

A wide-angle photograph of a marina on a bright, clear day. In the foreground, several small white and yellow motorboats are docked at a wooden pier. A group of about a dozen people, some wearing blue and white athletic gear, are standing on the pier and talking. In the background, more boats are docked, and a white building is visible on the right. The sky is a clear, pale blue. The water is calm and reflects the sky and the boats.

On July 27th, 2016 staff from NYC DEP joined the Guardians of Flushing Bay and the Empire Dragon Boat Team at the World's Fair Marina for a tour of Flushing Bay.



Flushing Bay Combined Sewer Overflow Long Term Control Plan

Public Meeting #2
Review of Alternatives

USTA Tennis Center
October 26, 2016

Welcome & Introductions

Mikelle Adgate
Director of Stormwater Management Outreach
DEP – BPA

➤ What is an LTCP?

- The goal of each LTCP is to identify appropriate CSO controls necessary to achieve waterbody specific water quality standards, consistent with the Federal CSO Policy and water quality goals of the CWA.

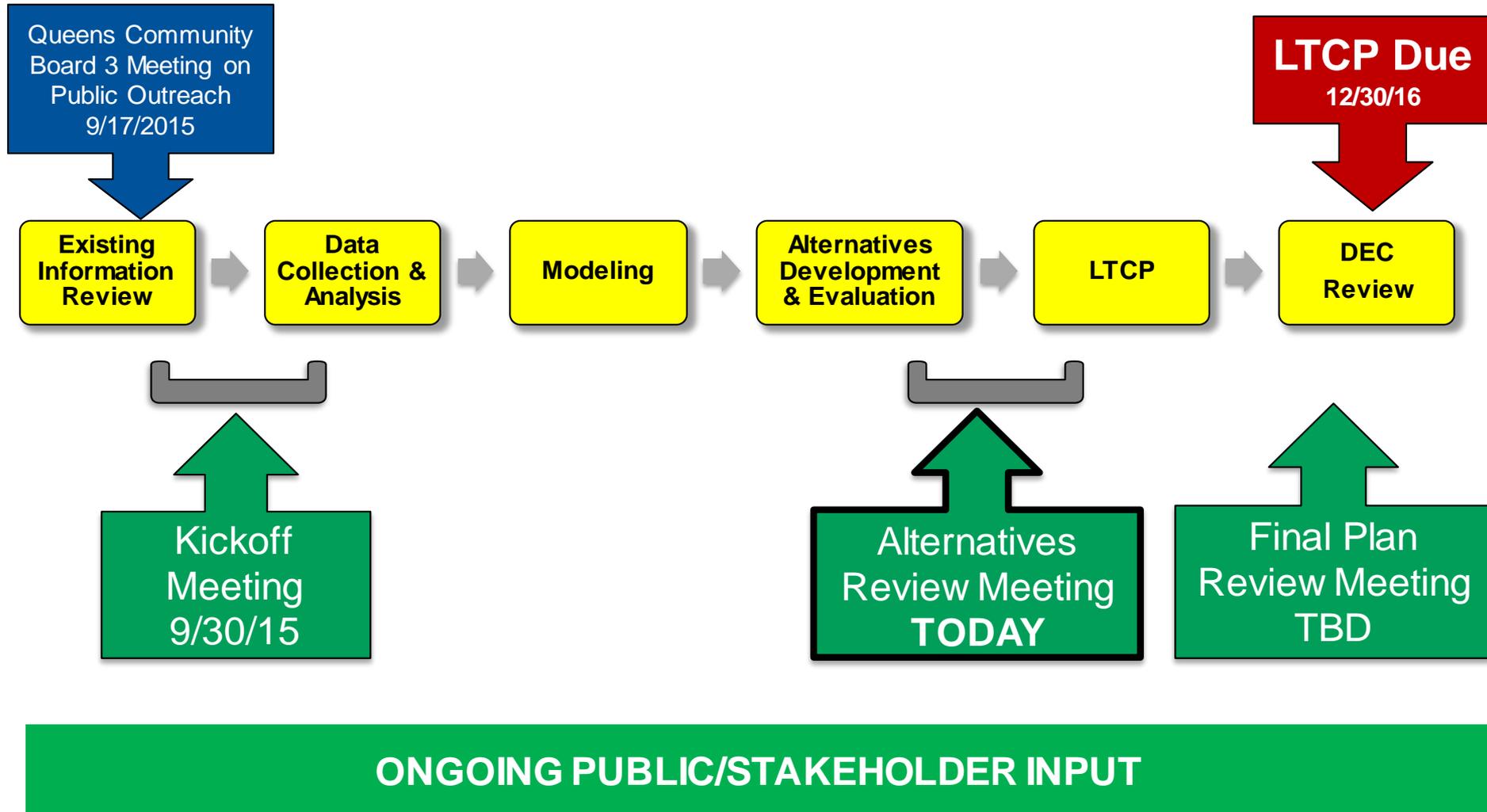
➤ The LTCP process:

- Builds off existing infrastructure investments (i.e. Waterbody/Watershed Plans)
- Assesses current waterbody and watershed characteristics
- Identifies and analyzes **Grey-Green*** infrastructure balance for different watersheds to meet applicable water quality standards
- The LTCP is subject to DEC review and approval
- Includes a public engagement process

**Definitions:*

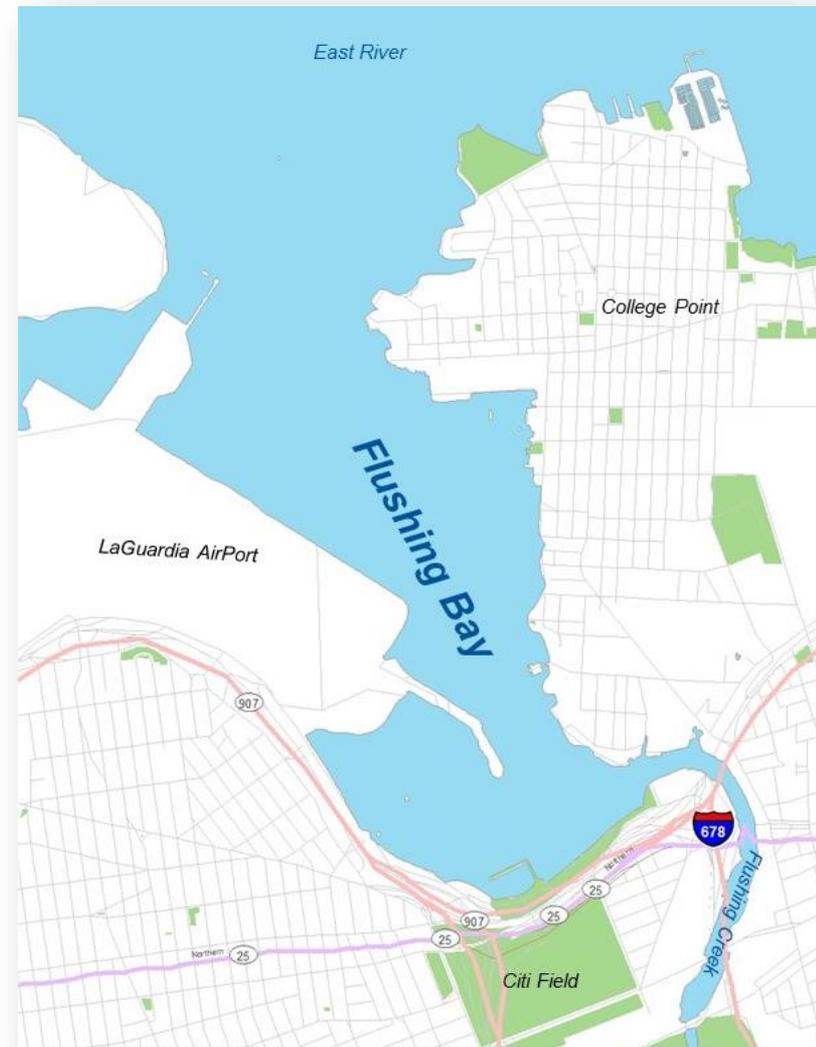
Grey = traditional practices such as tanks, pipes, and sewers

Green = sustainable pollution reducing practices that also provide other ecosystem benefits



- 1 Assess **Green Infrastructure** in the vicinity of the Flushing Bay and Creek
- 2 Evaluate **alternatives** beyond disinfection with chlorine
- 3 Concerns about **chlorine residual control**

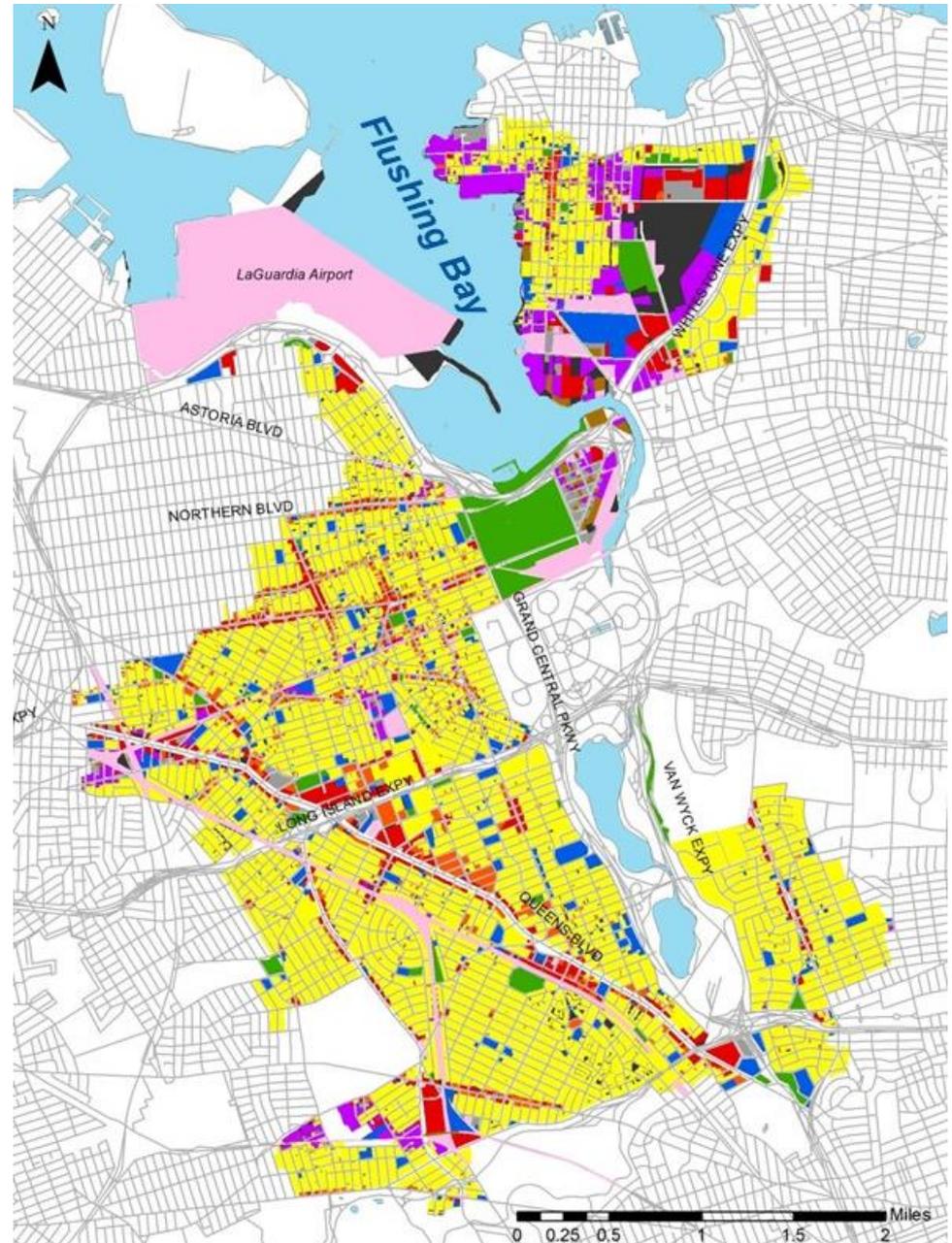
These comments will be addressed in subsequent sections of this presentation.



