Bergen County Utilities Authority
Supplemental CSO Team
Meeting Number 2 – Project Introduction

BCUA Administration Building, Public Meeting Room
September 19, 2017, 9:00 AM – 10:00 AM

Group Meeting Minutes

Attendees:
See sign in sheet (attached)

1. Safety Minute
The meeting began at 9:05 AM with John Rolak sharing some safety tips on hurricanes.

2. Presentation
System Monitoring and Modeling (attached)
Improvements to Ridgefield Park model
Typical Year analysis
Project schedule
John Rolak, Mott MacDonald
See power point slides

3. Discussion

a. Will BCUA use the same Typical Year as PVSC? It is important for everyone to use the same year to minimize challenges. While there are some differences in opinion on the analysis they are not significant enough to go it alone.
b. Why wasn't the Teterboro rain gauge used? Teterboro is not as centrally located among all the members of the NJ CSO Group. Newark has a longer period of record.
c. Will we need to update the Technical Guidance Manual? Our understanding is that PVSC is updating the manual, and will make that available to the members of the NJ CSO Group, if not, we will need to update it.
d. What about Green Stormwater Infrastructure (GSI)? NJDEP is preparing a guidance document for GSI.

4. **Next meeting –** The next meeting will be held in December
5. **Adjournment –** 9:55 AM

Bergen County Utilities Authority
Supplemental CSO Team
Meeting Number 2
BCUA Administration Building, Public Meeting Room
September 19, 2017, 9 – 10:30 am

Name	Organization	Email	initials
John Rolak	Mott MacDonald	John.rolak@mottmac.com	
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Susan McVeigh	Health Officer, Hackensack	smcveigh@hackensack.org	
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Mark Olson	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	
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[illegible]	WDR Inc	gary.sng@hdrinc.com	
Edward Mignone	Fort Lee	e-mignone@fortleenj.org	

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MOTT MACDONALD

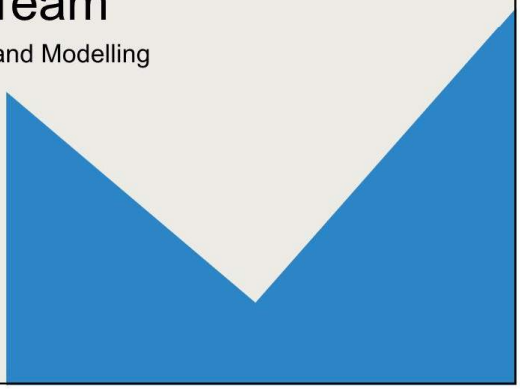
Supplemental CSO Team

Meeting Number 2 – System Monitoring and Modelling

September 19, 2017

BCUA CSO Group:

Borough of Fort Lee
City of Hackensack
Village of Ridgefield Park
Bergen County Utilities Authority

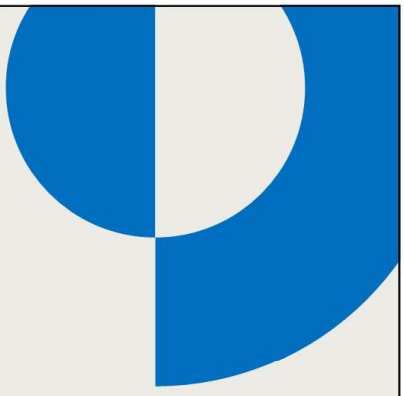


Safety moment

Think about and share a safety moment:

- We are still in Peak Hurricane Season

Refer to the Federal Emergency Management Agency's (FEMA) Ready.gov/hurricanes for comprehensive information on hurricane preparedness at home and in your community.
Information on how to prepare and take action are available on:
Gather Information
Plan & Take Action
Recover
Resources



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BCUA Supplemental CSO Team

Meeting No. 2 Agenda

Refresher – In Meeting #1 We Covered:

- What is a Combined Sewer System?
- What is a Combined Sewer Overflow?
- What is the BCUA CSO Group?
- Why are they undertaking this Project?
- What are the Requirements?
- What are the Deadlines?
- What is my role?

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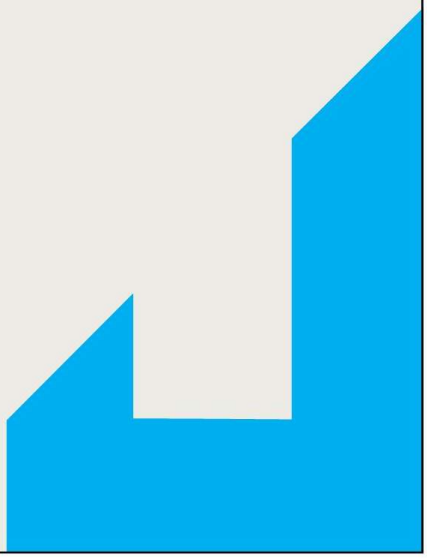
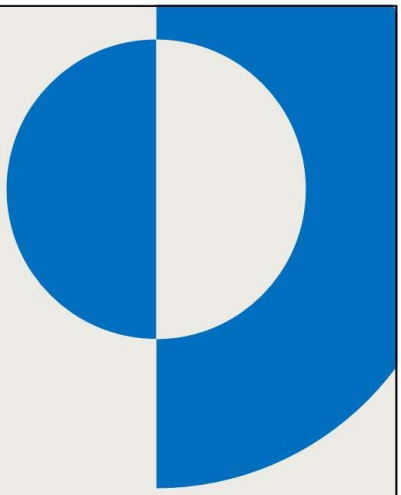


Any Questions on Previous Topics?



