Supplemental CSO Team – Session 8

PVSC Service Area
North Bergen MUA Service Area (Woodcliff Treatment Plant)
Long Term Control Plan

July 31, 2018

CLEAN WATERWAYS
Healthy Neighborhoods

Agenda

- Introduction and Recap
- Project Status Update
- July 1st, 2018 Report Submittals

  Presented by the New Jersey Department of Environmental Protection
- Evaluation of Alternatives
- City of Newark Evaluation of Green Infrastructure for CSO Control

  Presented by Frank Brilhante (HDR)
- Questions
- Adjourn

CLEAN WATERWAYS
Healthy Neighborhoods

Introduction and Recap

CLEAN WATERWAYS
Healthy Neighborhoods

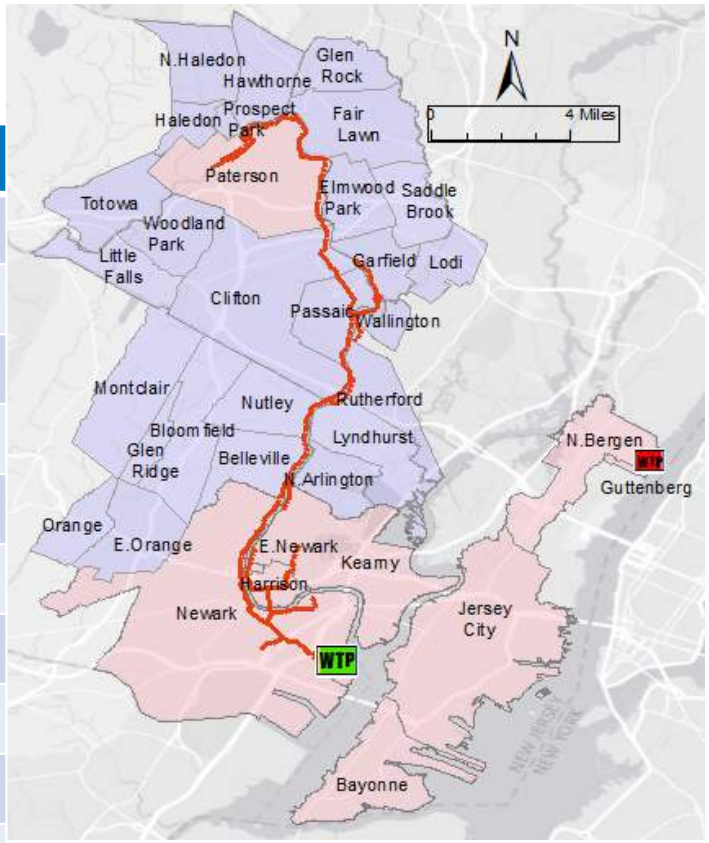
Supplemental CSO Team Members

Member	Organization	Member	Organization
Matt Dorans	Bayonne Chamber of Commerce	Sue Levine	Paterson Smart
TBD	Jersey City Redevelopment Agency	Ruben Gomez	City of Paterson Economic Development
Nicole Miller	Newark DIG	Sheri Ferreira	Greater Paterson Chamber of Commerce
Drew Curtis	Ironbound Community Corporation	Betty Jane Boros	New Jersey Business & Industrial Association
Robin Dougherty	Newark Greater Conservancy/Newark Business Partnership	Meiyin Wu, Ph.D	Montclair State University - Passaic River Institute
Jorge Santos	Newark Community Economic Development Corporation	Christopher C. Obropta, Ph.D	Rutgers University - Cooperative Extension Water Resources
Christopher Pianese	Township of North Bergen	Captain Bill Sheehan	Hackensack Riverkeeper
Janet Castro	Hudson Regional Health Commission Town of North Bergen	Harvey Morginstin	Passaic River Boat Club & Passaic River Superfund CAG
Thomas Stampe	North Bergen "Sustainable Jersey" group	Laurie Howard	Passaic River Coalition
Nancy Kontos	Bunker Hill Special Improvement District	Ben Delisle	Passaic River Rowing Association
Alison Cucco	Jersey City Environmental Commission	Patricia Hester-Fearon	Town of Kearny
Michele Langa	NY/NJ Baykeeper	Christopher Vasquez	Town of Kearny

Permittees

Permittee	Municipality	WWTP	CSOs
Bayonne MUA	Bayonne	PVSC	30
Borough of East Newark	East Newark		1
Town of Harrison	Harrison		7
Jersey City MUA	Jersey City		21
Town of Kearny	Kearny		5
City of Newark	Newark		18
North Bergen MUA	North Bergen		7
City of Paterson	Paterson		23
PVSC	-		0
Town of Guttenberg	Guttenberg	Woodcliff	1
North Bergen MUA*	North Bergen		1
	Total		114

** North Bergen MUA conveys flows to both PVSC and Woodcliff WWTPs*

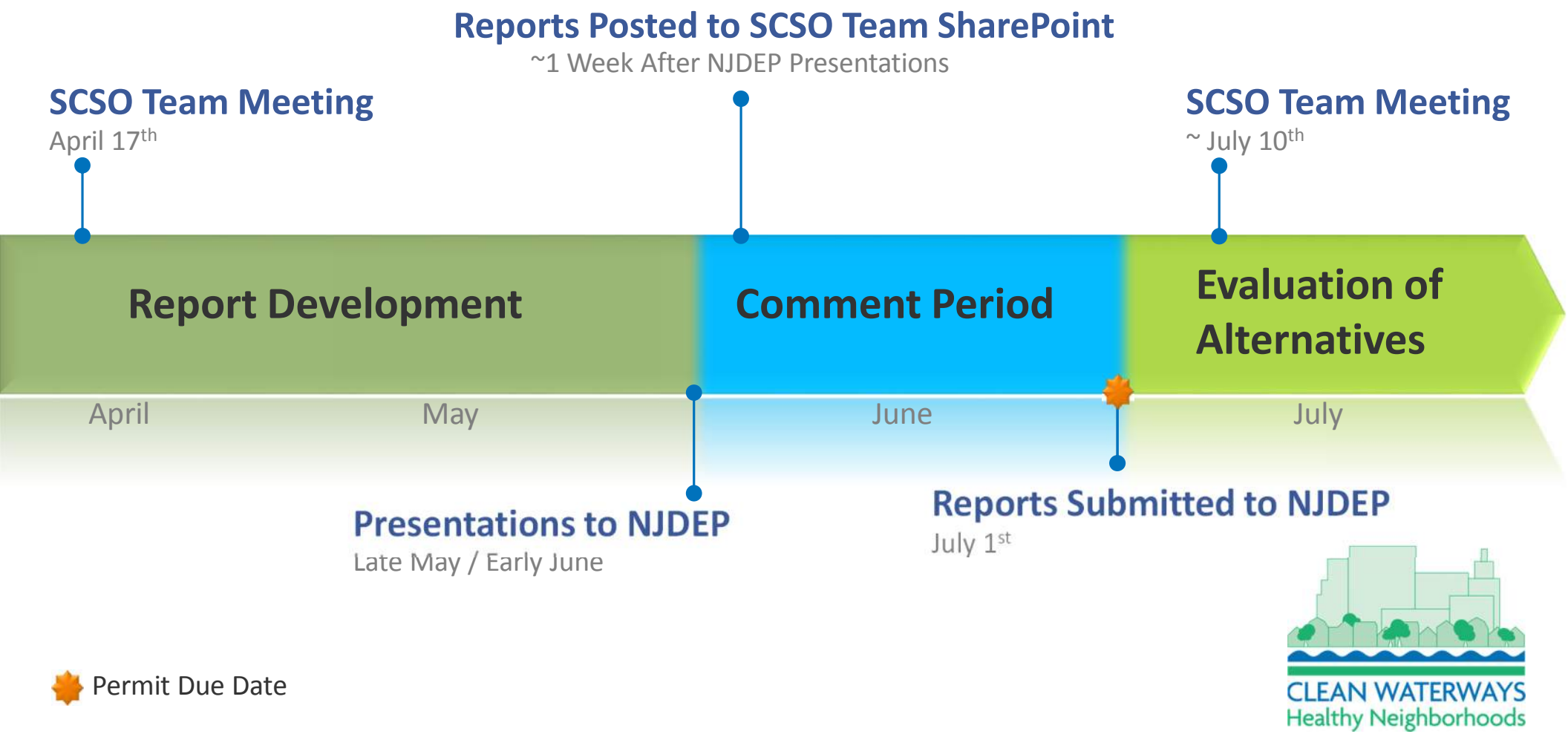


CLEAN WATERWAYS
Healthy Neighborhoods

Project Status Update

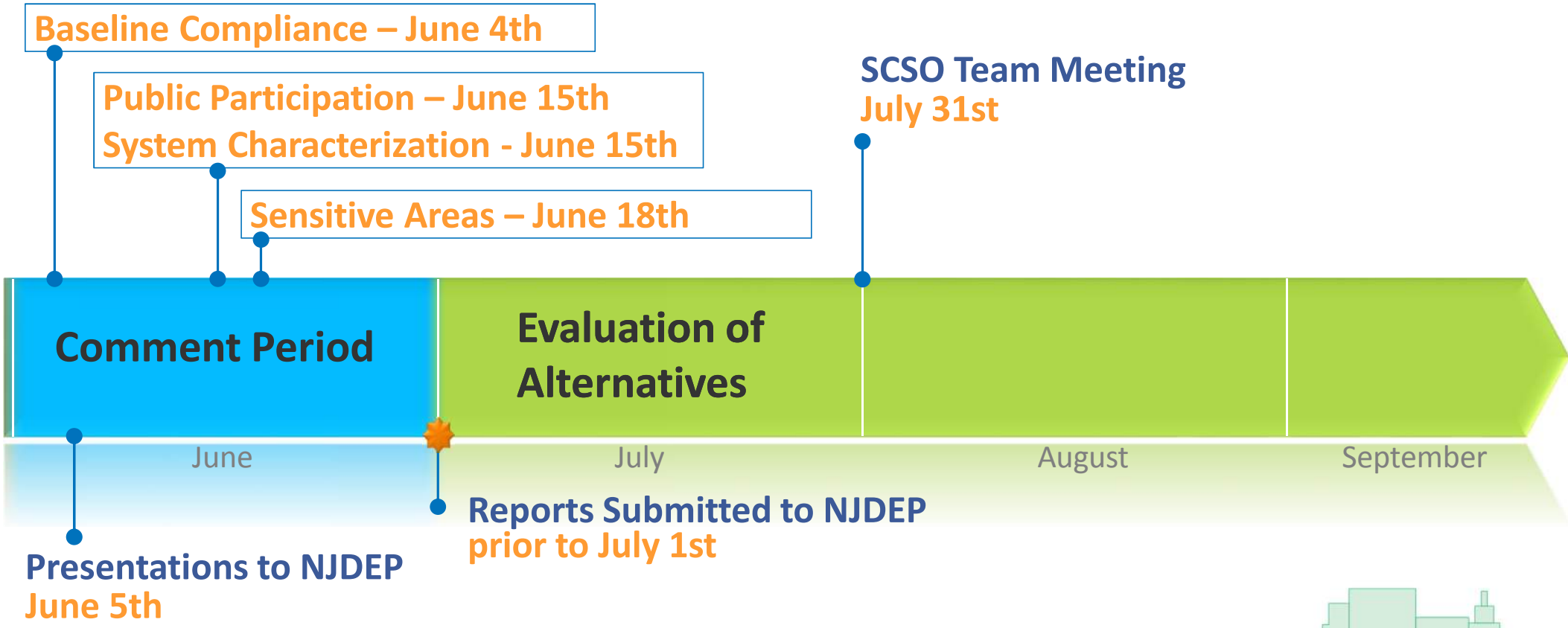
CLEAN WATERWAYS
Healthy Neighborhoods

Timeline for Submittals and Supplemental CSO Team Input



CLEAN WATERWAYS
Healthy Neighborhoods

Timeline for Submittals and Supplemental CSO Team Input



Permit Due Date

CLEAN WATERWAYS
Healthy Neighborhoods

59-Month Program Schedule and Milestones

January 1, 2016

- ✓ Coordinates of pumps, regulators, and outfalls
- ✓ System Characterization Work Plan
- ✓ Baseline Compliance Monitoring Program Work Plan

July 1, 2016

- ✓ Map of Combined and Separate Sewer Areas

Permit Due Date

July 1, 2018

- ✓ System Characterization Report
- ✓ Public Participation Process Report
- ✓ Compliance Monitoring Program Report
- ✓ Consideration of Sensitive Areas Plan

July 1, 2019

Development and Evaluation of Alternatives Report

June 1, 2020

Selection and Implementation of Alternatives Report in the Final LTCP

Timeline for Evaluation of Alternatives

Development and Evaluation of Alternatives Report
Due July 1st, 2019

Permit Due Date
Supplemental CSO Team Meeting

CLEAN WATERWAYS
Healthy Neighborhoods

Status of July 1st, 2018 Submissions to NJDEP

presented by: NJDEP

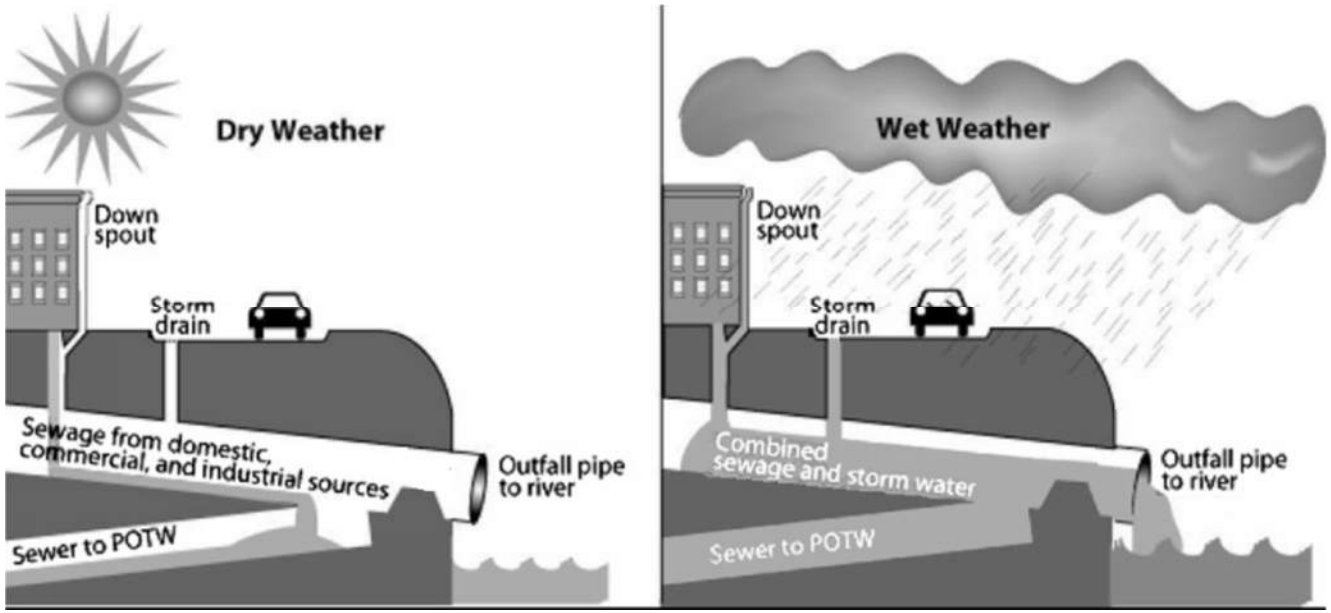
CLEAN WATERWAYS
Healthy Neighborhoods

The July 1st, 2018 CSO Submittals

Dwayne Kobesky, CSO Team Leader

July 31, 2018

What is a CSO?


