



NEWEA
Spring Meeting 2015

Micro-metering Quickly Isolates Sources of RDII in Bear Brook

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CITY OF SACO



The City of Saco is located on Maine's southern coast, approximately 14 miles south of the City of Portland. Saco is an attractive destination for both residents and visitors due to Saco's beautiful beaches, the Saco River, and the historic downtown and shopping district.

WATER RESOURCE RECOVERY



- Total Customers: 4700
- Average Daily Flow: 2.49 MGD
- Annual Budget: \$2.4 Million
- Employees: 9 Full-Time
- 31 Pump Stations

The Two Tier Strategy

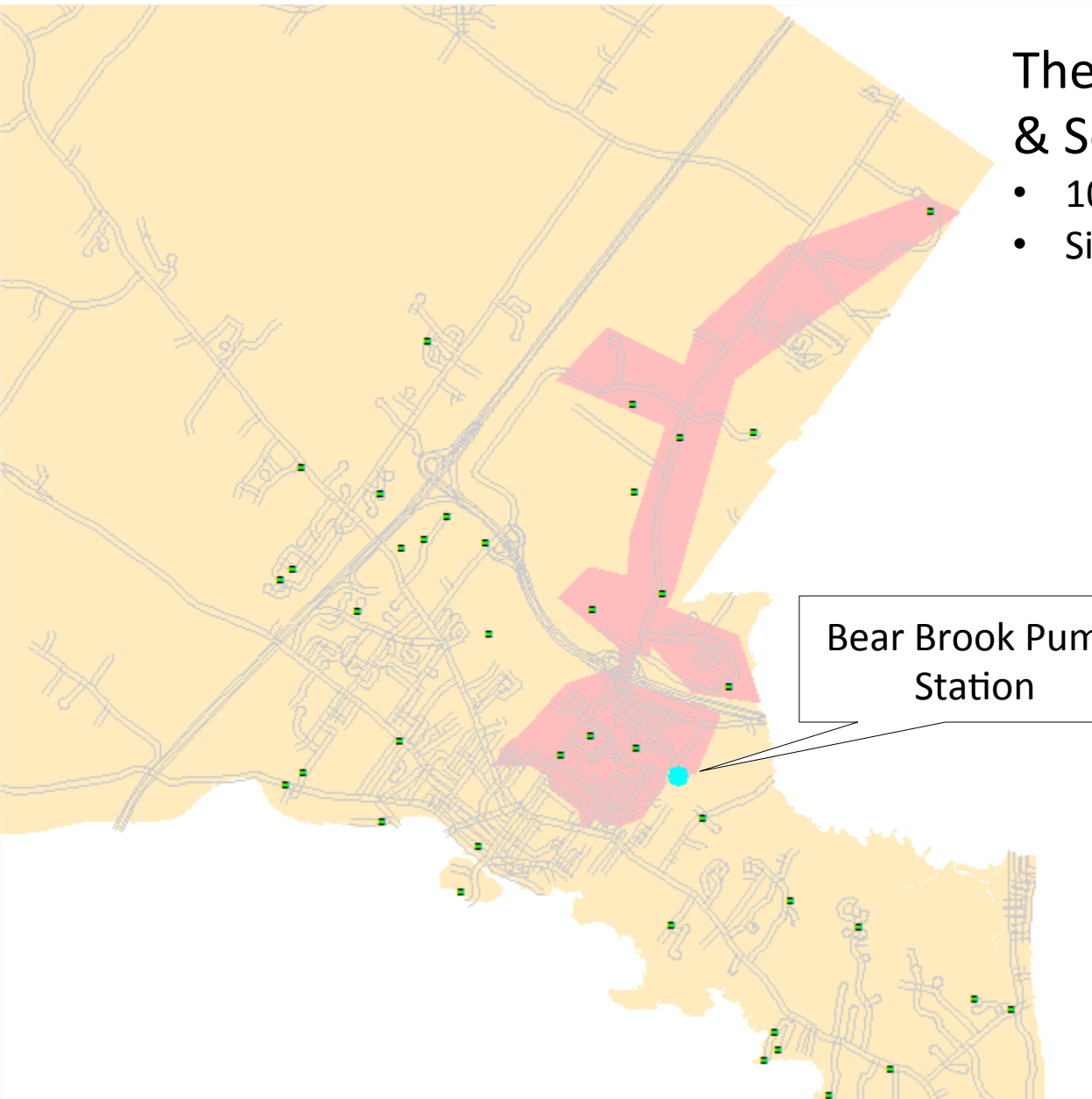
- The Bear Brook pump station has experienced severe RDII.
- Part of the sewershed parallels Bear Brook and it was assumed that most of the RDII was originating in that section of sewer.
- Instead of using the traditional smoke testing and CCTV in the 109,000 linear foot sewer shed, the City elected to deploy a two-tier mini-basin metering strategy. ADS Environmental Services was selected to conduct the metering and RDII analysis.

The Two Tiers

- Tier 1 metering was conducted in five sub basins (average of ~ 14,000 lf of pipe).
- Two of five sub areas produced low RDII and were eliminated from further examination leaving 43,103 LF to study.
- Tier 2 metering involved relocating and installing additional meters to create 8 smaller micro-basins in the three worst Tier 1 basins at an average size of 5,388 LF.
- It was found that during a 2.13-inch storm, 88% of the RDII was generated in three of the micro-basins. The three basins contained 22,397 LF or 20% of the total system size.

