

# **CANTERBURY MANOR SANITARY INVESTIGATION FEBRUARY 11, 2016**

**ROBERT P. KELLY, P.E.  
DIRECTOR OF ENGINEERING  
CITY OF WESTLAKE  
440-617-4145**



# RADCLIFFE DRIVE BASEMENT WATER INFILTRATION STUDY

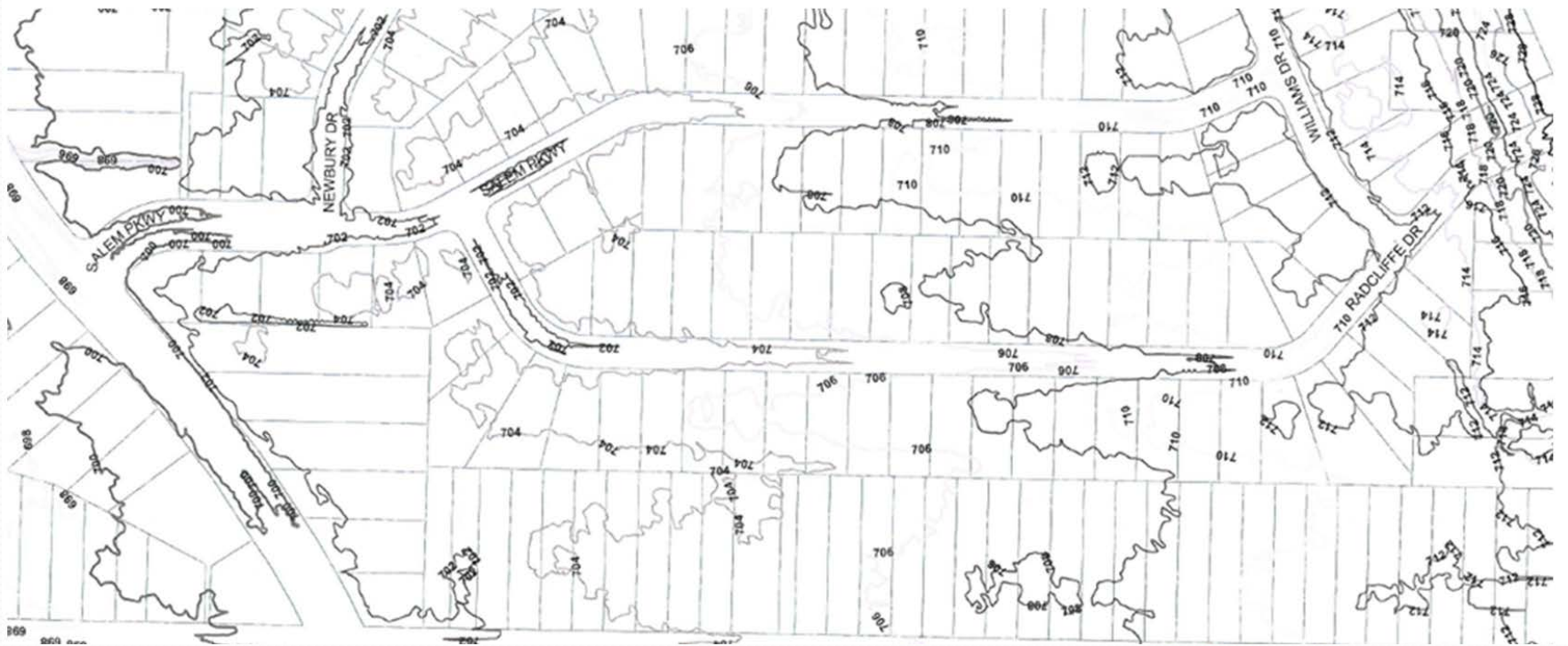
- R.E. WARNER WAS CONTRACTED IN 2015 TO PERFORM THE FOLLOWING SCOPE:
  1. ARE THE SEWERS BEING MAINTAINED PROPERLY?
  2. HAS MAINTENANCE OR OPERATIONAL ISSUES CAUSED BASEMENT WATER INFILTRATION?
  3. HAS THE CITY'S RESPONSE BEEN ADEQUATE TO THE EFFECTED RESIDENTS?
  4. HAS THE CITY'S RESPONSE TO STORM WATER I/I BEEN EFFECTIVE IN REDUCING THE LIKELY HOOD OF THIS OCCURRING ?
  5. IS THE PROPOSED REHABILITATION SOUND IN ADDRESSING THESE ISSUES?



# DYE TEST AUDIT

- R.E. WARNER ANALYZED THE FOLLOWING DYE TEST RESULT TO VERIFY GOOD SOUND ENGINEERING PRACTICE WAS BEING PERFORMED:
  - 1920 RADCLIFFE
  - 1930 RADCLIFFE
  - 2025 RADCLIFFE
- “TESTING PROCEDURE AND RECOMMENDATIONS APPEAR TO BE SOUND WITH GOOD ENGINEERING PRACTICES.”

# SUBDIVISION GRADING



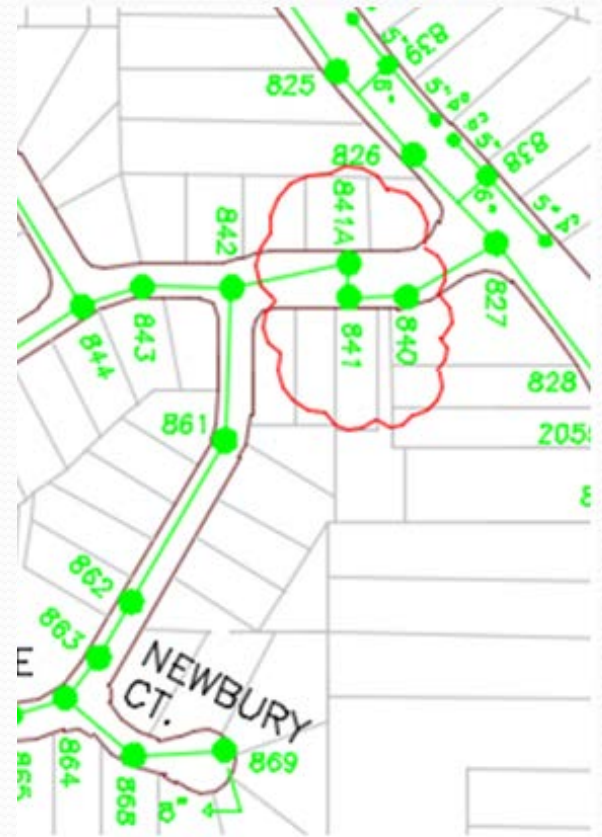
RADCLIFFE IS LOWER IN ELEVATION THAN SALEM PKWY. SO THE BASEMENT FLOOR ELEVATIONS ARE CLOSER TO THE SEWER ELEVATIONS.