Dry Weather
Down spout
Storm drain
Sewage from domestic, commercial, and industrial sources
Outfall pipe to river
Sewer to POTW
Wet Weather
Down spout
Storm drain
Combined sewage and storm water
Outfall pipe to river
Sewer to POTW

What has NJDEP Done?

- 25 Individual NJPDES CSO permits were issued on March 12, 2015, effective July 1, 2015.
- Permits require a complete Long Term Control Plan (LTCP).
- The LTCP must show a path to compliance with the Clean Water Act.
- The LTCP is due June 1, 2020.

NJDEP CSO Website - www.state.nj.us/dep/dwq/cso.htm

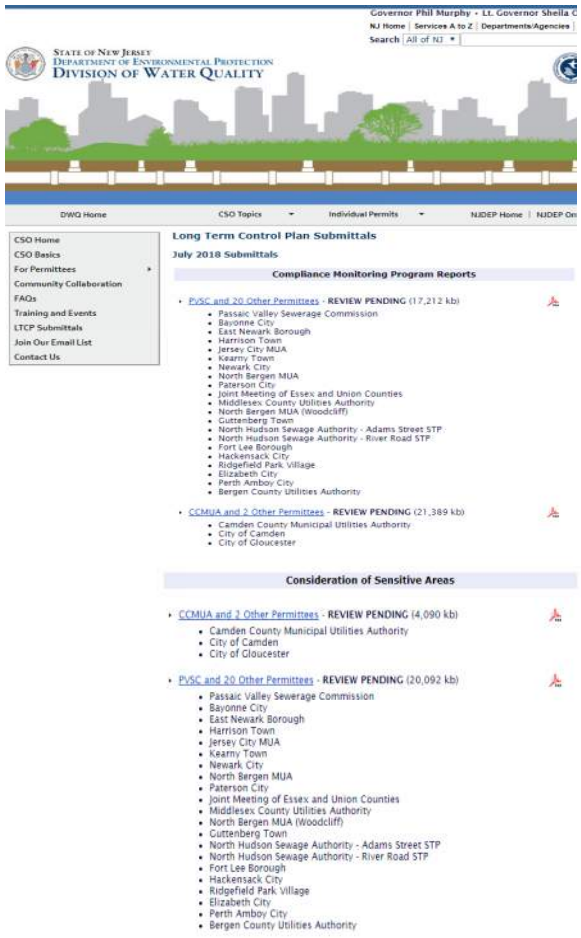
CSO Submittal Summary

Summary of Reports Required to be Submitted to the Department		
Permit Condition	**Abbreviated Description of Requirement**	**59 Month LTCP Due Date**
Part III	Discharge Monitoring Reports (due 25th day of the month following the reporting period) - Solids/Floatables and Precipitation	Monthly from July 1, 2015
Part IV.D.4.a	Submit Progress Reports (due 25th day of the month following the quarter)	Quarterly from July 1, 2015
Part III	Discharge Monitoring Report (due 25th day of the month following the reporting period) – Duration of Discharge	Monthly from January 1, 2016
Part IV.D.2.a	Submit GPS Latitude and Longitude for Pump Stations, CSO Regulators and CSO Outfalls	January 1, 2016
Part IV.D.3.b.i	Submit System Characterization Work Plan	January 1, 2016
Part IV.D.3.c	Submit Baseline Compliance Monitoring Program Work Plan	January 1, 2016
Part IV.D.2.b	Submit a Map of Combined and Separate Sewer Areas	July 1, 2016
Part IV.D.3.b.ii	Submit System Characterization Report	July 1, 2018
Part IV.D.3.b.iii	Submit Public Participation Process Report	July 1, 2018
Part IV.D.3.d	Submit Compliance Monitoring Program Report	July 1, 2018
Part IV.D.3.b.iv	Submit Consideration of Sensitive Areas Plan	July 1, 2018
Part IV.D.3.b.v	Submit Development and Evaluation of Alternatives Report	July 1, 2019
Part IV.D.3.b.vi	Submit Selection and Implementation of Alternatives Report in the Final LTCP	June 1, 2020

The July 1st Submissions

- Consideration of Sensitive Areas Plan
- Compliance Monitoring Program Report
- Public Participation Process Report
- System Characterization Report

www.state.nj.us/dep/dwq/cso-ltcpsubmittals.htm



Governor Phil Murphy · Lt. Governor Sheila C

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STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER QUALITY

DWQ Home | CSO Topics | Individual Permits | NJDEP Home | NJDEP On

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- CSO Basics
- For Permittees
- Community Collaboration
- FAQs
- Training and Events
- LTCP Submittals
- Join Our Email List
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Long Term Control Plan Submittals

July 2018 Submittals

Compliance Monitoring Program Reports

- PVSC and 20 Other Permittees - **REVIEW PENDING** (17,212 kb)
  - Passaic Valley Sewerage Commission
  - Bayonne City
  - East Newark Borough
  - Harrison Town
  - Jersey City MUA
  - Kearny Town
  - Newark City
  - North Bergen MUA
  - Paterson City
  - Joint Meeting of Essex and Union Counties
  - Middlesex County Utilities Authority
  - North Bergen MUA (Woodcliff)
  - Guttenberg Town
  - North Hudson Sewage Authority - Adams Street STP
  - North Hudson Sewage Authority - River Road STP
  - Fort Lee Borough
  - Hackensack City
  - Ridgefield Park Village
  - Elizabeth City
  - Perth Amboy City
  - Bergen County Utilities Authority
- CCMUA and 2 Other Permittees - **REVIEW PENDING** (21,389 kb)
  - Camden County Municipal Utilities Authority
  - City of Camden
  - City of Gloucester

Consideration of Sensitive Areas

- CCMUA and 2 Other Permittees - **REVIEW PENDING** (4,090 kb)
  - Camden County Municipal Utilities Authority
  - City of Camden
  - City of Gloucester
- PVSC and 20 Other Permittees - **REVIEW PENDING** (20,092 kb)
  - Passaic Valley Sewerage Commission
  - Bayonne City
  - East Newark Borough
  - Harrison Town
  - Jersey City MUA
  - Kearny Town
  - Newark City
  - North Bergen MUA
  - Paterson City
  - Joint Meeting of Essex and Union Counties
  - Middlesex County Utilities Authority
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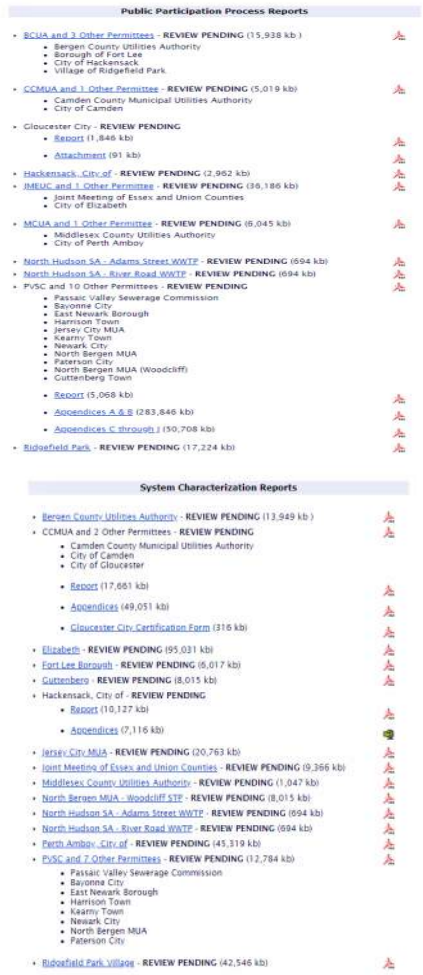
  - North Hudson Sewage Authority - River Road STP
  - Fort Lee Borough
  - Hackensack City
  - Ridgefield Park Village
  - Elizabeth City
  - Perth Amboy City
  - Bergen County Utilities Authority



Public Participation Process Reports

- BCUA and 3 Other Permittees - **REVIEW PENDING** (15,938 kb)
  - Bergen County Utilities Authority
  - Borough of Fort Lee
  - City of Hackensack
  - Village of Ridgefield Park
- CCMUA and 1 Other Permittee - **REVIEW PENDING** (5,019 kb)
  - Camden County Municipal Utilities Authority
  - City of Camden
- Gloucester City - **REVIEW PENDING**
  - Report (1,846 kb)
  - Attachment (91 kb)
- Hackensack, City of - **REVIEW PENDING** (2,962 kb)
- JMEUC and 1 Other Permittee - **REVIEW PENDING** (36,186 kb)
  - Joint Meeting of Essex and Union Counties
  - City of Elizabeth
- MCUA and 1 Other Permittee - **REVIEW PENDING** (6,045 kb)
  - Middlesex County Utilities Authority
  - City of Perth Amboy
- North Hudson SA - Adams Street WWTP - **REVIEW PENDING** (694 kb)
- North Hudson SA - River Road WWTP - **REVIEW PENDING** (694 kb)
- PVSC and 10 Other Permittees - **REVIEW PENDING**
  - Passaic Valley Sewerage Commission
  - Bayonne City
  - East Newark Borough
  - Harrison Town
  - Jersey City MUA
  - Kearny Town
  - Newark City
  - North Bergen MUA
  - Paterson City
  - North Bergen MUA (Woodcliff)
  - Guttenberg Town
  - Report (5,068 kb)
  - Appendices A & B (283,846 kb)
  - Appendices C through J (50,708 kb)
- Ridgefield Park - **REVIEW PENDING** (17,224 kb)

System Characterization Reports

- Bergen County Utilities Authority - **REVIEW PENDING** (13,949 kb)
- CCMUA and 2 Other Permittees - **REVIEW PENDING**
  - Camden County Municipal Utilities Authority
  - City of Camden
  - City of Gloucester
  - Report (17,661 kb)
  - Appendices (49,051 kb)
  - Gloucester City Certification Form (316 kb)
- Elizabeth - **REVIEW PENDING** (95,031 kb)
- Fort Lee Borough - **REVIEW PENDING** (6,017 kb)
- Guttenberg - **REVIEW PENDING** (8,015 kb)
- Hackensack, City of - **REVIEW PENDING**
  - Report (10,127 kb)
  - Appendices (7,116 kb)
- Jersey City MUA - **REVIEW PENDING** (20,763 kb)
- Joint Meeting of Essex and Union Counties - **REVIEW PENDING** (9,366 kb)
- Middlesex County Utilities Authority - **REVIEW PENDING** (1,047 kb)
- North Bergen MUA - Woodcliff STP - **REVIEW PENDING** (8,015 kb)
- North Hudson SA - Adams Street WWTP - **REVIEW PENDING** (694 kb)
- North Hudson SA - River Road WWTP - **REVIEW PENDING** (694 kb)
- Perth Amboy, City of - **REVIEW PENDING** (45,319 kb)
- PVSC and 7 Other Permittees - **REVIEW PENDING** (12,784 kb)
  - Passaic Valley Sewerage Commission
  - Bayonne City
  - East Newark Borough
  - Harrison Town
  - Kearny Town
  - Newark City
  - North Bergen MUA
  - Paterson City
- Ridgefield Park Village - **REVIEW PENDING** (42,546 kb)

Consideration of Sensitive Areas

NJPDES Permit Part IV.G.3

Permittee's LTCP shall give the highest priority to controlling overflows to sensitive areas:

- Outstanding National Resource Waters
- National Marine Sanctuaries
- Waters with threatened or endangered species and their habitat
- Waters used for primary contact recreation (including but not limited to bathing beaches)
- Public drinking water intakes or their designated protection areas, and
- Shellfish beds

Compliance Monitoring Program

NJPDES Permit Part IV.G.9

The permittee shall implement a CMP adequate to:

- Verify baseline and existing conditions
- The effectiveness of CSO controls, compliance with water quality standards, and
- Protection of designated uses

The CMP will be conducted before, during and after implementation of the LTCP.