The Bear Brook Pump Station & Sewer Shed

- 109,000 LF of Sanitary Sewers
- Sizes from 8 to 14 inch



Bear Brook Pump
Station

Meter Installation



2014/03/27



2014/03/27

Rainfall Totals for 8 Storms - March-June 2014

3/29/14 – 2.24"

4/4/14 - 0.53"

4/7/14 – 1.04"

4/15/14 - 0.65"

4/30/14 – 1.22"

5/16/14 - 0.92"

6/13/14 – 2.13"

6/25/14 – 1.15"

Phase 1

Phase 2

DDF Graph

SACO_RG-3/29/2014 9:00:00 PM

SACO_RG-6/13/2014 7:00:00 AM

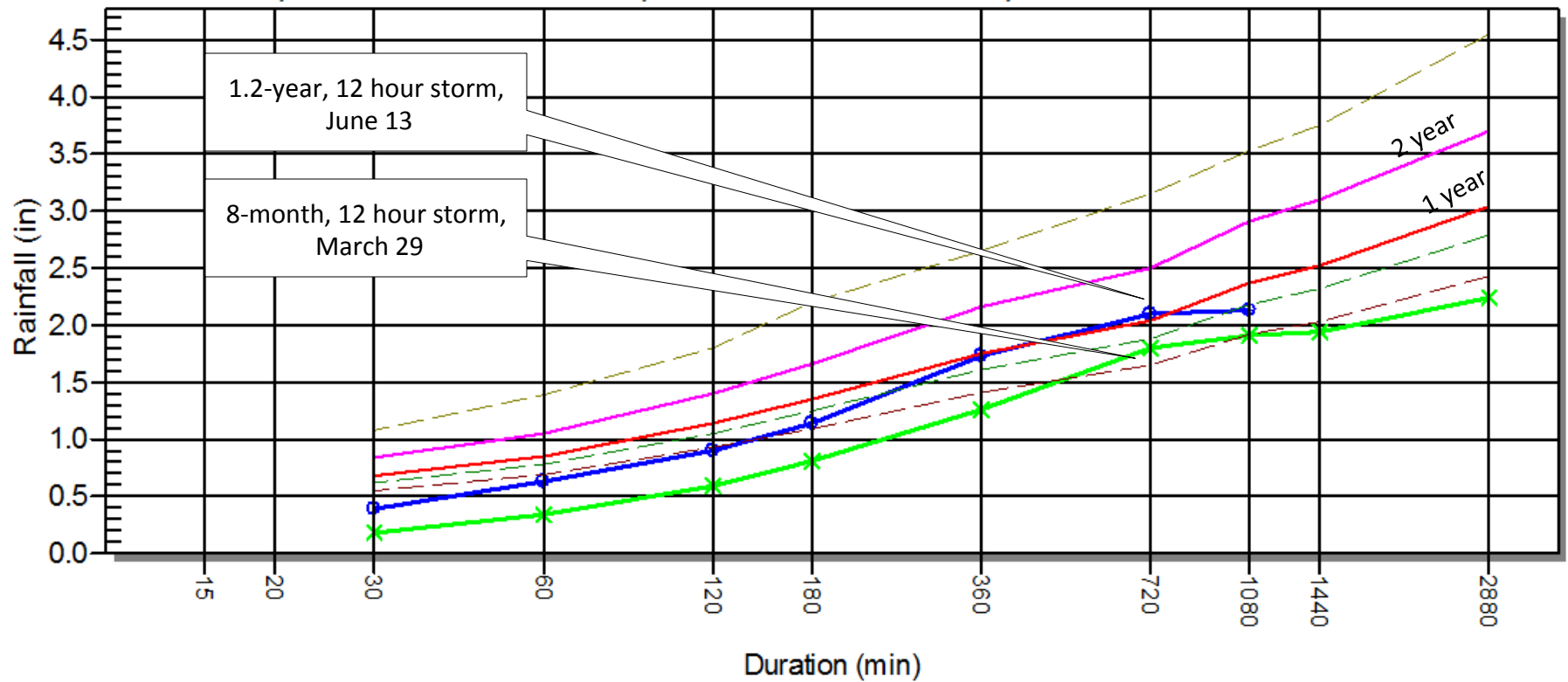
6-month

9-month

1-year

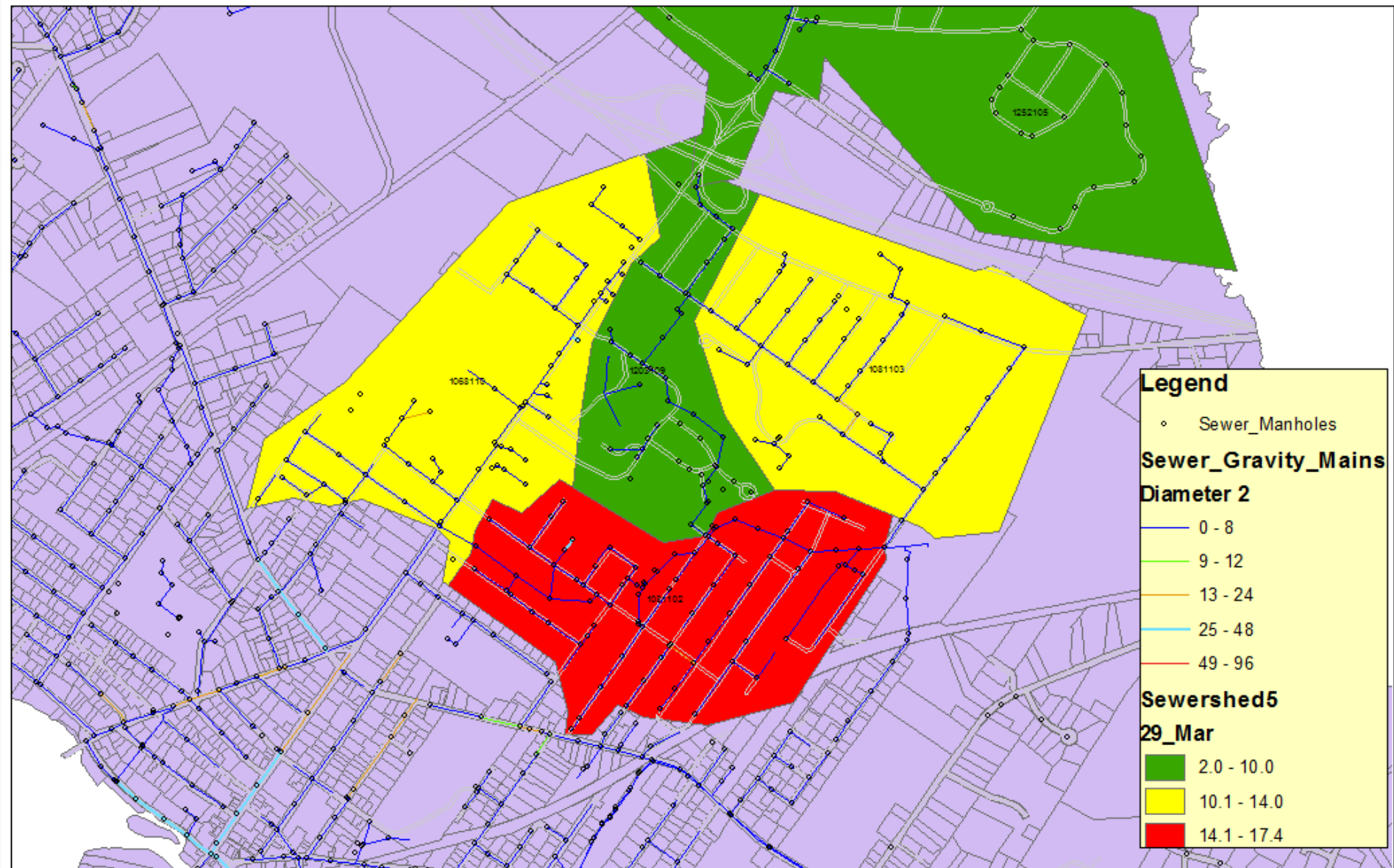
2-year

5-year



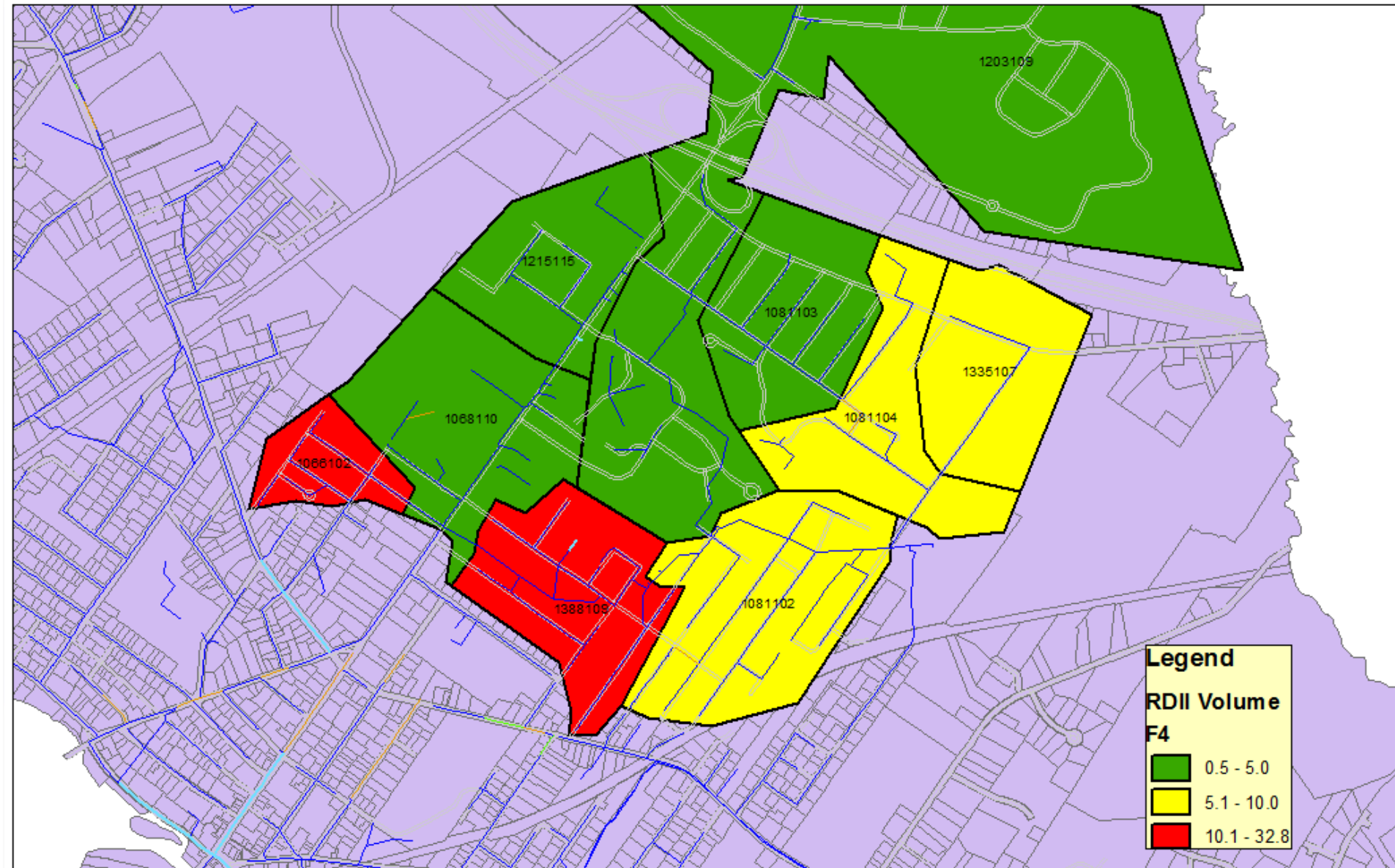
Findings from Phase I

RDII Severity in Gallons per LF of Sewer per Inch of Rain



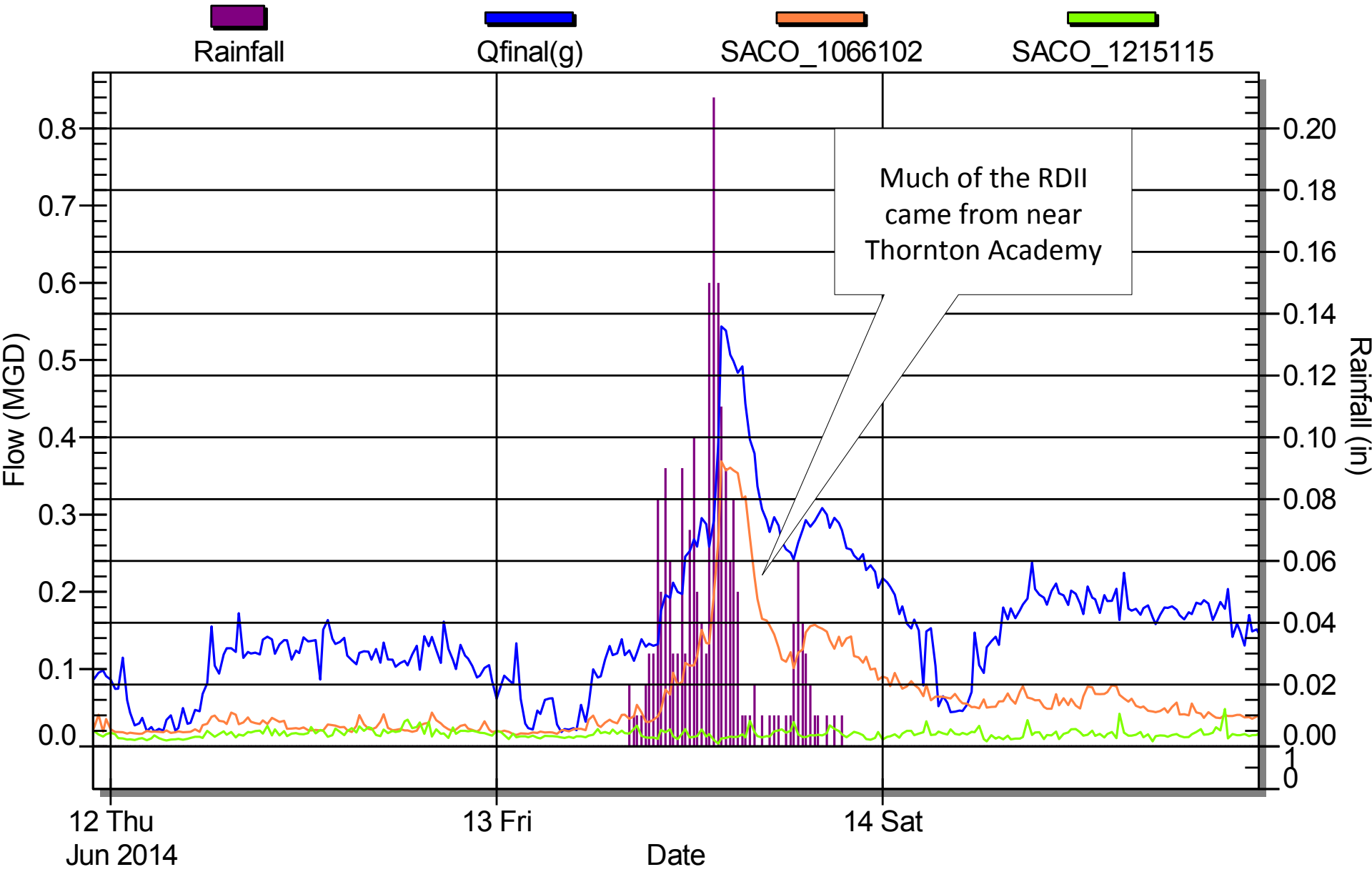
Findings from Phase II