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BCUA Supplemental CSO Team

Meeting No. 2 Agenda

- Reminder: The BCUA CSO Group is Undertaking the Regional LTCP Separately, but Together:
  - Each Municipality is Responsible for Developing All Reports for their System.
  - BCUA is establishing Guidelines and Undertaking Certain Required Tasks for the Group
  - Group Meeting are Held Monthly to Coordinate, and Agree upon Schedules, Tasks, and to Share Information.
  - BCUA will be Combining Individual Computer Models into one Regional Model.
  - BCUA is Compiling and Coordinating Report Submissions to NJDEP

September 19, 2017

Sewer System Characterization Report

Description and Status

Initial System Characterization Completed 2003 – 2006

Completed by Fort Lee, Hackensack, and Ridgefield Park

- Sewer System Mapping
- Dry and Wet Weather Monitoring at Regulators and Outfalls.
- Review of Land Use and Population Data
- Development of Land Side Computer Model
- Computer Output used to Characterize CSO Discharge

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Sewer System Characterization Report
Description and Status

System Characterization Updates Being Completed by:

Fort Lee, Hackensack, and Ridgefield Park

- Updating monitoring data to the extent needed:
  - Ridgefield Park completed flow monitoring in areas partially separated
  - Fort Lee doing additional flow and water quality monitoring in redevelopment areas
- All Permittees with CSOs are updating their computer models.

September 19, 2017

Sewer System Characterization Report
Description and Status

System Characterization Status Update

- BCUA has completed data collection and is currently reviewing data and developing their computer model
- Fort Lee is undertaking additional monitoring and will then update their modeling
- Hackensack has completed their model update.
- Ridgefield Park will complete their model update by October 1st.

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Sewer System Characterization Report
Description and Status Update for

Outline and Status of Village of Ridgefield Park Monitoring and Modeling

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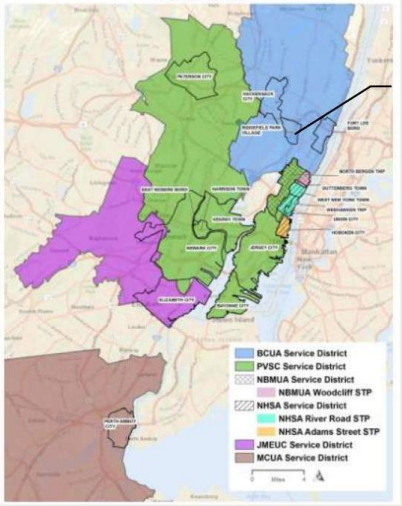
Where is Ridgefield Park in Relationship to Other CSOs?

Figure 1-1: Participating NJCSO Group Members and Associated Central Sewage Treatment Facilities



Ridgefield Park

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Sewer System Characterization Report Update
Ridgefield Park Info Works Computer Model Update

- Computer Model Updated from Info Works CS to Info Works ICM (Integrated Catchment Model)
- GIS Data Imported to Model for Sewer Network.
- New Flow Data Used to Better Calibrate Model.

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Sewer System Characterization Report Update
Ridgefield Park Info Works Computer Model Update

- GIS Sewer Reaches and Details Added to Model

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Sewer System Characterization Report Update

Ridgefield Park Info Works Computer Model Update

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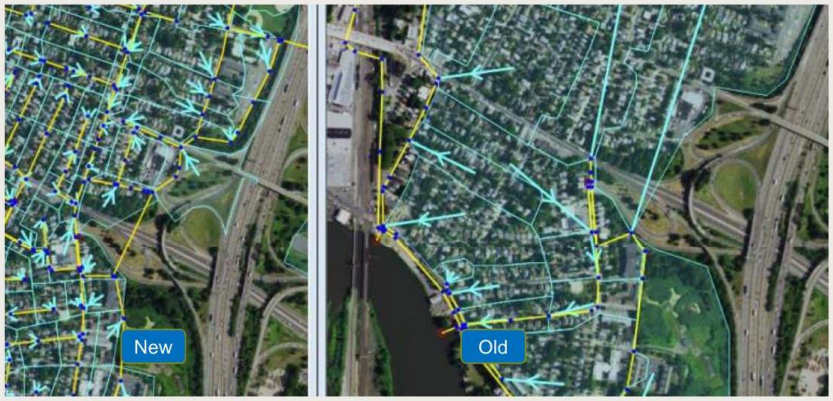
Sewer System Characterization Report Update

Ridgefield Park Info Works Computer Model Update



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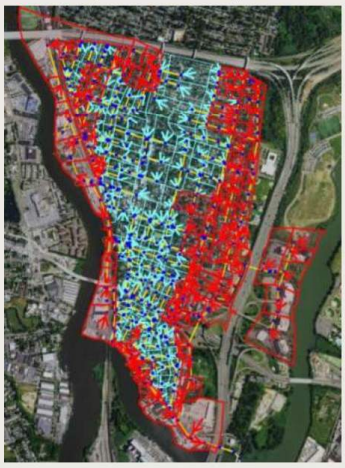
Sewer System Characterization Report Update
Ridgefield Park Info Works Computer Model Update

- Additional Separate Storm Sewer Reaches Located and Added to Model



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Sewer System Characterization Report Update
Ridgefield Park Info Works Computer Model Update

- New Flow Data Obtained on East Side of Village

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Sewer System Characterization Report Update

