

Out with the Inflow: Reducing I&I in Wastewater Collection Systems

2020 OTCO Wastewater Workshop Webinar

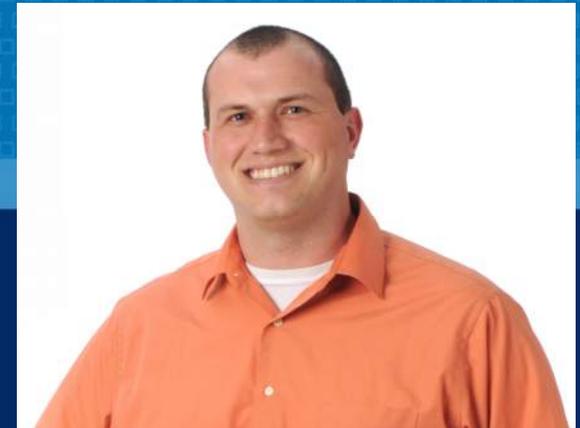
Presented by:

Matt Newlon, PE

April 15, 2020



BURGESS & NIPLE



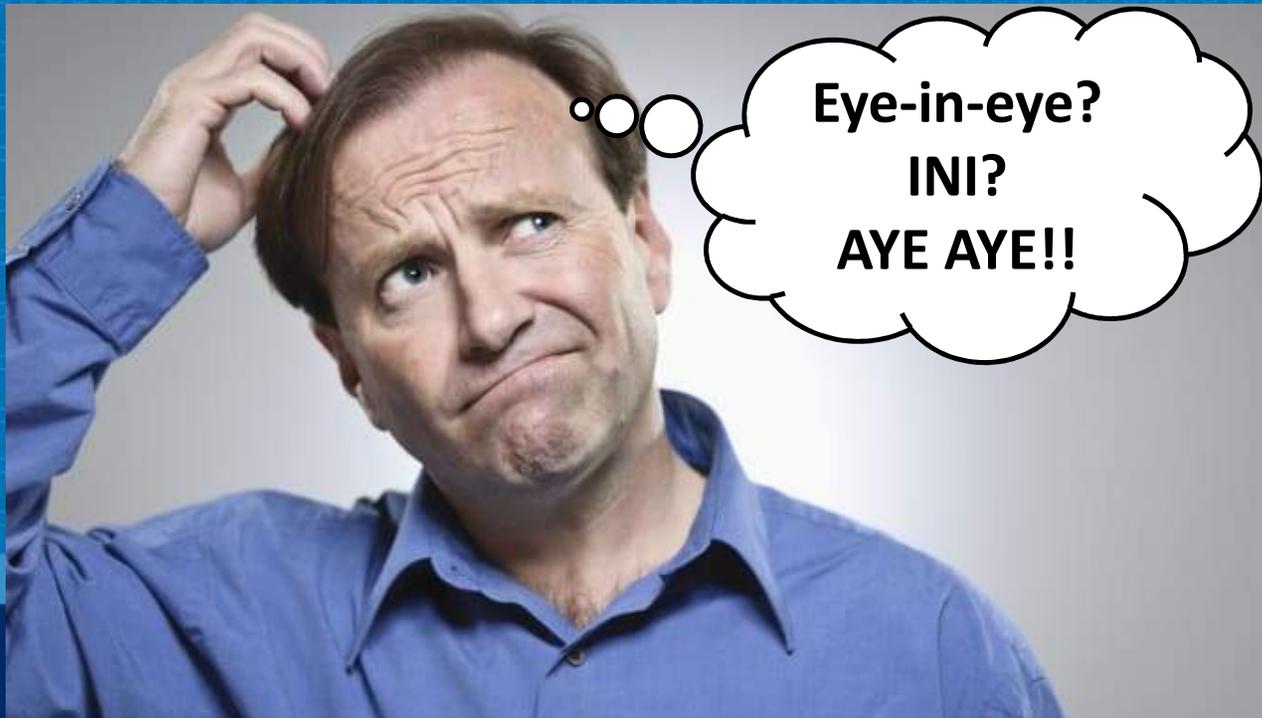
Presentation Overview

- What is I&I?
- Locating the Source of the I&I
- Identifying the I&I
- Eliminating the I&I
- Preventative Measures
- Wrap-up



BURGESS & NIPLE

What is I&I?



