Bergen County Utilities Authority

Supplemental CSO Team

Meeting #5

BCUA Administration Building, Public Meeting Room

June 12, 2018, 10:00 AM

1) Introduction
    a) John Rolak opened the meeting at 10:00 AM with a review of topics discussed at the last quarterly meeting held in March and opened for questions. No questions were asked at that time about previous topics.
2) Presentation by John Rolak about the BCUA Sewer System Characterization Report, which is due on July 1, 2018 (see power points).
    a) Presentation by David Stahl about the Fort Lee Sewer System Characterization Report (see power points).
    b) Presentation by Frank Belardo about the Hackensack Sewer System Characterization Report (see power points).
    c) Presentation by John Dening about the Ridgefield Park Sewer System Characterization Report (see power points).
    d) Presentation by John Dening on various reports due on or before July 1, 2018.
3) Discussions on date for next CSO Supplemental Team meeting. Tentative date set for September 11, 2018.
4) Meeting concluded at 11:15 am.

Minutes submitted by Donna Gregory

Bergen County Utilities Authority
Supplemental CSO Team
Meeting Number 5
BCUA Administration Building, Public Meeting Room
June 12, 2018, 10:00 am

Name	Organization	Email	initials
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6/25/2018

MOTT MACDONALD

Supplemental CSO Team

Meeting Number 5 – June 12, 2018
Sewer System Characterization Study Report

BCUA CSO Group

Supplemental CSO Team

Meeting No. 5 Agenda

Refresher - In Meeting #4 We Covered:

- Consideration of Sensitive Areas
  - Village of Ridgefield Park
  - Borough of Fort Lee
  - City of Hackensack
- Update on Typical Year Analysis
- Update on BCUA Computer Model
- Update on Sewer System Characterization Report

Any Questions On Previous Topics?

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6/25/2018

Supplemental CSO Team

Meeting No. 5 Agenda

Topics to Discuss Today:

Baseline Compliance Monitoring Report

Sewer System Characterization Study

Modelling Results for:

- BCUA Trunk Sewer System
- Borough of Fort Lee
- City of Hackensack
- Village of Ridgefield Park

06/12/2018 Meeting No. 5 | Presentation

BCUA Sewer System Characterization / Modeling

Description

Baseline Compliance Monitoring Report

- Undertaken by NJ CSO Group
- Conducted Year Long Receiving Water Monitoring
- Undertaking Calibration and Verification of a Receiving Water Model
- Monitoring Results Being Presented for Area Waters
  - Hackensack River
  - Overpeck Creek
  - Hudson River

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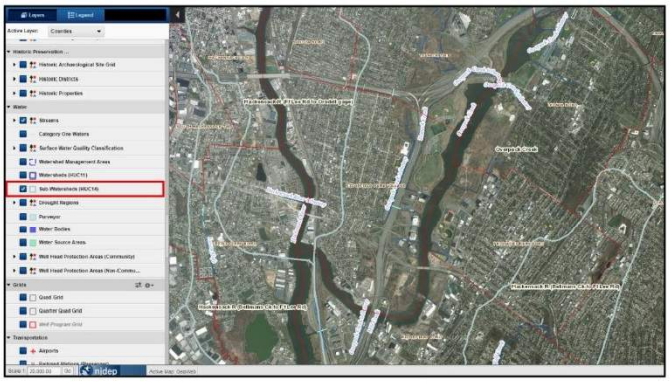
Receiving Waters

Overpeck Creek Sub-Watershed (HUC-14 02030103180040; Sub-watershed ID 05BB04)
Hackensack River, Fort Lee Road to Oradell gage (HUC-14 02030103180030; Sub-watershed ID 05BB03)



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Receiving Waters

SE-1 and FW2-NT/SE2

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Receiving Waters
Sampling

Hackensack River Basin

- NJ/NY State Line to Oradell — FW2-NT (C1)
- Oradell to Confluence with Overpeck Creek — SE-1
- Overpeck Creek to Route 1-9 Bridge — SE-2
- Route 1-9 Bridge to Newark Bay — SE-3

Hudson River in Area of Fort Lee — SE-2

Class	Description	Bacterial Standards	Monthly Mean	Single Sample Max	Protected Uses
SC	Saline Ocean	Entero	35	104	Primary Contact, Shellfishing
SE1	Saline Estuary	Entero	35	104	Primary Contact
SE2	Saline Estuary	Fecal	770	NA	Secondary Contact
SE3	Saline Estuary	Fecal	1500	NA	Secondary Contact
FW2	Fresh Water	Ecoli	126	235	Primary Contact and Public Water Supply

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Receiving Waters
Sampling

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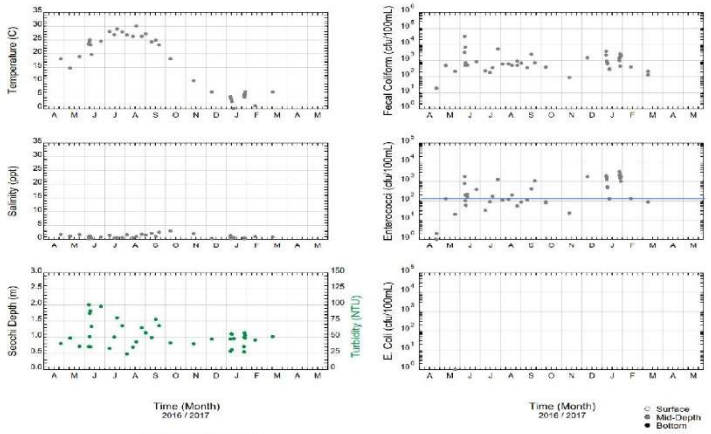
Receiving Waters

Sampling

Class	Description	Bacterial Standards	Monthly Mean	Single Sample Max	Protected Uses
SE1	Saline Estuary	Entero	35	104	Primary Contact

Hackensack River & Tributaries, Hackensack River, B1



Single Sample Max 104

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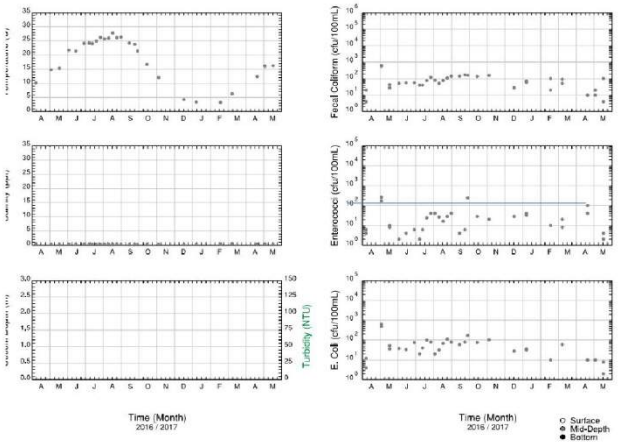
Receiving Waters

Sampling

Class	Description	Bacterial Standards	Monthly Mean	Single Sample Max	Protected Uses
SE1	Saline Estuary	Entero	35	104	Primary Contact

Hackensack River & Tributaries, Hackensack River, 13. (SE1)



Site Just Downstream of Dam Still Exceeds Single Sample Max 104

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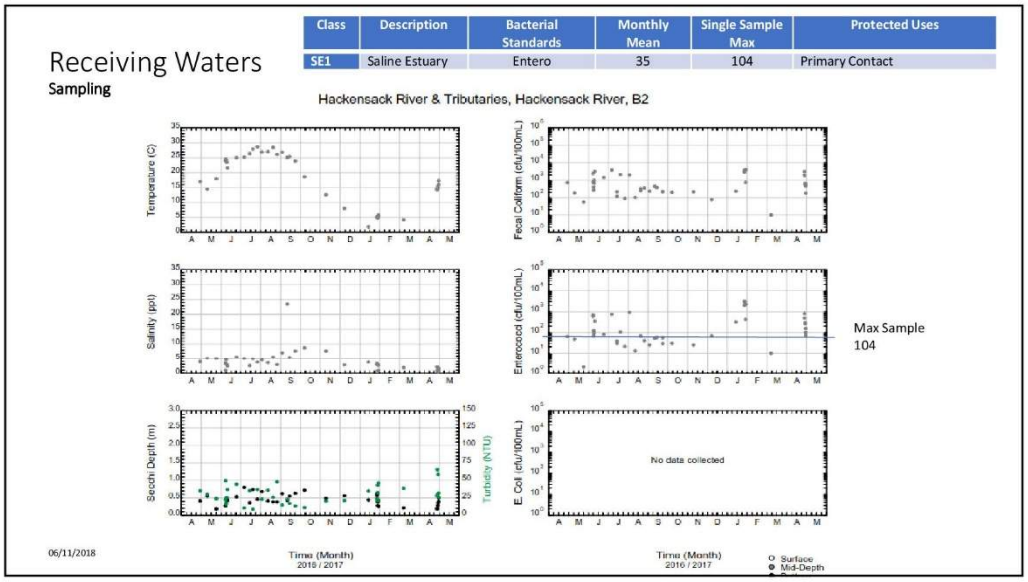
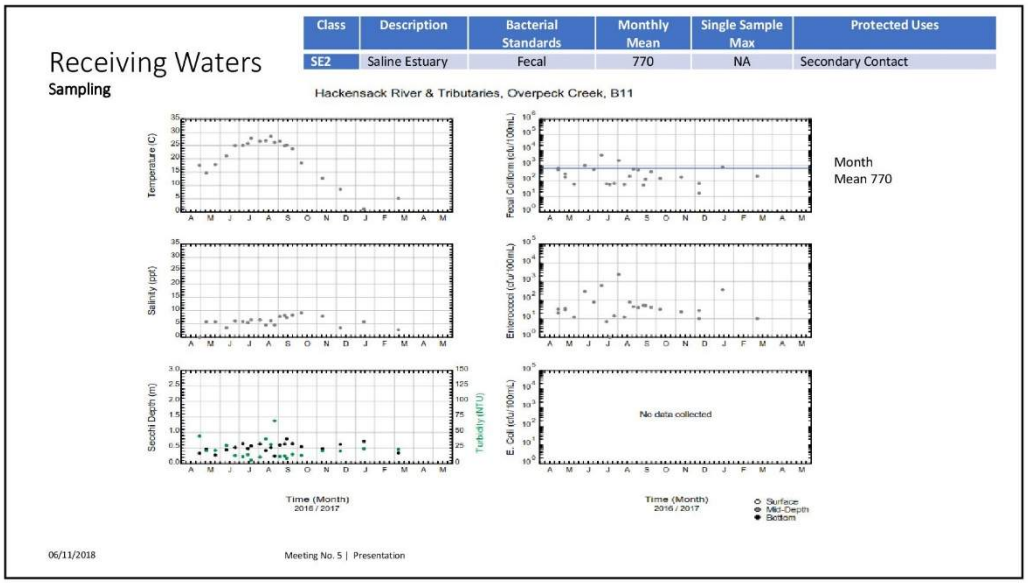

Receiving Waters
Sampling
Class | Description | Bacterial Standards | Monthly Mean | Single Sample Max | Protected Uses
SE1 | Saline Estuary | Entero | 35 | 104 | Primary Contact
Hackensack River & Tributaries, Hackensack River, B2
Temperature (C)
Fecal Coliform (cfu/100mL)
Salinity (ppt)
Enterococci (cfu/100mL)
Secchi Depth (m)
Turbidity (NTU)
E. Coli (cfu/100mL)
No data collected
Max Sample 104
06/11/2018
Time (Month) 2016 / 2017
Surface
Mid-Depth


Receiving Waters
Sampling
Class | Description | Bacterial Standards | Monthly Mean | Single Sample Max | Protected Uses
SE2 | Saline Estuary | Fecal | 770 | NA | Secondary Contact
Hackensack River & Tributaries, Overpeck Creek, B11
Temperature (C)
Fecal Coliform (cfu/100mL)
Salinity (ppt)
Enterococci (cfu/100mL)
Secchi Depth (m)
Turbidity (NTU)
E. Coli (cfu/100mL)
No data collected
Month Mean 770
Time (Month) 2016 / 2017
Surface
Mid-Depth
Bottom
06/11/2018
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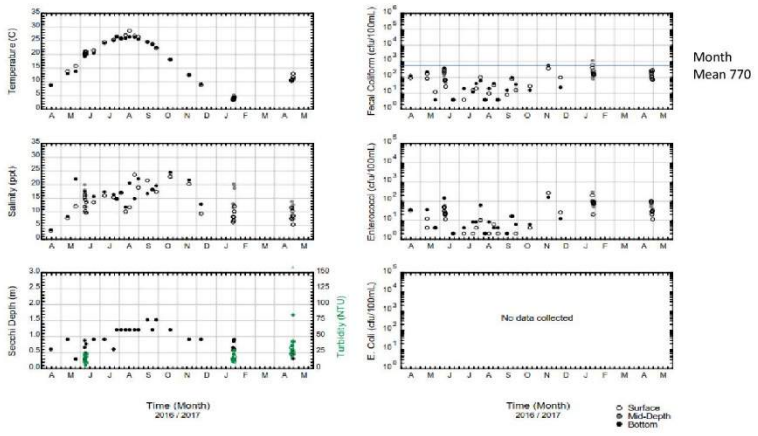
Receiving Waters

Sampling

Class	Description	Bacterial Standards	Monthly Mean	Single Sample Max	Protected Uses
SE2	Saline Estuary	Fecal	770	NA	Secondary Contact

Hudson River, Upper Bay, Hudson River, 31



Month
Mean 770

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Supplemental CSO Team

Meeting No. 5

BCUA Sewer System Characterization Study

Modelling Results for:

- BCUA Trunk Sewer System
- Borough of Fort Lee
- City of Hackensack
- Village of Ridgefield Park

06/12/2018 Meeting No. 5 | Presentation

Sewer System Characterization Report

Description

The Major Elements of a Sewer System Characterization Include:

I. Rainfall Records (Typical Year Analysis)

II. Combined Sewer Characterization (Most using 2007 data with updates)

Studies to understand the physical sewer system, including the number, location, and frequency of overflows.