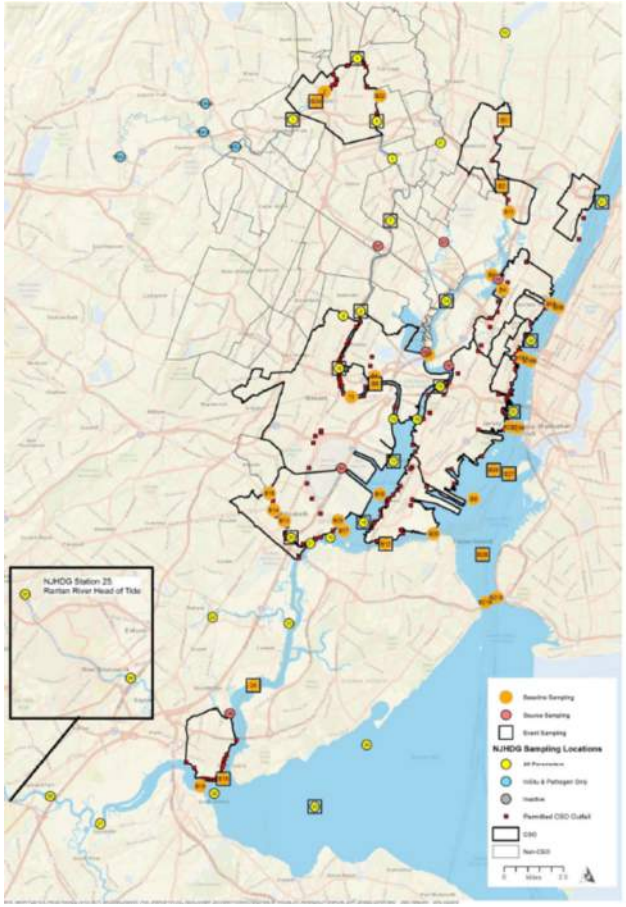
Compliance Monitoring Program
NJPDES Permit Part IV.G.9 (continued)

Monitoring shall include the following:

- Ambient in-stream monitoring may be performed in accordance with the guidance document entitled: "Receiving Waters Monitoring Work Plan Guidance for the CSO Program" at www.state.nj.us/dep/dwq
- Discharge frequency for each CSO (days and hours per month)
- Duration of each discharge for each CSO (number of days)
- Quality of the flow discharged from each CSO, which shall include pathogen monitoring at a minimum
- Rainfall monitoring in the vicinity of each CSO/municipality

Compliance Monitoring Program

NJPDES Permit Part IV.G.9 (continued)



Public Participation Process

NJPDES Permit Part IV.G.2

Implementation shall actively involve the affected public throughout each of the 3 Steps of the LTCP process. The affected public includes:

- Rate payers (including rate payers in the separate sewer sections)
- Industrial users of the sewer system
- Persons who reside downstream from the CSOs
- Persons who use and enjoy the downstream waters, and
- Any other interested persons

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Healthy Neighborhoods

Public Participation Process

NJPDES Permit Part IV.G.2

A Public Participation Process Report shall include the following elements:

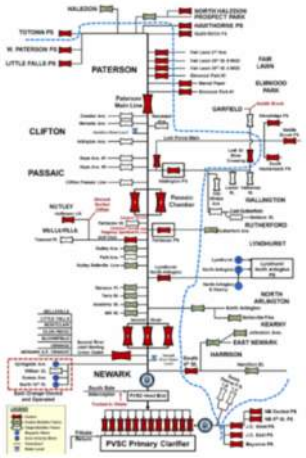
- Conduct outreach to inform the affected/interested public through various methods which may include: public meetings, direct mailers, billing inserts, newsletters, press releases to the media, postings of information on the permittee's website, hotline, development of advisory committees, etc.; and to
- Invite members of the affected/interested public to join a Supplemental CSO Team to work with the permittee's assigned staff, consultants and/or contractors.

Characterization Monitoring and Modeling of the Combined Sewer System

NJPDES Permit Part IV.G.1

The major elements of the Sewer System Characterization:

- Rainfall Records
- Combined Sewer Characterization
- CSO Monitoring
  - Includes CSO effluent and ambient in-stream monitoring for pathogens
- Modeling
- Identification of Sensitive Areas



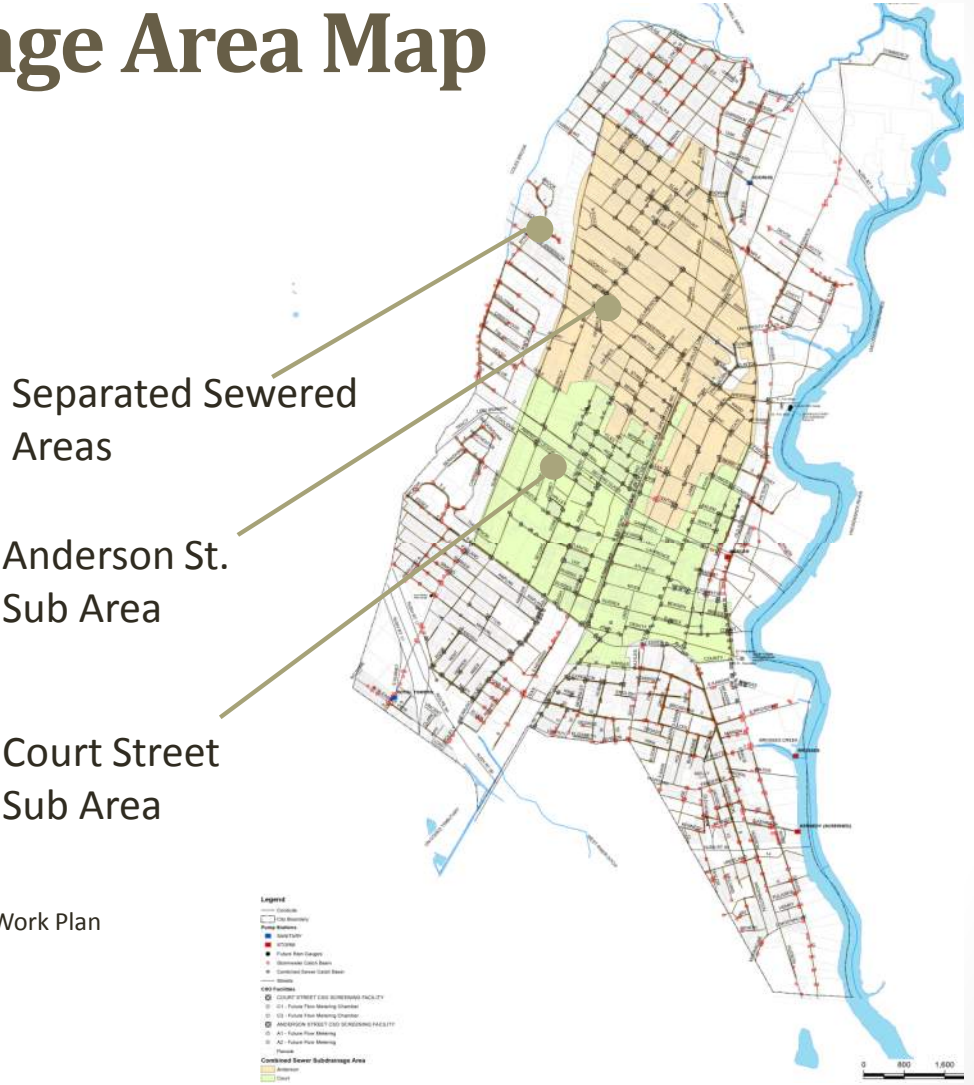
Purpose of the System Characterization

How the Combined Sewer System functions when it rains throughout a year

- Analysis of the relationship between the rainfall, CSO discharge and wet weather flows at the treatment plant
  - Which CSOs discharge? How much? How often?
  - How do the CSO discharges relate to rainfall amount and duration?
  - What areas, including basements, streets and other public and private areas that flood with combined sewage?

Sub Drainage Area Map

- Hackensack
- 2 CSO Outfalls
- 2 Subareas



Source: Hackensack Characterization Work Plan Submission, December 2015

CSO System	Team Leader
CCMUA, Camden, Gloucester Trenton	Armando Alfonso Armando.alfonso@dep.nj.gov
Bergen County Utilities Authority, Fort Lee, Hackensack, Ridgefield Park Joint Meeting, Elizabeth	Nancy Kempel Nancy.Kempel@dep.nj.gov
North Hudson Sewerage Authority North Bergen Woodcliff, Guttenberg	Joe Mannick Joe.Mannick@dep.nj.gov
PVSC, Bayonne, East Newark, Harrison, Jersey City, Kearny, NBMUA Central, Newark, Paterson MCUA, Perth Amboy	Dwayne Kobesky Dwayne.Kobesky@dep.nj.gov

Questions?

Dwayne Kobesky
dwayne.kobesky@dep.nj.gov
(609) 292-4860

Evaluation of Alternatives

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Healthy Neighborhoods

National CSO Policy

- Consider a reasonable range of alternatives
- Analysis should be sufficient to make a reasonable assessment of cost and performance
- Selected controls should be sufficient to meet CWA requirements
- Presumption vs. Demonstration Approach

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Healthy Neighborhoods

Presumption vs. Demonstration

- Two approaches for evaluating compliance with the water quality based requirements of the Clean Water Act
  - Presumption Approach

    achieving one of the following:
    - *No more than an average of four overflow events per year*
    - *The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events*
    - *The elimination or removal of no less than the mass of the pollutants… for the volumes that would be eliminated or captured with 85% capture*
  - Demonstration Approach
    - Demonstrate, through monitoring and modeling, that the LTCP will not preclude the attainment of water quality standards or the receiving water's designated uses.

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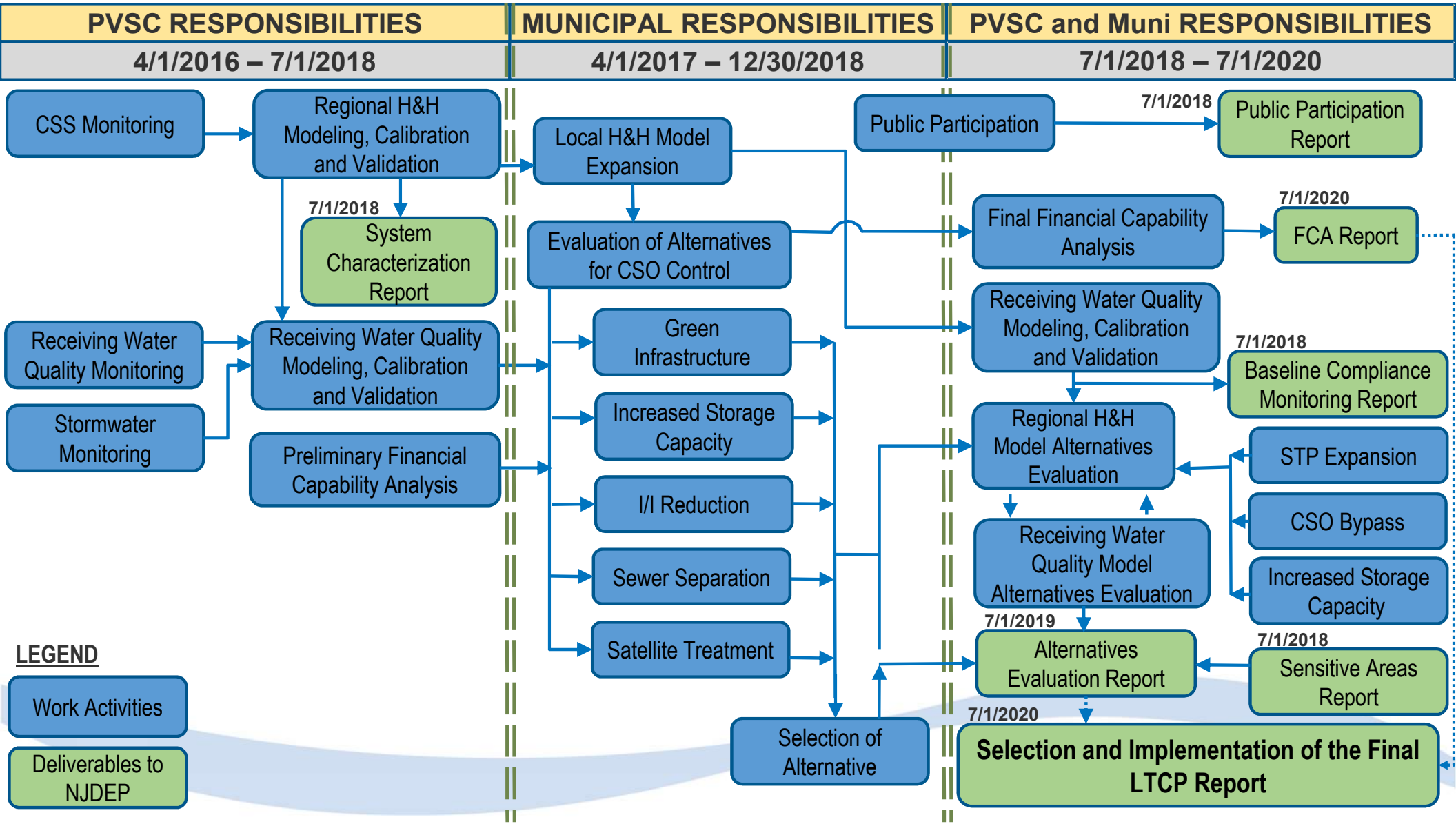
Healthy Neighborhoods

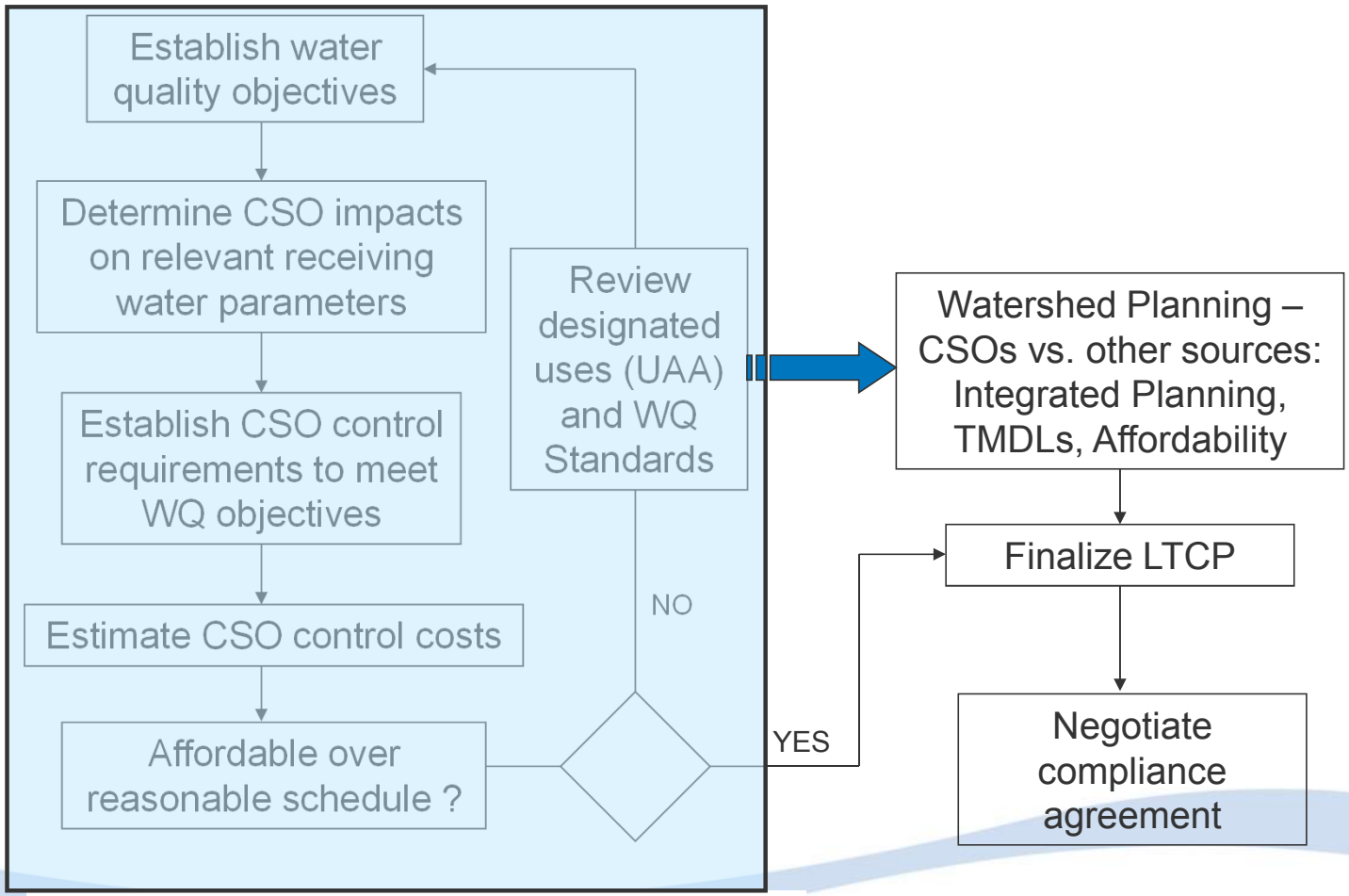
Permit Requirements

- Evaluate the feasibility of potential control alternatives, including:
  - ***Green infrastructure***
  - Increased storage capacity in the collection system
  - Treatment expansion or storage at PVSC
  - Inflow and Infiltration (I/I) reduction
  - Sewer separation
  - ***Treatment of CSO discharge***
  - CSO related bypass of secondary treatment at PVSC