Drainage Area and Land Use

LEGEND

- Residential
- Mixed Residential and Commercial
- Commercial and Office
- Industrial and Manufacturing
- Transportation and Utility
- Public Facilities and Institutions
- Open Space and Outdoor Recreation
- Parking Facilities
- Vacant Land
- Unknown



Residential & Commercial	62%
Transportation & Utility	15%
Other	7%
Public Facility	6%
Park and Open Space	5%
Industrial	5%

Questions?

Receiving Water Sampling

Keith Mahoney, P.E.
Director of Water Quality Planning
DEP – BEDC

Flushing Bay Drainage Area

➤ Annual Wet-Weather Discharge Volume \approx 2.1 Billion Gallons

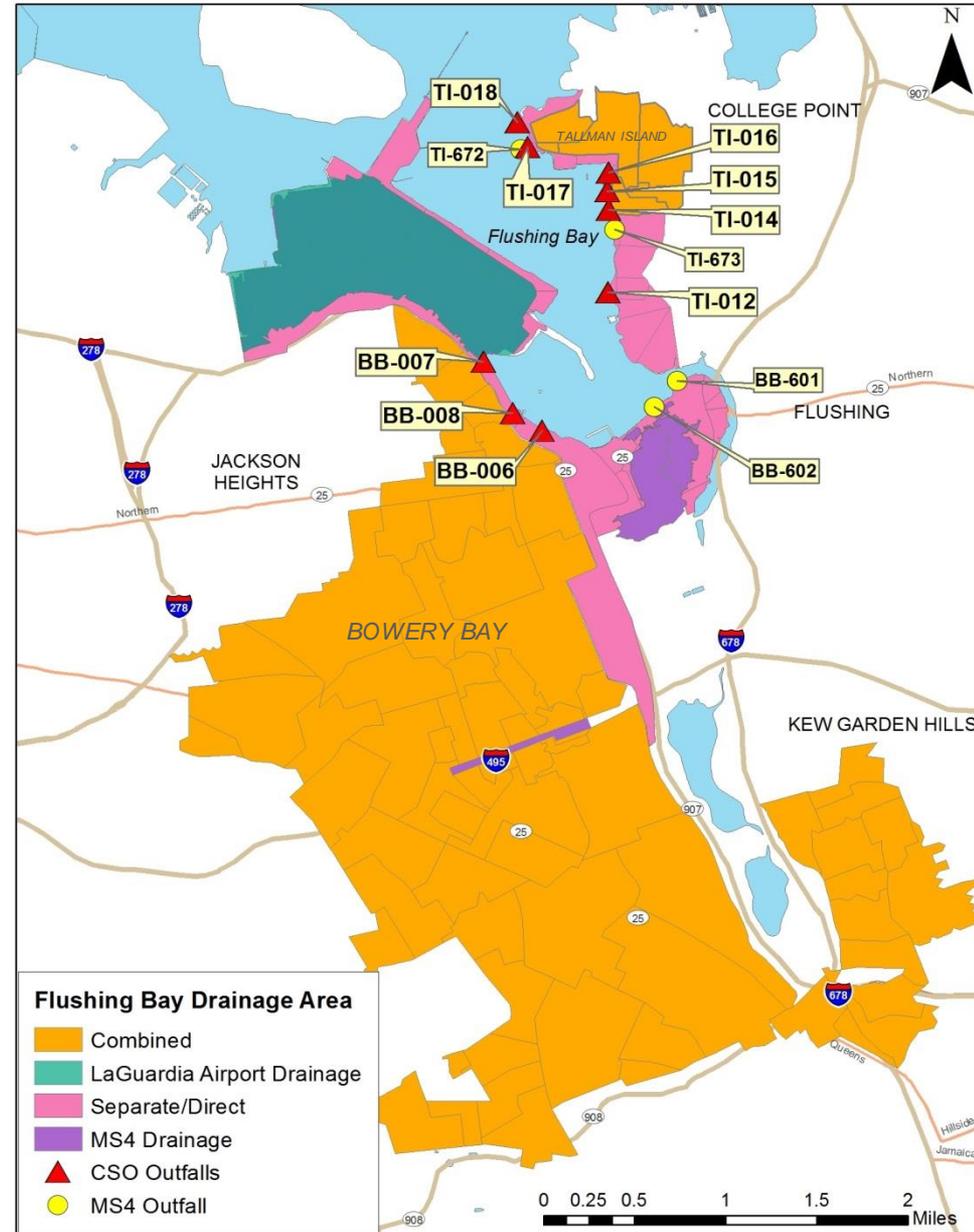
(LTCP baseline values based on Calibrated Model for entire drainage area)

- 1,454 MG CSO (69%)
- 103 MG MS4 Stormwater (5%)
- 560 MG Other Stormwater and Direct Drainage (26%)

➤ Sewer System:

- Tallman Island (TI) and Bowers Bay (BB) wastewater treatment plants
- 9 CSO Outfalls (▲)
- 4 MS4 Outfalls (●)

	Bowery Bay WWTP	Tallman Island WWTP	LaGuardia Airport
Drainage Area Acres	6,012	438	427
Served by Combined Sewers	84%	55%	N/A



CLASS I

Boating/Fishing

The **best usage** of Class I water is **secondary contact** recreation and fishing. These waters shall be suitable for fish, shellfish and wildlife propagation and survival. In addition, the water quality shall be suitable for primary contact recreation, although other factors may limit the use for this purpose.

Parameter	Criteria*	Reference
Fecal Coliform	Monthly Geometric Mean ≤ 200 col/100 mL	• New rulemaking promulgated by DEC on November 14 th , 2015
Total Coliform	Monthly Median ≤ 2,400 col/100 mL 80% ≤ 5,000 col/100 mL	• New rulemaking promulgated by DEC on November 14 th , 2015
Dissolved Oxygen	≥ 4.0 mg/L (acute, never less than)	• DEC water quality parameter

* EPA has also proposed a potential future RWQC for enterococcus: 30-Day Rolling GM ≤ 30 col/100 mL.

➤ CSO LTCP Goals and Targets:

- Annual and Seasonal Bacteria Compliance
- Annual Dissolved Oxygen Compliance
- Time to Recovery for Bacteria of ≤ 24 hours
- Floatables Control

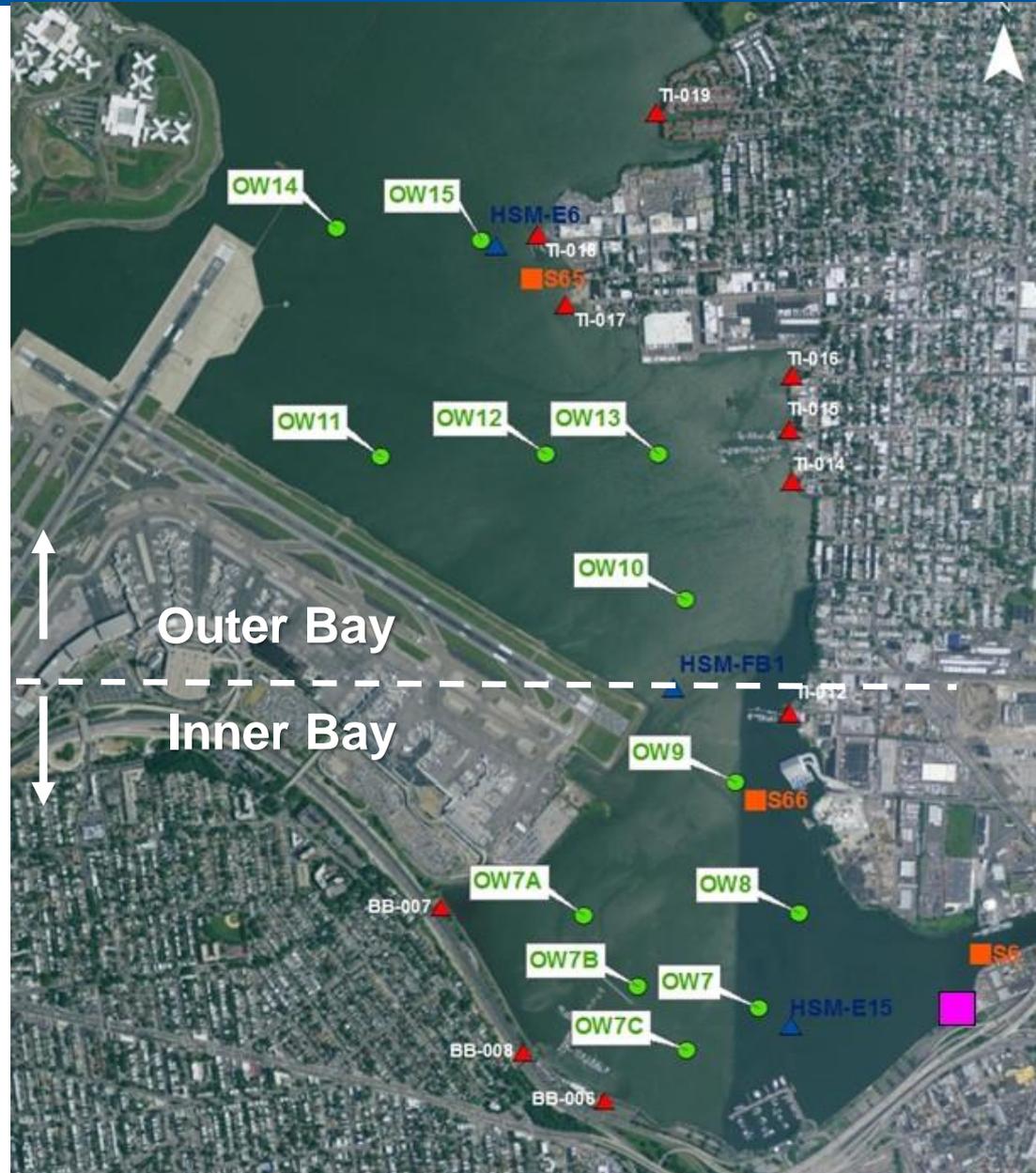
Flushing Bay Sampling Locations

LTCP Sampling: Oct.'13-May'14

- ▲ **Outfall Pipe**
 - 2 CSO Outfalls (BB-006 & BB-008)
- **Flushing Bay**
 - 12 locations / ~939 total samples
 - Inner Bay:** (OW7 thru OW9)
 - Outer Bay:** (OW10 thru OW15)

Other Sampling Programs:

- ▲ **Harbor Survey Monitoring**
 - 3 locations / 42 samples (E15, FB1, E6)
- **Sentinel Monitoring**
 - 2 locations / 9 samples (S65, S66)
- **Citizen Sampling**
 - 1 location / 40 entero samples only (World's Fair Marina)



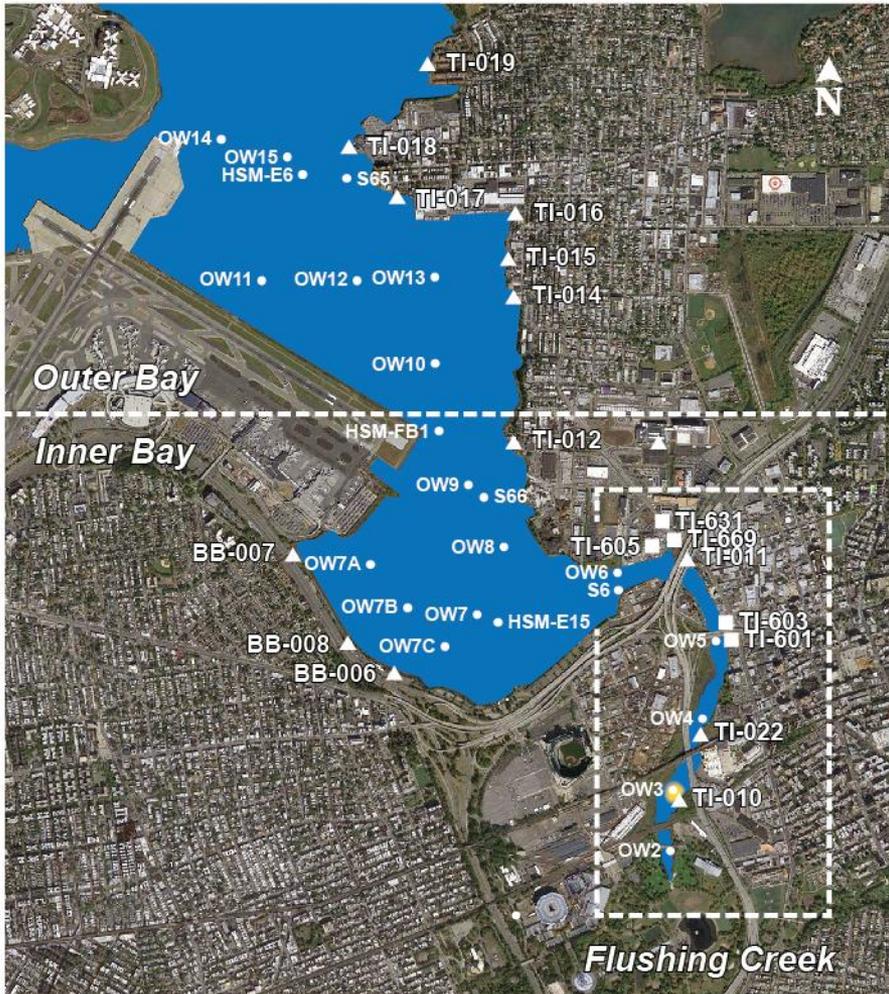
Fecal Coliform Sampling – Geometric Means

