Cross-Bore Inspection Programs

Do you know the risks?

Nathan Dore

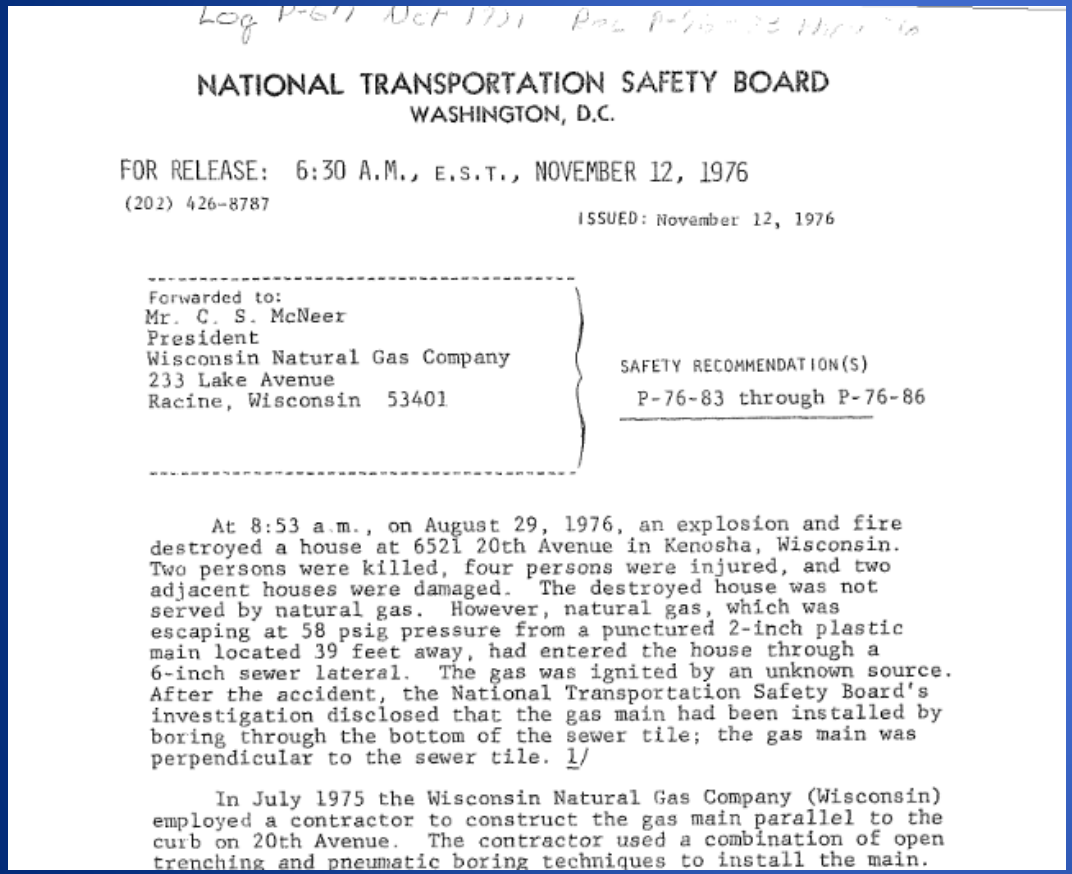
Gas Pipeline Safety Inspector

Maine Public Utilities Commission

Discussion Topics

- Warning Signs – Advisories and Incidents
- Basic Elements
- Performance-Based Program Quality – Safety Culture
- Program Evolution Scenario Lite - What Risks Have You Considered?
- A Common Effort

August, 1976 – Kenosha, Wisconsin



NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

FOR RELEASE: 6:30 A.M., E.S.T., NOVEMBER 12, 1976
(202) 426-8787

ISSUED: November 12, 1976

Forwarded to:
Mr. C. S. McNeer
President
Wisconsin Natural Gas Company
233 Lake Avenue
Racine, Wisconsin 53401

