8.1.i Community Acceptance

As described in Section 7, DEP is committed to involving the public, regulators, and other stakeholders throughout the planning process. Community acceptance of the recommended plan is essential to its success. As such, DEP uses the LTCP public participation process to present the scope of the LTCP, background, newly collected data, WQS and the development and evaluation of alternatives to the public and to solicit its support and feedback. The Newtown Creek LTCP is intended to improve water quality, and public health and safety are its priorities. The goal of raising awareness of and access to waterbodies was also considered throughout the alternative analysis. Several CSO control measures, such as GI, have been shown to enhance communities while increasing local property values. As such, the benefits of GI were considered in the formation of the baseline and the final recommended plan.

8.1.j Methodology for Ranking Alternatives

The multi-step evaluation process DEP used to develop the Newtown Creek LTCP accomplished the following:

1. Evaluated benchmarking scenarios, including baseline and 100 percent CSO control, to establish a range of controls within the Newtown Creek watershed for consideration. The results of this step were described in Section 6.
2. Used baseline conditions to prioritize the CSO outfalls for possible controls.

3. Developed a list of promising control measures for further evaluation based in part on the prioritized CSO list.
4. Established levels of intermediate CSO control that provide a range between baseline and 100 percent CSO control for the receiving water quality simulations that were conducted.
5. Held a Challenge Team Workshop on March 31, 2016, to brainstorm ideas ahead of the formal alternatives development process.
6. Toured the Narragansett Bay Commission (Providence, RI) CSO tunnel (as part of the Flushing Bay LTCP development) on October 19, 2016, to solicit feedback and lessons learned.
7. Conducted an initial "brainstorming" meeting with DEP staff on January 12, 2017, to review the most promising control measures and to solicit additional options to explore.
8. Held a meeting with DEP Bureau Executives on January 30, 2017, to develop presentation materials for joint DEC/EPA meeting.
9. Held a meeting with DEC and EPA staff on February 16, 2017, to present water quality sampling results, baseline modeling, WQS attainment and preliminary CSO control alternatives, and to review the progress to-date on the alternatives development.
10. Held a second "brainstorming" meeting with DEP staff on March 22, 2017, to further review additional details on the most promising control measures and to solicit additional options to further explore.
11. Conducted meetings with DEP staff on March 30 and April 4, 2017, to prepare for Inter-Bureau Alternatives Workshop.
12. Conducted a follow-up workshop with operations staff on April 10 2017, to review the progress to-date on the alternatives development and to solicit input and concerns on operability, and to select a shortlist of retained alternatives.
13. Toured the Monroe County (Rochester, NY) CSO tunnel on May 10, 2017, to solicit feedback and lessons learned.
14. Presented findings of retained alternatives to DEC on June 13, 2017.

The focal points of this process were the meetings and workshops listed above. Prior to the first meeting, the control measures that were evaluated in the 2011 WWFP were revisited from the perspective of the LTCP goal statement and in light of the implemented WWFP controls. Additional control measures were also identified and assessed. The resultant control measures were introduced at the first meeting. Based on discussions at that meeting, further additional control measures were identified. A preliminary evaluation of these control measures was then conducted including an initial estimation of costs and water quality CWA impacts. During the second meeting, promising alternatives were reviewed in more detail. The LTCP workshops, attended by a broader array of DEP operational and engineering staff, included updated alternative assessments.

Categories of control measures considered included, Source Control, System Optimization, CSO Relocation, Water Quality/Ecological Enhancement, Treatment and Storage. Specific control measures considered under each category were as follows:

Source Control

- Additional and Existing Green Infrastructure
- Sewer Separation

System Optimization

- Fixed Weirs
- Parallel Interceptor/Sewer
- Inflatable Dams, Bending Weirs or Control Gates
- Pumping Station Expansion/Optimization

CSO Relocation

- Gravity Flow Tipping to Other Watersheds
- Pumping Station Modification
- Flow Tipping with Conduit/Tunnel and pumping

Water Quality/Ecological Enhancement

- Floatables Control
- Environmental Restoration
- In-Stream Aeration
- Flushing Tunnel

Treatment

- Outfall Disinfection
- Retention Treatment Basin
- High Rate Clarification
- WWTP Expansion

Storage

- In-System/Outfall
- Shaft
- Tank
- Tunnel

Figure 8-4 presents these control measures according to their relative cost and level of complexity. The control measures in the upper left corner are generally the least costly and least complex to construct and/or operate, while those towards the lower right are the most costly and most complex to construct and/or operate. The level of loading removal performance of each measure typically corresponds with the level of cost and complexity.

Following the initial screening meeting, control measures were advanced to a second level of evaluation with the exception of the following (either marked with an "X" or highlighted as an ongoing project in Figure 8-4):

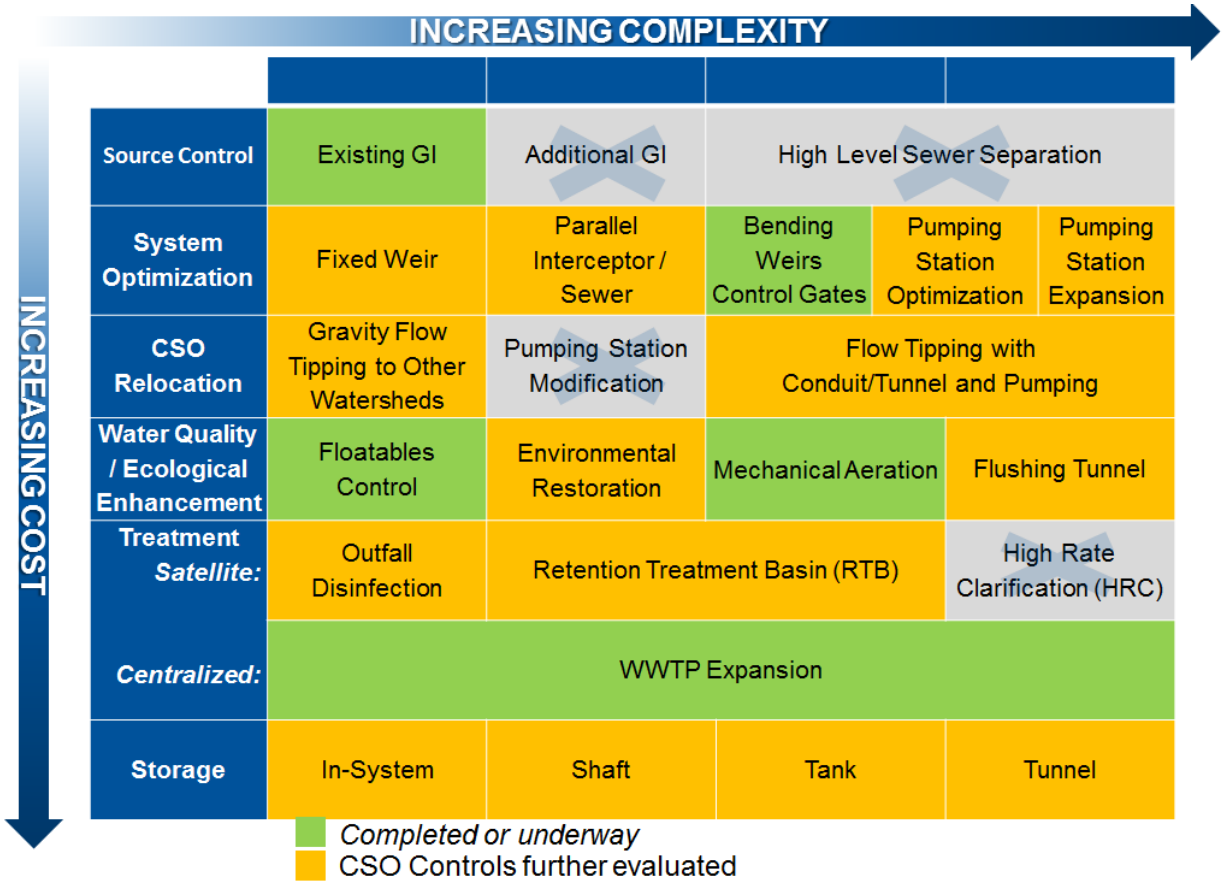

Figure 8-4. Matrix of CSO Control Measures for Newtown Creek

- *Additional and Existing Green Infrastructure (GI):* Newtown Creek is a priority target area for DEP's Green Infrastructure Program. DEP has installed or plans to install over 1,300 GI assets consisting of right-of-way (ROW) practices, public property retrofits, and GI implementation on private properties. Figure 8-5 illustrates the location of the built or planned GI projects. While GI will be encouraged in areas proposed for redevelopment, site characteristics in publicly owned rights-of-way throughout the sewershed limit the ability to implement additional GI. As noted in Section 5, the GI in the Newtown Creek watershed is projected to result in a CSO volume reduction of approximately 83 MGY, based on the 2008 baseline rainfall condition. Because the application of additional GI would rely on commitments from private property owners, it is not feasible to identify and commit definitively to such private GI projects within the timeframe for development of this LTCP. As a result, application of additional GI will not be evaluated as part of this LTCP. Nevertheless, DEP will continue to develop programs to incentivize the application of GI by private property owners for the purposes of managing stormwater runoff.

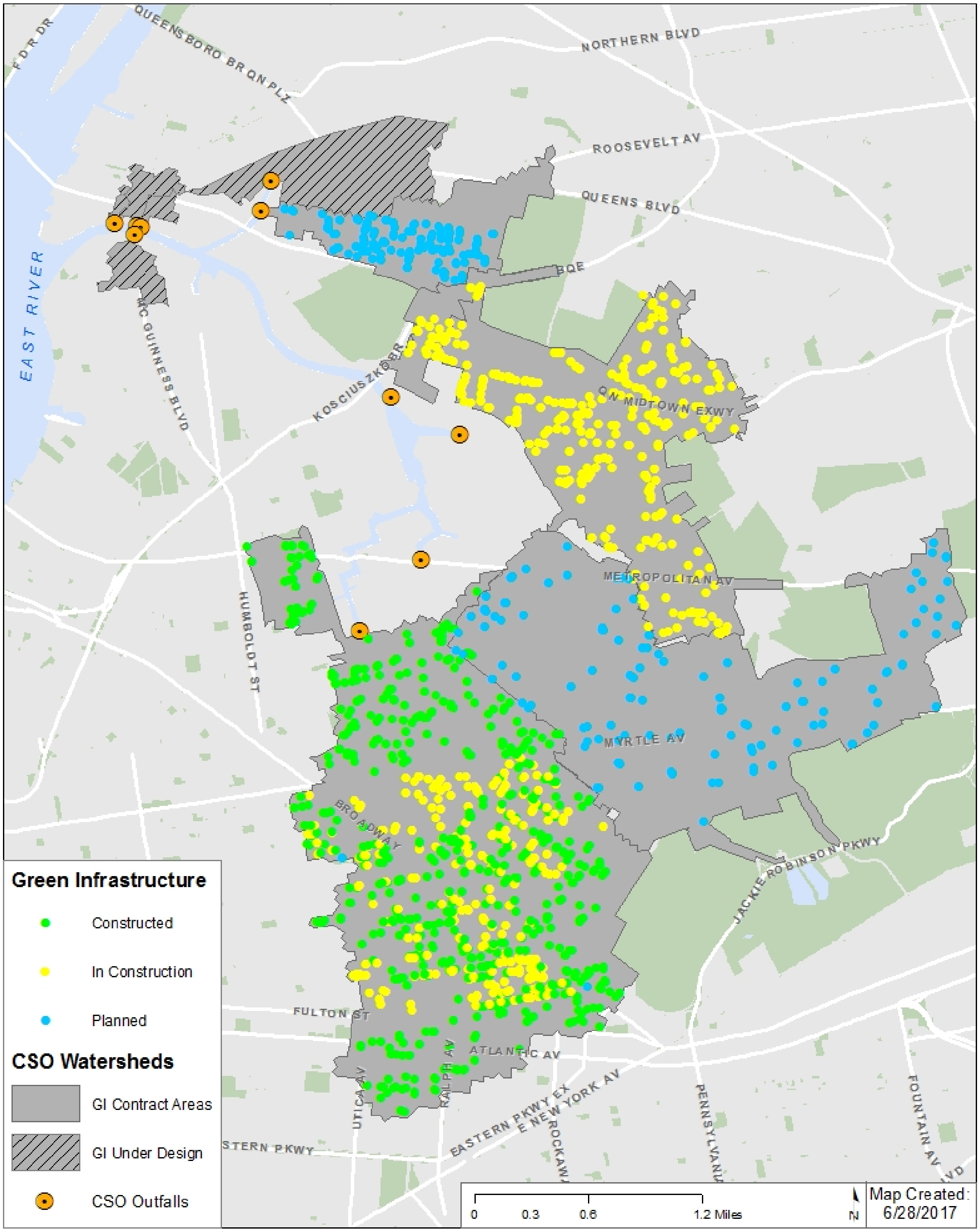

Figure 8-5. Built and Planned Green Infrastructure Projects

- *Sewer Separation:* The drainage areas tributary to the four largest CSO outfalls - BB-026, NC-077, NC-083 and NC-015 - are expansive and generate large volumes of annual discharge. The cost and disruption to the neighborhoods to separate sewers would be significant while only providing limited water quality benefits due to the resultant stormwater discharges. DEP has typically employed so-called high level storm sewer (HLSS) – i.e., the removal of public rights-of-way runoff from streets and sidewalks – only where localized flooding problems have occurred, rather than as a CSO control measure. Because flooding has not been identified as an issue in this watershed, HLSS was not considered for Newtown Creek.

  As a partial separation alternative, DEP considered redirecting the stormwater runoff generated on the large area of cemeteries along the northeastern edge of the Newtown Creek watershed. IW modeling indicated that about a 12 percent basin-wide CSO volume reduction could possibly be achieved by rerouting that stormwater directly to Newtown Creek. However, after further evaluation, it was determined that, as with HLSS, extensive new conveyance piping would be needed to redirect the cemetery-generated runoff to the Creek. As a result, both HLSS and this focused cemetery-generated stormwater redirection were eliminated from further consideration.

- *Inflatable Dams, Bending Weirs, Control Gates:* Mechanical methods of regulating CSO were evaluated under the 2011 WWFP. As described above, of these measures, bending weirs were deemed the most applicable control for the four largest outfalls due to the concern of adverse upstream hydraulic grade line impacts. Because the bending weirs already are being implemented, and nothing has changed regarding the potential hydraulic grade line impacts of the other technologies, these control measures were eliminated from further consideration, except as noted below under Floatables Control.

- *Pumping Station Modification:* The majority of the combined sewage in the Newtown Creek watershed is pumped to the Newtown Creek WWTP through the Brooklyn/Queens Pumping Station (BQPS). Per the Newtown Creek WWTP WWOP, the BQPS pumps a maximum of 400 MGD to the plant. The pumping station and the system of gates that control the inflow to the wet well were upgraded recently. The Newtown Creek WWTP also receives flow from the Manhattan portion of the sewershed via the Manhattan Pumping Station. Theoretically, flow from the Manhattan Pumping Station could be throttled during wet-weather, and the capacity of the BQPS expanded to keep the total peak flow to Newtown Creek WWTP at its peak design capacity of 700 MGD. However, hydraulic evaluations and the IW model have indicated that increasing the capacity of the BQPS would not significantly reduce CSO volumes to Newtown Creek, due to conveyance limitations along the Morgan Avenue interceptor (i.e., the additional peak flow could not get to the pumping station). As a result, further modification of the BQPS was not considered. The expansion of the Borden Avenue Pump Station was identified for further evaluation as described below. No other sanitary pump stations within the Newtown Creek drainage area discharge to the Bowery Bay WWTP system.

- *Floatables Control*: Underflow baffles ~~are being installed currently~~ were recently constructed at the four largest outfalls (BB-026, NC-015, NC-077 and NC-083) as part of the Bending Weirs/Floatables Control Project recommended in the 2011 WWFP~~Regulator Improvement Project~~, and a floatables control boom is located at the mouth of Maspeth Creek and near the head-end of English Kills and East Branch . Further, the control measures described below that include storage or treatment would inherently also capture floatables. As such, additional measures that specifically target floatables control were not initially considered. However, in response to comments from the DEC, providing underflow baffles at regulators associated with the next three largest outfalls to Newtown Creek in terms of annual overflow volume (BB-009, BB-013, and NCQ-029) was evaluated. The findings of this evaluation are presented in Section 8.2.a.1 below.

- *Environmental Dredging*: DEP conducted maintenance dredging of portions of Newtown Creek in April/May 2014. The dredging area encompassed the lower portion of the Creek, approximately between the mouth and Whale Creek, to improve navigability up to the new sludge loading dock near the Newtown Creek WWTP. Because EPA is currently evaluating dredging alternatives under the Superfund process, DEP did not consider that measure under this LTCP.
- *In-stream Aeration*: In-stream aeration has already been installed in English Kills and in East Branch. WQ modeling evaluations indicated that without those aeration systems, the Class SD DO criterion would not be achieved in the upstream reaches of Newtown Creek even with 75 percent CSO control. With 100 percent CSO control, the criterion still would not be met at Station NC-014 in English Kills. Therefore, it is recommended that the East Branch and English Kills aeration systems remain in operation. However, the WQ assessments indicated that the Class SD DO criterion is currently being met in Dutch Kills and the main trunk of Newtown Creek under baseline conditions. Therefore, the previously-proposed Dutch Kills aeration system is recommended to be eliminated.
- *High Rate Clarification*: High rate clarification is typically employed for CSO discharges when high levels of suspended solids and BOD reductions are targeted for control in addition to bacteria and floatables. Because high rates of removal of these parameters were not identified as concerns for the Newtown Creek watershed, this control measure was eliminated from further consideration.
- *WWTP Expansion*: As noted above, the benefit of expanding the WWTP capacity would be limited by the capacity of the collection system to convey additional wet-weather flow to the plant. In addition, because space constraints limit the ability to expand existing plant processes, storage or remote treatment was considered in lieu of WWTP expansion.
- *Storage Shafts*: Shaft storage involves constructing a deep circular shaft to provide storage, with pump-out facilities to dewater the shaft after the storm event. Shaft storage construction techniques would be similar to those used to construct deep tunnel drop or access shafts. The benefit of shaft storage is that it allows for relatively large storage volumes with relatively small facility footprints. Disadvantages of shaft storage include limits to the depth of shafts, complex dewatering pumping operations, and difficult maintenance. Another disadvantage is that very few operating shaft storage systems exist from which to gain insight on operational issues and experience. Finally, the largest shaft currently in operation is 7.5 MG. Using that size as a maximum, multiple units would be required at the largest Newtown Creek outfalls. Because the range of levels of CSO control could be provided by more conventional tunnels or, in some cases, tanks, storage shafts do not offer advantages sufficient to outweigh their disadvantages. For these reasons, shaft storage was eliminated from further evaluation.

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

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

Each control measure was initially evaluated on three of the key considerations described in Section 8.1: (1) benefits, as expressed by level of CSO control and attainment; (2) costs; and (3) challenges, such as siting and operations. Using this methodology, the retained control measures listed in Section 8.1 were evaluated on a cost-performance basis and used to develop the basin-wide alternatives.

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

8.2.a Other Future Grey Infrastructure

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

Grey infrastructure projects implemented under previous CSO control programs and facility plans, such as the 2011 WWFP, are described in Section 4. To summarize, those projects include:

1. Upgrade of Brooklyn/Queens Pumping Station to 400 MGD capacity.
2. The Regulator Improvement Project to install underflow baffles and bending weirs at regulators associated with the four largest CSO outfalls, specifically BBL-4, NCQ-01, NCB-01 and the NC-St. Nicholas Weir regulator. Figure 8-6 shows the longitudinal profile at one of the regulators, NCQ-01.
3. In-stream aeration at English Kills and East Branch (Figure 8-7).

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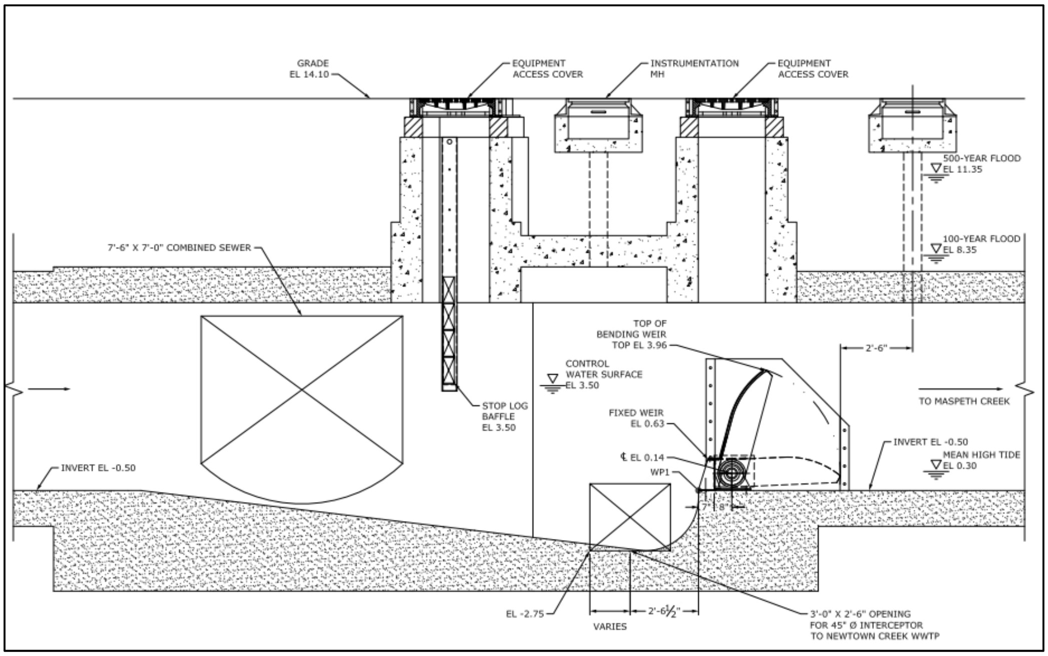

Figure 8-6. Bending Weir and Underflow Baffle at Regulator NCQ-01

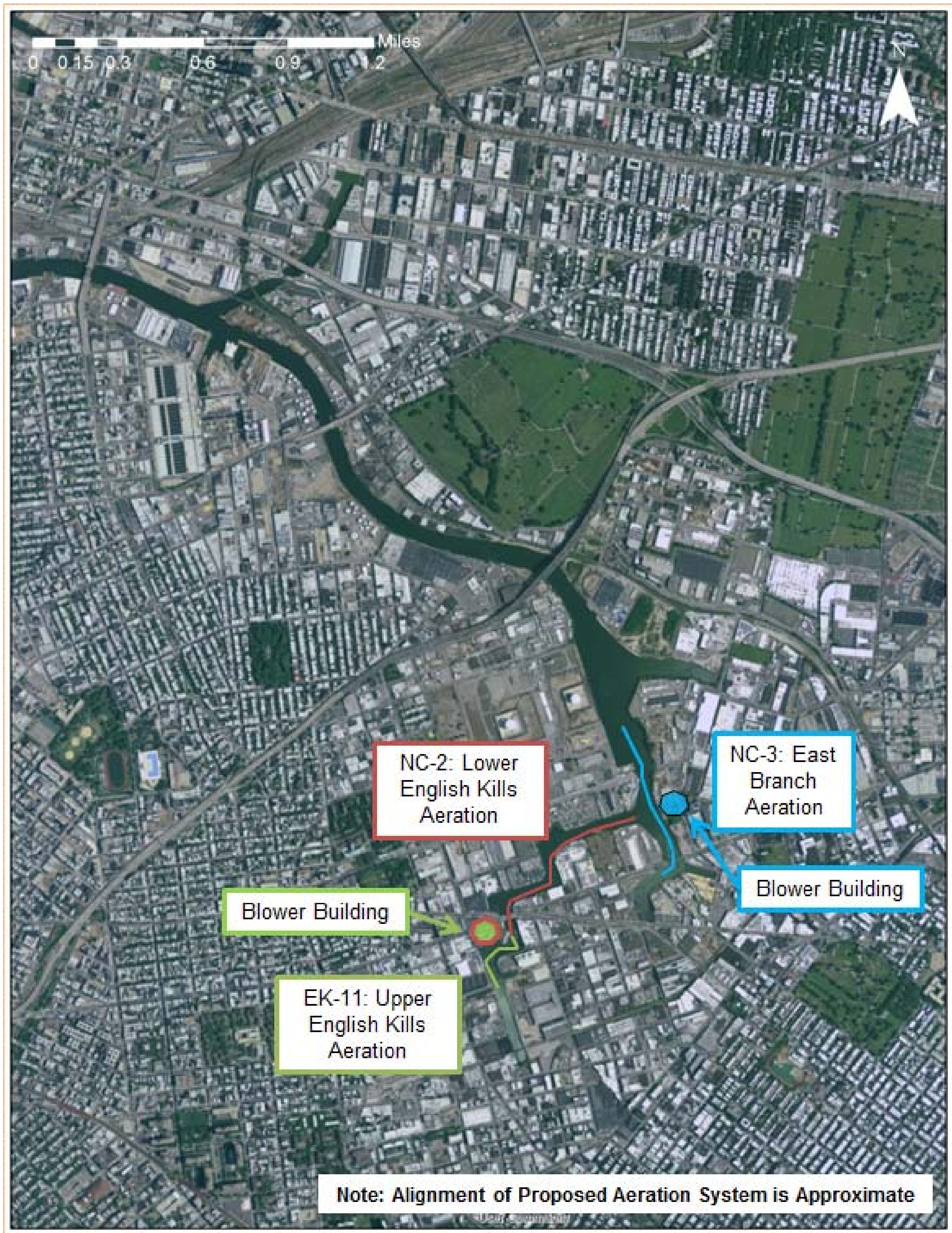

Figure 8-7. In-Stream Aeration at English Kills and East Branch

Additional grey infrastructure alternatives that were considered in the development of this LTCP are described here.

8.2.a.1 System Optimization - Sewer Enhancements

Sewer enhancements typically include measures to optimize the performance of the sewer system by taking advantage of in-system storage capacity to reduce CSO through automated controls or modifications to the existing collection system infrastructure. Examples include: regulator or weir modifications including fixed and bending weirs; control gate modifications; real time control; and increasing the capacity of select conveyance system components, such as gravity lines, pumping stations and/or force mains. Force main relocation or interceptor flow regulation would also fall under this category. These control measures generally retain more of the combined sewage within the collection system during storm events. The benefits of retaining this additional volume must be balanced against the potential for sewer back-ups and flooding, or the relocation of the CSO discharge elsewhere in the watershed or in an adjacent watershed. Viability of these control measures is system-specific, depending on existing physical parameters such as pipeline diameter, length, slope and elevation.

As part of the control measure review process described in Section 8.1, two system optimization measures passed the initial screening process and were subsequently developed and evaluated for Newtown Creek, while other system optimization measures were not carried forward, as described below. The evaluation of floatables control for outfalls BB-009, BB-013, and NCQ-029 is presented at the end of this section.

Fixed Weirs: Regulator improvements were recommended under the 2011 WWFP and resulted in the Regulator Improvement Project. The project evaluated opportunities to improve wet-weather capture and conveyance for treatment at the Newtown Creek WWTP, along with floatables control. To neutralize adverse impacts on the upstream hydraulic grade line, bending weirs were deemed preferable to fixed weirs and are now being installed at the key regulator structures associated with Outfalls BB-026, NC-077, NC-083 and NC-015. As a result of this ongoing work at the four largest CSO outfalls, this control measure was eliminated from further consideration as a stand-alone CSO reduction alternative for this LTCP. However, DEP evaluated relocating overflow between two large outfalls by replacing the existing bending weirs with lower fixed weirs at either Outfall NC-015 or NC-083. These evaluations targeted the potential elimination of a diversion structure, conveyance, and in some cases, a drop shaft, that would no longer be necessary under other CSO reduction alternatives (e.g., tunnel), if the overflows from one of these outfalls could be significantly relocated to the other outfall. These evaluations revealed that little CSO would be relocated from one outfall to the other due to capacity limitations in the existing conveyance piping. For this reason, this concept was not developed further in this LTCP.

Parallel Interceptor/Sewer: Construction of a major near-surface relief pipe parallel to the existing interceptors would have significant constructability and construction impact issues due to the size of the streets, level traffic and density of existing utilities, particularly along the existing Morgan Avenue Interceptor or the Long Island City Interceptor. Trenchless construction would not fully mitigate these challenges. For these reasons, parallel interceptors were not advanced as alternatives. However, other control measures targeting the conveyance of additional combined sewage from the upper end of Newtown Creek watershed to the Newtown Creek WWTP were evaluated. Specifically, a consolidation conduit was evaluated that would run along the northern portion of the watershed, capturing CSO discharges at Outfalls NC-015, NC-083 and NC-077, immediately downstream of the regulators. Because this conduit would convey CSO to a retention/treatment basin (RTB), it is described below as part of Alternative RTB-1, a treatment-based CSO control alternative.

Pumping Station Optimization: In addition to pumping station upgrade or expansion (see below), the operation of a station could also be evaluated to ensure that it is optimized with respect to its ability to maximize the amount of wet-weather flow that is controlled (treated or stored). For example, as noted above, two pumping stations feed flow to the Newtown Creek WWTP, and the adjustment of the rate of pumped flow from one (e.g., Manhattan Pumping Station) would affect the flow amount of flow that could be pumped from the other (e.g., BQPS). However, as also noted under the "Pumping Station Modification" alternative above, interceptor capacity would limit the CSO reduction benefit from increasing the BQPS capacity. As a result, the LTCP evaluations focused on optimizing the Kent Avenue interceptor gate controls, seeking to maximize the flow from the Morgan Avenue interceptor that enters the BQPS wet well. Because the conveyance capacity of the Morgan Avenue interceptor, through which the regulated flow from Outfalls NC-077, NC-083 and NC-015 is conveyed, is limited to approximately 211 MGD, further throttling of the Kent Avenue Gate would not allow more flow from the Morgan Avenue interceptor to reach the pumping station wet well. Consistent with the analyses conducted in the WWFP, the LTCP evaluations concluded that pumping station optimization alone, without significant conveyance relief works along the Morgan Avenue interceptor system, would not result in CSO reduction at Outfalls NC-015, NC-083 and NC-077. Therefore, this CSO measure was not considered further in this LTCP.

Pumping Station Upgrade/Expansion: The 3-MGD Borden Avenue Pumping Station (BAPS) is located adjacent to Dutch Kills on the north side of Newtown Creek. The pumping station serves a relatively small tributary area, and discharges flow to the Long Island City Interceptor (LICI) for conveyance to the Bowery Bay WWTP. The BAPS is currently a candidate for a state of good repair (SOGR) intervention, and the design of the SOGR upgrade was already underway during development of this LTCP. Independently, an alternative was identified whereby the overflow from Outfall BB-026 would be diverted to a wet-weather pumping station, and the discharge routed to a location across Newtown Creek to a point just upstream of the Kent Avenue Gate. Because the location of the wet-weather pumping station would be in the same general vicinity as the BAPS, expanding the BAPS to include additional wet-weather flow capacity presented an opportunity for synergy between the SOGR needs and CSO control. This specific pumping station upgrade/expansion is considered further in this LTCP and is evaluated as Alternative SO-1, described below.

Alternative SO-1: Borden Avenue Pumping Station Upgrade/Expansion

This alternative would involve the following elements (Figure 8-8):

- A new diversion chamber with tide gate constructed on the existing BB-026 outfall downstream of the existing regulator.
- Approximately 2,500 linear feet (LF) of gravity conveyance piping from the new diversion structure to the BAPS.
- Expansion of the BAPS to include additional wet-weather flow capacity.
- Approximately 4,350 LF of new force main from the BAPS to a location just upstream of the Kent Avenue Gate Structure, adjacent to the Newtown Creek WWTP. Two potential alternative routes for the force main are shown in Figure 8-8.

Under this alternative, dry-weather flow would continue to be pumped to the LICI similar to current operation. Under wet-weather conditions, when overflow is diverted from the BB-026 outfall, all flow from the BAPS would be discharged to the new force main. The flow that is discharged just upstream of the Kent Avenue Gate would partially displace flow from regulators associated with outfalls that discharge to the East River from the Newtown Creek WWTP system, resulting in an increase in CSO discharge to the East River. Modeled tracer studies and analysis of flow direction in the pipes indicates that none of the flow pumped from the BAPS would discharge to the East River.

For the 75 percent CSO control alternative, CSO volume will be reduced by about 110 MGY in Dutch Kills, but the additional flow at the Newtown Creek WWTP will displace approximately 80 MGY of CSO into the East River. The overall increase into the East River represents a nine percent increase above the current baseline projection of 848 MGY. Figure 8-9 shows the locations of the East River CSOs where the overflow volume would increase. As indicated in Figure 8-9, a number of GI projects are planned for the general vicinity of Outfall NC-014, where the greatest increase in volume would occur. Other potential options to mitigate the impact of the increased overflow volumes at those outfalls will be investigated under the City-wide/Open Waters LTCP.

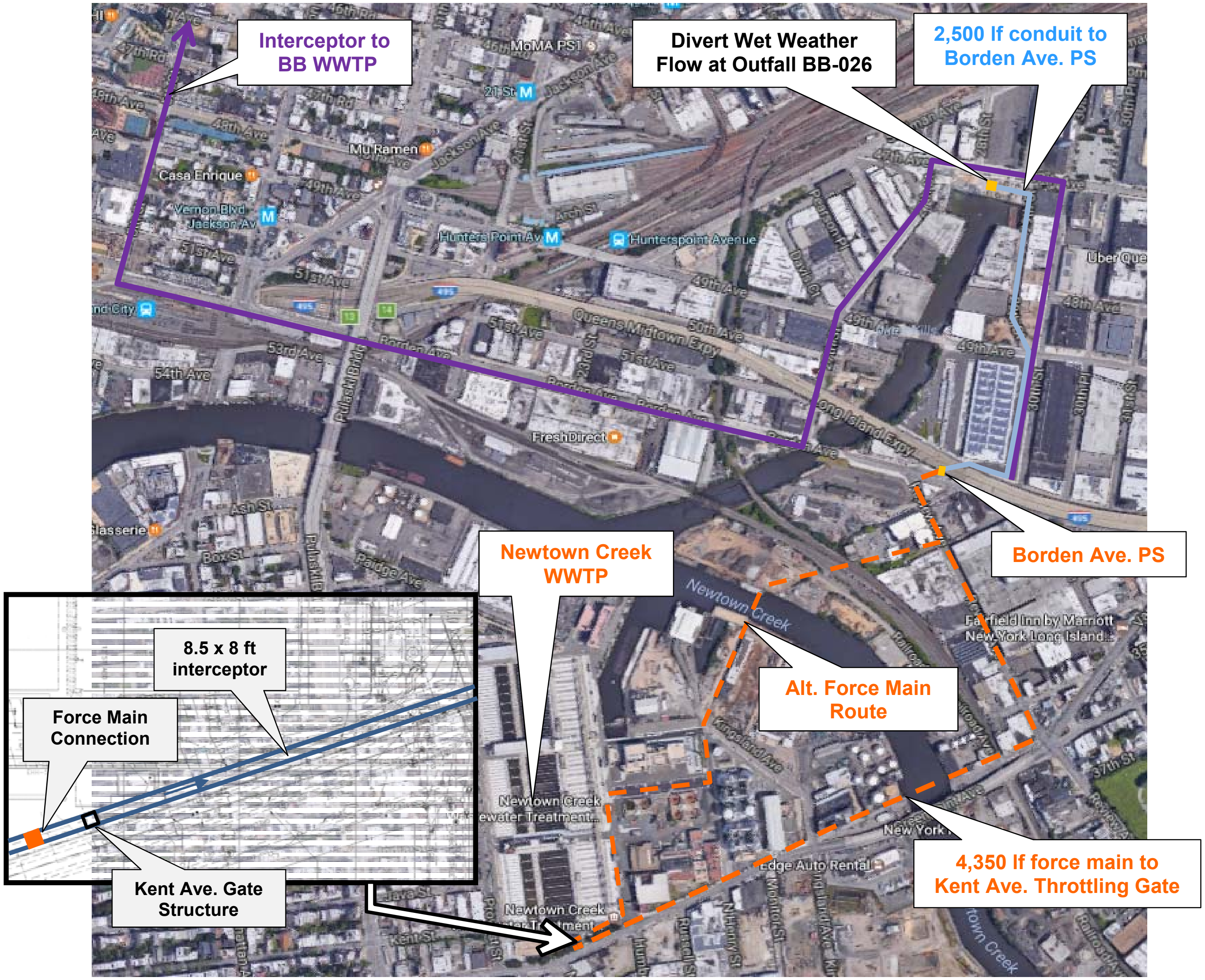

Figure 8-8. Borden Avenue Pump Station Upgrade/Expansion Layout

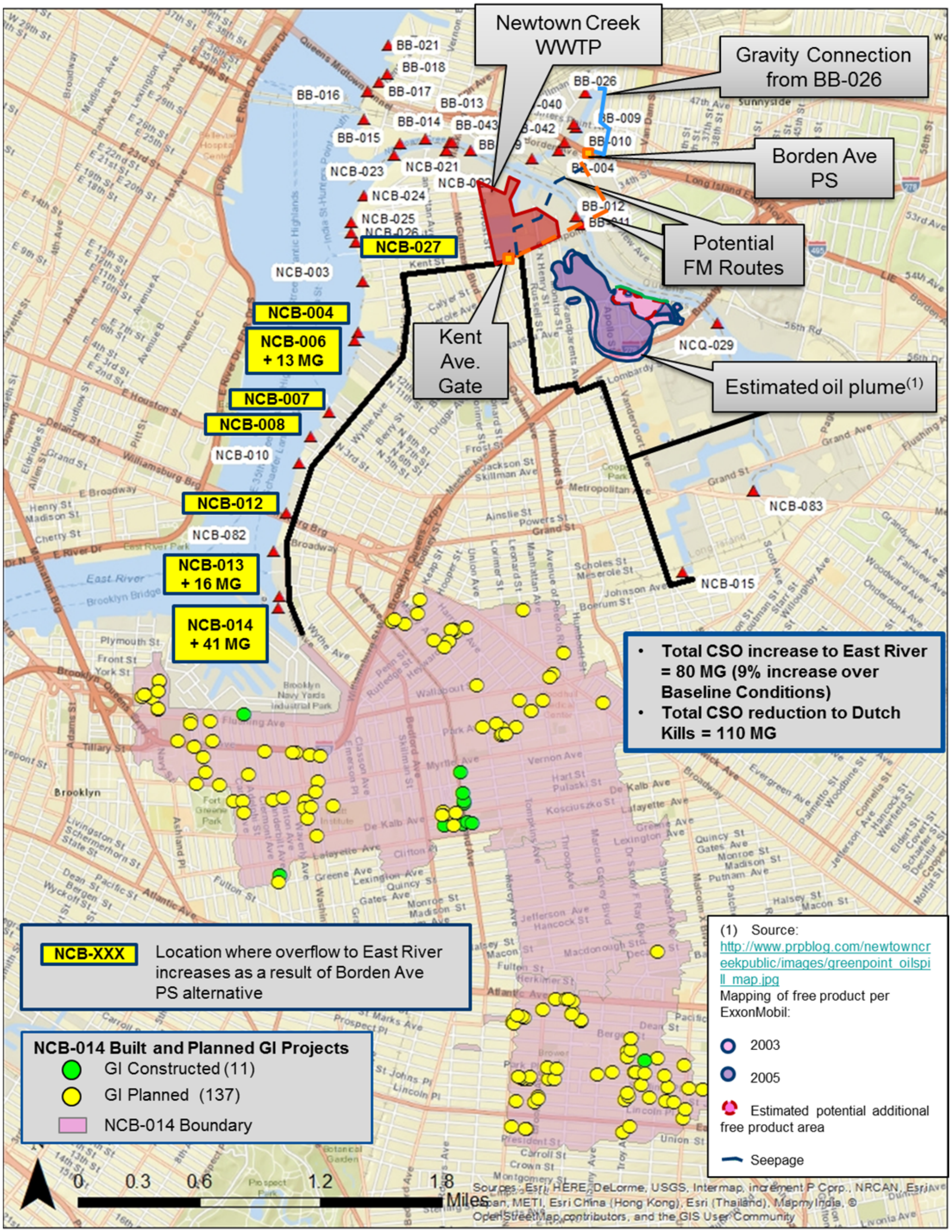

Figure 8-9. Locations of Increase in East River CSO Volume with 75 Percent CSO Control BAPS Expansion Alternative

Diverting wet-weather flow from Outfall BB-026 also results in a reduction in overflow at other CSO outfalls in the Bowery Bay low level system. Most of the additional reduction occurs at Outfall BB-009, in Dutch Kills, while more nominal reductions occur at other Bowery Bay outfalls along Newtown Creek and the East River. Total flow to the Newtown Creek WWTP is increased with this alternative, and total flow to the Bowery Bay WWTP is slightly decreased with this alternative.

The BAPS wet-weather expansion alternative was evaluated for 25, 50, and 75 percent control of the annual discharge from Outfall BB-026. The pumping capacity for 100 percent control would have been over 100 MGD, which would have required a new stand-alone pumping station, significantly increased the volume of overflow to the East River, and potentially have had adverse impacts on the hydraulic grade line in the Kent Avenue system. For these reasons, the 100 percent CSO control option for the BAPS wet-weather expansion was not pursued further.

Table 8-3 summarizes the additional wet-weather flow pumping capacity, force main diameter, and gravity influent sewer diameter associated with the 25, 50 and 75 percent CSO control alternatives for the BAPS expansion.

Table 8-3. Summary for Alternative SO-1

Parameter	Targeted BB-026 Level of Control		
	25%	50%	75%
Additional Wet Weather Flow Pumping Capacity (MGD)	6	13	24
Force Main Diameter (ft)	1.5	2	3
Gravity Conduit Diameter (ft)	2	3	3.5
Net Present Worth ($M)	51	59	71

An individual CSO storage alternative such as a retention tank would require property acquisition through either negotiated acquisition or eminent domain acquisition of developed parcels to provide equivalent levels of control. The maximum annual CSO control that could be implemented with a retention tank without negotiated acquisition or eminent domain land acquisition would be approximately 20 percent. As such, expansion of the BAPS is the only control measure considered throughout the LTCP for developing alternatives up to 75 percent level of control at Outfall BB-026. For 100 percent control, reduction of the discharges from BB-026 would be realized by conveying the flows to a basin-wide solution (i.e., a CSO storage tunnel) that would also capture CSO from the three large upstream Outfalls NC-077, NC-083 and NC-015.

The benefits, costs and challenges associated with the BAPS wet-weather expansion are as follows:

Benefits

Without further site acquisition, this control measure provides up to 75 percent annual CSO control at Outfall BB-026 at a relatively low cost and provides synergies with a SOGR intervention.

Cost

The estimated NPW for this control measure varies by level of control as follows:

- 25 percent CSO control: $51M
- 50 percent CSO control: $59M
- 75 percent CSO control: $71M

Details of the estimate for 75 percent CSO control are presented in Section 8.4. As noted above in Section 8.1, the WQ assessments indicated that the Class SD DO criterion is currently being met in Dutch Kills and the main trunk of Newtown Creek under baseline conditions. Therefore, the previously-proposed Dutch Kills aeration system is recommended to be eliminated. The Engineer's estimated construction bid cost for Phase 4 of Enhanced Aeration covering Dutch Kills and part of lower Newtown Creek was $30.8M. This cost savings would partially offset the cost of the Borden Avenue Pump Station expansion alternative.

Challenges

The challenges associated with this alternative would include:

- Increased CSO volume to the East River.
- Potential construction site constraints due to the location of the Borden Avenue Pumping Station under the highway bridge.
- The force main to the Kent Avenue Gate Structure will need to pass under Newtown Creek, through bulkheads along the shore of Newtown Creek, and under the Long Island Rail Road (LIRR) tracks. Dense utilities will be encountered along Greenpoint Avenue in the vicinity of the Kent Avenue gate.
- The need to maintain the function of the Borden Avenue Pumping Station during construction.
- The potential for interferences with Superfund remedy work related to dredging and/or bulkhead reconstruction.
- The construction of the diversion conduit and force main would require approval of construction within road rights-of-way to be coordinated with the Department of Transportation (DOT).

Floatables Control for Outfalls BB-009, BB-013, and NCQ-029

Sizing Criteria

Figure 8-9a presents a schematic representation of a typical underflow baffle installation for floatables control at a CSO regulator. The intent of the underflow baffle is to retain floating material during the period of time that the hydraulic grade line in the regulator is above the elevation of the overflow weir, minimizing the discharge of floatables during CSO activations. Once the wet weather flows recede, the floatables held behind the baffle would be conveyed to the interceptor through the dry weather underflow connection. Key sizing criteria related to underflow baffle performance include:

- Offset between the bottom of the baffle and the overflow weir crest
- Flow velocity under the baffle during CSO activations
- Headloss created by the underflow baffle

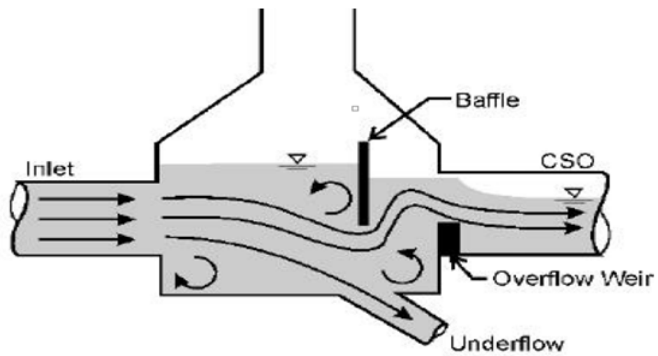

Figure 8-9a. Conceptual Underflow Baffle

For the first two criteria, sizing values were taken from a study of underflow baffle performance conducted at the Alden Research Laboratory in support of the design of underflow baffles and bending weirs for outfalls BB-026, NC-015, NC-077 and NC-083 in the tributaries to Newtown Creek. The findings of that study were summarized in Memoranda dated January 20, 2014[1] and February 27, 2014[2]. The bending weirs and baffles associated with that study have been constructed and are part of the Baseline Conditions for the Newtown Creek LTCP.

The Alden study showed that the floatables retention percentage dropped from about 80 percent to about 50 percent if the velocity under the baffle increased from 1.0 to 1.75 feet per second (ft/sec). To avoid sizing the underflow baffles based on relatively short and infrequent increments of peak flow, the baffles for outfalls BB-009, BB-013, and NCQ-029 were sized to achieve 1 ft/sec at the 90th percentile flow in the 2008 typical year.

[1] *F. Visingardi, O'Brien & Gere/Dewberry JV, to R. DeLorenzo, regarding CS-NCLFO-DES Floatables Retention Efficiency, 1/20/14.*
[2] *F. Visingardi, O'Brien & Gere/Dewberry JV, to R. DeLorenzo, regarding CS-NCLFO-DES Floatables Retention Efficiency, 2/27/14.*

With regard to baffle submergence relative to the weir crest elevation, the Alden study showed that for an offset of 1.0 foot, the floatables retention percentage was just over 75 percent, while for offsets ranging from 0.25 to 0.75 feet, the floatables retention percentage remained relatively constant at just under 75 percent. When the offset was reduced to zero, the retention percentage dropped to under 50 percent. Based on these findings, the offset between the bottom of the baffle and the weir crest for the baffles for outfalls BB-009, BB-013, and NCQ-029 was assumed to be 0.25 feet.

Regarding the headloss created by the underflow baffle, it was assumed that no increase in the baseline peak HGL in the DEP's 5-year, 2-hour design storm upstream of the regulator would be allowed. Thus, the calculated increase in headloss associated with the underflow baffle in the 5-year, 2-hour storm would have to be offset by physical modifications to the regulator that reduced the headloss by an equivalent magnitude.

Given the complex arrangement and hydraulics within the regulators associated with outfalls BB-009, BB-013, and NCQ-029, it is recommended that computational fluid dynamics (CFD) modeling be conducted to confirm the headloss calculations and sizing as part of pre-design planning activities for these outfalls. Subsurface conditions, utility survey, and other site investigations would also be needed to confirm the constructability of the regulator modifications.

Outfall BB-009 (Regulator BBL-3B)

Outfall BB-009 discharges to Dutch Kills. Regulator BBL-3B is located upstream of outfall BB-009, at the intersection of Hunters Point Avenue and 30th Street (Figure 8-9b). The influent combined sewer to Regulator BBL-3B is a 9-ft x 4.5-ft reinforced concrete sewer. The regulator overflows to an 11-ft x 4.5-ft reinforced concrete outfall pipe, and dry weather flows are conveyed to a 6-ft x 4.5-ft interceptor. The existing overflow weir has a crest elevation of 0.0, and the regulator structure includes twin tide gates. Table 8-3a presents key statistics related to Regulator BBL-3B.

Table 8-3a. Summary of Parameters for Regulator BBL-3B (Outfall BB-009)

Parameter	Value
Annual CSO Volume(1)	43.0 MG
Annual CSO Activations(1)	34
90th Percentile Flowrate (MGD) (1)	25 MGD
Peak HGL in 2008 Typical Year(1)	3.08
Peak HGL in DEP 5-year Design Storm(2)	9.21
Peak Overflow Rate in DEP 5-year Design Storm(2)	315 MGD

Notes:
(1) 2008 LTCP Baseline Conditions
(2) 5-year, 2-hour storm, constant tide of 0.86 ft, LTCP Baseline Conditions

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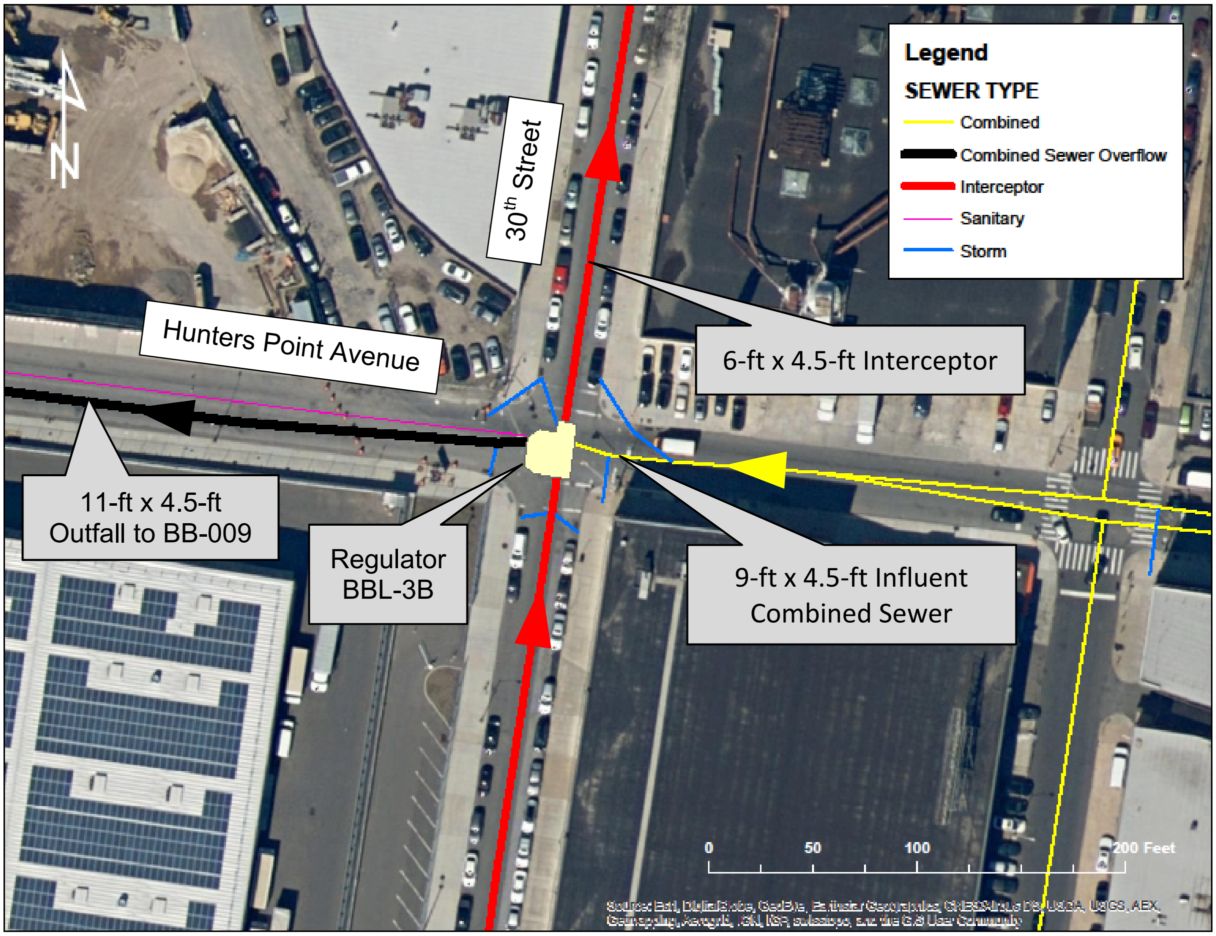

Figure 8-9b. Location of Regulator BBL-3B (Outfall BB-009)

The depth between the weir crest and the invert elevation in the regulator upstream of the weir is only 2.04 feet. In order to achieve the 1.0 ft/sec criterion for the 90th percentile flow with the bottom of the baffle set 0.25 feet below the weir elevation, the weir crest would need to be raised by 0.34 feet. However, when this configuration was assessed with the 5-year, 2-hour storm, the headloss through the regulator was predicted to increase by over 8 feet. Therefore, modifications to the regulator would be needed to offset the predicted increase in headloss associated with the underflow baffle. Through an iterative process, hydraulic neutrality in the 5-year, 2-hour storm was predicted to be achieved through a combination of lengthening the weir and baffle by 6.5 feet, increasing the height of the opening over the weir by 11 inches, and adding a third tide gate. Lengthening the weir and baffle by 6.5 feet would require expanding the existing regulator structure.

Figures 8-9c and 8-9e present the proposed modifications. A bending weir was not considered for this location due to the elevation of the tide relative to the weir crest elevation. The peak high tide in the typical year at this location is approximately elevation 1.5, which is approximately 1.5 feet above the existing weir crest elevation. The modifications to regulator BBL-3B are predicted to reduce the annual activation frequency at outfall BB-009 from 27 to 24, and would increase the annual CSO volume at outfall BB-009 by about 1 MG (due to the reduction in headloss at the outfall during bigger storms). However, the annual volume at the hydraulically-related outfall BB-026 would drop by about 1 MG, resulting in no net change in the total annual volume of CSO to Dutch Kills. No other outfalls in the BBL system would be affected by this project.

Based on a preliminary siting assessment, sufficient space appears to be available in the intersection of Hunters Point Avenue and 30th Street to accommodate the expansion of the regulator structure. Relocation of some utilities may be required. The estimated probable bid cost for this work would be approximately $10M. No significant change in annual O&M cost is anticipated.

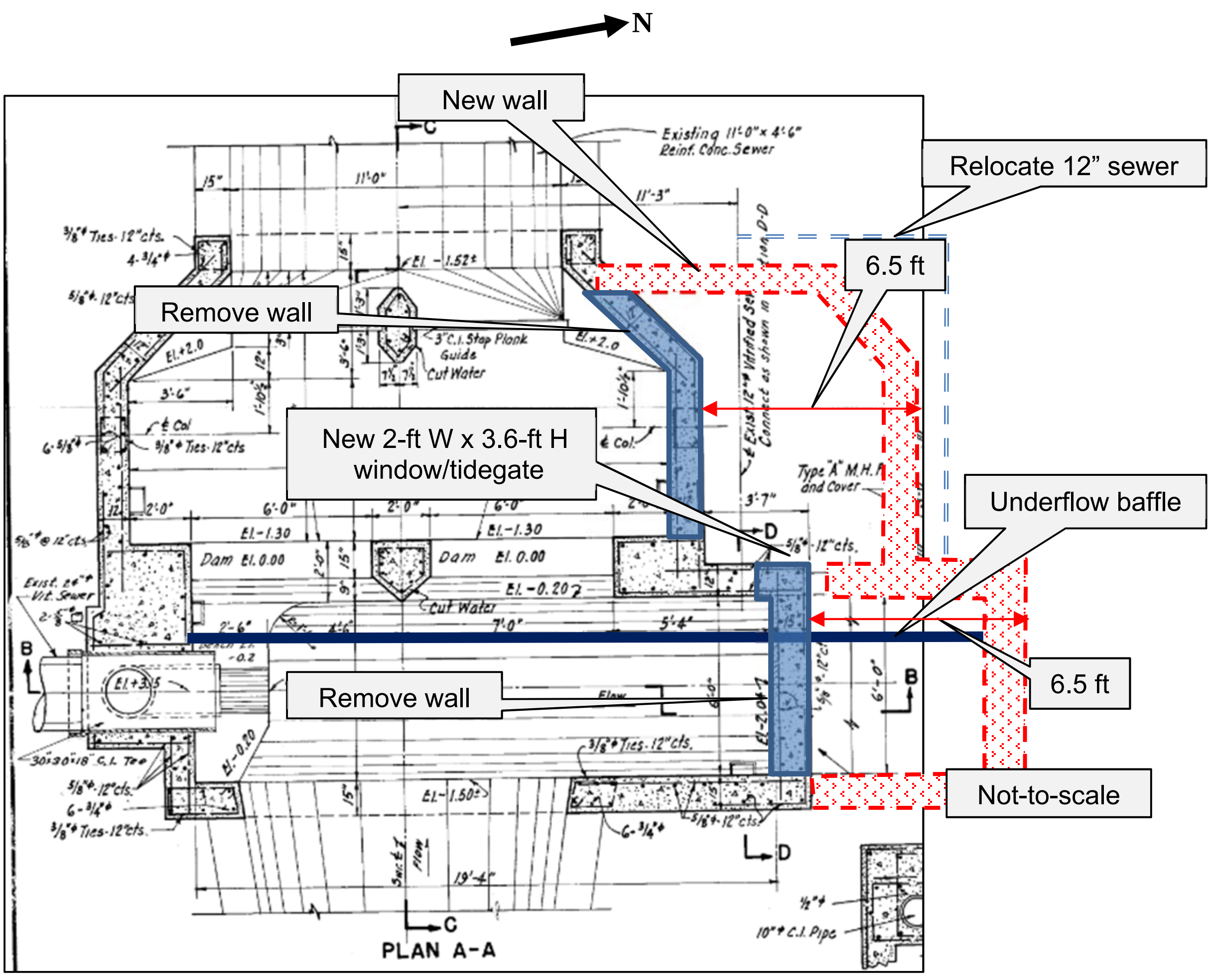

Figure 8-9c. Plan view of regulator modifications for underflow baffle at Regulator BBL-3B (Outfall BB-009)

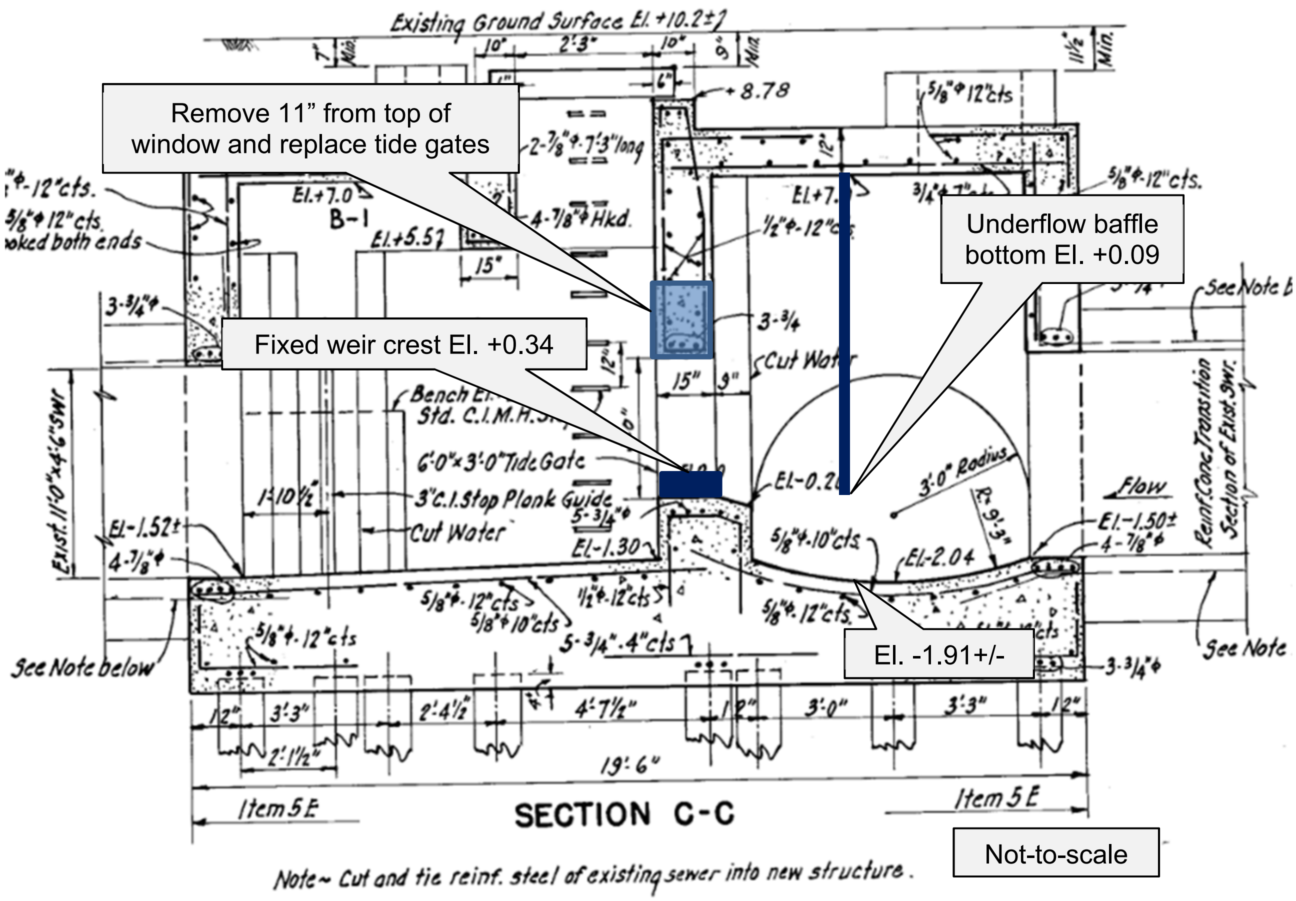

Figure 8-9d. Section view of regulator modifications for underflow baffle at Regulator BBL-3B (Outfall BB-009)

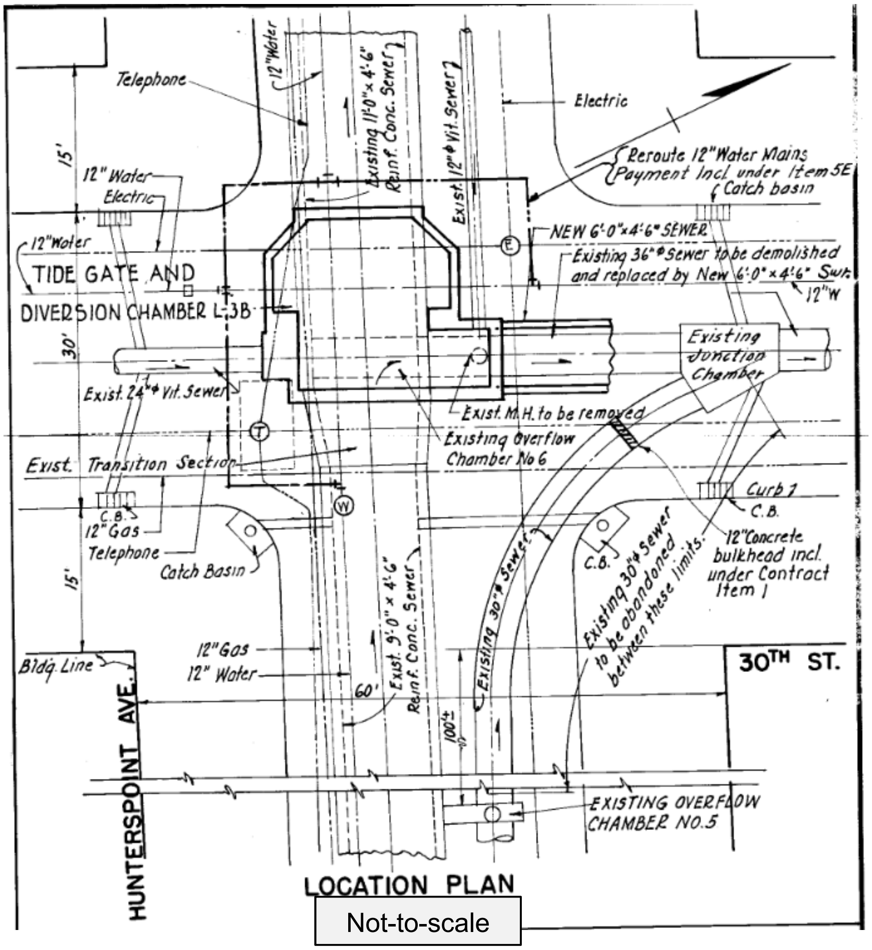

Figure 8-9e. Location plan for regulator modifications for underflow baffle at Regulator BBL-3B (Outfall BB-009)

Outfall BB-013 (Regulator BBL-8)

Outfall BB-013 discharges to Newtown Creek adjacent to the Pulaski Bridge. Regulator BBL-8 is located upstream of outfall BB-013, on 11th Street between 53rd Avenue and Newtown Creek (Figure 8-9f). The influent combined sewer to Regulator BBL-8 is 6-ft diameter. The regulator overflows to a 6-ft diameter outfall pipe, and dry weather flows are conveyed to a 2-ft diameter interceptor. The existing overflow weir has a crest elevation of -5.0, and the regulator structure includes a single tide gate. Table 8-3b presents key statistics related to Regulator BBL-8.

Table 8-3b. Summary of Parameters for Regulator BBL-8 (Outfall BB-013)

Parameter	Value
Annual CSO Volume(1)	16.2 MG
Annual CSO Activations(1)	31
90th Percentile Flowrate (MGD) (1)	7.5 MGD
Peak HGL in 2008 Typical Year(1)	1.76
Peak HGL in DEP 5-year Design Storm(2)	1.46
Peak Overflow Rate in DEP 5-year Design Storm(2)	63 MGD

Notes:
(1) 2008 LTCP Baseline Conditions
(2) 5-year, 2-hour storm, constant tide of 0.86 ft, LTCP Baseline Conditions

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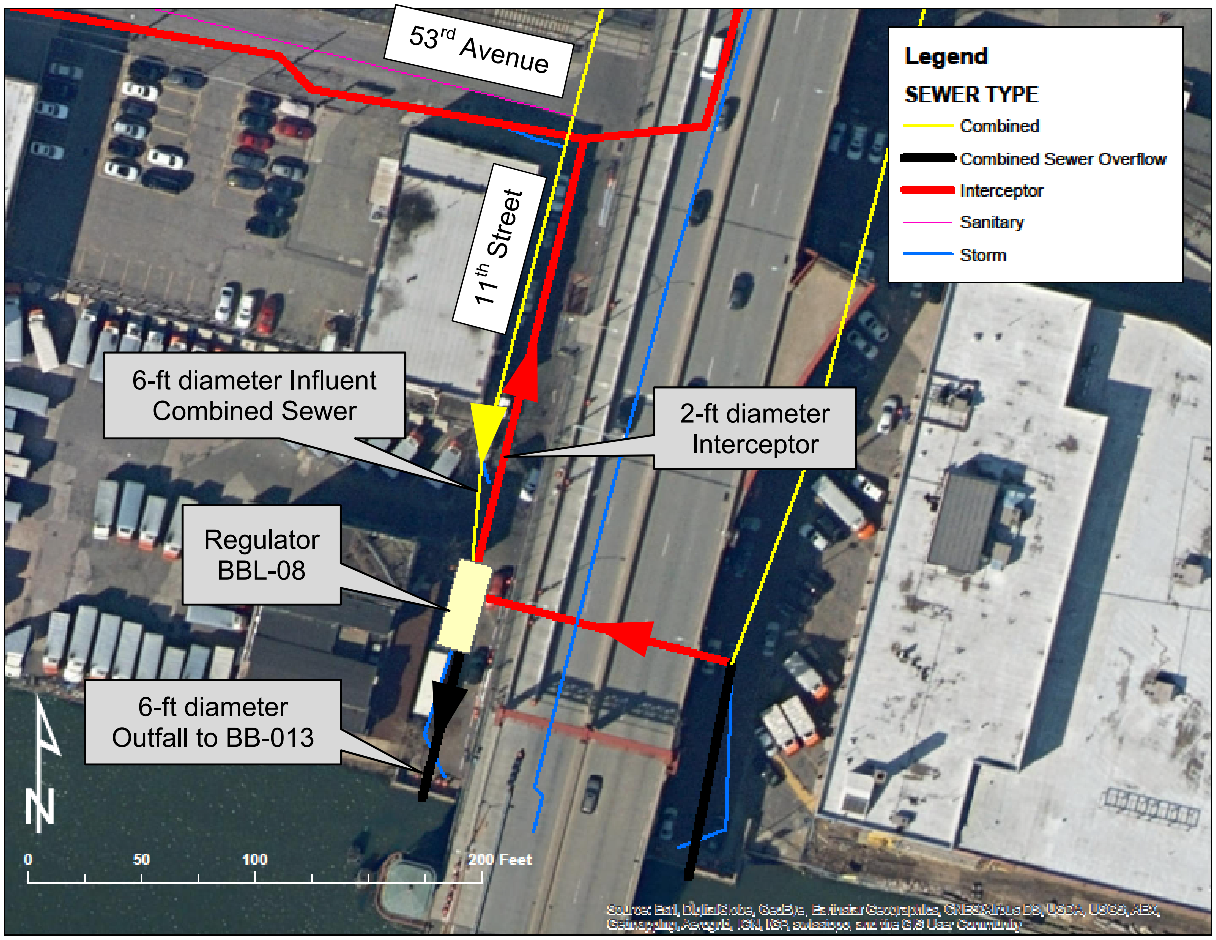

Figure 8-9f. Location of Regulator BBL-8 (Outfall BB-013)

The depth between the weir crest and the invert elevation in the regulator upstream of the weir is only 1.42 feet. In order to achieve the 1.0 ft/sec criterion for the 90th percentile flow with the bottom of the baffle set 0.25 feet below the weir elevation, the weir crest would need to be raised by 0.8 feet. However, when this configuration was assessed with the 5-year, 2-hour storm, the headloss through the regulator was predicted to increase by just under 3 feet. Therefore, modifications to the regulator would be needed to offset the predicted increase in headloss associated with the underflow baffle. Through an iterative process, hydraulic neutrality in the 5-year, 2-hour storm was predicted to be achieved by expanding the regulator/tidegate structure to allow lengthening of the underflow baffle by 8.75 feet, and lengthening the overflow weir by 4.75 feet. A new overflow opening with a new tide gate would be needed to provide the additional 4.75 feet of weir length. These modifications would require the west side of the regulator/tidegate structure to be extended by 8.75 feet. Figures 8-9g to 8-9i present the required modifications. A bending weir was not considered for this location due to the elevation of the tide relative to the weir crest elevation. The peak high tide in the typical year at this location is approximately elevation 1.5, which is approximately 6.5 feet above the existing weir crest elevation.

As indicated in Figure 8-9i, expanding the regulator by 8.75 feet would extend the structure past the building line along 11th Street. Based on a preliminary siting assessment, there does not appear to be sufficient space between the regulator structure and the building line along 11th Street to expand the regulator by 8.75 feet. Expansion on the other side of the structure would not be feasible due to the proximity of the bridge footing and the presence of the adjacent regulator structure. In conclusion, due to siting constraints, an underflow baffle would not be feasible at Regulator BBL-8.

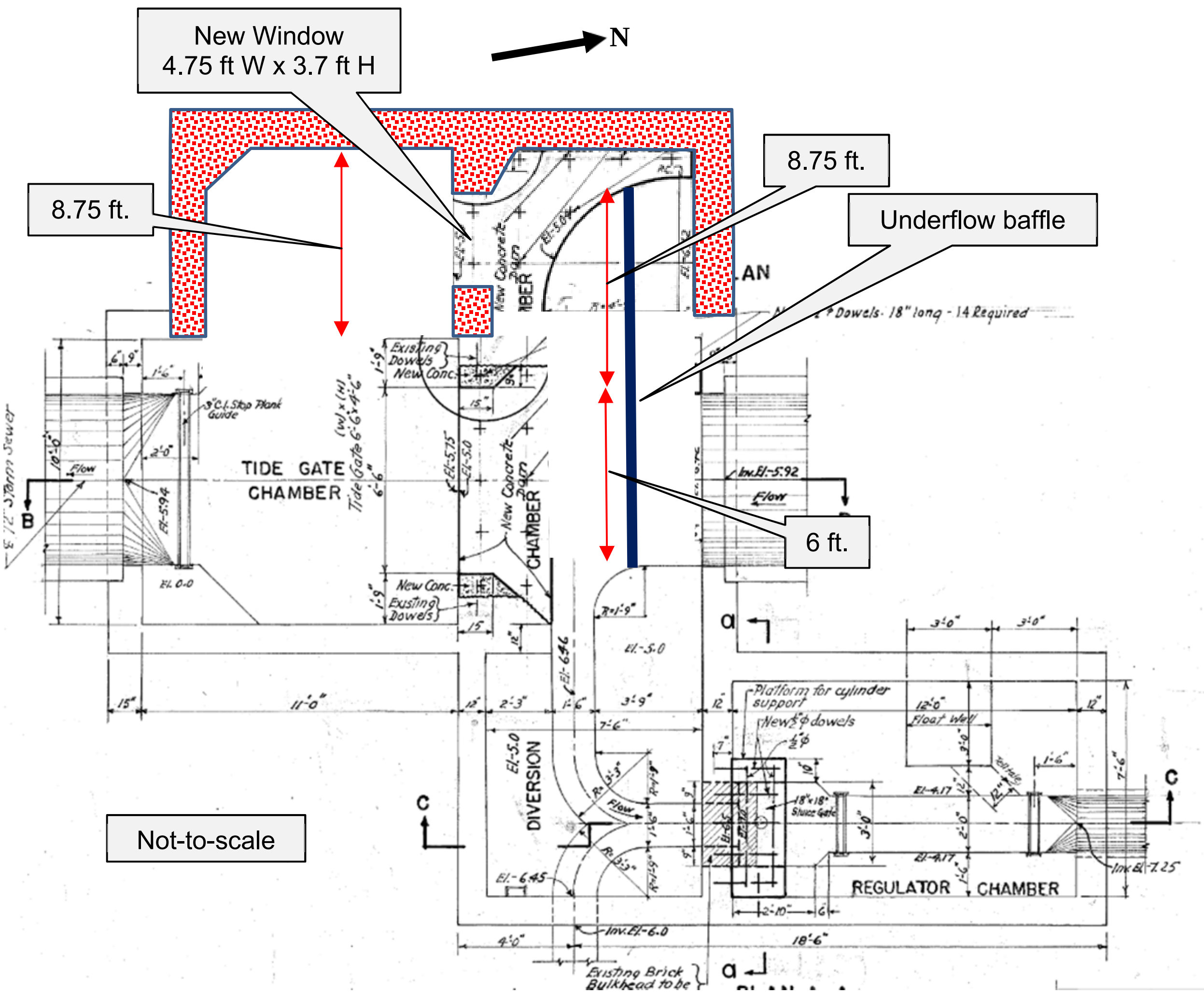

Figure 8-9g. Plan view of regulator modifications for underflow baffle at Regulator BBL-8 (Outfall BB-013)

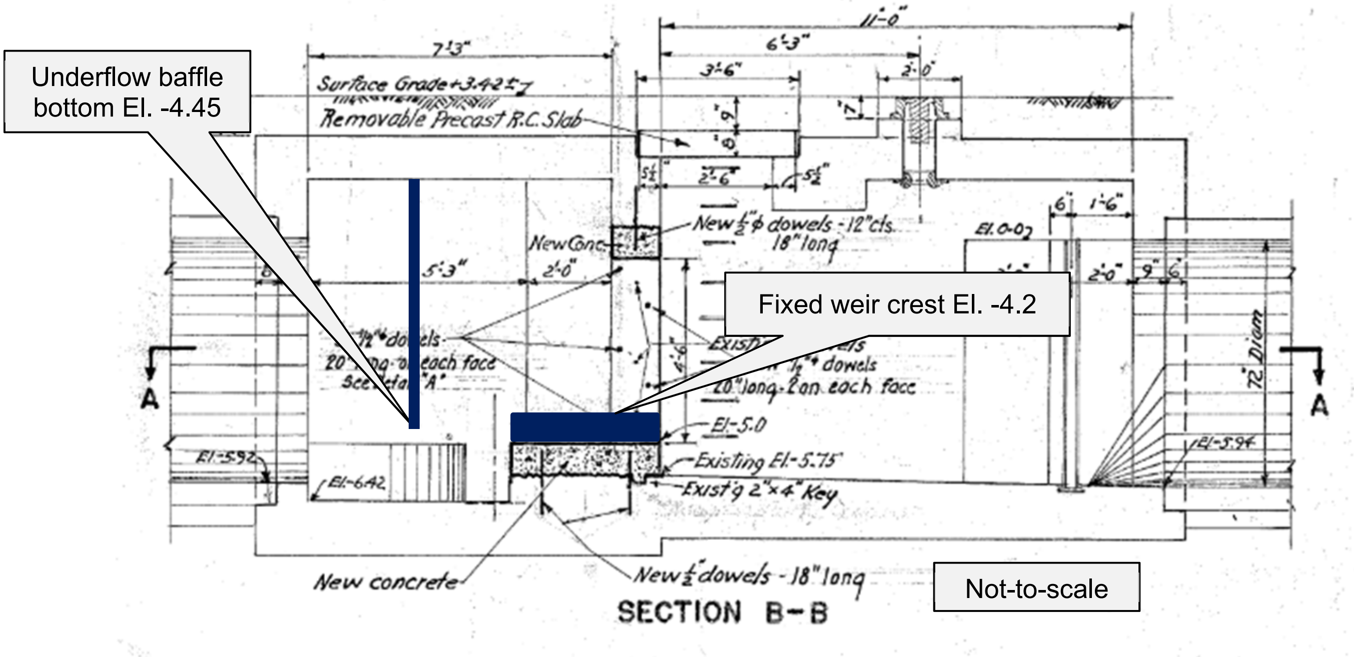

Figure 8-9h. Section view of regulator modifications for underflow baffle at Regulator BBL-8 (Outfall BB-013)

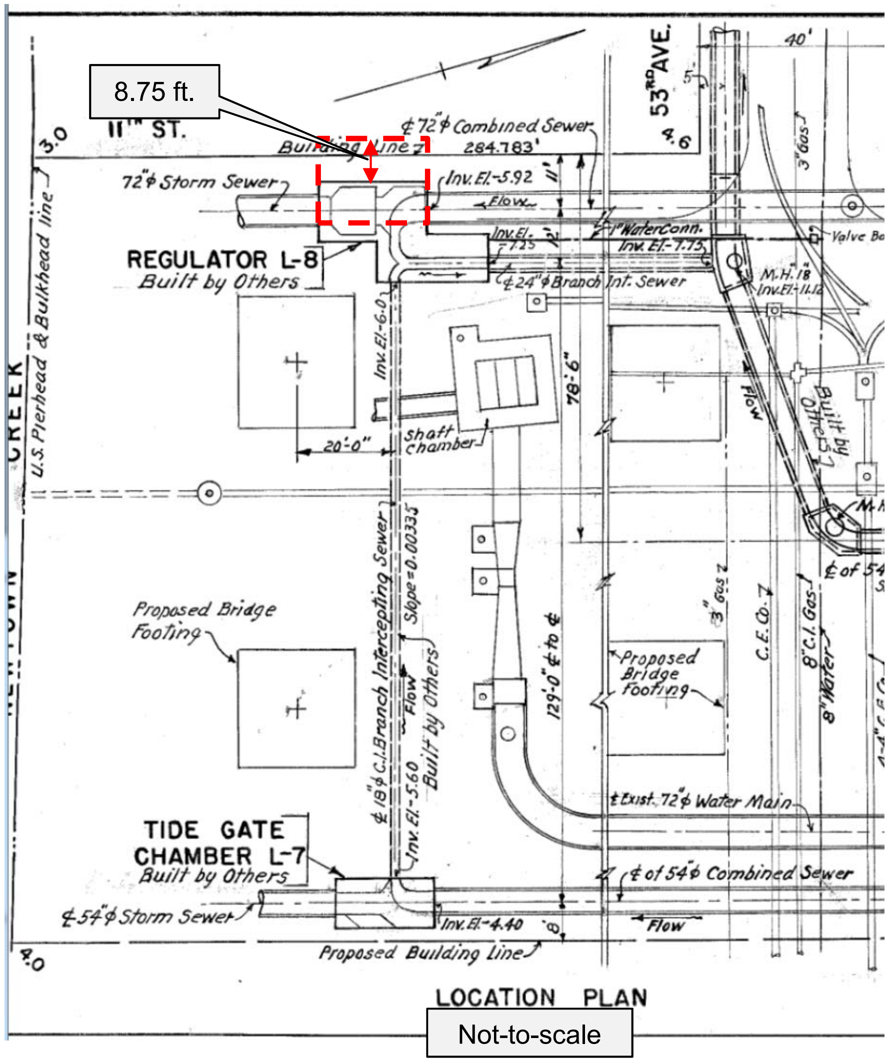

Figure 8-9i. Location plan for regulator modifications for underflow baffle at Regulator BBL-8 (Outfall BB-013)

Outfall NC-029 (Regulator NCQ-2)

Outfall NC-029 discharges to Newtown Creek just downstream of Maspeth Creek. Regulator NCQ-2 is located upstream outfall NC-029, on 43rd Street at 56th Road (Figure 8-9j). The influent combined sewer to Regulator NCQ-2 is a 3.75-ft diameter reinforced concrete sewer. The regulator overflows to a 5.5-ft diameter outfall pipe, and dry weather flows are conveyed to a 1.5-ft diameter combined sewer. The existing overflow weir has a crest elevation of 8.09. Since the weir crest elevation is well above high tide, the regulator structure does not have a tide gate. Table 8-3c presents key statistics related to Regulator NCQ-2.

Table 8-3c. Summary of Parameters for Regulator NCQ-2 (Outfall NC-029)

Parameter	Value
Annual CSO Volume(1)	18.7 MG
Annual CSO Activations(1)	40
90^{th} Percentile Flowrate (MGD) (1)	7.5 MGD
Peak HGL in 2008 Typical Year(1)	10.13
Peak HGL in DEP 5-year Design Storm(2)	12.01
Peak Overflow Rate in DEP 5-year Design Storm(2)	107 MGD

Notes:
(1) 2008 LTCP Baseline Conditions
(2) 5-year, 2-hour storm, constant tide of 0.86 ft, LTCP Baseline Conditions

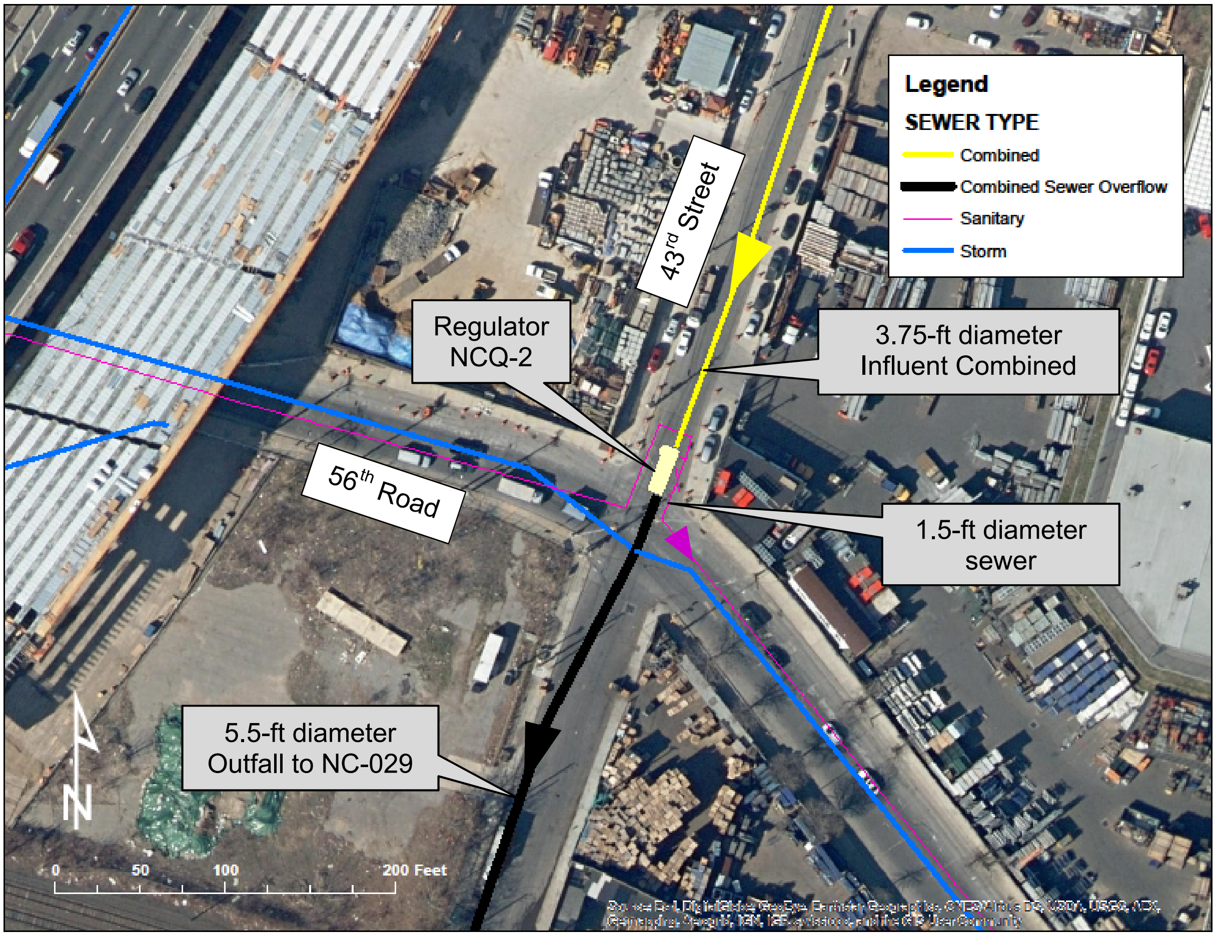

Figure 8-9j. Location of Regulator NCQ-2 (Outfall NC-029)

The depth between the weir crest and the invert elevation in the regulator upstream of the weir is only 1.0 foot. In order to achieve the 1.0 ft/sec criterion for the 90th percentile flow with the bottom of the baffle set 0.25 feet below the weir elevation, the weir crest would need to be raised by 0.7 feet. However, when this configuration was assessed with the 5-year, 2-hour storm, the headloss through the regulator was predicted to increase by over 10 feet. Therefore, modifications to the regulator would be needed to offset the predicted increase in headloss associated with the underflow baffle. Since the existing weir crest elevation is not influenced by the tide, a bending weir was considered as an option to reduce the needed lengthening of the weir. Through an iterative process, hydraulic neutrality in the 5-year, 2-hour storm was predicted to be achieved by expanding the regulator structure to allow lengthening of the underflow baffle by 7.5 feet, and providing a 1.25-foot high, 15.5-foot long bending weir. These modifications would require the west side of the regulator structure to be extended by 7.5 feet, with an additional 12 feet added for the counterweight chamber. Figures 8-9k to 8-9m present the proposed modifications. The modifications to regulator NCQ-2 are predicted to reduce the annual activation frequency at outfall NC-029 from 40 to 37, and would decrease the annual CSO volume at outfall NC-029 by about 0.7 MG. No other outfalls in the Newtown Creek WWTP system would be affected by this project.

Based on a preliminary siting assessment, sufficient space appears to be available in the intersection of 56th Road and 43rd Street to accommodate the expansion of the regulator structure. However, it appears that relocation of a 12-inch sewer, along with water, gas and electric utilities would be required. If a counterweight chamber is required for the bending weir, there may not be sufficient space between the new structure and the edge of the right-of-way to relocate those utilities. If an alternative type of bending weir is provided that does not require the counterweight structure, then it may be feasible to relocate those utilities within the right-of-way. A more detailed utility survey and evaluation of bending weir types will be needed in order to confirm the feasibility of this alternative. If feasible, the estimated probable bid cost for this work would be approximately $15M. The annual O&M cost is estimated at $36,400/year, and the NPW would be $15.5M.

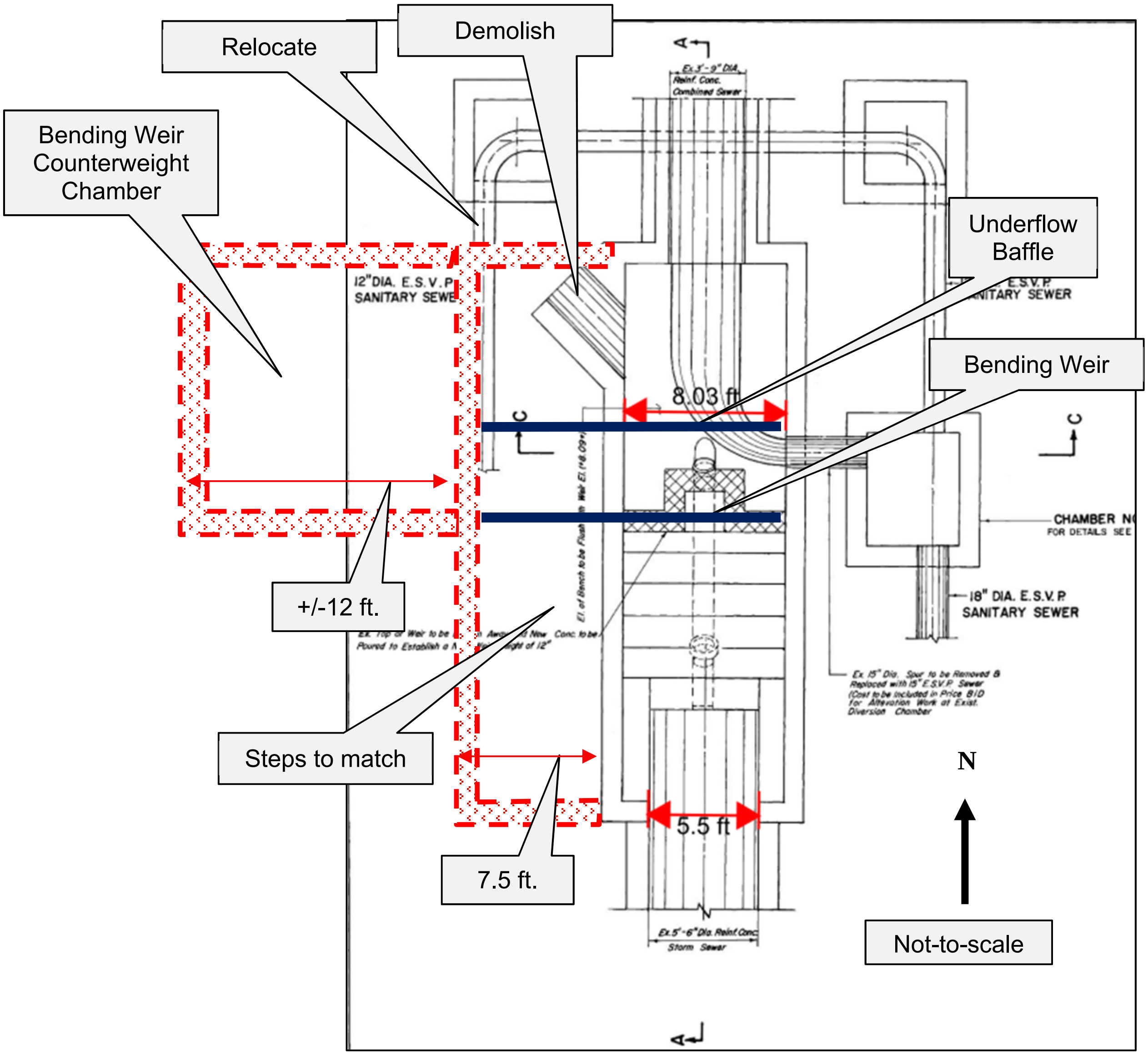

Figure 8-9k. Plan view of regulator modifications for underflow baffle at Regulator NCQ-2 (Outfall NC-029)

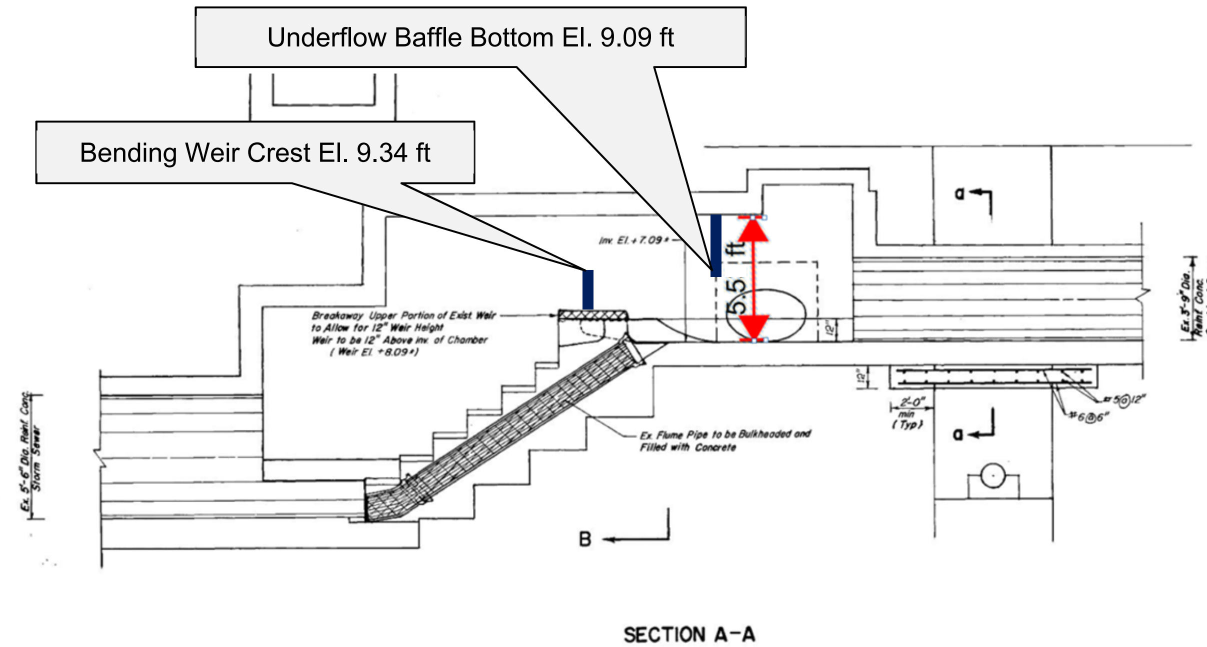

Figure 8-9l. Section view of regulator modifications for underflow baffle at Regulator NCQ-2 (Outfall NC-029)

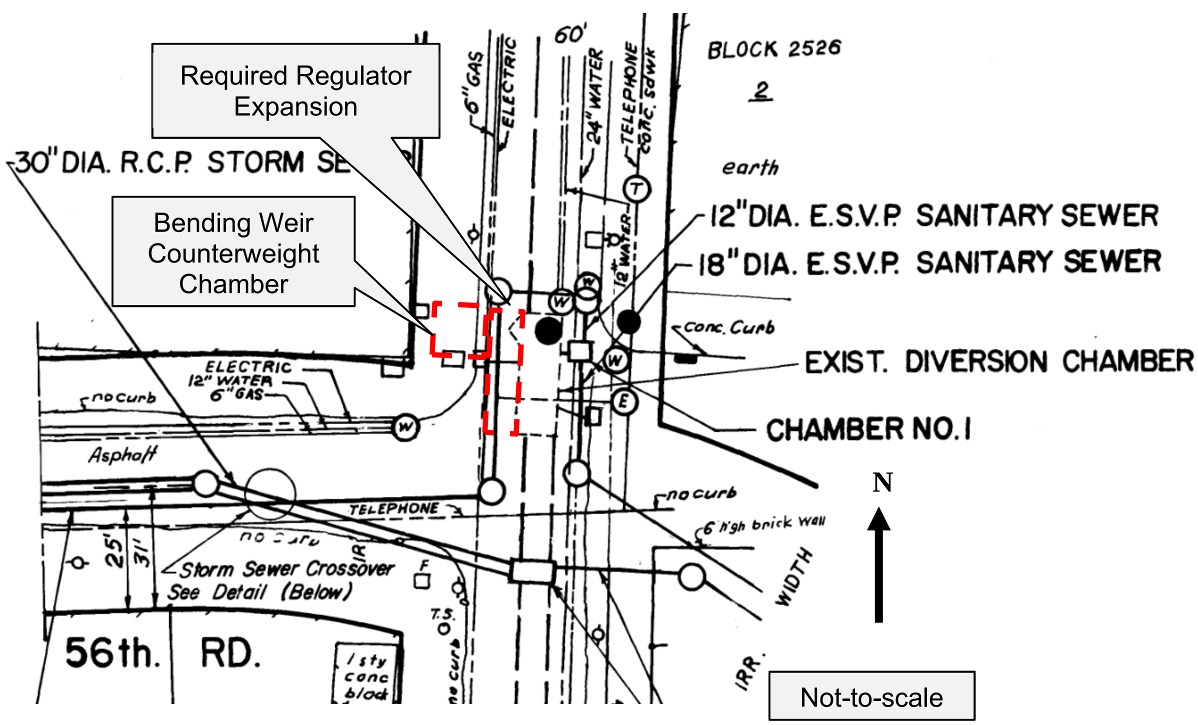

Figure 8-9m. Location plan for regulator modifications for underflow baffle at Regulator NCQ-2 (Outfall NC-029)

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Summary of Floatable Control Evaluation

Table 8-3d summarizes the findings of the evaluation of underflow baffles for floatables control at outfalls BB-009, BB-013, and NCQ-029. In terms of reduction in overall floatables loadings to Newtown Creek, it is noted that the Recommended Plan for Newtown Creek will reduce the CSO volume (and associated floatables load) from outfalls NC-15, NC-77 and NC-83 by 62.5 percent, and from outfall BB-026 by 75 percent. Of the 449 MG/yr of CSO to Newtown Creek remaining after implementation of the Recommended Plan, 359 MG (80 percent) will occur at outfalls NC-15, NC-77, NC-83 and BB-026, where the bending weirs and underflow baffles currently installed at the regulators associated with those outfalls will control floatables for the remaining discharges. Outfalls BB-009 and NCQ-029 represent 10 percent (46 MG) of the remaining 449 MG of CSO to Newtown Creek, leaving 44 MG (10 percent) without structural floatables control. However, DEP's BMP programs, including hooded catchbasins, catchbasin cleaning, street sweeping, and public engagement on litter control, will contribute to controlling floatables at those remaining outfalls. In accordance with direction from DEC, a floatables monitoring program will be implemented at outfalls BB-009 and NCQ-029 to determine whether the structural floatables control alternatives developed for those two outfalls will be required to be implemented.

Table 8-3d. Summary of Floatable Control Evaluation for Outfalls BB-009, BB-013, and NCQ-029

Outfall/Regulator	Modifications Required for Floatables Control with Hydraulic Neutrality(1)	Implementation Feasible?(2)	Estimated Probable Bid Cost
Outfall BB-009; Reg. BBL-3B	• Raise the static weir by 0.34 feet • Expand the north side of the structure by 6.5 feet • Lengthen the static weir by 6.5 feet • Provide an underflow baffle with bottom set 0.25 feet below the weir crest, extending the length of the weir • Increase the height of the opening over the weir by 11 inches • Add a third tide gate	Yes	$10 M
Outfall BB-013, Reg. BBL-8	• Raise the static weir by 0.8 feet • Expand the west side of the structure by 8.75 feet • Provide a new 4.75-foot wide overflow weir with a tide gate • Provide an underflow baffle with bottom set 0.25 feet below the weir crest, extending the length of the existing and new weir	No	N/A(3)

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Table 8-3d. Summary of Floatable Control Evaluation for Outfalls BB-009, BB-013, and NCQ-029

Outfall/Regulator	Modifications Required for Floatables Control with Hydraulic Neutrality(1)	Implementation Feasible?(2)	Estimated Probable Bid Cost
Outfall NCQ-029, Reg. NCQ-2	• Provide a 1.25-foot high, 15.5-foot long bending weir • Expand the west side of the structure by 7.5 feet to accommodate the bending weir • Provide a counterweight chamber next to the expansion on the west side of the structure • Provide an underflow baffle with bottom set 0.25 feet below the weir crest, extending the length of the bending weir	Needs more detailed assessment to confirm utility relocations	$15 M

8.2.a.2 CSO Relocation

Gravity Flow Tipping to Other Watersheds: This concept would involve conveying overflows by gravity from one receiving water to another receiving water, where the second receiving water would either be less sensitive or provide greater dilution/assimilation than the one from which the CSO is being diverted. A number of potential gravity flow tipping alternatives were identified and initially evaluated, but none were determined to provide significant opportunity to warrant pursuing this solution further. Options evaluated included the following:

Diversion from NCB-015 to NCB-014. Gravity diversion of flows was evaluated across the boundary between the subcatchments of outfalls NCB-015 and NCB-014, which discharge to Newtown Creek and the East River, respectively. A subsequent analysis of the conveyance network and the subcatchment boundaries revealed that the concept would relocate only flows generated by a very limited portion of the NC-015 drainage area, with limited benefit in terms of CSO reduction. As a result, this alternative was eliminated from further consideration.

