Bergen County Utilities Authority (BCUA)
Supplemental Combined Sewer Overflow (CSO) Team
Meeting Number 11
Selection and Implementation of Alternatives
Fort Lee Municipal Building
January 28, 2020 10:00am – 12:00pm

Attendees – See attached sign-in sheet

Presentation slides attached

Minutes

1. Introductions
    - Attendees introduced themselves. Mr. Dening (Mott MacDonald) and Ms. Rosenwinkel (NJDEP) encouraged attendees to ask questions and provide input at any time during the presentation. Mr. Dening presented the meeting agenda.

2. Safety minute
    - Mr. Dening presented on jump starting a car in cold weather, see attached presentation.

3. Review of prior meeting
    - Mr. Dening indicated that there would be no extensions to the LTCP submissions to NJDEP and the report would be submitted on or before June 1, 2020.
    - Mr. Dening indicated that minutes from previous meetings are available on the BCUA website, in the "Water Pollution Control" pulldown menu under "CSO Long-Term Control Plan" (https://www.bcua.org), and all previously submitted reports are available on the NJDEP website (https://nj.gov/dep/dwq/cso.htm) under "Long Term Control Plan Submittal" on the right side of the page.

4. Presentations from each permittee

    BCUA:
    - See attached presentation. Mr. Dening indicated that BCUA does not have any outfalls however it receives flow from connection communities. It is working together with the CSO communities to examine opportunities to increase flow to the plant, particularly dewatering flows, while ensuring there is no detrimental impact to interceptor or treatment plant capacity.
    - He noted that the alternative to blend flow receiving primary treatment and disinfection with flow receiving secondary treatment to meet the permit requirements seems to be getting more traction recently.
    - A resident asked what MGD means. Mr. Dening indicated that it means "million gallons per day". Again Mr. Dening encouraged questions to be asked at any time.

Ridgefield Park:

- Mr. Dening presented that Ridgefield Park will likely be selecting the level of control as 85% capture, meaning that 85% of the CSO volume would get treated at the plant or receives equivalent treatment. He noted that the permit and EPA policy require an evaluation of the costs and benefits of providing higher levels of treatment.
- He presented the range of costs for the various alternatives, noting that cost per gallon is also presented to compare the alternatives on equal footing. He also presented the additional rating criteria that were used to evaluate the alternatives.
- He indicated that storage tanks received the highest rating, followed by tunnel and satellite treatment. Storage tanks were also the lowest cost and least complex, as such this alternative would be recommended for further refinement.
- It will be recommended to the Village that end of pipe treatment and storage tunnels be eliminated due to cost and complexity, and sewer separation (though it would address CSOs completely) would be very costly and disruptive to the community as well as the potential for future stormwater treatment requirements.
- Mr. Dening noted that while green infrastructure would not be able to achieve the water quality objectives on its own, it has value to the community for green space and public education, as such it may be an add-on solution that would be retained for further analysis, primarily for public education. He noted that siting locations would be limited to the public right of way, as green infrastructure on private property could be problematic to include in the LTCP.
- Ms. Rosenwinkel asked what is currently on the 001A/002A site. Mr. Dening indicated that it is a primarily vacant site with a portion occupied by an abandoned VFW post which is owned by the Town. Ms. Rosenwinkel asked if the tanks would be subsurface or above ground. Mr. Dening indicated that the tanks would be subsurface so they could fill by gravity and could potentially be used for open space above the tanks.

Fort Lee:

- Mr. Grey (HDR) provided a review of the progress to-date, and indicate that the goal would be to achieve 85% capture, though the EPA and NJDEP may require more.
- He then provided an overview of the collection system infrastructure, and the % capture results from the model, including revised results following a model update. He noted that the outfalls discharged to the Hudson River, while the outfalls of the other permittees discharge to the Hackensack River, as such the fecal coliform measurement already meets the water quality standards. He indicated that Fort Lee would be focusing on the presumptive approach.
- He presented the range of CSO control alternatives, noting that the topography of Fort Lee including the cliffs and underlying bedrock present a challenge for the installation of storage tanks and green infrastructure. He indicated that the depth of soil over the bedrock would need to be further investigated to determine the feasibility of green infrastructure.
- Mr. Grey indicated that Fort Lee would be moving forward with regulator modifications (already done for the Lower Main Pump Station), high rate treatment at the outfalls, and green infrastructure if feasible. Green infrastructure would likely be permeable pavement and bioswales. It would only cap the peak rates, but the flow would eventually end up in the sewer system for treatment, resulting in less overflow

volume. He noted that underflow from a Flexfilter may be able to be sent to BCUA for treatment. He also noted that PAA disinfection was selected over chlorination because it does not have a residual following treatment that must be removed, and it also has a much lower contact time requirement. It also has a longer shelf life, which is important for CSO applications as it would only be in use periodically.

- Mr. Grey presented that range of present worth costs, noting the green infrastructure operations and maintenance costs would be updated to include costs of sampling, depending on frequency and parameters to be sampled.
- An attendee asked whether green infrastructure would be located in the public right-of-way. Mr. Grey confirmed that they are only looking at right-of-way and not private property.
- Mr. Grey indicated that the baseline % capture is 84.7%, and green infrastructure would achieve the remaining 0.3% for total 85% capture, while grey infrastructure would achieve 90.1% capture.
- Ms. Rosenwinkel asked what the size of the flex filter might be. Mr. Grey indicated that for a 10 MGD filter, it would be approximately the same area as the netting chamber, which would reduce overflows to about 20 per year. If a larger flex filter is required, this would require blasting rock out of the Palisades.

Hackensack:

- Mr. Belardo (Arcadis) presented that Hackensack has two outfalls and outlined the contributing subdrainage areas, and the outer portions of the town are mostly separated sewer. He indicated that each outfall has its own screening facility to prevent solids and floatables from entering the river.
- He indicated that based on the preliminary water quality findings from the NJ CSO Group, Hackensack would be selecting the presumptive approach with an 85% capture control level. He indicated that the current capture is about 68%.
- He presented the range of alternatives and their estimated costs. Sewer separation was found to be very costly, and satellite treatment and green infrastructure were both costly and would not achieve 85% capture. As such, storage was selected, particularly tank storage which was able to achieve 85% capture, and performed well in terms of the ranking criteria and cost. Green infrastructure would be retained as a supplement, using permeable pavement and bioswales. Two storage tanks were recommended, one at each outfall with an estimated 60 feet diameter and 100 feet depth below ground surface.
- Mr. Belardo presented an additional alternative, describing a stormwater study which had been recently completed. This study is currently a concept design and the City of Hackensack has not yet determined if it will move forward. This recommended a large storm sewer running down Railroad Avenue to Atlantic Street, with a pump near the Hackensack River. This sewer could contribute to a future sewer separation of the area and would be sized for the 25-year storm, but the initial primary purpose of this sewer is to address overland stormwater flow. The team is considering incorporating this project into the LTCP, although it would be more costly than just tanks, not only would it increase CSO % capture and reduce the number of overflow events, it would also address localized flooding.
- Mr. Belardo presented the cost curve for the various alternatives relative to overflow volume, noting that the stormwater project has not been added to the curve yet. He

noted that Hackensack is currently working the financial capability assessment to determine what the city can afford.

- Ms. Rosenwinkel asked how long this would take to implement. Mr. Belardo indicated that this is not known yet. He indicated that the % capture calculation only includes capture of the storm flow from the drainage area, and does not include future sewer separation.
- Mr. Grey asked if the storm sewer would be in the railroad right-of-way. Mr. Belardo indicated that it would be in the public right-of-way. Except for the location where the storm sewer would perpendicularly cross underneath the railroad.
- Ms. Rosenwinkel asked if the stormwater project would result in a new outfall. Mr. Belardo indicated that it would be a stormwater outfall with a stormwater-only pump station.

5. Water quality modelling
    - Mr. Dening presented preliminary water quality findings, noting that the analysis had extended from Cape May to the end of Long Island.
    - He explained what pathogens are, what affects their concentration, and how they are measured in the model. He indicated that the model had been calibrated based on about 36 sampling locations to identify the sources of pollutants. The concentrations were calculated on a 30-day geometric mean, which is similar, but not the same as a rolling average. He indicated that the model found that the Upper Hackensack River is not meeting the water quality requirements all the time.
    - An attendee asked what year the analysis was for. Mr. Dening indicated that the simulation was based on the "typical year" which uses 2004 representative data.
    - Mr. Dening presented figures indicating that CSOs represent a relatively small proportion of the pollutants, and if CSOs were the only pollutants, the Hackensack River would be below the threshold 90-95% of the time and the Hudson River would be below the threshold 100% of the time as it currently is.

6. Public participation discussion
    - Mr. Dening asked whether any attendees had any questions, concerns or feedback.
    - A representative of the Hackensack planning board asked whether the CSO alternatives account for redevelopment and additional population growth. Mr. Del Bove (Arcadis) responded that new developments are typically required to install a separate sewer as well as provide on-site storage so that they do not contribute additional flow to the combined system. A resident from Fort Lee asked whether this was the same in Fort Lee. Mr. Grey indicated that the projections include proposed projects and increased population, however there are reduced flows because of water conservation.
    - The resident from Fort Lee indicated that she had received a text message about this meeting, and asked if there were other ways to let people know about this project, as it is very important. Mr. Grey indicated that it had been advertised on the website, and would not be feasible to send a text to everyone in the community. The resident asked how to better inform residents. Mr. Grey indicated that the members of the Supplemental CSO Team were formally invited to be regularly involvement, however any members of the public are welcome to attend these meetings. The resident

indicated that it would be helpful to have information about facility locations, types of facilities and costs.

