



# UNDERGROUND CONSTRUCTION TECHNOLOGY

The Underground Utilities Event | July 13-15, 2021 | Music City Center | Nashville, TN



It Ain't Easy  
Being Me

Owner/Decision-Maker



## Drew Muirhead, P.E.

- Assistant Director Water Services, City of Brentwood, TN
- BS in Civil Engineering, Mississippi State University
- 16 years as a consultant and municipal engineer
- 11 years with the City of Brentwood's Sewer Rehabilitation Program





## Things to consider

- I/I Issues and SSO Concerns
- Budgetary Constraints
- Regulatory Oversight
- Construction Methods





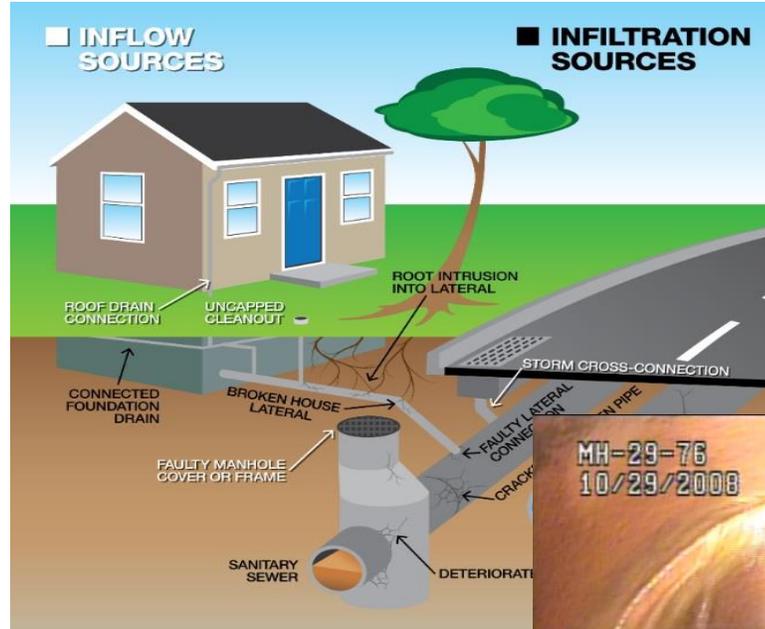
## The city I work for

- Population ~ 43,000
- Mostly Residential
- Collection System Only, No Treatment
- 5,600 Manholes
- 219 miles Gravity Pipe
- 3,000 Grinder Pumps





## The Early Years



- Rehab Efforts in the Mid to Late 90's
- CCTV Inspections
- Smoke Testing
- Clay and Concrete Joint Repairs with Grout Injections



## Regulatory Infractions(2006)

- Tennessee Department of Environment and Conservation (TDEC) issues an Agreed Order
- Sewer Moratorium Issued as Part of the Order
- Excessive SSOs, 30 overflow events in 2004

STATE OF TENNESSEE  
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

IN THE MATTER OF:	)	DIVISION OF WATER
	)	POLLUTION CONTROL
	)	
CITY OF BRENTWOOD AND	)	
METROPOLITAN GOVERNMENT	)	CASE NO. 04-0347
OF NASHVILLE AND DAVIDSON	)	
COUNTY	)	DOCKET NO. 04.30-84218A
	)	
RESPONDENT	)	

AGREED ORDER

This matter came to be heard before the Tennessee Water Quality Control Board upon the Commissioner's Order and Assessment and the Respondents Petitions to Appeal. The Board, a quorum present, hereby adopts the following Findings of Fact and Conclusions of Law and Order and Assessments to which the parties have agreed, as evidenced by the signatures below

FINDINGS OF FACT

I.



