Bergen County Utilities Authority
Supplemental CSO Team
Meeting Number 10
Development and Evaluation of Alternatives
BCUA Administration Building, Public Meeting Room
September 10, 2019 10:00 – 11:30 pm

Attendees – See attached sign in sheet

Presentation slides attached

Minutes

1. Introductions

2. Safety Minute
   - John presented on Food Safety, see attached presentation.

3. Review of prior meeting
   - John presented recap, see attached presentation.
   - John reminded everyone minutes from prior meetings are posted on the BCUA website.

4. Status of submissions
   - John presented on the status of submissions, see attached presentation.

5. Development and Evaluation of Alternatives Review
   - BCUA – John presented, see attached presentation.
     - It was discussed if "The American Dream" mall construction had already been accounted for in flows that are expected at the BCUA in the coming years and Dominick stated that the mall had been accounted for and approved.
   - Hackensack – Frank presented, see attached presentation.
   - Fort Lee – Gary presented, see attached presentation.
   - Village of Ridgefield Park – John presented, see attached presentation.

6. Public Participation Discussion
   - Planning board meetings were suggested to encourage public participation.
   - The meetings should be through the County to reach a broader group of people who interact with the water. The municipalities will be hosting their own meetings.
   - First meeting needs to leave an impression on the public to motivate public participation in future meetings.
   - DEP should attend town meetings for the public to be able to ask them direct questions.
   - It is important to notify the public of how much each alternative will cost and how this will impact their taxes or sewer bill.

- It was recommended the public meeting not be held until the plan was well formulated to that the public has something substantial to comment on and so they do not lose interest over the course of several meetings.

7. Upcoming Schedule / Next Steps
   - Selection and Implementation of Alternatives Report due June 1, 2020.
   - NJDEP comments are expected late September.
   - Towns meet with their mayors and elected officials to present alternatives.
   - Approval of Municipalities and BCUA by March 2020.
   - Each Municipality will do their own FCA with consistent methodology.

8. Wrap up and open discussion of additional topics.
   - DEP Discussion
     - The question of what happens if one town doesn't submit an acceptable plan, but the others do. How will this affect the other towns? Dominic clarified that these are individual permits for each town, and they shouldn't affect each other but it would be better to ask the DEP directly.
     - Green infrastructure is being strongly encouraged, but it is expensive and requires extensive of maintenance.
     - It was suggested DEP be asked how the costs of MS4s should be included in the financial analysis.
     - Stormwater utilities were suggested as a way to pay for LTCP.
   - Alternatives Final Decision
     - Prior to making a final decision on the alternatives each town should meet with their mayor and elected officials. However, this should only happen when the unknown variables are eliminated. Shouldn't happen too early or too late.
     - What do municipalities need to authorize the Selection of Alternatives report?
     - Meet with the DEP again before officially submitting final decision.
     - Report is due June 1, 2020 but when should everyone be finished? John indicated that this is a topic for the next BCUA Group permitees meeting, the overall anticipated schedule is in the presentation.

9. Next Meeting
   - John will follow up with potential dates for late November or early December but given that it is holiday season the date may need to be rescheduled.

Bergen County Utilities Authority
Supplemental CSO Team
Meeting Number 10
BCUA Administration Building, Public Meeting Room
September 10, 2019 10:00 am

Name	Organization	Email	initials
John Rolak	Mott MacDonald	John.rolak@mottmac.com	
John Dening	Mott MacDonald	John.dening@mottmac.com	
Donna Gregory	Mott MacDonald	Donna.gregory@mottmac.com	
Susan McVeigh	Health Officer, Hackensack	smcveigh@hackensack.org	
Francis Reiner	Senior Urban Designer, LLA-PP	francisr@dmrarchitects.com	
Mark Olson	Ridgefield Park Chairman, Green Team	Mark-olson@verizon.net	
Stephen Quinn	Ridgefield Park Environmental Commission	stephencquinn@aol.com	
Bob Applebaum	Borough of Fort Lee	Bappelbaum@aol.com	
Jan Goldberg	Borough of Fort Lee	j-goldberg@fortleenj.org	
Captain Bill Sheehan	Hackensack Riverkeeper	captain@hackensackriverkeeper.org	
Michelle Langa	Hackensack Riverkeeper, attorney	legal@hackensackriverkeeper.org	
Alan O'Grady	Ridgefield Park	aog560@aol.com	
Del Bove, Mark	Arcadis	Mark.DelBove@arcadis.com	
Dominic DiSalvo	BCUA	ddisalvo@bcua.org	
~~Edward Mignone~~	~~Fort Lee~~	~~E-Mignone@fortleenj.org~~	
Gary Grey	HDR	Gary.Grey@hdrinc.com	
Robert Laux	BCUA	rlaux@BCUA.org	
Frank Belardo	Arcadis	frank.belardo@arcadis.com	

Name	Organization	Email	initials
Susan Banzon	Hackensack	sbanzon@hackensackdpw.org	
Ryan Westra	Hackensack	rwestra@hackensackdpw.org	
Ron Phillips	BCUA	rphillips@bcua.org	
Nancy Kempel	NJDEP	Nancy.kempel@dep.nj.gov	
Jennifer Feltis Cortese	NJDEP	Jennifer.feltis@dep.nj.gov	
Susan Rosenwinkel	NJDEP	Susan.rosenwinkel@dep.nj.gov	
Dwyane Kobesky	NJDEP	Dwyane.kobesky@dep.nj.gov	
Sal Pagano	Fort Lee	Njlas128@aol.com	SP
Mike McAloon	Suburban Consulting	mmcaloon@suburbanconsulting.com	MKM
Ed Howroe	Ridgefield PK		EH
Yingying Wu	HDR	yingying.wu@hdrinc.com.	yw
Diego Rodriguez	Mott MacDonald	Diego.Rodriguez2@MottMac.com	DGR

MOTT MACDONALD

Development and Evaluation of Alternative Controls

BCUA CSO Group Supplemental CSO Team Meeting #10

September 10, 2019

Safety Topic

September is Food Safety Month

Stats

In the U.S.

76,000,000 cases a year

325,000 hospitalized

5,000 deaths

1

Chill

Within 2 hours

40ºF of colder

Thaw in Fridge

2

Clean

Wash hands 20 sec

Cutting boards

Countertops

3

Cook

Check temperature

Stir

Boil – soups, sauces and gravies

4

Separate

Meat

Cutting boards

Shopping Carts

Prevent dripping

http://safetytoolboxtopics.com/

BCUA CSO Group Supplemental CSO Team

Meeting No. 10 Agenda

Refresher – In meeting #9 we covered:

- Submissions Status
- Public Participation Status
- Status of Development and Evaluation of Alternatives
  - BCUA
  - Hackensack
  - Fort Lee
  - Village of Ridgefield Park
- Upcoming Schedule

- Reminder minutes now posted on BCUA Website

BCUA CSO Group Supplemental CSO Team

Meeting No. 10 Agenda

BCUA CSO Group Supplemental CSO Team

Meeting No. 10 Agenda

- Development and Evaluation of Alternatives
  - BCUA
  - Village of Ridgefield Park
  - Fort Lee
  - Hackensack
- Selection and Implementation of Alternatives
- Public Outreach Opportunities
- Upcoming Schedule

BCUA Supplemental CSO Team

DEP review status – July 1, 2018 submittals

- **Consideration of Sensitive Areas Report**: NJ CSO Group report; DEP comment letter dated 9/20/2018; revised report submitted to DEP on 10/19/2018. DEP comment letter dated 3/01/19. **Approved 4/8/19**
- **Baseline Compliance Monitoring Program Report**: NJ CSO Group report; DEP comment latter dated 9/7/2018; revised report submitted to DEP on 10/5/2018. DEP **Approval** letter dated 3/01/19.
- **Public Participation Process Report:** comment letter dated 11/15/2018; revised report submitted1/07/19. **Approved June 26, 2019.**
- **System Characterization Reports**: comment letter dated 12/17/2018, Revised Report submitted 2/15/19. NJDEP **Approval** letter dated 03/05/19

BCUA Supplemental CSO Team

DEP review status – July 1, 2019 submittals

- **Development and Evaluation of Alternatives Report:**
  - **All members submitted on time**
  - **Comments from NJDEP anticipated by end of September**

BCUA CSO Group Supplemental CSO Team

What does the permit say about Development and Evaluation of Alternatives?