- Ms. Rosenwinkel indicated that it might be helpful to have the reports condensed to key points. She also indicated that storage seems to be a popular solution across the country, and asked attendees if they had any thoughts about that. Mr. Grey indicated that storage would be very difficult to implement because of the Palisades.
- An attendee asked whether the team would be making the final decision following the submission of the reports to NJDEP, or whether the decision would be made before then. Mr. Dening indicate that BCUA is coordinating the decision to ensure that the selected alternative do not adversely impact treatment capacity, and the decisions would need to be made by June.
- A resident asked what the estimated cost to the property owner would be. Mr. Dening indicated that this would be discussed, in the next portion of the presentation, as part of the financial capability assessment.
- Another resident indicated that he had received a text message from the town. He suggested that an informational video could be produced (such as Fort Lee on-demand). Mr. Dening responded that he is not sure if the team would have the resources to do this, but could look into existing information videos publicly available. The resident requested that building awareness should be included in the schedule. The first resident indicated that she would be interested in just the facts, including numbers, problems and solutions. The second resident indicated that a white paper would be useful with layman's terms. Mr. Dening indicate the complete reports are linked on the NJDEP website and prior meeting minutes are posted on the BCUA website. Ms. Rosenwinkel indicated that the NJDEP's responses are also posted with the reports. She indicated that earlier meetings were mainly about background information and building the model, however, now is when things would get interesting and now would be a great time for the community to get involved. Ms. Langa (Hackensack Riverkeeper) indicated that the average person does not have time to read the reports and suggested a one-page informational flyer listed the problems and top solutions for each community, which could be mailed or circulated digitally. Mr. Dening also noted that there is a one-page newsletter prepared for Ridgefield Park, as well as the executive summaries of the reports which are meant to be able to be read as a stand-alone document. Ms. Langa indicated that Riverkeeper would be willing to circulate this information if it is shared with them.

7. Financial capability assessment
    - Mr. Dening presented the process for calculating the percentage of median household income. He indicated that EPA allows flexibility in this calculation, and most permittees have employed a dynamic model to account for changes over time. He indicated that wastewater costs are anticipated to grow faster than income.
    - He outlined the factors that would be considered in paying for these projects, noting that the costs have been projected until 2070, and would result in an annual increase in the sewer bill. Mr. Grey clarified that the % median household income (MHI) burden is based on wastewater and stormwater costs and does not include water.
    - The second resident asked whether the model accounts for the infusion of any external aid such as federal funding to help pay for these projects. Mr. Dening

indicated that the communities must plan for what is affordable to them. Additional funding should only be considered if you are confident you can obtain it, otherwise you may create a plan you cannot afford if the funding falls through.

- The first resident asked what control alternative the graph with the sharp cost increase represents. Mr. Dening indicated that it is based on a household burden of 2% MHI, but that actual costs would be dependent upon which project are selected and the timeline that they are implemented.

8. Next meeting
    - Mr. Dening indicated that there would be one more meeting before the June 1 report submission.
    - The second resident asked whether there is a parallel process in other communities. Mr. Dening indicated that there are 21 other municipal permittees in the state completing the same process, as well as in CSO communities across the country. Ms. Rosenwinkel there are 25 permittees total including wastewater treatment plant. She also added that permittees in New Jersey have been making their submissions on time, developing some innovative solutions, and focusing on low hanging fruit, as compared to places like Washington D.C. where they went straight to a costly tunnel solution. She indicated that any changes would need to be resolved in court, so it is good to present a range of alternatives.
    - Mr. Dening thanked everyone for coming and concluded the meeting just prior to 12:00PM.

Bergen County Utilities Authority
Supplemental CSO Team
Meeting Number 11
Fort Lee Municipal Building Room 201
January 28, 2020 10:00 am

Name	Organization	Email	initials
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Preliminary Selection and Implementation of Alternatives

BCUA CSO Group Supplemental CSO Team
Meeting #11

Fort Lee Municipal Building

January 28, 2020

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BCUA CSO Group Supplemental CSO Team

Meeting No. 11 Agenda

- Introductions
- Safety Minute
- Meeting No. 10 Refresher
- Refinement of CSO Alternatives
  - Permittee Presentations
- Water Quality Modeling
- CSO Community Input
- Financial Capabilities Assessment
- Selection of Alternatives DRAFT Report outline
- Schedule
- Open Discussion

2

Safety Topic

Jumpstarting a Car

1

Don't let cars touch.

Wear Safety Glasses.

2

Read the Manual.

3

Unless manual says otherwise connect cables: Red to dead and back to black.

4

Start booster car first. Run for a few minutes then start dead car.

5

Remove cables in reverse order.

http://safetytoolboxtopics.com/

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BCUA CSO Group Supplemental CSO Team

Meeting No. 10 Refresher

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

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BCUA CSO Group Supplemental CSO Team

Meeting No. 10 Minutes Posted

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MOTT MACDONALD

BERGEN COUNTY UTILITIES AUTHORITY

BCUA Update
Support of Alternatives

BCUA CSO Group Supplemental CSO Team
Meeting #11

January 28, 2020

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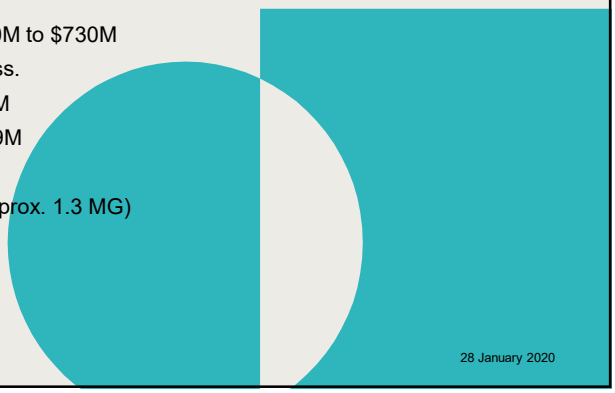
BCUA CSO Group Supplemental CSO Team

BCUA Support of Alternatives

- BCUA is not implementing alternatives
  - Providing support for municipalities
- Evaluated:
  - Plant Design Capacity – 120 MGD wet weather.
  - Interceptor Capacity – 210 MGD
  - Increased full treatment to add 29-115 MGD capacity - $310M to $730M
  - High rate primary treatment with secondary treatment bypass.
    - Increase plant treatment rate to 210 MGD for $77M-130M
    - Increase plant treatment rate to 300 MGD for $103M-179M
      - Would require interceptor expansion
  - Inline storage in interceptors – Limited volume available (approx. 1.3 MG)
  - On site storage volume – up to 40 MG $270 M



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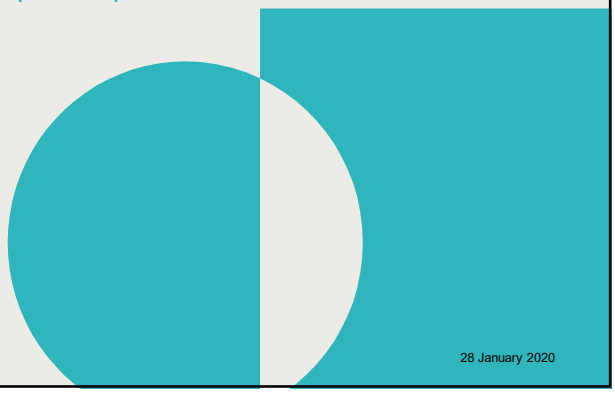
BCUA CSO Group Supplemental CSO Team

BCUA Support of Alternatives

- BCUA is carefully examining opportunities to increase flow to the plan. They are finalizing updates to their capacity assurance program and will be coordinating the needs of the CSO communities with that update.
- Acceptance of dewatering flows, provided no impact to plant.



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Ridgefield Park Update Support of Alternatives

BCUA CSO Group Supplemental CSO Team Meeting #11

January 28, 2020

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DRAFT - Preliminary Alternatives Selection

Level of Control

Recommend 85% Capture - Presumptive

- Most be calculated in conjunction with other permittees.
- Meets requirements of National CSO Policy.
- Evaluate effectiveness of increased level of control (knee of the curve).

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Rating – From Development and Evaluation of Alternatives Report

Costs – **NO SELECTION MADE AT DEAR PHASE!**

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	

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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

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Rating – From Development and Evaluation of Alternatives Report

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

Requested SCSO Team input on rankings

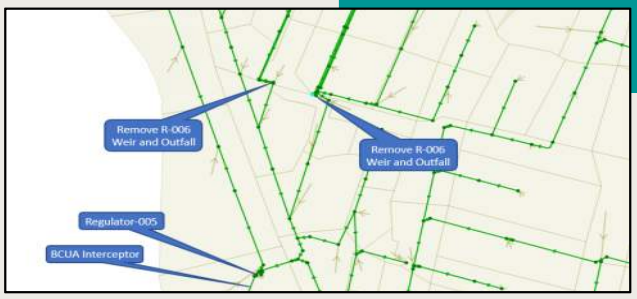
Control Program	Cost	CSO Volume Reduction	CSO Frequency Reduction	Institutional Issues	Implement-ability	Public Acceptance	Weighted Score
1. Eliminate CSO-006A	NA	NA	NA	NA	NA	NA	NA
2. Consolidated Tank Storage	4	5	5	4	3	3	4.0
3. Tunnel	3	5	5	4	2	2	3.5
4. Consoldiated End of Pipe Treatment	4	5	5	2	3	2	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%

DRAFT - Preliminary Alternatives Selection

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



RECOMMEND - RETAIN TO REDUCE CONSOLIDATION COSTS

DRAFT - Preliminary Alternatives Selection

Control Program 2 - Consolidated Tank Storage

RECOMMEND – RETAIN, BEST RATING AND LESS COMPLEX

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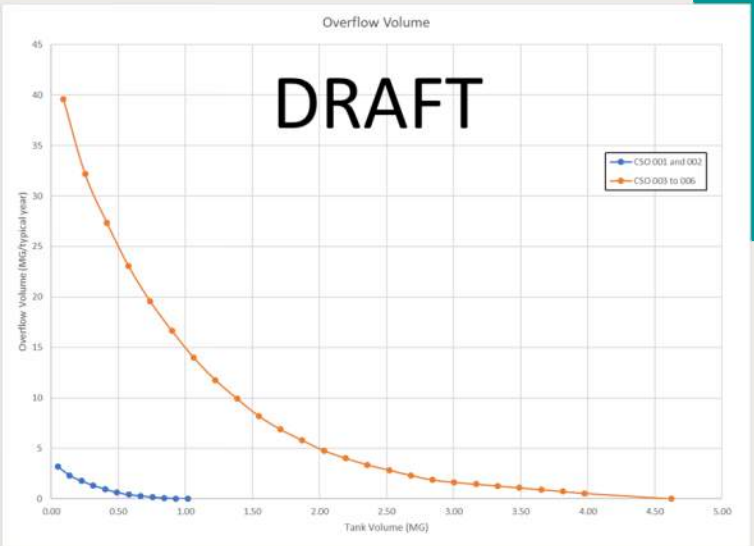
DRAFT - Preliminary Alternatives Selection