## CAP/ER Phase 1 & 2 (2007)

- Corrective Actions Plan / Engineering Report issued
- Sewer Rehabilitation program & projects
- Identified need for Equalization (EQ) tank
- Completion Date 2015
- ~\$30 million Program Cost

Table 5-9 Cost Summary for Alternative A08 (R-values of 2-4%)

Item	Location		Estimated Cost
Stage 1: Rehabilitation	Brentwood	*97,500 LF	9,800,000
		Connections (800)	2,800,000
		Private Laterals (800)	2,000,000
Stage 1: BPS Upgrades to 9.5mgd			1,000,000
Stage 2: Storage - 4.9 MG	BPS		3,660,000

\*Includes Basins T02, T03, T04, T07, E06

Sub-Total Part 1:	15,600,000	
Contingency Cost:	4,680,000	
25% Cost for Legal, Administration, and Engineering Services:	3,900,000	
<b>Total Part 1 Cost:</b>		<b>24,200,000</b>
Sub-Total Part 2:	3,660,000	
Contingency Cost:	1,100,000	
25% Cost for Legal, Administration, and Engineering Services:	914,000	
<b>Total Part 2 Cost:</b>		<b>5,670,000</b>
<b>Part 1 and 2 Total Cost:</b>		<b>29,870,000</b>



## Sewer Rehabilitation Implementation (2008)

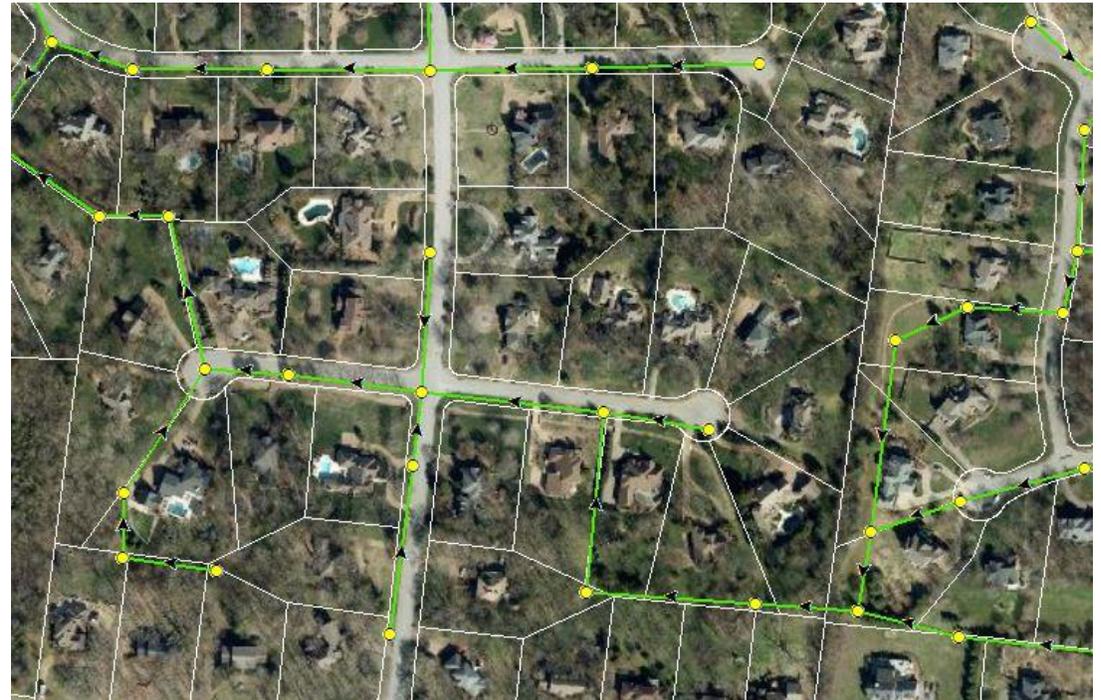
- Began Sewer Rehabilitation program (2008 – 2014)
- Flow Monitoring with I/I analysis & studies
- Program Management with construction oversight





