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December 24, 2019

Mark D. Marini, Secretary
Department of Public Utilities
One South Station, 5th Floor
Boston, MA 02110

Re: Bay State Gas Company d/b/a Columbia Gas of Massachusetts, D.P.U. 19-140

Dear Mr. Marini:

Attached for filing in the above-captioned matter on behalf of Bay State Gas Company d/b/a Columbia Gas of Massachusetts (the "Company") is an unredacted version of Attachment PL-1-21. This attachment was previously submitted to the Department stamped as "confidential" and is provided here for the public record.

Thank you for your attention to this matter.

Sincerely,

Brendan P. Vaughan

cc: Laurie E. Weisman, Esq. – Hearing Officer
Service List – D.P.U. 19-140

290 W. Nationwide Blvd
Columbus, Ohio 43215

July 15, 2019

By E-Mail & Overnight Mail: Roger.Evans@ntsb.gov

National Transportation Safety Board
490 L'Enfant Plaza East. SW
Washington, DC 20594

Attn: Mr. Roger Evans
Pipeline and Hazardous Materials Investigations Senior Investigator

Re: PLD18MR003 Merrimack Valley Investigation
NiSource Party Submission

Dear Roger:

Enclosed are NiSource's Proposed Findings & Recommendations concerning the Merrimack Valley overpressurization incident.

Please do not hesitate to advise should you or your team have any questions or comments.

Thank you very much once again for allowing NiSource and Columbia Gas of Massachusetts to participate in this NTSB investigation.

Very truly yours,

Robert Mooney
Vice President, Engineering & Pipeline Safety
NiSource Inc.

Copy to: Hon. NTSB Chairman Robert Sumwalt

Hon. NTSB Vice-Chairman Bruce Landsberg

Hon. NTSB Member Jennifer Homendy

Mr. Robert Hall
Director, NTSB Railroad, Pipeline and Hazardous Materials Investigations

Dr. Robert Beaton
Acting Chief, NTSB Pipeline and Hazardous Materials Investigations

NiSource Party Submission of Proposed

Findings & Recommendations to the NTSB

NiSource Assistance with this Investigation

The NTSB is conducting the investigation into this natural gas pipeline over-pressurization. Assisting the NTSB in its investigation are NiSource Inc. (and its subsidiary Columbia Gas of Massachusetts (CMA)), the Pipeline & Hazardous Materials Safety Administration (PHMSA), Massachusetts Department of Public Utilities (DPU), and Massachusetts State Police. As the operator of the gas system at issue, CMA's specific role in this investigation has been to provide technical information regarding the system design and operation and the construction activity that was taking place when the incident occurred. The NTSB has requested that all parties submit proposed findings to be drawn from the factual information established during the course of the investigation. NiSource is responding to the NTSB request with this document, which provides overviews of:

1. NiSource and CMA
2. The September 13, 2018 Event;
3. The Restoration Efforts in the Affected Merrimack Valley Communities;
4. NiSource's Enhanced Safety and Emergency Response Processes;
5. NiSource's Technical Training and Career Development Programs;
6. CMA's Distribution Integrity Management Program;
7. NiSource's Safety Management System Progress before and after the September Event;
8. NiSource's Safety Culture;
9. Factual Findings;
10. Probable Cause;
11. NiSource's Adoption of NTSB Urgent Safety Recommendations; and
12. Additional Recommendations

1. NiSource and CMA

NiSource Inc. (NiSource) is a public utility holding company whose utility subsidiaries serve approximately 3.5 million natural gas customers and 500,000 electric customers across seven states. NiSource's natural gas utilities provide natural gas to residential, commercial, and industrial customers via nearly 60,000 miles of pipeline and related facilities in Indiana, Kentucky, Maryland, Massachusetts, Ohio, Pennsylvania, and Virginia. This includes more than 6,000 miles of low-pressure gas mains serving more than 500,000 customers.

Columbia Gas of Massachusetts (CMA) is a subsidiary of NiSource. CMA is a supplier of natural gas to over 300,000 customers in parts of Massachusetts including the cities of Springfield, Brockton, and Lawrence, and surrounding areas. It operates more than 700 miles of low-pressure gas mains serving more than 80,000 customers.

As a public utility in Massachusetts, CMA is subject to extensive regulation by the Massachusetts Department of Public Utilities (DPU). The DPU determines what services may be offered, the terms and conditions under which those services are to be offered, and the rates to be charged for those services. The DPU also oversees numerous other aspects of CMA's operations, such as its energy efficiency programs, its long-term financing activities, and its forecast and supply planning process.

CMA is also subject to state and federal pipeline safety regulations, which are enforced by the DPU. Those regulations contain extensive, detailed requirements concerning matters such as pipe design; the design of pipeline components; the handling of customer meters, service regulators and service lines; corrosion control; test requirements for steel and plastic pipelines; uprating of pipelines; operation and maintenance of pipelines; training and qualification of pipeline personnel; integrity management for distribution and transmission pipelines; and leakage surveys and procedures.

2. The September 13, 2018 Event

In 2015, as part of its Gas System Enhancement Plan (GSEP), CMA initiated a project to replace the cast-iron, low-pressure main on South Union Street between Winthrop Avenue and Market Street in Lawrence with a new plastic, low-pressure main (the South Union Street Project). Consistent with federal and state pipeline safety policy, the South Union Street Project was part of the Company's long-term, ongoing efforts to modernize its natural gas infrastructure. The South Union Street Project was scheduled to be completed in 2016 before water improvement projects planned by the City of Lawrence would encroach upon CMA's existing cast-iron mains. CMA identified the South Union Street Project in its GSEP for 2016, which was submitted to the DPU in October 2015.

The South Union Street Project included:

- Installation of 3,700 feet of 8", plastic, low-pressure main;
- Tie-in of the new plastic main to the South Union at Winthrop regulator station (the Winthrop regulator station);
- Tie-in of side streets along South Union Street, and service line replacements and tie-overs; and
- Abandonment of 7,400 feet of cast-iron, low-pressure main.

The Winthrop regulator station was located on South Union Street, close to the intersection with Winthrop Avenue. It was one of 14 regulator stations that supplied gas to the low-pressure distribution system of which it was a part. It was an underground regulator station, housing a worker regulator and a monitor regulator. The worker and monitor regulators each had a dedicated sensing line (also known as a static, sense, or control line) attached to the cast-iron main on South Union Street. The regulators controlled the pressure in the low-pressure distribution system by responding to the pressure in the distribution system via their sensing lines.

The City of Lawrence granted CMA a permit for the South Union Street Project in April 2016. The Company began construction in June 2016, and the project was scheduled for completion that same year.

During the South Union Street Project's design and construction phases in 2016, both CMA's Engineering and Construction personnel spoke with Measurement and Regulation (M&R) personnel in Lawrence about the Winthrop regulator station's sensing lines. All of the construction personnel who worked on the South Union Street Project in 2016 knew that the sensing lines needed to be relocated from the cast-iron, low-pressure main before it was abandoned. The location of the sensing lines was documented in readily available company documentation located in CMA's Lawrence Operating Center, which the Inspector on the project in 2016 used to determine the location of the sensing lines. He notified the construction crew and foreman that the sensing lines were attached to the South Union cast-iron main, and they saw the sensing lines for themselves when they laid the new plastic main underneath them. During the 2016 construction phase, the South Union Street Project Inspector and Construction Leader discussed the need to relocate the sensing lines, and the Construction Leader notified M&R in October 2016 about the planned relocation of the sensing lines.

In October 2016, the City of Lawrence imposed a 30-day stop-work order. CMA raised concerns with the City about this cessation of work, and the City ultimately allowed the Company to undertake limited additional work on the South Union Street Project in November 2016. These work restrictions, together with the City's impending winter moratorium, impeded CMA from completing the project in 2016. In particular, CMA was unable to transfer to the new plastic main the distribution lines on South Union Street's side streets that were tied-in to the cast-iron main on South Union Street. Consequently, the project had not yet progressed to the point at which CMA ordinarily would transfer sensing lines on a project such as this. Prioritizing the safety and integrity of the project, and consistent with industry practice, CMA gassed the new plastic main in late November 2016, before the City's winter moratorium

took effect, so that if the plastic main incurred any damage before CMA was permitted to resume work on the project, that damage would be detected more readily.

The Company expected to resume work on the South Union Street Project in April 2017, after the City's winter moratorium was lifted. However, in March 2017, the City of Lawrence denied CMA a permit to resume work on the project. The City's work moratorium for the South Union Street Project lasted throughout 2017.

In January 2018, the City granted CMA a permit to resume work on the South Union Street Project. By the time CMA resumed work on the South Union Street Project in May 2018, there was a nearly complete turnover in project personnel. CMA did not effectively transfer the knowledge its 2016 construction personnel had about the status of the project sensing lines to its 2018 construction personnel. As noted above, CMA's 2016 construction personnel knew the location of the sensing lines and planned to relocate them to the new plastic main before the cast-iron main was abandoned. While the 2018 construction personnel had ready access to information about the status and location of the sensing lines, that information was not reviewed. As the project progressed, the construction crew disconnected the cast-iron main from the Winthrop regulator station and tied-in the distribution lines along the South Union Street side streets to the new plastic main. The cast-iron main remained tied-into to the low-pressure distribution system by the side streets that had not yet been tied-in to the plastic main.

On September 13, 2018, CMA tied-in the Salem Street main to the plastic main. Salem Street was the last remaining side street that was to be tied-in to the new plastic main. This work was done at the intersection of South Union Street and Salem Street, eight blocks (approximately 2,350 feet) north of the Winthrop regulator station. To monitor pressure during the tie-in process, the construction crew installed gauges on the cast-iron main on South Union Street, the plastic main on South Union Street, and the main on Salem Street.

Once Salem Street was tied-in to the plastic main, the cast-iron main was disconnected from the distribution system and began to lose pressure. Because the sensing lines for the Winthrop regulator station were still attached to the cast-iron main, they sensed its drop in pressure, and the regulators to which they were attached responded as designed by opening, which increased the flow of gas into the distribution system. This resulted in an over-pressurization.