Control Program 2 - Consolidated Tank Storage



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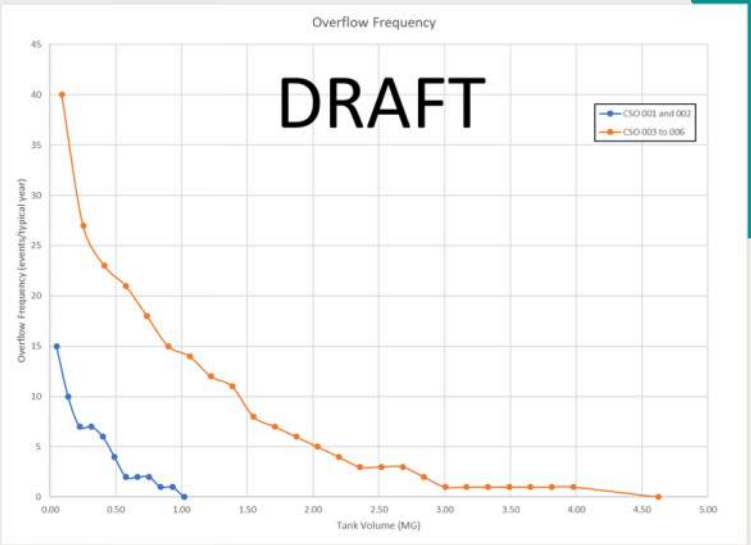
DRAFT - Preliminary Alternatives Selection

Control Program 2 - Consolidated Tank Storage



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DRAFT - Preliminary Alternatives Selection

Control Program 3 –
Consolidated Tunnel Storage

RECOMMEND - ELIMINATE DUE TO COST AND COMPLEXITY

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DRAFT - Preliminary Alternatives Selection

Control Program 4 - Consolidated End of Pipe Treatment

RECOMMEND - ELIMINATE DUE TO COST AND COMPLEXITY

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DRAFT - Preliminary Alternatives Selection

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%

RECOMMEND - ELIMINATE DUE TO COST AND DISRUPTION FUTURE WATER QUALITY CONCERNS

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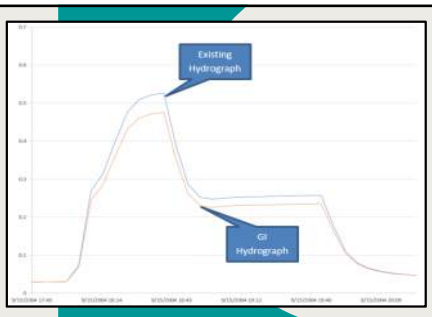
DRAFT - Preliminary Alternatives Selection

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

RECOMMEND - POTENTIALLY RETAIN FOR PUBLIC OUTREACH AND EDUCATION

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Borough of Fort Lee
CSO Team Meeting
Long Term Control Plan

December 10, 2019

HDR

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The Remaining 2015 CSO Permit Requirements

- ✓ CSO signs have been posted near outfalls
- ✓ CSO notification system is online (http://NJCSO.hdrgateway.com)
- ✓ CSO monthly Discharge Monitoring Reports (DMRs)
- ✓ Work plans/QAPPs submitted to NJDEP
  - Baseline Compliance Monitoring Plan
  - System Characterization and Landside Monitoring QAPP
- ✓ Monthly CSO Permittee meetings at BCUA
- ✓ Evaluation of previous landside model
- ✓ Water Quality monitoring
- ✓ Complete flow monitoring
- ✓ Update landside model
- ✓ Conduct alternatives analysis July 1, 2019
- **Submit the LTCP June 1, 2020**

GOAL – 85% Capture with water quality improvement but NJDEP and USEPA can require more.

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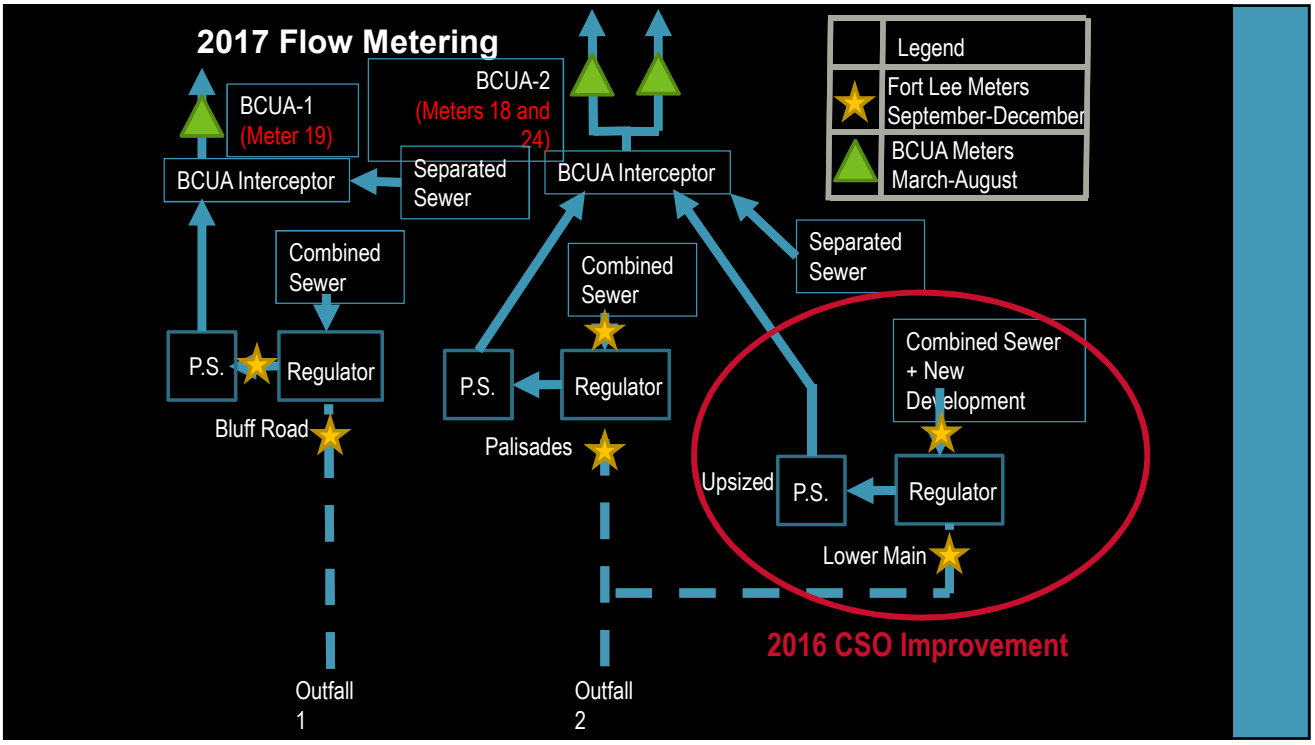

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Outfall Summary – 2004 Rainfall

Before Model Update

Outfall	001		002	
Month	Number of Overflows	Overflow Volume (MG)	Number of Overflows	Overflow Volume (MG)
January	3	0.91	1	0.01
Febuary	2	4.58	2	0.79
March	5	1.24	5	0.60
April	5	6.91	7	1.01
May	10	7.14	3	0.69
June	6	3.96	1	0.60
July	7	17.10	8	2.88
August	6	5.93	3	0.45
September	6	19.42	4	3.77
October	1	0.28	2	0.58
November	5	6.03	2	0.33
December	4	3.71	0	0.00
Total	60	77.20	38	11.73

After Model Update

Outfall	001		002	
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

84.7% Capture

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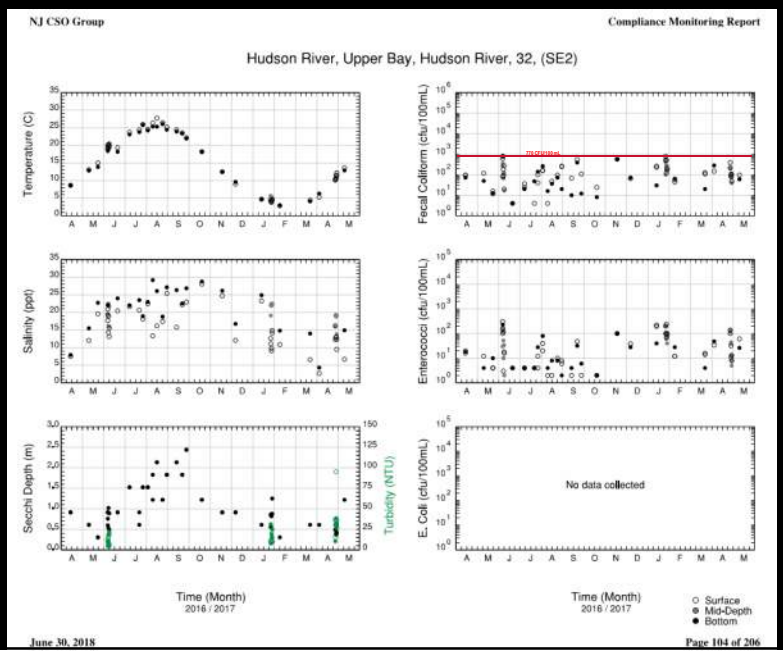
Hudson River Water Quality at GW Bridge



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CSO CONTROL OBJECTIVES

Presumptive Approach

- 4 Overflows per year
- 8 Overflows per year
- 12 Overflows per year
- 20 Overflows per year
- 85% Capture