Severity of RDII from 13 June Storm in Gal/LF/Inch



Pipe Flow

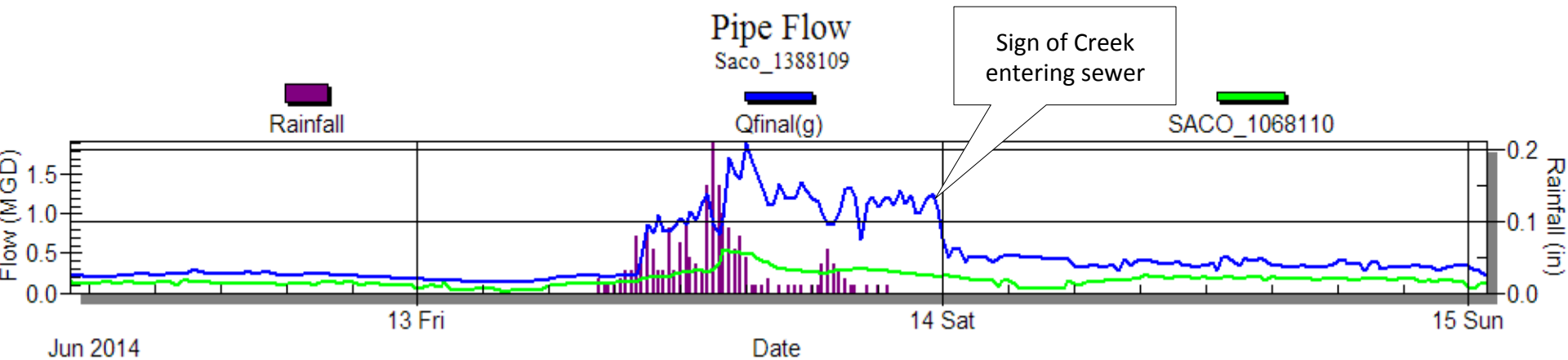
Saco_1068110





Near Thornton Academy,
a storm water plunge
pond and a storm drain
were connected to the
sanitary sewer.

Rapid rise and drop in flow is tell tale indicator of Bear Brook water entering sewer. Flow drops when creek level drops below the MH or pipe defect.