## Sewer Rehabilitation – GPS/GIS

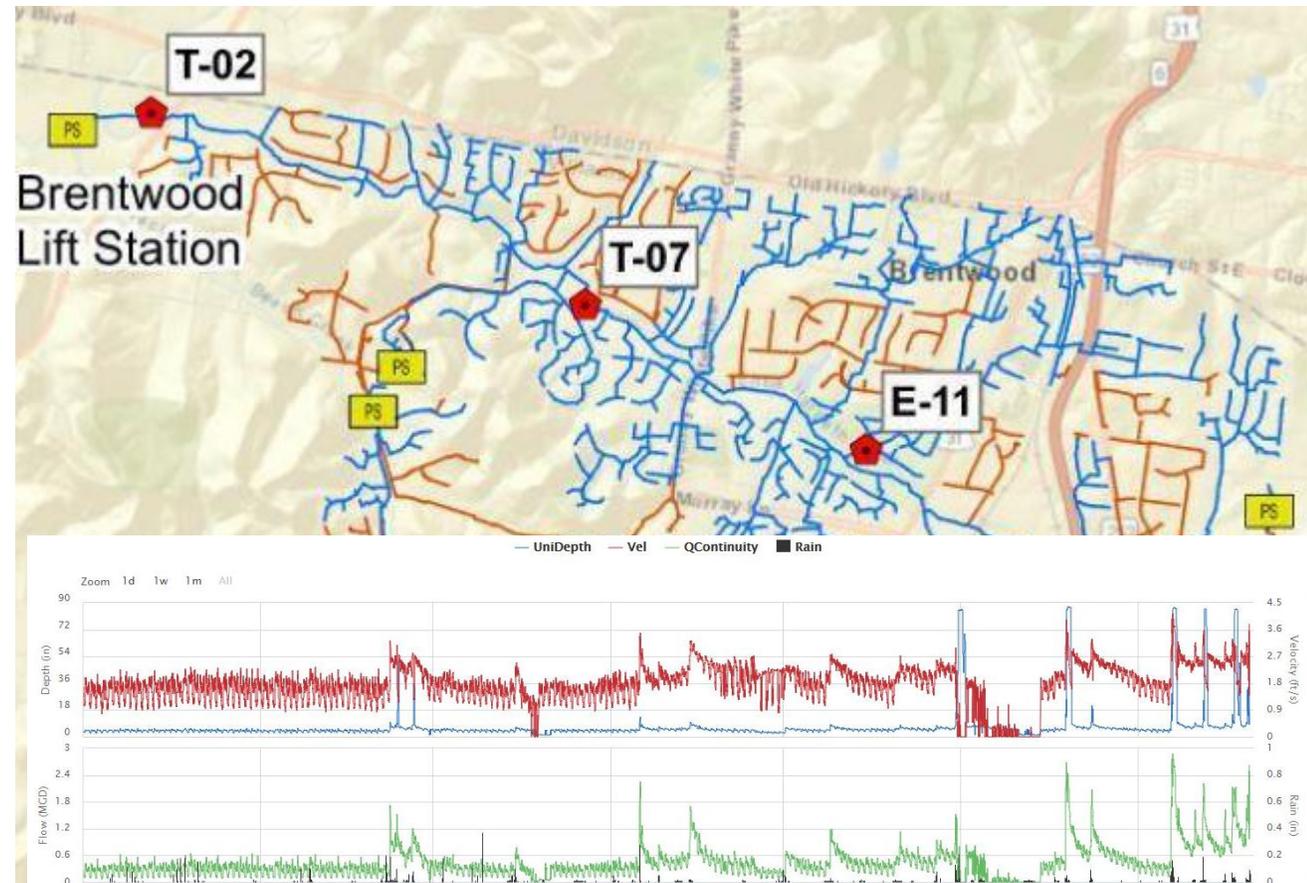
- GIS Department created in 2006
- Majority of sewer assets collected by 2008
- GIS utilized extensively during program





## Sewer Rehabilitation – Flow Monitoring

- Critical in I/I analysis and determining rehabilitation efforts
- 6 permanent flow meter sites with over 50 temporary meter sites
- I/I reduction measurements for regulatory compliance