Demonstration Approach

- Demonstrate that the selected control program, though not meeting Presumptive Approach criteria, will meet water quality based requirements

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CSO CONTROLS

Bluff Road will require improvements to control flooding

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CONTROLS

Source Controls:

Green infrastructure, *I&I Reduction*, Sewer separation, BMPs, **Nine Minimum Controls**

Collection System Controls

Gravity sewers, pump stations, hydraulic relief structures, in-line storage, outfall relocation/consolidation, **regulator modification**

Storage Technologies

Above and below ground storage tanks, storage tunnels

Treatment Technologies

Screening and disinfection, vortex separation, retention/treatment basins, **high rate filtration/clarification**, chlor/dechlor disinfection, **PAA disinfection (with or without filtration)**, UV disinfection, WWTP plant expansion

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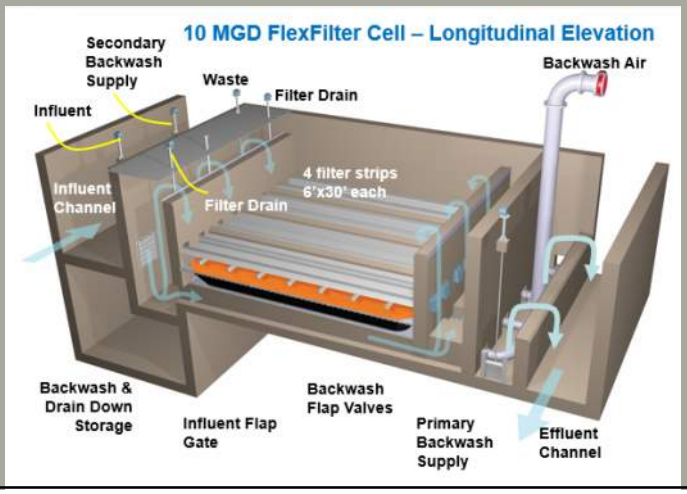
Flex Filter



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PAA Disinfection

- Peracetic Acid (PAA)
  - Acetic Acid and Hydrogen Peroxide solution
- Common Elements
  - 275 gallon totes or 55 gallon drums
  - Feed pumps
  - Mixers / diffusers
  - Instrumentation (flow, TSS)
  - Sampling equipment
  - Pressure relief
  - Temperature monitoring

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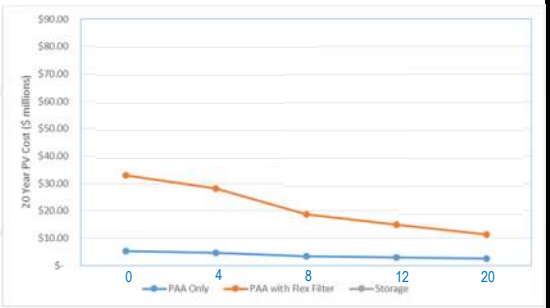
Preliminary Costs – Gray Infrastructure

Sewer Separation Costs - $400 to $450 million ($478,650/acre)

	PAA Only	PAA w/ FlexFilter
0 CSOs per year		
Capital Cost ($M)	$ 1.35	$ 28.95
20 yr PV O&M Cost ($M)	$ 3.90	$ 7.80
Total 20 yr PV Cost ($M)	$ 5.25	$ 32.97
4 CSOs per year		
Capital Cost ($M)	$ 1.27	$ 24.67
20 yr PV O&M Cost ($M)	$ 3.40	$ 3.51
Total 20 yr PV Cost ($M)	$ 4.67	$ 28.18
8 CSOs per year		
Capital Cost ($M)	$ 1.07	$ 16.16
20 yr PV O&M Cost ($M)	$ 2.38	$ 2.45
Total 20 yr PV Cost ($M)	$ 3.45	$ 18.61
12 CSOs per year		
Capital Cost ($M)	$ 1.00	$ 12.97
20 yr PV O&M Cost ($M)	$ 1.99	$ 2.05
Total 20 yr PV Cost ($M)	$ 2.99	$ 15.01
20 CSOs per year		
Capital Cost ($M)	$ 0.85	$ 9.75
20 yr PV O&M Cost ($M)	$ 1.60	$ 1.64
Total 20 yr PV Cost ($M)	$ 2.44	$ 11.39



O&M costs are being upgraded to include sampling of the discharge. One sample for fecal coliform will be collected for each event at each outfall.

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Green Infrastructure

Rain Gardens

Bioswales

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Green Infrastructure

Permeable Pavements

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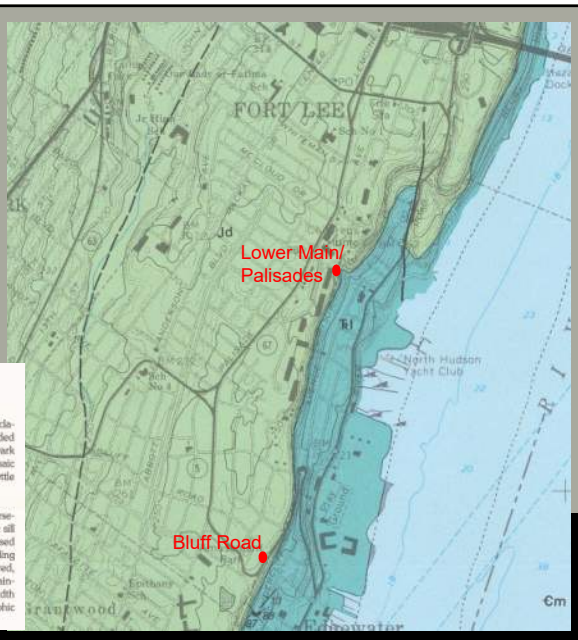
Bedrock constrains green infrastructure in Fort Lee



DESCRIPTION OF MAP UNITS

NEWARK BASIN ROCKS

The lithologic descriptions of the Newark basin rocks follow the usage and nomenclature of Lyttle and Epstein (1987) and Puffer (1989). The Newark basin rocks are included in what is known as the Newark Supergroup. The Newark Supergroup of the Newark basin in the map area, from top to bottom, includes the Palisade Diabase, the Passaic Formation, the Lockatong Formation, and the Stockton Formation (Olsen, 1980; Lyttle and Epstein, 1987).

Jd — **Palisade Diabase (Lower Jurassic)**—Dark-gray to black, fine- to coarse-grained (except very fine to fine-grained near chilled borders) diabase sill concordant with the Lockatong Formation. The diabase is composed largely of calcic plagioclase and augite. Shales and siltstones surrounding this intrusive have been thermally metamorphosed to a purplish-red, light-gray and dark-gray, indurated, brittle, fine-grained hornfels containing quartz, plagioclase, sericite, biotite, epidote, and magnetite. The width of this zone depends on the thickness of the intrusive, its topographic expression, and its inclination. The sill is as thick as 1,700 ft

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Preliminary Costs – Green Infrastructure

We are currently identifying specific candidate sites for Green Infrastructure

	Green Infrastructure Type	Min Capital Cost ($M)	Max Capital Cost ($M)	20 Year PV O&M Cost ($M)	Min Total 20 year PV Cost ($M)	Max Total 20 year PV Cost ($M)	
5% GI (~6.5 Acres)	Rain Garden	$ 0.63	$ 2.00	$ 0.80	$ 1.43	**$ 2.80**	
	Right-of-Way Bioswale	$ 0.99	$ 3.29	$ 0.80	$ 1.79	$ 4.09	
	Green Roof	$ 3.15	$ 16.03	$ 0.80	$ 3.95	$ 16.83	
	Porous Asphalt	$ 1.71	$ 3.58	$ 0.13	$ 1.83	$ 3.71	
	Permeable Interlocking Concrete Pavers (PICP)	$ 0.85	$ 2.43	$ 0.13	$ 0.98	**$ 2.56**	
10% GI (~13 Acres)	Rain Garden	$ 1.26	$ 4.01	$ 1.60	$ 2.86	**$ 5.61**	
	Right-of-Way Bioswale	$ 1.97	$ 6.57	$ 1.60	$ 3.57	$ 8.17	
	Green Roof	$ 6.31	$ 32.06	$ 1.60	$ 7.91	$ 33.66	
	Pervious concrete	$ 4.01	$ 8.02	$ 0.25	$ 4.26	$ 8.27	
	Permeable Interlocking Concrete Pavers (PICP)	$ 1.71	$ 4.86	$ 0.25	$ 1.96	**$ 5.11**	

+0.3% Capture

+0.6% Capture

O&M costs are being upgraded to include sampling of the discharge. One sample for fecal coliform will be collected for each event at each outfall.