CLEAN WATERWAYS
Healthy Neighborhoods


PVSC RESPONSIBILITIES
4/1/2016 – 7/1/2018
MUNICIPAL RESPONSIBILITIES
4/1/2017 – 12/30/2018
PVSC and Muni RESPONSIBILITIES
7/1/2018 – 7/1/2020
CSS Monitoring
Regional H&H Modeling, Calibration and Validation
7/1/2018
System Characterization Report
Receiving Water Quality Monitoring
Stormwater Monitoring
Receiving Water Quality Modeling, Calibration and Validation
Preliminary Financial Capability Analysis
Local H&H Model Expansion
Evaluation of Alternatives for CSO Control
Green Infrastructure
Increased Storage Capacity
I/I Reduction
Sewer Separation
Satellite Treatment
Selection of Alternative
Public Participation
7/1/2018
Public Participation Report
Final Financial Capability Analysis
7/1/2020
FCA Report
Receiving Water Quality Modeling, Calibration and Validation
7/1/2018
Baseline Compliance Monitoring Report
Regional H&H Model Alternatives Evaluation
STP Expansion
CSO Bypass
Increased Storage Capacity
Receiving Water Quality Model Alternatives Evaluation
7/1/2019
Alternatives Evaluation Report
7/1/2018
Sensitive Areas Report
7/1/2020
Selection and Implementation of the Final LTCP Report
LEGEND
Work Activities
Deliverables to NJDEP

CSO LTCP Development Process - Affordability



Clean Water Act negotiation cycle

City of Newark Evaluation of Green Infrastructure for CSO Control

presented by: Frank Brilhante

CLEAN WATERWAYS
Healthy Neighborhoods

Newark Model Review and Green Infrastructure Modeling

Frank Brilhante, Chenchen Li

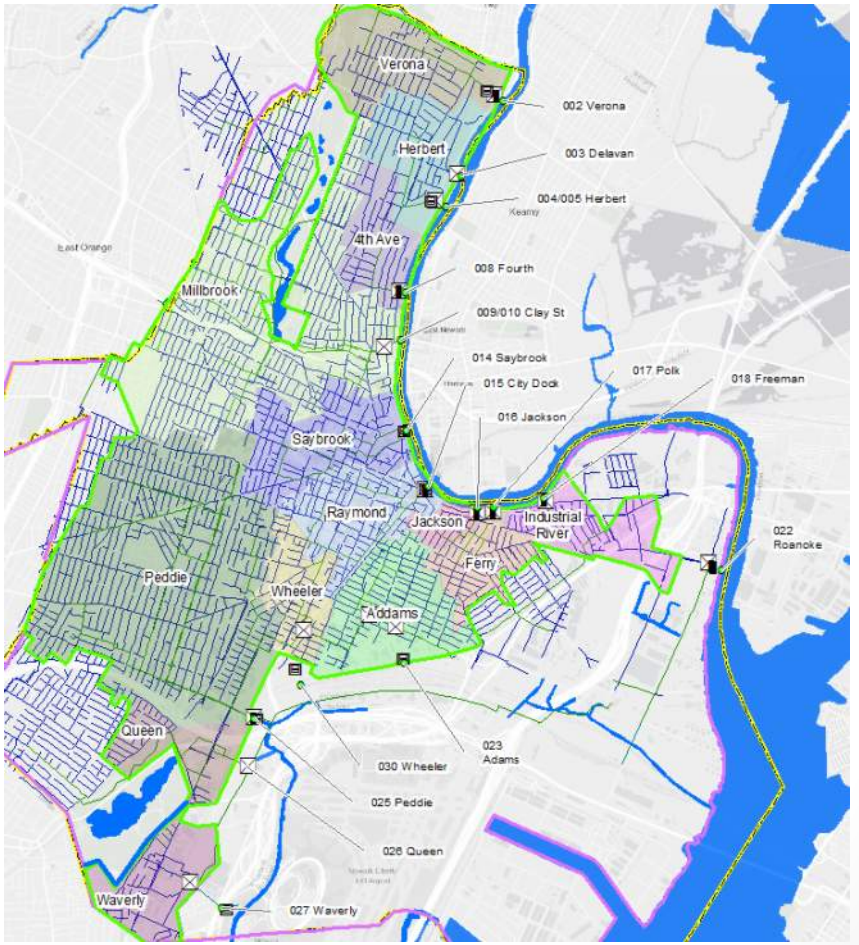
CSO Stakeholders Meeting July 31, Kearny NJ

Overview

- Newark Model Background
- Recent Model Update
- 2004 Baseline Condition
- Green Infrastructure Modeling

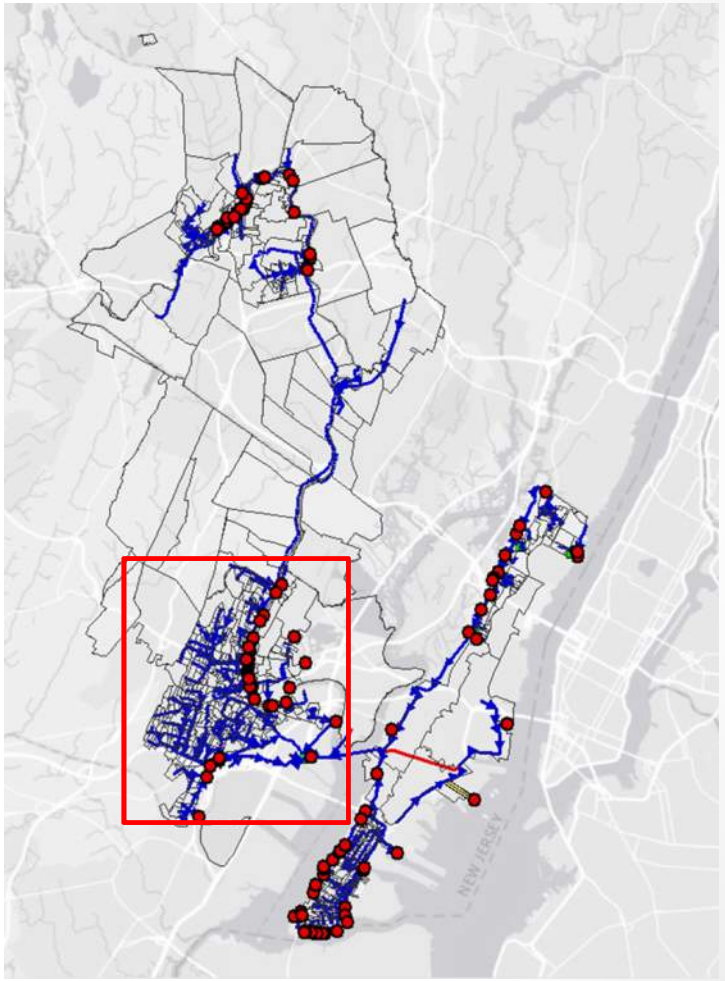
Collection System Overview

- Drainage Areas
  - Combined 6679ac
  - Separated 488ac
    - NE003
    - NE023
    - NE026
- Interceptors
  - PVSC Main Int.
  - Southside Int.
- Regulators
- Outfalls
  - 17 Operating
  - 1 may be reactivated



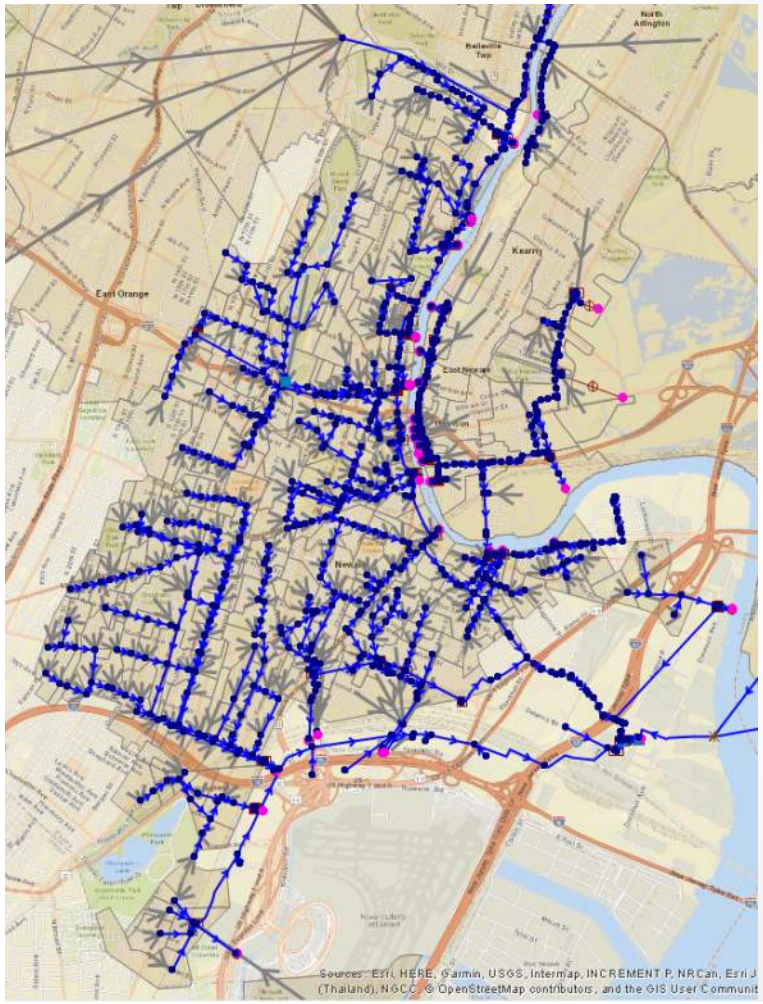
Model Development

- CSO Characterization and Modeling Study (2000)
  - Created XP-SWMM model
  - Calibrated to monitored data
  - Final report 2005
- PVSC LTCP Phase I (2005-2008)
  - Integrated into PVSC model
  - Converted to InfoWorks CS
- PVSC LTCP Phase II (2016-2018)
  - Interceptor Recalibration
  - Converted InfoWorks ICM
  - Calibrated to monitored data



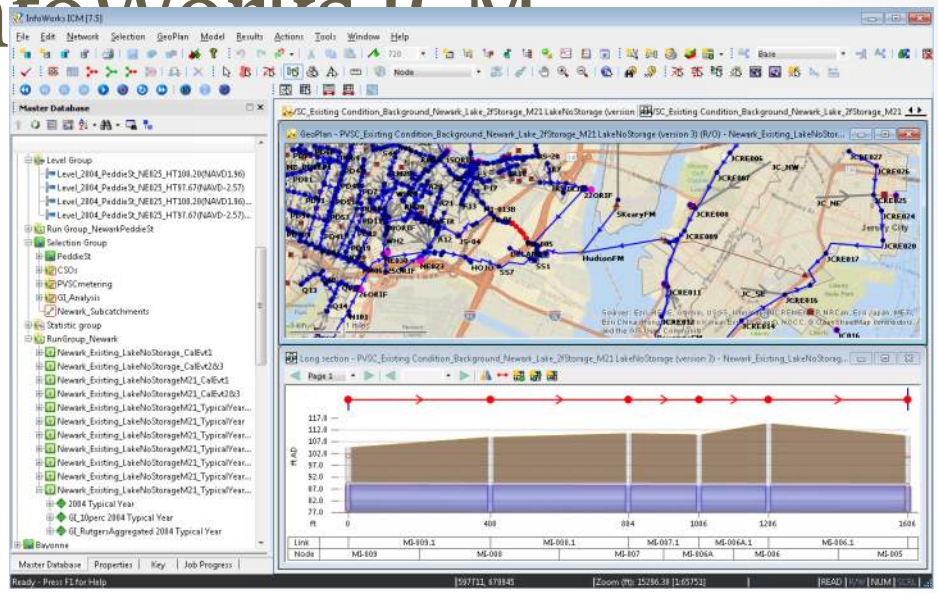
Newark Model Overview

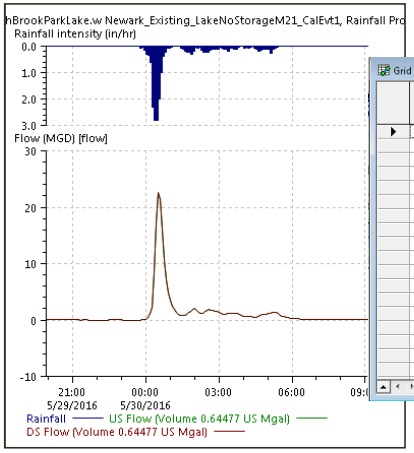
- Subcatchment: 732
- Nodes
  - Manhole: ~750
  - Outfall: 22
  - Storage: 1
- Link
  - Conduit: ~750
  - Flap Valve: 17
  - Orifice: 3
  - Sluice: 27 (17 variable)
  - Weir: 29