# SANITARY SEWER SYSTEM



# “DOG LEG” ALIGNMENT

- THIS ONLY RESULTS IN THE SANITARY SURCHARGE ELEVATION TO BE INCREASED BY ONLY ABOUT 1” WITH BOTH 90° BENDS.
- “THIS DOES NOT SIGNIFICANTLY CONTRIBUTE TO BASEMENT WATER INFILTRATION”



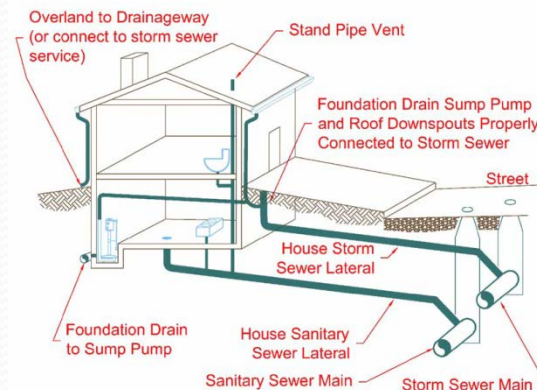
# R.E. WARNER FINDINGS

- “WESTLAKE ADEQUATELY OPERATES AND MAINTAINS THE SANITARY AND STORM SEWERS”.
- BASEMENT INFILTRATION IS NOT A RESULT OF MAINTENANCE OR OPERATION.
- CITY “PROVIDES A SUPERIOR SERVICE TO ITS RESIDENTS THAT HAS BECOME A BENCHMARK FOR OTHER COMMUNITIES”.
- “I/I REDUCTION IS DIFFICULT AND TIME CONSUMING SO THE CITY’S APPROACH ON HAVING RESIDENTS PROTECT THEIR HOMES IS PRUDENT”.
- “THE CITY IS FOLLOWING SOUND ENGINEERING PRACTICE IN THEIR PREVIOUS AND PROPOSED SEWER REHABILITATION PROJECTS”



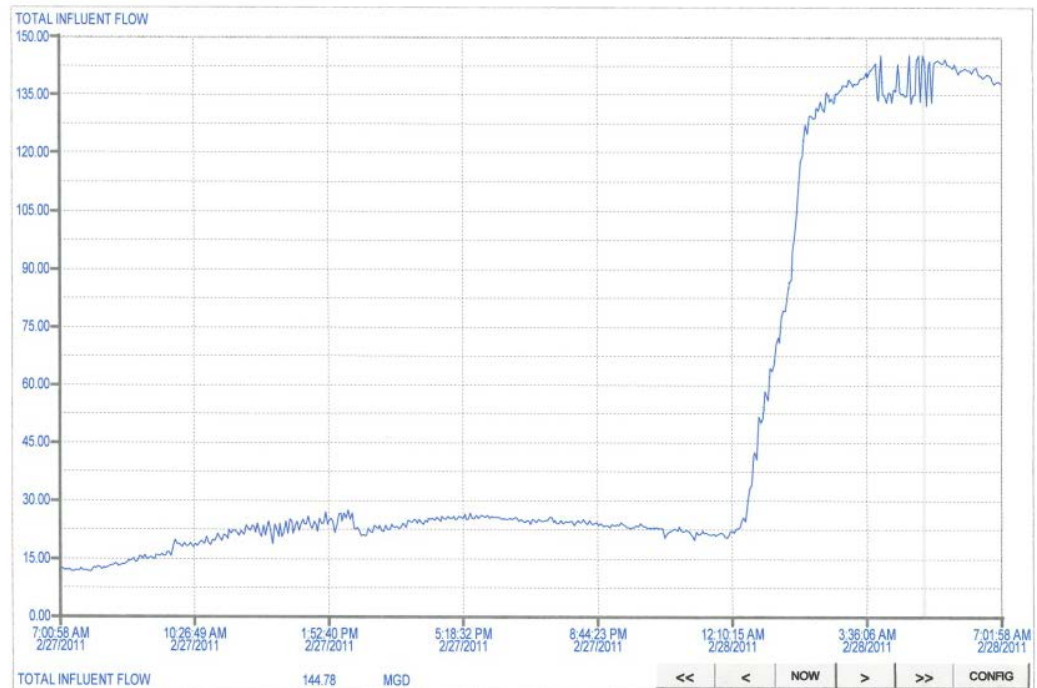
# R.E. WARNER CONCLUSION

- “THE HOMES WITHIN THIS SUBDIVISION ARE FLOOD-PRONE BECAUSE OF THE AREA’S TOPOGRAPHY AND HYDROLOGY, BUT ESPECIALLY BECAUSE OF THE RELATIONSHIP OF THE BASEMENT FLOOR TO THE ADJACENT SEWER”



# WWTP HYDRAULIC MODELING I/I ANALYSIS

- FEBRUARY 28, 2011 RAIN EVENT WAS MODELED FOR ALL MAJOR INTERCEPTORS ENTERING THE PLANT.
  - FLOW RATE OF PLANT 170 MGD (TYPICAL IS 12 MGD)
- WESTLAKE
  - INTERCEPTOR
  - TRUNK LINES
    - CLAGUE
    - COLUMBIA
    - CANTERBURY
    - DOVER CENTER
    - CAHOON
    - CROCKER



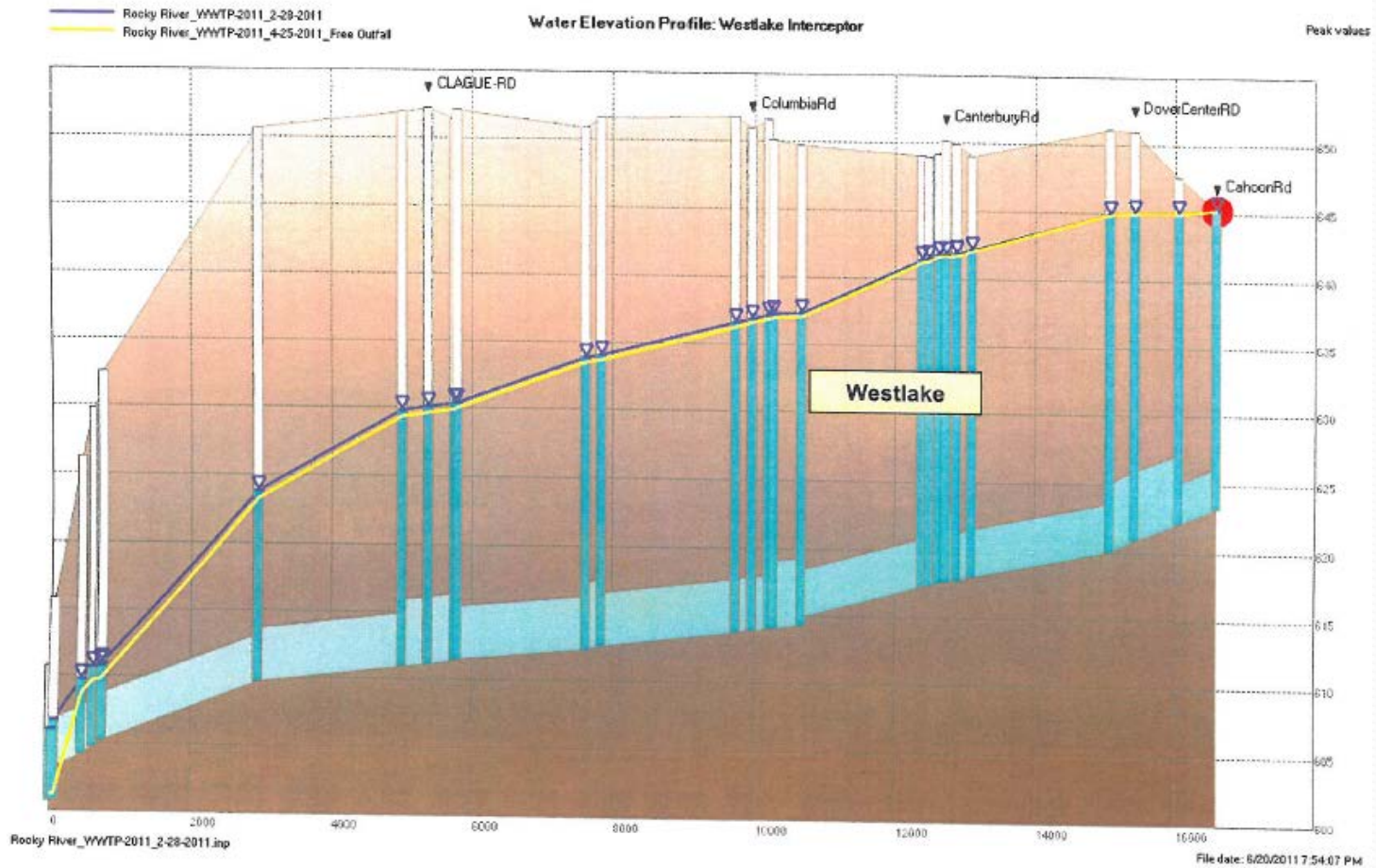
# HOW MUCH RAIN ENTERS THE SANITARY SYSTEM