Construction personnel at the Salem Street tie-in site recognized the over-pressure situation and contacted the Lawrence Operations Center. In addition, Gas Systems Control in Columbus, Ohio (which provides remote monitoring service to CMA) received two high-pressure alarms – one at 4:04 p.m. and the other at 4:05 p.m. – from the low-pressure distribution system's Supervisory Control and Data Acquisition (SCADA) system, a remote monitoring system that uses telemetry readings to monitor overall system pressure. At 4:06 p.m., Gas Systems Control called the on-call technician for M&R in Lawrence about the alarms. The Lawrence technician immediately notified all Lawrence M&R technicians, who then immediately moved to perform field checks on the affected distribution system's 14 regulator stations to identify and shut down any station that was continuing to feed the system. CMA shut down the Winthrop regulator station by about 4:30 p.m., within 25 minutes of being notified. The Field Operations Leader, acting as the Incident Commander under CMA's Emergency Response Plan, directed efforts leading to the shutdown of the entire low-pressure distribution system by 7:17 p.m. The Company also worked quickly to shut down meters at businesses and residences, assisted emergency responders with evacuations, and initiated venting of the system to reduce system pressure.

The CMA Director of Government Affairs, who was traveling from Boston amid the heavy traffic resulting from the incident, arrived at the Lawrence Emergency Operations Center between 6:00 p.m. and 7:00 p.m. While en route, he was in contact with government officials and emergency responders by phone and, once he arrived, he remained at the Emergency Operations Center, facilitating communications between public officials and CMA. Because that representative did not have complete situational knowledge and the individuals who did have such knowledge were fully engaged in shutting

down the low-pressure distribution system and making the situation safe, in the first hours after the incident CMA was unable to provide complete information to first responders and other officials at the Emergency Operations Center regarding the cause of the incident, the areas affected, or how long it would take to shut down the system. CMA recognizes the importance of having a liaison who can provide substantive knowledge to first responders and other government officials about ongoing incidents, and acknowledges that, while it had individuals in place to serve as liaisons, complete information was not communicated in a timely manner. CMA has placed renewed emphasis on ensuring communication with both emergency responders and government officials in its revised Emergency Response Plan submitted to DPU earlier this year.

CMA provided the public with information regarding the incident at approximately 9:00 p.m., and regularly supplemented this initial publication with additional information regarding the incident and the status of the restoration process. As CMA has previously acknowledged, communicating promptly with customers was a weakness in the response to the incident. Although CMA was still gathering relevant information during the first several hours following the incident and did not have a complete understanding of the situation, it nevertheless should have issued a public statement more quickly.

CMA immediately advised the NTSB that the likely cause of the over-pressurization was that regulator sensing lines at the Winthrop regulator station had not been relocated from the cast-iron main being taken out of service to the new plastic main. Excavation was performed on September 15 to confirm this.

The over-pressurization damaged the integrity of the affected distribution system. After consulting with the DPU, it was determined that it was necessary to replace the system's cast-iron main before restoring service to affected customers.

3. The Restoration Efforts in the Affected Merrimack Valley Communities

a. Introduction

Since September 13, 2018, NiSource and CMA have been committed to restoring the affected communities of Andover, Lawrence, and North Andover. Over the course of three months, more than 5,000 workers came together to safely and efficiently restore gas service. This effort included replacing nearly 45 miles of gas pipeline as well as going house-to-house and business-to-business and conducting significant in-home and in-business restoration work so each customer could safely receive gas service. CMA restored heat and hot water to nearly 7,500 residential and business meters, and in the process installed nearly 18,500 new appliances and pieces of heating equipment (*i.e.*, boilers, furnaces, ranges, and dryers).

CMA continues to provide support and services for its customers in the three affected communities, including support to self-mitigating customers and administering an equipment repair plan for new CMA-installed or repaired appliances and equipment, at no cost to customers. CMA and state and local officials continue to work to address the needs of the affected communities.

b. Organization

Shortly after the incident, Massachusetts Governor Charlie Baker appointed retired Navy Captain Joe Albanese as Chief Recovery Officer to provide program management, leadership and oversight for the restoration and recovery efforts. NiSource named Pablo Vegas, an executive vice president, as Chief Restoration Officer, and sent a number of senior executives to Lawrence full-time for the duration of restoration activities. The team established a Command Operations Center (COC) at CMA's gas operations facility in Lawrence. Ultimately, more than 5,000 workers, ranging from Columbia Gas employees, plumbers, linguists, management consultants and contractors worked on the operation, under the supervision of the COC.

The COC team maintained communications with state and local officials throughout the restoration process, including daily briefings with Governor Baker, Mayor Rivera (Lawrence), Town Managers Flanagan (Andover) and Maylor (North Andover), and others in the first months of the restoration. Representatives of the Baker administration and the Office of Energy and Environmental affairs were stationed in the COC, and state and local officials were part of the regular COC workflow.

c. Temporary Housing

Working with the Massachusetts Emergency Management Agency (MEMA), CMA established a temporary housing program, sourcing more than 4,000 hotel rooms across the Merrimack Valley and southern New Hampshire, more than 160 one-, two-, and three-bedroom apartments, and over 200 RVs placed in the affected communities. Additionally, a communal shelter with beds, showers and hot meals was established and operated in Lawrence. At its peak, more than 2,200 families utilized temporary housing, totaling more than 7,000 individuals.

CMA committed to placing customers in temporary housing three hours after they requested it, and worked with customers to find the best available solutions that accommodated their needs. Customers were able to stay in temporary housing until gas service to their homes was re-established. Customers moved back into their homes throughout the period of the restoration as their natural gas equipment was replaced or repaired, and as other home repairs were completed.

d. Service Restoration

The restoration effort had two primary components: "Gas Ready" and "House Ready," which together enabled CMA to restore customers' gas service. The Gas Ready component consisted of replacing and requalifying pipeline and installing service lines, while the House Ready component consisted of repairing and replacing appliances and other natural gas equipment and infrastructure in customers' homes and businesses.

Gas Ready: On September 16, CMA announced its commitment to a complete replacement of the majority of the affected gas distribution system, replacing it with state-of-the-art infrastructure. A portion of the affected pipeline infrastructure had been recently replaced with modern polyethylene pipeline and was requalified rather than replaced. The Gas Ready construction plan included eight work zones, further defined into 63 projects, all running in parallel across the three communities. At its peak, there were over 200 construction crews working each day, including pipeline contractor crews from 10 states. The completed Gas Ready effort included the installation of 43.5 miles of gas main lines and 5,086 service lines, and the requalification of nearly 12.3 miles of main line polyethylene pipe. CMA announced the completion of the gas pipeline construction work on October 30.

House Ready: The House Ready effort comprised the work required inside the affected homes and businesses to allow for safe restoration of gas service. This in-home (and in-business) work included assessment, removal of damaged appliances and equipment, replacement or repair of gas appliances and equipment, and safety inspections. Once a home or business was deemed both Gas Ready and House Ready, multiple safety checks were performed, natural gas service was re-established, and appliances were relit.

CMA prioritized restoring gas service to the elderly, individuals with disabilities or health concerns, and young children. In all, gas service was restored to nearly 7,500 residential and business meters. Approximately 18,500 new appliances and pieces of equipment (*i.e.*, boilers, furnaces, ranges, and dryers) were installed, and more than 20,000 pieces of damaged gas equipment were removed. Nearly 25,000 plumbing and gas permits were issued and 11,385 inspections were completed by 91 inspectors from across the state. At the peak of the recovery effort, hundreds of meters were made House Ready, and service to hundreds of customers was re-established daily.

As winter approached, CMA contacted those customers who would not have heat restored before November 19, 2018 (the initial date CMA targeted for service restoration) to discuss interim options, including the provision by CMA of professional winterization services and temporary heating solutions. Overall, CMA winterized properties at 190 meters and installed more than 950 temporary heating solutions.[1]

Nearly 700 businesses were affected by the event. Approximately 80% of affected businesses were open by early October 2018. CMA established a "Back-to-Business" initiative designed to streamline and expedite the process of approving property damage claims and restoring gas service so that affected businesses could return to normal operations as soon as possible. Each affected business was assigned a dedicated project manager, who was responsible for shepherding the business through the entire process—from assessing damages to ordering and installing new equipment, and managing the claims process. CMA also opened a Back-to-Business Center in each of the three affected communities, where businesses could utilize the resources of CMA staff.

On December 16, 2018, CMA and state and local officials announced that the gas restoration project was substantially complete, meaning that 98 percent of residential and business customers had their natural gas service restored and had heat, hot water, and working gas appliances. At that time, the only customers to whom service had not been restored were those with extenuating circumstances or those who had decided to self-mitigate.[2]

e. **Customer Communications**

[1] CMA also reimbursed customers who temporarily or permanently switched fuel sources (*e.g.*, electric, propane, oil) for heating, hot water, cooking and other appliances.

[2] Certain customers did not want CMA-contracted crews to work inside their homes or businesses. For those customers, CMA offered reimbursement through the claims process for work performed by their own contractors (labor and parts). This process is known as self-mitigation.

CMA sought to provide accurate and timely information to affected customers on all aspects of the recovery process, in English and Spanish. CMA provided a weekly newsletter, mailed directly to customers, with updates on the recovery effort and what to expect in the week ahead. CMA also introduced an interactive, online map for customers to track the schedule range when work would be performed at their address. CMA posted multiple times a day on its social media accounts and website, provided personal calls for customers whose House Ready schedule had shifted and provided written materials for work crews to provide to customers when they entered homes to conduct work.