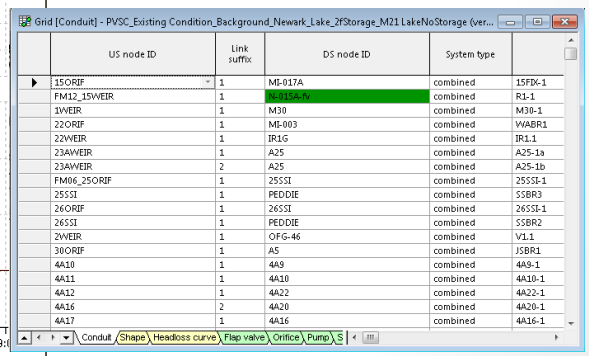


Model Software - InfoWorks ICM

- Hydrology and Hydraulics (H&H) Modeling
  - Integrating 1D/2D modeling
  - Real Time Control
- Multifunction User Interface
  - GIS
  - Model Database Management
  - Result Review

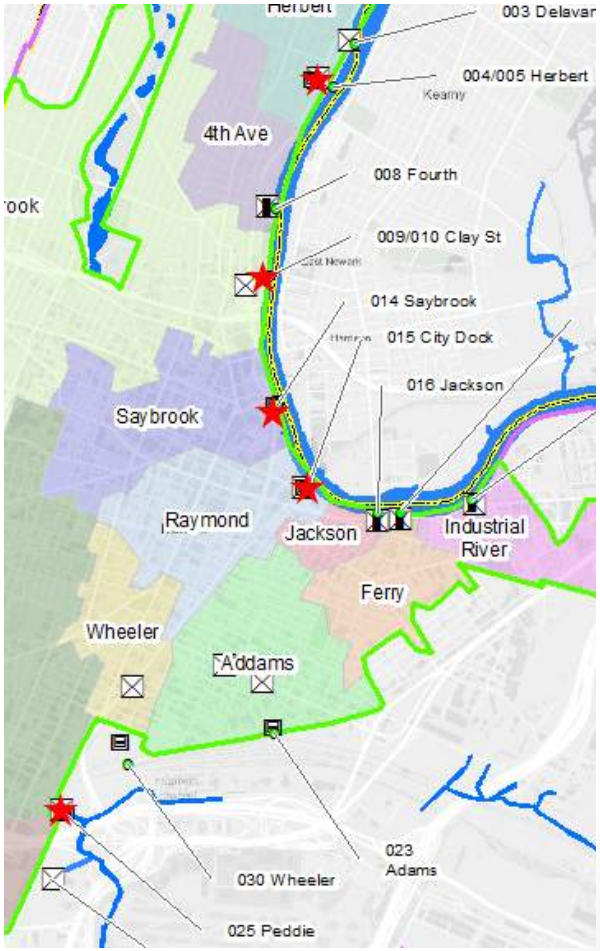






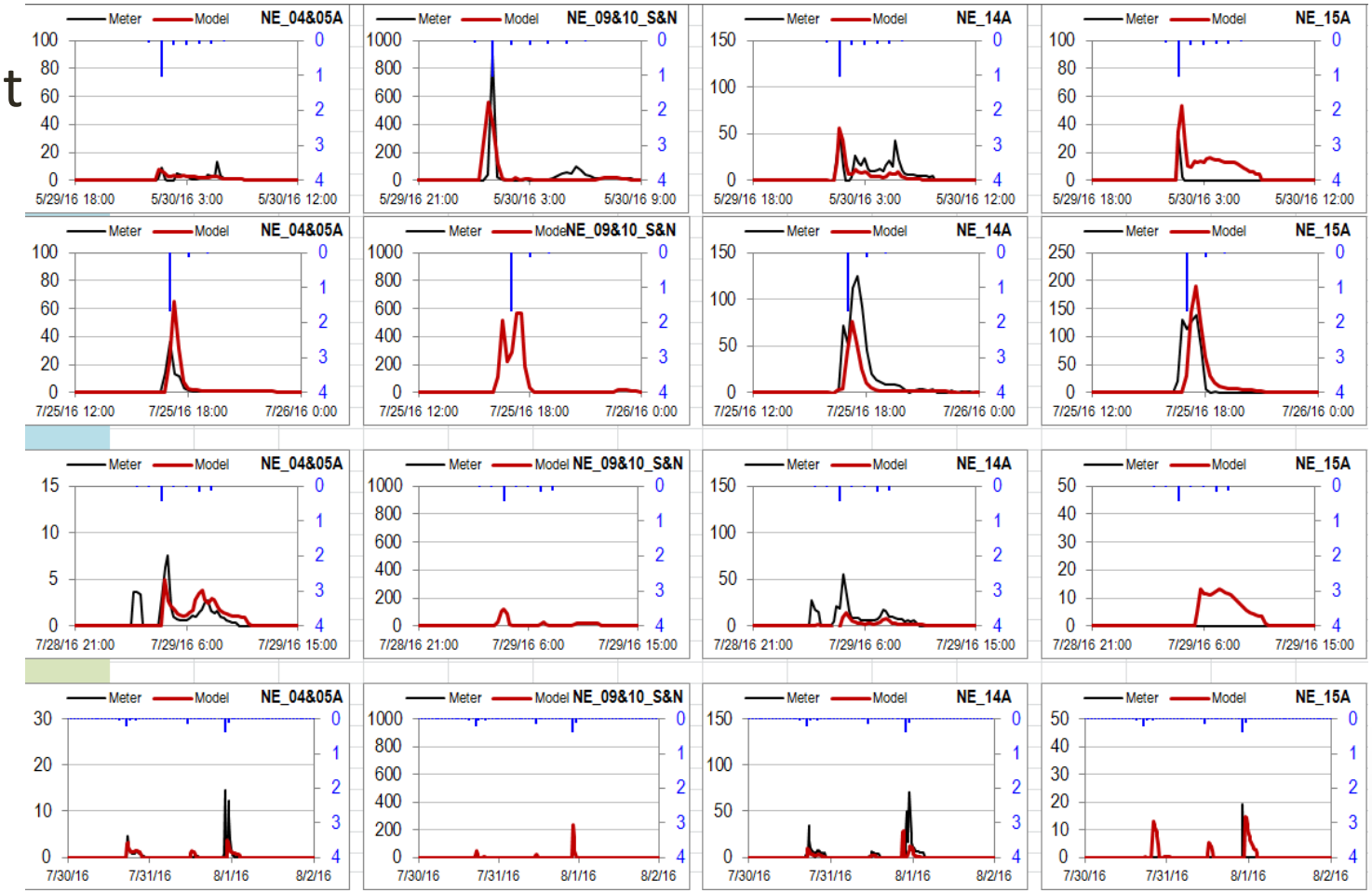
Recent Model Update

- Latest Monitoring (2016)
  - 4 events
    - May 29, July 25, July 29, July30
  - 5-min Data at CSOs
    - NE004&005 (Herbert Pl) Overflow
    - NE009&010 (Clay St) Overflow (2 meters)
    - NE014 (Rector/Saybrook St) Overflow
    - NE015(Raymond Plaza) Overflow
    - NE025(Peddie St) inflow/underflow
  - 15 min SS interceptor
- Latest Calibration



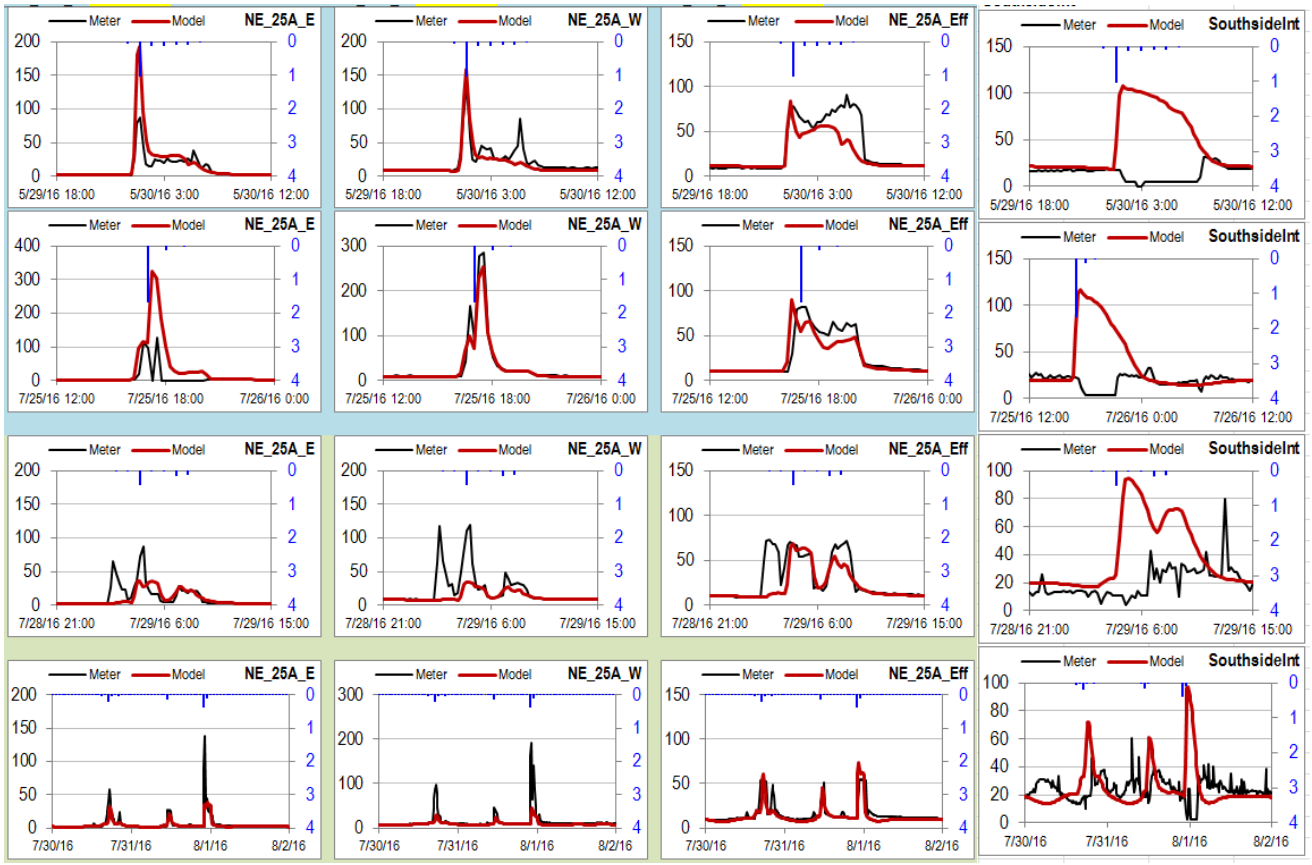
Recent Model Update

- Lat



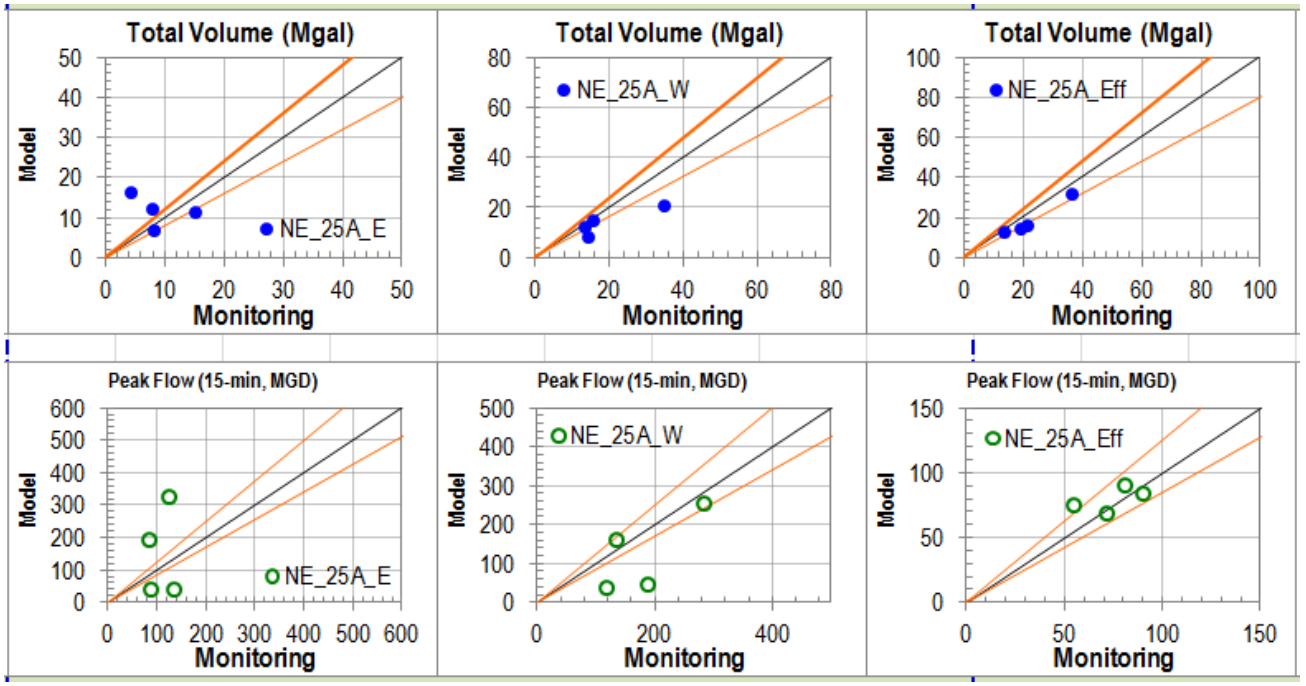
Recent Model Update

- Latest



Recent Model Update

- Latest

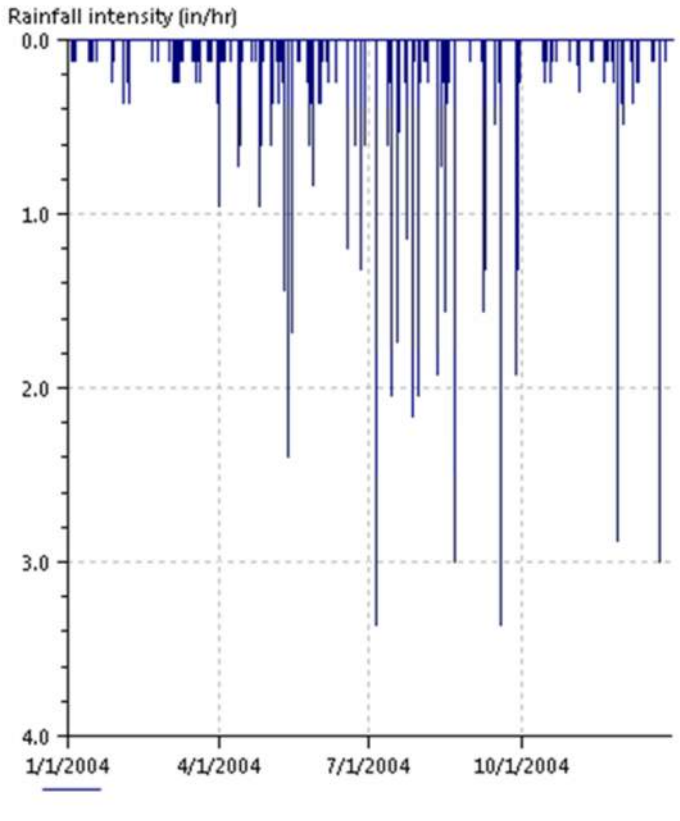


Recent Model Update

- Modeled Branch Brook Park Lake flow to sewer system
  - Drainage Area (273ac)
  - Added Storage Node
    - assume no storage in existing condition
    - Facilitate evaluating storage in future condition
  - Added weir as outlet from lake to sewer