Diversion from BB-026. Multiple gravity conveyance relief solutions were evaluated for CSO mitigation at Outfall BB-026. These alternatives primarily considered improving conveyance of combined sewage upstream and downstream of Regulator BLL-4 (Outfall BB-026). Multiple discharge locations along the Bowery Bay low level interceptor as well as the headworks of the Bowery Bay WWTP were evaluated. Consistent with the analyses conducted in the June 2011 WWFP, these concepts proved either hydraulically infeasible or extremely challenging to implement due to constructability restraints imposed by the dense transportation network along the potential routes, most notably the LIRR tracks and yard and Metropolitan Transportation Authority subway lines. As a result, these concepts were also eliminated from further consideration.

Morgan Avenue Prioritization. For the direct Newtown Creek WWTP sewershed, assessments were conducted to evaluate potential options to prioritize flow from the Morgan Avenue Interceptor to the plant. The performance gains from the various evaluated concepts were limited by the conveyance capacity of the Morgan Avenue Interceptor. As a result, these CSO relocation concepts for the Newtown Creek WWTP sewershed were also eliminated from further consideration.

Flow Tipping with Conduit/Tunnel and Pumping: This control measure would be similar to gravity flow tipping, but the conveyance of flow to another receiving water would require pumping. This concept was evaluated for Outfall NC-077 as described below.

Alternative CR-1: Alternative SO-1 + New Pumping Station at Outfall NC-077.

A 2.8-acre DEP owned parcel is located adjacent to the alignment of the existing NC-077 outfall and Regulator NCQ-01, providing the potential opportunity to utilize the site for a CSO control facility. One option would be to divert overflow from Outfall NC-077 to a new wet-weather pumping station on that site. The pumping station would discharge the flow through a long force main (9,800 LF) to a location upstream of the Kent Avenue Gate Structure, similar to the concept described above for Outfall BB-026. The required pumping rates for the various levels of control are shown in Table 8-4. Figure 8-10 shows the conceptual layout of Alternative CR-1.

Table 8-4. Summary of Parameters for Alternative CR-1

NC-077 CSO Control	25%	50%	75%
PS Cap.(MGD)	14	35	75
Force Main Diameter (ft)	2.5	3.5	5

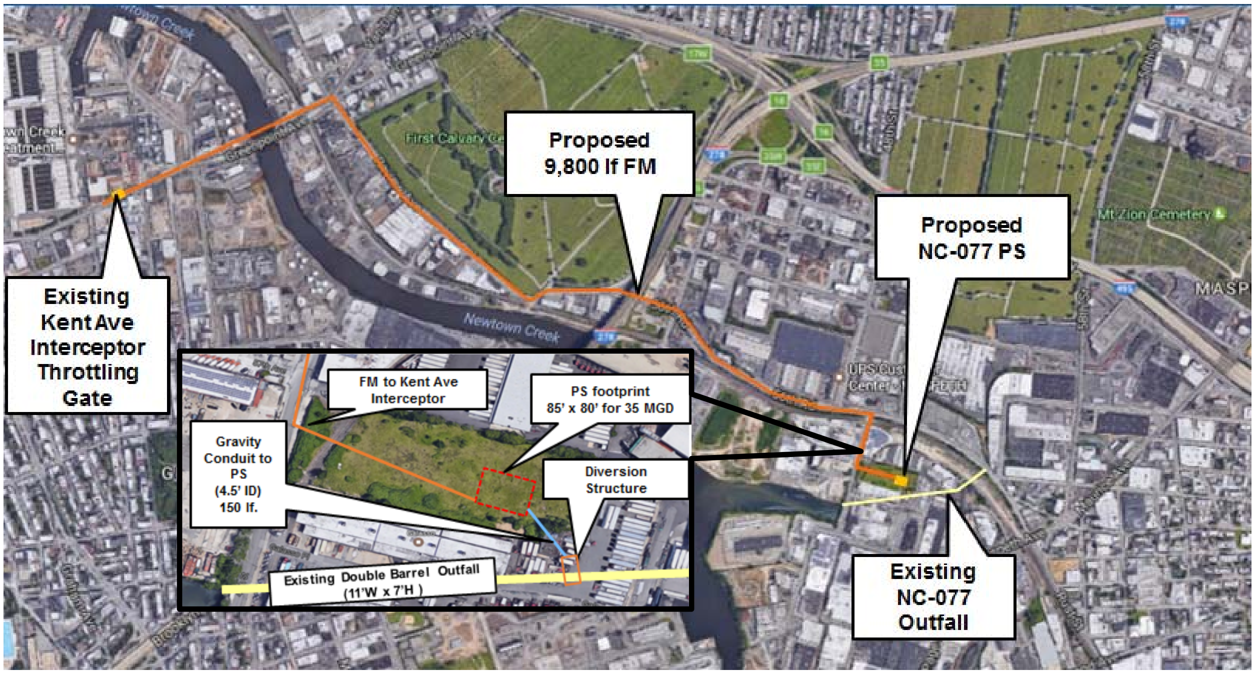

Figure 8-10. Layout of New Pumping Station at Outfall NC-077 part of Alternative CR-1

As with the BAPS alternative for Outfall BB-026, the pumping rate required to achieve 100 percent CSO control at Outfall NC-077 was excessive (482 MGD), so the 100 percent control option for this alternative was not evaluated further. Because of the large force main diameter required for the 75 percent level of control, and the cumulative impacts of this alternative with the BAPS alternative (SO-1) on the Kent Avenue interceptor performance, only the 50 percent CSO control option was evaluated further. Even at the 50 percent control level, the volume of additional overflow at the East River outfalls upstream of the Kent Avenue gate would further increase over the values presented for Alternative SO-1. The total increase in overflow volume to the East River for this alternative would be 187 MG, with a 100-MG increase at Outfall NC-014 alone.

Benefits

CSO discharges would be reduced from Maspeth Creek, a tributary with poor tidal exchange.

Cost

The preliminary estimated NPW for this control measure is $114M for 50 percent CSO control.

Challenges

The challenges associated with this control measure include:

- Although DEP owns the site of the proposed pumping station, other competing needs within DEP may affect the availability of the site for a wet-weather pumping station.

- The measure does not appear to be cost-effective when compared to broader solutions that could also target capture of the two other large CSO outfalls (NC-083 and NC-015) in the headwaters of the Creek and would result in increased CSO discharges at other outfalls.
- The long force main route would require multiple micro-tunneling launching stations with associated siting risks and disruption to the heavy industrial traffic in the neighborhood.
- The significant increase in additional volume discharged at the East River outfalls would likely require mitigation.

8.2.a.3 Water Quality/Ecological Enhancements

The control measures under the category of Water Quality/Ecological Enhancements are not CSO reduction measures but, rather, focus on enhancing the water quality through other approaches. As noted above, floatables control is currently being implemented at the four largest outfalls to Newtown Creek, and mechanical aeration systems have been or are being installed in English Kills and East Branch. Dredging was not considered under this LTCP because EPA is evaluating dredging alternatives for Newtown Creek under the Superfund process. At public meetings conducted during the development of the Newtown Creek LTCP, comments were received that expressed an interest in ecological enhancements/wetlands restoration along the banks of Dutch Kills. Given the existing volumes and peak flows from Outfall BB-026, a wetlands treatment system for Dutch Kills did not appear to be practical. However, wetlands plantings along the banks of Dutch Kills, similar to the pilot installation installed at the head of Dutch Kills, would likely be more feasible. However, the timing of wetlands restoration along the banks of Dutch Kills would depend on the scope and timing of any dredging and/or shoreline work that may be included in the Superfund ROD. For this reason, wetlands restoration along the Dutch Kills shoreline is not included as recommendation in this LTCP.

Flushing tunnels were ruled out for Maspeth Creek, East Branch and English Kills due to the length and cost of a tunnel to convey East River water to those upstream locations. An initial concept for a flushing tunnel was developed for Dutch Kills. This alternative included a 50-MGD pumping station located along Newtown Creek near the mouth of Dutch Kills, and a force main from the pumping station to the head end of Dutch Kills. The cost of this alternative would have been approximately the same as the BAPS wet-weather pumping alternative (SO-1) described above. However, because the flushing tunnel alternative would not have reduced the CSO volume to Dutch Kills, whereas the BAPS alternative would remove up to 75 percent of the annual volume, the flushing tunnel alternative was not pursued further.

The gap analysis presented in Section 6 indicated that for the receiving water stations in and upstream of Dutch Kills (Stations NC-5 to NC-9), the Class SD DO criterion was met more than 95 percent of the time on an average annual basis under baseline conditions. As a result, in-stream mechanical aeration is not recommended for Dutch Kills and the reach of Newtown Creek between Dutch Kills and Station NC-9. However, aeration was deemed to still be needed in English Kills and East Branch.

8.2.a.4 Retention/Treatment Alternatives

A number of the control measures considered for Newtown Creek fall under the dual category of treatment and retention. For purposes of this LTCP, the term “storage” is used in lieu of “retention.” These control measures include in-line or in-system storage, off-line tanks and deep tunnel storage. Treatment refers to disinfection in either CSO outfalls or at RTBs. A discussion of the retention/treatment alternatives evaluated follows.

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Evaluation of Retrofitting and Re-purposing of Existing Infrastructure for Retention/Treatment

Initial evaluations focused on maximizing the performance of existing infrastructure to capture and/or treat CSO discharges. Alternative OTF-1 and OTF-2 evaluated opportunities to modify Outfalls NC-077 and NC-083 for outfall storage or disinfection. The lengths of Outfalls NC-015 and BB-026 downstream of the respective regulators were too short to consider for outfall storage or disinfection.

Alternative OTF-1: In-line Storage at Outfalls NC-077 and NC-083

Outfall NC-077 is a 720-foot-long, twin-barrel, 11-ft W x 7-ft H conduit, and Outfall NC-083 is a 1,250-foot-long, 17-ft W x 13-ft H single-barrel conduit. Both outfalls run at a relatively flat slope, and were of sufficient length and size to be considered for outfall storage. Figure 8-11 shows the longitudinal profile for the NC-083 outfall barrel. To modify the outfalls for in-line storage, a weir structure would be required at the downstream end, with a small dewatering pumping station. In small storms, the outfall would fill up to the elevation of the weir, and the stored flow would be pumped back to the interceptor system at the end of the storm. In larger storms, higher flows would overflow the weir and continue to discharge, but at the end of the storm, the flow remaining behind the weir would still be pumped back to the interceptor.

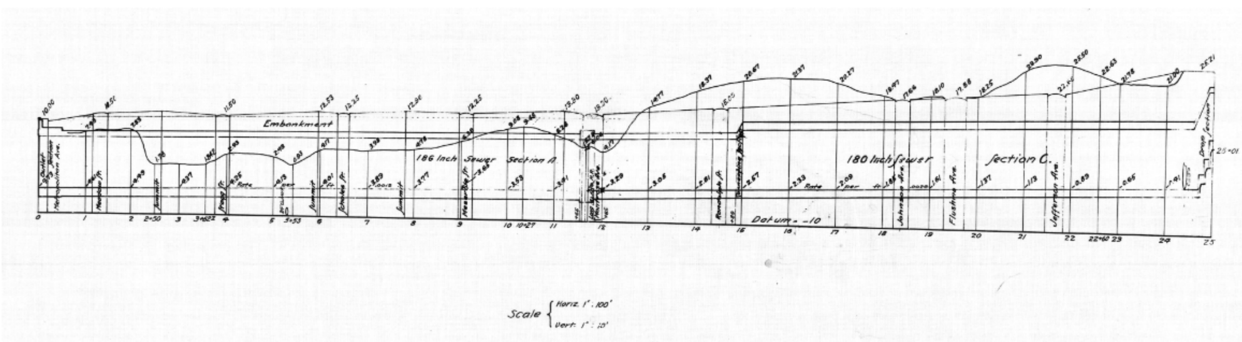

Figure 8-11. Longitudinal Profile of NC-083 Outfall Barrel.

An analysis was conducted to determine the maximum potential CSO reduction that could be achieved through outfall storage at each of these two longer outfall barrels. Table 8-5 summarizes the key characteristics of each outfall and the approximate maximum potential CSO level of control that could be achieved for Outfalls NC-077 and NC-083.

Table 8-5. Key Outfall Characteristics (NC-077 and NC-083)

Parameter	NC-077	NC-083
Length (lf)	720	1,250
Cross-section (W x H)	11 ft x 7 ft	17 ft x 13 ft
Number of Barrels	2	1
Percent Reduction in Annual Volume with Storage Only	2%	2%

As shown in Table 8-5, neither outfall would provide an appreciable amount of in-line storage. To achieve even the levels of storage stated, a number of separate storm drains that connect to the outfalls downstream of the CSO regulator would have to be re-routed. Given the potential costs of this alternative and the limited CSO reduction benefit, this alternative was eliminated from further consideration.

Alternative OTF-1: Disinfection at Outfalls NC-077 and NC-083

Building upon the maximum potential in-line storage volume that could be provided by Alternative OTF-1 at both the NC-077 and NC-083 outfalls, an analysis was also performed of the outfall disinfection opportunities associated with these two long outfalls. The concept for this alternative would be to dose sodium hypochlorite just downstream of the regulator, and use the volume in the outfall for disinfection contact time. Using a 15-minute chlorination contact time, it was determined that the maximum seasonal level of CSO control would not exceed 22 percent for NC-077 and 24 percent for NC-083. Given the limited benefit, together with the cost and complexity of outfall disinfection, this alternative was eliminated from further consideration.

Retention/Treatment Facilities

A review of existing parcels in the vicinity of Outfalls BB-026, NC-077, NC-083 and NC-015 was performed to identify potential sites for retention/treatment facilities. The siting review looked at parcels within a half-mile radius of the CSO regulators associated with each outfall. The initial siting assessment looked for unoccupied sites that did not have existing buildings, while cemeteries, schoolyards and rail yards were excluded as potential sites. The sizes of the unoccupied sites were then compared against the space needed for either a storage tank or RTB to provide 25, 50, 75, or 100 percent CSO control. Smaller sites were also identified for potential locations of tunnel drop shafts. The results of this analysis were as follows:

- Outfall BB-026: one site identified that could provide 25 percent control for a storage tank, or 50 percent control for an RTB
- Outfall NC-077: one site identified that could provide 50 percent control for a storage tank, or 75 percent control for an RTB
- Outfalls NC-083 and NC-015: no sites identified that could provide at least 25 percent control for a storage tank or RTB

Based on the limited number of unoccupied sites identified, the siting assessment was expanded to look at all parcels within a half-mile radius of the CSO regulator, regardless of whether the parcel was occupied by an existing building. Cemeteries, schoolyards and rail yards remained excluded as potential sites. While this approach identified more potential parcels of sizes sufficient to accommodate storage tanks or RTBs at higher levels of CSO control, the challenges of obtaining these sites for CSO storage tanks or RTBs were clearly recognized. Acquisition of these sites would likely be through either a negotiated acquisition or the eminent domain process. Although this process of land acquisition would be highly undesirable and time-consuming, it was necessary to consider this option to develop traditional individual off-line storage tank options for comparison to other consolidated CSO control alternatives (i.e., storage tunnels).

For Outfall BB-026 in Dutch Kills, the BAPS wet-weather expansion alternative described in Section 8.2.a.1 above could provide up to 75 percent control through expansion of the pumping station on the existing pumping station site. Given the high level of control achievable for that alternative, together with its minimal siting impacts and lower relative cost, storage tanks and RTBs were not evaluated further for BB-026.

For Outfalls NC-077, NC-083 and NC-015, the areas required to provide 25, 50, 75 or 100 percent control with storage tanks are presented in Table 8-6. Conceptual alternatives were developed for storage tanks to provide 50 percent CSO control at each of these three outfalls. As described further below, the 50 percent storage tanks would have sufficient volume to provide disinfection for flows up to the 100 percent control level. Based on this finding, no further individual storage or RTB alternatives were evaluated. Specific sites for the conceptual 50 percent storage tank alternatives were not identified, as these alternatives were considered place-holders for comparison to the alternatives that addressed all three outfalls as a consolidated project. The consolidated alternatives include storage tunnels, and consolidation of the outfalls with conveyance to an RTB located adjacent to the Newtown Creek WWTP.

Table 8-6. Outfalls NC-015, NC-083 and NC-077

Level of Control	Area Required for Storage Tank (acres)		
	NC-077	NC-083	NC-015
25%	1.5	1.5	1.9
50%	2.4	2.6	3.6
62.5%	3.1	3.4	4.5
75%	3.7	4.1	5.3
100%	6.8	7.9	9.3

Each of the Retention/Treatment Alternatives described below requires dewatering of stored CSO volumes after wet-weather events occur. Table 8-7 provides a summary of the total storage volume and the associated dewatering rate assuming a 24-hour dewatering period for storage facilities providing 25, 50, 75 and 100 percent levels of CSO control for Outfalls NC-077, NC-083 and NC-015. The 100 percent control level also assumes inclusion of Outfall BB-026.

Table 8-7. Storage and Dewatering System Capacity for Storage Alternatives for Outfalls NC-015, NC-083 and NC-077

Level of Control	Storage Volume (MG)	Dewatering PS Capacity(1) (MGD)
25%	10	10
50%	28	28
62.5%	39	39
75%	54	54
100%	138(2)	138(2)

Notes:
(1) Assumes pump-back of stored CSO within a 24 hour period.
(2) 100% control including BB-026.

The available dry-weather treatment capacity at the Newtown Creek WWTP limits the maximum dewatering rates at which storage facilities can be drained after each storm. The average dry-weather

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flow at the Newtown Creek WWTP under baseline conditions is 227 MGD, and the dry-weather flow capacity is 310 MGD, which leaves an average of 83 MGD available for dewatering during dry-weather. However, the Newtown Creek WWTP is a high-rate, step-feed plant with no primary settling tanks. As such, due to concerns related to solids loading on the WWTP, a 40-MGD tunnel dewatering rate was determined to be an appropriate dewatering rate limit for the WWTP. . Thus, for the 75 and 100 percent storage alternatives, additional treatment capacity would be needed to maintain a 24-hour dewatering time.

The following concepts were evaluated for control of CSO from Outfalls NC-077, NC-083 and NC-015: consolidation conduit with an RTB; individual off-line storage tanks; and storage tunnels. Additionally, a 100 percent control storage tunnel that also captures CSO from Outfall BB-026 was also evaluated. Discussion relating to these alternatives follows.

Alternative RTB-1: 152 MGD RTB and Consolidation Conduit for Outfalls NC-015, NC-083 and NC-077.

This concept would include a consolidation conduit and a single RTB to provide treatment and disinfection of CSO discharges to Newtown Creek from Outfalls NC-015, NC-083 and NC-077. The facility would be located in the vicinity of the Newtown Creek WWTP. Using a 4,000 gal/day/sf surface overflow rate, an RTB facility with a design flow of 152 MGD could be accommodated on a 3.5-acre site. That design flow rate would provide 50 percent control of bacteria during the recreational season (May 1st through October 31st), and 39 percent control of the annual bacteria load to Newtown Creek. The annual percent control assumes disinfection is applied during the recreational season (May 1st through October 31st), and the tank is operated as a storage facility without disinfection during the non-recreational season (November 1st through April 30th). The layout of Alternative RTB-1 is shown in Figure 8-12.

Flows entering the facility would be screened of large solids and floatable material. Following a wet-weather event, the tank would be dewatered and cleaned. Flushing gates or tipping buckets would be provided to facilitate cleaning of the tank bottom. Flushed grit and solids would be conveyed in a channel to a wet well containing dewatering pumps for pump down of the facilities to the Newtown Creek WWTP.

Disinfection would be accomplished by dosing sodium hypochlorite just upstream of the tank and dechlorination at the outfall, prior to release to the receiving waters. The operation of the chlorination/dechlorination process would be informed by the recent Spring Creek Facility chlorination study, seeking to maximize the efficiency of the bacteria reduction while minimizing the residual chlorination compounds released to the environment in the form of TRC.

A headworks building would be constructed to house screening facilities, pumps, odor control and equipment and piping for chemical delivery, storage, and feed. Ancillary electrical, instrumentation controls and heating, ventilation and air conditioning (HVAC) systems would also be included. With this concept, the facility would be made integral to the RTB tank.

Diversion structures would be required at each of the three outfalls being captured. It is assumed that the consolidation conduit would be constructed by microtunneling, to reduce impacts during construction.

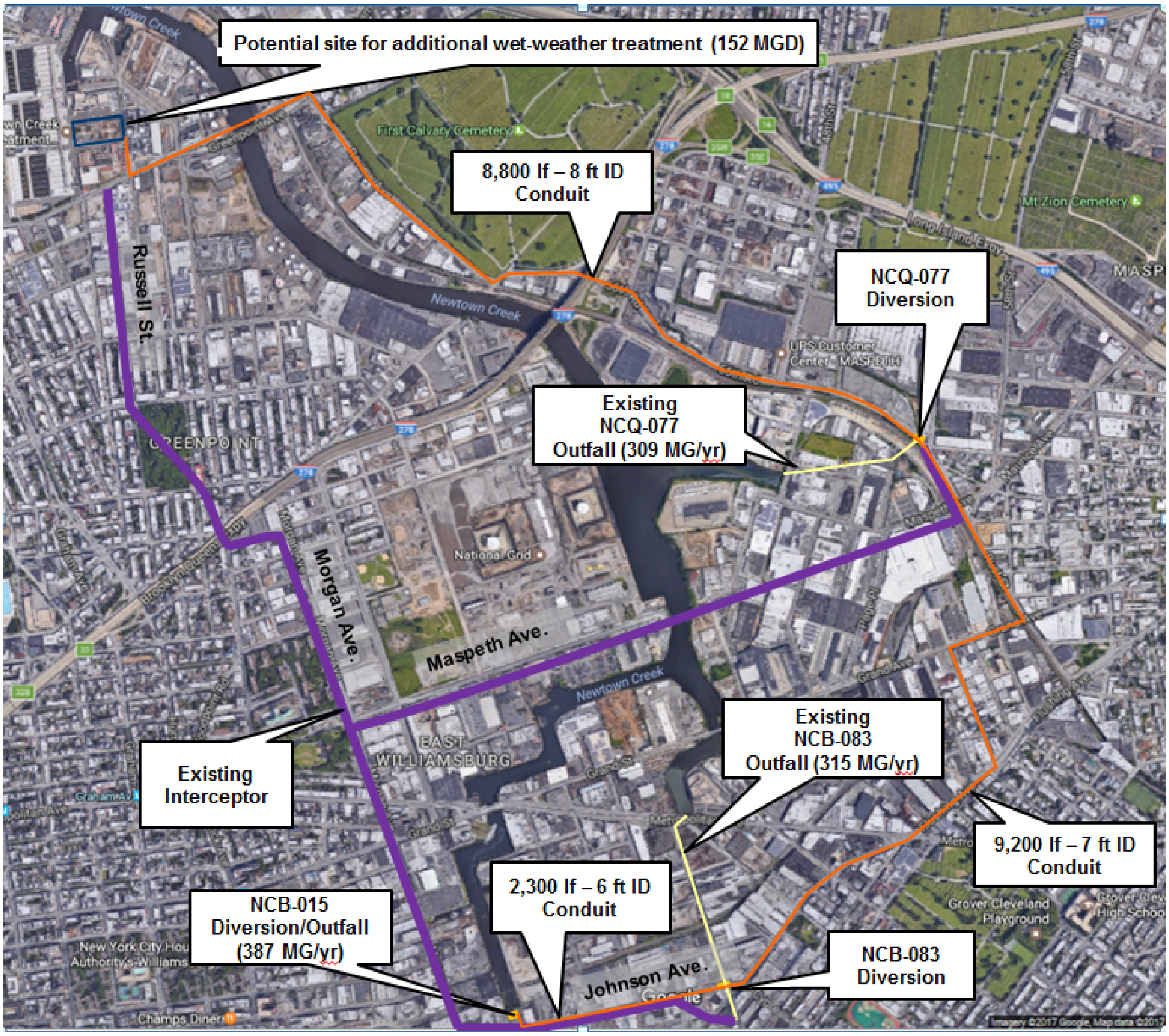

Figure 8-12. Layout of Alternative RTB-1 – Retention Treatment Basin with Consolidation Conduit for Outfalls NC-015, NC-083 and NC-077

The benefits, costs and challenges associated with construction and operation of the RTB are as follows:

<u>Benefits</u>

This alternative would provide 50 percent control of the CSO loads at Outfalls NC-015, NC-083 and NC-077 in the upstream reaches of Newtown Creek during the recreational season (May 1st through October 31st), and provide additional volume reduction and floatables control during the non-recreational season (November 1st through April 30th). Locating the RTB adjacent to the Newtown Creek WWTP would facilitate access for O&M of the facility, and allow for direct discharge of the dewatered solids load to the WWTP.

Cost

The estimated NPW for this control measure is $595M. Details of the estimate are presented in Section 8.4.

Challenges

The challenges associated with this alternative include:

- Permitting and approvals would be necessary for construction of a new outfall for the treated effluent to Newtown Creek. The construction of the outfall diversions and consolidation conduit would require approval of construction within road rights-of-way to be coordinated with the Department of Transportation (DOT).

- Although the 9,800 LF consolidation conduit would be constructed by microtunneling, traffic impacts and utility conflicts would still be anticipated at the multiple microtunneling shafts that would be required along the route.

- While the RTB could theoretically be upgraded in the future to provide chemically-enhanced primary treatment for higher levels of solids reduction, the flexibility to provide higher levels of CSO control would be limited by the contact time available in the tank and the conveyance capacity of the consolidation conduit.

- The discharge from the RTB, while treated, would still be in the downstream reach of Newtown Creek, where recreational use of the waterway is more likely to occur.

Although construction of Alternative RTB-1 would provide 50 percent recreational season (May 1st through October 31st) control of the three major upstream CSOs, this alternative has limited opportunity for future expansion for additional levels of control, carries the potential for significant construction impacts along the near-surface consolidation conduit route, and does not offer significant cost savings over other alternatives that would provide a similar level of control. For these reasons, this alternative was not carried forward to the next level of evaluation for inclusion in the retained alternatives.

Alternative IT-1: Individual Off-line Storage Tanks

As noted earlier, in consideration of siting constraints, a review of developed properties that could be acquired through the eminent domain process was conducted. Although this process of land acquisition is highly undesirable, it was necessary to consider this option to develop traditional individual off-line storage tank options for comparison to other broader CSO control alternatives. The developed parcels within a half-mile radius of the regulators associated with Outfalls NC-015, NC-083 and NC-077 were identified and, based on their size, categorized according to the level of CSO control that could be implemented within their property limits. Cemeteries, schoolyards, parks and parcels associated with transportation uses were excluded from the analysis. As an example, Figure 8-13 summarizes the analyses for Outfall NC-083. The area in acres is shown for each highlighted parcel. Parcels highlighted in blue, green and orange would be large enough to accommodate 25, 50 or 75 percent CSO control storage tanks, respectively. It should be stressed that none of the highlighted sites are specifically being considered for a storage tank facility. The intent is to demonstrate the lack of suitable sites and the difficulties in site acquisition that would be encountered if this alternative were to be further pursued. Similar analyses were conducted for Outfalls NC-077 and NC-015. It is noted that no single developed parcel that could accommodate 100 percent CSO control storage tanks were identified within the search radius for Outfalls NC-083 and NC-015.

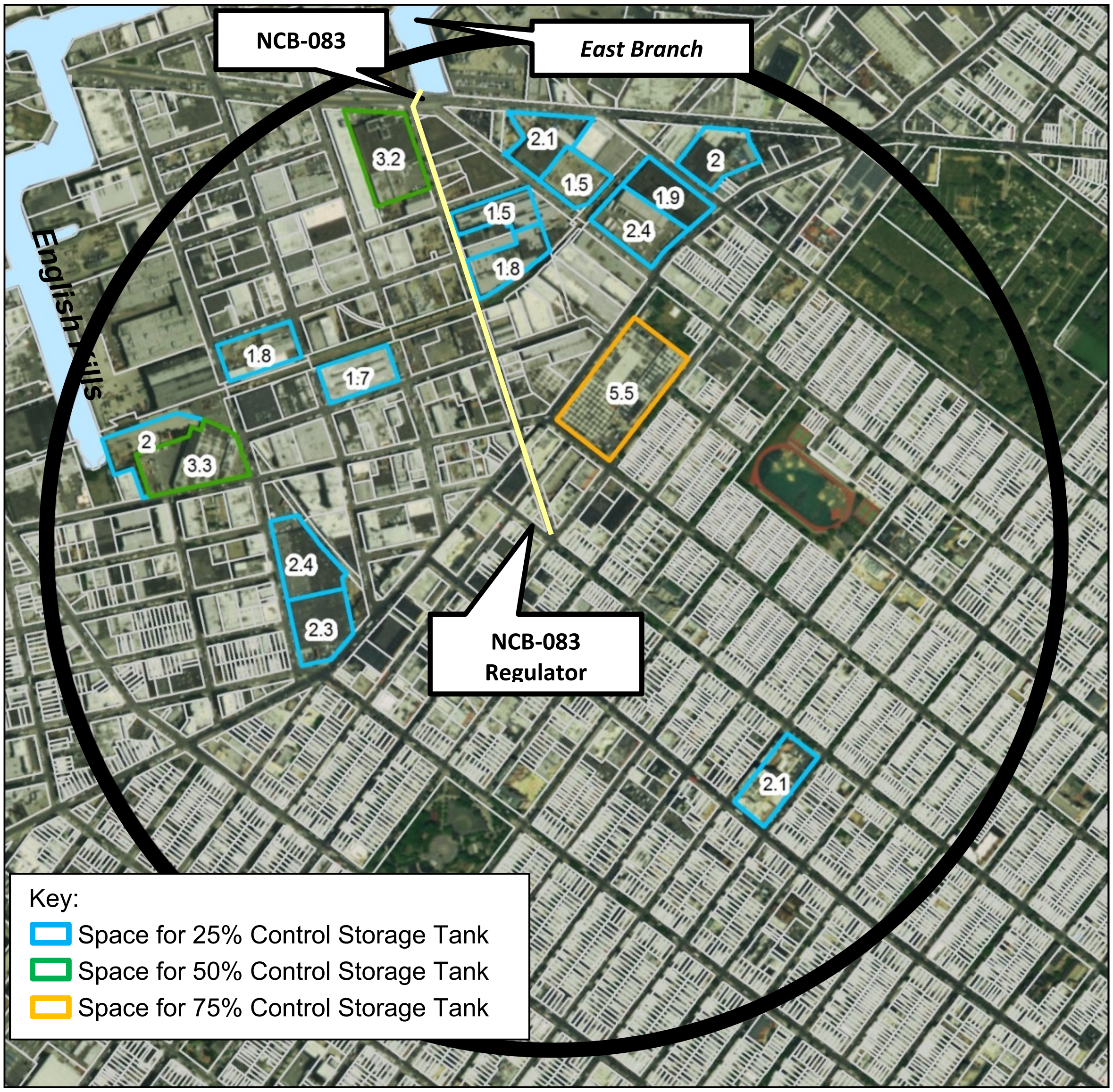

Figure 8-13. Developed Parcels Larger than 1.5 Acres Identified within Half-mile Radius from the Nicholas Weir/Regulator (Outfall NC-083)

Table 8-8 summarizes the individual storage tank dimensions and characteristics associated with the various levels of CSO control. Due to the multiple developed parcels that could accommodate a given tank size, approximate lengths of the corresponding conveyance elements had to be assumed for most tanks for cost estimation purposes.

For each facility, a diversion chamber would need to be constructed along each outfall to divert overflows to the storage tanks. The diameters of each collection conduit and dewatering force main are shown in Table 8-8.

Table 8-8. Characteristics of CSO Retention Tanks for Outfalls NC-077, NC-083 and NC-015

Outfall	Level of Control	Tank Volume (MG)	Inside Length (ft)	Inside Width (ft)	Dewatering PS Capacity (MGD)	Collection Conduit Diameter (ft)	Dewatering Force Main Diameter (ft)
NC-077	25%	2.4	146	73	2.4	3.0	1.0
	50%	6.8	248	124	6.9	4.5	2.0
	75%	14.2	356	178	14.2	5.5	2.0
	100%	37	574	287	37	2 X 8	4.0
NC-083	25%	3	164	82	3	3.5	1.0
	50%	8.5	275	138	8.5	5	2.0
	75%	17.2	392	196	17.2	7.5	3.0
	100%	41.1	605	303	41.1	2 x 8	4.0
NC-015	25%	4.3	196	98	4.3	4.0	2.0
	50%	12.3	332	166	12.3	5.5	2.0
	75%	22	443	221	22	7.0	3.0
	100%	44.3	628	315	44.3	2 x 8	4.0

Flows entering the facilities would be screened of large solids and floatable material. Following the event, the tank would be dewatered and cleaned and made ready for the next event. Flushing gates or tipping buckets would be provided to facilitate cleaning of the tank bottom. Flushed grit and solids would be conveyed in a channel to a wet well containing dewatering pumps for pump down of the facilities to the Newtown Creek WWTP. Ventilation of the tanks with activated carbon odor control facilities would be provided.

Given the large tank volumes shown in Table 8-8 an evaluation was conducted to determine the maximum flow rate for disinfection that could be achieved with those volumes assuming a 15 minute contact time, and the associated level of seasonal bacteria load control. The results indicated that, for Outfalls NC-077, NC-083 and NC-015, the chlorination rates that could be implemented for the 50 percent annual control tanks would exceed the rates required to provide 100 percent recreational season (May 1st through October 31st) bacteria load control. This analysis is summarized in Table 8-9 below.

Table 8-9. Potential Peak Disinfection Capacity for 50 Percent Control Storage Volume

Outfall	Tank Volume (MG)	Peak Disinfection Capacity (MGD)	Maximum Peak Flow During Recreational Season(1) (MGD)
NC-077	6.8	653	481
NC-083	8.5	816	725
NC-015	12.4	1190	564

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

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Providing 75 or 100 percent recreational season control would be more cost-effectively achieved through adding disinfection to the 50 percent annual control tanks than by building larger tanks, and would avoid the additional site acquisition issues associated with the greater area requirements of the larger tanks. For these reasons, the 75 and 100 percent control storage tanks were not retained for further consideration.

The benefits, costs and challenges associated with construction and operation of the individual CSO storage tanks are as follows:

Benefits

The primary benefit of a storage tank is its predicted high degree of volumetric CSO and annual bacterial capture. The operations are simple in comparison to treatment facilities and DEP operations staff is familiar with the maintenance requirements of the equipment used in this type of facility. In addition, the surface of the tanks could be designed to provide secondary uses, such as a parking lot, ball fields, a gathering area, a park or other recreational amenities.

Cost

The estimated NPW for this control measure at Outfalls NC-015, NC-083 and NC-077 ranges from $627M to $901M for 25 percent annual control and 50 percent annual control, respectively. Details of these estimates are presented in Section 8.4.

Challenges

The challenges associated with this alternative include:

- Acquisition of the sites would likely require either a negotiated acquisition process or eminent domain. In addition, most of the area covered by the siting assessment for Outfalls NC-077, NC-083 and NC-015 are designated by the City as NYC Industrial Business Zones (IBZ). These areas were established to protect existing manufacturing districts and encourage industrial growth citywide, and include tax credits for industrial and manufacturing firms choosing to relocate to these zones. Displacing active industrial or manufacturing uses in this area would run counter to the concept of the IBZ.

- During construction, plans for maintenance and protection of traffic will be required, along with coordination of construction methods and schedules with DOT. These issues will need to be addressed not only for the tank site, but for the alignments of the dewatering force main and the outfall sewer diversion and conveyance to the tanks. As a result, the immediate and long-term neighborhood impacts are expected to be widespread and will impact a large area of the community.

- Past operational experience of off-line CSO storage tanks in other parts of NYC indicates that grit and solids in the pump-back following a wet-weather event have a tendency to drop out of suspension in the interceptor. The deposition of sediment reduces interceptor capacity and increases the risk of flooding and sewer back-ups. More frequent cleaning of the interceptors would be necessary to manage this issue.

- Control of the three CSO outfalls would require operation and maintenance of three separate facilities remote from the Newtown Creek WWTP.

Alternatives DT-1 through DT-4 – Tunnel Storage for Outfalls NC-015, NC-083 and NC-077

As a result of the general limited availability of suitable sites for traditional storage and treatment technologies within the Newtown Creek watershed, tunnel alternatives were developed further. Unlike traditional tanks, tunnels:

1) Can provide for both conveyance and storage of CSO;
2) Require less permanent above-ground property per equivalent unit of storage volume;
3) Minimize surface construction impacts;
4) Reduce construction related groundwater pumping and treatment costs; and
5) Reduce the volume of near-surface spoil material to be treated, handled and transported for disposal during construction. For the Newtown Creek watershed, the likelihood of encountering contaminated near-surface soils is high.

These benefits make tunnel storage more practical for highly developed watersheds such as Newtown Creek. Tunnel alternatives are described below.

Tunnel construction would involve the boring of a linear storage conduit underground using a tunnel boring machine (TBM). Shafts would be installed during construction for the connection of CSO diversion pipes and O&M access. A tunnel dewatering pumping station (TDPS) would also be included at the downstream end of the tunnel with pumped discharges being conveyed to the Newtown Creek WWTP for treatment after wet-weather events. A mechanical ventilation system would be provided with an activated carbon odor control system. Additional passive odor control systems and/or backdraft dampers would be provided at the drop shafts.

Potential sites for the mining shaft/TDPS were identified. Figure 8-14 shows one potential site within the boundaries of the WWTP. Figure 8-15 shows a potential site currently owned by the DEP adjacent to Outfall NC-077. The site within the Newtown Creek WWTP was not considered advantageous due to considerations for reserving that site for potential future upgrades of the Newtown Creek WWTP, but other sites in the vicinity of the Newtown Creek WWTP could be considered as part of more detailed siting investigations. The deep tunnel alignments evaluated for the Newtown Creek watershed would either begin at a site near the Newtown Creek WWTP (longer tunnel) or at the DEP owned parcel near Outfall NC-077 (shorter tunnel). These parcels will be abbreviated herewith as “WWTP” and “DEP” parcels, respectively. The tunnels would terminate at the LIRR owned parcel near Outfall NC-015. For both mining shaft site options, the alignments would run either under Newtown Creek, to the extent possible, or under the public ROW, to the extent possible. As such, four potential tunnel alignments were identified and are shown in Figures 8-16 and 8-17, for the shorter and longer tunnel options, respectively. A longer tunnel option for 25 percent CSO control was not evaluated because the diameter associated with 25 percent control for the long tunnel would have been too small to be practical for a deep tunnel. Therefore, for this level of control, only the shorter tunnel with TDPS at the DEP parcel was evaluated further. Additionally, a shorter tunnel for the 100 percent level of control was not considered further as it resulted in a large diameter that was at the limit of current TBM technology.

Figure 8-14. Potential Mining Shaft Site near the Newtown Creek WWTP

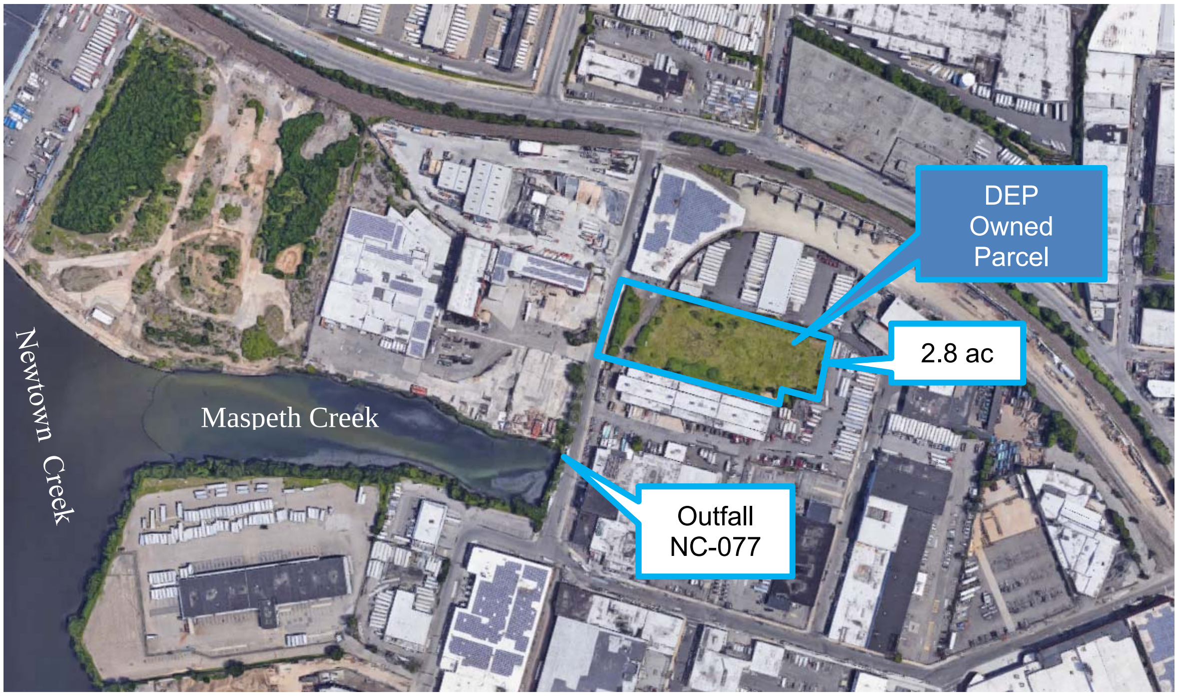


Figure 8-15. Potential Shaft Site at DEP Owned Parcel

Several conceptual layouts were evaluated for the tunnel alternatives. These conceptual layouts and sites were developed for the purposes of developing costs and evaluating the feasibility of the various CSO storage tunnel alternatives. The final siting of the dewatering pumping station, the tunnel alignment and other associated details of the tunnel alternatives presented herein will be further evaluated and finalized during subsequent planning and design stages.

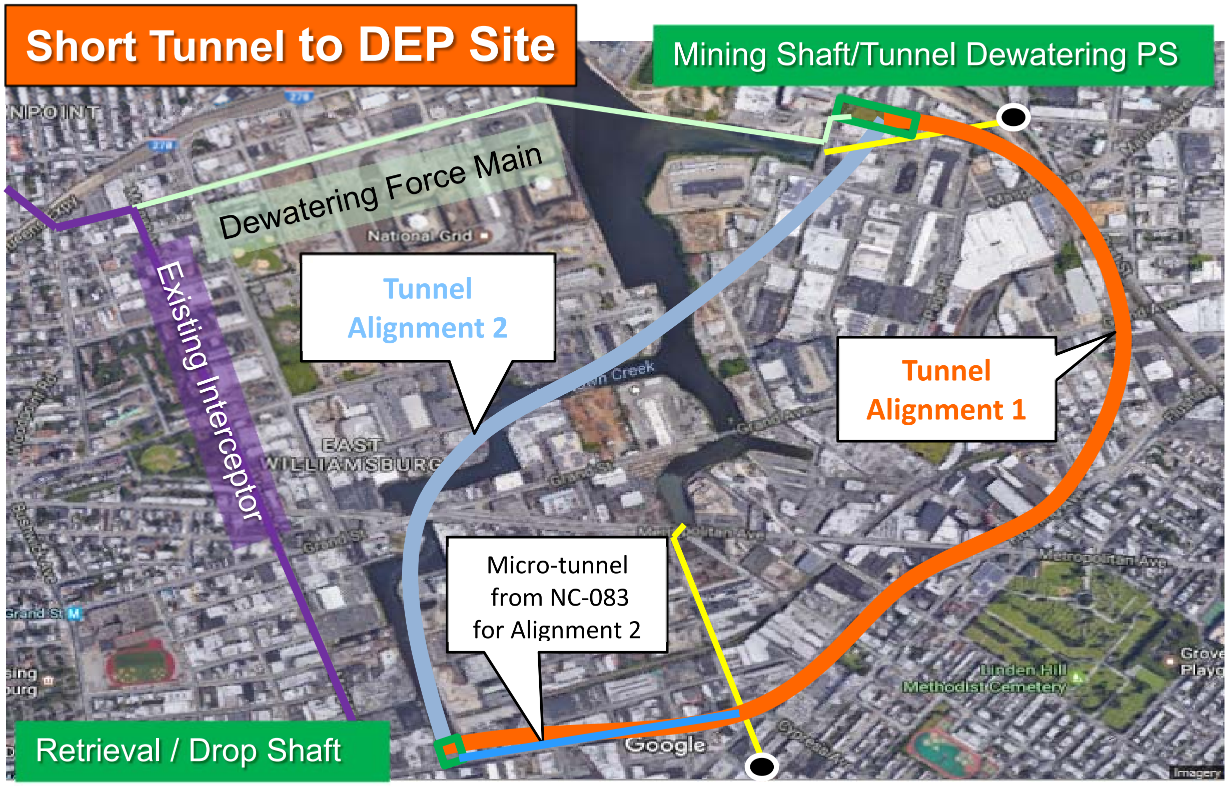


Figure 8-16. Conceptual Layout of Tunnel Storage with TDPS at DEP Parcel –Tunnel Alignments 1 and 2 for 25, 50, 62.5 and 75 Percent CSO Control of Outfalls NC-015, NC-083 and NC-077

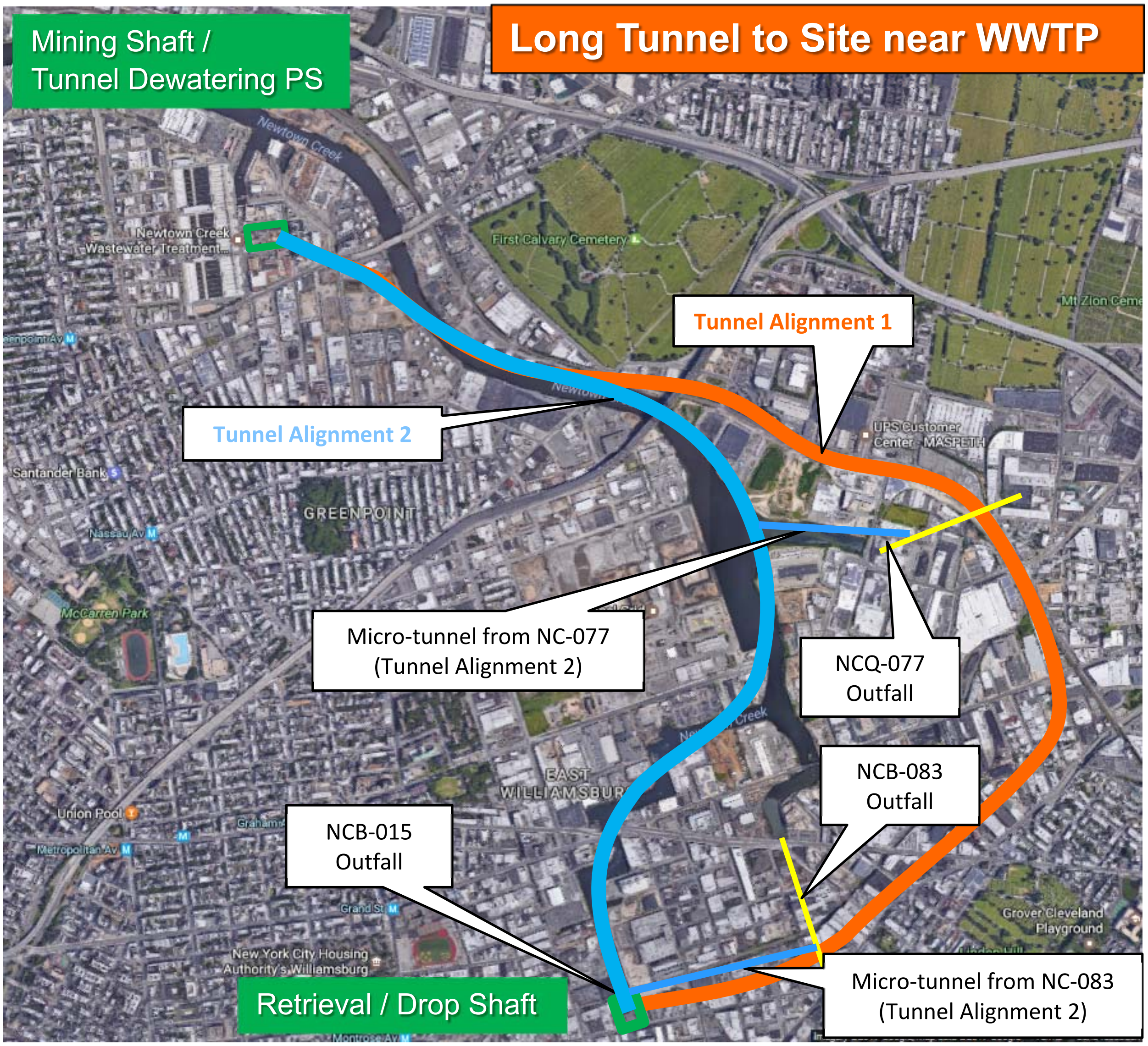


Figure 8-17. Conceptual Layout of Tunnel Storage with TDPS near WWTP for 50, 62.5 and 75 Percent CSO Control of Outfalls NC-015, NC-083 and NC-077 and 100 Percent CSO Control of Outfalls BB-026, NC-015, NC-083 and NC-077

Using the IW model, an evaluation was performed that included several iterations to assess the tunnel sizes necessary to provide the storage volume required for 25, 50, 62.5 and 75 percent control for the three largest outfalls, and 100 percent control for all four of the largest outfalls. The storage volumes and dewatering rates provided in Table 8-7 were used as a basis for sizing the tunnels. Required tunnel diameters were rounded up to the nearest foot, and it was assumed that the diameter would be constant for the entire length of the tunnel.

Based on available geotechnical information, which included United States Geological Survey rock contours and boring information from DEP water tunnels that run through the area, the depth to bedrock in the project area varies from approximately 60 feet in the vicinity of the proposed mining shaft at the WWTP site to approximately 230 feet in the vicinity of the proposed retrieval shaft at Outfall NC-015. As risk significantly increases with variable ground conditions, it is generally desirable to maintain a tunnel profile either completely within soft ground or completely in hard rock. Given the lengths of the tunnel routes and the density of development in the Newtown Creek area, passing under multiple private property parcels was unavoidable for the tunnel routes. This would necessitate acquisition of either the parcel or an easement on the parcel through either negotiated acquisition eminent domain. Although a rock tunnel would have deeper shafts than a soft ground tunnel, the unit costs of tunneling in rock are typically lower than the unit cost for similarly sized soft ground tunneling. Based upon these considerations, a vertical tunnel alignment in rock was considered to have lower risks and costs than a soft ground/mixed face tunnel vertical alignment for the storage tunnels being considered for this LTCP, and the alignments presented herein are based on a rock alignment.

Two DEP water tunnels run through the Newtown Creek project area. However, these tunnels are in the range of 500-to-600-feet deep, and would be well below the vertical alignment of the CSO storage tunnel. The water tunnels are not anticipated to be affected by the CSO storage tunnel, but the presence of the water tunnels would be taken into account during design.

Each of the tunnel alternatives requires a dewatering pumping station to convey the retained CSO volumes to the treatment plant following a wet-weather event. The capacities of the dewatering pumping stations for each of the tunnel alignment/level of control alternatives are shown in Table 8-10. The dewatering pumping station capacities shown are based on a 24 hour dewatering period. Analyses of the conveyance capacity of the interceptor system near the TDPSs revealed that for the short tunnel options, with the TDPS at the DEP parcel, the local Maspeth Avenue Interceptor did not have sufficient capacity for the dewatering flows from the 25 percent control tunnel or larger. The closest location with sufficient capacity would be downstream of the junction between the Maspeth Avenue and Morgan Avenue interceptors, about 5,800 ft away and across Newtown Creek from the TDPS site. A dewatering force main to that location has been included for those alternatives. For the 75 and 100 percent CSO control alternatives, the capacities indicated in Table 8-10 for 24-hour dewatering would exceed the level that would be considered prudent from a loading perspective and to maintain treatment levels at the Newtown Creek WWTP. Thus to consider a 75 or 100 percent CSO control alternative would require construction of an additional treatment facility. As noted above, the maximum dewatering rate based on the considerations of loading impacts to the WWTP would be 40 MGD.

Table 8-10. Tunnel Characteristics and Dewatering Pumping Station Capacity of Based on 24-hour Dewatering

Alternative/Level of CSO Control	Required Storage Volume (MG)	Tunnel Length (ft)	Selected Tunnel Diameter (ft)	Storage Volume Provided (MG)	PS Capacity (MGD)
DT-1a/25% (DEP/In-Creek)	10	7,570	16	11	11
DT-1b/25% (DEP/ROW)	10	9,980	16(1)	15	15
DT-2a/50% (WWTP/In-Creek)	28	13,700	19	28	28
DT-2b/50% (WWTP/ROW)	28	18,800	16	28	28
DT-2c/50% (DEP/In-Creek)	28	7,570	26	29	29
DT-2d/50% (DEP/ROW)	28	9,980	23	30	30
DT-3a/62.5% (WWTP/In-Creek)	39	13,700	22	39	39
DT-3b/62.5% (WWTP/ROW)	39	18,800	19	39	39
DT-3c/62.5% (DEP/In-Creek)	39	7,570	30	39	39
DT-3d/62.5% (DEP/ROW)	39	9,980	26	39	39
DT-4a/75% (WWTP/In-Creek)	54	13,700	26	55	55(3)
DT-4b/75% (WWTP/ROW)	54	18,800	23	58	58(3)
DT-4c/75% (DEP/In-Creek)	54	7,570	36	56	56(3)
DT-4d/75% (DEP/ROW)	54	9,980	32	59	59(3)
DT-5a/100% (WWTP/In-Creek)(2)	138	13,700	42	137(3)	137(3)
DT-5b/100% (WWTP/ROW)(2)	138	18,800	36	143(3)	143(3)

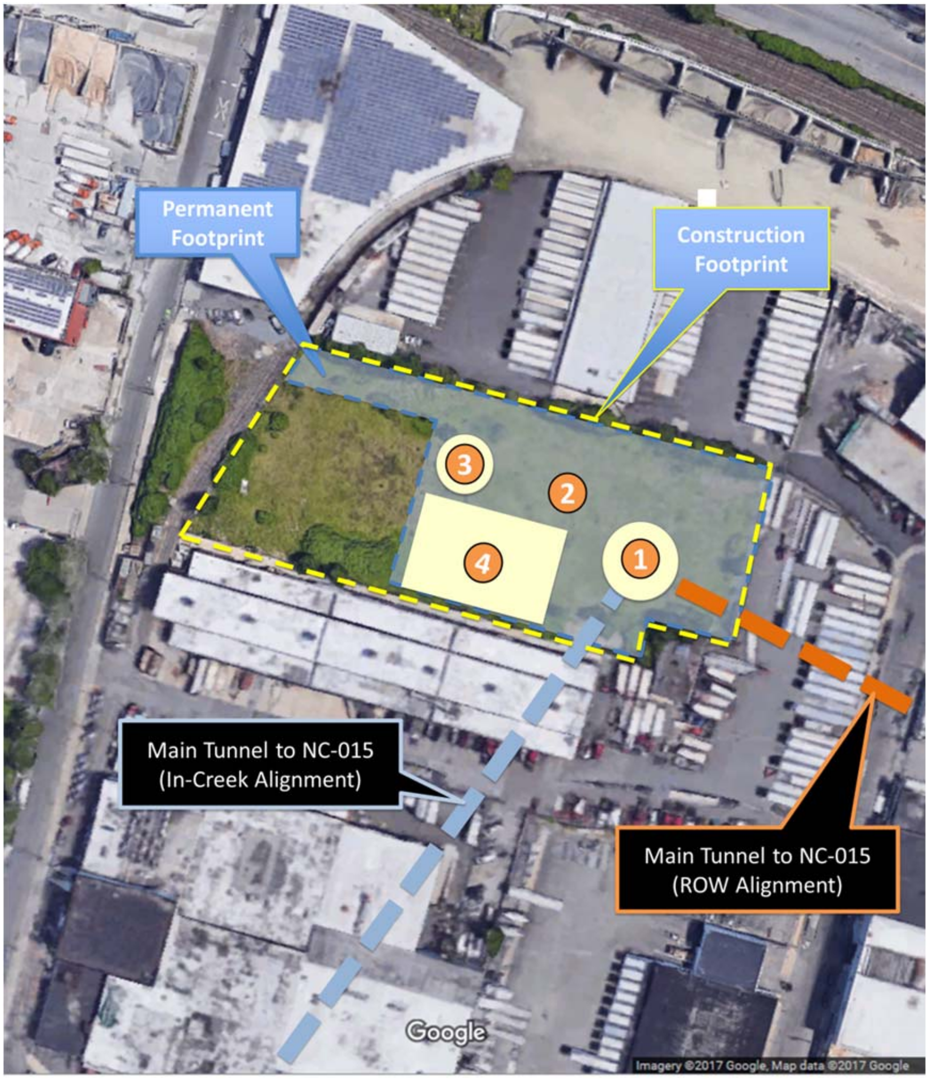
Notes:
(1) Assumed minimum cost-effective diameter for TBM technology.
(2) 100% control of Outfalls BB-026, NC-077, NC-083 and NC-015.
(3) Maximum capacity based on loadings to the Newtown Creek WWTP would be 40 MGD.

Alternative DT-1 – 25 Percent CSO Control Tunnel Options for Outfalls NC-015, NC-083 and NC-077, Mine from DEP Site

The tunnels designated as Alternatives DT-1a and DT-1b in Table 8-11 would provide 25 percent CSO control with the tunnel launching shaft and dewatering pumping station located at the DEP parcel near Outfall NC-077. From this mining shaft/TDPS site, the tunnel alignments would either follow the Creek alignment or the ROW alignment as shown in Figure 8-15. In both cases, the tunnel internal diameter would be 16 ft. A smaller diameter would provide 25 percent CSO control for the shorter ROW alignment (Alternative DT-1b). However, a rock tunnel at less than 16 ft diameter would be less efficient to construct due to space constraints, and would not likely provide cost savings compared to a 16-ft diameter tunnel. Upon completion of the tunnel, the associated TDPS would be constructed. The TDPS could either be a cavern pumping station constructed in rock, or a circular design for which a dedicated shaft would be provided. To minimize the extent of surface features, a cavern pumping station was assumed for the LTCP. The TDPS capacities would be 11 MGD and 15 MGD for Alternatives DT-1a and DT-1b, respectively. The layout of the pumping station and appurtenant features assuming a cavern configuration is shown on Figure 8-18.

Upon completion of the tunnel mining operations, the mining shaft would be converted to a screenings and grit removal shaft. A grit sump would be constructed in the bottom of the shaft, coarse bar screen would be provided on the downstream side of the grit sump, and an overhead bridge crane would be provided with clamshell bucket and bar screen rake attachments for removal of grit, screenings, or other large objects captured in the sump. Two access shafts would be provided for the pumping station: one main access shaft, and one equipment access shaft. An above-ground building housing HVAC and electrical support equipment for the pumping station would be provided adjacent to the access shafts.

Both the ROW and the Creek tunnel alignments would include diversion structures with weirs and tide gates on the existing NC-015, NC-083 and NC-077 outfalls, and both alignments would require drop shafts at Outfalls NC-015 and NC-077. For the Creek alignment, a micro-tunneled connection would be provided from the NC-083 diversion structure to the drop shaft at NC-015. For the ROW alignment, a drop shaft for NC-083 flows would be located adjacent to that outfall, in proximity to where the tunnel alignment crosses under the outfall. The drop shafts would include influent trash racks/grit sumps and passive odor control if determined to be necessary during design. Figure 8-19 shows the proposed configurations in the vicinity of Outfalls NC-015 and NC-083, and Figure 8-20 shows the configurations in the vicinity of Outfall NC-077. Table 8-10 above summarizes the key capacities and dimensions of Alternatives DT-1a and DT-1b.



1	Mining Shaft/Screen & Grit Removal Shaft
2	PS Equipment Access Shaft
3	PS Main Access Shaft
4	Pump Station Building

Figure 8-18. Conceptual Layout of Mining Shaft/TDPS at DEP Owned Parcel – Shorter Tunnel

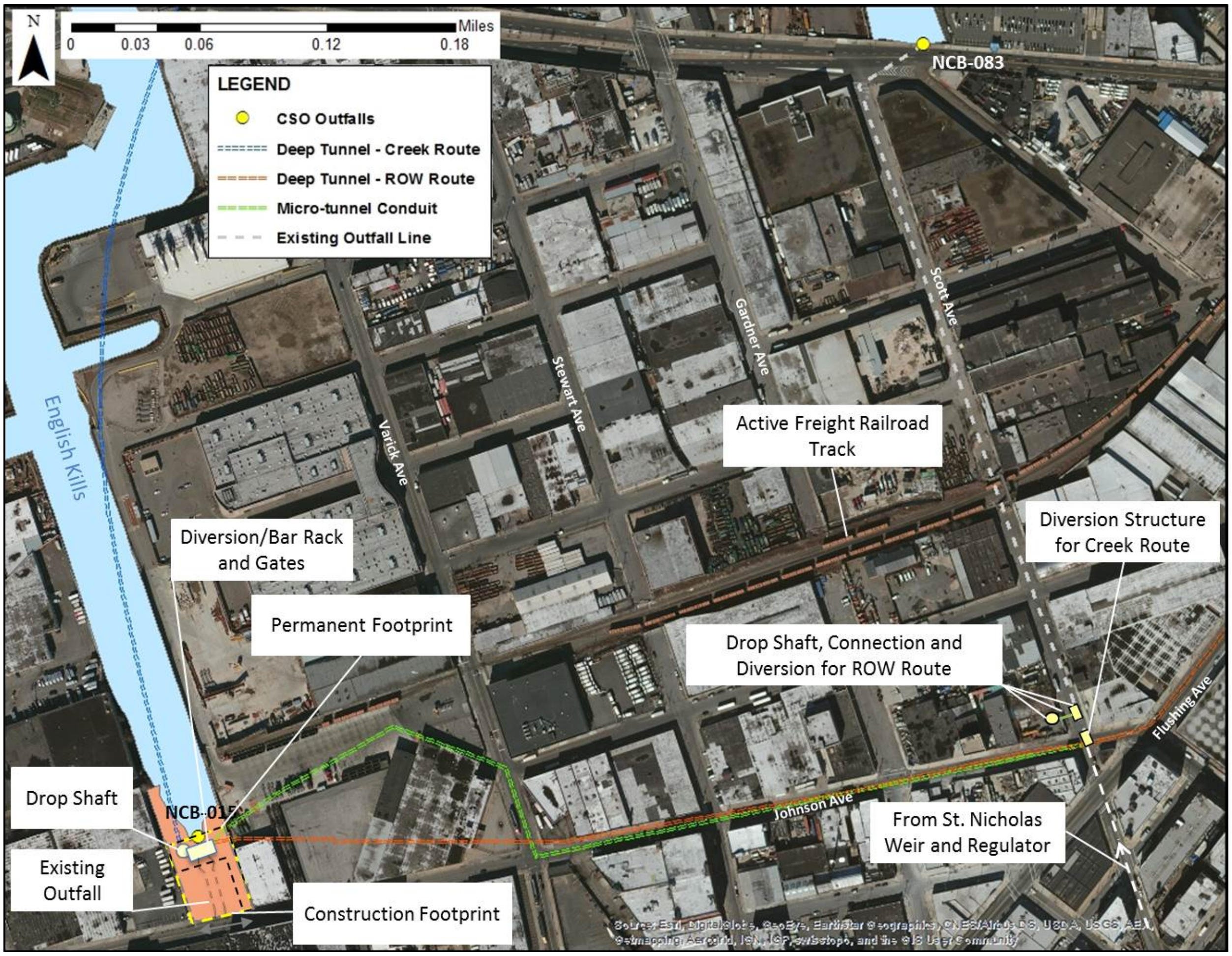


Figure 8-19 Details of Diversion Structures/Drop Shafts for Outfalls NC-083 and NC-015

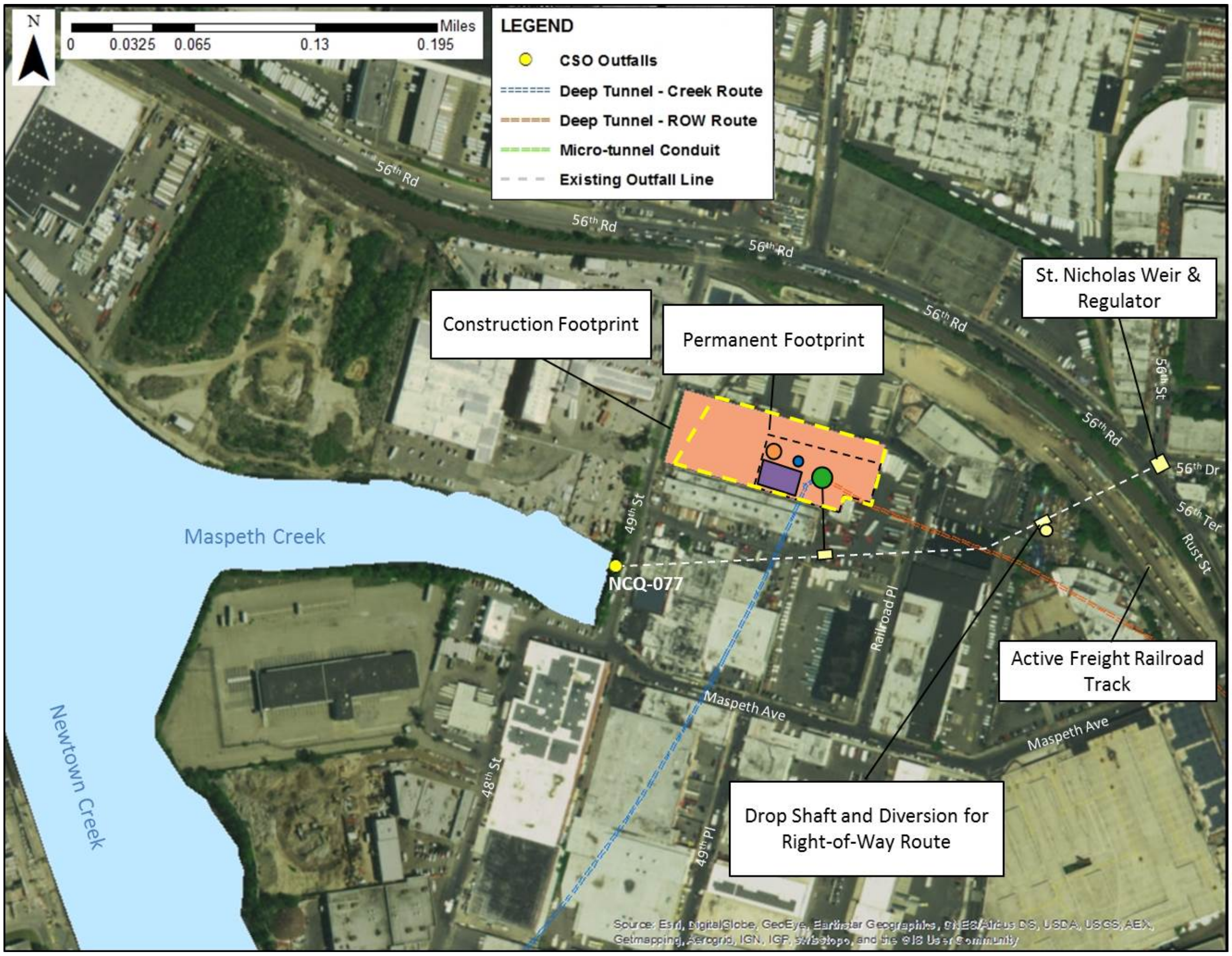


Figure 8-20 Details of Diversion Structures/Drop Shafts for Outfalls NC-077 (Shorter Tunnel)

The benefits, costs and challenges associated with this tunnel storage alternative are as follows:

Benefits

The primary benefit of tunnel storage is the high level of CSO volume reduction with minimal permanent above-ground land requirements and disruption during construction. The single tunnel facility addresses three of the largest CSO discharge locations to Newtown Creek.

Cost

The estimated NPW for this control measure is $437M for Alternative DT-1a (DEP site/creek route) and $456M for Alternative DT-1b (DEP site/ROW route). Details of the estimates are presented in Section 8.4.

Challenges

The challenges associated with this alternative include:

- Uncertainty related to the availability of the DEP site due to competing needs for existing maintenance needs and future treatment requirements for use as a tunnel mining location and long-term location for the TDPS.
- Construction of the long tunnel dewatering force main across Newtown Creek.
- Construction of the micro-tunneled connection from NC-083 to the drop shaft at NC-015 for the Creek route.
- Potential impacts of the dewatered flow on sediment deposition in the Morgan Avenue interceptor downstream of the dewatering force main tie-in location.
- More difficult/complex O&M associated with the deep dewatering force main and deep grit/screenings shaft.
- The potential for sediment deposition in the tunnel.
- The potential for hydraulic surge conditions in the tunnel.
- The potential for encountering unforeseen geotechnical conditions during construction of the tunnel, shafts, or cavern TDPS.
- Maintaining outfall functionality during construction of the diversion structures.
- Limited space for construction of the drop shaft at NC-015.
- Property acquisition through either negotiated acquisition or eminent domain process.

Both Alternatives DT-1a and DT-1b were carried forward to the next level of evaluation for inclusion in the basin-wide alternatives.

Alternative DT-2 – 50 Percent CSO Control Tunnel for Outfalls NC-015, NC-083 and NC-077

The tunnels designated as Alternatives DT-2a, DT-2b, DT-2c and DT-2d would provide 50 percent CSO control with the tunnel launching shaft and dewatering pumping station to be located at either the DEP parcel near Outfall NC-077 for the shorter tunnel option, or at a site in the vicinity of the Newtown Creek WWTP for the longer tunnel option. For each mining shaft/TDPS site, the tunnel alignments would either follow the Creek alignment or the ROW alignment shown in Figures 8-16 and 8-17 above. The tunnel internal diameters would range from 19 ft to 26 ft, depending on the route. As described for Alternative DT-1, the TDPS was assumed to be a cavern pumping station. The TDPS capacity would range from 28 MGD to 30 MGD, depending on the tunnel route. The layout of the pumping station configuration for the DEP owned parcel, assuming a cavern configuration, is shown above on Figure 8-18. The layout for a site in the vicinity of the Newtown Creek WWTP for the longer tunnel option would be similar. The configurations of the diversion structures and drop shafts for Outfalls NC-015 and NC-083 would be similar to the arrangements shown in Figure 8-19 above for all the potential alignments of this alternative. For the short tunnel from the DEP site, the arrangement at Outfall NC-077 would be similar to the arrangement shown in Figure 8-20. For the long tunnel alignment to the vicinity of the Newtown Creek

WWTP, the arrangement of diversion structures/drop shafts is presented in Figure 8-21. As with Alternative DT-1, the drop shafts would include influent trash racks/grit sumps and passive odor control if

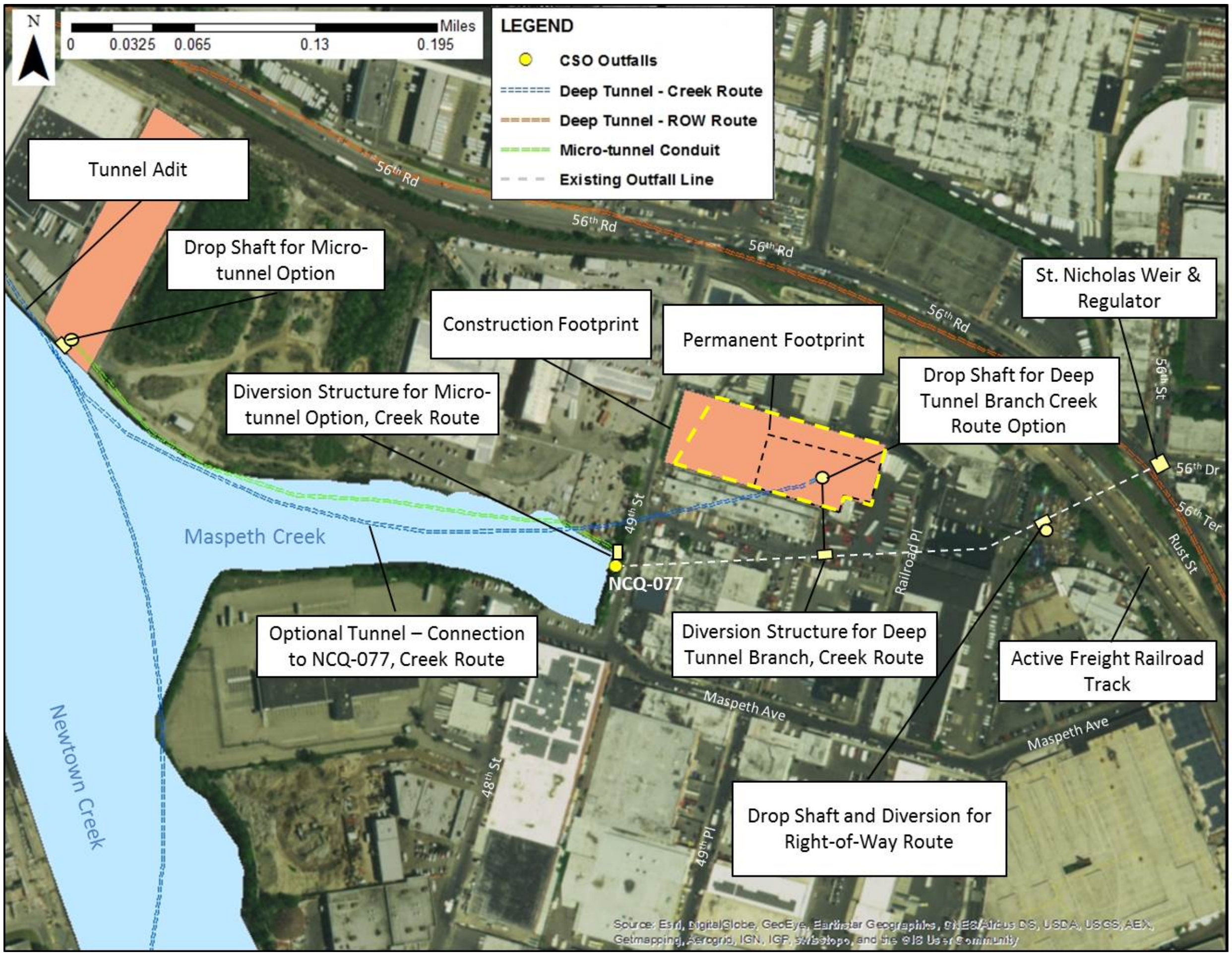


Figure 8-21 Details of Diversion Structures/Drop Shafts for Outfalls NC-077 (Longer Tunnel)

determined to be necessary during design. Table 8-10 above summarizes the features of Alternatives DT-2a, DT-2b, DT-2c and DT-2d.

The benefits, costs and challenges associated with this tunnel storage alternative are as follows:

<u>Benefits</u>

The primary benefit of tunnel storage is the high level of CSO volume reduction with minimal permanent above-ground land requirements and disruption during construction. The single tunnel facility addresses three of the largest CSO discharge locations to Newtown Creek.

Benefits of the long tunnel with TDPS in the vicinity of the Newtown Creek WWTP over the short tunnel with TDPS at the DEP site include that the long dewatering force main from the DEP site would be eliminated, along with the risks of sediment deposition in the Morgan Avenue interceptor from the dewatering flow. This site would also be much closer to the Newtown Creek WWTP, making access to the TDPS easier from the Newtown Creek WWTP.

Cost

The estimated NPW for this control measure is $576M for Alternative DT-2a (WWTP site/Creek route), $571M for Alternative DT-2b (WWTP site/ROW route), $574M for Alternative DT-2c (DEP site/Creek route) and $576M for Alternative DT-2d (DEP site/ROW route). Details of the estimates are presented in Section 8.4.

Challenges

The challenges associated with this alternative would be similar to those identified for Alternative DT-1, with the following differences:

- For the long tunnel route, uncertainty related to the availability of sites in the vicinity of the Newtown Creek WWTP for use as a tunnel mining location and long-term location for the TDPS and any necessary property acquisition through negotiated acquisition or eminent domain.
- Specific challenges associated with dewatering from the DEP site would not apply to a site near the Newtown Creek WWTP. The dewatering force main would be much shorter, and would tie in directly to the Newtown Creek WWTP.

Alternatives DT-2a, DT-2b, DT-2c and DT-2d were carried forward to the next level of evaluation for inclusion in the basin-wide alternatives.

Alternative DT-3 – 62.5 Percent CSO Control Tunnel for Outfalls NC-015, NC-083 and NC-077

The tunnels designated as Alternatives DT-3a, DT-3b, DT-3c and DT-3d would provide 62.5 percent CSO control with the tunnel launching shaft and dewatering pumping station to be located at either the DEP parcel near Outfall NC-077 for the shorter tunnel option, or a site in the vicinity of the Newtown Creek WWTP for the longer tunnel option. For each mining shaft/TDPS site, the tunnel alignments would either follow the Creek alignment or the ROW as shown in Figures 8-16 and 8-17 above. The tunnel internal diameters would range from 19 ft to 30 ft depending on the alignment. Upon completion of the tunnel, a TDPS would be constructed. As described for Alternatives DT-1 and DT-2, the TDPS was assumed to be a cavern pumping station. The dewatering pumping station capacity would have a capacity of 39 MGD for the four tunnel alignment options. The layout of the pumping station configuration for the DEP owned parcel, assuming a cavern configuration, is shown above on Figure 8-18. The layout for a site in the vicinity of the Newtown Creek WWTP for the longer tunnel option would be similar. The configurations of the diversion structures and drop shafts for Outfalls NC-015 and NC-083 would be similar to the arrangements shown in Figure 8-19 above for all the potential alignments of this alternative. For the short tunnel from the DEP site, the arrangement at Outfall NC-077 would be similar to the arrangement shown in Figure 8-20. For the long tunnel alignment to the vicinity of the Newtown Creek WWTP, the arrangement of diversion structures/drop shafts would be as shown in Figure 8-21. As with Alternatives DT-1 and DT-2, the drop shafts would include influent trash racks/grit sumps and passive odor control if determined to be necessary during design. Table 8-10 above summarizes the features of Alternatives DT-a, DT-3b, DT-3c and DT-3d.

The benefits, costs and challenges associated with this tunnel storage alternative are as follows:

Benefits

The primary benefit of tunnel storage is the high level of CSO volume reduction with minimal permanent above-ground land requirements and disruption during construction. The single tunnel facility addresses three of the largest CSO discharge locations to Newtown Creek.

Benefits of the long tunnel with TDPS in the vicinity of the Newtown Creek WWTP over the short tunnel with TDPS at the DEP site include that the long dewatering force main from the DEP site would be eliminated, along with the risks of sediment deposition in the Morgan Avenue interceptor from the dewatering flow. This site would also be much closer to the Newtown Creek WWTP, making access to the TDPS easier from the Newtown Creek WWTP.

Cost

The estimated NPW for this control measure is $646M for Alternative DT-3a (WWTP site/Creek route), $659M for Alternative DT-3b (WWTP site/ROW route), $651M for Alternative DT-3c (DEP site/Creek route) and $632M for Alternative DT-3d (DEP site/ROW route). Details of the estimates are presented in Section 8.4.

Challenges

The challenges associated with these tunnel alternatives would be similar to the challenges identified for the DT-2 alternatives for 50 percent control.

Alternatives DT-3a, DT-3b, DT-3c and DT-3d were carried forward to the next level of evaluation for inclusion in the basin-wide alternatives.

Alternative DT-4 – 75 Percent CSO Control Tunnel for Outfalls NC-015, NC-083 and NC-077

The tunnels designated as Alternatives DT-4a, DT-4b, DT-4c and DT-4d would provide 75 percent CSO control with the tunnel launching shaft and dewatering pumping station to be located at either the DEP parcel near Outfall NC-077 for the shorter tunnel option, or a site in the vicinity of the Newtown Creek WWTP for the longer tunnel option. For each mining shaft/TDPS site, the tunnel alignments would either follow the Creek alignment or the ROW as shown in Figures 8-16 and 8-17 above. The tunnel internal diameters would range from 23 ft to 36 ft depending on the alignment. Upon completion of the tunnel, a TDPS would be constructed. As described for Alternatives DT-1 and DT-2, the TDPS was assumed to be a cavern pumping station. The dewatering pumping station capacity for 24-hour dewatering would range from 55 MGD to 59 MGD, depending on the route. However, based on considerations of loadings to the Newtown Creek WWTP, the maximum dewatering rate would be 40 MGD. To achieve a 24-hour dewatering time, an approximately 20 MGD RTB would be required for treatment of the additional dewatering flow. The 20 MGD RTB would require an approximately 1.0-acre site. The layout of the pumping station configuration for the DEP owned parcel, assuming a cavern configuration, is shown above on Figure 8-18. The layout for a site in the vicinity of the Newtown Creek WWTP for the longer tunnel option would be similar. The configurations of the diversion structures and drop shafts for Outfalls NC-015 and NC-083 would be similar to the arrangements shown in Figure 8-19 above for all the potential alignments of this alternative. For the short tunnel from the DEP site, the arrangement at Outfall NC-077 would be similar to the arrangement shown in Figure 8-20. For the long tunnel alignment to the vicinity of the Newtown Creek WWTP, the arrangement of diversion structures/drop shafts would be as shown in Figure 8-21. As with Alternatives DT-1, DT-2and DT-3, the drop shafts would include influent trash racks/grit sumps and passive odor control if determined to be necessary during design. Table 8-10 above summarizes the features of Alternatives DT-4a, DT-4b, DT-4c and DT-4d.

The benefits, costs and challenges associated with this tunnel storage alternative are as follows:

Benefits

The primary benefit of tunnel storage is the high level of CSO volume reduction with minimal permanent above-ground land requirements and disruption during construction. The single tunnel facility addresses three of the largest CSO discharge locations to Newtown Creek.

Benefits of the long tunnel with TDPS in the vicinity of the Newtown Creek WWTP over the short tunnel with TDPS at the DEP site include that the long dewatering force main from the DEP site would be eliminated, along with the risks of sediment deposition in the Morgan Avenue interceptor from the dewatering flow. This site would also be much closer to the Newtown Creek WWTP, making access to the TDPS easier from the Newtown Creek WWTP.

Cost

The estimated NPW for this control measure is $942M for Alternative DT-3a (WWTP site/Creek route), $992M for Alternative DT-3b (WWTP site/ROW route), $983M for Alternative DT-3c (DEP site/Creek route) and $986M for Alternative DT-3d (DEP site/ROW route). Details of the estimates are presented in Section 8.4.

Challenges

The challenges associated with these tunnel alternatives would be similar to the challenges identified for the DT-2 alternatives for 50 percent control and DT-3 for 62.5 percent control, with the additional challenge of siting and operating an RTB to allow 24-hour dewatering of the tunnel.

Alternatives DT-4a, DT-4b, DT-4c and DT-4d were carried forward to the next level of evaluation for inclusion in the basin-wide alternatives.

Alternative DT-5 – 100 Percent CSO Control Tunnel for Outfalls BB-026, NC-015, NC-083 and NC-077

The tunnels designated as Alternatives DT-5a and DT-5b would provide 100 percent CSO control for Outfall BB-026 in addition to Outfalls NC-015, NC-083 and NC-077. The tunnel launching shaft and dewatering pumping station would be located in the vicinity of the Newtown Creek WWTP. The tunnel alignments would either follow the Creek alignment or the ROW alignment, as shown in Figure 8-17 above. The tunnel internal diameters would range from 36 ft to 42 ft, depending on the route. Upon completion of the tunnel, a dewatering pumping station would be constructed. As described for Alternatives DT-1, DT-2, DT-3 and DT-4, the TDPS was assumed to be a cavern pumping station. The dewatering pumping station capacity required to dewater the tunnel in 24 hours would be 137 MGD to 142 MGD depending on the tunnel route. However, as noted above, based on considerations of loadings to the Newtown Creek WWTP, the maximum dewatering rate would be 40 MGD. To dewater within 24 hours would require 97 to 103 MGD of additional treatment for the dewatered flow. The 100 MGD RTB would require an approximately 2.5-acre site. The layout of the dewatering pumping station configuration assuming a cavern configuration would be similar to the layout shown in Figure 8-18. The configurations of the diversion structures and drop shafts for Outfalls NC-015 and NC-083 would be similar to the arrangements shown in Figure 8-19 above for all the potential alignments of this alternative. The arrangement of diversion structures/drop shafts for Outfall NC-077 would be as shown in Figure 8-21. For Outfall BB-026, a consolidation conduit would be routed from a diversion structure at the outfall to a drop shaft adjacent to the mining shaft in the vicinity of the Newtown Creek WWTP. It may be possible to incorporate the drop shaft for the BB-026 flows into the mining shaft structure. As with Alternatives DT-1, DT-2, DT-3 and DT-4, the drop shafts would include influent trash racks/grit sumps and passive odor control if determined to be necessary during design. Table 8-10 above summarizes the features of Alternatives DT-5a and DT-5b.

The benefits, costs and challenges associated with this tunnel storage alternative are as follows:

<u>Benefits</u>

The benefits would be similar to those identified for the DT-3, 75 percent control alternatives, but the volume controlled would be greater.

<u>Cost</u>

The estimated NPW for this control measure is $1.6B for both Alternative DT-5a (WWTP site/creek route) and Alternative DT-5b (WWTP site/ROW route). Details of the estimates are presented in Section 8.4.

<u>Challenges</u>

The challenges associated with these tunnel alternatives would be similar to the challenges identified for the DT-2, DT-3 and DT-4 alternatives for 50, 62.5 and 75 percent control, with the additional challenge of installing the micro-tunneled connection from Outfall BB-026, and providing a much larger RTB (100 MGD) for the dewatering flows.

Alternatives DT-5a and DT-5b were carried forward to the next level of evaluation for inclusion in the basin-wide alternatives.

8.2.b Future Scalability of Tunnel Alternatives

The scalability opportunities for the tunnel alternatives depend on whether the mining shaft/TDPS is located in the vicinity of the Newtown Creek WWTP or the DEP site. If the shaft is located at the DEP site, and a site in the vicinity of the Newtown Creek WWTP remained available, then a future phase could potentially extend the tunnel from the DEP site to the vicinity of the Newtown Creek WWTP, providing additional storage capacity and higher levels of CSO control. However, an RTB would be required for treatment of the higher tunnel dewatering flows. If the shaft is located in the vicinity of the Newtown Creek WWTP, then a future scalability scenario would require the addition of an RTB facility to provide treatment of flows in excess of the tunnel capacity. These scenarios would likely require land acquisition either through a negotiated acquisition or eminent domain. These alternatives would also include providing additional pumping capacity to the RTB. Siting of the RTB would be a challenge.

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

As discussed in Section 5, DEP projects that GI should result in a CSO volume reduction to Newtown Creek of approximately 83 MGY, based on the 2008 baseline rainfall condition. This projected GI has been included as part of the baseline model projections, and is thus not categorized as an LTCP alternative.

For the purpose of this LTCP, "Other Future Green Infrastructure" is defined as GI alternatives that are in addition to those implemented under previous facility plans and those included in the baseline conditions. Because DEP is working on the implementation of GI area-wide contracts in the Newtown Creek watershed, additional GI beyond the baseline is not being considered for this LTCP at this time. DEP's goal is to saturate priority watersheds, such as Newtown Creek, with GI to maximize benefits and cost-effectiveness based on the specific opportunities, as discussed in Section 5.

8.2.d Hybrid Green/Grey Alternatives

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

8.2.e Retained Alternatives

The goal of the previous evaluations was the development of a list of retained control measures for Outfalls BB-026, NC-077, NC-083 and NC-015 to Newtown Creek. These control measures, whether individually or in combination, will form the basis of basin-wide alternatives that will be assessed using the more rigorous cost-performance and cost-attainment analyses. That list is presented in Table 8-11. The reasons for excluding the non-retained control measures from further consideration are also noted in the table.

Table 8-11. Summary of Next Level of Control Measure Screening

Control Measure	Category	Retained for Further Analysis?	Remarks
Additional GI Build-out	Source Control	NO	Planned GI build-out in the watershed (included in the baseline) is in development; unlikely that additional sites will be identified due to site constraints in publicly owned properties.
High Level Sewer Separation	Source Control	NO	Concern with resulting stormwater related pollution and construction impacts.
Fixed Weirs	System Optimization	NO	No CSO reduction benefit.
Parallel Interceptor Sewer	System Optimization	NO	Significant constructability challenges.
Pumping Station Optimization	System Optimization	NO	Limited benefit due to capacity limitation in Morgan Avenue interceptor.

Table 8-11. Summary of Next Level of Control Measure Screening

Control Measure	Category	Retained for Further Analysis?	Remarks
Pumping Station Expansion	System Optimization	YES	Borden Avenue PS (BAPS) expansion reduces CSO discharges to Dutch Kills and provides synergies with a SOGR intervention.
Gravity Flow Tipping to Other Watersheds	CSO Relocation	NO	No alternatives evaluated were determined to provide significant opportunity to warrant pursuing this solution further.
Flow Tipping with Conduit and Pumping	CSO Relocation	YES	BAPS expansion also falls into this category.
Floatables Control	Floatables Control	~~NO~~YES	~~Not evaluated as a separate CSO control measure.~~ Baseline conditions include floatables control at four largest outfalls. Underflow baffles were evaluated for the next three largest outfalls (BB-009, BB-013, and NCQ-029). Baffles were determined to be not feasible at outfall BB-013. The need for implementation of floatables control at outfalls BB-009 and NCQ-029 to be determined based on a floatables monitoring program to be implemented by DEP.
Environmental Restoration	Water Quality/ Ecological Enhancement	NO	EPA is evaluating dredging alternatives under Superfund; wetlands restoration could be required after dredging.
In-Stream Aeration	Water Quality/ Ecological Enhancement	NO	Gap analysis indicated Dutch Kills aeration system not required for average annual attainment of DO criterion.
Flushing Tunnel	Water Quality/ Ecological Enhancement	NO	Not practical for upstream reaches, not cost-effective compared to BAPS expansion for Dutch Kills.
Outfall Disinfection	Treatment: Satellite	NO	Very limited CSO control benefit.
Retention/Treatment Basins	Treatment: Satellite	NO	Alternative RTB-1 evaluated a 152 MGD RTB in conjunction with a consolidation conduit. High risk associated with long near-surface construction.
In-System Storage (Outfalls)	Storage	NO	Very limited levels of CSO control.
Off-line Storage (Shafts)	Storage	NO	Limited capacity would require multiple shafts; limited number of existing facilities from which to judge performance/ operational issues.
Off-line Storage (Tanks)	Storage	YES	To provide perspective on tunnel costs for equivalent levels of control.
Off-line Storage (Tunnels)	Storage	YES	Tunnels were evaluated under Alternatives DT-1, DT-2, DT-3 and DT-4.

As shown, the retained control measures include the BAPS expansion, storage tanks and deep tunnel storage. Floatables control is indicated in Table 8-11 as "retained, but the need for an underflow baffle at outfall BB-009 and an underflow baffle with bending weir at outfall NCQ-029 will be determined based on a floatables monitoring program to be implemented for those two outfalls. If those floatables control projects are determined to be required, they would be common elements to each of the other retained alternatives. Since the need for these floatables control projects is not certain at this time, the costs for the other retained alternatives presented below do not include the costs for floatables control at outfalls BB-009 and NCQ-029. ~~Measures for additional and/or improved floatables control are addressed within the retained alternatives.~~

8.3 CSO Reductions and Water Quality Impact of Retained Alternatives

To evaluate effects on the loadings and water quality CWA impacts, the retained alternatives listed in Table 8-12 were analyzed using both the Newtown Creek watershed (IW) and receiving water quality (NCRWQM) models. Evaluations of levels of CSO control for each alternative are presented below. In all cases, the predicted reductions shown are relative to the baseline conditions using 2008 JFK rainfall as described in Section 6. The baseline assumptions were described in detail in Section 6 and assume that the grey infrastructure projects from the WWFP have been implemented, along with the GI projected implementation identified in Section 5.

As noted earlier, a SOGR upgrade of the BAPS targeting an additional wet-weather pumping capacity of up to 24 MGD (75 percent CSO control at Outfall BB-026) was selected as the most favorable solution to mitigate the impacts of CSO discharges to Dutch Kills. Because the existing BAPS serves another small drainage area associated with Regulator BBL3a, whose flow contribution would also be pumped to the Newtown Creek WWTP during wet-weather, the total installed capacity at the BAPS would need to be 26 MGD to provide the targeted 75 percent CSO control at Outfall BB-026, 14 MGD to provide 50 percent CSO control and 7 MGD to provide 25 percent CSO control. Table 8-12 presents the annual and recreational season (May 1st through October 31st) activation frequencies at BB-026, the percent attainment of the Primary Contact WQ bacteria criteria based on 2008 rainfall, the PBC and NPW for the range of levels of control considered for the BAPS alternative. As shown in Table 8-12, implementation of at least 50 percent CSO control at Outfall BB-026 would bring Dutch Kills to seasonal attainment of the Primary Contact WQ fecal coliform criterion at WQ Station NC-6, which is the station closest to the Outfall. The locations of Outfall BB-026 and WQ Station NC-6 are shown in Figure 6-2. This assessment was conducted assuming equivalent levels of CSO control at Outfalls NC-077, NC-083 and NC-015. Table 8-12 also shows that implementing a 75 percent level of CSO control at Outfall BB-026, leads to elimination of four additional CSO activations in the recreational season (May 1st through October 31st). The NPW shown are described with more detail in Section 8-4.

Table 8-12. Summary of Performance for BAPS Alternatives

Outfall BB-026	Annual Activation Frequency	Seasonal Activation Frequency	2008 Seasonal Fecal Coliform Attainment (%)	PBC ($M)	NPW ($M)
Baseline	37	20	83	-	-
25% Control	35	15	>95	39	51

Table 8-12. Summary of Performance for BAPS Alternatives

Outfall BB-026	Annual Activation Frequency	Seasonal Activation Frequency	2008 Seasonal Fecal Coliform Attainment (%)	PBC ($M)	NPW ($M)
50% Control	29	9	>95	44	59
75% Control	25	5	>95	50	71

As mentioned in Section 8.2, 100 percent CSO control at Outfall BB-026 would be more effectively accomplished by conveying the typical year CSO discharges to a storage tunnel that would also target the capture of the discharges from Outfalls NC-077, NC-083 and NC-015. Through analysis of various tunneling options, it was possible to assign an additional PBC of $130M to the tunnel expansion scope required to retain and dewater the additional volume from Outfall BB-026. Neglecting the nominal increase in O&M cost associated with capturing the BB-026 volume, Figure 8-22 shows a clear knee-of-the-curve (KOTC) at the 75 percent level of control, based on PBCs. Expanding the BAPS up to 26 MGD to achieve 75 percent CSO control at Outfall BB-026 is the most cost-effective alternative for this outfall.

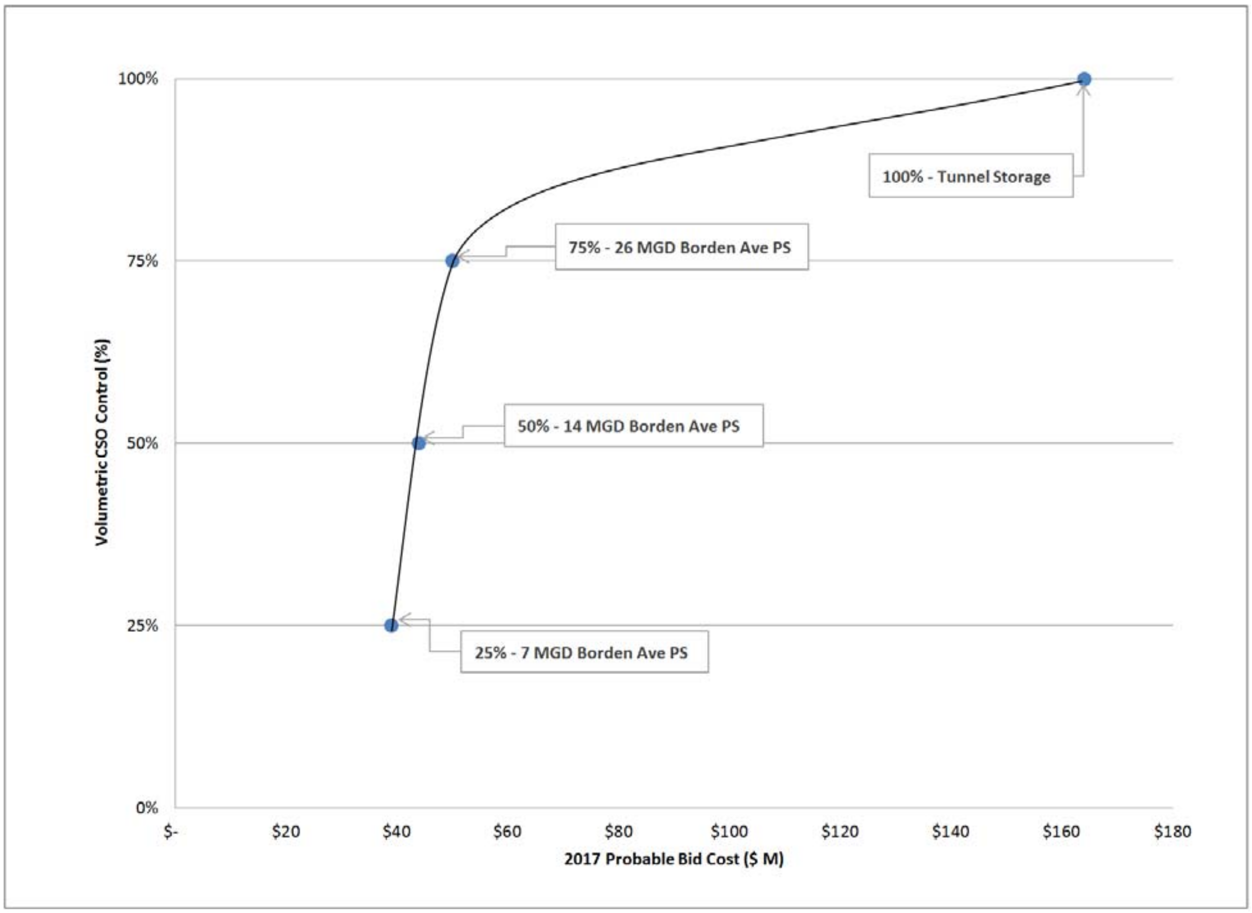


Figure 8-22. Probable Bid Cost vs Volumetric CSO Level of Control at Outfall BB-026

As noted above, elimination of the Phase 4 of Enhanced Aeration covering Dutch Kills and part of lower Newtown Creek will result in a $30.8M savings. Basin-wide alternatives were developed based on the combination of a 26 MGD expansion of the BAPS and CSO control tunnels or individual storage tanks for Outfalls NC-077, NC-083 and NC-015. Table 8-13 presents the resulting alternatives along with their new sequential numbering system. As shown, six basin-wide alternatives were included that target the largest, most active outfalls, BB-026, NC-077, NC-083 and NC-015. The evaluation of floatables control for outfalls BB-009, BB-013, and NCQ-029 would not affect the assessment of CSO volumes and loads, or WQS attainment for the basin-wide alternatives. The costs of the floatables control for outfalls BB-009, BB-013, and NCQ-029 are therefore not included in the basin-wide alternatives assessment presented below.

Table 8-13. Basin-Wide Alternatives with New Sequential Numbering

Alternative	Remarks
1. 26 MGD BAPS Expansion and Deep Tunnel for 25% Control of Three Largest Outfalls	16 foot interior diameter deep Tunnel with lengths ranging from 7,570 to 9,980 feet
2. 26 MGD BAPS Expansion and Individual Storage Tanks for 25% Control of Three Largest Outfalls	Volumes of Individual storage tanks: • NC-077 – 2.4 MG • NC-083 – 3.0 MG • NC-015 – 4.3 MG
3. 26 MGD BAPS Expansion and Deep Tunnel for 50% Control of Three Largest Outfalls	16 to 26 foot interior diameter Deep Tunnels with lengths ranging from 7,570 to 18,800 feet
4. 26 MGD BAPS Expansion and Individual Storage Tanks for 50% Control of Three Largest Outfalls	Volumes of Individual storage tanks: • NC-077 – 6.9 MG • NC-083 – 8.5 MG • NC-015 – 12.3 MG
5. 26 MGD BAPS Expansion and Deep Tunnel for 62.5% Control of Three Largest Outfalls	19 to 30 foot interior diameter Deep Tunnels with lengths ranging from 7,570 to 18,800 feet
6. 26 MGD BAPS Expansion and Deep Tunnel for 75% Control of Three Largest Outfalls	23 to 26 foot interior diameter Deep Tunnel with lengths ranging from 7,570 to 18,800 feet; 20 MGD RTB for dewatering flows
7. Deep Tunnel for 100% Control of Four Largest Outfalls	36 to 42 foot interior diameter Deep Tunnel with lengths ranging from 13,700 to 18,800 feet; 100 MGD RTB for dewatering flows

These seven Newtown Creek basin-wide retained alternatives were then analyzed on the basis of their cost-effectiveness in reducing loads and improving water quality. These more advanced analyses are described in Sections 8.3, 8.4 and 8.5.