The permittee shall evaluate a reasonable range of CSO control alternatives that will meet the water quality-based requirements of the CWA

The Development and Evaluation of Alternatives Report shall include a list of control alternative(s) evaluated for each CSO enabling the permittee, …to select the alternatives to ensure the CSO controls will meet the water quality-based requirements of the CWA

The permittee shall evaluate the practical and technical feasibility of the proposed CSO control alternative(s), and water quality benefits and give the highest priority to controlling CSO discharges to sensitive areas

The permittee shall select either the Demonstration or Presumption Approach

BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report

To be Evaluated by Municipalities

- Green Infrastructure
- Increased Storage Capacity
- Infiltration and Inflow Reduction
- Sewer Separation
- Satellite Treatment of CSO Discharge

To be Evaluated by BCUA

- Increased Storage Capacity
- Bypass of Secondary Treatment at STP
- Treatment Plant Expansion

MOTT MACDONALD

BCUA Update Development and Evaluation of Alternative Controls

BCUA CSO Group Supplemental CSO Team
Meeting #10

September 10, 2019

BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report

Future Conditions

Data Source	Conservative Projected Population 2050 (people)	Average Projected Population 2050 (people)
NJTPA	650,660	650,660
US Census Projection	659,880	659,880
NJ Department of Labor	745,480	
BCUA WMP Extended Projections	676,430	676,430
Average	**683,110**	**662,320**

New Wastewater Source	Projected Flow Increases to Little Ferry WPCF (MGD)
2050 Population Growth (114,240 people@65 gpcpd)	7.1
Edgewater WPCF	4.0
American Dream Complex	0.9
Total	**12.0**

BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report

Significant Indirect Users

No Significant Impact

CSO Basin 006, Ridgefield Park	Overflow statistics for typical year, 2015 Baseline
Number of overflows	12
Annual volume (MG)	0.5
Annual duration (hrs.)	39
Average flow rate (MGD)	0.31

CSO Basin 002A Court Street Hackensack	Overflow statistics for typical year, 2015 Baseline
Number of overflows	76
Annual volume (MG)	151.5
Annual duration (hrs.)	456 (76 overflow days, assumed 6 hrs. per day)
Average flow rate (MGD)	7.97

BCUA CSO Group Supplemental CSO Team

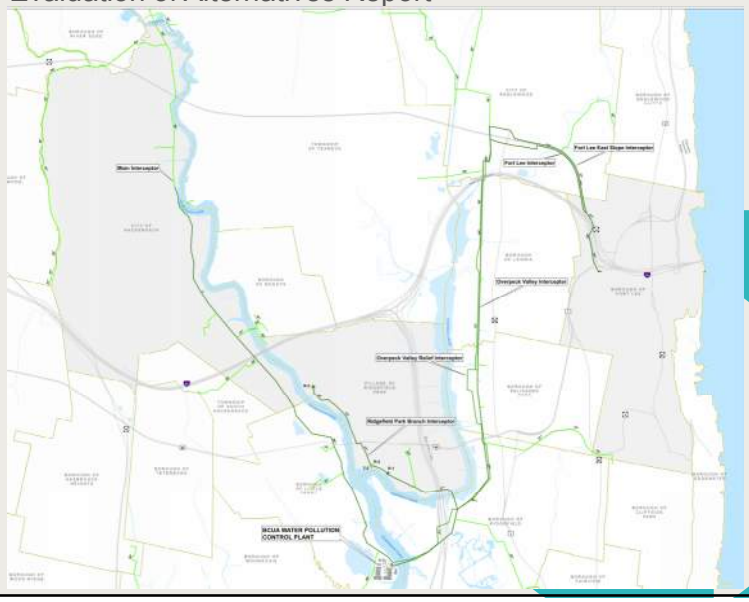
Development and Evaluation of Alternatives Report

BCUA Facilities

- Transport
- Treatment

BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report

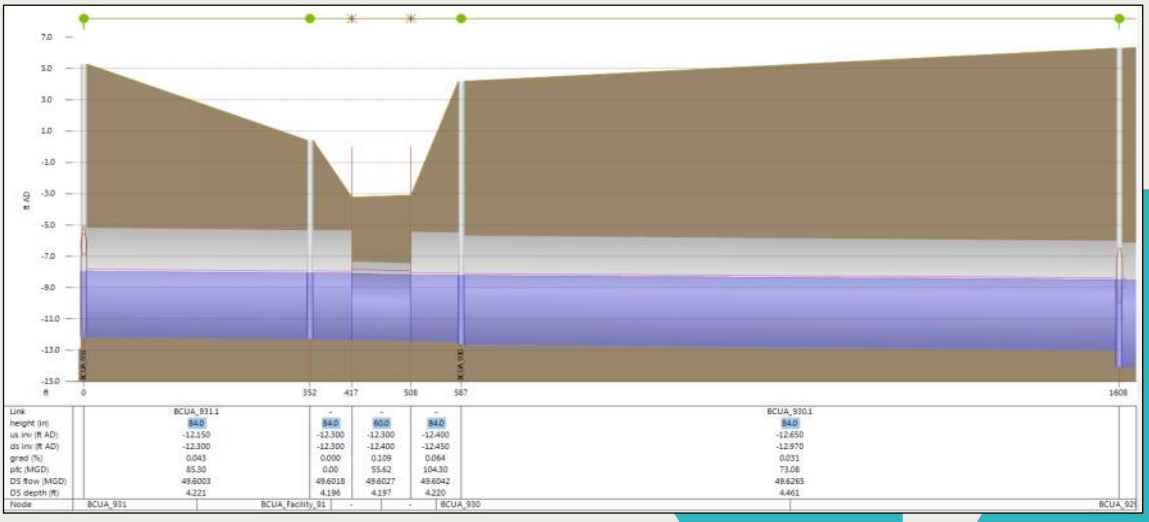


BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report – Typical Year Capacity

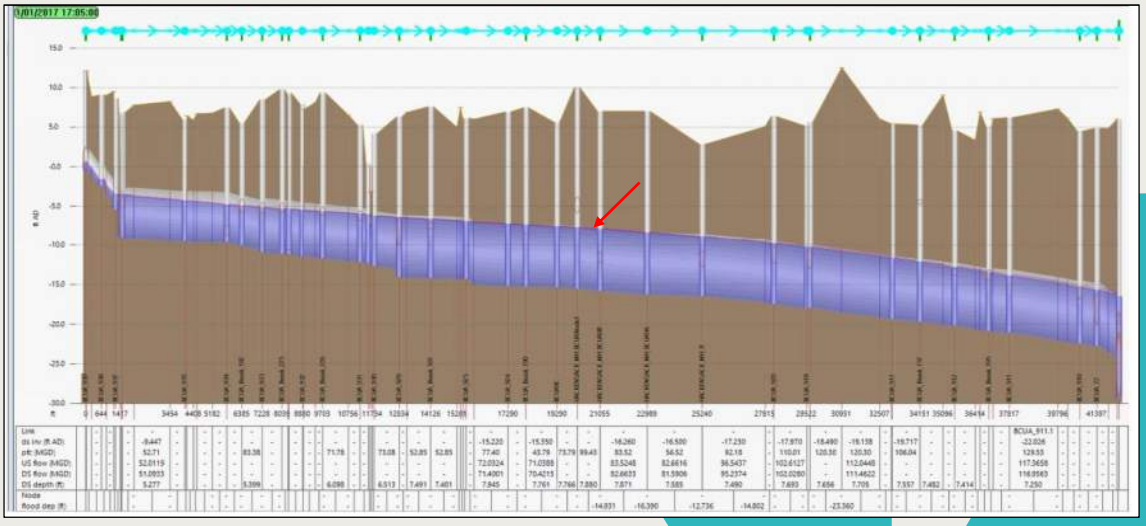
BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report – Typical Year Capacity



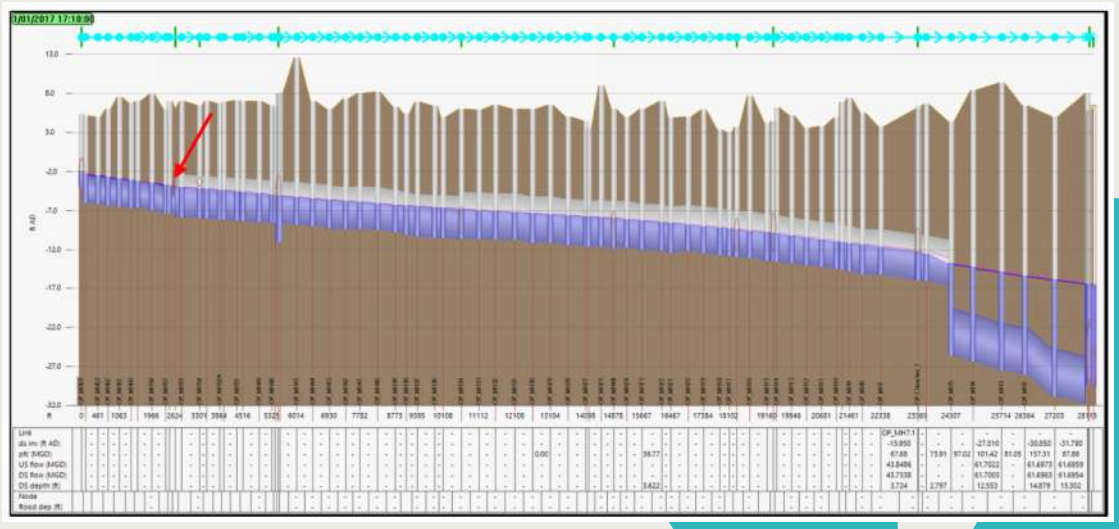
BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report – Design Storm



BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report – Low Connections



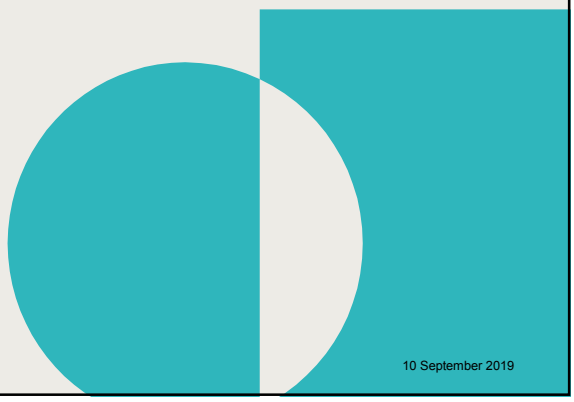
BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report

InfoWorks ICM Model was Used to Estimate Sewer Flow Capacity near WPCF:

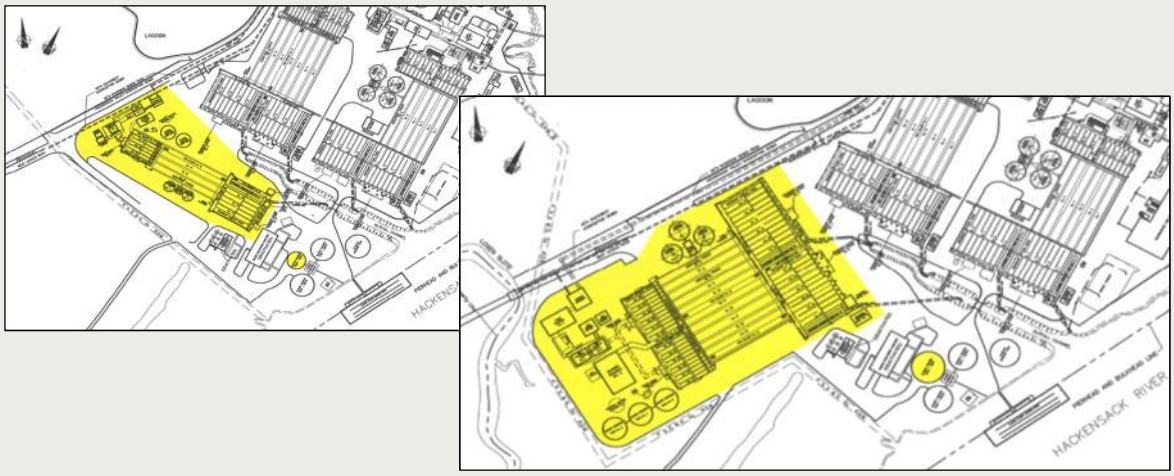
Trunk Sewer	Estimated Max Flow (mgd)*
Main Trunk Sewer	130
Overpeck Trunk & Relief Sewers	80
Total Max Peak Flow to WPCF	210

* Based on average wet well elevations and no system surcharge.



BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report



Control Program 1: Expand Plant Capacity

BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report

Plant Capacity Expansion	Total Plant Wet Weather Capacity	Capital Costs	O&M Costs	O&M Present Worth (20-year)	Total Present Worth (20-year)
29 MGD	149 MGD	$192,000,000	$7,400,000	$113,000,000	$305,000,000
58 MGD	178 MGD	$286,000,000	$11,000,000	$167,000,000	$453,000,000
86 MGD	206 MGD	$373,000,000	$14,400,000	$219,000,000	$592,000,000
115 MGD	235 MGD	$462,000,000	$17,800,000	$271,000,000	$733,000,000

Control Program 1: Expand Plant Capacity

BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report

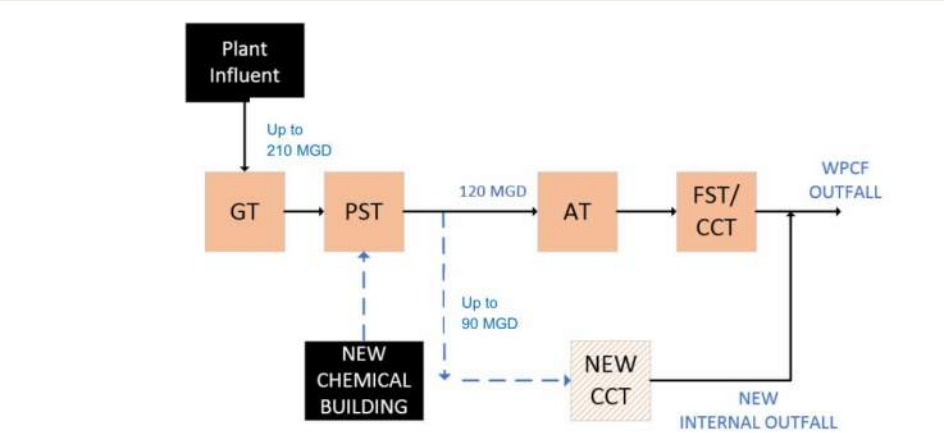


Figure 6. CEPT Alternative Block Flow Diagram

Control Program 2: Wet Weather Blending

Chemically Enhanced High Rate Treatment

BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report

Blended Flow and Technology	Total Wet Weather Treatment Capacity	Capital Costs	O&M Costs	O&M Present Worth (20-year)	Total Present Worth (20-year)
90 MGD CEPT	210 MGD	$64,500,000	$850,000	$12,900,000	$77,700,000
90 MGD BF	210 MGD	$111,500,000	$1,220,000	$18,600,000	$129,800,000
180 MGD CEPT	300 MGD	$90,200,000	$850,000	$12,900,000	$103,300,000
180 MGD BF	300 MGD	$161,100,000	$1,220,000	$18,600,000	$179,300,000

Control Program 2: Wet Weather Blending

BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report

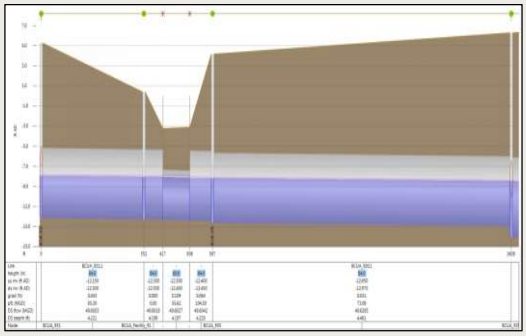
Treatment Rate [5-min] (MGD)	Required Storage Volume (MG)
120	40
140	7.9
160	0.5
180	0

Tank Size	Capital Costs	O&M Costs	O&M Present Worth (20-year)	Total Present Worth (20-year)
40 MG	$217,000,000	$3,800,000	$58,000,000	$269,000,000
7.9 MG	$56,000,000	$1,200,000	$18,000,000	$72,000,000
0.5 MG	$9,000,000	$430,000	$6,500,000	$15,500,000

Control Program 3: Regional Storage

BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report



Interceptor	Storage volume at max depth (MG)	Storage volume at max depth +2 ft (MG)
Hackensack Trunk Sewer	2.8	0.2
Overpeck Trunk Sewer	2.5	0.7
Overpeck Relief Sewer	1.8	0.4
Total	6.1	1.3

Control Program 4: Inline Storage

City of Hackensack

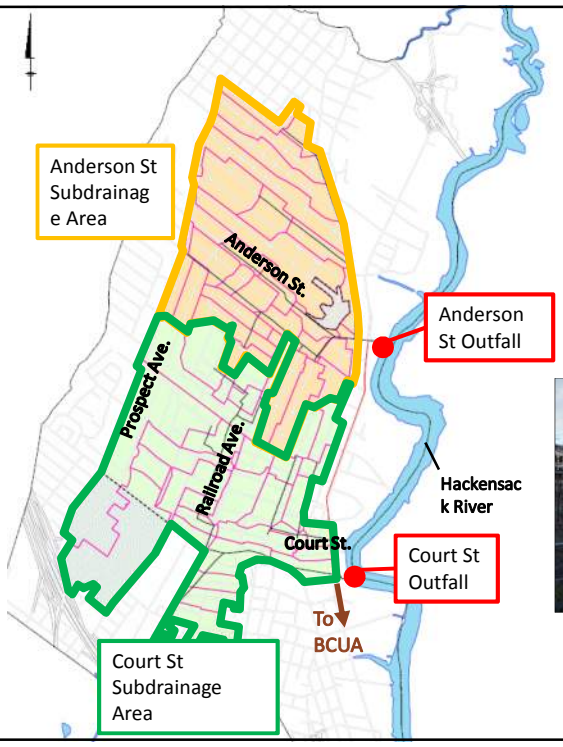
COMBINED SEWER SYSTEM LONG TERM CONTROL PLAN

DEVELOPMENT AND EVALUATION OF ALTERNATIVES SUMMARY RESULTS

SEPTEMBER 10, 2019

Agenda

- Overview of Hackensack's Combined Sewer System (CSS)
- Overview of the Combined Sewer System Long Term Control Plan (LTCP) Goals
- Combined Sewer Overflow (CSO) Control Alternatives
- Public Participation
- Next Steps



Overview of Hackensack Combined Sewer System

- ~31 miles of combined sewers
- ~50% of Hackensack's population served by combined sewer system
- Screening facilities

Long Term Control Plan (LTCP) Goals

- Reduce CSO to obtain water quality compliance with public input
- Two approaches:
  - **Presumption Approach:** 85% Capture of CSO discharge or reduce number of CSOs to 4-6 per year
  - **Demonstration Approach:** Demonstrate water quality compliance

CSO Control Alternatives

- Green Infrastructure
  - Bioswales/Raingardens
  - Permeable Pavement
- Sewer Separation
- Infiltration/Inflow Control
- Treatment of CSO discharge
- Storage
  - Tank(s)
  - Tunnel
  - In-line

Development and Evaluation of Alternatives

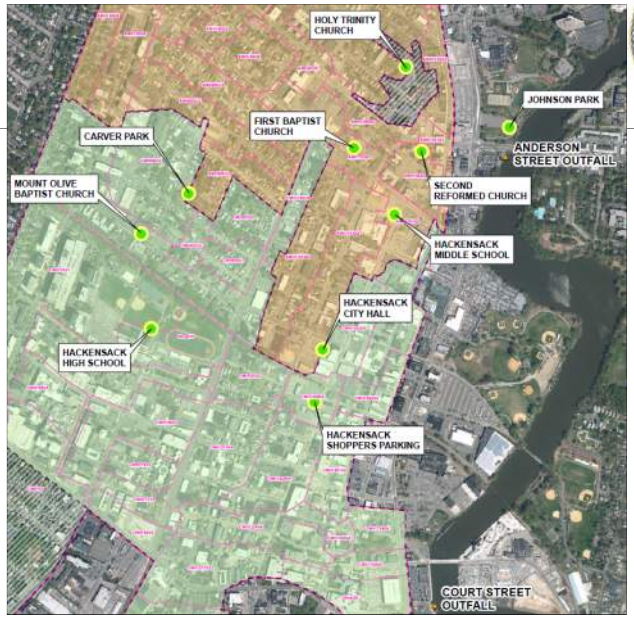
Green infrastructure (GI) – stores, absorbs, and uses storm water runoff

- Positives – lower capital cost, can assist in reducing flooding, streetscape
- Negatives – higher maintenance cost, site specific, low impact on CSOs

Bioswale

Rain Garden

Possible GI Location Map



Development and Evaluation of Alternatives

Green infrastructure (GI) Results Summary:

Name of Alternative	Percent of Capture	No. of Overflows	Reduction of Overflow Volume from Baseline (%)	Estimated Cost ($M)	Key Constraints
Baseline conditions for 2004	68%	56	N/A	-	-
GI - 5% Impervious Area	70%	51	13.0%	$32M	Does not reach performance & water quality goals, number of overflows not reduced.
GI - 10% Impervious Area	70%	51	14.8%	$43M	Does not reach performance & water quality goals, number of overflows not reduced.