Flushing Bay Sampling Period:
October 21, 2013 to May 7, 2014
(~25 Dry and ~65 Wet samples per location)

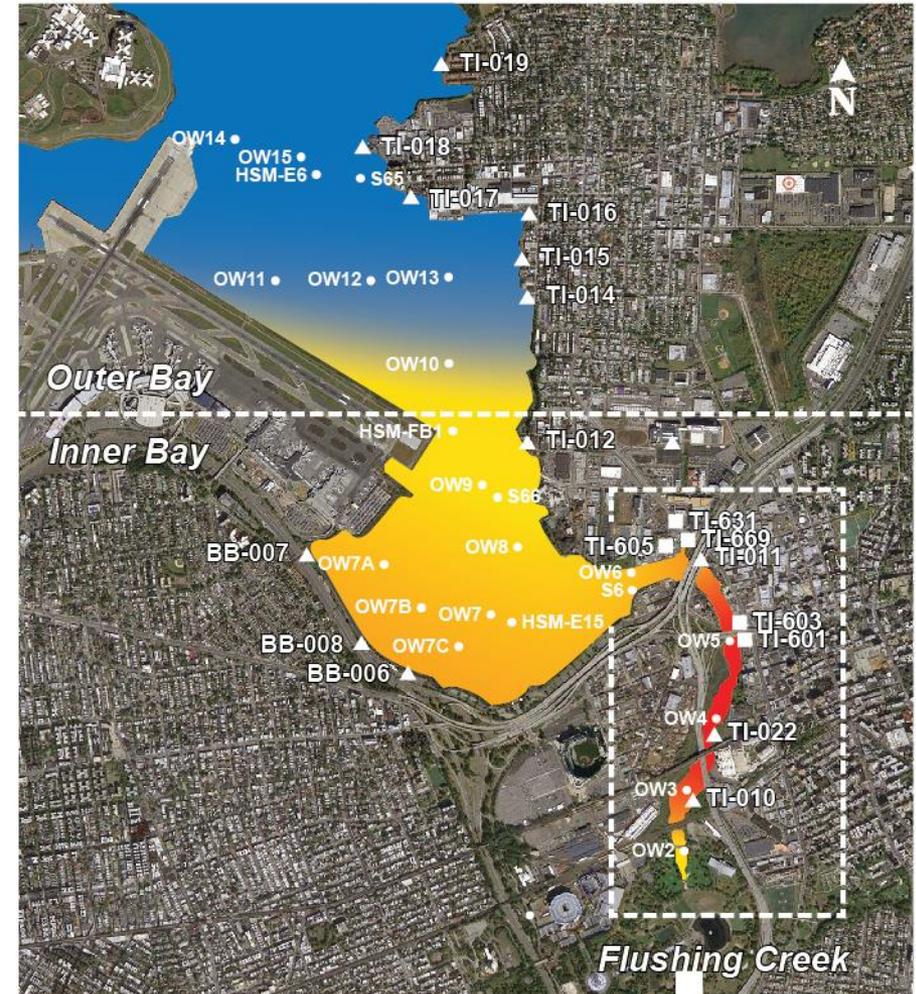
Scale (# col/100 mL)



Dry Weather



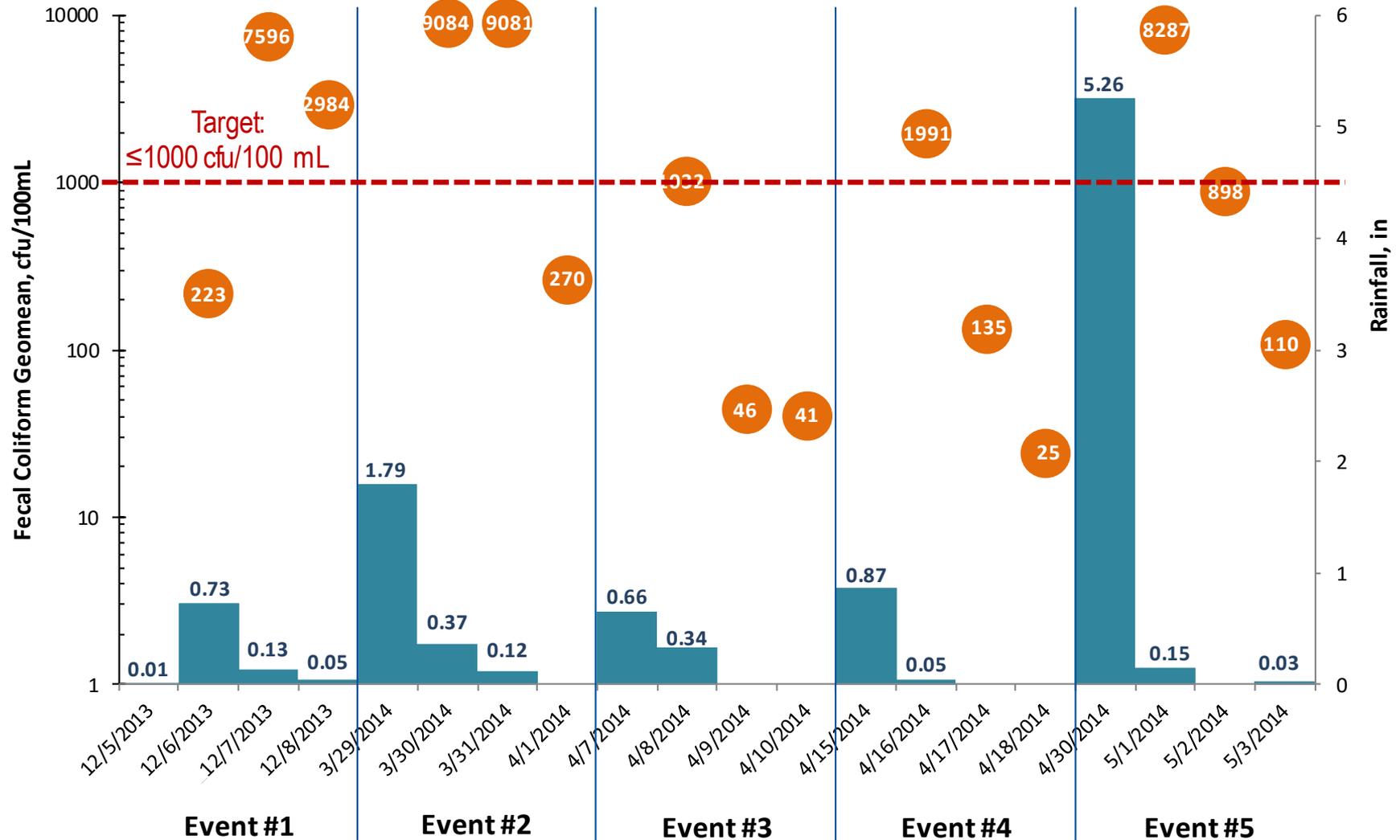
Wet Weather



Fecal Coliform Recovery Over Time



OW7 LTCP Receiving Water Sampling Data



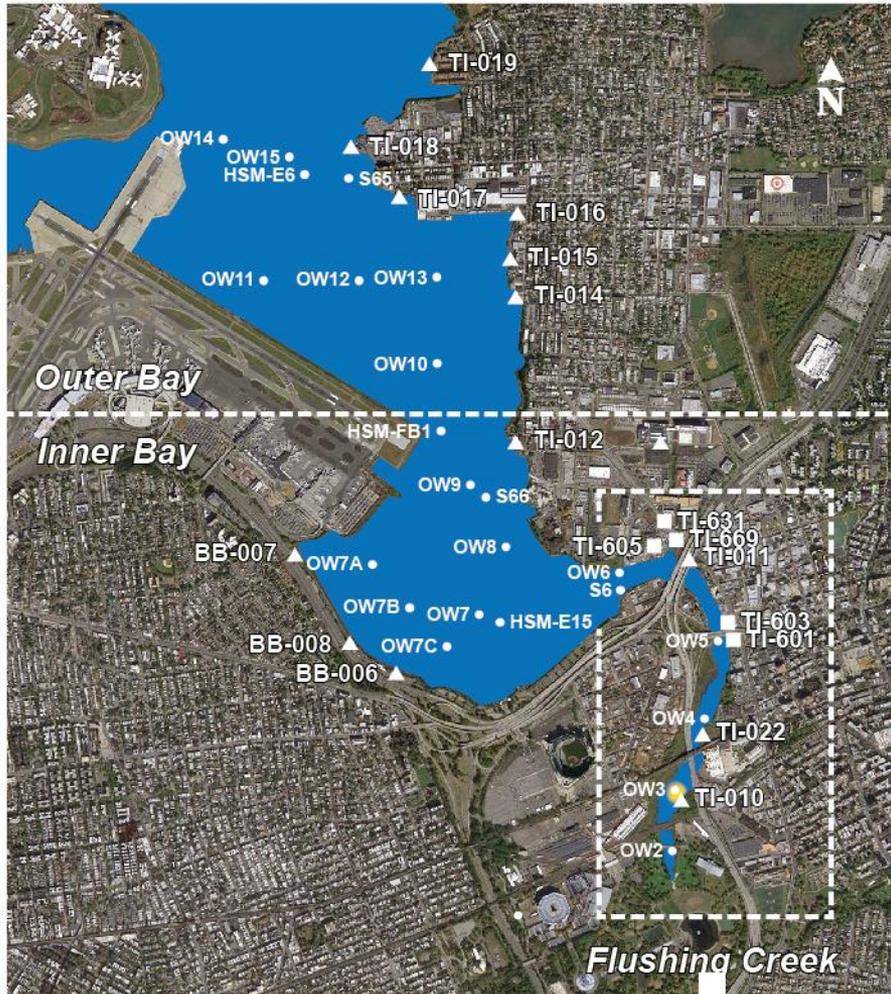
Enterococci Sampling – Geometric Means

Flushing Bay Sampling Period:
October 21, 2013 to May 7, 2014
(~25 Dry and ~65 Wet samples per location)

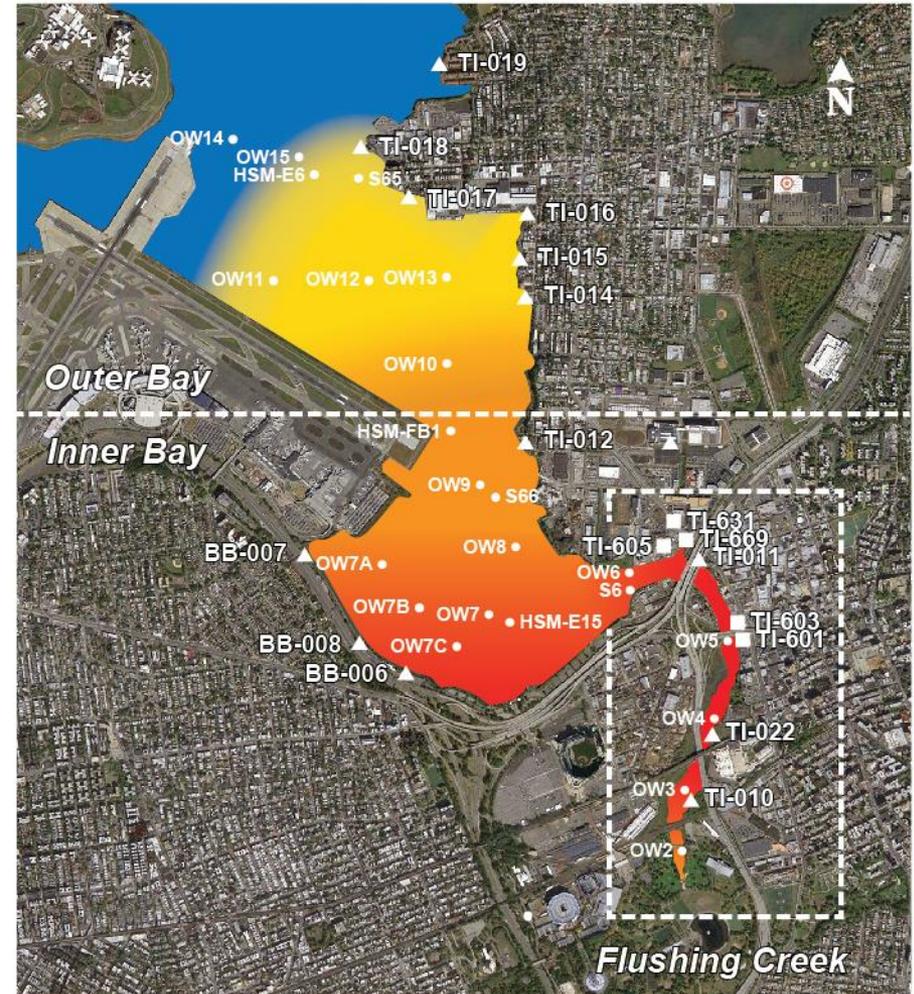
Scale (# col/100 mL)