SAFETY RECOMMENDATION(S)
P-76-83 through P-76-86

At 8:53 a.m., on August 29, 1976, an explosion and fire destroyed a house at 6521 20th Avenue in Kenosha, Wisconsin. Two persons were killed, four persons were injured, and two adjacent houses were damaged. The destroyed house was not served by natural gas. However, natural gas, which was escaping at 58 psig pressure from a punctured 2-inch plastic main located 39 feet away, had entered the house through a 6-inch sewer lateral. The gas was ignited by an unknown source. After the accident, the National Transportation Safety Board's investigation disclosed that the gas main had been installed by boring through the bottom of the sewer tile; the gas main was perpendicular to the sewer tile. 1/

In July 1975 the Wisconsin Natural Gas Company (Wisconsin) employed a contractor to construct the gas main parallel to the curb on 20th Avenue. The contractor used a combination of open trenching and pneumatic boring techniques to install the main.

Recommendations included:

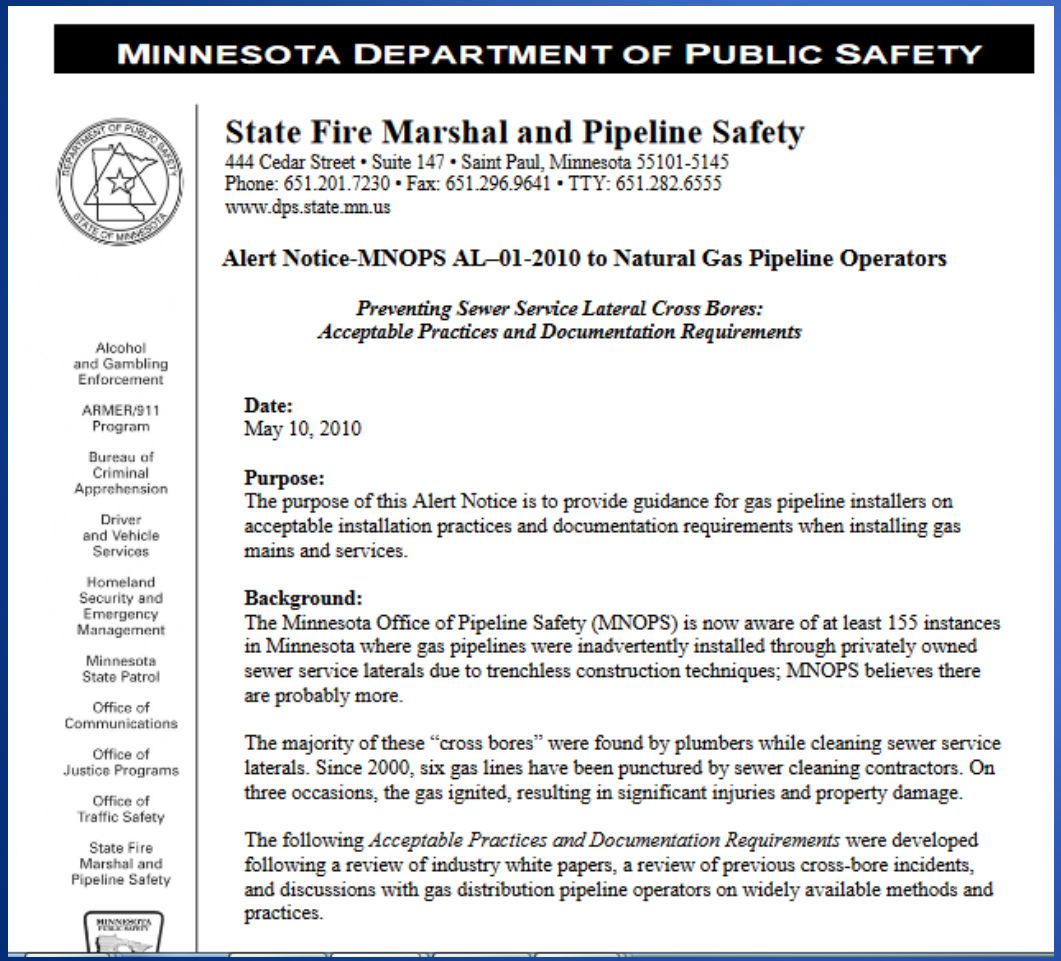
- Inspect other known close proximities, and correct deficiencies
- Examine records for additional unknown close proximities, review blockage complaint records
- Revise construction standards to result in more accurate facility locates
- Inform, advise, and train personnel