Ridgefield Park Info Works Computer Model Update

- New Flow Data Obtained on East Side of Village

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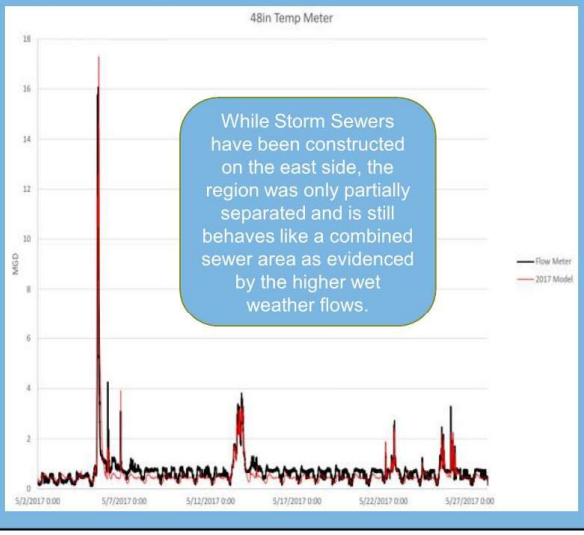
New Monitoring Data – Meter RP-795 – 48 inch Brick Sewer Teaneck Road



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Sewer System Characterization Report Update
Info Works Computer Model Update

Is the Updated Model for Ridgefield Park any Better?

Let's Look!

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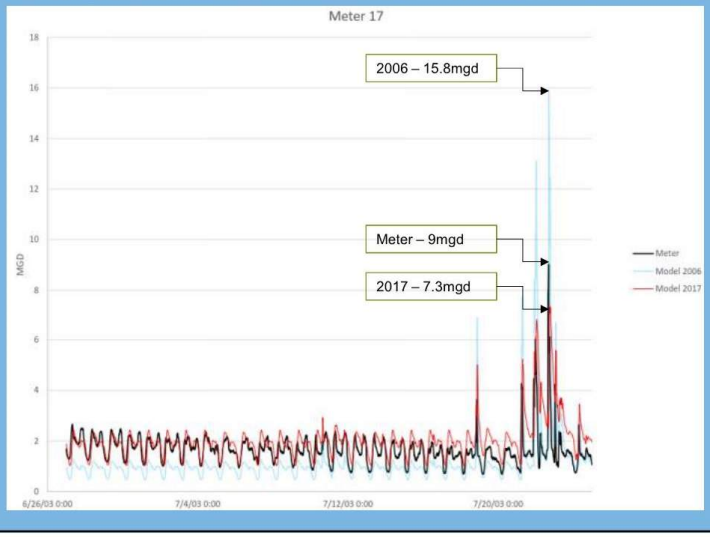
Comparison of Computer Simulation at BCUA Meter 17 for 2006 Model vs 2017 Model



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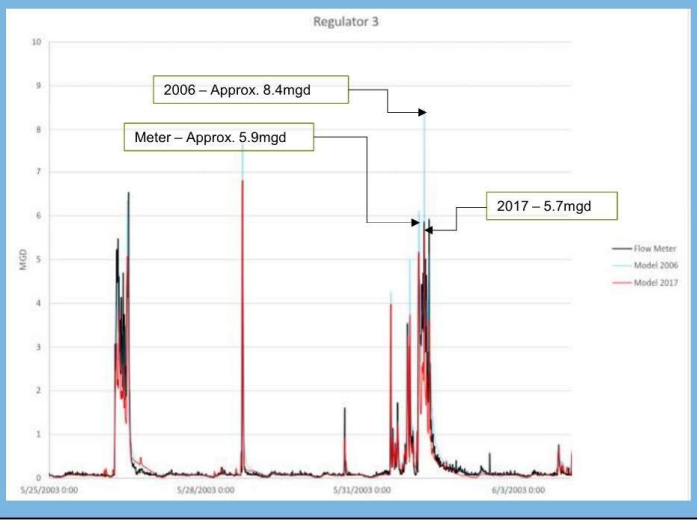
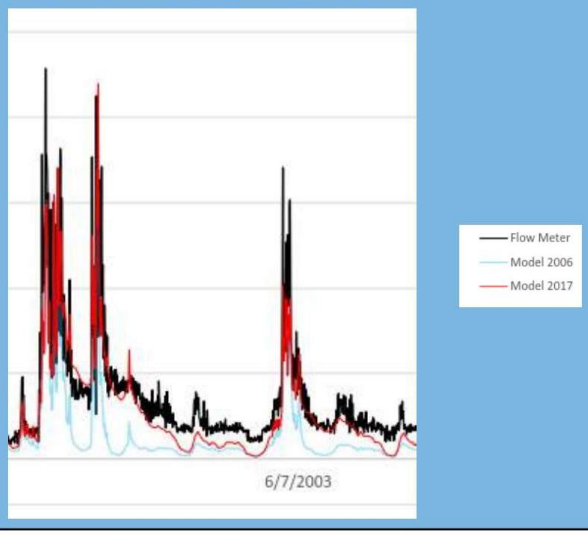
Comparison of Computer Simulation at Regulator 3 for 2006 Model vs 2017 Model



Comparison of Computer Simulation at Regulator 3 for 2006 Model vs 2017 Model



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Sewer System Characterization Report Update
Info Works Computer Model Update

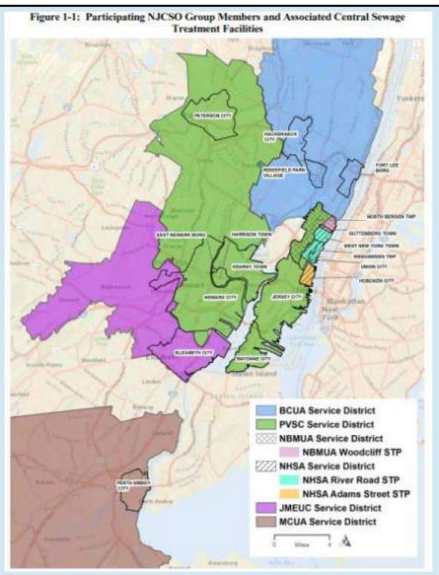
Is the Updated Model for Ridgefield Park any Better?

