NYC Environmental Protection

AECOM with Hazen

The CSO Long Term Control Plan Sampling Program

NEWEA CSO/Wet Weather Issues Conference

October 30, 2018

Safety Moment

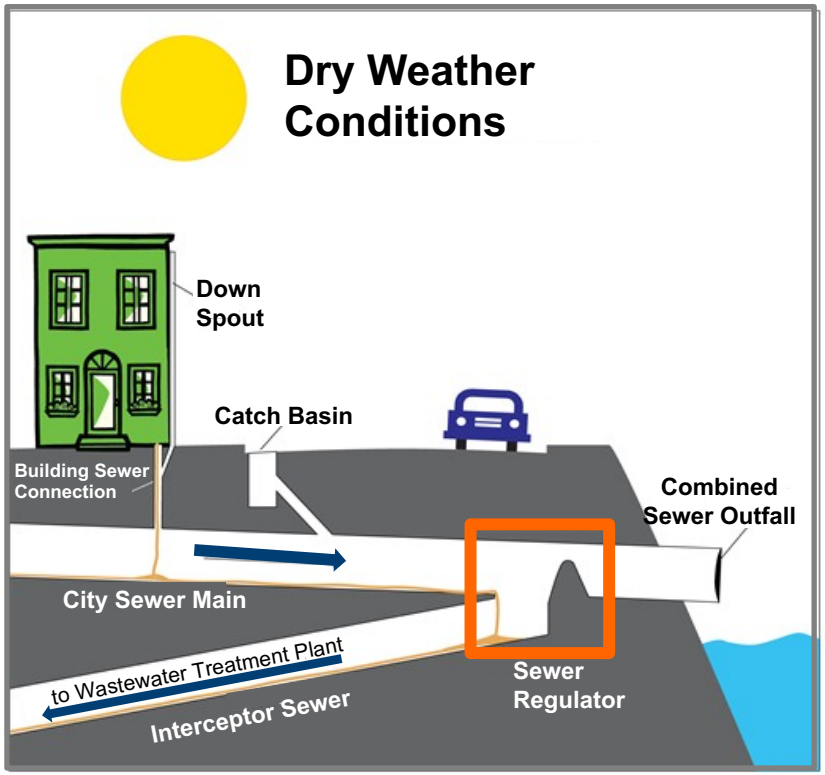
- Gloves, boots, safety vests were worn by all personnel as needed depending on site-specific conditions

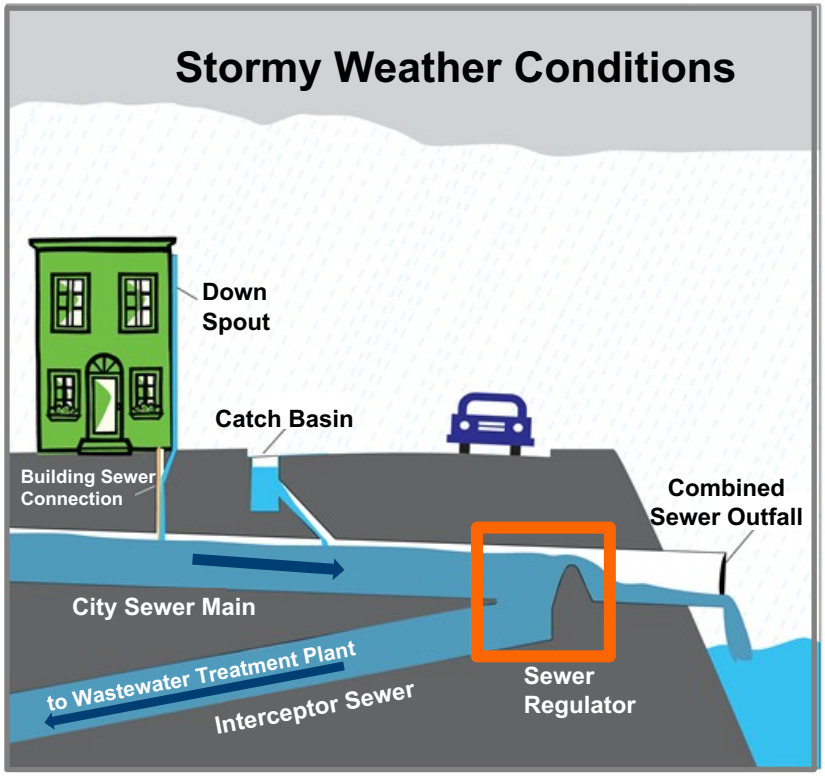
Agenda

- CSO Sampling and Program Overview
- Sampling Program Start-Up
- Sampling Implementation
- Field Sampling
- Results
- Analysis
- Model Calibration
- Challenges

What is a Combined Sewer Overflow (CSO)?

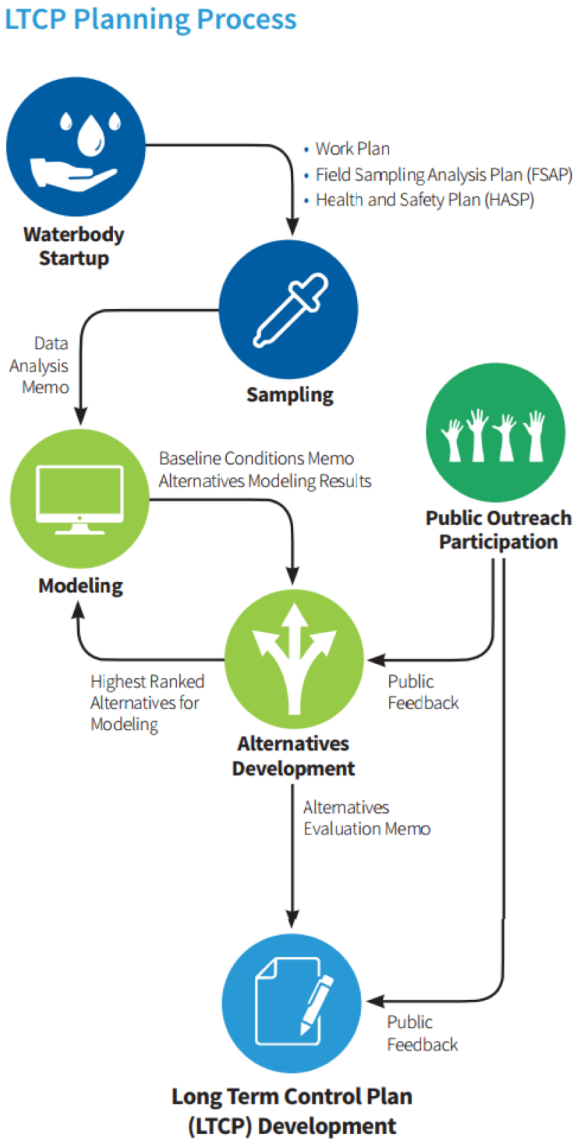
- NYC's sewer system is approximately 60% combined, which means it is used to **convey both sanitary and storm flows**





- When the sewer system is at full capacity, a diluted mixture of rain water and sewage may be released into local waterways. This is called a combined sewer overflow (CSO)
- 65% to 90% of **combined** sanitary and storm flow is captured at treatment plants