III. CSO Monitoring (Most using 2007 data with updates)

Studies to measure the frequency, duration, flow rate, volume and pollutant concentrations of CSO discharges.

IV. Modeling (Most using 2007 models with updates)

Calibration and Verification of EPA approved Models to aid in characterization

V. Sensitive Area Analysis

Sewer System Characterization Report

Description

The Major Elements of a Sewer System Characterization Include:

I. Rainfall Records (Typical Year – Meeting 2)

II. Combined Sewer Characterization (Meeting 1 and 2)

III. CSO Monitoring (Meeting 2)

IV. Modelling (Today's Topic)

V. Sensitive Area Analysis (Meeting 4)

BCUA Sewer System Characterization / Modeling

Description

- The BCUA consists of the following:
  - 47 member municipalities
  - 1 primary wastewater treatment plant (Little Ferry)
  - 108 miles of conveyance interceptor sewers
- Member communities:
  - 3 municipalities with combined sewers (and combined sewer overflows)
  - 44 municipalities with separate sanitary and storm sewers

06/12/2018 Meeting No. 5 | Presentation

BCUA model development goals

1. Accurately represent the performance of the BCUA infrastructure
2. Realistically represent the flows from the BCUA member municipalities
3. Consistently meet model calibration/validation criteria
4. Ultimately have a reliable tool for the evaluation of alternatives.

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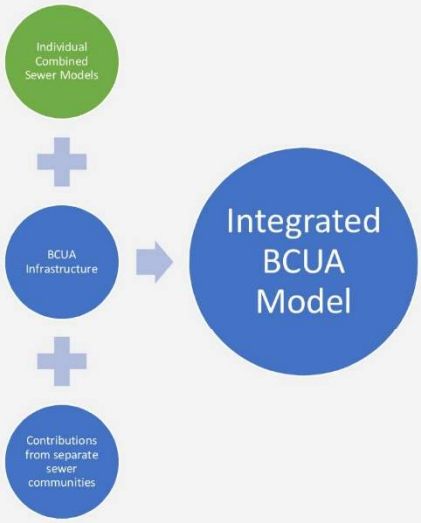
BCUA model development

Three municipalities have developed their own collection system models

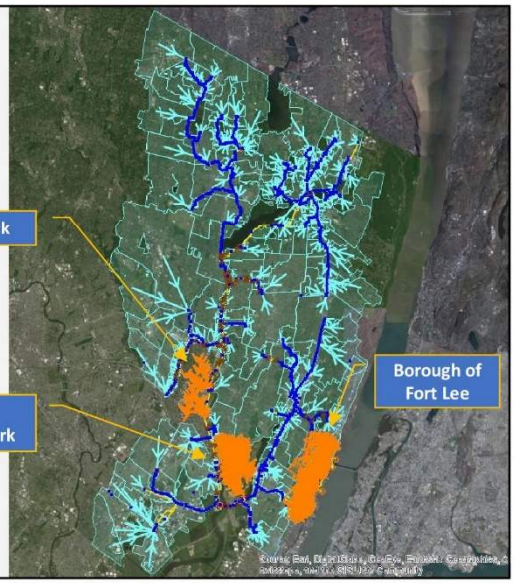
Village of Ridgefield Park
City of Hackensack
Borough of Fort Lee

These models include combined sewer overflows (CSOs)

They will directly integrated into the BCUA model without changes



Individual Models



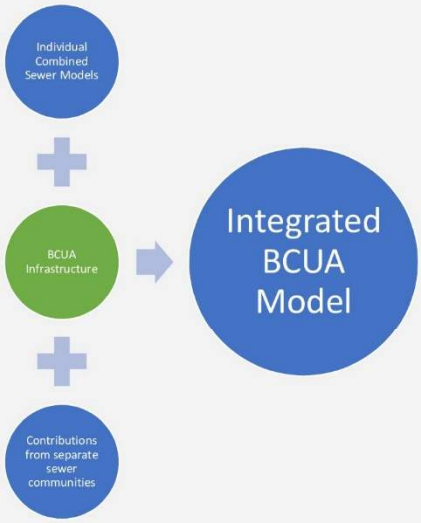
BCUA model development

The following BCUA infrastructure was added to the BCUA model:

Trunk/Intercepting sewer conveyance network

Significant pumping stations

Downstream boundary condition (Little Ferry WWTP wet well)



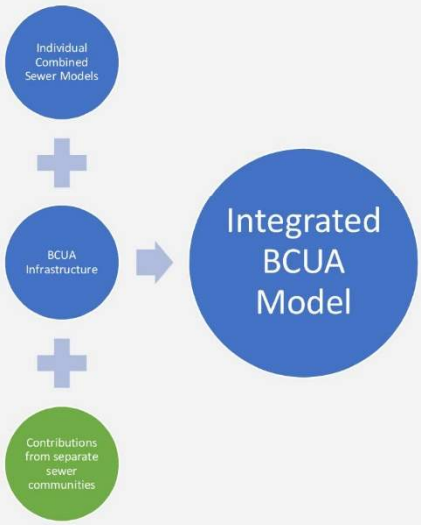
BCUA model development

The sanitary sewer municipalities were added to the BCUA model:

A portion of pipe connecting the municipality to the BCUA interceptor was added

Subcatchments (drainage areas) were developed for these municipalities

BCUA's permanent flow meter network was used to check the model flows



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BCUA model development

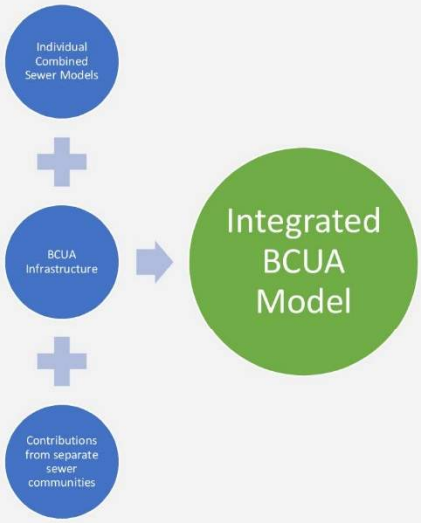
BCUA collection system model attributes:

Developed in InfoWorks ICM modeling software

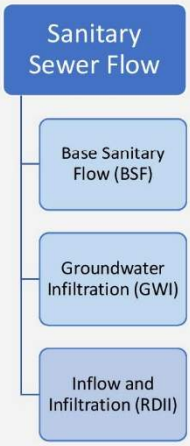
Combined sewer areas (Used BCUA meter data for Fort Lee since model was not available)

Sanitary sewer areas used monthly varying factors for Rainfall Induced Infiltration and Groundwater Levels

Downstream boundary condition set to the varying WWTP wet well elevation obtained from SCADA (four level pressure sensors)



Generating Sanitary Sewer Flow



DWF component that follows a repeating diurnal pattern and is typically generated from population

DWF component that follows a continuously gradually varying pattern that often varies in response to changing seasons or antecedent moisture conditions

WWF that enters the collection system through pipe defects, laterals and other entry points that is modeled using the RTK approach

BCUA Permanent Flow Meters

140+ flow meters measuring flows entering BCUA from member communities

55 of these flow meters were directly used for model calibration

85%+ of the total flow generated in system measured by the 55 flow meters

0.4 – 5.0 MGD were the average flow ranges from the 55 flow meters

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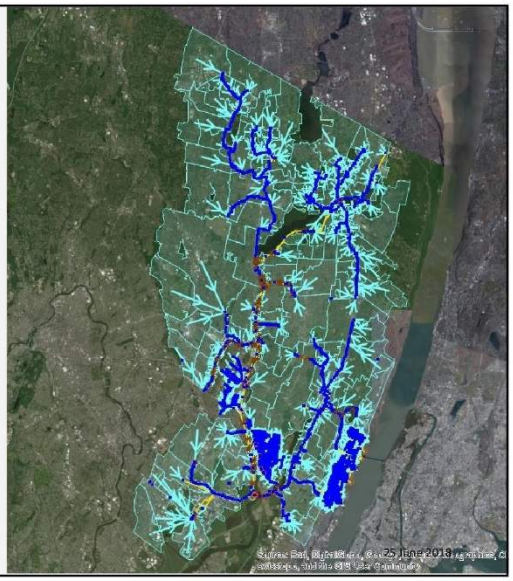

Calibration Flow Meters and Rain Gages

Ridgefield Park Rain Gage:

Village of Ridgefield Park
Tributary Sanitary Sewer Municipalities

Ridgefield Park Rain Gage

Teterboro Rain Gage:

City of Hackensack
Borough of Fort Lee

Teterboro Airport Rain Gage

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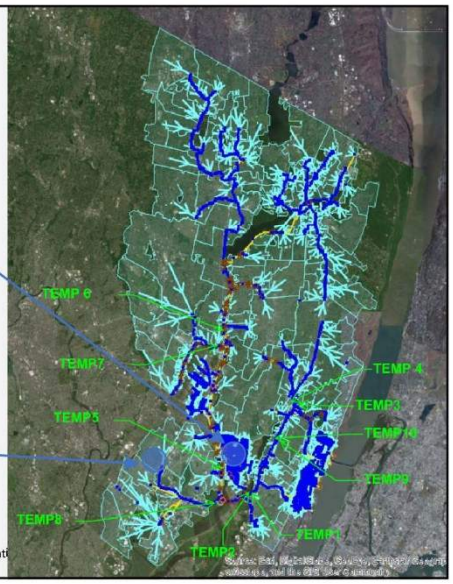
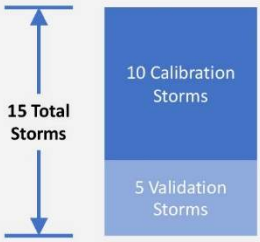


Selecting Calibration/Validation Storm Events

Good Storm Selection Includes a Variety of:

- Storm durations
- Rainfall intensities
- Rainfall volumes
- Seasons
- Antecedent conditions



Calibration/Validation Storm Events

This very large storm event was not used for calibration or validation but was referenced for overall system performance.