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Preliminary Results

CSO Volumes and Frequencies at Each CSO Control Level

	Baseline			0 CSO			4 CSOs			8 CSOs			12 CSOs			20 CSOs		
Outfall	CSO Volume (MG)	CSO Events	Percent Capture	CSO Volume (MG)	CSO Events	Percent Capture	CSO Volume (MG)	CSO Events	Percent Capture	CSO Volume (MG)	CSO Events	Percent Capture	CSO Volume (MG)	CSO Events	Percent Capture	CSO Volume (MG)	CSO Events	Percent Capture
FL-001	82.5	58	84.7%	0	0	100.0%	8.6	4	92.9%	11.1	8	92.7%	20.0	12	91.7%	34.0	20	90.1%
FL-002	4.7	20		0	0	100.0%	1.0	3	91.9%	1.8	6	90.3%	2.9	11	88.2%	4.7	20	84.7%

GI Alternatives									
Outfall	Baseline			5% GI-Bluff Road			10% GI-Bluff Road		
	CSO Volume (MG)	CSO Events	Percent Capture	CSO Volume (MG)	CSO Events	Percent Capture	CSO Volume (MG)	CSO Events	Percent Capture
FL-001	82.5	58	84.7	79.8	57	85%	77.0	58	85.3%
					Additional Percent Capture	**0.3%**		Additional Percent Capture	**0.6%**

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Preliminary Costs –

Alternative	Capture	Present Worth Cost
Baseline	84.7%	$0
Gray – 20 OF per Year	90.1%	$2.44 to 11.4 M
Green – Rain Garden, Bioswale or Porous Pavement	85%	$2.6 to 4.1 M

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Repair of the Netting Facility

Good Day

Bad Day
(twice in 2019)

Traffic Hazard on Route 5

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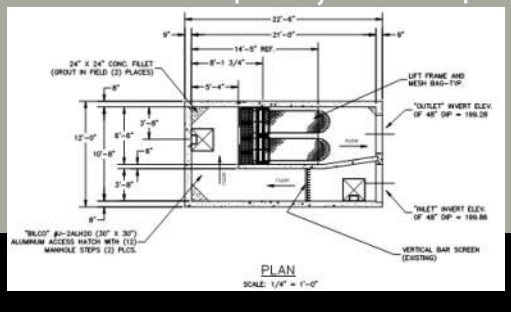
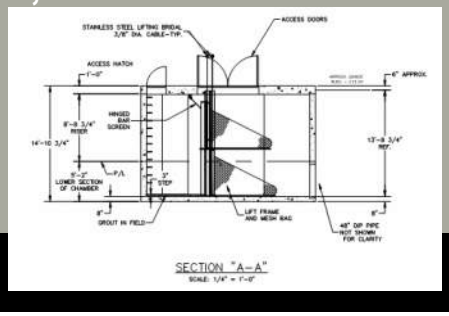
Planned Improvements for Bluff Road Netting Facility

- Replace 2 net system with 4 net system
- Add a knee wall to the netting chamber
- Repair erosion damage
- Cost ~$300,000 to $500,000





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Questions

Comments

Discussion

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City of Hackensack

COMBINED SEWER SYSTEM
LONG TERM CONTROL PLAN

PROGRESS UPDATE

SUPPLEMENTAL CSO TEAM MEETING

JANUARY 28, 2020

ARCADIS Design & Consultancy for natural and built assets

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Agenda

- Overview of Hackensack's Combined Sewer System (CSS)
- Development and Evaluation of Alternatives (DEAR) Review
- Additional Alternative: Court Street Stormwater Study
- Selection and Implementation of Alternative (SIAR)
  - Approach Selection: "Presumption" or "Demonstration"?
  - "Knee-of-the-curve" Analysis
  - Next Steps

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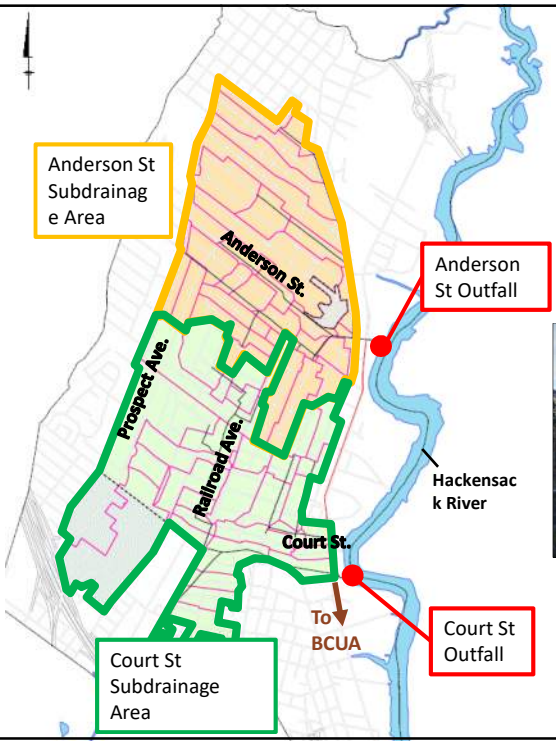

Overview of Hackensack Combined Sewer System

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

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Development and Evaluation of Alternatives (DEAR) Review

- CSO Control Objectives

Presumption Approach

- 85% Capture or
- 4 Overflows per year

Demonstration Approach

Demonstrate that the selected control program, though not meeting Presumption Approach criteria, will meet water quality-based requirements

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Development and Evaluation of Alternatives (DEAR) Review

Alternative	Percent Capture	Total Estimated Costs
Baseline Conditions for 2004	68%	-
Full City-wide Sewer Separation	100%	$560M
Pretreatment and Disinfection	-	$50M
GI - 10% Impervious Area	70%	$43M
Removal of I&I	68%	$11M
Tunnel Storage - 85%	86%	$74M
Satellite Storage Tanks - 85%	85%	$66M
Regional Storage Tank - 85%	85%	$63M

- Storage alternatives also evaluated for 0, 4, 8, 12 and 20 overflows scenarios

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Possible GI Location Map

Bioswale

Rain Garden

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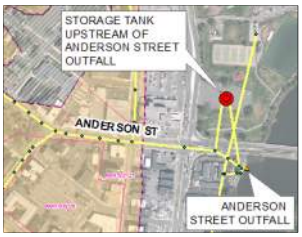
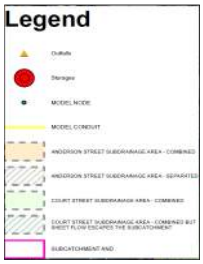
Storage Alternative: 2 Underground Storage Tanks



Alternative	Percent Capture	No. of Overflows	Reduction of Overflow Volume	Estimated Cost ($M)
Baseline conditions for 2004	68%	56	N/A	-
Two tanks, 60ft dia., (85% Capture)	85%	25	52.7%	$66M



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

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Additional Alternative: Court Street Stormwater Study

- The City of Hackensack performed a stormwater study in part of the Court Street Subdrainage Area
  - Goal: Determine a viable alternative to assist with flood mitigation in flood-prone areas west of Railroad Avenue

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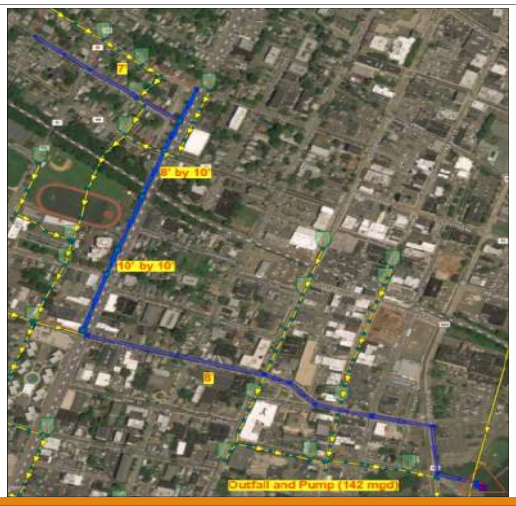
Additional Alternative: Court Street Stormwater Study

- 25-year design storm, 2050 tidal influence
- Stormwater interceptor with in-line storage along Railroad Avenue
- Pump station near the Hackensack River



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Additional Alternative: Court Street Stormwater Study

- How can this project assist with the City's LTCP?
  - Reduce number of CSOs from the Court Street outfall
  - Increase the CSO percent capture
  - Additional benefit: mitigate an often-occurring flooding issues within the City. This benefit would not occur with the storage tank alternative at Court Street.

CSO LTCP Alternatives		
Court Subdrainage Area (Outfall 001A)		
	% CSO Capture	Estimated Costs
Baseline (existing)	72.0%	-
Stormwater Project	88.3%	$66,000,000
Storage Tank (LTCP)	85.0%	$33,000,000
System-wide (Outfalls 001A and 002A)		
	% CSO Capture	Estimated Costs
Baseline (existing)	68.5%	-
Stormwater Project at Court Street & Storage Tank at Anderson Street (LTCP)	86.2%	$99,000,000

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Selection and Implementation of Alternatives

- Selection of approach: "Presumption" or "Demonstration"?

  Pending NJDEP approval of the Water Quality Modeling. Water quality results in the Hackensack River will determine the approach needed for the City's LTCP. **Initial results indicate that the presumption approach may be the appropriate approach to take.**

- Goal: Increase system-wide percent capture from 68% to a minimum of 85%

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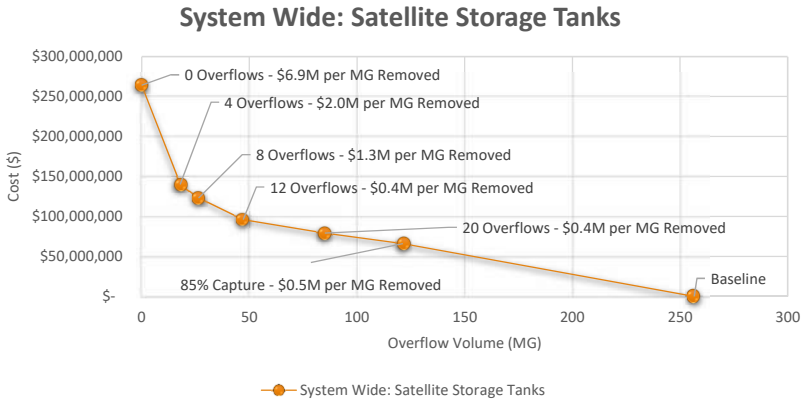
Selection and Implementation of Alternatives

- "Knee-of-the-curve" Analysis – Satellite Storage Tanks



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Selection and Implementation of Alternatives

- Next Steps
  - Final Selection of the LTCP
  - Implementation Schedule
  - Financial Capability Analysis (FCA – Affordability Study)
  - Submit SIAR Report to NJDEP by June 1, 2020
- Questions?
  - Website: www.hackensack.org/cso
  - Email: csoteam@hackensackdpw.org

ARCADIS Design & Consultancy for natural and built assets

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BCUA CSO Group Supplemental CSO Team

Development and Evaluation of Alternatives Report

Water Quality Modeling

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Models

- Hydrodynamic Model (ECOMSED)
  - Water Elevation
  - Currents
  - Temperature
  - Salinity
- WQ Model (RCA)
  - Salinity
  - Tracer
  - E. coli
  - Fecal coliform
  - Enterococci
- Both models are run on the same grid (segmentation)
  - 10 vertical layers