Development and Evaluation of Alternatives

Sewer separation – two separate sanitary and stormwater systems

- Positives – improves water quality, reduces or eliminates untreated sanitary discharge, reduces flooding in basements and streets
- Negatives – high cost, extensive construction, internal plumbing work

Alternative prescreening – City wide cost

- Estimated cost $560M
  - Cost Source: Updated 2007 Cost
- Includes new storm sewers in the CSS

s Report

Development and Evaluation of Alternatives

End of pipe treatment – pretreatment and discharge disinfection

- Positives – smaller footprint, chlorine widely used in wastewater treatment
- Negatives – disinfection relies on the TSS concentration, limited use in the US for CSOs, potentially produce toxic byproducts
- City of Hackensack currently has screening facilities at both outfalls

Alternative prescreening – still under consideration

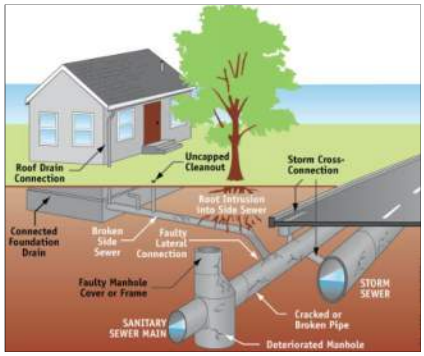
- Potential lower cost for disinfection alone
  - Unsure if disinfection alone will satisfy water quality requirements

Name of Alternative	Estimated Cost ($M)	Key Constraints
Disinfection	$16M	Uncertain if this alternative satisfies water quality goals, number of overflows not reduced, no pretreatment.
Pretreatment & Disinfection	$50M	Extent of pretreatment is unknown, uncertain if this alternative satisfies water quality goals, number of overflows not reduced.

Development and Evaluation of Alternatives

Infiltration/Inflow (I/I) Control

- Positives – improves water quality, reduces combined sewer volume
- Negatives – high cost, possible disruption in services, extensive construction



Development and Evaluation of Alternatives

Infiltration/Inflow (I/I) Results Summary:

Name of Alternative	Percent of Capture	No. of Overflows per Year	Reduction of Overflow Volume from Baseline (%)	Estimated Cost ($M)	Key Constraints
Baseline conditions for 2004	68%	56	N/A	-	-
Removal of Inflow and Infiltration (I&I)*	68%	56	0.1%	$11M	Does not reach performance and water quality goals, number of overflows not reduced.

***Removal of I/I based on 2015 Combined Sewer System Condition Assessment completed by Arcadis**

Development and Evaluation of Alternatives

Storage alternatives– temporarily store combined sewer flow and pump back slowly to the treatment plant after rain event

- In-line storage – not feasible because there is no additional capacity to store combined flow in the current sewer system
- Off-line storage – underground storage tanks near the outfalls or a tunnel
  - Positives – eliminates or reduces overflow discharges, reduces sewer backups, improves the efficiency of existing treatment capacity
  - Negatives – lack of real estate, high cost

Storage Tunnel from Anderson to Court

Development and Evaluation of Alternatives

Storage Tunnel from Anderson to Court Results Summary:

Name of Alternative	Percent of Capture	No. of Overflows	Reduction of Overflow Volume from Baseline (%)	Estimated Cost ($M)	Key Constraints
Baseline conditions for 2004	68%	56	N/A	-	-
Tunnel Storage - 18ft Diameter	96%	4	89.6%	$97M	Constructability of a deep tunnel has risks, high cost.
Tunnel Storage - 17ft Diameter	95%	8	87.2%	$94M	Constructability of a deep tunnel has risks, high cost.
Tunnel Storage - 14ft Diameter	93%	12	79.7%	$85M	Constructability of a deep tunnel has risks, high cost.
Tunnel Storage - 10.5ft Diameter	86%	20	60.9%	$74M	Constructability of a deep tunnel has risks, high cost.

Storage Prescreening Alternative – 2 Underground Storage Tanks (100-foot deep) near Court and Anderson Outfalls

Development and Evaluation of Alternatives

Storage Prescreening Alternative – 2 Underground Storage Tanks (100-foot deep) near Court and Anderson Outfalls Results Summary:

Name of Alternative	Percent of Capture	No. of Overflows	Reduction of Overflow Volume from Baseline (%)	Estimated Cost ($M)	Key Constraints
Baseline condltions for 2004	68%	56	N/A	-	-
Two tanks, 115ft dia.	98%	4	93.0%	$140M	Siting issues for tank locations, high cost.
Two tanks, 105ft dia.	96%	8	89.7%	$123M	Siting issues for tank locations, high cost.
Two tanks, 87ft dia.	94%	12	81.6%	$98M	Siting issues for tank locations, high cost.
Two tanks, 73ft dia.	89%	20	66.9%	$79M	Siting issues for tank locations, high cost.
Two tanks, 60ft dia., (85% Capture)	85%	25	52.7%	$66M	Siting issues for tank locations, high cost.

ARCADIS Design & Consultancy for natural and built assets

43

Dearborn, Michigan: http://www.we-technologies.com/wastewater-projects.php

44

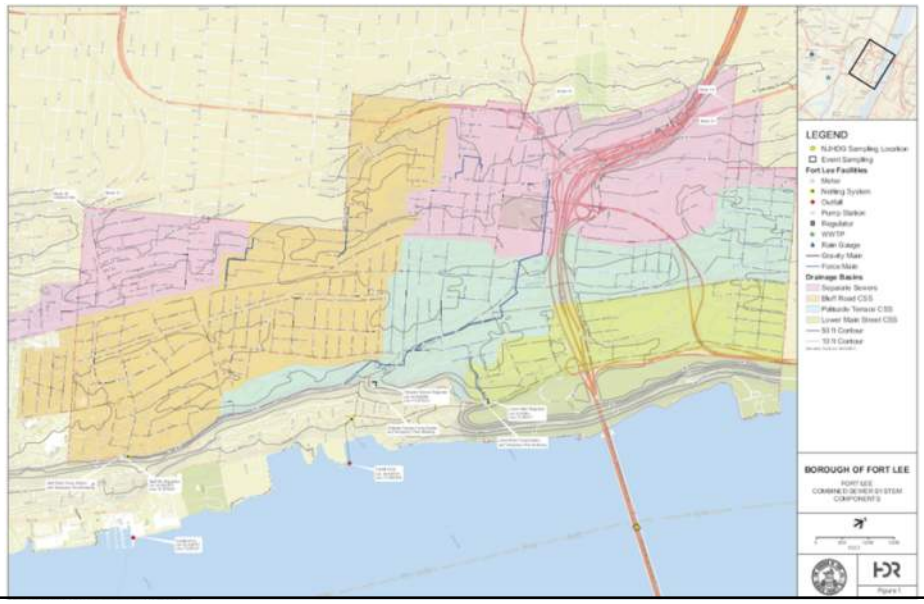
Public Participation

- Educate residents and businesses about the combined sewer system
- Inform residents/businesses about future projects and costs
- Incorporate public feedback into the selection of alternatives
- How?
  - Surveys – posted to the City's website
  - Public meetings – presented to Council, Public and Committee of the Whole (COW) on June 11, 2019. Will schedule additional presentations.
  - Invite interested residents to join Public Participation Team

Next Steps

- Next Steps
  - Continue and expand public participation efforts and schedule additional meetings
  - 2019-2020 selection of LTCP program alternatives for CSO control
- Questions?
  - Website: www.hackensack.org/cso
  - Email: csoteam@hackensackdpw.org

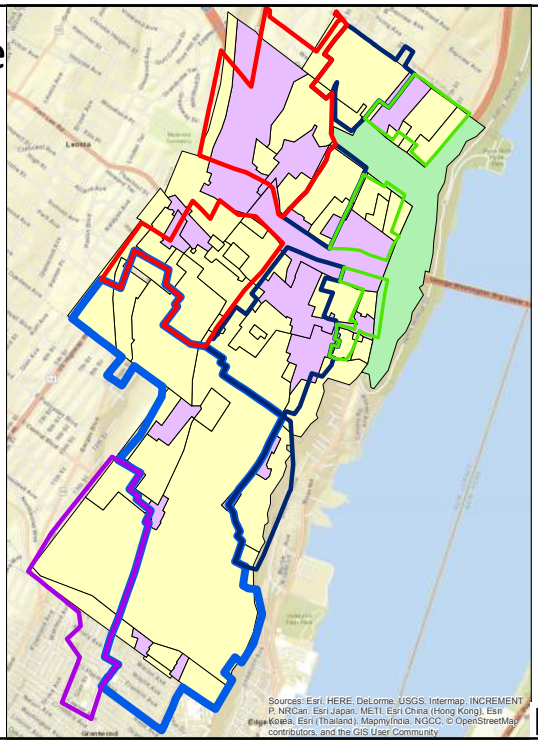
Fort Lee - NJPDES Permit No. NJ0034517
Development of Alternatives