February 2010 - St. Paul, Minnesota

Photo credit: MNOPS

Photo credit: Pioneer Press

MNOPS AL-01-2010



MINNESOTA DEPARTMENT OF PUBLIC SAFETY

State Fire Marshal and Pipeline Safety
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Phone: 651.201.7230 • Fax: 651.296.9641 • TTY: 651.282.6555
www.dps.state.mn.us

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Alert Notice-MNOPS AL–01-2010 to Natural Gas Pipeline Operators

Preventing Sewer Service Lateral Cross Bores:
Acceptable Practices and Documentation Requirements

Date:
May 10, 2010

Purpose:
The purpose of this Alert Notice is to provide guidance for gas pipeline installers on acceptable installation practices and documentation requirements when installing gas mains and services.

Background:
The Minnesota Office of Pipeline Safety (MNOPS) is now aware of at least 155 instances in Minnesota where gas pipelines were inadvertently installed through privately owned sewer service laterals due to trenchless construction techniques; MNOPS believes there are probably more.

The majority of these "cross bores" were found by plumbers while cleaning sewer service laterals. Since 2000, six gas lines have been punctured by sewer cleaning contractors. On three occasions, the gas ignited, resulting in significant injuries and property damage.

The following *Acceptable Practices and Documentation Requirements* were developed following a review of industry white papers, a review of previous cross-bore incidents, and discussions with gas distribution pipeline operators on widely available methods and practices.

- Summary of local problem
- Reactive attempt by regulatory body to address public safety concern
- Outlined acceptable installation practices and documentation requirements for new construction
- Did not address legacy issue directly
- Promotes data sharing

Adequate response?

- 2012 GTI “Cross Bore Best Practices” interviewed 23 LDCs
  - 83% had or planned to include cross-bore risks as part of DIMP
  - 56% had or were developing a legacy program
  - 30% had no legacy program and were not exploring the option
  - 17% made a process change to facilitate inspection or discovery of cross-bores

Adequate response?

- 2013 PHMSA/NAPSR survey
  - 38% responding states had formal directives/regulations directed towards avoiding cross-bore potential
  - 69% responding states had damage prevention regulations regarding boring
    - Of this 69%, 42% required sewer laterals to be marked

Must / should your company have a CBSIP?

"In all cases, it is recommended that the inclusion of trenchless be included in the Distribution Integrity Management Program of every company that used or uses trenchless technology as an installation method."

GTI Best Practices Guide, 2012

"If operators use trenchless technologies without taking measures to locate and protect utilities and other unmarked facilities during construction…they must evaluate its risk to their system."

PHMSA DIMP FAQ C.4.b.3

DIMP Implementation Keys

- Appropriate
- Integration v elements
  - O&M
- Flexible eno
  - Design and
  - Public Awa
- rce
- Es
- Re

Emissions Quantification Data

Segment ID	Segment Rank	Emissions Rate (SCFH)	Emissions range (confidence)	Segment Length (ft)	Emissions Factor (SCFH/ft)	Estimated # of leaks	# Leaks/ft	Emissions Rate / Leak
4	1	7.0	4 – 16 SCFH (90%)	1579	0.0044	5	0.0032	1.14
1	2	5.1	2 – 8 SCFH (90%)	3090	0.0017	5	0.0016	1.0
3	3	2.4	1 – 4 SCFH (90%)	2535	0.001	4	0.0016	0.6
2	4	1.5	0.5 – 2 SCFH (60%)	2514	0.0006	1	0.0004	1.5

Figure 2. EQ report data table and map for pipeline replacement

Some Basic Benefits to CBSIP

- Increase system knowledge / improve records
- Improve system integrity
- Avoid the cost of catastrophes
  - Life/Property, Damages, Brand Reputation
- Regulatory Compliance
- Proactive program offers benefits over emergency response
  - Planning, resource allocation, engineering