BURGESS & NIPLE

The Basics

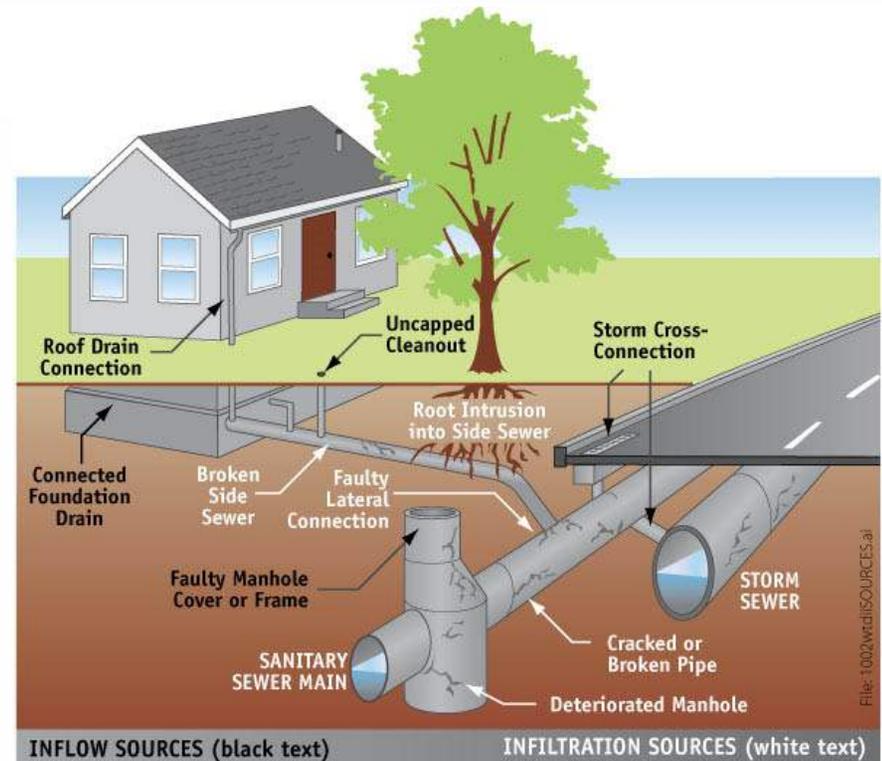
- I&I – Inflow and Infiltration
 - Undesirable groundwater and stormwater entering sanitary sewer systems
- Inflow
 - Stormwater entering a sewer system
 - Entry points include storm inlets, roof drain connections, foundation drain connections, sump pumps connected to lateral
- Infiltration
 - Groundwater entering into sewer pipes
 - Entry points include leaky joints, damaged pipes, deteriorated manholes and pipe connections



BURGESS & NIPLE

Problems Caused by I&I

- I&I Causes Overflows
 - Overflows cause backups that can damage homes and businesses
 - Overflows spill onto roads and into streams, potential health hazard
- I&I Increases Treatment Volumes
 - More treatment = more cost
 - Reduces existing sewer capacity
- I&I Accelerates Sewer Deterioration
 - Pipe Failures
 - Sinkholes