2007 Land Use Type and Drainage Area

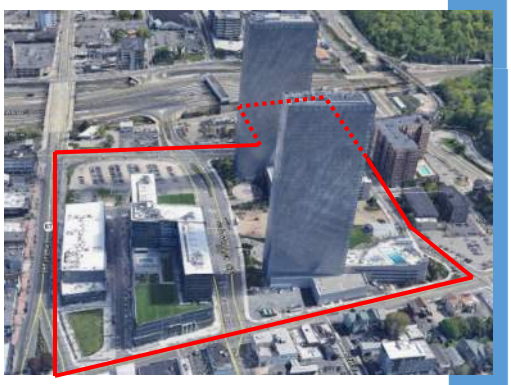
Regulator
- BCUA-1
- BCUA-2
- Bluff Rd
- Lower Main
- Palisades

Land Use
- Residential
- Commercial
- Park



Model Improvements Since 2007 Hudson Lights (~16 acres)
Lower Main Drainage Area

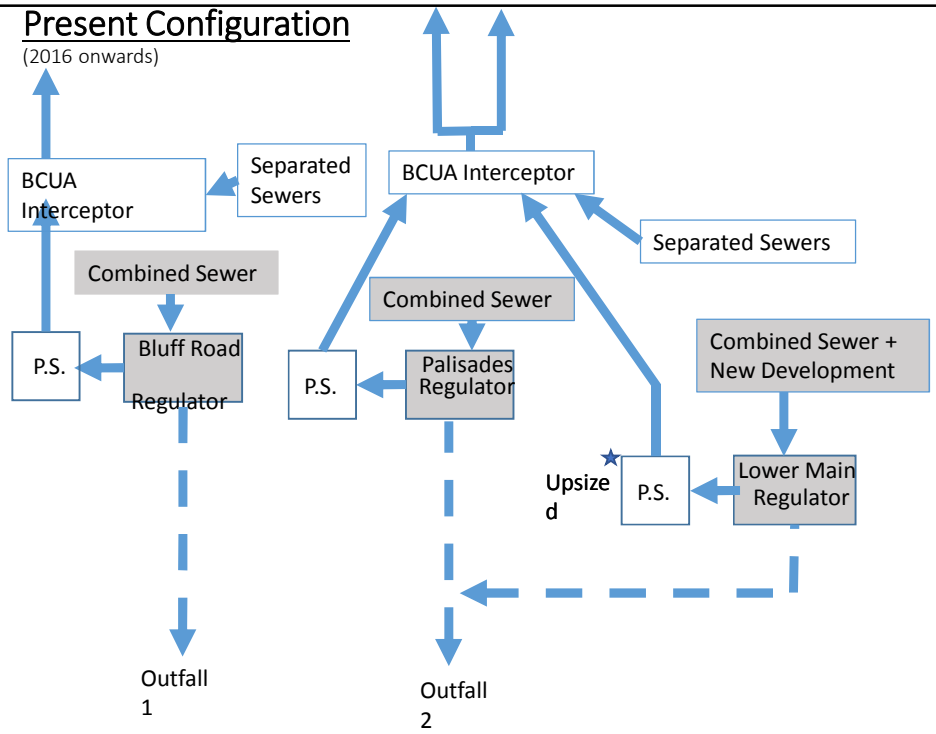
2012



2019

Present Configuration

(2016 onwards)

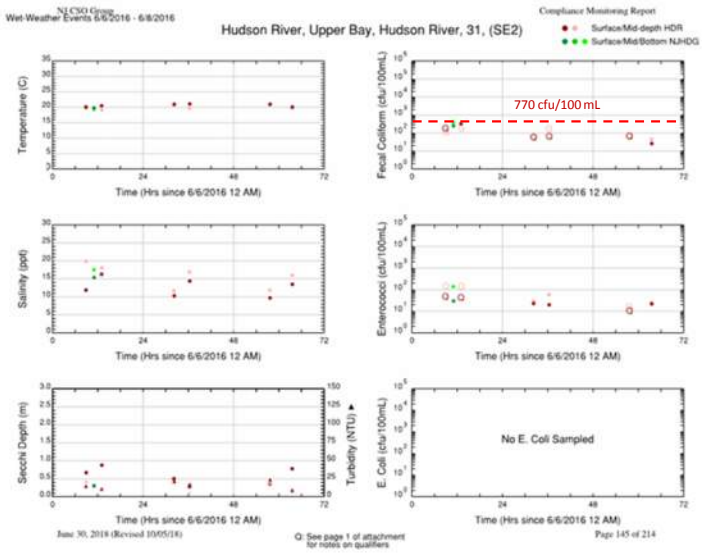


Projected Overflows for 2004 Typical Year

Condition	Outfall 001 (Bluff Road)		Outfall 002 (Palisade Terrace)	
	Overflows	Volume	Overflows	Volume
2004 before redirection of Lower Main	60	77.20	38	11.73
2004 after redirection of Lower Main	60	77.20	22	4.17

CSO capture after redirection of flow is 84.7%

Water Quality Sampling Results



No water quality impairment. The Hudson River meets current SE2 Criteria

Fort Lee Almost Meets the CSO Policy

"A program that meets any of the criteria listed below would be presumed to provide an adequate level of control ……. provided the permitting authority determines that such presumption is reasonable ……"

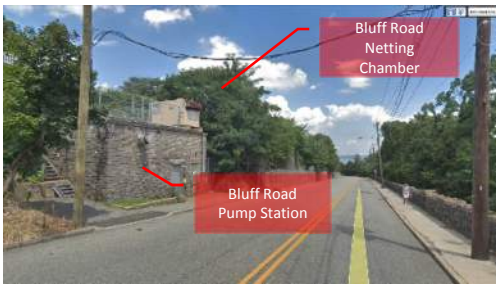
i. No more than an average of four overflow events per year...

ii. 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 on a system-wide annual average basis...

iii. The elimination or removal of no less than the **mass of pollutants, identified as causing water quality impairment**..., for the volumes that would be eliminated or captured for treatment under paragraph ii... " (Section II.C.4.a.)

Bluff Road

Bluff Road netting facility is on the boarder of Ft Lee and Edgewater on the Palisades. Access is from Claremont Road on Manatauck Avenue.



Gray Infrastructure - Storage Tank Control

Table 7-3. Storage Tank Size (MG) at Each Level of Control

CSO Event Target/yr	FL-001	FL-002
0	12.5	1.2
4	4.6	0.4
8	4.1	0.3
12	3.1	0.1
20	2.0	0.0

Table 7-4. Overflow Volumes and Events with Storage Tank Alternative

CSO Event Target/yr	CSO Volume (MG)				CSO Events			
	FL-001	FL-002	Total	Reduction	FL-001	FL-002	Total	Reduction
Baseline	82.5	4.7	87.2		58	20	60	
0	0.0	0.0	0.0	100%	0	0	0	100%
4	8.6	1.0	9.6	89%	4	3	4	93%
8	11.1	1.8	13.0	85%	8	6	8	87%
12	20.0	2.9	23.0	74%	12	11	12	80%
20	34.0	4.7	38.7	56%	20	20	20	67%

Gray Infrastructure - Treatment Control

(Solids Removal and Disinfection)

Table 7-5. CSO Peak Flow Rates (MGD) at Each Level of Control

CSO Event Target/yr	FL-001	FL-002
0	100.8	9.8
4	85.3	7.8
8	55.4	3.3
12	42.6	3.2
20	32.3	1.0

Table 7-6. Partially Treated CSO Volumes (MG) at Each Control Target

CSO Event Target/yr	FL-001	FL-002	Total	Volume Reduction
Baseline	82.5	4.7	87.2	
0	0.0	0.0	0.0	100%
4	3.6	0.3	3.9	96%
8	11.3	2.1	13.4	85%
12	15.8	2.1	18.0	79%
20	20.2	4.0	24.2	72%

Cost of Gray Infrastructure Controls

Table 7-7. Total Capital Cost, Total 20-yr O&M Cost, Raw and PTPC as 20-yr Present Value

	PAA Only	PAA w/ FlexFilter	Tanks
0 CSOs per year			
Raw Capital Cost ($M)	$ 1.35	$ 28.95	$ 50.64
20 yr PV O&M Cost ($M)	$ 3.90	$ 5.75	$ 30.29
Total 20 yr PV Cost ($M)	$ 5.25	$ 34.71	$ 80.94
Probable Total 20 yr PV Cost ($M)	$ 7.27	$ 78.14	$ 156.90
4 CSOs per year			
Capital Cost ($M)	$ 1.27	$ 24.67	$ 22.60
20 yr PV O&M Cost ($M)	$ 3.40	$ 5.01	$ 17.48
Total 20 yr PV Cost ($M)	$ 4.67	$ 29.68	$ 40.07
Probable Total 20 yr PV Cost ($M)	$ 6.58	$ 66.68	$ 73.97
8 CSOs per year			
Capital Cost ($M)	$ 1.07	$ 16.16	$ 20.11
20 yr PV O&M Cost ($M)	$ 2.38	$ 3.48	$ 16.34
Total 20 yr PV Cost ($M)	$ 3.45	$ 19.63	$ 36.45
Probable Total 20 yr PV Cost ($M)	$ 5.05	$ 43.87	$ 66.61
12 CSOs per year			
Capital Cost ($M)	$ 1.00	$ 12.97	$ 16.31
20 yr PV O&M Cost ($M)	$ 1.99	$ 2.89	$ 14.61
Total 20 yr PV Cost ($M)	$ 2.99	$ 15.85	$ 30.91
Probable Total 20 yr PV Cost ($M)	$ 4.50	$ 35.30	$ 55.37
20 CSOs per year			
Capital Cost ($M)	$ 0.85	$ 9.75	$ 11.25
20 yr PV O&M Cost ($M)	$ 1.60	$ 2.29	$ 8.72
Total 20 yr PV Cost ($M)	$ 2.44	$ 12.04	$ 19.97
Probable Total 20 yr PV Cost ($M)	$ 3.72	$ 26.66	$ 36.85

There is a significant cost associated with providing solids removal for disinfection. Disinfection will be piloted with and without solids removal.