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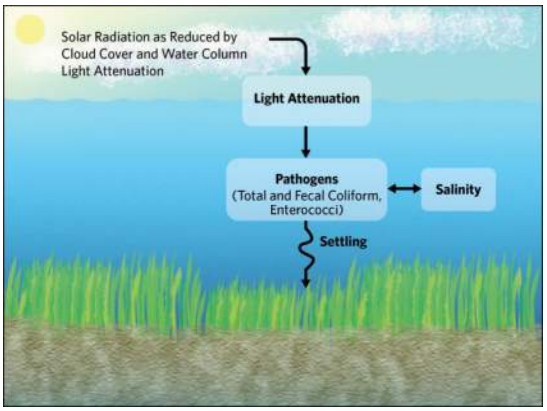
Pathogen Model

Factors that affect bacteria

- Natural die-off
- Temperature
- Solar radiation
- Salinity
- Settling



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Required Hydrodynamic Model Inputs

- Physical Dimensions
  - Shoreline
  - Bathymetry
- Boundary Conditions
  - Tides
  - Temperature
  - Salinity
- Freshwater Sources
  - Rivers
  - CSOs
  - Storm Sewers
  - Direct Drainage
  - WWTPs
- Meteorology

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Landside Pathogen Concentration Stations

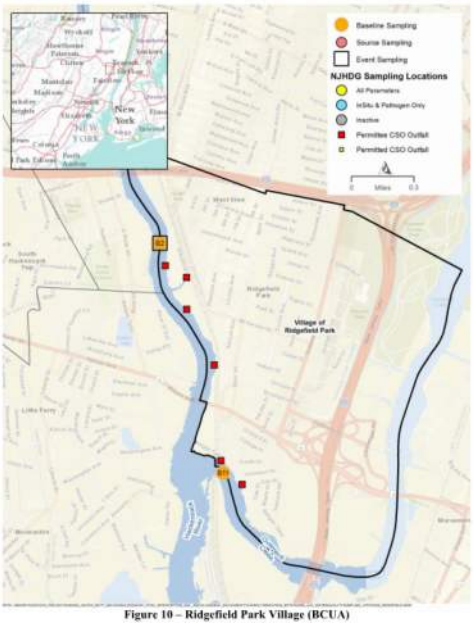

Figure 10 – Ridgefield Park Village (BCUA)

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Landside Pathogen Concentration Stations

Figure 11 – Borough of Fort Lee (BCUA)

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WQM Component Analysis

- WQ Component Analysis:
  - E. coli
  - Fecal
  - Enterococci
- Components:
  - NJ CSO
  - NJ SW/Runoff
  - NJ STP
  - NJ/NY/CT Rivers
  - Hudson River
  - Dry-weather
  - NYC CSO+SW
  - NY/CT STP

CLEAN WATERWAYS
Healthy Neighborhoods

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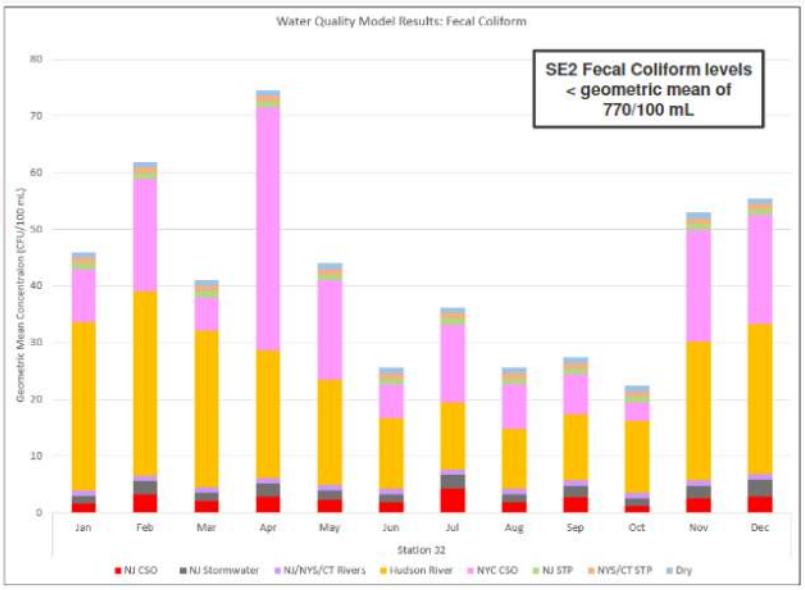
WQM Component Analysis – Fecal Coliform-Hudson River



CLEAN WATERWAYS
Healthy Neighborhoods

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WQM Attainment

CLEAN WATERWAYS
Healthy Neighborhoods

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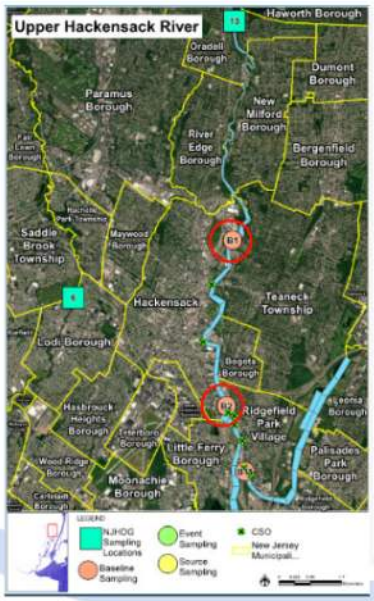
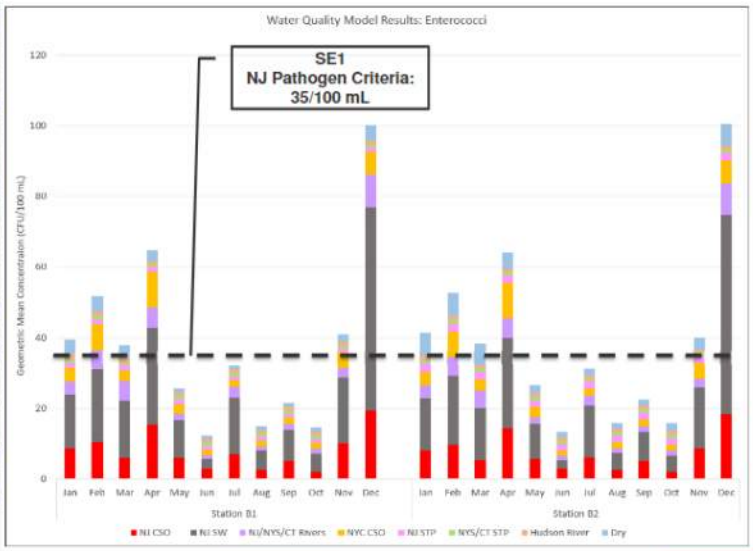
WQM Component Analysis – Upper Hackensack River -Enterococci





CLEAN WATERWAYS
Healthy Neighborhoods

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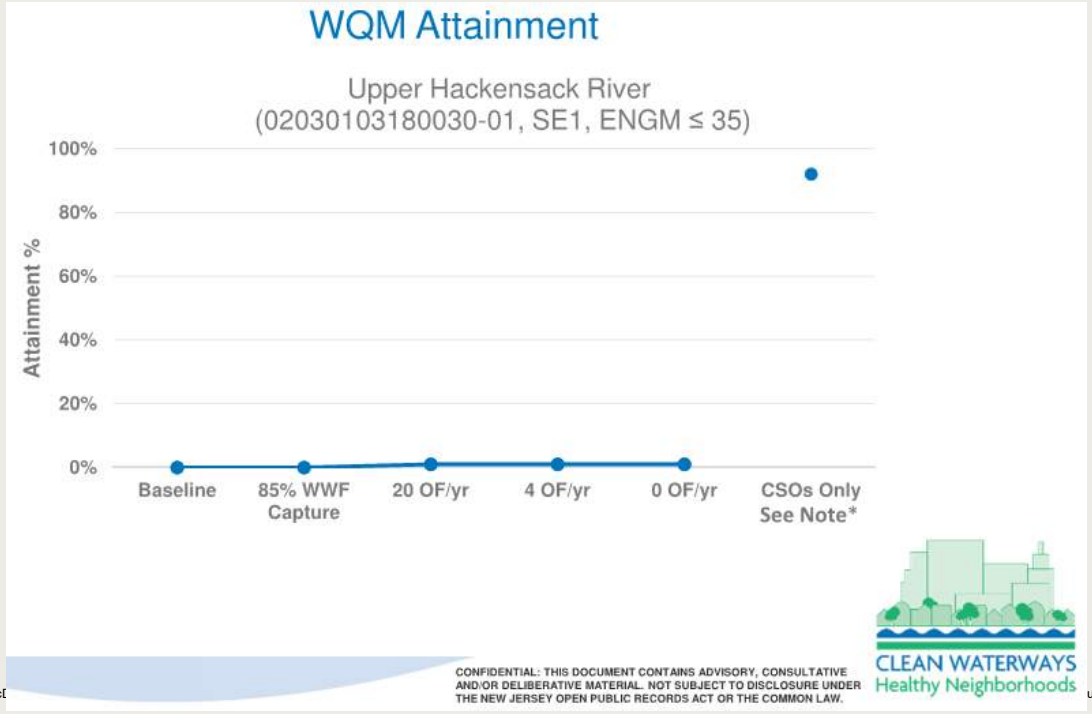
WQM Attainment



CLEAN WATERWAYS
Healthy Neighborhoods

Mott MacD uary 2020

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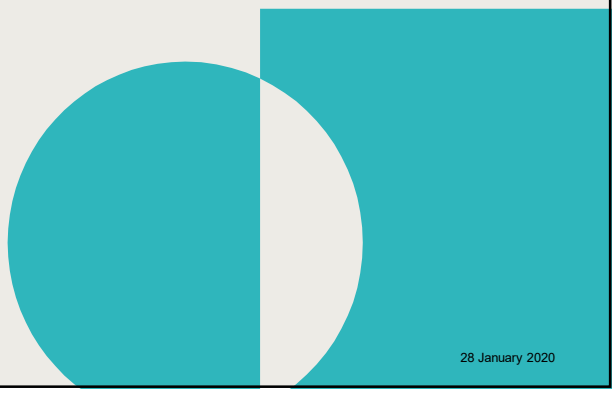
BCUA CSO Group Supplemental CSO Team

Public Outreach Opportunities



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Public Outreach Opportunities

- Input on the selection process?
  - Are your interested being considered?
  - Comments on locations of facilities?
  - Comments on types of facilities?
  - Comments on costs?

