Flow Monitoring in the Collection System

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SEWAGE IS MY BREAD AND BUTTER
• Definitions
• Why Flow Monitor?
• Flow Monitoring Applications
• Site Selection
• Lessons Learned
- DWF – Typical daily flow from the system

![Graph showing dry weather flow for City of Niles Meter 3 18-inch DWF with flow (gpm) on the y-axis and time (12:00 AM to 12:00 AM) on the x-axis. The graph includes lines for Weekday DWF and Weekend DWF.]
• DWI – groundwater entering the sanitary sewer system through indirect paths like at pipe joints and lateral connections
• WWF – sewer flows in addition to DWF that occur during a precipitation event
• RDII – stormwater entering the sanitary sewer system through direct and indirect connections like catch basins, down spouts, and pipe joints
• Measure discharge for billing purposes
• Establish dry weather flow patterns
• Quantify and isolate wet weather flow
Why Flow Monitor?
• Sewage overflows
• Basements back ups
• Capacity assurance/MDEQ compliance
• Transport and treatment costs
• I/I problem?
  ▪ MORs/WWTP data and lift station data

Who Needs to Flow Monitor?
• I/I study
  o Flow monitoring
  o Modeling
  o Sewer System evaluation study (SSES)
• Flow monitoring – a decision-making tool
  ○ Collect data used to model collection system
  ○ Establish DWF patterns
  ○ Identifying areas with high WWF
• Establish diurnal or seasonal flow patterns
Dry Weather Flow Patterns – Casino
Dry Weather Flow Patterns – Industrial
DWF Patterns – Seasonal Variations
Wet Weather Flow Patterns

Village of Baldwin
Meter 3 - 5/9 Event

Flow (gpm)

Rainfall (inches)

Wet Weather Flow Patterns
• Flow monitoring process
• Installation
• Things to consider
• Ideal site
• Area Velocity Measurements

\[ Q = A \times V \]

ISCO 2150
Sigma 910
ISCO LaserFlow
Marsh-McBirney Flo Dar
Flow Monitoring Process

- Monitoring program development
  - Site selection and installation
  - Data collection and handling
  - Data analysis
• Confined space certified personnel needed for installation
• Proper installation provides for accurate measurements and can prevent malfunctions and data loss

Air Monitoring
Site Selection Considerations

- Program objectives
- Physical criteria
- Accessibility
- Security
- Budget
Ideal Site
CSO #003 (24-inch) - Flow Chart

Flow (gpm)

Rainfall (inches)

Flow Chart

Raw Data

Rainfall

7/5/14 7/6/14 7/7/14 7/8/14 7/9/14 7/10/14 7/11/14 7/12/14 7/13/14 7/14/14 7/15/14

0 50 100 150 200 250 300 350 400

0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00

7/5/14 7/6/14 7/7/14 7/8/14 7/9/14 7/10/14 7/11/14 7/12/14 7/13/14 7/14/14 7/15/14

0 50 100 150 200 250 300 350 400

0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00

Raw Data

Rainfall
Less Ideal Site
• Where to install flow monitors?
  - Monitor all areas contributing to the WWTP or pump station
  - Monitor areas of suspected high I/I
• Straight through manhole  
• No other incoming sewers or laterals  
• Adequate depth and velocity  
• Not within the influence of a lift station  
• No surcharging  
• Easily accessible  
• Free of excess grease or debris
Site Selection Lessons Learned
• Site hydraulics
• Lift station
• Site access
• Grease/debris
Multiple Incoming pipes

Sensor

0

0.5

1

1.5

2

2.5

3

-200

1,000

1,400

1,600

0

1

1.5

2

2.5

3

7/8/12

7/10/12

7/12/12

7/14/12

7/16/12

7/18/12

7/20/12

Raw Data

Rainfall

Flow (gpm)

Rainfall (inches)

Meter 8 - Flow Chart

Flow Chart

Meter 8 - Flow Chart

Multiple Incoming pipes
Ideal Site?
Lift Station Influence
Lift Station Influence

Meter 4 - 4/15 Event

Flow (gpm)

Rainfall (inches)

Wet Weather Flow
Rainfall

4/14/12  4/15/12  4/16/12  4/17/12  4/18/12  4/19/12  4/20/12  4/21/12

0  0.1  0.2  0.3  0.4  0.5  0.6  0.7  0.8  0.9  1.0

500  1,000  1,500  2,000  2,500  3,000  3,500  4,000  4,500  5,000
Accessibility
Silt and Seasonal Variation
Meter 7 - Flow Chart

Flow (gpm) vs Rainfall (inches) for the period from 2/1/12 to 2/17/12.

Flow Chart
Ideal Site?
• Know the objectives of your flow monitoring program
• Allow enough budget and time to collect necessary data
• Work closely with field staff when picking sites
• Flow vary greatly between systems and seasons
• Careful site selection can save time and money
Thank You

Questions?