CSO Long Term Control Plan Development



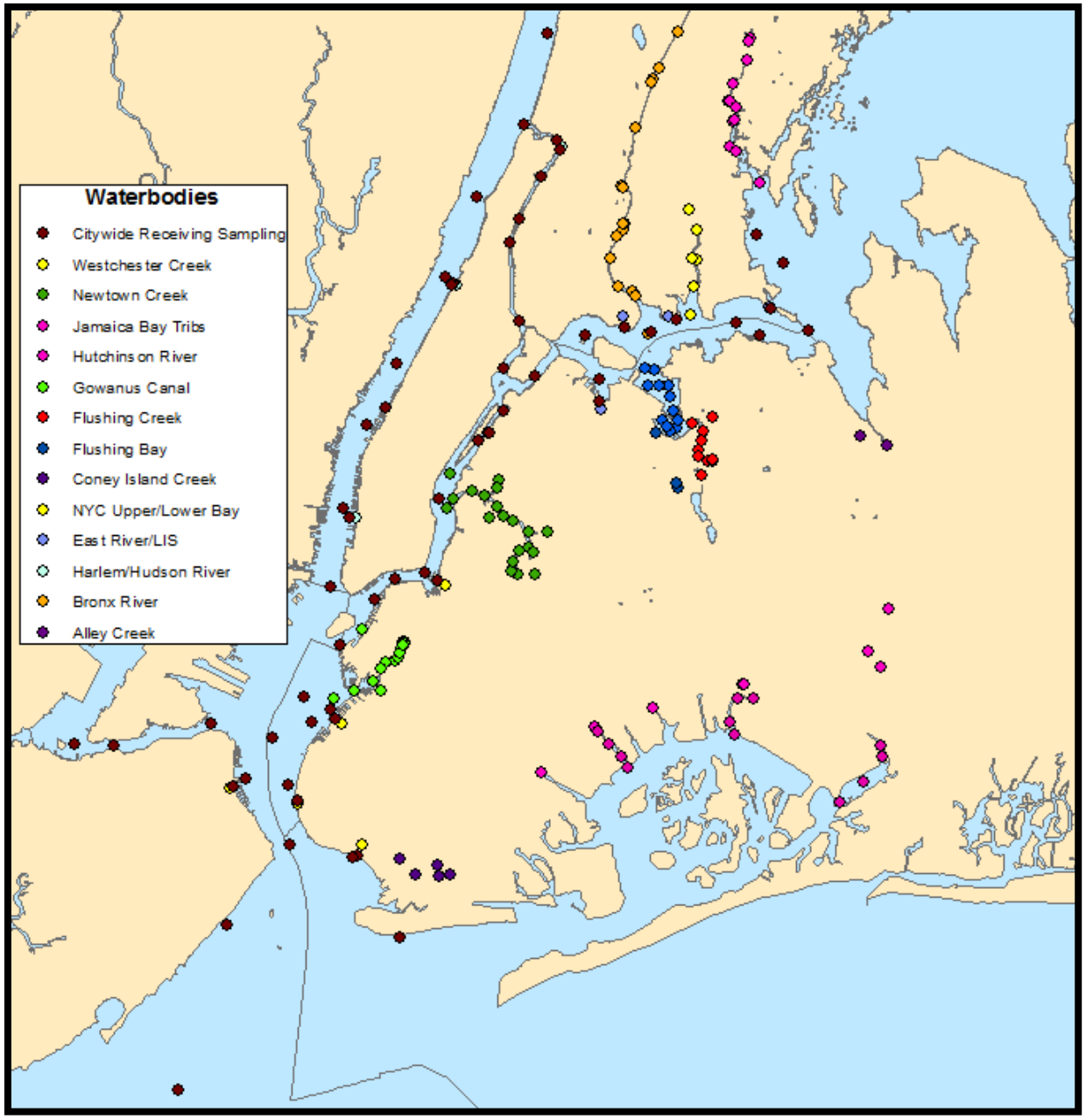
Elements of Sampling Program

- **Landside Sampling:**
  - collection of CSO and stormwater effluent bacteria samples
- **Flow Monitoring:**
  - continuous flow measurement of regulator and interceptors
- **Receiving Water Sampling:**
  - collection of wet and dry weather waterbody samples

Sampled Locations

FACTS

- 14 waterbodies sampled
- 50+ landside locations sampled
- 80+ receiving water locations were sampled
- 9000+ samples collected and analyzed
- Program spanned for ~5 years
- 9 Consultants involved



Sampling Program Start-Up

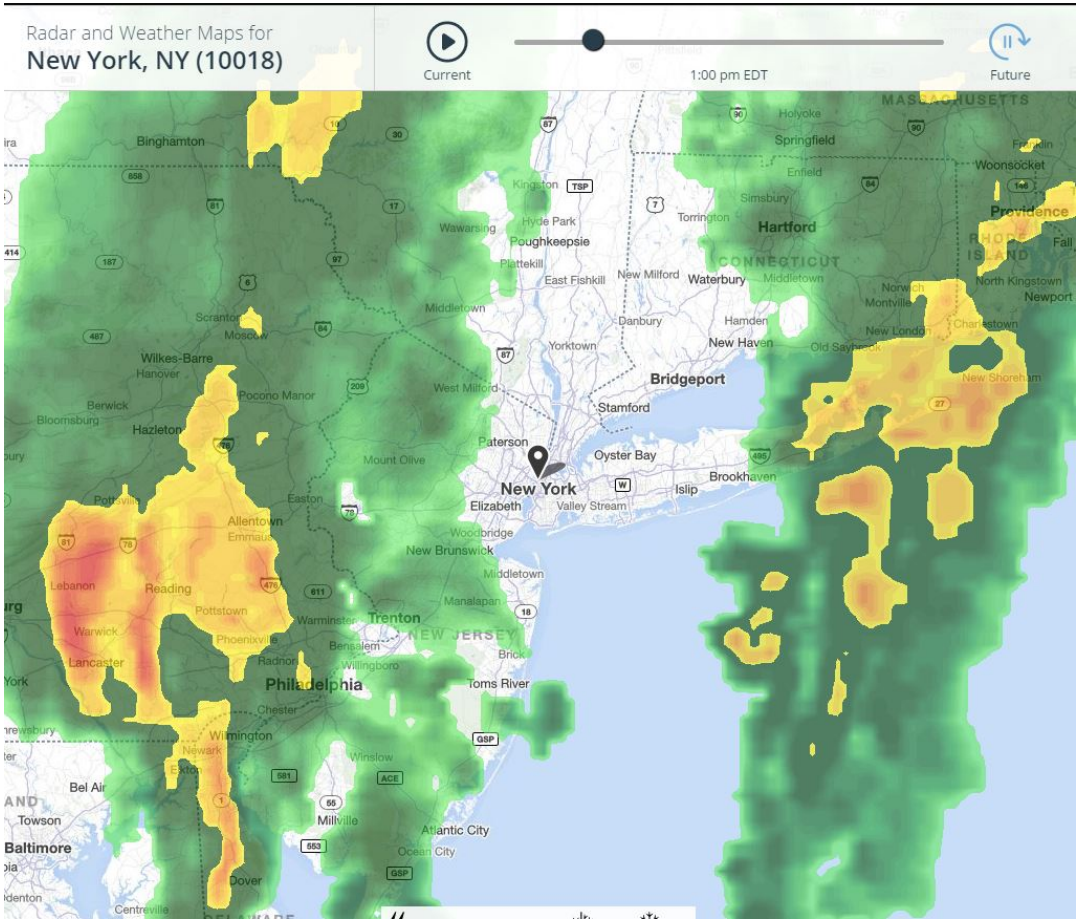
Sampling Start-up | Sampling Implementation | Field Sampling | Results | Analysis | Model Calibration

- Select outfalls and receiving waterbody locations of interest
- Confirm metering plans with modelers and meter installation crews
- Develop a waterbody specific Field Sampling Analysis Plan (FSAP)
- Site reconnaissance and staffing
- Determine reference weather gauges and forecasting stations
- Identify central location for staff meeting and equipment storage

Sampling Program Implementation

Sampling Start-up | Sampling Implementation | Field Sampling | Results | Analysis | Model Calibration

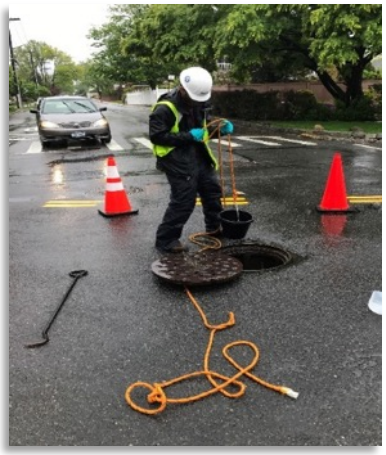
- Considerations:
  - Weather Forecast & Mobilization
  - Crew coordination
  - Coordination with public/private entities