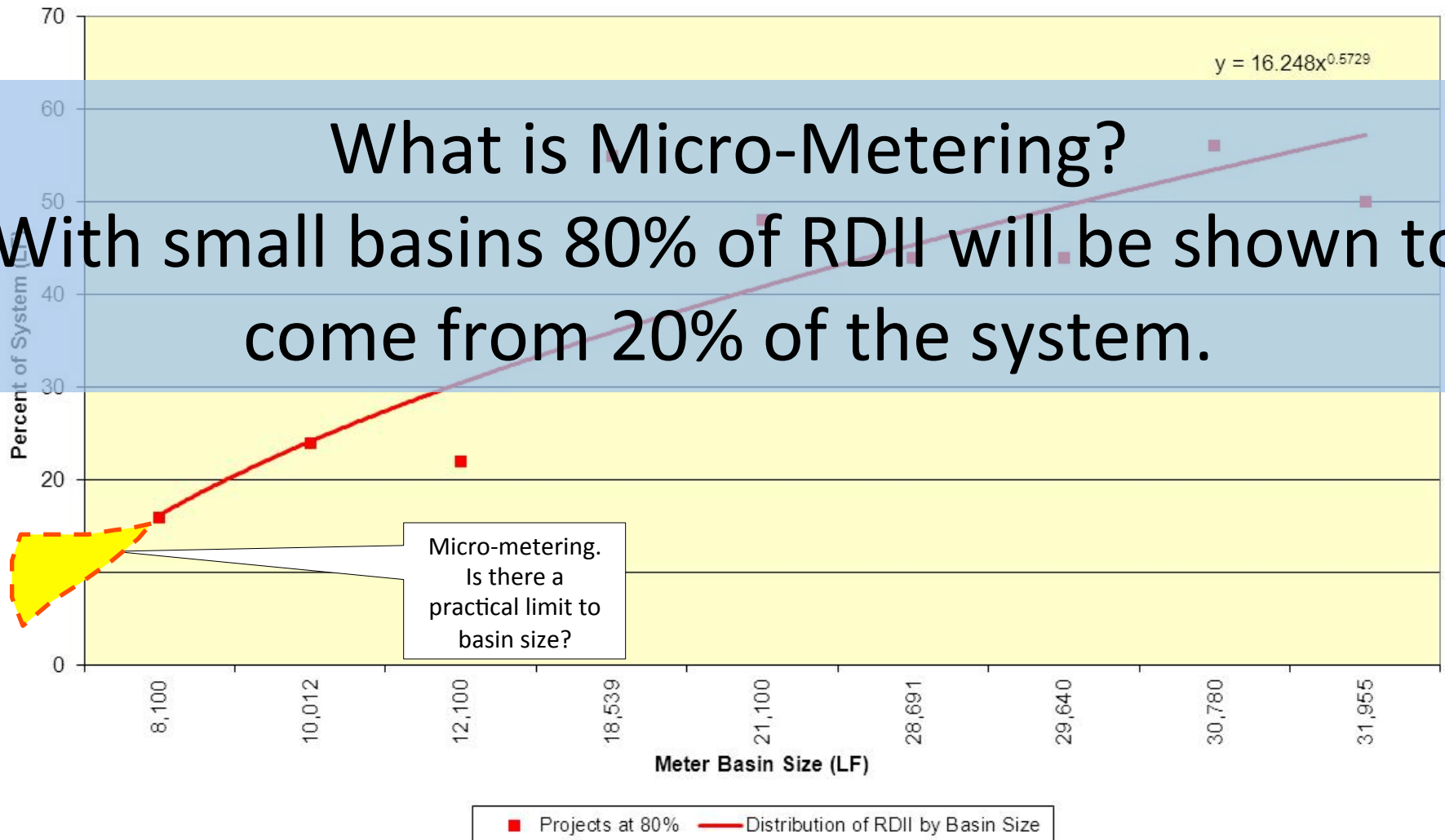
A contract is pending to line the sewer along Bear Brook.



Percent of System (LF) Producing 80% of RDII Volume
as Function of Meter Basin Size

What is Micro-Metering?

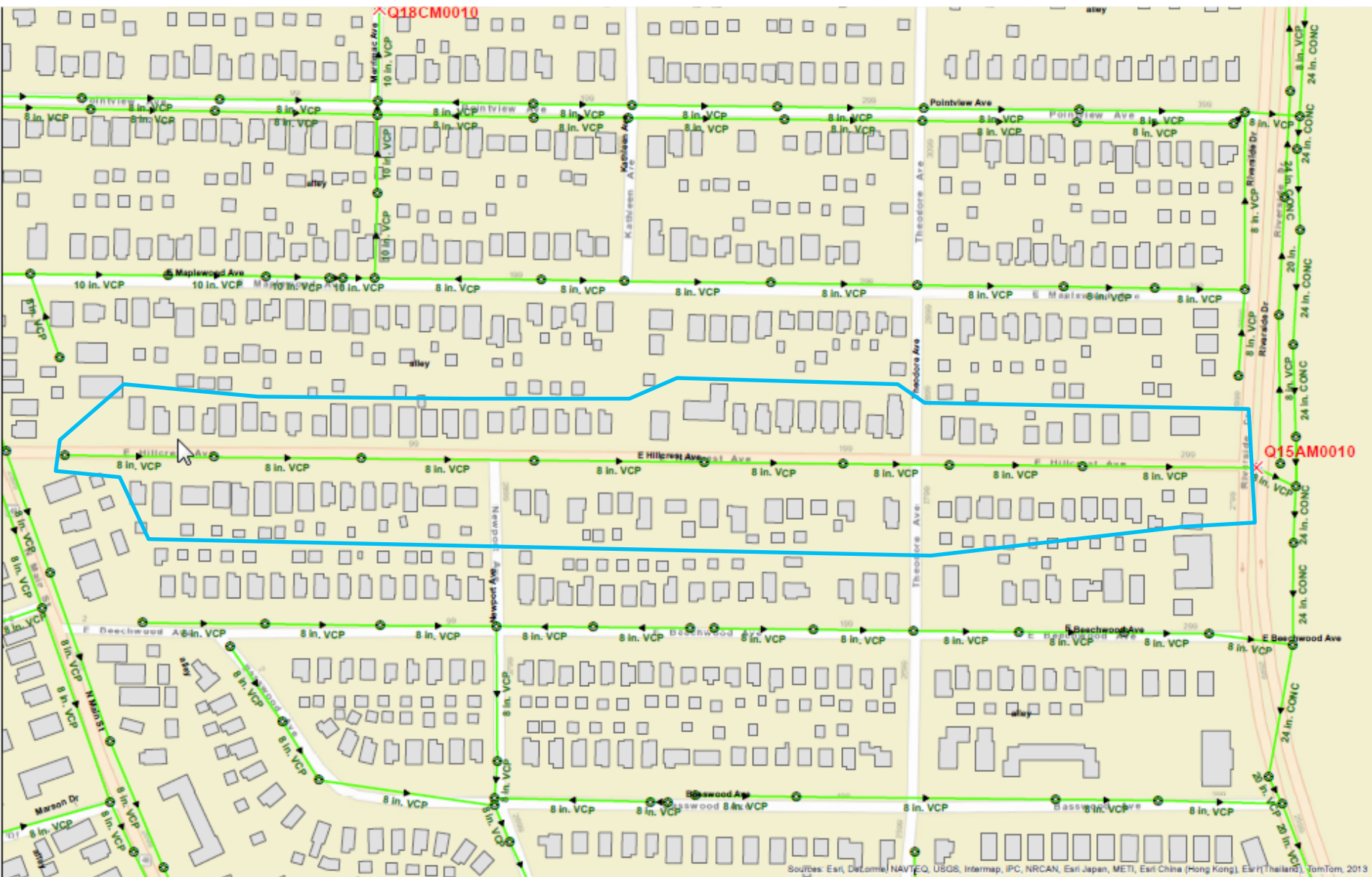
With small basins 80% of RDII will be shown to come from 20% of the system.