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

Table 8-14 summarizes the projected performance of the retained Newtown Creek basin-wide alternatives in terms of CSO volume, fecal coliform and *Enterococci* load reduction. These data are plotted on Figure 8-23.

Table 8-14. Newtown Creek Retained Alternatives Performance Summary (2008 Rainfall)

Alternative	CSO Volume (MGY) (3)	Frequency of Overflow(4)	CSO Volume Reduction(3) (%)	Fecal Coliform Reduction(1)(3) (%)	*Enterococci* Reduction(1)(3) (%)
Baseline Conditions(2)	1,055	42	-	-	-
1. 26 MGD BAPS Expansion and Deep Tunnel for 25% Control of Three Largest Outfalls	696	29	34	29	37
2. 26 MGD BAPS Expansion and Individual Storage Tanks for 25% Control of Three Largest Outfalls	696	29	34	29	37
3. 26 MGD BAPS Expansion and Deep Tunnel for 50% Control of Three Largest Outfalls	475	29	55	53	58
4. 26 MGD BAPS Expansion and Individual Storage Tanks for 50% Control of Three Largest Outfalls	475	19	55	52	57
5. 26 MGD BAPS Expansion and Deep Tunnel for 62.5% Control of Three Largest Outfalls	364	19	65	63	68
6. 26 MGD BAPS Expansion and Deep Tunnel for 75% Control of Three Largest Outfalls	286	18	73	70	75
7. Deep Tunnel for 100% Control of Four Largest Outfalls	0	0	100	100	100

Notes:
(1) Bacteria reduction is computed on an annual basis.
(2) Based upon 2008 Typical Year.
(3) Maximum values reported for four largest outfalls (BB-026, NC-077, NC-083 and NC-015).
(4) Maximum values for the three upstream outfalls (NC-077, NC-083 and NC-015); annual frequency for BB-026 is 25.

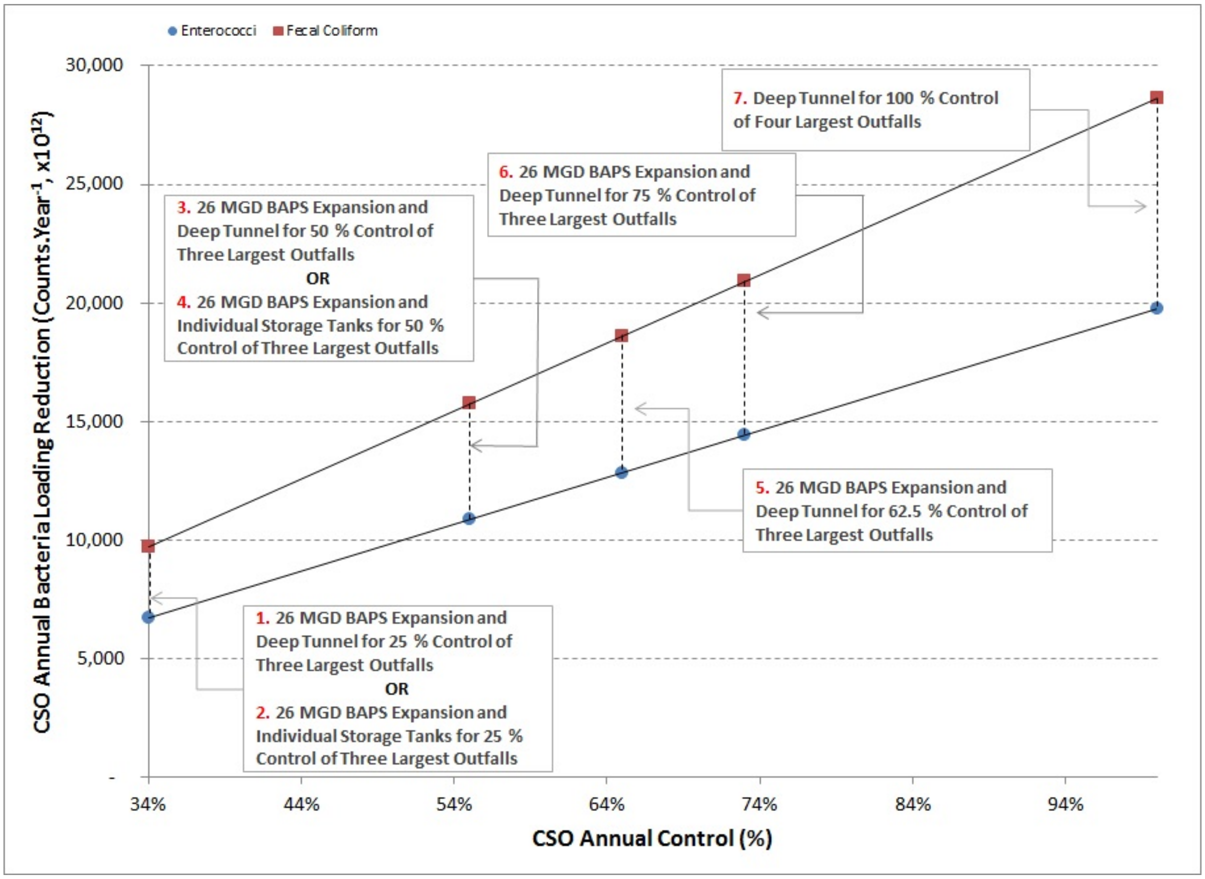


Figure 8-23. Untreated CSO Volume Reductions (as Percent CSO Annual Control) vs. Annual CSO Bacteria Loading Reduction (2008 Rainfall)

The bacteria loading reductions shown in Table 8-14 were computed on an annual basis. Because the retained alternatives for Newtown Creek provide volume reduction and not treatment, the predicted bacteria loading reductions of the alternatives are very closely aligned with their projected CSO volume reductions.

8.3.b Water Quality Impacts Within Newtown Creek

Due to the geographic location of Dutch Kills relative to the other tributary branches, the analysis of water quality impacts to the waterbody was segmented accordingly below:

CSO reduction at Outfall BB-026 and WQ improvements at WQ Station NC-6

The evaluation of the improvements to the WQ in Dutch Kills upon implementation of various levels of CSO control focused on WQ Station NC-6 and CSO Outfall BB-026, both close to the head end of the tributary branch. This assessment was conducted assuming equivalent levels of CSO control at Outfalls NC-077, NC-083 and NC-015. As discussed in Section 8.2 and above in this section, the preferred solution is to provide 75 percent CSO control at Outfall BB-026 by an expansion of the BAPS to 26 MGD. The cost for 100 percent control is based on the incremental cost to connect Outfall BB-026 to a tunnel storage alternative. Figure 8-24 presents the NPW of the various alternatives for BB-026 versus annual and recreational season (May 1st through October 31st) attainment of the Existing Primary Contact WQ Criteria, as well as attainment of the Potential Future Primary Contact WQ Criteria. The attainment in

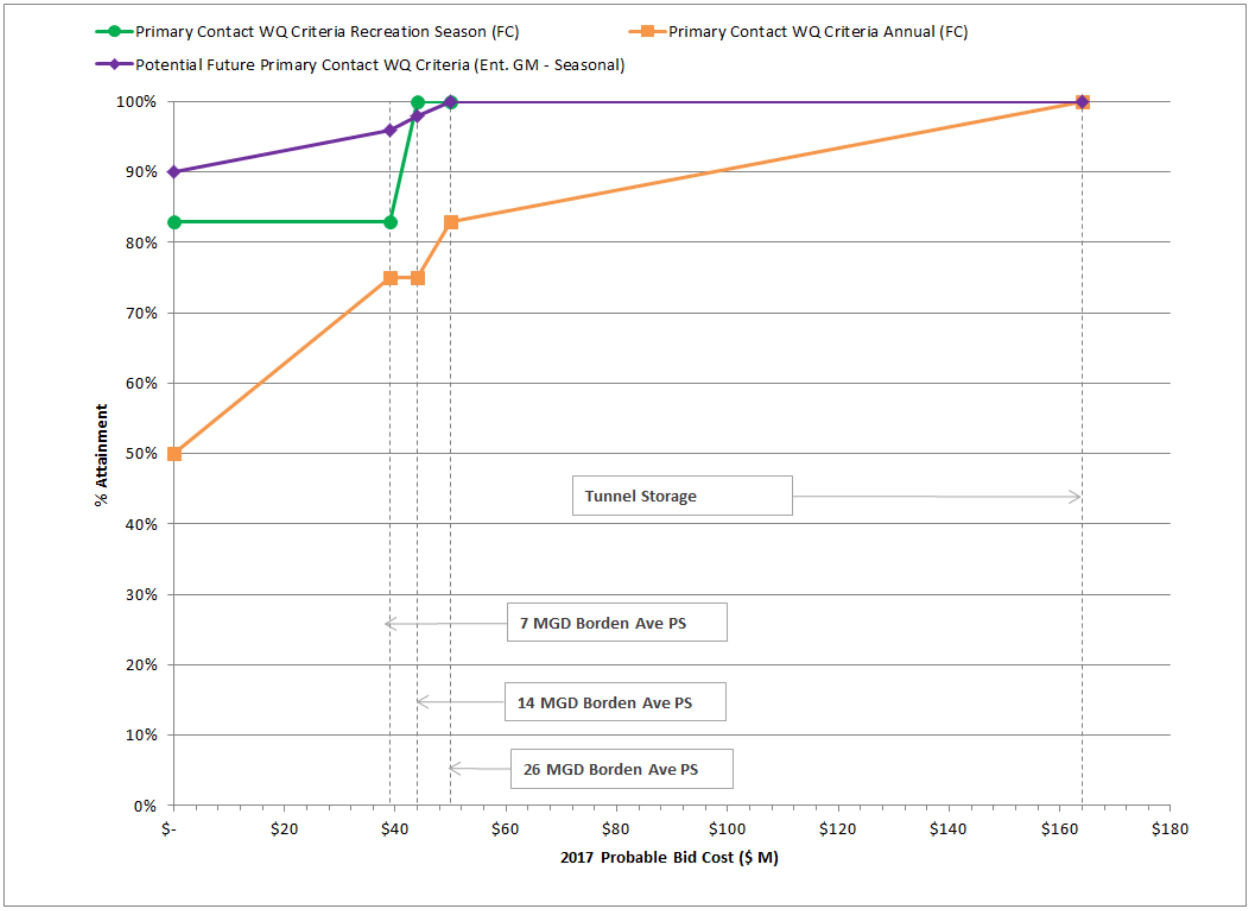


Figure 8-24. Probable Bid Cost vs Attainment at Outfall BB-026

these plots is based on the 2008 typical year. These plots further support selection of the 75 percent level of control alternative as the preferred alternative for BB-026.

<u>Basin-wide Alternatives 1 through 7 and WQ Improvements to Newtown Creek and Tributary Branches</u>

This section describes the levels of attainment with applicable current and potential future bacteria criteria within Newtown Creek that would be achieved through implementation of the basin-wide retained CSO control alternatives listed in Table 8-13.

Newtown Creek is a Class SD waterbody. Based on the analysis presented in Section 6.0, and supported by the NCRWQM runs for 2008 typical year, historic and recent water quality monitoring, along with baseline condition modeling, none of the stations within the waterbody are in attainment with the Primary Contact WQ Criteria for fecal coliform under baseline conditions. A review of the Potential Future Primary Contact Water Quality Criteria for *Enterococci* indicates that under baseline conditions, Newtown Creek would also not be in attainment of the rolling 30-day geomean criterion of 30 cfu/100mL and the 90th percentile standard threshold value criterion of 110 cfu/100mL. Upon implementation of at least 50 percent CSO control at Outfalls BB-026, NC-077, NC-083 and NC-015, recreational season (May 1st

through October 31st) attainment of the fecal coliform criterion would be achieved at all sampling locations except NC12 and NC14 for the 2008 typical year. NC12 and NC14 are located in the upstream reaches of East Branch and English Kills, respectively. Providing 62.5 percent CSO control would bring locations NC12 and NC14 into recreational season compliance based on the 2008 typical year. General aspects of the relationship between levels of CSO control through implementation of the retained alternatives and predicted levels of WQS attainment are discussed in greater detail in Section 8.5.

8.4 Cost Estimates for Retained Alternatives

Evaluation of the retained alternatives requires cost estimation. The methodology for developing these costs is dependent upon the type of technology and its O&M requirements. The construction costs were developed as PBC and the total NPW costs were determined by adding the estimated PBC to the NPW of the projected annual O&M costs at an assumed interest rate of 3 percent over a 20-year life cycle. However, for tunnel alternatives which provide longer service, a longer 100 year lifecycle was used for computing NPW. Design, construction management and land acquisition costs are not included in the cost estimates. All costs are in February 2017 dollars and are considered Level 5 cost estimates by AACE International with an accuracy of -50 percent to +100 percent.

8.4.a Alternative 1 – 26 MGD BAPS Expansion and 25 Percent Control Individual Tanks for Outfalls NC-015, NC-083 and NC-077

Costs for Alternative 1 include planning-level estimates of the costs to expand the BAPS to provide 26 MGD pumping capacity and the construction of conveyance elements to and from the upgraded station. The costs also include construction of three storage tanks for Outfalls NC-077, NC-083 and NC-015 and reflect the description provided in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative 1 is $627M as shown in Table 8-15.

Table 8-15. Costs for Basin-Wide Alternative 1

Item	February 2017 Cost ($ Million)		
	BAPS Expansion	Individual Storage Tanks	Total
Probable Bid Cost	50	513	563
Annual O&M Cost	1.4	2.9	4.3
Net Present Worth	71	556	627

8.4.b Alternative 2a – 26 MGD BAPS Expansion and 25 Percent Control Deep Tunnel for Outfalls NC-015, NC-083 and NC-077 (Creek Alignment/Shorter Tunnel)

Costs for Alternative 2a include planning-level estimates of the costs to expand the BAPS to provide 26 MGD pumping capacity and the construction of conveyance elements to and from the station. The costs also include construction of a deep tunnel for Outfalls NC-077, NC-083 and NC-015 and reflect the description provided in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative 2a is $508M as shown in Table 8-16.

Table 8-16. Costs for Basin-Wide Alternative 2a

Item	February 2017 Cost ($ Million)		
	BAPS Expansion	Storage Tunnel	Total
Probable Bid Cost	50	358	408
Annual O&M Cost	1.4	2.5	3.9
Net Present Worth	71	437	508

8.4.c Alternative 2b – 26 MGD BAPS Expansion and 25 Percent Control Deep Tunnel for Outfalls NC-015, NC-083 and NC-077 (ROW Alignment/Shorter Tunnel)

Costs for Alternative 2b include planning-level estimates of the costs to expand the BAPS to provide 26 MGD pumping capacity and the construction of conveyance elements to and from the station. The costs also include construction of a deep tunnel for Outfalls NC-077, NC-083 and NC-015 and reflect the description provided in detail in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative 2b is $527M as shown in Table 8-17.

Table 8-17. Costs for Basin-Wide Alternative 2b

Item	February 2017 Cost ($ Million)		
	BAPS Expansion	Storage Tunnel	Total
Probable Bid Cost	50	377	427
Annual O&M Cost	1.4	2.5	3.9
Net Present Worth	71	456	527

8.4.d Alternative 3 – 26 MGD BAPS Expansion and 50 Percent Control Individual Storage Tanks for Outfalls NC-015, NC-083 and NC-077

Costs for Alternative 3 include planning-level estimates of the costs to expand the BAPS to provide 26 MGD pumping capacity and the construction of conveyance elements to and from the station. The costs also include construction of three storage tanks for Outfalls NC-077, NC-083 and NC-015 and reflect the description provided in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative 3 is $901M as shown in Table 8-18.

Table 8-18. Costs for Basin-Wide Alternative 3

Item	February 2017 Cost ($ Million)		
	BAPS Expansion	Individual Storage Tanks	Total
Probable Bid Cost	50	776	826
Annual O&M Cost	1.4	3.6	5
Net Present Worth	71	830	901

8.4.e Alternative 4a - 26 MGD BAPS Expansion and 50 Percent Control Deep Tunnel for Outfalls NC-015, NC-083 and NC-077 (Creek Alignment)

Costs for Alternative 4a include planning-level estimates of the costs to expand the BAPS to provide 26 MGD pumping capacity and the construction of conveyance elements to and from the station. The costs also include construction of a deep tunnel collecting overflows from Outfalls NC-077, NC-083 and NC-015 and reflect the description provided in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative 4a ranges from $645M to $647M, as shown in Table 8-19.

Table 8-19. Costs for Basin-Wide Alternative 4a

Item	February 2017 Cost ($ Million)				
	BAPS Expansion	Shorter (DEP)		Longer (WWTP)	
		Tunnel	Total	Tunnel	Total
Probable Bid Cost	50	476	526	478	528
Annual O&M Cost	1.4	3.1	4.5	3.1	4.5
Net Present Worth	71	574	645	576	647

8.4.f Alternative 4b - 26 MGD BAPS Expansion and 50 Percent Control Deep Tunnel for Outfalls NC-015, NC-083 and NC-077 (ROW Alignment)

Costs for Alternative 4b include planning-level estimates of the costs to expand the BAPS to provide 26 MGD pumping capacity and the construction of conveyance elements to and from the station. The costs also include construction of a deep tunnel for Outfalls NC-077, NC-083 and NC-015 and reflect the description provided in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative 4b ranges from $642M to $647M as shown in Table 8-20.

Table 8-20. Costs for Basin-Wide Alternative 4b

Item	February 2017 Cost ($ Million)				
	BAPS Expansion	Shorter (DEP)		Longer (WWTP)	
		Storage Tunnel	Total	Storage Tunnel	Total
Probable Bid Cost	50	478	528	473	523
Annual O&M Cost	1.4	3.1	4.5	3.1	4.5
Net Present Worth	71	576	647	571	642

8.4.g Alternative 5a - 26 MGD BAPS Expansion and 62.5 Percent Control Deep Tunnel for Outfalls NC-015, NC-083 and NC-077 (Creek Alignment)

Costs for Alternative 5a include planning-level estimates of the costs to expand the BAPS to provide 26 MGD pumping capacity and the construction of conveyance elements to and from the station. The costs also include construction of a deep tunnel collecting overflows from Outfalls NC-077, NC-083 and

NC-015 and reflect the description provided in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative 5a ranges from $717M to $722M, as shown in Table 8-21.

Table 8-21. Costs for Basin-Wide Alternative 5a

Item	February 2017 Cost ($ Million)				
	BAPS Expansion	Shorter (DEP)		Longer (WWTP)	
		Tunnel	Total	Tunnel	Total
Probable Bid Cost	50	539	589	534	584
Annual O&M Cost	1.4	3.6	5.0	3.6	5.0
Net Present Worth	71	651	722	646	717

8.4.h Alternative 5b - 26 MGD BAPS Expansion and 62.5 Percent Control Deep Tunnel for Outfalls NC-015, NC-083 and NC-077 (ROW Alignment)

Costs for Alternative 5b include planning-level estimates of the costs to expand the BAPS to provide 26 MGD pumping capacity and the construction of conveyance elements to and from the station. The costs also include construction of a deep tunnel for Outfalls NC-077, NC-083 and NC-015 and reflect the description provided in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative 5b ranges from $703M to $730M as shown in Table 8-22.

Table 8-22. Costs for Basin-Wide Alternative 5b

Item	February 2017 Cost ($ Million)				
	BAPS Expansion	Shorter (DEP)		Longer (WWTP)	
		Storage Tunnel	Total	Storage Tunnel	Total
Probable Bid Cost	50	520	570	547	597
Annual O&M Cost	1.4	3.6	5.0	3.6	5.0
Net Present Worth	71	632	703	659	730

8.4.i Alternative 6a – 26 MGD BAPS Expansion and 75 Percent Control Deep Tunnel for Outfalls NC-015, NC-083 and NC-077 (Creek Alignment)

Costs for Alternative 6a include planning-level estimates of the costs to expand the BAPS to provide 26 MGD pumping capacity and the construction of conveyance elements to and from the station. The costs also include construction of a deep tunnel for Outfalls NC-077, NC-083 and NC-015 and reflect the description provided in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative 6a ranges from $1.01B to $1.05B as shown in Table 8-23.

Table 8-23. Costs for Basin-Wide Alternative 6a

Item	February 2017 Cost ($ Million)				
	BAPS Expansion	Shorter (DEP)		Longer (WWTP)	
		Storage Tunnel	Total	Storage Tunnel	Total
Probable Bid Cost	50	787	837	745	795
Annual O&M Cost	1.4	6.0	7.4	6.0	7.4
Net Present Worth	71	983	1,054	942	1,013

8.4.j Alternative 6b – 26 MGD BAPS Expansion and 75 Percent Control Deep Tunnel for Outfalls NC-015, NC-083 and NC-077 (ROW Alignment)

Costs for Alternative 6b include planning-level estimates of the costs to expand the BAPS to provide 26 MGD pumping capacity and the construction of conveyance elements to and from the station. The costs also include construction of a deep tunnel for Outfalls NC-077, NC-083 and NC-015 and reflect the description provided in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative 5b is approximately $1.06B as shown in Table 8-24.

Table 8-24. Costs for Basin-Wide Alternative 6b

Item	February 2017 Cost ($ Million)				
	BAPS Expansion	Shorter (DEP)		Longer (WWTP)	
		Storage Tunnel	Total	Storage Tunnel	Total
Probable Bid Cost	50	790	840	795	845
Annual O&M Cost	1.4	6.0	7.4	6.0	7.4
Net Present Worth	71	986	1,057	992	1,063

8.4.k Alternative 7a - 100 Percent Control Deep Tunnel for Outfalls BB-026, NC-015, NC-083 and NC-077 (Creek Alignment)

The costs for Alternative 7a include planning-level estimates for the construction of a deep tunnel for Outfalls BB-026, NC-077, NC-083 and NC-015 and reflect the description provided in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative 7a is $1.65B, as shown in Table 8-25.

Table 8-25. Costs for Basin-Wide Alternative 7a

Item	February 2017 Cost ($ Million)
Probable Bid Cost	1,371
Annual O&M Cost	8.8
Net Present Worth	1,649

8.4.l Alternative 7b – 100 Percent Control Deep Tunnel for Outfalls BB-026, NC-015, NC-083 and NC-077 (ROW Alignment)

Costs for Alternative 7b include planning-level estimates of the costs construction of a deep tunnel collecting overflows from Outfalls BB-026, NC-077, NC-083 and NC-015 and reflect the description provided in Section 8.2. Site acquisition costs are not included. The total cost, expressed as NPW, for Alternative 6b is $1.65B, as shown in Table 8-26.

Table 8-26. Costs for Basin-Wide Alternative 7b

Item	February 2017 Cost ($ Million)
Probable Bid Cost	1,373
Annual O&M Cost	8.8
Total Net Present Worth	1,650

The cost estimates of these retained alternatives are summarized below in Table 8-27 and are then used in the development of the cost-performance and cost- attainment plots presented in Section 8.5. For the purposes of the cost-performance and cost-attainment curves development, costs for the tunnel options whose alignment follows the Creek to the extent possible were used. These costs do not differ significantly from those estimated for the ROW alignments. As noted above, elimination of the Phase 4 of Enhanced Aeration covering Dutch Kills and part of lower Newtown Creek will result in a $30.8M savings that would be applicable to all basin-wide alternatives.

Table 8-27. Cost of Retained Alternatives

Alternative	February 2017 PBC ($ Million)	Annual O&M Cost ($ Million)	Total Net Present Worth ($ Million)
1. 26 MGD BAPS Expansion and Individual Storage Tanks for 25 % Control of Three Largest Outfalls	563	4.3	627
2a. 26 MGD BAPS Expansion and Deep Tunnel for 25% Control of Three Largest Outfalls- Creek Alignment[1][2]	408	3.9	508
2b. 26 MGD BAPS Expansion and Deep Tunnel for 25% Control of Three Largest Outfalls (Row Alignment)[1]	427	3.9	527
3. 26 MGD BAPS Expansion and Individual Storage Tanks for 50% Control of Three Largest Outfalls [1]	826	5	901
4a. 26 MGD BAPS Expansion and Deep Tunnel for 50% Control of Three Largest Outfalls (Creek Alignment)[1][2]	526 to 528	4.5	645 to 647
4b. 26 MGD BAPS Expansion and Deep Tunnel for 50% Control of Three Largest Outfalls (ROW Alignment)[1]	523 to 528	4.5	642 to 647
5a. 26 MGD BAPS Expansion and Deep Tunnel for 62.5% Control of Three Largest Outfalls (Creek Alignment)[1][3]	584 to 589	5.0	717 to 722
5b. 26 MGD BAPS Expansion and Deep Tunnel for 62.5% Control of Three Largest	570 to 597	5.0	703 to 730

Table 8-27. Cost of Retained Alternatives

Alternative	February 2017 PBC ($ Million)	Annual O&M Cost ($ Million)	Total Net Present Worth ($ Million)
Outfalls (ROW Alignment)(1)			
6a. 26 MGD BAPS Expansion and Deep Tunnel for 75% Control of Three Largest Outfalls (Creek Alignment)(1)(4)	795 to 837	7.4	1,013 to 1,054
6b. 26 MGD BAPS Expansion and Deep Tunnel for 75% Control of Three Largest Outfalls (ROW Alignment)(1)	840 to 845	7.4	1,057 to 1,063
7a. Deep Tunnel for 100% Control of Four Largest Outfalls (Creek Alignment)(1)(2)	1,371	8.8	1,649
7b. Deep Tunnel for 100% Control of Four Largest Outfalls (ROW Alignment)(1)	1,373	8.8	1,650

Notes:

(1) Both the WWTP and DEP sites were used for the purposes of developing conceptual layouts for evaluation of 25, 50, 75 and 100% CSO control tunnel alternatives. The final siting of the TDPS, the tunnel alignment and other associated details of the tunnel alternatives presented herein will be further evaluated and finalized during subsequent planning and design stages.
(2) Tunnel alternative shown in subsequent cost-performance and cost-attainment plots.
(3) Tunnel alternative with higher NPW of $722M shown in subsequent cost-performance and cost-attainment plots.
(4) Tunnel alternative with higher NPW of $1,054M shown in subsequent cost-performance and cost-attainment plots.

8.5 Cost-Attainment Curves for Retained Alternatives

The final step of the analysis is to evaluate the cost-effectiveness of the basin-wide retained alternatives based on their NPW and projected impact on CSO loadings and attainment of applicable WQS. Those retained alternatives that did not show incremental gains in performance (shown in red in the figures) were not included in the development of the best-fit curve.

8.5.a Cost-Performance Curves

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

A best-fit cost curve was developed based on those alternatives judged most cost-effective for a defined level of CSO control as estimated by IW modeling for the typical year rainfall (2008).

DEP also evaluated the level of bacteria loadings reductions to the receiving waters. Figure 8-25 shows the percent reductions on a volumetric basis achieved by each alternative whereas Figure 8-26 illustrates the CSO events remaining upon implementation of each alternative. Bacteria load reduction plots are presented in Figures 8-27 (*Enterococci*) and 8-28 (fecal coliform). These curves plot the cost of the alternatives against their associated projected annual CSO *Enterococci* and fecal coliform loading reductions, respectively. The primary vertical axis shows percent CSO bacteria loading reductions. The secondary vertical axis shows the corresponding total bacteria loading reductions, as a percentage, when loadings from other non-CSO sources of bacteria are included. Figures 8-25, 8-27 and 8-28 show a KOTC at the alternative with the 62.5 percent control tunnel.

The evaluation of the retained alternatives focused on cost-effective reduction of the frequency of CSO discharge in addition to CSO volume and pathogen load reductions to address current impacts to waterbody uses and issues raised by the public.

8.5.b Cost-Attainment Curves

This section evaluates the relationship of the costs of the retained alternatives versus their expected level of attainment of bacteria Primary Contact WQ Criteria and Potential Future Primary Contact WQ Criteria as modeled using NCRWQM with 2008 rainfall. The cost-performance plots shown in Figures 8-25 through 8-28 indicate that most of the retained alternatives represent incremental gains in marginal performance. Those retained alternatives that did not show incremental gains in marginal performance on the cost-performance curves are not included in the cost-attainment curves as they were deemed not to be cost-effective relative to other alternatives.

In addition to the bacteria Primary Contact WQ Criteria, the cost-attainment analysis considered Potential Future Primary Contact WQ Criteria. As was noted in Section 2.0, under the BEACH Act of 2000, *Enterococci* criteria do not apply to tributaries such as Newtown Creek, which is not a coastal recreation water and does not have primary contact recreation as a designated use. The bacteria standards evaluations thus only considered the fecal coliform criterion, specifically the monthly GM of 200 cfu/100mL both on an annual and recreational season (May 1st through October 31st) basis. The resultant curves for the current and potential future standards and relevant criteria are presented as Figures 8-29 through 8-40 for eleven locations (Stations OW-4 through OW-14) within Newtown Creek.

Based on the 2008 typical year WQ simulations for Newtown Creek, annual or seasonal attainment of the Existing WQ (Class SD) or Primary Contact WQ Criteria for fecal coliform under baseline conditions are not satisfied 100 percent of the time.

Upon implementation of at least 50 percent CSO control at Outfalls BB-026, NC-077, NC-083 and NC-015, recreational season (May 1st through October 31st) attainment of the fecal coliform criterion would be achieved at all sampling locations except NC12 and NC14 for the 2008 typical year. NC12 and NC14 are located in the upstream reaches of East Branch and English Kills, respectively. Providing 62.5 percent CSO control would bring locations NC12 and NC14 into recreational season compliance based on the 2008 typical year.

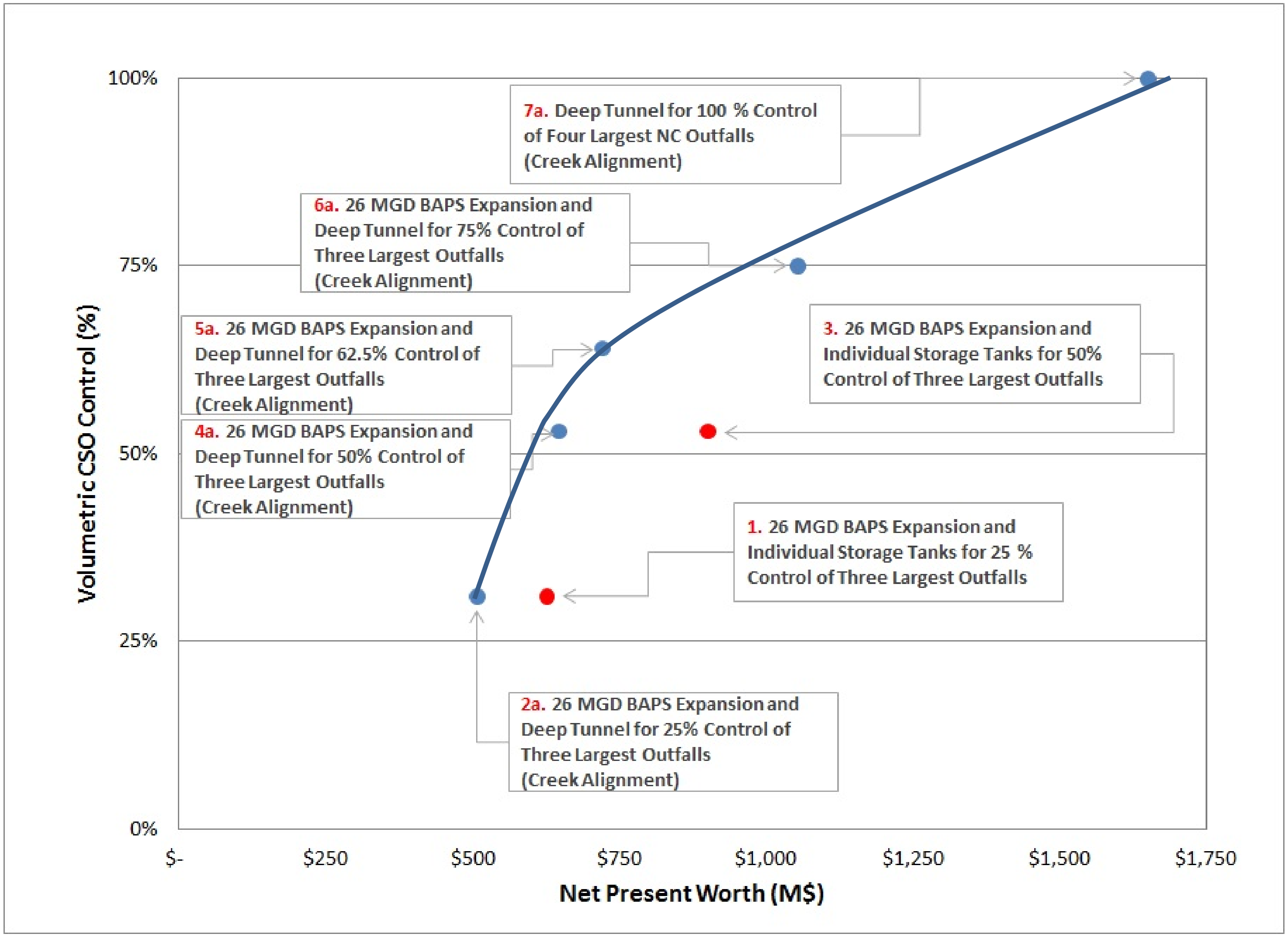


Figure 8-25. Cost vs. CSO Control (2008 Rainfall)

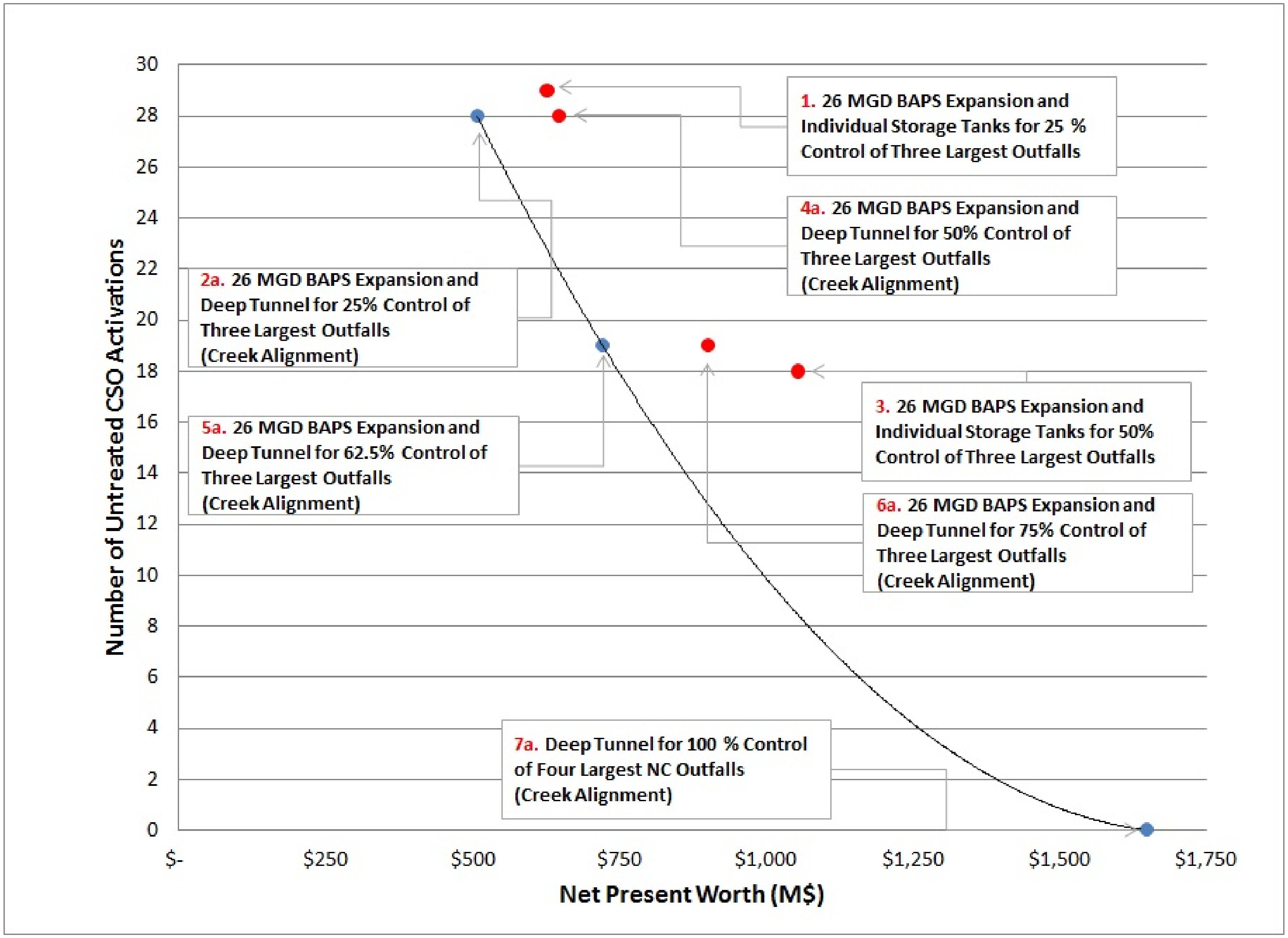


Figure 8-26. Cost vs. Remaining CSO Events (2008 Rainfall)

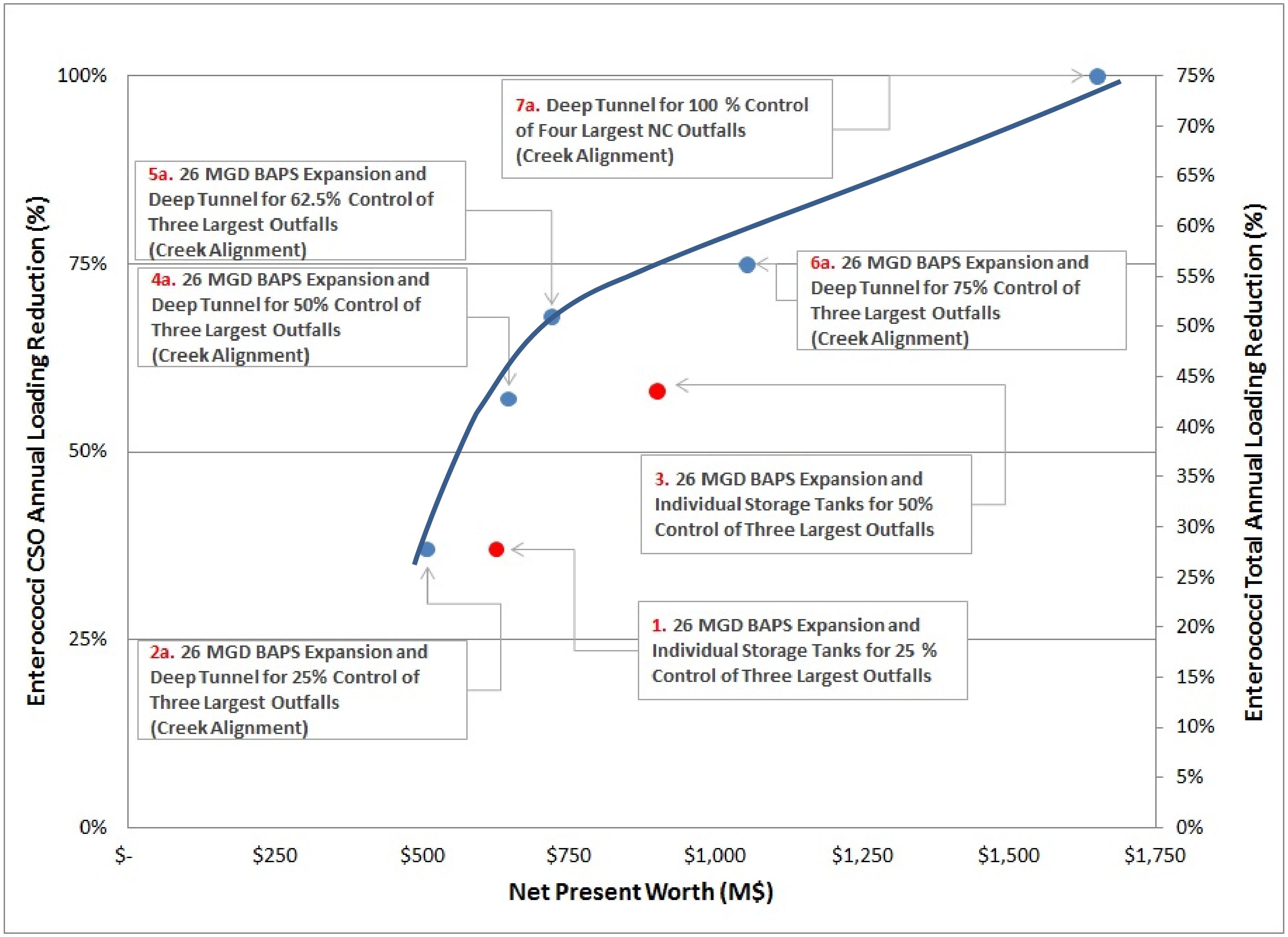


Figure 8-27. Cost vs. *Enterococci* Loading Reduction (2008 Rainfall)

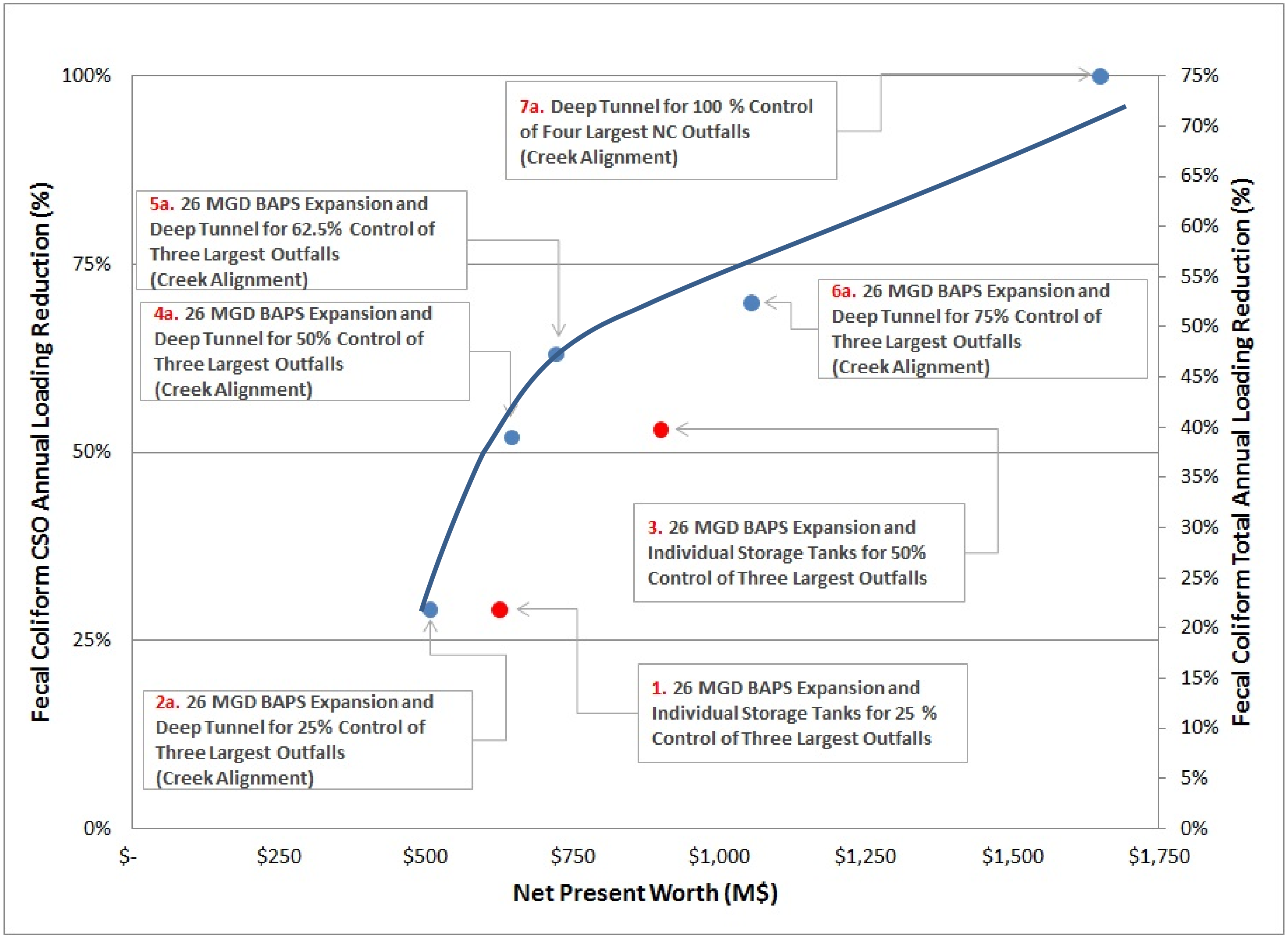


Figure 8-28. Cost vs. Fecal Coliform Loading Reduction (2008 Rainfall)

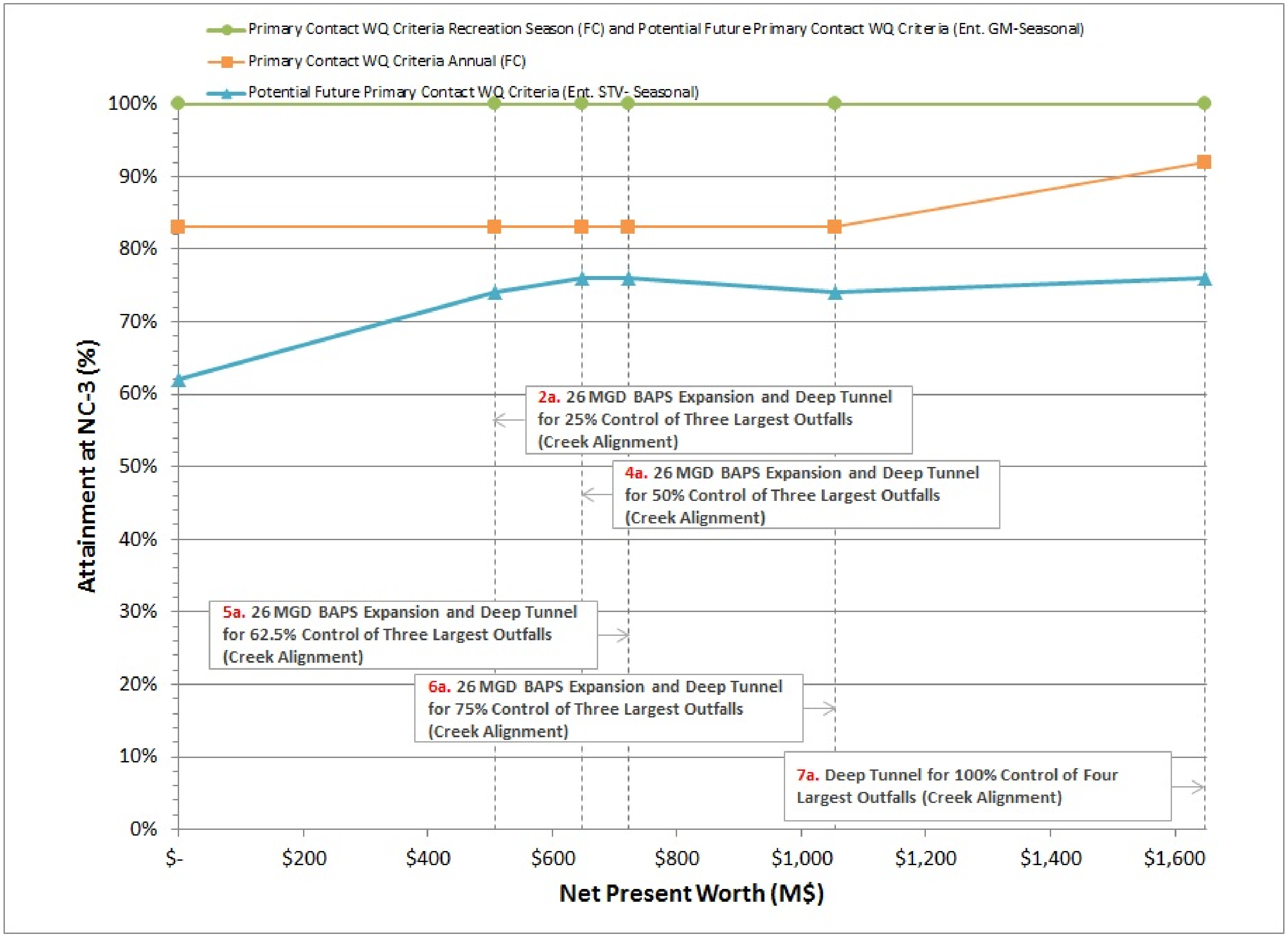


Figure 8-29. Cost vs. Bacteria Attainment at Station NC3 (2008 Rainfall)

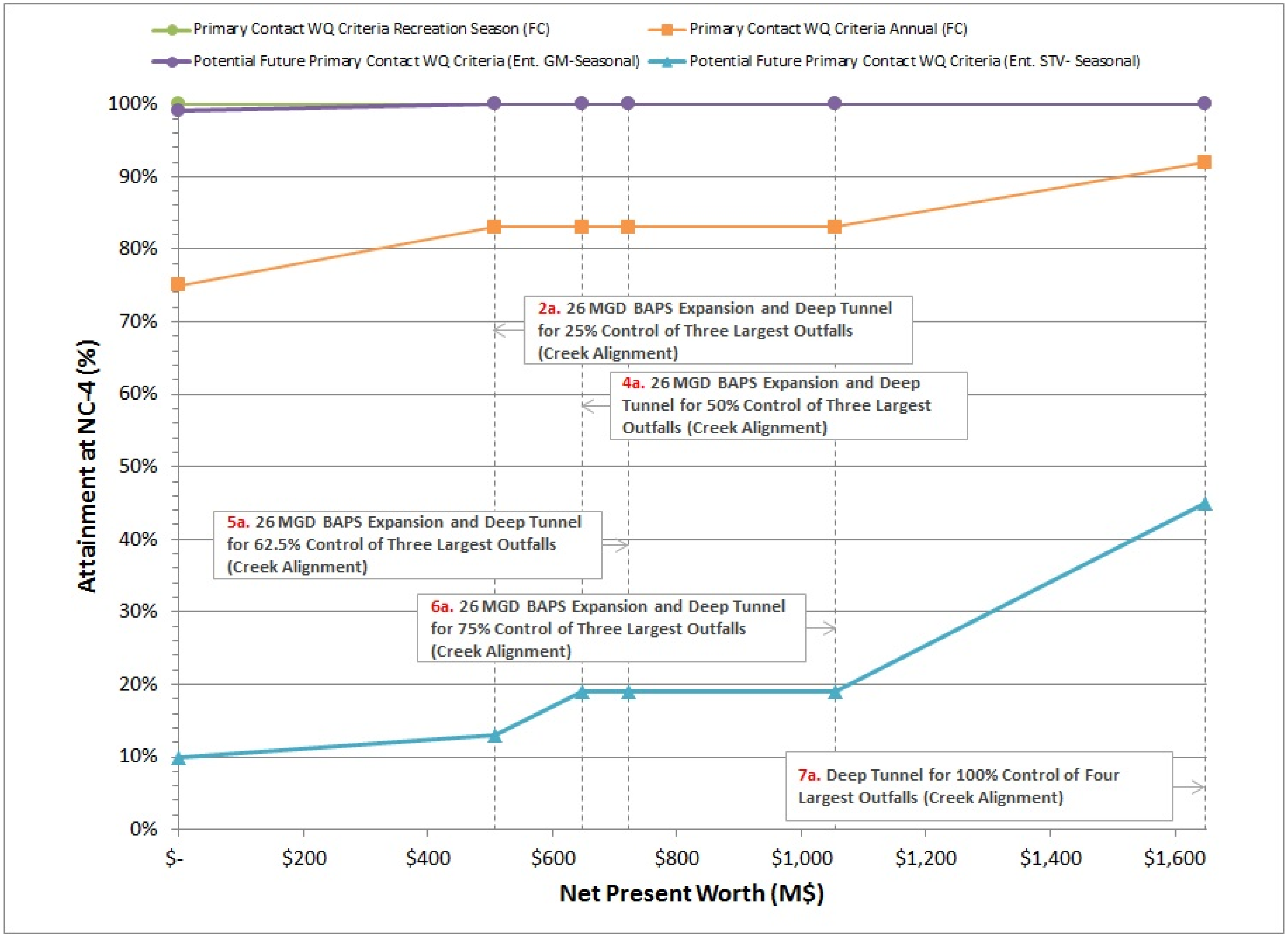


Figure 8-30. Cost vs. Bacteria Attainment at Station NC4 (2008 Rainfall)

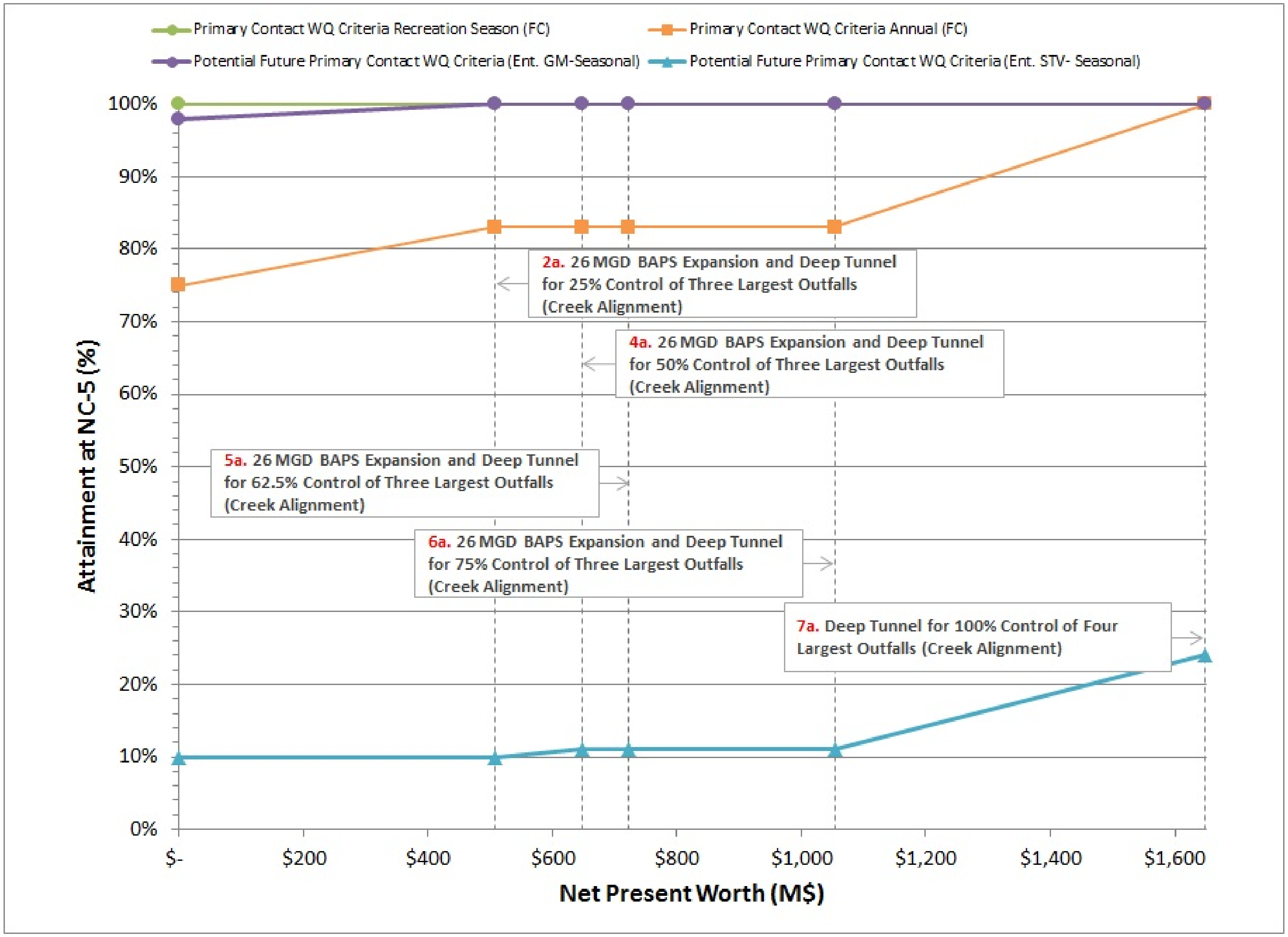


Figure 8-31. Cost vs. Bacteria Attainment at Station NC5 (2008 Rainfall)

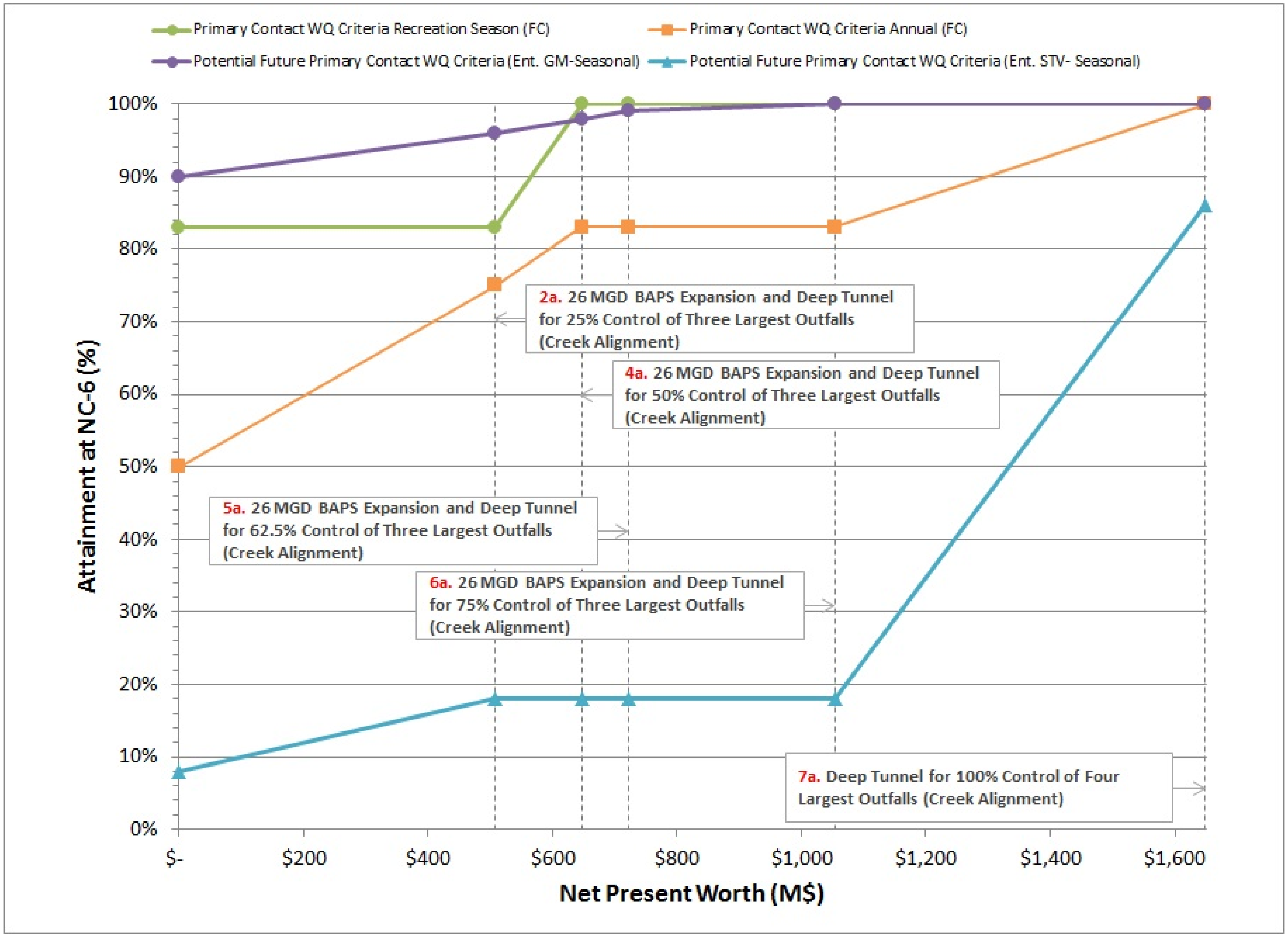


Figure 8-32. Cost vs. Bacteria Attainment at Station NC6 (2008 Rainfall)

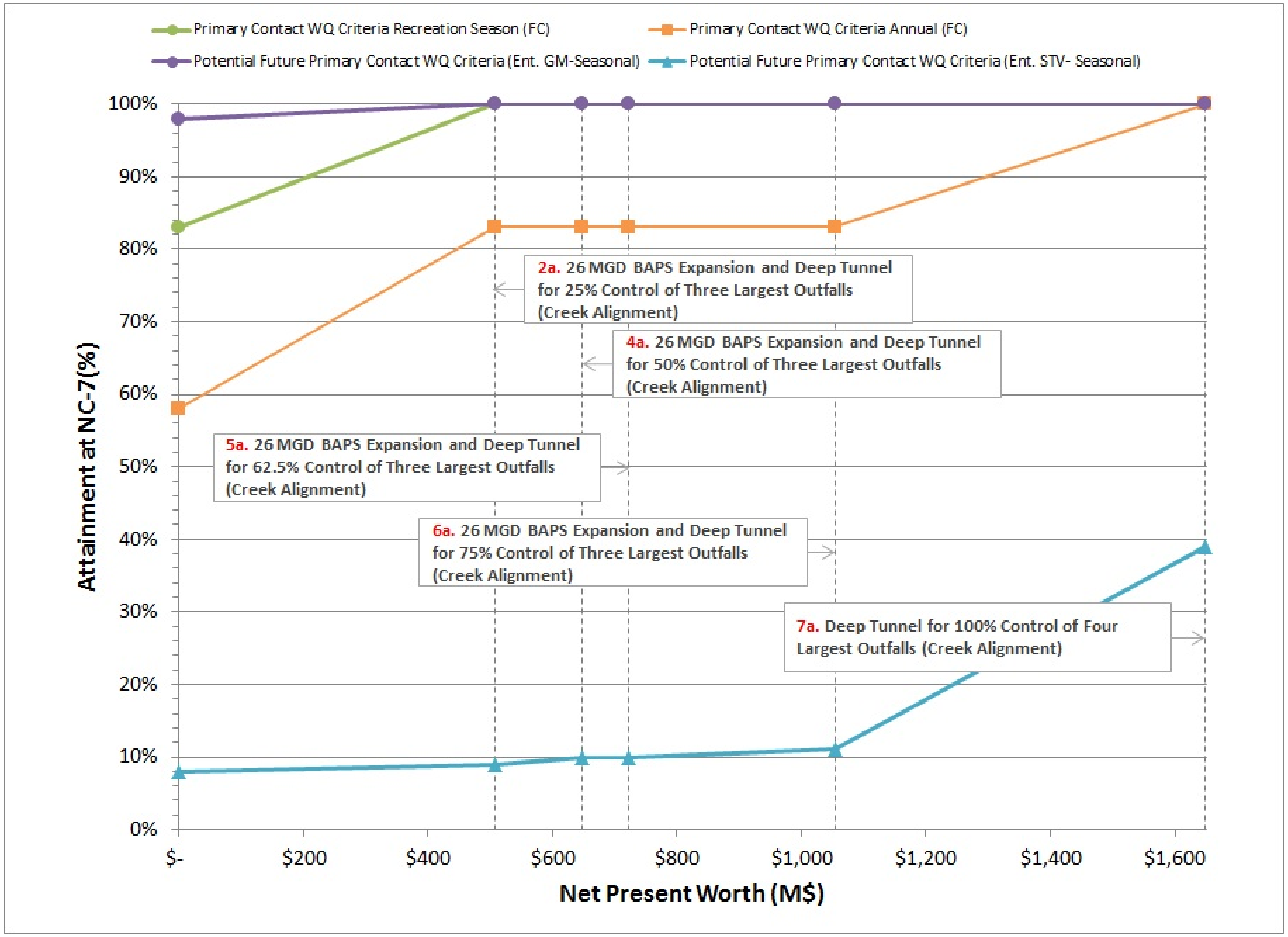


Figure 8-33. Cost vs. Bacteria Attainment at Station NC7 (2008 Rainfall)

AECOM with Hazen

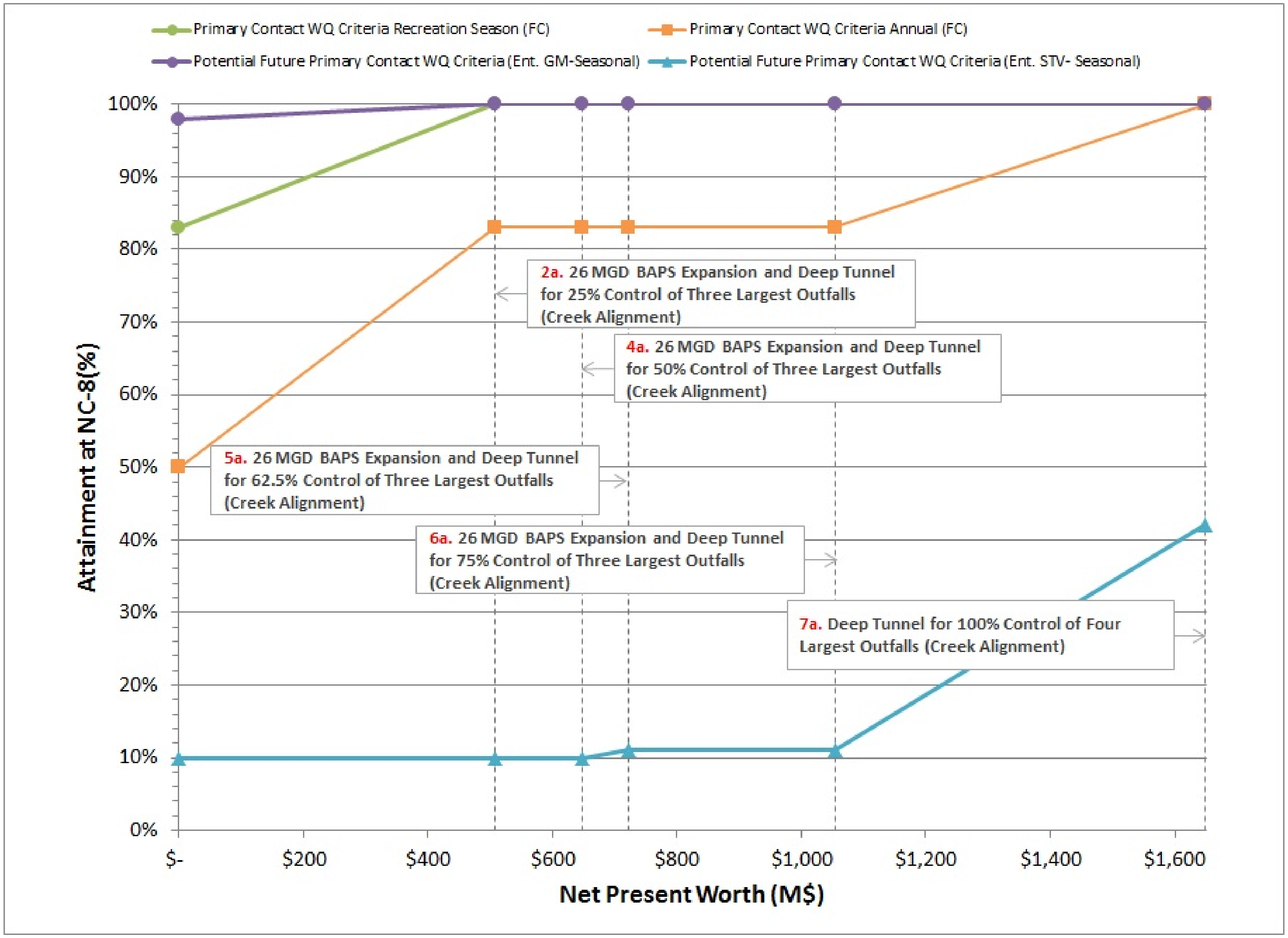


Figure 8-34. Cost vs. Bacteria Attainment at Station NC8 (2008 Rainfall)

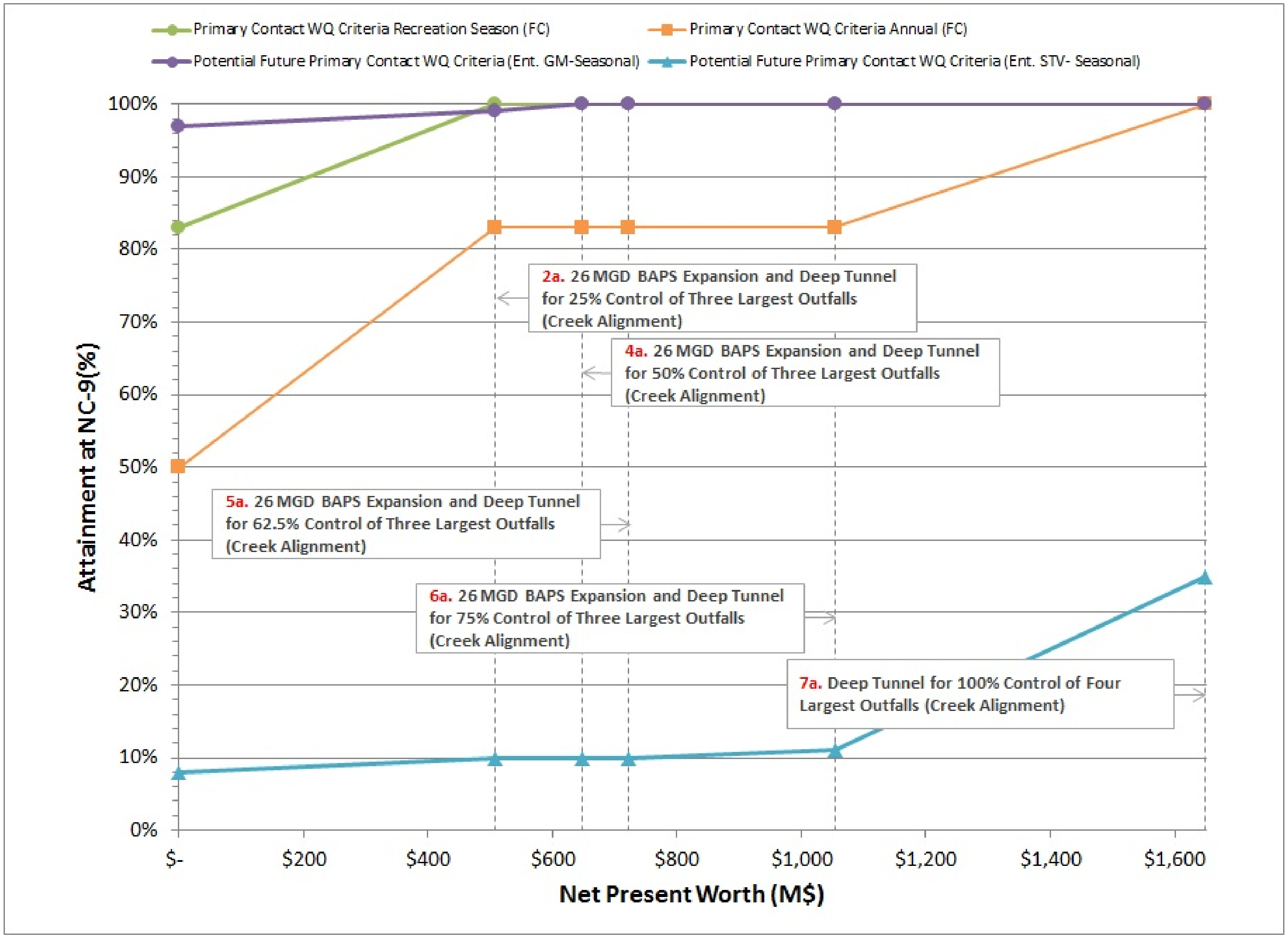


Figure 8-35. Cost vs. Bacteria Attainment at Station NC9 (2008 Rainfall)

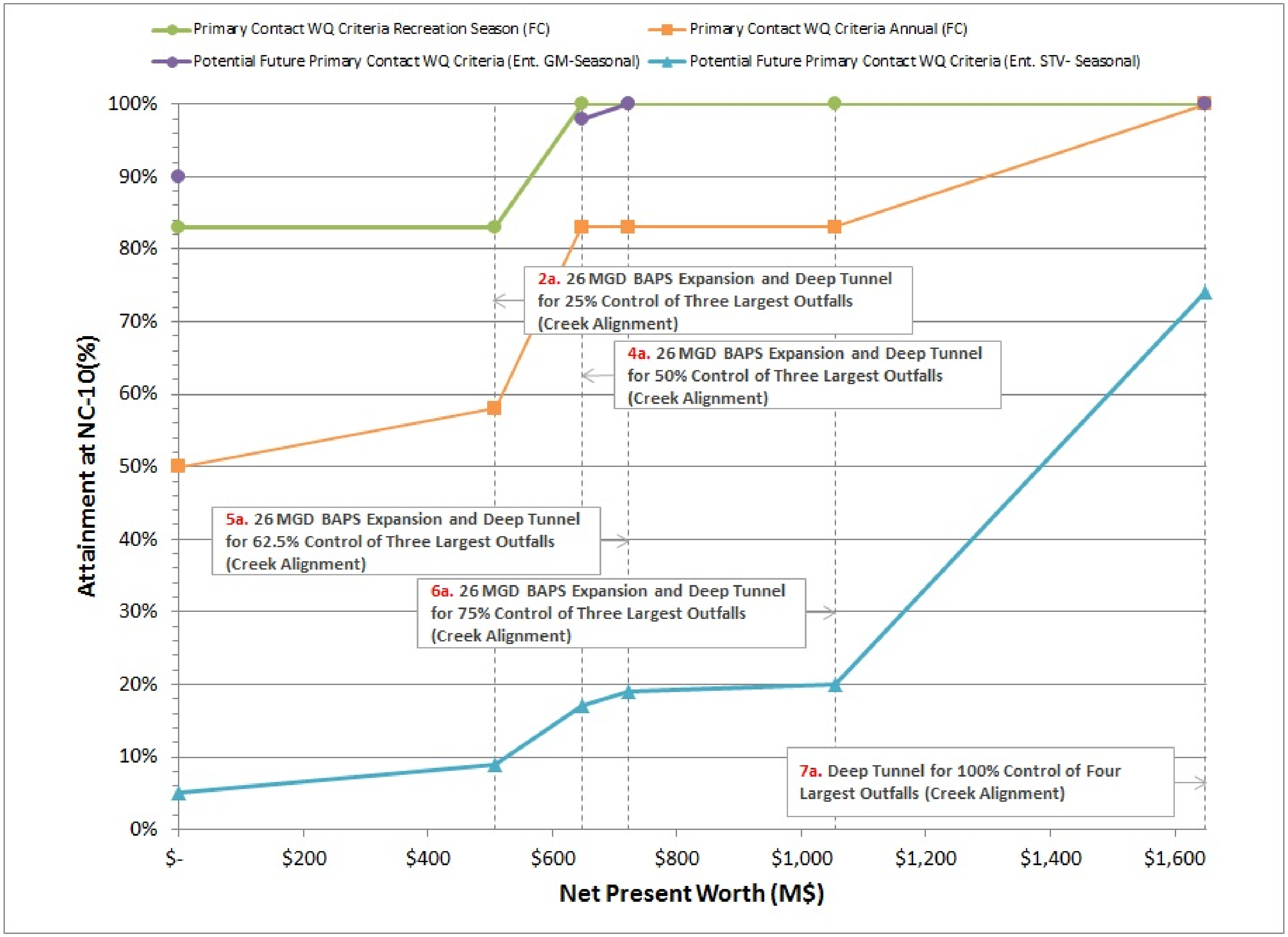


Figure 8-36. Cost vs. Bacteria Attainment at Station NC10 (2008 Rainfall)

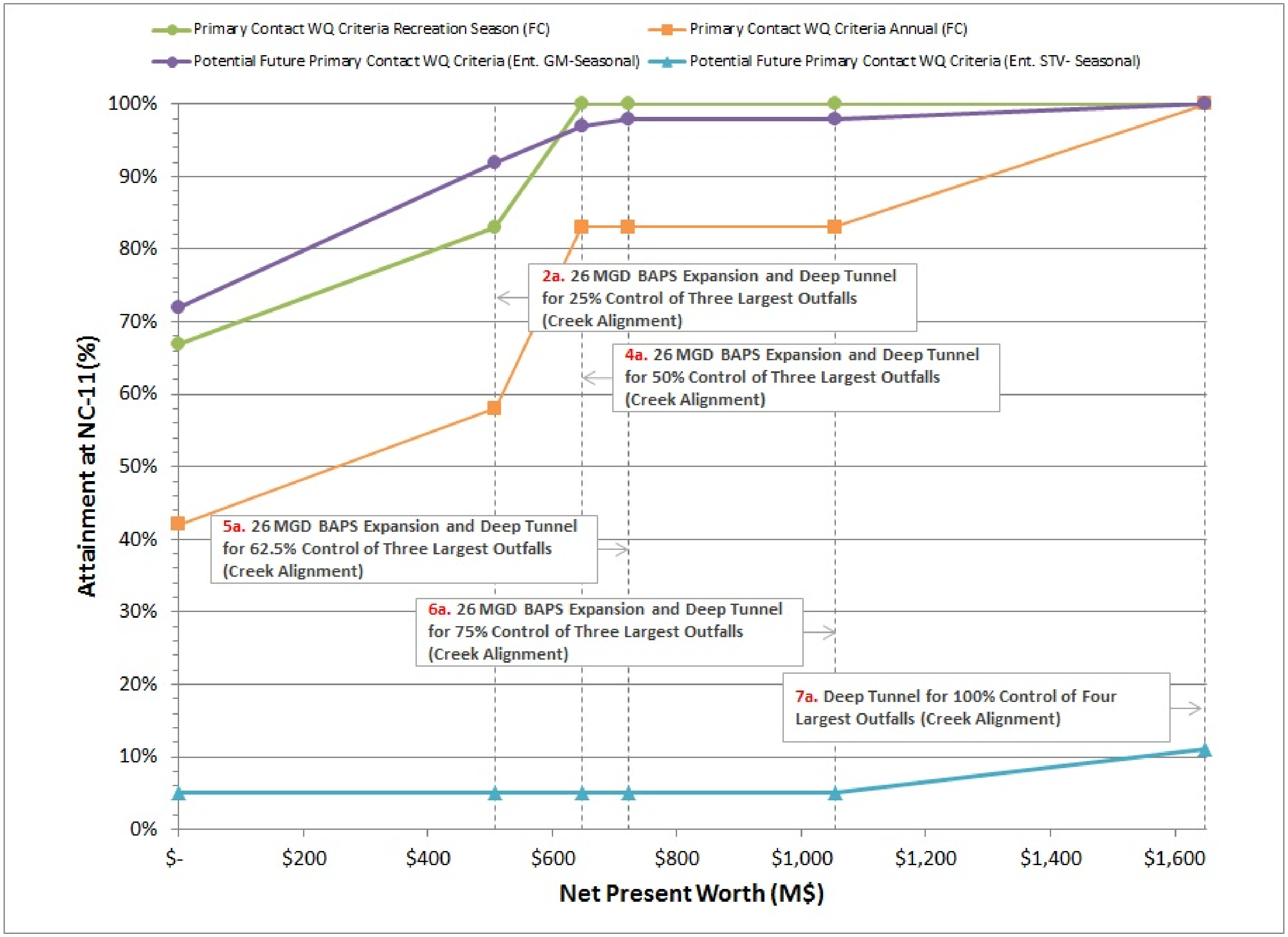


Figure 8-37. Cost vs. Bacteria Attainment at Station NC11 (2008 Rainfall)

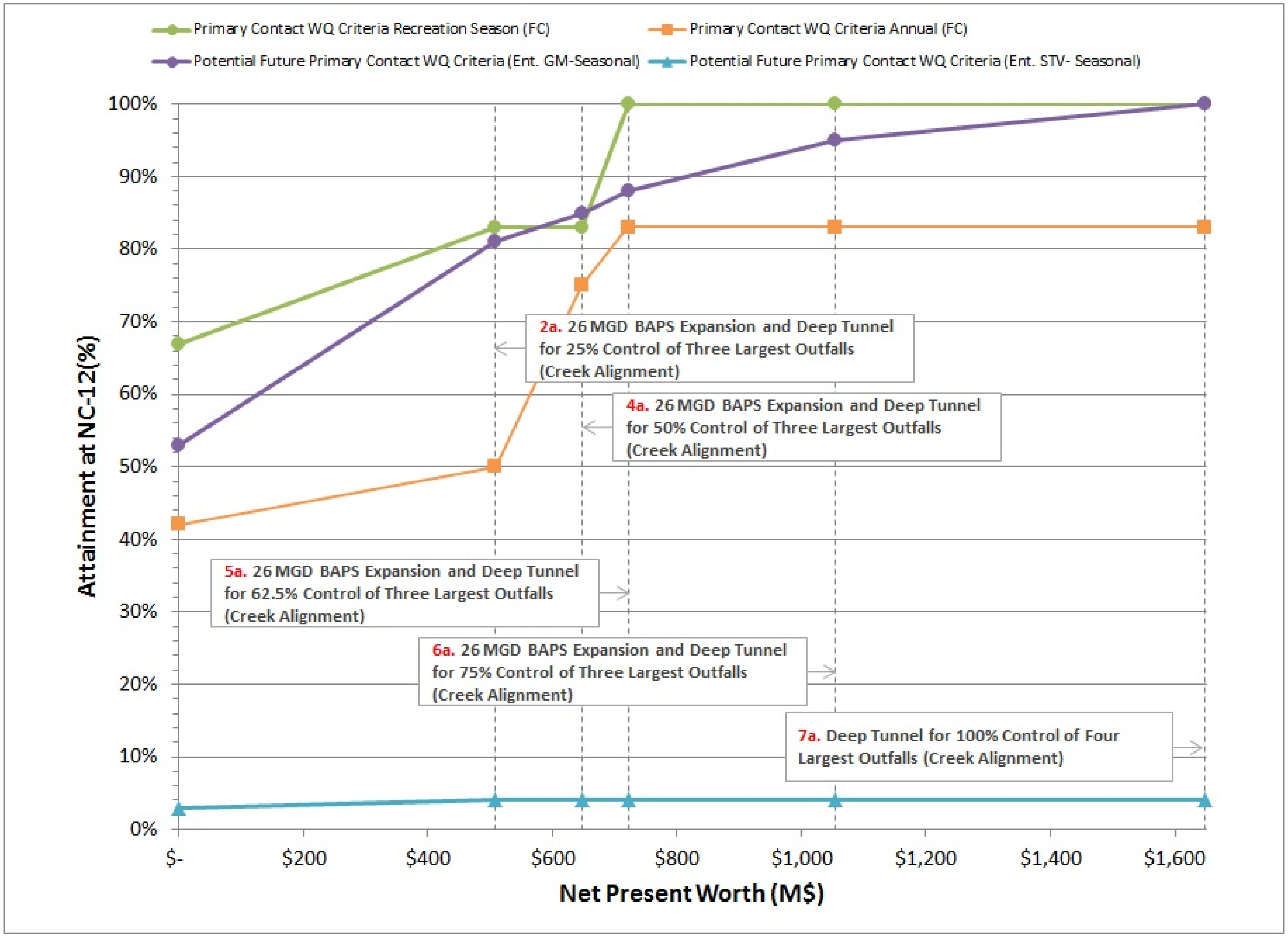


Figure 8-38. Cost vs. Bacteria Attainment at Station NC12 (2008 Rainfall)

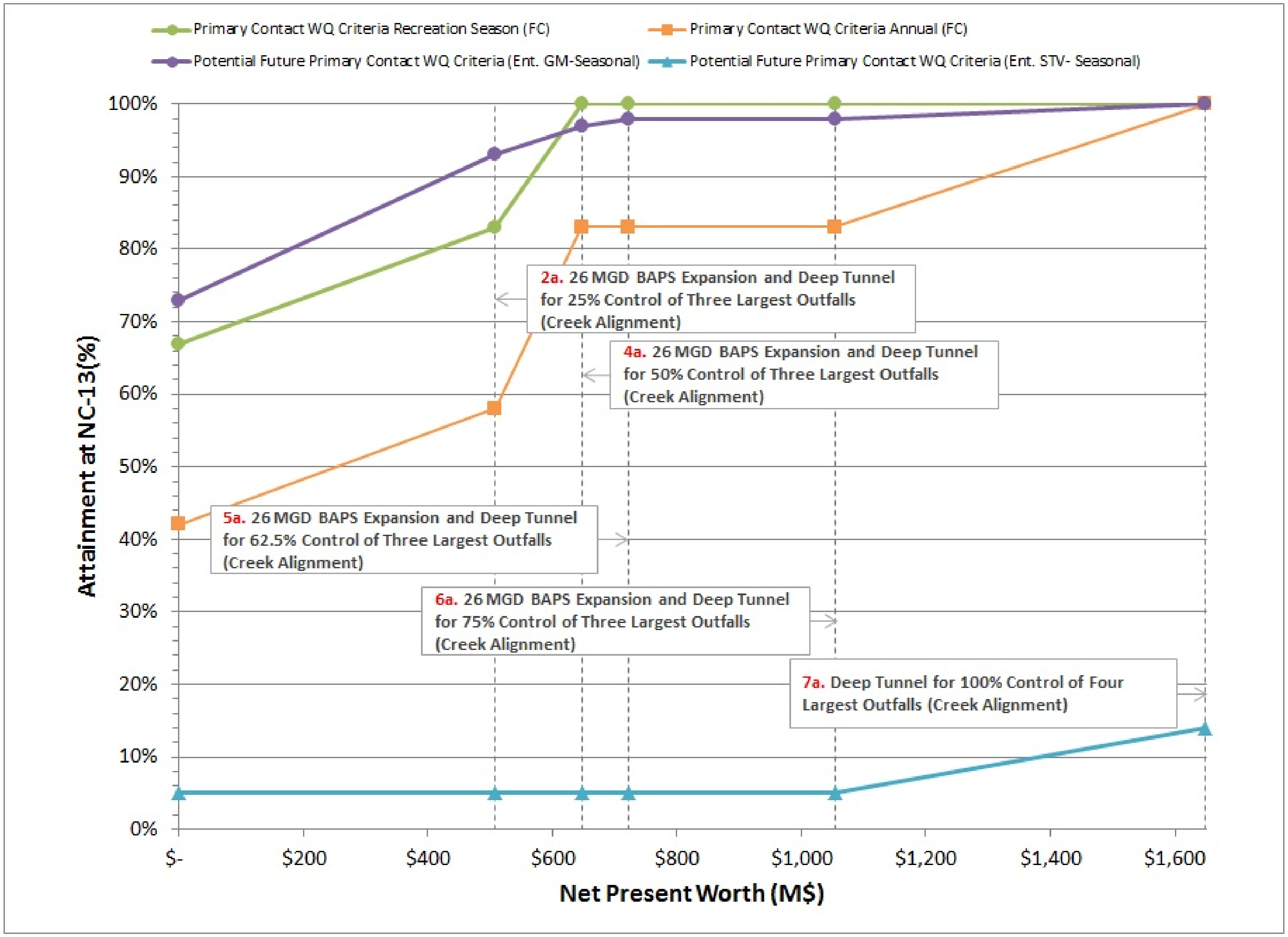


Figure 8-39. Cost vs. Bacteria Attainment at Station NC13 (2008 Rainfall)

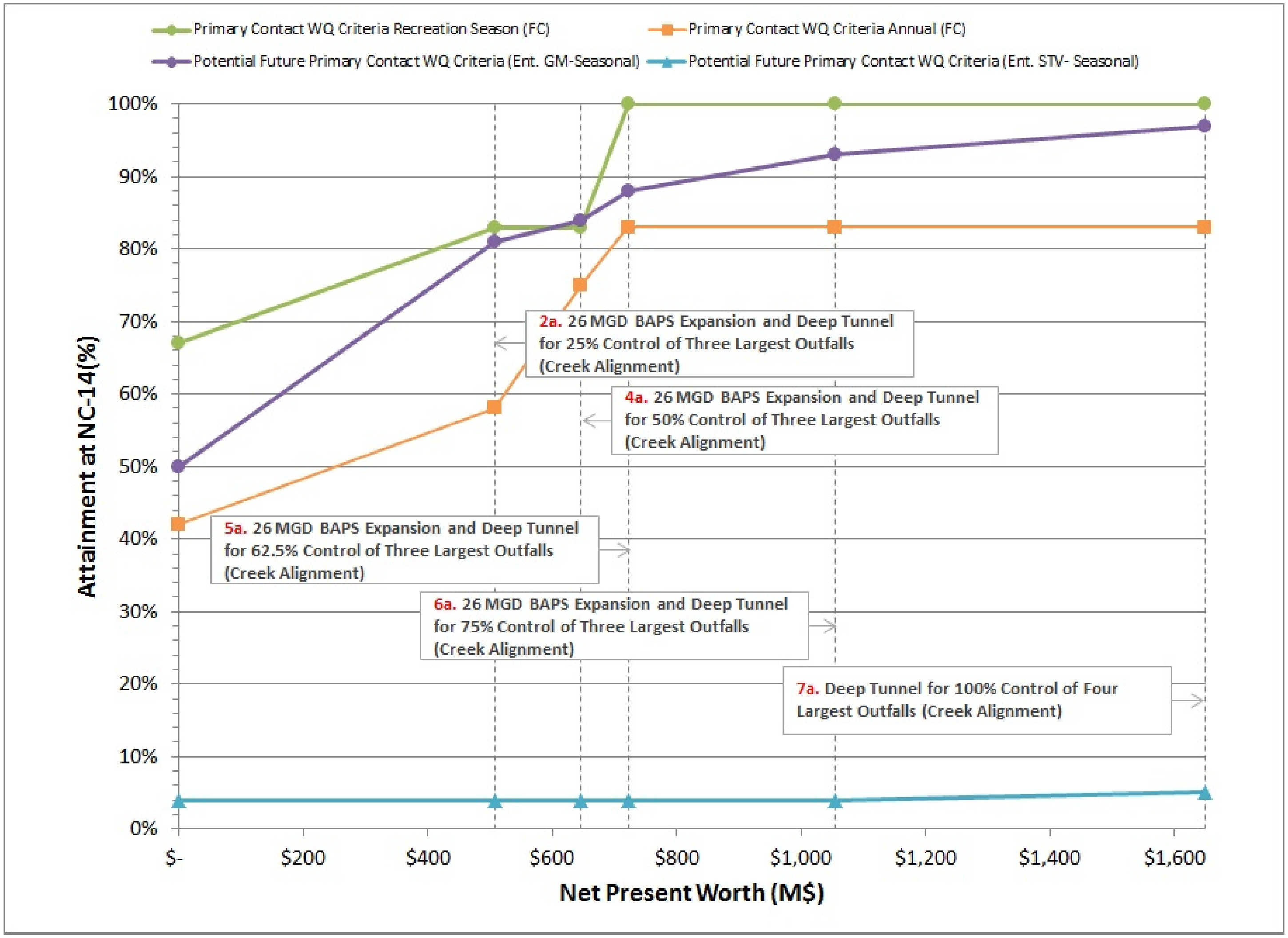


Figure 8-40. Cost vs. Bacteria Attainment at Station NC14 (2008 Rainfall)

8.5.c Conclusion on Preferred Alternative

The alternatives were reviewed for cost effectiveness, ability to meet water quality criteria, public comments and operations. The construction costs were developed as Probable Bid Costs (PBC), and the total Net Present Worth (NPW) costs were determined by adding the estimated PBC to the NPW of the projected annual O&M costs at an assumed interest rate of 3 percent over a 20-year life cycle. However, for tunnel alternatives that provide longer service, a longer 100-year lifecycle was used for computing NPW. Design, construction management and land acquisition costs are not included in the cost estimates. All costs are in February 2017 dollars and are considered Level 5 cost estimates by Association for the Advancement of Cost Engineering (AACE) International with an accuracy of -50 to +100 percent.

The selection of the preferred alternative is based on multiple considerations including public input, environmental and water quality benefits, and costs. A traditional KOTC analysis is presented above. As described above, based on that analysis, a 26 MGD expansion to the BAPS was identified as the most cost-effective alternative for reducing the frequency and volume of CSOs from Outfall BB-026 to Dutch Kills. For Outfalls NC-015, NC-083, and NC-077, the evaluations indicated that a storage tunnel would be more cost-effective and would have less siting impacts on established businesses than individual storage tanks. However, the final tunnel route depends on whether DEP is successful in obtaining a site near the Newtown Creek WWTP and/or resolving the potential competing uses for the DEP-owned site near Outfall NC-077. Based on the cost/performance curves presented above, a tunnel sized for 62.5 percent control fell on the KOTC for cost versus CSO volume and bacteria load controlled. A tunnel sized for 62.5 percent control is projected to achieve recreational season (May 1st through October 31st) attainment of the Existing WQ Criteria for bacteria at all sampling locations in Newtown Creek for the 2008 typical year. Assessment of compliance using a 10-year continuous model run indicated that recreational season compliance would be in the 83 to 93 percent range for the 62.5 percent control tunnel. Most of the main trunk of Newtown Creek and Dutch Kills is projected to be at 93 percent attainment, while the upstream reaches would be in the 83 to 90 percent range.

In comparison, a tunnel sized for 75 percent control fell beyond the KOTC for cost versus CSO volume and bacteria load controlled, meaning that the additional control achieved required a proportionally larger incremental cost compared to the 62.5 percent control tunnel. In terms of attainment, the 75 percent control tunnel would provide no improvement for the 2008 recreational season, as the 62.5 percent tunnel would already provide 100 percent attainment. For the 10-year continuous simulation, the recreational season attainment for the 75 percent tunnel would range from 90 to 95 percent, with only station NC4 achieving the 95 percent level. All other stations in the Creek would range from 90 to 93 percent. The 75 percent tunnel would therefore not achieve full attainment in the recreational season, and would provide only marginal improvement in attainment as compared to the 62.5 percent tunnel. As described above, the Newtown Creek WWTP is a high-rate, step-feed plant with no primary settling tanks. As such, a 40-MGD tunnel dewatering rate was determined to be an appropriate dewatering rate limit for the WWTP. This limitation would not constrain the dewatering rate for the 62.5 percent tunnel, but would require additional treatment capacity in the form of a retention treatment basin (RTB) to allow dewatering of the 75-percent tunnel within 24 hours. This requirement would complicate the implementation of a 75-percent tunnel due to the potential need for additional property acquisition, siting, construction, and long-term O&M requirements. This requirement also adds to the implementation cost for the 75-percent tunnel alternative.

In summary, the 62.5 percent tunnel provides the following:

1. 100 percent attainment of the Existing WQ Criteria for bacteria during the 2008 recreational season

2. The most cost-effective alternative, based on the KOTC analysis approach, consistent with EPA's CSO Control Policy

3. Is projected to have a time to recovery of less than 24 hours for 90% of the wet weather events.

4. Tunnel dewatering in 24 hours without the cost, siting, O&M, and other implementation issues associated with providing additional treatment for dewatering flows that would otherwise exceed the established limit for the Newtown Creek WWTP

Although the 62.5 percent tunnel would not achieve recreational season compliance with the Existing WQ Criteria for bacteria based on the 10-year continuous simulation, the 75-percent tunnel would provide only an incremental improvement, and still would not achieve full compliance. Nevertheless, the final siting of the dewatering pumping station, the tunnel alignment and other associated details of the tunnel alternative, will be evaluated further based upon a number of factors including additional modeling and will be finalized during subsequent planning and design stages. That additional planning will provide an opportunity to optimize the sizing of the tunnel. However, the ability of the Newtown Creek WWTP to handle the dewatering flows would remain a limiting factor for the sizing of the tunnel. Based on these considerations, the 62.5-percent tunnel has been selected as the preferred alternative for controlling CSO to Newtown Creek from outfalls NC-015, NC-083 and NC-077. Conceptual layouts for the tunnel alternatives are provided in Section 8.

Tables 8-27a and 8-27b below present the baseline and recommended plan annual overflow volumes and frequencies for 2008, for the Newtown Creek and East River CSOs associated with the Bowery Bay and Newtown Creek WWTPs.

Table 8-27a. 2008 Baseline and Recommended Plan CSO Volume and Overflows per Year – Newtown Creek CSOs

Waterbody/WWTP System	CSO	2008 Baseline		Recommended Plan	
		Volume	Annual Overflow Events	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)	Total Discharge (MG/yr)	Total (No./yr)
Dutch Kills/BBL(1)	BB-004	0.1	1	0.0	0
	BB-009	43.0	34	28.3	24
Newtown Creek/BBL	BB-010	0.5	7	0.8	10
	BB-011	1.6	14	2.3	16
	BB-012	0.1	1	0.1	1
	BB-013	16.2	31	15.3	30
	BB-014	1.8	18	1.7	18
	BB-015	0.7	13	0.7	13

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Table 8-27a. 2008 Baseline and Recommended Plan CSO Volume and Overflows per Year – Newtown Creek CSOs

Waterbody/WWTP System	CSO	2008 Baseline		Recommended Plan	
		Volume	Annual Overflow Events	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)	Total Discharge (MG/yr)	Total (No./yr)
Dutch Kills/BBL	BB-026(3)	120	37	28.3	25
	BB-040	1.1	16	0.9	12
Newtown Creek/BBL	BB-042	1.5	22	1.2	17
	BB-043	9.4	32	8.6	33
English Kills/NCWWTP(2)	NCB-015(3)	321	31	119	13
Newtown Creek/NCWWTP	NCB-019	3.0	21	2.9	20
	NCB-021	0.0	0	0.0	0
	NCB-022	7.5	29	8.3	28
	NCB-023	0.5	8	0.6	9
	NCQ-029	18.7	40	17.8	37
Maspeth Creek/NCWWTP	NCQ-077(3)	300	41	100	18
Newtown Creek/NCWWTP	NCB-083(3)	314	42	112	22
	NCB-002(4)	N/A	N/A	N/A	N/A
Total		1,161	42 (max)	449	37 (max)

Notes:

(1) BBL = Bowery Bay Low Level Interceptor, to Bowery Bay WWTP
(2) NCWWTP = Newtown Creek WWTP system
(3) NCB-015 + NCB-083 + NCQ-077 + BB-026 = 91% of Total Annual Volume.
(4) NCB-002 is the Newtown Creek WWTP effluent outfall that discharges to Whale Creek Canal during peak flow and high tide conditions. This flow is treated before discharge.