CMA established an Affected Customer Helpline, which operated 24 hours a day, seven days a week. These call centers handled hundreds of customer calls per day (totaling more than 100,000). CMA also operated Mobile Customer Care Centers which traveled throughout the affected communities to provide support to customers on the ground. CMA also conducted 15 open-house and town hall meetings, five in each of the affected communities. At these events, customers heard directly from those leading the recovery effort, and information stalls were available for each aspect of the effort so that customers could get answers to questions and resolve issues.

f. **Response to those Affected**

CMA established a claims process for those in the affected area who experienced losses caused by the incident. CMA took immediate steps to allow impacted individuals and businesses to access the claims process, including establishing a toll-free number and claims centers in each of the three affected municipalities, and making resources available to assist affected customers with the claims process. As of June 2019, more than 25,000 claims had been filed, and more than 97% of those claims had been resolved. Access to the claims process and two community walk-in centers remains available today.

g. **Community Donations**

In mid-September, CMA made a $10 million donation to the Greater Lawrence Disaster Relief Fund at the Essex County Community Foundation. The fund supported the work of meeting the immediate needs of people affected by the event. CMA also provided $10 million in funding to address immediate and longer-term needs of affected businesses and worked closely with state and local officials on a strategic plan for deploying these funds. The funding addressed three major areas: $2 million for direct technical and other business support such as bookkeeping, staffing, inventory management, claims submissions, business development and marketing efforts; $6 million for municipal discretion for business support and economic development, administered by the Essex County Community Foundation and the Lawrence Partnership, a grant-providing entity; and $2 million for longer-term regional support for economic development.

h. **Phase II Restoration**

In December 2018, CMA announced its Phase II of the restoration project, which includes:

- **Equipment Repair Plan**: For residential appliances, CMA will provide required repairs through May 1, 2020 to new boilers, furnaces, hot water heaters, ranges, and dryers installed by CMA or its subcontractors; for business customers, repairs will be covered for one year from date of installation.
- **Equipment Replacement Program**: Those residential customers who had their heating equipment repaired (rather than replaced) in the fall will receive full replacement. This covers approximately 900 customers. CMA has committed to complete this work by September 15, 2019.[3]

[3] During the House Ready restoration effort, for some customers, appliances were repaired instead of replaced to ensure that those customers could return to their homes as quickly as possible.

- **Property Restoration**: CMA contractors have been restoring outdoor property including: lawn repair, irrigation systems, and hardscape restoration such as concrete walkways.
- **Curb-to-Curb Paving**: CMA has fully compensated the affected municipalities for curb-to-curb paving of all roadways, sidewalks and intersection exchanges affected by the incident, including required accessibility improvements.

4. NiSource's Enhanced Safety and Emergency Response Processes

a. Safety Enhancements

Following the September 13, 2018 incident, NiSource has taken, or committed to take, the following infrastructure and operational improvements across its seven-state operating area, all of which are intended to better ensure safer operations:

- **Regulator Station Design/Over-Pressure Protection**: NiSource initiated and completed an engineering design review of low-pressure regulator stations to determine how best to install additional over-pressure protection systems and other safety features.
- **Over-Pressure Protection Devices**: NiSource is installing automatic pressure control equipment on low-pressure systems (which include more than 6,000 miles of low-pressure gas mains) across its seven-state operating area. These devices operate like circuit-breakers; when they sense operating pressure that is too high or too low, they shut down the flow of gas to the system, regardless of the cause. These devices operate independently of other pressure control devices, so they will automatically shut down the system to prevent over-pressurization.
- **Remote Monitoring**: NiSource is installing remote monitoring devices on low-pressure systems (to the extent not already in place on those systems) to expand the ability of its gas control centers to receive pressure alarms on a real-time basis. In the event a system is shut down by an automatic pressure control device (as described above), the remote monitors will enable quicker response times to restore service to customers.
- **Infrastructure Modernization**: NiSource is continuing to modernize its system (in Massachusetts and elsewhere) by replacing cast-iron and bare-steel pipes with more modern materials.
- **Field Survey/Mapping**: NiSource has completed a field survey of its low-pressure regulator stations to identify available options to enhance the safe, reliable operation of regulator station equipment. This effort included the locating, marking, and mapping of sensing lines (*i.e.*, regulator-sensing lines) at all 2,072 low-pressure regulator runs across the seven-state footprint. NiSource is using the information from the field survey to add further details to its electronic mapping system. NiSource also is also updating the drawings at the regulator stations themselves, as needed.
- **Asset Review**: NiSource retained a third-party gas engineering firm to verify the components and configurations of the assets required to safely operate low-pressure gas systems (including regulators, valves, and sensing lines) and ensure these assets are clearly indicated on relevant maps and records.
- **Professional Engineers**: Across NiSource, all relevant construction documents and plans for construction work for complex projects are being sealed by a professional engineer prior to commencing construction work, consistent with the recently-enacted Massachusetts statute. NiSource continues to consider ways to review and validate Standard Designs for non-complex or routine mainline projects.
- **Capital Projects Review**: NiSource has revised its procedure for stakeholder review of designed capital projects, which will include an enhanced Constructability Review process to assist the project engineer with identifying the stakeholders required to participate in the review and to otherwise be consulted during project planning.
- **Management of Change**: NiSource has supplemented its Management of Change (MOC) procedures to detail steps to enhance safety on construction projects, for example, during changes in company and contractor personnel.

- **Tie-In and Tapping Procedures**: NiSource has developed enhanced tie-in and tapping procedures. These enhanced procedures also outline stakeholder engagement, risk identification, roles and responsibilities, and MOC principles.
- **Damage Prevention**: NiSource has implemented enhanced damage prevention practices around low-pressure regulator stations, including field inspection and monitoring excavators working for third parties. When excavation work is being conducted in close proximity to regulator stations, a NiSource employee will be present.

In addition, as described in Section 7, NiSource has accelerated its implementation of a Safety Management System (SMS) to help identify and mitigate risk and continuously improve system safety and integrity.

b. **Emergency Preparedness and Response**

In early 2019, NiSource commissioned a cross-functional Emergency Preparedness and Response team[4] to integrate improved preparedness plans and exercises covering a broad range of potential scenarios and levels of emergency; it will provide increased awareness and understanding of all roles during an emergency to required personnel across the gas segment and corporate support teams. The overarching goal is to ensure an emergency response team that is capable of a timely and effective response to incidents with potentially wide ranges of scale and complexity anywhere in NiSource's service territory, and to be positioned to assist peer utilities in their restoration efforts as required.

In the first half of 2019, the NiSource Emergency Preparedness and Response team:

- Successfully completed classroom training and certification in Federal Emergency Management Agency ICS 100, 200, 300, and 700 modules.
- Reviewed and analyzed existing corporate and operating company Emergency and Crisis Communications Plans, as well as Business Continuity Plans.
- Completed best practice visits with industry peers as well as internally with the Northern Indiana Public Service Company's electric storm team.
- Submitted an updated Emergency Response Plan to the Massachusetts Department of Public Utilities, which included a significant restructuring and rewriting of the previous year's plan and incorporates improvement actions based on learning from prior responses of NiSource's previous incident response processes, plans and performance. The new Emergency Response Plan focuses on enhancing the Incident Command System to ensure a clear leadership structure in the event of an incident. It also provides a defined timeline for communications to ensure the public is informed, and adds a maintenance and Management of Change section.

The Emergency Preparedness and Response team's goals for the rest of 2019 include the following:

- A single emergency response plan that is utilized across the gas segment.
- Consistent definitions for incident levels from less severe to the most severe.
- Implementation of a single Incident Command System and structure that will be scalable to accommodate the incident level, and consistent use of Incident Command System processes and terminology.
- Enhanced training (computer-based and independent study) for all employees with roles in the emergency response plan and Incident Command System.[5]

[4] This team was established as part of NiSource's SMS implementation, described in more detail in Section 7 below.
[5] Enhanced classroom training for these employees will extend into 2020.

- Emergency exercises in the third and fourth quarters to build familiarity with the plan, processes and terminology, while ensuring employees more deeply understand their respective roles and responsibilities and enhancing relationships with external stakeholders

Concurrently, the team is working with the NiSource compliance team to develop a comprehensive exercise program to test the plan, identify gaps and make the necessary adjustments to strengthen overall company preparedness.

In addition to creating consistency across the NiSource gas segment, these efforts will enhance communications with key external partners with which NiSource works in an emergency, such as public safety personnel. NiSource will engage with first responders and other external stakeholders to build awareness of NiSource's emergency response plans. NiSource will also invite their participation in exercises to increase mutual understanding of the critical roles each participant plays.

Lastly, NiSource is enhancing its corporate crisis response efforts. The effort includes response protocols, template media statements, and customer-facing communications materials for use during crisis situations. NiSource intends to incorporate these materials into the gas segment Emergency Preparedness and Response Plan.

5. NiSource's Technical Training and Career Development Programs

a. Training for Engineers

The key elements of NiSource's training program for Field Engineers are effective onboarding, classroom and practical experience training, and feedback through mentorship/peer exchange and project reviews.

Each new Engineer completes a required onboarding program (designed to last four to eight weeks) that provides the Engineer with an overview of the information needed to do his or her job. Onboarding activities are grouped into four main categories: (1) Safety and Administrative; (2) Engineering, Technical and Standards; (3) Observation of Operations Activities; and (4) Technology. Engineers are required to review applicable Gas Standards, and the observation component includes a job shadow with several departments within NiSource.

After the initial onboarding, Engineers are assigned a detailed training program to complete over the next several years. Engineers are required to take substantive training on key subject areas such as the design of main line replacement projects and the operation and function of regulators and regulator stations. The training also provides an understanding of applicable Gas Standards necessary for the safe operation of the system. In addition to technical competencies, the curriculum covers safety and administrative responsibilities and includes observational opportunities. The resources utilized include internal classes for technical training and organizational development, safety, and IT applications. External sources (*e.g.*, GTI, Synergi, Corrosion Short Course) are also utilized. The training curriculum was created by a team of Engineers with a wide range of experience, in conjunction with members of NiSource's Training organization.