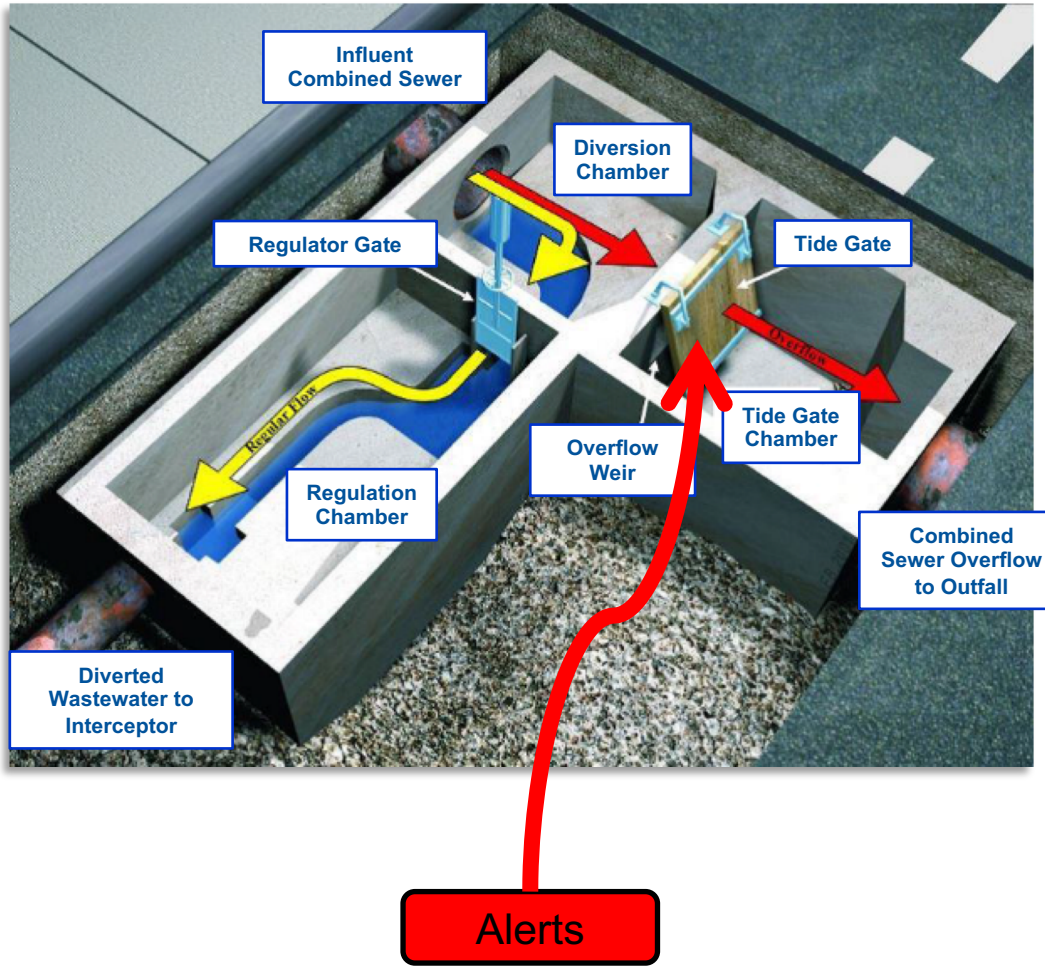


Landside Sampling

Sampling Start-up → Sampling Implementation → Field Sampling → Results → Analysis → Model Calibration

- Sampled upstream of tide gate
- Grab samples
  - Every 30 minutes for 2 hours
- Lab analysis parameters included fecal, entero
- In-situ parameters included DO, salinity, conductivity, temperature

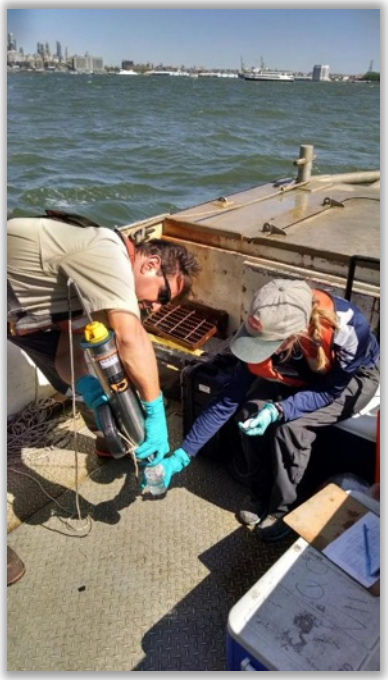




Receiving Water Sampling

Sampling Start-up → Sampling Implementation → Field Sampling → Results → Analysis → Model Calibration

- Sampled for 4 days (last day dry) after a successful landside wet weather event
- Top and bottom grab samples using a kemmerer
- Sampled twice a day to capture flooding and ebbing tide conditions
- Lab analysis parameters included fecal, entero
- In-situ parameters included DO, salinity, conductivity, temperature



In-Situ Parameters

Sampling Start-up → Sampling Implementation → Field Sampling → Results → Analysis → Model Calibration

Receiving Water Field Log

Sampling Date

Equipment Calibration

CSO Long Term Control Plan - Receiving Water Sampling
Long Island Sound and Upper East River YSI Data
Wet / Dry Weather Event

Date: 6/23/17
Sampled By: JR
DO Calibration Target: 100 Reading: 99.8
Courier drop off time (military):

Station	Time (military)	Temp (°C)	Conductivity (mS/cm)	Salinity (ppt)	DO (%)	DO (mg/l)	Duplicate Taken at this Station	Depth of Sample (ft)	Depth at Station (ft)
ER-1	1455	20.26	39.52	25.24	83.7	6.47		2	7
	1458	19.44	38.97	24.89	78.4	6.06		5	7
ER-2	1503	19.65	39.04	24.95	68.8	5.39		2	8
	1506	19.44	39.22	25.05	62.3	4.99		6	8
ER-3	1515	19.77	39.07	24.93	63.5	4.95		2	99
	1518	18.03	40.06	25.63	57.9	4.63		97	99
ER-4	1526	18.94	39.54	25.26	49.6	3.95		2	9
	1529	17.93	39.80	25.28	50.7	4.13		7	9
ER-5	1533	19.02	38.75	24.70	53.9	4.31		2	90
	1536	17.49	39.89	25.50	51.4	4.20		88	90
ER-6	1548	19.98	37.23	23.65	50.4	3.98	X	2	15.5
	1551	19.05	38.07	24.22	51.4	4.10		13.5	15.5
ER-7	751	20.31	37.17	23.58	57.1	4.41		2	4
	754								
ER-8	740	21.88	33.11	20.76	59.5	4.64		2	10
	743	16.97	37.18	23.60	52.2	4.12		8	10
ER-9	759	20.79	34.51	21.73	60.0	4.70		2	68
	802	20.70	34.23	21.54	64.1	5.02		61	68
ER-10	820	21.25	34.63	21.81	59.0	4.58		2	4.5
	823								
ER-11	2124	33.91	21.31	69.0	533			2	33
	936	20.72	33.84	21.27	64.8	5.09		36	28

Sampling Location & Time

In-situ parameters

Landside Field Log

Sampling Date

Equipment Calibration

Citywide Phase 2 - Long Island Sound and Upper East River Long Term Control Plan
Wet Weather Sampling - Field Data Sheet (Landside Crew)
CSO

Date: 1-23-17
Sampled By: George Salanco
Courier time:
YSI Calibrated Prior to Sampling? (Yes) No If No, please explain:

Station	Time	Temp (°C)	Conductivity (mS/cm)	Salinity (ppt)	DO (%)	DO (mg/l)	Duplicate Taken at This Station	Flow at the location Yes/No
BB-028-1	0:42	24.8	.1023	.1	43	3.5		Yes
BB-028-2	1:12	24.5	.0808	0	69	5.7		Yes
BB-028-3	1:42	24.3	.0858	0	74	6.2		Yes
BB-028-4	2:12	24.2	.1355	.1	60	5.0		Yes
BB-028-5	2:42							Yes
BB-028-Dup	1:12	24.5	.0808	0	69	5.7		Yes

Notes:

Sampling Location and Time

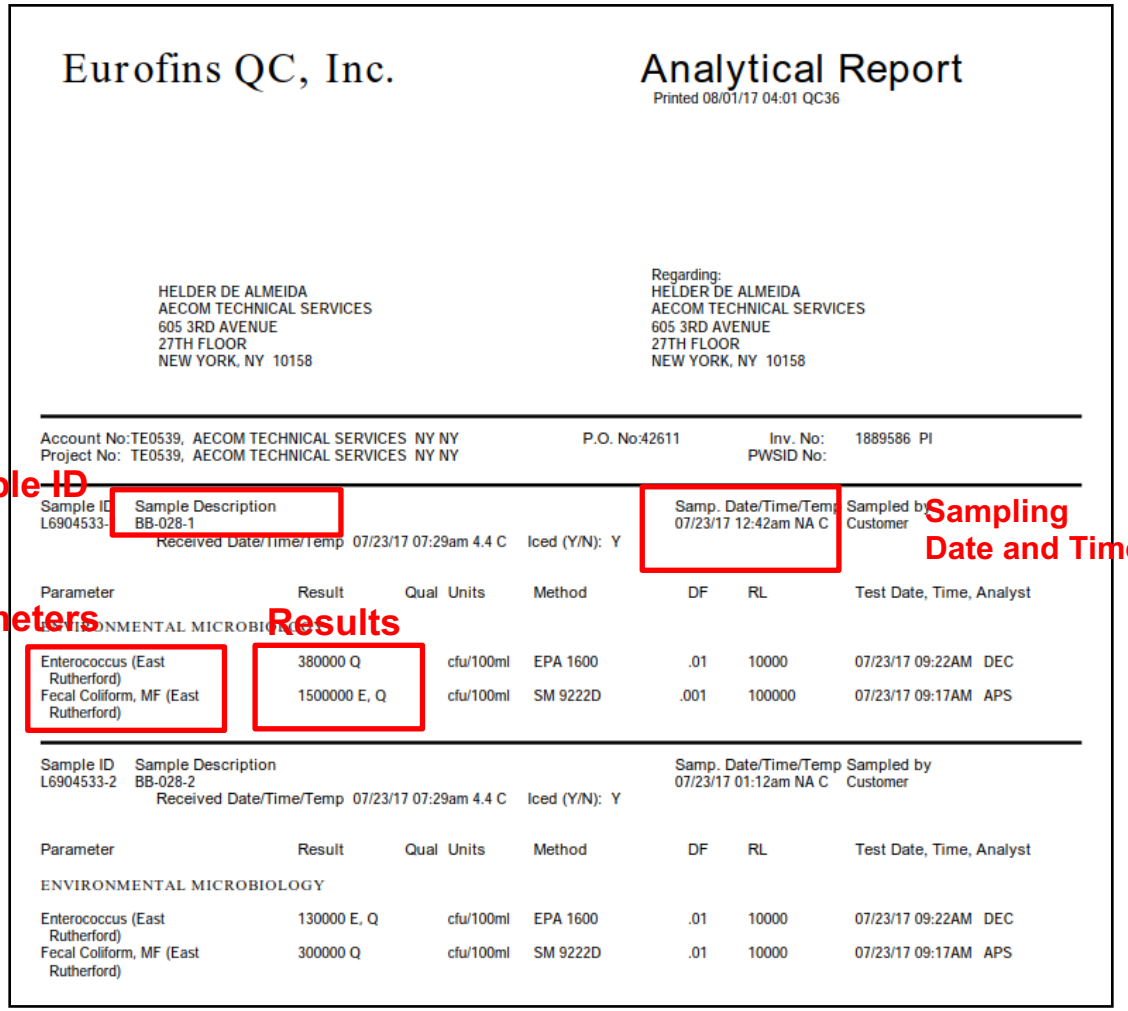
In-situ parameters

In-situ parameters include:

- DO
- Salinity
- Conductivity
- Temperature

Lab Results

Sampling Start-up → Sampling Implementation → Field Sampling → Results → Analysis → Model Calibration



Eurofins QC, Inc.

Analytical Report
Printed 08/01/17 04:01 QC36

HELDER DE ALMEIDA
AECOM TECHNICAL SERVICES
605 3RD AVENUE
27TH FLOOR
NEW YORK, NY 10158

Regarding:
HELDER DE ALMEIDA
AECOM TECHNICAL SERVICES
605 3RD AVENUE
27TH FLOOR
NEW YORK, NY 10158

Account No:TE0539, AECOM TECHNICAL SERVICES NY NY
Project No: TE0539, AECOM TECHNICAL SERVICES NY NY
P.O. No:42611
Inv. No: 1889586 PI
PWSID No:

Sample ID
Sampling Date and Time
Parameters
Results

Sample ID	Sample Description	Samp. Date/Time/Temp	Sampled by
L6904533-1	BB-028-1	07/23/17 12:42am NA C	Customer

Received Date/Time/Temp 07/23/17 07:29am 4.4 C Iced (Y/N): Y

Parameter	Result	Qual	Units	Method	DF	RL	Test Date, Time, Analyst
ENVIRONMENTAL MICROBIOLOGY							
Enterococcus (East Rutherford)	380000	Q	cfu/100ml	EPA 1600	.01	10000	07/23/17 09:22AM DEC
Fecal Coliform, MF (East Rutherford)	1500000	E, Q	cfu/100ml	SM 9222D	.001	100000	07/23/17 09:17AM APS

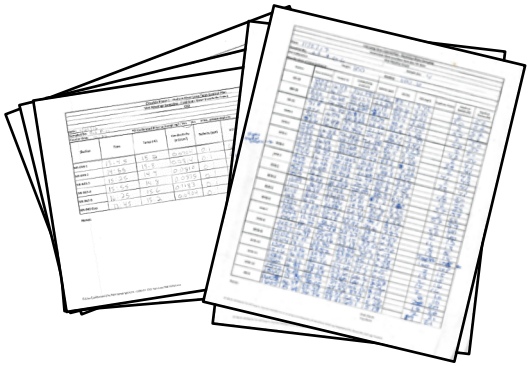
Sample ID	Sample Description	Samp. Date/Time/Temp	Sampled by
L6904533-2	BB-028-2	07/23/17 01:12am NA C	Customer

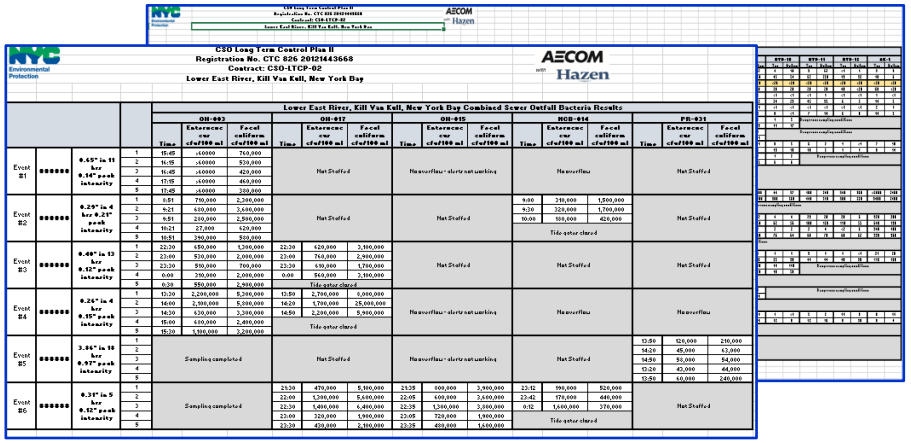
Received Date/Time/Temp 07/23/17 07:29am 4.4 C Iced (Y/N): Y