Inflow Examples

Storm Inlets



Roof Drains



Foundation Drains



BURGESS & NIPLE

Infiltration Examples

Leaking Joints



Damaged Pipes



Deteriorated Manholes



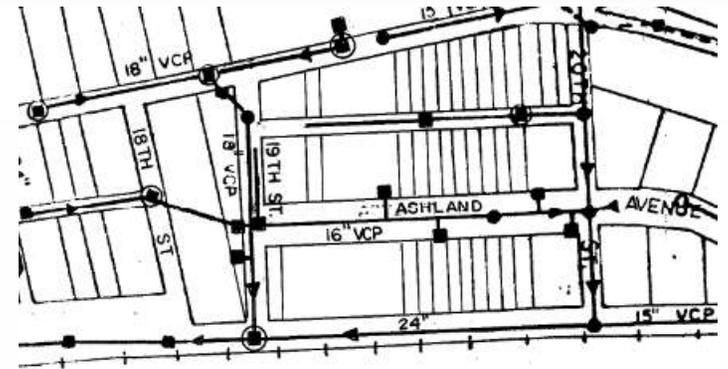
Locating the Source of the I&I



BURGESS & NIPLE

Determine Where the Flow is Coming From

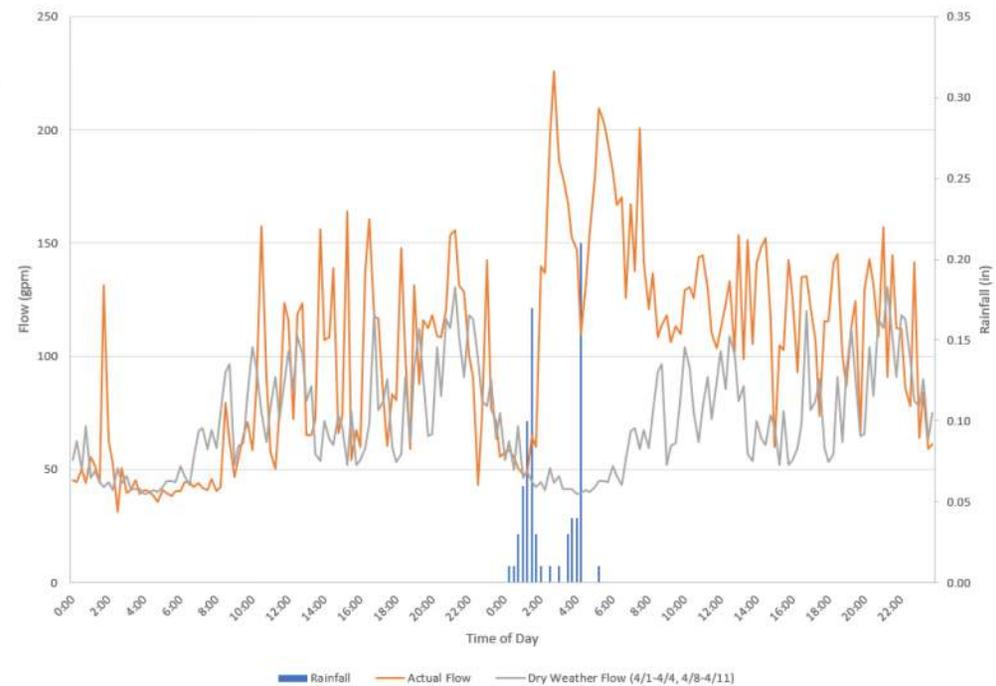
- Review Existing System Mapping
 - Identify any “old”/existing cross connections
 - Locate inactive sewer mains that could invite I&I
- Perform Flow Monitoring
 - Quantifies comparison of dry weather flows vs. wet weather flows
 - Isolate segments or subareas



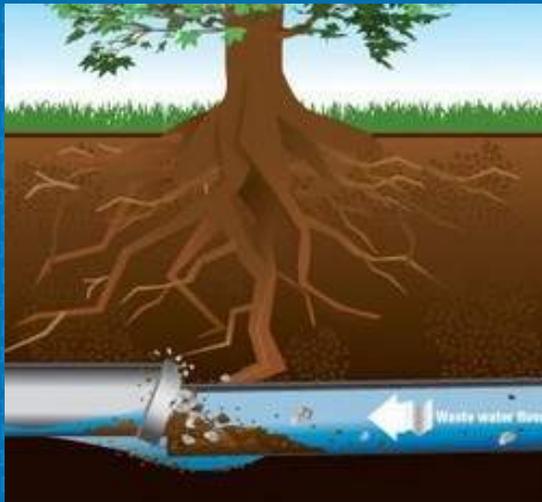
BURGESS & NIPLE

Flow Monitoring

- Establishes baseline flows
- Records changes in flow conditions
- Add rainfall data
- Compare to determine the impact rainfall has on flows