NiSource has established a set of Advancement Criteria that individual engineers must meet before they can be promoted to the next step. There are four levels within the Field Engineer job family, *i.e.*, the series of engineering positions at NiSource ranging from entry-level to senior roles: Associate Field Engineer (AFE) 1, Associate Field Engineer 2, Field Engineer, and Senior Field Engineer. The advancement criteria is grouped into three major categories: Key Work Experiences/Education Criteria; Technical/Functional; and General/Transferable. Across the three categories, there are a total of approximately 45 individual elements on which the engineer is evaluated.

The Engineer and his or her supervisor (Leader) meet periodically throughout the year to evaluate progress and alignment of goals. The overall program is designed to progress an engineer from Associate to the Senior level with intermediate milestone requirements for each level, and encourages engineers to obtain Professional Engineer certifications as part of advancement to the Senior level. Each Engineer submits evidence that he or she has met the criteria, which is then reviewed by his or her Leader. The Leader then sends the package to their supervisor (Manager), who decides whether to promote the Engineer from AFE 1 to AFE 2. For advancement to Field Engineer or Senior Field Engineer, the Director of Engineering (to whom the Manager of Engineering reports) must be involved in the process and sign off on the advancement proposal before it is final. Advancement to the Senior level also involves approval from a review team of the Managers and Director with the Leader presenting as a sponsor for the candidate.

NiSource has maintained an intern/co-op program for nearly a decade. The program has been successful in developing young engineers who return to NiSource as full-time employees. Approximately one-third of NiSource hires come from the internship program. The intern development and work assignment process is very similar to the experience any new engineer would have upon hiring.

b. Training for Construction Personnel

NiSource has a company-wide training program for field employees (including Inspectors and internal Construction Crews) who are new to the company or who internally transfer into the Construction department. This program focuses on hands-on training, and covers all aspects of the job (from

paperwork and customer interactions to safety requirements, environmental standards, and technical skills), at each level of expertise. This training is designed to prepare employees to perform the technical aspects of the work and to provide them with the larger picture of what goes into their job, as well as completion of associated Operator Qualifications (OQs).

The focus of this technical training is aimed at field employees – Inspectors, as well as Construction Crew employees. The program for new hires begins with a three-week onboarding program that includes elements on culture, process, safety/OSHA, driving, and the minimal qualifications an employee needs to work in the field, such as safe use of basic field tools and equipment, customer interactions, setting up a work zone, assisting with line locating, using the one-call system, identifying Abnormal Operating Conditions, and using the mobile data terminal (MDT). All employees attend at least a portion of this onboarding, depending on the level of experience s/he brings to the job when hired (either internally or externally). Once employees complete onboarding training within the training center, onboarding training continues in their new operating area, where they meet their leadership team and prepare for the next level of training.

After a few weeks, new field employees return for a three-week course titled Plant Basic. Employees learn how to use tools in the truck for service lines; safely excavate for service line installation, repair, or abandonment; join plastic pipes; identify and repair service line leaks; pressure test service lines; perform purging; and install, repair, and replace service lines.

After Plant Basic, the on-the-job training (OJT) portion of an employee's training begins. Each employee is assigned an "OJT coach" who monitors their progress. When the OJT coach and the employee's local leader believe the employee is ready, s/he is scheduled to take the OQ tasks necessary to perform his/her job. Once the OQs are passed, the individual is released to the field to perform the work he or she has been trained to perform.

The third phase of training begins with Plant 1, another three-week course designed to instruct employees on what is required to lead a crew on service line work. Plant 1 is intended to round out the skills and knowledge required to lead service and maintenance crews and respond to dig-ins where some main line work is required. The subjects of this phase of training include leak repair and leak investigation; purging; installing a temporary bypass; tapping; and the capital work order process. Employees who complete Plant 1 then engage in additional OJT and, in coordination with their OJT, take the relevant OQ tasks. Once an employee receives all OQs related to Plant 1, he or she may be designated as a "Tier 1" employee to lead an internal Construction Crew in service line and maintenance work, and to sign off on job orders such as service line leak repairs, locating, facility damage, and main line maintenance.[6] In addition, new Inspectors shadow experienced Inspectors to obtain construction project management skills and to understand the paperwork involved in their positions. Beginning in 2018, NiSource has started to develop additional classes and a formal OJT program that focus on project management and paperwork requirements to deepen Construction Inspectors' skills.

c. CMA Operator Qualification Plan

In accordance with federal and state requirements, CMA has developed an Operator Qualification (OQ) plan to ensure that employees and contractors who work on CMA gas line projects have the appropriate qualifications and training to complete assigned tasks safely. The CMA Operator Qualification Plan (CMA OQ Plan or OQ Plan) is designed to establish a verifiable, qualified workforce to promote personnel and public safety. CMA utilizes the Northeast Gas Association (NGA) written template as the basis for its own OQ Plan. CMA revised and edited that document to reflect its own operational requirements.

[6] Tier 1 employees may take advanced training offerings depending on the needs of their operating area, including courses on sequencing tie-in operations, complex pressure testing and uprates, and high pressure pipeline repair.

As a regulated entity, CMA must include provisions in its OQ Plan to identify covered tasks. To that end, the CMA OQ Plan includes provisions to:

- Ensure through evaluation that individuals performing covered tasks are qualified;
- Allow individuals who are not qualified to perform a covered task if directed and observed by an individual that is qualified;
- Evaluate an individual if the operator has reason to believe that the individual's performance of a covered task contributed to an incident;
- Evaluate an individual if the operator has reason to believe that the individual is no longer qualified to perform a covered task;
- Communicate changes that affect covered tasks to individuals performing those covered tasks; and
- Identify those covered tasks and intervals at which evaluation of the individual's qualifications is needed.

If a CMA employee or contractor needs to be able to perform a covered task in the course of his or her job, the individual shall be provided training, as appropriate. This applies to new hires, operators, and contractor/subcontractor employees transferring from other functions, individuals seeking to qualify for new covered tasks, or an individual who fails a covered task assessment. The appropriate level of training may include: on-the-job training, classroom instruction, demonstrations, or other methods deemed appropriate by CMA. Prior experience could allow the individual to proceed directly to qualification testing without training. Testing may be administered by NGA, CMA, or by one of the agencies identified as operator-approved in the CMA OQ Plan, and can include online testing, written testing, oral testing, and simulations. On-the-job performance can also be used as a qualification method, if used in conjunction with at least one of the other methods.[7]

In the event a CMA employee or contractor fails an evaluation of a covered task, or the individual's qualifications are suspended for cause, CMA immediately notifies the employee and his or her supervisor. The affected employee or contractor is thus no longer qualified in that task, and can either no longer perform the task, or, where allowed, can only perform the task under direct observation of a qualified individual. CMA will provide additional training to an employee who fails an evaluation or whose qualifications are suspended for cause, and the employee will then be re-tested on the task. If the employee passes the reevaluation, he or she will regain the qualifications, and he or she can once again perform the task without supervision. In the event of multiple failures, those are handled by management on a case by case basis. Additionally, if CMA has reason to believe an individual's performance contributed to an incident, the individual must be evaluated prior to continuing the performance of the covered task.

d. **Emergency Response Training**

As part of NiSource's continued efforts to enhance its training programs, NiSource has built four new training centers since 2016, including a training center in Massachusetts, which opened in 2018. These training centers have significant capabilities for training on emergency response, which build on NiSource's existing emergency response training. The new training centers service new hires and existing employees, and are also used for coordinated training with local emergency responders on

[7] When CMA employs a subcontractor to perform covered tasks, the subcontractor will either be qualified under the CMA OQ Plan or, if the subcontractor has its own plan, the plan will be reviewed and approved by the CMA OQ Plan Administrator to ensure the subcontractor plan meets all of the requirements in the CMA plan.

responding to natural gas emergencies. NiSource is working to further enhance training offered at the training centers based on recent experiences, including the incident.

These new training centers include an outdoor "Emergency Response Safety Town" – a mock neighborhood of mini-homes and buildings complete with underground utilities, meters, and regulators where instructors can create and control various emergency training scenarios, including natural gas leak simulations. Instructors use this area to teach other critical skills, including line locating and marking; leak detection and corrosion monitoring; and re-establishing gas service. These centers can create approximately 50 separate gas leak scenarios to provide unique training experiences. New employees joining the service department will spend a full week practicing emergency response individually and as a team to build confidence and competence in emergency response.

Instructors also use a variety of gas appliances to provide employees with experience relighting equipment and recognizing faulty operation, to help employees prepare for the wide variety of equipment that may be in customers' homes. Employees are also trained on proper installation of equipment in the safe, controlled environment of the centers. Hands-on training is supplemented with simulators that allow employees to experience various work activities in a safe environment. Participants are able to experience as close as possible to a real emergency situation and practice how they should respond.

While natural gas-related fires are rare, they require specialized training and coordination with first responders and other community partners. NiSource's fire school allows NiSource employees and local first responders to work together to gain valuable experience while safely approaching and extinguishing a broad range of gas-related fires. NiSource offers safety response training to local emergency responders free of charge.

6. CMA's Distribution Integrity Management Program

In accordance with federal pipeline safety regulations, NiSource companies, including CMA, have developed a comprehensive Distribution Integrity Management Program ("DIMP") that enhances pipeline safety by systematically identifying and reducing risks to its gas distribution systems. Since NiSource first implemented DIMP, it has enhanced its processes through continuous learning and improvement. NiSource's DIMP includes processes to:

- Develop general knowledge of its distribution system;
- Identify potential threats to facilities and materials ("assets");
- Rank the risk of each identified threat;
- Identify and implement measures to reduce risk;
- Measure performance, monitor results and evaluate effectiveness;
- Evaluate and improve the DIMP; and
- Report results.