Classification	Start Date/Time	Rainfall (in)	Duration (hr)	Peak Intensity (in/hr)
Calibration	03/31/17 0:30	1.50	29.25	0.19
Calibration	04/20/17 5:45	0.12	1.75	0.10
Calibration	04/21/17 0:15	0.39	7.33	0.23
Reference	05/05/17 3:50	2.87	22.50	1.18
Validation	05/13/17 2:30	1.67	37.75	0.19
Calibration	05/25/17 4:25	0.73	25.42	0.11
Calibration	05/31/17 20:55	0.24	0.75	0.24
Validation	06/16/17 17:10	0.10	0.58	0.10
Validation	06/17/17 11:15	0.35	2.25	0.26
Calibration	06/23/17 21:35	1.16	10.08	0.59
Calibration	07/07/17 8:00	0.89	24.17	0.60
Calibration	07/22/17 23:00	0.41	6.08	0.25
Calibration	07/24/17 0:05	0.81	12.17	0.28
Validation	08/07/17 10:15	0.89	10.50	0.31
Calibration	08/15/17 2:45	0.12	1.17	0.11
Validation	08/18/17 7:45	1.42	12.58	1.31

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Calibration/Validation Storm Event Return Period Analysis

BCUA Model Calibration/Validation
Rainfall Return Period Analysis

Date		Volume (inches)	Return Period Months	Peak hourly (in/hr)	Return Period Months
3/31/2017	Calibration	1.5	2.3	0.19	0.3
4/20/2017	Calibration	0.12	0.2	0.1	0.1
4/21/2017	Calibration	0.39	0.3	0.23	0.4
5/25/2017	Calibration	0.73	0.6	0.11	0.1
5/31/2017	Calibration	0.24	0.2	0.24	0.4
6/23/2017	Calibration	1.16	1.3	0.59	2.6
7/7/2017	Calibration	0.89	0.8	0.6	2.8
7/22/2017	Calibration	0.41	0.3	0.25	0.4
7/24/2017	Calibration	0.81	0.7	0.28	0.5
8/15/2017	Calibration	0.12	0.2	0.11	0.1
	Range		0.2 - 2.3		0.1 - 2.8
5/5/2017	Reference	2.87	15.9	1.18	21.4
5/13/2017	Validation	1.67	3.1	0.19	0.3
6/16/2017	Validation	0.1	NA	0.1	0.1
6/17/2017	Validation	0.35	0.3	0.26	0.4
8/7/2017	Validation	0.89	0.8	0.31	0.6
8/18/2017	Validation	1.42	2.1	1.31	28.1
	Range		0.3 - 3.1		0.1 - 28.1

This very large storm event was not used for calibration or validation but was referenced for overall system performance.

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Model Calibration/Verification Review

- The state of model calibration/validation was evaluated by reviewing:
  - Peak Flow vs. Peak Flow graphs
  - Volume vs. Volume graphs
  - Individual storm results vs. calibration/validation criteria
- Overall goals when reviewing calibration:
  - High R^2 value and low bias in the peak flow and volumes graphs
  - Sufficient number of storm events meeting calibration/validation numerical criteria

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Calibration/Validation Notes

The final Fort Lee model is not yet available, so inflow time series from the permanent meters were used instead (for now).

It was challenging to match pairs of temp meters that were on opposite sides of a flow split (even when the total flow checked out).

At times (but rarely) there was evidence of the rainfall being non-representative of the true rainfall that fell over the system.

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Temporary Flow Meters were used in addition to BCUA permanent meters:

Meters 1, 3, & 10 – Overpeck Trunk Sewer
Meters 2, 4, & 9 – Overpeck Relief Sewer
Meters 5 and 6 – Main Trunk Sewer
Meters 7 and 8 – Branch Trunk Sewers

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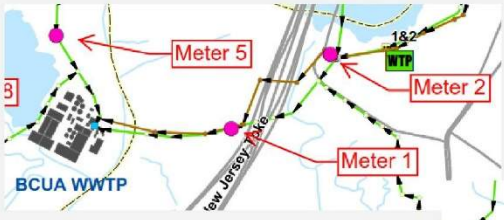
BCUA Sewer System Characterization / Modeling

Some Meters Were Moved After Field Investigations



Meter No.1 (Overpeck Creek Trunk) Was Moved Due to Poor Hydraulics to Same Chamber as Meter 2.

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Calibration/Validation Notes

Calibration / Verification was conducted for two period:

Dry Weather Flows

Wet Weather Flows

WaPUG (Wastewater Planning User Groups) Code of Practice for Hydraulic Modelling of Sewer Systems was set as the Goal.

Dry Weather Goal

Peak - Peak -10% to +10%

Volume – Volume:

-10% to +10 %

Wet Weather Goal

Peak - Peak -15% to +25%

Volume – Volume:

-10% to +20 %

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Calibration/Verification of Hydraulic Model

Dry Weather Flows

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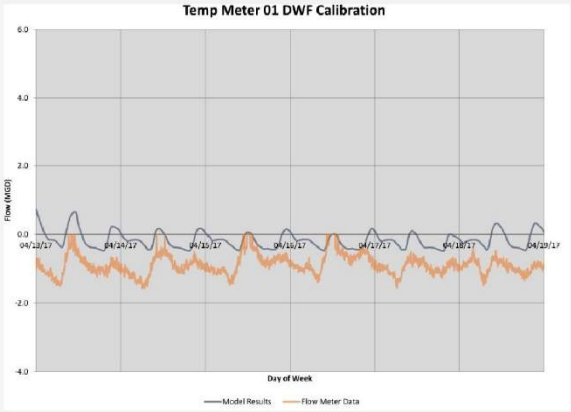
BCUA Sewer System Characterization / Modeling

Calibration Results – Meter 1



Unfortunately the Meter showed flows flowing towards to Chamber instead of the WPCF thus Negative Flows.

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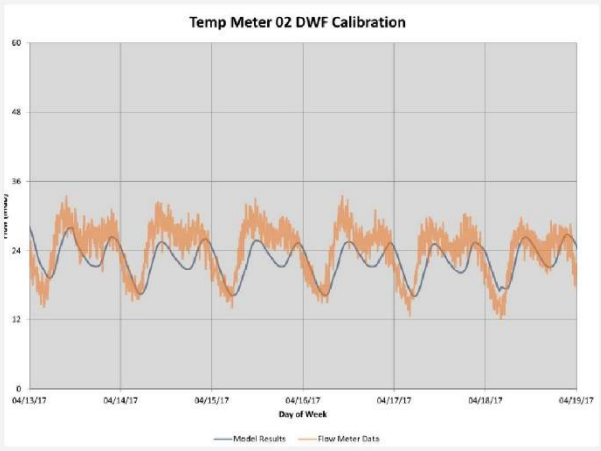
BCUA Sewer System Characterization / Modeling



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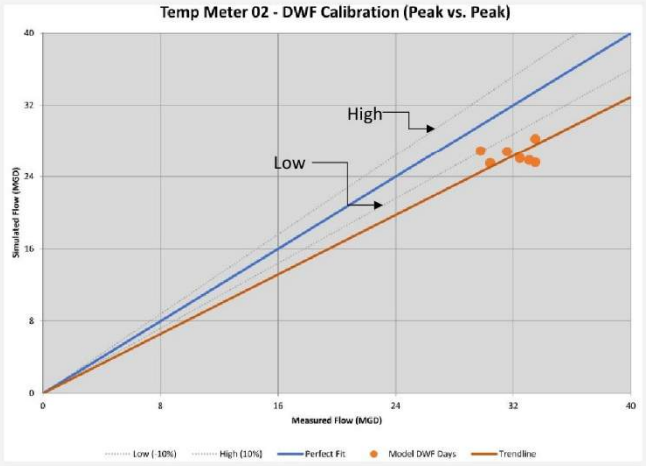
BCUA Sewer System Characterization / Modeling



Ideally Points Fall within Low (-10%) and High (+10%) Bands.

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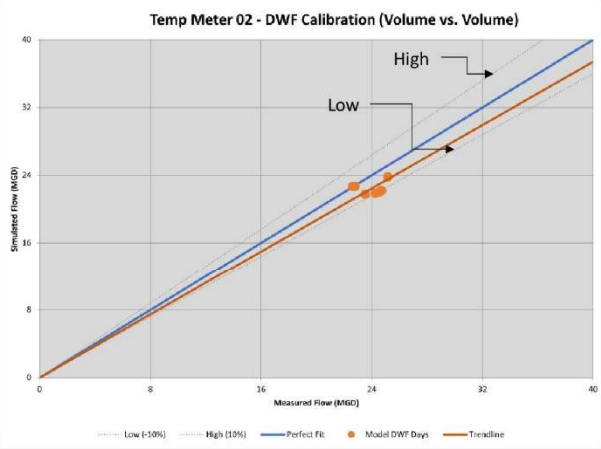
BCUA Sewer System Characterization / Modeling



Flow Volume Was More in Line with Anticipated Results –
Difficult to Model Due to Split Flows Between the Overpeck Trunk Sewer and Overpeck Relief Sewer

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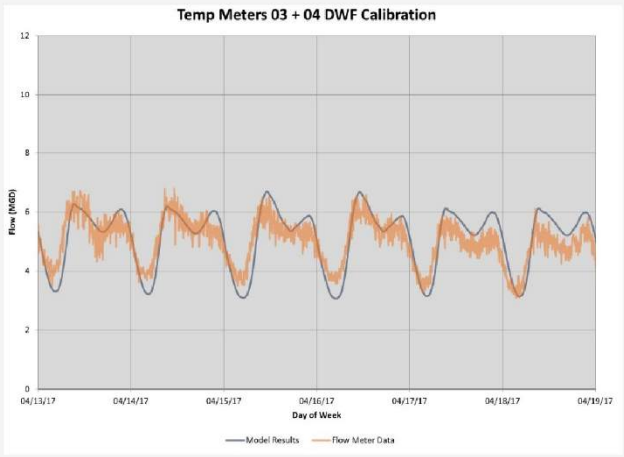
BCUA Sewer System Characterization / Modeling



While looking at Individual Meters on the Trunk Sewer and Relief Sewer were not perfect. Looking at Total Flow between the Trunk and Relief Sewer gave much better results.

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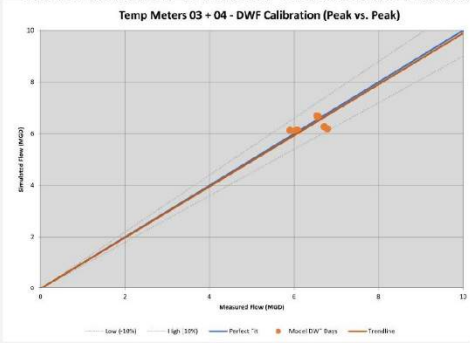
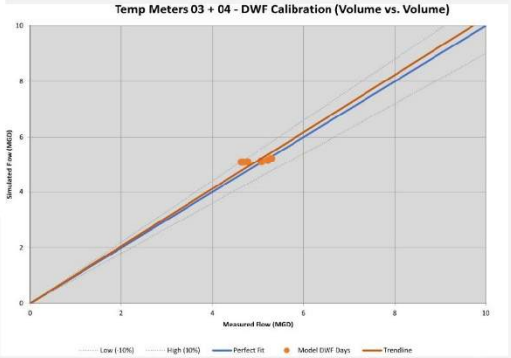
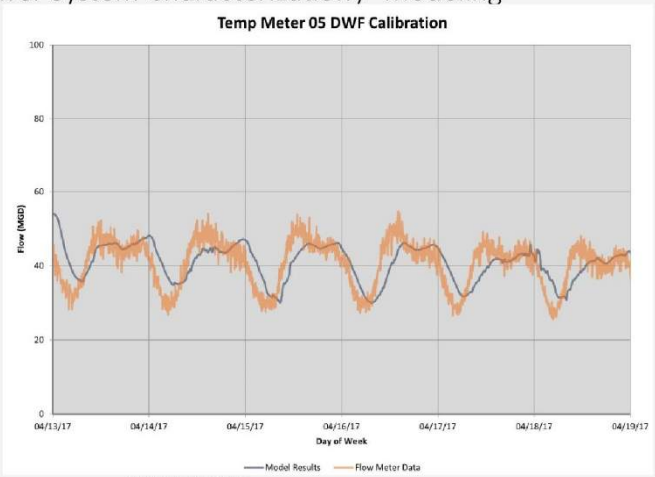
BCUA Sewer Svstem Characterization / Modeling