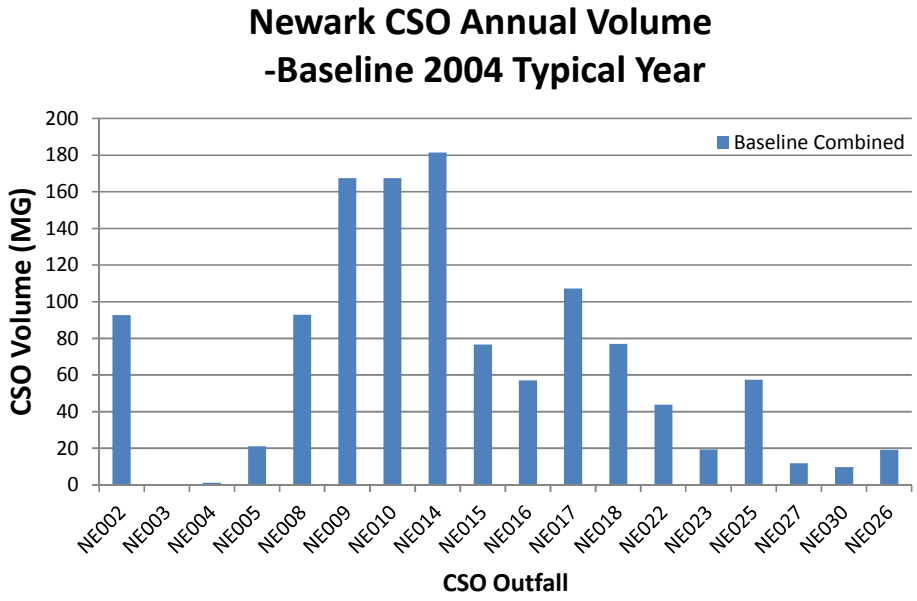
2004 Typical Year Baseline Condition

- Established 2004 as Typical Year for LTCP Evaluation
- Typical Year Rainfall Condition
  - 5 min data - EWR
  - Total rain – 48.37in
  - Peak 5min Intensity- 3.36in/hr
  - 134 (4hr inter-event interval)



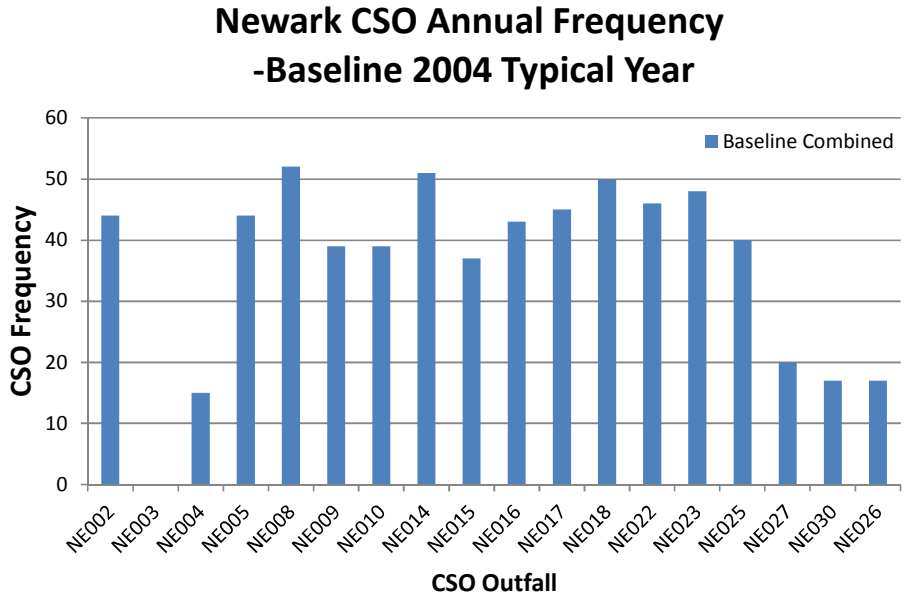
Newark Annual CSO Volume

- 2004 Typical Year Total CSO -1203MG (Excluding 345MG Stormwater at NE003, 023, 026)

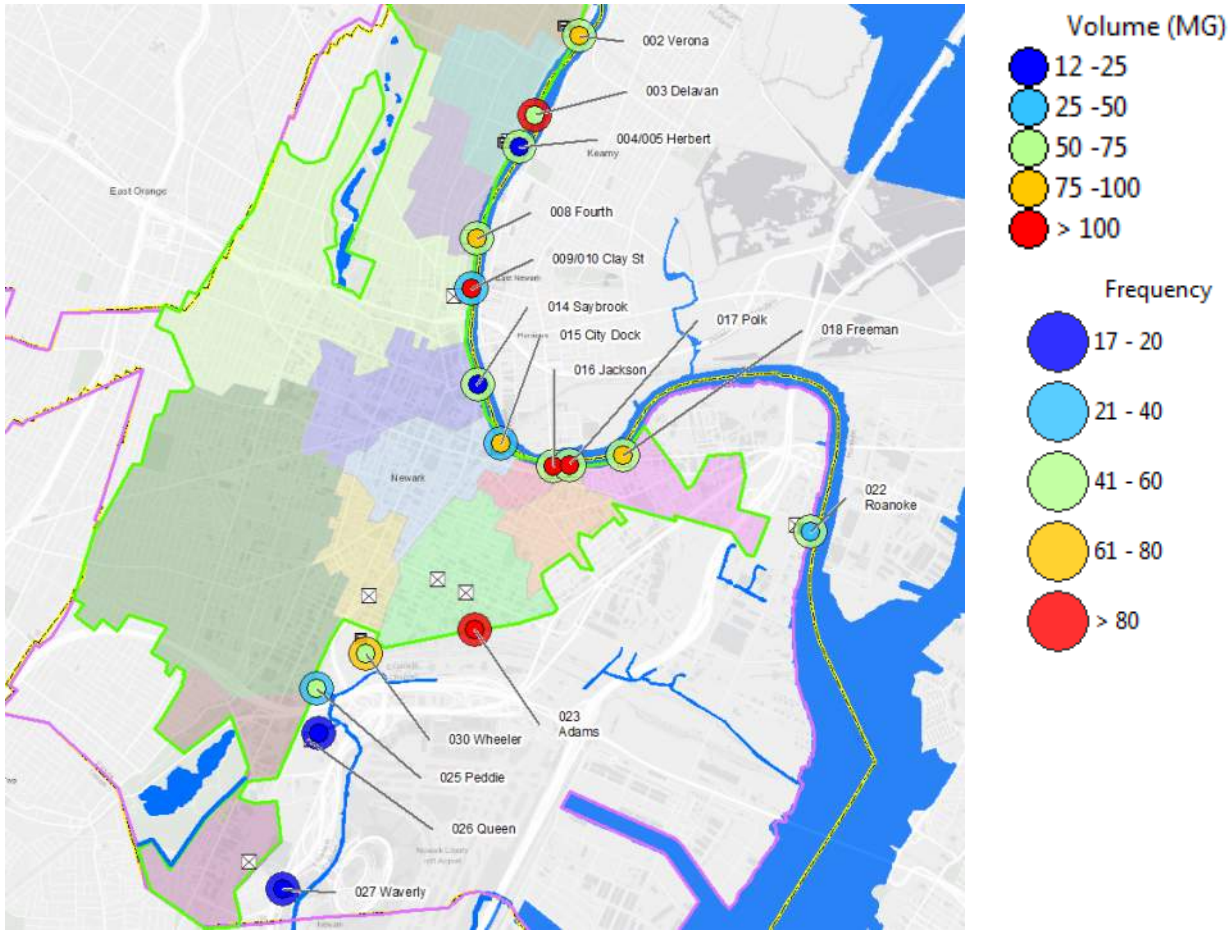


Newark Annual CSO Frequency

- Summarized based on
  - 12-hr inter-event time
  - 0.01 MGD Flow threshold
  - 0.01 MG Volume threshold



Newark Annual Overflow Map



GI Evaluation

- Two Scenarios Evaluated
  - Rutgers GI Opportunity
  - Maximum Control Scenario
- Results to compare with Baseline-changes in CSOs
  - Overflow Volume
  - Overflow frequency

Rutgers GI Opportunity

RUTGERS
New Jersey Agricultural Experiment Station

Draft

Impervious Cover Reduction Action Plan
for
Newark, Essex County, New Jersey – Volume 1

Prepared for the City of Newark by the
Rutgers Cooperative Extension Water Resources Program

April 16, 2018

- 4 Volumes
  - GI Opportunities Summarized
  - Located in GIS based on block and lot
  - Correlated to Model Subcatchment

Rutgers GI Opportunity

Summary of Proposed Green Infrastructure Practices

		Subwatershed/Site Name/GI Practice		Potential Management Area		Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP	Unit Cost ($/unit)	Unit	Total Cost ($)	I.C. Treated %
				Area (SF)	Area (ac)									
1	11	590-596 15th Avenue Community Garden	Rainwater harvesting	815	0.02	0.021	4	650	0.06	650	$ 2	gal	$ 1,300	407.50%
2	12	Art of Survival Garden	Rainwater harvesting	415	0.01	0.011	2	325	0.03	325	$ 2	gal	$ 650	166.00%
2	12	Art of Survival Garden	Stormwater planter	480	0.01	0.013	2	950	0.04	120	$ 375	SF	$ 45,000	192.00%
3	13	George Washington Carver Elementary School	Pervious pavement	37,000	0.85	0.964	161	73,030	2.74	6,600	$ 25	SF	$ 165,000	29.10%
4	14	Hawthorne Avenue Elementary School	Bioretention system	5,800	0.13	0.151	25	11,450	0.50	1,450	$ 5	SF	$ 7,250	10.30%
4	14	Hawthorne Avenue Elementary School	Pervious pavement	3,400	0.08	0.089	15	6,710	0.30	1,250	$ 25	SF	$ 31,250	6.10%
5	15	HOV Healthy Haven Garden	Rainwater harvesting	480	0.01	0.006	1	200	0.02	200	$ 2	gal	$ 400	150.00%
6	16	HOV Healthy Haven Garden	Stormwater planter	705	0.01	0.013	2	950	0.04	120	$ 375	SF	$ 45,000	320.00%
6	16	Peshine Academy Elementary School	Pervious pavement	34,750	0.80	0.905	152	68,590	3.02	6,200	$ 25	SF	$ 155,000	40.70%
7	17	13th Avenue School	Pervious pavement	29,500	0.68	0.769	129	58,230	2.56	6,850	$ 25	SF	$ 171,250	22.70%
8	18	391 7th Avenue West Community Garden	Stormwater planter	1,000	0.02	0.026	4	1,970	0.09	250	$ 375	SF	$ 93,750	2000.00%
9	19	MLK Jr. Boulevard Vacant Lot and Sidewalk	Bioretention system	1,700	0.04	0.044	7	3,360	0.15	425	$ 5	SF	$ 2,125	24.70%
9	19	MLK Jr. Boulevard Vacant Lot and Sidewalk	Stormwater planter	7,000	0.16	0.182	31	13,820	0.61	1,750	$ 375	SF	$ 656,250	101.50%
10	110	Newark Police Station 3rd Precinct	Stormwater planter	3,500	0.08	0.091	15	6,910	0.30	875	$ 375	SF	$ 328,125	36.30%
11	111	Robert Treat Academy Charter School	Bioretention system	2,525	0.06	0.066	11	4,980	0.22	630	$ 5	SF	$ 3,150	5.10%
11	111	Robert Treat Academy Charter School	Pervious pavement	11,600	0.27	0.302	51	22,900	1.01	3,125	$ 25	SF	$ 78,125	23.50%
12	112	Terrell Homes	Bioretention system	17,250	0.40	0.449	75	34,050	1.50	4,325	$ 5	SF	$ 21,625	4.50%
13	113	Terrell Homes	Pervious pavement	29,400	0.67	0.766	128	58,040	2.55	5,250	$ 25	SF	$ 131,250	7.60%

Art of Survival Garden

RUTGERS

GREEN INFRASTRUCTURE RECOMMENDATIONS

Subwatershed: Elizabeth River

Site Area: 4,858 sq. ft.