YES!

Typical Hydraulic Year Analysis and Report

We need to Establish Average Precipitation Characteristics for Use in the Analysis of Alternatives

The Combined Sewer Overflow (CSO) discharges in the Region need to be evaluated on an **average year basis** and should be conducted using the same rainfall data to be consistent!



Typical Hydraulic Year Analysis and Report

1. What is a typical hydraulic year?
   - Average/typical Annual Rainfall Volume
   - Average/typical Storm Intensities
   - Average/typical Peak Rainfall Volume per Storm
2. Why is It important?
   - Permit Requires no more than and average of four overflows per year, or
   - 85% capture of CSO Volume on an average basis.
3. How is it determined?
   - Analysis of Historic Rainfall data.

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Typical Hydraulic Year Analysis and Report

Rainfall in New Jersey / New York Region is Highly Variable!

Typical Hydraulic Year Analysis and Report

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1996	5.24	2.34	4.40	5.63	2.59	5.06	5.27	2.39	6.05	6.92	2.31	6.57	56.07
1997	3.50	2.15	5.19	3.05	3.12	2.42	7.05	2.59	2.20	2.02	4.54	4.16	42.35
1998	4.93	4.77	4.14	6.17	6.52	5.95	1.34	3.20	2.72	1.81	0.56	1.03	43.47
1999	6.57	3.10	3.63	1.90	4.19	0.41	1.01	5.51	9.35	2.90	2.90	2.95	44.75
2000	3.39	1.60	3.43	3.57	5.66	3.42	6.30	4.73	4.55	0.54	2.71	3.42	43.35
2001	2.57	1.79	6.69	1.71	2.55	3.97	2.29	1.97	4.29	0.46	0.51	2.01	31.44
2002	1.55	0.52	3.59	3.76	3.59	5.55	1.19	4.05	3.66	6.79	4.45	3.71	43.37
2003	2.94	3.90	3.95	2.42	3.45	10.50	2.59	5.21	5.57	3.72	3.94	5.11	56.33
2004	1.59	2.44	3.07	4.55	4.60	2.95	5.39	3.70	5.01	0.59	4.21	3.37	45.37
2005	3.93	2.51	4.16	3.42	1.21	2.99	4.05	0.51	3.36	3.74	3.65	44.14	
2006	4.52	2.36	0.79	4.05	3.35	5.99	6.71	2.52	3.36	6.75	6.95	2.19	50.16
2007	3.50	1.43	3.93	11.55	1.57	5.24	6.71	7.32	1.51	3.70	2.35	4.75	54.49
2008	2.39	5.52	3.61	2.79	3.95	5.63	3.14	2.80	7.14	2.79	3.07	5.68	48.63
2009	2.56	0.55	1.51	4.61	4.05	7.96	6.60	4.14	1.73	5.43	1.20	7.13	47.93
2010	1.66	5.45	10.05	2.90	3.45	2.37	1.93	2.44	3.58	3.54	1.53	3.55	43.47
2011	4.40	3.49	5.54	5.56	4.75	2.74	2.04	15.79	3.13	3.53	4.51	69.91	
2012	2.59	1.33	1.05	3.45	4.32	5.02	2.27	2.56	3.65	1.62	5.06	36.35	
2013	2.49	3.55	3.00	1.47	5.44	5.74	3.74	4.57	1.54	0.51	2.97	4.62	42.94
2014	2.75	4.94	3.65	7.95	4.03	4.41	5.10	1.76	1.52	4.15	4.13	4.91	49.33
2015	4.42	2.06	4.63	1.67	4.53	5.90	2.69	1.40	2.33	3.35	1.30	4.40	38.96
2016	4.01	4.04	1.35	1.12	3.65	2.40	6.05	0.93	2.17	3.00	6.52	2.91	38.41

Rainfall is Highly Variable

Newark Airport – 1996 to 2015

Lowest

Lowest

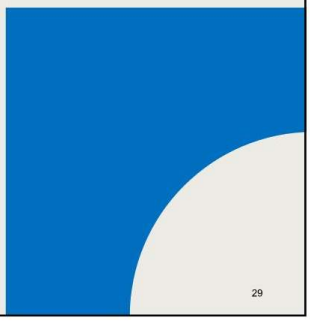
Highest

Highest

Typical Hydraulic Year Analysis and Report

Rainfall in New Jersey / New York Region is Highly Variable!

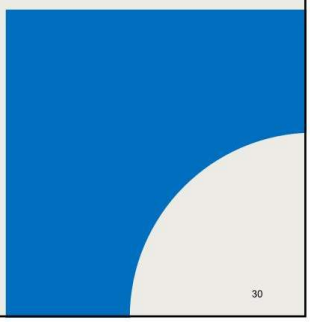
Conduct a Statistical Analysis of Rainfall



Typical Hydraulic Year Analysis and Report

The Analysis is Being Undertaken by PVSC
For the New Jersey CSO Group

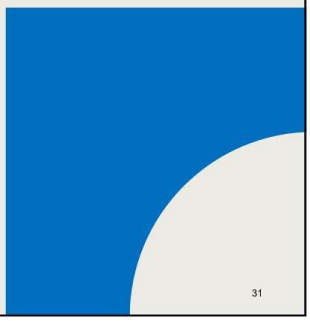
Analysis as Presented hereafter is taken from the Draft Report (August 2017)



Typical Hydraulic Year Analysis and Report

Rainfall in the Region is typically based on Long Term (100+ years) Records from Newark International Airport,

but for what period?