**Table (3): 2009 Flow Monitoring Data**

**Average Dry Weather Flow and Peak Wet Weather Flow during 4/13/2009 Storm**

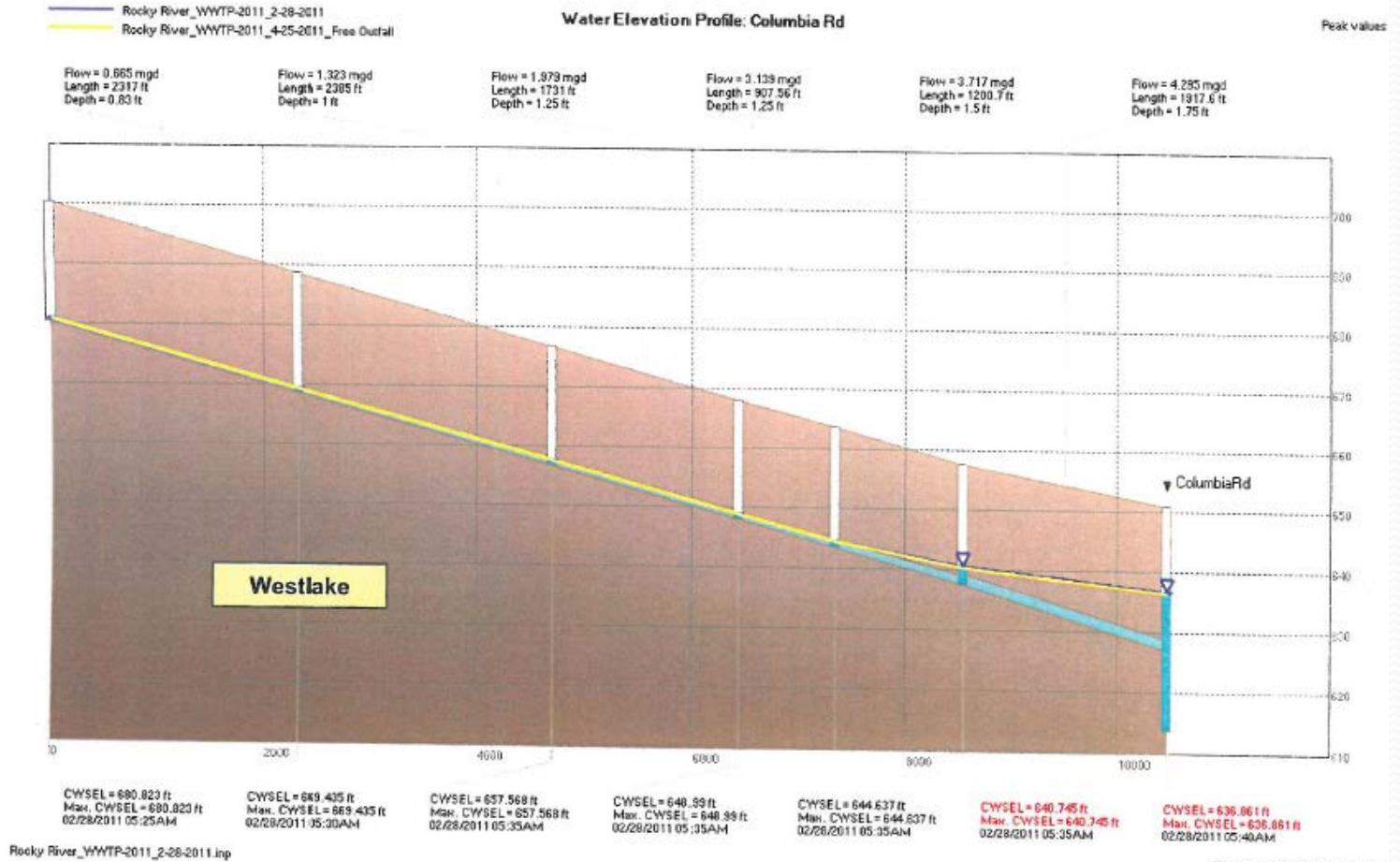
<b>Westlake</b>	<b>Tributary Area (Acres)</b>	<b>RDII as a percentage of rainfall (%)</b>
<b>Westlake</b>	<b>7,293</b>	<b>7.75%</b>
<b>Bay Village</b>	<b>2,669</b>	<b>14.3%</b>
<b>Rocky River</b>	<b>2,692</b>	<b>16.26%</b>
<b>Fairview Park</b>	<b>1,648</b>	<b>16.62%</b>
<b>Total</b>	<b>16,133</b>	<b>10.28%</b>

# WESTLAKE INTERCEPTOR



Hydraulic grade line along Westlake Interceptor  
Blue HGL is existing Condition; Yellow HGL is free outfall condition