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Table 8-27b. 2008 Baseline and Recommended Plan CSO Volume and Overflows per Year – East River CSOs Associated with Newtown Creek WWTP and Bowery Bay WWTP Systems

Waterbody/WWTP System	CSO	2008 Baseline		Recommended Plan	
		Volume	Annual Overflow Events	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)	Total Discharge (MG/yr)	Total (No./yr)
East River/BBL[(1)]	BB-016	1.8	17	1.7	16
	BB-017	1.7	20	1.6	20
	BB-018	1.1	17	1.1	16
	BB-021	23.4	34	22.5	34
	BB-022	1.0	12	1.0	11
	BB-023	16.4	30	16.1	28
	BB-024	36.4	28	35.9	28
	BB-025	11.0	30	10.9	29
	BB-027	6.1	27	6.1	27
	BB-028	352	44	349	43
	BB-029	105	32	105	32
	BB-030	27.6	43	27.5	43
	BB-031	3.9	18	3.9	18
	BB-032	1.9	17	1.9	17
	BB-033	6.1	28	6.1	29
	BB-034	202	57	202	57
	BB-035	3.9	32	3.9	32
	BB-036	8.9	30	8.9	29
	BB-037	0.6	8	0.6	8
Steinway Creek/BBL	BB-041	84.2	61	84.2	61
East River/BBL	BB-045	0.04	1	0.04	1
	BB-046	7.0	33	7.0	33
	BB-047	2.0	21	2.0	20
Subtotal BBL		**904**	**61 (max)**	**899**	**61 (max)**
East River/NCWWTP[(2)]	NC-003	0.4	10	0.4	10
	NC-004	15.9	36	17.0	36
	NC-006	92.2	42	104.5	42
	NC-007	7.5	31	8.0	31
	NC-008	21.6	32	24.4	31
	NC-010	0.0	0	0.0	1
	NC-012	30.8	15	36.7	18
	NC-013	58.3	28	72.9	27
Wallabout Channel/NCWWTP	NC-014	607	27	646.5	29
East River/NCWWTP	NC-024	0.0	0	0.0	0
	NC-025	0.5	10	0.5	11
	NC-026	0.3	7	0.3	10
	NC-027	13.3	31	16.1	30
	NC-082	0.6	10	0.6	10

Table 8-27b. 2008 Baseline and Recommended Plan CSO Volume and Overflows per Year – East River CSOs Associated with Newtown Creek WWTP and Bowery Bay WWTP Systems

Waterbody/WWTP System	CSO	2008 Baseline		Recommended Plan	
		Volume	Annual Overflow Events	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)	Total Discharge (MG/yr)	Total (No./yr)
Subtotal NCWWTP		**848**	**42 (max)**	**929**	**42 (max)**
Total		**1,752**	**61 (max)**	**1,828**	**61 (max)**

Notes:
(1) BBL = Bowery Bay Low Level Interceptor, to Bowery Bay WWTP
(2) NCWWTP = Newtown Creek WWTP system

This preferred alternative is projected to achieve recreational season (May 1st through October 31st) attainment of the Existing WQ Criteria for bacteria in Newtown Creek at all sampling locations in Newtown Creek for the 2008 typical year. The preferred alternative will also provide significant reduction in CSO volume and frequency of overflow. The implementation of the preferred alternative, which would include the storage tunnel for Outfalls NC-015, NC-083 and NC-077, plus the expansion of the BAPS to 26 MGD, has an estimated NPW ranging from $703M to $730M. This estimate reflects $5.0M of annual O&M over the course of 20 years, and an unescalated PBC ranging from $570M to $597M, depending on the final route to be determined in subsequent planning and design stages. Costs escalated to the assumed midpoint of construction would range from $1,275M to $1,335M. Note that these costs do not include costs for land acquisition, design and construction management.

The Existing WQ Criteria for fecal coliform attainment levels (monthly GM<200 cfu/100mL) as determined using the 10-year simulation are shown below in Table 8-28. As noted above, the values presented in Table 8-28 for the preferred alternative were interpolated from the 50 percent and 75 percent control runs. As indicated in Table 8-28, recreational season (May 1st through October 31st) compliance for the preferred alternative would be in the 83 to 93 percent range. Most of the main trunk of Newtown Creek and Dutch Kills would be at 93 percent attainment, while the upstream reaches would be in the 83 to 92 percent range. Annual compliance is predicted to be slightly lower than recreational season compliance. To put the 10-year simulation performance into perspective, the 10-year period includes a total of 60 months that fall within the recreational season. 93 percent attainment in the recreational season over 10 years means that in 56 out of the 60 recreational season months, the monthly GM did not exceed 200 cfu/100mL.

Table 8-28. Model Calculated Preferred Alternative Fecal Coliform Percent Attainment of Existing WQ Criteria and Bacteria Primary Contact WQ Criteria

Station		75% Control at BB-026, 62.5% Control at NC-015, 083, 077			
		2008 % Attainment		10 Year % Attainment(1)	
		Annual Monthly GM <200 cfu/100mL	Recreational Season(2) Monthly GM <200 cfu/100mL	Annual Monthly GM <200 cfu/100mL	Recreational Season(2) Monthly GM <200 cfu/100mL
Main Channel	NC4	83	100	90	93
	NC5	83	100	90	93
Dutch Kills	NC6	83	100	88	93
Main Channel	NC7	83	100	90	93
	NC8	83	100	90	93
	NC9	83	100	90	93
Maspeth Creek	NC10	83	100	89	92
English Kills	NC11	83	100	89	92
East Branch	NC12	83	100	83	88
English Kills	NC13	83	100	89	92
	NC14	83	100	83	83

Notes:

(1) Values interpolated from 10-year simulations of 50% and 75% control tunnel (with 75% control at BB-026) runs.
(2) The recreational season is from May 1st through October 31st.

The average annual attainment of the Existing WQ Criterion for DO (Class SD) for the entire water column is presented for the preferred alternative in Table 8-29. As indicated in Table 8-29, the Existing WQ Criterion for DO (Class SD) are predicted to be attained at all stations for the preferred alternative. The average annual attainment of the Class SC criteria for the entire water column is presented for the preferred alternative in Table 8-30. As discussed in Section 6, analysis of attainment of Class SC DO criteria are complex because the standard allows for excursions from the daily average limit of 4.8 mg/L for a limited number of consecutive calendar days. To simplify the analysis, attainment was based solely upon attainment of the daily average without the allowed excursions. The results indicate full attainment (at least 95 percent) of the acute criterion (never less than 3.0 mg/L) for the preferred alternative. Attainment of the chronic criterion (greater than or equal to 4.8 mg/L) ranges from 84 to 96 percent for the preferred alternative. As discussed in Section 6, the gap analysis indicates that with 100 percent CSO

Table 8-28. Model Calculated (2008) Preferred Alternative DO Attainment – Existing WQ Criterion – Aeration System Operational

Station		DO Annual Attainment (%)
		Class SD ≥ 3.0 mg/L
		75% Control at BB-026, 62.5% Control at NC-015, NC-083, NC-077
Main Channel	NC4	100
	NC5	100
Dutch Kills	NC6	99.0
Main Channel	NC7	100
	NC8	100
	NC9	100
Maspeth Creek	NC10	99.7
English Kills	NC11	100
East Branch	NC12	100
English Kills	NC13	99.8
	NC14	96.2

Table 8-29. Model Calculated (2008) Preferred Alternative DO Attainment of Class SC WQ Criteria – Aeration System Operational

Station		DO Annual Attainment (%) 75% Control at BB-026, 62.5% Control at NC-015, 083, 077	
		Class SC Chronic(1)	Class SC Acute(2)
Main Channel	NC4	94	100
	NC5	95	100
Dutch Kills	NC6	88	100
Main Channel	NC7	96	100
	NC8	94	100
	NC9	93	100
Maspeth Creek	NC10	91	99
English Kills	NC11	90	99
East Branch	NC12	88	99
English Kills	NC13	87	99
	NC14	84	97

Notes:
(1) Chronic Criteria: 24-hr average DO≥ 4.8 mg/L with allowable excursions to ≥ 3.0 mg/L for certain periods of time.
(2) Acute Criteria: DO≥ 3.0 mg/L.

control, the Class SC Chronic criterion would still not be met at Station NC14, although it would be met at all other Newtown Creek stations.

Table 8-31 summarizes the projected levels of attainment for the Potential Future Primary Contact WQ Criteria. Values presented for the preferred alternative were interpolated from the 50 percent and 75 percent control runs. As indicated in Table 8-31, attainment of the 30-day rolling GM for *Enterococci* is projected to range from 72 to 91 percent. Attainment of the 90th Percentile STV criterion is projected to range from 6 to 26 percent.

Table 8-31. Model Calculated 10-Year Preferred Alternative Enterococci Percent Attainment of Potential Future Primary Contact WQ Criteria

Station		75% Control at BB-026, 62.5% Control at NC-015, 083, 077			
		2008 Recreational Season% Attainment(1)		10 Year Recreational Season % Attainment(1)(2)	
		30-day Rolling GM <30 cfu/100mL	90th Percentile STV <110 cfu/100mL	30-day Rolling GM <30 cfu/100mL	90th Percentile STV <110 cfu/100mL
Main Channel	NC4	100	19	91	26
	NC5	100	11	90	19
Dutch Kills	NC6	99	18	90	25
Main Channel	NC7	100	10	90	20
	NC8	100	11	90	22
	NC9	100	10	90	20
Maspeth Creek	NC10	100	19	90	25
English Kills	NC11	98	5	83	11
East Branch	NC12	88	4	72	6
English Kills	NC13	98	5	83	12
	NC14	88	4	72	6

Notes:
(1) The recreational season is from May 1st through October 31st.
(2) Values interpolated from 10-year simulations of 50% and 75% control tunnel (with 75% control at BB-026) runs.

The preferred alternative is based on multiple considerations, including public input and environmental and water quality benefits and costs. The LTCP assessment shows that the preferred alternative would achieve recreational season (May 1st through October 31st) attainment of the Existing WQ Criteria for fecal coliform bacteria at all sampling locations in Newtown Creek, based on the 2008 typical year. Annual compliance with Existing WQ Criteria for fecal coliform bacteria would not be met at any of the sampling locations in Newtown Creek with the preferred alternative.

Assessment of compliance using a 10-year continuous model run indicated that recreational season (May 1st through October 31st) compliance would be in the range of 83 to 93 percent. The difference between the 2008 and 10-year attainment is likely due to certain months during the 10-year period having more rainfall than the months in 2008. In addition, the documented low circulation and flushing in the upstream reaches of Newtown Creek contribute to more extended impacts of the bacteria loads from larger storms. The preferred alternative will also provide significant reduction in CSO volume and frequency of overflow. The preferred alternative is projected to reduce CSO discharges to Newtown Creek by approximately 65 percent, and CSO events are projected to be reduced by 55 percent.

As described above, underflow baffles were evaluated as a means to provide floatables control at outfalls BB-009, BB-013, and NCQ-029, which were the next three largest outfalls after BB-026, NC-015, NC-077 and NC-083 in terms of annual CSO volume. Based on that evaluation, providing an underflow baffle for outfall BB-009 appeared to be feasible. More detailed evaluations are needed to confirm the feasibility of providing an underflow baffle with a bending weir at NCQ-029, based on potential siting constraints. At each of those locations, regulator modifications will be required to achieve hydraulic neutrality in the 5-year, 2-hour storm with the underflow baffle in place. Providing a baffle for outfall BB-013 was determined to be infeasible due to siting constraints associated with the needed regulator modifications. The need for an underflow baffle at outfall BB-009 and an underflow baffle with bending weir at outfall NCQ-029 will be determined based on a floatables monitoring program to be implemented for those two outfalls.

The key components of the preferred alternative include:

- Expansion of the Borden Avenue Pumping Station to 26 MGD capacity, with a new diversion structure and gravity pipe from Outfall BB-026, and a new force main to the Kent Avenue Gate Structure;
- A storage tunnel that will capture 62.5 percent of the annual CSO volume from Outfalls NC-015, NC-083 and NC-077, with the final route to be determined during subsequent planning and design activities;
- A dewatering pumping station; ~~and~~
- Appurtenant near-surface connecting conduits and structures~~;~~ and
- Floatables control at outfalls BB-009 and NCQ-029, if determined to be necessary based on a floatables monitoring program for those outfalls.

The implementation of ~~these~~ the elements addressing outfalls BB-026, NC-015, NC-083 and NC-077 has a NPW ranging from $703M to $730M, reflecting $5.0M of annual O&M over the course of 20 years for the BAPS and 100 years for the CSO Deep Storage Tunnel. Floatables control at outfalls BB-009 and NCQ-029, if necessary, would have a NPW of approximately $25.5M, reflecting $36,400 of annual O&M over 20 years.

The proposed schedule for the implementation of the recommended plan is presented in Section 9.2. Floatables control at outfalls BB-009 and NCQ-029 is not included in the implementation schedule, as the need for those projects will not be known until the completion of the floatables monitoring program for those outfalls. The DEC has established a milestone date of August 31, 2018 for submittal of an approvable floatables monitoring plan for outfalls BB-009 and NCQ-029.

8.5.d Newtown Creek Wastewater Treatment Plant Performance During CSO Pump-back

The following presents an analysis of the impacts to the Newtown Creek WWTP of a 60-MG CSO Storage Tunnel in terms of infrastructure and equipment capacity and total nitrogen loadings. During wet-weather events, CSO will be prevented from overflowing at Outfalls NC-015, NC-083 and NC-077 by diverting it into a CSO storage tunnel for subsequent treatment after the rain event subsides. In evaluating plant impacts from the captured CSO, a 24-hour pump-back was considered, which would contribute an additional hydraulic and mass loading to the Newtown Creek WWTP.

First, an analysis of historical data from 2012-2016 was performed to estimate the potential process impacts and limitations. Next, a calibrated BioWin model was used to estimate impacts to plant

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equipment/infrastructure. Additionally, impacts to the total nitrogen effluent discharges from the plant were quantified during CSO pump-back conditions. A conservative "worst-case" analysis provided an upper limit on the potential CSO storage volume, but recognizing that the impacts would be of limited duration.

Historical Data Analysis

The Newtown Creek WWTP has a DDWF capacity of 310 MGD and a peak wet-weather capacity of 700 MGD. The historical plant influent concentrations for key pollutant parameters are shown below in Table 8-32.

Table 8-30. Newtown Creek WWTP Historical Data Analysis 2012-2016- Plant Influent

Parameter	Historical Average (Total)	Wet Weather Average
TSS, mg/L	157	188
CBOD, mg/L	178	152
TKN, mg/L	29	23

BioWin and State Point Analysis Modeling

A calibrated BioWin model for the Newtown Creek WWTP was used to analyze process impacts and ensure sufficient infrastructure and equipment capacity exists during CSO pump-back. From a loading perspective, CSO storage will increase the process loadings to Newtown Creek during CSO pump-back. The model was used to determine: (1) the aeration tank solids inventory requirement to maintain a solids retention time (SRT) of 1.25 days to ensure sufficient bio-flocculation; (2) the impact of increased solids on final clarifier solids loading in conjunction with a clarifier State Point Analysis (SPA); (3) aeration requirements related to the increased loads; and (4) solids handling equipment capacity.

Using plant data, the increase in process loadings during CSO pump-back is shown in Table 8-33.

Table 8-31. Secondary Process Loadings During CSO Pump-back of 60 MG in 24-hours

Parameter	Avg Raw Influent[1]	CSO Component[2]	Total Secondary Loading	% Increase
TSS, lbs/d	347,100	84,300	431,300	24%
ISS, lbs/d	49,000	39,500	88,400	81%
CBOD, lbs/d	350,600	52,700	403,300	15%
TKN, lbs/d	57,300	6,400	63,600	11%

1. Forecasted 2040 average flows using influent concentrations from 2012-2016
2. Calculated using recorded influent concentrations during wet weather 2012-2016

Process modeling confirmed that the increase in secondary solids and loadings to the final settling tanks (FSTs) will not exceed the capacity of the FSTs. As shown in Table 8-34, Newtown Creek has sufficient aeration, thickening, and anaerobic digestion capacity.

Table 8-32. 60 MG CSO Storage Tunnel at Newtown Creek and Impact on Equipment Capacity

Equipment	Parameter	Total Capacity	Model Prediction	Capacity Available (Y/N)
Aeration	**Flow Rate**	180,000 scfm (5 of 7 total Units)	139,000 SCFM	Y
Thickening Centrifuges	**Feed Concentration**	2,000 to 10,000 mg/L	4,300 mg/L	Y
	Feed Flow	23.3 MGD (18 of 24 total Units)	14 MGD	Y
Digester	**Target HRT**	20+ Days (6 of 8 Units)	21.8 days[1]	Y

1. HRT calculated assuming pump-back frequency consistent with 2008 representative storm conditions. Conservatively assumed full pump-back was needed with each storm.

Nitrogen

Newtown Creek is not a BNR facility and does not have the infrastructure and equipment to remove nitrogen. Thus, the nitrogen contained within the stored CSO volume, which otherwise would have been discharged directly into the NYC waterways, would now be discharged from the plant. Because the increase in nitrogen load from the WWTP is offset by the corresponding reduction in loads at the CSO outfalls, there is no net increase in overall nitrogen discharged as a result of CSO storage and pump-back.

A historical data analysis using 2008 as a representative year for storm frequencies and intensities was used to evaluate the impact of CSO pump-back on effluent nitrogen loading. A "worst case" effluent TN concentration during wet weather (16.5 mgN/L) was selected based on historical data analysis of wet-weather events at Newtown Creek to estimate effluent TN loads during CSO pump-back. Based on a total of 41 CSO pump-back events, with volumes ranging from less than 1 MG to 69 MG, the projected TN effluent discharges from the Newtown Creek WWTP will increase approximately 224 lbs/d on an annual average basis. Only one quarter, or 56 lbN/d, of this increase will impact Combined East River TN TMDL, as shown in Table 8-35. This impact is minimal and is not expected to compromise permit compliance, assuming current operations are maintained at the Upper East River BNR plants contributing to the TMDL, and no changes in effluent permits are implemented.

Table 8-33. Total Nitrogen Discharges for the UER and LER Treatment Plants with 60 MG CSO Storage Tunnel to Newtown Creek WWTP

Condition	Total Nitrogen Discharges
Combined East River TN TMDL Limit (Jan.2017)	44,325 lbs/d
Actual East River TN as of Jan 2017	41,175 lbs/d
Modeled UER TN Compliance with final stepdown[1]	41,000 lbs/d
Net increase from CSO pump-back	~56 lbs/d total nitrogen increase

1. Modeling East River Nitrogen Bulge – Update, July 24, 2015

Potential Implications of Increased Nitrogen Discharges from Newtown Creek

Process considerations related to the additional CSO loads due to increased effluent nitrogen loadings from Newtown Creek and their impact to the overall East River Nitrogen TMDL must be recognized. One quarter of Newtown Creek effluent Total Nitrogen (TN) is applied to the Combined East River Nitrogen TMDL. Pump-back of the stored CSO increases the total influent nitrogen load, and subsequent effluent load, from the Newtown Creek WWTP. The increased nitrogen load to the WWTP thereby reduces the margin of safety in meeting the final Combined East River Nitrogen TMDL limit.

A net increase in effluent TN from Newtown Creek may need to be mitigated by increased TN removal at the Upper East River (UER) BNR facilities. Any process limitations at the UER BNR facilities during periods of pump-back at Newtown Creek, such as tanks out of service or poor DO levels, can increase the risk to the BNR treatment process. These impacts could be further exacerbated during critical conditions such as colder weather that could effectively limit the ability for the plant to completely nitrify.

Additionally, effluent TN limits likely will be stricter in the coming decades, and discussions of numerical limits are currently underway. If future numerical limits substantially reduce the acceptable effluent TN from the City's BNR facilities, or if stricter TN limits specific to Newtown Creek WWTP are implemented, any increases in net TN loads due to CSO pump-back could compromise permit compliance.

For these reasons, a conservative approach is taken in determining the maximum CSO storage volume to both mitigate TN discharges and manage the risks of maintaining permit compliance. While this analysis showed that the Newtown Creek WWTP potentially could handle up to 60 MGD of dewatering flow, consideration is given to the fact that the Newtown Creek WWTP is a high-rate, step-feed plant with no primary settling tanks. As such, a 40-MGD tunnel dewatering rate was deemed to be an appropriate dewatering rate limit for the WWTP.

Grit Accumulation

With an increase in ISS loading from CSO pump-back, it is also appropriate to consider possible impacts to the frequency of aeration tank cleaning. In an October 1998 correspondence titled "NYCDEP Response to NYSDEC Preliminary Technical Comments on Track 3 Facility Plan", DEP responded to DEC concerns regarding the Grit Chamber Effectiveness, citing an improvement in grit removal as a result of new grit tanks, for which a more than seven-year cleaning frequency was deemed appropriate. The increase in ISS anticipated from CSO pump-back was calculated to be 1,350 lb/d over the course of a year, an increase in ISS of less than 5% over the influent without CSO pump-back in place. Accordingly, this minimal increase in grit is not expected to require more frequent aeration-tank cleaning.

8.6 Use Attainability Analysis

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

1. Naturally occurring loading concentrations prevent the attainment of the use; or
2. Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met; or
3. Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or
4. Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the waterbody to its original condition or to operate such modification in a way that would result in the attainment of the use; or

5. Physical conditions related to the natural features of the waterbody, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or
6. Controls more stringent than those required by Sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.

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

As noted in previous sections, with the implementation of the preferred alternative, Newtown Creek is predicted to meet the Existing WQ fecal coliform bacteria criterion of 200 cfu/100mL during the recreational season (May 1st through October 31st) (based on 2008 rainfall) for the preferred alternative. However, the Existing WQ fecal coliform bacteria criterion of 200 cfu/100mL is not predicted to be fully attained on an annual basis based on 2008 rainfall. The 10-year continuous simulation showed that the preferred alternative would not fully attain the existing fecal coliform bacteria criterion of 200 cfu/100mL during the recreational season (May 1st through October 31st). As discussed above, the DO criterion is predicted to be achieved for the existing WQS under the preferred alternative.

8.6.a Use Attainability Analysis Elements

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

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

1. Waterbody meets WQ requirements. This may either be the existing WQS (where primary contact is already designated) or for an upgrade to the Primary Contact WQ Criteria (where the existing standard is not a Primary Contact WQ Criteria). In either case, a high-level assessment of the factors that define a given designated use is performed, and if the level of control required to meet this goal can be reasonably implemented, a change in designation may be pursued following implementation of CSO controls and Post-Construction Compliance Monitoring.

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

As indicated in Tables 8-29 and 8-30, the modeled attainment of fecal coliform criterion of the Class SD waters upon implementation of the LTCP recommended plan is not achieved on an annual basis. Implementation of the plan will lead to Class SD DO criterion being fully attained throughout the waterbody. Future revisions of the Newtown Creek WQ classification should await completion of construction of the preferred alternative and the results of the Post-Construction Compliance Monitoring.

8.6.b Fishable/Swimmable Waters

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

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

- Based on the 2008 typical year simulations, as presented in Figures 8-29 to 8-40, the preferred alternative would result in attainment of the Existing WQ Criteria (Class SD) for bacteria during the recreational season (May 1st through October 31st), but would not achieve full attainment on an annual basis. As indicated in Table 8-29, the Class SD DO criterion would be met on an annual average basis.
- For the 10-year continuous simulation, summarized in Table 8-28, attainment of the Existing WQ Criteria (Class SD) criterion for bacteria is not predicted to be met on an annual basis or for the recreational season (May 1st through October 31st).

8.6.c Assessment of Highest Attainable Use

The 2012 CSO Order Goal Statement stipulates that, in situations where the proposed alternatives presented on the LTCP will not achieve the CWA Section 101(a)(2) goals, the LTCP will include a UAA. Because the analyses developed herein indicate that Newtown Creek is not projected to fully attain the Class SD fecal coliform criterion on an annual basis, a UAA is required under the 2012 CSO Order. Table 8-32 summarizes the compliance for the identified plan.

Table 8-34. Recommended Plan for Compliance with Bacteria Water Quality Criteria

Compliance with Existing WQ Criteria and Primary Contact WQ Criteria (Class SD)				Compliance with Potential Future Primary Contact WQ Criteria	
(2008)(1)		(10-yr)(2)		Rec. Season(3)	
Annual	Rec. Season(3)	Annual	Rec. Season(3)	30-day Rolling GM	90% STV
83%	100%	83-90%	83-93%	88-100% (2008)(1) 72-91% (10-yr)(2)	4-19% (2008)(1) 6-26% (10-yr)(2)

Notes:
(1) Compliance based on 2008 typical year.
(2) Compliance based on interpolation of10-year simulation.
(3) Recreational season is May 1st to October 31st.

8.7 Water Quality Goals

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

8.7.a Existing Water Quality

Newtown Creek is a navigable urban channel that primarily supports shipping traffic associated with the commercial, industrial and municipal land uses of the adjacent taxable lots. Public access to the shoreline is extremely limited, and includes two small parks/nature walks and two kayak/boat launch locations. The shoreline is highly bulkheaded, further limiting access onto or off the water. No DOHMH certified bathing beaches are located in Newtown Creek. Under baseline conditions, the waterbody is not in attainment with its current classifications for bacteria or DO criteria.

8.7.b Primary Contact Water Quality Criteria

As presented in Section 8.5, this LTCP incorporates assessments for attainment with primary contact WQS criteria, as the Existing WQ Criteria for bacteria are the same as the primary contact criteria. Attainment was assessed, both spatially and temporally, using the 2008 rainfall year, and a 10-year simulation for bacteria. Projected bacteria levels for the preferred alternative comply with Primary Contact WQ Criteria during the recreational season (May 1st through October 31st) for the 2008 rainfall, but not on an annual basis for 2008, or for the 10-year simulation. DO levels were assessed against the Existing WQ Criterion (Class SD) for the 2008 typical year. With the preferred alternative, attainment with the Class SD criterion is predicted at all stations in Newtown Creek.

8.7.c Potential Future Water Quality Criteria

DEP is committed to improving water quality in Newtown Creek. Toward that end, DEP has identified instruments for Newtown Creek that will allow DEP to continue to improve water quality in the system over time. Wet-weather advisories based on time to recovery analysis are recommended for consideration while advancing towards the numerical criteria established, or others under consideration by DEC, including Potential Future Primary Contact WQ Criteria consistent with the 2012 EPA RWQC.

8.7.d Time to Recovery

Although Newtown Creek could be protective of primary contact use during the recreational season (May 1st through October 31st), it will not be capable of supporting primary contact 100 percent of the time. Even with anticipated reductions in CSO overflows resulting from grey and green infrastructure, the waterbody cannot support primary contact during and following rainfall events. Toward the goal of maximizing the amount of time that Newtown Creek can achieve water quality levels to support primary contact, DEP has performed an analysis to assess the amount of time following the end of a rainfall event required for Newtown Creek to recover and return to fecal coliform concentrations less than 1,000 cfu/100mL.

The analyses consisted of examining the WQ model-calculated bacteria concentrations in Newtown Creek for recreational periods (May 1st through October 31st) abstracted from 10 years of model simulations. The time to return (or “time to recovery”) to a fecal coliform concentration of 1,000 cfu/100mL for each water quality station within the waterbody was then calculated for each storm with the various size categories and the median time after the end of rainfall was then calculated for each rainfall category. The results of these analyses for Newtown Creek are summarized in Table 8-33. As described above, results presented for the preferred alternative for the 10-year model simulations were interpolated from available results for the 50 and 75 percent control alternatives. As indicated in Table 8-33, the median duration of time within which pathogen concentrations are expected to be higher than the DOHMH considers safe for primary contact varies by storm size and location within Newtown Creek. For the preferred alternative, the median times to recovery are below 24 hours at all of the sampling locations for the storm sizes up to 1.5 inches except for location NC6 in Dutch Kills, where the median for storms in the 0.8 to 1.5 inch range is 38 hours. For storms greater than 1.5 inches, the median times to recovery are well above 24 hours at all locations.

Table 8-35. Time to Recovery to 1,000 cfu/100mL Fecal Coliform – Preferred Alternative 62.5 Percent Control Tunnel with 75 Percent Control at BB-026

Station		Average Time to Recovery to 1,000 cfu/100mL Fecal Coliform (Hrs)(1)					
		Storm Size Bins (inches of rainfall)					
		<0.1	0.1 – 0.4	0.4-0.8	0.8-1.0	1.0-1.5	>1.5
Main Channel	NC4	1	1	1	6	6	43
	NC5	1	1	1	3	1	54
Dutch Kills	NC6	1	1	1	38	38	73
Main Channel	NC7	1	1	1	1	1	63
	NC8	1	1	1	1	1	70
	NC9	1	1	1	1	1	72
Maspeth Creek	NC10	1	1	3	9	10	67
English Kills	NC11	1	1	1	1	1	57
East Branch	NC12	1	1	1	5	8	79
English Kills	NC13	1	1	1	1	1	50
	NC14	1	1	1	2	7	80

Notes:
(1) Values interpolated from 10-year simulations of 50% and 75% control tunnel (with 75% control at BB-026) runs.

8.8 Recommended LTCP Elements to Meet Water Quality Goals

Water quality in Newtown Creek will be improved with the preferred alternative and other actions identified herein.

The actions identified in this LTCP include:

- Expansion of the Borden Avenue Pumping Station to 26 MGD capacity, with a new diversion structure and gravity pipe from Outfall BB-026, and a new force main to the Kent Avenue Gate Structure;
- A storage tunnel that will capture 62.5 percent of the annual CSO volume from Outfalls NC-015, NC-083 and NC-077, with the final route to be determined during subsequent planning and design activities;
- A dewatering pumping station;
- Appurtenant near-surface connecting conduits and structures.
- Elimination of the in-stream mechanical aeration for Dutch Kills as contained in the 2012 CSO Order.
- Implementation of a floatables monitoring program to determine the need for additional floatables control at outfalls BB-009 and NCQ-029
- Ranges of costs (in February 2017 dollars) for the recommended alternative for outfalls BB-026, NC-015, NC-083 and NC-077 are: NPW $703M to $730M, PBC of $570M to $597M, and annual O&M of $5.0M. The costs (in February 2017 dollars) for floatables control at outfalls BB-009 and NCQ-029 (if feasible) are: NPW $25.5M, PBC of $25M, and annual O&M of $36,400.
- Compliance with Primary Contact WQ Criteria during the recreational season (May 1st through October 31st) based on 2008 rainfall, but not achieving compliance annually based on 2008 rainfall, or during the recreational season based on a 10-year continuous simulation. As a result, a UAA is included as part of this LTCP.
- DEP will establish with the DOHMH through public notification a wet-weather advisory during the recreational season (May 1st through October 31st) during which recreational activities would not be recommended in Newtown Creek. The LTCP includes a recovery time analysis that can be used to establish the duration of the wet-weather advisory for public notification.

DEP is committed to improving water quality in this waterbody, which will be advanced by the improvements and actions identified in this LTCP. These identified actions have been balanced with input from the public and awareness of the cost to the citizens of NYC.

SECTION 9 EDITS

The following text is hereby incorporated into Section 9.2 of the Newtown Creek LTCP:

As stated in the LTCP at ES-4, the data shows that CSO discharges are not a source of hazardous substances in Newtown Creek above background concentrations. For this reason, the City expects the CSO control alternative selected in the LTCP would be sufficient to address any CSO discharge controls that EPA may require under Superfund. However, there are potential schedule inconsistencies between design of the approved LTCP alternative and EPA's evaluation of CSO alternatives under CERCLA. Specifically, DEP is beginning the contracting process to design the approved LTCP CSO controls. Concurrently, the Feasibility Study evaluating the overall Newtown Creek Superfund Site remedial alternatives is ongoing. Consequently, EPA will not issue a Record of Decision (ROD) selecting a final site-wide remedy for Newtown Creek until 2023 at the earliest.

Because of these separate timelines under the LTCP and CERCLA, as set forth in DEP's January 8, 2018 Response to Comments, EPA's selection of a remedy for Newtown Creek could impact several elements of the LTCP Recommended Plan for Newtown Creek. For example, the expansion of the Dutch Kills Pump Station, which would result in a 75% reduction of CSO at BB-026, would be well underway by 2023. If the ROD does not support the Dutch Kills Pump Station expansion technology, or requires greater than 75% CSO reduction, DEP's LTCP project would not satisfy the ROD and a storage solution may be required. For example, a storage alternative would be significantly more expensive, would require a much longer implementation schedule, and would delay CSO controls. Further, a storage alternative would require land acquisition, thus adding significant time and risk to the LTCP Recommended Plan.

Accordingly, DEP has been coordinating with EPA and DEC on integrating the LTCP and Superfund processes and schedule. In January 2018, DEP proposed to EPA that DEP would conduct a Focused Feasibility Study (FFS) that would evaluate the effectiveness of the elements of the LTCP at addressing CERCLA contaminants in CSO discharges. DEP would utilize much of the data gathered and generated in developing the LTCP Recommend Plan, and would evaluate the data under the Superfund criteria set forth in the National Contingency Plan (NCP).

DEP stated that it is prepared to begin work on the FFS immediately, and that it would deliver its final FFS by October 31, 2018. Under this schedule, DEP would complete its FFS and EPA would make a final decision with respect to CSO controls under CERCLA before DEP awarded a contract for the design of the LTCP Recommended Plan. Importantly, if EPA were to require additional CSO controls under Superfund, CSO Long Term Control Plan II Long Term Control Plan Technical Memorandum Newtown Creek TM-39 DEP would not have expended significant resources with respect to the design of the LTCP Recommended Plan at the time of EPA's decision.

DEP and EPA have held further discussions relating to the LTCP Recommended Plan and the proposed FFS. Consistent with these discussions, DEP and EPA are negotiating a draft Scope of Work for the FFS and in the interim DEP is commencing the work required to undertake the FFS at risk pending EPA's final approval of the scope of work. In addition, on a parallel track with the FFS, DEP will undertake contract development/procurement for the proposed LTCP project. This work effort ensures certainty that the design contract for the proposed LTCP project can be awarded upon completion of the approval of the FFS.

ATTACHMENT 1. DEP'S JANUARY 8, 2018 RESPONSE TO DEC'S NOVEMBER 9, 2017 COMMENTS ON THE JUNE 30, 2017 NEWTOWN CREEK LTCP

NYC Environmental Protection

Vincent Sapienza, P.E.
Commissioner

James Mueller, P.E.
Acting Deputy Commissioner

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January 8, 2018

Joseph DiMura, P.E.
Director, Bureau of Water Compliance
New York State Department of Environmental Conservation
625 Broadway, 4th Floor
Albany, New York 12233-3506

**Re: Order on Consent ("CSO Order"), DEC Case #CO2-20110512-25
Modification to DEC Case #CO2-20000107-8, Appendix A
VIII. Newtown Creek CSO, M. Submit Approvable Drainage Basin Specific LTCP for Newtown Creek**

Dear Mr. DiMura:

On June 30, 2017 the New York City Department of Environmental Protection (DEP) submitted the Newtown Creek Long Term Control Plan (LTCP) to the New York State Department of Environmental Conservation's (DEC). DEP received DEC's review comments on the LTCP on November 9, 2017. DEP and DEC technical staff discussed technical comments on December 19, 2017. DEP's responses to DEC's comments are included as an attachment to this letter. Some of the comments require additional evaluation and technical analysis. To respond to such comments, DEP will provide the requested information in an LTCP technical memo. Due to the time required for such additional evaluations, DEP proposes to submit the LTCP technical memo to DEC by April 30, 2018.

Please feel free to contact me at (718) 595-5972 or kmahoney@dep.nyc.gov should you have any questions regarding this submittal.

Sincerely,

Keith Mahoney

Keith Mahoney, P.E.
Acting LTCP Program Manager

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RESPONSES TO NOVEMBER 4, 2017 DEC COMMENTS ON THE NEWTOWN CREEK LTCP

1. **Floatables Control.** Evaluate the benefits and feasibility of floatables control on CSO outfalls other than the four largest outfalls to Newtown Creek, such as BB-009, NCQ-029, and BB-013. In addition, under the City-wide LTCP, DEP should evaluate installing floatables control technologies at the CSO regulators/outfalls on the East River that will experience increased overflows because of the Newtown Creek LTCP.

   Response: *The four largest outfalls to Newtown Creek (BB-026, NC-015, NC-077 and NC-083) contribute 1,055 MG (91%) of the baseline annual CSO volume to the Creek. The installation of bending weirs and underflow baffles at these outfalls was completed in November 2017, so floatables control is currently being provided for over 90% of the baseline volume. Outfalls BB-009, BB-013, and NCQ-029 together contribute only 7 % of the annual baseline volume. In addition, the Borden Avenue Pump Station expansion project recommended in the LTCP will reduce overflows at outfall BB-026, and is predicted to reduce the annual volume at outfall BB-009 by approximately 16 MG/yr.*

   DEP is currently reviewing the configurations of the regulators associated with outfalls BB-009, BB-013, and NCQ-029 to assess the feasibility of installing the preferred option of floatables control, underflow baffles. Key considerations in the feasibility and cost-effectiveness of the baffles will be whether the baffles can be installed without adversely affecting the upstream hydraulic grade line, and without extensive structural modifications to the existing regulators. A recommendation for floatables control for outfalls BB-009, BB-013, and NCQ-029 will be presented in an LTCP technical memo to be submitted by the end of April 2018.

   Consistent with DEC's comment, in the Citywide LTCP, DEP will evaluate the feasibility and cost-effectiveness of installing floatables control at the East River outfalls that are predicted to experience increased overflow volumes as a result of the proposed Borden Avenue Pump Station expansion project.

2. **Estimated Cost.** The costs savings from elimination of the Phase 4 of Enhanced Aeration should be factored into the cost estimates for the alternatives (it should decrease the cost estimated for the alternatives).

   Response: *The Engineer's estimated construction bid cost for Phase 4 of Enhanced Aeration was $30.8M. As described in Section 8 of the LTCP, as the water quality assessments indicated that the Class SD DO criterion is predicted to be met in Dutch Kills and the main trunk of Newtown Creek under Baseline Conditions, DEP recommended eliminating the previously proposed Phase 4 aeration system. For planning purposes, DEP believes it is important to present the actual estimated costs of the alternatives for Dutch Kills. In response to DEC's comment, DEP proposes to add a sentence identifying the projected cost estimates of the Phase 4 Aeration project in relation to the projected cost estimates for the alternatives in appropriate locations within the text of Section 8 and the Executive Summary where costs of alternatives for Dutch Kills are presented. These edits to the text will be presented in an LTCP technical memo.*

3. **Synergies within Bowery Bay Drainage.** During a January 26, 2016 CSO technical meeting, DEP proposed evaluating alternatives for the entire Bowery Bay drainage area holistically to identify synergies with currently approved LTCPs. Confirm if DEP will continue to evaluate alternatives for additional opportunities for CSO reduction from the Newtown drainage area using this approach under the City-wide LTCP and how the upgrade to the Borden Avenue PS fits into that analysis.

   Response: *DEP anticipates further investigating the hydraulic interrelationships among outfalls in the Bowery Bay and Newtown Creek WWTP service areas as part of the evaluation of alternatives for East River and Bowery Bay outfalls under the East River/Open Waters with Citywide LTCP. The evaluation of alternatives for the East River or Bowery Bay CSOs under the Citywide LTCP will consider the potential hydraulic impacts on the performance of the Borden Avenue Pump Station Expansion project. The evaluation may include assessing the impacts of pumping dry weather flow from the Bowery Bay system to the Newtown Creek WWTP via the proposed Borden Avenue Pump Station Expansion project.*

4. **Baseline CSO Volumes.** Include a table like Table 6.2 that includes the flows for the East River CSO outfalls that will be impacted by the Borden Avenue PS upgrades.

   Response: *Table 6-2a below lists the 2008 Baseline Conditions CSO Volumes and Activations for the East River CSOs associated with the Bowery Bay Low Level Interceptor and the Newtown Creek WWTP. Although not all the outfalls in this table will be affected by the proposed Borden Avenue Pump Station Expansion, listing all of the outfalls provides context for the outfalls where the volumes would increase. A similar table will be inserted into Section 8 to show the impact of the Borden Avenue Pump Station Expansion under the LTCP Recommended Plan, as presented below in response to Comment No. 14. This table will be incorporated in an LTCP technical memo.*

Table6-2a. 2008 Baseline CSO Volume and Overflows per Year – East River CSOs Associated with Newtown Creek WWTP and Bowery Bay WWTP Systems

Waterbody/WWTP System	CSO	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)
East River/BBL(1)	BB-016	1.8	17
	BB-017	1.7	20
	BB-018	1.1	17
	BB-021	23.4	34
	BB-022	1.0	12
	BB-023	16.4	30
	BB-024	36.4	28
	BB-025	11.0	30
	BB-027	6.1	27

Table6-2a. 2008 Baseline CSO Volume and Overflows per Year – East River CSOs Associated with Newtown Creek WWTP and Bowery Bay WWTP Systems

Waterbody/WWTP System	CSO	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)
	BB-028	352	44
	BB-029	105	32
	BB-030	27.6	43
	BB-031	3.9	18
	BB-032	1.9	17
	BB-033	6.1	28
	BB-034	202	57
	BB-035	3.9	32
	BB-036	8.9	30
	BB-037	0.6	8
Steinway Creek/BBL	BB-041	84.2	61
East River/BBL	BB-045	0.04	1
	BB-046	7.0	33
	BB-047	2.0	21
Subtotal BBL		**904**	**61 (max)**
East River/NCWWTP(2)	NC-003	0.4	10
	NC-004	15.9	36
	NC-006	92.2	42
	NC-007	7.5	31
	NC-008	21.6	32
	NC-010	0.0	0
	NC-012	30.8	15
	NC-013	58.3	28
Wallabout Channel/NCWWTP	NC-014	607	27
East River/NCWWTP	NC-024	0.0	0
	NC-025	0.5	10
	NC-026	0.3	7
	NC-027	13.3	31
	NC-082	0.6	10
Subtotal NCWWTP		**848**	**42 (max)**
Total		**1,752**	**61 (max)**

Notes:

(1) BBL = Bowery Bay Low Level Interceptor, to Bowery Bay WWTP

(2) NCWWTP = Newtown Creek WWTP system

5. **Initial Screening of Alternatives.** In section 8.1.i, the discussion under the Pumping Station Modification category focuses only on the pump stations for the Newtown Creek WWTP, but there are pump stations associated with the Bowery Bay WWTP that are also located within the Newtown Creek drainage basin

and these facilities should be considered for expansion or upgrading. As such, this section should mention the Borden Avenue PS as one facility that will be evaluated further.

Response: *A sentence will be added to the Pumping Station Modification category to identify that the expansion of the Borden Avenue Pump Station was identified for further evaluation and that there are no other sanitary pump stations within the Newtown Creek drainage area that discharge to the Bowery Bay WWTP system.*

6. **Green Infrastructure.** Though beyond the terms of the LTCP and CSO Order, the public has suggested and DEC supports that the DEP take steps to assess and provide detail on the potential for additional GI implementation in the highly industrial areas of the Newtown Creek watershed. Such an LTCP assessment could include creating an inventory of large private sites within drainage area outfalls not targeted for grey infrastructure investments and the development of an upper and lower bound estimate of potential future CSO volume reductions from those targeted outfalls. GI program annual reports could update the private property inventory and progress in DEP's efforts to advance retrofits in those drainage areas that can be counted towards the City-wide GI goals of the CSO Order.

Response: *DEP believes any assessment of GI or CSO volume reduction and an inventory of GI projects is best addressed in the Green Infrastucture Annual Report. To update DEC on this effort separate from the LTCP, please note that DEP has a Request for Proposals (RFP) under development to select a Program Administrator to administer a new Private Property Retrofit Incentive Program. The first phase of the Program will target privately owned properties in the combined sewer areas of the City that are categorized in two tiers. Tier 1 includes properties that are greater than 100,000 square feet (sf) in gross area. Tier 2 includes properties that are greater than 50,000 sf and less than 99,999 sf in gross area. The Program Administrator will be charged with retrofitting 200 Greened Acres (a Greened Acre is defined as one inch of stormwater managed over one acre) within Tier 1 and Tier 2 properties in the first phase of the Program. Key components of the Program Administrator's scope and ultimate success of the Program include effective targeted marketing of the* ***voluntary*** *retrofit Program and project bundling or aggregation to achieve cost and time efficiencies. DEP has preliminarily identified 130 Tier 1 and Tier 2 properties within the Newtown Creek watershed. Prior to execution of the contract with the Program Administrator and subsequent Program rollout, DEP will be engaging Tier 1 and Tier 2 property owners and stakeholders with ties to these property owners.*

In addition, the Office of Green Infrastructure's ROW Program has active contracts in all CSO tributary areas to Newtown Creek including those not targeted for grey infrastructure controls, BB-009, BB-043, BB-014, BB-013, NCB-022, and NCQ-029. This is in addition to ROW projects in tributary areas that are targeted for grey infrastructure controls, BB-026, NCB-015, NCB-083, and NCQ-077. Contracts in the tributary areas not targeted for grey infrastructure controls are in various stages of design and construction and DEP will continue to report on them in the Green Infrastructure Annual Report.

DEP is also looking at public onsite opportunities in the entire Newtown Creek watershed, including outfalls not targeted for grey infrastructure controls. Active public onsite projects in Newtown Creek are in various stages of design and construction, with several more in planning stages pending the kick-off of three new public onsite design contracts. DEP will continue to report on the status of these projects in the Green Infrastructure Annual Report.

7. **Table ES-2.** Some of the CSO outfalls have a Discharge Volume in Million Gallons per Year (MGY) of "0" but also indicate that there are overflow events, thus the table should either include a footnote explaining that discharges are less than 1 MGY or in insert >0 in the table.

   Response: *Table ES-2 has been revised below to show volumes to one decimal point, thus eliminating the reference to outfalls with one or more activations and zero volume. The table has also been expanded to identify the waterbody and transport system associated with each outfall. This table (and a revised Table 6.2, which is the same table as ES-2) will be incorporated into the LTCP via an LTCP technical memo.*

Table ES-2. 2008 Baseline CSO Volume and Overflows per Year – Newtown Creek CSOs

Waterbody/WWTP System	CSO	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)
Dutch Kills/BBL[1]	BB-004	0.1	1
	BB-009	43.0	34
Newtown Creek/BBL	BB-010	0.5	7
	BB-011	1.6	14
	BB-012	0.1	1
	BB-013	16.2	31
	BB-014	1.8	18
	BB-015	0.7	13
Dutch Kills/BBL	BB-026[3]	120	37
	BB-040	1.1	16
Newtown Creek/BBL	BB-042	1.5	22
	BB-043	9.4	32
English Kills/NCWWTP[2]	NCB-015[3]	321	31
Newtown Creek/NCWWTP	NCB-019	3.0	21
	NCB-021	0.0	0
	NCB-022	7.5	29
	NCB-023	0.5	8
	NCQ-029	18.7	40
Maspeth Creek/NCWWTP	NCQ-077[3]	300	41
Newtown Creek/NCWWTP	NCB-083[3]	314	42
	NCB-002[4]	N/A	N/A

Table ES-2. 2008 Baseline CSO Volume and Overflows per Year – Newtown Creek CSOs

Waterbody/WWTP System	CSO	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)
Total		1,161	42 (max)

Notes:

(1) BBL = Bowery Bay Low Level Interceptor, to Bowery Bay WWTP
(2) NCWWTP = Newtown Creek WWTP system
(3) NCB-015 + NCB-083 + NCQ-077 + BB-026 = 91% of Total Annual Volume.
(4) NCB-002 is the Newtown Creek WWTP high relief outfall that discharges to Whale Creek Canal. This flow is treated before discharge.

8. **Pages ES-7 and ES-9.** The LTCP states that the dry-weather geometric means for fecal coliform at Stations NC-4 to NC-14 are all above 200 cfu/100mL but attributes the elevated bacterial levels to a slow time to recovery following a wet weather event, as opposed to being caused by a dry-weather source of bacteria in the creek. While a slow recovery time is plausible, the Department recommends that DEP conduct track-down in Newtown Creek to confirm if there are any illicit discharges. On Page 2-24, the LTCP states that there are over 150 non-CSO, non-MS4 pipes located along the banks of Newtown Creek, which could be a source of illicit discharges.

   Response: *BWT Shoreline staff has been doing periodic track downs in Newtown Creek over the last few years. They have abated multiple illicit connections and have reported other ongoing discharges to DEC Region 2.*

   With regard to the non-CSO and non-MS4 pipes mentioned in the LTCP, if BWT Shoreline sees a dry weather discharge, it is reported to DEC. However, BWT Shoreline has not observed anything in the past year. Many of the outfalls are submerged most of the time. The area around NCQ-077 has private sewers and most of the area has no sewer fronting the building.

9. **Page ES-27.** Section "Estimated Costs of Retained Alternatives and Selection of the Preferred Alternative", the expansion of BAPS is listed as a 24 MGD expansion whereas the Table ES-11 listed it as 26 MGD. Please reconcile this discrepancy.

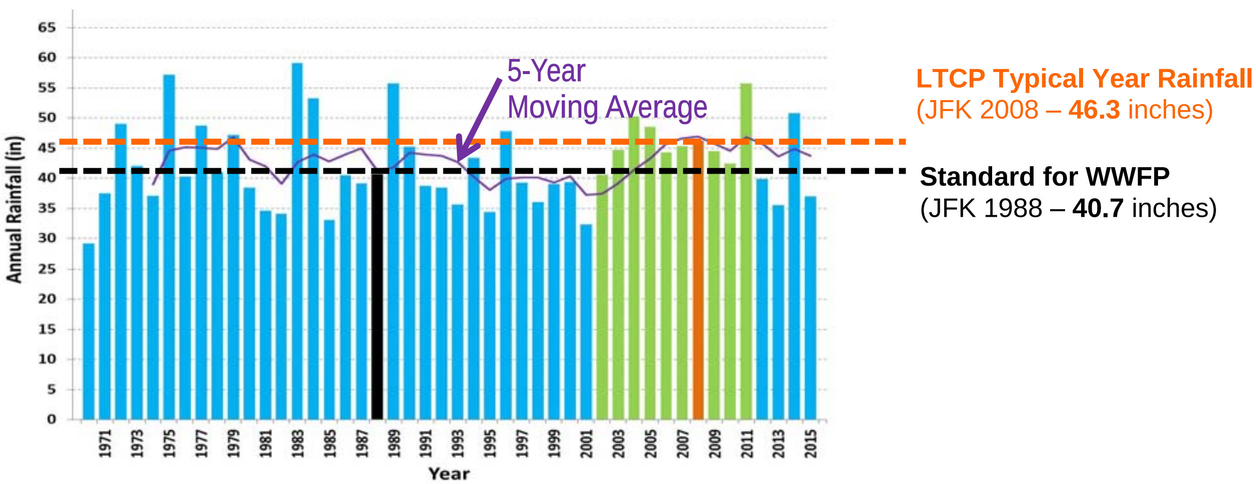
   Response: *The total capacity of the expanded Borden Avenue Pump Station should be indicated as 26 MGD. The text on page ES-27 will be revised to clarify, and the text on page 8-55 will be similarly revised. The revised text will be incorporated in an LTCP technical memo.*

10. **Table 2-14.** Confirm that there are no endangered or threatened species within the Newtown Creek waterbody.

Response: *The criteria for including a waterbody on the New York State Department of State's (DOS) list of Significant Coastal Fish and Wildlife Habitats include whether the waterbody supports populations of species which are endangered, threatened or of special concern. Specifically, the species would have to be resident in the ecosystem or the ecosystem contributes significantly to the survival of the rare species in New York. Newtown Creek is not listed on the DOS website (https://www.dos.ny.gov/opd/programs/consistency/scfwhabitats.html) as a Significant Coastal Fish and Wildlife Habitat. This source provides the basis of the finding presented in Table 2-14.*

11. **Page 2-16.** On Figure 2-8, adjust purple leader depicting the "5-Year Rolling Average".

    Response: *The revised figure below will be incorporated into the LTCP technical memo.*



12. **Page 2-17.** Table 2-4 listed the "Other" acreage contributing to Newtown Creek at 923 acres; clarify what "Other" means.

    Response: *The "Other" acreage includes cemeteries and the Sunnyside rail yard. A footnote will be added to the table and will be incorporated in an LTCP technical memo.*

13. **Page 2-22.** The LTCP states that the Glendale PS is a stormwater station that discharges into the combined sewer system. Confirm if the DEP considered discharging the stormwater directly to the waterbody.

    Response: *Routing of the flow from the Glendale Pumping Station directly to Newtown Creek was initially considered as part of preliminary evaluations. However, the small contribution from this 1.2 MGD peak capacity stormwater pumping station to the combined sewer system and the approximately three miles of new force main construction required to reach Newtown Creek led to an early dismissal of this concept as a viable or cost-effective option.*

Figure 1 shows the location of the Glendale Pumping Station relative to Newtown Creek. The pump station is located on Cooper Avenue west of 76th Street. No high-level storm sewers are located in the vicinity of the Glendale Pumping Station.

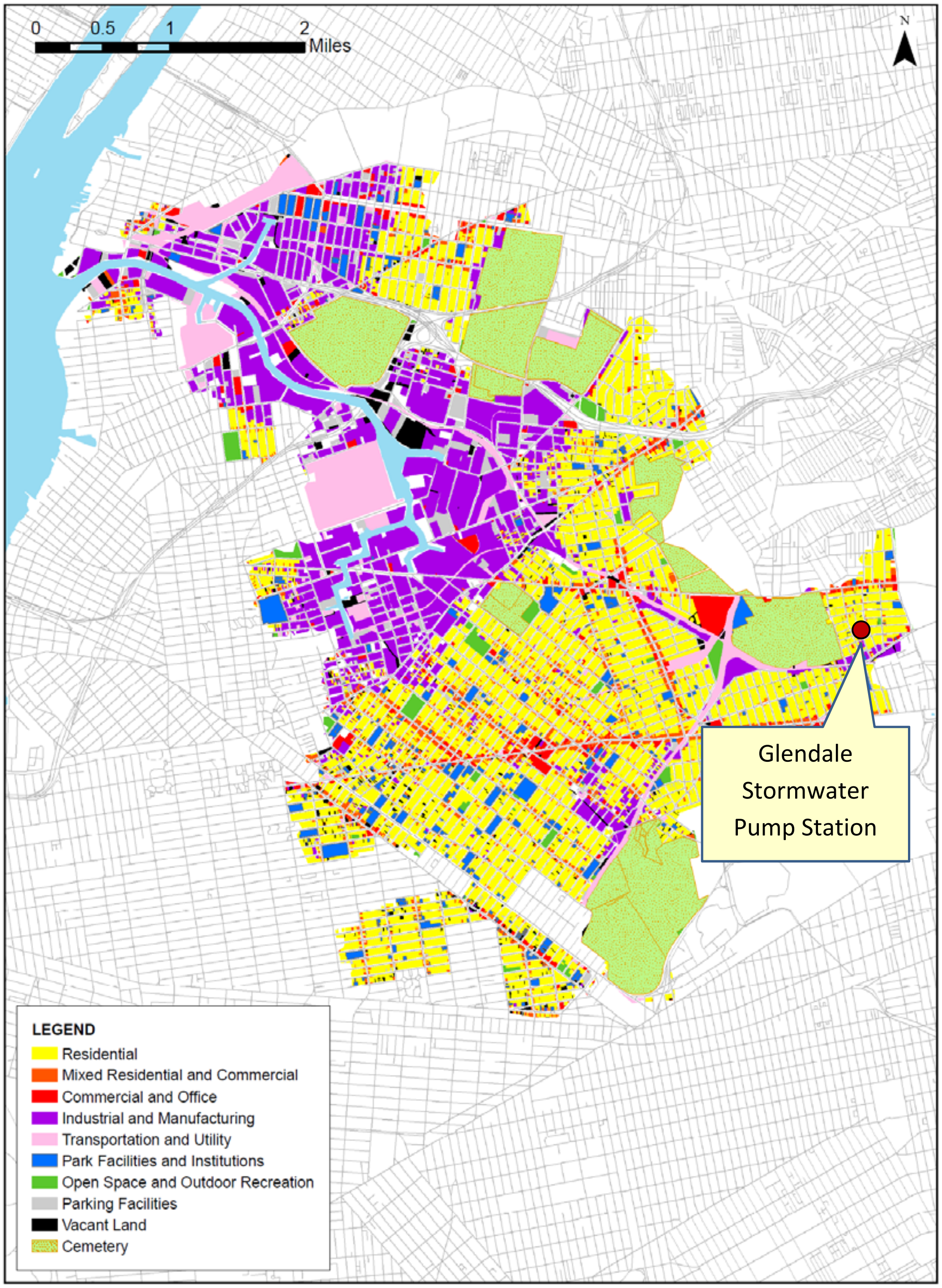


Figure 1. Location of Glendale Stormwater Pump Station

14. Somewhere in Section 8, include a table that provides the CSO volumes for each outfall for baseline condition and selected alternative and include outfalls along East River impacted by the Borden Avenue PS.

Response: *Tables 8-27a and 8-27b below present the baseline and recommended plan annual overflow volumes and frequencies for 2008, for the Newtown Creek and East River CSOs associated with the Bowery Bay and Newtown Creek WWTPs. These tables will be incorporated in an LTCP technical memo.*

Table 8-27a. 2008 Baseline and Recommended Plan CSO Volume and Overflows per Year – Newtown Creek CSOs

Waterbody/WWTP System	CSO	2008 Baseline		Recommended Plan	
		Volume	Annual Overflow Events	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)	Total Discharge (MG/yr)	Total (No./yr)
Dutch Kills/BBL(1)	BB-004	0.1	1	0.0	0
	BB-009	43.0	34	27.4	27
Newtown Creek/BBL	BB-010	0.5	7	0.8	11
	BB-011	1.6	14	2.3	16
	BB-012	0.1	1	0.1	1
	BB-013	16.2	31	15.3	30
	BB-014	1.8	18	1.7	18
	BB-015	0.7	13	0.7	13
Dutch Kills/BBL	BB-026(3)	120	37	29.3	25
	BB-040	1.1	16	0.9	12
Newtown Creek/BBL	BB-042	1.5	22	1.2	17
	BB-043	9.4	32	8.6	33
English Kills/NCWWTP(2)	NCB-015(3)	321	31	119	13
Newtown Creek/NCWWTP	NCB-019	3.0	21	2.9	20
	NCB-021	0.0	0	0.0	0
	NCB-022	7.5	29	8.3	28
	NCB-023	0.5	8	0.6	9
	NCQ-029	18.7	40	18.7	40
Maspeth Creek/NCWWTP	NCQ-077(3)	300	41	100	18
Newtown Creek/NCWWTP	NCB-083(3)	314	42	112	22
	NCB-002(4)	N/A	N/A	N/A	N/A
Total		1,161	42 (max)	450	40 (max)

Notes:

Table 8-27a. 2008 Baseline and Recommended Plan CSO Volume and Overflows per Year – Newtown Creek CSOs

Waterbody/WWTP System	CSO	2008 Baseline		Recommended Plan	
		Volume	Annual Overflow Events	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)	Total Discharge (MG/yr)	Total (No./yr)

(1) BBL = Bowery Bay Low Level Interceptor, to Bowery Bay WWTP
(2) NCWWTP = Newtown Creek WWTP system
(3) NCB-015 + NCB-083 + NCQ-077 + BB-026 = 91% of Total Annual Volume.
(4) NCB-002 is the Newtown Creek WWTP effluent outfall that discharges to Whale Creek Canal during peak flow and high tide conditions. This flow is treated before discharge.

Table 8-27b. 2008 Baseline and Recommended Plan CSO Volume and Overflows per Year – East River CSOs Associated with Newtown Creek WWTP and Bowery Bay WWTP Systems

Waterbody/WWTP System	CSO	2008 Baseline		Recommended Plan	
		Volume	Annual Overflow Events	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)	Total Discharge (MG/yr)	Total (No./yr)
East River/BBL[1]	BB-016	1.8	17	1.7	16
	BB-017	1.7	20	1.6	20
	BB-018	1.1	17	1.1	16
	BB-021	23.4	34	22.5	34
	BB-022	1.0	12	1.0	11
	BB-023	16.4	30	16.1	28
	BB-024	36.4	28	35.9	28
	BB-025	11.0	30	10.9	29
	BB-027	6.1	27	6.1	27
	BB-028	352	44	349	43
	BB-029	105	32	105	32
	BB-030	27.6	43	27.5	43
	BB-031	3.9	18	3.9	18
	BB-032	1.9	17	1.9	17
	BB-033	6.1	28	6.1	29
	BB-034	202	57	202	57
	BB-035	3.9	32	3.9	32
	BB-036	8.9	30	8.9	29
	BB-037	0.6	8	0.6	8

Table 8-27b. 2008 Baseline and Recommended Plan CSO Volume and Overflows per Year – East River CSOs Associated with Newtown Creek WWTP and Bowery Bay WWTP Systems

Waterbody/WWTP System	CSO	2008 Baseline		Recommended Plan	
		Volume	Annual Overflow Events	Volume	Annual Overflow Events
		Total Discharge (MG/yr)	Total (No./yr)	Total Discharge (MG/yr)	Total (No./yr)
Steinway Creek/BBL	BB-041	84.2	61	84.2	61
East River/BBL	BB-045	0.04	1	0.04	1
	BB-046	7.0	33	7.0	33
	BB-047	2.0	21	2.0	20
Subtotal BBL		**904**	**61 (max)**	**899**	**61 (max)**
East River/NCWWTP(2)	NC-003	0.4	10	0.4	10
	NC-004	15.9	36	17.0	36
	NC-006	92.2	42	104.5	42
	NC-007	7.5	31	8.0	31
	NC-008	21.6	32	24.4	31
	NC-010	0.0	0	0.0	1
	NC-012	30.8	15	36.7	18
	NC-013	58.3	28	72.9	27
Wallabout Channel/NCWWTP	NC-014	607	27	646.5	29
East River/NCWWTP	NC-024	0.0	0	0.0	0
	NC-025	0.5	10	0.5	11
	NC-026	0.3	7	0.3	10
	NC-027	13.3	31	16.1	30
	NC-082	0.6	10	0.6	10
Subtotal NCWWTP		**848**	**42 (max)**	**929**	**42 (max)**
Total		**1,752**	**61 (max)**	**1,828**	**61 (max)**

Notes:

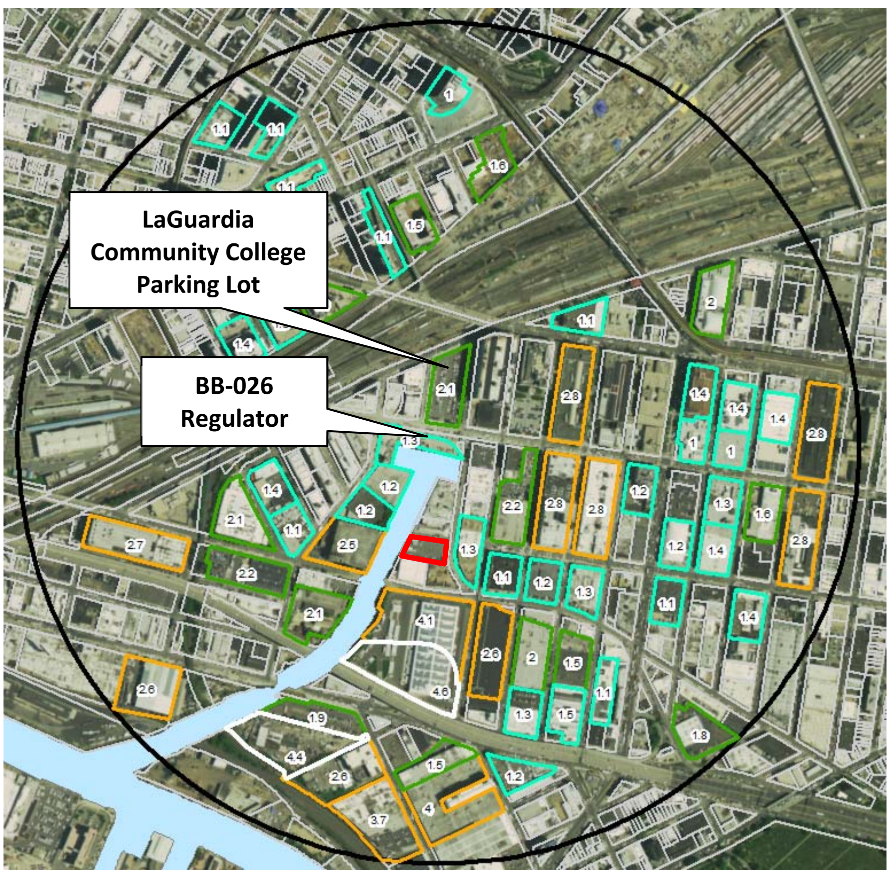
(1) BBL = Bowery Bay Low Level Interceptor, to Bowery Bay WWTP

(2) NCWWTP = Newtown Creek WWTP system

15. **Section 8.2.** The DEP should evaluate the benefits and costs of a storage tank for BB-026, and compare those benefits and costs to those for the upgrade to the Borden Avenue PS. This evaluation should also include the technical feasibility and limitations of operating a tank at BB-026 detailing pump back requirements and any capacity restraints at Newtown Creek WWTP and/or Bowery Bay WWTP given the pump back requirements of the proposed future storage tunnels for Newtown Creek and Flushing Bay.

Response: *Storage for outfall BB-026 was evaluated in the LTCP. As described in Section 8 of the LTCP, a review of existing parcels in the vicinity of Outfall BB-026 was performed to identify potential sites for retention/treatment facilities. The siting review looked at parcels within a half-mile radius of the CSO regulator associated with the outfall. The initial siting assessment looked for unoccupied sites that did not have existing buildings, while cemeteries, schoolyards and rail yards were excluded as potential sites. The sizes of the unoccupied sites were then compared against the space needed for either a storage tank or a flow-through retention/treatment basin (RTB) to provide 25, 50, 75, or 100 percent CSO control. For Outfall BB-026, the results of this analysis were that one site was identified that could provide 25 percent control for a storage tank, or 50 percent control for an RTB. This site was an open lot located along the east side of Dutch Kills.*

Based on the limited number of unoccupied sites identified, the siting assessment was expanded to look at all parcels within a half-mile radius of the CSO regulator, regardless of whether the parcel was occupied by an existing building (Figure 2; note this figure had been developed as part of the alternatives development process, but was not included in the LTCP). Cemeteries, schoolyards and rail yards remained excluded as potential sites. While this approach identified more potential parcels of sizes sufficient to accommodate storage tanks or RTBs at higher levels of CSO control, the challenges of obtaining these sites for CSO storage tanks or RTBs were clearly recognized.



Storage Tank		
% Annual Control	Required Area(1) (acres)	# of Identified Parcels(2)
25	1.0	32
50	1.5	16
75	2.3	13
100	4.3	2

1) Includes 50 ft. setback.
2) Cemeteries, schools and rail yards not included

Only sites not at least partially occupied by buildings were the 1-acre site indicated in red along the east shore of Dutch Kills, and the parking lot for LaGuardia Community College just north of Dutch Kills.

Figure 2. Siting Evaluation for BB-026 Storage

As further noted in Section 8, a CSO storage tank alternative to provide an equivalent level of control to the recommended Borden Avenue Pump Station Expansion (75% control) would require property acquisition through either negotiated acquisition or eminent domain acquisition of developed parcels. The LaGuardia Community College parking lot would have been big enough to site a storage tank that would provide more than 50% but less than 75% control of outfall BB-026. However, construction of a storage tank on that site would have had a significantly negative impact on the community college, as it is the only parking lot for the college identified on the college's website. The construction cost of a tank on the community college parking lot would have been on the order of five to six times the estimated construction cost of the Borden Avenue Pump Station Expansion alternative, and the storage tank would not have provided as high of a reduction in the CSO volume to Newtown Creek. For these reasons, expansion of the BAPS was the only control measure further considered throughout the LTCP for developing alternatives up to 75 percent level of control at Outfall BB-026. For 100 percent control, reduction of the discharges from BB-026 would be realized by conveying the flows to a CSO storage tunnel that would also capture CSO from the three large upstream Outfalls NC-077, NC-083 and NC-015 and this alternative would be substantially more expensive then the recommended alternative with no projected improvements in water quality.

16. **Page 8-13, Section 8.1.i,** Sewer Separation states that High Level Sewer Separation for cemeteries could reduce CSOs by 12 percent area-wide. Given the magnitude of the potential reduction, this alternative should be retained for further analysis in the LTCP.

    Response: *The 12% reduction in CSO volume associated with separation of the cemeteries was computed as a percentage of the Baseline Conditions annual volume, and equated to an approximately 140 MG reduction in CSO volume to Newtown Creek. This predicted volume reduction would have occurred at outfalls NC-015, NC-077 and NC-083. None of the other CSOs to Newtown Creek were predicted to be affected by the separation of the cemeteries. Under the LTCP Recommended Plan, the proposed storage tunnel will capture 62.5% of the overflow volume from outfalls NC-015, NC-077 and NC-083. If the cemeteries were to be separated in addition to implementing the storage tunnel, the total additional volume reduction associated with the sewer separation from those outfalls would be approximately 81 MG, distributed as follows:*

    - *NC-015: 20 MG reduction*
    - *NC-077: 24 MG reduction*
    - *NC-083: 37 MG reduction*

    The 81 MG would represent an additional 7% reduction from the Baseline Conditions annual volume to Newtown Creek. However, these sewer separation projects are typically very expensive and have very long implementation periods. Such a project may not even be viable in this drainage area due to all the underground utilities and infrastructure. Due to the high cost and complexity of the sewer separation projects, it was considered to be not cost effective and it wasn't retained as a recommended alternative.

17. The LTCP should provide some additional detail on DEP's effort to coordinate the ongoing EPA Superfund and CSO programs. Describe where and how DEP believes there are program synergies and any potential conflicts that may impede LTCP implementation process.

Response: *As stated in the LTCP at ES-4, the data show that CSO discharges are not a significant source of hazardous substances in Newtown Creek. Nevertheless, the City expects the CSO control alternative selected in the LTCP would be sufficient to address any CSO discharge controls that EPA may require under Superfund. The FS, which is currently being undertaken will evaluate potential remedies for Newtown Creek based on both data collected during the RI and on additional sampling and studies. EPA expects to issue a Record of Decision (ROD) in 2022, which will set forth EPA's selected remedy for Newtown Creek.*

DEP has been coordinating with DEC and EPA on integrating the LTCP and Superfund processes, and has attended several meetings on this subject both before and since the submittal of the LTCP. As both CWA and CERCLA approvals are required to ensure the LTCP project can proceed without interruption, DEP is continuing to develop a path forward with DEC and EPA. The next meeting with EPA on this topic is scheduled for late January 2018. *Refer to Attachment A for a summary of the potential impacts of the Superfund project on the various elements of the LTCP Recommended Plan for Newtown Creek. DEP will provide updated information on this process, if such is available, with submittal of the LTCP technical memo.*

18. **Section 9.2.** The Department requests that the DEP examine ways to accelerate the schedule for the Borden Avenue PS upgrade for completion within 10 years. DEC appreciates the complexity of developing a schedule for the proposed CSO storage tunnel. DEC will work with DEP throughout the planning, design and construction phases to find opportunities to advance the project timetable.

Response: *The schedule for the Borden Avenue PS upgrade is based on DEP experience on similar projects. Based on this experience it is expected to take approximately 10 years to complete the upgrade. However, the DEP will attempt to expedite this project where feasible and will keep DEC updated on its progress.*

ATTACHMENT A

Potential Impacts of the future Superfund Record of Decision on the Newtown Creek Recommended Long Term Control Plan

Introduction

The recommended plan in the Long Term Control Plan (Plan) for Newtown Creek includes the following elements:

- Expansion of the Borden Avenue Pumping Station (BAPS) from its current 3.9 MGD to a wet weather capacity of up to 26 MGD, with a new diversion structure and gravity pipe from Outfall BB-026, and a new force main to the Kent Avenue Gate Structure. This element will reduce the Baseline annual CSO volume at Outfall BB-026 by 75%.
- A 39 MG CSO storage tunnel that will capture 62.5 percent of the annual CSO volume from Outfalls NC-015, NC-083 and NC-077. The proposed tunnel includes drop shafts to divert CSO flows to the tunnel, near-surface connecting conduits and structures, and a dewatering pumping station. The final route to be determined during subsequent planning and design activities.
- Elimination of the in-stream mechanical aeration for Dutch Kills as contained in the 2012 CSO Order.

This memorandum identifies the potential impacts that the ROD, to be issued in 2023 (current projection), could have on the Plan. The potential impacts could be driven by the ROD's requirements for:

- The level of CSO control ;
- The depth and extend of dredging; and
- The extent of bulkhead restoration

Borden Avenue Pumping Station Upgrade/Expansion

Table 1 summarizes the potential impacts of the future ROD to the critical design elements of the BAPS upgrade/expansion project.

Table 1. Summary of Potential Impacts of ROD on Critical Design Factors for the BAPS Expansion

Project Element/Issue	Current Arrangement per LTCP Recommended Plan	Potential Impact of ROD
Diversion Structure at Outfall BB-026	• A new diversion chamber with tide gate constructed on the existing BB-026 outfall downstream of the existing regulator.	• If a higher level of CSO control is required by the ROD, a larger diversion structure may be needed to accommodate a larger conveyance conduit to BAPS. • If bulkhead restoration is conducted near outfall BB-026 as part of the ROD, it could affect construction of the diversion structure.
Conveyance Conduit from Diversion Structure to BAPS	• Approximately 2,500 LF of 3.5-ft. diameter gravity conveyance piping from the new diversion structure to the BAPS.	• If a higher level of CSO control is required by the ROD, a larger diameter conveyance conduit to BAPS may be required. • If bulkhead restoration is conducted near outfall BB-026 as part of the ROD, it could affect the route of the conveyance conduit in the vicinity of the diversion structure.
BAPS	• Expansion of the BAPS to 26 MGD, within the footprint of the existing BAPS.	• If a higher level of CSO control is required by the ROD, the proposed capacity of BAPS would need to be increased. • The increase in capacity may require expansion of BAPS beyond the existing footprint, and if so, could require acquisition of property to site the expansion of the pump station.

Table 1. Summary of Potential Impacts of ROD on Critical Design Factors for the BAPS Expansion

Project Element/Issue	Current Arrangement per LTCP Recommended Plan	Potential Impact of ROD
		• If the required level of control were to approach 100 percent, the pumping capacity would be over 100 MGD, which would require a new stand-alone pumping station, significantly increase the volume of overflow to the East River, and potentially have had adverse impacts on the hydraulic grade line in the Kent Avenue system. • If this higher level of control is required under Superfund, the pumping station expansion would likely be not feasible and an alternate technology would be needed and would cost an additional $90M and require a much longer construction schedule. • If the ROD does not accept PS expansion as an acceptable action, any funding spent on the PS would be wasted; alternate controls would be much more expensive. The design is currently estimated to cost approximately $10 million.
Force Main to Kent Avenue Gate	• Approximately 4,350 LF of 3-ft. diameter force main from the BAPS to a location just upstream of the Kent Avenue Gate Structure.	• If a higher level of CSO control is required by the ROD, a larger diameter force main may be required • If dredging is conducted as part of the ROD where the force main will cross the creek, the depth of dredging could affect

Table 1. Summary of Potential Impacts of ROD on Critical Design Factors for the BAPS Expansion

Project Element/Issue	Current Arrangement per LTCP Recommended Plan	Potential Impact of ROD
		the depth of the force main • If bulkhead restoration is conducted as part of the ROD where the force main will cross the creek, it could affect the force main design
Impact to East River CSOs	• The additional flow at the Newtown Creek WWTP will displace approximately 80 MGY of CSO into the East River	• If a larger pump station is required by the ROD, a further increase in CSO volume would be displaced to the East River, potentially affecting water quality and mitigation measures such as floatables control for affected outfalls. The NC WWTP doesn't have wet weather capacity for these higher flow rates to capture 100% of storm events during a typical year.

Figure 1 presents the P80 implementation schedule for the BAPS expansion alternative, with the addition of a row at the bottom indicating the current schedule for issuance of the Superfund ROD (2023, although the timing within 2023 is not known). As shown in Figure 1, the ROD is expected to be issued, at least a full year after the initiation of planning for the BAPS expansion, assuming DEC approval of the Newtown Creek LTCP in June 2018. With this schedule, procurement of the planning/design consultant for the BAPS expansion as well as design work under that contract would occur before the ROD is issued. If the ROD requires a substantially different project from the currently-recommended BAPS expansion, then re-procurement of the planning/design consultant would be required, as well as re-design, because the basis for selecting the planning/design consultant would be different (a consultant selected for expertise in pump station expansion would not necessarily be the same consultant selected for expertise in, for example, CSO storage tank design) and because the scope of the planning/design contract would need to be substantially modified. Finally, such a material change in scope would likely require a new procurement under the City's procurement rules. A "substantially different project" would include increasing the capacity of the BAPS beyond the point where expansion of the pump station could still occur on the existing BAPS site, or providing a different approach to CSO control, such as storage. Elements of the ROD not related specifically to CSO control (such as the scope of bulkhead improvements and dredging) would not be expected to significantly affect planning-phase activities. These details would, however, be needed for comencement of design activities.

If the ROD substantially changes the project, the costs for procurement and up to 3 to 4 years of activity by the planning/design consultant would likely be wasted. Similarly, because the ROD will be issued after 2020, any planning or design activities for the BAPS initiated prior to issuance of the ROD would be at risk, as the final scope of the project would not be known with certainty until the ROD is issued. Changing course during the planning or design process could result in millions of dollars in wasted ratepayer resources and delay the project by several years.

Milestone	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Borden Ave Pump Station Extension													
DEC Approval		6/2018											
Initiate Planning			12/2019										
Planning Completion						2/2022							
Initiate Final Design						2/2022							
Design Completion								05/2024					
Construction NTP										11/2026			
Construction Completion													11/2029
Superfund ROD							2023						

Figure 1. Borden Avenue Pumping Station P80 Implementation Schedule

CSO storage tunnel for Outfalls NC-015, NC-083 and NC-077

Table 2 summarizes the potential impacts of the ROD to the critical design elements of the CSO storage tunnel project.

Table 2. Summary of Potential Impacts of ROD on Critical Design Factors for the Storage Tunnel for Outfalls NC-015, NC-083, and NC-077

Project Element/Issue	Current Arrangement per LTCP Recommended Plan	Potential Impact of ROD
39 MG Storage Tunnel	• The length and diameter of the storage tunnel will depend on the location of the mining shaft, and on the final route of the tunnel. The tunnel volume is sized to provide 62.5 percent capture of the annual volume from outfalls NC-015, NC-083, and NC-077.	• If a higher level of CSO control is required by the ROD, the diameter of the tunnel would need to be increased for each of the mining shaft location/tunnel route options. An additional leg of the tunnel may be required if the ROD requires storage at outfall BB-026. • Increasing the tunnel diameter could force the invert of the tunnel to be lower, resulting in the need for deeper mining and drop shafts, and a deeper TDPS. • If the required level of control approaches 100 percent, the shorter tunnel route option, with the mining shaft at the DEP-owned site near outfall NC-077, may become infeasible due to the diameter of the tunnel required. Typical CSO rock tunnel diameters range from 12 ft to 40 ft.
Tunnel mining shaft/screenings and grit removal shaft	• A 35 to 46-foot diameter mining shaft would be required, depending on the mining shaft location/tunnel route option. Upon completion of the tunnel mining operations, the mining shaft would be converted to a screenings and grit removal shaft.	• If a higher level of CSO control is required by the ROD, the mining shaft diameter may need to be increased to accommodate the TBM needed for the larger tunnel diameter for each of the mining shaft location/tunnel route options thus limiting properties available to construct drop shafts.

Table 2. Summary of Potential Impacts of ROD on Critical Design Factors for the Storage Tunnel for Outfalls NC-015, NC-083, and NC-077

Project Element/Issue	Current Arrangement per LTCP Recommended Plan	Potential Impact of ROD
		• Increasing the tunnel diameter could force the invert of the tunnel to be lower, resulting in the need for a deeper mining shaft.
Drop shafts for flows from outfalls NC-015, NC-083, and NC-077	• Drop shafts will be required at outfalls NC-015 and NC-077. Depending on the tunnel route selected, a shaft may be required at outfall NC-083, or the flows from outfall NC-083 may be conveyed to the drop shaft at outfall NC-015.	• If a higher level of CSO control is required by the ROD, the size of the drop shafts may need to be increased to accommodate the higher flows captured. • If bulkhead restoration is required by the ROD near outfall NC-015, it could affect the construction of the drop shaft at outfall NC-015. • If the ROD requires that the tunnel capture CSO from outfalls other than NC-015, NC-083, and NC-077, then additional drop shafts could be required.
Diversion structures for outfalls NC-015, NC-083, and NC-077	• New diversion chambers with tide gates will be constructed on the existing NC-015, NC-083 and NC-077 outfalls downstream of the existing regulators.	• If a higher level of CSO control is required by the ROD, larger diversion structures and conveyance conduits will be needed to accommodate larger conveyance conduits to the drop shafts. • If bulkhead restoration is required by the ROD near outfall NC-015, it could affect the construction of the diversion structure at that location.

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Table 2. Summary of Potential Impacts of ROD on Critical Design Factors for the Storage Tunnel for Outfalls NC-015, NC-083, and NC-077

Project Element/Issue	Current Arrangement per LTCP Recommended Plan	Potential Impact of ROD
		• If the ROD requires that the tunnel capture CSO from outfalls other than NC-015, NC-083, and NC-077, then additional diversion structures would be required.
Near-surface connecting conduits from diversion structures to drop shafts	• Near surface conveyance piping will be required between the diversion structures and the tunnel drop shafts. The length of the conveyance piping will depend on the tunnel route selected.	• If a higher level of CSO control is required by the ROD, larger-diameter conveyance conduits may be needed to accommodate the higher flows captured. • If the ROD requires that the tunnel capture CSO from outfalls other than NC-015, NC-083, and NC-077, then additional near-surface conveyance conduits would be required. • If bulkhead restoration is required by the ROD near outfall NC-015, it could affect the construction of the conveyance conduit at that location.
39 MGD tunnel dewatering pump station (TDPS)	• A 39 MGD TDPS would be constructed in a rock cavern adjacent to the tunnel mining shaft. The capacity of the TDPS would allow for dewatering of the tunnel within 24 hours.	• If a higher level of CSO control is required by the ROD, the capacity of the TDPS would need to be greater than 39 MGD in order to dewater the tunnel in 24 hours.

Table 2. Summary of Potential Impacts of ROD on Critical Design Factors for the Storage Tunnel for Outfalls NC-015, NC-083, and NC-077

Project Element/Issue	Current Arrangement per LTCP Recommended Plan	Potential Impact of ROD
		• As described in Section 8 of the LTCP, based on considerations of loadings to the Newtown Creek WWTP, the maximum tunnel dewatering rate would be 40 MGD. Dewatering rates greater than 40 MGD would require an additional retention/treatment basin (RTB) for treatment of the additional dewatering flow. A site would need to be identified and acquired for this RTB
TDPS force main	• A 3.5-foot diameter TDPS force main would be required. The length and route of the force main would depend on the location of the mining shaft/TDPS (site near Newtown Creek WWTP or DEP-owned site near outfall NC-077).	• If a higher level of CSO control is required by the ROD, the size of the force main may need to be increased to accommodate the higher capacity of the TDPS. • If the TDPS is located at the DEP-owned site near outfall NC-077, the force main may need to cross Newtown Creek to tie into the Morgan Avenue Interceptor. In this case, the depth of the force main may be affected if dredging is conducted in that reach of the creek as part of the ROD.
NC WWTP / Satellite Treatment	• During dry weather the CSO volume retained in the tunnel will be pumped	• A larger CSO capture will require much higher pump out flow rates sand the

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Table 2. Summary of Potential Impacts of ROD on Critical Design Factors for the Storage Tunnel for Outfalls NC-015, NC-083, and NC-077

Project Element/Issue	Current Arrangement per LTCP Recommended Plan	Potential Impact of ROD
Facility	back to the NC WWTP for full secondary treatment. The target pump back will be 39 MGD, in order to dewater the tunnel in less than 24 hours.	existing Newtown Creek WWTP is a high rate Step Feed treatment system and DEP is concerned that pumping additional flow beyond this 39 MGD may jeopardize plant performance. Therefore, if a larger CSO capture was required then the tunnel alternative would also require some type satellite treatment facility to treat the retained CSO flow before discharging it back into the receiving waters. • A satellite treatment facility will require additional land acquisition, may impact the route of the tunnel, and require additional contractual resources. This will significantly impact the project implementation schedule.

Figure 2 presents the P80 implementation schedule for the Newtown Creek CSO Storage Tunnel alternative, with the addition of a row at the bottom indicating the current schedule for issuance of the Superfund ROD (2023, although the timing within 2023 is not known). As shown in Figure 2, the current timing of the ROD falls well after significant resources have been expended on planning for the CSO Storage Tunnel, assuming DEC approval of the Newtown Creek LTCP in June 2018. With this schedule, procurement of the planning/design consultant for the CSO Storage Tunnel would have to be conducted prior to issuance of the ROD. If the ROD requires a substantially higher level of control than the currently-recommended 62.5-percent CSO Storage Tunnel, it is very likely that a storage tunnel would still be a major component of the project. However, the scope of the project would likely increase to include a treatment facility for the dewatering flow, a larger-diameter and/or longer tunnel, and potentially more near-surface conduits and drop shafts.

Initial planning activities related to the major shaft locations and tunnel routes based on the current recommended plan would still be useful if the size of the tunnel were to significantly increase. However, the planning scope would need to expand to cover the dewatering treatment facility siting/sizing/layout, as well as other new components of the project associated with the change in design capacity of the tunnel. This expansion of the planning scope will require an extension of the time needed for planning completion and site acquistion activities. It is also not clear that the planning/design team selected for a CSO storage tunnel/dewatering pump station project would be the same team that would be selected if a wet weather treatment facility were part of the project scope. Adding the wet weather treatment facility could potentially require an additional consultant and contractor procurement step.

Even if the ROD does not require a substantially different level of CSO control for the CSO Storage Tunnel (for example, if the diameter increases slightly, but not to the extent that would require a dewatering treatment facility), the potential of a 3 to 4 year gap between initiation of planning and issuance of the ROD in 2023 will likely affect the overall planning schedule. Elements of the ROD not related specifically to CSO control (such as the scope of bulkhead improvements and dredging) would not be expected to significantly affect planning-phase activities. These details would, however, be needed for comencement of design activities.

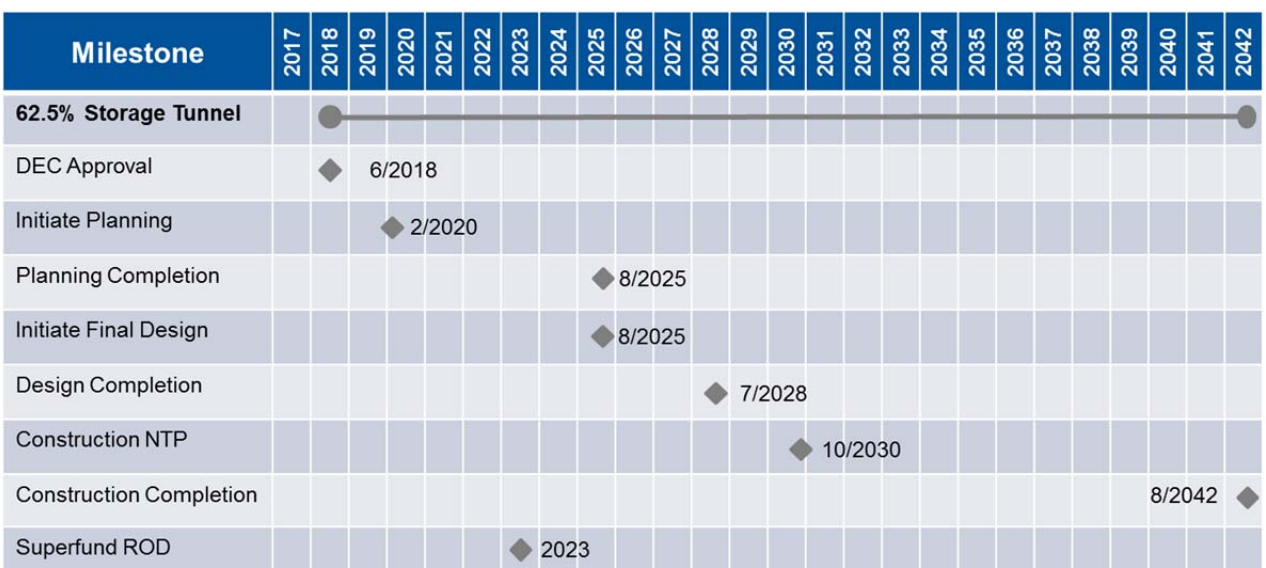

Figure 2. Newtown Creek CSO Storage Tunnel P80 Implementation Schedule

Because the ROD is currently projected for 2023 a significant amount of planning activities for the CSO Storage Tunnel initiated prior to issuance of the ROD would likely be at risk, or at a minimum need to be updated, depending on how much the scope of the project changed as a result of the ROD. The current cost estimate for design is $120M; signficant changes in the scope could result in millions of dollars in wasted ratepayer resources.

ATTACHMENT 2. RESPONSIVENESS SUMMARIES

NEWTOWN CREEK PUBLIC COMMENT RESPONSE SUMMARY
COMMENTS RECEIVED PRIOR TO SUBMITTAL OF THE LTCP

Public Letters Received:

1. Newtown Creek Alliance (NCA), February 11, 2015. Aeration Project within Newtown Creek.
2. Stormwater Infrastructure Matters (S.W.I.M), December 19, 2016. Newtown Creek CSO LTCP Kick-off meeting.
3. Newtown Creek Alliance (NCA), May 31, 2017. Newtown Creek CSO LTCP Alternatives meeting.
4. Newtown Creek Group (NCG), May 31, 2017. Comments on the Newtown Creek LTCP Alternatives.

1. Request delay in expansion of the Aeration Project to greater part of main channel of Newtown Creek (NC-4)

Response:

- *Based on the results of water quality sampling and modeling conducted for the Newtown Creek LTCP, the recommended plan for Newtown Creek includes a recommendation to delete the NC-4 Aeration Project that was proposed to cover Dutch Kills and parts of the main branch of Newtown Creek. The sampling and modeling indicated that the aeration project would not be necessary to achieve average annual attainment of the DO criteria in the reaches of the waterbody that would have been covered by the NC-4 project. In a letter to DEP dated June 29, 2018, DEC indicated that it intends to delete the NC-4 project from the CSO Consent Order Schedule.*

2. Alternative green strategies for Dutch Kills.

Response:

- *DEP's strategy is to utilize GI where it provides the highest benefits for water quality and other co-benefits. Accordingly, DEP is now looking at strategic projects for both public and private property retrofits in the Newtown Creek watershed. These future projects are not assumed in the baseline condition; however, DEP expects that targeting these properties will have a positive impact on water quality.*

3. Lack of CSO data presented at Kickoff Meeting.

Response:

- *Based on concerns raised by attendees of the November 15, 2016 Kickoff Meeting related to the lack of CSO/water quality data presented, a separate meeting was subsequently held on February 21, 2017, the focus of which was the presentation of water quality sampling data and baseline modeling results.*

4. **Provide more information on planned and completed Green Infrastructure (GI) projects; extend the DEP GI Grant Program to the MS4 areas of the city.**

Response:

- *The DEP's website includes a GIS map showing the locations and descriptions of planned and constructed GI projects City-wide. The link is as follows:*

  http://www.arcgis.com/home/webmap/viewer.html?webmap=a3763a30d4ae459199dd01d4521d9939&extent=-74.3899,40.497,-73.3757,40.9523

- *DEP's strategy is to utilize GI where it provides the highest benefits for water quality and other co-benefits. Accordingly, DEP is now looking at strategic projects for both public and private property retrofits in the Newtown Creek watershed. These future projects are not assumed in the baseline condition; however, DEP expects that targeting these properties will have a positive impact on water quality.*

5. **Request meeting on current aeration system operation and planned expansion.**

Response:

- *As noted in the response to Comment No. 1 above, the recommended plan for Newtown Creek includes a recommendation to delete the NC-4 Aeration Project. DEP is open to further discussions with SWIM related to the operations of the aeration systems currently operating and/or under construction.*

6. **Illegal dumping of cement and other wastes to the creek.**

Response:

- *DEP will continue to enforce regulations related to illegal dumping of materials into Newtown Creek.*

7. **Request more opportunity for public involvement in alternatives; separate meeting to discuss alternatives before initial knee-of-the-curve decisions.**

Response:

- *On April 26, 2017, DEP conducted a public meeting that focused on the alternatives being considered for the LTCP. This meeting was held prior to selection of a recommended plan for Newtown Creek, and provided an opportunity for public input on the alternatives in advance of submittal of the LTCP on June 30, 2017.*

8. **Supports 100% capture for largest 3 CSOs.**

Response:

- *The recommended plan for Newtown Creek includes a CSO storage tunnel that will be sized to provide 62.5% capture of the CSO from outfalls NC-015, NC-077 and NC-083. This level of capture was determined to be the most cost-effective in terms of CSO volume reduction and resulting attainment of water quality standards.*

- *As described in the LTCP, a tunnel sized for 75% capture would require a dewatering pumping station capacity of 55 MGD to 59 MGD for 24-hour dewatering, depending on the tunnel route. However, based on considerations of loadings to the Newtown Creek WWTP, the maximum dewatering rate would be 40 MGD. To achieve a 24-hour dewatering time, approximately 20 MGD of additional treatment would be required for the dewatering flow discharged from the tunnel. Providing the additional treatment added significant cost and siting complexity to the 75% or 100% control tunnel alternative.*

- *As described in the LTCP, the final siting of the dewatering pumping station, the tunnel alignment and other associated details of the tunnel alternative will be evaluated further based upon a number of factors including additional modeling and will be finalized during subsequent planning and design stages. That additional planning will provide an opportunity to optimize the sizing of the tunnel. However, the ability of the Newtown Creek WWTP to handle the dewatering flows would remain a limiting factor for the sizing of the tunnel.*

9. Prefer storage tank for Dutch Kills; concerned with increasing discharge to East River if BB-026 flows diverted to Newtown Creek WWTP.

<u>Response:</u>

- *The recommended plan for Newtown Creek includes expansion of the Borden Avenue Pumping Station to 26 MGD capacity, with a new diversion structure and gravity pipe from Outfall BB-026, and a new force main to the Kent Avenue Gate Structure. This alternative will provide a 110 MG reduction in annual CSO volume to Newtown Creek, and will result in an 80 MG increase in annual CSO volume to the East River. All of the flow from BB-026 will be treated at the Newtown Creek WWTP; the 80 MG increase in volume to the East River will be from East River regulators.*

- *The Borden Avenue Pump Station expansion was determined to be the most cost-effective solution for Dutch Kills, and also provided the opportunity for synergies with state-of-good-repair needs that had been independently identified for the pump station. The cost of providing a storage tank for 75% capture of the BB-026 flows would have been more than five times the cost of the Borden Avenue Pump Station Expansion. In addition, the site acquisition process would have extended the schedule for implementation of the project.*

- *The projected 80 MG increase in CSO into the East River represents a nine percent increase above the current baseline projection of 848 MGY for East River CSOs associated with the Newtown Creek WWTP system. A number of GI projects are planned for the general vicinity of Outfall NC-014, where the greatest increase in volume would occur. Other potential options to mitigate the impact of the increased overflow volumes at the East River outfalls will be investigated under the City-wide/Open Waters LTCP*

10. Oppose use of chlorination as a CSO control measure.

<u>Response:</u>

- *Chlorination of CSO discharges is not included in the recommended plan for Newtown Creek.*

11. Wetlands and softer shoreline edges, where feasible, should be considered part of a long term strategy in Newtown Creek.

<u>*Response:*</u>

- *Wetlands restoration along the banks of Newtown Creek would most efficiently be implemented following completion of any dredging and/or shoreline work that may be included in the Superfund ROD. The timing for implementation of wetlands restoration would therefore depend on the scope and timing of the Superfund ROD dredging and/or shoreline work. For this reason, wetlands restoration along the shoreline of Newtown Creek was not included as recommendation in the LTCP.*

12. LTCP should identify design and construction schedules and justification for delays at start of the process. 100% CSO control solutions should be able to proceed independently of Superfund ROD. Less than 100% CSO control solution may create complications, delays and additional costs waiting for the ROD.

<u>*Response:*</u>

- *Section 9 of the LTCP includes milestone schedules for the Borden Avenue Pump Station Expansion and the CSO storage tunnel. The schedules assume DEC approval of the LTCP by June 2018. The procurement process for planning/design consultants would begin following DEC approval of the LTCP.*

- *Refer to the response to Comment No. 8 above regarding the 100% CSO control alternative. Issues related to timing of LTCP implementation with respect to the ROD and the potential impact of the ROD on the LTCP recommended plan are currently under discussion among DEP, DEC and EPA.*

13. Solutions beyond standards

  a. Consider pollutants/impacts beyond fecal coliform and dissolved oxygen; address water quality in a comprehensive fashion and invest in reduction of CSO.

<u>*Response:*</u>

- *As noted in the response to Comment No. 8 above, the recommended plan for Newtown Creek includes a CSO storage tunnel that will be sized to provide 62.5% capture of the CSO from outfalls NC-015, NC-077 and NC-083. The estimated unescalated probable bid cost of the recommended plan presented in the LTCP was $570 to $597M, depending on the final alignment of the storage tunnel. Therefore, DEP is making a significant investment in reduction in CSO volume to Newtown Creek. The analyses in the LTCP demonstrated that providing higher levels of CSO storage would not be cost-effective in terms of both CSO reduction and attainment of water quality standards.*

  b. Question validity of model predicting attainment of water quality standards with over half a billion gallons of CSO discharging to Newtown Creek every year.

<u>*Response:*</u>

- *Newtown Creek is a Class SD saline surface water. The best usage defined by DEC is fishing. The Class SD definition further states that “These waters shall be suitable for fish, shellfish, and wildlife survival. In addition, the water quality shall be suitable for primary contact recreation, although other factors may limit the use for this purpose”.*

- *For fecal coliform, the Class SD criterion is defined as a monthly geometric mean of five or more samples less than or equal to 200 colony forming units per 100 milliliters (cfu/100 ml). The criterion considers pathogen concentrations over an extended period of time as opposed to a specific point in time. Water quality sampling data presented in Section 2 of the LTCP showed that in dry weather, fecal coliform concentrations in Newtown Creek are generally well below 200 cfu/100mL. Although the sampling demonstrated that the duration of high fecal coliform concentrations associated with CSO events could extend for two to three days for larger events, for the more common smaller storm events, concentrations often recover with a day of the rain event. As the periods of low bacteria concentration are much longer than the periods of high concentration, attainment of the geometric mean criterion can be achieved despite the remaining CSO discharges and other sources of pathogen contributions to Newtown Creek.*

- *Water quality evaluations conducted as part of the LTCP have demonstrated that short-term impacts to water quality will continue to occur during wet-weather events. As a result, wet-weather advisories based on time to recovery analysis are recommended for consideration for this waterbody. As indicated in the LTCP, under the recommended plan, the frequency of CSO discharges to Newtown Creek will be reduced from 42 to 19 on an average annual basis. Therefore, the frequency of CSO-related short-term impacts to water quality in Newtown Creek will be significantly reduced.*

14. Comments from NCG dated May 31, 2017

a. The NCG is committed to identifying and quantifying the risks that Newtown Creek may pose to human health and the environment…Although the RI/FS process is ongoing, the extensive work to date reveals that the CSOs and MS4s are significant contributors to those risks.

Response:

- *DEP disagrees that CSOs and MS4s are significant contributors to risks associated with hazardous substances. A substantial set of data collected by DEP shows that CSO discharges are not a significant source of hazardous substances in Newtown Creek.*

- *The LTCP acknowledges that with implementation of the recommended plan, full compliance with existing Water Quality Standards will not be attained. However, full compliance not be attained even with 100% CSO control. As noted in the response to Comment No. 13 above, wet-weather advisories based on time to recovery analysis are recommended for consideration for this waterbody.*

b. These comments represent NCG's attempt to jumpstart the necessary dialogue between the two programs.

Response:

- *NYCDEP is committed to coordinating between CWA and CERCLA, and has presented to EPA and DEC on the LTCP process in February and August 2017, with ongoing updates to DEC.*

c. CSOs and MS4s are the dominant source of freshwater flow (i.e., surface water inflow primarily comprised of municipal sewage, runoff and stormwater) into Newtown Creek.

Response:

- *DEP disagrees with this statement. Approximately 30 percent of the freshwater flow into Newtown Creek is from direct drainage from private stormwater pipes or overland flow. In addition, data collected from the RI/FS show that private stormwater pipes and flow from groundwater treatment systems are a larger source of contaminants than CSO/MS4.*

d. According to data the NCG has collected and analyzed during the CERCLA RI/FS process, the following ongoing sources contribute solids, Total Polycyclic Aromatic Hydrocarbon ("TPAH"), total polychlorinated biphenyls ("TPCB"), copper ("Cu"), pharmaceuticals, personal care products, and pathogens ("3Ps") to surface sediment in Newtown Creek. Point sources (primarily CSOs and MS4s) and the East River are the dominant current sources of solids to CM 2+.

Point sources (primarily CSOs and MS4s) are dominant current sources of solids to the surface sediment and surface water in the tributaries.

For all three chemicals (TPAH, TPCB, Cu), CSOs and MS4s contribute significantly to the total loads to surface sediment. It should be noted, however, that the majority of the point source TP AH load enters the Study Area in CM 0-1 from the Con Edison - 11th Street Conduit discharge. This discharge, which contains dewatered groundwater effluent, alone contributes approximately 65% of the total point source discharge of TP AH to Newtown Creek.

Response:

- *DEP disagrees with these assertions. These statements are based on un-validated, un-reviewed model results from the NCG. The RI/FS process is ongoing; NCG submitted preliminary models to USEPA for review, and USEPA responded with many comments and revisions needed. Models used by NYCDEP have been developed in conjunction with an independent Peer Review. Preliminary modeling by NYCDEP indicates that CSOs and MS4s do not impact surface sediment throughout the Creek. This is further supported by data from non-Superfund reference areas, which also have CSO and MS4 inputs of similar magnitude to Newtown Creek, showing low surface sediment contamination levels.*

- *The data show that CSO discharges are not a significant source of hazardous substances in Newtown Creek.*

e. The CSO and MS4 discharges pose ongoing risks to human health and the environment.

Response:

- *DEP finds the information in this section of the commentor's letter to be inaccurate and misleading, as it appears to be based on a version of the Baseline Ecological Risk Assessment that has been rejected by USEPA due to numerous inaccuracies and incorrect statements.*

f. The NCG has observed that CSO discharges to Newtown Creek introduce significant levels of sheen to the water surface, and thus represent an additional source of NAPL which can adversely impact water quality and create ecological and human health risks.