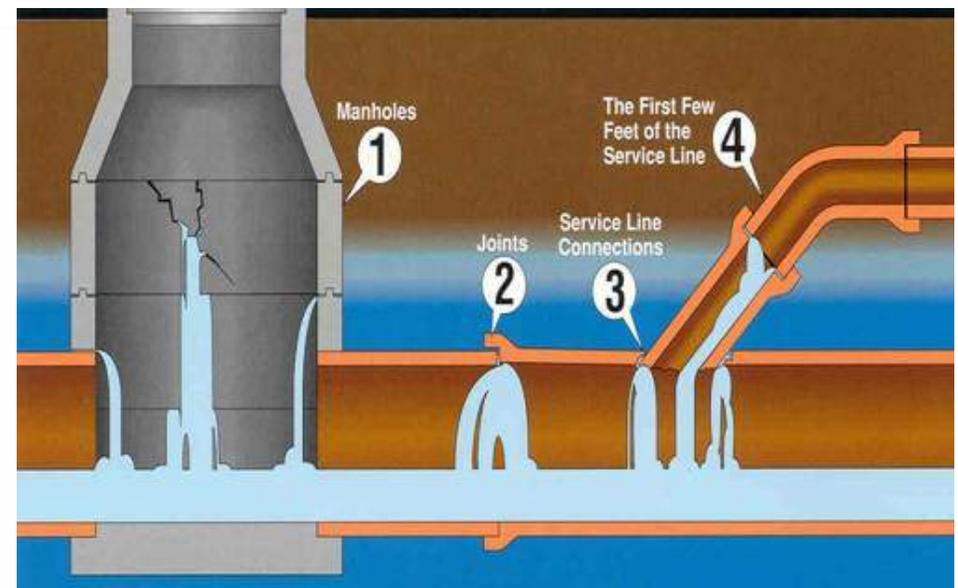
Identifying the I&I



BURGESS & NIPLE

Investigate Condition of the System

- Manhole Inspections
- Smoke Testing
- Dye Testing
- Acoustic Pipe Inspection
- Sewer Cleaning and Televising



BURGESS & NIPLE

Manhole Inspections

- Detailed Assessment of Sewer Structures
- Brick Manholes Common Infiltration Points
- Pipe Connections Leak as they Deteriorate
- Vented Lids = GLORIFIED CATCH BASIN!
- Quick Confirmation of Cross Connections



BURGESS & NIPLE

Smoke Testing

- Setup Smoke Machine at Manhole
- Fills System with Smoke
- Identifies Roof Drain and Storm Connections
- Locate Voids between Pipe and Ground Surface
- RESIDENTS LOVE IT!



BURGESS & NIPLE

Dye Testing

- Confirm Connectivity Between Access Points
- Confirm Suspected I&I Access to Sewers
 - Cross connections
 - Voids in ground leading to pipe
- Useful for Identifying House Service Connection Point



Acoustic Inspections

- Use of Sound to Detect Obstructions
 - Pipe Failures
 - Blockages
 - Roots
- Scores Pipe Segments
- Helps Identify Priority Cleaning Areas
- Can “Test” Around 10,000 l.f. per day