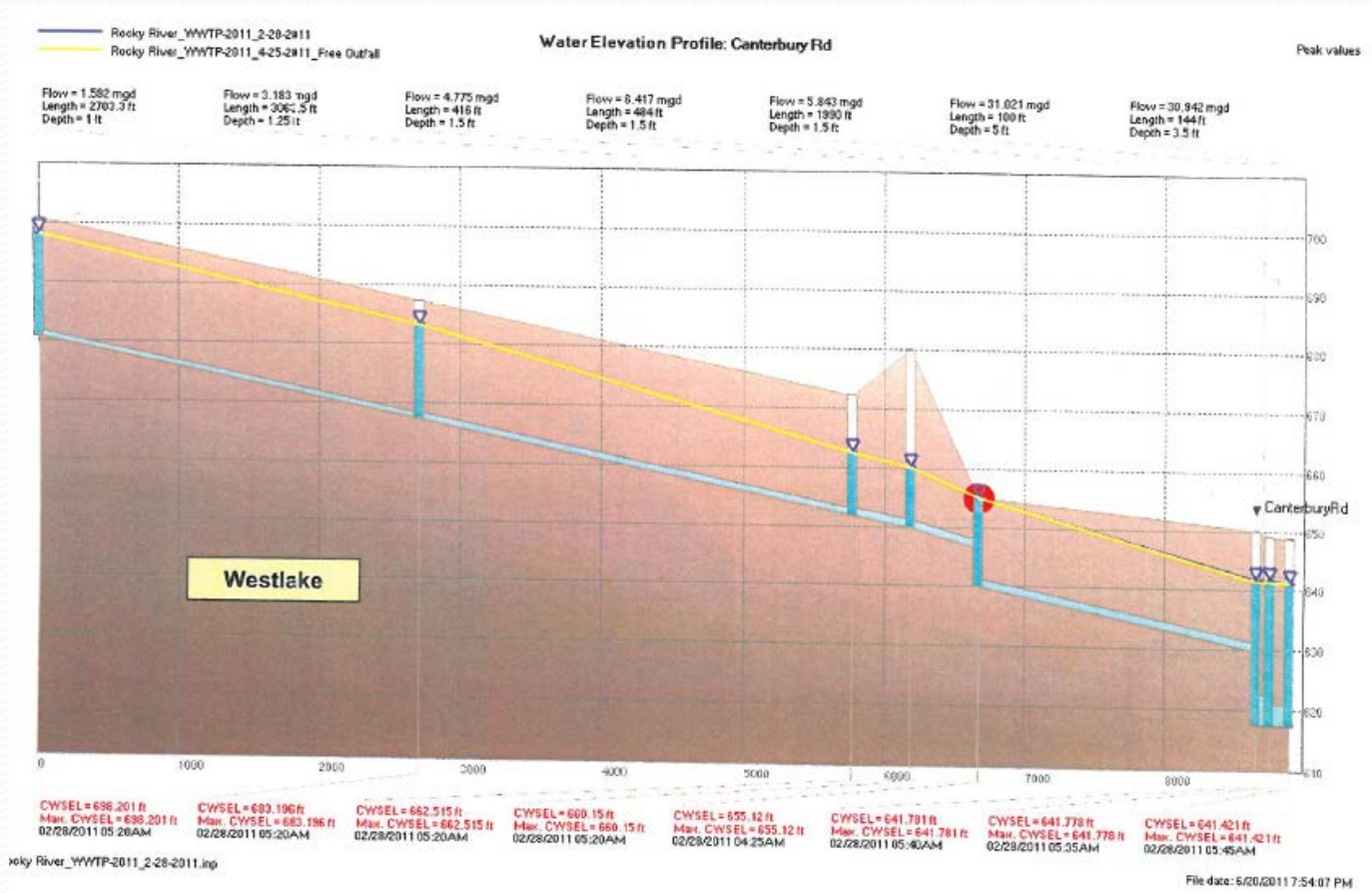
# COLUMBIA



Hydraulic grade line along Westlake Interceptor  
 Blue HGL is existing Condition; Yellow HGL is free outfall condition

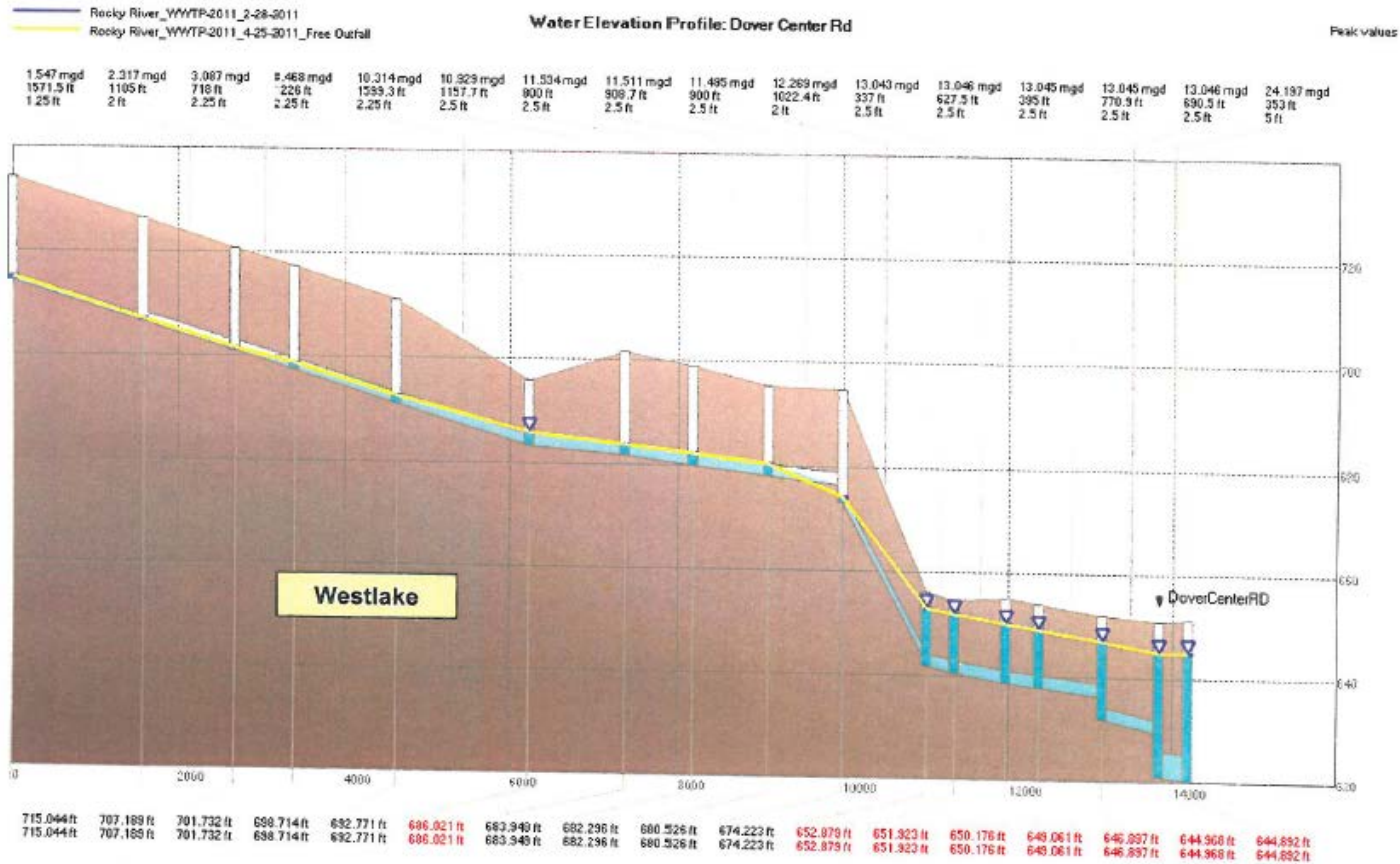


# CANTERBURY



Hydraulic grade line along Westlake Interceptor  
Blue HGL is existing Condition; Yellow HGL is free outfall condition

# DOVER CENTER



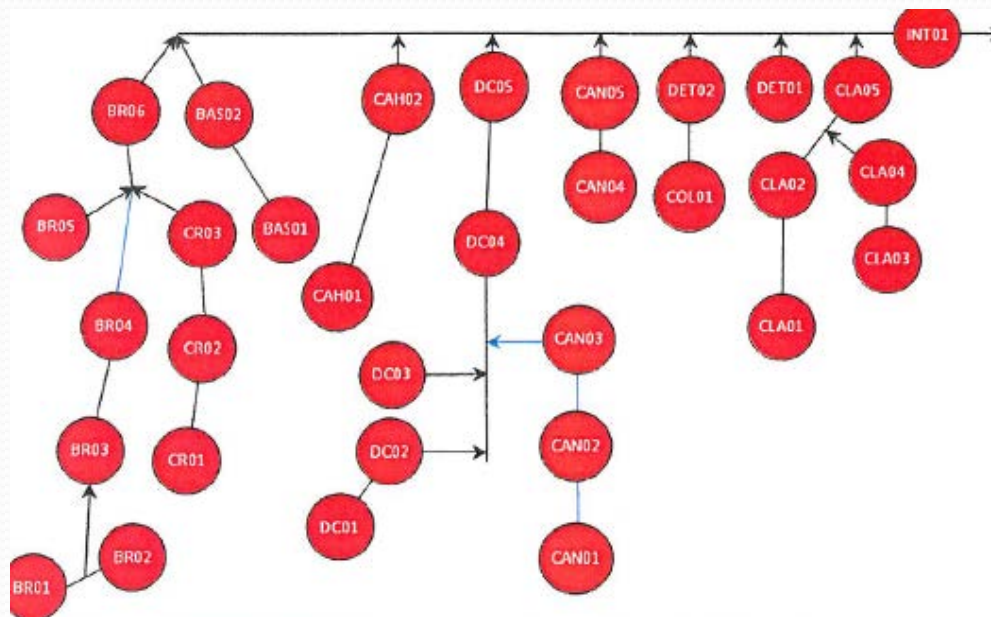
Rocky River\_WWTP-2011\_2-28-2011.inp

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**Hydraulic grade line along Westlake Interceptor**  
**Blue HGL is existing Condition; Yellow HGL is free outfall condition**