<u>Response:</u>

- *The major sources of sheens and contaminants in Newtown Creek are Non-Aqueous Phase Liquid (NAPL) and oil from NCG members including Texaco, BP, Phelps-Dodge Refining Corporation, specifically the Exxon Mobil oil spill (Meeker Ave Plume) and the National Grid former Manufactured Gas Plant (MGP) sites. The NYSDEC spills website has documented ongoing NAPL (pure product which results in sheens) seeps from the BP former Pratt oil works site, National Grid former Greenpoint energy site, Manhattan Poly bag – a former oil storage site, Morgan oil terminal site. NCG fails to document these sites as sources of sheens to the Creek.*
- *Sheens are also caused by NAPL releasing from the subsurface sediments to the surface sediments and surface water due to groundwater and processes such as ebullition.*
- *Conversely, NCG has collected CSO and MS4 samples for over 15 sampling events and did not document presence of sheens in the collected samples.*

g. Possible conflict between aeration and CERCLA remedy; alternatives analysis is flawed in that it does not address the possible impacts of any sediment remedy.

<u>Response:</u>

- *The recommended plan for Newtown Creek presented in the LTCP identified the elimination of the previously-proposed aeration project NC-4, covering for Dutch Kills and parts of the main branch of Newtown Creek (see response to Comment No. 1 above).*
- *The evaluations conducted for the LTCP further demonstrated that without the aeration system for East Branch/English Kills, the existing DO criteria would not be fully met in Newtown Creek even with 100 percent CSO control.*
- *DEP acknowledges and has been fully aware that if dredging, cap construction, or similar activity is required in the areas of Newtown Creek where in-stream aeration equipment is located, then that equipment will have to be removed at the appropriate time so as not to interfere with construction of the Superfund remedy. Without knowing the depth of dredging or final bottom bathymetry that could result from the Superfund remedy, DEP was not in a position to eliminate the East Branch/English Kills aeration systems as part of the LTCP.*
- *If the East Branch/English Kills aeration equipment needs to be removed to accommodate construction of the Superfund remedy, then the design of the replacement system would need to take into account the new final bathymetry. These evaluations would include reassessment of the need for these systems, as well as operational changes that may be dictated by the new conditions in the Creek. Again, these evaluations cannot be undertaken definitively until the final bathymetry is known.*
- *The commentor asserts that DEP's alternatives analysis was flawed because it did not evaluate a remedy (dredging) the scope and need for which is not currently known. DEP strongly disagrees with this assertion. The appropriate time for evaluating the impact of dredging depth on DO will come when the dredging depth that may be required as a Superfund remedy is known. Then the cost/benefit of potentially adjusting the depth, revising the aeration system design, or other changes can be more definitively evaluated.*

h. Overly narrow range of pollutants examined.

Response:

- *The purpose of an LTCP is to evaluate attainment of water quality standards (WQS) and to evaluate potential CSO control alternatives that may improve WQS attainment. Bacteria and DO are the WQS parameters evaluated in an LTCP. Newtown Creek is classified by DEC as a Class SD waterbody. Class SD waters' best uses are fish, shellfish, and wildlife survival. The WQS analysis conducted in the LTCP was developed in close coordination with the DEC, and is consistent with the previous eight LTCPs that DEC approved under this program as well as the Clean Water Act. As noted above under Comment 14.d, the data show that CSO discharges are not a significant source of hazardous substances in Newtown Creek*

i. NYCDEP cannot rewrite the DO and Pathogen Water Quality Standards during the LTCP process.

Response:

- *DEP disagrees with the statement in NCG's comments that "NYCDEP appears to be attempting to dramatically re-define the water quality standards for Newtown Creek, which will result in its failure to provide adequate protection to ensure Newtown Creek is suitable for fish, shellfish, and wildlife survival and suitable for primary and secondary contact recreation"*

- *As noted in the response to Comment No. 13a above, Newtown Creek is a Class SD saline surface water. The Class SD definition states that "These waters shall be suitable for fish, shellfish, and wildlife survival. In addition, the water quality shall be suitable for primary contact recreation, although other factors may limit the use for this purpose". It is important to note the qualifier that is included in DEC's use description. While the Class SD criterion for fecal coliform (200 cfu/100mL) is consistent with the criterion for primary contact recreation, DEC is acknowledging that in Class SD waters such as Newtown Creek, the use may not be fully attained due to other factors.*

- *DEP worked closely with DEC to develop the scope, content, and organization of the LTCPs developed under the current program, including the approach to demonstrating compliance with water quality standards. With regard to DO, DEP has followed DEC's guidance in presenting the attainment on annual average basis. As stated in the LTCP, the average annual attainment was calculated by averaging the calculated attainment in each of ten modeled depth layers, comprising the entire water column. This approach to presenting DO compliance is consistent with the approach taken in the LTCPs that have been approved to date under this program.*

- *With regard to fecal coliform, DEP is not "seeking to change the criterion from monthly geometric mean to seasonal bacteria compliance" as asserted in NCG's comments. The LTCP presents both seasonal and annual compliance with the Class SD fecal coliform bacteria criterion. Compliance during the recreational season is relevant, as that is the period of time when recreational use of the waterbody would be most common. However, as clearly stated in Section 8 of the LTCP, the recommended plan is not projected to fully attain the Class SD bacteria criterion on an annual basis, and for this reason, a Use Attainability Analysis is included as an appendix to the LTCP.*

- *The evaluation of the "time to recovery" was developed in conjunction with DEC as a means of demonstrating the duration of short-term disruptions to the recreational use of the waterbody following wet weather events. This assessment came out of a recognition that even if the monthly geometric mean criterion is met, the waterbody will not be capable of supporting primary contact 100 percent of the time. The time to recovery, which measures the time to return to a fecal coliform bacteria level that the Department of Health and Mental*

Hygiene (DOHMH) considers safe for primary contact (<1,000 cfu/100mL), provides useful guidance on the duration of wet weather advisories that may be necessary during certain wet weather events.

- *DEP finds the assertion by the commentor that DEP is attempting to "lower the bar of regulatory compliance standards, rather than directly address the impact of CSO discharges on Newtown Creek" to be incorrect. As noted above, DEP has worked closely with DEC throughout the LTCP program on the approach to demonstrating compliance with water quality standards. The recommended plan for Newtown Creek represents an approximately $570 to $600M (unescalated) investment in CSO reduction in Newtown Creek. The evaluations presented in the LTCP demonstrated that the recommended plan provides the most cost-effective level of CSO control, and that higher levels of storage would incur significant additional cost while providing diminishing incremental benefits. DEP is cognizant of the impacts of rate increases on the vulnerable populations in New York City, and must carefully weigh the costs of the CSO program against both the water quality benefit and the economic impacts on its rate payers. For these reasons, cost-effectiveness is a key consideration in evaluating CSO control alternatives and establishing the most appropriate level of control.*

j. NYCDEP data needs to be readily available. Data not presented in a manner consistent with applicable water quality standards.

- *Slide No. 14 from the April 26, 2017 Review of Alternatives public meeting showed the locations of the DEP's Harbor Survey Monitoring (HSM) and Sentinel Monitoring (SM) program sampling locations in Newtown Creek, as well as the sampling locations from the LTCP sampling program conducted specifically in support of the Newtown Creek LTCP. The data from the HSM program are available at http://www.nyc.gov/html/dep/html/harborwater/harbor_water_sampling_results.shtml; the data from the SM program are available at http://www.nyc.gov/html/dep/html/harborwater/sentinel-monitoring-program.shtml.*

- *The commentor refers to the presentation of bacteria geometric means and DO data in the "Alternatives Review", but it appears that the commentor is referring to slides from the February 21, 2017 Public Data Review Meeting. That meeting was conducted by DEP in response to comments received at the November 15, 2017 Kickoff Meeting, where attendees requested a meeting specifically focused on the water quality sampling results.*

- *The comment on slides 22 to 24 from the February 21, 2017 Public Data Review Meeting states that monthly geometric means of the data from January to November 2016 should have been presented, and the data from the recreational season in slides 25 to 27 should similarly have been presented on a monthly basis. The intent of those slides from the Public Data Review Meeting was to provide a snapshot of the sampling data conducted in 2016. These data were used to support the calibration of the receiving water quality model for Newtown Creek. Slides 23 and 24 showed the geometric mean and 10th and 90th percentile values for dry and wet weather samples at 14 sampling locations in Newtown Creek. To show monthly geometric means would have required preparing 11 separate slides, showing the geometric mean concentrations for the 14 locations for each of the 11 months from January to November. Presenting 11 separate slides on geometric mean concentration data would not have provided any clearer understanding of the wet weather conditions in Newtown Creek, and would have been more difficult for the attendees at the public meeting to follow.*

- *Further, the commentor states that "by taking geomeans over a longer period of time, larger exceedances of the water quality criterion for bacteria may have been effectively masked". However, the data in the slides clearly show wet weather geometric means well over the 200* *cfu/100mL criterion. For example, the wet weather geometric mean at station NC-6 was 20,213. The implication that the presentation of the data "effectively masked" the exceedances has no merit.*

- *Similarly, slide 22 showed a mosaic of the wet weather geometric mean concentrations for fecal coliform and Enterococcus for the January to November data set. Breaking this data into monthly geometric means would have required preparing 11 mosaic slides, one for each month. The point of slide 22 was to show that the data demonstrated that Newtown Creek has high bacteria concentrations in wet weather.*

- *DEP finds the comments on the slides presenting DO data (slides 34 to 38 from the February 21, 2017 Public Data Review Meeting) to be similarly off base. Again, the intent of the slides was to provide a snapshot of the DO data collected during the 2016 monitoring period. Slide 36 shows the average, and 95^{th} and 5^{th} percentile ranges of the dry and wet weather DO data collected. The data show that the average concentrations are above 3 mg/L in dry and wet weather, but excursions below the 3 mg/L level were recorded. Showing the full range of data instead of the 95^{th} and 5^{th} percentiles would not have changed that observation. Showing the data range in terms of percentiles is customary in presenting water quality data, to minimize the impact of a limited number of outliers on the understanding of the data range. Again, the conclusion that excursions below 3 mg/L were observed in the data is not changed by presenting the 5^{th} percentile range.*

k. NYCDEP has not considered several effective alternatives and too many alternatives were presented in insufficient details during the Alternatives Public Meeting.

Response:

- *Section 8 of the Newtown Creek LTCP presents the "toolbox" of CSO control technologies considered for Newtown Creek. For each technology in the toolbox that was not carried forward to a short-listed alternative, the LTCP describes the reasons for eliminating the technology from further consideration.*

- *At the April 26, 2017 Review of Alternatives public meeting, DEP presented six categories of alternatives that were under consideration for Newtown Creek. While each of these categories could be developed for a range of levels of control, the public was provided with a sense of the scale, impacts, and range of costs associated with these alternatives. NCG's comment that DEP presented 184 alternatives is misleading, as is the comparison to Coney Island Creek. Coney Island Creek had just a single CSO outfall, and the most cost-effective control for Coney Island Creek had already been implemented (Avenue V Pump Station improvements).*

NEWTOWN CREEK PUBLIC COMMENT RESPONSE SUMMARY
COMMENTS RECEIVED AFTER LTCP SUBMITTAL

Public Letters Received:

1. Newtown Creek Alliance (NCA), Letter dated October 23, 2017.
2. Newtown Creek Group (NCG), Letter dated August 14, 2017, with Appendices A1, A2, A3 and H1

1. NCA: The implementation timeline is too long, and should be accelerated.

Response:

- *The schedule presented in Section 9 of the LTCP was based on DEP's experience in implementing major wastewater infrastructure projects in New York City. A significant planning and comprehensive environmental review effort will be required to identify the final tunnel route, select the location of the tunnel mining shaft/dewatering pump station, and perform detailed geotechnical borings along the final tunnel route. Additionally, the site acquisition process to obtain the mining/pump station site may also be a key factor driving the schedule, depending on the selected tunnel alignment. The tunnel construction schedule was based on experience of other projects undertaken in New York City and other cities of a similar scale to the tunnel proposed for Newtown Creek.*

2. NCA: Increased CSO discharges to East River are unacceptable. CSO from Dutch Kills should be captured by a storage tank, not relocated.

Response:

- *The Borden Avenue Pump Station expansion to control 75% of the annual discharges from BB-026 was determined to be the most cost-effective solution for Dutch Kills, and also provided the opportunity for synergies with state-of-good-repair needs that had been independently identified for the pump station. The cost of providing an equivalent storage tank for 75% capture of the BB-026 flows would have been more than five times the cost of the Borden Avenue Pump Station Expansion. In addition, the site acquisition process would have extended the schedule for implementation of the project.*

- *The projected 80 MGY increase in CSO into the East River represents a nine percent increase above the current baseline projection of 848 MGY for East River CSOs associated with the Newtown Creek WWTP system, and this additional overflow volume is not projected to detrimentally impact water quality. The increased CSO volume to the East River will not occur during every storm event, but will mostly occur during the larger, less frequent storms in the typical year. A number of GI projects that will mitigate a portion of the annual CSO volume are planned for the general vicinity of Outfall NC-014, where the greatest increase in volume would occur. Other potential options to mitigate the additional CSO volumes into the East River will be investigated under the City-wide/Open Waters LTCP.*

3. NCA: The evaluation of additional Green Infrastructure (GI) was insufficient. More investment in stormwater capture is necessary to improve water quality.

Response:

- *DEP has one of the most ambitious green infrastructure programs in the country and has constructed or is planning for over 1,400 green infrastructure assets in the Newtown Creek watershed which will manage an estimated 161 million gallons of stormwater annually. DEP's strategy is to utilize GI where it is feasible, cost-effective to stormwater management, water* *quality enhancements and other co-benefits In addition, although future projects are not assumed in the baseline, DEP is planning to pursue a combination of public and private property retrofits to achieve additional stormwater capture. All green infrastructure projects in the Newtown Creek watershed, including any additional green infrastructure beyond baseline assumptions, will be reported in the GI Program's Annual Reports as the Program progresses. For more information on the green infrastructure program, visit www.nyc.gov/dep/greeninfrastructure.*

4. Comments from Newtown Creek Group (NCG) dated August 14, 2017

a. Installing LTCP controls may delay or prevent certain CERCLA actions.

<u>Response:</u>

- *Based on DEC's June 27 approval of the LTCP, the key milestones for implementation of the Newtown Creek LTCP recommended plan have been incorporated by DEC into the CSO Consent Order. DEP is closely coordinating implementation of the LTCP project with DEC, EPA, as well as other appropriate parties to enhance coordination with CERCLA actions.*

b. The LTCP will not eliminate all CSO discharges or address discharges from MS4s or the Newtown Creek Wastewater Treatment Plant discharges into Whale Creek.

<u>Response:</u>

- *The LTCP demonstrated that elimination of CSO to Newtown Creek would be cost-prohibitive, and would not result in full attainment of water quality standards for fecal coliform on an annual basis. The recommended plan was demonstrated to be the most cost-effective approach to addressing CSOs. Controlling or reducing SPDES-permitted MS4 discharges or the treated effluent from the Newtown Creek WWTP were not part of the scope of the LTCP. The City received its MS4 Permit in August 2015 and will submit a Stormwater Management Program (SWMP) to NYSDEC for review and approval on August 1, 2018. The SWMP details measures to reduce pollution in stormwater runoff in the MS4 areas of the City. For more information, visit www.nyc.gov/dep/ms4.*

c. Future contamination from CSOs and MS4 discharges will contribute to urban background that will include CERCLA hazardous substances and other pollutants that create risks for human health and the aquatic community.

<u>Response:</u>

- *On March 20, 2017, the City submitted extensive comments to EPA on the Draft Remedial Investigation (RI) Report.*

- *The data show that CSO discharges are not a significant source of hazardous substances in Newtown Creek. Nevertheless, the City expects that the CSO control alternative selected in this LTCP (see Section 8) would be sufficient to address any CSO discharge controls that EPA may require under Superfund. The Feasibility Study, which is being conducted by the non-City PRPs, will evaluate potential remedies for Newtown Creek based on both data collected during the RI and on additional sampling and studies. EPA expects to issue a Record of Decision (ROD) sometime after 2020, which will set forth EPA's selected remedy for Newtown Creek.*

- *The data collected by the USEPA to assess background levels for reference areas, which include inputs from CSOs and MS4s, do not show presence of toxicity to benthic organisms or human health. It is expected that once the EPA remediation for the Site takes place, which may include, but not be limited to, removal or isolation of contaminated sediments, control of*

NAPL and contaminated groundwater from upland properties the Creek will return to the background conditions expected in reference areas with varying levels of point source inputs.

d. The CERCLA process for Newtown Creek will have to account for these future uncontrolled loadings from CSOs and MS4s discharging to the creek.

Response:

- *DEP has been actively coordinating with EPA and DEC on integrating the LTCP and Superfund processes. Thus, DEP expects that the selected remedy will account for future reduced loadings to the creek.*

The NCG's August 14, 2017 comment letter, with four attached appendices, put forth a number of assertions based on data and analyses conducted by the NCG. DEP disagrees with many of those assertions, as presented below.

e. NCG: CSOs and MS4 outfalls produce sheens, and the sheens provide a pathway by which contaminants enter the waters of the creek from CSOs and MS4 outfalls.

Response:

- *See above response on the CSO and MS4 data. The major sources of sheens and contaminants in Newtown Creek are Non-Aqueous Phase Liquid (NAPL) and oil from NCG members including Texaco, BP, Phelps-Dodge Refining Corporation, specifically the Exxon Mobil oil spill (Meeker Ave Plume) and the National Grid former Manufactured Gas Plant (MGP) sites. The NYSDEC spills website has documented ongoing NAPL (pure product which results in sheens) seeps from the BP former Pratt oil works site, National Grid former Greenpoint energy site, Manhattan Poly bag – a former oil storage site, Morgan oil terminal site. NCG fails to document these sites as sources of sheens to the Creek.*
- *Sheens are also caused by NAPL releasing from the subsurface sediments to the surface sediments and surface water due to groundwater and processes such as ebullition.*
- *Conversely, NCG has collected CSO and MS4 samples for over 15 sampling events and did not document presence of sheens in the collected samples.*

f. NCG: Surface sediment in the creek exhibits high concentrations of total organic carbon (TOC), compared to those normally found in natural estuarine systems, primarily due to ongoing discharges of solids from CSOs and MS4 outfalls. The extremely high load of organic matter entering the creek via CSOs is likely the primary cause of gas ebullition due to the decomposition of organic material by microbes. This may be an important process due to the potential for gas bubbles to transport contaminants, particularly nonaqueous phase liquid (NAPL), from the sediment to surface water.

Response:

- *Gas ebullition is a natural process that occurs in many ecosystems with or without CSO/MS4 input. This phenomenon has been documented in the middle reaches of the Creek and at the mouth where CSO/MS4 inputs are not significant inputs. USGS data collected for the Site under EPA supervision shows gas generation throughout the length of the Creek. In addition, TOC inputs for the Newtown Creek system are not limited to CSOs and MS4s. This is evident in the reference areas where CSOs/MS4s are present but the TOC is not elevated. Additional sources of TOC to the Site are NAPLs which are present in the sediments due to ongoing and legacy contamination from former refineries, former manufactured gas plants and fuel storages owned by various parties.*

g. NCG: Data collected as part of the Newtown Creek RI demonstrate that CSO and MS4 discharges are ongoing sources of CERCLA hazardous substances to Newtown Creek.

<u>*Response:*</u>

- *See above on data analysis. Although CERCLA hazardous substances were detected in CSO/MS4 discharges, the relative inputs are less than background inputs from the East River and are comparable to inputs from atmospheric deposition. The reference areas which have inputs from CSOs and MS4s do not show toxicity under CERCLA.*

h. NCG: Results suggest that major CSOs and MS4s have been and continue to be sources of phytane and pristane to the sediment.

<u>*Response:*</u>

- *See above. As per the Baseline Human Health Risk Assessment (BHHRA) and the recently submitted (July 13, 2018) Baseline Ecological Risk Assessment (BERA) to the EPA by the NCG, phytane and pristane are not shown to pose risks to human health or the environment.*

i. NCG: Pathogens and pharmaceuticals and personal care products (PPCP) are at levels in the sediment porewater that represent potentially significant chemical stressors to the aquatic community, and the major CSOs and MS4s are likely the major sources of these compounds in the sediment of the creek.

<u>*Response:*</u>

- *The data do not support this assertion. Pathogens are not a significant chemical stressor to the aquatic community. Reference area data collected at waterbodies with CSO/MS4 inputs outside of Newtown Creek (including Westchester Creek, Spring Creek, Gerritson Creek) show low toxicity (Anchor QEA (Anchor QEA, LLC), 2018. Draft Baseline Ecological Risk Assessment. Remedial Investigation/Feasibility Study, Newtown Creek. July 2018).*

j. NCG: TPCB concentrations on particulate matter discharging from CSO and MS4s exceed the average concentrations in surface sediment of the four regional reference areas.

<u>*Response:*</u>

- *The data do not support this assertion. The CSO and MS4 concentrations are very similar or lower than the concentrations in the regional reference areas. The major inputs of PCBs have not been identified by the NCG for the RI; this is considered a major data gap for the CERCLA investigation of Newtown Creek. Data collected by the City shows that sources of PCB to the Creek are from the NCG historical spills and ongoing/uncontrolled seeps. Review of available upland site data reports also shows presence of elevated PCB concentrations in soils and NAPLs present in the upland properties (see attached list of references).*

k. NCG: At locations in the vicinity of the larger CSOs and MS4s, porewater concentrations of CERCLA hazardous substances were too low to explain the observed toxicity to benthic organisms. Other factors contributing to toxicity include high organic matter leading to high porewater sulfide concentrations, high PPCP concentrations in porewater, and elevated concentrations of unresolved complex mixtures of organic compounds (UCMs). Continued CSO and MS4 discharges will contribute to risks to benthic organisms.

<u>*Response:*</u>

- *Comparison to reference/background areas that have CSO/MS4 input and low toxicity show that they are not the risk driver to benthic organisms. There is an extremely high correlation between benthic toxicity and chemicals associated with tar/oil, as well as locations where*

NAPL has been observed. The assertion fails to account for toxicity due to sources coming in from other properties and upland sources.

l. NCG: CSOs and MS4s will influence the composition and level of urban background conditions of the creek and future chemical equilibrium concentrations within surface sediment. Incremental risks due to CERCLA hazardous substances will be overestimated if these background risks are not accounted for in the development of preliminary remediation goals (PRGs).

Response:

- *The data does not support this assertion, but rather demonstrates the low benthic toxicity measured at reference/background areas where CSO/MS4 inputs are present in varying degrees (Anchor QEA (Anchor QEA, LLC), 2018. Draft Baseline Ecological Risk Assessment. Remedial Investigation/Feasibility Study, Newtown Creek. July 2018).*

m. NCG: In many cases, predicted equilibrium surface sediment chemical concentrations increase with CSO control, due to the increased influences of stormwater on net sedimentation rates (NSRs) and the relatively higher contaminant concentrations of stormwater solids (as compared to CSO solids) measured as part of the RI point source sampling. These results show that LTCP control scenarios will have little influence on future recontamination levels and that MS4s will result in future sedimentation at concentrations that need to be considered when setting PRGs for the CERCLA remedy.

Response:

- *This assertion is not supported by verified models. . The volume of stormwater is being discharged from the City's MS4 into Newtown Creek is less than the volume from direct drainage and private stormwater pipes, and the City's stormwater discharges are authorized an MS4 SPDES Permit. Approximately 30% of the freshwater flow into Newtown Creek is from direct drainage from private stormwater pipes or overland flow. Data collected from the RI/FS shows that private stormwater pipes and flow from groundwater treatment systems are a much larger source of contaminants than CSO/MS4.*

n. NCG: The proposed CSO Controls face a number of challenges that may result in these controls being delayed, modified or totally prevented from being implemented.

Response:

- *The LTCP reviewed a number of implementation challenges for each of the two major elements of the recommended plan: the Borden Avenue Pumping Station (BAPS) expansion, and the CSO storage tunnel. These challenges will need to be addressed during the implementation phase, but none of these challenges was determined to be a "fatal flaw" to the successful implementation of the project. DEP has faced similar types of challenges on the many major wastewater infrastructure projects that it has implemented over the years, and had demonstrated the ability to work through these challenges and successfully implement projects.*

o. NCG: Construction schedules, predicted CSO volume reductions and predicted water quality improvements are not clearly presented in the LTCP.

Response:

- *Section 9 of the LTCP clearly lays out the milestone schedule for implementation of the BAPS expansion and the CSO storage tunnel. In response to comments from the DEC, a table comparing the baseline vs. recommended plan CSO volumes and activation frequencies by outfall will be incorporated into Section 8 of the LTCP via Supplemental*

Documentation. The impact of the recommended plan on attainment of water quality standards is presented in Tables 8-28 to 8-31 and Figures 8-29 to 8-40 in the LTCP.

p. NCG: The Newtown Creek LTCP makes inaccurate predictions of water quality improvements associated with proposed CSO controls. NCG identified the following as "flaws that affect its accuracy".

i. Overly narrow focus on bacteria and dissolved oxygen (DO) concentrations.

Response:

- *The purpose of an LTCP is to evaluate attainment of water quality standards (WQS) and to evaluate potential CSO control alternatives that may improve WQS attainment. Bacteria and DO are the WQS parameters evaluated in an LTCP. Newtown Creek is classified by DEC as a Class SD waterbody. Class SD waters' best uses are fish, shellfish, and wildlife survival. The WQS analysis conducted in the LTCP was developed in close coordination with the DEC, and is consistent with the previous eight LTCPs that DEC approved under this program as well as the Clean Water Act. As noted above under Comment 4.c, the data show that CSO discharges are not a significant source of hazardous substances in Newtown Creek.*

ii. Inappropriate use of baseline conditions in the LTCP. The LTCP baseline conditions compared two highly speculative future CSO conditions, rather than comparing existing conditions to a future CSO control condition.

Response:

- *The elements of the baseline conditions that are used as a basis for comparing CSO controls in the LTCP were established with DEC early in the LTCP program, and have been used consistently in the eight LTCPs previously submitted and approved by DEP. The baseline conditions for Newtown Creek as described in Section 6 of the LTCP are based on the following:*

  - *Dry-weather flow and loads to the Bowery Bay and Newtown Creek WWTPs were based on CY2040 projections. The 2040 projected dry-weather flow rate for the Bowery Bay WWTP was 113.5 MGD and was 112 MGD for the Brooklyn/Queens portion of Newtown Creek WWTP.*

  - *The Bowery Bay WWTP could accept and treat peak flows up to 300 MGD, equal to two times design dry-weather flow (2xDDWF). The Newtown Creek WWTP could accept peak flows up to 700 MGD, which is greater than 2xDDWF (design dry-weather flow at Newtown Creek WWTP is 310 MGD).*

  - *Constructed or planned GI projects resulting in an 83 MGY reduction in baseline annual CSO volume in the watershed were included. Most of the CSO volume reduction takes place at Outfall NC-014 (64 MG).*

  - *Cost-effective Grey Infrastructure CSO controls included in the CSO Order were fully implemented. For Newtown Creek, these projects included:*
    - *Diversion of low-lying sewers [construction completed 2017], and*
    - *Modifications to regulators along the Bowery Bay High Level Interceptor system [construction completed 2017]*

- *As described in Section 6 of the LTCP, the dry-weather sanitary sewage flows used in the baseline modeling were escalated to reflect anticipated population growth in NYC. In 2014, DEP completed detailed analysis of water demand and wastewater flow projections. A detailed GIS analysis was also performed to apportion total population among the 14 WWTP* *sewersheds throughout NYC. For this analysis, Transportation Analysis Zones were overlaid with WWTP sewersheds. Population projections for 2010-2040 were derived from population projections developed by DCP and the New York Metropolitan Transportation Council. These analyses used the 2010 census data to reassign population values to the watersheds in the model and project sanitary flows to 2040. These projections also reflect water conservation measures implemented by DEP that have reduced flows to the WWTPs and thus free up capacity in the conveyance system. The trends in water conservation are firmly established from DEP's flow data at the WWTPs, and are consistent with trends in reduced per-capita water use seen in major cities nation-wide. The estimated future dry weather flows are therefore based on detailed and realistic evaluations of population and water use trends.*

- *The current wet weather capacities at the Bowery Bay and Newtown Creek WWTPs are 225 mgd and 700 mgd, respectively. The Newtown Creek WWTP is therefore currently providing the wet weather flow capacity that is included in the baseline conditions. The Bowery Bay WWTP is currently undergoing upgrades to provide the 300 mgd wet weather flow capacity. These upgrades are under a Consent Order milestone schedule, with a scheduled completion date of December 2019*.

- *As described in Section 5 of the LTCP, DEP has installed or plans to install over 1,300 GI assets, including ROW practices, public property retrofits, and GI implementation on private properties resulting in a CSO volume reduction of approximately 83 MGY, based on the 2008 baseline rainfall condition. Figure 5-1 in the LTCP shows the multiple contracts that have either been constructed, are in construction, or are in the planning phase in the Newtown Creek CSO tributary areas. The implementation of the GI program has been incorporated into the Consent Decree.*

- *As shown above, the cost-effective grey CSO control projects included in the baseline conditions have all been completed as of 2017.*

- *Therefore, each of the projects on the list of baseline conditions has either already been completed, or is under a Consent Order schedule for completion. The intent of including these previously-approved projects in the baseline conditions is to allow for a clear distinction between the expected conditions upon completion of the previously-approved projects and the relative performance of the alternatives considered in the Newtown Creek LTCP. Inclusion in the baseline conditions of previously approved projects and/or projects expected to be completed within the planning horizon of an LTCP, is a well-established practice in the development of LTCPs.*

iii. Failure to include Newtown Creek water quality measurements in the LTCP.

<u>*Response:*</u>

- *All of the raw data from the LTCP sampling program have been submitted to the DEC and EPA. The plots of the sampling data that were included in the LTCP were also presented to the public at the LTCP public meeting held on February 21, 2017 that specifically focused on water quality data. The intent of showing the plots of the data was to provide a snapshot of the general water quality conditions. The data were used specifically as a basis for verifying the calibration of the receiving water model for Newtown Creek. As the data cover only the specific periods when sampling was conducted, they do not allow for determination of the annual or recreational season attainment of water quality standards. As defined in conjunction with DEC at the start of the LTCP program, the calibrated receiving water model output provides the basis for establishing annual or recreational season attainment with water quality standards.*

iv. Use of an incorrect water quality standard for DO in the LTCP

Response:

- *The representation of DO attainment based on average annual concentrations was based on direction from DEC. NCG's statement that "NYCDEP has not used an average annual attainment metric as a DO WQS surrogate in previous LTCPs" is not correct. The average annual attainment metric for DO has been used in all of the previous LTCPs approved by DEC.*

v. Long-term phased implementation and adaptive management without robust monitoring

Response:

- *The comment, as presented in Appendix H1 to NCG's comment letter, concludes that the annual monitoring program for Newtown Creek should be expanded to include, at a minimum, the 14 LTCP2 sampling stations, with additional stations so that there are at least two stations in each tributary. The commentor also indicates that the monitoring program should include monitoring of CSO outfall flows and water quality during wet weather events, as well as MS4 outfalls and direct discharges.*

- *The long-term monitoring program described by the commentor would be so expensive and labor intensive as to be completely unrealistic and unsustainable over a long-term period. The level of monitoring proposed is not necessary to quantify general trends in water quality in Newtown Creek. DEP's Harbor Survey Monitoring Program has been providing robust and reliably data on Newtown Creek water quality for decades. As the implementation of the Newtown Creek LTCP recommended plan proceeds, DEP will work with DEC to develop a more detailed post-construction monitoring plan.*

- *DEP takes issue with the commentor's statements in Appendix H1 that "NYCDEP appears to undervalue direct water quality measurements to support assessment of water quality conditions and compliance with water quality standards in Newtown Creek," and "the importance of a robust water quality monitoring program is increased by NYCDEP's use of speculative future conditions in the baseline and performance gap analysis." Over the course of the LTCP program, DEP has invested over $8.1 million in water quality sampling and monitoring programs, including $935,000 in Newtown Creek. The substantial investment in cost and resources to these programs was critical to provide the data needed to calibrate and verify the collection system and water quality models that DEP uses to assess the performance and expected water quality improvements from CSO control alternatives.*

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NEWTOWN CREEK ALLIANCE

February 11, 2015

Angela Licata
Deputy Commissioner for Sustainability
NYC Department of Environmental Protection

Gary E. Kline, P.E.
NYC Municipal Compliance Section Chief
NYS Department of Environmental Conservation

Dear Ms. Licata and Mr. Kline,
I am writing in regards to the aeration project within Newtown Creek, especially phase NC-4 that expands the project into the lower stretches of the main channel and the Dutch Kills tributary. Much of our previous conversation has focused on the failure to collect on-site data that demonstrate the safety of inorganic particulates aerosolized by the aeration; an omission of particular concern, given on-site data that demonstrates benthic microbes are aerosolized. We now wish to shift focus to other vital concerns regarding the expansion of the project. For reasons stated below we request a delay of the NC-4 expansion.

Dissolved Oxygen Levels in the Main Channel
The proposed expansion of the aeration project includes the greater part of the main channel of Newtown Creek (extending 4500 feet eastward from the mouth of Dutch Kills and about one mile north from the Maspeth blower building). While we fully appreciate efforts to raise dissolved oxygen levels above the 3 mg/L standard that is driving the consent order, we would like to point out that the main channel of Newtown Creek regularly meets this standard from May through September (when DO levels are typically lower and the system would be in operation). From last year's Harbor Survey conducted during this period by the New York City Department of Environmental Protection (NYCDEP), we find that a large majority of the samples from three main channel sites proposed for inclusion in the aeration project - NC3, NC2 and NC1 measured above the 3 mg/L DO standard; respectively 97%, 84% and 87%. To offer comparison to other waterways with conditions similar to Newtown Creek (poor circulation and heavy CSO discharge), we examined NYCDEP data from the Harbor Survey for sites CIC2, WC2, HC1 and BR3. In contrast to the NC sites, records for BR3 and HC1 show that a minority of samples measured above 3 mg/L DO: respectively, 41% and 48%. For sites WC2 and CIC2, the standard was exceeded in only 65% and 73%, respectively, of recorded samples.[1] In sum, the NYCDEP's own data reveal that conditions are measurably worse at sites where no aeration system is currently proposed. Given these data, the community of Newtown Creek is owed an explanation for the speed with which the aeration project is being implemented, especially in light of the community's growing concerns.

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[1] See NYCDEP Harbor Survey data referenced here:
http://www.newtowncreekalliance.org/wp-content/uploads/2015/02/DO_ncversus.jpg

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To this point, at a recent meeting with the Environmental Committee of Queens Community Board 2, DEP officials clearly stated that the system would “only run during times when DO concentrations are below the 3 mg/L threshold”. If this is indeed to be the case then the some 2 miles of piping within the main channel would only need to run 11% of the time during summer months (using the average of the three test sites given above). Given that water quality conditions continue to improve throughout NY Harbor (in large part due to significant investments from both your agencies to reduce CSO volume) one would only expect these numbers to improve, as they have already done so from 1992 when this consent order was originally initiated.

Alternative ‘Green’ Strategies for Dutch Kills
There are numerous advantages to implementing a natural system (*i.e*. wetland habitat) for water quality remediation over an engineered aeration strategy. These advantages include:
- no energy footprint
- no greenhouse gas emissions
- no health risk
- long-term self-sustaining environmental services in addition to increasing DO levels
- habitat creation for wildlife
- social benefit to local businesses and residents

No area of Newtown Creek would be better suited for such a strategy as the Dutch Kills tributary. There has been documented interest, effort and progress in the reintroduction of marsh habitat here, given the proximity of the tributary to LaGuardia Community College and community support for funding wetland remediation through the NYS Environmental Benefits Fund. Pilot habitat modules, installed and monitored with the help of LaGuardia students, have now demonstrated the viability of cordgrass and ribbed mussel along the bulkhead of the upper tributary. A local business, American Storage, is soon to remove an abandoned barge and associated structures from the adjacent shore, thereby rendering this shoreline available for habitat remediation. A salt marsh constructed here could be designed so as to serve the function of a treatment wetland, given the proximity of a Tier 3 CSO. Unlike the main channel and English Kills, this tributary is totally void of commercial maritime traffic and many areas have already become too shallow for navigation, presenting great potential conditions for wetland restoration as identified in the Newtown Creek BOA report (2011) as well as DEP Ecological Services.

Additionally, aeration within Dutch Kills will have a more pronounced impact on local communities than areas like English Kills and East Branch. The waterway has become a focused area of study for environmental science students at LaGuardia, is a frequent destination for environmental education canoe trips led by the North Brooklyn Boat Club and is only a few hundred feet from several high schools and community gardens. Additionally, plans for a Dutch Kills Basin Park at the tributary’s edge are still being actively pursued (via City Parks Foundation). As with other parts of the waterway, a number of businesses border the Creek, many here with the tributary as their personal backyard. The installation of a loud and disruptive aeration system will directly impact current uses as well as the calm nature of the water that makes for safer boating and better observations of wildlife. In regards to local interest in restoring natural systems, the community has twice supported wetland development in Newtown Creek by voting to pursue such efforts with NYS Environmental Benefit Funds. While we appreciate that consent orders are issued to effect compliance with environmental legislation on behalf of the public good; we urge your agencies to allow public feedback to guide how consent orders are addressed. We see an amazing opportunity in Dutch Kills to implement a project that can provide significant long lasting improvements, and urge the Departments of Environmental Conservation and Protection to consider employing green alternatives to the planned gray infrastructure project.

Long Term Control Plan (LTCP) and Water Quality Standards and Classifications
As a LTCP for Newtown Creek will be submitted (2017) well before construction of NC-4 is completed (December 2019) and would ostensibly drive all future initiatives to improve water quality conditions, we find it prudent to delay the aeration expansion until the LTCP is put in place. As no timeline has been given for how long the aeration project would remain installed and operating within the Creek, it seems that an LTCP would be the appropriate time to plan and identify such a timeline, incorporating goals beyond a 3mg/L threshold. For instance, we are hopeful that the LTCP will take significant steps to address CSO discharge into the Creek, which again will improve and stabilize DO levels.

And there is yet another argument to temper the pursuit of gray infrastructure construction, given that the DEC is considering a revision this year of Water Quality Classifications (the basis of the consent order). The present consent order is to bring conditions within the Creek up to current SD standards to accommodate fish survival with DO levels greater than 3mg/L. In the new standards, SD waters are to be suitable for primary and secondary contact and would be measured by bacteria standards, as well as DO levels. While it is unclear if the consent order will be updated to reflect new classifications it is reasonable to re-evaluate the approach to improving water quality in the Creek so that both DO and bacteria levels will meet the new standard. In other words, if the new standards are adopted aeration alone will not fulfill the original consent order, which is to meet SD classification.

In closing, we fully appreciate the thousands of hours that DEP, DEC and numerous contractors have spent to date on the aeration project, as well as the tremendous budget for the project, including some $20 million to be spent on NC-4. However, we feel that the improving conditions on the Creek and upcoming planning opportunities have changed the very nature of the consent order and that the NC-4 expansion should not advance without a serious re-evaluation of alternatives that can offer long term solutions to improving water quality. We look forward to a continued dialog that engages both agencies and respects all members of the Newtown Creek community.

Sincerely,
Willis Elkins
Newtown Creek Alliance

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CC:
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Emily Lloyd, DEP
Eileen Mahoney, DEP
Carolyn Kwan, EPA
Peter Washburn, NY State Attorney General's Office
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Sean Dixon, Riverkeeper
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Dr. Eli Dueker, Queens College
Dr. Greg O'Mullen, Queens College
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Council Member Stephen Levin
Council Member Jimmy Van Bramer
Council Member Elizabeth Crowley
Assemblywoman Catherine Nolan
Assemblyman Joseph Lentol
Joseph Conley, Queens Community Board 2 Chair
Dorothy Moorehead, Queens Community Board 2 Environmental Chair
Vincent Arcuri, Jr., Queens Community Board 5 Chair
Walter Sanchez, Queens Community Board 5 Land Use Chair
Dealice Fuller, Brooklyn Community Board 1 Chair
Ryan Kuonen, Brooklyn Community Board 1 Environmental Chair
Dewey Thompson, North Brooklyn Boat Club
Noah Kauffman, LIC Roots

S.W.I.M. Coalition
Stormwater Infrastructure Matters: utilizing stormwater as a resource, not a waste!

NCA
NEWTOWN CREEK ALLIANCE

December 19, 2016

Vincent Sapienza, P.E.
Acting Commissioner
NYC Department of Environmental Protection
59-17 Junction Boulevard
Flushing, NY 11373

Sent via email ltcp@dep.nyc.gov

Re: Newtown Creek CSO LTCP Kick-off meeting

Dear Commissioner Sapienza,

The Stormwater Infrastructure Matters (SWIM) Coalition and Newtown Creek Alliance submit this letter in response to the New York City Department of Environmental Protection (DEP) invitation for public comments concerning the development of the Newtown Creek CSO Long Term Control Plan (LTCP).

The SWIM Coalition represents over 70 organizations dedicated to ensuring swimmable and fishable waters around New York City through natural, sustainable stormwater management practices. Our members are a diverse group of community-based, citywide, regional and national organizations, water recreation user groups, institutions of higher education, and businesses.

The Newtown Creek Alliance (NCA) is a community-based organization dedicated to restoring, revealing and revitalizing Newtown Creek. NCA represents the interests of community residents and local businesses who are dedicated to restoring community health, water quality, habitat, access, and vibrant water-dependent commerce along Newtown Creek. Since 2002, the Alliance has served as a catalyst and channel for effective community action and our efforts have made a positive and enduring impact on the health and quality of life of Creek-side communities.

On behalf of the SWIM Coalition Steering Committee and the Board of Directors for the Newtown Creek Alliance, please accept these comments regarding the Newtown Creek LTCP.

CSO Data

First and foremost, we are concerned about the lack of detailed information provided at the kick off meeting. As one example, inconsistent with other LTCP presentations by the DEP, no details were provided on outfall-specific CSO volumes. This data has been provided for the Westchester Creek, Flushing Creek, Gowanus Canal, Bronx River, Flushing Bay, and Coney Island Creek LTCP kick-off presentations. Citywide, SWIM, Newtown Creek Alliance, our partners, and the public rely on such data for everything from outreach and education to providing detailed comments on LTCP proposals.

The last time the Newtown Creek community was presented with specific CSO discharge volumes was in the 2011 Waterbody Watershed Facility Plan. We request that this information be made publicly available on the Newtown Creek LTCP webpage as soon as possible. We also reiterate a request made at the public meeting, and below, that there be a new, data-focused, detail-driven meeting with the community before the planned "Alternatives" meeting.

Green Infrastructure

The Community also needs more details for planned and completed green infrastructure (GI) projects. What are the 24 preliminary projects being considered? What projects were considered but ultimately not considered? What is the total square footage and potential gallons managed from these potential and constructed projects? These details should be made available on the Newtown Creek LTCP webpage as soon as possible. This information is vital for the community; it aligns ongoing private property work with public projects and DEP initiatives, shows the public what regional approaches are underway for reducing stormwater before it enters the CSO system, and it gives community boards and neighborhood associations a clear picture of upcoming or planned projects in their action areas.

Specific GI information also informs interested stakeholders, such as our groups, as to where gaps are in green infrastructure proposals and where we can focus our efforts for outreach and engagement. In short, it appears that the City is walking back investments in green infrastructure for this region - we request, therefore, that the DEP generate a more robust presentation on its plans and progress for GI in this sewershed.

Members of the public mentioned that industrial buildings near the Creek have the potential for and capacity to install and maintain green roofs but do not qualify for the current

DEP GI Grant Program because they are in an MS4 area. We recommend that the Grant Program be extended to the MS4 areas of the city so that GI on private property can assist in capturing stormwater runoff.

<u>Aeration</u>

In regards to the LTCP and CSO "control", we seek to fully address the numerous issues surrounding the currently operational aeration system and planned expansion. We have raised a multitude of concerns over the years and have not received straight answers from DEP or DEC addressing these concerns. To have meaningful engagement on this topic, and most importantly, find solutions that satisfy all vested interests, we request a meeting with DEC and DEP to specifically discuss aeration in person. Given the lack of dialog regarding the long - term plan for utilizing aeration as well as the actual necessity for aerating different areas of Newtown Creek, and the fact that the system only addresses one symptom of Clean Water Act standards, we ask that growing community concerns and unanswered questions not only be acknowledged but addressed in determining a revised plan going forward. The DEP, the State DEC, and the EPA (in its role overseeing the Creek's contamination remediation) cannot continue to ignore the public on this fundamental issue.

<u>Illegal Dumping/Discharges in the Creek</u>

It is important to note that several community members at the kick off meeting raised concerns about the illegal dumping into the Creek and nearby catch basins. While we recognize that DEP will address this matter through the forthcoming MS4 plans and their enforcement program, we recommend that DEP consider stronger enforcement measures against chronic violators and not just impose fines but rather require that these violators pay for the costs to clean up the waterway and catch basins that they damage when they dump cement and other toxins into the Creek and the City's sewer system.

<u>Public Involvement in Alternatives Selection</u>

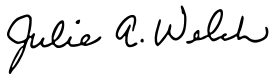
Finally, as noted during the meeting, the current process of meeting for the kick-off and then for the proposed alternatives does not allow sufficient opportunity for the public to weigh in on the alternatives. This community is well informed on CSO and water quality issues, due in part to Newtown Creek Alliance outreach and education efforts, as well as involvement from the Newtown Creek Superfund CAG.

The knowledge of the community should be leveraged through this process. As such, we ask DEP to hold a separate collaborative session to explore and discuss alternatives for the LTCP before the agency makes its initial knee-of-the-curve decisions.

Thank you for the opportunity to submit these comments for the Newtown Creek CSO LTCP. We would welcome the opportunity to meet with you to discuss these matters further.

Sincerely,

Willis Elkins, Project Manager
Newtown Creek Alliance



Julie A. Welch, Program Manager
On Behalf of the SWIM Coalition Steering Committee

Sean Dixon, Riverkeeper
Andrea Leshak, NY/NJ Baykeeper
Larry Levine, Natural Resources Defense Council
Michelle Luebke, Bronx River Alliance
Paul Mankiewicz, The Gaia Institute
Tatiana Morin, New York City Soil & Water Institute
Jaime Stein, Pratt Institute
Shino Tanikawa, New York City Soil & Water Conservation District

CC: Pamela Elardo, NYC DEP
Angela Licata, NYC DEP
James Tierney, NYS DEC
Joseph DiMura, NYS DEC
Gary Kline, NYS DEC

NEWTOWN CREEK ALLIANCE

May 31st, 2017

Vincent Sapienza, P.E.
Commissioner
NYC Department of Environmental Protection
59-17 Junction Boulevard
Flushing, NY 11373
Sent via email ltcp@dep.nyc.gov

Newtown Creek LTCP Comments

Dear Commissioner Sapienza,
As the New York City Department of Environmental Protection (NYCDEP) prepares a Long Term Control Plan (LTCP) for addressing Combined Sewer Overflow (CSO) and Clean Water Act standards in Newtown Creek, we offer the following comments. CSO is one of the most significant threats to the health of Newtown Creek. The estimated 1.2 billion gallons of untreated combined sewage per year brings excessive nutrients, pathogens, chemicals and plastic debris into the waterway posing harm to local wildlife and community members who seek to use the Creek for recreational and educational opportunities. We believe the following solutions are necessary steps forward in creating a healthier and more vibrant waterway for generations to come.

100% Capture for Largest 3 CSOs
We believe that large-scale capture of CSO is the most viable solution to improving water quality in Newtown Creek. We are in support of a storage tunnel that will capture 100% of CSO volume from the largest 3 outfalls on the Creek: NCQ-077 (Maspeth Creek), NCB-083 (East Branch) and NBC-015 (English Kills)[1]. We feel strongly that complete capture is the only viable path forward to ensure compliance and protection of both the ecosystem and human health for generations to come. A partial reduction of CSO volume from these big three outfalls will ensure that ongoing water quality hazards present in these most stagnant areas of the Creek will persist. Allowing half a million gallons of CSO to continue to enter Newtown Creek is simply unacceptable. If a significant investment of time and resources are required to bring a storage tunnel online; we urge NYCDEP to ensure that the resulting benefits to the ecosystem and surrounding communities reflect such an investment. We look forward to learning more details about storage tunnel specifications.

Storage Tank in Dutch Kills
As with the other 3 largest CSOs, we believe that capture at the largest CSO in Dutch Kills (BB-026) is a necessity. As stated in NYCDEP's Alternative Presentation, a 2.3 acre site is

[1] We recognize that abnormally large storms may render 100% capture impossible in reality, but support a tunnel with capacity over 130 millions gallons, as outlined in NYCDEP's Alternative Presentation from April 26, 2017.

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required to achieve 75% capture at this outfall. The NYS Dormitory Authority parking lot, which lies in direct proximity to the outfall tide gate, covers 2.1 acres - essentially allowing for more than 70% capture. We urge NYCDEP to engage with LaGuardia Community College in an evaluation of feasibilities at this location. While we fully appreciate the value of parking space for an institution of this size in a crowded urban environment; we believe that solutions exist that can retain parking, allow for DEP infrastructure and possibly add extra benefits (such as a green roof on top of a parking garage). Given that a growing number of LaGuardia faculty and students are some of the most engaged and committed stakeholders in creating a cleaner and more accessible Dutch Kills, we feel there is great potential for a partnered project between a city agency and city college.

We are also in favor of CSO capture in Dutch Kills so as to not overburden adjacent waterways. The idea of increasing the volume of wet weather flow from BB-026 to the Newtown Creek Water Pollution Control Plant (WPCP) is of concern for us, given the likelihood of increasing CSO discharge to the East River. Although less stagnant, the East River is connected to Newtown Creek both via tidal flushing and by the communities that border both. Simply put, we seek solutions that prevent pollution - not redirect it.

Increase Green Infrastructure (GI) in Dutch Kills

In addition to the 25% to 30% of annual CSO volume that a 2.1 acre storage tank could not capture from outfall BB-026 (30 to 36 Million Gallons per Year (MGY)), there are additional CSOs that discharge into Dutch Kills, primarily from outfall BB-009, which discharges an estimated 43 MGY. To address this estimated 79 million gallons, we urge NYCDEP to expand Green Infrastructure in the Dutch Kills area, primarily the BB-026 and BB-009 sewersheds. We understand that scoping for GI in Dutch Kills is underway but feel that current commitments are inadequate and need to be increased. There are a number of GI opportunities in these areas, including large industrial rooftops, residential, commercial and industrial streets as well as runoff from the Long Island Expressway which currently drains directly to catch basins in CSO drainage areas. An expansive and innovative GI program in Dutch Kills could help capture CSO which will continue to create environmental and public health risk.

Opposed to Expansion of Aeration and Use of Chlorination

We are encouraged to know that NYCDEP is not considering expansion of aeration within Dutch Kills and the main channel of Newtown Creek (from Whale Creek to the Turning Basin), as originally planned in the 2011 Waterbody Watershed Facility Plan. NCA has challenged the effectiveness and necessity of aeration since 2012 and we are encouraged that recent evaluation and discussion of current data and community concerns will spare large sections of Newtown Creek from this narrowly focussed water quality improvement. We continue to urge NYCDEP and NYSDEC to implement improved protocols for operating existing aeration sections, based on real time dissolved oxygen levels, as well as explore alternative systems that don't pose disruption to surface waters and create potential hazards for human health.

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As with aeration, we oppose the potential use of Chlorination as a CSO improvement measure - given that such a method only treats one symptom of a much larger issue and introduces additional impacts to the waterway and surrounding communities. We are discouraged to see this method being pursued at other waterbodies in New York City, given the potential negative impacts and strong opposition from our partner community and environmental organizations.

Wetlands and Ecological Services

Just ten years ago Newtown Creek was totally void of any native salt marsh grasses and populations of native filter feeder bivalves, like ribbed mussels and oysters, had not yet been identified or acknowledged[2]. Thanks to community interest and investments from agencies like NYCDEP, we have made great strides in advancing the possibility for increased ecological services in Newtown Creek. Salt marshes can produce oxygen, uptake excess nutrients, sequester carbon, breakdown bacteria and even help mitigate impacts of coastal flooding. We believe that wetlands and softer shoreline edges, where physically feasible, should be considered part of a long term strategy in Newtown Creek in conjunction with reduction of CSO volume. The greater the reduction of CSO, the more potential for natural systems to survive and thrive.

Timeframes

We ask that the LTCP submitted to NYSDEC specifically outlines design and construction timelines with justification for any significant delays in beginning the process. While we appreciate the amount of time necessary to fulfill these desired solutions, we ask that NYCDEP proceed with urgency in completing these vital projects. Additionally, we ask that solutions are able to proceed independently of other clean-up and regulatory projects underway, namely the USEPA Superfund Record of Decision (ROD). As with the ROD at Gowanus Canal, we believe the USEPA will identify CSO as an ongoing source of chemical contamination. An LTCP that outlines a 100% reduction of CSOs will achieve benefits for both Superfund contaminants as well as meet the Clean Water Act. Limited reductions to CSO volume under the LTCP may create great complications, delays and additional costs as we await a final ROD in the years to come. We therefore urge NYCDEP to select thorough solutions to CSO now; in the interest of avoiding complications, advancing environmental improvements and benefiting the surrounding communities.

Solutions Beyond Standards

Lastly, we are deeply concerned that solutions being considered as part of the Long Term Control Plan are too narrowly focused on meeting individual standards through the use of predictive modeling. As earlier mentioned, CSO contribute numerous types of pollutants that directly impact the health of Newtown Creek; including pathogens, nutrient pollution, petrochemicals, plastics, pharmaceuticals and a number of emerging chemical compounds.

[2] A recent survey conducted by Newtown Creek Alliance counted over 200,000 ribbed mussels; present throughout Newtown Creek and it's many tributaries.

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Many of these pollutants are not currently addressed under Clean Water Act standards, but pose significant risk to ecological and human health. Seeking a solution which only address a few symptoms of this larger problem, such as fecal coliform and dissolved oxygen levels (during select months no less) is nearsighted and inadequate. We urge the NYCDEP to address water quality in a comprehensive fashion and invest directly in the reduction of CSO itself. By doing so, solutions outlined this year will not just address current Clean Water Act standards but help create a clean water body for decades to come - a true Long Term Control Plan.

Additionally, we are concerned about the use of modeling to prescribe a necessary level of reduction to CSO. Many of the alternatives presented at the April 26th meeting predict compliance to current standards with a 50% reduction from the largest CSO outfalls in Newtown Creek. A 50% capture of CSO, still leaves 600,000,000 gallons of untreated sewage flowing into our waterbody every year. Such a high volume is unacceptable in the long term (for numerous impacts listed above) and we question the validity of a model predicting attainment of water quality standards with over half a billion gallons of CSO discharging into Newtown Creek every year.

Continued Dialog
We thank NYCDEP for strong consideration of these comments and welcome ongoing dialog concerning potential solutions. We fully appreciate the complications in improving an impaired urban waterbody like Newtown Creek and hope that NYCDEP take necessary actions that repair ecological harm and provide justice for surrounding communities.

Sincerely,

Willis Elkins
Program Manager
Newtown Creek Alliance

Sean Dixon
Staff Attorney
Riverkeeper

Julie A. Welch
Program Manager
on behalf of the SWIM Coalition Steering Committee

waller

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May 31, 2017

Via Electronic Mail

New York City Department of Environmental Protection
96-05 Horace Harding Expressway
Corona, New York 11368.

Re: Comments on the Newtown Creek LTCP Alternatives Review

Dear Sir or Madam:

The Newtown Creek Group ("NCG"), appreciates the opportunity to submit these comments on the April 26, 2017 Review of Alternatives ("Alternatives Review") pursuant to the Newtown Creek Long Term Control Plan ("LTCP") process. The NCG, which is comprised of Phelps Dodge Refining Corporation, Texaco, Inc., BP Products North America Inc., The Brooklyn Union Gas Company d/b/a National Grid NY, and ExxonMobil Oil Corporation, is conducting the Remedial Investigation & Feasibility Study ("RI/FS") at the Newtown Creek NPL Site pursuant to an Administrative Order on Consent ("AOC") with the United States Environmental Protection Agency ("EPA"), to which the City of New York is also a named party. The site boundary for the Newtown Creek NPL site and the waterbody of interest under the Newtown Creek LTCP process are one and the same waterbody. For that reason, the NCG has a direct interest in the LTCP process and evaluation of sources, and the steps that the New York Department of Environmental Protection ("NYCDEP") ultimately takes pursuant to the LTCP to address the impacts on Newtown Creek of NYCDEP's ongoing discharges from its Combined Sewer Outfall ("CSO") and Municipal Separate Storm Sewer ("MS4") discharges into Newtown Creek.

The NCG shares with the New York State Department of Environmental Conservation ("NYSDEC") and the New York City Department of Environmental Protection ("NYCDEP") the broad goal of improving water quality in Newtown Creek. The NCG is committed to identifying and quantifying the risks that Newtown Creek may pose to human health and the environment and identifying scientifically sound solutions that will address those risks. The NCG believes that remedial alternatives should be developed and selected in a manner that is protective of human health and the environment, while thoughtfully balancing the environmental, economic and social effects of remediation on the Creek and community. Although the RI/FS process is ongoing, the extensive work to date reveals that the CSOs and MS4s are significant contributors to those risks, so any proposed remedial response must take account of those contributions and what reductions (treatment, system upgrades, or control), if any, will result from the implementation of the Newtown Creek LTCP. Moreover, recognizing the risks posed by CSOs and MS4s, Newtown Creek community stakeholders have been extremely vocal in their desire to have these risks addressed in order to improve water quality. Any LTCP that fails to do so will be unacceptable to the community.

The NCG's direct interest in the LTCP process will come as no surprise to NYCDEP, NYSDEC or EPA, as they are all direct participants in the Newtown Creek RI/FS process. Moreover, EPA itself has explained that "the CWA and CERCLA domains are intersecting with increased frequency on contaminated sediment sites, offering the opportunity for improved integration, including increasing collaboration between EPA, and state CWA program managers, CWA permittees, and responsible parties under CERCLA."[1] What is unstated in the EPA Guidance is that in the absence of such coordination, both programs are destined to fail to meet their objectives. These comments represent the NCG's attempt to jumpstart the necessary dialogue between the two programs.

I. Introduction

Newtown Creek is one of the most complex environmental remediation sites in the United States, owing to the concurrent efforts under the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") and the Clean Water Act ("CWA"). NYCDEP, NYSDEC, EPA, and NCG understand that actions taken under one statutory and regulatory regime must take into account actions taken under the other. As the comments below highlight, in many instances, there are direct conflicts between potential CWA remedies and potential CERCLA remedies. In other instances, even if no direct conflict exists, actions taken pursuant to the CWA may have direct and negative ramifications for the scope, timing, and effectiveness of any potential remedy under CERCLA. Again, EPA has recognized those facts, as it has explained that "the CWA and CERCLA are inherently linked when sediment sites are considered, because surface water discharges can be sources of contamination to sediment, and contaminated sediment can be an ongoing source of contamination to surface water."[2] Moreover, because of differences in regulatory approach, "the effectiveness of Superfund remedies at urban sites may depend on successful coordination between regional CWA and CERCLA programs,

[1] EPA Guidance (December 2013): "A Primer for Remedial Project Managers on Water Quality Standards and the Regulation of Combined Sewer Overflows under the Clean Water Act"

[2] *Id.*

throughout the entire RI/FS and remedy selection and implementation process."[3] In the context of Newtown Creek, the core issue with respect to the relation between the CWA and CERCLA is that the effectiveness of any remedy will be affected by the manner and extent to which NYCDEP controls its ongoing discharges from CSOs and MS4s into Newtown Creek.

II. Newtown Creek Background

The Newtown Creek area has a history of extensive urban and industrial development. Modifications to the physical layout of the creek shoreline and configuration of freshwater discharges have resulted in a system that is largely engineered for industrial, municipal, navigational, and sewage management purposes. Historically, freshwater flow to the creek largely consisted of tributary flow and groundwater flow. Decades of urban development has led to the elimination of tributary flows and to the creation of freshwater point source discharges (e.g., CSOs and MS4s).

The land use around Newtown Creek from the 1800s through the present has been, and continues to be, predominately industrial. This industrial use has occurred in parallel with municipal use of Newtown Creek as a receiving waterbody for both untreated stormwater and wastewater discharges. Dating back to the 1800s and the early 1900s, untreated stormwater, industrial wastewater, and domestic sewage were typically discharged directly to Newtown Creek. This municipal use of Newtown Creek has evolved over time, especially with the initial construction of a wastewater treatment plant ("WWTP") in the late 1960s.

Significant changes have occurred in the use of Newtown Creek and the surrounding uplands since the early 1800s. Industrial activities in the surrounding uplands and use of the creek for shipping and navigational purposes increased steadily after the Civil War. In 1912, The New York Times reported that Newtown Creek "has commerce greater than that of the Mississippi River or any of its tributaries." Historical industrial operations located around Newtown Creek generally included adhesives factories; animal rendering, glue factories, and fertilizer plants; asphalt mining, mixing, and storage operations; automobile manufacture, repair, and service; canneries; coal processing, handling, and storage; copper wiring plants; creosote production and treatment; distilleries; electronics and electroplating industries; hide-tanning plants; incinerators; MGPs; metal production, smelting, metal works, and fabricating; metal scrap and storage; municipal wastewater treatment; paints and pigments industry; paper products industry; pencil manufacturing; petroleum refining and bulk storage; plastics industry; printing;

[3] *Id.*

railyards; sawmills and lumberyards; shipbuilding; solid waste disposal/landfilling by the City of New York; sugar refining; utilities; and waste oil refining operations. Following World War II, marine cargo on Newtown Creek decreased significantly and there was a shift away from manufacturing facilities to materials handling facilities. Today, the predominant land use around Newtown Creek and the tributaries remains industrial, with pockets of mixed use, commercial, and, at further distance from the Creek, residential developments. Industrial activities near the creek currently include the following: warehouse and distribution facilities; vehicle storage and maintenance; electrical distribution; plastics and foil manufacturing; waste transfer yards and recycling facilities; road service support facilities; construction materials storage; facilities that store electrical equipment; scrap metal processing facilities; lumberyards; ready-mix concrete plants; bulk fuel distribution terminals; railroads (e.g., tracks, yards); utilities; and municipal wastewater treatment.

III. CSO and MS4 Discharges are the Dominant Sources of Surface Water to the Creek

The Newtown Creek drainage area comprises approximately 7,300 acres in Brooklyn and Queens. Approximately 66% of this area is served by combined municipal sewer infrastructure. The remaining area is primarily served by municipal separate sewage and stormwater systems. In portions of the Newtown Creek drainage area served by municipal combined sewer systems, stormwater and sewer discharges enter the same pipe. In other areas near the creek, stormwater is discharged to the creek via privately owned infrastructure.

CSOs and MS4s are the dominant source of freshwater flow (i.e., surface water inflow primarily comprised of municipal sewage, runoff, and stormwater) into Newtown Creek. Freshwater from point sources and overland flow discharges into the Study Area both continuously (e.g., treated effluent from groundwater dewatering and remediation systems) and during episodic rain events (i.e., CSO, WWTP effluent overflow, or stormwater). CSOs account for the largest fraction of total freshwater flow among the point sources. The four largest CSO outfalls (i.e., English Kills [NCB-015], East Branch [NCB-083], Maspeth Creek [NCQ-077], and Dutch Kills [BB-026]), which discharge to Newtown Creek during episodic rain events, have the following range of discharge characteristics:

- Annual discharge ranging between 100 and 600 million gallons ("MG") per year
- 40 to 80 CSO events per year (i.e., discharges during rain events)
- Discharge duration of 2 to 6 hours per event

– Peak flow rates ranging between 370 and 1,500 gallons per second

A diagnostic analysis to evaluate the precipitation amounts needed to trigger CSO events for two of the large CSOs (English Kills and East Branch) indicates that approximately 0.1 inch (East Branch) to between 0.1 and 0.2 inch (English Kills) of precipitation is needed for discharge from these two CSO outfalls to occur.

- According to data the NCG has collected and analyzed during the CERCLA RI/FS process, the following ongoing sources contribute solids, Total Polycyclic Aromatic Hydrocarbon ("TPAH"), total polychlorinated biphenyls ("TPCB"), copper ("Cu"), pharmaceuticals, personal care products, and pathogens ("3Ps") to surface sediment in Newtown Creek. Point sources (primarily CSOs and MS4s) and the East River are the dominant current sources of solids to CM 2+.

- Point sources (primarily CSOs and MS4s) are dominant current sources of solids to the surface sediment and surface water in the tributaries.

- For all three chemicals (TPAH, TPCB, Cu), CSOs and MS4s contribute significantly to the total loads to surface sediment. It should be noted, however, that the majority of the point source TPAH load enters the Study Area in CM 0 – 1 from the Con Edison – 11th Street Conduit discharge. This discharge, which contains dewatered groundwater effluent, alone contributes approximately 65% of the total point source discharge of TPAH to Newtown Creek.

IV. The CSO and MS4 Discharges Pose Ongoing Risks to Human Health and the Environment

The Baseline Ecological Risk Assessment ("BERA") the NCG conducted during the RI/FS process identified potential risks from exposure to CSO and MS4 discharges for benthic macroinvertebrates and benthic fish in Creek Mile ("CM") 2+, the tributaries, and English Kills. These potential risks in CM 2+ are associated with the following receptors and exposure pathways:

- Surface sediment toxicity to benthic organisms in CM 2+ and the tributaries is significantly greater than toxicity in sediments in the four Phase 2 reference areas. These four different reference areas were selected to encompass a wide range of potential impacts from both industrial and CSO-related point sources. This indicates that CSO-related impacts in the tributaries of Newtown Creek are greater than those in otherwise similar water bodies with lower amounts of CSO flows.

- Toxicity results at sample locations close to CSOs and MS4s cannot be explained solely, or in many cases, at all, by either PAHs or certain metals in porewater. At these locations, the toxicity results appear to be linked to the presence of other constituents (e.g., a complex mixture of organic compounds or other pollutants or contaminants, including pharmaceuticals, personal care products, and/or pathogens), that were observed in proximity to CSOs, MS4s, and other stormwater discharges.

- In addition to the potential risks quantified as part of the baseline risk assessments, potential risk to human health and the environment also arise from other confounding factors or pollutants and contaminants (e.g., pathogens, pharmaceuticals, and personal care products from CSO/MS4 discharges), resulting in an underestimation of potential risk as evaluated in the BERA. Moreover, ongoing anthropogenic contributions from CSO/MS4 discharges to Newtown Creek impact the ecological environment because of high organic carbon loadings which lower dissolved oxygen (DO).

As documented by NYCDEP, subtidal surface sediment with total organic carbon ("TOC") greater than 3% is likely contributing to impairment of the benthic macroinvertebrate community in Newtown Creek.[4] This is in large part because bacterial decomposition of organic matter results in a decrease in DO and an increase of toxic byproducts such as ammonia and sulfide. DO below 2 milligrams per liter (mg/L) results in hypoxic conditions that adversely affect the respiration of benthic macroinvertebrates and can result in local extinction except for the microbial community. This condition is exacerbated during the summer months when water temperatures are elevated and the bacterial degradation of organic matter is accelerated. During the summer RI/FS Phase 1 field surveys conducted by the NCG in 2012, surface water DO at depth fell below the New York State Class SD threshold of 3 mg/L, particularly in the tributaries; the benthic macroinvertebrate community was impaired even further, with no macroinvertebrates found at tributary sampling stations.

The RI/FS field data reveal the ongoing risks to the ecological communities at many locations in the tributaries. These risks are due in large part to massive ongoing discharges from

[4] Hyland et al. (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 as cited in Newtown Creek Waterbody/Watershed Facility Plan Report (June 2011).

CSOs and MS4s. While those ongoing discharges are regulated by the CWA, the discharges also include CERCLA hazardous substances and other pollutants and contaminants that contribute to those risks and must be considered in the evaluation of remedial alternatives under the CERCLA process in those portions of Newtown Creek.

In addition to the BERA, the NCG also collected sediment and water data to evaluate the potential for ecological[5] and human health[6] risks from pharmaceuticals, personal care products, and pathogens. These chemical and biological constituents enter Newtown Creek from CSO and/or MS4-related sources, and they have significant adverse impacts on Newtown Creek. The key findings from the NCG studies include:

- Eight pharmaceuticals and personal care products (PPCPs) exceeded ecological screening criteria. Of these eight, four PPCPs (beta-estradiol, bisphenol A, estrone, and nonylphenol) contributed the most to unacceptable ecological risks from exposure in both surface water and sediments.

- Area-wide ecological risks were identified from exposure to PPCPs in surface water under both dry and wet conditions, with ethinyl estradiol representing the greatest contribution to the risk. Area-wide and location-specific ecological risks also were identified for benthic macroinvertebrate and fish receptor groups exposed to PPCPs in surface sediment pore water. The spatial extent of surface sediment pore water ecological risks were similar to that of surface water, with the highest risks primarily located in the vicinity of major CSOs and a mix of both acceptable and unacceptable risk present within the main channel of Newtown Creek.

- Dose-response relationships for bisphenol A, nonylphenol, and 4-tert-octylphenol (as both bulk sediment concentrations and estimated pore water toxic units) suggest that these PPCPs are contributing to the overall toxicity observed in organisms exposed to Newtown Creek sediments.

[5] NewFields and GEI. 2016. Baseline Ecological Risk Assessment, Pharmaceuticals and Personal Care Products. Newtown Creek Superfund Site. Prepared for the Newtown Creek Group, July, 2016.

[6] GEI and NewFields. 2016. Human Health Risk Assessment for Pathogens, Pharmaceuticals, and Personal Care Products, Newtown Creek Superfund Site. Prepared for the Newtown Creek Group, July, 2016.

- The human health risk investigation revealed that potentially significant human health risk is likely to occur from recreational exposure to pathogens in surface waters, particularly near CSO discharge points under wet weather conditions.

Finally, the NCG has observed that CSO discharges to Newtown Creek introduce significant levels of sheen to the water surface, and thus represent an additional source of NAPL which can adversely impact water quality and create ecological and human health risks. During the CERCLA remedial investigation, the NCG documented sheens during wet and dry weather near and emanating from CSOs and MS4s. The Newtown Creek Alliance (NCA) has also documented sheens emanating from CSO discharges during wet weather events.[7]

V. <u>NYCDEP Has Considerable Additional Work to Do in its Limited Analysis of Proposed Alternatives</u>

NYCDEP has undertaken some infrastructure projects to address CWA requirements on Newtown Creek, including the installation of enhanced aeration, bending weirs, floatables control, and green infrastructure. In the Alternatives Review, NYCDEP identified a number of other projects that might help it fulfill its obligations under the CWA. Before any alternatives are selected, however, NYCDEP must consider the following:

1. <u>Possible conflict between aeration and CERCLA remedy</u>

In an effort to meet water quality standards for DO, NYCDEP installed an enhanced aeration system in lower English Kills, completed in March 2014. That aeration system will interfere with the successful implementation of a CERCLA remedy in the area. The aeration system consists of sections of air header piping that are connected to a series of diffusers that distribute oxygen into the water column. The infrastructure for the diffusers and piping is typically less than 1 to 2 feet tall and rests on the bottom of the creek. The aeration system only operates during certain months of the year when DO levels fall below regulatory requirements of 3 mg/L specified by the CWA.

As part of the permit approval process for the system, NYCDEP will be required to remove the infrastructure associated with the aeration system in the creek for any of the following reasons: (1) Maintenance dredging required by the USACE; (2) Obstruction of vessel traffic or interference with navigation or adjacent facilities; and (3) USEPA-required remedial activities within the Creek under CERCLA (e.g., dredging, cap construction, etc.). Future

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[7] NCA (Newtown Creek Alliance), 2017. Combined Sewer Overflow: Newtown Creek. Video, 2:20 minutes. Available from: https://www.facebook.com/newtowncreek/videos/1248501821852107/. March 2017.

expansions of the aeration system are planned to cover East Branch and upper Newtown Creek by June 2018 and Dutch Kills and lower Newtown Creek by December 2020. Not only does the physical structure create a conflict with implementation of a CERCLA remedy, but removal of the system during any in-creek work will result in a substantial drop in DO, which will in turn cause ecological stresses, die off of microinvertebrates, and degradation of surface water quality, threatening the effectiveness of any remedy.

Furthermore, NYCDEP's alternatives analysis is flawed in that it does not address the possible impacts of any sediment remedy (e.g., dredging and capping) that would increase water column depth and could therefore impact the effectiveness of the aeration system. NYCDEP has not evaluated this, and must take it into account when assessing each alternative.

2. NYCDEP Examined an Overly Narrow Range of Pollutants

In its Alternatives Review (as in previous presentations), NYCDEP focused only on pathogens and DO. That narrow focus ignores the fact there is ample evidence that a number of other pollutants coming from the CSOs (and MS4s), including but not limited to TPAH, TPCB, non-aqueous phase liquid ("NAPL"), Cu, oil and grease, pharmaceuticals, and personal care products. All of these constituents will adversely impact the suitability of Newtown Creek for fish, shellfish and wildlife survival, and its suitability for primary and secondary recreation. The ongoing discharges of those other pollutants and contaminants must be analyzed and controlled if the LTCP is to effectively address the ongoing impact of the CSOs on Newtown Creek.[8]

3. NYCDEP Cannot Rewrite the DO and Pathogen Water Quality Standards During the LTCP Process

In direct conflict with statutory and regulatory procedures, NYCDEP appears to be attempting to dramatically re-define the water quality standards for Newtown Creek, which will result in its failure to provide adequate protection to ensure Newtown Creek is suitable for fish, shellfish, and wildlife survival, and suitable for primary and secondary contact recreation. It is doing this by removing the temporal components of the criteria. For DO, NYCDEP appears to be seeking to change the criterion "acute, never less than" 3.0 mg/L to an annual average of greater than 3 mg/L. This would be a dramatic change directly conflicting with regulatory practice and procedures for changing or complying with water quality standards. For example, DO

[8] Moreover, MS4 sources are not discussed in any detail whatsoever. The modeling and CSO controls alternatives analyses are mute regarding MS4 control. As discussed above, while the LTCP process does focus on CSO controls, the lack of planning to control MS4 discharges represents a large gap in NYCDEP's Newtown Creek point source control program. Without addressing stormwater sources, including MS4s, it is difficult to envision compliance with the water quality standards in Newtown Creek.

measurements in the East Branch tributary collected during July and August 2016 were continuously less than 3 mg/L for 60 consecutive days (i.e., never in compliance for two months), but the average annual DO concentration at the same location was above 3 mg/L (*see* Alternatives Review presentation slides 36 and 38). Thus, the East Branch tributary might achieve the NYCDEP redefined LTCP goal, while failing to meet the actual water quality criterion for extended time periods. This change in the DO criterion does not appear to have a credible technical or legal basis and would not be protective of aquatic life or designated uses (e.g., fishable).

For pathogens, NYCDEP appears to be seeking to change the criterion from monthly geometric mean to seasonal bacteria compliance. NYCDEP also seeks to establish a 24-hour "time of recovery" following CSO events when bacteria concentrations would be allowed to exceed the criterion.

These DO and bacteria compliance goals and targets are an attempt by NYCDEP to lower the bar of regulatory compliance standards, rather than directly address the impact of CSO discharges on Newtown Creek. If NYCDEP is permitted to do so, not only will water quality suffer, but the reduction will negatively impact the effectiveness of any CERCLA remedy. In evaluating the alternatives and finalizing the draft LTCP for submission to NYSDEC, NYCDEP should not be permitted to demonstrate compliance through lowering the bar on what counts as compliance with the water quality standards.

4. NYCDEP Needs to Make its Data Readily Available.

Slide 14 of the Alternatives Review presents a map of pathogen sampling locations and provides a brief summary of the data. One bullet on the slide states; "Data is available online," but these data do not appear to be currently available. A previous presentation, the Newtown Creek LTCP Kickoff meeting (Nov. 15, 2016), NYCDEP provided an online link to Newtown Creek data (slide 16). However, only data for 4 Newtown Creek harbor wide sampling locations (with prefix NC) were available at the online address provided. The NCG requests that NYCDEP make these data fully available online to NCG and the public, as NYCDEP has previously committed to do. Further, on a number of slides, data are not presented in a manner consistent with applicable water quality standards:

- For example, in slides 22 – 24 of the Alternatives Review, the bacteria geometric mean[9] ("geomean") concentrations for the period of January to November 2016 appear to be presented as a single geomean, when the appropriate metric would be monthly geomeans throughout that time period. Similarly, in slides 25 – 27, the bacteria geomean concentrations for May – October 2016 (the recreational season) appear to be presented as a single geomean rather than monthly geomeans throughout that time period. By taking geomeans over a longer period of time, larger exceedances of the water quality criterion for bacteria may have been effectively masked.

- In another case (slides 34-38), DO concentration results are presented in a manner that is very different from the water quality criterion (DO never less than 3 mg/L). Annual average DO concentration data are presented; as described above, annual average and "never less than" are at opposite ends of the temporal spectrum. Annual averaging effectively masks long periods of water quality violations. Furthermore, on slide 35, the 5th percentile values are presented. The 5th percentile value represents the lowest 5th percent in the distribution of DO data at each sampling location. However, because an annual average (rather than the "never less than" metric) is used, the 5th percentile values of an annual average is misleading because it is less conservative than using the appropriate regulatory metric, i.e., "Shall not be less than 3.0 mg/L at any time."

As discussed above (and echoed by comments by other stakeholders), NCG requests that all data supporting or involved in the LTCP process be made available in detail, and in a format matching the applicable water quality standards (e.g., monthly geomeans rather than annual averages, individual DO measurements rather than annual averages, etc.).

5. NYCDEP has not Considered Several Effective Alternatives

Slide 30 of the Alternatives Review provides a table of CSO control alternatives organized by type and by increasing complexity and increasing cost. The table shows that 11 CSO control types have been removed from further consideration. Specifically, high rate

[9] A geometric mean is calculated similar to an average. However, instead of adding the numbers together and dividing by the number of values (a simple average), to calculate a geometric mean, the different calculations are multiplied together and then the root of the number of calculations is taken of the total. In the case of fecal coliforms, the water quality standards for Newtown Creek require that a minimum of five samples are taken over the course of a month to calculate the monthly geometric mean.

clarification, in-system storage, and shaft storage, among others, were removed. These are among the potentially most effective alternatives, and many have been implemented across the country even at great cost. In fact, New York City has implemented some of these remedies at other sites. Examples of costs for significant CSO controls in other cities including Kansas City ($2.5 billion), Cleveland ($3 billion), Washington DC ($3 billion), and Atlanta ($1.5 billion).[10] NYCDEP should thus fully evaluate all potentially effective alternatives, or at a minimum, substantively explain why these alternatives were removed from further consideration.

6. Too Many Alternatives Are Presented in Insufficient Detail

In the Alternatives Review, NYCDEP presented 184 Newtown Creek CSO control alternatives that were described as under further evaluation.[11] It is not feasible for stakeholders to assess this many alternatives. In contrast, for example, the Coney Island LTCP alternatives meeting (April 20, 2016) featured four alternatives under further evaluation. The NCG requests (and believes that other stakeholders would agree) that NYCDEP conduct a second alternatives meeting focusing on a near-final set of alternatives so that stakeholders can better evaluate possible CSO controls and provide an additional comment before NYCDEP submits the draft LTCP.

Conclusion

The NCG looks forward to continuing to work with EPA, NYSDEC, and NYCDEP in identifying effective solutions on Newtown Creek. To that end, we would welcome the opportunity to discuss these comments further with NYCDEP, NYSDEC, and EPA.

Respectfully submitted,

W. David Bridgers
Common Counsel, the Newtown Creek Group

[10] CSO cost data are from publicly available consent decrees (e.g., https://www.epa.gov/enforcement/st-louis-clean-water-act-settlement)

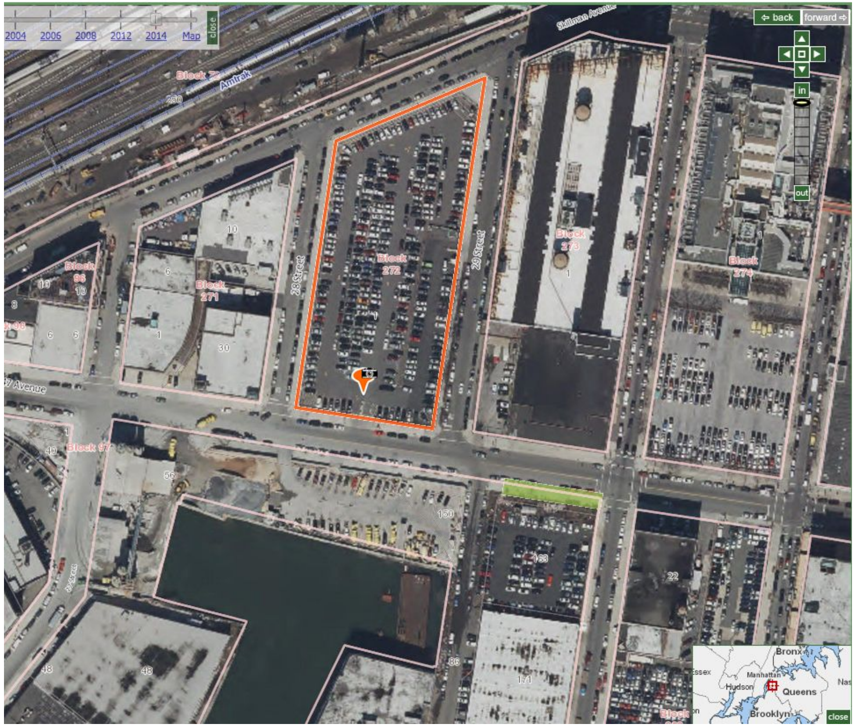
[11] The 184 total alternatives were estimated as follows: There were 16 alternatives listed in the alternatives summary (slides 44 and 45). Of the 16 alternatives, six included four outfalls, six included three outfalls, and four included one outfall. Each alternative included four sub-alternatives; 25%, 50%, 75%, and 100% control. Six alternatives x four outfalls x four levels of control = 96 total alternatives, 6 x 3 x 4 = 72, and 4 x 1 x 4 = 16. Summing 96, 72, and 16 yields a total of 184 alternatives presented.

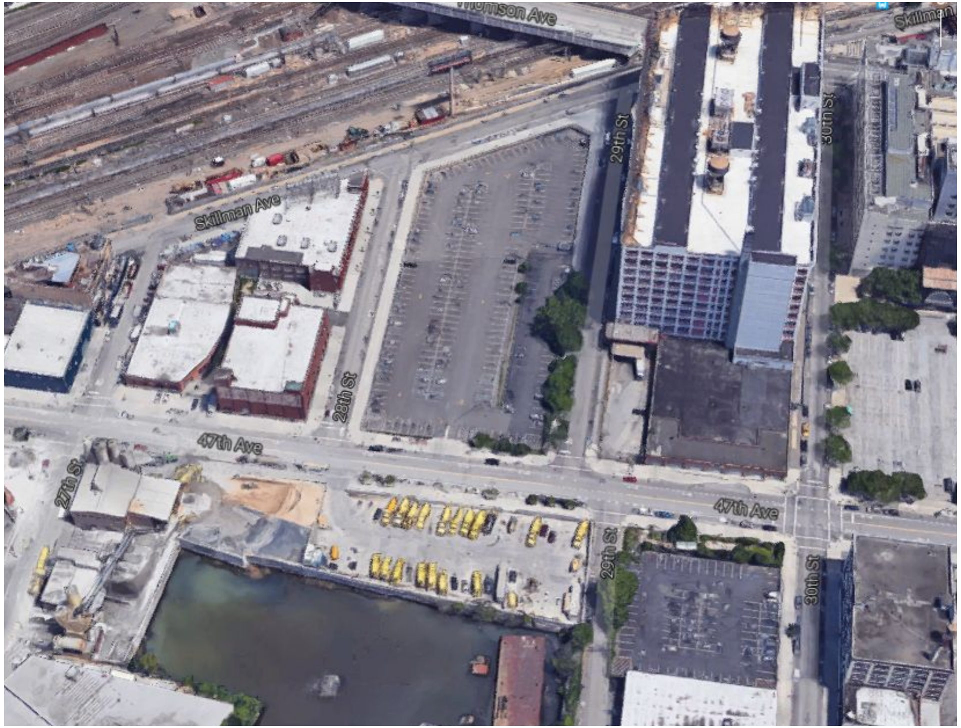
CSO Storage Options for Newtown Creek

4 outfalls release 90% of total CSO volume into Newtown Creek

BB-026 = 141 million gallons per year
NCQ-077 = 327 million gallons per year
NCB-083 = 314 million gallons per year
NCB-015 = 356 million gallons per year

NCA
NEWTOWN CREEK ALLIANCE

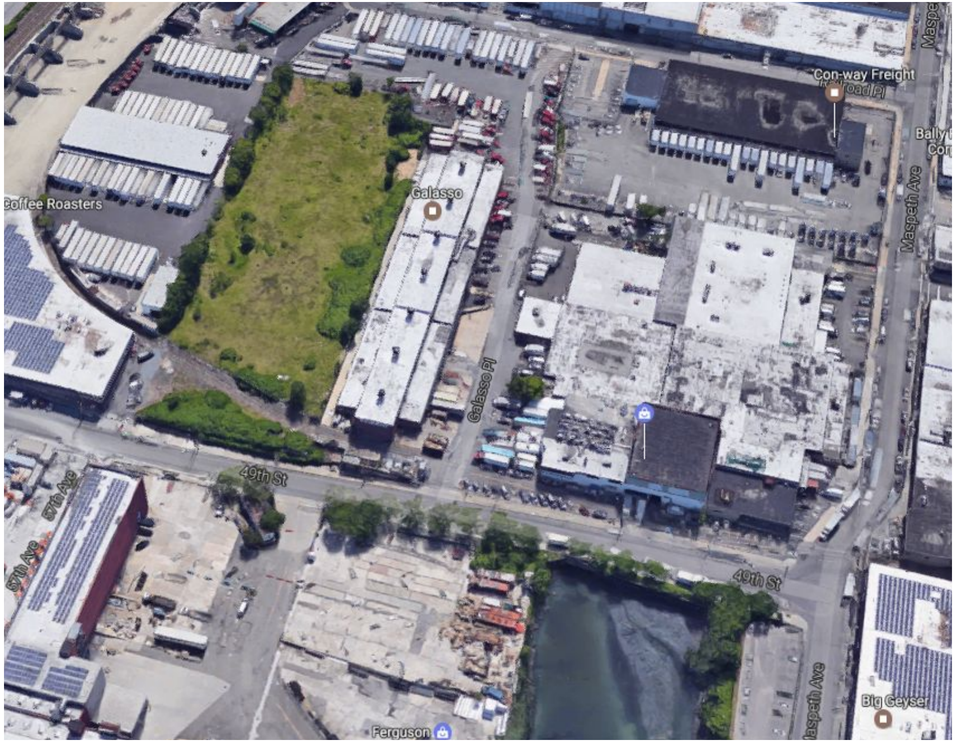




Head of Dutch Kills

Possible CSO Storage Tank for BB-026

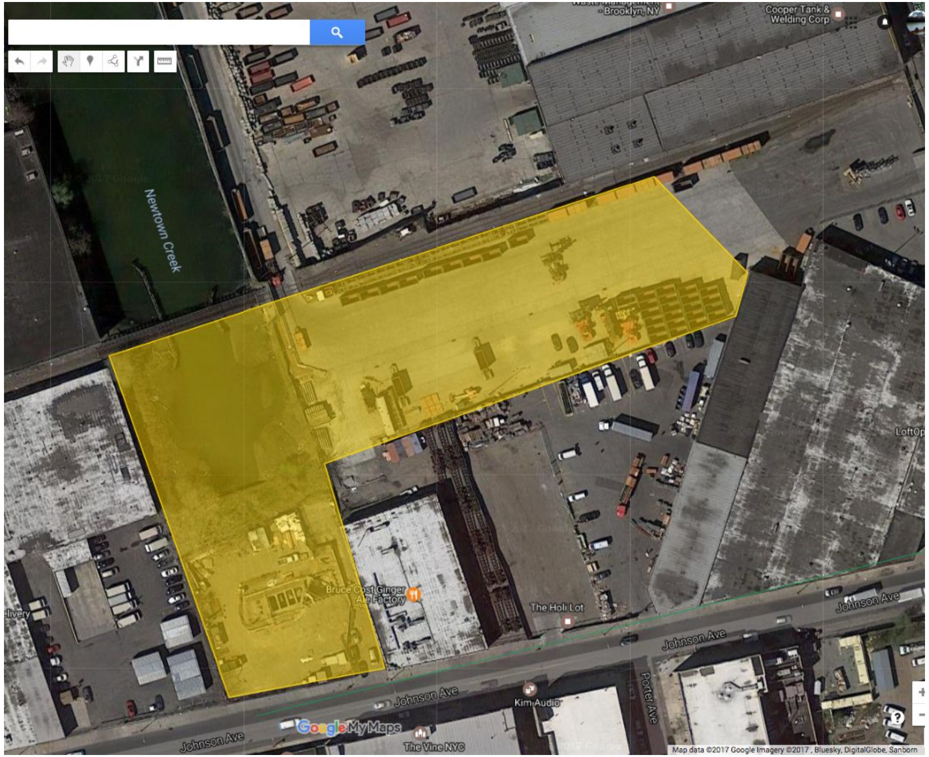
Address: 28-02 Skillman Ave, Queens NY 11101
Block: 272 **Lot:** 1
Owner: The Dormitory Authority (NYS)
Size: 2.1 acres
Current Use: Parking lot for LaGuardia Community College

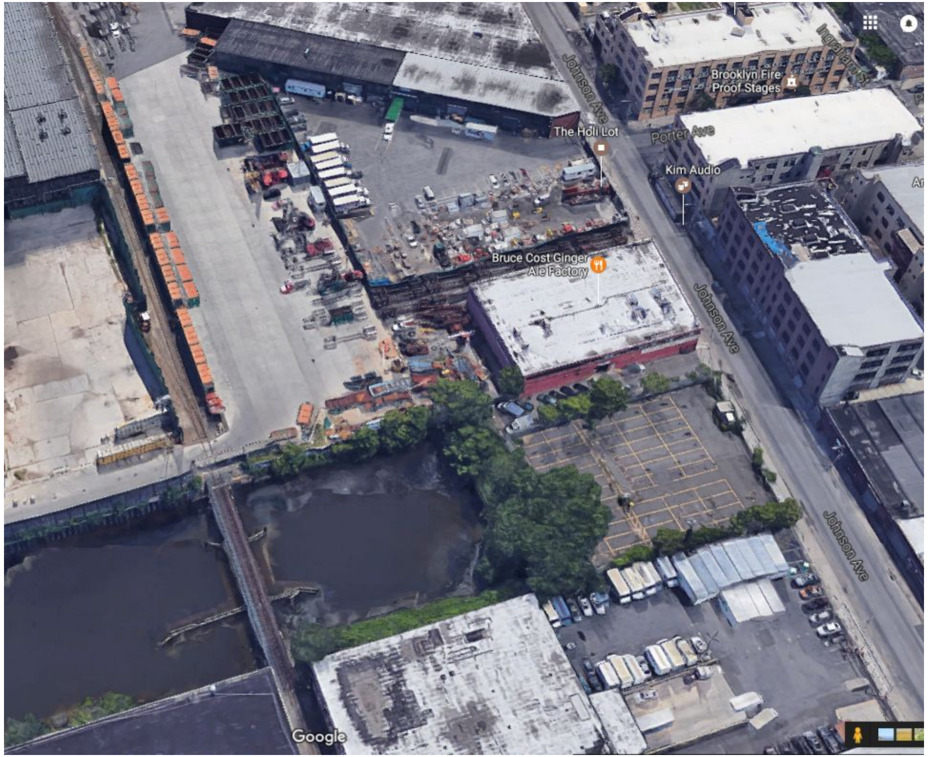


Head of Maspeth Creek

Possible CSO Storage Tank for NCQ-077

Address: 49th Street, Queens, NY 11378
Block: 2575 **Lot:** 26
Owner: NYC DEP
Size: 2.8 acres
Current Use: Vacant. More info and background here.





Head of English Kills

Possible CSO Storage Tank for NCB-015 + NCB-083

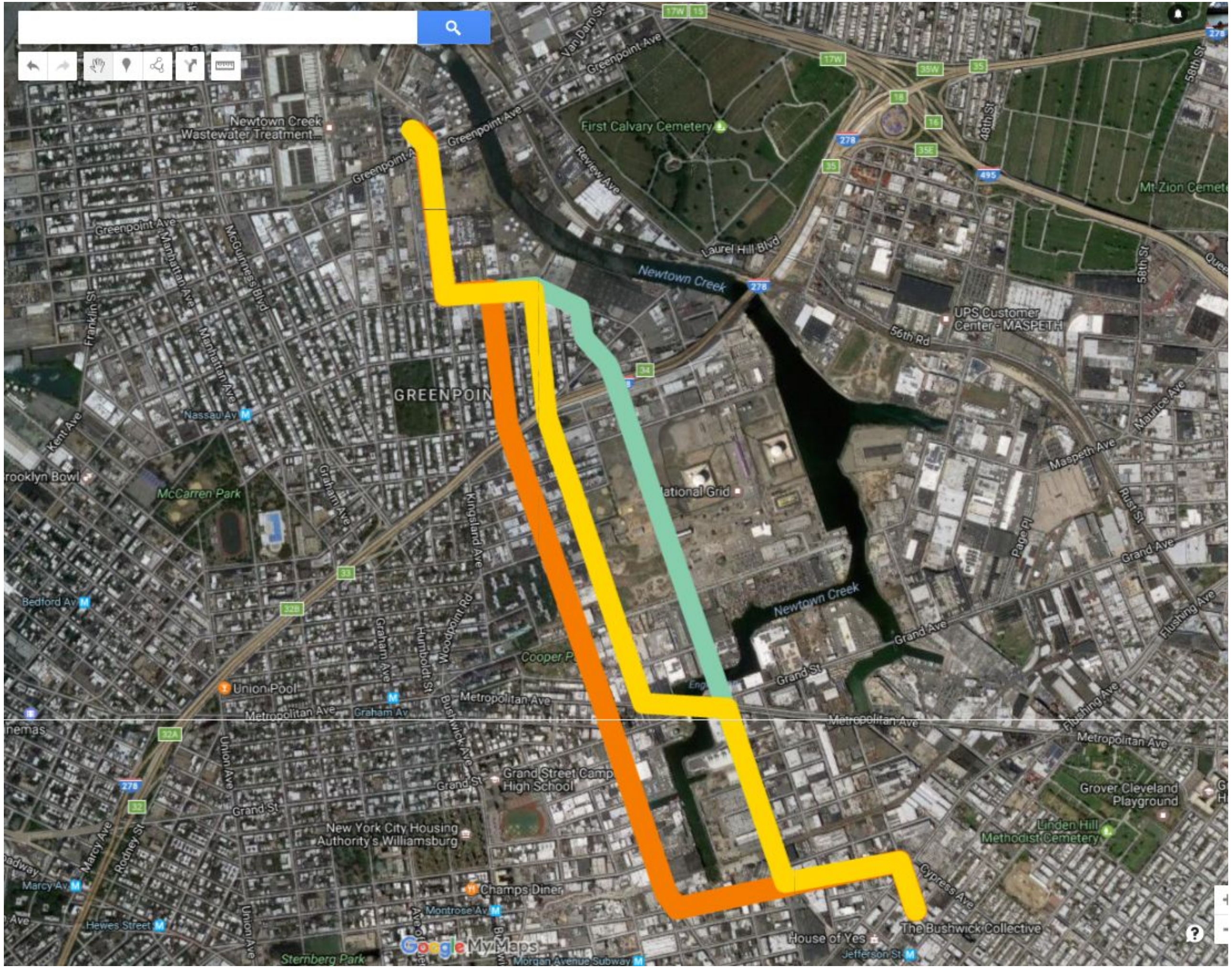
Address: 469 and 451 Johnson Ave
Block: 2974 **Lot:** 112 + 162
Owners: Unknown + MTA
Size: 3 acres
Current Use: Parking lot + open industrial + non-navigable head of English Kills

Head of Creek to WWTP

Possible CSO Storage Tunnel for NCB-083 and NCB-015

Route: Running from St. Nicholas Ave (NCB-083) to Johnson Ave (NCB-015). Main route via Morgan Ave, Vandervoort Ave or Varick Ave then to Norman Ave, Kingsland Ave and to Newtown Creek WWTP.

Length: 2.5 miles approximately



NEWTOWN CREEK ALLIANCE

October 23rd, 2017

Basil Seggos
Commissioner
NYS Department of Environmental Conservation
625 Broadway
Albany, NY 12233

Vincent Sapienza, P.E.
Commissioner
NYC Department of Environmental Protection
59-17 Junction Boulevard
Flushing, NY 11373

Dear Commissioners Seggos and Sapienza,

Following review of the Long Term Control Plan (LTCP) for Newtown Creek (submitted to New York State on June 30th, 2017)[1] we submit the following comments. Many of our concerns are similar to comments we submitted to the NYC Department of Environmental Protection (NYCDEP) on May 31st, 2017, a letter which was also signed by NYC Council Members Crowley, Levin and Reynoso.[2]

Timeline

While we appreciate the complications and scope of building out a massive underground storage tunnel to collect some 62.5% of CSO discharge from the 3 largest outfalls on Newtown Creek, we believe the timeline proposed is of unnecessary, and frankly disappointing, length. An estimated completion date of 2042 means the significant impacts of ongoing CSOs, including the severe ecological stresses and threats to human health will be borne by the surrounding communities for the next 25 years (or more).

Additionally, with a federal Superfund investigation underway and Record of Decision expected in the next few years, there is risk that a prolonged delay of CSO pollution control may deleteriously affect the process and ultimate outcome of the Superfund remediation. Recontamination and remedial action delays are very real risks given the LTCPs 25-year planning horizon. These communities have suffered a polluted Newtown Creek for too long; we deserve real reduction of CSO and remediation of contaminated sediments in a timely fashion. In

[1] http://www.nyc.gov/html/dep/pdf/cso_long_term_control_plan/ltcp-newtown-creek-cso.pdf
[2] http://www.newtowncreekalliance.org/wp-content/uploads/2016/12/LTCP-comments-5.31.17.pdf

45-18 Skillman Avenue Sunnyside, NY 11104
info@newtowncreekalliance.org

order to effectively remediate Newtown Creek, ongoing sources of contamination and pollution - including the annual, extreme Combined Sewer System discharges into the Creek - must be controlled. Only when we've stopped making matters worse can we truly begin to turn the corner toward restoration. We ask that the timeline for this vital project be accelerated, and for action toward construction to begin immediately.

East River Discharges

The LTCP proposes the construction of a pumping station to transport approximately 75% of the combined sewage from the largest Dutch Kills CSO (BB-026) to the Newtown Creek Water Pollution Control Plant. To allow for increased capacity at the Plant there will be an increase (i.e., displaced discharge) in CSO volume from a number of outfalls on the East River, including in Wallabout Basin and the Navy Yard. While this will - according to the LTCP - improve the water quality in Dutch Kills, it is far from ideal for NY Harbor and the many boaters, fishermen, businesses and industries along the receiving waters of these redirected sewage discharges (including the waters around and under many of the City's expanded ferry docks). With emerging communities of water users in these areas and reinvestments in both the aquatic ecosystems and economies of these waterfronts, not to mention new NYC Ferry hubs, increased CSO discharges to those areas are unacceptable.

We firmly believe that Dutch Kills CSOs need to be eliminated - but they should not just transported or redirected (or cause displacement within the system effectively leading to a gallon-to-gallon discharge displacement) into neighboring waterways. As stated in our original comments on the proposed LTCP, we believe that CSO storage tanks adjacent to Dutch Kills should be part of the LTCP. We do not believe that this issue will be adequately or fairly treated in the city-wide LTCP. We ask that the City and State reopen the LTCP with respect to the need to capture CSO discharges, not redistribute them.

Additional Green Infrastructure

Based on modeling numbers within the LTCP, total CSO volume entering Newtown Creek will be approximately 486 million gallons per year. This represents a 58% decrease from the baseline of 1,161 million gallons per year. There will thus continue to be a tremendous amount of untreated sewage and stormwater entering our waterway every year.

The LTCP should incorporate greater commitments to Green Infrastructure (GI) and stormwater capture. Many of the industrial areas that surround Newtown Creek have ample sidewalk space for rain gardens and rain barrels and large rooftops for blue and green roofs. We fully appreciate the value in targeting the 4 largest CSOs on Newtown Creek, but the LTCP does not offer reductions for the 18 other CSOs on the Creek. For instance, outfall BB-009 in Dutch Kills releases approximately 49 MGY and drains a large industrial area with little storm water mitigation currently in place. We believe increased financial investments and incentives for stormwater capture, as well as improved community planning, is necessary in improving long term water quality conditions in Newtown Creek.