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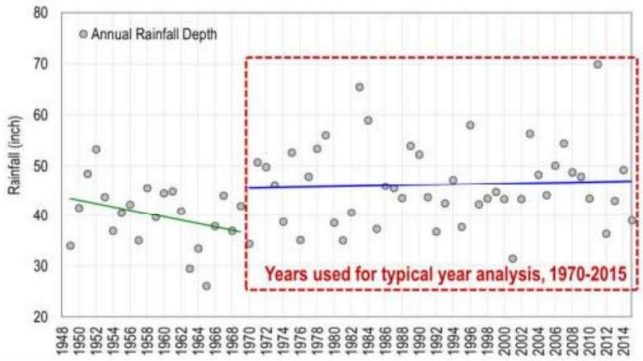
Typical Hydraulic Year Analysis and Report

Tables and Figures are from PVSC Draft Report

PVSC's Consultant reviewed the Period from 1948 to 2014 initially.

Selected Period from 1970 - 2014

Figure 1-2: Historical Annual Precipitation at Newark Liberty International Airport



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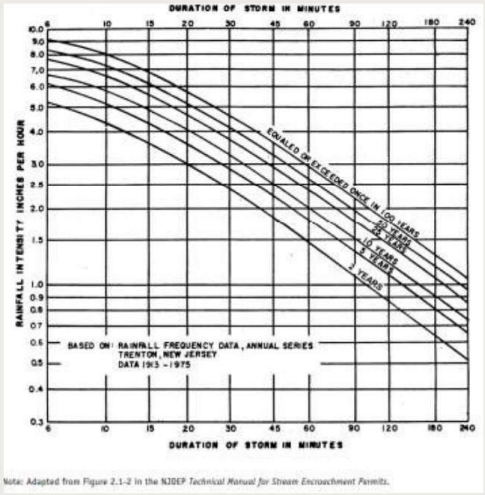
Typical Hydraulic Year Analysis and Report

Rainfall Can Be Analyzed to Illustrate a Certain Pattern Known as the **Return Period** based on Duration of the Storm in Minutes and the Rainfall Intensity Measured in Inches per Hour.

Return Period : The Probability of Having a Storm Equal to or Greater Than that in any one Year.



Note: Adapted from Figure 2.1-2 in the NJDEP *Technical Manual for Stream Encroachment Permits.*

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Typical Hydraulic Year Analysis and Report

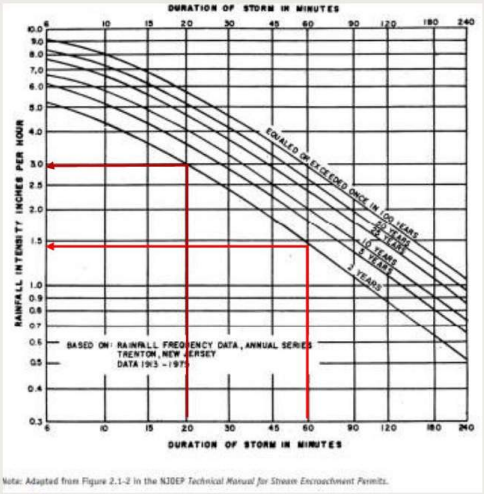
For Example: A 2 year storm has a probability of ½ or 50% in any one year.

But 2 Years Storms Can Be Very Different

A Storm that has Rainfall Intensity of around 1.45 inches/hr. for 60 minutes is called a 2 Year Storm.

A Storm that has Rainfall Intensity of around 3.0 inches/hr. for 20 minutes is also called a 2 Year Storm.

Each has a 50% Probability of Occurring in any one year.



Note: Adapted from Figure 2.1-2 in the NJDEP *Technical Manual for Stream Encroachment Permits.*

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Typical Hydraulic Year Analysis and Report

Tables and Figures are from PVSC Draft Report

Various **Return Periods** to characterize storms from 1970 - 2014

Table 1-3: Partial Duration Series (PDS) - Based Precipitation Frequency Estimates with 90% Confidence Intervals (in inches) for Newark WSO Airport
(Source: NOAA Precipitation Frequency Data Server)

Duration	Average recurrence interval (years)					
	1	2	5	10	25	50
5-min	0.332 (0.304-0.365)	0.396 (0.363-0.435)	0.469 (0.429-0.516)	0.522 (0.476-0.573)	0.59 (0.536-0.647)	0.636 (0.575-0.698)
10-min	0.529 (0.484-0.580)	0.633 (0.580-0.695)	0.75 (0.685-0.824)	0.834 (0.759-0.915)	0.935 (0.848-1.03)	1.01 (0.909-1.11)
15-min	0.66 (0.604-0.724)	0.793 (0.726-0.870)	0.946 (0.863-1.04)	1.05 (0.957-1.15)	1.18 (1.07-1.30)	1.27 (1.15-1.40)
30-min	0.903 (0.827-0.991)	1.09 (1.00-1.20)	1.34 (1.22-1.47)	1.52 (1.38-1.67)	1.74 (1.58-1.91)	1.91 (1.72-2.09)
60-min	1.12 (1.03-1.23)	1.37 (1.25-1.50)	1.71 (1.56-1.88)	1.97 (1.80-2.16)	2.31 (2.10-2.54)	2.58 (2.33-2.83)
2-hr	1.38 (1.26-1.52)	1.68 (1.53-1.85)	2.13 (1.93-2.35)	2.47 (2.24-2.73)	2.96 (2.66-3.26)	3.35 (3.00-3.69)
3-hr	1.54 (1.40-1.69)	1.87 (1.71-2.06)	2.37 (2.16-2.61)	2.76 (2.51-3.04)	3.3 (2.98-3.63)	3.75 (3.36-4.12)
6-hr	1.98 (1.81-2.18)	2.4 (2.20-2.64)	3.03 (2.77-3.33)	3.55 (3.22-3.88)	4.28 (3.85-4.68)	4.88 (4.37-5.34)
12-hr	2.43 (2.22-2.67)	2.95 (2.70-3.24)	3.75 (3.42-4.11)	4.41 (4.01-4.83)	5.39 (4.85-5.87)	6.22 (5.56-6.76)
24-hr	2.72 (2.52-2.96)	3.3 (3.06-3.58)	4.23 (3.91-4.59)	5.02 (4.63-5.44)	6.21 (5.69-6.72)	7.25 (6.59-7.83)