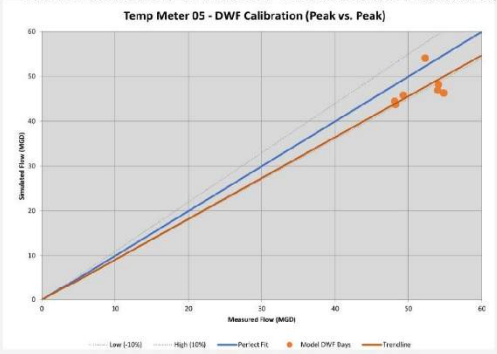
06/12/2018 Meeting No. 5 | Presentation

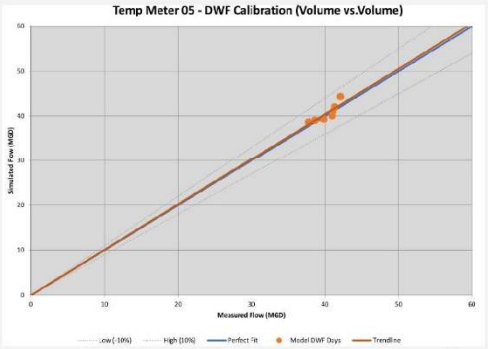
BCUA Sewer System Characterization / Modeling



06/12/2018 Meeting No. 5 | Presentation

BCUA Sewer System Characterization / Modeling





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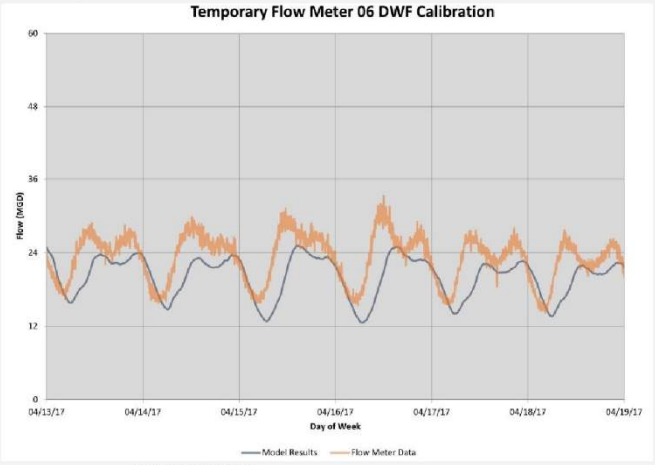
BCUA Sewer System Characterization / Modeling



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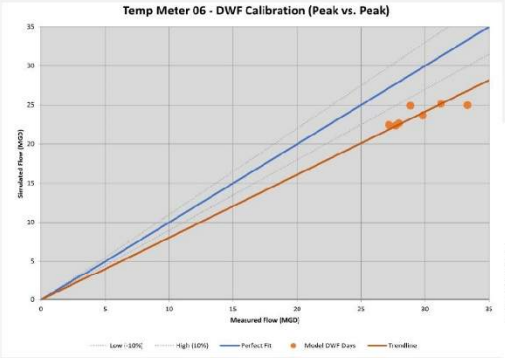
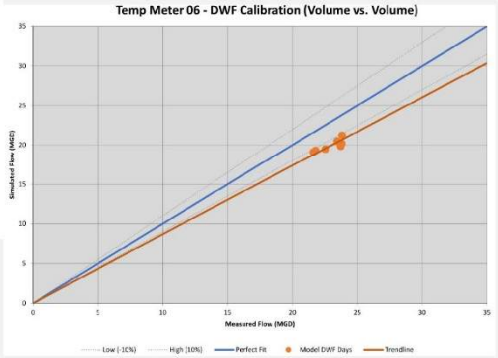
BCUA Sewer System Characterization / Modeling





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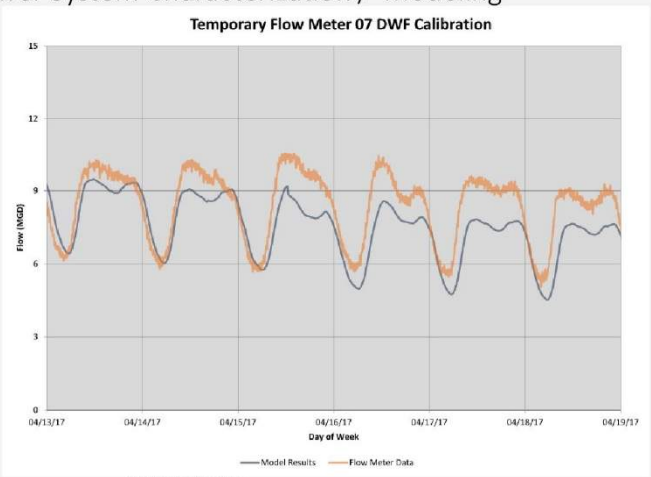
BCUA Sewer System Characterization / Modeling



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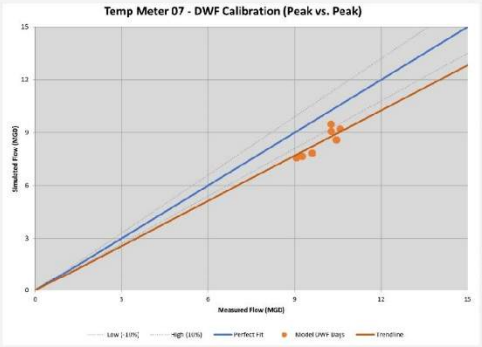
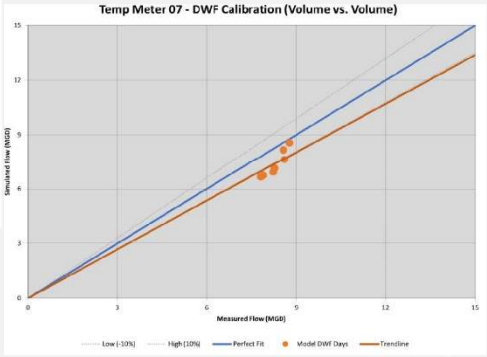
BCUA Sewer System Characterization / Modeling





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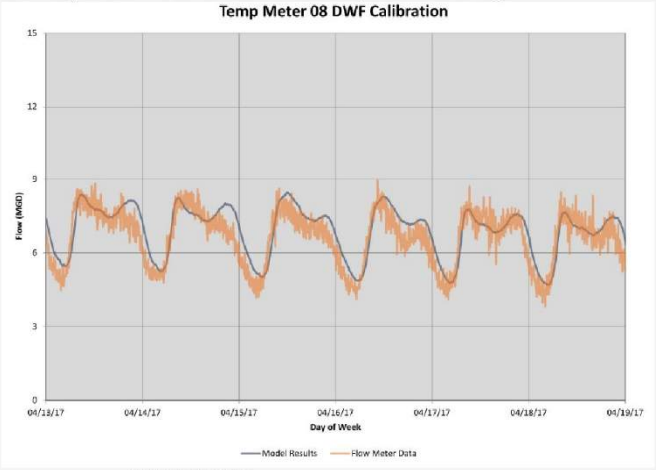
BCUA Sewer System Characterization / Modeling



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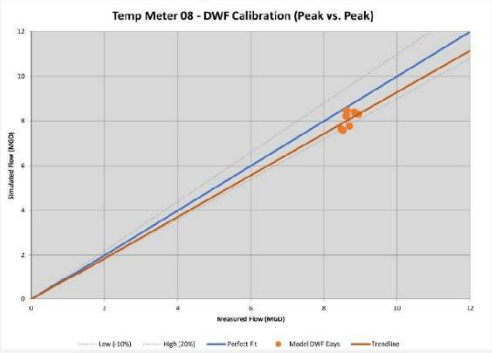
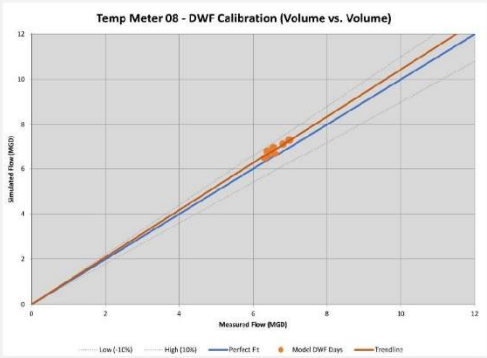
BCUA Sewer System Characterization / Modeling





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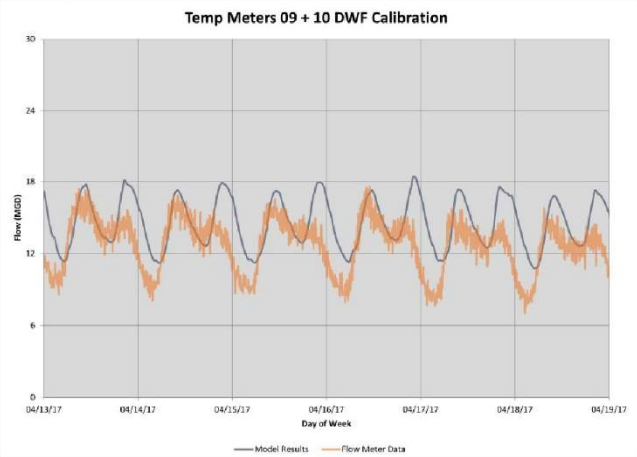

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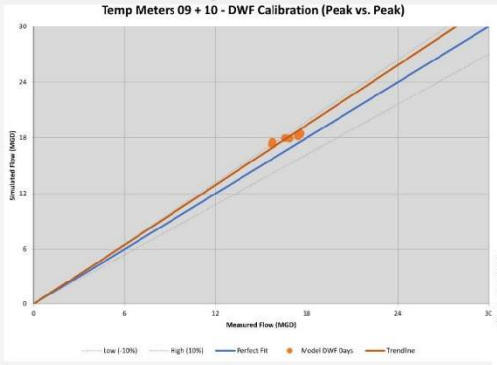
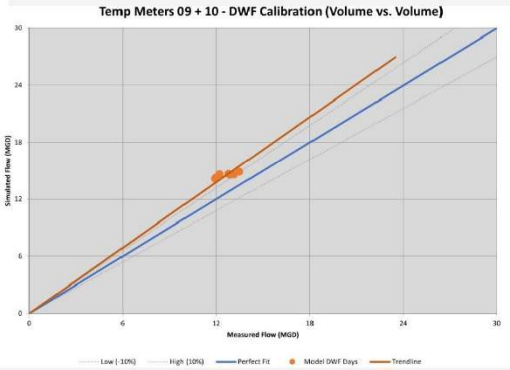
BCUA Sewer System Characterization / Modeling





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Calibration/Verification of Hydraulic Model

Wet Weather Flows

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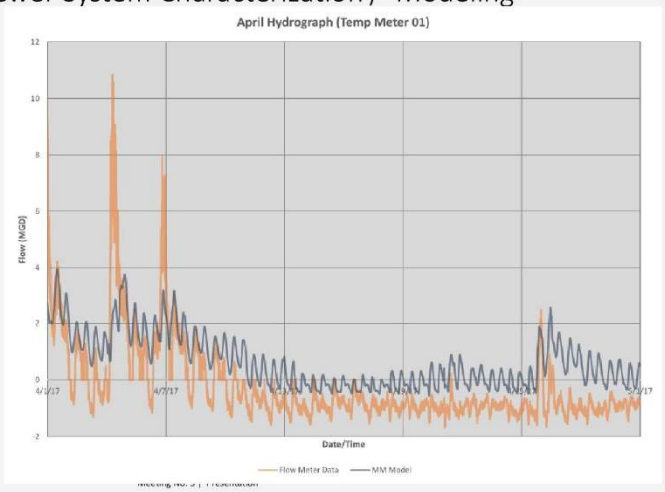
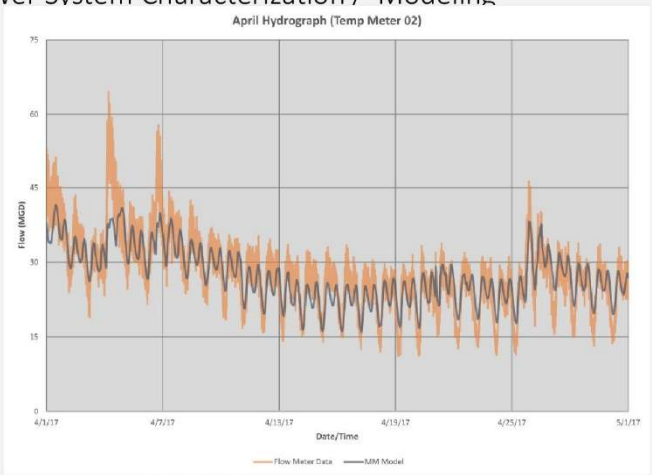
BCUA Sewer System Characterization / Modeling