Address: 367 Seymour Avenue
Newark, NJ 07112

Block and Lot: Block 3603, Lot 7,8

A cistern can be installed to capture roof runoff from buildings adjacent to the gardens. The water can then be used to water the garden or for other non-potable uses. Two stormwater planters can be installed in the sidewalk to capture, treat, and infiltrate runoff from the road. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
5	250	0.0	0.1	1.1	0.000	0.01

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Rainwater harvesting	0.011	2	325	0.03	325 (gal)	$650
Stormwater planters	0.013	2	950	0.04	120	$45,000

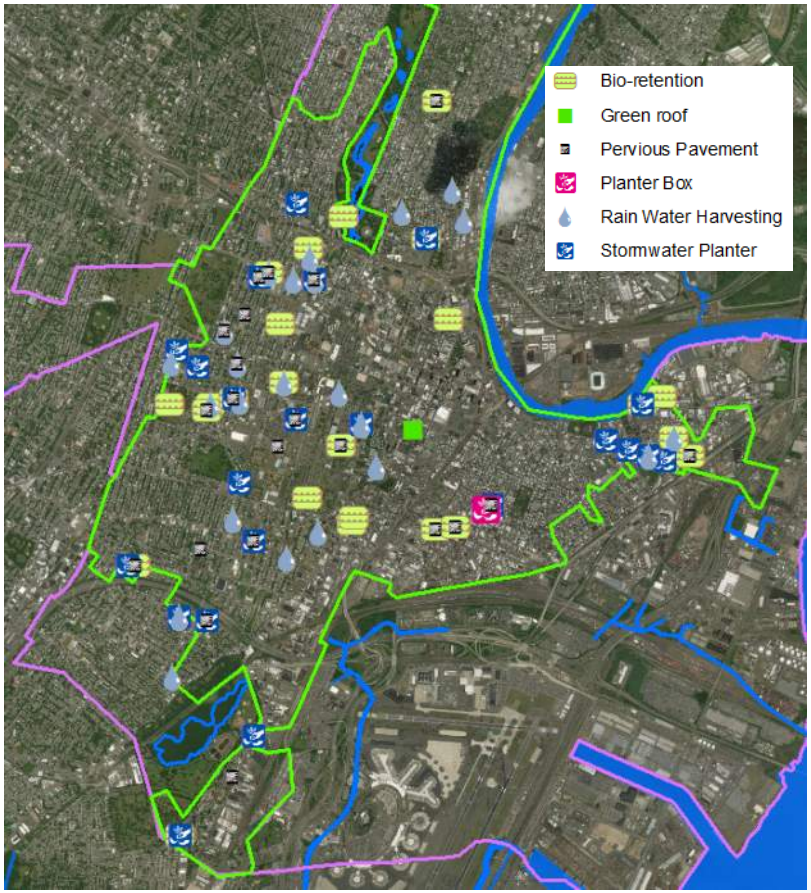
Art of Survival Garden

- rainwater harvesting
- stormwater planter
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 15' 30'

Rutgers GI Opportunity

- 63 Sites (52 model catchments)
- Six Types of GI
  - Bio-retention
  - Green roof
  - Pervious Pavement
  - Planter Boxes
  - Rain Water Harvesting
  - Stormwater Planter
- Total Manageable Area -11.7 ac



GI Scenario Assumptions

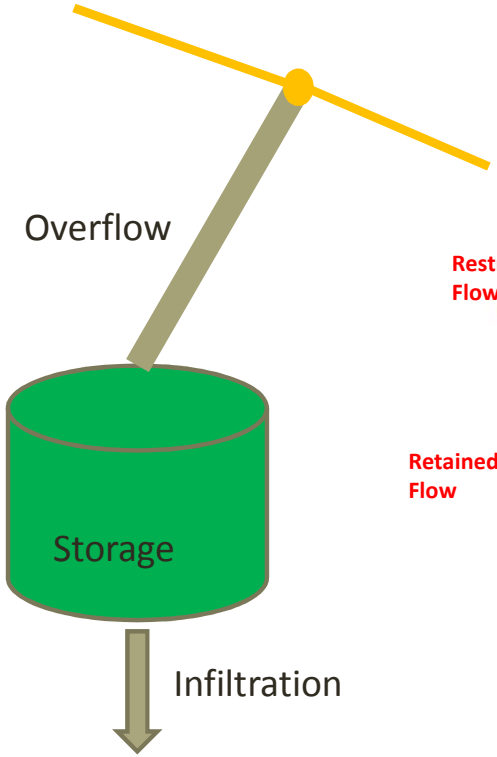
- Simplified GI type to ROW Bio-Swale - Retention
  - Easy to access and implement in reality
  - Most GI types involves runoff intersect, store, infiltrate (evapotranspiration)and overflow.
  - Parameters used in NYC LTCP evaluation available

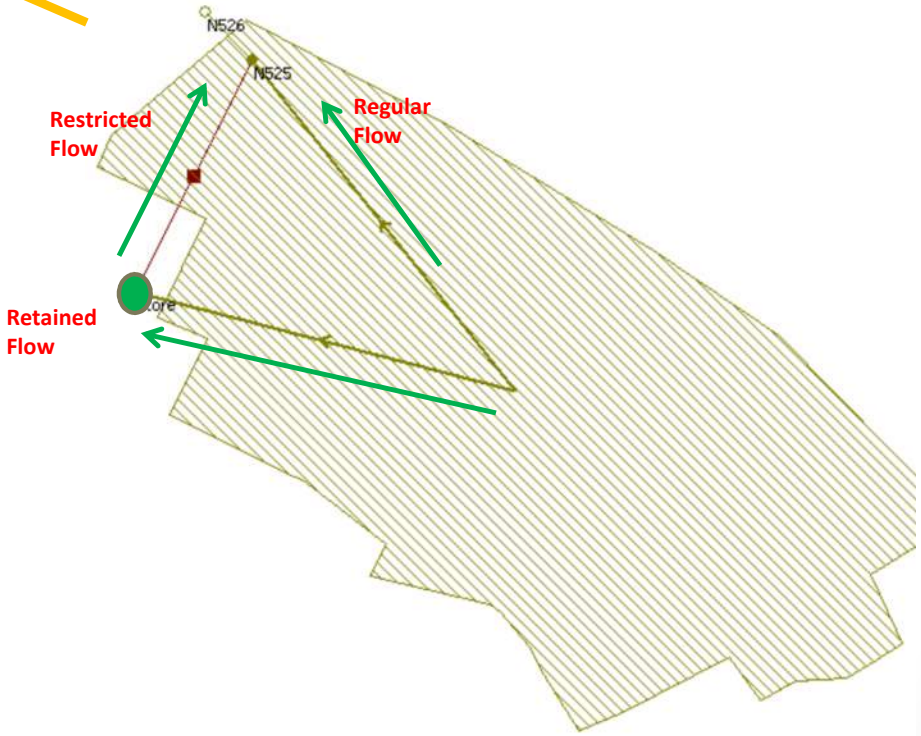
Modeling of Retention

Retention Facility (Bioswale) at Site Scale

Neighborhood Scale Modeling of Retention Facilities

Modeling of Retention





GI Scenario Assumptions

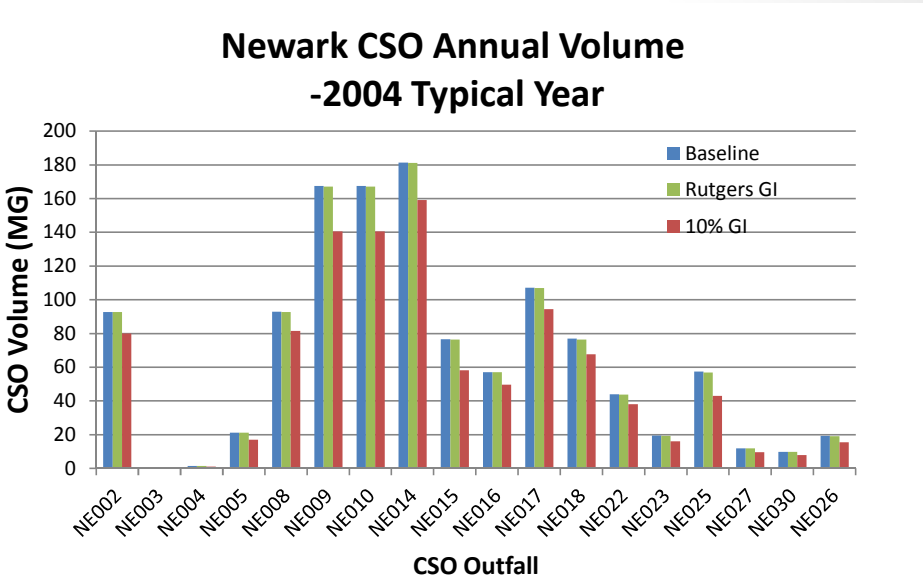
- GI managed area is 100% impervious (75% with depression storage, 25% without depression storage)
- Directly connected to manholes, no internal routing to previous areas first
- For maximization scenario, 10% impervious will be the targeted management areas.
- Ratio of management area to GI footprint area is 30 to 1. (assuming 3000sqft management area to 10'x2.5' ROW bioswale)

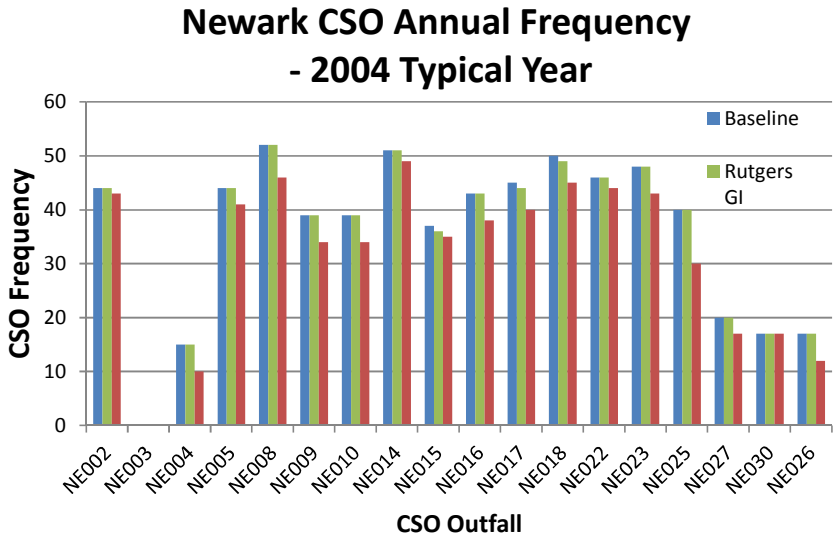
GI Scenario Assumptions

- Bio-swale Parameters (from NYC LTCP)
  - Size 10’x2.5’
  - Depth 4.223ft
  - Media porosity 0.29
  - Infiltration rate is 1.75in/hr, effective through the base area, not through sides of the sites
  - Overflow represented with a weir. Weir length 1ft per 100sqft site areas

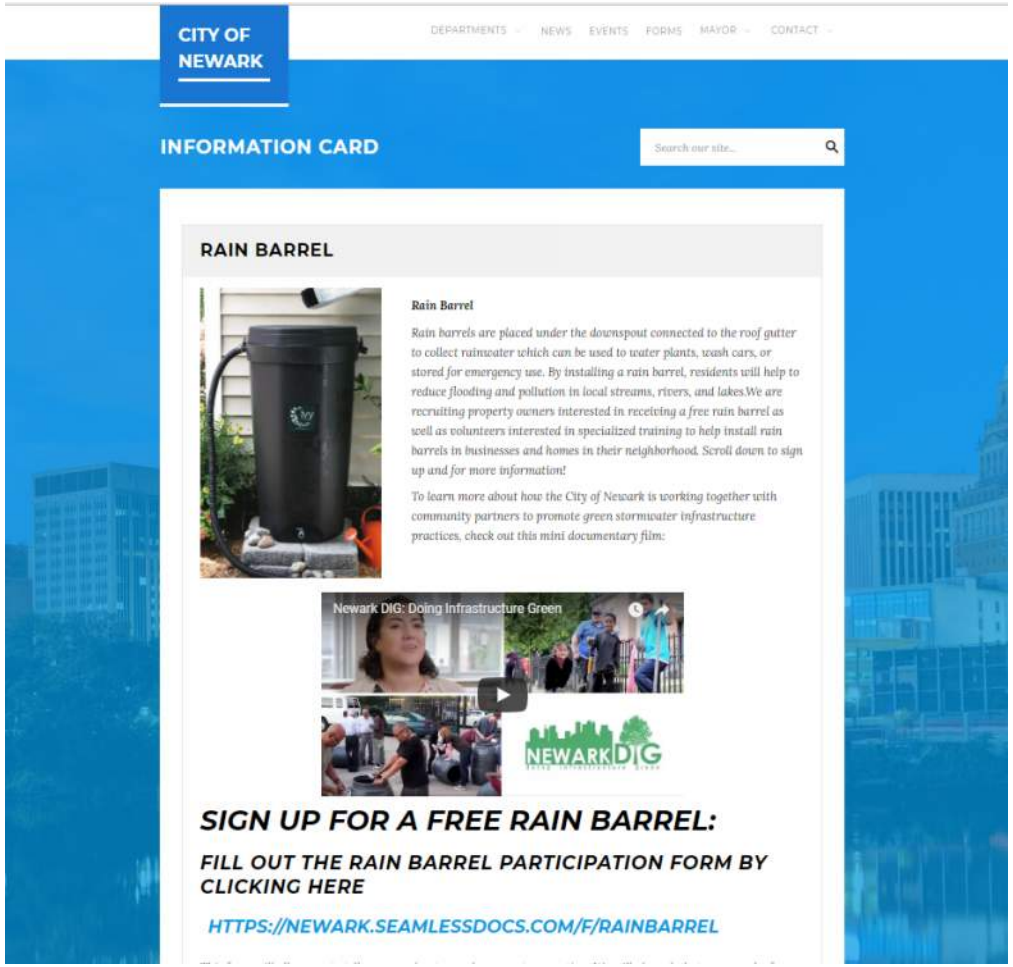
Results

- Total Reduction
  - Volume
    - Rutgers – 0.3%
    - 10% GI – 14.1%
  - Frequency
    - Rutgers – 1 at three locations
    - 10% GI – 1~10 at all locations except three