A central DIMP administration team at NiSource facilitates the development of DIMP plans for each NiSource gas distribution company (including CMA), each of which has its own DIMP steering team made up of local subject matter experts representing all relevant disciplines within the company, including but not limited to Systems Operations, Field Operations, Construction, Communications, Field Engineering, Standards, and Damage Prevention. The DIMP administration team is in frequent contact, and meets formally at least annually with the steering teams to share and update information and coordinate ongoing efforts to identify, evaluate and reduce risks.

a. Knowledge

The knowledge element of a DIMP focuses on knowledge of system design and operation, as well as environmental conditions that can affect the distribution system. CMA's DIMP addresses the need to collect information about new facilities that it installs, as well as the need to incorporate evolving information to govern established facilities. CMA maintains data and records on system design and pressure, pipe installation methods, regulator stations, valves, leakage rates, and exposure to natural forces, among other aspects of its distribution system. As part of its ongoing DIMP review process, CMA and each of the NiSource gas companies also use "Knowledge Enhancement" programs to secure information about new potential threats as they are identified.

b. Threat Identification

By regulation, a DIMP must consider eight general threat categories: corrosion, natural forces, excavation damage, other outside force damage, material or welds, equipment failure, incorrect operations, and other concerns. The regulations contemplate that operators will develop integrity management programs tailored to their individual systems, as long as they demonstrate how those programs satisfy integrity management requirements. CMA's threat identification process considers not only these general categories, but also dozens of sub-categories specific to CMA's distribution systems and operating conditions.

To help identify potential threats, the DIMP Steering Team reviews information from the other NiSource operating companies, peer companies, industry associations, PHMSA Advisory Bulletins and NTSB Reports and Recommendations. NiSource actively participates in industry association programs and monitors industry-wide reports, to help ensure that any relevant issues are brought to the attention of local steering teams in the course of re-evaluating their DIMPs. CMA's DIMP plan also calls for operations, maintenance and engineering personnel to communicate potential threats or pipeline safety concerns that

they discover to members of the DIMP Steering Team; any such issues are documented and routed to the DIMP Coordinator for further consideration.

CMA's DIMP subdivides its distribution system into assets with similar physical characteristics (e.g., steel pipe, plastic pipe, location above or below ground) or functions (e.g., main or service line), thus grouping together assets for which similar actions would be most effective in reducing risk. CMA has historically considered M&R Stations (of which worker and monitor regulators and sensing lines are components) as assets in its DIMP. Going forward, CMA plans to separately identify the discrete components of M&R Stations as "assets" in its DIMP so that threats can be identified at a more granular level.

c. **Risk Evaluation and Ranking**

Risk ranking takes two factors into consideration: the probability of a threat and the consequences of that threat. Based on these factors, CMA ranks the risk for each threat, and subject matter experts evaluate the results. CMA evaluates risk at a system-level and a segment-level. The system-level process considers all threat categories and all distribution facilities, enabling CMA to focus efforts on those asset groups and threats that pose the greatest risk. The segment-level process includes evaluation of both main lines and service lines; both of these evaluations use a risk-model based decision support software tool (Optimain DS) to assess and prioritize the risks. CMA's segment-level risk evaluation also includes a Regulator Model Evaluation, which is informed by the field experience and knowledge of company personnel. The evaluation process, which is updated annually, enables CMA to assess and prioritize the risks specific to regulator stations. The system- and segment-level processes are assessed in parallel, and the results of each are used to add value to the other.

d. **Implementation of Measures to Reduce Risk**

CMA implements numerous processes to reduce known risks to its assets. These programs incorporate all relevant aspects of pipeline operation, including leak management, damage prevention, public awareness and education, operator qualification and training, internal audits, inspections and monitoring of facilities, quality assurance/quality control, and replacement of leak-prone infrastructure. In some instances, these programs have led to the implementation of programs or operational changes that go beyond federal regulations and DPU code requirements, such as conducting annual leak surveys of all distribution mains.

e. **Performance Measures**

CMA routinely collects and evaluates specific data that reflect the current performance of its distribution system to confirm that the system is safer and more reliable than in the past and that risk is being removed. In addition to the mandatory measures required by regulations, CMA has implemented additional measures over time as a means of assessing the effectiveness of "Additional or Accelerated Actions" taken in response to an identified threat or risk, or to obtain high level trend analysis that would provide leading indicators of change. Examples of performance measures that CMA has tracked in addition to those required include: number of leaks on cast iron pipeline; miles of cast iron pipeline remaining; damage rates; average response time for high priority calls; number of redundant communication SCADA sites; and average risk score for all assets in Optimain.

f. **Evaluation and Improvement**

The NiSource DIMP administration team has regular (generally monthly) meetings with CMA's DIMP Coordinator to track the progress of ongoing risk-reduction efforts. A separate quarterly meeting is dedicated to discussing initiatives to identify and study potential threats. In addition to these regular meetings, the NiSource DIMP administration team has frequent informal contact with members of CMA's DIMP Steering Team as specific issues arise.

While federal regulations call for DIMP plans to be re-evaluated at least every five years, CMA's DIMP plan is updated annually. NiSource's DIMP administration team meets annually with CMA's DIMP Steering Team to review and update CMA's DIMP. At the annual meeting, the DIMP administration team presents the results of risk modeling based on data gathered during the previous year. CMA's subject matter experts review and validate the data, and supplement it with insight gained from field employees. The NiSource DIMP administration team also presents information to CMA's DIMP Steering Team regarding incidents experienced by other operators, within or outside of NiSource, and incidents described in PHMSA advisory bulletins. The DIMP administration team incorporates the new data and other input from the CMA DIMP Steering Team into CMA's DIMP plan annually. This process allows NiSource to bring to bear the knowledge and expertise of personnel company-wide to improve the DIMP of each operating company.

g. **Reporting Requirements**

CMA reports results annually and provides updates on the DIMP plan to the DPU upon request. In 2015, the DPU inspected CMA's DIMP plan and found it be in compliance with the regulations and otherwise satisfactory in all regards. In addition, the DPU has specifically found that CMA's GSEP is prioritized to implement the DIMP consistent with the requirements of 49 C.F.R. §§ 192.1001 through 192.1015.

7. NiSource's Safety Management System Progress Before and After the September Event

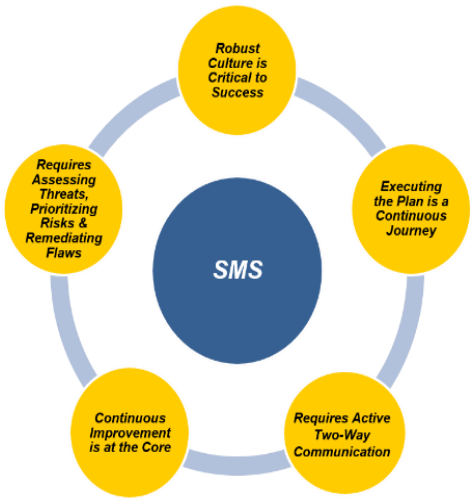
NiSource has been in the process of implementing an advanced, comprehensive approach to managing safety, known as the Safety Management System (SMS). NiSource is joining other industries, from the airline industry to the nuclear industry, in adopting this forward-looking approach to safety. NiSource has aligned its SMS program with a framework developed for the pipeline industry by the American Petroleum Institute, in the form of Recommended Practice 1173 (RP 1173). SMS provides pipeline operators with an approach for rigorously identifying and managing risk, communicating with stakeholders, ensuring the effective operation of key processes, and promoting a learning environment.

a. SMS 2015 - 2018

The American Petroleum Institute published its Recommended Practice 1173 in 2015. As part of its commitment to safety, NiSource became one of 12 companies to publicly commit to implement SMS by participating with the industry's lead trade group, the American Gas Association, on a best-practice and information-sharing pilot group. NiSource began work on SMS in 2015 and, in 2016, NiSource established its SMS pilot program at Columbia Gas of Virginia. In 2018 (prior to the incident), NiSource adopted a staggered implementation plan for SMS across NiSource's seven operating companies.

b. Accelerated SMS Implementation

Following the incident, NiSource has accelerated its implementation of SMS across all operating companies in its gas segment, continuing its focus on identifying and mitigating potential risks while continually assessing and improving processes and procedures to keep its employees, contractors, customers, and the public safe. In late 2018, NiSource expanded the leadership team overseeing the implementation of SMS and established a significant operation that includes multiple workstreams staffed by employees and consultants dedicated to the implementation of SMS.



As NiSource implements and matures SMS, it will:

- Integrate the NiSource gas segment organization and connect safety management across people, assets, and processes.
- Promote safety leadership and individual accountability on the front line, as well as for executives.
- Build on NiSource's strong foundation of safety with a culture of transparency and mutual trust, an inclusive workplace, and a focus on continuous learning and improvement.
- Add rigor to work resulting in the identification and mitigation of risks to protect employees, contractors, customers and communities.

As NiSource works to operationalize SMS in each of its seven operating companies, it has established cross-functional teams to evaluate, prioritize, and elevate state-level risks. The state teams include two newly-created positions in each of the seven states in which NiSource operates: a Director of Safety, Compliance, and Risk, and a Safety Management System Lead. The Director role in each state reports to the state president and chief operating officer and is accountable for employee safety, pipeline safety and compliance, SMS program leadership, and overall risk management at the state level. The Lead position deploys and leads SMS processes in each state by driving performance improvement around public and

employee safety and advancing state level SMS continuous improvement. These teams have been engaged in comprehensive onboarding and training.