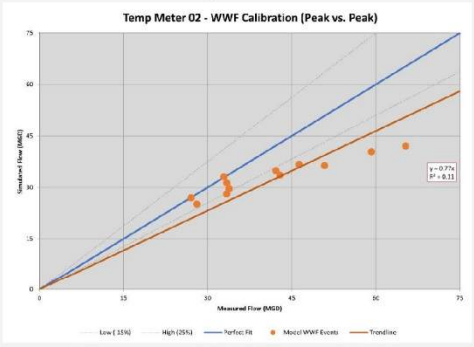
06/12/2018

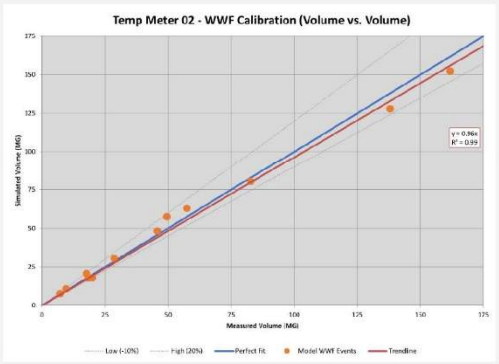
BCUA Sewer System Characterization / Modeling



06/12/2018 Meeting No. 5 | Presentation

BCUA Sewer System Characterization / Modeling





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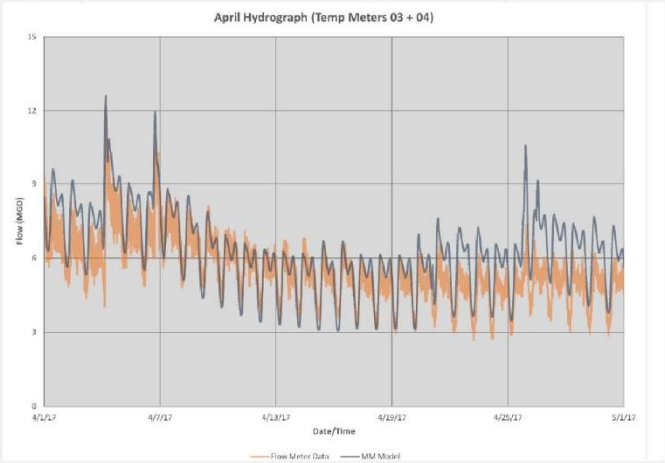
BCUA Sewer System Characterization / Modeling



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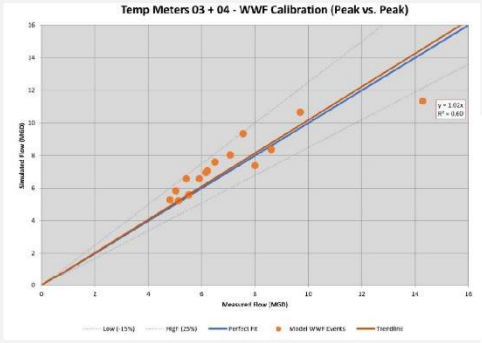

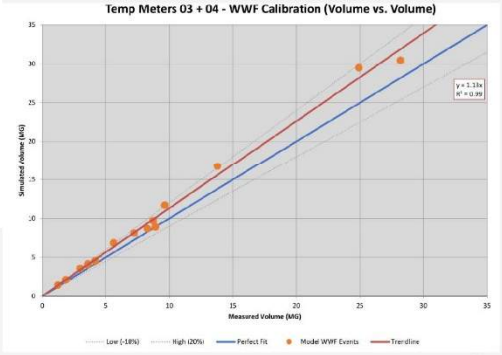

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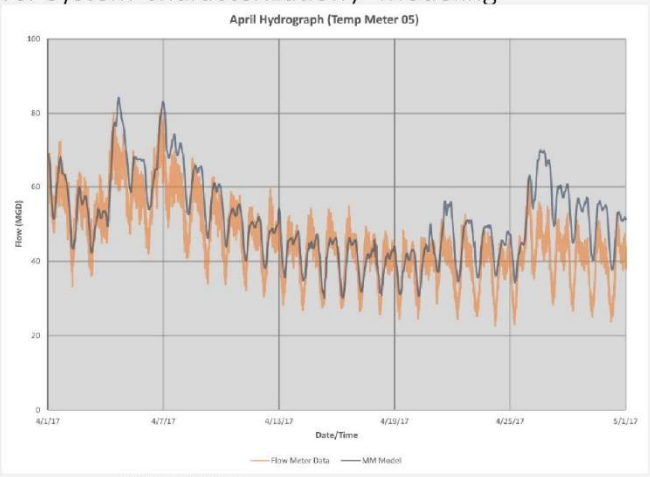

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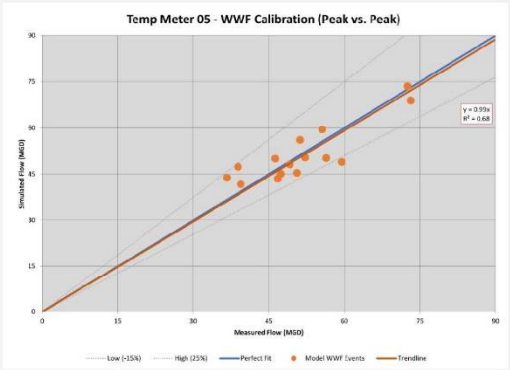

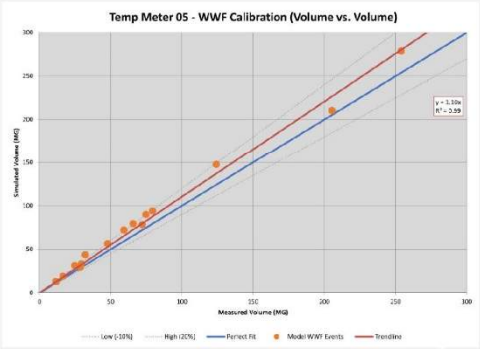

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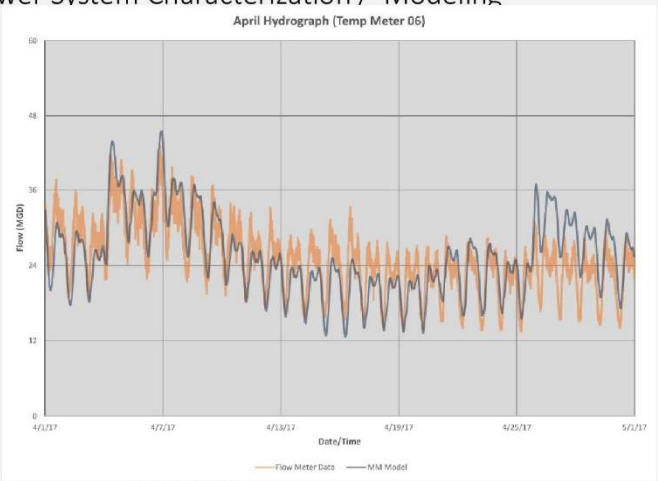

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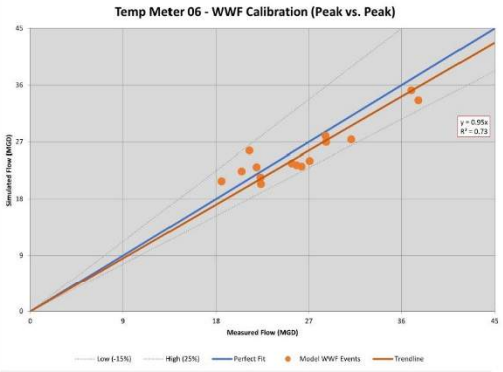

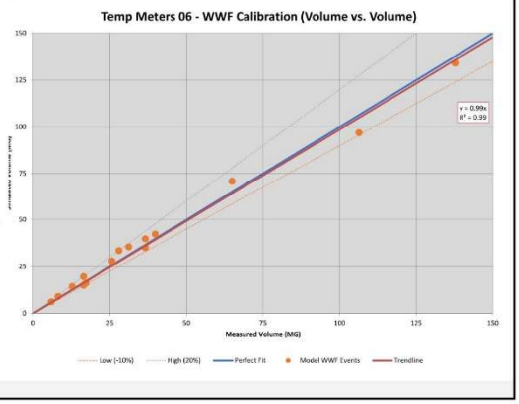

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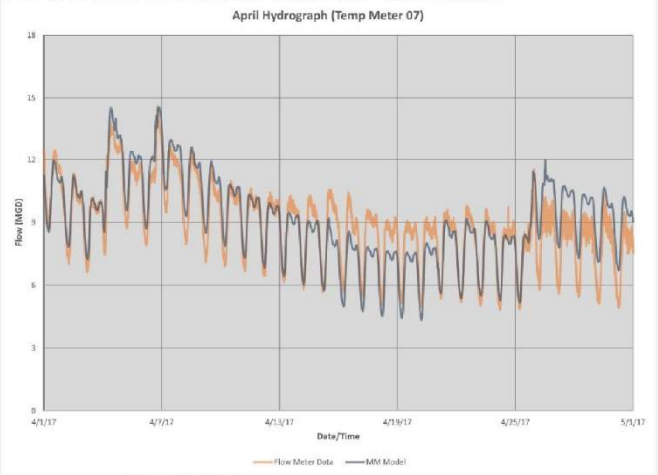

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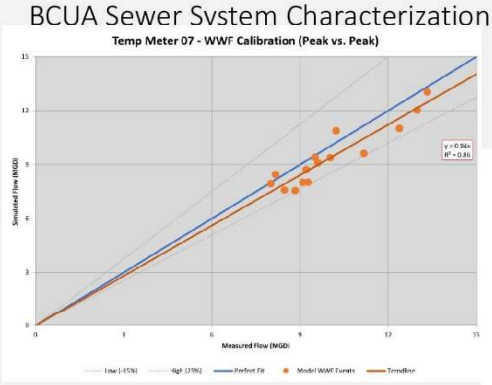

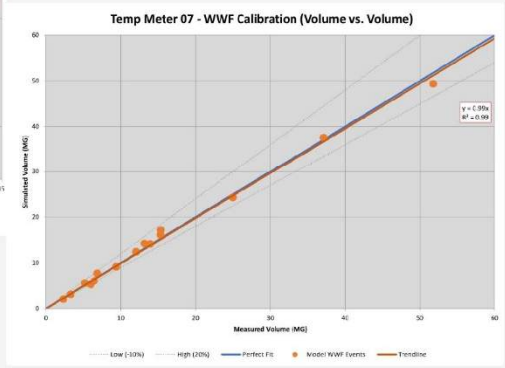

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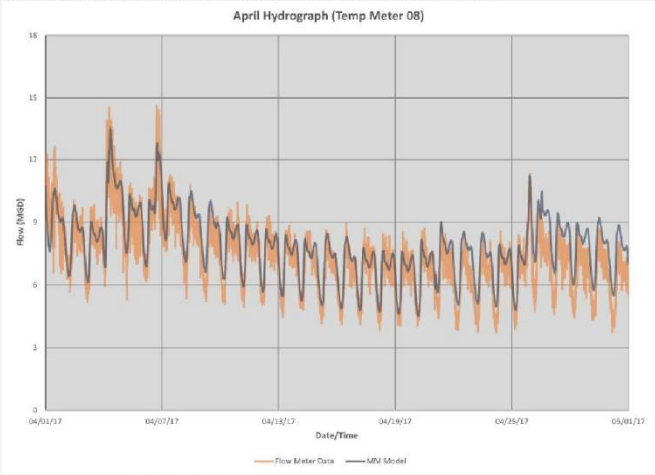

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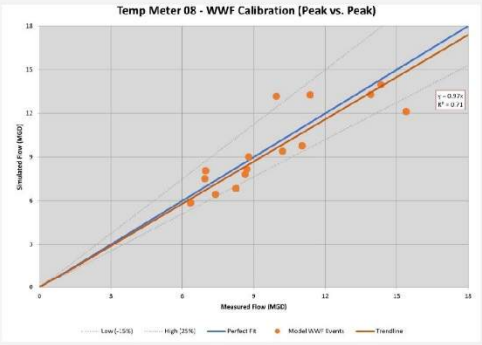