Basic Program Outline

- Cross-bore Avoidance Program
  - New Construction
- Cross-bore Inspection/Remediation Program
  - Legacy Installations

Basic Program – New Construction

- Adequate project planning
  - Cost/Benefit of Using Trenchless Methods
  - Available Sewer System Records
  - Private Utilities/Homeowners Contacted along with 811
  - Establish Level of Confidence in Records / Locating Method
  - Establish Tolerance Zone for Mandatory Exposure and Observation

Basic Program – New Construction

Location Methods

- Measurement
- Calculation
- Visual + Tolerance
- Camera
- Proximity / DNE
- SNT

Basic Program – New Construction

- Confirm Accuracy of Locating Equipment

- Utility Post-Inspection

Basic Program – Legacy Inspections

- Actual Field Methods Similar to New Construction

- Risk Assessment and Evaluation
  - Setting Project Scope
  - Information Gathering
  - Project Validation (QA/QC) and Oversight

Basics - Other Program Elements

- Remediation Procedures
  - Utility-Specific
- Emergency Response Integration
- Incorporation of Records / System Knowledge

Basics - Public Awareness

- Outreach to homeowners and service professionals
- Outreach to public w/o gas service adjacent to trenchless installations
- Public Service Messages to wide audience

Basics – Procedures and Personnel Training

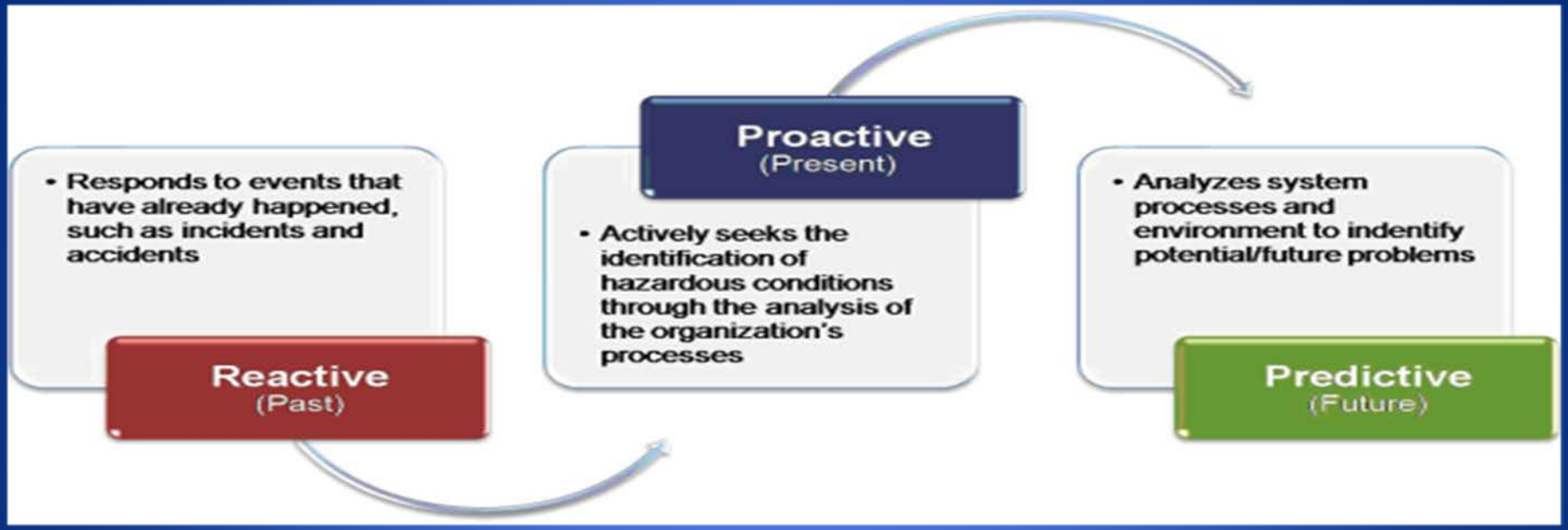
- Design/Engineering
- Operations/Maintenance
- Emergency Response/Dispatch
- Construction Personnel
- Contractors
- Inspection/QA/QC