Some of the steps NiSource is taking to implement SMS include:

- **Development of a NiSource SMS Policy and Standard:** NiSource has established a policy that governs SMS, and has developed a standard and process documentation that will serve as a guide for the execution and administration of SMS.
- **SMS Risk Tables:** NiSource is establishing SMS Risk Tables at the NiSource gas segment level as well as the individual operating company level. At each operating company the Risk Table will be chaired by the presidents and chief operating officers and the top leaders in each company. Using a shared risk quantification model, they will monitor SMS performance and support performance improvement through proactive risk mitigation programs. These same actions will be performed at the NiSource gas segment Risk Table to achieve a balanced focus on all operating company risk management programs.
- **Corrective Action Program (CAP):** NiSource is establishing a Corrective Action Program or CAP to identify risks and to take action to mitigate those risks. CAP will identify issues or concerns with physical assets, materials, resourcing, tools and equipment, work methods, and issues regarding health and safety. Any concerns or opportunities for improvement pertaining to pipeline and public safety can be reported through an online NiSource CAP tool and then will be addressed. Reports through the CAP tool may be submitted anonymously.
- **Identification of Leadership Competencies to Support RP 1173 and Related Assessments:** Leaders across the NiSource gas segment will be assessed based on the management and leadership requirements of RP 1173. These assessments will drive consistency in defining the behaviors, knowledge, and experiences needed to be successful in safety and risk identification.
- **Safety Culture and Local Action Plans:** NiSource will strengthen its safety culture guided by competencies that align to the management and leadership requirements set forth in RP 1173. The majority of areas across the NiSource footprint will participate in this process and action planning through early 2020.
- **Emergency Preparedness and Response**: NiSource commissioned a cross-functional team to enhance emergency preparedness activities and emergency response capabilities. The team is integrating improved preparedness plans and exercises covering a broad range of potential scenarios and levels of emergency, and establishing well-defined roles with clear responsibilities.
- **SMS Training**: All 6,000 gas segment employees will participate in hands-on learning activities between mid-2019 to early 2020 to help them understand SMS and its implementation.

c. **External Governance: Quality Review Board**

NiSource has established a Quality Review Board (QRB), an independent body that provides oversight and governance of NiSource's implementation of SMS across its seven-state footprint with respect to program quality and alignment with API RP-1173. Chaired by Former United States Secretary of Transportation and Congressman Ray LaHood, the Quality Review Board is comprised of experts with diverse backgrounds spanning the nuclear, aviation, and energy industries. The six members are:

- Secretary Ray LaHood, Former United States Secretary of Transportation (Chair)
- John Cox, President & CEO, Safety Operating Systems
- John Durham, Retired Director, Enercon Services, Inc.
- Gary Harland, President, Work Management Inc.

- Cynthia Quarterman, former Administrator of PHMSA
- Jeff Wiese, Vice President for Pipeline Integrity, TRC Companies and former Associate Administrator of PHMSA

The QRB has held monthly meetings (four to date) with NiSource executive leadership and the SMS program team since March 2019. Meetings include significant program updates, engagement with front-line employees, and visits at training facilities and worksites. During these sessions, QRB members provide independent review of and challenges to NiSource's SMS approach, results, priorities, and actions. At the end of each meeting, QRB members meet with NiSource SMS executive sponsors to share key observations and recommendations.

8. NiSource's Safety Culture

As NiSource accelerates its implementation of SMS across its seven-state footprint, it is committed to building upon and enhancing its already strong safety culture. NiSource's long-term focus on continuous improvement in safety performance is rooted in its safety culture, which is NiSource's foremost stakeholder commitment, guiding daily work activities in the field as well as company investment in infrastructure and other safety enhancements. NiSource's safety commitment applies to all aspects of safety: customers, employees, business partners, and the communities NiSource serves. It reflects a continual focus on the personal safety of people, pipeline safety for the public, and the health and wellness assured through responsible environmental stewardship.

a. "Just Culture" Approach and Safety Coaching

For the past several years, NiSource has provided training to employees and leaders to educate, promote and foster a "Just Culture" approach to managing unwanted outcomes. This approach builds the organizational trust needed to proactively identify and mitigate risk, while creating a learning environment where the company learns from near misses and safety incidents.

To reinforce safety behaviors and the Just Culture safety approach, NiSource trains all front-line employees and leaders on behavior practices designed by the Aubrey Daniels Institute, which is an independent, research-based, behavior analysis organization that assists companies in optimizing their business metrics, work culture, and safety performance through behavioral science. NiSource launched this organizational learning through a Safe by Choice program to teach employees and leaders how to pinpoint key safety behaviors and positively reinforce those behaviors. The critical coaching element of the program is to "catch people doing something right" and reinforce that behavior to create positive safety habits and build organizational culture, trust in leadership, and safety accountability.

b. National Safety Council Partnership

NiSource partners with the National Safety Council (NSC), a non-profit organization that promotes health and safety in the workplace as well as in homes and communities, in improving NiSource's year-over-year safety culture, process, and management systems through NSC's Safety Barometer Survey. The Barometer Survey is a 50-question employee perception survey that focuses on a variety of safety and work-related statements. Over time, NiSource has modified the Survey to include additional questions that are specifically focused on employees who handle gas distribution and gas transmission. NiSource's responses are compared with the responses from the 820 participating organizations in the NSC database to produce comparative percentile values.

NiSource surveys all employees across its seven-state operating areas every year and uses the survey results to establish local, state, and corporate level improvement action plans. NiSource has seen annual improvement in these surveys, and, in the latest Survey, NiSource achieved scores higher than 91% of companies in the NSC peer group and CMA achieved scores higher than 94% of those companies.

c. Executive Safety Leadership

Executive Safety Council: NiSource has an Executive Safety Council chaired by its CEO and comprised of executive leaders. The purpose of the NiSource Executive Safety Council is to establish NiSource as an industry leader in safety through continued learning, support, strategy development, program performance reviews, predictive data analysis, reinforcement of leadership safety actions, and demonstrated safety engagement (internal and external).

NiSource Executive Field Safety Observations Program: NiSource has established an executive field safety observation program that requires every officer to perform field observations every quarter. This program provides the opportunity for executive learning, engagement, and reinforcement of NiSource's safety culture.

d. **Core Personal Safety Program and Policies**

Stop Work Authority: NiSource emphasizes the importance of Stop Work Authority to all employees and contractors. All employees and contractors (regardless of seniority or job responsibility) are expected to stop work whenever a situation arises due to an unsafe action, condition, behavior, or non-action and may potentially lead to harm.

Observation Programs: NiSource has established field observation programs to perform and collect information from pre-job briefs, safe driving observations, and leadership field safety observations. Additionally, NiSource performs Quality Assurance/Quality Control audits in the field and deploys employee field-based On-the-Job Coaches to support newly trained employees.

Industry Participation: NiSource is an active participant in industry associations and safety programs. NiSource is part of the American Gas Association's (AGA) Safety Management Systems working group and participates in the AGA's peer review / best practice program.

e. **Public Safety Improvements**

Infrastructure Modernization: In the late 2000's, NiSource established infrastructure modernization programs for its seven operating companies. These programs established year-over-year increases in capital investment to replace bare steel and cast-iron gas mains and customer service lines with modern plastic and coated steel pipe. This program has resulted in annual decreases in leaks from bare steel and cast-iron infrastructure.

Damage Prevention: NiSource has increased its external outreach to customers, first responders, public officials, and excavators with enhanced communications and education programs aimed at preventing excavation damage to its gas facilities. NiSource continues to trend positively, on average an 8-10% year-over-year reduction in the number of excavation damages per thousand one-call notifications. NiSource uses enhanced data analytics to continuously improve in how it deploys further focused efforts to address damages resulting from failure to call for a locate ticket, improper excavation, and locating errors.

Public Awareness: In addition to damage prevention focused awareness activities, NiSource conducts Public Awareness Surveys to drive key programs around gas odor detection, appliance safety, and carbon monoxide detection.

Integrity Management Programs: NiSource's Transmission Integrity Management (TIMP) and Distribution Integrity Management (DIMP) programs have driven the creation of several public safety programs in addition to infrastructure modernization and damage prevention, expanded in-line inspection and aerial patrolling and a pilot program utilizing fiber optic pipeline monitoring, among others.

Safety Technology Research and Development: NiSource is an original investor in the Gas Technology Institute's Operation Technology Development (OTD) and has also partnered in additional investments and development of methane detection equipment, tools, and processes for both gas emergency first responders and customer in-home monitoring.

9. Factual Findings

The South Union Street Project

a. Consistent with federal and state pipeline safety policy, CMA undertook the South Union Street Project in Lawrence, Massachusetts as part of its long-term, ongoing efforts to modernize and make safer its natural gas infrastructure. CMA identified the South Union Street Project in its GSEP for 2016, which was submitted to the DPU in October 2015.

b. The timing of the project was triggered by anticipated encroachment of existing cast-iron gas mains by water improvement projects planned by the City of Lawrence. The project was scheduled to be completed in 2016.

c. The NiSource Field Engineer who prepared the construction plans for the project was technically qualified and appropriately trained.[8]

d. This Field Engineer reported to a Leader of Field Engineering with advanced qualifications, a Professional Engineer certification, and more than 25 years of experience in the natural gas industry. One of that Leader's responsibilities was to review and approve the plans at issue.

e. Prior to the 2016 construction, the NiSource Field Engineer who prepared the construction plans spoke with the Lawrence System Operations Supervisor overseeing M&R in Lawrence about the project design and the Winthrop regulator station sensing lines.[9]

f. In 2016 and throughout this project, sensing line location information was readily available to Engineering, Construction, and M&R through multiple documentary and departmental resources in the Lawrence Operations Center. The 2016 Inspector and Construction Leader on the South Union Street Project used these materials to determine the location of the sensing lines. M&R technicians also had sensing line location information available in the M&R Regulator Books in their vehicles.

Sources of Sensing line Information		
Document or Source of Information	**Location**	**Description**
Critical Valve Book	Lawrence Operations Center	Identifies the location of critical valves in relation to other system components, including regulator stations and sensing lines where applicable.
Work Done Files	Lawrence Operations Center	Compilation by town and street of records and as-built sketches of work done on system, including sensing line installations, replacements, and relocations.
Historical Maps	Lawrence Operations Center	System maps pre-dating implementation of GIS. Certain historical maps include sensing line locations.

[8] When the engineer prepared the plans at issue, he had successfully completed training concerning regulator station design, regulator upstream and downstream piping, regulator sensing pressures, regulator vent lines, and regulator pressure ratings. That training also included the importance of pressure regulation, the way sensing lines help regulate pressure, and the hazards of inoperable regulators/sensing lines.

[9] Field Engineer completed "To Do" list.