Parameter	Result	Qual	Units	Method	DF	RL	Test Date, Time, Analyst
ENVIRONMENTAL MICROBIOLOGY							
Enterococcus (East Rutherford)	130000	E, Q	cfu/100ml	EPA 1600	.01	10000	07/23/17 09:22AM DEC
Fecal Coliform, MF (East Rutherford)	300000	Q	cfu/100ml	SM 9222D	.01	10000	07/23/17 09:17AM APS

Sampling Results

Sampling Start-up → Sampling Implementation → Field Sampling → Results → Analysis → Model Calibration





CSO Long Term Control Plan II
Registration No. CTC 826 20121443668
Contract: CSO-LTCP-02
Lower East River, Kill Van Kull, New York Bay

NYC Environmental Protection | AECOM with Hazen

Lower East River, Kill Van Kull, New York Bay Combined Sewer Outfall Bacteria Results

				OH-003			OH-012			OH-015			HCB-014			FR-021		
				Time	Enterococcus cfu/100 ml	Fecal coliform cfu/100 ml	Time	Enterococcus cfu/100 ml	Fecal coliform cfu/100 ml	Time	Enterococcus cfu/100 ml	Fecal coliform cfu/100 ml	Time	Enterococcus cfu/100 ml	Fecal coliform cfu/100 ml	Time	Enterococcus cfu/100 ml	Fecal coliform cfu/100 ml
Event #1	[redacted]	0.45" in 11 hr 0.14" peak intensity	1	15:45	<6000	760,000												
			2	16:15	<6000	520,000												
			3	16:45	<6000	420,000												
			4	17:15	<6000	460,000												
			5	17:45	<6000	320,000												
Event #2	[redacted]	0.29" in 4 hr 0.21" peak intensity	1	5:51	790,000	2,300,000												
			2	6:21	630,000	2,600,000												
			3	6:51	220,000	2,300,000												
			4	16:21	27,000	420,000												
			5	16:51	240,000	830,000												
Event #3	[redacted]	0.40" in 13 hr 0.12" peak intensity	1	22:30	650,000	1,300,000	22:30	420,000	2,300,000									
			2	23:00	530,000	2,000,000	23:00	760,000	2,900,000									
			3	23:30	590,000	700,000	23:30	690,000	1,700,000									
			4	0:00	280,000	2,000,000	0:00	560,000	2,300,000									
			5	0:30	850,000	2,400,000	Tide gator closed											
Event #4	[redacted]	0.26" in 4 hr 0.15" peak intensity	1	13:30	2,200,000	5,200,000	13:30	2,700,000	6,000,000									
			2	14:00	2,300,000	5,200,000	14:30	1,700,000	25,000,000									
			3	14:30	630,000	2,300,000	14:59	2,200,000	9,900,000									
			4	15:00	600,000	2,400,000	Tide gator closed											
			5	15:30	1,100,000	3,200,000												
Event #5	[redacted]	3.86" in 18 hr 0.97" peak intensity	1	Sampling completed			Not Staffed									13:00	120,000	210,000
			2													14:00	45,000	63,000
			3													14:51	51,000	54,000
			4													15:00	42,000	46,000
			5													15:50	40,000	240,000
Event #6	[redacted]	0.31" in 5 hr 0.12" peak intensity	1	Sampling completed			21:30	470,000	5,300,000	21:35	600,000	2,900,000	23:12	590,000	524,000	Not Staffed		
			2				22:00	1,300,000	5,600,000	22:05	600,000	2,600,000	23:42	570,000	640,000			
			3				22:30	1,400,000	6,400,000	22:35	1,300,000	3,300,000	0:12	1,600,000	270,000			
			4				23:00	320,000	1,900,000	23:05	720,000	1,900,000	Tide gator closed					
			5				23:30	420,000	2,300,000	23:35	480,000	1,600,000						