Dry Weather



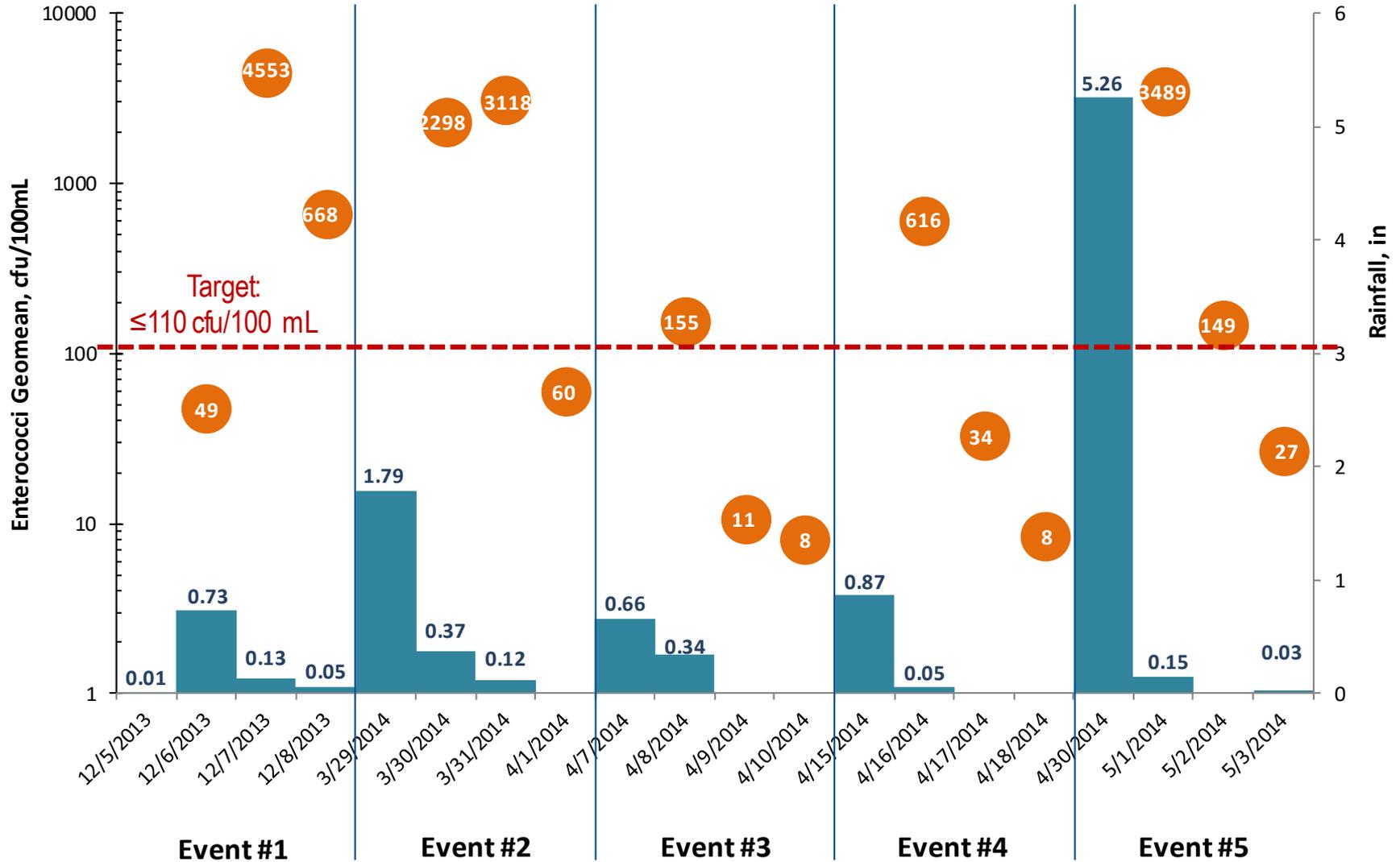
Wet Weather



Enterococci Recovery Over Time



OW7 LTCP Receiving Water Sampling Data

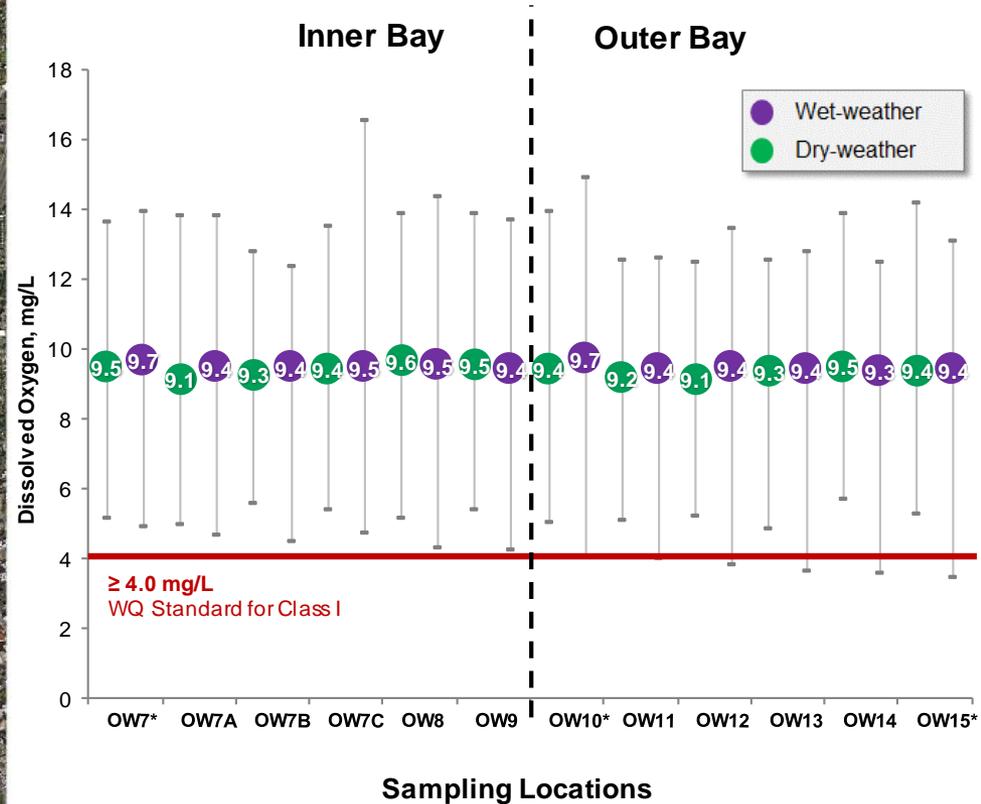
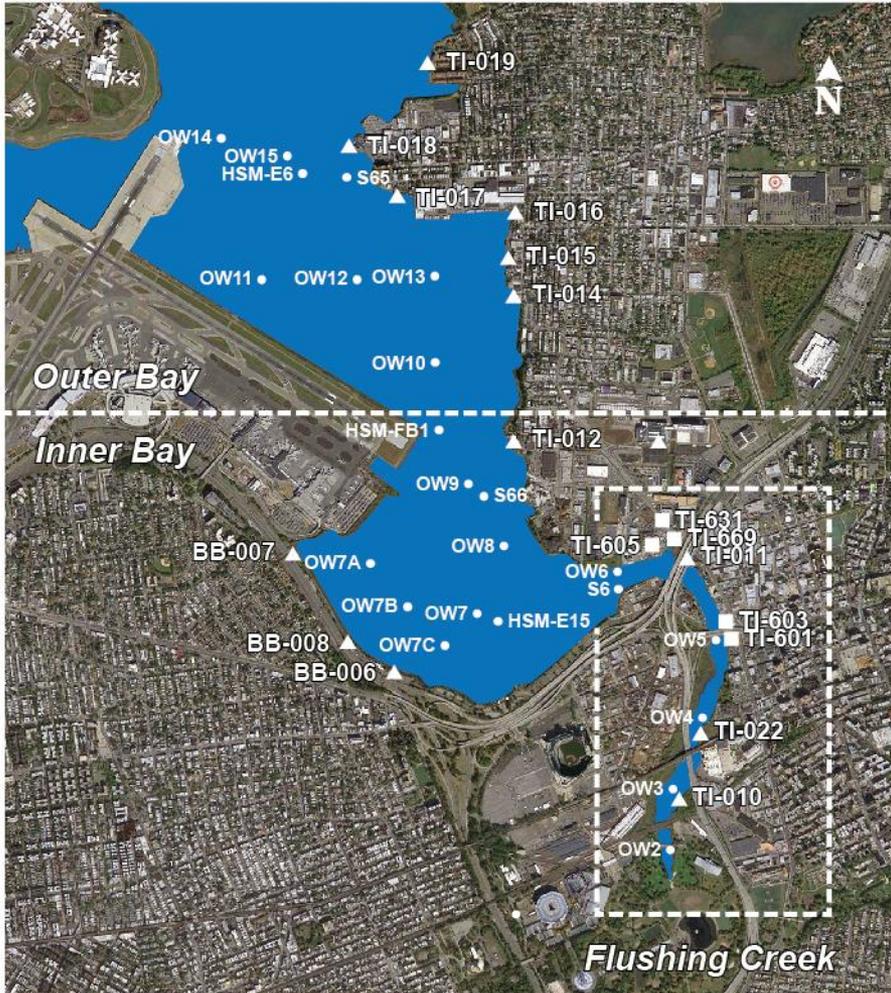


Dissolved Oxygen Sampling - Averages

Flushing Bay Sampling Period:
October 21, 2013 to May 7, 2014
 (~25 Dry and ~65 Wet samples per location)

Average DO > 9 mg/L across all Flushing Bay samples.

Dry & Wet Weather



*Includes LTCP and Harbor Survey Data

Questions?