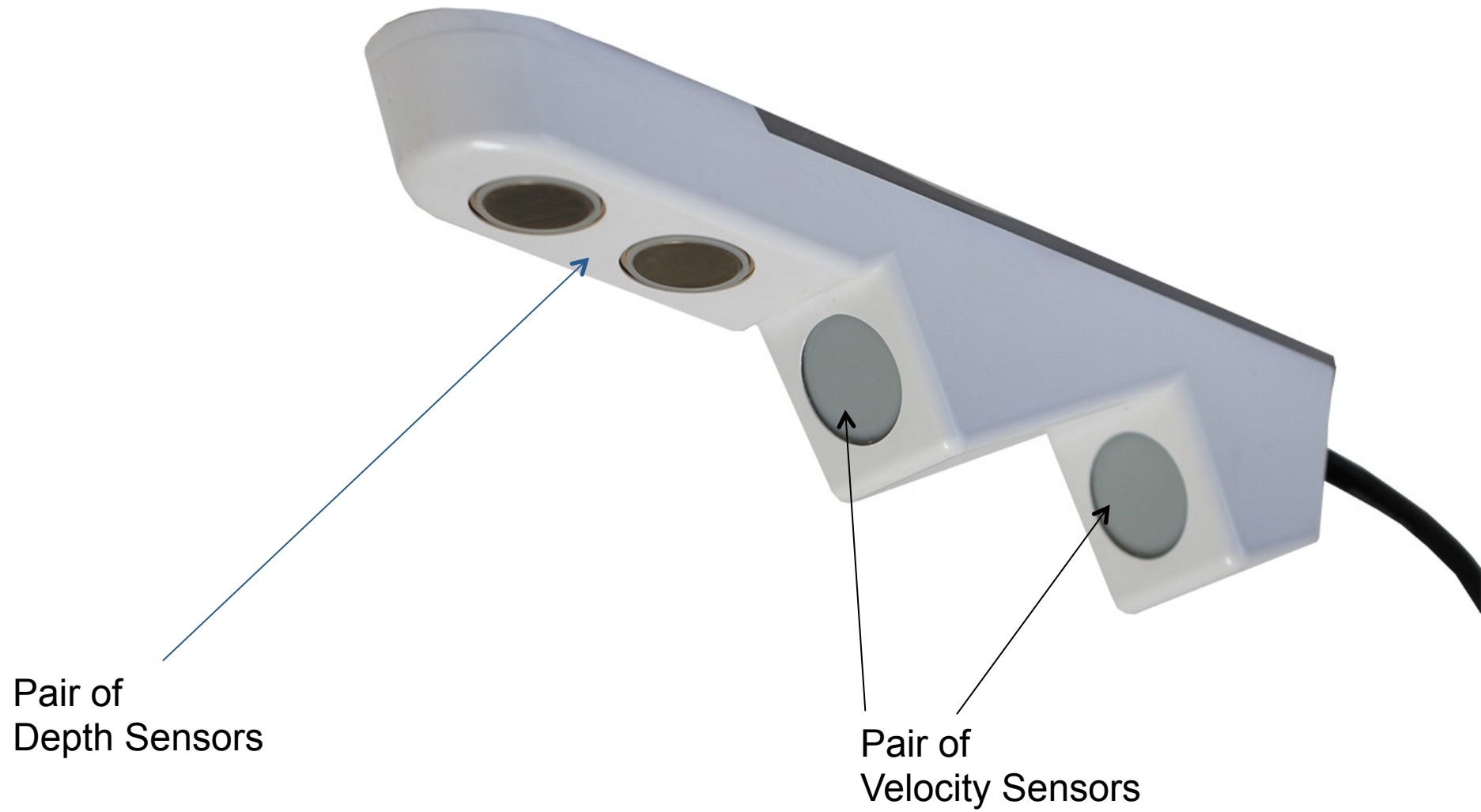
Four meters with Surface Sensors in 8-inch sewers in Dayton, OH

- Q06AM0010 – 52 homes – 2 blocks – 1,100 lf
- Q15AM0010 – 80 homes – 3 blocks – 1,976 lf
- Q18CM0460 – 28 homes – 3 blocks – 1,985 lf
- Q18FM0070 – 25 homes – 1 block – 650 lf

Q15AM0010 - 8 inch – 80 homes – 3 blocks – 1,976 lf



Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, IPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Thailand, TomTom, 2013