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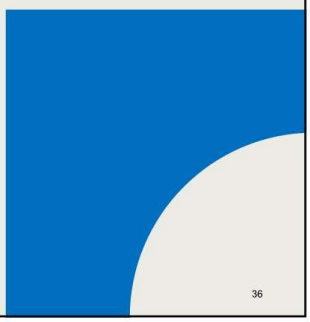
Typical Hydraulic Year Analysis and Report

What Impacts CSO Discharge Volume?

- Rainfall Volume (inches of rainfall)
- Peak Rainfall Intensity (inches per hour)
- The Size of the Drainage Area (time of concentration)
- Frequency of Rainfall (When did it last rain?)



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Typical Hydraulic Year Analysis and Report

Tables and Figures are from PVSC Draft Report

PVSC's Consultant Setup the Variables that needed to be Considered and Gave Each a Weighing Factor

Table 1-2: Typical Hydrologic Year Ranking Parameters

Criteria Parameter	Description / Importance	Weighing Factor
Annual rainfall depth	Impacting total overflow volume and storage volume	10%
Rainfall, May 15-Sep 15	Rainfall during Recreational Season, May 15-Sep 15	5%
Passaic River Flow, May 15-Sep 15	River flow during Recreational Season, May 15-Sep 15	5%
Ratio (Passaic River Flow)/(Rainfall), May 15-Sep 15	Impacts waterbody dilution factor	10%
5th largest storm	Determining max storage volume or WWTP capacity	15%
Rainfall volume for 85% captured	Determining max storage volume or WWTP capacity	15%
# of events with rainfall depth ≥ 0.2 in	Rainfall depth to trigger overflow in existing system	5%
# of back-to-back rainfall events	Determining antecedent conditions and potential storage facility operation	15%
Maximum peak intensities of the 5th largest storm and less	Determining the sizing of conveyance pipes, diversions, regulators, pumps, etc.	15%
# of storms with return frequency ≥ 1-year	Extremely large storms to be avoided	5%

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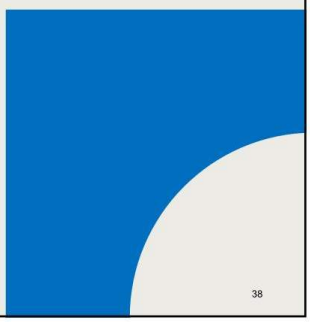
Typical Hydraulic Year Analysis and Report

To Be Conservative PVSC's Consultant Eliminated any Year Where the Total Rainfall was less than the Average of 46.3 inches



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Typical Hydraulic Year Analysis and Report

Tables and Figures are from PVSC Draft Report

PVSC's Consultant determined the top 5 years based on the results of the analysis.

Table 2-3: Top 5 Ranked Years

Rank	Year	Score	Demonstration Approach				Presumption		Operational			
			Annual Rainfall (in)	Rainfall (in) May 15 - Sep 15	River Avg. Flow (cfs) May 15 - Sep 15	Ratio Rainfall / River, May 15 - Sep 15	5th Largest Storm (in)	Rainfall Volume for 85% Captured (in)	# of Events >0.2" Rainfall Depth	# of back-to-back events	Maximum Peak Intensity of 5th Largest & Smaller	# of Storms with Return Freq > 1-yr
1	2004	0.100	48.4	19.9	850	42.8	1.63	1.21	54	5	0.99	3
2	2008	0.130	48.8	18.5	504	27.3	1.84	1.37	49	6	0.77	3
3	2009	0.161	47.9	19.8	1,140	57.5	1.87	1.16	54	6	0.80	1
4	1996	0.165	58.1	18.6	770	41.4	2.00	1.32	63	7	1.09	3
5	2014	0.186	49.3	14.8	686	46.3	1.56	1.26	60	8	1.26	2
Average 1970-2015			46.3	16.7	779	43.7	1.72	1.38	51	5.6	0.90	2

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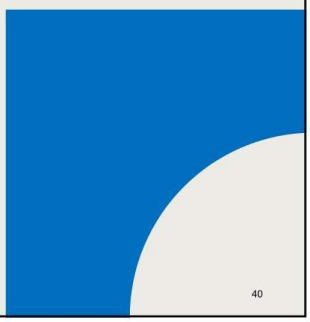
Typical Hydraulic Year Analysis and Report

How do you Verify that 2004 is Equal To (required) or Greater Than (Conservative) an Average Year?

