



National Transportation Safety Board

Overpressurization of Natural Gas Distribution System, Explosions, and Fires, in Merrimack Valley, Massachusetts

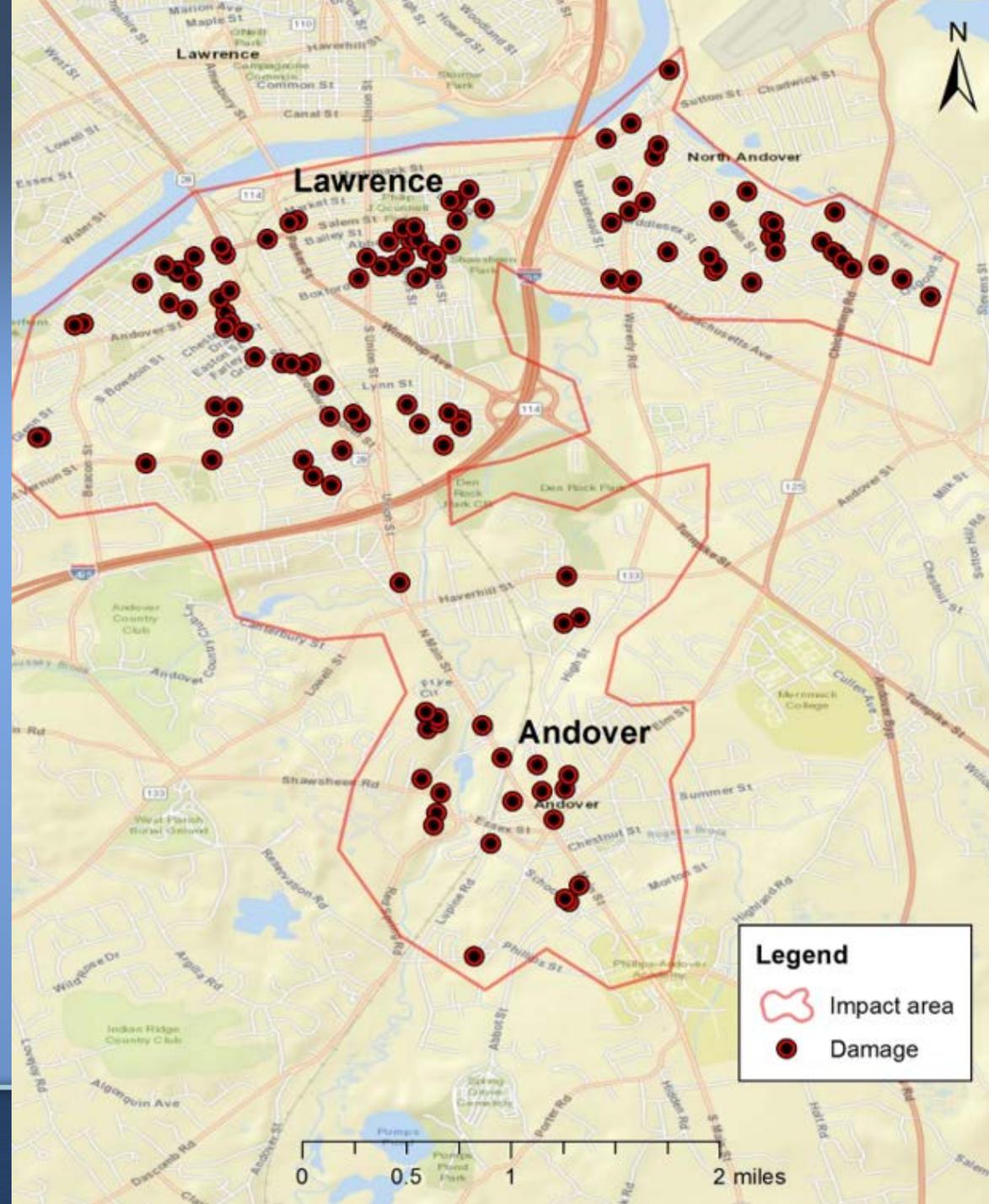
Roger D. Evans

Investigator-in-Charge

Accident Location



The impacted area



Consequences

- 1 fatality
- 22 individuals transported to the hospital
- Over 50,000 residents asked to evacuate
- Electricity shut off for 18,000 customers
- Gas shut down for 11,000 customers