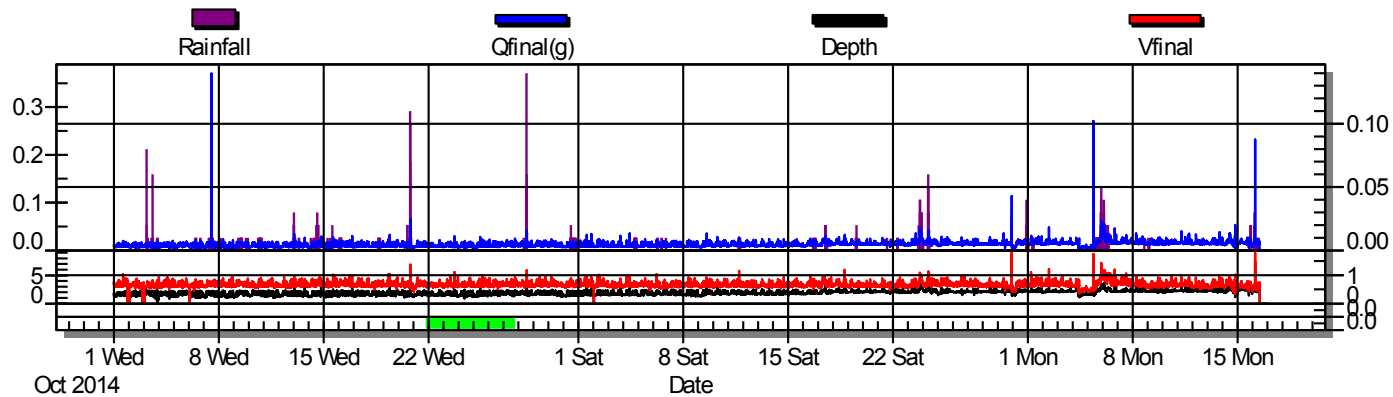


Pair of
Depth Sensors

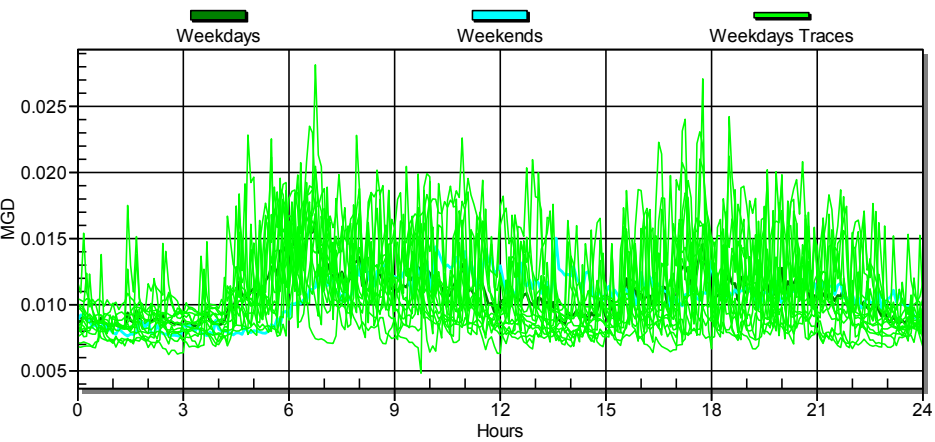
Pair of
Velocity Sensors



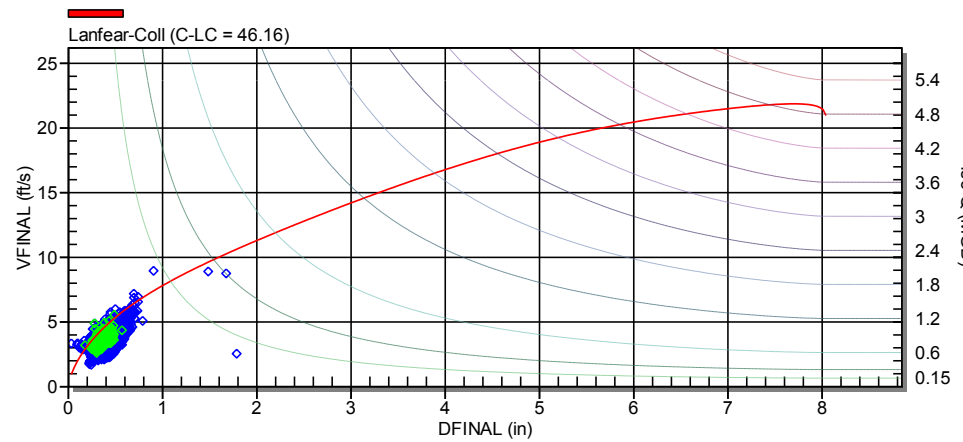
Pipe Flow Q18460



Dry Weather Flow Q18460



Scatter Graph Q18460

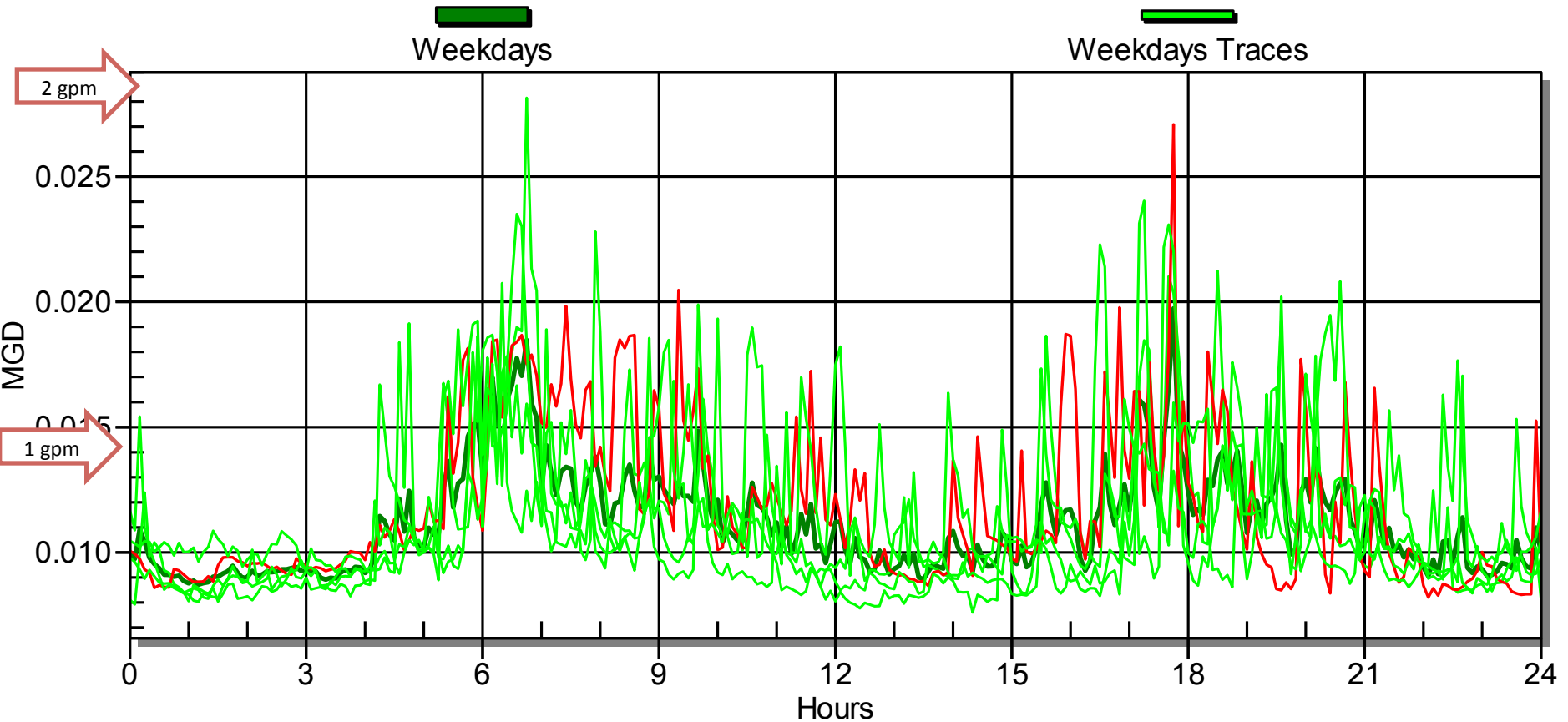


Measuring Showers and Toilet Flushes from 28 Homes?

5-Minute Time Steps

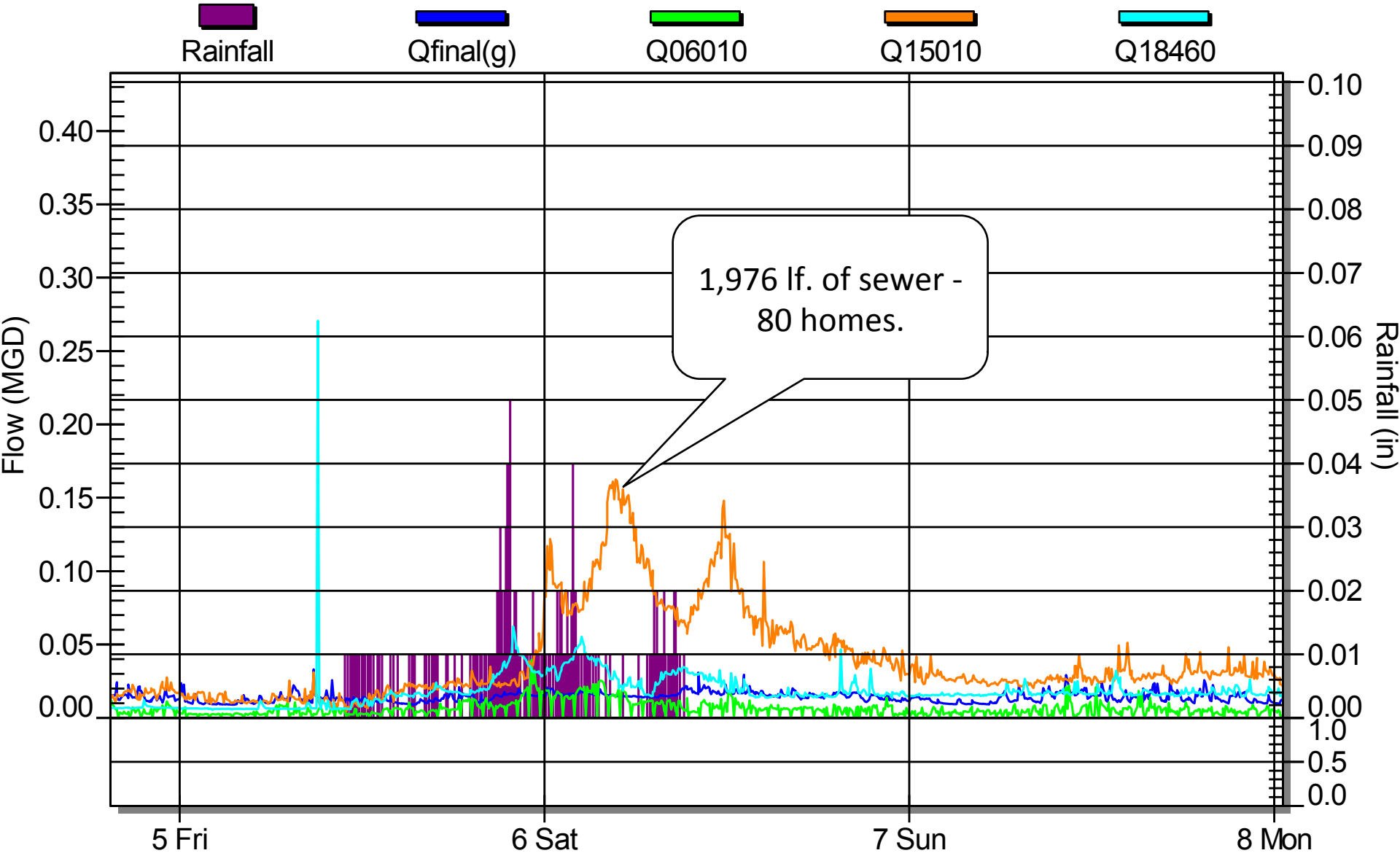
Dry Weather Flow

Q18460



Pipe Flow

Q18FM070



Savings in SSES costs

There are three possible options for locating sources of RDII;

1. The old way of doing SSES over the entire Bear Brook sewershed.
2. Doing SSES on the worst of the five large basins
3. Doing SSES on the worst of the micro-basins.

| Strategy | Length of Sewer LF | Cost of SSES at \$4/LF | Savings |
|----------------------------------|--------------------|------------------------|-----------|
| SSES entire system - no metering | 109,000 | \$424,000 | None |
| SSES on worst of Large Basins | 64,365 | \$257,460 | \$166,540 |
| SSES on 3 Micro Basins | 24,106 | \$96,424 | \$327,576 |

The metering cost for both phases of the work was \$25,000 and the payback over straight SSES was greater than 15:1

Conclusions

- As expected much of the RDII was entering the system along the Bear Brook.
- The majority of the RDII was from three other micro-basins.
- 88% of the RDII was isolated within 20% of the system.
- As a result this micro basin technique, the town saved of approximately \$250,000 in avoidable SSES (CCTV, smoke, dye test, manhole inspections).

THE END