Existing Water Quality Improvement Projects

Green and Grey Infrastructure

Angela Licata
Deputy Commissioner
DEP – BEPA

Keith Mahoney, P.E.
Director of Water Quality Planning
DEP – BEDC

- **Green Infrastructure (GI)** collects stormwater runoff from impervious surfaces, such as streets and roofs, reducing flow to sewers
- **\$1.5 billion** committed for GI Citywide to manage 1" of stormwater runoff in combined sewered areas to reduce CSO
- DEP will meet this goal through:
 - Area-Wide Contracts
 - Public Property Retrofits
 - Grant Program for Private Property Owners
 - Stringent Detention Rule for New Development



Rain Gardens

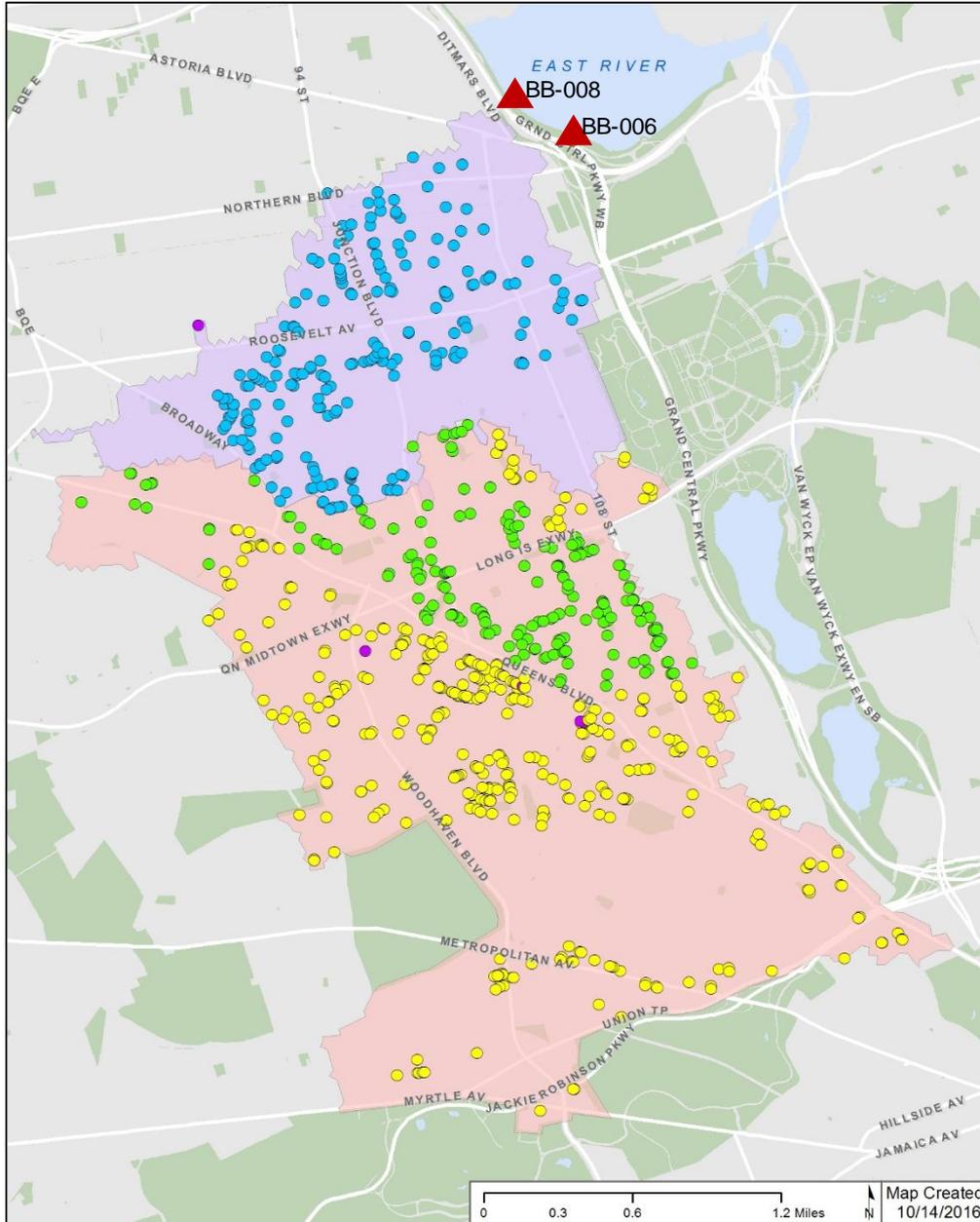


Permeable Pavers



Green Roofs

Flushing Bay Built and Planned GI Projects



- **More than 800 GI assets within streets, parks, and schools**
- **113 Impervious Acres Managed**
- **90% are ROW Rain Gardens**
(also known as bioswales)

Legend

 BB-006 Drainage Area

 BB-008 Drainage Area

 CSO Outfalls

Area-Wide GI Contracts:

 Constructed (190)

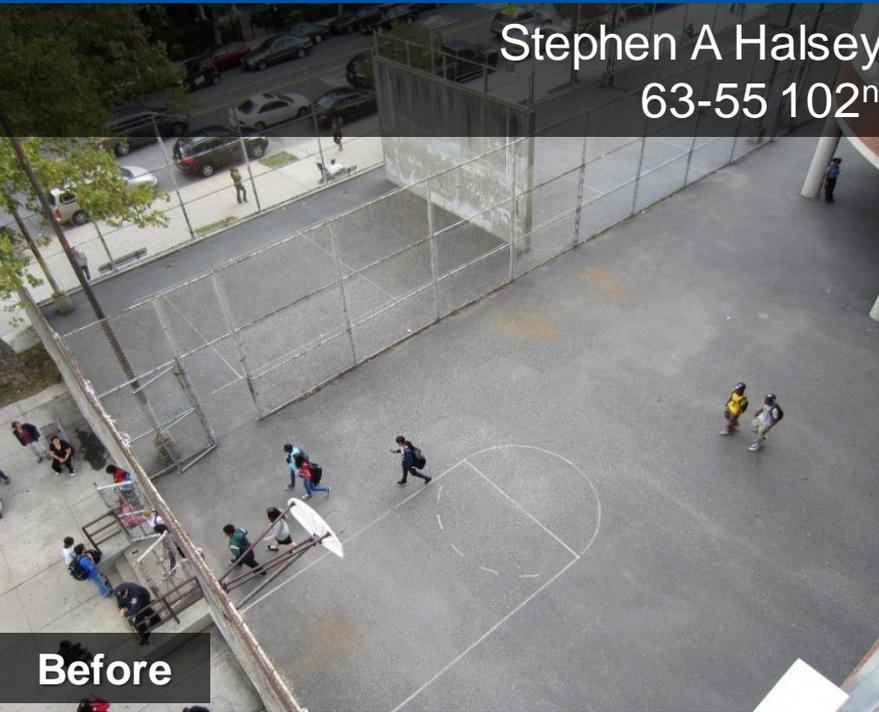
 In Construction (212)

 Final Design (401)

 In Design (5)

Public Property Retrofits

Stephen A Halsey Junior High School 157Q
63-55 102nd Street, Rego Park



Before



After

Project Status	Parks/ Playgrounds	Public Schoolyards	Total
Potential	2	0	2
Preliminary	1	0	1
Contract Plans	7	2	9
In Construction	1	0	1
Constructed	0	1	1
Total	11	3	14

➤ **Green Infrastructure Grant Program:**

DEP provides funding for the design and construction costs of green infrastructure on private property in combined sewer areas of the City.

➤ **Green Roof Tax Abatement:**

The City provides a one-year property tax abatement for private properties that install green roofs. The abatement value is \$5.23 per square foot (up to the lesser of \$200,000 or the building's tax liability) and is available through March 2018.

➤ **New Private Incentive Program:**

DEP is currently developing a new private property green infrastructure retrofit initiative to augment its current efforts on stormwater management on private property. The Agency released an RFI in September seeking ideas on innovative program management structures for this new initiative.

➤ **2012 Stormwater Rule:**

In 2012, DEP amended the allowable flow rate of stormwater to the City's combined sewer system for new and existing development. Site Connection Proposals may include green infrastructure technologies to meet the new allowable rate.

Grey Infrastructure

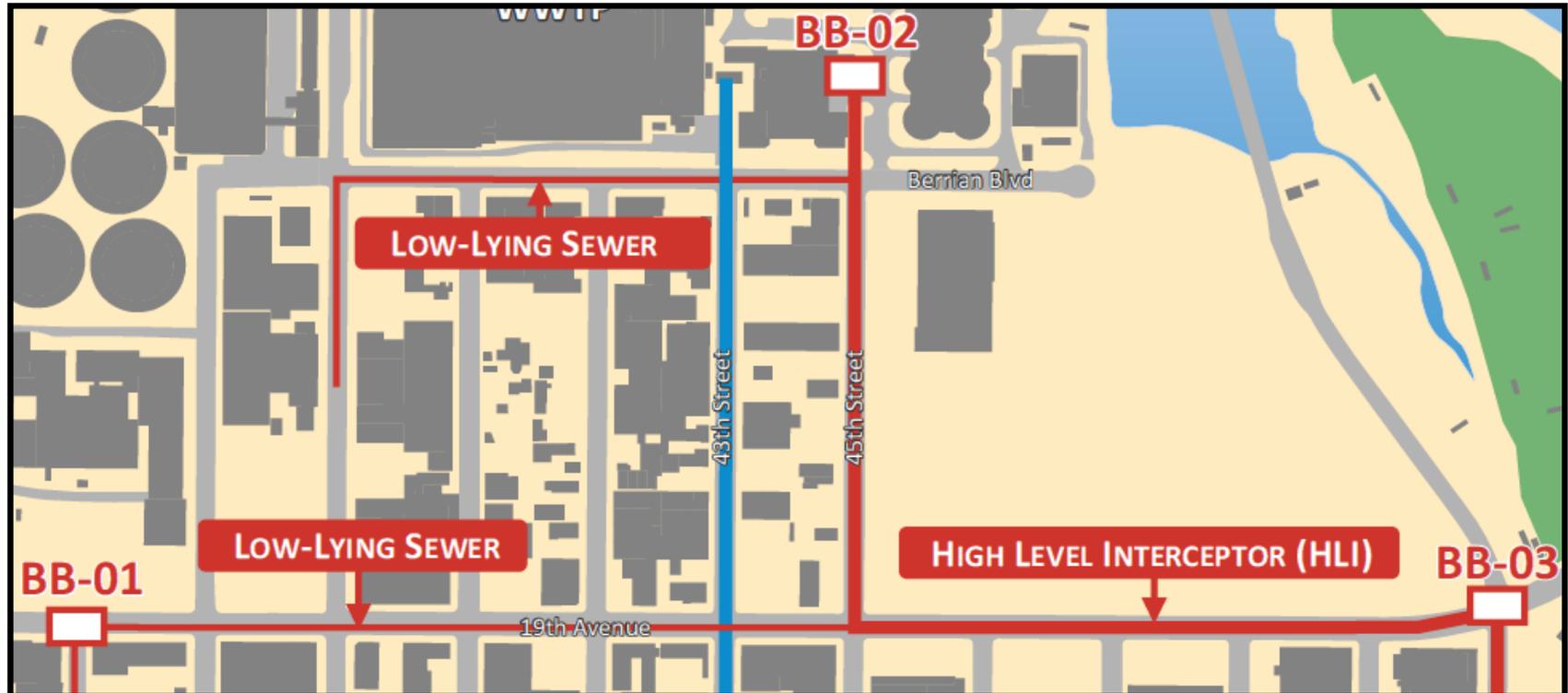
Results in CSO Reduction and Addresses Legacy CSO Odor Issues

Waterbody/Watershed Facility Plan (WWFP) Recommended Implementation of Three Grey Infrastructure Projects:

- 1) Divert Low-Lying Sewers / Raise Weir BB-02
- 2) Regulator Modifications
- 3) Environmental Dredging of Flushing Bay

1) Divert Low-Lying Sewers / Raise Weir BB-02

- Divert low-lying sewers in the vicinity of Bowery Bay WWTP and raise the weir at regulator BB-02
- **Estimated Cost**
= \$5.6 Million
- **Construction Completion**
= December 2016
- **Current Status**
= In Construction



2) Regulator Modifications

➤ Bowery Bay high level interceptor regulator modifications at 5 regulators: BB-R4, BB-R5, BB-R6, BB-R9, and BB-R10

- **Estimated Cost**
= \$41.4 Million
- **Construction Completion**
= June 2018
- **Current Status**
= Under Construction

➤ Achieve ~10% reduction in CSO discharges.