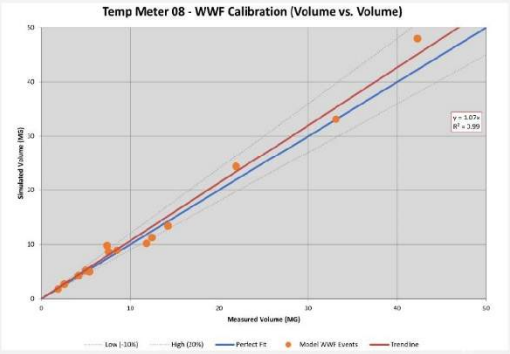

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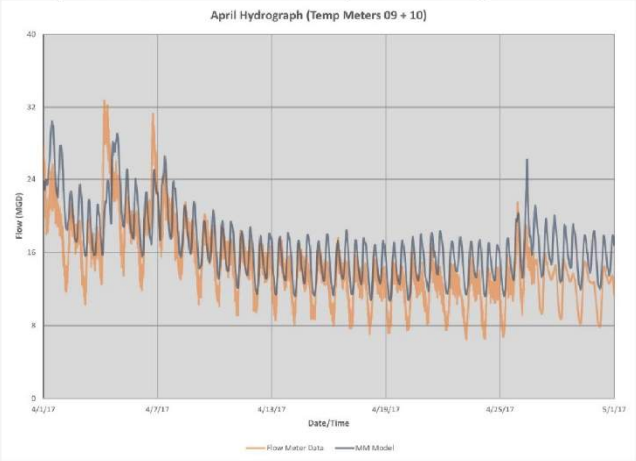

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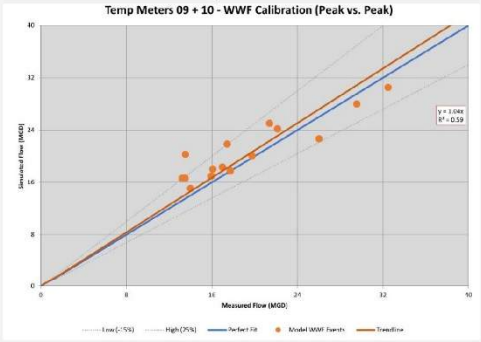

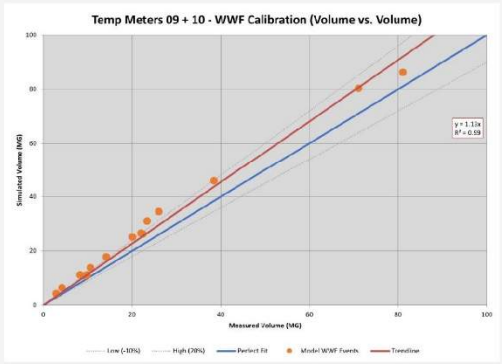

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BCUA Sewer System Characterization / Modeling

Facts:

a. Flow in Sewer Systems are dynamic. (not steady)
b. Hydraulic models are not perfect.
c. Hydraulic models are meant to predict typical background conditions and responses to rainfall.
d. The BCUA model does not mimic individual flows between the Overpeck Trunk and the Overpeak Relief Sewer.
e. The BCUA model **does** mimic the total flows within the Overpeck Trunk and the Overpeak Relief Sewer.

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BCUA Sewer System Characterization / Modeling

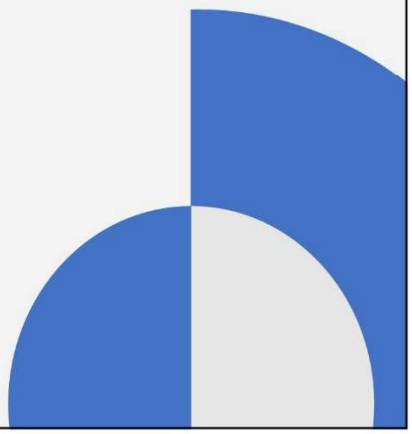
Facts:

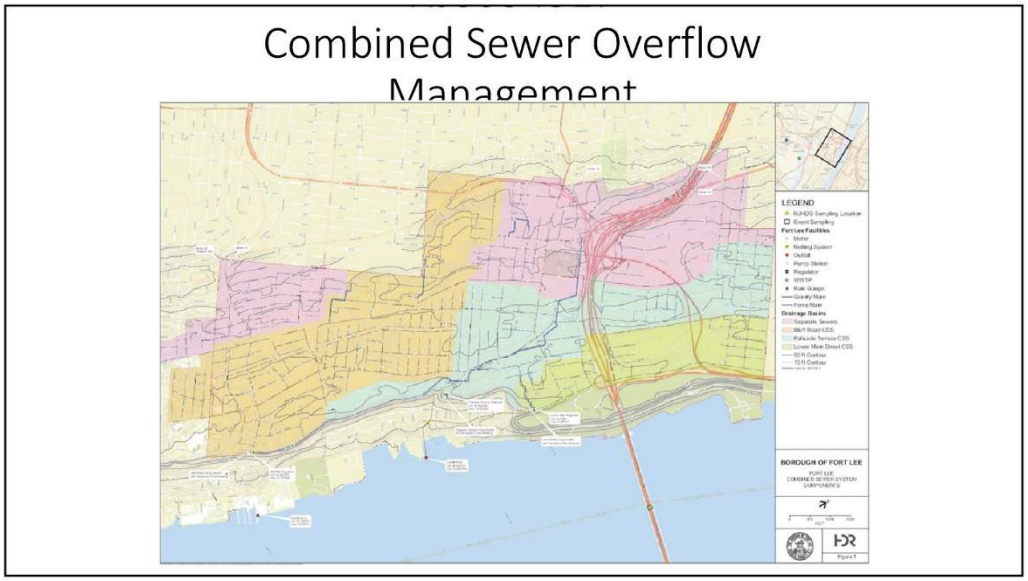
Most data points for peak flow and volume, as predicted by the model fall, within the WaPUG guidelines and thus the BCUA model was successfully calibrated and verified.

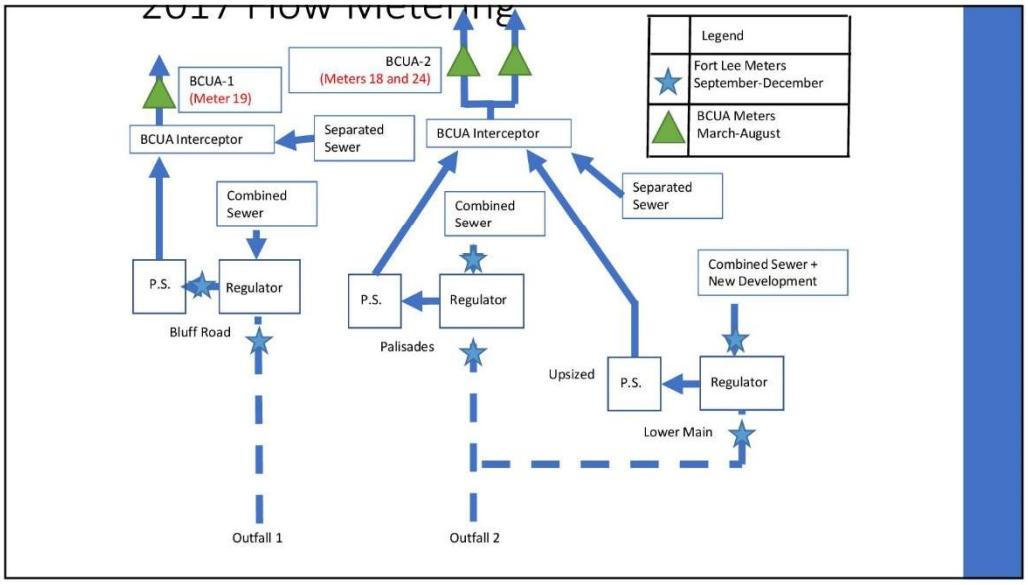
MOTT MACDONALD

Borough of Fort Lee

Sewer System Characterization Study




Combined Sewer Overflow
Management
LEGEND
BOROUGH OF FORT LEE

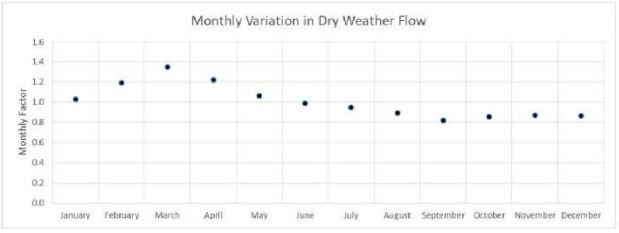

2017 Flow Metering
BCUA-1
(Meter 19)
BCUA-2
(Meters 18 and 24)
BCUA Interceptor
Separated
Sewer
BCUA Interceptor
Separated
Sewer
Combined
Sewer
Combined
Sewer
Combined Sewer +
New Development
P.S.
Regulator
Bluff Road
P.S.
Regulator
Palisades
Upsized
P.S.
Regulator
Lower Main
Outfall 1
Outfall 2
Legend
Fort Lee Meters
September-December
BCUA Meters
March-August

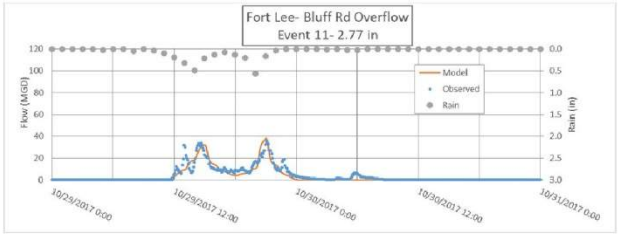
Population Calculation

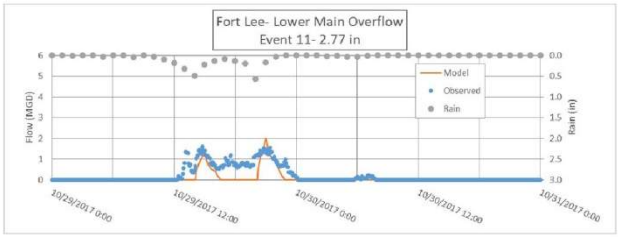
- 2010 census data from the US Census Bureau

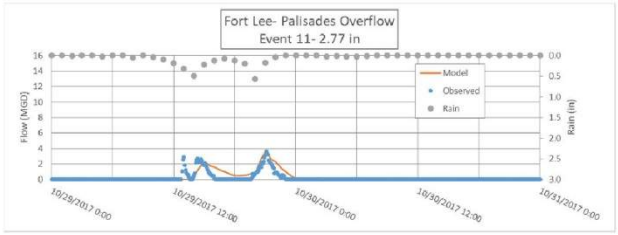
Regulator	Population	Average Dry Weather Flow (MGD)	Sanitary Flow (MGD)	Average I/I (MGD)
Lower Main	2,532	0.64	0.25	0.39
Palisades	9,101	1.23	0.91	0.32
Bluff Rd	12,094	1.83	1.21	0.62
BCUA-1	3,471	0.52	0.35	0.18
BCUA-2	7,757	2.01	0.78	1.23
Total	34,955	6.23	3.50	2.73

Monthly Variation in Dry Weather Flow

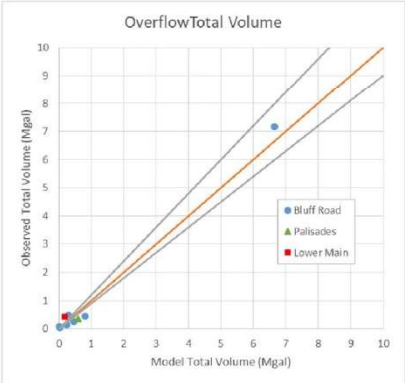



Fort Lee- Bluff Rd Overflow
Event 11- 2.77 in
Flow (MGD)
Rain (in)
Model
Observed
Rain
10/29/2017 0:00
10/29/2017 12:00
10/30/2017 0:00
10/30/2017 12:00
10/31/2017 0:00

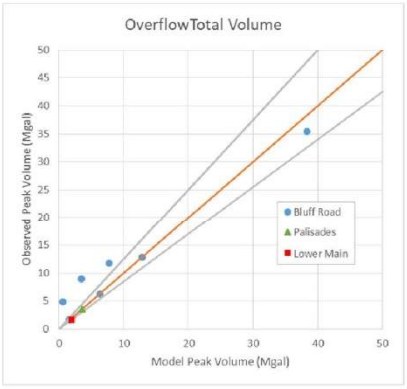

Fort Lee- Lower Main Overflow
Event 11- 2.77 in
Flow (MGD)
Rain (in)
Model
Observed
Rain
10/29/2017 0:00
10/29/2017 12:00
10/30/2017 0:00
10/30/2017 12:00
10/31/2017 0:00