While the DEP noted that it reviewed as part of its toolbox "additional green infrastructure" (i.e., beyond the minimum targets established by the currently enforceable green infrastructure consent order), the DEP failed to put into the LTCP any evidence whatsoever to this effect. In fact, at public meetings, the DEP indicated that the existing consent order GI work has already saturated the places it's feasible to install GI - a contention we thoroughly disagree with.

The LTCP contains no engineering assessments of green roof potential, no reviews of bioswales in entire sections of the Creek sewershed, and no analysis of the potential for aboveground rainwater capture along elevated highways or along manufacturing corridors. Nor was there any review of private property GI potential, opportunities to require more GI in redevelopment projects, or strategies that DEP separately has been exploring to massively scale-up a private property GI grant program. Weak allusions to existing actions and green-streets potential do not count as a *thorough review* of potential additional GI projects. There is a vast difference between meeting the 2012 GI Consent Order terms and reviewing the potential for additional GI in the Newtown Creek sewershed, and the DEP failed to fill that gap. This issue is even more timely given the State's decision to approve the GI Contingency Plan for the City in August 2017. The LTCP and the community deserve an actually thorough review of Newtown Creek specific GI potential - above the currently-mandated citywide minimum - not the DEP's immediate dismissal of GI program expansion. We ask that the LTCP be held as incomplete until such time as the DEP does a thorough GI review of the public and private GI potential in this drainage area.

Superfund Needs

CSOs are currently being investigated as sources of chemical contamination under the Superfund process. As with the Gowanus Canal, it is more than likely that the EPA will require CSO reductions and capture in Newtown Creek. We are concerned that the proposed LTCP may not satisfy potential EPA requirements, nor be flexible or adaptive enough to scale up should the EPA remediation plan so require. We ask that NYSDEC, NYCDEP and USEPA discuss and provide transparency to the community about this issue - specifically, how the proposed LTCP action would be expanded in the event that the EPA decision would require additional (or even complete) CSO capture as part of the Superfund process.

When we asked about this issue at a recent CAG meeting, the DEP stated that, in short, it had not developed this LTCP in a manner where it could be enlarged should the EPA so order. If this is incorrect, this must be clarified with the community and the EPA. Best management practices would dictate that planning one large infrastructure project be made with another one in mind - and this is certainly no exception.

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We are encouraged to see both agencies commit resources to seriously reduce CSO volumes in Newtown Creek. We are further encouraged to see previous plans (that only treat symptoms of CSOs, not the causes) re-examined and excluded in the new LTCP; specifically, the in-stream aeration for Dutch Kills and the main channel of Newtown Creek. We agree with NYCDEP that expanded aeration is a poor investment of resources and look forward to NYS DEC's decision to formally modify the existing consent order to reflect this.

We would be happy to discuss this letter, and anything else related to the Newtown Creek Superfund or CSO plans and processes, at your convenience.

Sincerely,

Willis Elkins	Sean Dixon
Program Manager	Senior Attorney
Newtown Creek Alliance	Riverkeeper

CC:

NYC Councilmember Elizabeth Crowley
NYC Councilmember Stephen Levin
NYC Councilmember Antonio Reynoso
NYC Councilmember Jimmy Van Bramer
Brooklyn Community Board 1
Queens Community Board 2
Queens Community Board 5
Brooklyn Borough President Eric Adams
Queens Borough President Melinda Katz
NYC Mayor Bill de Blasio
NYS Assemblymember Joseph Lentol
NYS Assemblymember Catherine Nolan
NYS Senator Martin Dilan
NYS Senator Michael Gianaris
U.S. Congresswoman Carolyn Maloney
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U.S. Congresswoman Nydia Velazquez
Steve Zahn, NYSDEC Region 2 Director
Gary Kline, NYSDEC Division of Water
Ian Bielby, NYSDEC Division of Environmental Remediation
Caroline Kwan, USEPA Newtown Creek Project Manager
Mark Schmidt, USEPA Newtown Creek Project Manager
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August 14, 2017

Via Electronic Mail

New York State Department of Environment and Conservation
Division of Water, Bureau of Water Compliance
625 Broadway
Albany, New York 12233-3506

New York City Department of Environmental Protection
96-05 Horace Harding Expressway
Corona, New York 11368

Re: Comments on the Newtown Creek LTCP

Dear Sir or Madam:

The Newtown Creek Group (NCG) appreciates the opportunity to submit these comments on the Newtown Creek Long-Term Control Plan (LTCP). The NCG, comprising Phelps Dodge Refining Corporation, Texaco, Inc., BP Products North America Inc., The Brooklyn Union Gas Company d/b/a National Grid NY, and ExxonMobil Oil Corporation, is conducting the Remedial Investigation/Feasibility Study (RI/FS) at the Newtown Creek National Priorities List (NPL) site pursuant to an Administrative Order on Consent (AOC) with the U.S. Environmental Protection Agency (USEPA), to which the City of New York is also a named party. The site boundary for the Newtown Creek NPL site and the waterbody of interest under the Newtown Creek LTCP process are one and the same waterbody. For that reason, the NCG has a direct interest in the LTCP process and evaluation of sources and the steps that the New York City Department of Environmental Protection (NYCDEP) takes pursuant to the LTCP to address the impacts on Newtown Creek of NYCDEP's ongoing discharges from its combined sewer overflow (CSO) and municipal separate storm sewer system (MS4) discharges into Newtown Creek.

Executive Summary

The NCG recognizes that the Clean Water Act LTCP process is not occurring in a vacuum. At the same time, USEPA is overseeing an RI/FS process for Newtown Creek under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). These two processes are intertwined and, in some cases, directly in conflict. In addition, decisions made in the LTCP process will interfere with the scope, timing, and effectiveness of any potential remedy under CERCLA. At Newtown Creek, the fundamental reality is that, even if the LTCP is successfully implemented precisely as proposed, the ongoing discharges from CSOs and MS4s into the foreseeable future will continue to load CERCLA hazardous substances, raw sewage, stormwater, solids, oil, sheens, and other contaminants into the creek. These ongoing uncontrolled loadings must be accounted for in the CERCLA process to avoid failure of the CERCLA remedy.

The Newtown Creek LTCP will have multiple crucial impacts on the CERCLA process:

1. **Installing LTCP controls may delay or prevent certain CERCLA actions**. The CERCLA process requires ongoing sources to be controlled early in the process in order to ensure the remedy does not fail. The LTCP controls are not scheduled to be complete until 2042, and consequently, the construction, operation, and maintenance of the controls could delay some or all CERCLA remedies for years or decades.

2. **The LTCP will not eliminate all CSO discharges or address discharges from MS4s or the Newtown Creek Wastewater Treatment Plant discharges into Whale Creek.** The uncontrolled CSO discharges that will remain after the proposed LTCP action is implemented—along with discharges from MS4s, the Newtown Creek wastewater treatment plant (WWTP), and other contributors such as the East River—will contribute to "urban background"[1] contamination in Newtown Creek. NYCDEP estimates that total discharges from point sources (including CSOs) and overland flow discharges into the creek amounts to a total baseline volume of 3,743 million gallons per year (MGY), including 1,162 million gallons from CSOs, 1,650 million gallons of treated effluent from the Newtown Creek WWTP (discharged at Whale Creek), and 404 million gallons from MS4 stormwater outfalls. The proposed LTCP calls for CSO discharges to decrease markedly by 2042, but it does not address discharge volumes from MS4 outfalls or the Newtown Creek WWTP.

3. **Future contamination from CSOs and MS4 discharges will contribute to urban background that will include CERCLA hazardous substances and other pollutants that create risks for human health and the aquatic community.** Significant CSO and MS4 discharges will continue after CSO controls are put in place. These discharges will contain hazardous substances such as those being evaluated by the CERCLA RI/FS (e.g., polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and metals). PCBs will continue to contribute to human health risks for recreational consumers of fish and crabs from the creek. Kayakers and others will be at risk from pathogens discharged from CSOs and MS4s. The aquatic community will continue to be impacted by or face risk from the following: 1) a complex mixture of organic compounds likely originating in large part from the CSOs and MS4s; 2) loadings of organic materials contributing to the

[1] The term "urban background" in this document refers to ongoing sources of sediment contamination via particulate deposition to Newtown Creek from the East River, CSOs, and MS4s.

production of ammonia and sulfide in the sediments, elevated sediment oxygen demand, and low dissolved oxygen (DO) concentrations in the water column, even if seasonal; and 3) pharmaceuticals and personal care products (PPCPs) that will continue to be discharged.

4. **The CERCLA process for Newtown Creek will have to account for these future uncontrolled loadings from CSOs and MS4s discharging to the creek**. The CERCLA process will have to take into account these continuing discharges of hazardous substances being evaluated by the CERCLA RI/FS (such as PAHs, PCBs, and metals). Furthermore, decision-making based on the CERCLA RI/FS will have to take into account the full suite of pollutants that impact human use of the creek and the aquatic community and that originate from CSOs, MS4s, and other continuing urban background sources.

The comments below cover each of these topics in further detail. These comments should inform USEPA's attempt to effectuate the CERCLA process in the same footprint of Newtown Creek as that addressed by the LTCP. The NCG takes no current position as to whether or when the City controls flows from its CSOs and MS4s, but it does believe the impacts on a CERCLA remedy are critical to understand and acknowledge in remedy selection.

Analysis of CSO and MS4 Contributions

1. Installing LTCP controls may delay or prevent certain CERCLA actions.[2]

USEPA (2013) has realized that "the CWA and CERCLA domains are intersecting with increased frequency on contaminated sediment sites, offering the opportunity for improved integration, including increasing collaboration between EPA, and state CWA program managers, CWA permittees, and responsible parties under CERCLA." USEPA has also noted that "CWA and CERCLA are inherently linked when sediment sites are considered, because surface water discharges can be sources of contamination to sediment, and contaminated sediment can be an ongoing source of contamination to surface water." Moreover, because of differences in the regulatory approach, "the effectiveness of Superfund remedies at urban sites may depend on successful coordination between regional CWA and CERCLA programs, throughout the entire RI/FS and remedy selection and implementation process."

This guidance from USEPA offers the proper approach to investigating and exploring the intersection of and conflicts between the CWA and CERCLA. If decisions in *either* regulatory program are made without full information, there could be a failure of *both* CWA and CERCLA

[2] See Appendix H1.

remedies. As written, however, the Newtown Creek LTCP does not investigate these conflicts, concluding only that the "data show that CSO discharges are not a significant source of hazardous substances in Newtown Creek" and noting that "the City expects the CSO control alternative selected in this LTCP . . . would be sufficient to address any CSO discharge controls that EPA may require under Superfund." (LTCP at ES-4, 1-3, 1-4). As discussed below, the data gathered by the NCG demonstrates that this is not the case.[3]

There are a number of inevitable conflicts between proposed LTCP controls and possible CERCLA actions. Most strikingly, since the proposed LTCP CSO controls will take so long to put in place, any CERCLA remedy may be delayed or prevented, in whole or in part. The CERCLA process requires ongoing sources to be controlled early in the process in order ensure the remedy does not fail. The LTCP provides descriptions of preliminary conceptual designs for the two preferred CSO controls, each of which presents major regulatory, logistical, and construction-related obstacles that will have to be overcome prior to project completion. The LTCP states that that the cumulative reduction from all CSO controls is predicted to be 71%, but implementation is not scheduled to be complete until 2042.

NYCDEP plans to construct two "preferred" CSO controls as a part of the Newtown Creek LTCP. The first control will reroute Dutch Kills CSO from outfall BB-026 through the expanded Borden Avenue Pumping Station (BAPS) to the Kent Avenue Gate Structure and then to the Newtown Creek WWTP. The Dutch Kills BAPS CSO rerouting project is scheduled to be completed in 2029 (LTCP at 9-2) and is predicted to reduce annual CSO volume to Newtown Creek by 110 MGY. The second control will provide underground tunnel storage for CSOs from the three largest Newtown Creek outfalls (LTCP at ES-5), which are located in English Kills (outfall NC-015), East Branch (outfall NC-083), and Maspeth Creek (outfall NC-077). The storage tunnel will include a tunnel dewatering pumping station (TDPS) that will pump the CSO waters stored in the tunnel to the Newtown Creek WWTP for treatment after wet-weather conditions have ended. The storage tunnel project is scheduled to be completed in 2042 and is predicted to reduce annual CSO volume to Newtown Creek by 584 MGY.

Predicted CSO volume reductions and predicted water quality improvements associated with future CSO controls and Newtown Creek modifications are not presented clearly in the LTCP, but the LTCP does show a modest 5% reduction in annual Newtown Creek CSO volume is predicted over the next 10 years (62 MGY of the current total of 1,161 MGY, due to bending weir installation). In 13 years (by 2030), the Dutch Kills BAPS CSO rerouting project and green infrastructure projects are scheduled to be completed, adding another 16% reduction in the predicted annual CSO volume reduction (110 MGY from rerouting and 83 MGY from green infrastructure). Thus, over the next 25 years, the Newtown Creek LTCP predicts only a modest

[3] The NCG recognizes that good data and methodology are the foundation of good decision-making. Unfortunately, the LTCP suffers from some flaws in both data collection and data analysis, which the NCG believes may undermine the conclusions reached in the LTCP. The NCG's analysis of the LTCP is included in Appendix H1.

21% annual Newtown Creek CSO volume reduction. More substantial CSO volume reductions do not appear to be scheduled to be implemented until 2042, 25 years from now. The storage tunnel is scheduled to be completed in 2042, resulting in an additional predicted annual CSO reduction of 584 MGY, which alone would represent a predicted 50% reduction of the current annual CSO volume discharged to Newtown Creek.

2. **The LTCP will not eliminate all CSO discharges or address discharges from MS4s or the Newtown Creek Wastewater Treatment Plant discharges into Whale Creek.**[4]

As discussed in Section 1, the cumulative reduction in CSO discharges as a result of all of the controls proposed in the LTCP is predicted to be 71%. However, this reduction still results in a baseline estimate of nearly half a billion gallons (454 million gallons) of combined sewage flow being discharged to Newtown Creek annually, assuming controls are implemented as planned. This volume estimate does not include discharges from the WWTP discharge at Whale Creek (a tributary to Newtown Creek) even though this discharge is listed as a CSO in Table 6-2 of the LTCP. It is assumed that volume remains unchanged at 1.6 billion gallons of treated effluent discharged directly to Newtown Creek each year. In addition to CSO flows, MS4 stormwater outfalls and direct drainage will continue to discharge 0.4 billion gallons and 0.5 billion gallons of stormwater a year respectively. Combined, the estimated point source discharges to Newtown Creek will still total more than 3 billion gallons per year. CERCLA hazardous substances and other pollutants discharged from these outfalls are further discussed in this section and in Appendix A1 and A2.

Current Discharges of Sewage, Freshwater, and Solids

Based on NYCDEP's 2015 point source model[5], the four largest CSO outfalls that discharge to the creek during episodic rain events (i.e., English Kills [NCB-015], East Branch [NCB-083], Maspeth Creek [NCQ-077], and Dutch Kills [BB-026]) have the following range of discharge characteristics:

- Annual discharge ranging between 100 and 600 MGY
- 40 to 80 CSO events per year (i.e., discharges during rain events)
- Discharge duration of 2 to 6 hours per event

Incorporating the suspended solids data collected as part of the RI, the solids loading from point sources can be estimated: current point source loadings account for approximately

[4] See Appendix A1.

[5] These statistics were developed based on the method for evaluating CSO discharge events using a geo-neutral version of NYCDEP's 2015 point source model documented in Anchor QEA (2016). NYC's LTCP document uses an updated version of their point source model, which incorporates CSO improvements that are still under construction and results in a reduction of estimated flows.

1,200 metric tons (more than 2.6 million pounds) of solids entering the creek each year, with CSOs accounting for between 50 and 60% of the total, and stormwater (including MS4s) accounting for a majority of the remaining point sources load.

Not only are these discharges large and frequent, but they have a residence time in the creek that is much longer than the duration of discharge. Based on the hydrodynamic data and modeling analyses reported in the draft RI Report (Anchor QEA 2016; see Appendix G of the draft RI Report for more detail), after a storm-related discharge, water and solids from CSOs can remain in the water column for 24 hours or longer, due to mixing and dispersion processes.

Moreover, the sediment transport model indicates that deposition of CSO and MS4 solids occurs throughout the creek, especially in the tributaries. Under current conditions, point source solids dominate deposition in English Kills, East Branch, and Maspeth Creek, with more than 80% of the sediment bed comprising CSO and stormwater solids and less than 20% of net sedimentation being due to East River solids in these tributaries. CSOs and stormwater solids make up nearly half of the total deposition in the Turning Basin. Considering the potential historical impacts of CSO and MS4 discharges, sediment transport model results indicate that a significant fraction of the surface sediments (i.e., the top 6 inches of sediment) in the upstream tributaries and the Turning Basin contain CSO and MS4 solids that were deposited over the last 10 to 30 years. More detailed results of the impacts of CSO and MS4 solids and the accompanying approach are discussed in Appendix A1.

The implication of these results is that the CSOs and MS4s discharge a large volume of water and a large mass of solids to Newtown Creek. Once a discharge event occurs, the discharged solids in the water column have ample opportunity to settle out on the sediment bed of the creek, and due to tidal mixing can be dispersed over much of the upper part of the creek, influencing creek water and sediment quality more broadly than the area immediately adjacent to the discharge point.

Sheens

In addition to freshwater and solids inputs, CSO and MS4 discharges introduce sheens into Newtown Creek. In 2017, the NCG performed a pipe sheen investigation during which sheens were observed emanating from CSOs and MS4s during storm events. The study was conducted during four storm events that occurred between April 25 and May 22, 2017, and included the monitoring of ten NYCDEP-owned discharges to Newtown Creek (seven CSOs and three MS4s) and collection and analysis of sheen samples for a suite of chemical analytes, including PAHs. Over the course of the four storm events, which ranged in magnitude from 0.36 to 2.44 inches of total precipitation, a total of 22 sheens (from a possible maximum of 40) were observed emanating from the NYCDEP-owned discharges. Note, the study focused on only ten NYCDEP-owned discharges; it did not include monitoring at the other more than 20 NYCDEP-owned CSOs and MS4s that discharge to Newtown Creek. Note also that these findings are corroborated by the Newtown Creek Alliance research that documented sheens emanating from several CSOs in their video survey (NCA 2017).

The sheens entering the creek from CSOs and MS4s contain contaminants, including hazardous substances being evaluated as part of the CERCLA RI/FS (such as PAHs, PCBs, and metals). For example, PAHs were measured in every sheen sample collected from the CSOs by the NCG. The sheens that were observed by the NCG to be emanating from CSOs and MS4 outfalls were found to have PAH fingerprints similar to the associated point source particulate and adjacent surface sediment samples, providing a consistent link between point source effluent, sheens emanating from point sources, and current surface sediment contamination. Thus, sheens provide a pathway by which contaminants enter the waters of the creek from CSOs and MS4s.

Present Day Organic Loadings

Surface sediment in the creek exhibits high concentrations of total organic carbon (TOC) compared with those normally found in natural estuarine systems, primarily due to ongoing discharges of solids from CSO and MS4 point sources. The bacterial decomposition of the more labile organic matter recently discharged from CSOs and MS4s results in a decrease in surface water DO concentration and an increase of toxic byproducts such as ammonia and sulfide. Organic material deposited historically (from industrial sources as well as past CSO and MS4 discharges) has already been largely degraded and mineralized to more recalcitrant forms over time and probably contributes to these effects to a lesser extent than organic material freshly discharged from CSOs and MS4s.

Ammonia and sulfide are known toxicants that impact benthic macroinvertebrates. Both are found in the sediments of Newtown Creek, particularly in locations impacted by CSO discharges, with porewater sulfide concentrations at levels above reported threshold effect levels for benthic macroinvertebrates (see Appendix A2). This has also been documented by NYCDEP, where they note that subtidal surface sediment with a TOC greater than 3% is likely contributing to impairment of the benthic macroinvertebrate community in Newtown Creek (Hyland et al. 2000, as cited in NYCDEP 2011).

Furthermore, low DO concentrations adversely affect the benthic macroinvertebrate community. This is made worse during the summer months when water temperatures are elevated and the bacterial degradation of organic matter is accelerated. The data presented in the LTCP indicate the DO concentration standard of 3 milligrams per liter (mg/L) is currently violated in the creek. Furthermore, a more complete evaluation (including sampling at the heads of the tributaries and sampling during wetter years) would likely produce more frequent violations than reported in the LTCP.

The extremely high load of organic matter entering the creek via CSOs is likely the primary cause of gas ebullition due to the anaerobic decomposition of the organic material by microbes. This may be an important process due to the potential for gas bubbles to transport contaminants, particularly nonaqueous phase liquid (NAPL), from the sediment to surface water. In ebullition surveys conducted by the NCG, apparent gas ebullition was more extensive and of a higher frequency in the tributaries and Turning Basin than in the main stem, consistent with higher labile organic matter inputs from CSOs in these parts of the creek.

Current Discharges of CERCLA Hazardous Substances

Data collected as part of the Newtown Creek RI demonstrate that CSO and MS4 discharges are ongoing sources of CERCLA hazardous substances to Newtown Creek. CERCLA hazardous substances were measured in samples collected from CSO and MS4 discharges in 2014 and 2015 as part of the Newtown Creek RI. PCBs, PAHs, and metals were detected in every CSO and MS4 sample collected during the RI, including samples that were analyzed separately for solid-associated chemicals and dissolved chemicals.

Because sediment deposition in the tributaries and Turning Basin is strongly influenced by the discharge of solids from the CSOs and MS4s, contaminant concentrations in surface sediment concentrations in the creek tributaries and Turning Basin are also strongly influenced by the CSOs and MS4s (see Appendix A3). Average concentrations of total PAHs (measured as the sum of 17 individual compounds; TPAH [17]), total PCBs (TPCB), and copper on particulate matter in Newtown Creek CSO and MS4 effluents exceeded those measured in other regional New York Harbor urban sites (i.e., the 14 Phase 1 reference areas sampled during the RI; *s*ee Appendix A1). The influence of point sources on water quality and surface sediment in the creek is also illustrated by a PAH fingerprinting analysis, which shows that PAHs from current and historical CSO discharges are present in the surface sediment of the tributaries (see Appendix A1). In the future, because of the influence of MS4s and remaining CSO discharges, surface sediment concentrations of these contaminants in the tributaries and Turning Basin? are likely to continue to exceed concentrations measured in the reference areas. This is a critical consideration for the characterization of urban background contamination as part of the CERCLA investigation.

Current Discharges of Unresolved Complex Mixtures of Organic Compounds

Chemical mixtures in urban sediments are complex and contain, in addition to CERCLA hazardous substances, an unresolved complex mixture (UCM) of organic compounds. Hydrocarbon UCMs have been shown to be associated with toxicity to benthic organisms. Recent research suggests that non-PAH petroleum hydrocarbons, including C19-C36 aliphatic fractions that are typically not considered to be toxic, may influence sediment toxicity test results due to physical effects for some invertebrates, including sensitive estuarine amphipods. The UCM is consistent with biodegraded petroleum, uncombusted petroleum, motor (crankcase) and hydraulic oils, or abraded asphalt. All of these have been documented as present in the urban environment and are conveyed via CSO and municipal stormwater point source discharges to urban waterways (Brownawell et al. 2007; Stout et al. 2004).

The importance of the UCM to the aquatic community within Newtown Creek was explored further in the draft RI Report using the sediment analyte C19-C36 aliphatics as a surrogate to represent the distribution of UCM and its potential impacts on benthic organisms. C19-C36 aliphatic hydrocarbons were observed in surface sediment throughout Newtown Creek. The highest concentrations were from samples in English Kills, East Branch, Maspeth Creek, and Dutch Kills, where large municipal point source discharges are located. Concentrations decline with distance downstream to the mouth of the creek, supporting the conclusion that the major CSOs and MS4s are important sources of C19-C36 aliphatics and, therefore, the UCM.

Additional insights can be gleaned from other organic analytes measured as part of the RI field program. Two isoprenoid compounds (phytane and pristane) are of particular interest due to their resistance to weathering, as well as their consistent presence in point source and surface sediment samples. Phytane and pristane are found in diesel and heavy fuel oils, so they are likely to be constituents of urban runoff that contributes to urban sediment. Estimated particulate phase concentrations of these compounds in point sources generally exceed or are similar to concentrations in surface sediment, and in some cases, a decreasing trend with distance downstream from the head of the tributaries is observed (e.g., East Branch). These results suggest that the major CSOs and MS4s have been and continue to be sources of phytane and pristane to the sediment. Furthermore, the sum of phytane and pristane covaries with C19-C36 aliphatics in surface sediment, which also supports the use of the sum of phytane and pristane as a reasonable proxy for the UCM.

Current Discharges of Pathogens, Pharmaceuticals, and Personal Care Products

Pathogens, pharmaceuticals, and personal care products include biogenic hormones (e.g., estrogens contained in birth control pills), personal care products (e.g., detergents, disinfectants) veterinary and human antibiotics, prescription and non-prescription drugs, plasticizers, pesticides and steroids. Numerous surveys over the past 10 to 15 years have indicated the widespread presence of 100 or more PPCPs in biosolids, surface waters, and even untreated human drinking water sources, most notably by the U.S. Geological Survey in its National Water Quality Assessment Project (Barnes et al. 2002; Focazio et al. 2008; Glassmeyer et al. 2005; Kolpin et al. 2002). Although most of these studies have focused on treated wastewater effluents as sources of pathogens, pharmaceuticals, and personal care products, untreated wastewater flows from CSOs also will contain these chemicals, and as such represent a significant source of pathogens, pharmaceuticals, and personal care products to Newtown Creek.

Contaminants from all three classes of these constituents (i.e., pathogens, pharmaceuticals, and personal care products) have been measured in the sediments of Newtown Creek (by NewFields and GEI in 2014 and the NCG in 2014 and 2017). These contaminants were found throughout Newtown Creek and exhibited the highest concentrations in the tributaries. As the major CSOs and MS4s are likely the major sources of these compounds in the sediment of the creek, these data confirm the spatial distribution of their discharges throughout the creek.

Pathogens and PPCPs are not only markers that indicate that materials discharging from the CSOs deposit throughout Newtown Creek, but they themselves affect the human and ecological communities. Pathogens cause disease in people, and their presence restricts human use of the creek. In addition, based on comparisons with water quality criteria, PPCPs are at levels in the sediment porewater that represent potentially significant chemical stressors to the aquatic community (see Appendix A2).

Conclusions – Future Conditions

In the future, even with the LTCP CSO controls in place, the MS4 discharges and a portion of the CSO discharges will continue to influence the water and surface sediment quality far from their discharge points. Discharges of CERCLA hazardous substances, UCMs, pathogens, and PPCPs will continue. Adverse impacts due to sheens will continue. MS4 discharges and a portion of the CSO discharges will continue to be important sources of organic matter to the surface water and sediment of the creek; these impacts are likely to be even greater than implied in NYC's LTCP. Thus, implementation of the LTCP will still result in impacts to the aquatic community and will still limit human use of the creek. This will put limits on the extent to which water and sediment quality conditions in the creek can be improved and this must be accounted for in the CERCLA process. More details are provided in Appendices A1, A2, and A3.

3. **Future contamination from CSOs and MS4 discharges will contribute to urban background that will include CERCLA hazardous substances and other pollutants that create risks for human health and the aquatic community.[6]**

As discussed in Section 2, a large suite of contaminants is found in the surface sediment and surface water of the creek, and CSOs and MS4s are current sources of many of them. Moreover, in the future, MS4s, along with partially controlled CSOs, will continue to contribute these contaminants to the surface water and surface sediment and will thus comprise a component of background contamination that must be considered in the CERCLA process. As discussed in the draft *Baseline Ecological Risk Assessment* (BERA; Anchor QEA 2017a) and final *Baseline Human Health Risk Assessment* (BHHRA; Anchor QEA 2017b), under present conditions, the contaminants currently present in the creek cause human health and ecological risks that exceed thresholds and risk ranges considered acceptable by USEPA. In the future, even after the LTCP actions are in place, risks to people and the environment are likely to remain and must be considered a consequence of the urban background contamination in decision-making based on the CERCLA process. These risks are discussed in this section.

[6] See Appendix A2.

Human Health Risks

Tissue concentrations of PCBs lead to estimated cancer and noncancer risks above the USEPA acceptable risk range for human consumption of fish and shellfish (see final BHHRA; Anchor QEA 2017b). Risks from PCBs due to recreational fish and shellfish consumption were also elevated in four regional reference areas; estimated cancer risks were at the upper end of USEPA's acceptable risk range or exceeded the acceptable risk range, and noncancer hazard indices exceeded the threshold of 1, indicating that PCB contamination is a regional issue.

Based upon data collected as part of the RI, average TPCB concentrations on particulate matter discharging from CSOs and MS4s exceed the average concentrations in surface sediment of the four regional reference areas. This means that CSOs and MS4s alone contribute PCBs at concentrations that, by themselves, would likely equal or exceed current regional levels. In fact, estimated future surface sediment concentrations for PCBs in English Kills, East Branch, and Maspeth Creek are in the range of approximately 0.5 to 1.0 milligrams per kilogram, for a range of LTCP scenarios (based on the mass balance calculations described in Appendix A3 of this document). This range is similar to or exceeds average concentrations measured in the reference area surface sediment samples.

These results suggest that even with CSO controls, future risks to recreational consumers of fish and shellfish are likely to be in the range similar to or above current regional risk levels. This also means that to the extent that regional urban contamination is sufficient to maintain New York State fish advisories, such advisories will continue into the future in Newtown Creek, even with the proposed LTCP. Without achievement of fishable/swimmable criteria, human use of Newtown Creek will continue to be limited in the future.

Ecological Risks

Contaminants currently in the surface sediment of Newtown Creek lead to measurable toxicity to benthic organisms. In 10-day and 28-day sediment toxicity tests conducted with the benthic macroinvertebrate *Leptocheirus plumulosus*, reduced survival, growth, and reproduction were observed at locations near CSOs in creek mile (CM) 2+ and in Dutch Kills, Maspeth Creek, English Kills, and East Branch (see draft BERA Figure 8-13 of Anchor QEA 2017a). Concentrations of CERCLA hazardous substances in porewater explain toxicity at many locations. However, at other locations, particularly in the vicinity of the larger CSOs and MS4s, porewater concentrations of CERCLA hazardous substances were too low to explain the observed toxicity (see Anchor QEA 2017a).

These factors were investigated in a follow-up sediment toxicity study conducted by the NCG in April and May of 2017 (see Appendix A2). The study included sediment toxicity tests and complimentary bulk sediment and porewater chemistry for samples collected from locations in Dutch Kills, Maspeth Creek, East Branch, English Kills, and Newtown Creek. Sediment toxicity tests were performed using the amphipod *Leptocheirus* (the same test organism used in the Newton Creek draft BERA) and another amphipod (*Ampelisca abdita*) to test for differences in amphipod sensitivity to sulfides, UCM, and CERCLA hazardous substances. To evaluate the physical effects of bulk sediment UCM on amphipod survival, observations of amphipod fouling were also made during the test period.

In summary, the sediment toxicity tests showed that for samples collected close to CSOs and MS4s, factors other than CERCLA hazardous substances are likely contributing to benthic macroinvertebrate toxicity. These other stressors include high organic matter leading to sediment porewater sulfide concentrations above threshold values, measured sediment porewater concentrations of PPCPs above threshold values, and elevated concentrations of bulk sediment UCM that results in a physical fouling of the organisms. In the future, CSO and MS4 discharges remaining after implementation of the LTCP will continue to contribute to the loading of organic matter, PPCPs, and UCM to the creek, contributing to risks to benthic organisms. Additional detail is provided in Appendix A2.

4. **The CERCLA process for Newtown Creek will have to account for these future uncontrolled loadings from CSOs and MS4s discharging to the creek.**

Given the significant influence of NYC's discharges on the creek and its sediments, currently and in the future following implementation of the LTCP actions, the CERCLA process will need to recognize the limitations imposed by these discharges. Specifically, these discharges will ultimately influence the composition and level of urban background conditions of the creek and future chemical equilibrium concentrations within surface sediment. Thus, the possible remedies under CERCLA to mitigate risks associated with CERCLA hazardous substances are necessarily affected by these discharges, especially with respect to cleanup goals (e.g., preliminary remediation goals [PRGs]), which may include numeric targets for concentrations of chemicals in the sediment. The CERCLA process and any PRGs developed for the Newtown Creek RI/FS will have to account for these future uncontrolled loadings from CSOs and MS4s discharging to the creek, in conjunction with other urban background sources in the greater New York harbor area. Incremental risks due to CERCLA hazardous substances will be overestimated if these background risks are not accounted for in the development of PRGs.

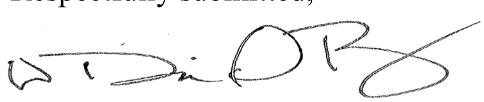
To demonstrate the importance of these ongoing discharges to the CERCLA process, an evaluation was developed to quantitatively estimate future equilibrium surface sediment contaminant concentrations that would reestablish following a hypothetical CERCLA remediation of the existing sediments. A full description of the evaluation is provided in Appendix A3, and a summary is as follows.

The evaluation developed quantitative estimates of long-term equilibrium surface sediment concentrations of key CERCLA hazardous substances in the tributaries and the upper main stem reaches of the creek based on a combination of the following: 1) predictions of future sediment loads and sedimentation rates in the creek (based on the NCG sediment transport model); and 2) CSO and MS4 contaminant concentration data collected as part of the USEPA-approved RI sampling. The analysis was conducted for current CSO conditions, as well as CSO control scenarios consistent with those evaluated in the LTCP (i.e., baseline as well as a range of CSO flow reductions).

The results of the evaluation show that reducing CSO flows, and therefore solids loads, will result in decreases in predicted net sedimentation rates (NSRs) in the creek, most prominently in the portions that are most influenced by CSO discharges (i.e., the upstream tributaries and the Turning Basin). However, a byproduct of these decreases in NSR is that the relative influence of stormwater solids in the upstream tributaries will increase, with MS4s representing the dominant contributor to sedimentation under the LTCP CSO control scenario. Due to the influence of stormwater, including MS4s, LTCP actions to reduce CSO activity will not eliminate the potential for future recontamination. In fact, in many cases predicted equilibrium surface sediment chemical concentrations increase with CSO control, due to the increased influences of stormwater on NSRs and the relatively higher contaminant concentrations of stormwater solids (as compared to CSO solids) measured as part of the RI point source sampling. Thus, these results show that LTCP control scenarios will have little influence on future recontamination levels and that the other ongoing stormwater discharges (namely MS4s) will result in future sedimentation at concentrations that need to be considered when setting PRGs for the CERCLA remedy.

Overall, the evaluation illustrates the strong influence of stormwater solids on future surface sediment equilibrium in cases with CSO control. Thus, the goals for the CERCLA remedy, including PRG selection, will need to consider this reality.

Respectfully submitted,



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APPENDIX A1
CONTRIBUTION OF CSOS AND MS4S TO CONTAMINATION IN NEWTOWN CREEK

CONTRIBUTION OF CSOS AND MS4S TO CONTAMINATION IN NEWTOWN CREEK

1 INTRODUCTION

As discussed in the main body of the Newtown Creek Group's (NCG's) comments on the Long-Term Control Plan (LTCP), combined sewer overflows (CSOs) and municipal separate storm sewer systems (MS4s) are significant ongoing sources of sewage, freshwater, solids, sheens, and contaminants to Newtown Creek, in particular to the tributaries and Turning Basin. These loadings adversely affect human health and human use of Newtown Creek, are toxic to ecological receptors, and degrade habitat quality.

This appendix provides details that document these ongoing sources. With the exception of the at-risk data presented in Section 7 (i.e., pathogens, etc.) all data evaluated in this appendix were collected and analyzed as part of the U.S. Environmental Protection Agency-approved work plans that are part of the Remedial Investigation (RI) for Newtown Creek. Specifically, in the sections that follow, site-specific data, observations, and modeling results are presented to illustrate that CSOs and MS4s are ongoing sources of the following:

- Sewage, freshwater, and solids (Section 2)
- Sheens (Section 3)
- Organic loadings (Section 4)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substances (Section 5)
- Unresolved complex mixtures of organic compounds (Section 6)
- Pathogens, and pharmaceuticals and personal care products (PPCPs) (Section 7)

2 SEWAGE, FRESHWATER, AND SOLIDS

The draft *Remedial Investigation Report* (RI Report; Anchor QEA 2016) provides a robust quantification of the effects of New York City Department of Environmental Protection's (NYCDEP's) discharges on the hydrodynamics and sediment transport within the creek. This was based on the following suite of models: a landside model developed by NYCDEP that estimates flows from point sources into Newtown Creek and its tributaries; and hydrodynamic and sediment transport models developed for Newtown Creek and its tributaries by the NCG. These models incorporate a wide body of site-specific data, as discussed in the RI Report and its appendices. The results of these models are summarized in the remainder of this section, focusing on the nature of these discharges and how they mix within the Newtown Creek water column and affect sediment loading and net sedimentation rates (NSRs[1]).

NYCDEP's 2015 point source model characterizes CSO and stormwater discharge events. A diagnostic analysis of a geographically neutral (geo-neutral) version of the 2015 model results for the 5-year period from 2008 through 2012 was conducted as part of the RI (Anchor QEA 2016). This shows that the four largest CSO outfalls (i.e., English Kills [NCB-015], East Branch [NCB-083], Maspeth Creek [NCQ-077], and Dutch Kills [BB-026]), which discharge to the creek during episodic rain events, have the following range of discharge characteristics[2]:

- Annual discharge ranging between 100 and 600 million gallons per year
- 40 to 80 CSO events per year (i.e., discharges during rain events)
- Discharge duration of 2 to 6 hours per event

Not only are these discharges large and frequent, but they have a residence time in the creek that is much longer than the duration of discharge. The following are the primary findings

[1] The NSR is the long-term average rate at which sediments deposit in a particular area; this average may include shorter time periods when erosion or sedimentation may occur, but on average more sedimentation occurs than erosion.

[2] These statistics were developed based on the method for evaluating CSO discharge events using a geo-neutral version of NYCDEP's 2015 point source model documented in Anchor QEA (2016). NYCDEP's LTCP document uses an updated version of their point source model, which incorporates CSO improvements that are still under construction and results in a reduction of estimated flows.

of the hydrodynamic data and modeling analyses reported in the RI Report (Anchor QEA 2016; see Appendix G of the RI Report for more detail):

- During dry weather conditions (i.e., minimal inflow of freshwater from point source and overland flow discharges), the hydrodynamics in the creek are primarily affected by East River tidal circulation.
- During wet weather conditions, when freshwater is discharged into the creek from point sources and overland flow, stratified flow conditions can develop in the creek, with less-dense, fresher water flowing toward the East River in a surface layer, and denser, more saline water flowing inland in a bottom layer. Following a point sources discharge event (e.g., typically on the order of 2 to 6 hours), stratified conditions typically exist for less than 24 hours within the creek and its tributaries. However; water and solids discharged from CSOs can remain in the water column for 24 hours or longer, due to mixing and dispersion processes. For example, a 1.5-day tracer simulation was conducted with the hydrodynamic model during a precipitation event in which 1.8 inches of rain fell, and discharges from the four largest CSOs lasted 4 to 6 hours. The results from this simulation showed that tracer concentrations in the upper portions of the creek remained more than 50% of the CSO release concentration for over 12 hours following the event and remained at 25% of the release concentration at the end of the 1.5-day simulation.

The sediment transport model developed by the NCG uses inputs on solids loadings (based on flows from the 2015 geo-neutral version of NYCDEP's point source model and total suspended sediment concentration data from the RI sampling program) to simulate solids deposition patterns within the creek (see Appendices E and G of the RI Report [Anchor QEA 2016] for more detail). Point sources account for approximately 1,200 metric tons (more than 2.6 million pounds) of solids entering the creek each year, with CSOs accounting for between 50 and 60% of the total, and stormwater (including MS4s) accounting for a majority of the remaining point sources load.

The sediment transport model indicates that deposition of CSO and MS4 solids occurs throughout the creek and their relative contribution to total deposition is highest in the tributaries (see Figure A1-1). A summary of these results broken out by sections of Newtown Creek (reaches) is presented in Figure A1-2. Under current conditions, point source solids dominate deposition in English Kills, East Branch, and Maspeth Creek, with more than 80% of the sediment bed being from CSOs and stormwater solids and less than 20% of net sedimentation being due to East River solids in these tributaries. CSOs and stormwater solids make up nearly half of the total deposition in the Turning Basin (i.e., creek mile [CM] 2+), whereas East River solids from tidal flows dominate deposition in the lower 2 miles of the creek, Dutch Kills and Whale Creek.

Sediment transport model predictions were also used to understand the potential historical impacts of CSO and MS4 discharges on the surface sediment layer (i.e., the top 6 inches of sediment) being evaluated as part of the CERCLA Remedial Investigation/Feasibility Study (RI/FS). Model-predicted residence times in the surface sediment layer were calculated based on predicted net sedimentation rates, as presented in Figure A1-3. When these results are evaluated for areas where CSO and MS4 solids comprise a significant portion of the sediment bed (see Figure A1-2), they show that the upstream tributaries and Turning Basin contain a significant fraction of CSO and MS4 solids in the surface sediment that were deposited over the last 10 to 30 years.

The implication of these results is as follows: CSOs and MS4s discharge a large volume of water and a large mass of solids to Newtown Creek. Once a discharge event occurs, the discharged solids in the water column have ample opportunity to settle out on the sediment bed of the creek; and due to tidal mixing can be dispersed over much of the creek, influencing creek water and sediment quality more broadly than the area immediately adjacent to the discharge point. In the future, even with the LTCP actions fully in place, MS4 discharges and a portion of the CSO discharges will continue to influence the water and surface sediment quality far from the discharge points (see Appendix A3 for more detail).

3 SHEENS

In addition to freshwater and solids inputs, CSO and MS4 discharges introduce sheens into Newtown Creek. In 2017, the NCG performed a pipe sheen investigation during which sheens were observed emanating from CSOs and MS4s during storm events. The study was conducted during four storm events that occurred between April 25 and May 22, 2017, and included the monitoring of ten NYCDEP-owned discharges to Newtown Creek (seven CSOs and three MS4s) as well as the collection and analysis of sheen samples for a suite of chemical analytes, including polycyclic aromatic hydrocarbons (PAHs). Over the course of the four storm events, which ranged in magnitude from 0.36 to 2.44 inches of total precipitation, a total of 22 sheens (from a possible maximum of 40) were observed emanating from the NYCDEP-owned discharges (see Figure A1-4). Note the study focused on only the ten NYCDEP-owned discharges shown in Figure A1-4; it did not include monitoring at the other more than 20 NYCDEP-owned CSOs and MS4s that discharge to Newtown Creek. Finally, these findings are corroborated by the Newtown Creek Alliance research that documented sheens emanating from several CSOs in their video survey (NCA 2017).

The sheens entering the creek from CSOs and MS4s contain contaminants, including hazardous substances being evaluated as part of the CERCLA RI/FS (such as PAHs, polychlorinated biphenyls [PCBs], and metals). For example, PAHs were measured in every sheen sample collected in Newtown Creek by the NCG

In conclusion, sheens discharge from CSOs and MS4s under current conditions. In the future, even with the LTCP actions in place, MS4 discharges and a portion of the CSO discharges will continue. As a result, the adverse impacts due to sheens will continue.

4 ORGANIC LOADINGS

Surface sediment in the creek exhibits high concentrations of total organic carbon (TOC) compared with those normally found in natural estuarine systems, due primarily to discharges of solids from CSO and MS4 point sources. TOC concentrations in the Study Area range from 0.23 to 26 weight percent (wt%), with a median value of 8.4 wt% (see Figure A1-5). TOC concentrations above 3 to 4 wt% are considered high (Ecology 2015), compared with aquatic systems that do not have strong local sources of organic matter, and are consistent with high organic loads from the large CSOs at the heads of the tributaries and the depositional nature of the creek. The spatial distribution of surface sediment TOC provides further evidence of the key role played by the CSOs in discharging organic matter into the creek, and in particular, the tributaries and Turing Basin. Lower TOC concentrations are found in the main stem below CM 2, where East River inputs play a more important role. As discussed in Section 2, the TOC range is 0.23 to 10 wt%, and median is 4.5 wt%). Higher TOC concentrations are found above CM 2 and the Turning Basin (range is 3.4 to 26 wt%, and median is 9.3 wt%), while the highest concentrations are in the tributaries (range is 0.80 to 20 wt%, and median is 11 wt%).

The bacterial decomposition of organic matter recently discharged from CSOs and MS4s results in a decrease in surface water dissolved oxygen (DO) concentration and an increased concentration of toxic byproducts such as ammonia and sulfide (Diaz and Rosenberg 1995; Hyland et al. 2005; Norton et al. 2002; Pelletier et al. 2011). Historically deposited organic material has already been largely degraded and mineralized to more recalcitrant forms over time. In contrast, recently deposited organic matter released from CSOs and MS4s is more labile and likely has a higher sediment oxygen demand (SOD) (Howarth et al. 2006; Taylor and Owens 2009). Ammonia and sulfide are known toxicants that impact benthic macroinvertebrates (Caldwell 2005; Inouye et al. 2015). Both are found in the sediments of Newtown Creek, particularly in locations impacted by CSO discharges, with porewater sulfide concentrations at levels above reported threshold effect levels for benthic macroinvertebrates (see Appendix A2). This has also been documented by NYCDEP, where they note that subtidal surface sediment with a TOC greater than 3% is likely contributing to impairment of the benthic macroinvertebrate community in Newtown Creek (Hyland et al. 2000, as cited in NYCDEP 2011).

Furthermore, a DO concentration less than 2 milligrams per liter (mg/L) results in hypoxic conditions that adversely affect the respiration of benthic macroinvertebrates (CENR 2010; Gray et al. 2002; Brown et al. 2000) and can result in local extinction, except for the microbial community (CENR 2010; Llanso 1992). This condition is made worse during the summer months, when water temperatures are elevated and the bacterial degradation of organic matter is accelerated (Gray et al. 2002). During the summer Phase 1 RI surveys in 2012, surface water DO concentration at depth fell below the New York State Class SD threshold of 3 mg/L, particularly in the tributaries. Based on a benthic community survey conducted at the time, no macroinvertebrates were found at tributary stations (see Appendix I of Anchor QEA 2014).

While elevated TOC itself can be problematic for benthic organisms (see Appendix A2), it can also enhance the process of gas ebullition. Gas ebullition is the formation of gas bubbles in highly organic rich sediment due to the anaerobic decomposition of the organic material by microbes. This may be a contaminant transport process, due to the potential for gas bubbles to transport contaminants, particularly nonaqueous phase liquid (NAPL), from the sediment to surface water. The organic material in sediment that can be considered the feedstock for gas ebullition may originate from different sources, including naturally occurring marine vegetation and organisms (Amos and Mayer 2006); discharges of organic rich materials, including fecal material and other anthropogenic organic material from CSOs; and other organic contaminants. Portions of the creek (i.e., the tributaries and Turning Basin) are high in organic matter due to CSO inputs and, as a result, have a higher potential for gas ebullition (Viana et al. 2012). In ebullition surveys conducted by the NCG, apparent gas ebullition was more extensive and of a higher frequency in the tributaries and Turning Basin than in the main stem, consistent with a higher concentration of labile organic matter inputs from CSOs.

The data analysis presented in the LTCP provides an incomplete assessment of water quality under current conditions:

- **Incomplete spatial coverage**. The LTCP provides water quality data at multiple stations throughout Newtown Creek (see LTCP Figure ES-4). LTCP Table ES-6 presents model results for these sampling locations. The most upstream NYCDEP station in English Kills, NC14, is approximately 0.3 mile downstream from the head of the tributary. As part of the RI, water quality was measured at multiple locations throughout Newtown Creek, including multiple stations within English Kills, with one station (RI station EK022SW) upstream of NC14 in English Kills. DO concentrations at this RI location (and the rest of English Kills) are summarized in Figure A1-6. The data shown represent pooled DO measurements (i.e., all sampling events and depths) collected during Phase 2 of the RI from May to September 2004. The median DO concentration at RI station EK022SW was lower than 3 mg/L (i.e., the water quality standard was violated more than 50% of the time). This contrasts with NYCDEP station NC14, where the standard was violated during the 2016 sampling period approximately 30% of the time (estimated visually from the box plot in LTCP Figure ES-9). Thus, NYCDEP's characterization of water quality in English Kills is incomplete; by not utilizing the RI/FS water column data that was part of the CERCLA investigation, NYCDEP does not fully characterize current water quality and future conditions under the proposed LTCP near the CSO discharge areas.

- **Characterization of current conditions**. The LTCP characterizes current DO concentrations using data collected in 2016. Although NYCDEP's Harbor Survey Monitoring Program includes data for the period 2013 through 2016, and NYCDEP has been collecting harbor-wide data since 1909, only the 2016 data are included in the LTCP; the reason is not given. To investigate the potential impacts of this limitation of the model results and data presentation, the NYCDEP data for the four long-term stations within Newtown Creek (NC0, NC1, NC2, and NC3) were evaluated over the period 2003 through 2016. Because water quality conditions are related to precipitation in this CSO- and MS4-dominated system, the metrics used in this analysis were total precipitation from May through September (in inches) and the frequency with which DO concentrations less than 3.0 mg/L were measured. The relationships between these metrics for each NYCDEP's long-term Newtown Creek station are presented in Figure A1-7. The frequency of violation of the standard is correlated with total precipitation at all stations (see footnote for description of data treatment). The most recent years, 2014 to 2016, turn out to have low precipitation, suggesting that water quality in these years may not be representative of long-term conditions. In fact, Figure A1-7 indicates the DO concentration standard was violated to a greater degree in other, wetter years. Similarly, violations under wetter years may be more frequent than in 2008, which was used in the model to establish rainfall conditions. Use of a year with conditions that are more conservative would be in line with a typical CERCLA process. Therefore, in characterizing current and future conditions, the LTCP should include the full range of measured total precipitation.

In conclusion, organic loadings affect the aquatic community in multiple ways under current conditions. In the future, even with the LTCP actions in place, MS4 discharges and a portion of the CSO discharges will continue to be important sources of organic matter to the surface water and sediment of the creek. These impacts will include the degradation of habitat due to the production of toxic byproducts (ammonia and sulfide), as well as the potential transport of contaminants due to ebullition. These impacts are likely to be even greater than implied in NYCDEP's LTCP. Thus, there will still be impacts to the benthic community even after complete implementation of the LTCP, which will need to be accounted for in the CERCLA process.

5 CERCLA HAZARDOUS SUBSTANCES

Data collected as part of the Newtown Creek RI demonstrate that CSO and MS4 discharges are ongoing sources of CERCLA hazardous substances to Newtown Creek.

CERCLA hazardous substances were measured in samples collected from CSO and MS4 discharges in 2014 and 2015 as part of the Newtown Creek RI. PCBs, PAHs, and metals were detected in every CSO and MS4 sample collected during the RI, including samples that were analyzed separately for solid-associated chemicals and dissolved chemicals.

Moreover, average concentrations of total PAHs (measured as the sum of 17 individual compounds; TPAH [17]), total PCBs (TPCB), and copper on particulate matter in Newtown Creek CSO and MS4 effluents exceeded those measured in other regional New York Harbor urban sites (i.e., termed reference areas[3]) (see Table A1-1).[4] Because sediment deposition in the tributaries and Turning Basin is strongly influenced by the discharge of solids from the CSOs and MS4s (see Section 2 in this appendix), contaminant concentrations in surface sediment in the creek tributaries and Turning Basin are strongly influenced by the CSOs and MS4s (see Appendix A3). Therefore, future surface sediment concentrations in the tributaries and Turning Basin are likely to continue to exceed concentrations measured in the reference areas. This is a critical consideration for the characterization of urban background contamination as part of the CERCLA investigation.

The influence of point sources on water quality and surface sediment quality in the creek is also illustrated by a PAH fingerprinting analysis, which shows that PAHs from current and historical CSO discharges are present in the surface sediment of the tributaries. PAH fingerprinting analysis rests on the fact that the relative abundance of individual PAHs in various sources differs based on such factors as temperature of formation, nature of the feedstock, and nature of the process. These differences allow the use of ratios of

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[3] As part of the RI, sediment data were collected from 14 urban reference areas to evaluate background conditions for comparison with Newtown Creek (Anchor QEA 2017). These locations were tidal inlets in the New York Harbor area, selected to represent a range of conditions with respect to levels of industrial influence and levels of CSO impact.

[4] Particulate concentrations in point source effluents were based on a combination of measurements and calculation from water samples, as described in Section 5.1.3.2 and Appendix E (Attachment E-C) of the RI Report (Anchor QEA 2017).

concentrations of individual PAHs for the purpose of discriminating PAH sources (EPRI 2008). One such ratio that is often used in PAH forensic studies is fluoranthene to pyrene (FL/PY) (Yunker et al. 2002). Figure A1-8 shows the FL/PY ratio in surface sediment and particulate matter in point source effluents. FL/PY values in the measured point sources generally range from 1 to 1.5. Values in surface sediment deposited at the heads of the tributaries (i.e., near the major CSOs) are similar. FL/PY values in surface sediment then decline with distance downstream within the tributaries, reaching values that generally range from 0.6 to 1 in the Turning Basin and main stem of Newtown Creek. The similarity of point source FL/PY values to nearby sediments and the gradual decline moving away from the point sources together indicate that at least some portion of the PAHs present in the tributaries originated from the point source discharges and that the major CSOs are ongoing sources of PAHs to the surface sediment.

In addition, the sheens observed by NCG to be emanating from CSOs and MS4 outfalls (see Section 3) have FL/PY ratios similar to the associated point source particulate and adjacent surface sediment samples (i.e., FL/PY ratios in 2017 sheen samples are nearly all in the range of 1 to 1.5; see Figure A1-9), consistent with sheen observations, and consistent with a contribution from point sources to current surface sediment contamination.

Finally, two other PAH metrics were employed to aid in understanding the sources of contaminants to the sheens: 1) the percentage of alkylated PAHs in the total PAHs (considering only PAHs with three or more rings); and 2) the proportion of high-molecular-weight PAHs (defined as those having four or more rings; HPAHs) to total PAHs.[5] These metrics were calculated for both 2017 pipe sheen samples and the associated CSO/MS4 particulate values based on samples collected as part of the RI.[6] When matched up by point source, the value of these metrics in the point source particulate phase samples and the associated 2017 sheen samples have similar percentages of alkylated PAHs and similar ratios of HPAH/total PAH (see Figure A1-10). These results support the conclusion that CSOs and MS4s are sources of surface water sheens and the CERCLA hazardous substances associated with them.

[5] Total PAHs in these calculations includes only those with three or more rings

[6] Samples collected from point sources include a subset of samples with separate particulate and dissolved measurements, and some total water samples, for which particulate phase was calculated (Anchor QEA 2017).

In summary, CSOs and MS4s are sources of sheens and CERCLA hazardous substances under current conditions. In the future, even with the LTCP controls in place, MS4 discharges and a portion of the CSO discharges will continue to be important sources of sheens and CERCLA hazardous substances to the surface water and sediment of the creek. These conclusions are based on several lines of evidence, including the presence of CERCLA hazardous substances in CSO and MS4 effluents; the observation of sheens emanating from CSOs and MS4s; the measurement of CERCLA hazardous substances in those sheens; forensic analyses of point source, sheen, and surface sediment PAHs; and the observation that chemical concentrations on point source particulate matter exceed reference area sediment data. This will put limits on the extent to which water and sediment quality conditions in the creek can be improved in the CERCLA process.

6 UNRESOLVED COMPLEX MIXTURES OF ORGANIC COMPOUNDS

Chemical mixtures in urban sediments are complex and contain, in addition to CERCLA hazardous substances, an unresolved complex mixture (UCM) of organic compounds. Hydrocarbon UCM has been shown to be associated with toxicity to benthic organisms (Scarlett et al. 2007) and may be a potential confounding factor in the evaluation of benthic toxicity. Recent research suggests that non-PAH petroleum hydrocarbons, including C19-C36 aliphatic fractions that are typically not considered to be toxic (Battelle 2007), may influence sediment toxicity test results due to physical effects for some invertebrates, including sensitive estuarine amphipods (Mount 2010; Stanley et al. 2010). This UCM can comprise up to 20% of TOC (White et al. 2013; Brownawell et al. 2007). Stout et al. (2004) compared the nature and amount of total extractable petroleum hydrocarbons (EPHs) and PAHs, including alkylated PAHs, within 280 surficial sediments from nine, well-studied urban waterways on the east and west coasts of the United States. Although variable by site, the UCM, per Stout et al. (2004), is consistent with biodegraded petroleum, uncombusted petroleum, motor (crankcase) and hydraulic oils, or abraded asphalt. All of these compounds are present in the urban environment and are conveyed via CSO and municipal stormwater point source discharges to urban waterways.

The importance of UCM to the aquatic community within Newtown Creek was explored further in the RI Report (Anchor QEA 2016). The sediment analyte “C19-C36 aliphatics” was used as a surrogate to represent the distribution of UCM and its potential impacts on benthic organisms, based on laboratory work of Mount (2010) and Stanley et al. (2010). These authors used mineral oil to represent non-PAH petroleum hydrocarbons and reported on an adverse physical effect to test organisms through the adhesion and fouling of the respiratory structures that would impair breathing (i.e., smothering). The EPH C19-C36 aliphatic fraction was considered the best bulk sediment EPH fraction to compare with the mineral oil used in the studies by Mount and Stanley on the basis of physical properties (i.e., low solubility, high log octanol/water partition coefficient [Kow], and similar boiling points). Concentrations of C19-C36 aliphatics in Newtown Creek range from 19 to 17,000 milligrams per kilogram (Anchor QEA 2016). These concentrations are consistent with UCM of solvent-extractable matter in urban estuarine sediment (Frysinger et al. 2003; White et al. 2013; Eganhouse and Sherblom 2001). Most importantly, the highest C19-C36 aliphatic hydrocarbon concentrations are from samples in English Kills, East Branch, Maspeth Creek, and Dutch Kills, in which large municipal point source discharges are located. Furthermore, concentrations in surface sediment of the creek have a spatial pattern of a general decline with distance downstream to the mouth of the creek, supporting the conclusion that the major CSOs and MS4s are important sources of C19-C36 aliphatics, and therefore the UCM (see Figure A1-11).

Additional insights can be gleaned from other organic analytes measured as part of the RI field program. Two isoprenoid compounds (phytane and pristane) are of particular interest, due to their resistance to weathering, as well as their consistent presence in point source and surface sediment samples. Phytane and pristane are found in diesel and heavy fuel oils, and are likely to be constituents of urban runoff that contributes to urban sediment. Estimated particulate phase concentrations of these compounds in point sources are compared with surface sediment data in Figure A1-12a and A1-12b. As can be seen, concentrations for these two compounds in point sources generally exceed or are similar to concentrations in surface sediment, and in some cases, a decreasing concentration trend with distance downstream from the head of the tributaries is observed (e.g., East Branch). These results suggest that the major CSOs and MS4s have been and continue to be sources of phytane and pristane to the sediment. Furthermore, the sum of phytane and pristane covaries with C19-C36 aliphatics in surface sediment (see Figure A1-13), which supports the use of the sum of phytane and pristane as an additional reasonable proxy for UCM.

In summary, these results support the conclusion that CSOs and MS4s are potentially a primary source of a UCM of organic compounds that impact the benthic community, distinct from CERCLA hazardous substances (see also Section 5). In the future, even with the LTCP actions in place, MS4 discharges and a portion of the CSO discharges will continue to be important sources of UCM constituents to the surface water and sediment of the creek, and these will continue to impact the benthic environment.

7 PATHOGENS, AND PHARMACEUTICALS AND PERSONAL CARE PRODUCTS

The effects of pathogens and PPCPs in the aquatic environment are becoming increasingly well-known, owing to numerous studies that have focused on municipal wastewater effluents as significant sources of many chemicals of emerging concern to human health and the environment. Such chemicals include biogenic hormones (e.g., estrogens contained in birth control pills), personal care products (e.g., detergents, disinfectants), veterinary and human antibiotics, prescription and non-prescription drugs, plasticizers, pesticides, and steroids (Kolpin et al. 2002; Anderson 2008). Numerous surveys over the past 10 to 15 years have indicated the widespread presence of 100 or more pathogens and PPCPs in biosolids, surface waters, and even untreated human drinking water sources, most notably by the USGS (USGS; Barnes et al. 2002, Kolpin et al. 2002, Glassmeyer et al. 2005, Kinney et al. 2006, Focazio et al. 2008) and their National Water Quality Assessment Program. While most of these studies have focused on treated wastewater effluents as sources of pathogens and PPCPs, untreated wastewater flows from CSOs will also contain these chemicals, and as such will provide a significant exposure pathway of pathogens and PPCPs to Newtown Creek.

Contaminants from all classes of these constituents (i.e., pathogens and PPCPs) have been measured in the sediments of Newtown Creek (by NewFields and GEI in 2014 and NCG in 2014 and 2017). These contaminants were found throughout Newtown Creek and exhibited the highest concentrations in the tributaries, as discussed in the following text.

The pathogen data indicate that releases from the CSOs and MS4s have contaminated the entirety of Newtown Creek. *Clostridium perfringens* is a spore-forming bacterium with relatively extended survival in sediments and so represents another tracer of sewage-related particle deposition patterns within the creek. Data on *C. perfringens* in surface sediment (see Figure A1-14a) show their presence throughout the creek in the surface sediment, with concentrations rising from the mouth through English Kills. Coliforms (fecal, total, *E. coli*) and *Enterococci* are shorter-lived in the aquatic environment, yet are also present throughout Newtown Creek, with highest concentrations in tributaries (see Figures A1-14b through A1-14e). Their presence indicates recent deposition from CSOs and MS4s. Further, results from NYCDEP's own model simulations presented in the LTCP show that pathogens discharged from CSOs impact the entire creek: "CSOs are the largest contributor to the monthly GM fecal coliform concentration at Stations NC4 to NC14" (LTCP at 6-21; NYCDEP 2017).

In addition to pathogens, selected PPCPs (see Figures A1-14f and A1-14g) illustrate the impact of these compounds throughout Newtown Creek and, in particular, the tributaries. For example, bisphenol-a and nonylphenol concentrations increase by more than an order of magnitude, from the mouth, through the main stem, and into English Kills; high concentrations are also observed in other tributaries with major CSOs. The large CSOs and MS4s are likely the major sources of these compounds in the sediment of the creek; the in-creek PPCP data indicate the dispersal of their discharges throughout the creek.

Pathogens and PPCPs are not only markers that indicate that materials discharging from the CSOs deposit throughout Newtown Creek, but they themselves affect the human and ecological communities. Pathogens cause disease in people, and their presence restricts human use of the creek. In addition, based on comparisons with surface water quality criteria, PPCPs are present in sediment porewater at concentrations that are potentially significant to the aquatic community (see Appendix A2).

In conclusion, discharges from CSOs and MS4s are important sources of pathogens and PPCPs to the surface water and sediment of the creek; and restrict human use of the creek and impact the benthic environment. In the future, even with the LTCP controls in place, MS4 discharges and a portion of the CSO discharges will continue to be important sources of these substances to the surface water and sediment of the creek so their impacts on human health and the aquatic community will continue.

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TABLE

Table A1-1
Concentrations of TPAH, TPCB, and Copper on CSO and MS4
Sample Particulates and Reference Area Surface Sediment

Chemical	Units	Group	No. of Observations	Average	Standard Deviation	95/95 UTL	No. of Extreme Values Removed
TPAH (17)	mg/kg	Reference areas (together)	142	13	14	52	1
		CSO	19	28	14	62	1
		MS4	21	40	19	84	2
TPCB	mg/kg	Reference areas (together)	140	0.29	0.31	1.0	3
		CSO	20	0.38	0.29	1.4	0
		MS4	21	0.79	0.47	1.9	2
Copper	mg/kg	Reference areas (together)	143	121	95	354	0
		CSO	20	273	126	574	0
		MS4	23	353	141	681	0

Notes:
Extreme values based on review of probability plots and ProUCL outlier test.

Acronyms:
95/95 UTL = 95/95 upper tolerance limit
CSO = combined sewer overflow
K_{oc} = organic carbon partitioning coefficient
LTCP = Long-Term Control Plan
mg/kg = milligrams per kilogram
MS4 = municipal separate storm sewer system
ng/kg = nanograms per kilogram
TPAH = polycyclic aromatic hydrocarbon
TPCB = polychlorinated biphenyl

FIGURES

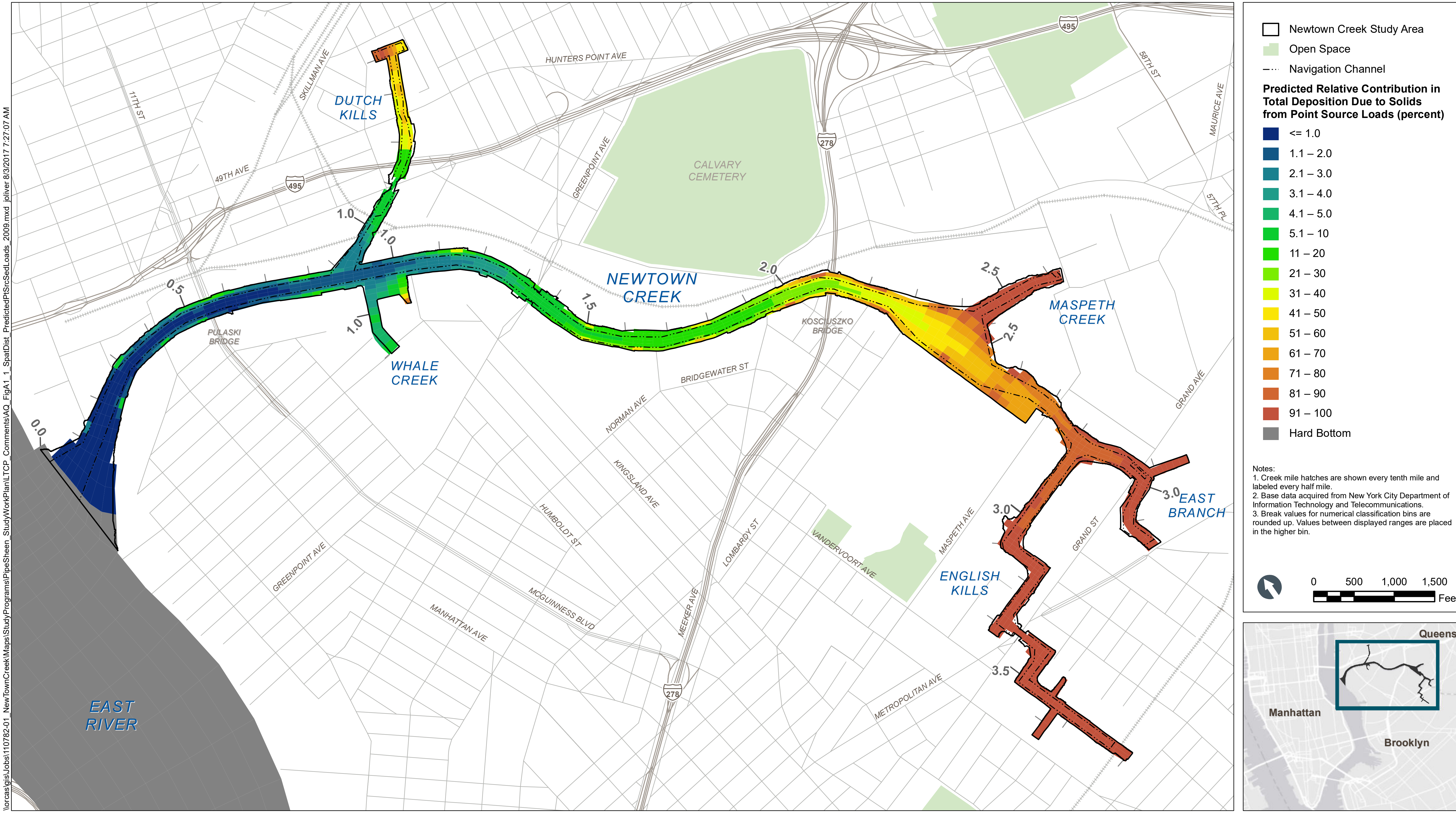

Figure A1-1
Spatial Distribution of Relative Contribution of Point Source Sediment Loads to Total Deposition During 2009
LTCP Comments
Newtown Creek

ANCHOR QEA

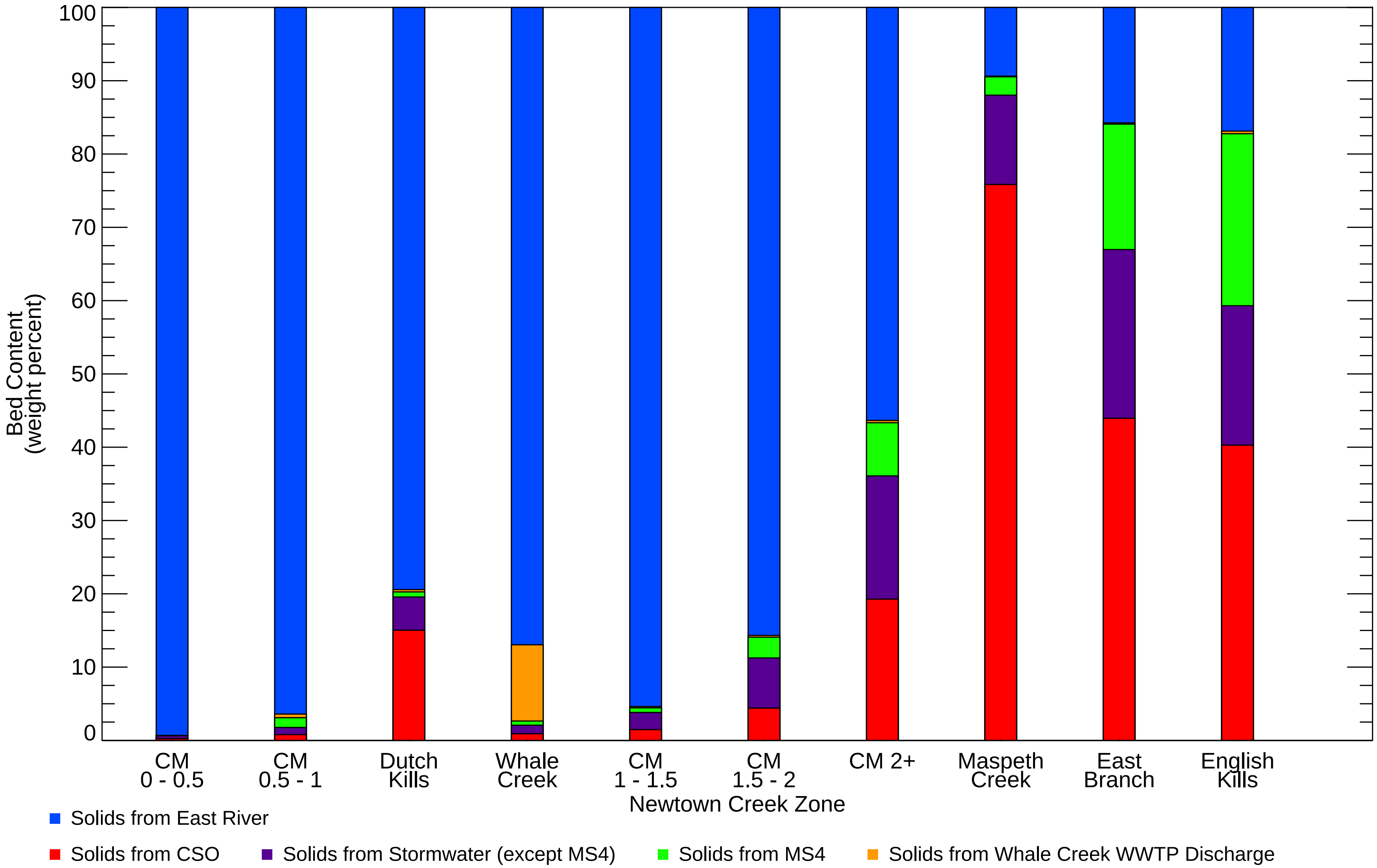

Figure A1-2

Predicted Bed Content of Solids From Different Sources for Current Conditions
LTCP Comments
Newtown Creek

ANCHOR QEA

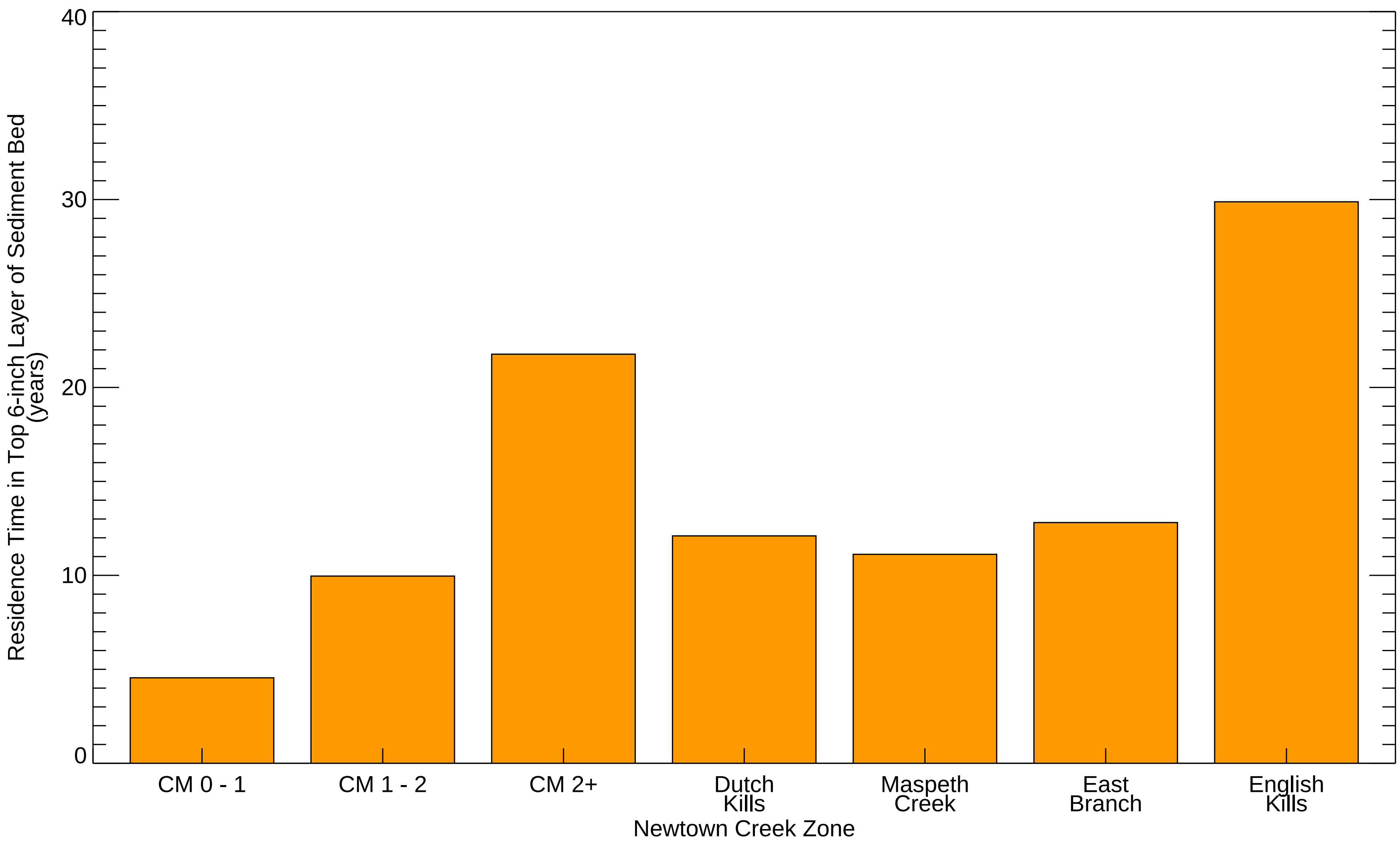

Figure A1-3

Time for Net Sedimentation of Surface Sediments (top 6 Inches) based on Sediment Transport Model Simulation for Current Conditions
LTCP Comments
Newtown Creek

DN - \\woodcliffbu\Jobs\Newtown_Creek\Hydro_Sedtran\Model\EFDC\Postprocessors\p_relative_dep\ntc_residence_time_ltcp_170711_base_old_format.pro Thu Aug 03 09:56:54 2017

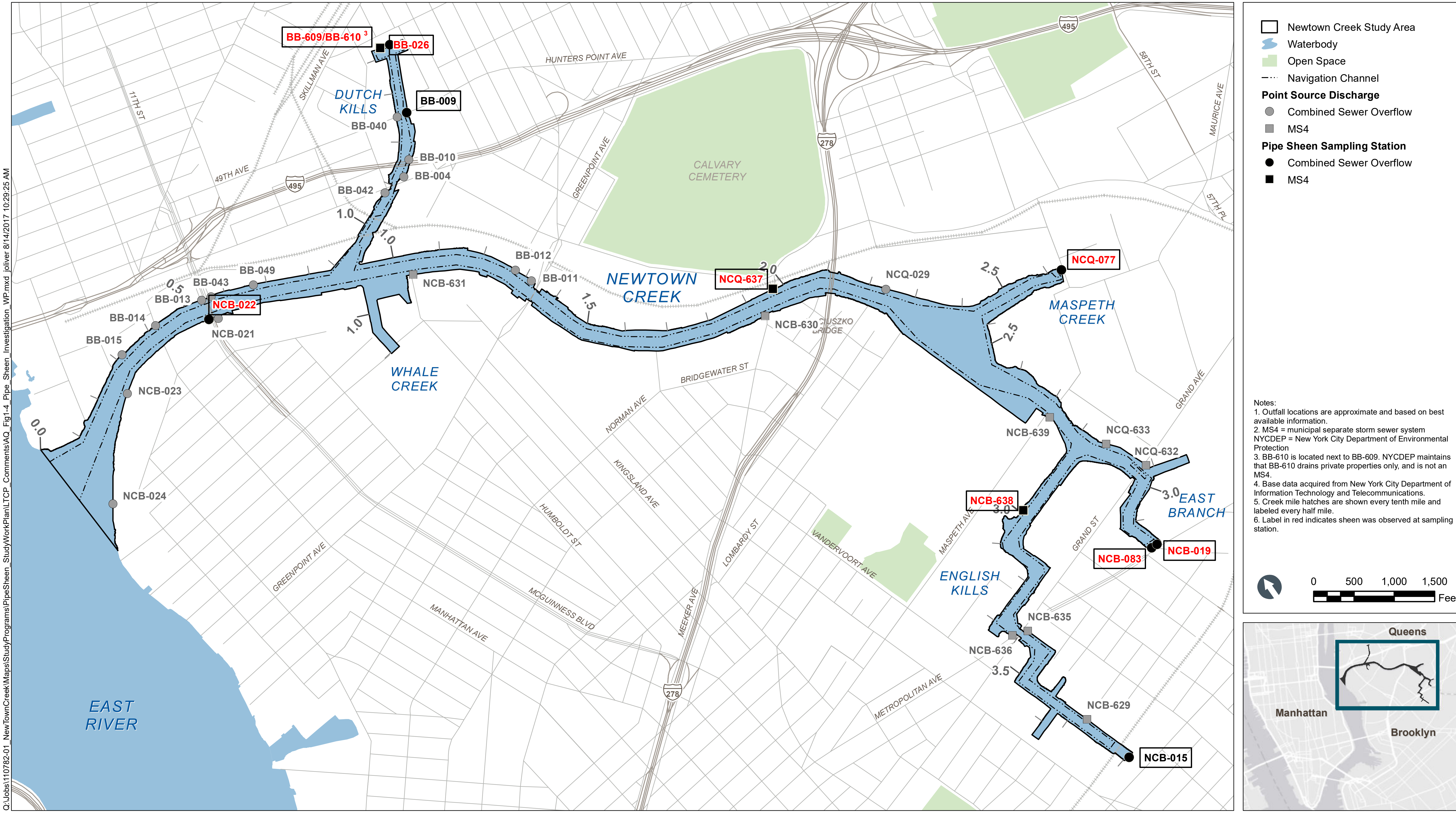

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Figure A1-4
CSO and MS4 Discharge Locations and Pipe Sheen Sampling Stations
LTCP Comments
Newtown Creek

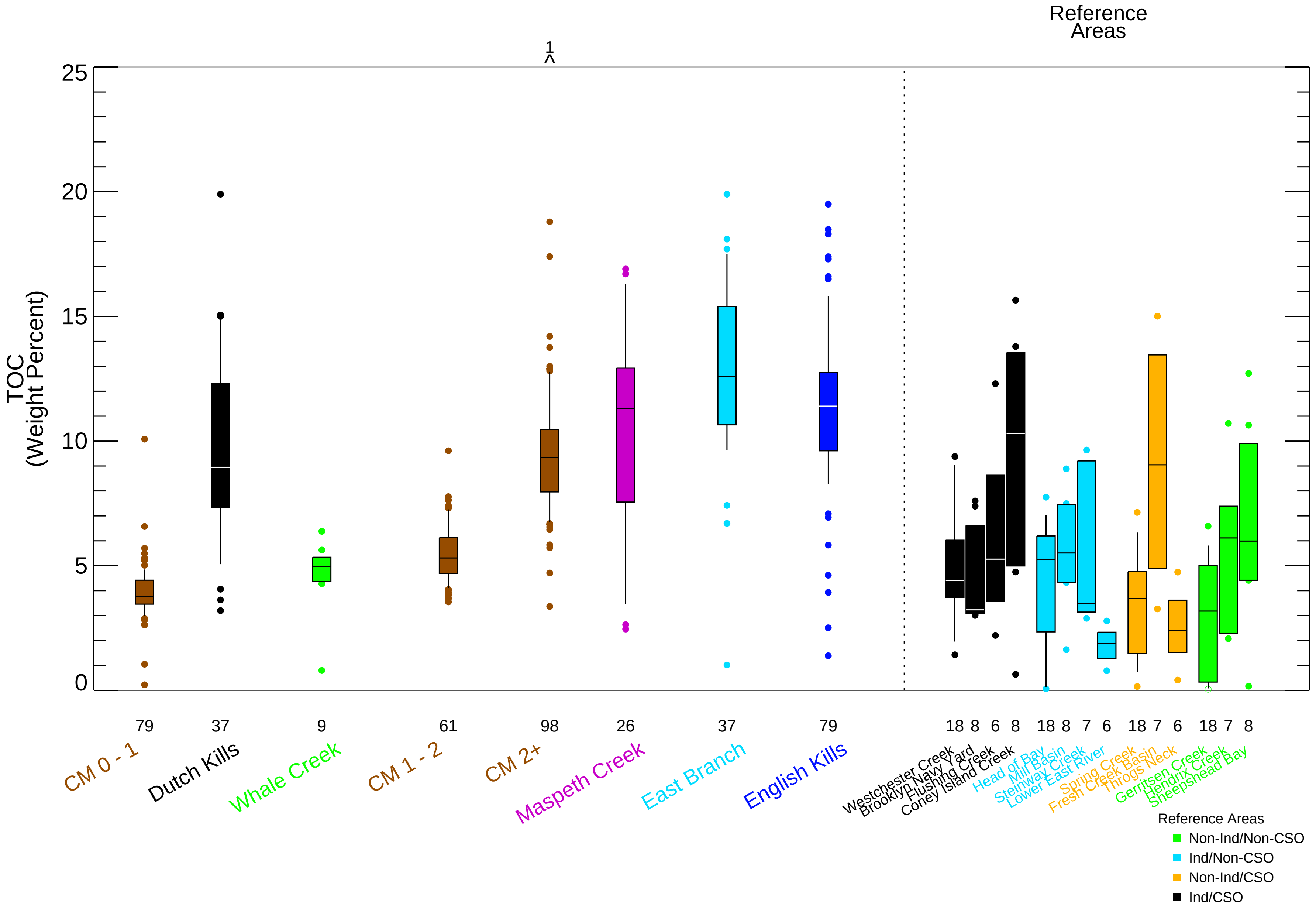
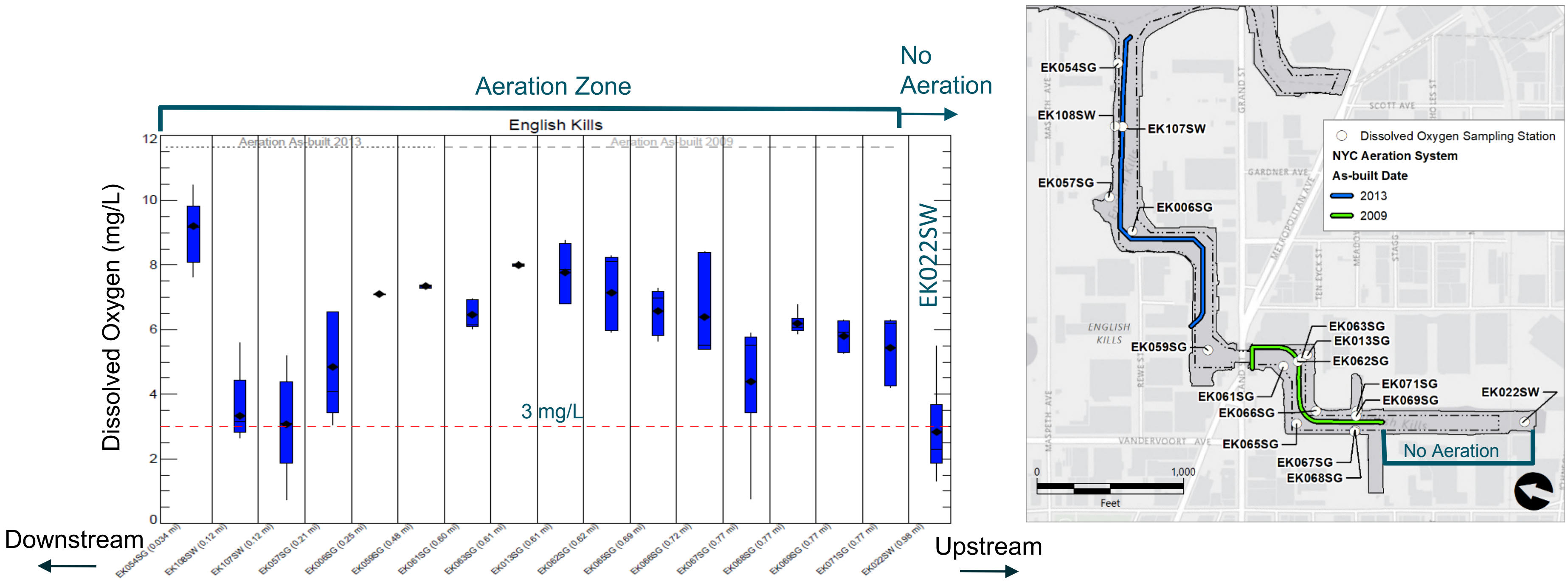


Figure A1-5

TOC in Surface Sediment - Box Plots by Location
LTCP Comments
Newtown Creek

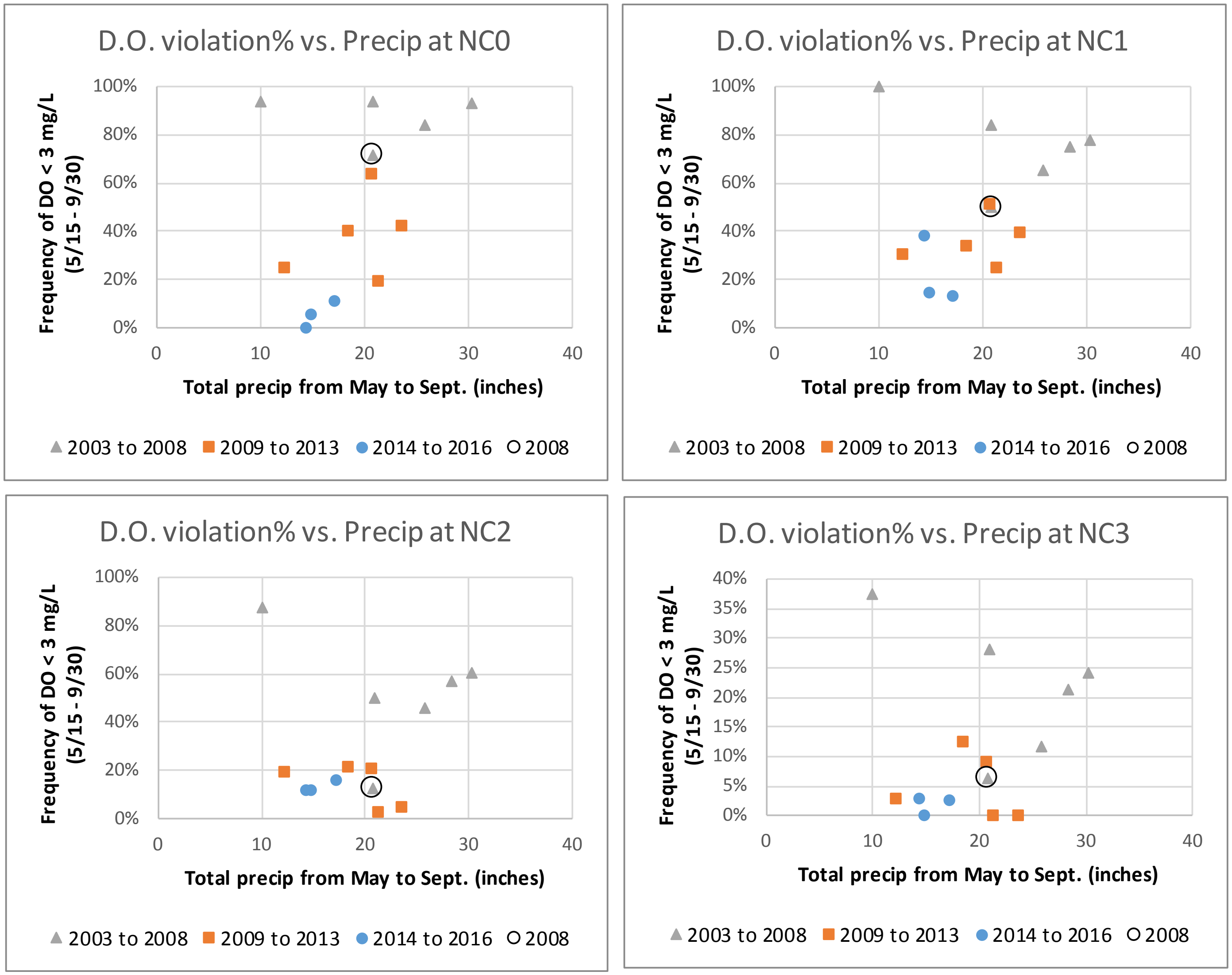
*Notes: Non-detects set to the MDL and plotted with open symbol. Totals reported using Kaplan-Meier, if applicable. Depth range for surface sediment is 0 to 15 cm. Sample size posted below x-axis. Box: median, 25th, 75th percentiles; whiskers: 10th, 90th percentiles. Symbols: data outside whiskers; for n <= 10, no whiskers; for n <= 4, no box. Phase 1 TOC consists of reanalyzed TOC and TOC * correction factor. Caret symbols and numbers above panel indicate the number of values outside y-axis range.*

LHB - \\iris\Woodcliff\Projects\Newtown_Creek\RI-FS\Nature_and_Extent\Multimedia\Analysis\LTCP\IDL\surfsed_boxplots_TOC.pro Fri Aug 11 13:03:46 2017
Data source: surfsed_combined_20161222_wupdatedPCB_NatGrid06_wcorrectedTOC.bin



Data source: Phase 2 data (5/15 to 9/30/2014; all depths and sampling programs pooled)

Figure A1-6
Dissolved Oxygen Concentrations in English Kills – Remedial Investigation Data
LTCP Comments
Newtown Creek



Notes:
Rainfall data source: LaGuardia Airport (LGA)
One very large storm in 2011 removed

Figure A1-7
Relationship Between Frequency of Violation of the DO Standard and Precipitation
LTCP Comments
Newtown Creek

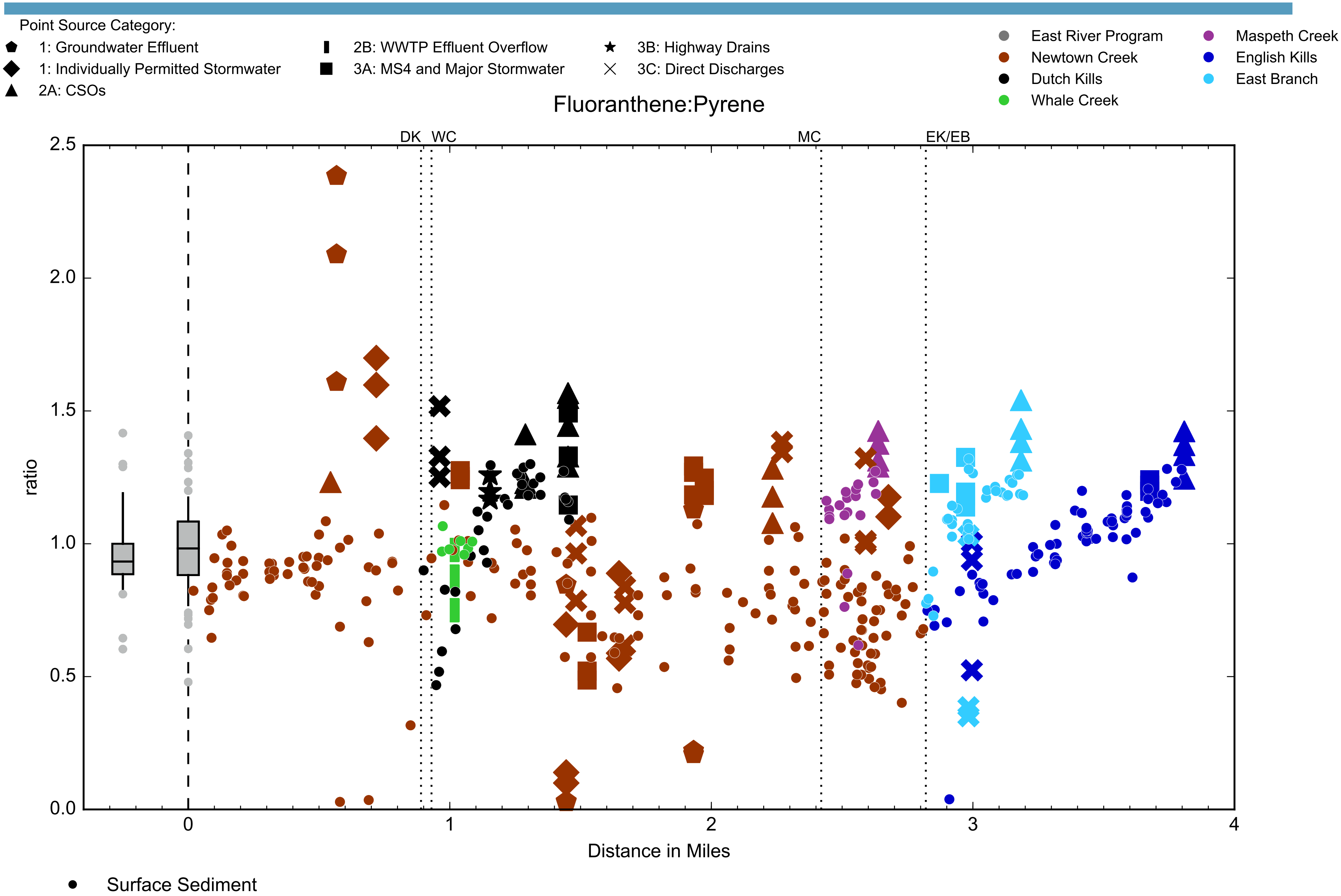


Figure A1-8

Longitudinal Profiles of Fluoranthene/Pyrene Ratio in Surface Sediment and Particulate Matter from Point Sources

LTCP Comments

Newtown Creek

Notes: Total PAH (TPAH3+) includes the 3-Ring forensic PAHs and larger.

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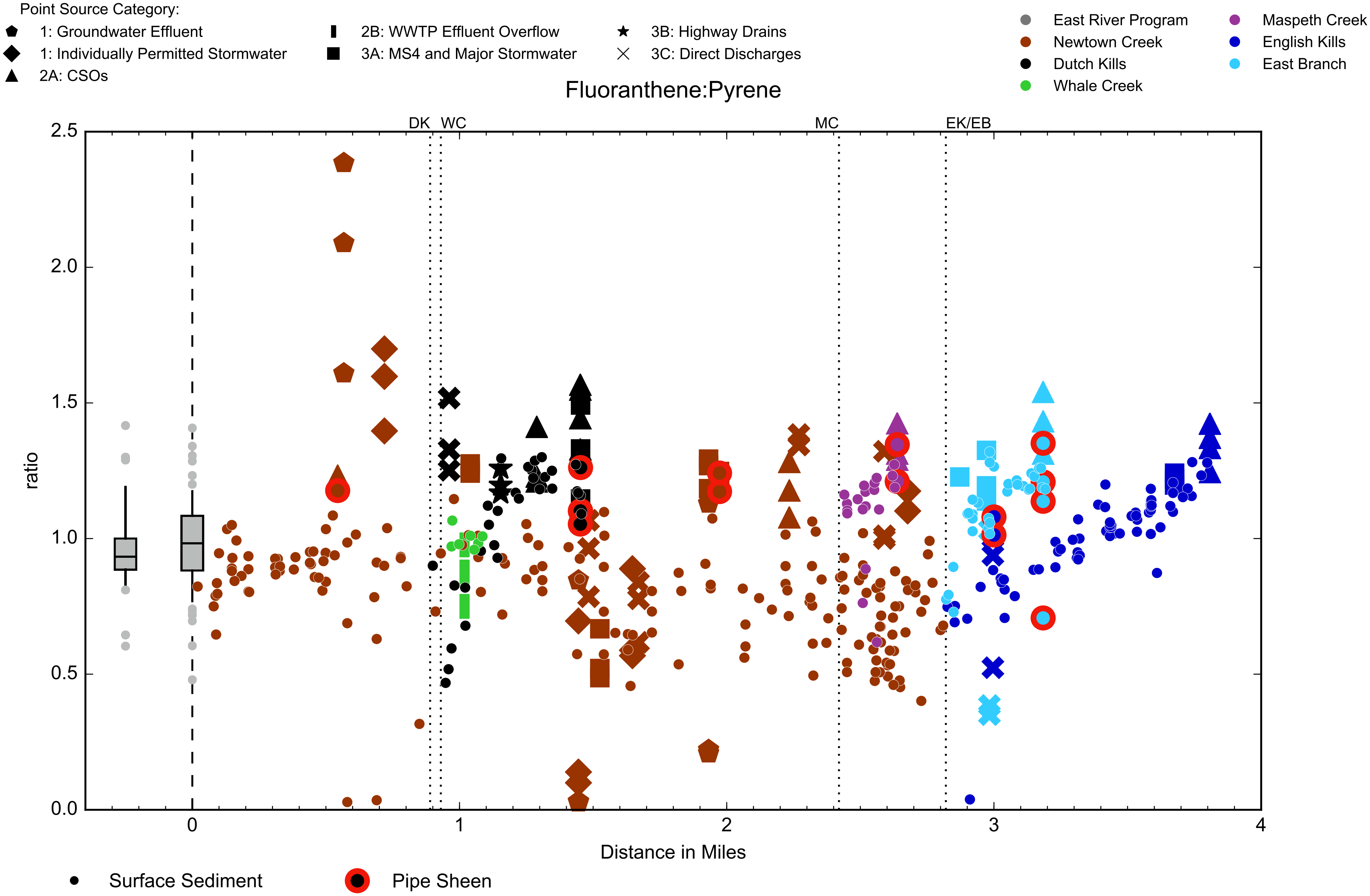

Figure A1-9

Longitudinal Profile of Fluoranthene/Pyrene Ratio in Sheen, Surface Sediment, and Particulate Phase Point Source Samples
LTCP Comments
Newtown Creek

Notes: Total PAH (TPAH3+) includes the 3-Ring forensic PAHs and larger.
Includes first, second, and third pipe sheen event.