- Run Your Computer Model with all Rainfalls for an extended period.
- Separate the Results (Number of Overflows and Overflow Volume) by Years.
- Determine the Average Number of Overflows and the Average Annual Overflow Volume
- Compare that to 2004



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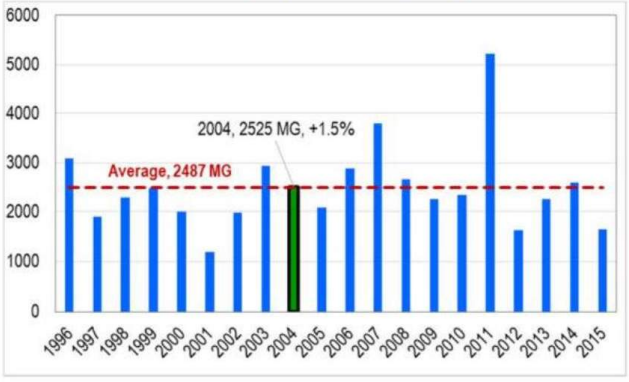
Typical Hydraulic Year Analysis and Report

Tables and Figures are from PVSC Draft Report

Figure 2-2: Hydrologic and Hydraulic Model - CSO Volume



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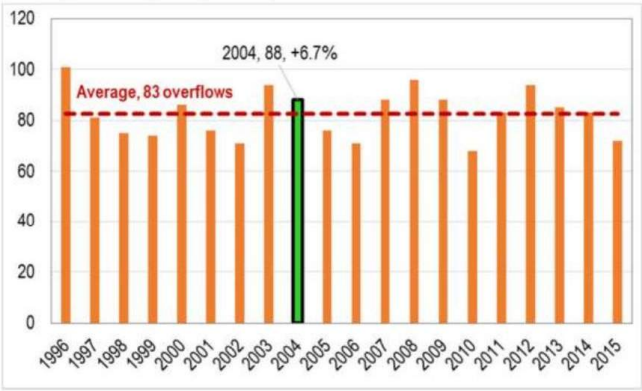
Typical Hydraulic Year Analysis and Report

Tables and Figures are from PVSC Draft Report

Figure 2-3: Hydrologic and Hydraulic Model - Number of CSO Events



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Typical Hydraulic Year Analysis and Report

Tables and Figures are from PVSC Draft Report

How does it Compare to Average Conditions?

Table 2-5: Summary of the Recommended Typical Year - 2004

Parameters		2004
Rank		Top 1
Annual Rainfall		48.37 in (4.5% greater than average 46.27)
Extreme Storm		1 Year Storm (2) 2 Year Storm (1)
Back-to-Back Storm Events		5 (11% less than average 5.6)
May 15 through Sep 15	Rainfall	19.9 in (19% greater than average 16.7)
	Passaic River Flow	850 cfs (9% greater than average 779)
	Ratio, River Flow / Rainfall	42.8 (2% less than average 43.7)
Modeled Annual CSO Volume		2,525 MG (1.5% greater than average 2,487)
Modeled Annual Overflow Frequency		88 (6.7% greater than average 83)

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Typical Hydraulic Year Analysis and Report

PVSC's Consultant Has Completed the Draft and Is Recommending 2004 as the Typical Year.

- Currently Under Review by Individual Municipalities
- Needs to Be Submitted and Approved by NJDEP

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Project Schedule

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BCUA CSO Group Project Schedule

Reports with Deadline of July 1, 2018:

- Quarterly Reports to NJDEP
- Submit Regional System Characterization Report
  - Develop Template for Report (BCUA)
  - Coordinate Model Integration (BCUA)
  - Finalize Individual Reports – Target: March 1, 2018
  - Finalize Regional Report – Target: June 1, 2017
- Submit Public Participation Report
- Submit Compliance Monitoring Program Report*
- Submit Consideration of Sensitive Areas Plan

* New Jersey CSO Group Joint Effort

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Ridgefield Park Project Schedule

Deadlines After July 1, 2018:

- Quarterly Reports to NJDEP
- Submit Development and Evaluation of Alternatives Report (July 1, 2019)
- Submit Selection and Implementation of Alternatives Report in Final Regional LTCP (June 1, 2020)

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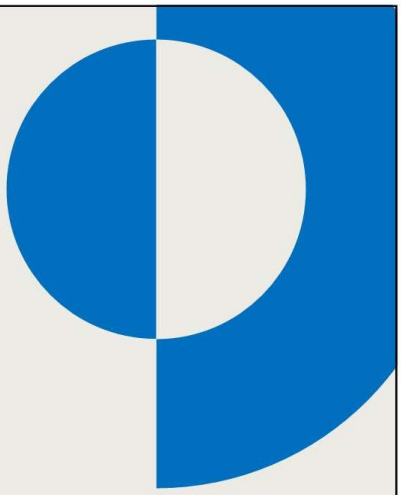
Questions?



September 19, 2017

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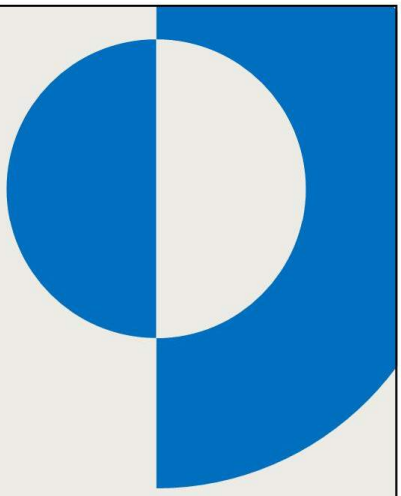
MOTT MACDONALD

Thank you

- BCUA CSO Group
- Supplemental CSO Team –
  Meeting 2: System Characterization

BERGEN COUNTY UTILITIES AUTHORITY



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Sewer System Characterization Report Update

Description and Status

In Most CSO Municipalities:

- Land Use Has Not Changed.
- Population Has Not Changed.
- Sewer System Has Not Changed.