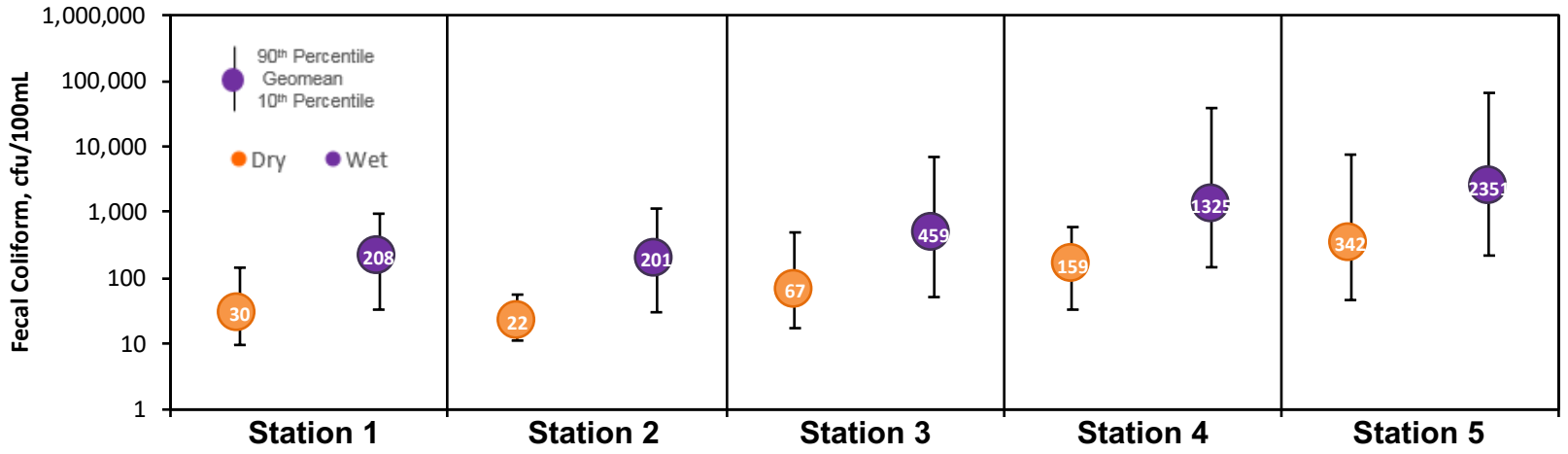
Data Analysis – Landside CSO

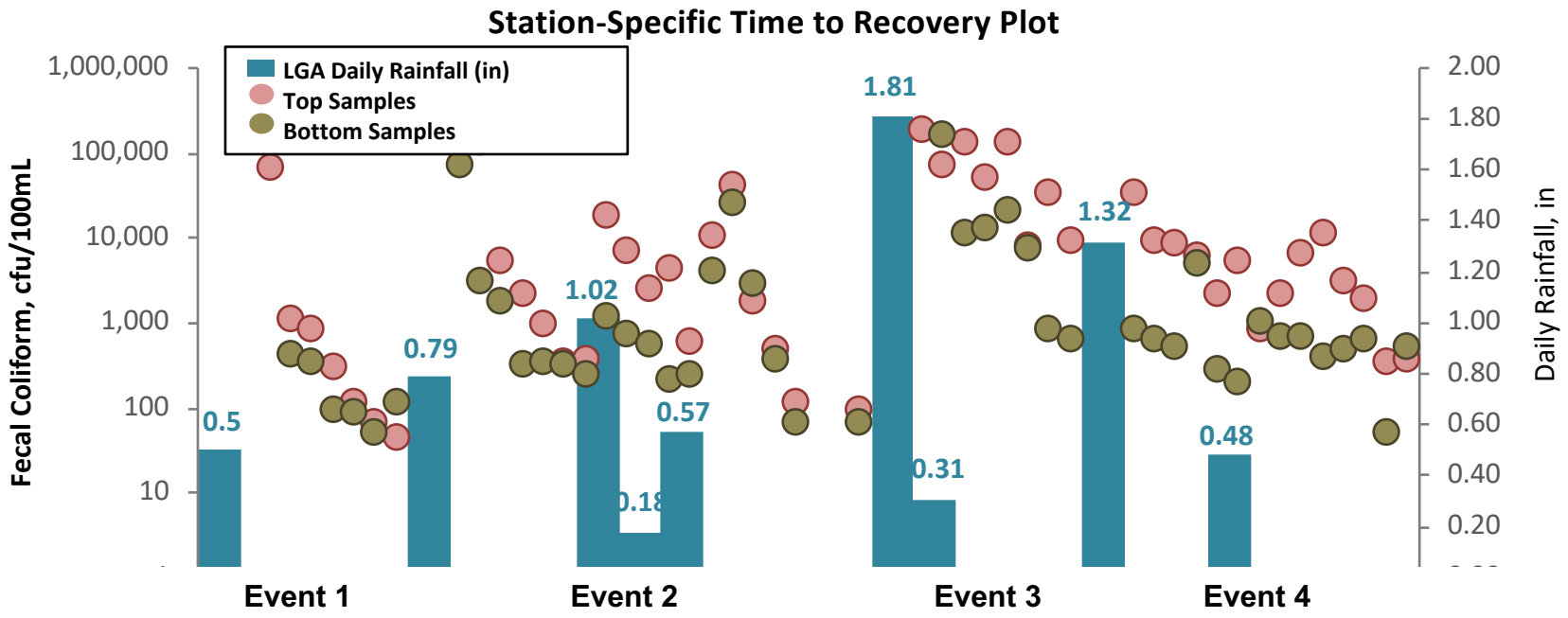
Sampling Start-up → Sampling Implementation → Field Sampling → Results → Analysis → Model Calibration

	Sampled Rainfall Event Depth (in)	Sampled Rainfall Event Duration (hr)	Sampled Rainfall Event Peak Intensity (in/hr)	GM Fecal (cfu/100mL)	GM Entero (cfu/100mL)	CSO Overflow Volume (MG)	CSO Overflow Duration (hr)
Event 1	0.07	3	0.05	570,520 Min: 490,000 Max: 770,000	356,629 Min: 220,000 Max: 660,000	0.23	15:50 – 16:45
Event 2	0.54	2	0.47	560,191 Min: 380,000 Max: 790,000	202,911 Min: 130,000 Max: 350,000	7.44	10:35 – 14:50
Event 3	1.81	10	0.36	1,305,557 Min: 720,000 Max: 3,100,000	464,068 Min: 80,000 Max: 1,500,000	29.33	6:45 – 22:25

Data Analysis – Receiving Water

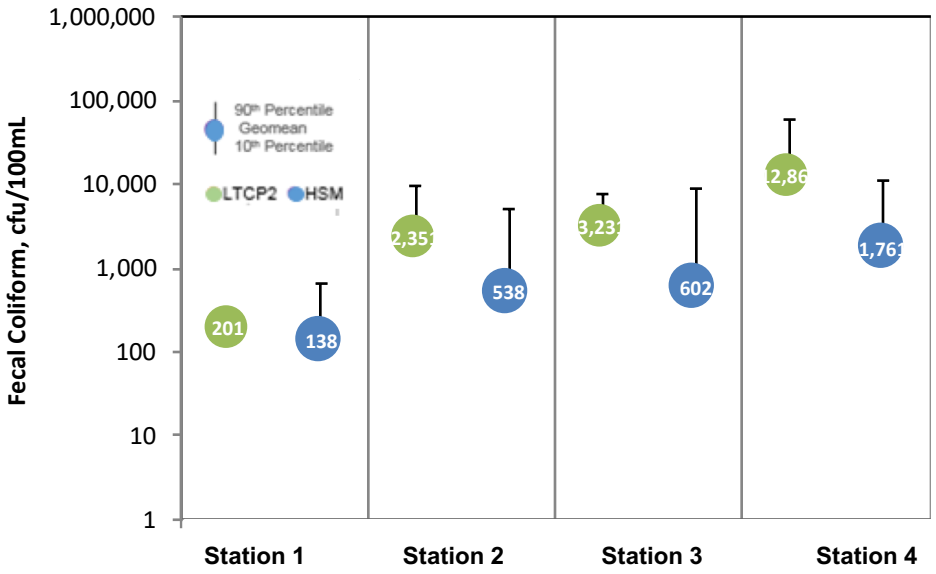
Sampling Start-up → Sampling Implementation → Field Sampling → Results → Analysis → Model Calibration