# CITY WIDE FLOW METERING

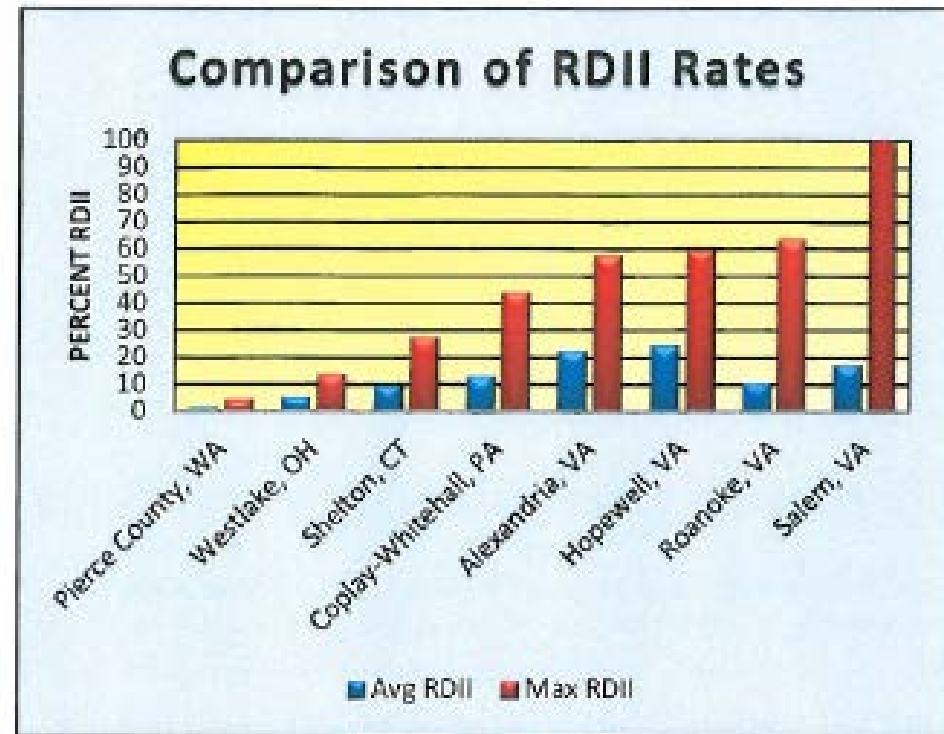
- CONDUCTED BY ADS ENVIRONMENTAL SERVICES IN 2013
- SANITARY SEWER SYSTEM DIVIDED INTO 32 SUB-BASINS





# RAINFALL DERIVED INFLOW/INFILTRATION(RDII)

- COMPARISON TO OTHER SANITARY SYSTEMS STUDIED BY ADS. THE HIGHER THE BAR THE “LEAKIER” THE SEWER.
- SINCE RDII IS LOW IT IS DIFFICULT TO ELIMINATE



# WESTLAKE CITY WIDE METER RESULTS

- CANTERBURY ESTATES IS IN BASIN CANo4 AND IS CONSIDERED TO HAVE AN EXCESSIVE AMOUNT OF I/I.

Table 1-1: Maximum Percent RDII Results

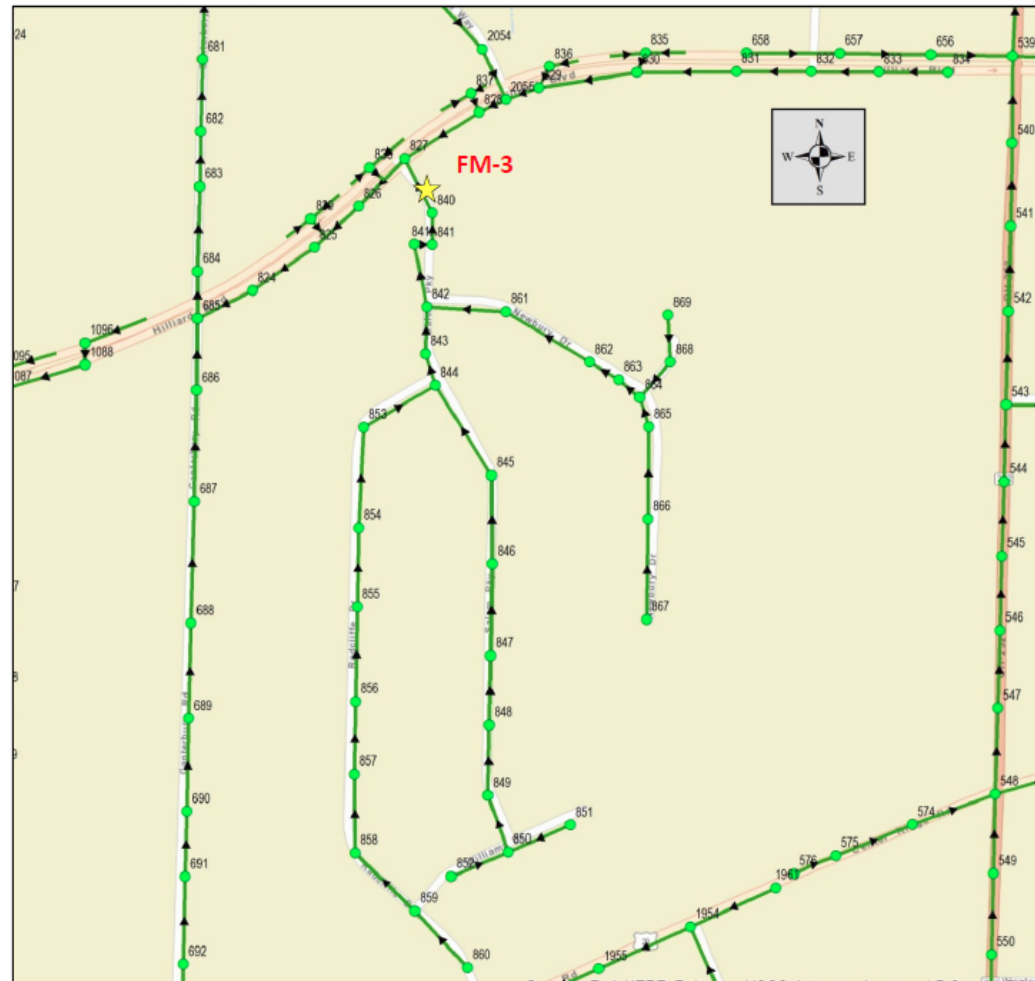
Basin	Linear Footage	Pain of Subtraction Multiplier	Max Percent RDII	Num SSOs	Num WIBs	Excessive?	Rank
DET01	13,296	1.00	13.87	0	0	excessive	1
CAN01	20,669	1.00	12.82	0	0	excessive	2
DC03	15,930	1.00	12.67	0	0	excessive	3
DC04	34,748	3.93	11.95	0	0	excessive	4
INT01	65,376	12.56	10.89	0	0	excessive	5
CAN04	20,838	3.06	10.05	0	0	excessive	6
CAN02	14,640	2.41	9.71	0	0	possibly excessive	7
CAN03	22,343	1.93	9.55	0	0	possibly excessive	8
COL01	12,130	1.00	9.55	0	0	possibly excessive	9
CLA02	24,773	1.78	8.74	0	0	possibly excessive	10
CLA03	21,612	1.00	6.88	0	0	possibly excessive	11
CAH02	21,315	1.76	6.87	0	0	possibly excessive	12
BR04	35,114	2.55	6.69	0	0	possibly excessive	13
DET02	36,605	1.33	5.83	0	0	possibly excessive	14
BR05	10,769	1.00	5.82	0	0	possibly excessive	15
DC05	37,273	4.66	5.26	0	0	possibly excessive	16
CAN05	26,041	3.45	5.21	0	0	possibly excessive	17
CLA01	19,360	1.00	4.76	0	0	nonexcessive	18
CLA04	11,725	2.84	4.75	0	0	nonexcessive	19
BAS02	35,746	1.59	4.66	0	0	nonexcessive	20
DC02	23,843	1.79	4.37	0	0	nonexcessive	21
CAH01	16,094	1.00	4.12	0	0	nonexcessive	22
BR03	21,472	2.53	3.95	0	0	nonexcessive	23
BR06	46,443	4.84	3.93	0	0	nonexcessive	24
BR01	16,288	1.00	3.80	0	0	nonexcessive	25
CR03	33,873	2.30	3.70	0	0	nonexcessive	26
BAS01	21,090	1.00	2.95	0	0	nonexcessive	27
CLA05	33,937	3.28	2.82	0	0	nonexcessive	28
CR01	15,268	1.00	2.45	0	0	nonexcessive	29
CR02	28,721	1.53	2.22	0	0	nonexcessive	30
DC01	18,933	1.00	2.14	0	0	nonexcessive	31
BR02	16,645	1.00	1.67	0	0	nonexcessive	32