Sources of Sensing line Information		
Document or Source of Information	**Location**	**Description**
Capital Close Out Files	Lawrence Operations Center	As-built drawings and other project documentation from inspector work order packets for capital projects, including as-built drawings of project sensing line installations, replacements, relocations.
WMS Docs	WMS Docs Database	Electronic version of Capital Close Out files, including as-built drawings of project sensing line installations, replacements, relocations.
Measurement & Regulation Regulator Books	Measurement & Regulation Technician Vehicles	Books maintained for reference by M&R in the field. The Books contain diagrams depicting the piping configuration around regulator stations, including the location of sensing lines.

g. During the 2016 construction phase, the construction crew, Construction Foreman, Construction Leader, Inspector, and Systems Operations Supervisor all knew that the sensing lines would eventually need to be moved to the new plastic main, and planned to do so. The Construction Leader notified M&R in October 2016 regarding the planned relocation of the sensing lines.[10]

h. In October 2016, the City of Lawrence imposed an unexpected 30-day stop-work order. Once the stop-work order was lifted, CMA was able to perform only limited work on limited projects in November 2016 before the City's winter moratorium went into effect. The City unexpectedly maintained its work moratorium on the South Union Street Project throughout 2017. Work on the project was permitted to resume in 2018.

i. There was a nearly complete turnover in project personnel by the time work resumed on the South Union Street Project in May 2018. Although the 2018 construction personnel had ready access to information about the status and location of the sensing lines, that information was not reviewed.

j. CMA's transfer of information about the project sensing lines from its 2016 construction personnel to the 2018 construction personnel was ineffective.

The Over-Pressurization

k. On September 13, 2018, CMA tied-in the Salem Street main to the new 8-inch plastic main. Salem Street was the last remaining side street that was to be tied-in to the new plastic main. This work took place eight blocks (approximately 2,350 feet) north of the Winthrop regulator station. Pressure gauges had been installed and used at the location of the tie-in. Personnel in the field (the Inspector and construction crew) monitored and verified the pressure at the work site using those gauges as the tie-in work was ongoing.

l. Once Salem Street was tied-in to the plastic main, the cast-iron main was disconnected from the distribution system and began to lose pressure. Because the sensing lines for the Winthrop regulator station were still attached to the cast-iron main, they sensed its drop in pressure, and the

[10] On October 17, 2016, the Construction Leader e-mailed the supervisor of M&R in Lawrence about this, who did not inform his successor of the work that needed to be done.

regulators to which they were attached responded as designed by opening, which increased the flow of gas into the distribution system. This resulted in an over-pressurization.

m. NiSource Gas Systems Control's remote monitoring of the distribution system pressure generated high-pressure alarms at 4:04 p.m. and 4:05 p.m. The controller at NiSource Gas Systems Control promptly responded to the alarms and called the on-call technician at 4:06 p.m. That technician immediately notified all Lawrence M&R technicians, who then immediately moved to perform field checks on the affected distribution system's 14 regulator stations to identify and shut down any station that was continuing to feed the system.

n. CMA responded immediately to the over-pressurization, including shutting down the Winthrop regulator station within 25 minutes of being notified, shutting down the entire system by 7:17 p.m., working quickly to shut down meters at businesses and residences, assisting emergency responders with evacuations, and initiating venting of the system to reduce pressure.

M&R Practices & Policies

o. NiSource 2015 Operational Notice 15-05 requires M&R personnel be consulted on all excavation work that is done within 25 feet of a regulator station with sensing lines. In this instance, excavation and construction work was being done, but approximately 2,350 feet from the regulator station at issue.

p. The NTSB's Safety Recommendation Report: Natural Gas Distribution System Project Development and Review (Urgent) (Report PSR1802 issued November 15, 2018) referenced a purported past policy or practice that NiSource allegedly phased out whereby M&R personnel stood by a regulator station whenever construction took place on its gas mains. Continued investigation revealed that no such a policy or practice existed, except as outlined by NiSource Operational Notice 15-05.[11]

The Low-Pressure Gas System

q. CMA's distribution system has pressure-relieving and/or pressure-limiting devices. CMA maintains at least two regulators (worker and a monitor), each with its own sensing lines, at each of its regulators stations. The monitor regulator serves as the over-pressurization protection should the worker regulator fail.

r. The regulator station design deployed at the Winthrop regulator station is widely used and accepted across the industry, meeting the design criteria described in applicable regulations.

s. The regulators at each regulator station are not the only aspect of the system designed to control and reduce the impact of an over-pressurization. Shut-off valves and remote monitoring of pressure levels are part of the design to mitigate accidental over-pressurization.

t. Following the incident, NiSource added the geometry of over 2,000 sensing lines to GIS across its seven-state operating area. Engineers and technicians can now view sensing line geometry from several electronic platforms.

NiSource Professional Career Development & Training for Engineers

u. NiSource has a comprehensive, multi-year career development program for Field Engineers. This program includes classroom and hands-on training in the design of main line replacement projects and the operation and function of regulators, regulator sensing lines and regulator stations.

[11] NiSource provided sworn affidavits from 18 Construction and M&R personnel in each of NiSource's three operational locations in Massachusetts attesting that no such policy or practice ever existed.

v. Field engineer advancement criteria are grouped into approximately 45 individual elements. The overall program is designed to progress an engineer from Associate Field Engineer 1 and 2, to Field Engineer to the Senior level with intermediate milestones and requirements for each level. For advancement to Field Engineer or Senior Field Engineer, the Director of Engineering (to whom the Manager of Engineering reports) must be involved in the process and sign off on the advancement proposal before it is final. The program encourages engineers to obtain Professional Engineer certifications.

NiSource Construction & Field Employee Training

w. NiSource's company-wide training program for field employees (including Inspectors and Construction Crews) focuses on hands-on training, and covers all aspects of the job (from paperwork and customer interactions to safety requirements, environmental standards, and technical skills). This training is designed not just to prepare employees to pass their Operator Qualifications (OQs), but to understand the larger picture and what goes into their job.

x. The program begins with a three-week onboarding program that includes elements on culture, process, safety/OSHA, driving, and the minimal qualifications an employee needs to work in the field, such as safe use of basic field tools and equipment, customer interactions, setting up a work zone, assisting with line locating, using the one-call system, identifying Abnormal Operating Conditions, and using the mobile data terminal (MDT).

y. Once new field employees have completed onboarding, they take a three-week course titled Plant Basic. Employees learn how to use tools in the truck for service lines; safely excavate for service line installation, repair, or abandonment; join plastic pipes; identify and repair service line leaks; pressure test service lines; perform purging; and install, repair, and replace service lines. After Plant Basic, the on-the-job training (OJT) portion of an employee's training begins. Each employee is assigned an "OJT coach" who monitors their progress. When the OJT coach believes the employee is ready, s/he is scheduled to take the OQ tasks necessary to perform his/her job. Once the OQs are passed, the individual is released to the field to perform the work he or she has been trained to perform.

z. The third phase of training begins with Plant 1, another three-week course designed to instruct employees on what is required to lead a crew on service line work. Plant 1 is intended to round out the skills and knowledge required to lead service and maintenance crews and respond to dig-ins where some main line work is required. The subjects of this phase of training include leak repair and leak investigation; purging; installing a temporary bypass; tapping; and the capital work order process.

Emergency Response Training

aa. As part of NiSource's continued efforts to enhance its training programs, NiSource has built four new training centers since 2016, including a training center in Massachusetts, which opened in 2018. These training centers have significant capabilities for training on emergency response, which build on NiSource's existing emergency response training. These training centers include an outdoor "Emergency Response Safety Town" – a mock neighborhood of mini-homes and businesses complete with underground utilities, meters, and regulators where instructors can create and control various emergency training scenarios, including natural gas leak simulations. Instructors use this area to teach other critical skills, including line locating and marking; leak detection and corrosion monitoring; and re-establishing gas service. These centers can create approximately 50 separate gas leak scenarios to provide unique training experiences. New employees joining the service department will spend a full week practicing emergency response individually and as a team to build confidence and competence in emergency response. NiSource

is working to further enhance training offered at the training centers based on recent experiences, including the incident.

bb. While natural gas-related fires are rare, they require specialized training and coordination with first responders and other community partners. NiSource's fire school allows NiSource employees and local first responders to work together to gain valuable experience while safely approaching and extinguishing a broad range of gas-related fires. NiSource offers safety response training to local emergency responders free of charge.

CMA's Distribution Integrity Management Program

cc. NiSource companies, including CMA, have developed a comprehensive Distribution Integrity Management Program (DIMP) that enhances pipeline safety by systematically identifying and reducing risks to its gas distribution systems. A central DIMP administration team facilitates the development of DIMP plans for each NiSource gas distribution company, each of which has its own DIMP steering team made up of local subject matter experts.

dd. The threat identification process of CMA's DIMP assesses not only the general threat categories required by regulation, but also dozens of sub-categories specific to CMA's distribution systems and operating conditions. To identify potential threats, CMA considers information from various sources, including personnel in the field, other NiSource operating companies, peer companies, industry associations, PHMSA Advisory Bulletins, and NTSB Reports and Recommendations.

ee. CMA's DIMP evaluates risk at a system- and segment-level. To reduce known risks, CMA's DIMP implements processes such as leak management, damage prevention, public awareness and education, operator qualification and training, internal audits, inspections and monitoring of facilities, quality assurance/quality control, and replacement of leak-prone infrastructure. These programs also have led to the implementation of risk reduction practices beyond those required by regulation, such as conducting annual leak surveys of all distribution mains. To confirm that risk is being removed, CMA also routinely collects and evaluates data that reflect the current performance of its distribution system.

ff. While federal regulations call for DIMP plans to be re-evaluated at least every five years, CMA's DIMP plan is updated annually. The NiSource DIMP administration team meets regularly (generally monthly) with CMA's DIMP Coordinator to track the progress of ongoing risk-reduction efforts, and conducts a separate quarterly meeting to discuss initiatives to identify and study potential threats. This culminates in an annual meeting between the NiSource DIMP administration team and CMA's DIMP Steering Team to review and update CMA's DIMP.

gg. In 2015, the DPU inspected CMA's DIMP plan and found it be in compliance with the regulations and otherwise satisfactory in all regards. In addition, the DPU has specifically found that CMA's GSEP is prioritized to implement the DIMP consistent with the requirements of 49 C.F.R. §§ 192.1001 through 192.1015.