But computer models are old and no longer supported. New computer models will be used and therefore models need to be updated.

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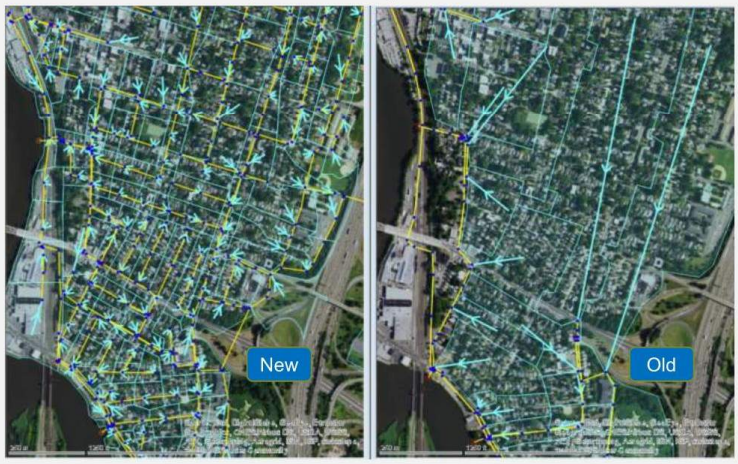
Sewer System Characterization Report Update

Ridgefield Park Info Works Computer Model Update



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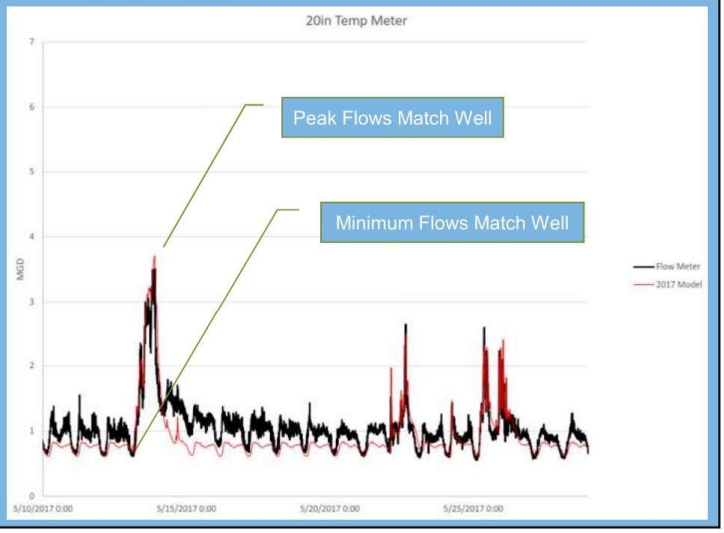
New Monitoring Data – Meter BCUA-1 – Easement



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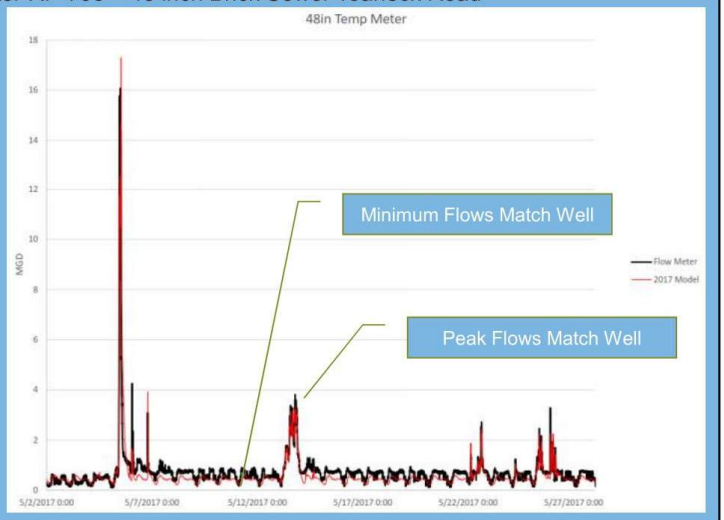
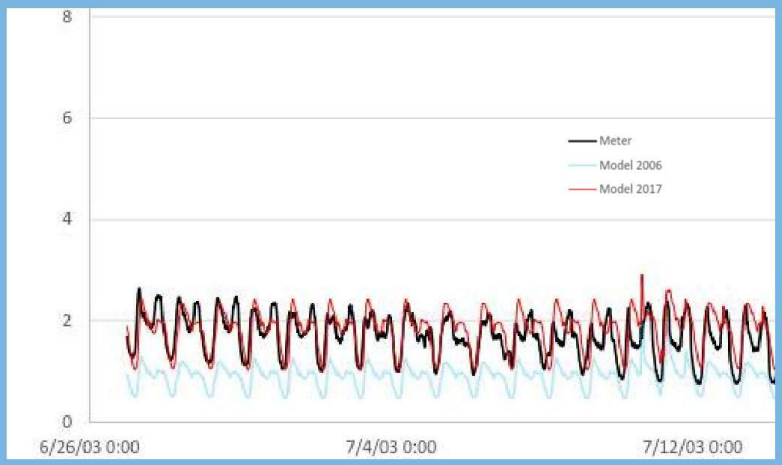
New Monitoring Data – Meter RP-795 – 48 inch Brick Sewer Teaneck Road



Comparison of Dry Weather Computer Simulation – Meter 17 for 2006 Model vs 2017 Model



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Comparison of Computer Simulation at Regulator 3 for 2006 Model vs 2017 Model