3) Environmental Dredging of Flushing Bay

- Removal of CSO related sediments that are exposed at low tides
- Dredge Area = 17.5 acres
- Dredge Quantity = 91,600 cubic yards
- Post-Dredge Depth = 4 feet below mean lower low water
- Removal of deteriorated piles and abandoned Pier head at Pier 2
- **Estimated Cost = \$39 Million**
- **Current status = Under Construction**

Milestone	Date
NTP Construction	Sept. 2016
Complete Dredging & Planting	March 2019
Complete Wetlands Maintenance	March 2021



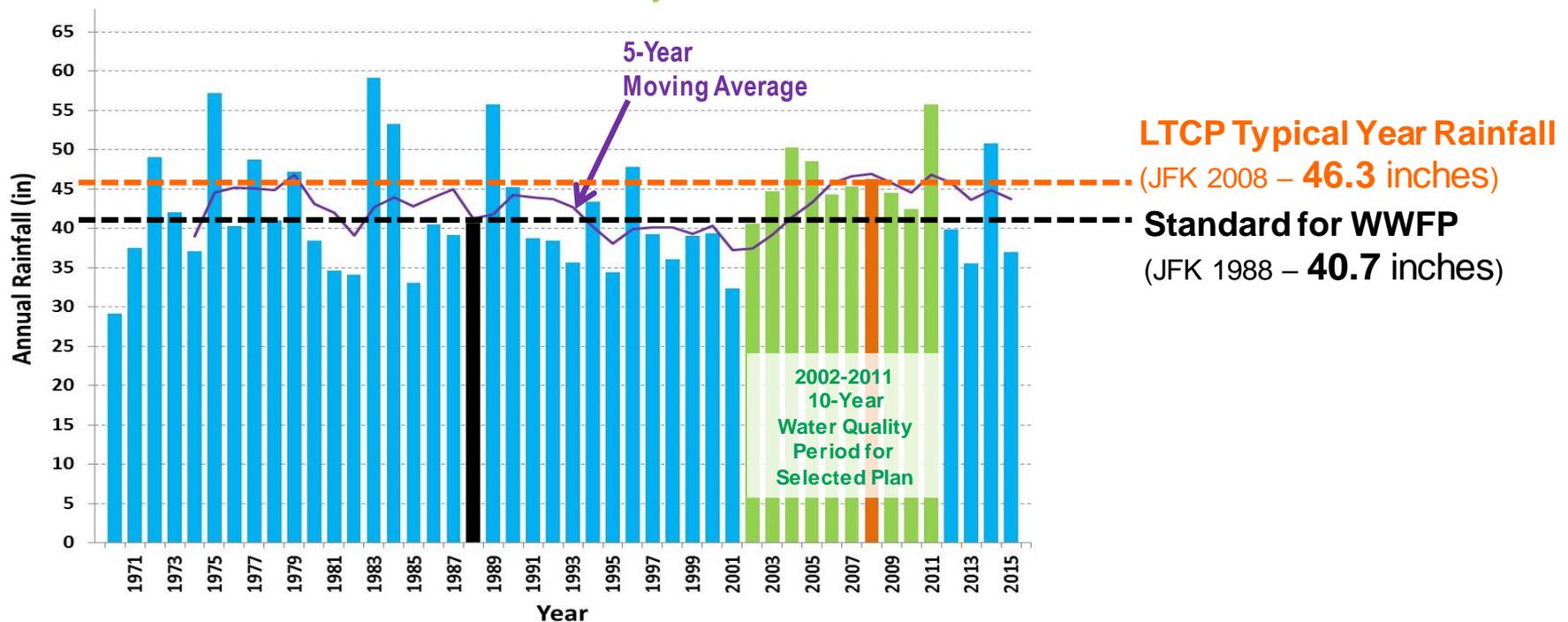
Questions?

Preliminary Gap Analysis

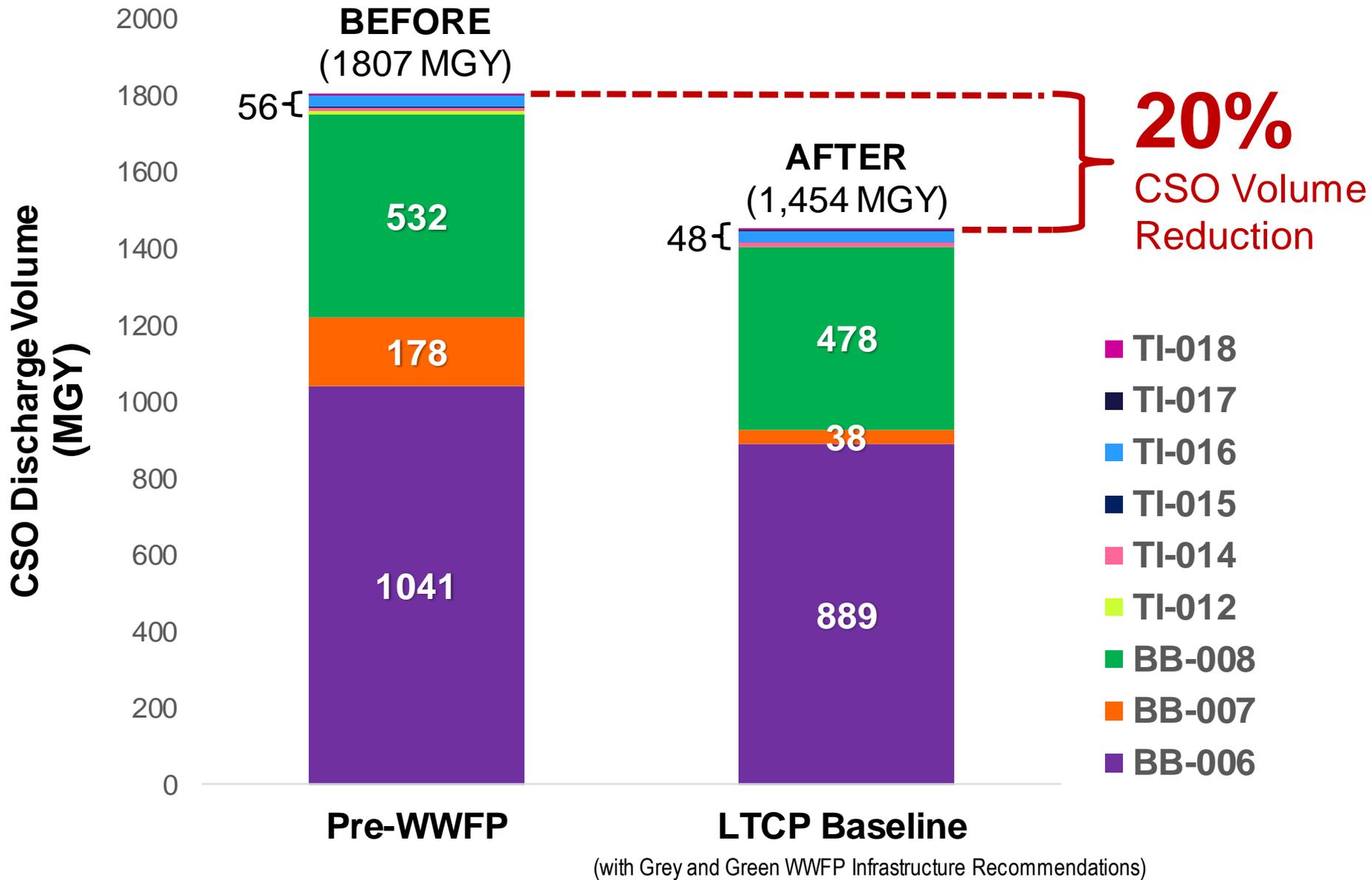
Keith Mahoney, P.E.
Director of Water Quality Planning
DEP – BEDC

LTCP Baseline Assumptions

- Uses LTCP calibrated collections system and water quality models
- Accounts for population projections to 2040
- Committed grey and green infrastructure are implemented
- Flushing Creek LTCP preferred alternative is implemented
- Assumes all illicit discharges are abated
- Uses JFK Rainfall Records:
 - 2008 for screening analysis
 - 2002-2011 for detailed analysis



Modeled Flushing Bay CSO Volumes



Fecal Coliform: Projected Attainment

	Station	% Attainment for Primary Contact Fecal (Monthly GM \leq 200 cfu/100 mL)				Time to Recover (hours) (Target \leq 1000 cfu/100 mL)	
		Annual		Recreational		(under Aug 15, 2008 storm conditions)	
		Baseline	100% FB CSO Control	Baseline	100% FB CSO Control	Baseline	100% FB CSO Control
Flushing Creek	OW-3	58% – 83%	58% – 83%	100%	100%	25 – 29 hr	20 – 25 hr
	OW-4						
	OW-5						
	OW-6						
Inner Bay	OW-7	100%	100%	100%	100%	21 – 23 hr	0 – 10 hr
	OW-7A						
	OW-7B						
	OW-7C						
	OW-8						
	OW-9						
Outer Bay	OW-10	100%	100%	100%	100%	9 – 21 hr	0 – 10 hr
	OW-11						
	OW-12						
	OW-13						
	OW-14						
	OW-15						

Enterococci: Projected Attainment

	Station	% Attainment for Enterococci (30-Day Rolling GM \leq 30 cfu/100 mL)		Time to Recover (hours) (Target \leq 110 cfu/100 mL)	
		Recreational		(under Aug 15, 2008 storm conditions)	
		Baseline	100% FB CSO Control	Baseline	100% FB CSO Control
Flushing Creek	OW-3	60% – 97%	78% – 100%	46 – 51 hr	24 – 38 hr
	OW-4				
	OW-5				
	OW-6				
Inner Bay	OW-7	100%	100%	32 – 38 hr	12 – 20 hr
	OW-7A				
	OW-7B				
	OW-7C				
	OW-8				
	OW-9				
Outer Bay	OW-10	100%	100%	20 – 36 hr	0 – 12 hr
	OW-11				
	OW-12				
	OW-13				
	OW-14				
	OW-15				

Dissolved Oxygen: Projected Attainment

Station	% Attainment for Dissolved Oxygen (Acute, never less than 4 mg/L)		
	Baseline	100% FB CSO Control	
Flushing Creek	OW-3	94% – 99%	97% – 100%
	OW-4		
	OW-5		
	OW-6		
Inner Bay	OW-7	100%	100%
	OW-7A		
	OW-7B		
	OW-7C		
	OW-8		
	OW-9		
Outer Bay	OW-10	97% – 99%	97% – 99%
	OW-11		
	OW-12		
	OW-13		
	OW-14		
	OW-15		

Questions?

CSO Reduction Alternatives Evaluation

James Mueller, P.E.
Deputy Commissioner
DEP – BEDC

1. Bacteria Source Component Analysis

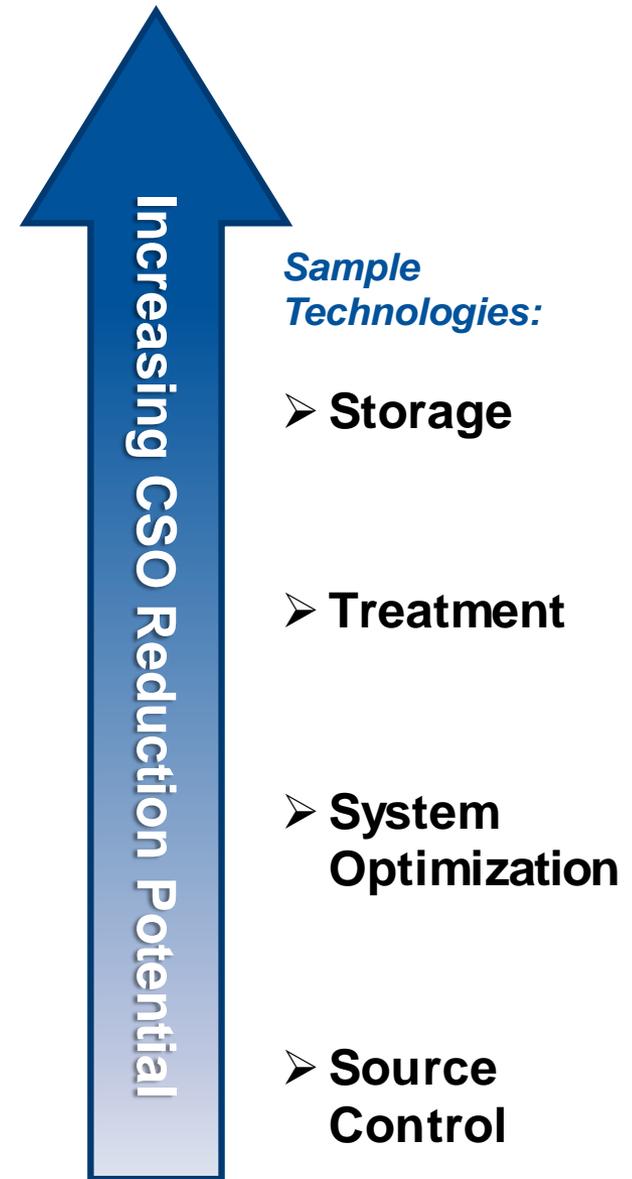
- CSO, stormwater and direct drainage

2. Gap Analysis for Water Quality Standard (WQS) Attainment

- Calculate bacteria and dissolved oxygen for:
 - Baseline Conditions
 - 100% CSO Control Conditions