# 2015 HYDRAULIC MODELING

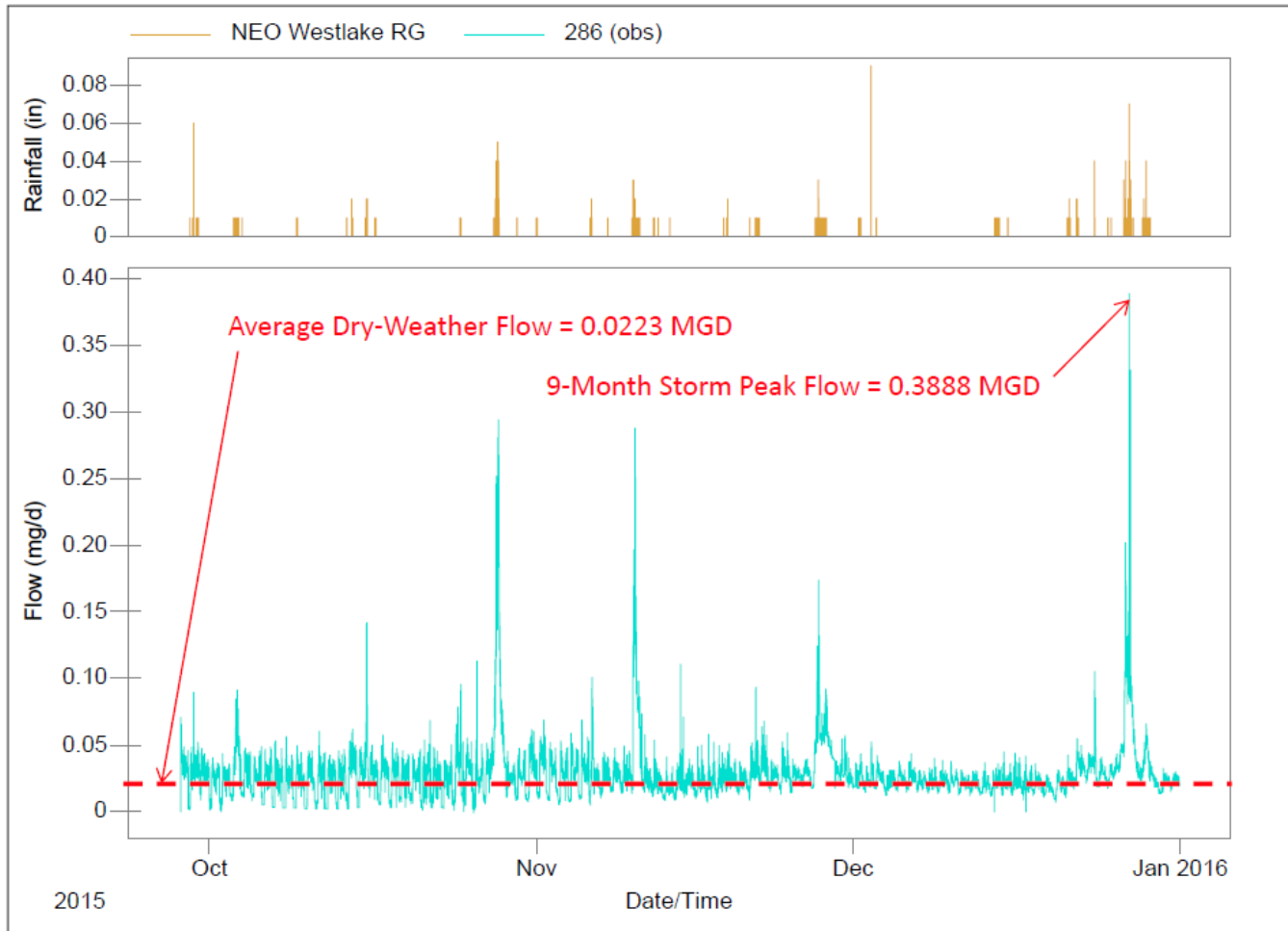
- AECOM (FORMER URS) IS UPDATING THE HYDRAULIC MODELING USED IN 2009 AND IS INCLUDING THE FOLLOWING SUBDIVISION TO FURTHER UNDERSTAND I/I.
  - BERKELEY ESTATES
  - CANTERBURY MANOR
- MODELING RESULTS SHOULD BE COMPLETED IN ABOUT 3-4 WEEKS.
- FLOW METERS WERE ALSO PLACED AT THE OUTLET OF THESE SUBDIVISION AS WELL, WHICH IS ISOLATING THEM FROM THE REST OF THE SUB-BASIN. FURTHER DIVIDING THE SUB-BASINS FROM THE CITY WIDE FLOW METERING PROJECT

# CANTERBURY MANOR FLOW METER

- Flow Meter 3 located on Salem Pkwy.
- Monitored between Oct. 2015 and January 2016