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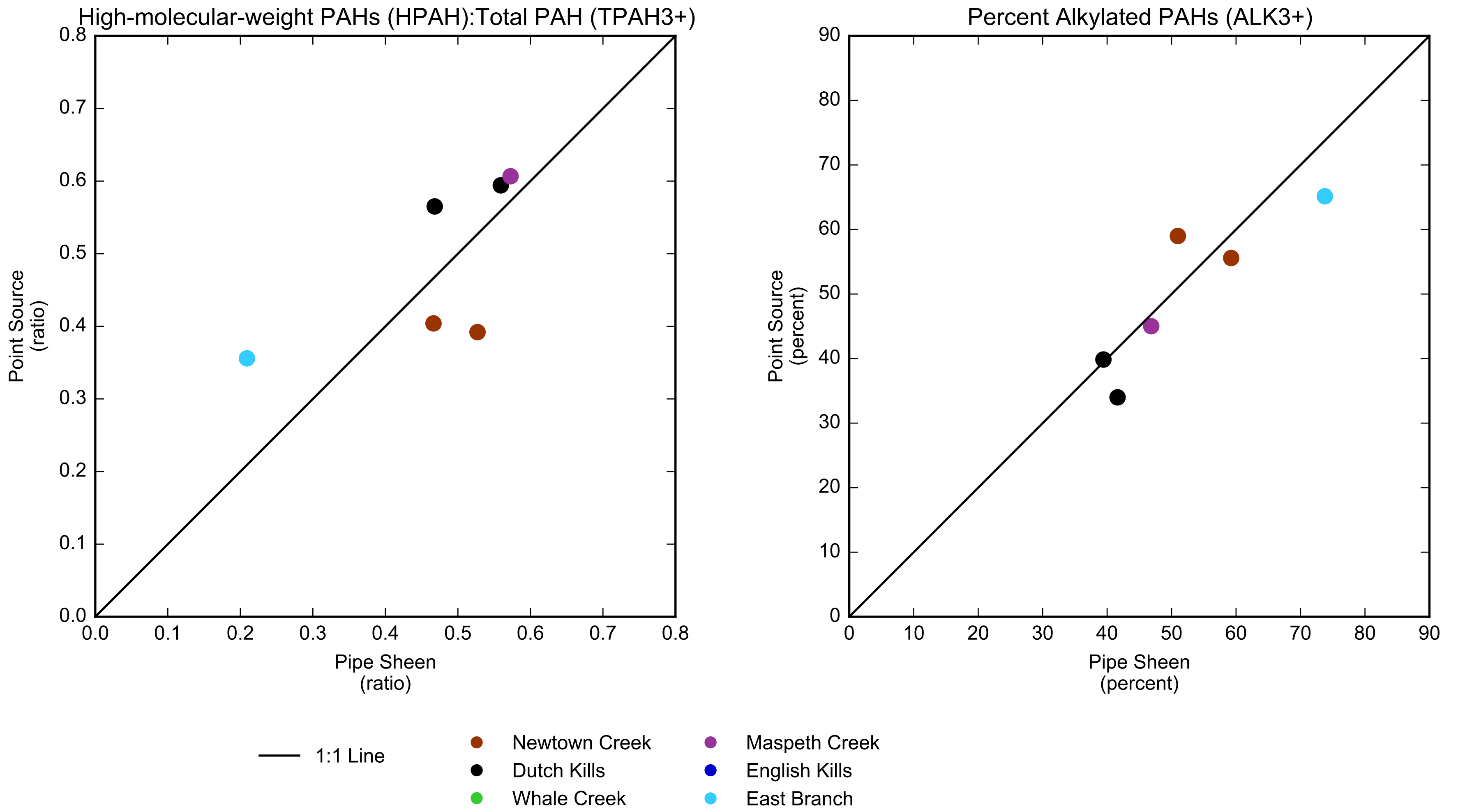

Figure A1-10
Crossplot of Median Values for Particulate Point Source and Pipe Sheen
LTCP Comments
Newtown Creek

Notes: Total PAH (TPAH3+) includes the 3-Ring forensic PAHs and larger. FL/PY excludes non-detects.
Includes all three pipe sheen events.
Data source: Point_Source_Part_Sample_Summary_Table_20170420.xlsx; PipeSheen_Sample_Summary_Table_20170627.xlsx

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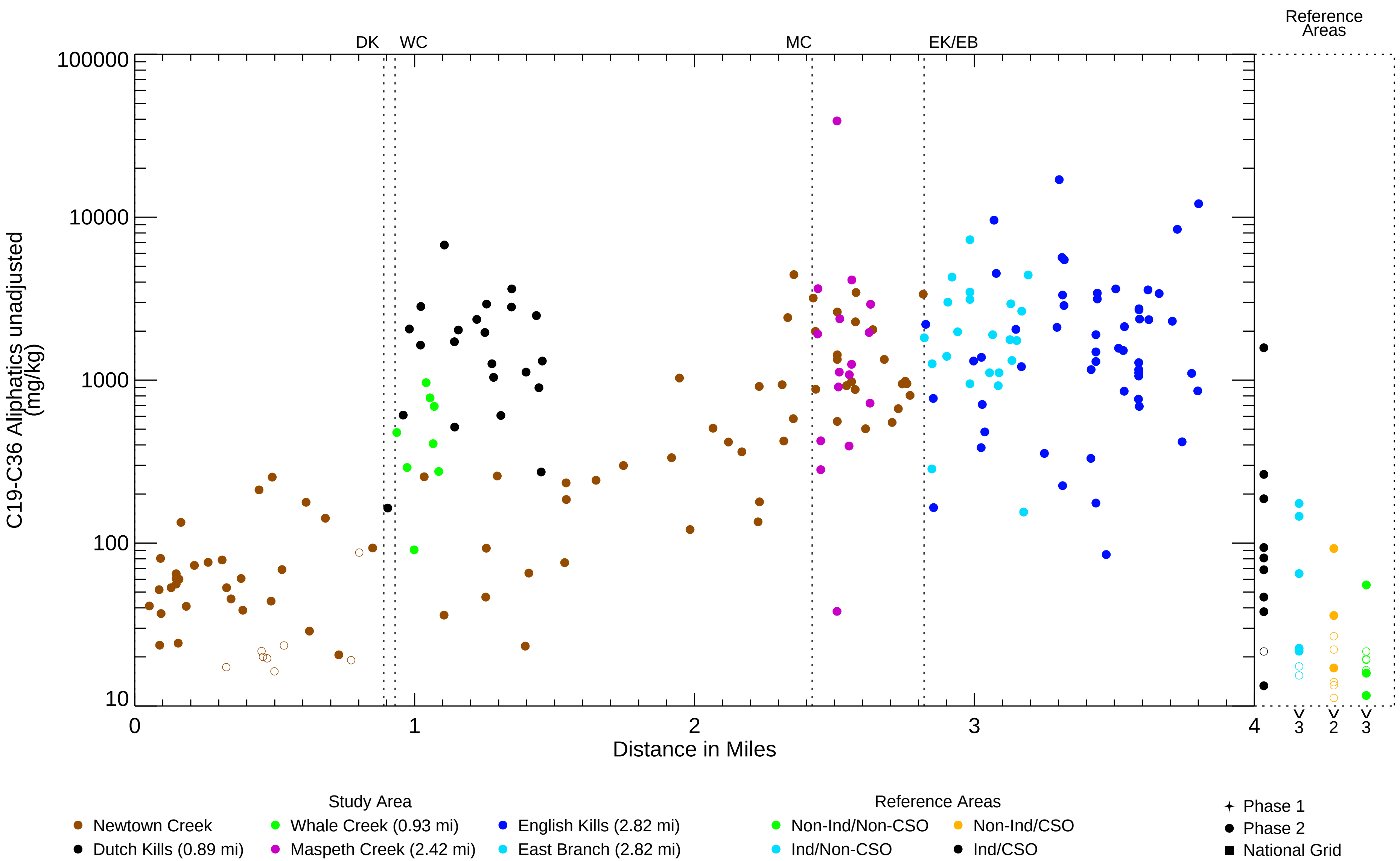

Figure A1-11

C19-C36 Aliphatics unadjusted in Surface Sediment - Longitudinal Profile
LTCP Comments
Newtown Creek

Notes: Non-detects set to the MDL and plotted with open symbol. Totals reported using Kaplan-Meier, if applicable. Depth range for surface sediment is 0 to 15 cm. Dashed vertical lines represent the confluence of the indicated tributaries with Newtown Creek. Caret symbols and numbers above or below panel indicate the number of values outside y-axis range.

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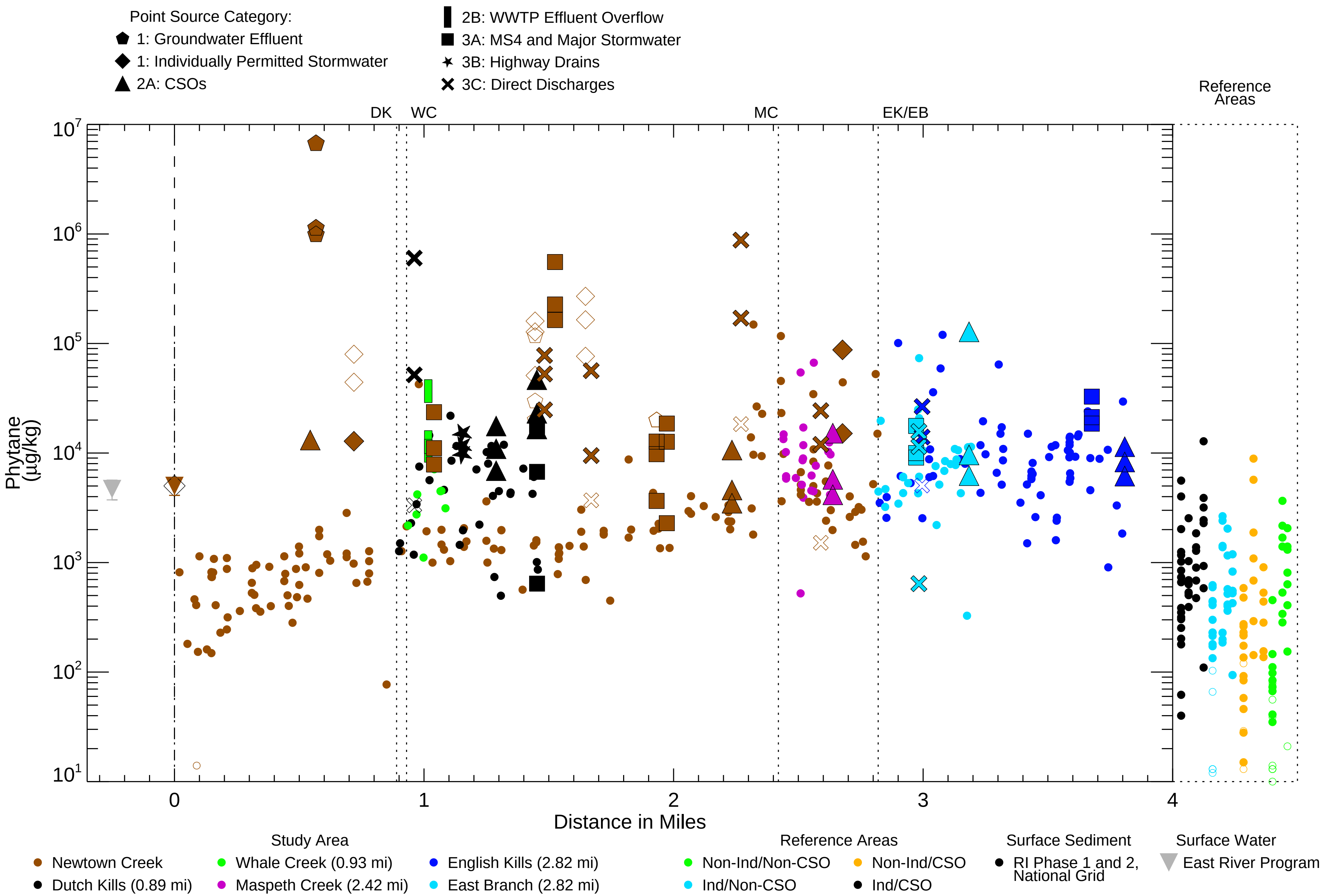

Figure A1-12a

Point Source, Surface Water Particulate Phase and Surface Sediment: Phytane

LTCP Comments

Newtown Creek

Notes: Non-detects included at MDL. Error bars represent two standard errors.
Isoprenoid particulate values were calculated using log Kow to determine Koc values.

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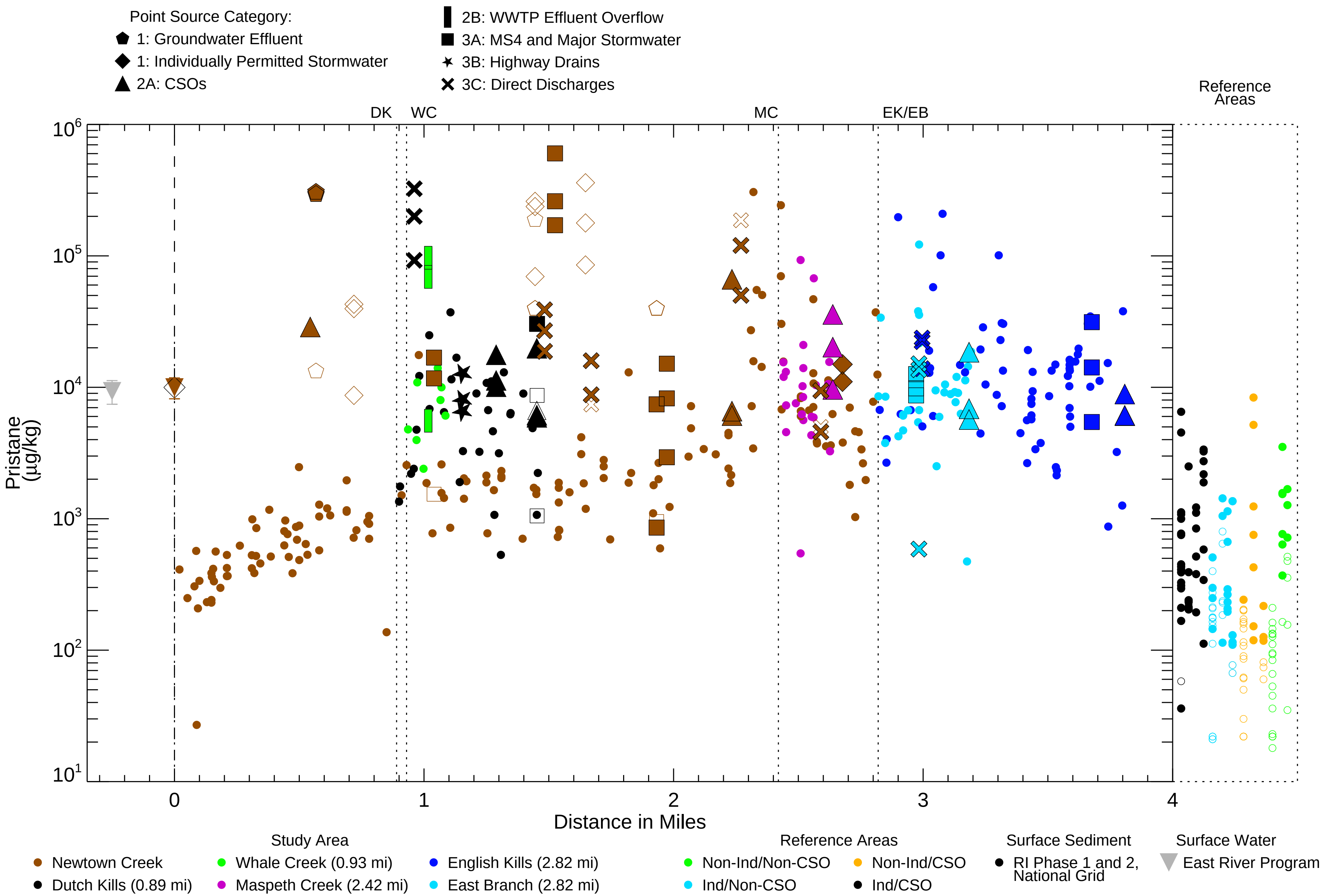

Figure A1-12b

Point Source, Surface Water Particulate Phase and Surface Sediment: Pristane
LTCP Comments
Newtown Creek

ANCHOR QEA

Notes: Non-detects included at MDL. Error bars represent two standard errors.
Isoprenoid particulate values were calculated using log Kow to determine Koc values.

LHB - \\iris\woodcliff\Projects\Newtown_Creek\RI-FS\Nature_and_Extent\Multimedia\Analysis\LTCP\IDL\spatial_multi_media_PS_surfsed_wisoprenoids_estimate_Koc.pro Wed Aug 02 19:49:02 2017

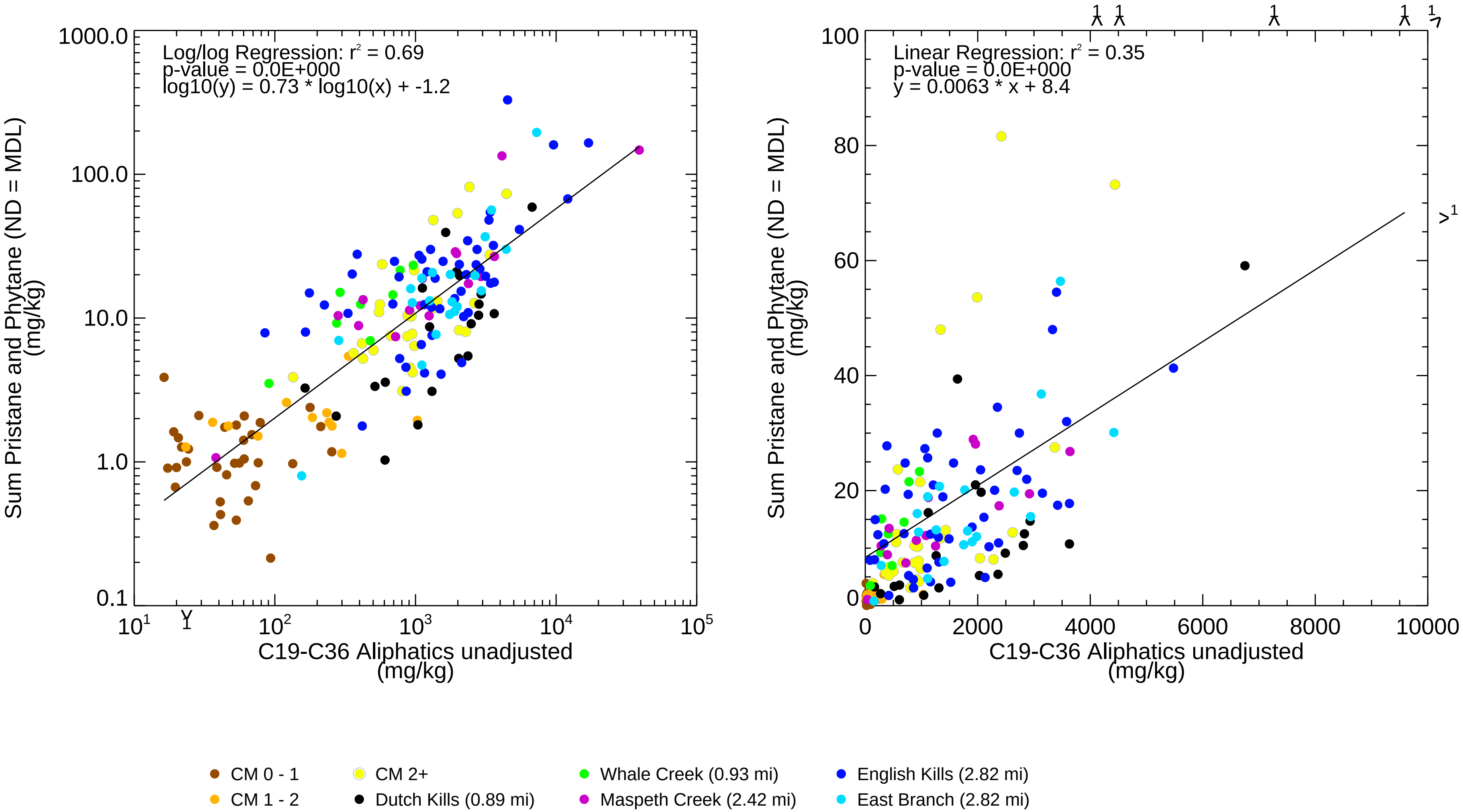

Figure A1-13

Sum of Pristine and Phytane versus C19-C36 Aliphatics in Surface Sediment - Cross Plot

LTCP Comments

Newtown Creek

ANCHOR QEA

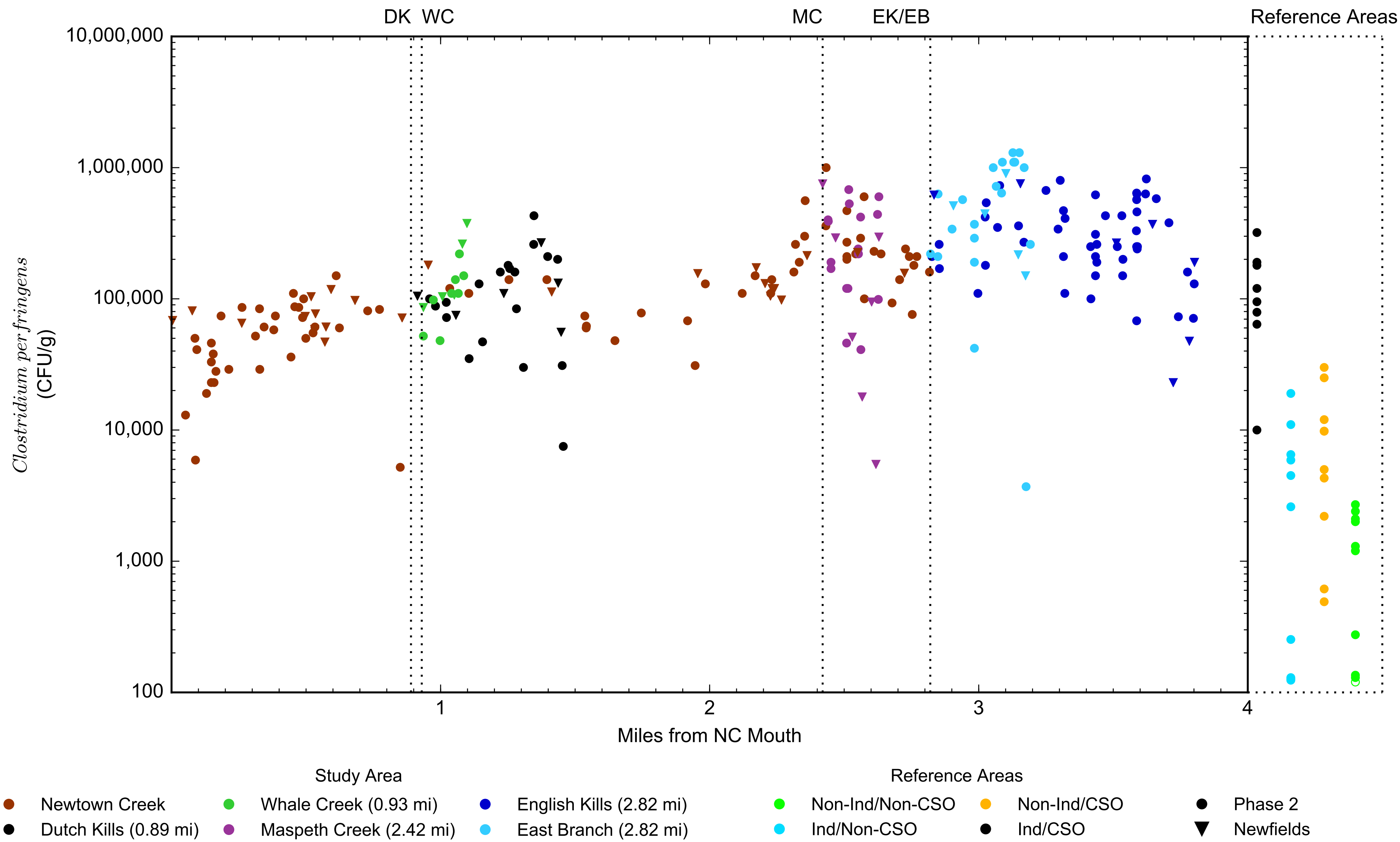

Figure A1-14a

Newtown Creek Surface Sediment: *Clostridium perfringens*

LTCP Comments

Newtown Creek

Notes: Non-detects set to the MDL and plotted with an open symbol.
Data source: NCP2_3P_Preliminary_20151204.txt,
NC_TIE_Preliminary20170628_with SPME_TPAH34-TU.xlsx

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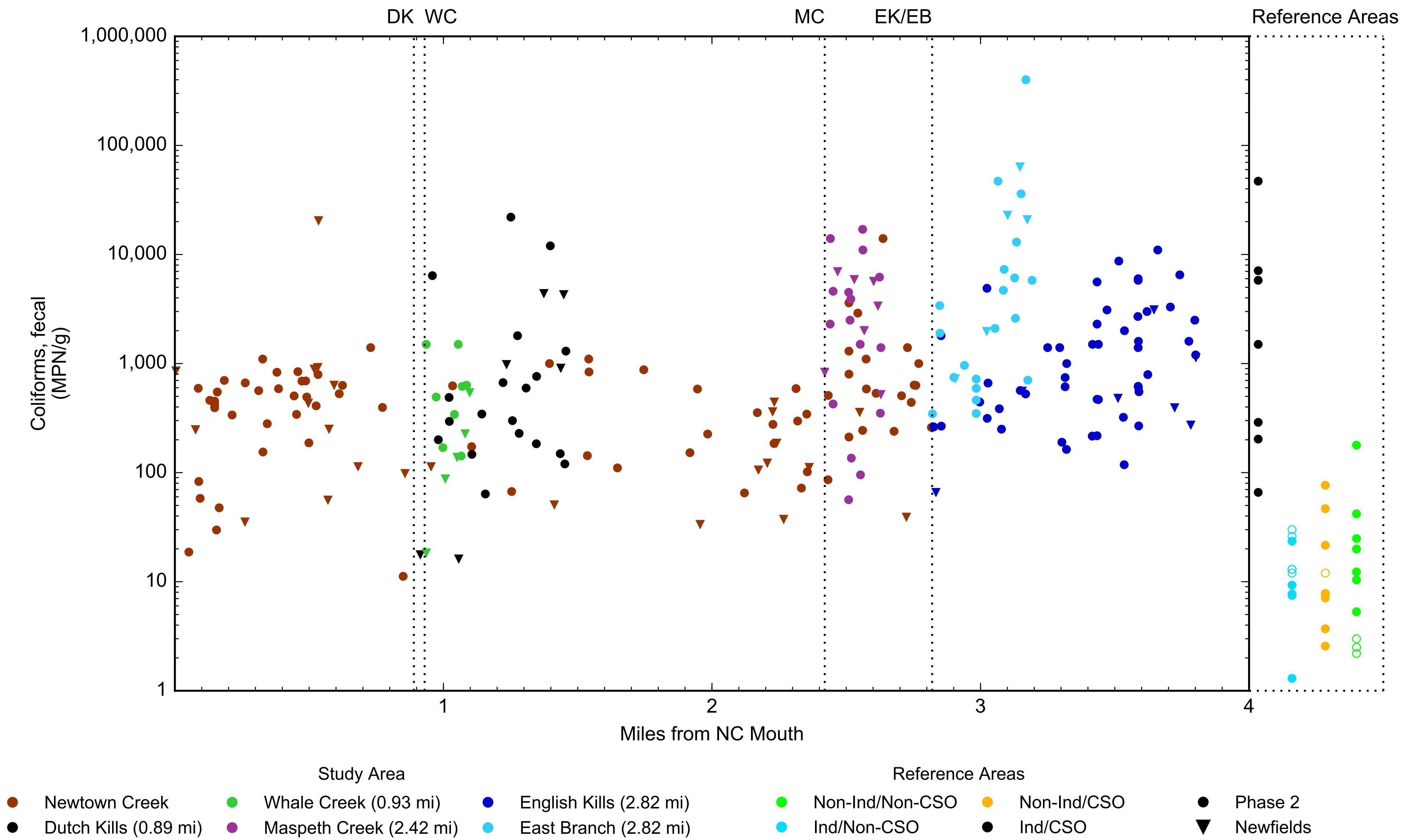

Figure A1-14b

Newtown Creek Surface Sediment: Coliforms, fecal

LTCP Comments

Newtown Creek

Notes: Non-detects set to the MDL and plotted with an open symbol.

Data source: NCP2_3P_Preliminary_20151204.txt,

NC_TIE_Preliminary20170628_with SPME_TPAH34-TU.xlsx

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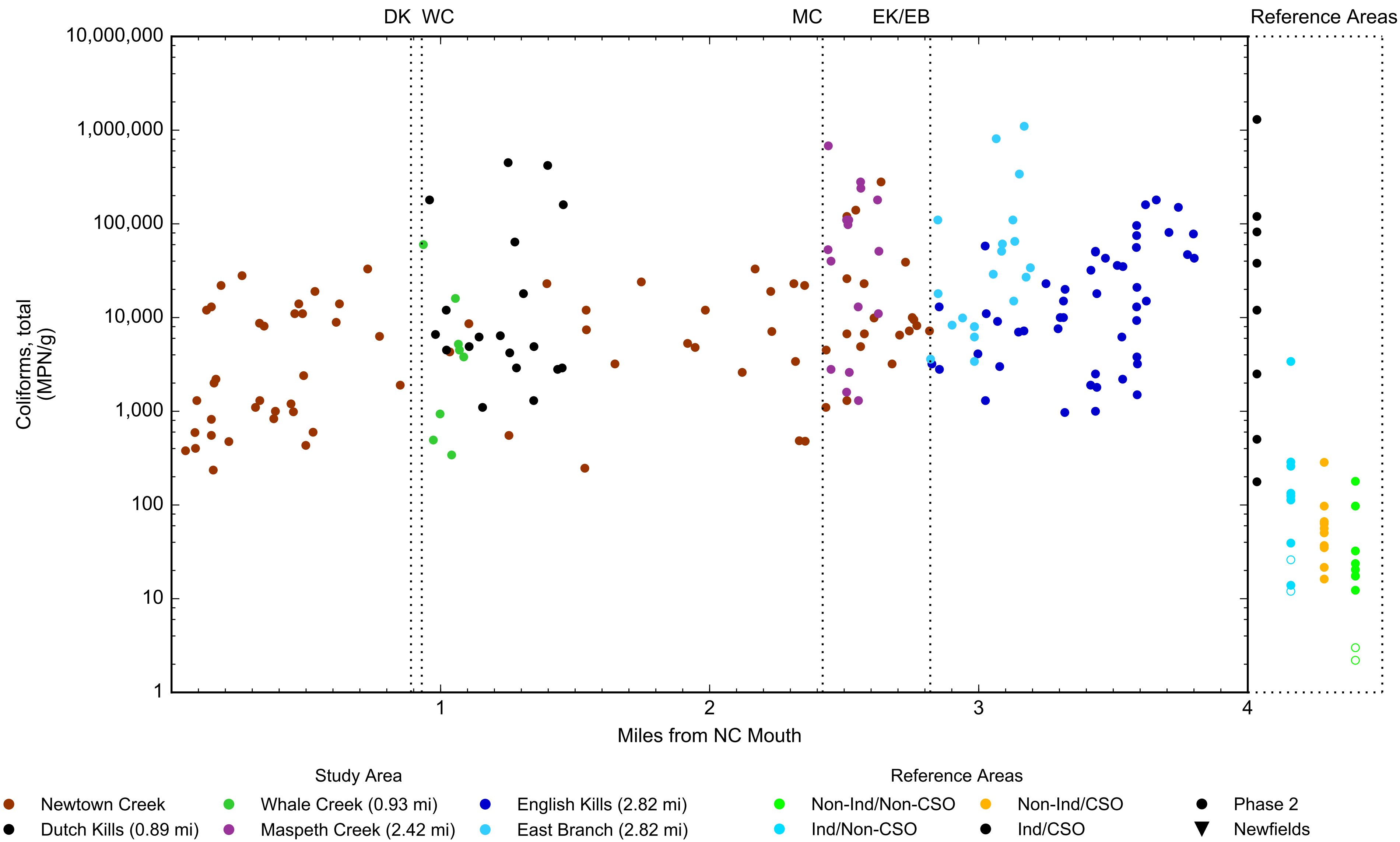

Figure A1-14c

Newtown Creek Surface Sediment: Coliforms, total

LTCP Comments

Newtown Creek

Notes: Non-detects set to the MDL and plotted with an open symbol.

Data source: NCP2_3P_Preliminary_20151204.txt,

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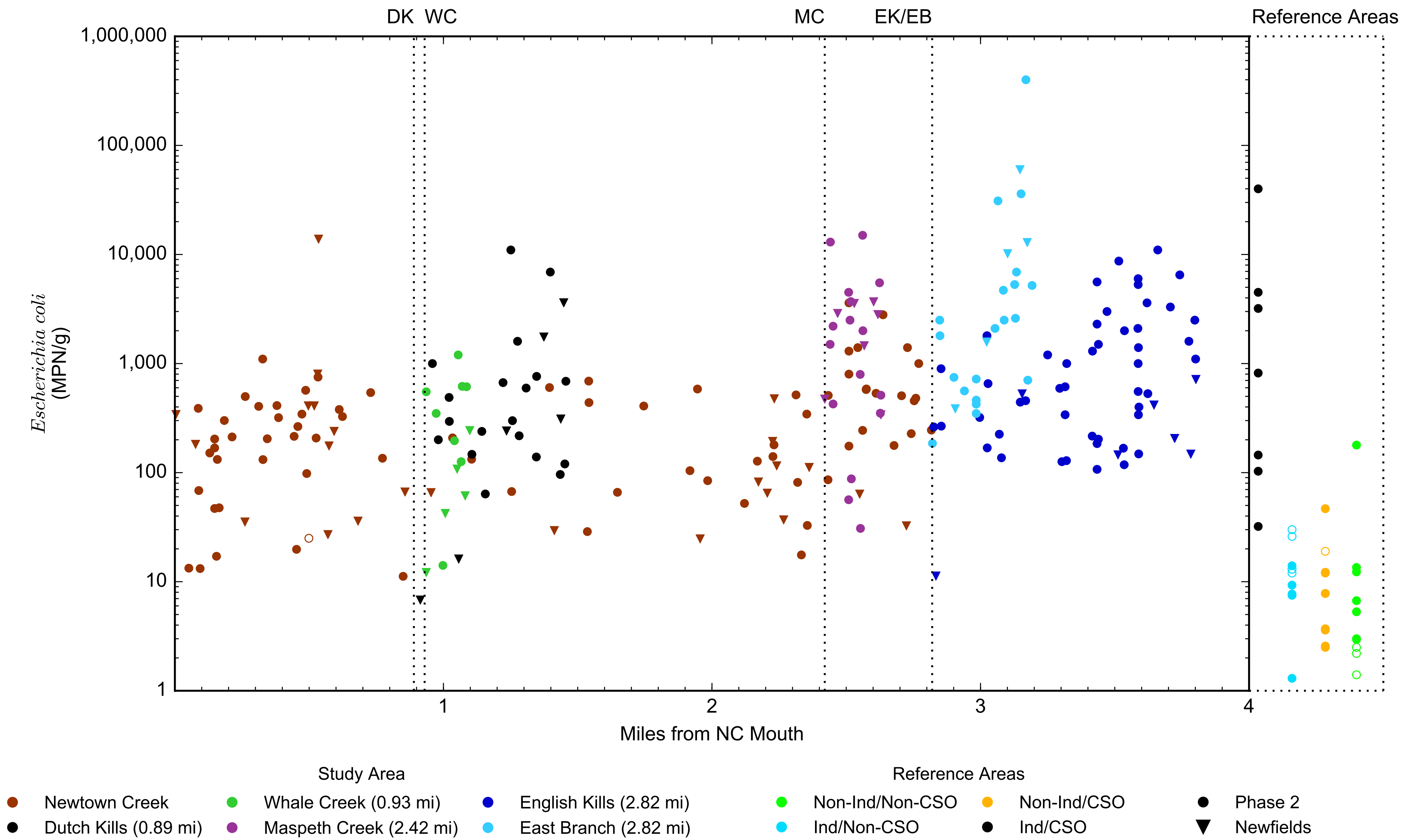

Figure A1-14d

Newtown Creek Surface Sediment: *Escherichia coli*

LTCP Comments

Newtown Creek

Notes: Non-detects set to the MDL and plotted with an open symbol.

Data source: NCP2_3P_Preliminary_20151204.txt,

NC_TIE_Preliminary20170628_with SPME_TPAH34-TU.xlsx

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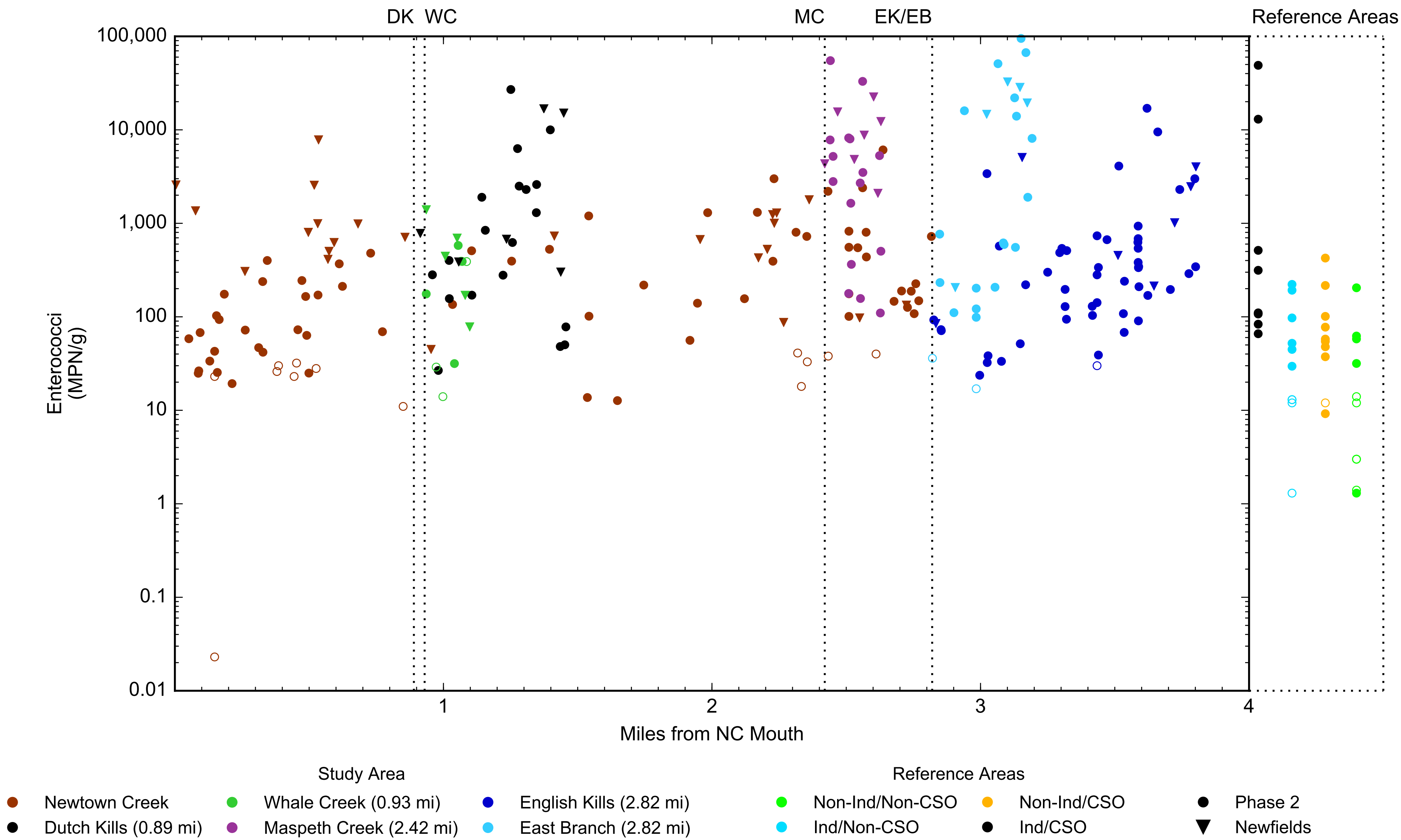

Figure A1-14e
Newtown Creek Surface Sediment: Enterococci
LTCP Comments
Newtown Creek

Notes: Non-detects set to the MDL and plotted with an open symbol.
Data source: NCP2_3P_Preliminary_20151204.txt,
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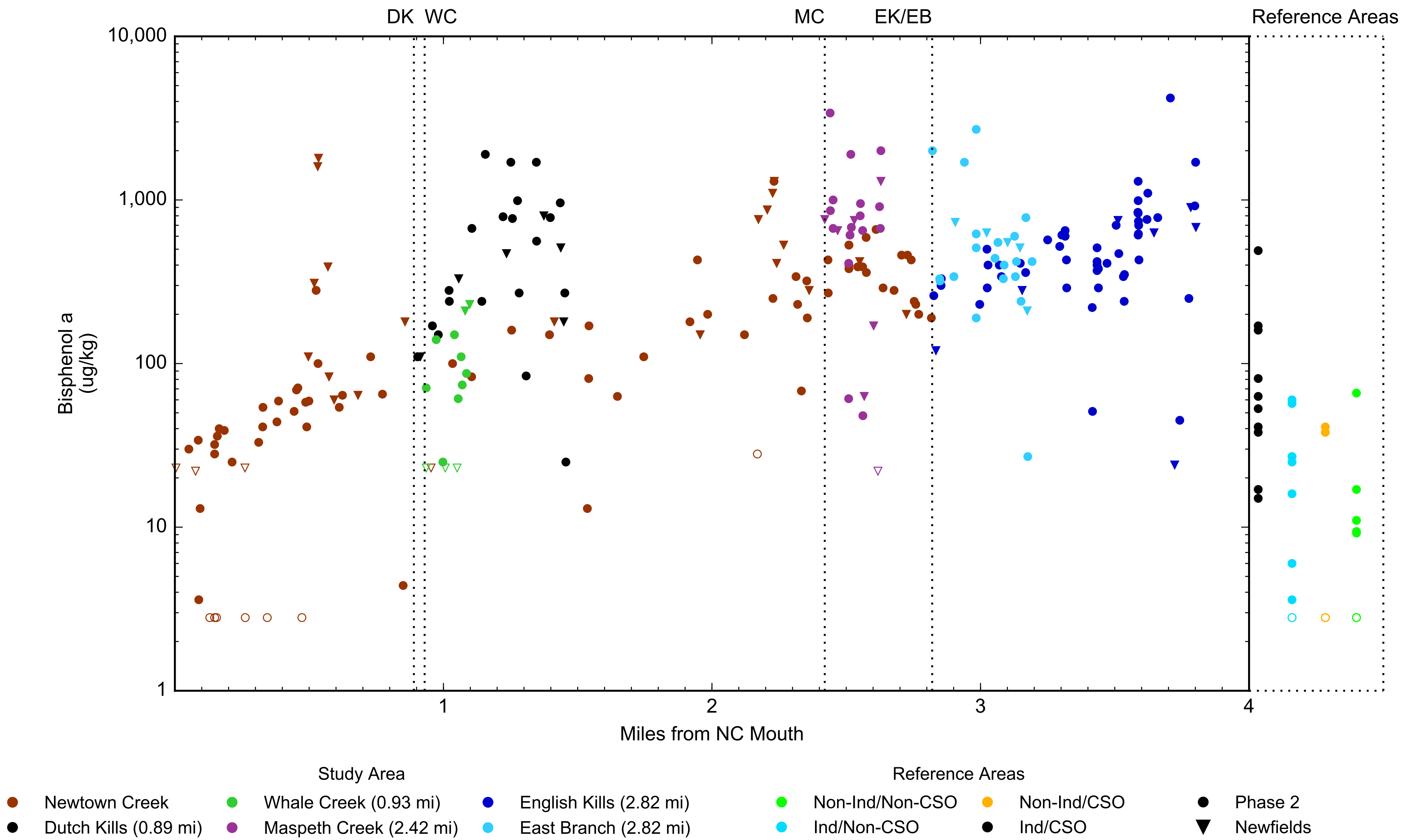

ANCHOR QEA

Figure A1-14f

Newtown Creek Surface Sediment: Bisphenol a

LTCP Comments

Newtown Creek

Notes: Non-detects set to the MDL and plotted with an open symbol.

Data source: NCP2_3P_Preliminary_20151204.txt,

NC_TIE_Preliminary20170628_with SPME_TPAH34-TU.xlsx

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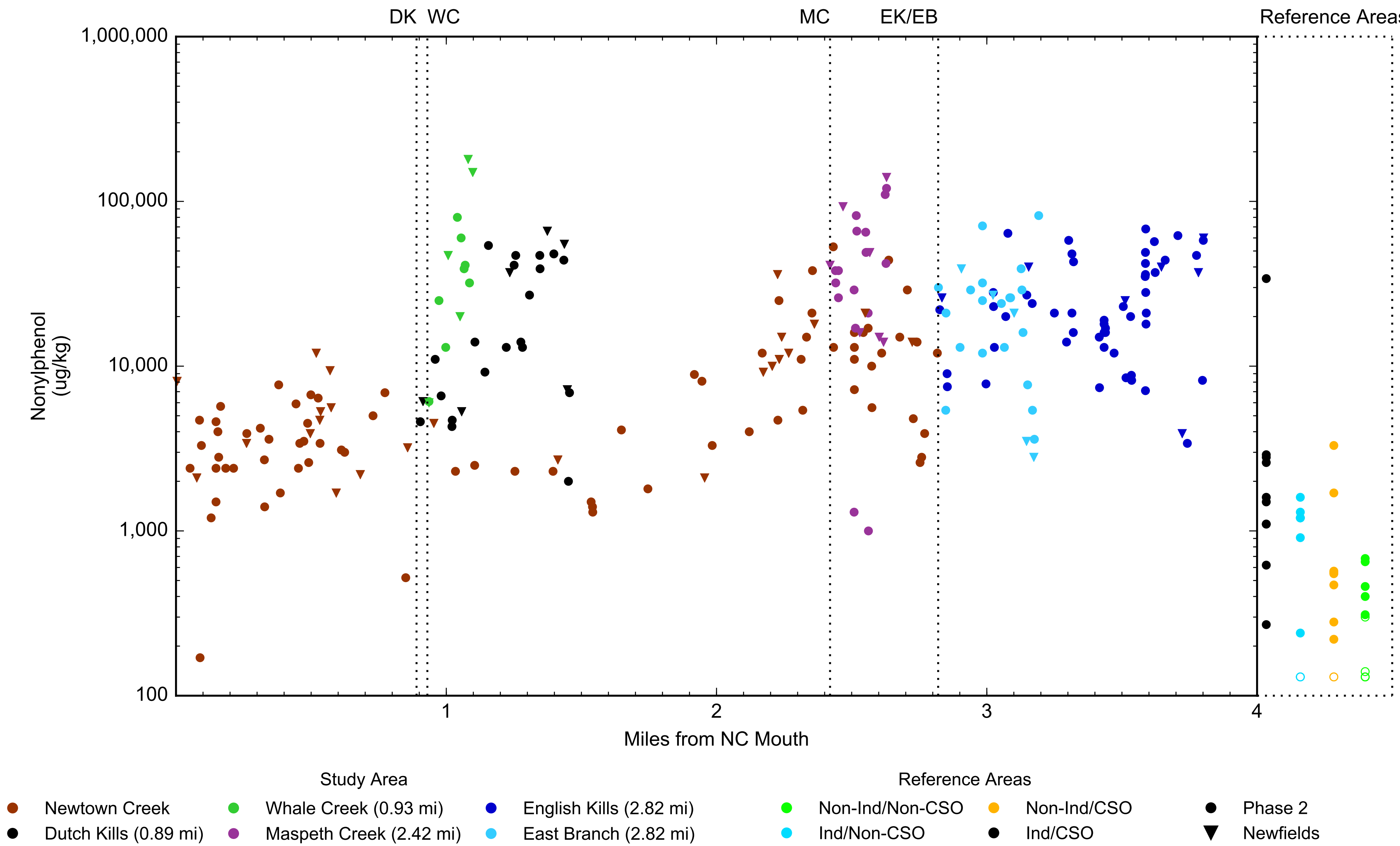

ANCHOR QEA

Figure A1-14g

Newtown Creek Surface Sediment: Nonylphenol
LTCP Comments
Newtown Creek

Notes: Non-detects set to the MDL and plotted with an open symbol.
Data source: NCP2_3P_Preliminary_20151204.txt,
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APPENDIX A2
NEWTOWN CREEK GROUP SEDIMENT TOXICITY STUDY: APRIL AND MAY 2017

NEWTOWN CREEK GROUP SEDIMENT TOXICITY STUDY: APRIL AND MAY 2017

1 INTRODUCTION

As part of the Newtown Creek Remedial Investigation/Feasibility Study draft *Baseline Ecological Risk Assessment* (BERA; Anchor QEA 2017a), 10-day and 28-day sediment toxicity tests were conducted with the benthic macroinvertebrate *Leptocheirus plumulosus.* These studies showed adverse impacts at locations near combined sewer overflows (CSOs) and municipal separate storm sewer systems (MS4s) in creek mile 2+ (including the Turning Basin), and in Dutch Kills, Maspeth Creek, English Kills, and East Branch (see BERA Figure 8-13 of Anchor QEA 2017a). Survival, growth, and reproduction of *Leptocheirus* were below reference envelope thresholds developed using four regional reference areas, and were statistically different from controls. Although contaminant concentrations measured in the sediment porewater during the sediment toxicity tests could explain toxicity at some locations, at other locations, particularly in the vicinity of the larger CSOs and MS4s, porewater contaminants alone could not explain toxicity. The BERA discussed other stressors that are contributing to toxicity in these locations. In addition, as described in this appendix, these stressors were further investigated in a follow-up sediment toxicity study conducted by the Newtown Creek Group (NCG) in April and May of 2017. The study included sediment toxicity tests along with bulk sediment and porewater chemistry measurements for samples collected from locations in Dutch Kills, Maspeth Creek, East Branch, English Kills, and Newtown Creek. The study was conducted to investigate further possible causes of toxicity in sediments impacted by solids from CSOs and MS4s, including porewater toxicity associated with elevated sulfide, ammonia, and pharmaceutical and personal care products (PPCPs), as well as physical effects associated with insoluble unresolved complex mixtures (UCMs).

2 STATION SELECTION

To meet the objectives of the study, five stations were selected based on the results of the BERA sediment toxicity tests (see Figure A2-1). Four of the stations (DK040, MC017, EB036, and NC065) exhibited low survival for *Leptocheirus* and low porewater concentrations of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substance but moderate to high bulk sediment concentrations of long-chain aliphatic C19-C36 hydrocarbons. One station (EK059) exhibited low survival for *Leptocheirus* but, in contrast to the other four, exhibited higher porewater concentrations of polycyclic aromatic hydrocarbons (PAHs) and was included in the study as a positive control. Furthermore, based on the results of studies conducted by NewFields and GEI (2016a), all five stations had relatively high concentrations of pathogens and the PPCP compounds—bisphenol-A, nonylphenol, and 4,tert-octylphenol.

3 SAMPLE COLLECTION AND PROCESSING

Surface sediment samples (0 to 15 centimeters) were collected from April 24 to 28, 2017, using methods and equipment similar to those used in the Phase 2 Remedial Investigation (RI) sediment program, and in accordance with the study-specific draft *Toxicity Identification Evaluation Study Field Sampling and Analysis Plan* (Anchor QEA 2017b) and draft *Toxicity Identification Evaluation Study Quality Assurance Project Plan* (Anchor QEA 2017c). Once collected, subsamples were packaged and shipped for chemical analysis and toxicity testing as shown in Figures A2-2 and A2-3.

Bulk sediment was analyzed for n-alkanes and isoprenoids including total petroleum hydrocarbons (TPHs), diesel range organics, extractable petroleum hydrocarbons, volatile petroleum hydrocarbons, total PAHs (TPAH), alkyl PAHs, metals, acid volatile sulfide, simultaneously extracted metals (SEM), bisphenol-A, nonylphenol, 4,tert-octylphenol, fecal coliforms, and *C. perfringens*, as well as general chemistry. Porewater was analyzed for TPAH and alkyl PAHs, metals, bisphenol-A, nonylphenol, 4,tert-octylphenol, and dissolved organic carbon, as well as ammonia and sulfide during the toxicity tests.

4 TOXICITY TESTING APPROACH

Sediment toxicity tests were performed by EnviroSystems Inc., using the amphipod *Leptocheirus* (the same test organism used in the Newton Creek BERA) but also using another amphipod, *Ampelisca abdita*, to test for differences in amphipod sensitivity to sulfides, UCM, and CERCLA hazardous substances. The tests were run as static, non-renewal tests, with counts of amphipod survival made on Days 1, 2, 4, and 10. To further investigate the effects of porewater ammonia and sulfide on amphipod survival, the tests were run in two rounds—Round 1 *without* a pre-treatment phase to reduce porewater ammonia and sulfide levels, and

Round 2 *with* a pre-treatment phase to reduce porewater ammonia and sulfide levels (see Figure A2-3). Because ammonia and sulfide are known confounding factors in the interpretation of sediment toxicity tests (Gardiner et al. 1995; Kohn et al. 1997; Wang and Chapman 1999), test sediments are typically allowed to stabilize for several days during which the overlying water is renewed to reduce porewater and overlying water concentrations to acceptable levels before introducing the test organisms. The overlying water is also aerated during this period. To evaluate the physical effects of bulk sediment UCM on amphipod survival, observations of amphipod fouling were also made on Days 1, 2, 4, and 10. The observations included the fouling of gills, body plates, or antennae, as well as the number of amphipods on the sediment surface and the number burrowed. These observations were used to generate a fouling metric as described in Section 5.2.1.

The following section discusses the results of the NCG follow-up sediment toxicity study and interpretation of the findings based on bulk sediment and porewater chemistry, observations of amphipod fouling, and station location with respect to CSOs and MS4s in Newtown Creek.

5 TOXICITY TEST RESULTS AND INTERPRETATION

A summary of the NCG follow-up sediment toxicity test results is presented in Figures A2-4a through A2-4d. The figures show the mean percent survival (mean of three replicates) for Days 1, 2, 4, and 10 of the test, for the Round 1 (without pre-treatment) and Round 2 (with pre-treatment) tests. Figures A2-4a and A2-4b show the results unadjusted based on the laboratory controls, and Figures A2-4c and A2-4d show the results adjusted based on the laboratory controls.

For both *Ampelisca* and *Leptocheirus*, there was an overall decrease in survival with time, and an overall trend for lower survival in Round 1 compared to Round 2. Survival was lower for the English Kills station compared to the other four stations, which is consistent with the porewater chemistry for this station and a TPAH (34) toxic unit (TU) of 17.7 (see Table A2-1).

For the stations in East Branch, Dutch Kills, Maspeth Creek, and Newtown Creek, TPAH (34) TUs are low, ranging from 1 to 1.5, and although the porewater TUs for the sum of the SEM metals (copper, cadmium, lead, nickel, and zinc) range from 1.2 to 6.7, these are not correlated with survival. For example, for DK040 with a porewater SEM TU of 1.2 (see Table A2-1), average survival for *Leptocheirus* ranges from 26 to 53% (see Figure A2-4b), while for NC065 and MC017 with higher porewater SEM TUs of 5.6 and 6.7, respectively, *Leptocheirus* survival is also higher, ranging from 65 to 81% and 32 to 53%, respectively. Therefore, as discussed in the following subsections, other stressors appear to be contributing to the observed toxicity at these four stations.

5.1 Organic Loadings

As discussed in Appendix A1, Section 4, the bacterial decomposition of labile organic matter discharged from CSOs and MS4s results in a decrease in surface water dissolved oxygen (DO) concentration and an increase in the toxic byproducts ammonia and sulfide (Diaz and Rosenberg 1995; Hyland et al. 2005; Miskewitz and Uchrin 2013; Norton et al. 2002; Pelletier et al. 2011). Given the results of the NCG follow-up toxicity tests, the sensitivity of *Ampelisca* and *Leptocheirus* to ammonia and sulfide was explored. For *Ampelisca* and *Leptocheirus*, Figures A2-5 and A2-6, respectively, show for each station, the porewater concentrations for ammonia (total ammonia and unionized ammonia) and sulfide (total sulfide and undissociated hydrogen sulfide), and for each amphipod, the respective threshold values reported in the literature (see Table A2-2).

For the toxicity test with *Ampelisca,* porewater sulfide concentrations were above reported threshold values for both total sulfide and undissociated hydrogen sulfide for East Branch, Dutch Kills, Maspeth Creek, and Newtown Creek stations in Round 1 (without pre-treatment) and in three of four samples in Round 2 (with pre-treatment; see Figure A2-5). Thus, although pre-treatment may have reduced porewater sulfide concentrations, it is likely that bacterial decomposition of the labile organic matter continued to generate porewater sulfide at levels that were toxic to *Ampelisca*. Although the same was true for the test conducted with *Leptocheirus*, this species is less sensitive than *Ampelisca* to sulfide as illustrated in Figure A2-6 (see also Table A2-2).

It is also noted that in the BERA 28-day sediment bioassays conducted with *Leptocheirus* reported in the Newtown Creek BERA, four stations exhibited porewater sulfide concentrations above 20 milligrams per liter (mg/L)[1] (two in East Branch, one in Maspeth Creek, and one in the Turning Basin) and exhibited reduced survival, growth, and reproduction. Three of these four samples exhibited low porewater TUs for contaminants of potential ecological concern (COPECs), meaning that these COPECs could not explain toxicity (see Anchor QEA 2017a). Furthermore, in the BERA 10-day sediment bioassays, stations tested in Maspeth Creek and East Branch, where porewater sulfide exceeded 70 mg/L on day 3, are near the larger tributary CSOs, where sediments are organically enriched (TOC up to 20 wt% with a median of 11 wt%—see Appendix A1, Section 4), and experience low DO at the sediment mudline. These findings show that elevated porewater concentrations of sulfide likely contribute to benthic macroinvertebrate toxicity observed for the stations tested in the Newtown Creek BERA and the NCG follow-up sediment toxicity study.

5.2 Physical Impacts of UCM

Another stressor that can impact benthic organisms is the physical fouling due to the complex mixture of organic compounds present in the sediment of Newtown Creek (see Appendix A1, Section 6 and Anchor QEA 2017a). As part of the NCG follow-up sediment toxicity study, *Ampelisca* and *Leptocheirus* observations of physical fouling were made on Days 1, 2, 4, and 10 of the tests. These observations included the fouling of gills, body plates, or antennae. Examples of fouled versus control test organisms are shown in Figures A2-7a and A2-7b. The fouling observations were used to develop the following fouling metric representing the number of organisms exhibiting fouling on any given day.

$$fouling\ metric = \frac{maximum\ of\ all\ fouling\ observations}{number\ of\ organisms\ observed}$$

The relationship between the fouling metric and UCM is shown in Figure A2-8, which uses bulk sediment concentrations of C19-C36 aliphatics as a surrogate for the UCM of organic compounds (see discussion in Appendix A1).

[1] Sulfide concentrations of 20 mg/L in porewater is associated with toxicity for *Rhepoxynius* and *Eohaustorius*, burrowing estuarine amphipods (Caldwell 2005).

In one of the two *Ampelisca* and both the *Leptocheirus* toxicity tests, the fouling metric generally increased with increasing bulk sediment concentrations of C19-C36 aliphatics. The maximum fouling was observed for the English Kills station, coincident with minimum survival, and higher concentrations of TPH and C19-C36 (see Table A2-1). These results show that UCM does have a physical impact on the test organisms and may have contributed to the low survival observed in the toxicity tests (see Appendix A1, Section 6).

5.3 Pathogens and PPCPs

Pathogens and PPCPs are common urban contaminants associated with CSOs and MS4s and are known toxicants, as discussed in Appendix A1, Section 7. In 2016, the NCG conducted an at-risk study for PPCPs (NewFields and GEI 2016) and for pathogens and PPCPs (GEI and NewFields 2016) in Newtown Creek. Both studies were based on data collected as part of a pilot study conducted in 2013 (NewFields and GEI 2014), as well as data collected during the Newtown Creek Phase 2 RI (see the draft *Remedial Investigation Report*; Anchor QEA 2016). In these studies, risks were identified for benthic macroinvertebrates and fish from exposure to four PPCPs in surface water and estimated sediment porewater (in particular, beta-estradiol, estrone, bisphenol-A, and nonylphenol). The risks from estimated sediment porewater exposure were highest for stations in the vicinity of CSOs, with risks from combined surface water and estimated sediment porewater higher during wet weather.

Sediment porewater PPCP concentrations in the NewFields and GEI studies were estimated based on equilibrium partitioning. To empirically confirm the potential bioavailability of these compounds, selected PPCPs were measured in sediment porewater as part of the NCG follow-up toxicity study conducted in April and May of 2017. As shown in Table A2-1, bisphenol-A, nonylphenol, and 4,tert-octylphenol were all analytically detected in porewater at relatively high concentrations. Specifically, concentrations of bisphenol-A and nonylphenol exceeded their respective surface water chronic thresholds at stations in Dutch Kills, Maspeth Creek, East Branch, and Newtown Creek in the vicinity of the larger CSOs, and in English Kills in the vicinity of two of the larger MS4s. Porewater concentrations of 4,tert-octylphenol exceeded its surface water chronic threshold at stations in Maspeth Creek, East Branch, and English Kills. Resulting TUs ranged from 3.5 to 207 for bisphenol-A, from 1.2 to 559 for nonylphenol, and from 0.4 to 68 for 4,tert-octylphenol. These results not only confirm the presence of these PPCPs in porewater, but also their presence at concentrations high enough to be of significant ecological concern, so these, therefore, likely contribute to the toxicity observed in the toxicity tests.

The pathogen and PPCP study conducted by GEI and NewFields (2016) found that for pathogens, human health risk-based criteria were exceeded by total coliforms, fecal coliforms, *Enterococcus*, and *E. coli*. As part of the NCG follow-up sediment toxicity study, total coliforms for those stations in the vicinity of CSOs ranged from 140,000 most probable number of colony forming units per gram (MPN/g) for MC017 to 460,000 MPN/g for station EB036, and *E. coli* ranged from 1,090 MPN/g for NC065 to 21,000 for EB036. Based on the spatial distribution of the pathogens and PPCPs in surface water, risks to human health in Newtown Creek are associated with proximity to CSO outfalls, particularly under wet weather conditions, when measured concentrations of pathogens in surface water were higher than during dry weather conditions.

6 SUMMARY

The results of sediment toxicity tests and bulk sediment and porewater chemistry show that for samples collected close to CSOs and MS4s in Newtown Creek, stressors other than CERCLA hazardous substances are likely contributing to benthic macroinvertebrate toxicity. These other stressors include high organic matter leading to porewater sulfide concentrations above threshold values, porewater concentrations of PPCPs above threshold values, and elevated concentrations of bulk sediment UCM that results in a physical fouling of the organisms.

These findings show that loadings from CSOs and MS4s will continue to impair the survival and health of benthic organisms in the creek. As a result, although the proposed Long-Term Control Plan will control some CSO discharges, the remaining CSO and MS4 discharges will continue to contribute to the loading of organic matter, PPCPs, and UCM to the creek, and the degradation of the sediment ecological habitat.

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TABLES

Table A2-1
Concentrations and Toxic Units for Key Sediment and Porewater Chemicals by Location

Sample Type	Location	TPAH (17)	TPAH (34)	C19-C36 Aliphatics Unadjusted	Total Petroleum Hydrocarbons (C9-C40)	Bisphenol-A	Nonylphenol	4-tert-Octylphenol	Cadmium	Copper	Lead	Nickel	Zinc	SEM/AVS Ratio
Sediment (mg/kg)	EK059SG	320	3,180	3,800	58,100	0.370	120	9.80	198	3,070	1,190	747	5,380	0.121
	EB036SG	169	432	1,230	15,700	0.470	15.0	0.580	4.16	298	333	39.6	1,100	0.059
	DK040SG	125	252	645	11,900	0.960	14.0	0.190	4.11	374	249	44.7	1,250	0.040
	MC017SG	264	1,220	2,970	11,600	1.20	45.0	0.490	4.02	509	278	57.5	1,430	0.051
	NC065SG	56.0	145	658	6,040	2.10	7.90	0.059	4.37	629	236	60.1	716	0.049
Porewater (µg/L)	EK059SG	3.5	79.0	--	--	31	950	68	0.5	10.2	5.1	29.8	223	--
	EB036SG	0.31	3.06	--	--	0.91	19	1.1	0.1 U	1.6	2.9	15.3	139	--
	DK040SG	0.31	2.72	--	--	0.74	8.9	0.41 U	0.1 U	0.6	0.8	4.9	33.6	--
	MC017SG	0.18	4.79	--	--	2.5	280	4.3	0.2	13.4	12.6	4.1	183	--
	NC065SG	0.05	0.97	--	--	0.52	2 U	0.4 U	0.10	15.2	2.9	2.6	179	--

Sample Type	Location	TPAH (17)	TPAH (34)	C19-C36 Aliphatics Unadjusted	Total Petroleum Hydrocarbons (C9-C40)	Bisphenol-A	Nonylphenol	4-tert-Octylphenol	Cadmium	Copper	Lead	Nickel	Zinc	Sum SEM TU
Porewater (TUs)	EK059SG	--	17.7	--	--	207	559	68	0.06	1.8	0.63	3.6	2.8	8.9
	EB036SG	--	1.2	--	--	6.1	11.2	1.1	0.01	0.29	0.36	1.9	1.7	4.2
	DK040SG	--	1.1	--	--	4.9	5.2	0.41	0.01	0.11	0.10	0.60	0.41	1.2
	MC017SG	--	1.5	--	--	16.7	165	4.3	0.02	2.4	1.6	0.50	2.3	6.7
	NC065SG	--	0.96	--	--	3.5	1.2	0.40	0.01	2.7	0.36	0.32	2.2	5.6

Notes:
Laboratories are ESI for metals, ALS for PPCP, and EERC for TPAH.
Sediment (mg/kg) values for organic compounds are converted from original units, µg/kg, and reported to 3 significant figures; the values for metals are as reported by the analytical laboratory. Similarly, porewater (µg/L) values are as reported by the analytical laboratory.

Acronyms:
µg/L = micrograms per liter
ALS = ALS Environmental
AVS = acid volatile sulfide
EERC = Energy and Environmental Research Center
ESI = EnviroSystems, Inc
mg/kg = milligrams per kilogram
PPCP = pharmaceuticals and personal care products
SEM = simultaneously extracted metals
TPAH = total polycyclic aromatic hydrocarbons
TU = toxic unit
U = Undetected at method detection limit

Table A2-2
Ammonia and Sulfide Threshold Values for *Ampelisca* and *Leptocheirus*

Parameter	Overlying Water	Porewater	Notes
Ampelisca abdita			
Total Ammonia (mg/L)			
Threshold	17	30	OW – Inouye et al. 2015; PW – ASTM E1367 and USEPA 1994
LC50/EC50	49.8		Inouye et al. 2015
Unionized Ammonia (mg/L)			
Threshold	0.24	0.4	OW – Inouye et al. 2015; PW – ASTM E1367 and USEPA 1994
LC50/EC50	0.83		Inouye et al. 2015
Total Sulfide (mg/L)			
Threshold	0.096	2	OW – Inouye et al. 2015, calculated from undissociated hydrogen sulfide at average Aa test conditions; PW – Caldwell 2005 and Inouye et al. 2015, based on *Ampelisca* being approximately 10x more sensitive to sulfide than *Eohaustorius* [1]
LC50/EC50	0.411	8	OW – Inouye et al. 2015, calculated from undissociated hydrogen sulfide at average Aa test conditions; PW – Inouye et al. 2015, calculated based on the ratio between OW LC50 and no-effect level and *Ampelisca* being approximately 10x more sensitive to sulfide than *Eohaustorius* [1]
Undissociated Hydrogen Sulfide (mg/L)			
Threshold	0.0094	0.195	OW – Inouye et al. 2015; PW – undissociated hydrogen sulfide at average Aa test conditions based on total sulfide values above
LC50/EC50	0.0402	0.782	OW – Inouye et al. 2015; PW – undissociated hydrogen sulfide at average Aa test conditions based on total sulfide values above
Leptocheirus plumulosus			
Total Ammonia (mg/L)			
Threshold	N/A	60	PW – ASTM E1367 and USEPA 1994
LC50/EC50	N/A	125.5	PW – Inouye et al. 2015, based on *Eohaustorius*
Unionized Ammonia (mg/L)			
Threshold	N/A	0.8	PW – ASTM E1367 and USEPA 1994
LC50/EC50	N/A	2.49	PW – Inouye et al. 2015, based on *Eohaustorius*
Total Sulfide (mg/L)			
Threshold	1.64	20	OW – Inouye et al. 2015 value for *Eohaustorius,* calculated from undissociated hydrogen sulfide at average *Leptocheirus* test conditions; PW – Caldwell 2005, 20 mg/L total sulfide value is the estimated no effect level from *Rhepoxynius* and *Eohaustorius* [2]
LC50/EC50	3.07	38	OW – Inouye et al. 2015 value for *Eohaustorius,* calculated from undissociated hydrogen sulfide at average *Leptocheirus* test conditions; PW – Caldwell 2005 threshold value adjusted using the ratio between OW LC50 and threshold level
Undissociated Hydrogen Sulfide (mg/L)			
Threshold	0.122	1.485	OW – Inouye et al. 2015 value for *Eohaustorius;* PW – Caldwell 2005 total sulfide value converted to undissociated hydrogen sulfide
LC50/EC50	0.322	2.822	OW – Inouye et al. 2015 value for *Eohaustorius;* PW – Caldwell 2005 total sulfide value converted to undissociated hydrogen sulfide

Notes:
1 = *Eohaustorius* is a burrowing amphipod that is used as a surrogate for *Leptocheirus.*
2 = Caldwell (2005) provides data for *Eohaustorius* and *Rhepoxynius* , two burrowing amphipods that were evaluated for toxicity to sulfide in exposures to sediment impacted by wood debris (e.g., an organically enriched sediment matrix). The threshold value was estimated from charts presented by Caldwell (2005).

Acronyms:
EC50 = median effect concentration for 50% of the test organisms
LC50 = median lethal concentration for 50% of the test organisms
mg/L = milligram per liter
N/A = not applicable
OW = overlaying water
PW = porewater

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FIGURES

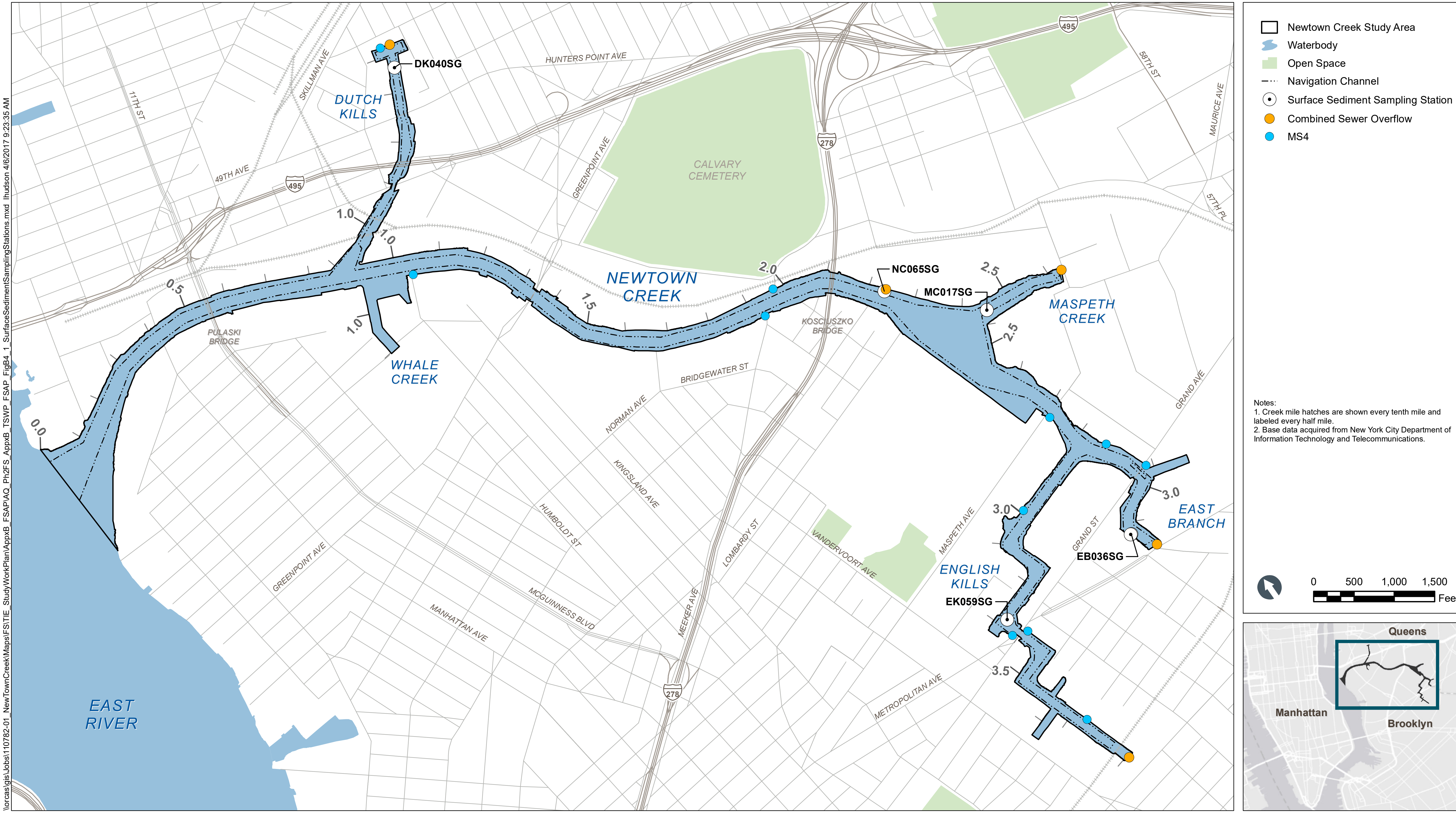
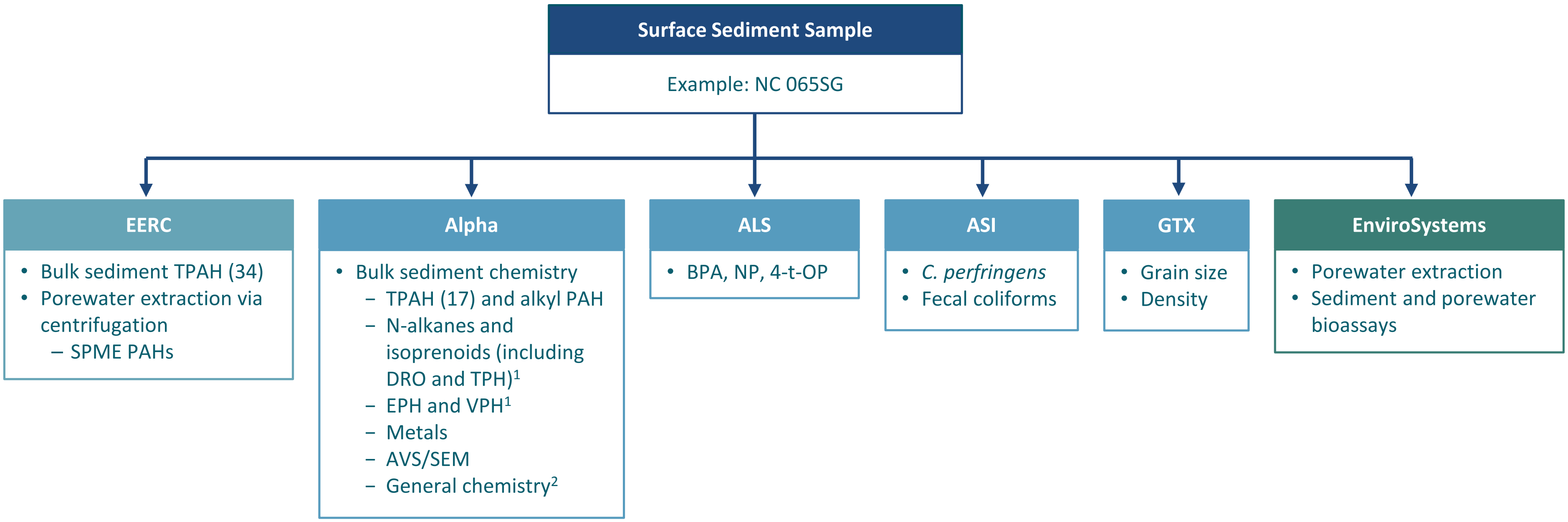


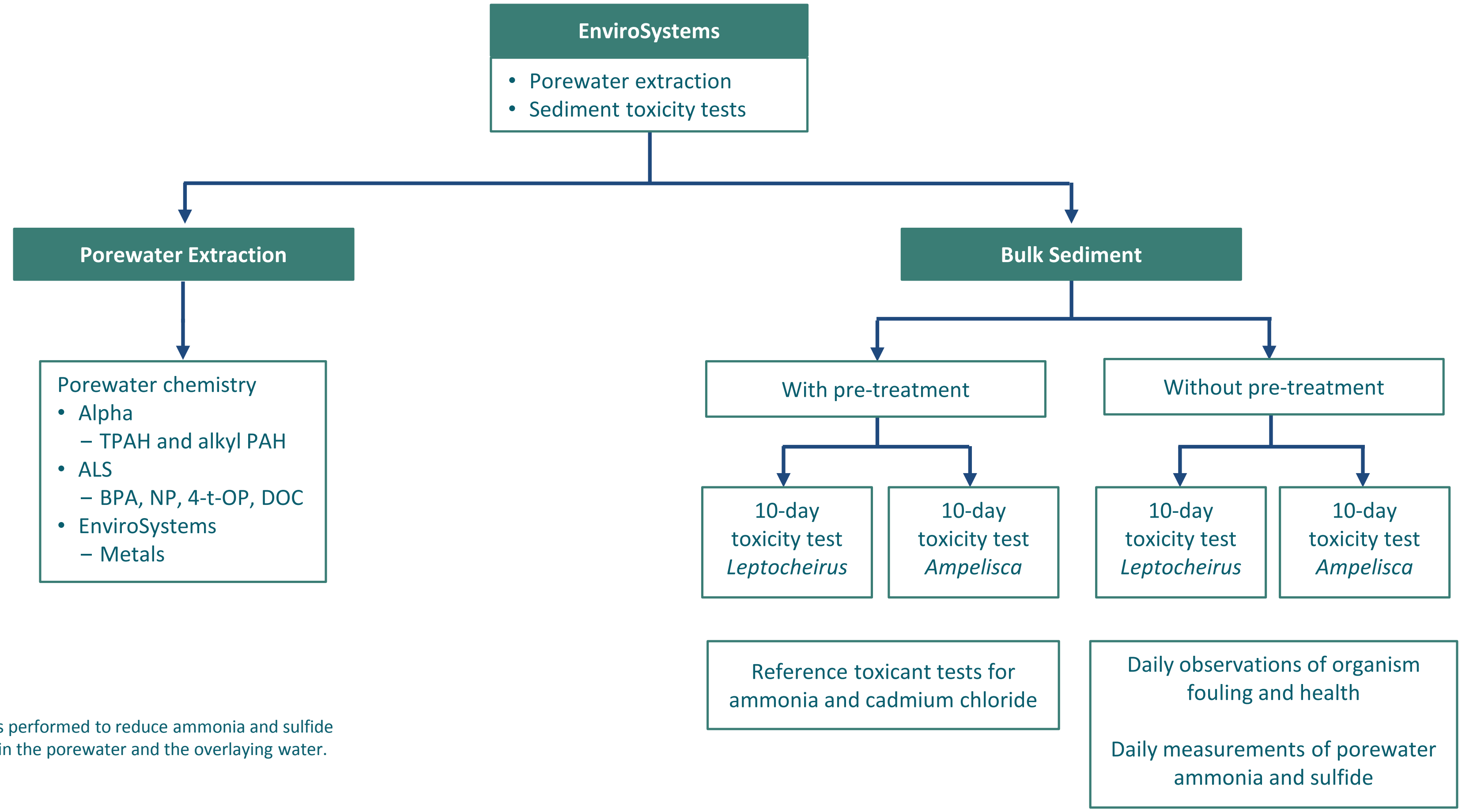
Figure A2-1
Surface Sediment Sampling Stations
LTCP Comments
Newtown Creek



Notes:
1 = N-alkanes and isoprenoids (including DRO and TPH) and EPH will be analyzed in advance with a 5-day turnaround time.
2 = General chemistry includes total organic carbon, soot carbon, percent solids, ammonia, sulfide, and pH.

Acronyms:
4-t-OP = 4-tert-octylphenol
Alpha = Alpha Analytical Laboratories
ALS = ALS Environmental
ASI = Analytical Services, Inc.
AVS = acid volatile sulfide
BPA = bisphenol A
DRO = diesel range organics
EERC = Energy and Environmental Research Center
EPH = extractable petroleum hydrocarbons
GTX = GeoTesting Express
NP = nonylphenol
PAH = polycyclic aromatic hydrocarbon
SEM = simultaneously extracted metals
SPME = solid-phase microextraction
TIE = Toxicity Identification Evaluation
TPAH = total polycyclic aromatic hydrocarbons
TPH = total petroleum hydrocarbons
VPH = volatile petroleum hydrocarbons

Figure A2-2
Sediment Sample Analyses by Laboratory
LTCP Comments
Newtown Creek



Note:
Pre-treatment is performed to reduce ammonia and sulfide concentrations in the porewater and the overlaying water.

Acronyms:
4-t-OP = 4-tert-octylphenol
Alpha = Alpha Analytical Laboratories
ALS = ALS Environmental
BPA = bisphenol A
DOC = dissolved organic carbon
NP = nonylphenol
PAH = polycyclic aromatic hydrocarbon
TIE = Toxicity Identification Evaluation
TPAH = total polycyclic aromatic hydrocarbons

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Figure A2-3
EnviroSystems Sample Processing and Analyses
LTCP Comments
Newtown Creek

Ampelisca abdita

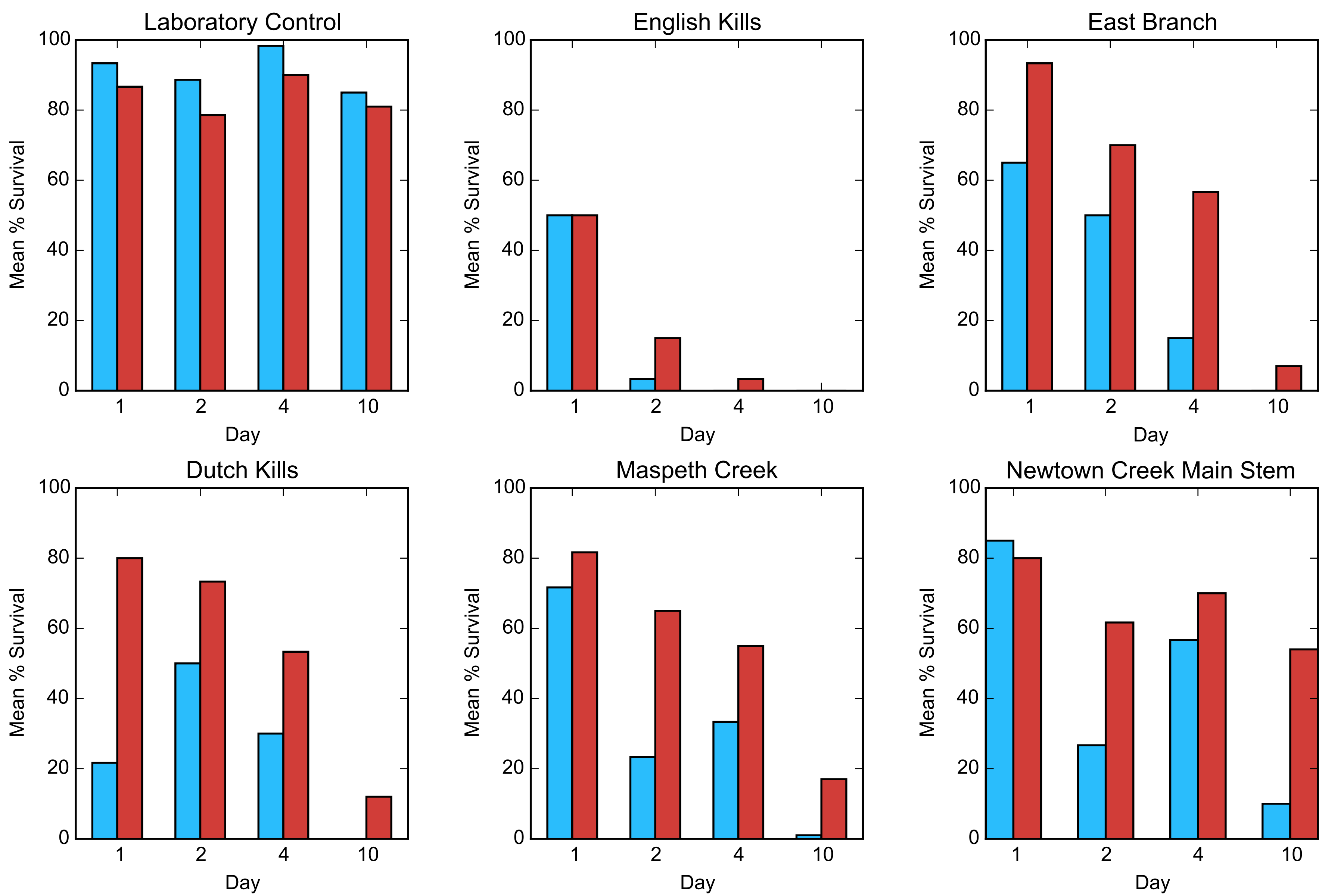
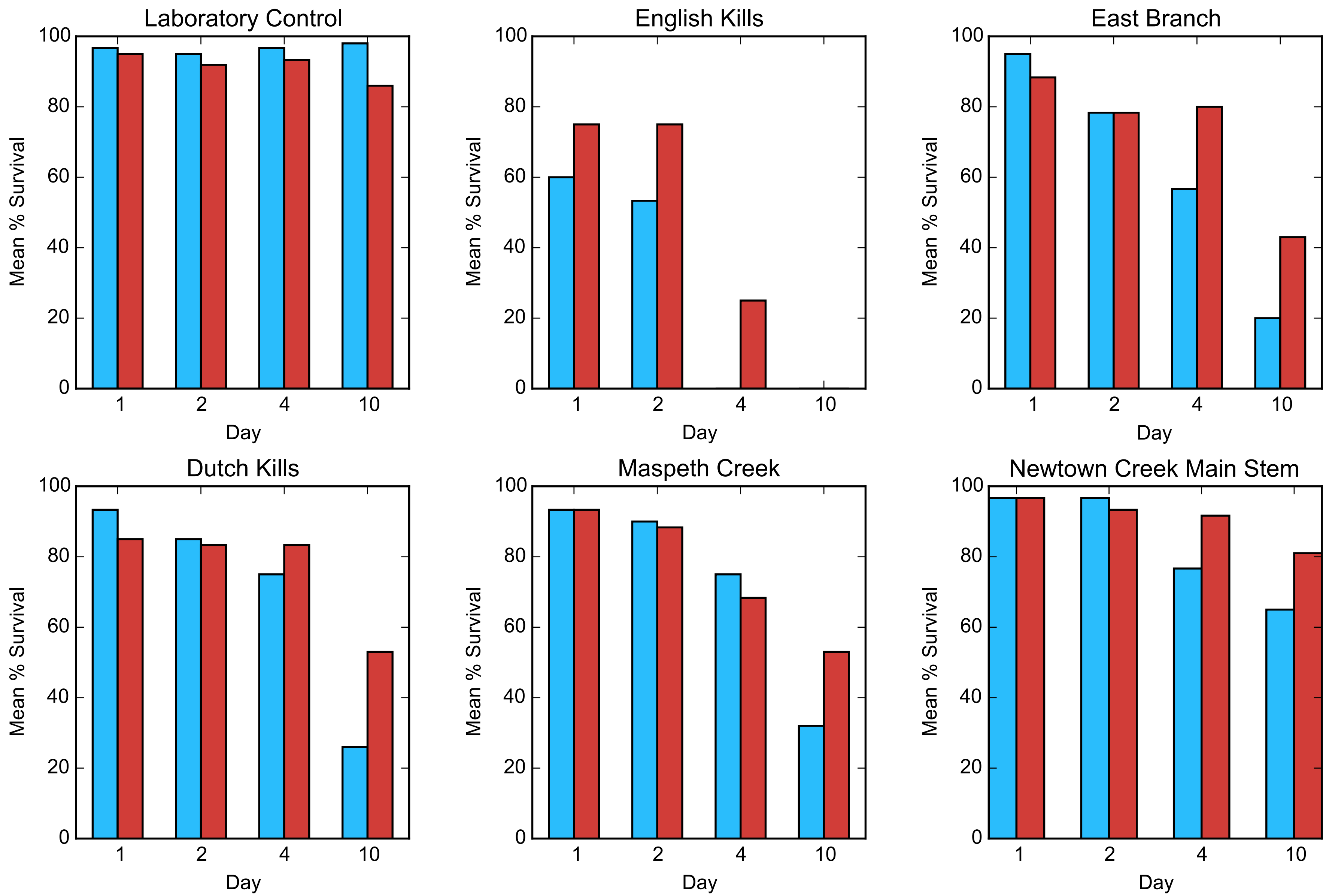


Figure A2-4a
Comparison of *Ampelisca* Survival with Time in Bioassays with and without Pre-treatment
LTCP Comments
Newtown Creek

Notes: Bars represent the average of replicates.
Data source: \NC_TIE_Sed_Tox_10d_R1+R2_Summary_2017_06-28

WCL-PSON - \\IRIS\Woodcliff\Projects\Newtown_Creek\Analysis\LTCP_TIE\python\NTC_barplot_surv.py 7/11/2017 10:15:39

Leptocheirus plumulosus



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Round 1
Round 2

Figure A2-4b
Comparison of *Leptocheirus* Survival with Time in Bioassays with and without Pre-treatment
LTCP Comments
Newtown Creek

Notes: Bars represent the average of replicates.
Data source: \NC_TIE_Sed_Tox_10d_R1+R2_Summary_2017_06-28

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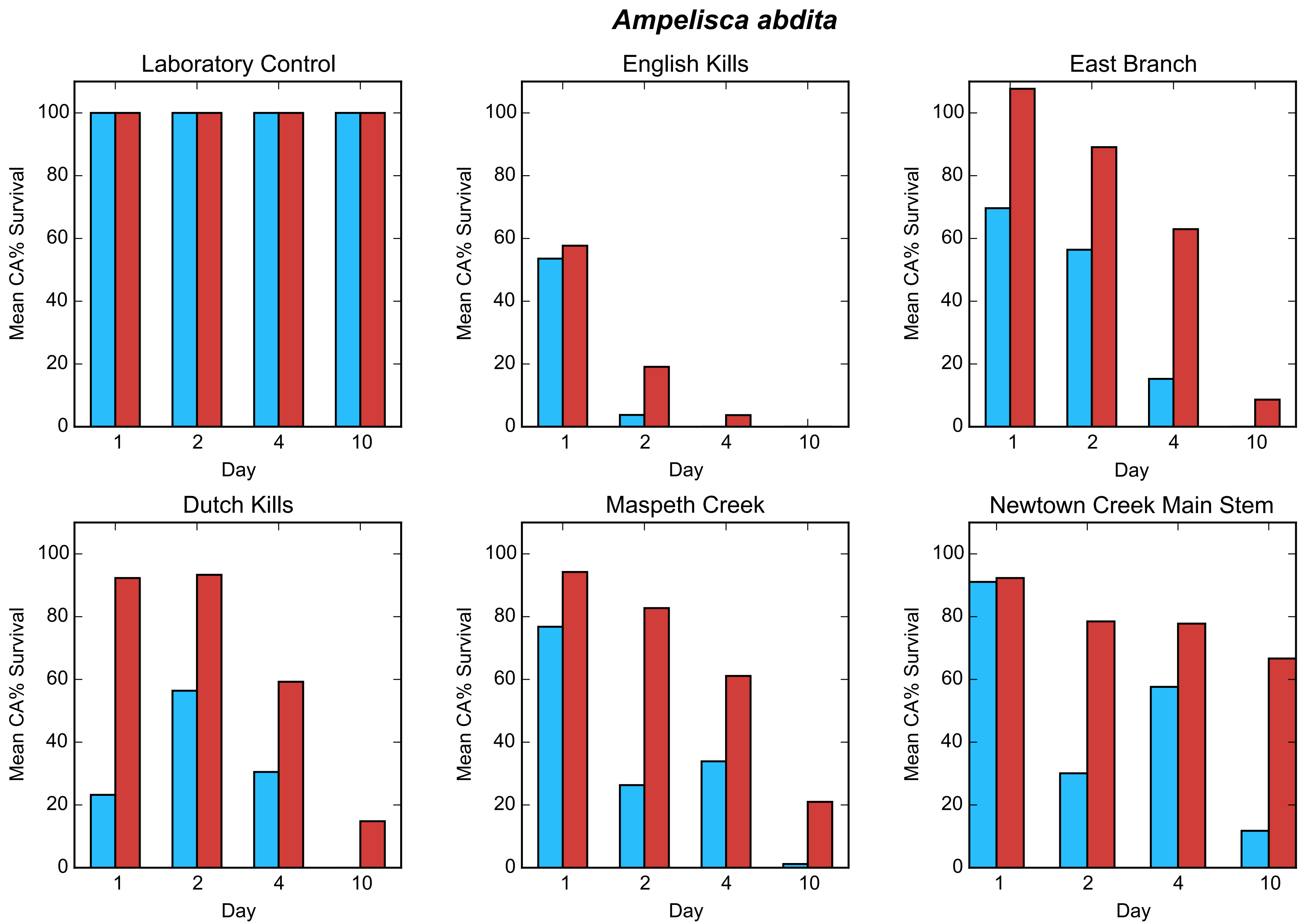

ANCHOR QEA

Round 1
Round 2

Figure A2-4c
Comparison of *Ampelisca* Survival (control adjusted) with Time in Bioassays with and without Pre-Treatment
LTCP Comments
Newtown Creek

Notes: Bars represent the average of replicates.
Data source: \NC_TIE_Sed_Tox_10d_R1+R2_Summary_2017_06-28

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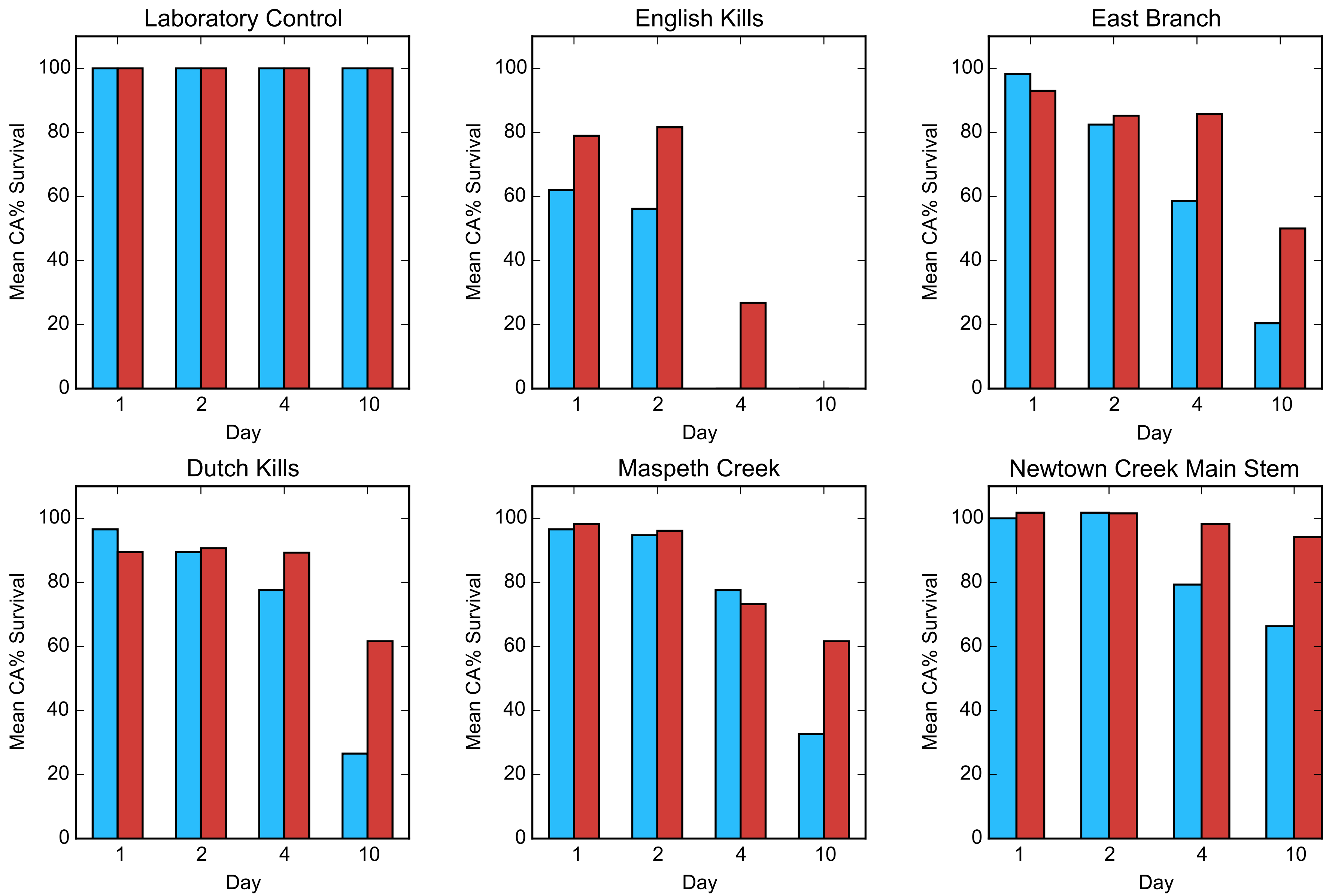
Leptocheirus plumulosus



Round 1
Round 2

Figure A2-4d
Comparison of *Leptocheirus* Survival (control adjusted) with Time in Bioassays with and without Pre-Treatment
LTCP Comments
Newtown Creek

Notes: Bars represent the average of replicates.
Data source: \NC_TIE_Sed_Tox_10d_R1+R2_Summary_2017_06-28

WCL-PSON - \\IRIS\Woodcliff\Projects\Newtown_Creek\Analysis\LTCP_TIE\python\NTC_barplot_surv.py 7/11/2017 10:15:42

Ampelisca, Porewater

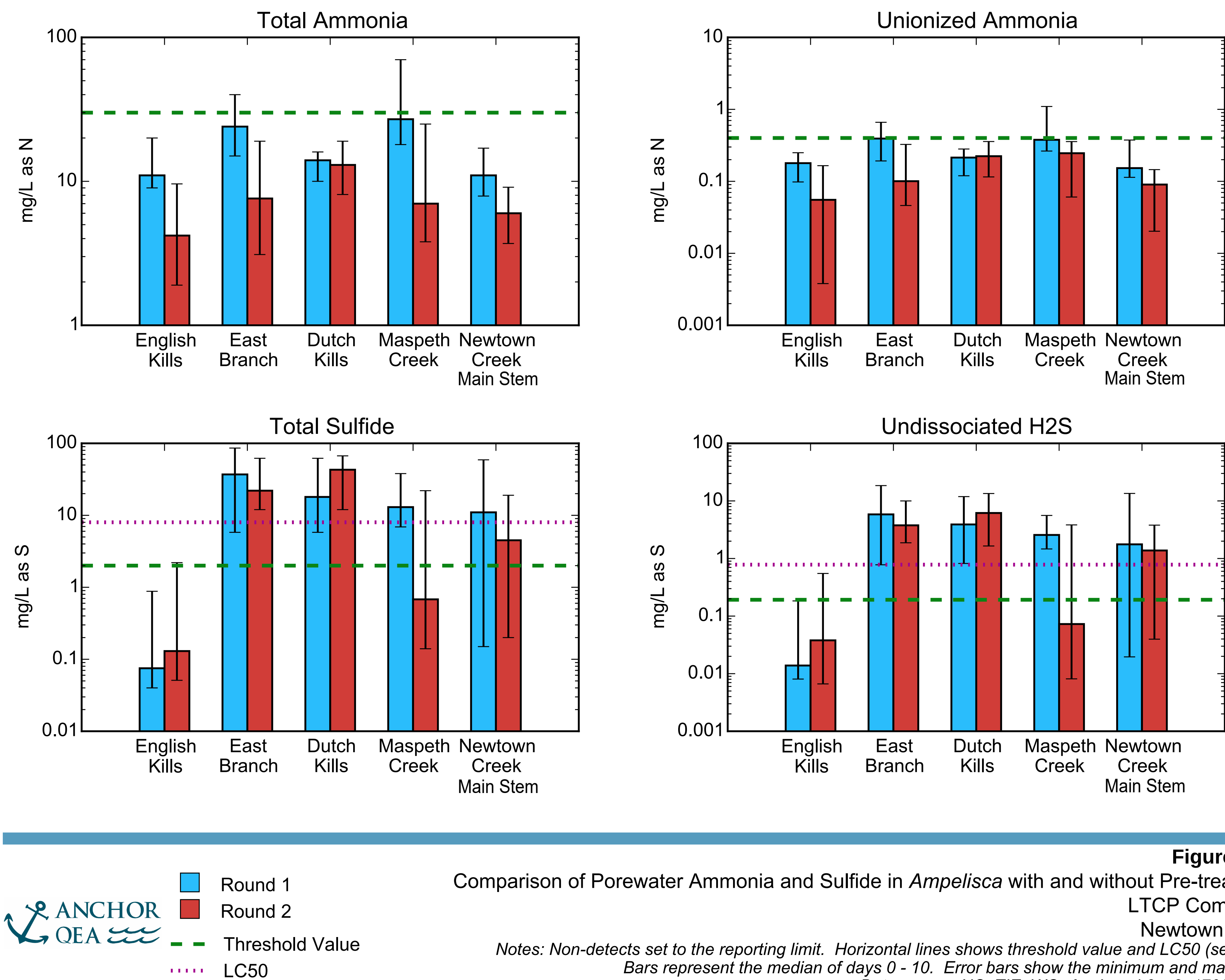


Figure A2-5

Comparison of Porewater Ammonia and Sulfide in *Ampelisca* with and without Pre-treatment