## Sewer Rehabilitation – Construction Management

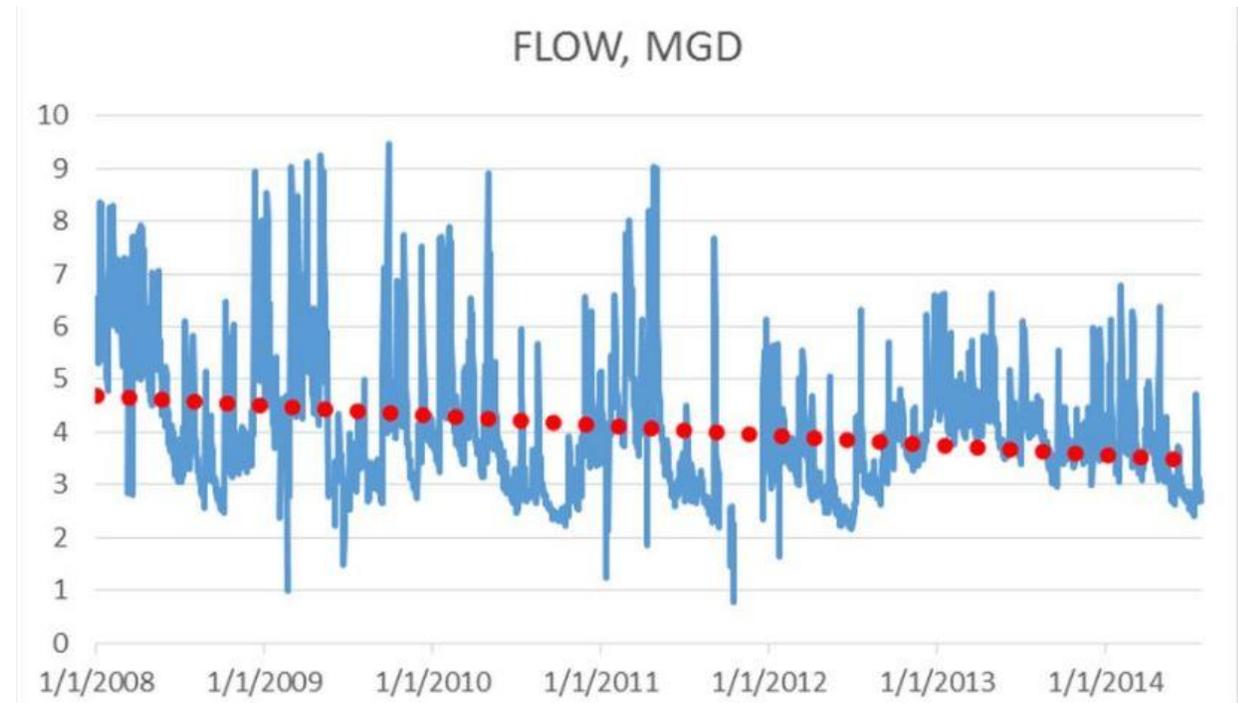
- Find and Fix Project Method
- Rehabilitation of Pipes, Laterals, and Manholes
- 25 miles of sewer mains rehabilitated, 8" – 30"
- Over 1,600 manholes rehabilitated
- Over 400 laterals rehabilitated