3. Assess Levels of CSO Control Necessary to Achieve WQS

4. Identify Technologies to Cost-Effectively Achieve the Required Level of CSO Control



CSO Mitigation Toolbox

INCREASING COMPLEXITY

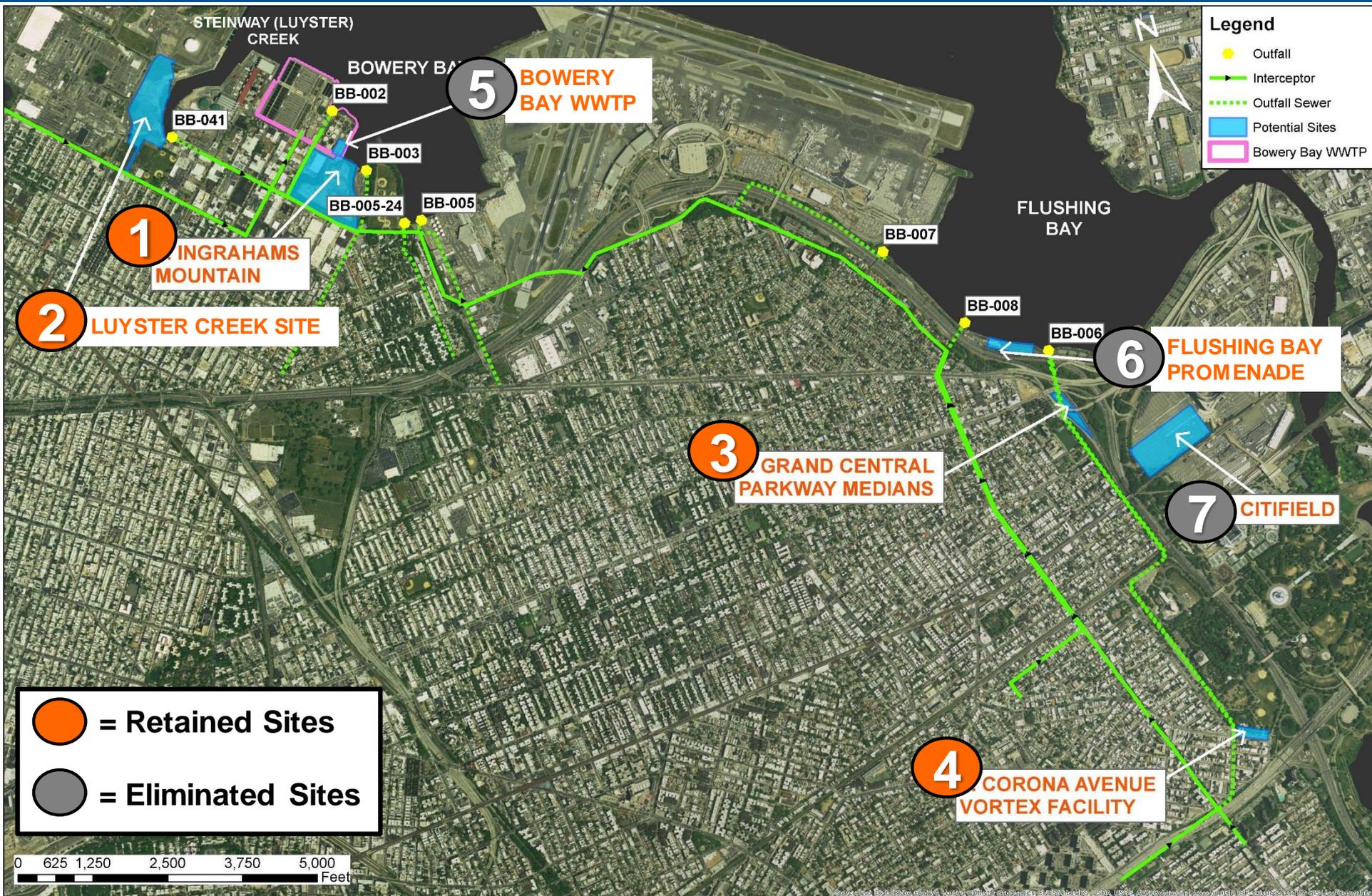
INCREASING COST

Source Control	Green Infrastructure	High-Level Sewer Separation		
System Optimization	Fixed Weirs	Inflatable Dams Bending Weirs Control Gates		Pump Station Expansion
CSO Relocation	Interceptor Flow Regulation	Flow Tipping to Other Watersheds	Re-Purpose Corona Avenue Vortex Facility	Parallel Interceptor/Sewer
Water Quality / Ecological Enhancement	Floatables Control	Dredging	Aeration	
Treatment	Outfall Disinfection	Retention Treatment Basin (RTB)	High Rate Clarification (HRC)	WWTP Expansion
Storage	In-System	Shaft	Tank	Tunnel

Ongoing projects identified in Waterbody / Watershed Facility Plan

Preliminary evaluations were conducted for many CSO mitigation options

Potential Sites



1 **Ingrahams Mountain**

- Tunnel and Pump Station
- Tunnel and High Rate Clarification

2 **Luyster Creek**

- Tunnel and Pump Station
- Tunnel and High Rate Clarification

3 **Grand Central (GC) Parkway Medians**

- In-System Storage

4 **Corona Avenue Vortex Facility (CAVF)**

- Retention Treatment Basin with Seasonal Disinfection

1 Ingrahams Mountain Site

CSO Storage Tunnel Route:

➤ From BB-006 and BB-008 along Astoria Blvd. to Ingrahams Mountain

CSO Control	Tunnel Diameter	CSO Storage Volume	Dewatering Pump Station	High Rate Clarification	20-Year Net Present Value
25%	10 ft.	8 MG	20 MGD	-	\$430 Million
50%	18 ft.	25 MG	50 MGD	-	\$600 Million
75%	18 ft.	25 MG	-	60 MGD	\$880 Million
100%	18 ft.	25 MG	-	400 MGD	\$2,050 Million

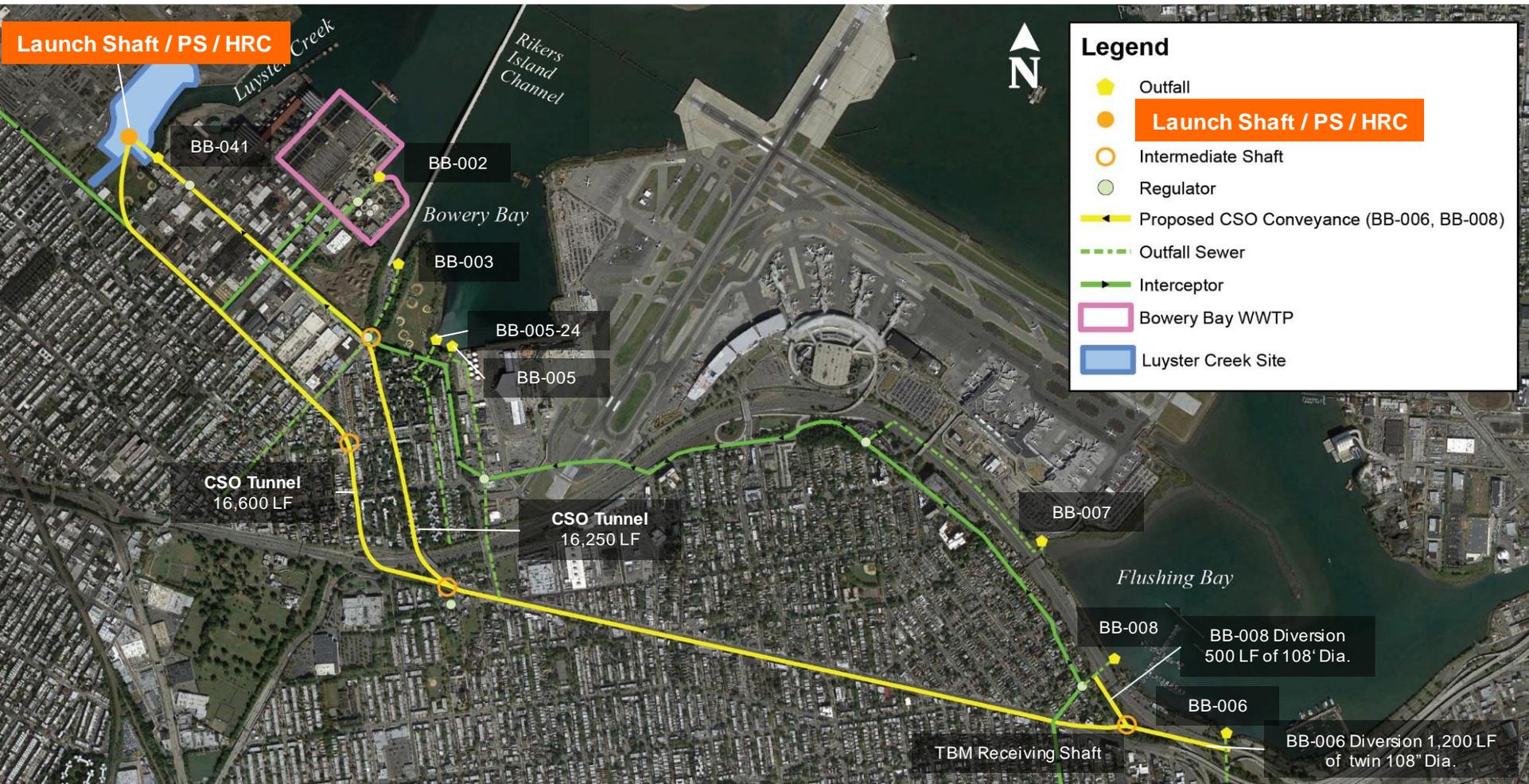


2 Luyster Creek Site

CSO Storage Tunnel Route:

➤ From BB-006 and BB-008 along **Astoria Blvd.** to Luyster Creek site west of the Bowery Bay WWTP

CSO Control	Tunnel Diameter	CSO Storage Volume	Dewatering Pump Station	High Rate Clarification	20-Year Net Present Value
25%	9 ft.	9 MG	20 MGD	-	\$530 Million
50%	16 ft.	25 MG	50 MGD	-	\$630 Million
75%	16 ft.	25 MG	-	60 MGD	\$950 Million
100%	16 ft.	25 MG	-	400 MGD	\$2,120 Million



3 Grand Central Parkway Medians

In-System Storage within Outfalls BB-006 and BB-008

- Install bending weirs, baffles & dewatering pump stations along Outfalls BB-006 and BB-008 with force main to return captured CSO to the High Level Interceptor