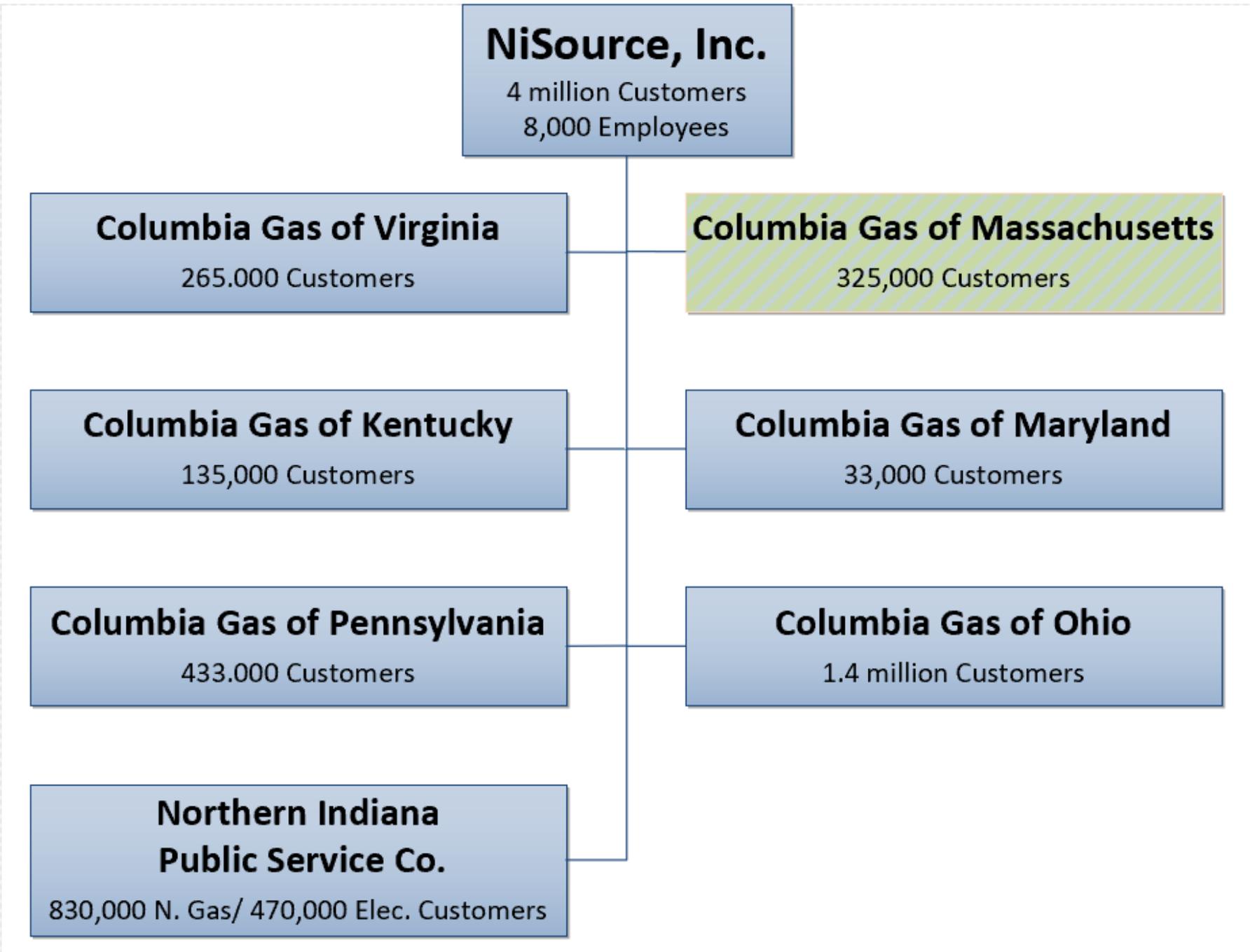
Property Damage

- 131 structures impacted









Safety Issues

- Overpressure protection in low-pressure gas distribution systems
- Engineering management for gas distribution systems
- Emergency response to large-scale accidents

NTSB Postaccident Actions

- NTSB issued:
 - One recommendation to Massachusetts
 - Four urgent recommendations to NiSource
- Congressional hearing:
 - Chairman Sumwalt participated in the Congressional hearing

Industry Postaccident Actions

AGA Released:

“Leading Practices to Reduce the Possibility of a Natural Gas Over-Pressurization Event”

<https://www.aga.org/news/news-releases/aga-unveils-leading-practices-to-avoid-over-pressurization/>

Staff

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- Joseph Panagiotou
- Jim Southworth
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Parties to the Investigation

- US Department of Transportation – Pipeline and Hazardous Materials Safety Administration
- Massachusetts Department of Public Utilities
- Massachusetts State Police
- NiSource, Inc.
- Columbia Gas of Massachusetts



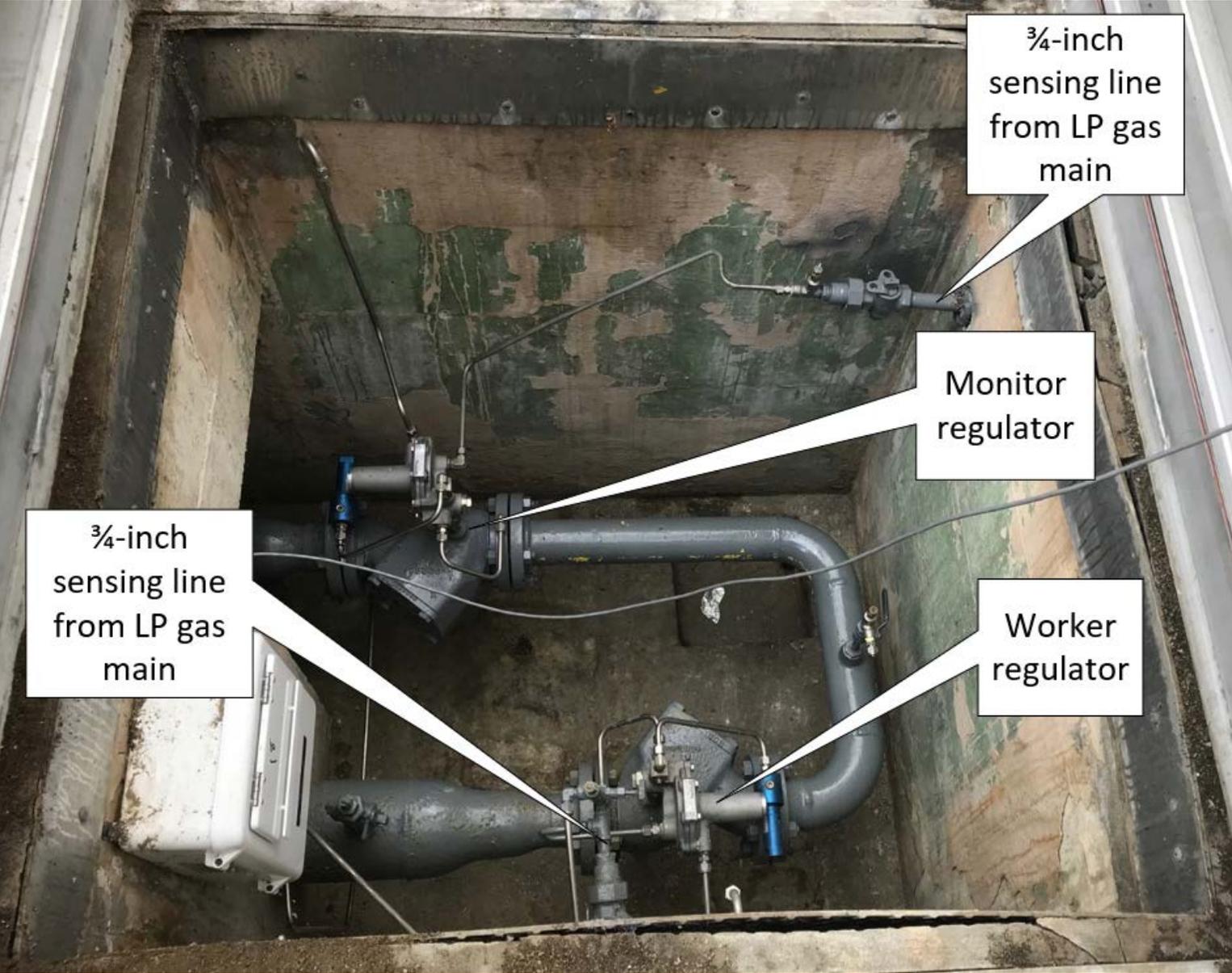
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Pipeline Operations