Establishing Culture

- Top-down approach includes:
  - Universal commitment at all levels
  - Promote sharing and engagement
  - Broadcast values consistently
  - Accountability
  - Incentivize buy-in

- Program must be:
  - Integrative
  - Accessible / Approachable at all levels
  - Useful
  - Self-Informed by Meaningful Metrics
  - Focused on achieving results

Evolution of Safety Programs



Federal Aviation Administration, "Safety Management System"

- Mature programs within performance based requirements follow a model of continuous improvement
- This model has analogs to the sophistication of CBSIPs – from Response-based processes (reactive) to data-driven inspection programs (predictive)

Scenario - Getting Started

49 CFR § 192.1007

What are the required elements of an integrity management plan (distribution operators)?

a) Knowledge

b) Identify threats

c) Evaluate and rank risk

d) Address risks

e) Measure performance

f) Periodic improvement

Getting Started

Scenario:

Company hired a contractor to install ten miles of 4” MDPE plastic in moderately dense residential portions of service territory in 1990s. Contractor drilled in pipe where possible to save on restoration costs.

Cross bore prevention techniques included consistent use of 811, company inspectors over construction crews, sewer manhole measurements where available to confirm sewer district markouts. Sewer records inconsistent, sewer system vintage varied.

Scenario - Getting Started

- “Leaks by cause” have never included “other outside force damage” via plumbing service since DIMP implementation in 2011
- No recorded instances of cross-bores company-wide

Scenario - Initial Posture

- Cross-bore risk mentioned in DIMP documents – low risk, no additional measures to address issue
- Review of construction records to determine areas of system installed via trenchless methods
- Discuss implementing new construction practices

Scenario – Nearby Event

- Neighboring operator self-reports several cross-bores to regulatory agency during main replacement project
- Regulatory agency issues advisory bulletin
- Topic is covered at annual regulatory safety conference

Scenario - Basic Program Developed

Leadership Interest In:

- Legacy Inspection Program for Target System
- New Construction Procedures Established
- Personnel Training
- Basic Public Awareness Campaign
- Emergency Response Protocol

Program Maturity

- Team Membership
- Recordkeeping Practices
- Outreach and Information Sharing
- Risk – Based Approach to Records Review
- Self Assessment

Program Maturity – Legacy Records

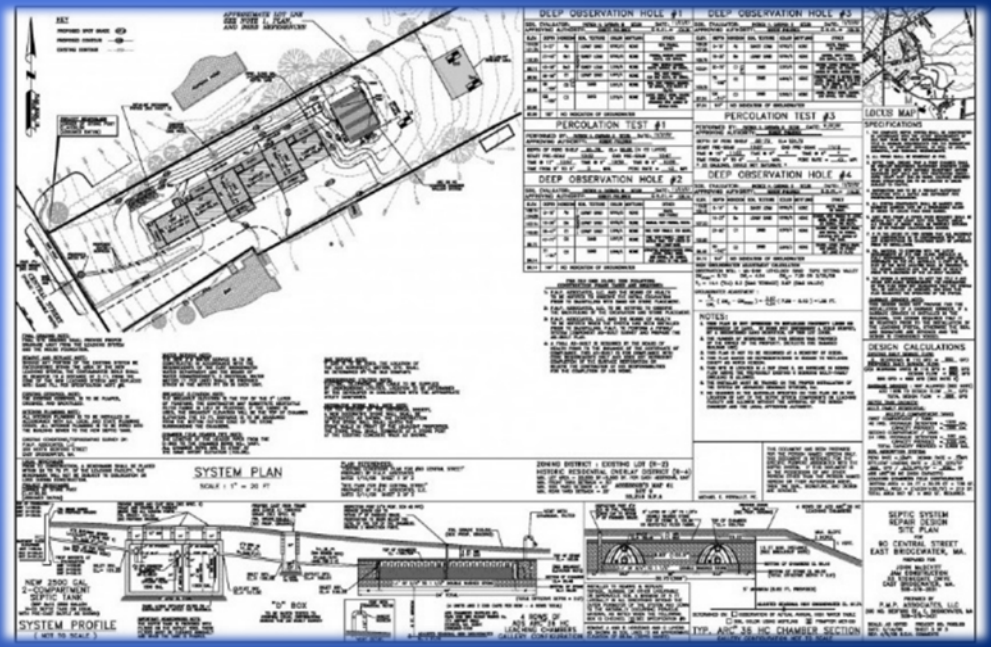
- Trenchless installation methods used?
  - Era
  - Contractors
  - Personnel on Site
  - Soil Type
  - Density of Below-Grade Obstructions
  - Depth
  - Material Type
  - Type of Structures