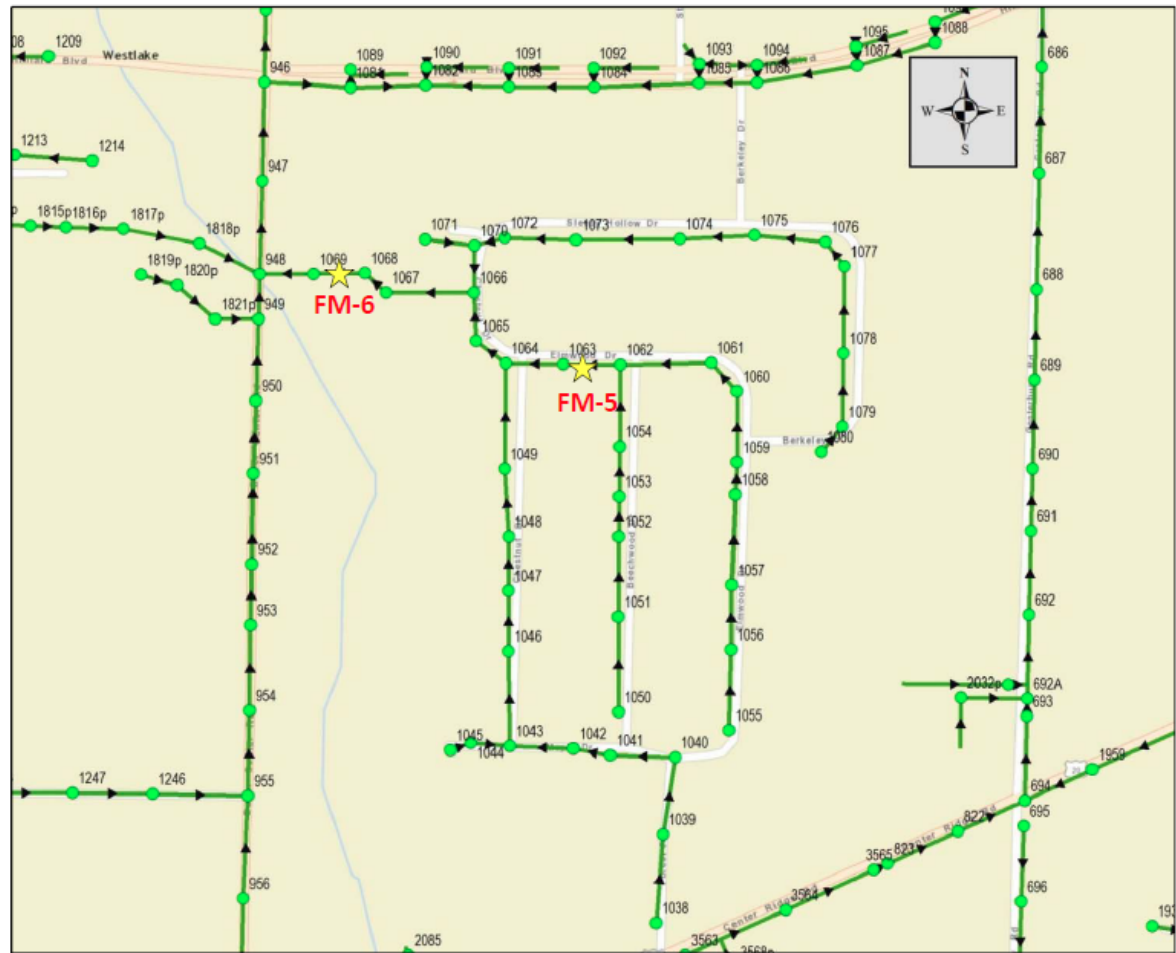


# CANTERBURY MANOR FLOW METER

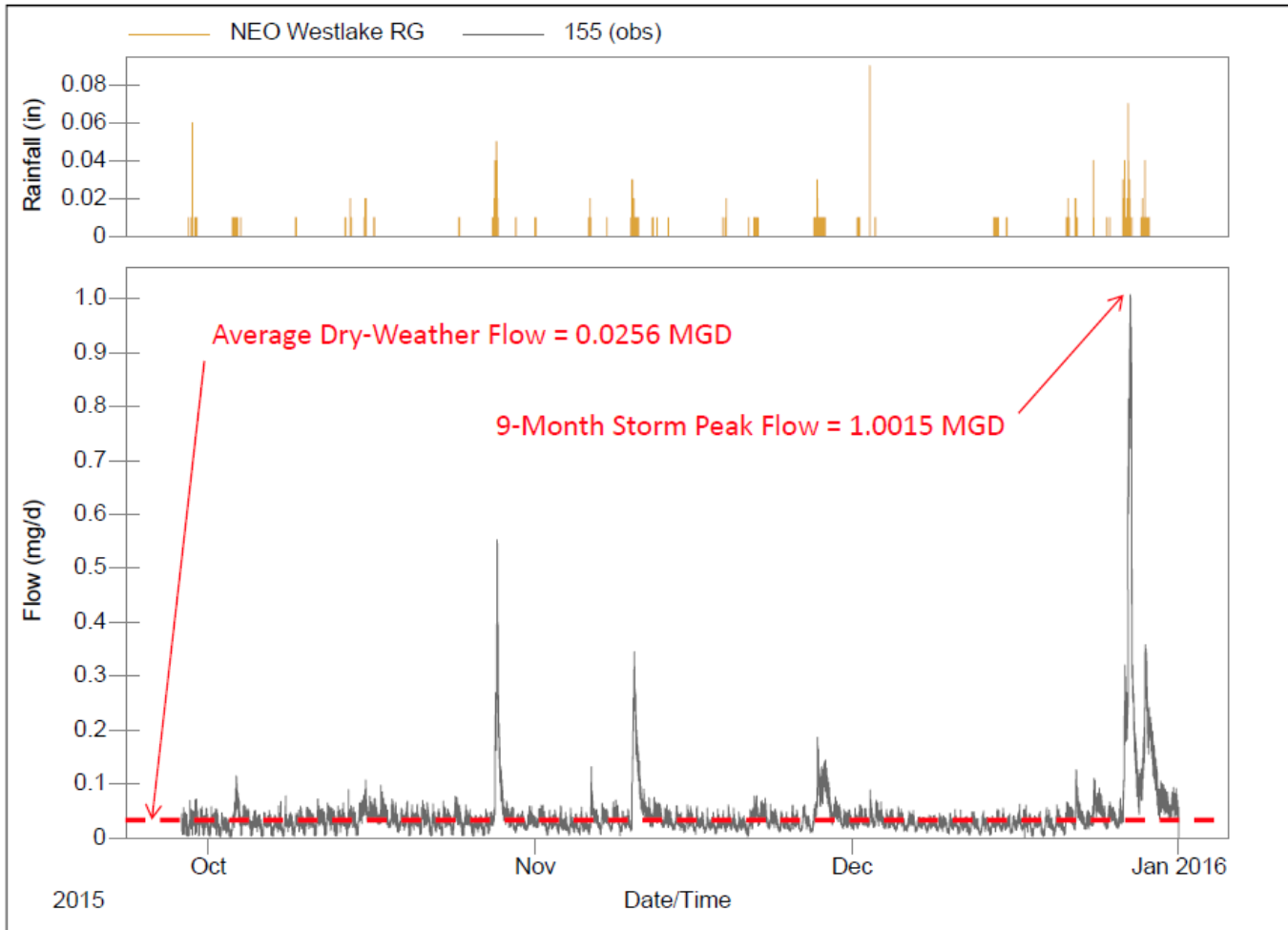


# BERKELEY ESTATES FLOW METERS

- Flow Meters 5 and 6 located on Elmwood Rd. and east of Dover Center Rd., respectively.
- Monitored between Oct. 2015 and January 2016