Roger D. Evans

Investigator-in-Charge

The Winthrop Avenue Regulator Station:



South Union Street Project Timeline

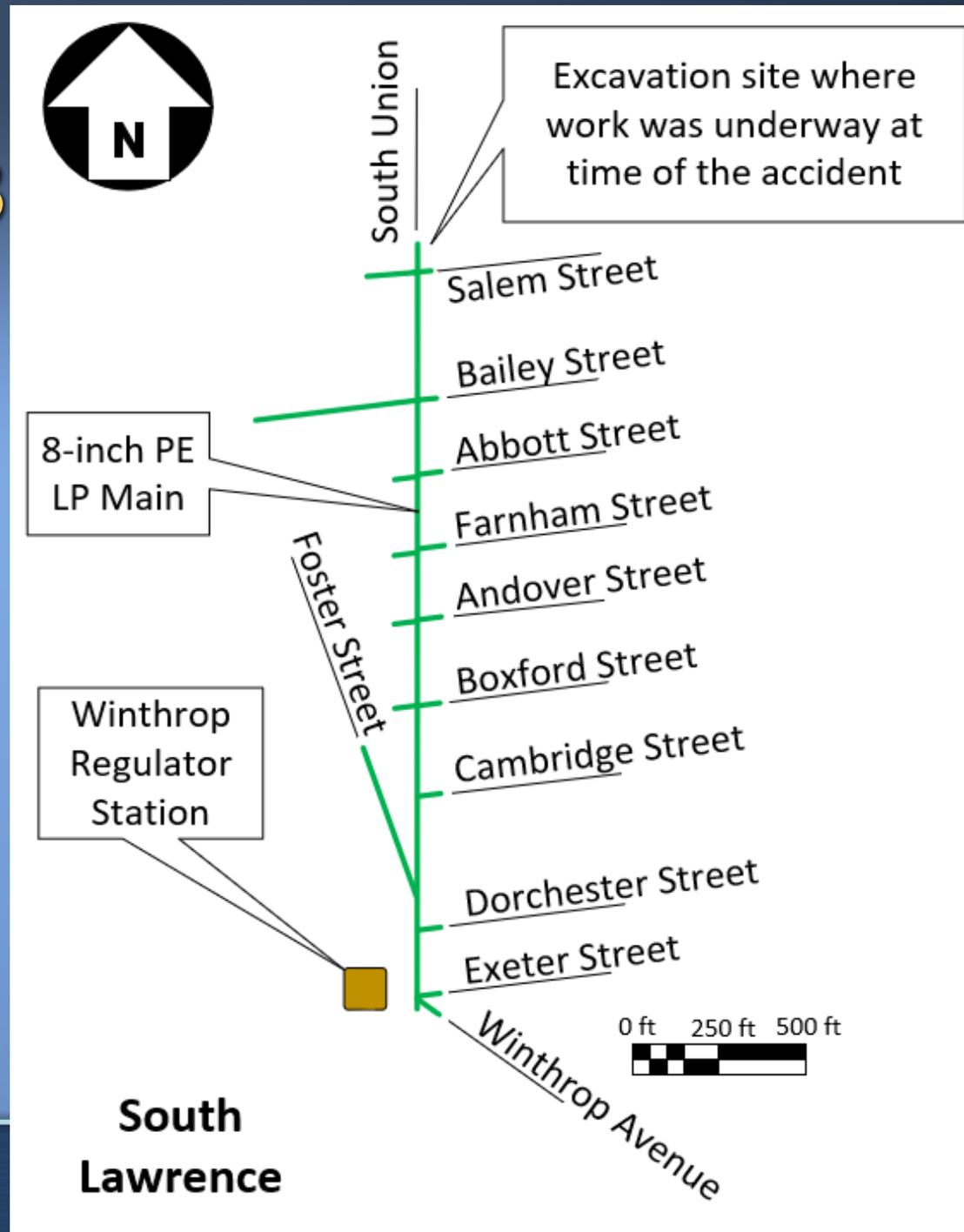
- 2015 – Project planning began
- 2016 –
 - March: First constructability review
 - June: Project begins
 - August: 8-inch polyethylene installed at Winthrop regulator station
 - October: Sensing line e-mail from construction
 - November: City suspends project

South Union Street Project Timeline (cont.)