1.2 MG storage in outfall pipe up to BB-R9

3.8 MG storage in lower level of outfall up to CAVF

1.5 MG storage in upper level of outfall up to BB-R10

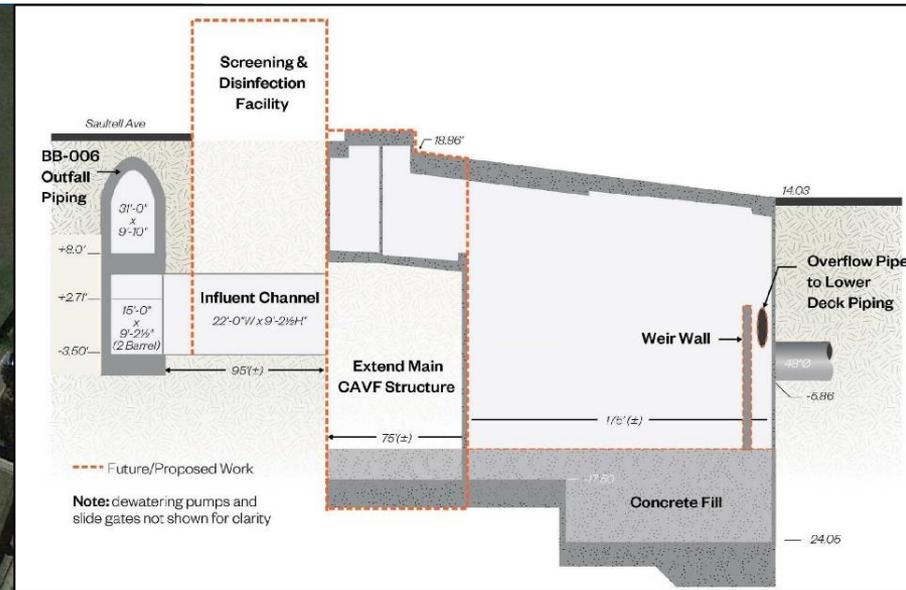
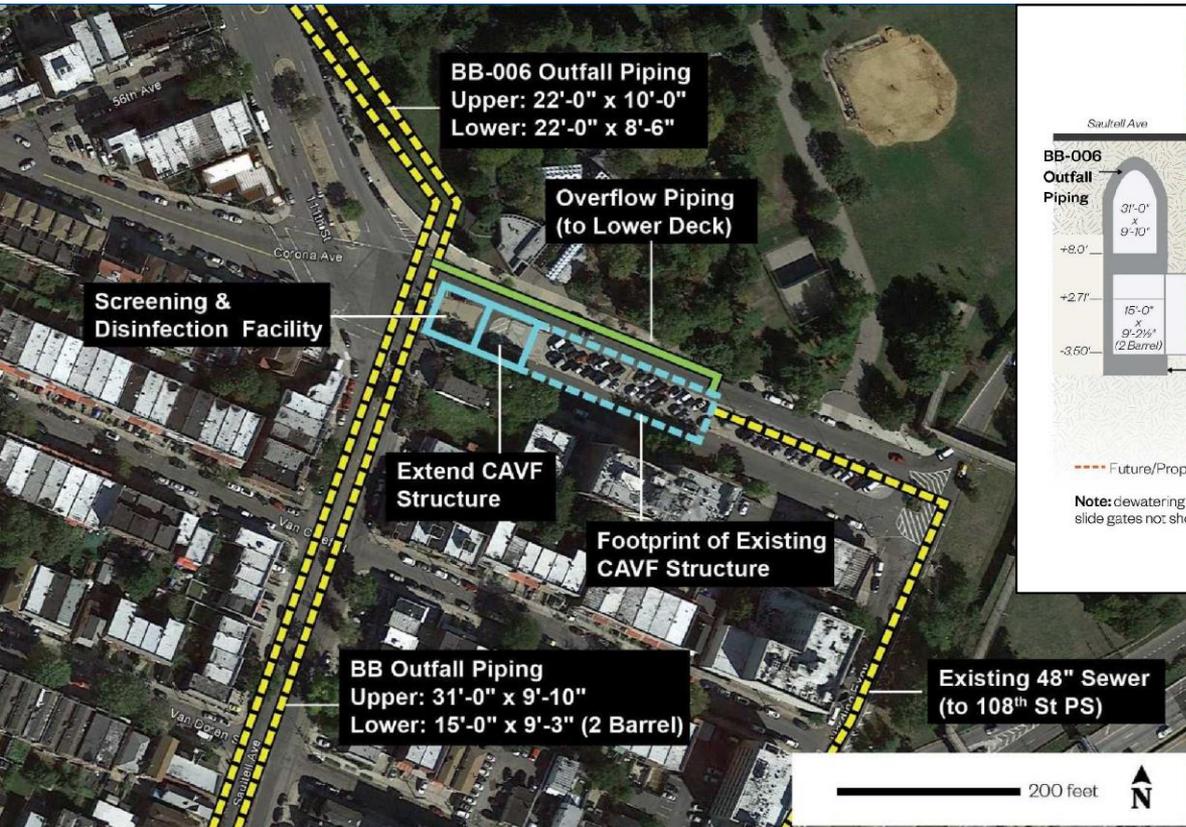


Total Available CSO Storage Volume
≈ 6.5 MG

20-Year Net Present Value:
≈ \$120 Million

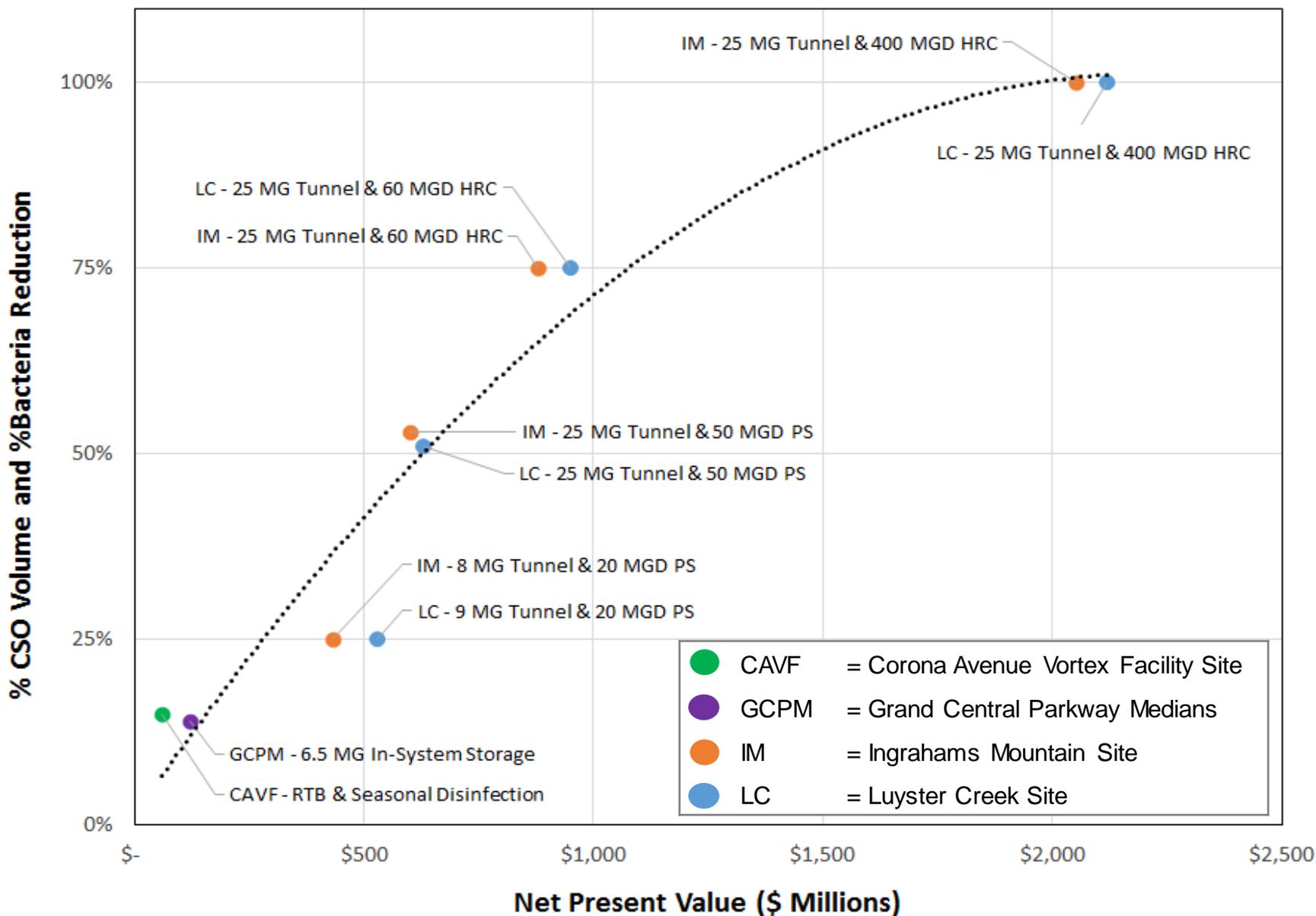
4 Corona Avenue Vortex Facility Site

- Re-purpose the existing CAVF as a Retention Treatment Basin with screening and disinfection (15 minute contact time)
- Remote dechlorination facility (1 minute contact time)
- Install tide gates on outfalls

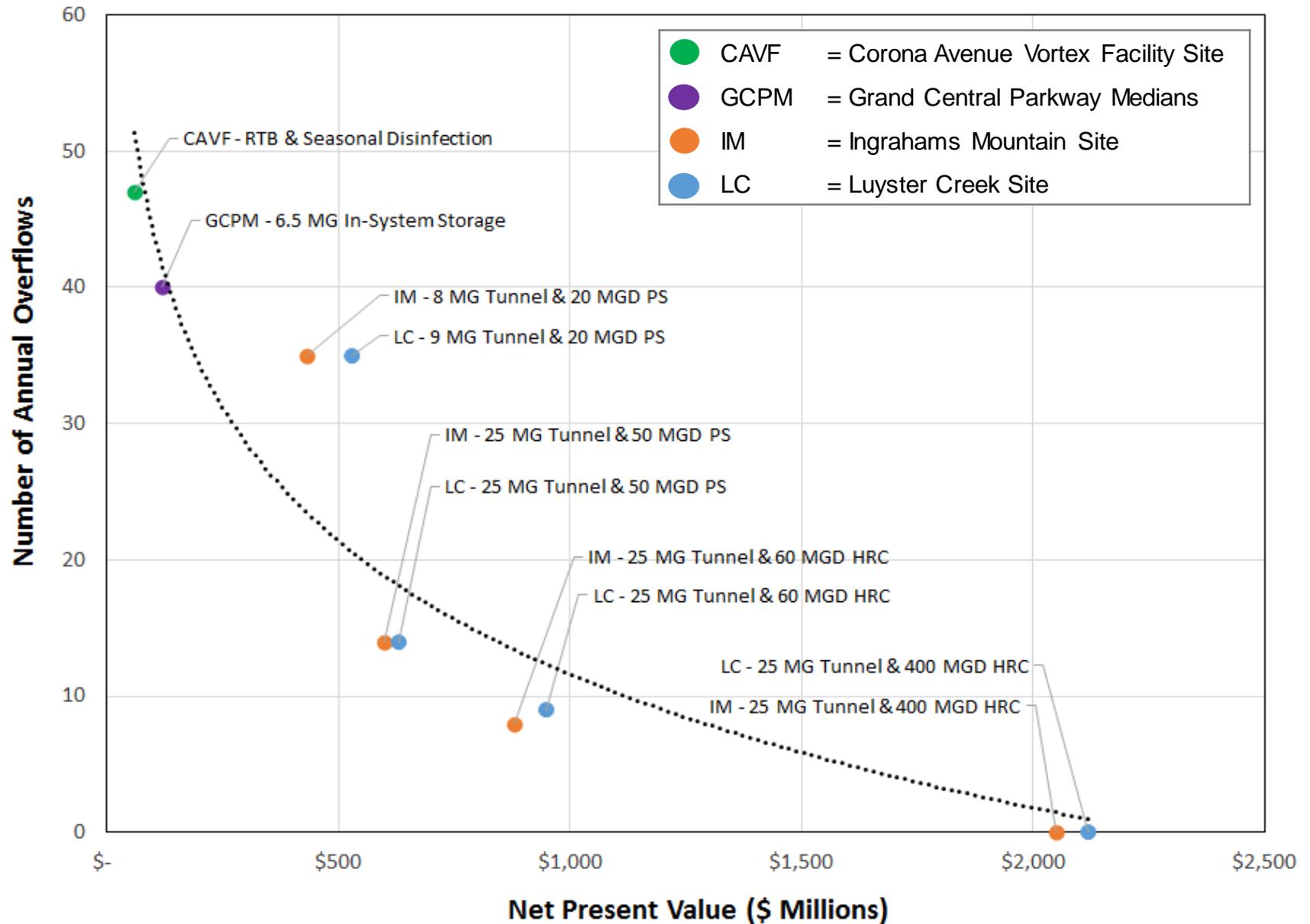


**20-Year Net Present Value:
≈ \$60 Million**

%CSO Volume and Bacteria Reduction vs. Cost



Frequency of Overflow vs. Cost



Questions?

Next Steps

Mikelle Adgate
Director of Stormwater Outreach
DEP – BPA

- LTCP Submittal to NYSDEC by December 30, 2016

- Public Comments will be accepted for Flushing Bay through **November 30, 2016**
 - There will be subsequent comment periods following the Final Plan Review Meeting.

- Comments can also be submitted to:
 - New York City DEP at: ltcp@dep.nyc.gov

- Visit the informational tables tonight for handouts and poster boards with detailed information

- Go to www.nyc.gov/dep/ltcp to access:
 - LTCP Public Participation Plan
 - Presentation, handouts and poster boards from this meeting
 - Links to Waterbody/Watershed Facility Plans
 - CSO Order including LTCP Goal Statement
 - NYC's Green Infrastructure Plan
 - Green Infrastructure Pilots 2011 and 2012 Monitoring Results
 - NYC Waterbody Advisory Program
 - Upcoming meeting announcements
 - Other LTCP updates