Green Infrastructure Controls - 5% and 10% of Impervious Area

Table 7-2. Overflow Volumes and Frequencies with GI Alternative

	GI Alternative							
	Baseline		5% GI-Bluff Road			10% GI-Bluff Road		
Outfall	CSO Volume	CSO Events	CSO Volume	CSO Events	Volume Reduction	CSO Volume (MG)	CSO Events	Volume Reduction
FL-001	82.5	58	79.8	57	3%	77.0	58	7%

Cost of Green Infrastructure Controls

Table 7-8. Cost Summary for Green Infrastructure to Control 5% and 10% of Impervious Cover

	Green Infrastructure Type	Capital Cost Min PTPC ($M)	Capital Cost Max PTPC ($M)	20-Yr O&M Cost as PV ($M)	Min PTPC 20-Yr Life Cycle Cost as PV ($M)	Max PTPC 20-Yr Life Cycle Cost as PV ($M)
5% GI (~6.5 Acres)	Rain Garden	$ 1.58	$ 5.01	$ 0.80	$ 2.38	$ 5.81
	Right-of-Way Bioswale	$ 2.46	$ 8.21	$ 0.80	$ 3.26	$ 9.01
	Green Roof	$ 7.88	$ 40.08	$ 0.80	$ 8.68	$ 40.88
	Porous Asphalt	$ 4.27	$ 8.95	$ 0.13	$ 4.40	$ 9.08
	Pervious concrete	$ 5.01	$ 10.02	$ 0.13	$ 5.13	$ 10.14
	Permeable Interlocking Concrete Pavers	$ 2.14	$ 6.08	$ 0.13	$ 2.26	$ 6.20
10% GI (~13 Acres)	Rain Garden	$ 3.15	$ 10.02	$ 1.60	$ 4.75	$ 11.62
	Right-of-Way Bioswale	$ 4.93	$ 16.43	$ 1.60	$ 6.53	$ 18.03
	Green Roof	$ 15.77	$ 80.16	$ 1.60	$ 17.37	$ 81.76
	Porous Asphalt	$ 8.54	$ 17.90	$ 0.25	$ 8.79	$ 18.15
	Pervious concrete	$ 10.02	$ 20.04	$ 0.25	$ 10.27	$ 20.29
	Permeable Interlocking Concrete Pavers	$ 4.27	$ 12.16	$ 0.25	$ 4.52	$ 12.41

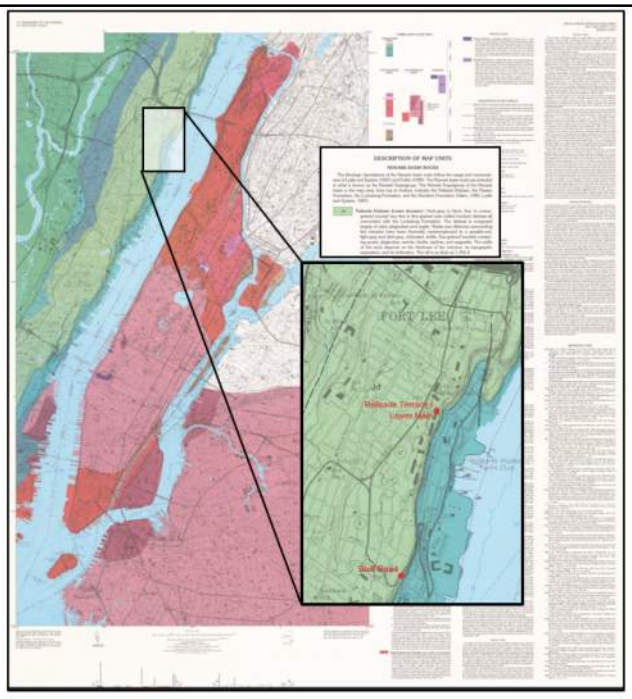
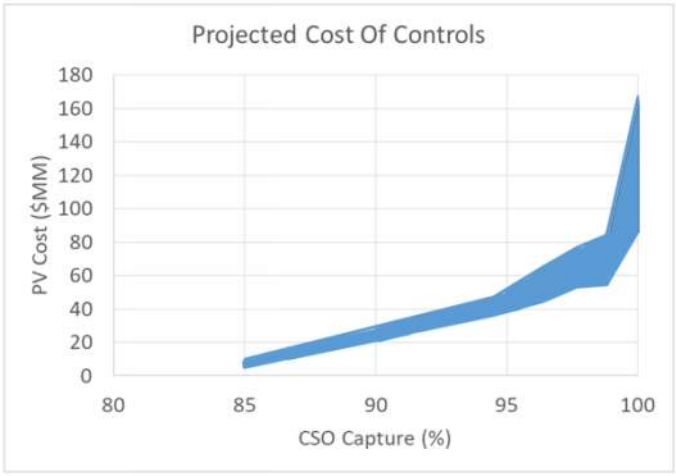


Figure 6-3. Bedrock Map of New York and Parts of Kings and Queens Counties, New York and Bergen and Hudson Counties, New Jersey

Ft Lee is underlain by Palisade bedrock which will impede recharge.

Cost Range of CSO Controls



Questions to be answered:

- Is 84.7% CSO control enough considering we are currently meeting SE2 water quality criteria?
- How will water quality criteria change?
- Can GI get us to 85+% CSO control at a reasonable cost?
- If we have to do more than 85% CSO control should we pilot test disinfection with and without solids removal?
- If we want to use tanks where can we site them and how much more will sewage disposal cost?

Gary Grey
HDR Inc.
gary.grey@hdrinc.com

Yingying Wu
HDR Inc.
yingying.wu@hdrinc.com

Outfall Summary – 1988 Typical Year

NJPDES	Month	Number of CSO Events	Average CSO Duration (Hours)	Average CSO Volume (MG)	Total CSO Volume (MG)
FL-001	1	5	8.42	0.85	4.26
FL-001	2	5	8.03	1.31	6.54
FL-001	3	3	8.58	1.37	4.11
FL-001	4	4	3.65	0.75	3.00
FL-001	5	7	7.62	1.38	9.66
FL-001	6	3	4.08	0.83	2.50
FL-001	7	10	4.90	1.51	15.08
FL-001	8	4	2.65	1.11	4.44
FL-001	9	2	7.63	3.29	6.58
FL-001	10	3	7.83	2.34	7.02
FL-001	11	6	12.30	2.21	13.25
FL-001	12	4	3.11	0.31	1.22
Total		**56**			**77.76**

NJPDES	Month	Number of CSO Events	Average CSO Duration (Hours)	Average CSO Volume (MG)	Total CSO Volume (MG)
FL-002	1	4	11.50	0.08	0.32
FL-002	2	4	7.86	0.18	0.73
FL-002	3	2	16.80	0.19	0.38
FL-002	4	2	7.58	0.11	0.23
FL-002	5	6	12.00	0.23	1.38
FL-002	6	3	3.23	0.04	0.13
FL-002	7	6	19.10	0.37	2.22
FL-002	8	1	31.30	0.56	0.56
FL-002	9	2	11.00	0.51	1.01
FL-002	10	3	11.10	0.30	0.89
FL-002	11	6	13.20	0.29	1.72
FL-002	12	1	0.75	0.00	0.00
Total		**40**			**9.57**

Condition	Outfall 001 (Bluff Road)		Outfall 002 (Palisade Terrace)	
	Overflows	Volume	Overflows	Volume
2004 before redirection of Lower Main	60	77.20	38	11.73
2004 after redirection of Lower Main	60	77.20	22	4.17

Outfall Summary – Typical Year 2004

Outfall	001 Bluff Road		002 Lower Main/Palisade	
Month	Number of Overflows	Overflow Volume (MG)	Number of Overflows	Overflow Volume (MG)
January	3	0.91	0	0.00
Febuary	2	4.58	2	0.11
March	5	1.24	0	0.00
April	5	6.91	4	0.01
May	10	7.14	3	0.24
June	6	3.96	1	0.30
July	7	17.10	5	0.94
August	6	5.93	2	0.14
September	6	19.42	3	2.09
October	1	0.28	0	0.00
November	5	6.03	2	0.35
December	4	3.71	0	0.00
Total	**60**	**77.20**	**22**	**4.19**

BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report

Village of Ridgefield Park

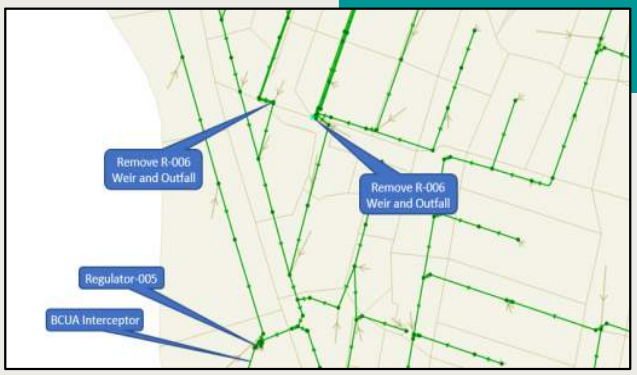
Alternatives Analysis

Alternatives Evaluation

Control Program 1 - Elimination of Outfall 006A

Small overflow volume at 006A

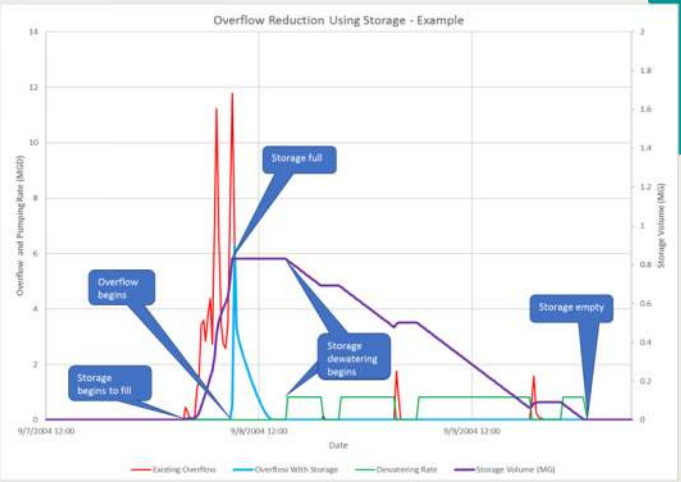
- Feasible to combine 005A and 006A to reduce burden on other alternatives
- Model shows additional upgrades required to the system if 006A is eliminated
- No water quality benefit to elimination, but extra costs



Alternatives Evaluation

Storage – Tanks and Tunnels

Temporary storage tunnels and tanks reduce and delay overflows



69

Alternatives Evaluation

Control Program 2 - Consolidated Tank Storage

Tanks retain overflows and return them to sewer and WWTP

Consists of:

- Diversion structures with fine screens;
- Consolidation piping
- An offline below grade tank equipped with a flushing system and odor control;
- Tank overflow to an outfall;
- Dewatering pumping station; and
- Discharge connection back to the interceptor.

- 2 Consolidated Tanks for 001A & 002A and 003A-006A
- Consolidation - pros and cons to individual outfall storage
- Largest Project issues come with large-scale construction in an urban area

70

Alternatives Evaluation

Control Program 2 - Consolidated Tank Storage Contd.

71

Alternatives Evaluation

Control Program 3 - Consolidated Tunnel Storage

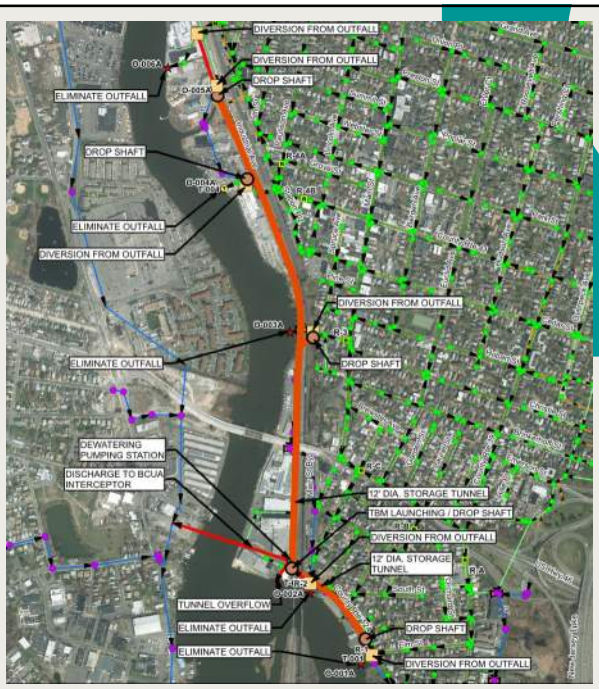
All outfalls will be consolidated into one, central tunnel

- Results in only one outfall near current 002A
- Consists of:
  - Consolidation piping from Outfall 006A
  - Diversion piping from each outfall
  - Control Gates
  - Drop shafts along Industrial Avenue and at intersection of 2nd Avenue, and Bergen Turnpike.
  - Deaeration chambers
  - A dewatering pumping station
  - Grit and screening facilities
  - Force main connection back to the BCUA Main Trunk Sewer.
  - A tunnel overflow with tide gate
- Issues are typical with large-scale urban construction, though tunnels introduce further complications
  - Mining and construction across the entire route as well complexity in tunnel management

72

Alternatives Evaluation

Control Program 3 – Consolidated Tunnel Storage Contd.



Consolidated Tunnel Map

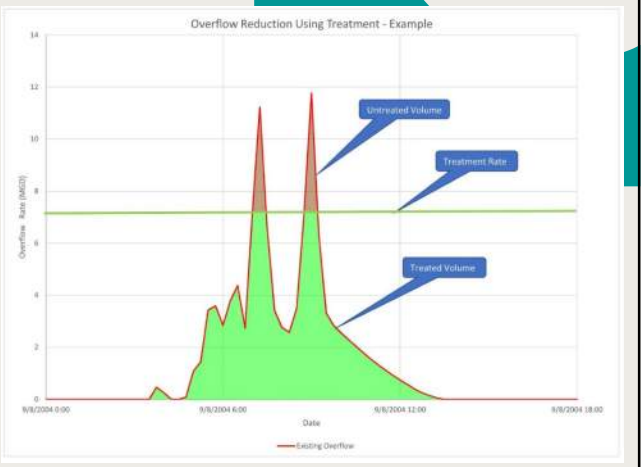
73

Alternatives Evaluation

Control Program 4 - Consolidated End of Pipe Treatment

Similar to EOP storage, but overflow is not returned to interceptor

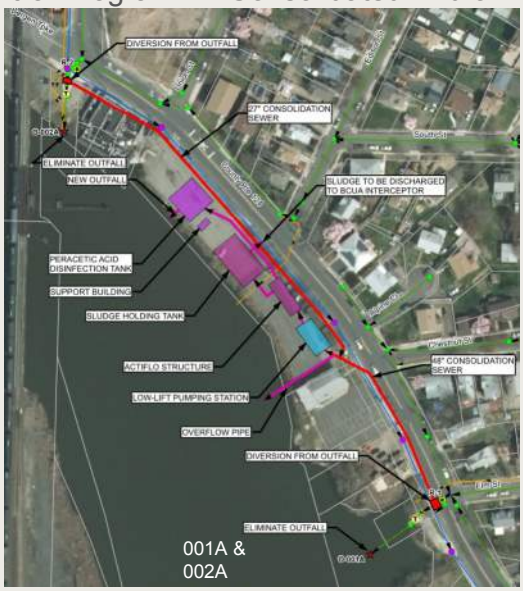
- Treatment capacity governed by flow, not volume like the storage tanks
- Treatment process:
  - Fine Screening for floatable and course particles
  - Pump Station
  - High-rate primary treatment (i.e. ActiFlo)
  - Disinfection by peracedic acid
- Similar pros and cons to consolidation as storage
- Issues are general for large-scale urban construction

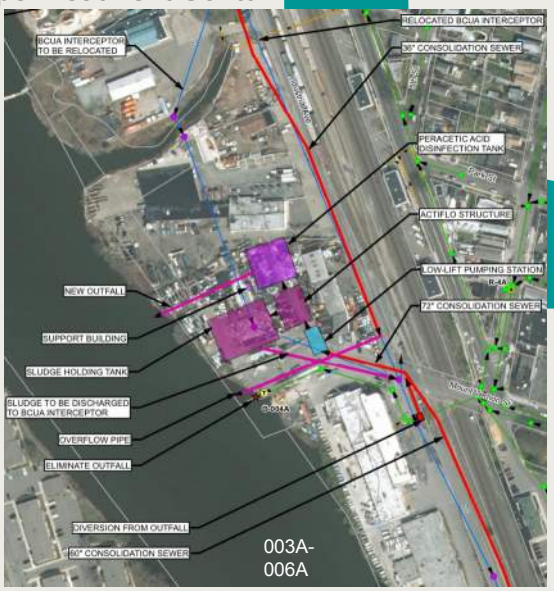


74

Alternatives Evaluation

Control Program 4 - Consolidated End of Pipe Treatment Contd.