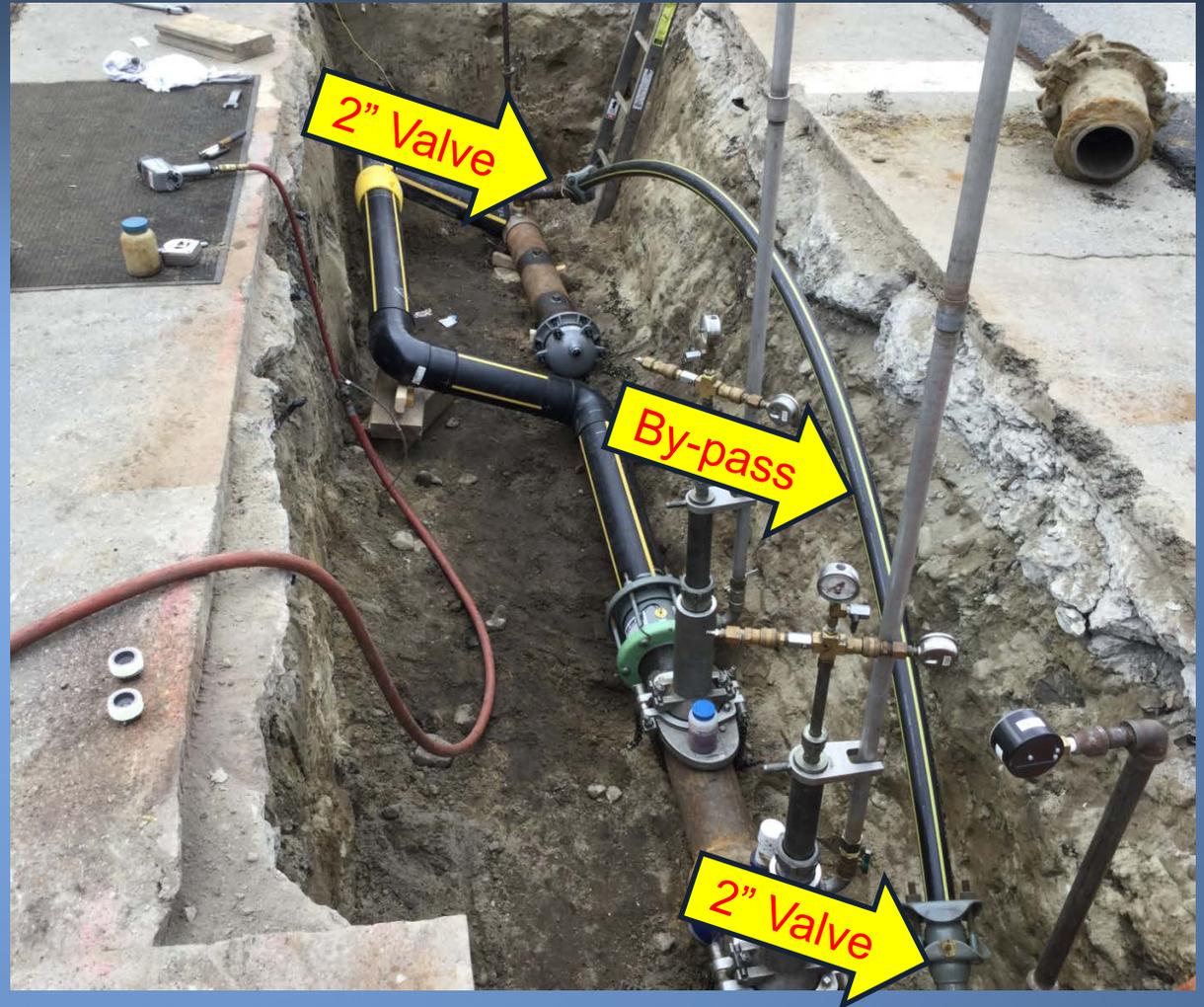
- 2017 –
 - January: Second constructability review
 - December: Third constructability review
- 2018 –
 - January: City permits work to resume
 - September: Accident occurred

Events of September 13

- South Union Street project was underway on a pressurized main
- The final tie-in to complete the work was at the north end of South Union Street
- The Winthrop Regulator Station is at the south end of South Union Street



The Excavation Site at Salem and South Union Streets



Previous Related NTSB Investigations

- Seven similar accidents investigated over the past 50 years
 - El Paso, Texas (1977): nearly identical
- Single point of failure
- Current overpressure protection not optimal



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System Safety

Mike Hoepf, Ph.D.