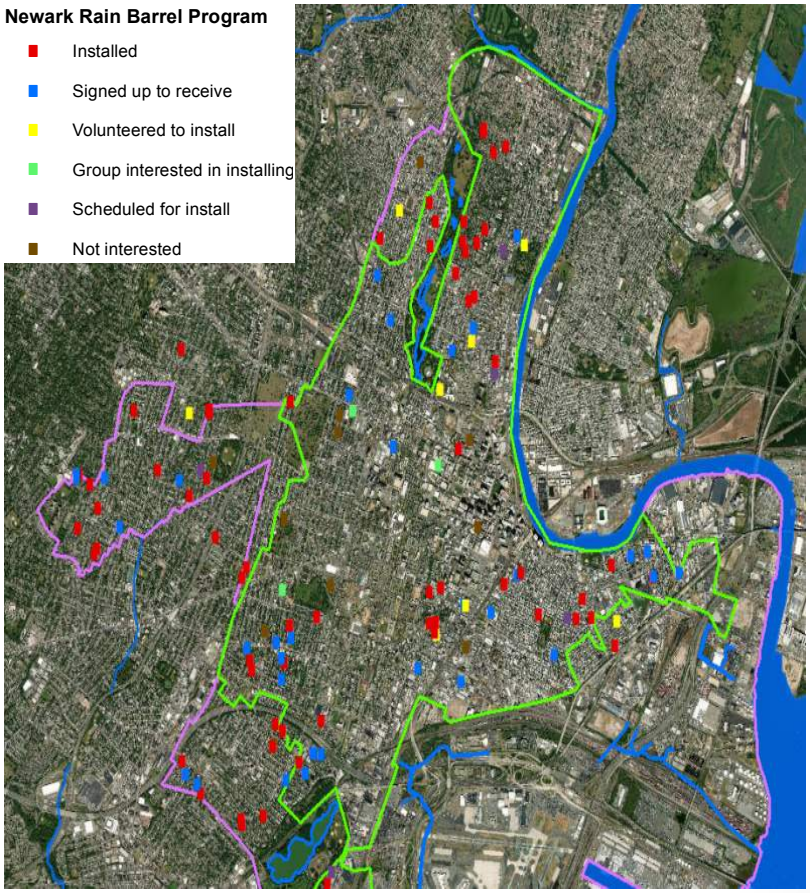


Newark Rain Barrel Program



Newark Rain Barrel Program

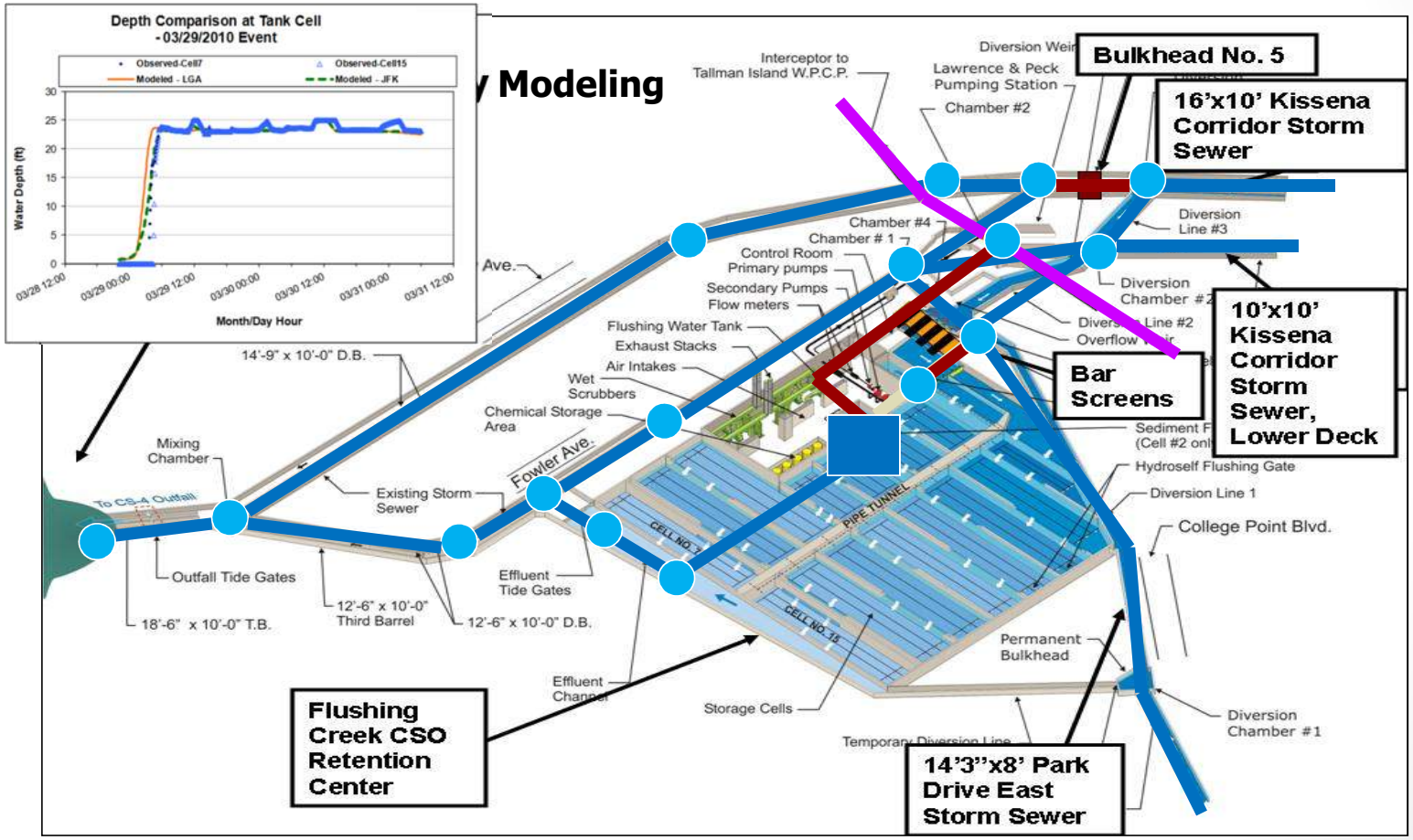
- 66 Rain barrels installed
- 45 scheduled or signed up for installation
- Modeled Similarly to GI
  - Manages roof area of connected down spouts
  - Storage volume = barrel volume
  - Volume in excess of storage runs off
- Assumptions
  - Manages roof area of connected down spouts
  - Barrels are empty at start of each event



Modeling CSO Control Measures

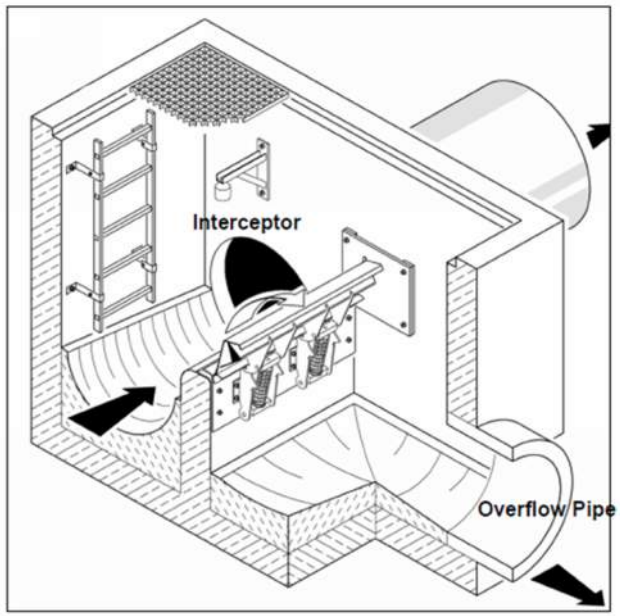
- Model Capability of Simulating RTC
  - Maximize conveyance to plant
- Control measures
  - Storage Facility
  - Bending Weirs
  - Inflatable Dams

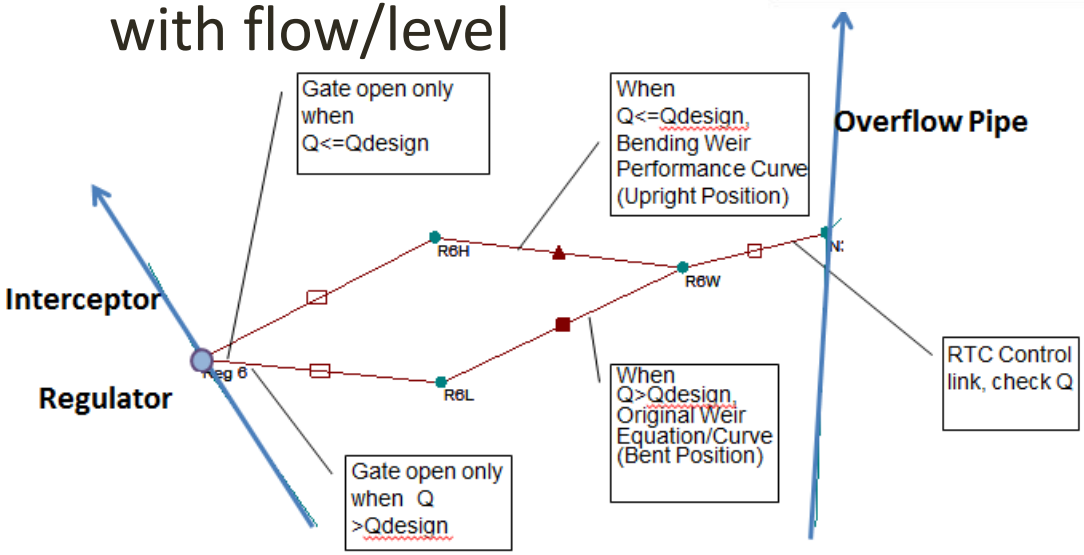
Modeling of CSO Facility



Bending Weirs

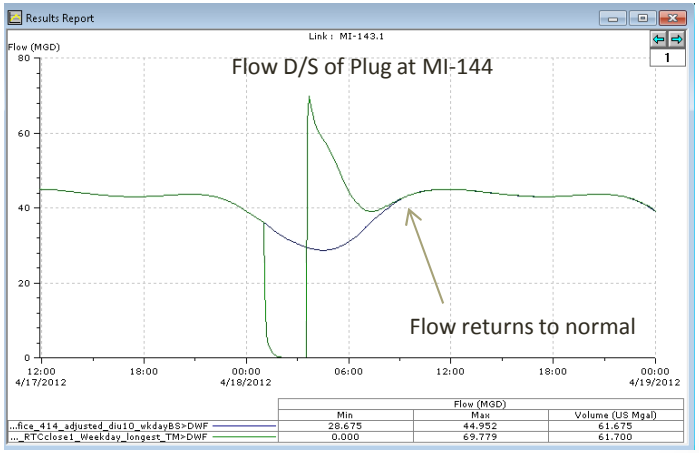
- Weir bends down at high flow condition
- RTC to simulate changes of crest level with flow/level





Inflatable Dam

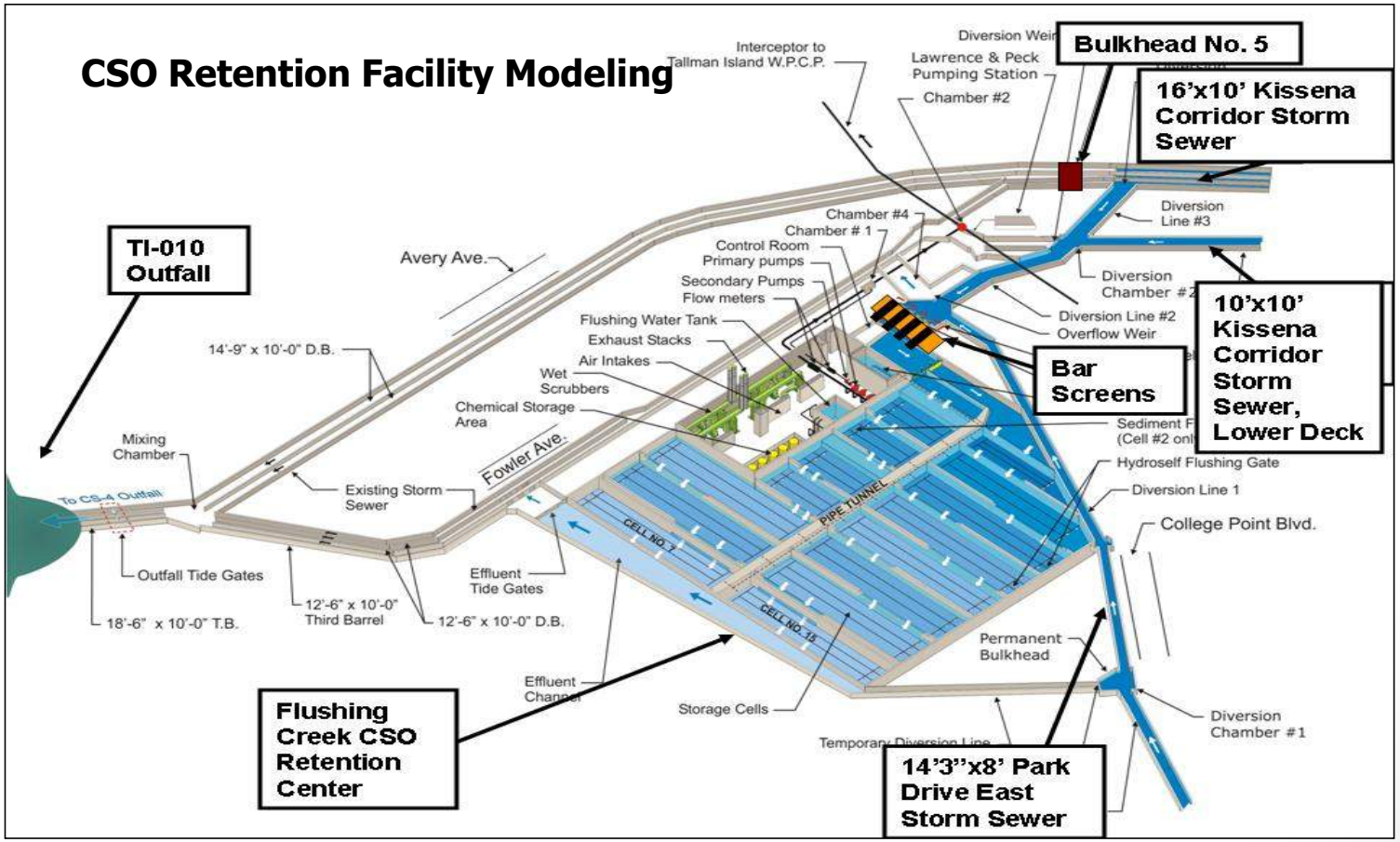
- Dam Inflates/Deflates to block flow
- RTC to simulate changes of crest level of the inflatable dam with time



Next Steps

- Finalize Model
  - Calibration
  - Tidal Conditions
- Identify Alternatives
  - Green Infrastructure
  - Flow Maximization
  - Storage
    - Inline
    - Offline
  - Sewer Separation
  - Treatment
    - Pretreatment
    - Disinfection
    - Ozonation

Modeling of CSO Facility



Questions and Final Discussion

CLEAN WATERWAYS
Healthy Neighborhoods