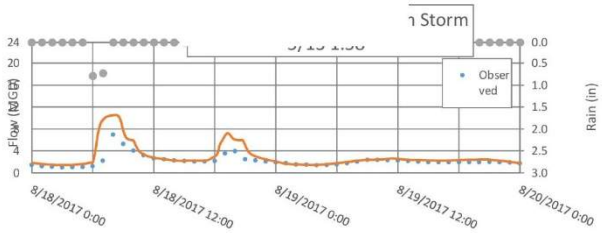
WAPUG Total Volume



WAPUG- Peak Flow

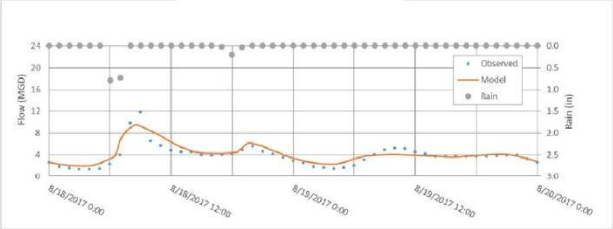


Validation Storm- BCUA-1 (Meters 19)
8/18/17 Storm- 1.52”



6/25/2018

Validation Storm- BCUA-2 (Meters 18 and 24) 8/18/17 Storm- 1.52”



Outfall Summary - 2004

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

Outfall Summary - 1988

Outfall	001		002	
Month	Number of Overflows	Overflow Volume (MG)	Number of Overflows	Overflow Volume (MG)
January	5	4.3	4	0.3
Feburay	5	6.6	4	0.7
March	3	4.1	2	0.4
April	4	3.0	2	0.3
May	7	9.7	6	1.4
June	3	2.5	3	0.1
July	10	15.1	6	2.2
August	4	4.4	1	0.6
September	2	6.6	2	1.0
October	3	7.0	3	0.9
November	6	13.3	6	1.7
December	4	1.2	1	0.0
Total	56	77.7	40	9.59

Contact Information

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MOTT MACDONALD

City of Hackensack

Sewer System Characterization Study

ARCADIS Design & Consultancy for natural and built assets

CITY OF HACKENSACK

Characterization and 2004 Typical Year Summary

Tuesday, June 12th , 2018

Agenda

- Approved Reuse of 2006 Data for Characterization
- Model Work
  - Conversion Process & Updates from XPSWMM to PCSWMM
  - Model Calibration
  - 2004 Typical Year Model Work

Approved Reuse of 2006 Data

- Reused 2006 Monitoring Data for the following reasons as approved in the 2015 Characterization Work Plan:
  - Little or no change in impervious area and urban land use data from 1995 to 2012
    - 0.13% change in urban general land use
  - Little change in population from 2005 to 2015 that would increase sanitary flow
    - Population of 44,519 in 2015 is up 4% from 42,657 in 2005
    - Dry weather flow decreased from 2006 to 2015 according to BCUA meter data
  - Industrial flows have not changed
    - SIU is Hackensack University Medical Center which was present in 2006 and 2015

Approved Reuse of 2006 Data

TABLE 2-3: A Comparison of the City of Hackensack's Impervious Area and Urban Land Use Area from 1995 to 2012

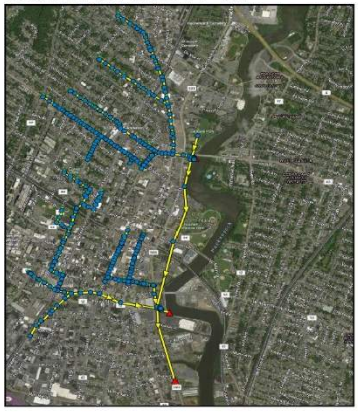
Name Land use or Subdrainage Area	1995 Impervious Area , Acres	2012 Impervious Area, Acres	Percent of Change Imperviou s Area from 1995 to 2012	1995 Land Use Area, Acres	2012 Land Use Area, Acres	Percent of Change in Urban Land Use Area from 1995 to 2012
URBAN GENERAL LAND USE for Court and Anderson	643.6	646.3	0.42%	1039.3	1040.6	0.13%
Anderson	246.2	248.3	0.85%	468.7	467.3	-0.3%
Court	397.4	398.1	0.15%	570.6	573.3	0.5%
Forests & Barren land	0.8	0.3	-62.5%	10.2	8.8	-13.73%
Total Areas	644.4	646.7	0.34%	1049.5	1049.5	0%

Model Work – Conversion & Updates

- Converted the existing XP-SWMM Hackensack model to new PCSWMM software – completed in 2016
- 2015 condition assessment and survey updates
  - Converted elevation datums from NGVD 29 to NAVD 88
  - Updated manhole/pipe depths based on 2015 Condition Assessment of the CSS
  - Updated elevations and pipe lengths based on 2016 Survey of the CSS

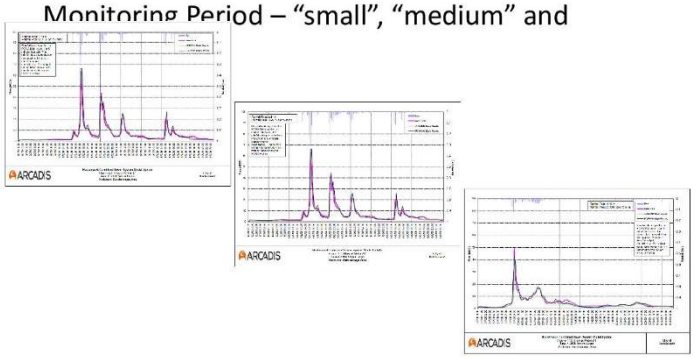
Model Work – Conversion & Updates

- Court and Anderson Street Drainage Areas
- Subcatchment Areas (57)
- Hydraulic Components:
  - Pipes (285)
  - Manholes (285)
  - CSO Regulators
    - Court Street
    - Anderson Street
  - Outfalls (2)
    - 001A
    - 002A



Model Work – Calibration

- 3 Calibration events from the 2006 Data Monitoring Period – "small", "medium" and



2004 Typical Year Simulation

- QA/QC of 2004 precipitation data from Newark
- Ran the model with this data
- QA/QC of model results
- Analyzed and formatted results with pollutant loadings from 2006 sampling data

2004 Typical Year Simulation

- Anderson Drainage Area Results

	Total (All CSO Events)			Pollutant Loadings						
Month	Days of Overflow	Volume (MG)	% of Annual Volume	Fecal	Entero	CBOD	TKN	TP	TN	TSS
January	4	1.65	1.6%	1.21E+14	7.32E+13	1,050.6	745.4	27.4	756.6	1,182.3
February	2	6.03	5.7%	4.43E+14	2.68E+14	3,848.6	2,730.7	100.2	2,771.6	4,331.1
March	5	1.42	1.3%	1.04E+14	6.30E+13	903.6	641.1	23.5	650.7	1,016.9
April	7	9.21	8.7%	6.76E+14	4.09E+14	5,873.3	4,167.2	153.0	4,229.6	6,609.5
May	11	9.07	8.6%	6.67E+14	4.04E+14	5,788.8	4,107.3	150.8	4,168.8	6,514.5
June	6	6.93	6.6%	5.09E+14	3.08E+14	4,420.7	3,136.6	115.1	3,183.6	4,974.9
July	9	23.27	22.1%	1.71E+15	1.03E+15	14,846.0	10,533.6	386.7	10,691.4	16,707.1
August	8	8.60	8.2%	6.32E+14	3.83E+14	5,489.1	3,894.7	143.0	3,953.0	6,177.2
September	7	23.48	22.3%	1.72E+15	1.04E+15	14,976.3	10,626.1	390.1	10,785.2	16,853.7
October	3	0.79	0.7%	5.79E+13	3.51E+13	503.0	356.9	13.1	362.3	566.1
November	8	9.31	8.8%	6.84E+14	4.14E+14	5,938.7	4,213.6	154.7	4,276.7	6,683.1
December	6	5.69	5.4%	4.18E+14	2.53E+14	3,628.1	2,574.3	94.5	2,612.8	4,082.9
Annual	76	105.45	1	7.75E+15	4.69E+15	67,266.8	47,727.6	1,752.0	48,442.4	75,699.3

Note: For pollutant loadings, Fecal and Entero are in MPN units, while all remaining numbers are in pounds.

2004 Typical Year Simulation

- Court Drainage Area Results

	Total (All CSO Events)			Pollutant Loadings						
Month	Days of Overflow	Volume (MG)	% of Annual Volume	Fecal	Entero	CBOD	TKN	TP	TN	TSS
January	3	1.97	1.3%	1.41E+14	8.31E+13	1,177.2	190.8	32.2	179.1	2,116.9
February	3	10.22	6.7%	7.33E+14	4.30E+14	6,096.6	987.9	167.0	927.5	10,963.1
March	7	1.67	1.1%	1.19E+14	7.01E+13	994.0	161.1	27.2	151.2	1,787.4
April	7	14.57	9.6%	1.04E+15	6.13E+14	8,691.5	1,408.4	238.1	1,322.3	15,629.2
May	10	11.11	7.3%	7.96E+14	4.68E+14	6,627.6	1,073.9	181.5	1,008.3	11,917.8
June	7	9.24	6.1%	6.62E+14	3.89E+14	5,509.9	892.8	150.9	838.2	9,907.9
July	10	34.84	23.0%	2.50E+15	1.47E+15	20,785.0	3,368.0	569.3	3,162.1	37,375.9
August	7	11.57	7.6%	8.29E+14	4.87E+14	6,902.7	1,118.5	189.1	1,050.1	12,412.5
September	6	32.28	21.3%	2.31E+15	1.36E+15	19,258.3	3,120.6	527.5	2,929.8	34,630.6
October	3	0.96	0.6%	6.91E+13	4.06E+13	575.0	93.2	15.7	87.5	1,033.9
November	7	13.72	9.1%	9.84E+14	5.78E+14	8,185.3	1,326.3	224.2	1,245.2	14,718.8
December	6	9.31	6.1%	6.67E+14	3.92E+14	5,554.1	900.0	152.1	845.0	9,987.5
Annual	76	151.47	100.0%	1.09E+16	6.38E+15	90,357.1	14,641.5	2,475.1	13,746.2	162,481.5

Note: For pollutant loadings, Fecal and Entero are in MPN units, while all remaining numbers are in pounds.