Program Maturity – Legacy Records

- Other Information Sources
  - In-house SMEs
  - Public records
  - Foreign utility records
  - Homeowners/Proprietors
  - Contractors
  - Previous Response Logs (Pre-Awareness)

Program Maturity – Legacy Records

- Other Information Sources Could Reveal:
  - Depth of Utilities
  - Unrecorded Branch Services
  - Previous Structures
  - Conflict Types Not Considered
- Establish Criteria for Confirmed Clearance
  - May Require Site Inspection



Feedback

- Confirmed cross-bore data points used to inform process
  - Analysis gaps
  - Review for system-wide commonalities
  - Right-size Program
- QA/QC Process
  - Records and field verifications
  - Findings used to expand quality reviews

GIS Benefits

- GIS System Integration
  - Monitor program status vs. risk priority
  - Complex queries and iterative analysis
  - System design
  - Improved response
  - Integrate data from multiple process including CBSIP

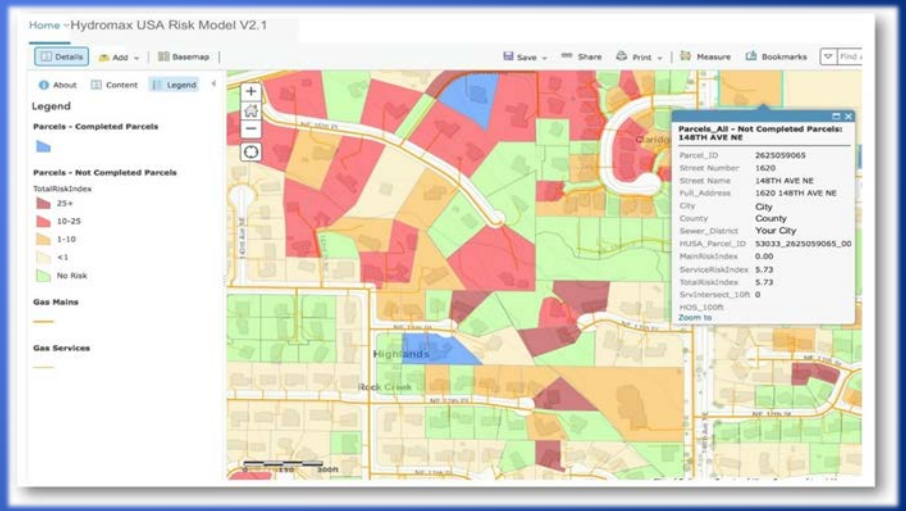


Image: Cross Bore Safety Association/Hydromax

Common Interests

- Sewer Departments
  - Cleaning and Inspection
  - Locating Data
- Regulatory Agencies
  - Sharing Best Practices
  - Self-Reporting
- Damage Prevention Stakeholders
  - Reducing Utility Damages
  - Mutual Planning and Awareness
  - Public Awareness Campaigns

What's Going On?

- Call Before You Clear™
  - Using Existing One-call Foundation
- Comprehensive Public Awareness Campaigns
- New Technology Developments
- Stakeholder Working Groups
- Cross-Bore Bounty
- Industry Organizations

Thank You!

Maine Public Utilities Commission

Gas Safety Program

www.maine.gov/mpuc/natural_gas/natural_gas_safety

Thanks To: UGI Utilities, Inc., Southwest Gas Corporation, Cross-Bore Safety Association, NAPSR, Gas Technology Institute, Summit Utilities, Inc., Hydromax USA, Pro-Pipe, PHMSA