Alternatives Evaluation

Control Program 5 - Sewer Separation

Effectively removes the Village from being a CSO community

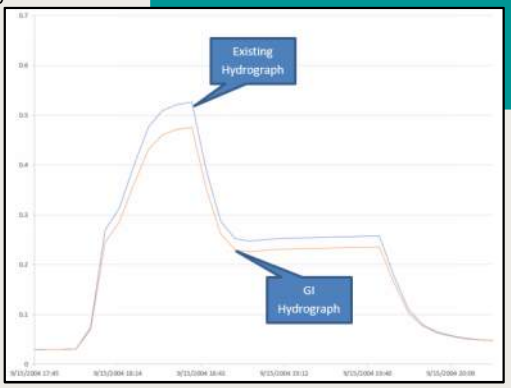
- Pros:
  - Work in public right-of-way; no new land needed
  - Opportunity for current system renewal and reconstruction
  - Elimination of outfalls
- Cons:
  - Highly disruptive to roads and traffic
  - Need to redirect every sanitary service connection on the street
  - Need for stormwater controls and treatment in the future
- Issues are general for large-scale construction in urban areas
- Pollutant loads (excepting some pathogens) to receiving water will increase 40%

Alternatives Evaluation

Control Program 6 - Green Infrastructure

Distributed storage or detention throughout the village

- Bioswales selected as representative GI
  - Anticipated GI would consist largely of bioswales and permeable pavement
- Site suitability was a major issue
  - Land-use, impervious cover, hydrologic soil group (HSG), and publicly owned land
- Maximum of 4% of total impervious area directed to GI
- Minimal institutional/implementation issues



77

Performance

CSO Reduction

Table 8-1: Summary of CSO Volumes for Typical Year

Control Program	2015 Baseline (MG)	Level of Control - Overflows during Typical Year (MG)				
		0	4	8	12	20
1. Eliminate CSO-006A	50.3	NA	NA	NA	NA	NA
2. Consolidated Tank Storage	50.3	0.0	5.7	5.8	9.7	21.5
3. Tunnel	50.3	0.0	4.7	4.7	7.9	11.4
4. Consoldiated End of Pipe Treatment	50.3	0.0	0.2	0.2	0.2	3.0
5. Sewer Separation	50.3	0.0	NA	NA	NA	NA
% Impervious to GI		2.5%	5%	7.5%	10%	
6. Green Infrastructure	50.3	49.9	49.4	48.9	48.3	

Table 8-3: Summary of Frequency of Overflows for Typical Year

Control Program	2015 Baseline	Level of Control - Overflows during Typical Year				
		0	4	8	12	20
1. Eliminate CSO-006A	53	NA	NA	NA	NA	NA
2. Consolidated Tank Storage	53	0	4	4	10	20
3. Tunnel	53	0	4	4	7	10
4. Consoldiated End of Pipe Treatment	53	0	1	1	2	10
5. Sewer Separation	53	0	NA	NA	NA	NA
% Impervious to GI		2.5%	5%	7.5%	10%	
6. Green Infrastructure	53	53	53	53	53	

Table 8-4: Summary of Percent Capture Achieved by Each Control Program

Control Program	2015 Baseline	Level of Control - Overflows during Typical Year				
		0	4	8	12	20
1. Eliminate CSO-006A	69.5%	NA	NA	NA	NA	NA
2. Consolidated Tank Storage	69.5%	100.0%	96.5%	96.5%	94.1%	86.9%
3. Tunnel	69.5%	100.0%	97.2%	97.2%	95.2%	93.1%
4. Consoldiated End of Pipe Treatment	69.5%	100.0%	99.9%	99.9%	99.9%	98.2%
5. Sewer Separation	69.5%	100.0%	NA	NA	NA	NA
% Impervious to GI		2.5%	5%	7.5%	10%	
6. Green Infrastructure	69.5%	69.7%	70.0%	70.3%	70.7%	

78

Costing

Cost Estimating Procedures

Order of Magnitude estimate (Class 5)

- Capital Costs
  - Design = 10% of Construction Costs
  - Construction Management = 10% of Construction Costs
  - Administrative/Legal = 5% of Construction Costs
- O&M
  - Only routine costs – no large-scale overhauls or replacements due to 20 yr planning period
- NPW
  - n=20 years i=2.75%
  - PW from O&M costs used the following:
    - $(P|A, i\%, n) = ((1+i)^n-1)/((i(1+i)^n)$

79

Costing

NPW Calculations

Control Program	Cost per Gallon Volume CSO Reduction ($/gal)				
Level of Control	0	4	8	12	20
1) Eliminate Outfall 006	NA	NA	NA	NA	NA
2) Storage (Consolidated)	$1.7	$1.2	$1.2	$1.1	$1.2
3) Tunnel	$2.4	$2.2	$2.2	$2.2	$2.2
4) Treatment (Consolidated)	$1.7	$1.5	$1.5	$1.5	$1.3
5) Sewer Separation	$3.8	NA	NA	NA	NA
	Volume Reduction for Impervious Area Managed (MG)				
	2.50%	5%	7.50%	10%	
6) Green Infrastructure	$9.1	$7.2	$6.3	$5.8	

Control Program	NPW Summary - Overflows per Year ($M)				
Level of Control	0	4	8	12	20
1) Eliminate Outfall 006	NA	NA	NA	NA	NA
2) Storage (Consolidated)	$84	$54	$52	$47	$34
3) Tunnel	$118	$99	$99	$92	$86
4) Treatment (Consolidated)	$87	$77	$77	$77	$60
5) Sewer Separation	$193	NA	NA	NA	NA
	NPW Summary - % of Impervious Area Managed ($M)				
	2.50%	5%	7.50%	10%	
6) Green Infrastructure	$2.7	$6	$9	$12	

80

Alternatives Rating

Rating Procedure

Control Programs rated 1 (worst) to 5 (best) on several categories and a weighted average found

- Cost
  - Normalized by $/gallon
  - Based on 4 overflows per year and 5% GI
  - 25% weight
- CSO Reduction
  - Overall reduction of CSO volume in Typical Year
  - 15% weight
- Institutional Issues
  - Ranked according to possibility of permitting delaying project six (6) months or more
  - 15% weight
- Implementability
  - Ranked according to project being delayed by other factors for six (6) or more months
  - 15% weight
- Public acceptance
  - Ranked according to how we think the public would welcome and support the plan
  - 15% weight

81

Alternatives Rating

Ranking – **NO SELECTION MADE AT THIS PHASE!**

Control Program	Cost	CSO Volume Reduction	CSO Frequency Reduction	Institutional Issues	Implement-ability	Public Acceptance	Weighted Score
1. Eliminate CSO-006A	NA	NA	NA	NA	NA	NA	NA
2. Consolidated Tank Storage	4	5	5	4	3	3	4.0
3. Tunnel	3	5	5	4	2	2	3.5
4. Consoldiated End of Pipe Treatment	4	5	5	2	3	2	3.6
5. Sewer Separation	2	5	5	3	2	2	3.1
6. Green Infrastructure	1	1	1	5	4	5	2.7
Weighting	25%	15%	15%	15%	15%	15%	100%

82

BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report

Back to General Discussions

BCUA CSO Group Supplemental CSO Group

Selection and Implementation of Alternatives

Due June 1, 2020

- Must be approvable
- Implementation Schedule
  - Annual Milestones
  - Sensitive area Prioritization
  - Construction
  - Financing
- Financial Capability
- Compliance Monitoring Program

BCUA CSO Group Supplemental CSO Group

Public Participation

Suggestions for additional members to invite.

Public Meeting

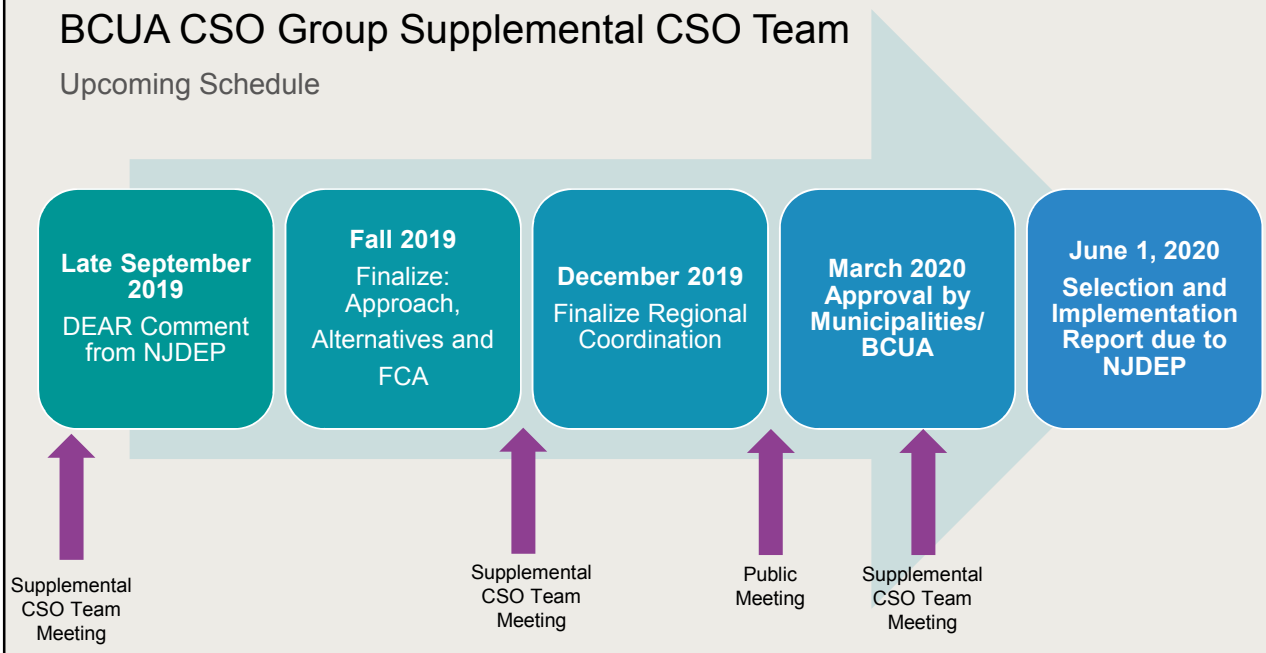
- Location
- Time
- Project phase

Webpage Article

- Suggestions for Topic/Focus

BCUA CSO Group Supplemental CSO Team

Upcoming Schedule



Final Questions?

Thank You?