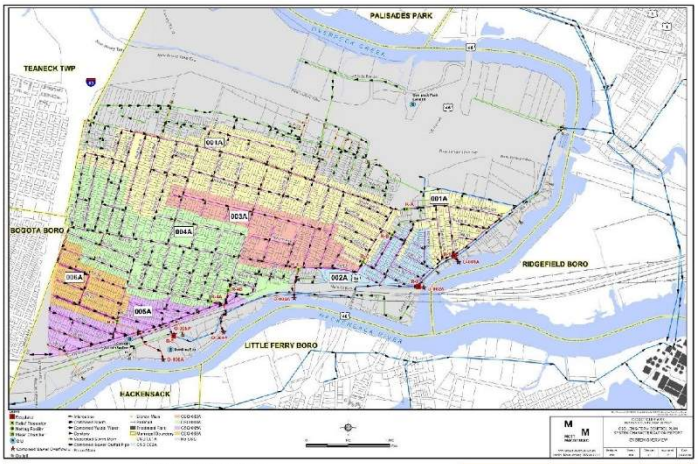
Thank you

MOTT MACDONALD

Village of Ridgefield Park

Sewer System Characterization Study

Collection System - Overall



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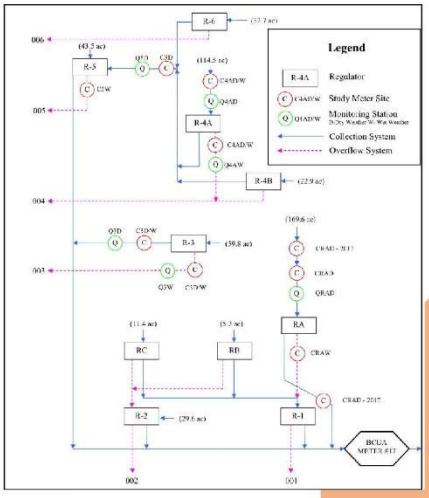
Collection System



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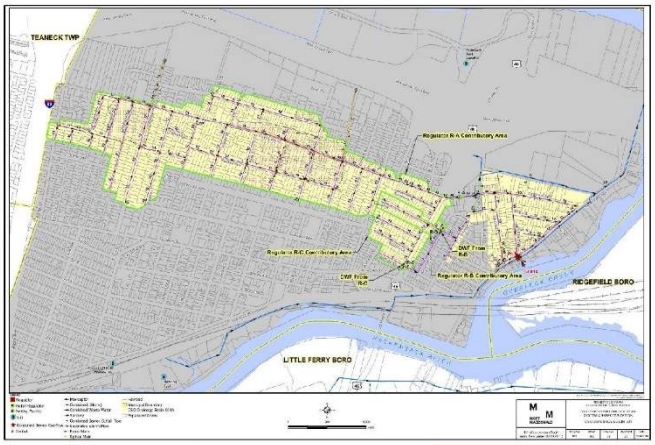
Collection System – Basin Level



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Collection System – Basin Level

Pipe Statistics Regulator Basin 001		
Pipe Size	**LF of Pipe**	**% of Total LF**
8"	1,709	4%
10"	14,295	35%
12"	9,793	24%
15"	4,540	11%
18"	2,784	7%
20"	972	2%
22"	26	0.1%
24"	2,230	6%
29"	155	0.4%
36"	1,241	3%
48"	3,719	9%
Unknown	657	2%
Total	**40,412**	**100%**

25 June 2018 Meeting No. 5 | Presentation 101

Collection System – Facilities

Outfalls

Outfall	Latitude*	Longitude*	Receiving Water
001	40° 50' 43"	74° 1' 31"	Overpeck Creek
002	40° 50' 49"	74° 1' 38"	Overpeck Creek
003	40° 51' 13"	74° 1' 40"	Hackensack River
004	40° 51' 27"	74° 1' 49"	Hackensack River
005	40° 51' 35"	74° 1' 49"	Hackensack River
006	40° 51' 38"	74o 1' 56"	Hackensack River

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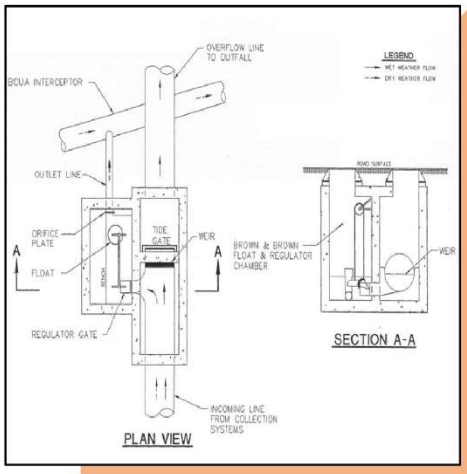
Collection System – Facilities

Regulators

Regulator	Type	Function	Owner
R-A	Float	Internal Relief	Ridgefield Park
R-B	Float	Internal Relief	Ridgefield Park
R-C	Float	Internal Relief	Ridgefield Park
R-I	Float	CSO Regulation	BCUA
R-2	Float	CSO Regulation	BCUA
R-3	Vortex Valve	CSO Regulation	Ridgefield Park
R-4A	Vortex Valve	CSO Regulation	Ridgefield Park
R-4B	Vortex Valve	CSO Regulation	Ridgefield Park
R-5*	Float	CSO Regulation	BCUA
R-6	Vortex Valve	CSO Regulation	Ridgefield Park



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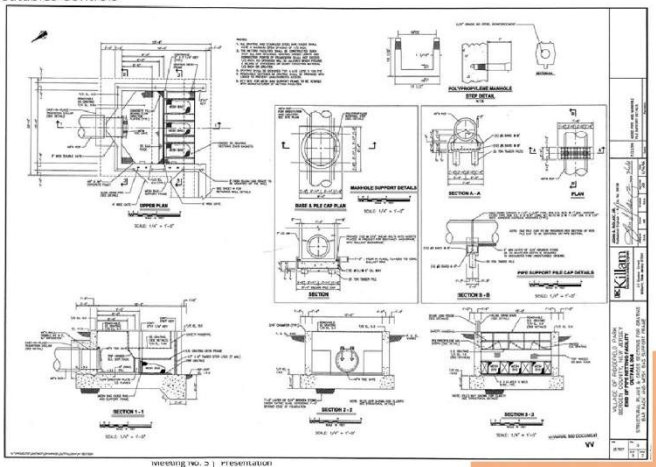
Collection System – Facilities

Solids and Floatables Controls



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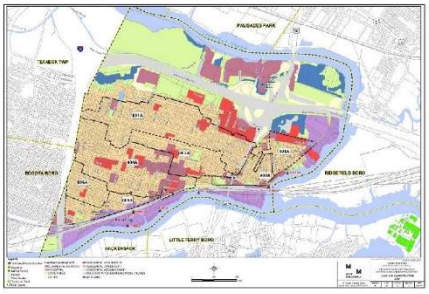
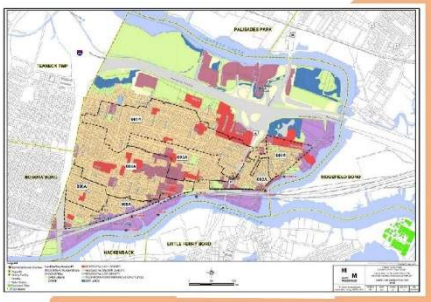
Use of Prior Data

Land Use – 2007 vs 2012





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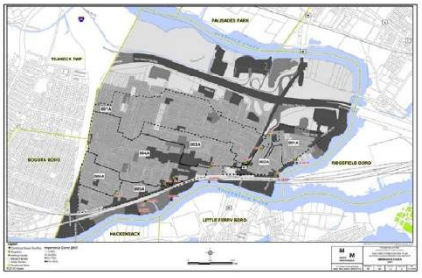
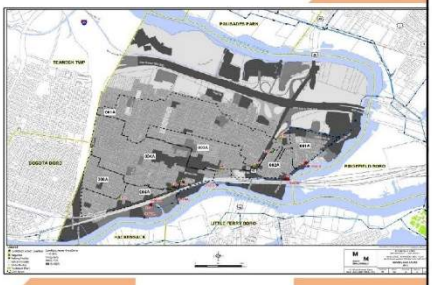
Use of Prior Data

Impervious Cover – 2007 Vs. 2012





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Use of Prior Data

- Land Use – No Change
- Impervious Cover – No Change
- Population – No Change
- Sewer System – No Change

2000 Census
12,873

2007 Characterization is Valid!

25 June 2018 Meeting No. 5 | Presentation 107

Sewer System Characterization Report

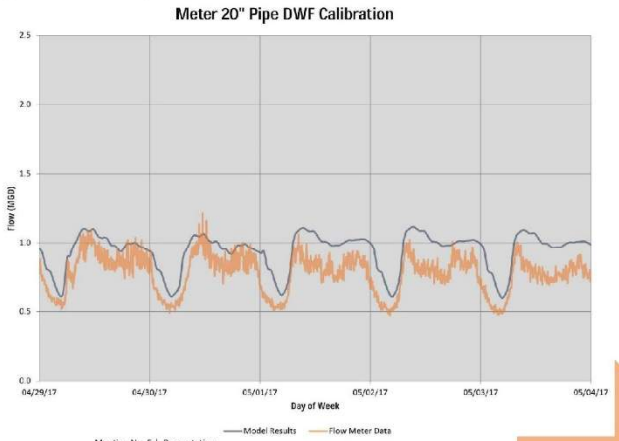
Info Works Computer Model Update

- Additional Sewer Control Facilities

25 June 2018 Meeting No. 5 | Presentation 108

Sewer System Characterization Report

Info Works Computer Model Update



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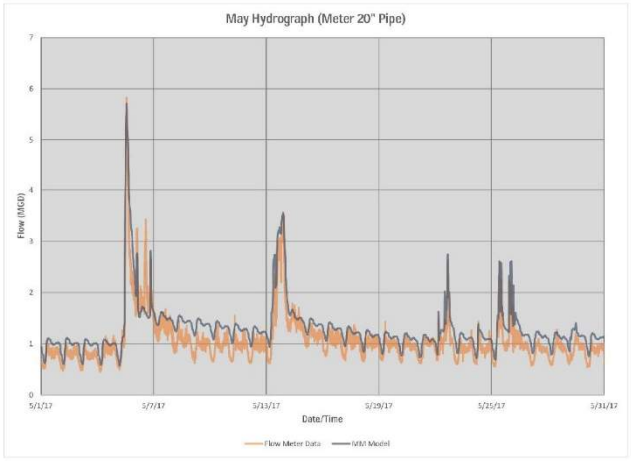
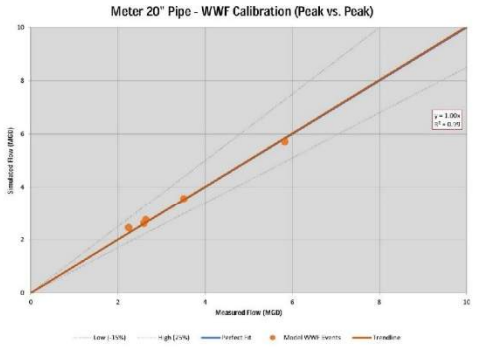
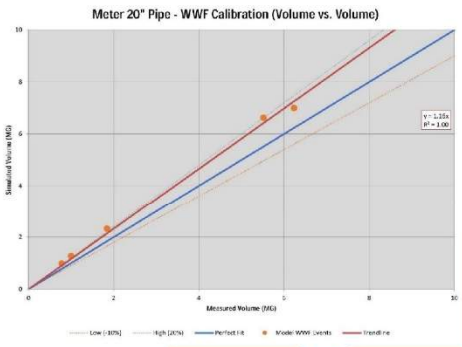


25 June 2018 Meeting No. 5 | Presentation 110

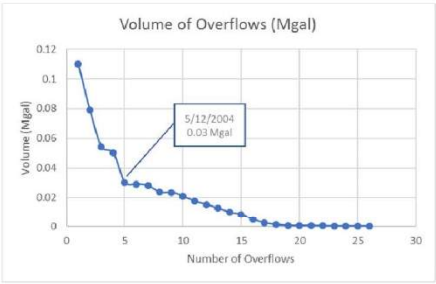
Sewer System Characterization Report
Info Works Computer Model Update

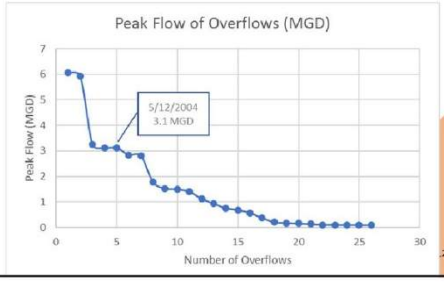




6/11/2018 Meeting No. 5 | Presentation 111

Sewer System Characterization Report
Typical Year Results – Regulator 2





25 June 2018 Meeting No. 5 | Presentation 12

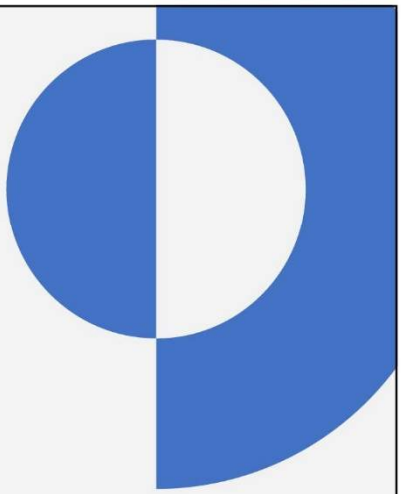
BCUA CSO Group Project Status Report

Reports with Deadline of July 1, 2018:

- Submit Sewer System Characterization Study Report
  (Draft under Review)
- Submit Public Participation Report
  CSO Supplemental Team Report
  (Draft under Review)
- Submit Compliance Monitoring Program Report* * New Jersey CSO Group Joint Effort
  (Draft under Review)
- Submit Consideration of Sensitive Areas Plan
  (To be included in Sewer System Characterization Report)

06/12/2018 Meeting No. 5 | Presentation

Questions?



06/12/2018 Meeting No. 5 | Presentation 114