LTCP Comments

Newtown Creek

Notes: Non-detects set to the reporting limit. Horizontal lines shows threshold value and LC50 (see text).
Bars represent the median of days 0 - 10. Error bars show the minimum and maximum.
Data source: NC_TIE_WQ_Aa_Lp_nh3_s2_170629.xlsx

Leptocheirus, Porewater

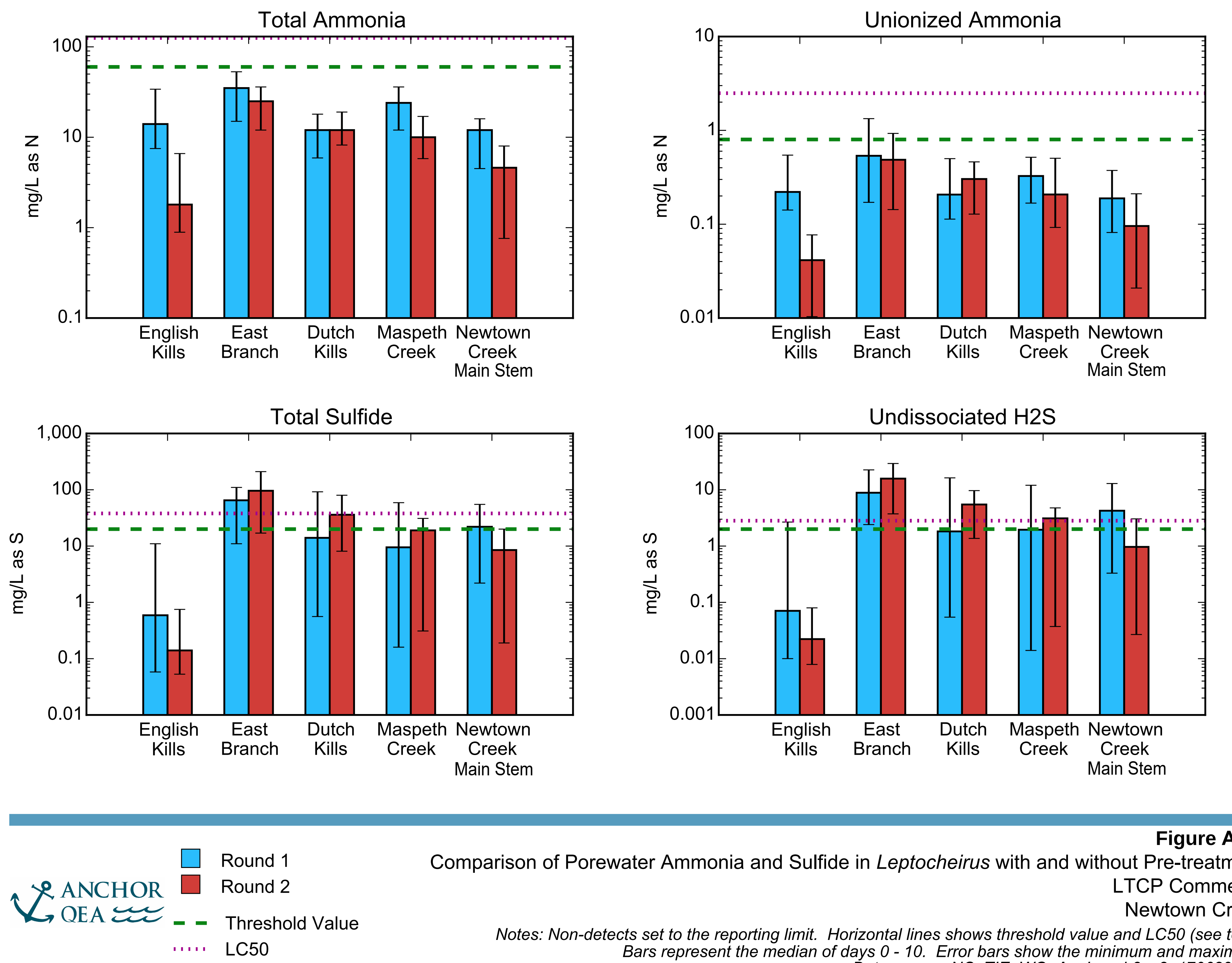


Figure A2-6
Comparison of Porewater Ammonia and Sulfide in *Leptocheirus* with and without Pre-treatment
LTCP Comments
Newtown Creek

Notes: Non-detects set to the reporting limit. Horizontal lines shows threshold value and LC50 (see text).
Bars represent the median of days 0 - 10. Error bars show the minimum and maximum.
Data source: NC_TIE_WQ_Aa_Lp_nh3_s2_170629.xlsx

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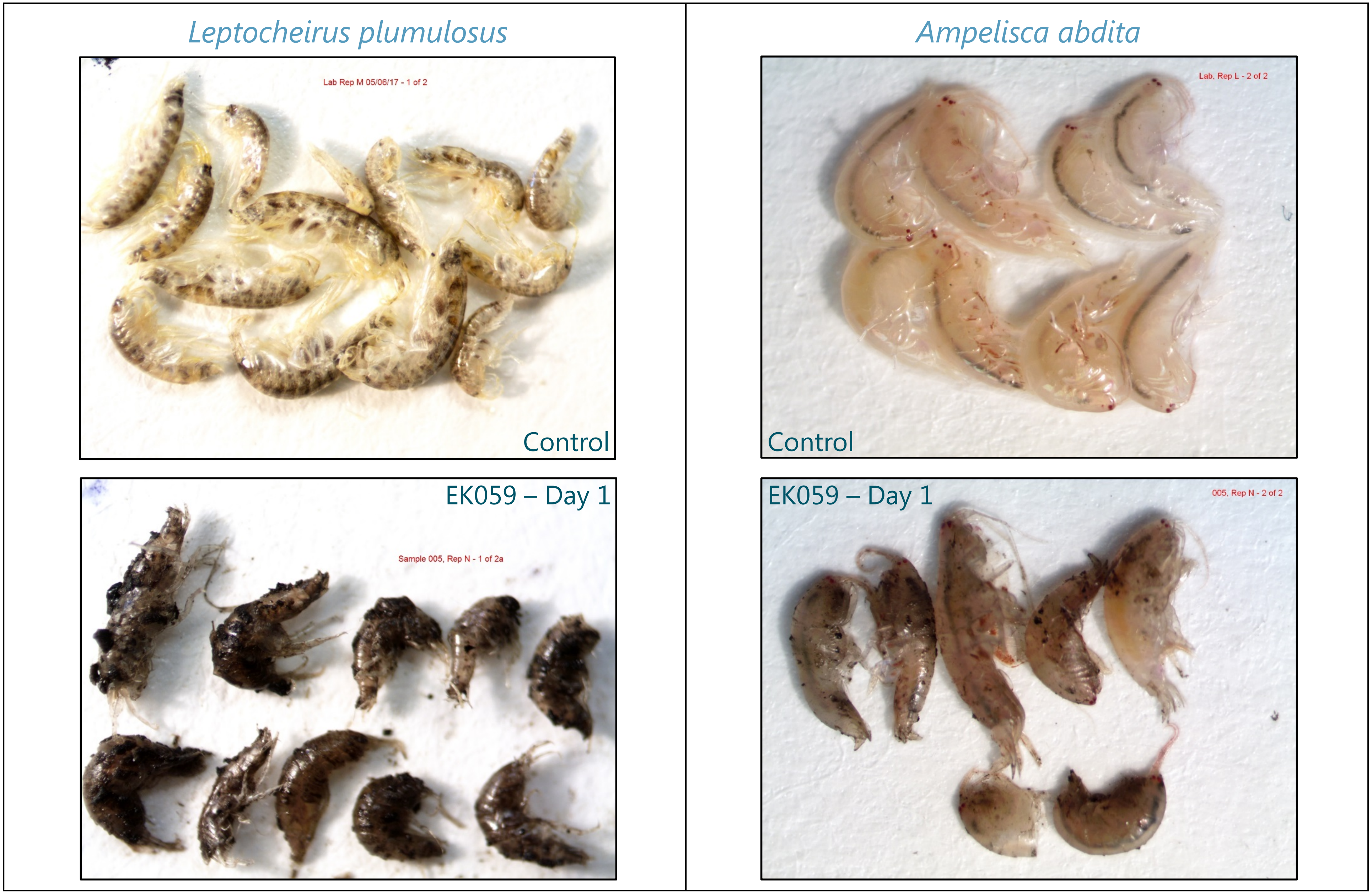

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Figure A2-7a
Newtown Creek Sediment Toxicity Tests: Day 1 Fouling of *Leptocheirus plumulosus* and *Ampelisca abdita* at Station EK059
LTCP Comments
Newtown Creek

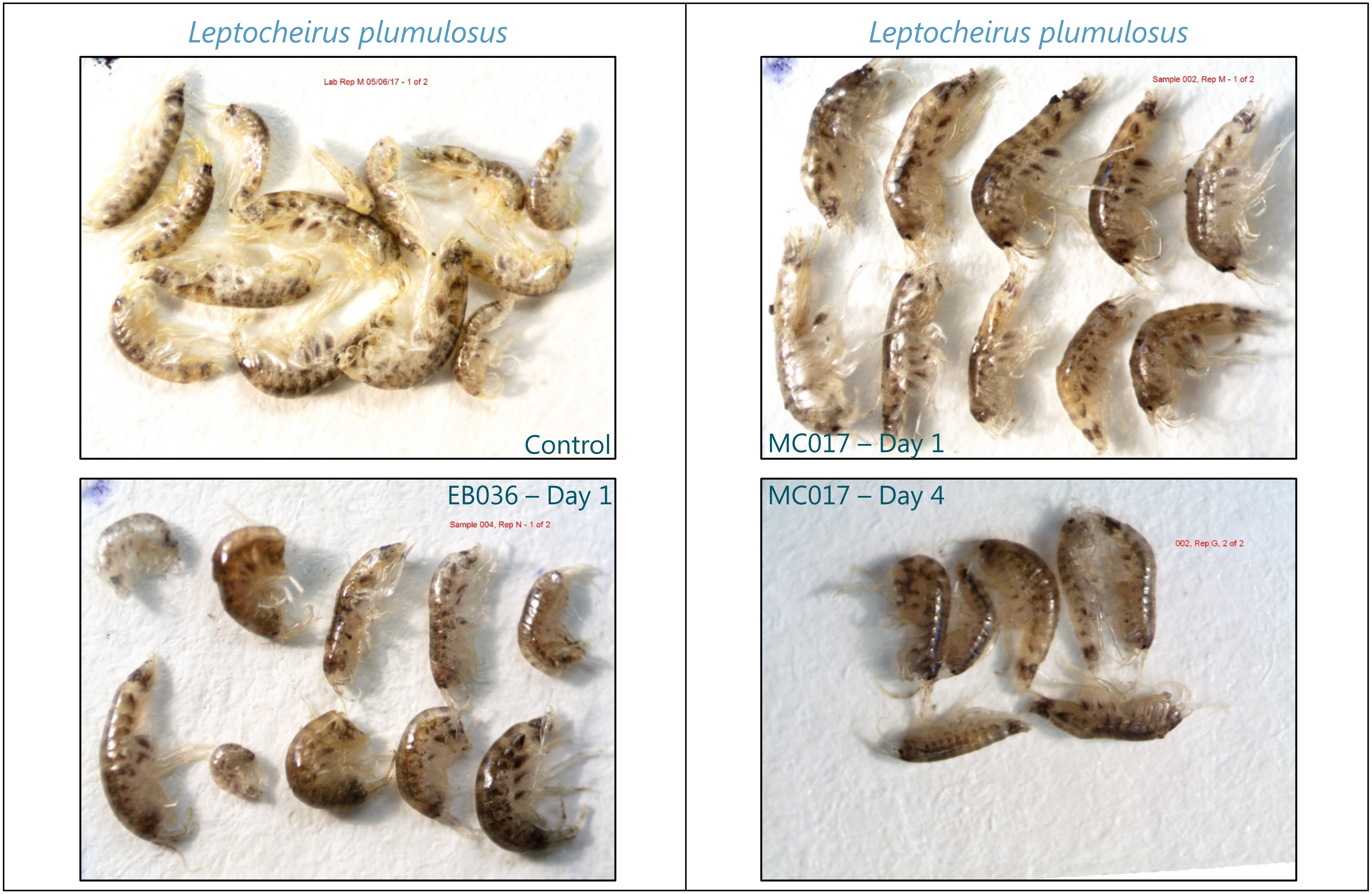
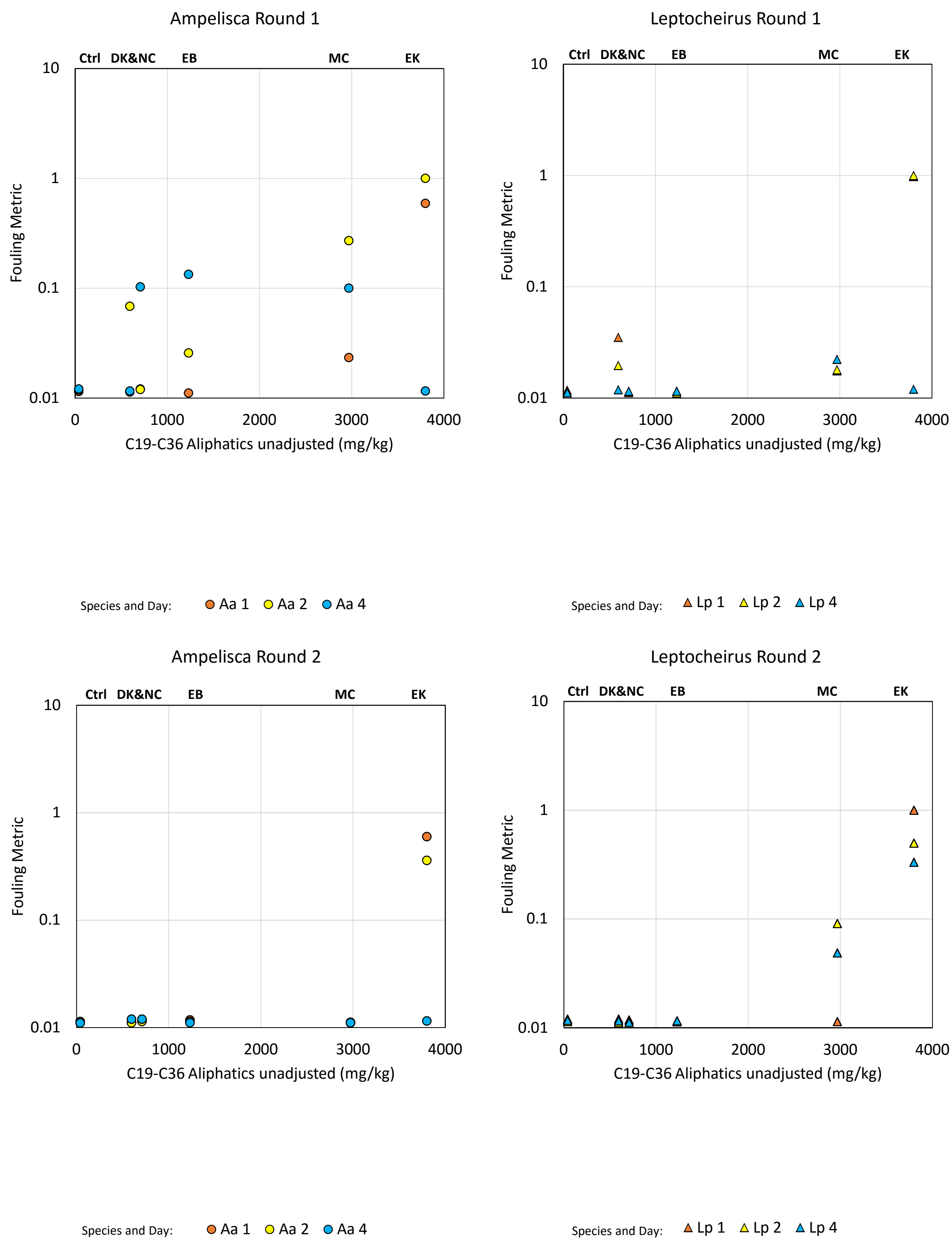


Figure A2-7b
Newtown Creek Sediment Toxicity Tests: Day 1 and Day 4 Fouling of *Leptocheirus plumulosus* at Stations EB036 and MC017
LTCP Comments
Newtown Creek



Fouling metric = maximum of all fouling observations/number of organisms observed. All fouling metrics included in the maximum of the gill, body plate, and antennae fouling. Metric = 0 set equal to 0.01 to view on log scales. For DK and NC, the concentrations were manually separated by subtracting 50 from DK and adding 50 to NC values to avoid overlap. Values with zero survival were not plotted. Note that there are 3 possible values for each concentration and round (days 1, 2, and 4). C19-C36 value for lab control set = 40 mg/kg based on highest MDL.

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Figure A2-8

Relationship between *Ampelisca* and *Leptocheirus* Fouling Metric and Bulk Sediment C19-C36

LTCP Comments

Newtown Creek

APPENDIX A3
ANALYSIS OF FUTURE SURFACE SEDIMENT CHEMICAL EQUILIBRIUM CONCENTRATIONS

1 INTRODUCTION

As discussed in Section 4 of the Newtown Creek Group's (NCG's) comments on the Long-Term Control Plan (LTCP), and in the draft *Remedial Investigation Report* (RI Report; Anchor QEA 2016) (e.g., see Section 8.3 of the RI Report), large portions of Newtown Creek, especially the upper tributaries, are impacted by ongoing New York City Department of Environmental Protection (NYCDEP) discharges, which include combined sewer overflows (CSOs), municipal separate storm sewer system (MS4s), and the Newtown Creek wastewater treatment plant effluent into Whale Creek. These CSO impacts will only be partially abated under the CSO controls proposed by the LTCP. Thus, the ongoing Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Remedial Investigation/Feasibility Study (RI/FS) process is necessarily affected by the LTCP, especially with respect to preliminary remediation goals (PRGs), which may include numeric targets for concentrations of chemicals in sediment. Specifically, any PRGs developed for the Newtown Creek RI/FS will have to account for these future uncontrolled loadings from CSOs and MS4s discharging to the creek, in conjunction with other urban background[1] sources in the greater New York harbor area.

To help illustrate the importance of these ongoing discharges to the Newtown Creek CERCLA process, this appendix presents an evaluation of future surface sediment contaminant concentrations that was developed for the purposes of this comment document. This evaluation consisted of a quantitative analysis to answer the following question:

- If a hypothetical CERCLA remedial action were implemented that resulted in a "clean" sediment surface, what chemical concentrations would that sediment surface equilibrate to due to NYCDEP's ongoing future discharges (CSOs as well as MS4s) and other stormwater and the loadings of solids and chemicals they contain?

The purpose was to develop quantitative estimates of long-term equilibrium surface sediment concentrations in the tributaries and the upper main stem reaches of the creek (i.e., those areas that contain concentrations of CERCLA chemicals that are elevated relative to regional

[1] The term "urban background" in this document refers to ongoing sources of sediment contamination via particulate deposition to Newtown Creek from the East River, CSOs, and MS4s.

background[2]) based on a combination of predictions of future sediment loads and sedimentation rates (from the NCG's sediment transport model—see Appendix A1); and data collected as part of the RI sampling approved by the U.S. Environmental Protection Agency (USEPA) to measure concentrations of CERCLA chemicals in point source solids and surface water. An overview of the analysis is as follows:

- The analysis quantifies estimated contaminant concentrations that would establish on top of an assumed clean surface (e.g., cap) that would result from a hypothetical CERCLA remediation of existing sediments.
- The analysis was conducted for current CSO conditions as well as CSO control scenarios consistent with those evaluated in the LTCP (i.e., LTCP baseline as well as a range of CSO flow reductions).

[2] As discussed in the RI Report, chemical concentrations in the lower portion of the creek (specifically creek mile [CM] 0 to 1 and CM 1 to 2 of the main stem) tend to be at or approaching regional background levels as represented by reference area data (e.g., see RI Report graphics ES-1 through ES-3).

2 APPROACH

A solids mass balance analysis developed based on the NCG hydrodynamic and sediment transport models, as documented in Appendix G of the RI Report and using 2009 data to represent a typical rainfall year[3], formed the basis for this analysis. By tracking sediments originating from different source loadings separately, the sediment transport model can differentiate the contributions of different solids sources to the various terms of the solids balance. This includes the relative contribution of solids originating from point sources versus the East River to the gross and net terms for water column transport (advection) and net sedimentation. For example, as shown in Figures A1-1 and A1-2 of Appendix A-1, the relative contributions of CSOs and MS4s to current sedimentation were quantified by the model.

Each given reach within Newtown Creek was represented as a completely mixed reactor to calculate a weighted average chemical concentration of the depositing solids. Total polychlorinated biphenyls (TPCB), total polycyclic aromatic hydrocarbon (17) (TPAH), and copper were the contaminants used in this evaluation.

Contaminant concentrations were assigned using data collected as part of the USEPA-approved RI sampling to measure concentrations of point source solids and RI surface water sampling and partitioning calculations for the East River (see Section 5 of the RI Report for details). The analysis was developed using average concentrations by point sources category (i.e., CSOs and stormwater) consistent with the Collective Data Method outlined in Section 3.3.1 of Appendix E of the RI Report. The variability associated with these data was quantified using ± 2 standard errors of the mean, so that uncertainty bounds for the results could be quantified.

CSO control scenarios were evaluated using the same methodology previously described in this section, except that the hydrodynamic and sediment transport models were re-run based on the anticipated/assumed flow reductions, which resulted in a different solids balance and

[3] The quantitative evaluations of CSO reductions outlined in the LTCP were conducted using 2008 as the representative rainfall year. The total rainfall for 2009 and 2008 are nearly identical, so results from this recontamination analysis would not differ greatly if the other year's rainfall conditions were used.

net sedimentation rates (NSRs) and hence different results for long-term chemical equilibrium concentrations. The following four scenarios were evaluated:

- **Current conditions**, which are based on source flow predictions with no adjustments to CSOs, as presented in Appendix G of the RI Report
- **LTCP baseline**, which includes CSO flow reductions anticipated from planned grey and green infrastructure projects, as documented in the LTCP; the analysis involved applying the percent volume reduction as presented in the LTCP for all CSOs (recognizing that most reductions occur in the four large CSOs)
- **50% CSO flow reduction** for all CSOs (remaining after implementing the LTCP baseline scenario)
- **100% CSO flow reduction** for all CSOs (i.e., complete elimination of CSOs)

The latter two scenarios are consistent with the range of reduction scenarios evaluated in the LTCP and bound the LTCP alternative recommended by NYCDEP (which would result in 62.5 to 75% control of the four largest CSOs).

3 RESULTS

3.1 Net Sedimentation Rates

The predicted changes in the NSRs of the upstream reaches and tributaries of Newtown Creek for the various CSO control scenarios are shown in Figure A3-1. This figure shows that reducing CSO flows, and therefore, solids loads, results in decreases in predicted NSRs in the creek, most prominently in the portions that are most influenced by CSO discharges (i.e., the upstream tributaries). The CSO reduction scenarios also impact the upstream tributaries by increasing the influence of stormwater solids. The percent contributions of sources of solids depositing in the upstream reaches and tributaries, which show the increased influence of stormwater solids for the various CSO reduction scenarios, are presented in Figures A3-2 through A3-4 (compare to current conditions presented in Figure A1-2 of Appendix A1). For the most extreme scenario of 100% CSO control, these figures show that sedimentation in the upstream tributaries will continue to be dominated by point sources rather than East River solids, with stormwater (MS4s, as well as direct runoff and other outfalls) accounting for more than 70% of the net sedimentation.

3.2 Surface Sediment Equilibrium Chemical Concentrations

The calculated future equilibrium surface sediment chemical concentrations (including error bars to represent effects of data variability) are shown by reach and scenario in Figures A3-5 through A3-7. Overall, these results show that future sedimentation from point source discharges would result in long-term average surface sediment equilibrium chemical concentrations for the three upstream tributaries (i.e., English Kills, East Branch, and Maspeth Creek) in the following ranges:

- 0.6 to 1.2 milligrams per kilogram (mg/kg) for TPCB (up to 1.8 mg/kg when considering uncertainty)
- 30 to 35 mg/kg for TPAH (up to 40 mg/kg when considering uncertainty)
- 300 to 400 mg/kg for copper (up to 500 mg/kg when considering uncertainty)

Concentrations in the other reaches evaluated were somewhat lower (e.g., by 15 to 30% in the Turning Basin and by approximately 70% in Dutch Kills), due to the increasing influence of solids from the East River in these areas. Consistent with the NSR results, these results show that CSOs are not the only driver for future surface sediment chemical concentrations.

Due to the influence of stormwater, including MS4s, LTCP actions to reduce CSO activity will not eliminate the influence of New York City discharges on surface sediment chemistry. In fact, in many cases predicted equilibrium concentrations increase with increasing CSO control due to increased influences of stormwater and the relatively higher contaminant concentrations of stormwater solids measured as part of the RI point source programs. Overall, these results show that LTCP scenarios will have little influence on future surface sediment equilibrium concentrations and that the effects of other ongoing stormwater discharges (primarily MS4s) will result in future sedimentation at chemical concentrations that will need to be considered when setting PRGs for the CERCLA remedy.

Although the analysis presented herein focused on chemical equilibrium concentrations for various CSO reduction scenarios, another consideration is the timeframe over which such equilibration would establish. The rate at which a clean surface (e.g., top layer of a cap constructed as part of a CERCLA remedy) will equilibrate with ongoing loads is a combination of the chemical concentrations of the depositing sediment, the NSR, and sediment bed mixing processes. Reductions in CSO volumes result in lower model-predicted NSRs (see Figure A3-1), which will slow down the equilibration process to some extent. Also, mixing processes in the sediment bed, their extent and rates, may further slow the rate of equilibration, but the extent and rate of mixing is both variable and uncertain.

Overall, this analysis illustrates the strong influence of stormwater solids on future surface sediment equilibrium even in cases with CSO control. Thus, the goals for the CERCLA remedy, including PRG selection, will need to consider this reality.

4 REFERENCE

Anchor QEA (Anchor QEA, LLC), 2016. *Remedial Investigation Report*. Draft. Remedial Investigation/Feasibility Study, Newtown Creek. November 2016.

FIGURES

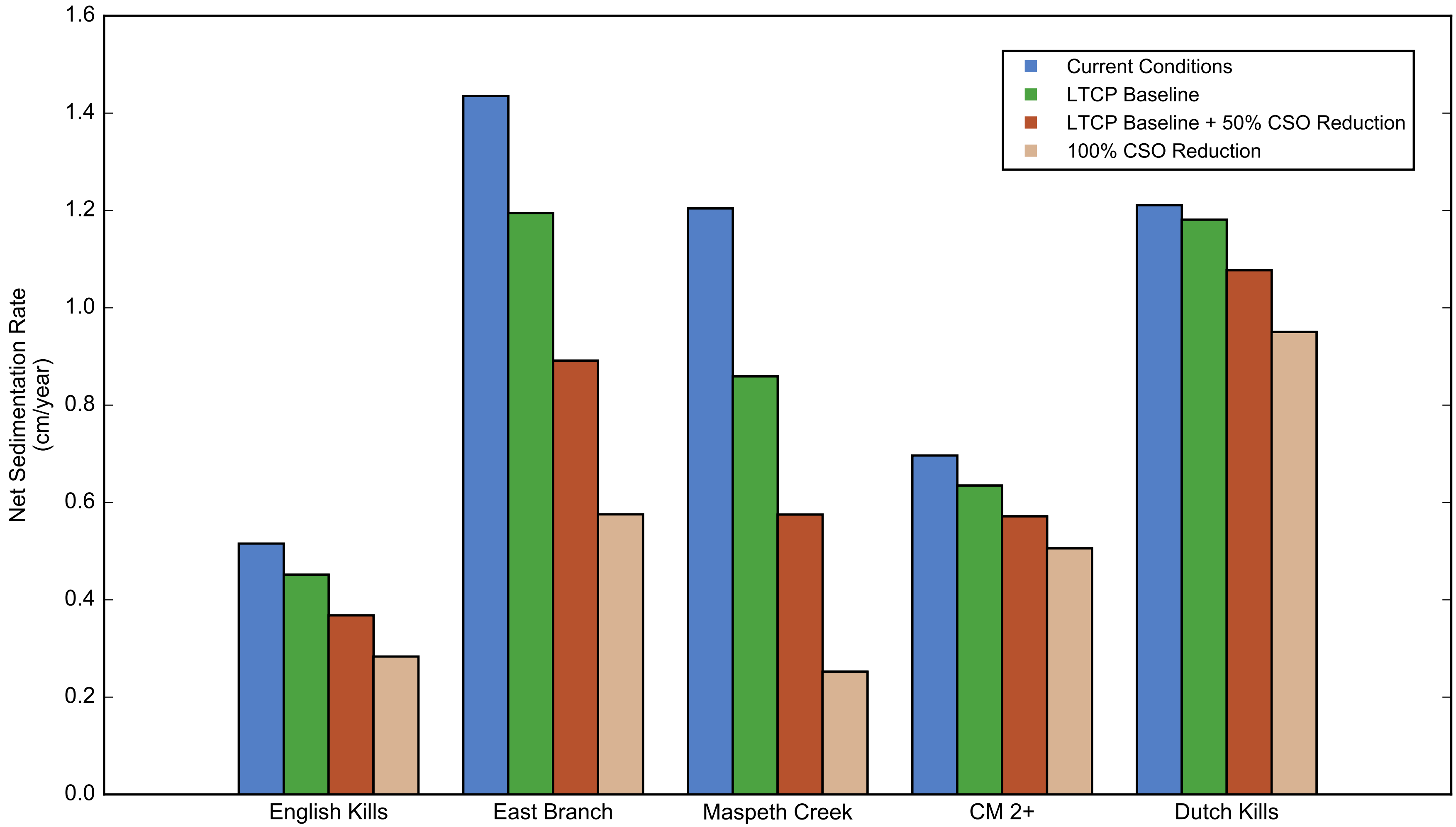

Figure A3-1
Predicted Net Sedimentation Rate by Scenario
LTCP Comments
Newtown Creek

ANCHOR QEA

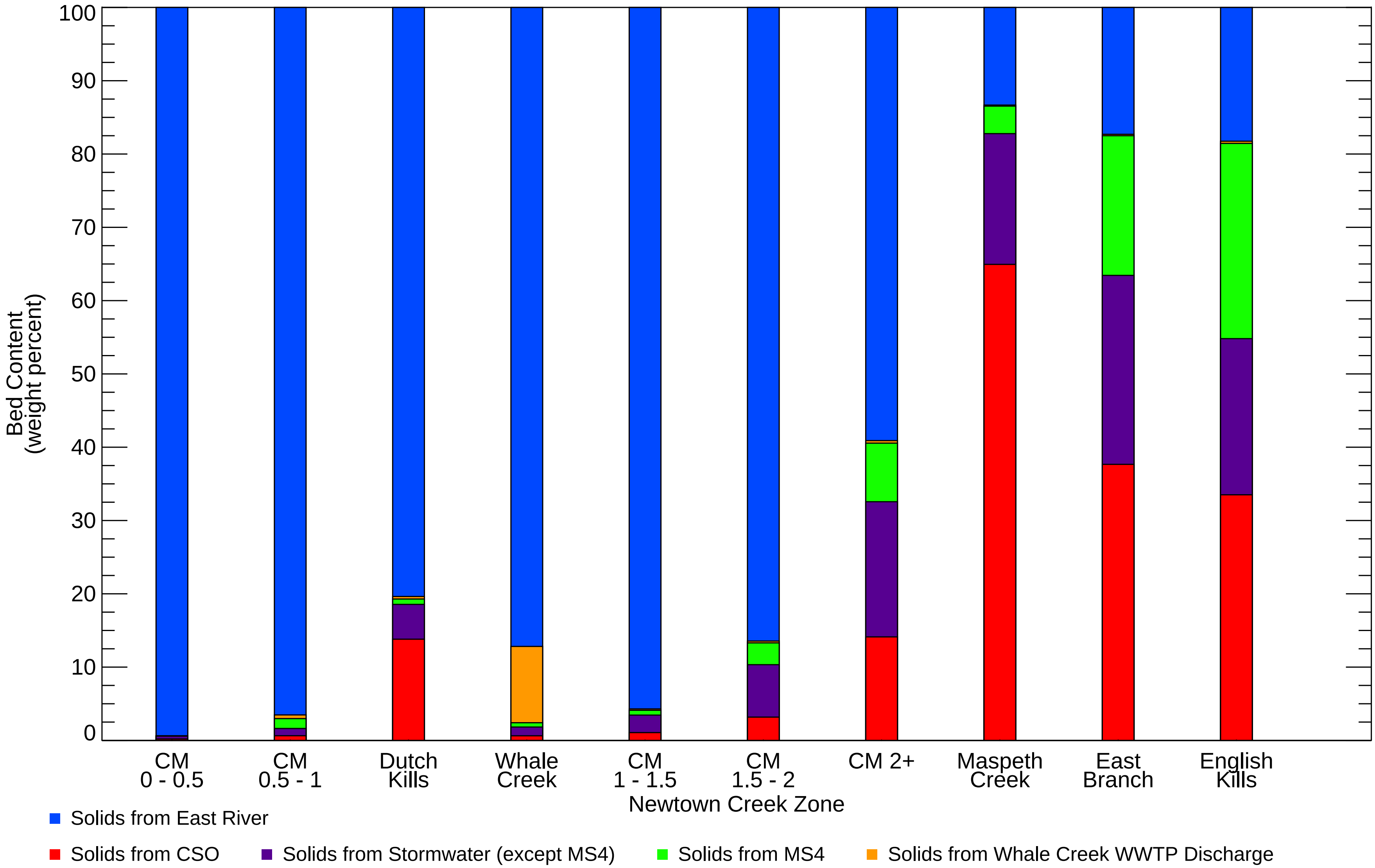

Figure A3-2

Predicted Bed Content of Solids From Different Sources for LTCP Baseline Scenario
LTCP Comments
Newtown Creek

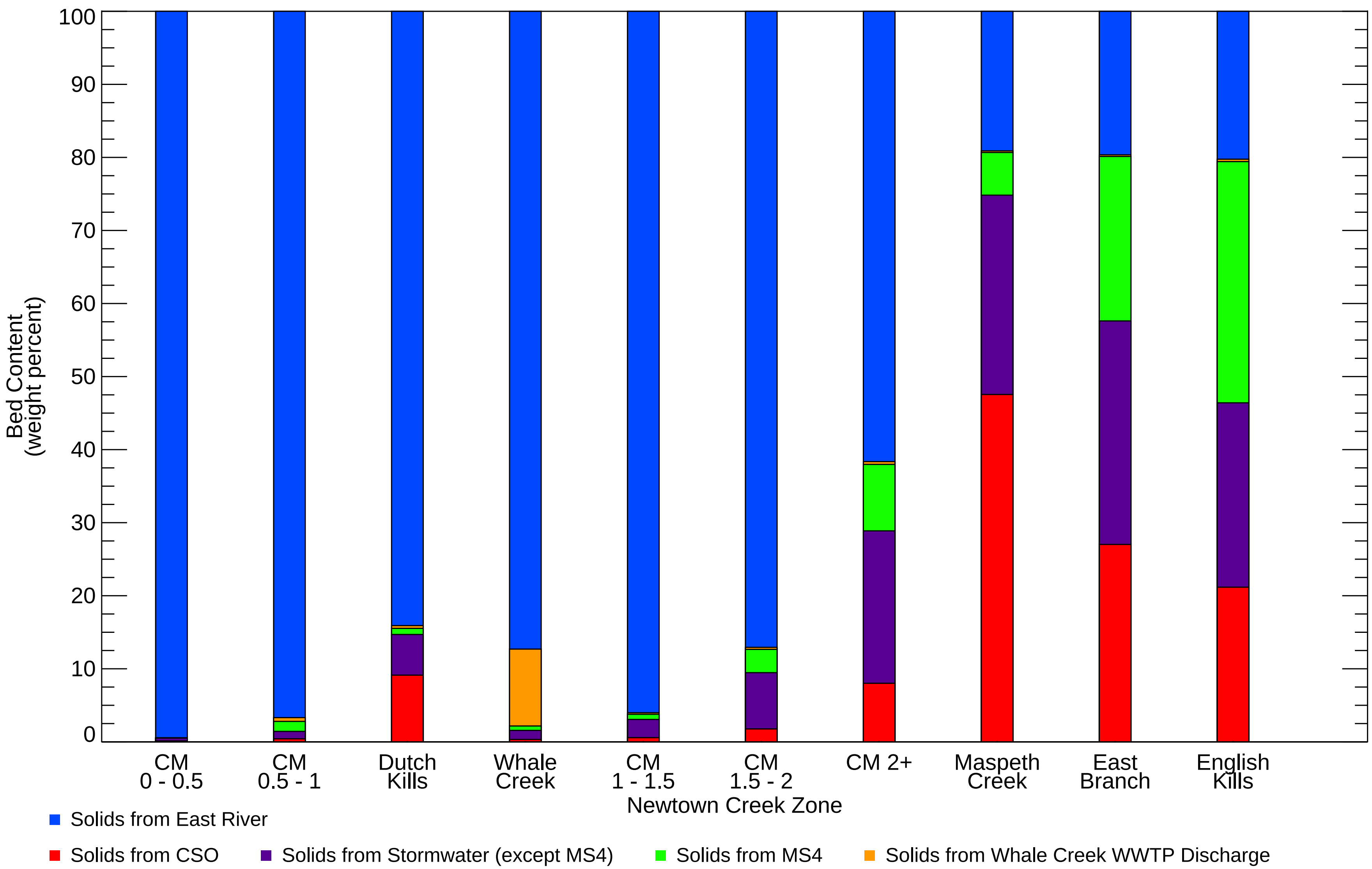

Figure A3-3

Predicted Bed Content of Solids From Different Sources for LTCP Baseline + 50% CSO Reduction Scenario
LTCP Comments
Newtown Creek

fc - \\woodcliffbu\Jobs\Newtown_Creek\Hydro_Sedtran\Model\EFDC\Postprocessors\p_relative_dep\p_bar_cumulative_gross_dep_by_source_added_DK_WC_20170711_ltcp_memo.pro Fri Aug 11 16:05:23 2017

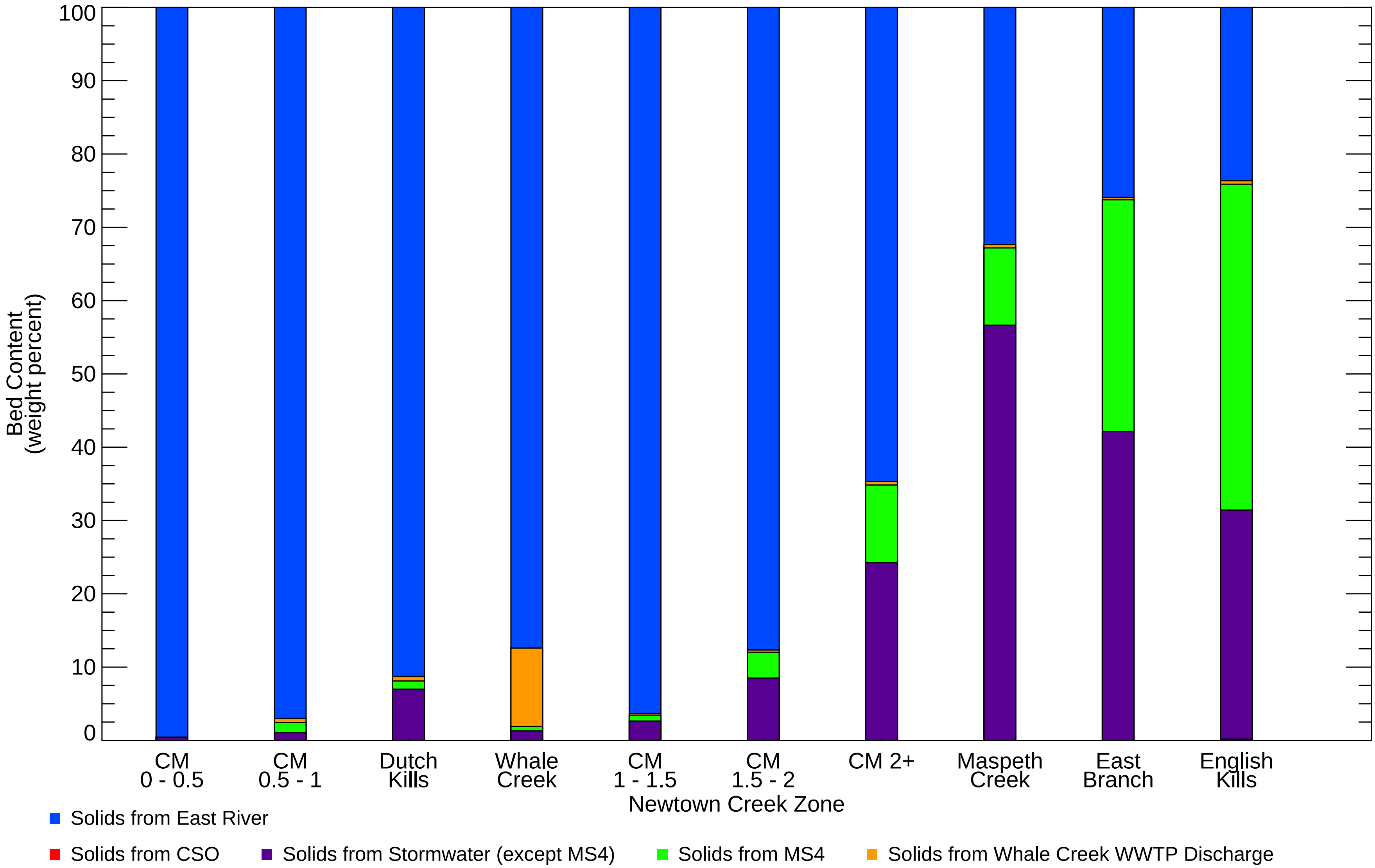

Figure A3-4

Predicted Bed Content of Solids From Different Sources for 100% CSO Reduction Scenario
LTCP Comments
Newtown Creek

ANCHOR QEA

fc - \\woodcliffbu\Jobs\Newtown_Creek\Hydro_Sedtran\Model\EFDC\Postprocessors\p_relative_dep\p_bar_cumulative_gross_dep_by_source_added_DK_WC_20170711_ltcp_memo.pro Fri Aug 11 16:05:30 2017

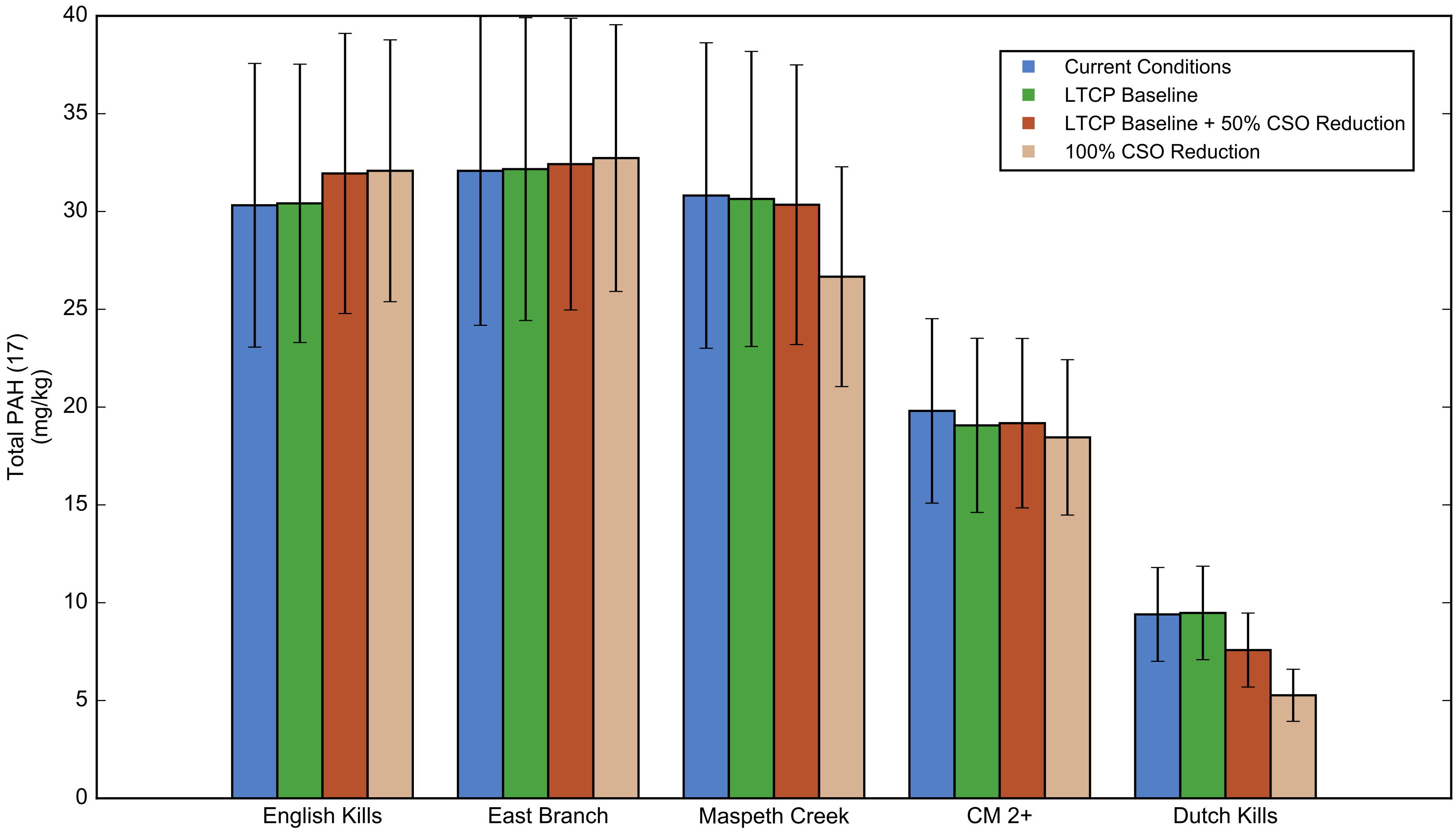

Figure A3-5

Calculated Future Equilibrium Surface Sediment Chemical Concentration by Scenario for Total PAH (17)

LTCP Comments

Newtown Creek

*Note: The error bars correspond to predicted chemical concentrations using +/- 2*standard error in the arithmetic average of the surface water and point source chemical concentration data.*

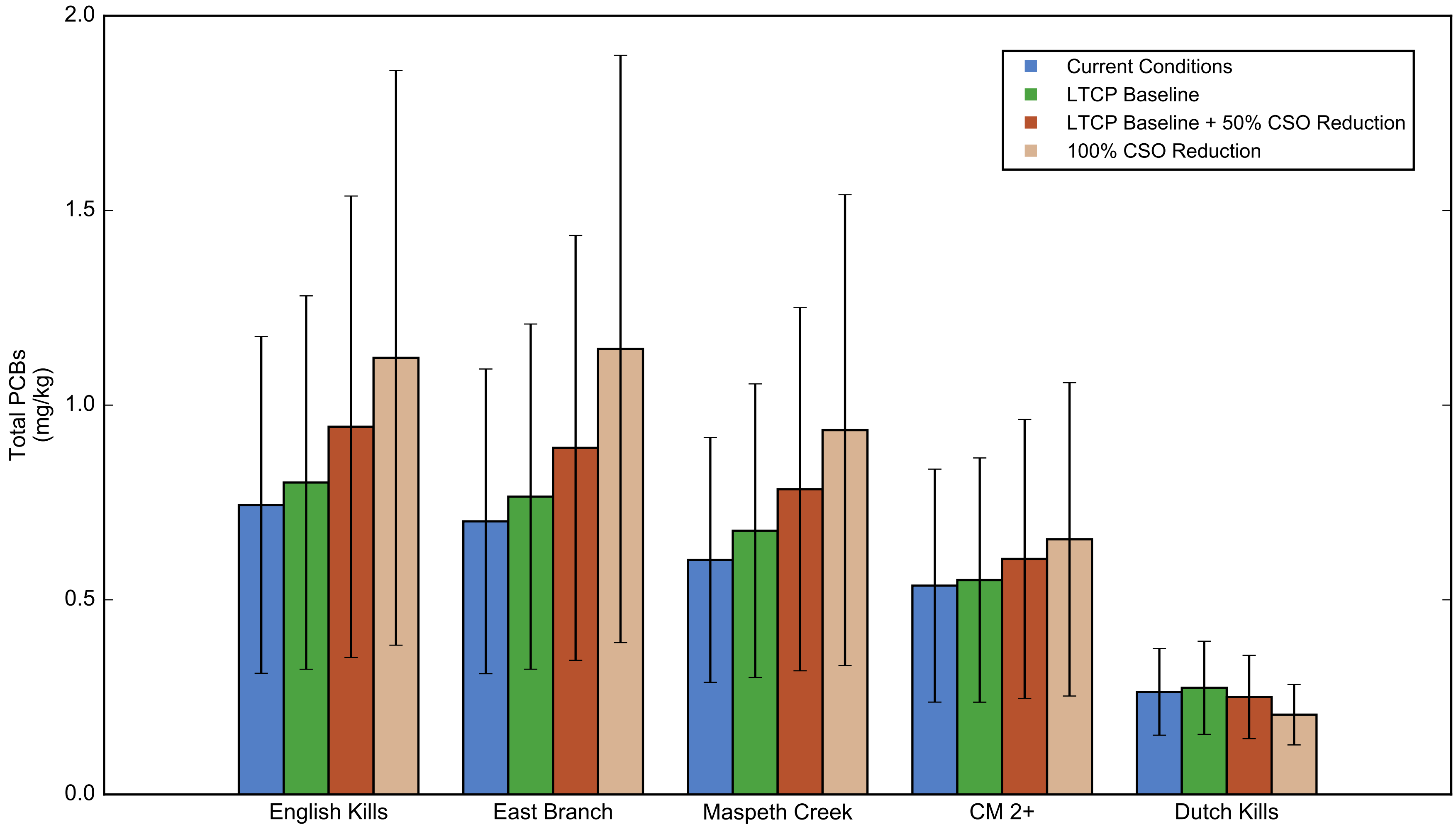

Figure A3-6
Calculated Future Equilibrium Surface Sediment Chemical Concentration by Scenario for Total PCBs
LTCP Comments
Newtown Creek

*Note: The error bars correspond to predicted chemical concentrations using +/- 2*standard error in the arithmetic average of the surface water and point source chemical concentration data.*

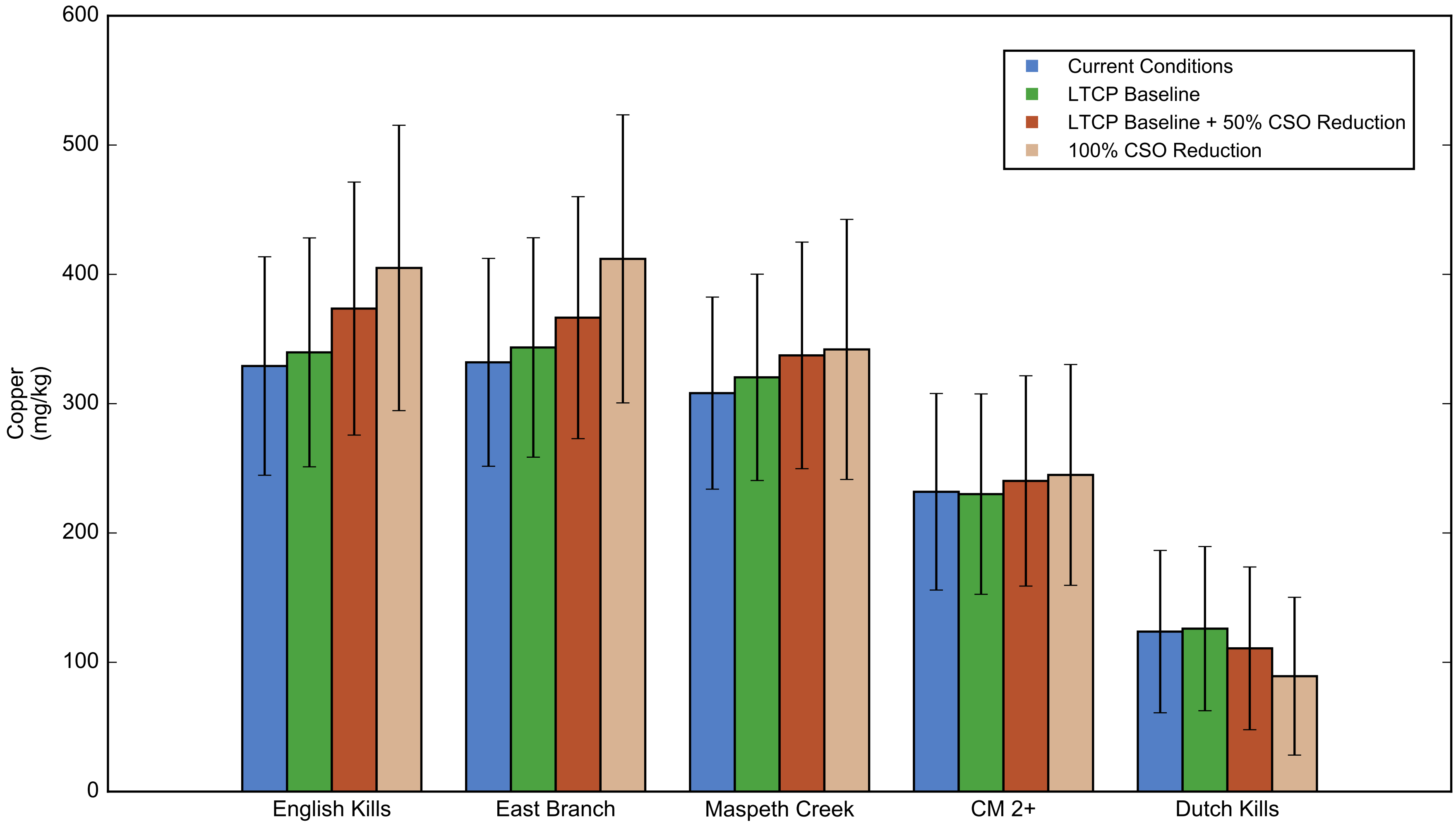

Figure A3-7

Calculated Future Equilibrium Surface Sediment Chemical Concentration by Scenario for Copper

LTCP Comments

Newtown Creek

*Note: The error bars correspond to predicted chemical concentrations using +/- 2*standard error in the arithmetic average of the surface water and point source chemical concentration data.*

WCL-LBAT - N:\Newtown_Creek\Analysis\LTCP_Modeling\python\LTCP_barplot_concentrations.py 8/11/2017 14:48:56

APPENDIX H1

CHALLENGES TO IMPLEMENTATION OF PROPOSED CSO CONTROLS AND FLAWS IN LTCP DATA AND ANALYSIS

The NCG's primary reason for commenting on the LTCP is to establish a public record and understanding that accurately characterizes the effects the City's CSOs, MS4s, and direct discharges will continue to have on Newtown Creek--even after the LTCP is implemented. The NCG will advocate that such ongoing urban background[1] contaminant loads from the CSOs, MS4s, and direct discharges and associated contaminated sediment deposition need to be acknowledged as part of the urban background impacts at Newtown Creek. The NCG will urge EPA to use this urban background sediment deposition under CERCLA as a realistic "floor" for what might be achieved by a CERCLA sediment remedy at Newtown Creek.

The quality of EPA's decisions under CERCLA at Newtown Creek will be undermined if EPA relies on overly optimistic, inaccurate, or incomplete findings or assertions generated under the CWA and the LTCP programs. In order to ensure an accurate public record for that purpose, the NCG has evaluated the assertions made by NYC in its LTCP presentation (April 2017) and draft plan (June 2017).

1. <u>The Proposed CSO Controls Face a Number of Challenges that May Result in these Controls Being Delayed, Modified, or Totally Prevented from Being Implemented</u>

NYCDEP plans to construct two "preferred" combined sewer overflow (CSO) controls as a part of the Newtown Creek Long Term Control Plan (LTCP at 8-99). The first control will reroute Dutch Kills CSO from outfall BB-026 through the Borden Avenue Pumping Station (BAPS) to the Kent Avenue Gate Structure and then to the Newtown Creek Wastewater Treatment Plant (NC WWTP). The Dutch Kills BAPS CSO rerouting project is scheduled to be completed in 2029 (LTCP at 9-2), and is predicted to reduce annual CSO volume to Newtown Creek by 110 million gallons per year (MGY).

The second control will provide underground tunnel storage for CSOs from the three largest Newtown Creek outfalls (LTCP at ES-5), which are located in English Kills (outfall NC-015), the East Branch (outfall NC-083), and Maspeth Creek (outfall NC-077). The storage tunnel will include a tunnel dewatering pumping station (TDPS) that will pump the CSO waters stored in the tunnel to the NC WWTP for treatment after wet-weather conditions have ended. The storage tunnel project is scheduled to be completed in 2042 and is predicted to reduce annual CSO volume to Newtown Creek by 584 MGY.

The Newtown Creek LTCP provides descriptions of preliminary conceptual designs for the two preferred CSO controls. For each CSO control, there are major regulatory, logistical, and construction-related obstacles that will have to be overcome prior to project completion.

[1] The term "urban background" in this document refers to ongoing sources of sediment contamination via particulate deposition to Newtown Creek from the East River, CSOs, and MS4s.

A. Rerouting of Dutch Kills CSO Outfall BB-026A

Dutch Kills CSO outfall BB-026 is estimated to discharge the fourth largest annual CSO volume to Newtown Creek (120 MGY) (LTCP at ES-5). The Dutch Kills BAPS CSO rerouting project includes four components: (1) a new diversion chamber that will route flow away outfall BB-026, (2) approximately 2,500 feet of conduit that will conduct water from outfall BB-026 to the Borden Avenue Pumping Station, (3) expansion of the BAPS pumping capacity from 3 million gallons per day (MGD) to 26 MGD, and (4) approximately 4,350 feet of conduit to conduct water from the BAPS to the Kent Avenue Gate Structure (LTCP at 8-18). The Kent Avenue Gate Structure is adjacent to the Newtown Creek Wastewater Treatment Plant and controls the flow of water to the NC WWTP from the Kent Avenue interceptor (LTCP at 8-18). Diverted flow from outfall BB-026 would flow from the Kent Avenue Gate Structure to the NC WWTP for treatment. However, increasing the flow to the Kent Avenue Gate Structure necessitates a tradeoff: during wet weather some other CSOs that now go to the NC WWTP would need to be discharged untreated into the East River in order to keep flows within available capacities.

Obstacles to implementing the Dutch Kills BAPS CSO rerouting project include:

- **Acceptance of increased CSO volume to East River**

  Diverting CSO from outfall BB-026 to the NC WWTP will mean that approximately 80 MGY of CSO from other sources that are currently being treated at the NC WWTP will instead be discharged untreated to the East River (LTCP at 8-18).

  NYCDEP states that the 80 MGY increase in CSO volume to the East River will be addressed in the City-wide/Open Waters LTCP (LTCP at 8-18). The City-wide LTCP has not yet been completed, and the NYSDEC may not approve an increase in CSO discharge to the East River.

- **Site-specific space constraints**

  Expansion of the BAPS may not be possible because the BAPS is located under a highway bridge. The presence of the bridge may mean that there is insufficient space at the BAPS site for the increased facility size needed to provide the increased pumping capacity (LTCP at 8-22).

- **Conduit pathway obstacles including Newtown Creek, railroad track, and dense utility areas**

  "The force main to the Kent Avenue Gate Structure will need to pass under Newtown Creek, through bulkheads along the shore of Newtown Creek, and under the Long Island Rail Road (LIRR) tracks. Dense utilities will be encountered along Greenpoint Avenue in the vicinity of the Kent Avenue gate" (LTCP at 8-22). The Dutch Kills BAPS CSO rerouting project will require conduit to be placed through highly-congested areas and that may prove infeasible. Installation of conduit would also require approval of road rights-of-way in coordination with the New York State Department of Transportation.

- **Potential for CERCLA remedy conflict**

  Dredging and/or bulkhead reconstruction for CSO control may interfere with a future CERCLA remedy (LTCP at 8-22). Clearly, there are major obstacles that would need to be overcome before the Dutch Kills BAPS CSO rerouting project could be completed. If any of these obstacles could not be overcome, then the implementation of this CSO control would be delayed, modified, or prevented.

B. Storage tunnel for Tributary CSO Outfalls NC-015, NC-083, and NC-077

The storage tunnel project is designed to store CSO volume until after storm events, when CSO waters would be pumped to the NC WWTP for treatment. The storage tunnel would reportedly stop 62.5% of CSO volume from the three largest CSOs (outfalls NC-015, NC-083, and NC-077) from being discharged directly to Newtown Creek. Creating tunnel storage includes three components: (1) boring a horizontal underground tunnel with a 39 MG capacity, (2) constructing a tunnel dewatering pumping station, and (3) boring vertical shafts to connect CSO diversion pipes to the tunnel and to connect the tunnel to the TDPS (LTCP at 8-36). The TDPS will pump stored CSO water to the NC WWTP for treatment after wet-weather conditions have ended and WWTP treatment capacity once again becomes available.

The conceptual design provided in the LTCP is preliminary because it does not include specification of the tunnel location, the tunnel depth, the location of the TDPS, or other important details. Completion of the storage tunnel project is contingent on overcoming many major obstacles including (LTCP at 8-47):

- **Uncertainty regarding site availability** due to conflicting uses of identified sites.

- **Obstacles associated with construction of long tunnel conduit across Newtown Creek** and additional tunnels between CSO outfalls.

- **Potential for problems with construction** of tunnels, shafts, and caverns due to unforeseen geotechnical conditions.

- **Challenges associated with acquiring required property**, which must be obtained through negotiated acquisition or an eminent domain process.

- **Build-up of sediment** in the tunnel, which will reduce system performance and create challenges for maintaining the system.

Due to the complexity of this project, additional obstacles will arise as the project moves forward. If any of the listed obstacles or future additional obstacles cannot be overcome, then implementation of this CSO control will be delayed, modified, or prevented.

C. CSO Controls Schedule and Predicted Performance

Construction schedules, predicted CSO volume reductions, and predicted water quality improvements associated with future CSO controls and Newtown Creek modifications are not presented clearly in the LTCP. A summary of the LTCP's scheduled completion dates and predicted CSO volume reductions is provided in Table 1 for each CSO control, to the extent the information in the LTCP could be interpreted.

Table 1 shows that a modest 5% reduction in annual Newtown Creek CSO volume is predicted over the next 10 years (62 MGY of the current total of 1,161 MGY, due to bending weir installation). In 13 years (by 2030), the Dutch Kills BAPS CSO rerouting project and green infrastructure projects are scheduled to be completed, adding another 16% reduction in the predicted annual CSO volume reduction (110 MGY from rerouting and 83 MGY from green infrastructure). Thus, over the next 25 years, the Newtown Creek LTCP predicts only a modest 21% annual Newtown Creek CSO volume reduction. More substantial CSO volume reductions do not appear to be scheduled to be implemented until 2042, 25 years from now.

Table 1: Newtown Creek CSO Control Performance Summary

Newtown Creek CSO Control Performance Summary

Future Condition [1]	CSO Source Control	Estimated Annual CSO Volume Reduction (MGY) [2]	Estimated % Reduction in Annual Estimated CSO Volume	Scheduled Completion Date
1	Grey infrastructure— Construction of bending weirs at four largest CSO outfalls by volume (NC-015, NC-077, NC-083, BB-026) [3]	62 [3]	5%	2017 [3]
2	Dutch Kills CSO Diversion— BAPS expansion and CSO flow re-rerouting (75% control of BB-026) [4]	110 [4]	9%	2029 [5]
1	Green infrastructure— 3% control of impervious runoff in watershed [6] (64 MGY reduction to NC-014 in English Kills) [7]	83 [6]	7%	2030 [6]
1	Per capita dry-weather flow reduction [8]	Unknown	Unknown	2040
2	Deep Storage Tunnel for English Kills, East Branch, and Maspeth Creek CSO flow (62.5% control of NC-015, NC-077, NC-083) [9]	584 [10]	50%	2042 [5]
	Total Estimated Reductions	839	71%	2042
	Total Estimated Annual CSO Volume	**1,161**		

Notes:

[1] Future Condition #1 includes grey infrastructure, green infrastructure, Newtown Creek triburary aeration, environmental dredging, and other projects. Future Condition #2 includes LTCO CSO controls for a deep storage tunnel and BAPS CSO flow re-routing for Dutch Kills.

[2] Estimated Annual CSO Volume Reduction based on typical year (2008) and with existing condition discharge volumes provided in Tables ES-2 and 8-1. Newtown Creek LTCP, p. 8-2.

[3] Newtown Creek LTCP, p. 4-2.

[4] Newtown Creek LTCP, p. 8-18.

[5] Newtown Creek LTCP, p. 9-2.

[6] Newtown Creek LTCP, p. 5-5.

[7] Newtown Creek LTCP, p. 6-2.

[8] Newtown Creek LTCP, p. 6-3.

[9] Newtown Creek LTCP, p. 8-49.

[10] Deep Storage Tunnel CSO volume reduction estimated using typical (2008) CSO discharge volumes for targeted outfalls (Table 8-1) and stated CSO volume control (62.5%). Newtown Creek LTCP, p. 8-2.

The storage tunnel is scheduled to be completed in 2042, resulting in an additional predicted annual CSO reduction of 584 MGY which alone would represent a predicted 50% reduction of the current annual CSO volume discharged to Newtown Creek. The cumulative reduction from all controls is predicted to be 71% (839 MGY).

2. <u>The Newtown Creek LTCP Makes Inaccurate Predictions of Water Quality Improvements Associated with Proposed CSO Controls</u>

As described in the following sections, the NCG believes the LTCP contains flaws that affect its accuracy. These include:

- **An overly narrow focus on bacteria and dissolved oxygen (DO) concentrations.** This focus excludes critically important ongoing CSO contributions of solids and toxic substances and associated adverse impacts on the aquatic life and recreational uses of Newtown Creek.
- **Inappropriate use of baseline conditions in the LTCP**. NYCDEP used speculative "future conditions," rather than existing (2014-2016) conditions, as the "baseline condition" throughout the LTCP. This approach does not allow for comparison of existing baseline conditions (2014-2016) to future CSO control conditions. NYCDEP's approach to establishing baseline conditions also implies that future conditions, such as those resulting from green infrastructure, gray infrastructure, dredging, and other projects, presently exist and have resulted in predicted water quality improvements, when that is not the case. As a result, the only known Newtown Creek water quality conditions—the existing conditions measured in 2014-2016—are disconnected from the CSO controls evaluation.
- **Failure to include Newtown Creek water quality measurements in the LTCP**. Water quality measurements provide the basis for understanding water quality conditions and assessing compliance with water quality standards (WQS). Water quality measurements also provide the foundation for subsequent water quality modeling and other analyses. Unfortunately, there are no direct water quality measurements provided in the LTCP (only statistical summaries) making it impossible to evaluate water quality conditions and compliance with water quality standards.
- **Use of an incorrect water quality standard for DO in the LTCP**. NYSDEC classifies Newtown Creek as a Class D saline surface water (Class SD). The NYSDEC WQS for DO concentration is "never less than 3.0 mg/L" for SD surface waters, including Newtown Creek (6 NYCRR 703.3). In the LTCP, NYCDEP uses a WQS for DO concentration called the "average annual attainment of DO criteria." This metric is not clearly defined and there is no such applicable NYSDEC WQS for DO concentration. NYCDEP uses the average annual DO concentration surrogate exclusively throughout the LTCP. As a result, comparison between predicted future Newtown Creek DO concentrations and the average annual DO concentration surrogate metric is meaningless in terms of water quality compliance with NYSDEC WQS.
- **Long-term phased implementation and adaptive management without robust monitoring**. NYCDEP proposes a long-term (25-year) schedule to implement CSO controls and states that EPA adaptive management principles will be followed. The adaptive management process relies on establishing a monitoring program, evaluating monitoring data and trends, and making appropriate adjustments to the plan as needed.

In the LTCP, NYCDEP outlines plans for a Newtown Creek water quality monitoring program that is deficient because it features a total of only three tributary sampling locations with no sampling locations in Dutch Kills or Maspeth Creek and no CSO flow or water quality sampling. A robust monitoring program is critically important for Newtown Creek given the long-term implementation schedule and high levels of uncertainty associated with predicted water quality improvements.

Each of these flaws has important implications on the conclusions drawn by NYCDEP in the LTCP. The Newtown Creek LTCP's claims of water quality compliance and CSO control performance, stated throughout the plan, are deeply undermined by these flaws, as described below.

A. Narrow Focus of the LTCP

NYCDEP designed the Newtown Creek LTCP narrowly, ignoring ongoing violations of ambient water quality criteria for toxic substances and contributions to sediment toxicity caused by CSO discharges. In the Newtown Creek LTCP goal statement (LTCP at ES-1), NYCDEP states that the "goal of this LTCP is to identify appropriate CSO controls necessary to achieve waterbody-specific water quality standards, consistent with EPA's 1994 CSO Policy and subsequent guidance." The EPA CSO Control Policy (1994) recognizes that "CSOs often contain high concentrations of suspended solids, pathogenic microorganisms, toxic pollutants, floatables, nutrients, oxygen-demanding organic compounds, oil and grease and other pollutants. CSOs can cause exceedances of water quality standards. Such exceedances may pose risks to human health, threaten aquatic life and its habitat, and impair the use and enjoyment" (59 FR 18689). Moreover, the Policy notes that the monitoring program required under the LTCP process "should include necessary CSO effluent and ambient in-stream monitoring and, where appropriate, **other monitoring protocols such as biological assessment, toxicity testing and sediment sampling.** Monitoring parameters should include, for example, oxygen demanding pollutants, **nutrients, toxic pollutants, sediment contaminants**, pathogens, bacteriological indicators (e.g., *Enterococcus*, *E. Coli*), **and toxicity**." (*see* CSO Control Policy at 18692 (emphasis added)). The New York State water quality standards also include a much wider range of possible pollutants than simply bacteria and solids, including "taste-, color-, and odor-producing **toxic and other deleterious substances**," "suspended, colloidal and settleable solids," and "**oil and floating substances**." *See* NYCRR § 703.2 (emphasis added). The NYCDEP LTCP analysis overlooks most of these pollutants and potential risks, some of which are very significant relative to the long-term health of Newtown Creek.[2]

[2] The EPA CSO Control Policy's (1994) requirement of toxicity and other testing (beyond simply bacteriological and DO testing) has been carried out in a number of other cities' LTCPs. For example, the District of Columbia LTCP (2002) notes (similar to New York WQS) that in "addition to numeric standards the WQS also include narrative language that require Class A waters be free from discharges of untreated sewage and litter, and surface waters to be free from substances discharged in amounts that cause injury to, are toxic to, or produce adverse physiological or behavioral changes in humans, plants and animals." (D.C. LTCP at 2-4). The LTCP investigated extensively whether CSO and stormwater discharges contained any number of 127 priority pollutants, including (but not limited to) total recoverable metals, cyanide, dissolved metals, pesticides, PCBs, volatiles, and semivolatiles (D.C.

As discussed in the main body of the Comment, the Newtown Creek CSOs are contributing toxic pollutants and other contaminants that are resulting in violations in applicable WQS in Newtown Creek and its tributaries. CSO contributions of toxic substances have resulted in sediment accumulation and sediment toxicity that represent major adverse impacts. These ongoing CSO contaminant loads directly affect the ongoing CERCLA process in Newtown Creek.

Given the known conditions in Newtown Creek, NYCDEP should have designed the LTCP monitoring program, consistent with the EPA CSO Control Policy, to "include necessary CSO effluent and ambient in-stream monitoring and, where appropriate, other monitoring protocols such as biological assessment, toxicity testing and sediment sampling. Monitoring parameters should include, for example, oxygen demanding pollutants, nutrients, toxic pollutants, sediment contaminants, pathogens, bacteriological indicators (e.g., *Enterococcus*, *E. coli*) and toxicity." Instead, NYCDEP limited the Newtown Creek water quality goals and targets to only include indicator bacteria (i.e., fecal coliform) and DO concentrations. NYCDEP ignored EPA's CSO Control Policy and developed a LTCP that fails to evaluate major adverse impacts associated with known pollution by toxic substances from the Newtown Creek CSOs. As a result, the Newtown Creek LTCP will fail to achieve compliance with water quality standards and, thus, still present significant adverse impacts to ecological communities and human health.

In recent years, it has become common practice for CSO LTCPs to focus on a subset of water quality standards and, in some cases, this practice is appropriate. In its *Primer for Remedial Project Managers on Water Quality Standards and the Regulation of Combined Sewer Overflows under the Clean Water Act*, EPA states that "The EPA has focused on limiting releases of conventional pollutants such as fecal indicator bacteria (FIB), 5-day biochemical oxygen demand (BOD5), and total suspended solids (TSS). The hazardous substances often found at Superfund sites are typically not addressed **unless it has been shown that the CSO discharge causes or contributes to violations of the ambient water quality criteria or equivalent state standard**" (US EPA 2013, p. 13; emphasis added). Newtown Creek is a Superfund site where CSO discharges cause and contribute to violations. As a result, exclusion of toxic substances from the Newtown Creek LTCP represents a departure from EPA CSO Control Policy in the CWA context, which must be taken into account in the CERCLA process.

The stated goal of the NYCDEP CSO control alternatives evaluation is to reduce CSO discharges, such that indicator bacteria and DO concentration water quality standards are met. This narrowly focused goal is not appropriate for Newtown Creek. The goal excludes reducing adverse impacts to sediment quality and toxicity from CSO solids and toxic substances, which is necessary to achieve compliance with applicable numerical water quality standards for toxic substances (6 NYCRR 703.5) and narrative standards for taste-, color-, and odor-producing,

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LTCP at 4-9 – 4-14). The Metro Nashville LTCP (2011) also did testing for, among other things, ammonia-nitrogen, nitrate, phosphorus, priority pollutant metals, hardness, oil and grease, cyanide, volatile organic compounds, acid extractables, polychlorinated biphenyls (PCBs), pesticides, base neutrals, fecal coliform, suspended solids, settleable solids, and whole effluent toxicity (Metro Nashville LTCP at 3-18).

toxic and other deleterious substances; turbidity; suspended, colloidal and settleable solids; oil and floating substances; and garbage, cinders, ashes, oils, sludge and other refuse (6 NYCRR 703.2). By ignoring CSO loads of solids and toxic substances, and the associated adverse sediment impacts, NYCDEP has failed to evaluate or control major and critically important CSO pollutant loads to the Creek. As a result, these pollutants will continue to have impacts on water and surface sediment concentrations.

Recommendations

The Newtown Creek LTCP should acknowledge and justify the narrow focus on just two water quality parameters.

B. Use of Baseline Conditions

Baseline conditions are typically used to provide a known basis or reference point for comparison to a future modified condition. In Newtown Creek, the baseline conditions should include specification of existing (2014-2016) CSO and Newtown Creek flows and water quality conditions that would then be compared to future conditions with CSO controls and associated flow and water quality improvements in place. As NYCDEP states; "Establishing baseline conditions was an important step in the LTCP process. Baseline conditions were used to compare and contrast the effectiveness of CSO controls, and to predict whether water quality goals would be attained after implementation of the preferred LTCP alternative" (LTCP at 6-1). Unfortunately, the Newtown Creek LTCP baseline conditions compared two highly speculative future CSO control conditions, rather than comparing existing conditions to a future CSO control condition.

In the LTCP, three different conditions were evaluated:

- **Existing conditions**, as measured in 2014 through 2016: these conditions are briefly summarized in the Executive Summary and in Section 2 and were used to calibrate and validate the water quality model (LTCP at 2-57). The water quality model of existing conditions does not appear to have been used for evaluating future CSO control conditions in the LTCP.

- **Future conditions #1,** which will be established when gray infrastructure, green infrastructure, water conservation, tributary aeration, environmental dredging, and other projects have been completed: this is a set of future CSO controls and Newtown Creek tributary modification conditions. The water quality model was applied to predict these Future conditions #1, and these future conditions were assigned as "baseline conditions" in the performance gap analyses and CSO alternatives evaluation analyses. By setting Future conditions #1 as the baseline conditions, NYCDEP assumes these future conditions have already occurred and achieved the predicted water quality improvements, when that is not the case.

- **Future conditions #2**, which will be established when CSO controls recommended in the LTCP are complete: these LTCP CSO control alternatives include 1) a major storage tunnel to reduce CSO discharge to English Kills, East Branch, and Maspeth Creek; and 2) CSO rerouting to reduce CSO discharge to Dutch Kills. The water quality model was applied to predict future conditions with these Future conditions #2 controls completed in addition to the projects listed under Future conditions #1.

Existing conditions were measured during the 2014 through 2016 time period and these actually represent existing baseline conditions. Future conditions #1 and #2 will not be completely implemented for many years (likely decades) and predictions of the performance of these proposed future CSO controls and tributary modifications in improving water quality conditions are highly uncertain. NYCDEP does not appear to present flow and water quality modeling predictions associated with existing (2014-2016) conditions or to use modeling of existing conditions for comparison to future CSO control conditions in the LTCP. As a result, the only known Newtown Creek CSO and water quality conditions—the 2014-2016 existing conditions—are disconnected from the evaluation, so it is impossible to compare existing conditions to predicted future conditions.

Instead, NYCDEP uses Future conditions #1 as "baseline conditions" in the LTCP. In the LTCP Executive Summary, NYCDEP uses the term "future baseline conditions" without defining it. Despite not providing a definition, NYCDEP goes on to refer to future baseline conditions as if these conditions were a known reference point. To make matters more confusing, the word "future" is removed from the phrase after the Executive Summary. NYCDEP's subsequent use of the term "baseline condition" throughout the document is confusing because it is not, as the words suggest, a true existing baseline condition, but is instead some unknown future condition. Compounding this confusion, the LTCP then compares future CSO controls to this "baseline" (really "future predicted baseline")—an inappropriate comparison to hypothetical future conditions, rather than actual existing conditions.

NYCDEP described the following objectives for the analysis of baseline conditions, 100 Percent CSO Control, and Performance Gap (LTCP at ES-16):

1. "Determine the levels of compliance with water quality criteria for bacteria and dissolved oxygen under future baseline conditions, defined as conditions with sanitary flows based on 2040 population projections, with all other sources being discharged at existing levels to the waterbody."

2. "Determine potential attainment levels with WQS for bacteria and dissolved oxygen without discharge of CSO to the waterbody (100 percent control), keeping the remaining non-CSO sources. This analysis is based on the criteria shown in Table ES-1." (Table ES-1 provides the NYS WQS for bacteria and DO.)

The "future baseline conditions" applied by NYCDEP do not represent "all other sources being discharged at existing levels to the waterbody" as stated. NYCDEP included many speculative modifications to existing conditions as a part of baseline conditions, resulting in likely inaccurate estimates of resulting CSO volume and Newtown Creek water quality conditions. Assumptions in NYCDEP's baseline conditions (i.e., Future conditions #1) include (LTCP at 6-2 and 6-3):

- Completion of green infrastructure projects resulting in an 83-million-gallons-per-year (MGY) reduction in baseline annual CSO volume;

- Completion of gray infrastructure CSO controls including bending weirs at CSO outfalls, expansion of the Bronx/Queens Pump Station to 400 million gallons per day (MGD), and expanded tributary aeration;

- 2040 dry-weather flow rates to Bowery Bay Wastewater Treatment Plant (WWTP) of 113.5 MGD and Newtown Creek WWTP of 112 MGD (LTCP at 6-2) (the existing dry weather flow rates at the two WWTPs are not provided); and,

- Environmental dredging and other modifications in Newtown Creek.

As part of baseline conditions, NYCDEP has assumed that the future projects listed above will be completed and that these projects will result in CSO volume reduction and water quality improvements, as predicted. The green infrastructure and gray infrastructure projects will not be completed for many years. The CSO volume reductions and water quality improvements associated with these projects have been estimated, but these estimates have high levels of uncertainty. The performance of these projects will likely be significantly different from estimates and the predicted baseline conditions may not be realized.

NYCDEP states that environmental dredging is included in the baseline conditions, but does not provide further details. Environmental dredging plans have not been completed as part of the ongoing CERCLA process. Environmental dredging would likely have significant impacts on future Newtown Creek hydrodynamics and water quality. NYCDEP should specify the assumptions used to include environmental dredging in water quality modeling of baseline conditions (i.e., Future conditions #1).

NYCDEP's baseline conditions are scheduled to be implemented on different schedules resulting in a temporally inconsistent set of conditions. For example, some of the gray infrastructure projects are scheduled to be completed over the next several years, while green infrastructure and reduced dry-weather flow conditions are scheduled to be completed over the next several decades. The scope and schedule of Newtown Creek environmental dredging has not been established. Grouping this temporally mismatched set of conditions together results in predicted conditions that are unlikely to be realized.

Summary

By replacing existing (2014-2016) baseline conditions with speculative future conditions, NYCDEP is taking full credit for many CSO control projects that have not yet been implemented and is assuming estimated water quality benefits that have not been demonstrated. As a result, existing conditions (2014–2016), representing the only known conditions, have been disconnected from the LTCP analysis process.

NYCDEP's incorporation of speculative future projects into baseline conditions creates a weak foundation for the gap analysis and evaluation of CSO control alternatives. Its use of baseline conditions results in a biased evaluation that likely overestimates the benefits of the proposed CSO controls. The resulting analysis consists of a mixed-up comparison of different future CSO controls and tributary modifications, with some assumed to be complete (but actually not to be completed for many years) and others assumed to occur in the future. The structure of baseline and future CSO conditions must be revised to enable a meaningful analysis to be conducted.

Recommendations

Baseline conditions and future CSO control conditions should be redefined. NYCDEP should specify existing 2014-2016 conditions as baseline conditions and should conduct a sequential analysis of the implementation of the various CSO controls prior to finalization and approval of the Newtown Creek LTCP. The water quality modeling analysis, the performance gap analysis, and the CSO control evaluation should be conducted in a manner that recognizes the ongoing phased implementation process in Newtown Creek.

Specifically, NYCDEP should analyze and present existing conditions (2014-2016) as baseline conditions. Next, CSO controls and Newtown Creek modifications should be organized by expected completion date and two separate future conditions should be specified. For example, CSO controls and modifications that are expected to be completed by 2030 should be specified as Future conditions #1, and CSO controls and modifications that are expected to be completed by 2042 should be specified as the Future conditions #2. Water quality modeling, performance gap analysis, and CSO control evaluations should then be conducted on Future conditions #1 and #2 separately. Baseline conditions should be compared to Future conditions #1 and to Future conditions #2 separately. This approach would allow for comparison of existing conditions to predicted conditions resulting from implementation of two phases of CSO control implementation.

C. Lack of CSO Flow and Water Quality Data

NYCDEP has collected and analyzed many Newtown Creek water quality samples for indicator bacteria, DO, BOD, solids, and other water quality constituents. These measurements provide important information for understanding water quality conditions in Newtown Creek.

Compliance with applicable water quality standards is based on comparison of actual water quality sampling results to water quality standards.

The Newtown Creek LTCP was developed to establish a plan to improve water quality conditions in Newtown Creek from existing conditions to a future condition that attains water quality standards. Direct water quality measurements are the primary means for characterizing existing conditions and for monitoring future water quality conditions and compliance with water quality standards. In summary, direct water quality measurements are central to the Newtown Creek LTCP process and access to the water quality sampling results is necessary to determine whether existing and future conditions attain water quality standards.

NYCDEP does not present the actual Newtown Creek water quality data in the LTCP, online, electronically, or in any other format. Instead, NYCDEP provides statistical summaries of water quality data that do not include critical temporal and spatial components of the data (e.g., Figures ES-6 through ES-9). The NYSDEC water quality standards for DO and indicator bacteria include specification of magnitude, duration, and frequency (as described in detail below). By not making actual Newtown Creek water quality sampling results available and providing only a statistical summary of the data, NYCDEP makes it impossible to evaluate whether, and to what extent, violations of the applicable water quality criteria occur.

Recommendation

NYCDEP should provide a complete dataset of water quality sampling results prior to finalizing the LTCP, in addition to the statistical summaries already provided.

D. Failure to Use Applicable NYS DO Water Quality Standards

Violations of applicable WQS for dissolved oxygen concentrations in the Newtown Creek tributaries are frequent and persistent (NYCDEP 2017b). NYCDEP collected DO concentration measurements in Newtown Creek during the July to November 2016 time period and states that ". . . DO measurements below 3.0 mg/L were recorded consistently through the lower portion of Newtown Creek (Stations NC-9, NC-10 and NC-11) and in the tributaries Dutch Kills (Station NC-6), East Branch (NC-12), and English Kills (Stations NC-13 and NC-14)" (LTCP at ES-9).

The applicable Class SD water quality standard for DO concentration is "acute, never less than" 3.0 mg/L (6 NYCRR 703.3). NYCDEP states that the "criteria assessed in this Newtown Creek LTCP include the Existing WQ Criteria (Class SD)" and refers the reader to Table ES-1, which accurately describes the "DO never <3.0 mg/L" standard although it inaccurately describes it as a criterion rather than a standard (LTCP at ES-3). Criteria are the EPA's recommendations of water quality concentrations that are protective of designated uses, human health, and the environment. The states in turn set standards, typically using EPA criteria as an input. EPA guidance specifies that, "The criteria established by the EPA include three components: magnitude (allowable level of pollutant or pollutant parameter usually expressed as a concentration), duration (the averaging period), and frequency (how often the criteria may be exceeded without causing an adverse impact on the use)" (US EPA 2013, p. 4). In the case of the New York State Class SD water quality standard for DO concentration, the magnitude of the standard is 3.0 mg/L while the duration and frequency are specified as "never less than," clearly indicating that there is no averaging period and no acceptable frequency. Thus, the applicable water quality standard for DO in Newtown Creek is clearly defined.

On page ES-17 and subsequently throughout the Newtown Creek LTCP, however, NYCDEP uses the metric "average annual attainment of DO criteria" when evaluating compliance with the DO water quality standard. There is no such "average annual attainment" DO standard or criterion in the NYS Class SD WQS. The average annual attainment metric is very different from the applicable water quality standard, has no regulatory basis, and cannot be used to evaluate compliance with the applicable DO standard. NYCDEP's use of the average annual attainment metric as a WQS surrogate results in dramatically different conclusions regarding DO violations compared to using the correct DO standard.

For example, during July and August 2016, NYCDEP collected continuous DO measurements in the East Branch tributary that were always less than 3 mg/L for 60 consecutive days (i.e., never in compliance for two months) (NYCDEP 2017b, slide 38). These low DO concentration measurements represent a persistent violation of water quality standards and conditions that are harmful to the ecological community. NYCDEP, however, calculated an average annual DO concentration of greater than 3.0 mg/L for the East Branch, based on an average of DO measurements collected from January to November 2016 (NYCDEP 2017b, slide 36). Using an average metric on the 2016 East Branch DO dataset masks a continuous, two-month period of water quality standards violations and leads to an incorrect conclusion regarding compliance.

Throughout the Newtown Creek LTCP, NYCDEP uses the annual average attainment metric and not the correct water quality standard for DO. This is potentially confusing because NYCDEP claims to be evaluating attainment of applicable water quality standards for DO. Since DO measurements have not been made available for review, claims regarding WQS compliance cannot be verified.

NYCDEP has not used an average annual attainment metric as a DO WQS surrogate in previous LTCPs. In the Gowanus Canal LTCP, for example, NYCDEP states that the water quality criterion for Class SD waters is "DO never < 3.0 mg/L" (NYCDEP 2015a). To evaluate DO attainment, NYCDEP applied a water quality model that predicts DO concentration continuously at 10 locations in the Gowanus Canal study area. To evaluate DO water quality attainment, NYCDEP presented the percent of the time that DO concentration is predicted to be below 3.0 mg/L at each location. In the Bronx River LTCP, the Flushing Bay LTCP, and the Coney Island LTCP (NYCDEP 2015b, 2016a, 2016b), the applicable DO criterion is "never less than 4.0 mg/L." In each of these LTCPs, the percent of the model simulation period when the DO was predicted to be below 4.0 mg/L was provided to represent DO WQS attainment. The method of evaluating DO water quality attainment in the Gowanus, Bronx River, Flushing Bay, and Coney

Island LTCP appears to have been appropriate. In contrast, the new average annual attainment metric as a DO WQS surrogate for the Newtown Creek LTCP appears inappropriate.

In addition, as a part of the water quality modeling analysis, NYCDEP depth-averaged the DO concentration predictions. The Newtown Creek water quality model reportedly has 10 vertical cells representing the water column and predicts DO concentration in each of the 10 vertical cells continuously over time. NYCDEP explains that the "average annual attainment is calculated by averaging the calculated attainment in each of the ten modeled depth layers that comprise the entire water column. When assessing the water column in its entirety, attainment of the DO criterion is high." (LTCP at ES-17). This imprecise definition leaves ambiguous what exactly NYCDEP is calculating. First, "attainment" is not defined. It could mean the percent of the time DO at a particular location meets WQS, but it could also mean the percent of the stations in a particular model layer at which DO standards are met. The details of what are apparently two averaging processes—averaging over depth and averaging over a year's time—is also undefined. The net result is a very unclear metric of attainment.

Depth is important because DO concentrations can vary dramatically with depth. For example, organically-rich sediment can exert a large sediment oxygen demand that results in near-zero DO concentrations in bottom waters, while water near the surface at the same location may have much higher DO concentrations. By depth-averaging the Newtown Creek DO concentration predictions, low DO measurements are averaged with higher DO measurements, resulting in masking of low DO events. This is ecologically important since many aerobic organisms inhabit the bottom waters, where the DO concentrations are lowest. Depth-averaging is inappropriate, because a violation of the DO WQS at any depth is a violation of the DO WQS. In the water quality modeling evaluations presented in the Gowanus, Bronx River, Flushing Bay, and Coney Island LTCPs, there is no mention of depth-averaging of DO predictions.

NYCDEP states that baseline and future CSO control conditions are evaluated for bacteria and DO attainment, but DO attainment appears to have been an afterthought in the process. For example, bacteria was simulated using a one-year (2008) simulation period and a 10-year simulation period (2002-2011), but DO was simulated only for the one-year period and not for the 10-year simulation period (LTCP at ES-16). Biochemical oxygen demand (BOD) concentrations from the CSOs are likely major contributors to low DO concentration in the tributaries, but there is very little discussion of CSO BOD loads in the LTCP. Finally, when evaluating water quality conditions associated with preferred CSO alternatives (LTCP Section 8.3), predicted future bacteria concentrations are discussed and presented, but DO concentrations and associated WQS attainment are not mentioned (LTCP at 8-55).

Implications

Use of inappropriate baseline conditions and incorrect DO WQS result in inaccurate conclusions in the LTCP. For example, the LTCP concludes that aeration is not needed in the Dutch Kills. A statistical distribution of DO concentration measurements collected from July to

November 2016 is presented in Figure ES-9. In Dutch Kills (NC-6), a DO concentration measurement of 3.0 mg/L was approximately at the 25% quartile, meaning that approximately 25% of DO observations would be expected to be below 3.0 mg/L. On an annual basis, these findings indicate that DO concentrations in Dutch Kills would be below the 3.0 mg/L WQS for approximately three months of the year (3 of 12 months represents 25% of the year). As a result, measurements of DO collected in Dutch Kills in 2016 indicate that DO violations occur for long periods of time.

In contrast, NYCDEP states that "since the baseline water quality modeling indicated that Dutch Kills would be in annual compliance with the Existing Class SD DO criterion, the previously proposed Dutch Kills in-stream aeration system is not needed to comply with DO water quality standards." (LTCP at ES-24). Two flaws in the LTCP led to this erroneous conclusion. First, the "baseline conditions" are Future conditions #1, which includes numerous CSO controls and tributary modifications that will not be implemented for many years. As a result, the "baseline" modeling is based on highly speculative future conditions with associated highly uncertain water quality impacts. Secondly, NYCDEP is incorrectly using depth-averaging and annual averaging in comparing model predictions of DO concentrations to NYSDEC WQS for DO. This combination of errors results in the false conclusion that DO concentration in Dutch Kills will be in compliance with the WQS for DO.

Recommendations

Newtown Creek DO measurements and model predictions should be presented in the LTCP. The WQS for DO should be correctly defined and compared to Newtown Creek DO measurements and model predictions. The surrogate metric "annual average DO attainment" is meaningless from a regulatory perspective and should not be used. Any averaging of DO measurements and predictions, whether annual averaging or depth averaging, is inappropriate and should be removed from the LTCP. The LTCP should be revised to provide a comparison of Newtown Creek DO measurements and predictions to the correct WQS for DO.

E. Failure to Use Applicable NYS Bacteria Water Quality Standards

Violations of applicable water quality standards for the indicator bacteria (i.e., fecal coliform) in the Newtown Creek tributaries are also frequent and persistent (LTCP at ES-7). NYCDEP collected fecal coliform measurements in Newtown Creek during the July to November 2016 time period and found exceedances of the geometric mean (geomean or GM) standard for all Newtown Creek LTCP2 sampling locations (NC-3 through NC-14) (LTCP at ES-7).

The New York State water quality standard for fecal coliform bacteria (in units of number per 100 mL) in Class SD waters is "The monthly geometric mean, from a minimum of five examinations, shall not exceed 200." (6 NYCRR 703.4). Thus, in the case of this standard, the magnitude of the standard is 200 per 100mL, the duration is monthly (as measured through the geometric mean), and the acceptable frequency is never (i.e., shall not exceed). The applicable water quality criterion for fecal coliform in Newtown Creek is clearly defined.

In the LTCP Executive Summary, measured fecal coliform data are presented as statistical distributions presumably for all samples collected over the entire period of monitoring (LTCP Figures ES-5 and ES-7 at E-11 and ES-13), rather than as monthly GMs as is appropriate to support comparison to the applicable standard. Baseline model predictions are presented as "maximum monthly geometric means" and "% Attainment" for the year and recreational season (LTCP Table ES-3 at E-17). It is assumed that the maximum monthly GM is the largest predicted monthly GM over the course of the simulated period. It is also assumed the % Attainment metric is the percentage of months that the monthly GM was below the WQS. Regardless of their precise definition, these seasonal and annual attainment metrics are not connected to the applicable standard. NYCDEP should provide the monthly GMs for each station and each month to enable unequivocal evaluation of WQS attainment.

In presenting fecal coliform predictions for the preferred alternative, only "% Attainment" metrics and no monthly GMs of fecal coliform concentrations are provided (LTCP Table ES-14 at ES-33). This presentation format does not provide predicted fecal coliform concentrations or GMs and masks the nature and extent of fecal coliform concentrations predicted in Newtown Creek.

Although the comments in this section are directed to fecal coliform, they are equally applicable to *Enterococci*, for which there is a pending standard also expressed in terms of geometric mean over a thirty-day period.

Recommendations

The LTCP should be revised to provide monthly GM values of fecal coliform concentrations for existing conditions (based on measurements) and predicted future conditions (based on water quality modeling), consistent with the bacteria WQS. Use of metrics such as "% Attainment" are supplemental to the standards-based metric, which is the monthly geometric mean concentration, and should not be used in place of monthly GMs.

F. Adaptive Management without a Robust Monitoring Plan

NYCDEP is recommending a phased implementation approach with CSO controls being completed over the next 25 years. The majority of CSO volume reductions are scheduled to be completed in 2042 (LTCP at 9-2). NYCDEP has requested a phased implementation plan following the principles of adaptive management. As NYCDEP states, "Adaptive management, as defined by the EPA, is the process by which new information about the characteristics of a watershed is incorporated into a watershed management plan on a continuing basis. The process relies on establishing a monitoring program, evaluating monitoring data and trends and making adjustments or changes to the plan. NYCDEP will continue to apply the principles of adaptive management to this LTCP based on its annual evaluation of monitoring data, which will be collected to sustain the operation and effectiveness of the currently operational CSO controls" (LTCP at 9-1). The core of successful adaptive management is robust monitoring, efficient evaluation of data, and appropriate adjustments to plans based on monitoring results.

The Newtown Creek tributaries are the focus of the LTCP water quality data collection program, modeling evaluations, and assessments of WQS attainment. NYCDEP states that they will be following the principles of adaptive management and will be conducting annual water quality monitoring in Newtown Creek. Post-construction monitoring (PCM) is described in two sections of the LTCP, in Section 4.3, as part of the gray infrastructure section and in Section 9.5, as part of the LTCP implementation section. NYCDEP states that "The PCM program is integral to the optimization of the Newtown Creek LTCP, providing data for model validation and feedback on system performance" (LTCP at 4-5). The description of the gray infrastructure PCM states that Newtown Creek water quality data will be collected at NYCDEP's Harbor Survey Monitoring (HSM) and Sentinel Monitoring stations (LTCP at 4-5). The HSM and Sentinel Monitoring programs consist of a total of eight sampling locations with only three stations in Newtown Creek tributaries (LTCP Figure ES-4). The monitoring plan outlined by NYCDEP includes no monitoring in Dutch Kills or Maspeth Creek and no monitoring of CSO flow or water quality.

NYCDEP also states that water quality sampling will be conducted once per month from November through April and once per week from May through October. This is insufficient to support water quality characterization or assess compliance with WQS. For example, a monthly minimum of five samples is necessary to calculate a geometric mean fecal coliform concentration comparable to the water quality standard (6 NYCRR 703.4).

In the LTCP implementation section, NYCDEP devotes a total of two sentences to the PCM, stating that "Ongoing NYCDEP monitoring programs such as the HSM and Sentinel Monitoring Programs will provide water quality data. NYCDEP will conduct PCM after the recommended plan is placed into operation to assess effectiveness in terms of water quality improvements and CSO reductions" (LTCP at 9-3). Again, NYCDEP outlines an annual monitoring program that would include a total of three tributary monitoring stations, with no monitoring in two tributaries (Dutch Kills and Maspeth Creek), and with no CSO flow or water quality monitoring.

NYCDEP appears to undervalue direct water quality measurements to support assessment of water quality conditions and compliance with water quality standards in Newtown Creek. Water quality measurements are not provided in the LTCP and the future water quality monitoring program is extremely limited and is mentioned only briefly in the LTCP. This is problematic because the goal of the LTCP is to improve water quality in Newtown Creek, and the primary method for assessing improvement is to directly measure water quality.

The importance of a robust water quality monitoring program is increased by NYCDEP's use of speculative future conditions in the baseline and performance gap analyses. The only reliable way to establish and maintain an accurate characterization of water quality conditions in Newtown Creek tributaries is to measure those conditions directly. Flow and water quality modeling can be useful tools for predicting future conditions, but models are inherently dependent on direct measurements. Further, assessment of compliance with water quality standards are based on comparison with direct water quality measurements. For these reasons, it is critically important that NYCDEP conduct a robust flow and water quality monitoring program. Measurements collected during the monitoring program must be shared to support collaborative evaluation of the performance of CSO controls over time, as described in EPA adaptive management protocols.

Recommendations

The Newtown Creek annual monitoring program should include, at a minimum, the 14 LTCP2 sampling locations (LTCP Figure ES-4) with additional stations so that there are at least two stations in each tributary. Two stations should be added to Maspeth Creek (presently none), one station should be added to Dutch Kills (presently one), and one station should be added to English Kills (none near upstream bulkhead). Sampling should be conducted at least twice-weekly to obtain sufficient water quality data to support assessment of compliance with WQS. The program should also include monitoring of CSO outfall flows and water quality during wet-weather events. The monitoring program should include measurement of indicator bacteria, BOD, DO, solids, and toxic substances in Newtown Creek, CSO outfalls, MS4 outfalls, and direct discharges (although not all water quality parameters would need to be measured twice weekly). NYCDEP should provide a more detailed monitoring plan in the LTCP that describes sampling locations, water quality parameters measured, sampling frequency, and dry-weather and wet-weather surveys. The process of efficiently analyzing data and modifying the LTCP plan, as needed, should also be described.

Monitoring program data will prove invaluable for quantifying compliance with WQS, for verifying and adjusting model predictions of future conditions, and for guiding modifications to CSO controls that may be required to ensure water quality attainment in the future. Given the large costs associated with CSO controls and Newtown Creek modifications ($100s of millions), the costs associated with conducting a robust water quality monitoring program are modest.

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