Topics

NiSource/Columbia Gas - Engineering Management

- Records and Documentation
- Constructability Review
- Professional Engineer Review and Approval
- Risk Assessment

Columbia Gas Engineering Management

- Overpressurization, fires, and explosions result of failure to relocate sensing lines
- Contractors followed instructions
- Systemic deficiencies in the engineering management of Columbia Gas
 - Incomplete engineering plans

Columbia Gas Engineering Workflow

Field Engineer



Constructability Review



Supervisory Engineering Approval

Columbia Gas Documentation

- Geographic information system: computer-based centralized record system
- Used in development of project
- Sensing line information not included

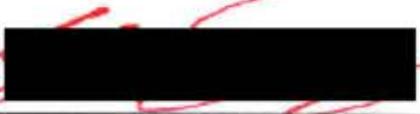
Columbia Gas Documentation (cont.)

- No engineering plans to relocate sensing lines
- E-mail: “eventually” be relocated
- Informal and unstructured approach to documenting critical step

Columbia Gas Constructability Review

- Structured evaluations of construction plans to ensure there are no conflicts, errors, or omissions - stakeholder input critical
- Measurement and Regulation Department maintains sensing lines
- “As-needed basis”

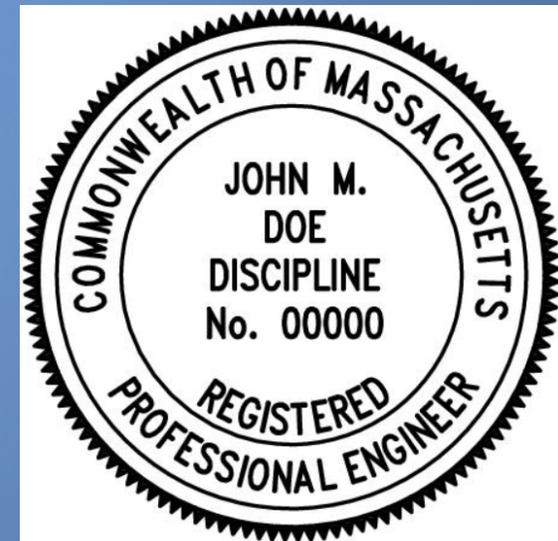
Columbia Gas Constructability Review

For Engineering:			12/14/17	Date:	1/6/17
For Construction:			12/14/17	Date:	1/6/17
For M&R:				Date:	
	(M&R only needs to sign when applicable)				
For Land Services:				Date:	
	(Land Services only needs to sign when applicable)				

Constructability Review Signatures

Professional Engineer License

- Technical competency
- Continuing education requirements
- Code of ethics
- Duty to public safety & health
- Personally accountable for work approved



Columbia Gas Professional Engineer Review and Approval

- Field engineer had not met experience requirements for license
- Columbia Gas did not require project evaluation from professional engineer

Professional Engineer Exemptions

- Massachusetts eliminated exemption on December 31, 2018
- Currently, 31 states with industrial exemption for natural gas infrastructure projects

Columbia Gas Internal Guidance



Operational Notice

Distribution Operations

Issue Date: 09/02/2015	Below Grade Regulator Control Lines: Caution When Excavating Near Regulator Stations or Regulator Buildings	Notice Number ON 15-05
Supersedes: N/A		Page 1 of 3

Companies Affected:

<input checked="" type="checkbox"/> NIPSCO	<input checked="" type="checkbox"/> CGV	<input checked="" type="checkbox"/> CMD
	<input checked="" type="checkbox"/> CKY	<input checked="" type="checkbox"/> COH
	<input checked="" type="checkbox"/> CMA	<input checked="" type="checkbox"/> CPA

Columbia Gas Risk Assessment

- Did not mitigate all the risks identified
- Did not conduct an effective risk assessment for the South Union Street project
- Did not ensure necessary engineering controls for overpressure protection