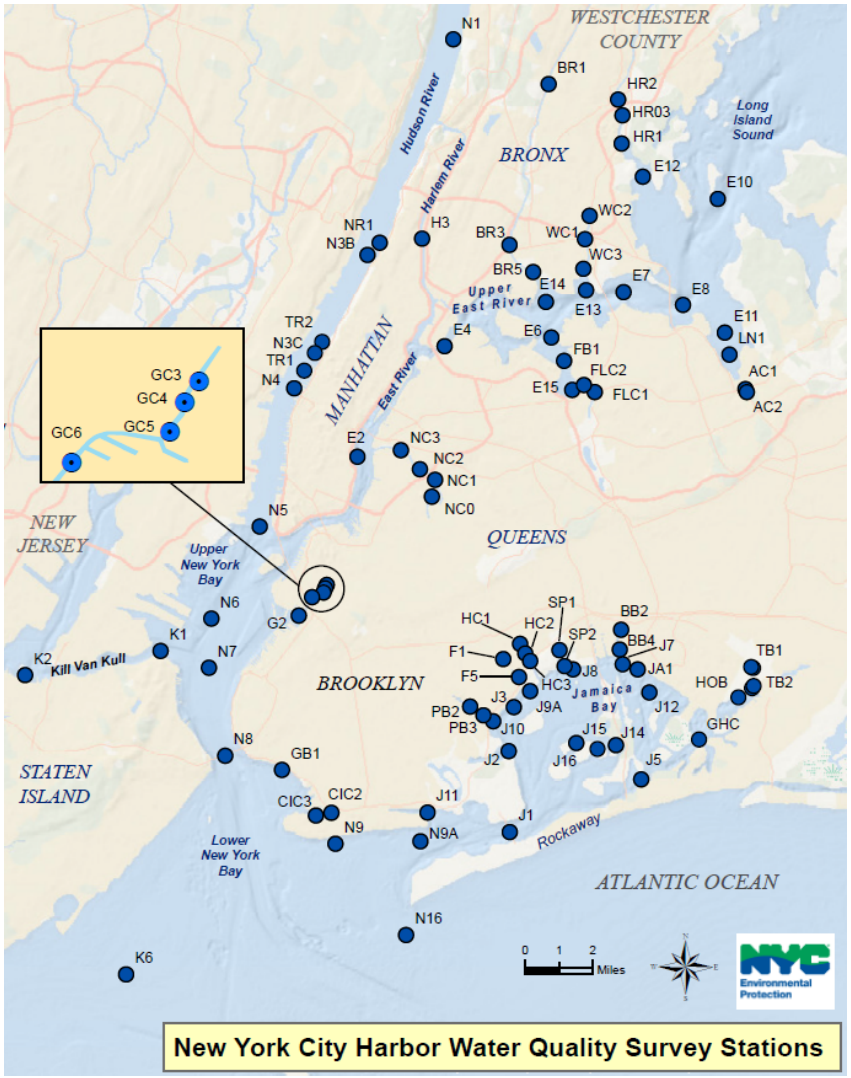




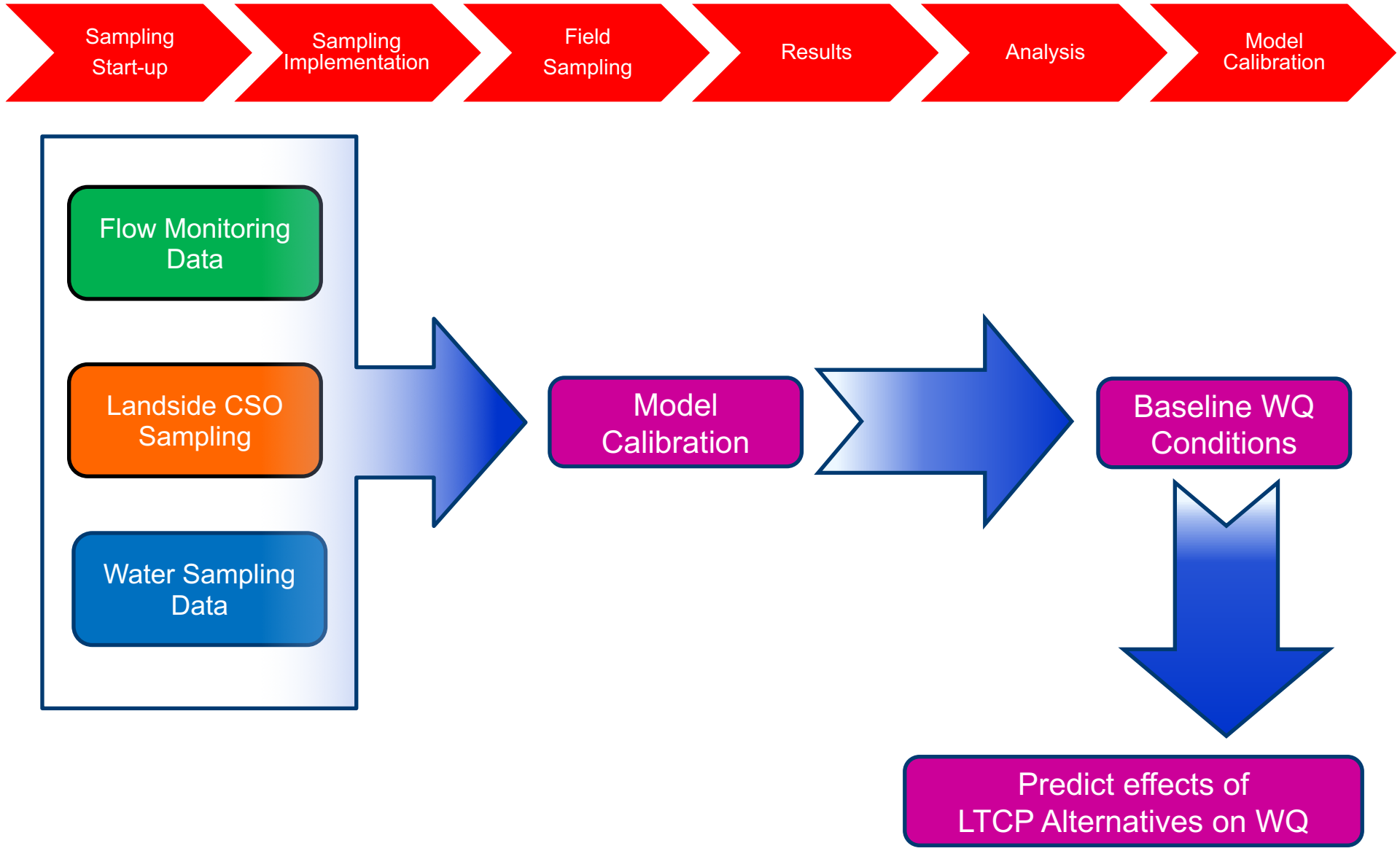
Comparison HSM & LTCP Data-WW

Sampling Start-up → Sampling Implementation → Field Sampling → Results → Analysis → Model Calibration