## CAP/ER Phase 3 (2015)

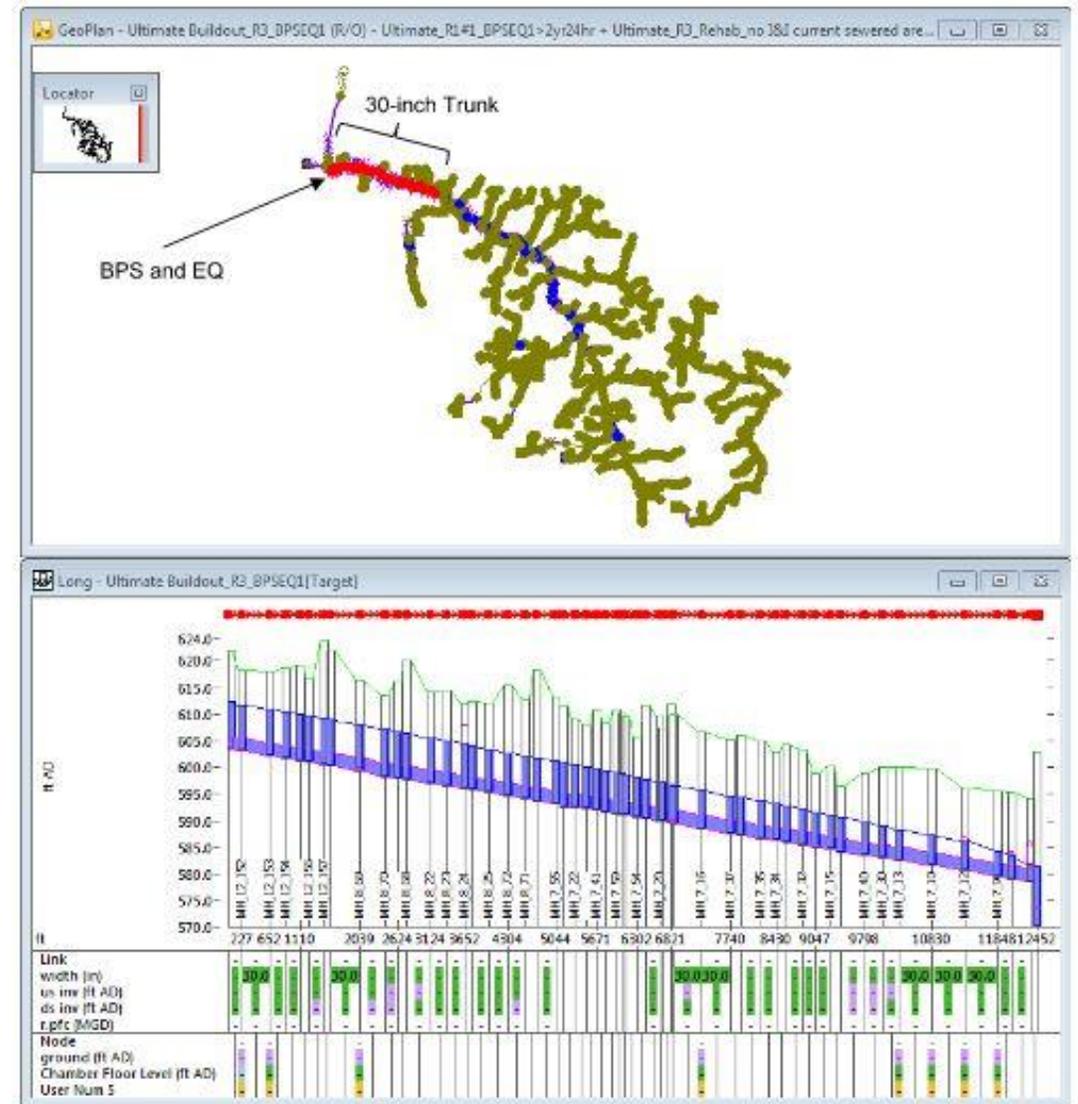
- Identified additional rehabilitation of sewer system including mains, laterals, and manholes
- ~ \$24 million spent to date with an additional \$5 million through 2019
- Completed 20% of sewer rehabilitation of entire system by this time





## Sewer System Master Plan (2015)

- Improvements in system due to growth & I/I issues
- Hydraulic model created for entire collection system
- Improved process for new development capacity requests
- Identified \$16 million in system improvement projects





## Post CAP/ER Rehabilitation (2019)

- TDEC grants time extension to complete additional I/I removal in system through 2022
- Equalization Tank to be designed and constructed by 2022
- Sewer rehabilitation program continued through 2027





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