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BCUA CSO Group Supplemental CSO Group

Public Participation

- Future opportunities
  - Next SCSO Team Working Meeting?
  - Planned public meeting – tentatively May 2020
    - Venues
    - Time
    - Advertising
    - Invitees
  - Other activities

Webpage Article

- Suggestions for Topic/Focus

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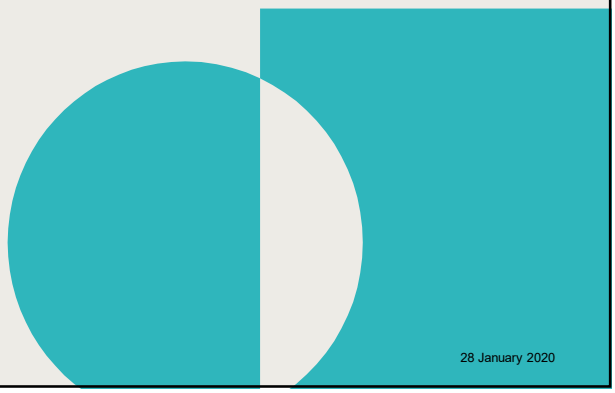
BCUA CSO Group Supplemental CSO Team

Financial Capability Assessment



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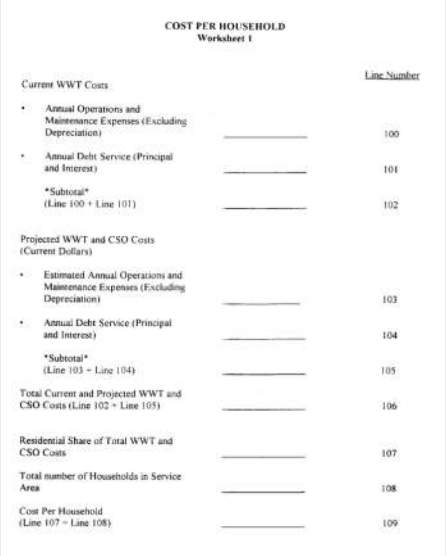
Financial Capabilities Assessment

Goal is to determine impact on residential population and to allow the LTCP extent and schedule to incorporate those impacts.

- EPA Methodology
  - Snapshot based on current conditions.
  - Allows for flexibility and additional factors to be considered.
  - Very limited view of affordability.
- "Dynamic" Model
  - Accounts for inflation
  - Accounts for expected project schedule.



COST PER HOUSEHOLD
Worksheet 1

		Line Number
Current WWT Costs		
• Annual Operations and Maintenance Expenses (Excluding Depreciation)	_____	100
• Annual Debt Service (Principal and Interest)	_____	101
Subtotal (Line 100 + Line 101)	_____	102
Projected WWT and CSO Costs (Current Dollars)		
• Estimated Annual Operations and Maintenance Expenses (Excluding Depreciation)	_____	103
• Annual Debt Service (Principal and Interest)	_____	104
Subtotal (Line 103 + Line 104)	_____	105
Total Current and Projected WWT and CSO Costs (Line 102 + Line 105)	_____	106
Residential Share of Total WWT and CSO Costs	_____	107
Total number of Households in Service Area	_____	108
Cost Per Household (Line 107 ÷ Line 108)	_____	109

BCUA CSO Group Supplemental CSO Group

Financial Capabilities Assessment - EPA Indicators

How much CSO Control can the Municipality afford?

- Primarily based on EPA Guidance
  - 2% of Median Household Income (MHI)
- Implications of affordability:
  - Implementation schedule
    - Prioritize projects with highest cost effectiveness
  - Level of control
  - Required annual rate increases

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Financial Capabilities Assessment - EPA Indicators

Residential Indicator	Current system costs (combined, sanitary, and stormwater)	
	Percent residential share = Typ. 75-85%	
	Cost per residential household – should be less than 2% of MHI	
Financial Indicator	Debt Indicators	Bond Ratings
		Overall Net Debt as % of Full Market Property Value
	Socioeconomic Indicators	Unemployment Rate
		Median Household Income
	Financial Management Indicators	Property Tax Revenues as % of Full Market Property Value
		Property Tax Revenue Collection Rate

BCUA CSO Group Supplemental CSO Group

Financial Capabilities Assessment - EPA Indicators

FINANCIAL CAPABILITY MATRIX
Table 3

Permittee Financial Capability Indicators Score (Socioeconomic, Debt and Financial Indicators)	Residential Indicator (Cost Per Household as a % of MHI)		
	Low (Below 1.0 %)	Mid-Range (Between 1.0 and 2.0%)	High (Above 2.0 %)
Weak (Below 1.5)	Medium Burden	High Burden	High Burden
Mid-Range (Between 1.5 and 2.5)	Low Burden	Medium Burden	High Burden
Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden

FINANCIAL CAPABILITY GENERAL SCHEDULING BOUNDARIES
Table 4

Financial Capability Matrix Category	Implementation Period
Low Burden	Normal Engineering/Construction
Medium Burden	Up to 10 years
High Burden	Up to 15 Years*
	*(Schedule up to 20 years based on negotiation with EPA and state NPDES authorities)

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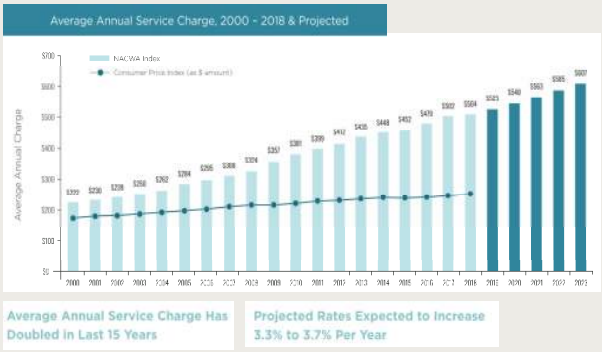
Financial Capabilities Assessment - Additional Items to Consider

- Sewer utility costs likely to rise faster than income growth over next 20-30 years
- Consider future non-CSO costs and obligations
- Income and Cost Considerations
  - Burden by income distribution brackets
  - Poverty rates
  - Unemployment and labor force participation rates
- Financial Strength Considerations
  - Debt ratio and debt per capita
  - Number of customers and composition
  - Legislative revenue limitations



Source: NACWA, 2018 Cost of Clean Water Index, https://www.nacwa.org/docs/default-source/news-publications/pub-5-index-1-web-final.pdf

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Financial Capabilities Assessment

So what is this all about?

- It's like buying a house or car.
  - What are my current expenses?
  - How much money do I make now and in the future?
  - When will I buy it?
  - How expensive is it?
  - How much will it cost to maintain?
  - What will my payments be?
  - What is the interest rate?
  - What is the inflation rate?
  - What is my mortgage term?

BCUA CSO Group Supplemental CSO Group

Financial Capabilities Assessment

So what is this all about?

- So now we turn it into a LTCP
  - What are my Wastewater and Stormwater expenses?
  - What is my Median Household Income (MHI) and is it growing?
  - What projects will I build and when?
  - What do the projects cost?
  - How much will it cost to maintain?
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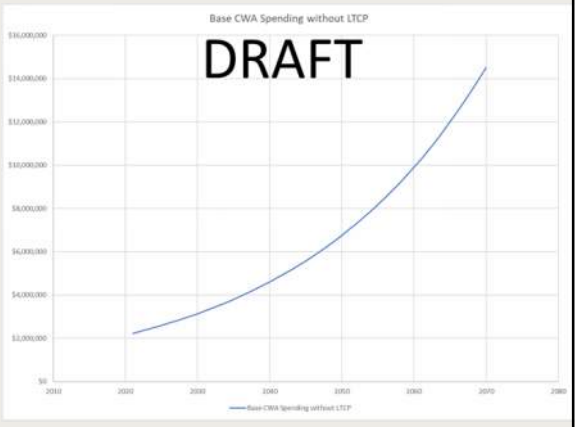
Financial Capabilities Assessment



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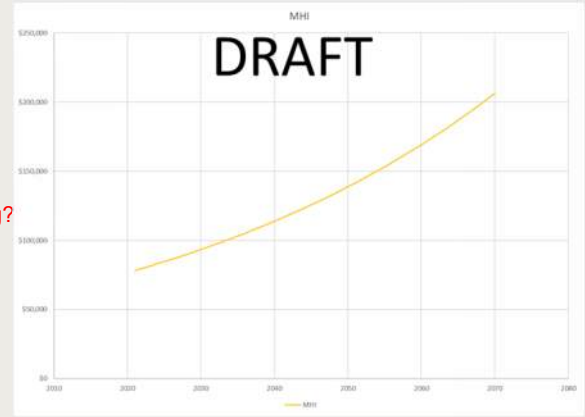

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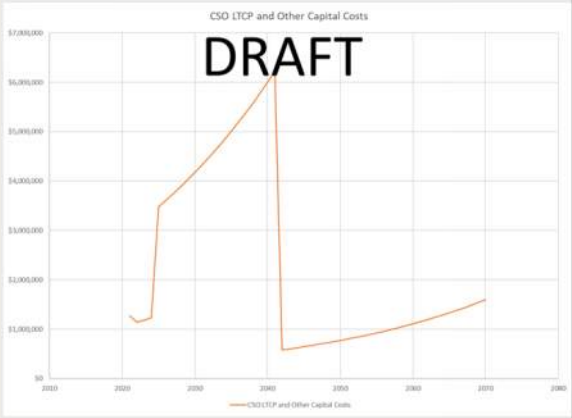

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Financial Capabilities Assessment