# BERKELEY ESTATES FLOW METER



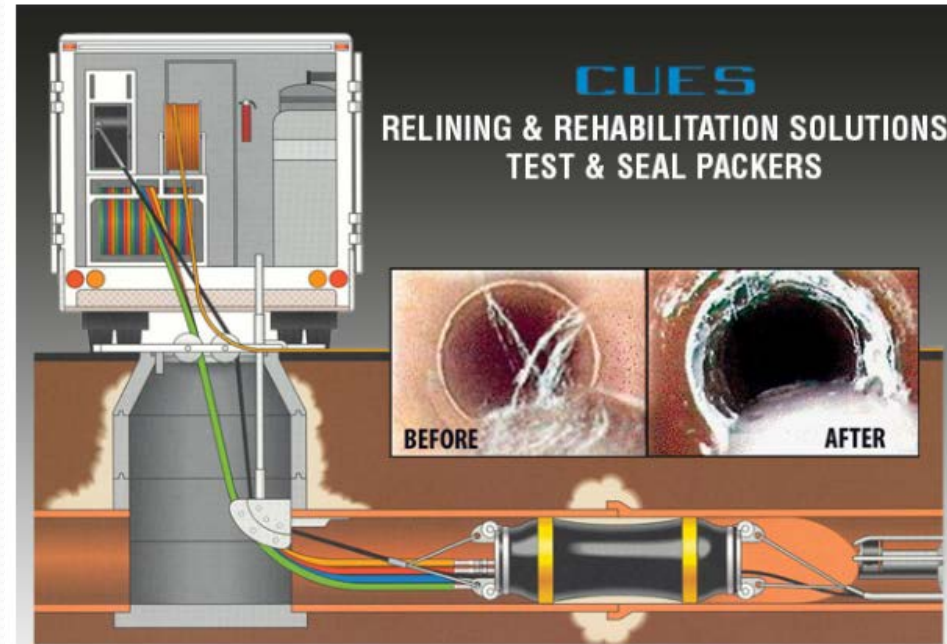
# PROPOSED REHABILITATION

- PERFORM CHEMICAL GROUTING (IF WARRANTED)
  - BERKELEY ESTATES
  - CANTERBURY MANOR
- LOWER THE SANITARY SURCHARGE ELEVATION ALONG THE CANTERBURY TRUNKLINE BY THE USE OF A BYPASS PIPE TO THE COLUMBIA TRUNKLINE (IF MODELING IS FAVORABLE)



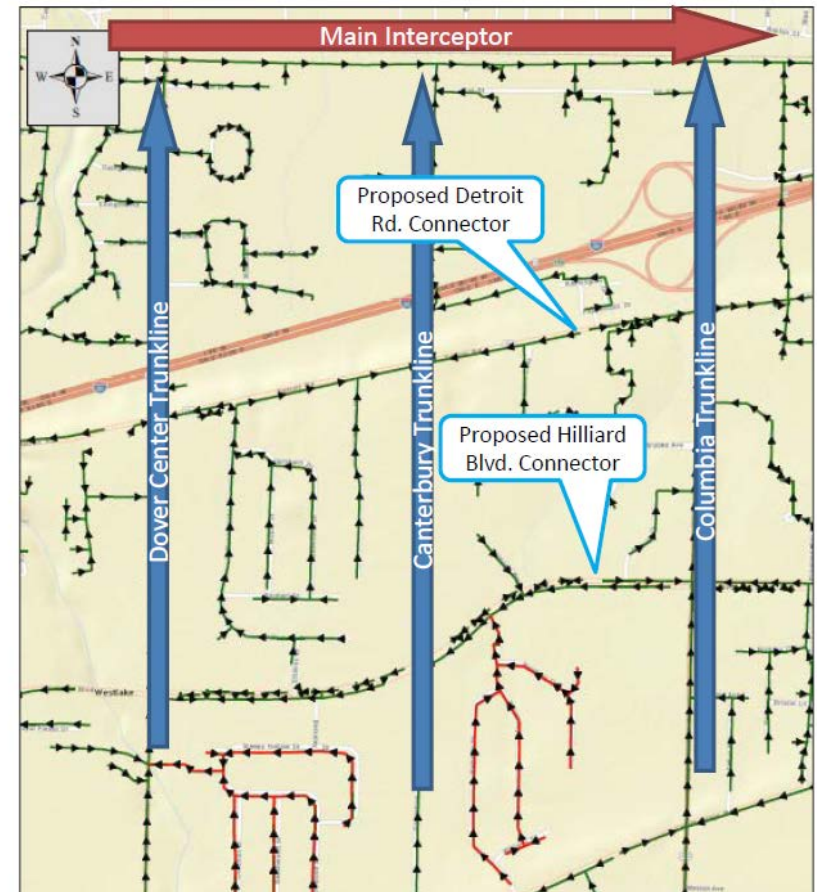
# CHEMICAL GROUTING

- MANHOLE TO MANHOLE GROUTING
- PREVIOUS SANITARY REHABILITATION:
  - STM LATERAL REPAIRS
  - SAN LATERAL CIPP
  - LATERAL CIPP
  - MANHOLE REHAB.
  - STORM MAIN REPAIR
  - SECTIONAL GROUTING



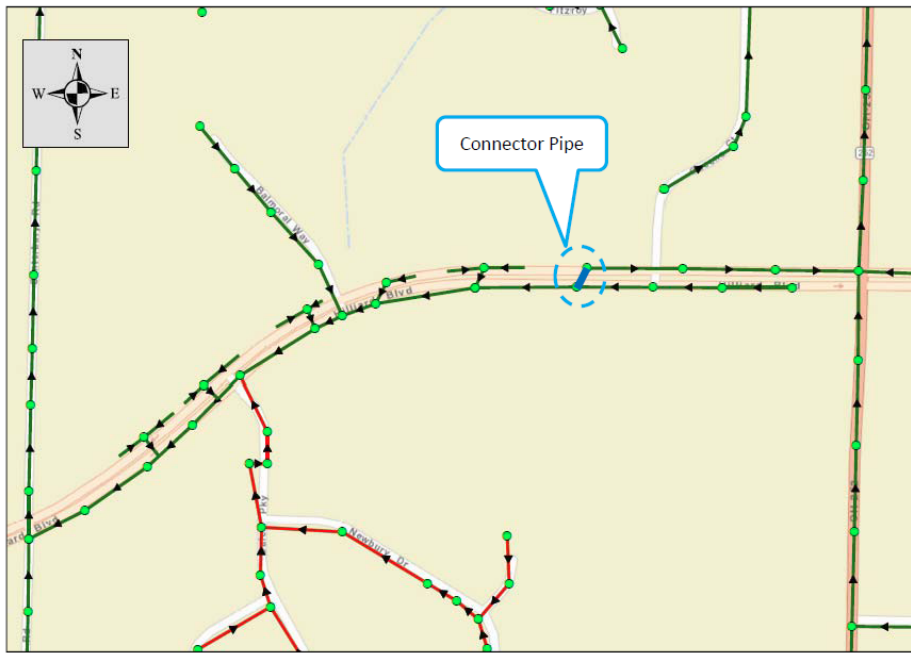
# SANITARY BY-PASS

- COLUMBIA TRUNK LINE HAS SOME CAPACITY DURING A RAIN EVENT
- SOME OF CANTERBURY SEWAGE WILL BE BY-PASSED TO COLUMBIA
- MODELING WILL DETERMINE EFFECTIVENESS AND TO VERIFY NO ISSUES OCCUR ON COLUMBIA



# BY-PASS LOCATIONS

## Proposed Hilliard Blvd. Connector



## Proposed Detroit Rd. Connector



# THE END

- QUESTIONS OR COMMENTS