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Emergency Response

Shawn Currie

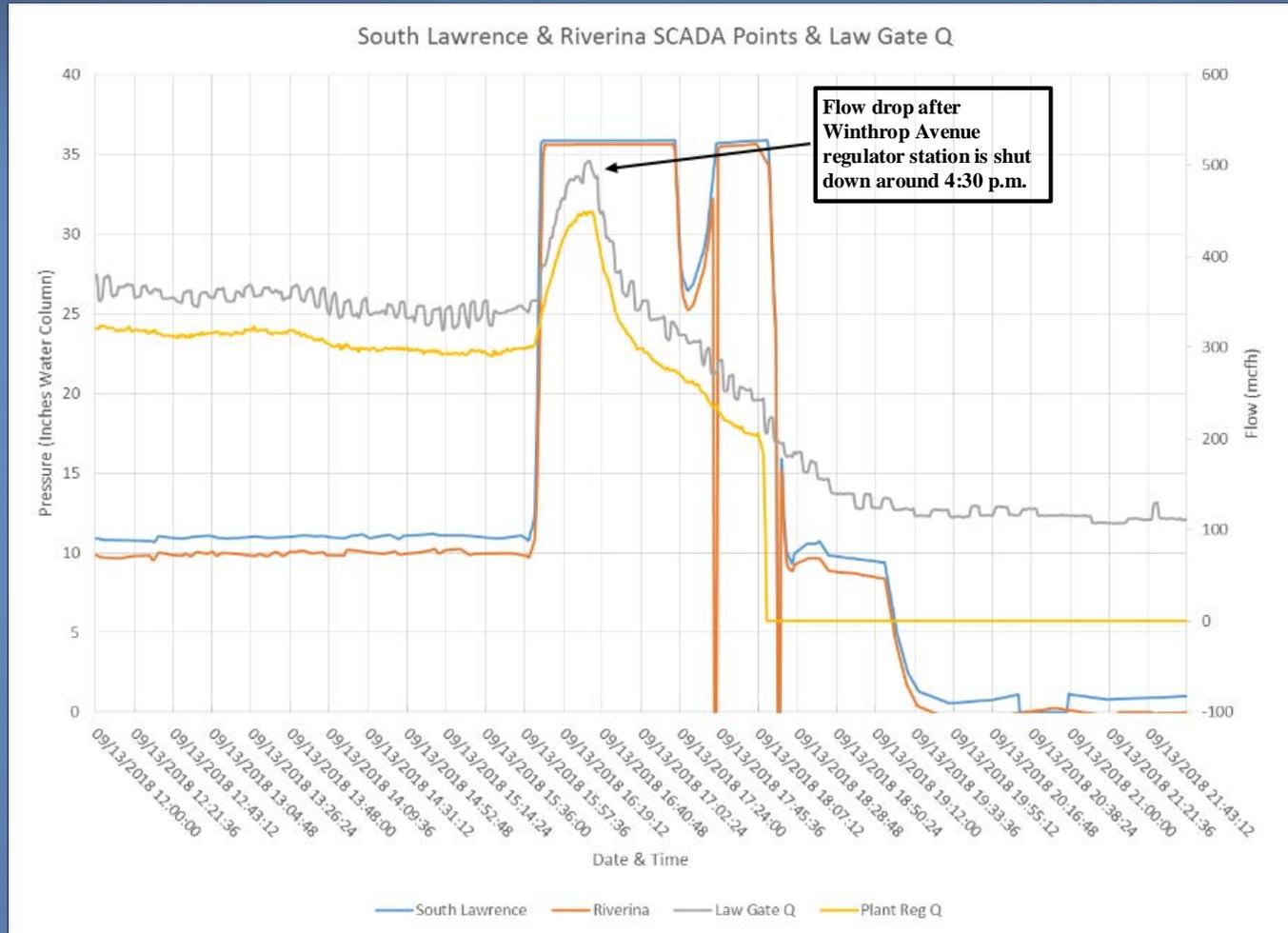
State and Local Emergency Response

- Fire Departments: 184
 - 167 engines
 - 65 ladder trucks
 - 54 ambulances
- State and Local Police Agencies: 141
 - > 1,000 officers

Radio Communication Issues

- Coordination of hundreds of emergency responders
- Limited radio channels available to three fire departments
- Statewide planning for multi-jurisdictional event

Columbia Gas Emergency Response



Columbia Gas Emergency Response

- Did not follow their own emergency response procedures
- Did not update state and local officials of their activities in a timely manner
- Lack of information complicated emergency response and strained resources



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