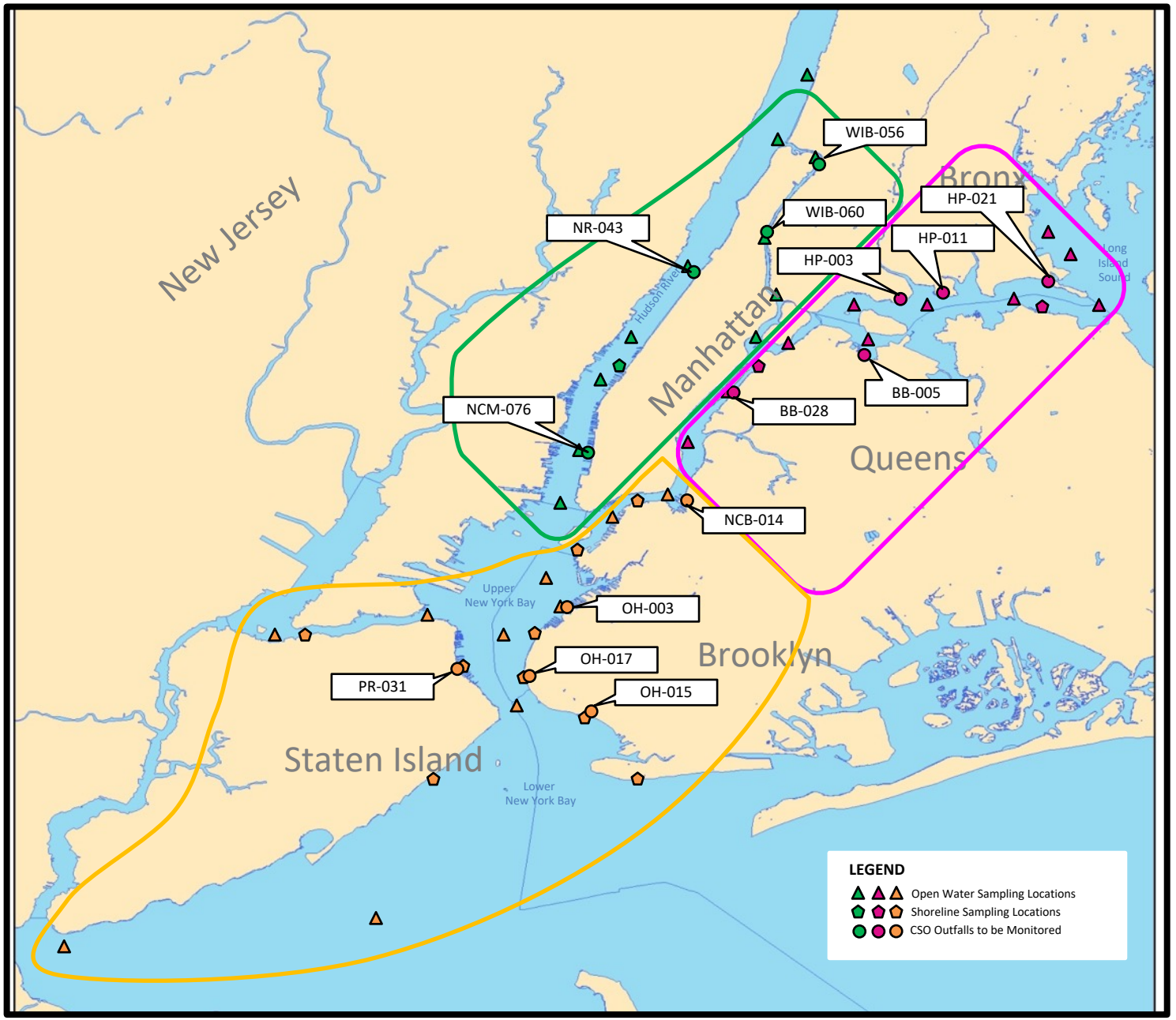




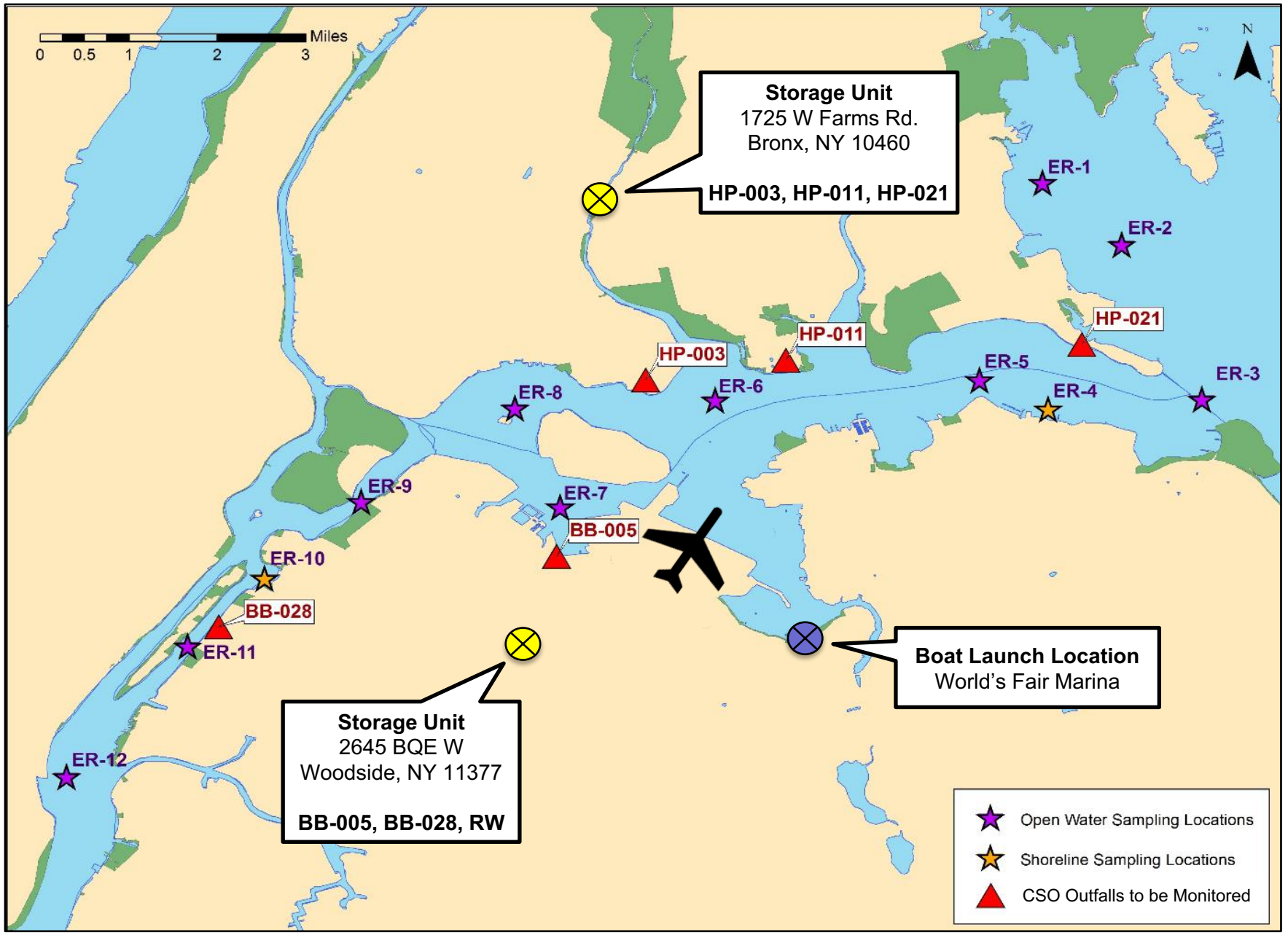
Model Calibration



Challenges: Citywide Sampling Program

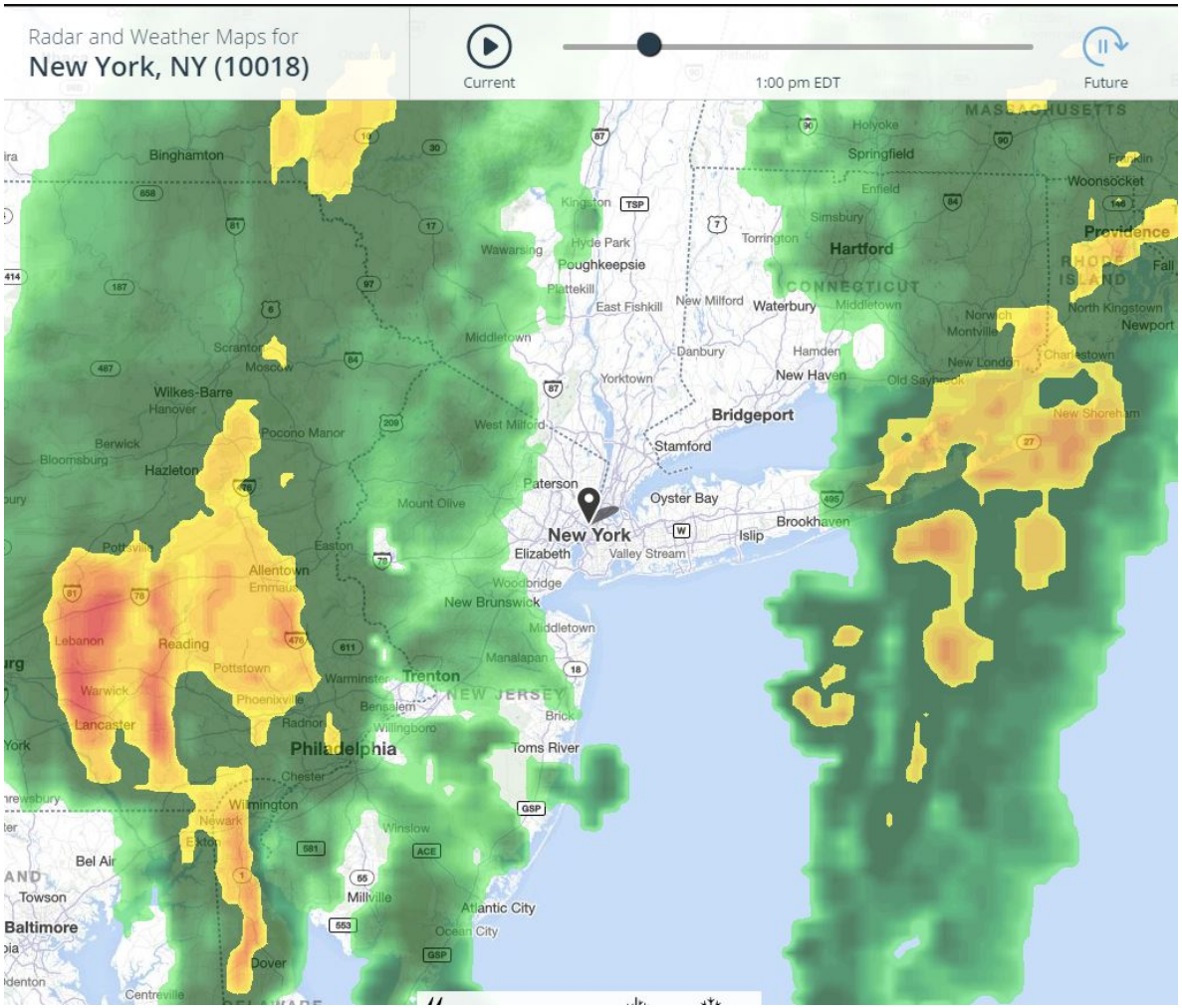


Challenges: Citywide Phase 2



Challenges/Lessons Learned

- Weather Forecast & Mobilization
- False starts
- Extended sampling periods due to additional rain on 4th day



Acknowledgements

- **NYC DEP**
- **Nova Consulting**
- **Savin Engineers**
- **Eurofins/QC Lab**
- **ADS Environmental Services**
- **Flow Assessment**
- **Aqua Survey**
- **Miller's Launch**

Questions?