BURGESS & NIPLE

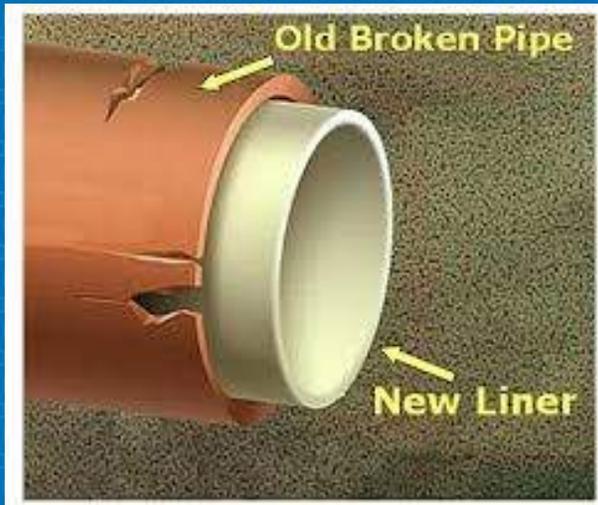
Sewer Cleaning and Televising

- Full Visual Inspection of Existing Sewers
- Assess Flow Levels and Condition
- Trace Out Sewer Locations
- Use with Dye Test to Confirm Tap Locations
- Restore Lost Capacity with Thorough Cleaning



BURGESS & NIPLE

Eliminating the I&I



BURGESS & NIPLE

What Options Are Out There??

- Sewer Separation
- Rehabilitation
- Pipe Bursting
- Sewer Replacement
- Pump and Treat



BURGESS & NIPLE

Sewer Separation

- Option for Existing Combined Sewers
- Install New Sanitary Sewer
 - Existing sewer becomes dedicated storm sewer
 - Divert downstream connection to storm outfall
 - Select rehabilitation of deteriorated pipes
- Install New Storm Sewer
 - Existing sewer becomes dedicated sanitary sewer
 - Plug existing storm inlet connections
 - Select rehabilitation of deteriorated pipes



Rehabilitation

- Sewer Rehabilitation
 - Cured-in-Place-Pipe (CIPP) Lining
 - Slip Lining
 - Pipe Bursting
- Manhole Rehabilitation
 - Epoxy Coating
 - Cementitious Coating
- Lateral Rehabilitation
 - Service Lateral Lining
 - Service Connection Sealing
- Trenchless = Less Disturbance



BURGESS & NIPLE

Sewer Replacement

- Install New Sanitary Sewers
 - Existing sewer capacity not adequate
 - Existing sewers too shallow or too deteriorated to rehab
 - Limited access points on system
 - Sewer segments not straight
 - Location/terrain causes access issues
 - Project constraints affect rehab feasibility



BURGESS & NIPLE

Pump and Treat

- Determine Impacts of Existing I&I
 - How much I&I is the system experiencing?
 - What risk is associated with no change?
- Replacement/Rehab vs. No Change
 - Which costs more over 10 years? 25 years?
 - What legal impact could there be?



Preventative Measures



BURGESS & NIPLE

Evaluate Existing System Conditions

- Have the Tools
 - Smoke Blower
 - Push Camera (crawler if funds allow)
 - Improvise
- Know Your System
 - Regular inspections (manholes, sewer, TV)
 - Create grid and schedule to review entire system on a 10-year cycle
 - Monitor lift station pumping records
 - Keep and maintain mapping
 - Remember to budget
- Keep Records of Condition
 - Asset Management Plan (AMP)
 - Capacity, Management, Operations and Maintenance (CMOM) Program



BURGESS & NIPLE

Be Proactive!

- **YOU DON'T HAVE TO WAIT FOR I&I PROBLEMS TO DECIDE TO DO SOMETHING ABOUT IT!!**
- Install CIPP Liner on 60 year old VCP sewers
- Rehabilitate aging manholes
- Perform Lateral Sealing for non-factory connections



Being proactive costs money, but being reactive usually costs more!

BURGESS & NIPLE

Thank you!

2020 OTCO Wastewater Workshop Webinar

Presented by:

Matt Newlon, PE



BURGESS & NIPLE