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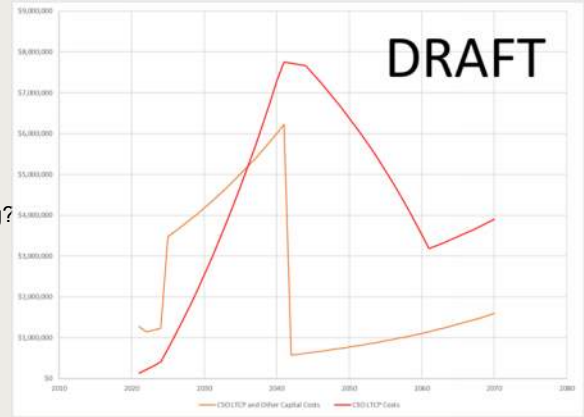

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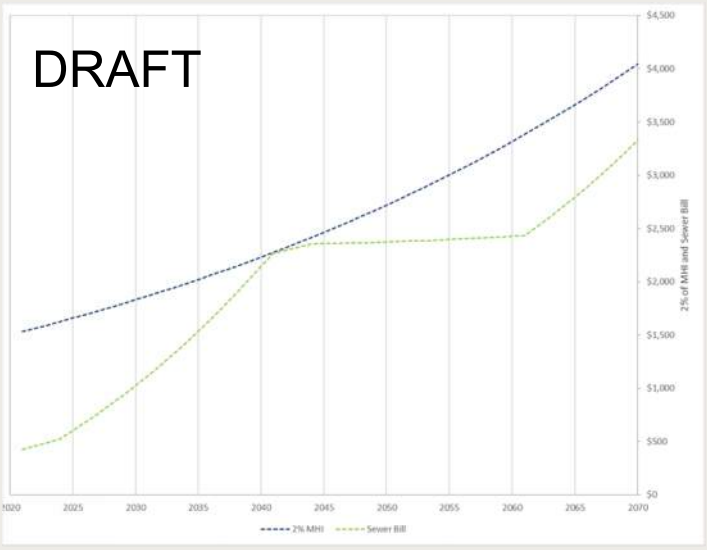
Financial Capabilities Assessment

What is the impact to me?



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Financial Capabilities Assessment

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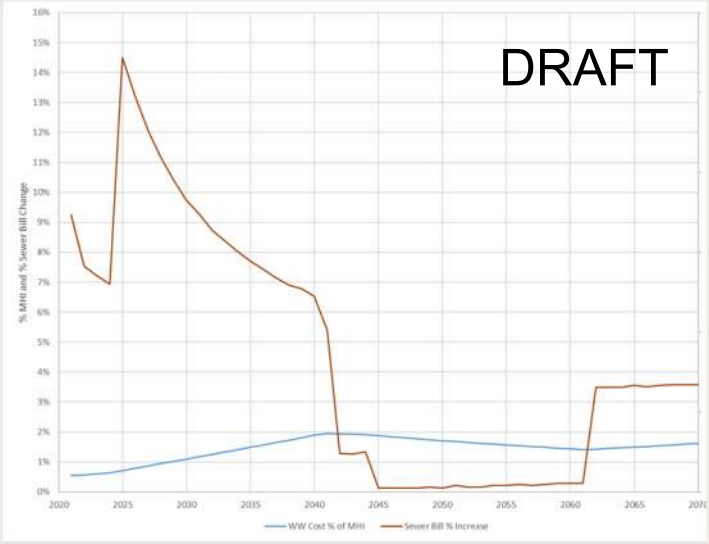

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Financial Capabilities Assessment

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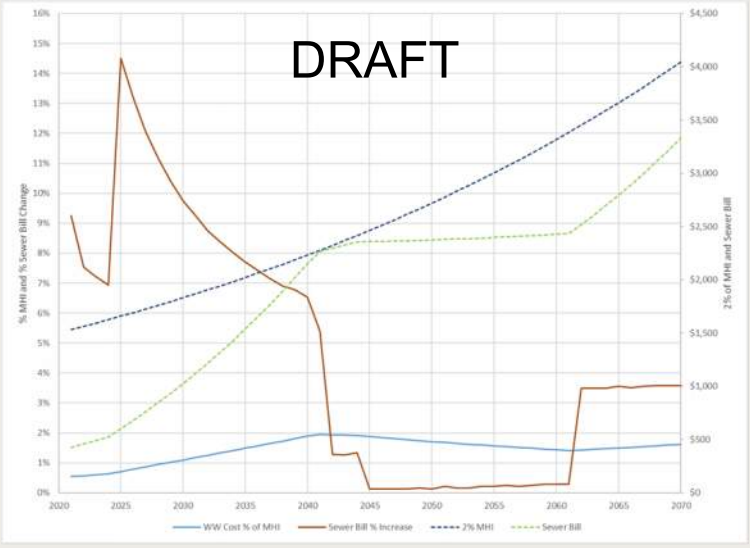
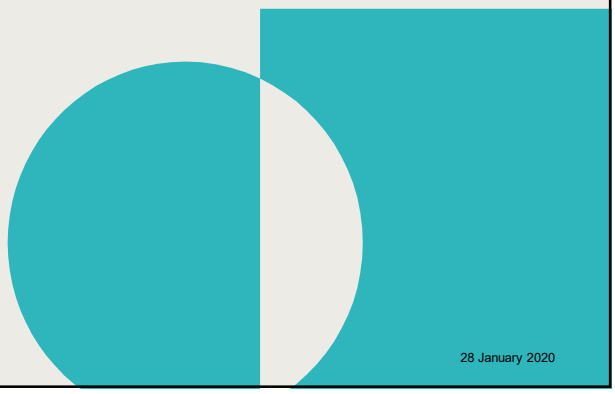


BCUA CSO Group Supplemental CSO Team

Selection and Implementation of Alternatives Report



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Selection and Implementation of Alternatives Report - Requirements

Due June 1, 2020

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

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Selection and Implementation of Alternatives Report Outline

- Certifications
- Executive Summary
- Introduction
- System Characterization and Modeling
- Control Plan Approach and Strategy
- Development of Alternatives
- Selection of LTCP

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Selection and Implementation of Alternatives Report Outline (Cont'd)

- Financial Capabilities
- Financing Plan
- Implementation Schedule
- Operational Plan
- Compliance Monitoring – Potentially Regional
- Public Participation

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Schedule

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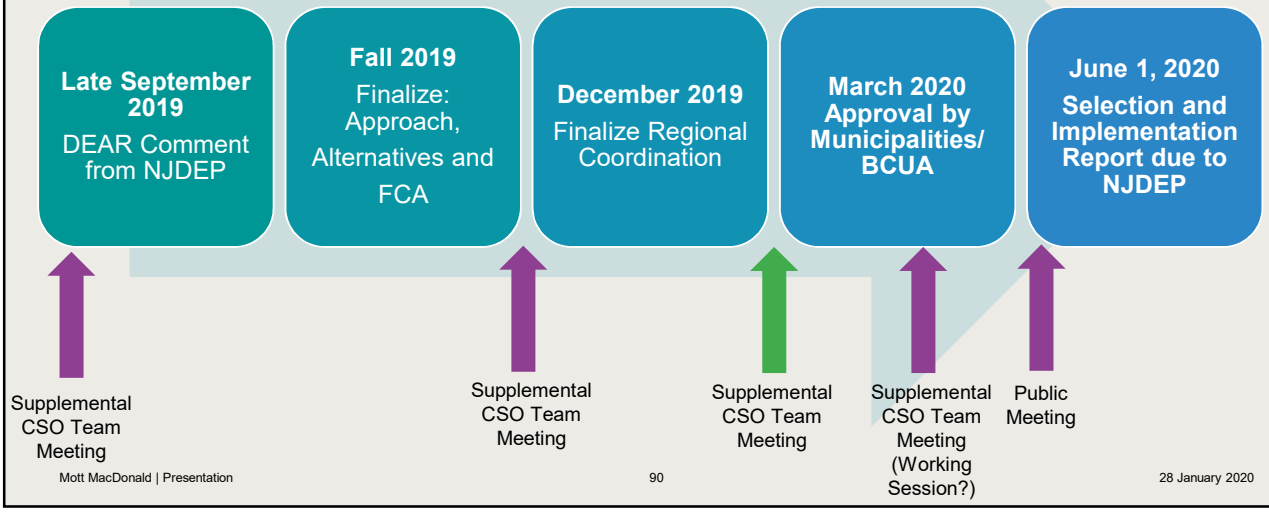
BCUA CSO Group Supplemental CSO Team

Upcoming Schedule



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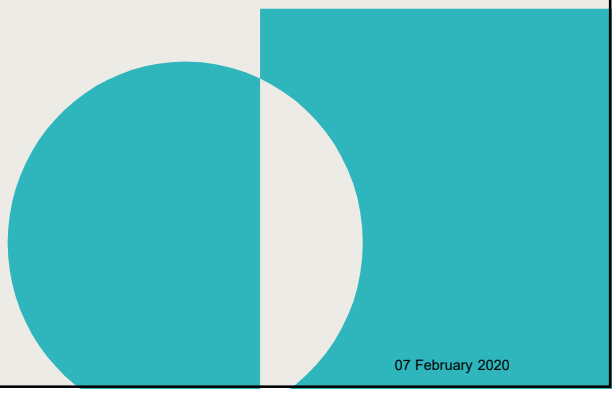
Final Questions?



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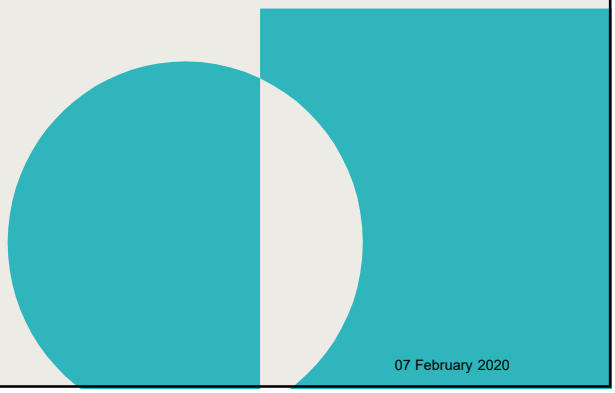
Thank You?



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