NiSource Safety Management System

hh. NiSource initiated its Safety Management System (SMS) process in 2015. This process is modeled after the American Petroleum Institute's 2015 Recommended Practice 1173. NiSource was one of only 12 companies to publicly commit to implement SMS by participating with the industry's lead trade group, the American Gas Association, on a best-practice and information-sharing pilot group.

ii. In 2016, NiSource established its SMS pilot program at Columbia Gas of Virginia. In 2018 (prior to the incident), NiSource adopted a staggered implementation plan for SMS across NiSource's seven operating companies.

jj. Following the incident, NiSource accelerated implementation of SMS across all operating companies in its gas segment. In late 2018, NiSource expanded the leadership team overseeing the implementation of SMS and established a significant operation that includes multiple workstreams staffed by employees and consultants dedicated to the implementation of SMS.

kk. NiSource has established cross-functional teams to evaluate, prioritize, and elevate state-level risks. The state teams include two newly-created positions in each of the seven states in which NiSource operates: a Director of Safety, Compliance, and Risk, and a Safety Management System Lead. The Director role in each state reports to the state president and chief operating officer, and is accountable for employee safety, pipeline safety and compliance, SMS program leadership, and overall risk management at the state level. The Lead position deploys and leads SMS processes in their state by driving performance improvement around public and employee safety and advancing state level SMS continuous improvement.

ll. NiSource has established a Quality Review Board, an independent body that provides oversight and governance of NiSource's implementation of SMS across its seven-state footprint. Chaired by Former United States Secretary of Transportation and Congressman Ray LaHood, the Quality Review Board is comprised of experts with diverse backgrounds spanning the nuclear, aviation, and energy industries.

NiSource Safety Culture

mm. NiSource has provided training to employees and leaders to educate, promote and foster a "Just Culture" approach to managing unwanted outcomes. This approach builds the organizational trust needed to proactively identify and mitigate risk, while creating a learning environment where the Company learns from near misses and safety incidents.

nn. NiSource partners with the National Safety Council (NSC) to improve NiSource's year-over-year safety culture, process, and management systems through NSC's Safety Barometer Survey. The Barometer Survey is a 50-question employee perception survey that focuses on a variety of safety and work-related statements. Over time, NiSource has modified the Survey to include additional questions that are specifically focused on employees who handle gas distribution and gas transmission. NiSource's responses are compared with the responses from the 820 participating organizations in the NSC database to produce comparative percentile values.

oo. NiSource surveys all employees across its seven-state operating areas every year and uses the survey results to establish local, state, and corporate level improvement action plans. NiSource has seen annual improvement in these surveys, and, in the latest Survey, achieved scores higher than 91% of the companies in the NSC peer group.

pp. NiSource has an Executive Safety Council chaired by its CEO and comprised of executive leaders. The purpose of the NiSource Executive Safety Council is to establish NiSource as an industry leader in safety through continued learning, support, strategy development, program performance reviews, predictive data analysis, reinforcement of leadership safety actions, and demonstrated safety engagement (internal and external).

10. Probable Cause

As CMA advised the NTSB in the immediate aftermath of the event, the probable cause of the September 13, 2018 over-pressurization was the failure to move the worker and monitor regulator sensing lines from a natural gas cast-iron main that was being abandoned to a new plastic main that had been installed to replace the cast-iron main.

Contributing to the cause of this incident were several factors:

- The project work order package did not explicitly address sensing line locations or their relocation.
- The City of Lawrence issued a stop work order in 2016 and denied CMA a work permit to resume work in 2017. This resulted in an unprecedented suspension of project work and complicated project execution. When the project was permitted to resume one-and-a-half years later, in 2018, there had been a nearly complete turnover in project personnel.
- CMA's 2016 construction personnel knew the location of the sensing lines and that they needed to be relocated before the cast-iron main was abandoned. Although the 2018 project personnel had ready access to information about the status and location of the sensing lines, that information was not reviewed.
- CMA did not effectively transfer the knowledge its 2016 construction personnel had about the status of the project sensing lines to its 2018 construction personnel.[12]

[12] The NTSB Urgent Safety Recommendations addressed in Section 11 of this submission each bear on effective transfer of knowledge of such information (sensing lines in GIS; gas main modification procedures and safeguards; constructability review improvements and professional engineer design review and sealing; and, management of change risk assessments and methodologies). NiSource's accelerated adoption of the Safety Management System addressed by API RP 1173 will also address effective transfer of knowledge of such information.

11. NiSource's Adoption of NTSB Urgent Safety Recommendations

On November 14, 2018, the NTSB published its Safety Recommendation Report detailing the ongoing investigation and identifying four urgent safety recommendations addressed to NiSource. Since the incident and the NTSB's November 14 report, NiSource has been focused and working diligently on aligning business practices and enhancing procedures to adhere to these safety recommendations.

NiSource submitted a response to the four urgent safety recommendations on December 14, 2018, in which the company defined the proposed actions to comply with each of the NTSB's four urgent safety recommendations. This response was deemed acceptable by the NTSB on February 19, 2019. Since then, NiSource has provided regular updates to the NTSB, sharing the status of activities related to the urgent safety recommendations. NiSource has substantially completed its implementation of these recommendations.

P-18-007 Records & Document Traceability, Reliability & Completeness: Review and ensure that all records and documentation of your natural gas systems are traceable, reliable, and complete.

NiSource has completed locating, marking, and mapping sensing lines at all 2,072 low-pressure regulator runs across its seven-state footprint. These facilities are depicted in isometric drawings, examples of which were provided to the NTSB during a meeting on April 18, and are visible in the NiSource geographic information system (GIS).

NiSource worked with third-party gas engineering firm to verify the assets required to safely operate its low-pressure gas systems and ensure these assets are clearly indicated on relevant maps and records. The review of critical assets concluded that NiSource maps include visual records with attributes of facilities required to operate the low-pressure systems including but not limited to pipes, valves, and pressure regulating stations. The review focused closely on the existence and quality of updated station drawings showing sensing lines. This review concluded that those station schematics are traceable, reliable, and complete.

Above and beyond the scope of this urgent recommendation, and as part of business planning and overall SMS implementation, NiSource is prioritizing the mapping of sensing lines on the remaining elevated pressure stations across its seven-state footprint.

P-18-009 Control Procedures During Gas Main Modifications: Develop and implement control procedures during modifications to gas mains to mitigate the risks identified during management of change operations. Gas main pressures should be continually monitored during these modifications and assets should be placed at critical locations to immediately shut down the system if abnormal operations are detected.

NiSource has enhanced its tie-in and tapping procedures, including updates to Gas Standard 1680.010 Tie-Ins and Tapping Pressurized Pipelines, effective February 28, 2019, and the written tie-in plan template, which is required for all mainline projects. The updates include:

- New tie-in procedure risk assessments, completed through checklists requiring key stakeholder engagement and reviews of the tie-in plan by Engineering, the project execution crew, and Measurement & Regulation.
- A new contingency plan that provides field crews the system knowledge required to perform emergency shut down of the impacted pipeline segments in the event of a hazardous situation.
- Identification of regulator stations impacted by the tie-in procedure and monitoring requirements.
- Enhanced station monitoring requirements for identified management of change activities.
- Clear roles and responsibilities for tasks during the tie-in procedure.

- Sign-off at each significant step of the tie-in procedure signifying completion of steps by the "person in charge."
- Documentation of pressure gauge readings during the procedure.

NiSource has promulgated enhanced procedures encompassing these updates and trained appropriate Engineering, Construction, and Operations personnel on these procedures. The Gas Standard and written tie-in plan template provide strength in management of change procedures with respect to changes in the control of energy.

In addition to the enhanced procedures set forth in this recommendation, NiSource continues to install automatic shutoff and pressure control devices on low-pressure systems across its footprint, as described in Section 4 above. This project also includes installing remote monitoring devices on its low-pressure systems (to the extent not already installed) to ensure quick response to abnormal system conditions.

P-18-006 Engineering Plan & Constructability Review Process: Revise the engineering plan and constructability review process across all of your subsidiaries to ensure that all applicable departments review construction documents for accuracy, completeness, and correctness, and that the documents or plans be sealed by a professional engineer prior to commencing work.

NiSource has developed a comprehensive procedure for stakeholder review of capital projects. The procedure includes an enhanced Constructability Review process that assists the project engineer with identifying the stakeholders required to participate in the review and to otherwise be consulted during project planning. This procedure has undergone a management of change process for review and edits and has received final approval.

Additionally, as stated in the NiSource response to P-18-009, the written tie-in plan template has been enhanced to include multiple briefings where critical stakeholders including Engineering, the project execution crew, and Measurement & Regulation review the tie-in plan for risks and accuracy.

All relevant construction documents and plans for construction work for complex projects are being sealed by a professional engineer prior to commencing construction work.

P-18-008 Management of Change Process: Apply management of change process to all changes to adequately identify system threats that could result in a common mode failure.

NiSource has undertaken efforts focused on improving risk identification, analysis, and mitigation across the organization.

A critical management of change procedure was developed and implemented through the enhanced Gas Standard 1680.010 and written tie-in plan template as described with respect to P-18-009.

As discussed in Section 7, NiSource also continues to develop and implement SMS, including NiSource enterprise-wide management of change governance documentation.

12. Additional Recommendations

1. NiSource recommends that the safety of low-pressure gas distribution systems be enhanced beyond existing code requirements and industry-standard working and monitor regulator pressure control designs by adding another level of over-pressure protection. Considerations in evaluating the required added level of over-pressure protection should include the capability to (1) automatically shut down the flow of gas, (2) automatically fully relieve pressure by the venting of gas, and (3) conduct remote system monitoring.
2. NiSource recommends industry adoption of the American Petroleum Institute's Recommended Practice 1173, Pipeline Safety Management Systems, and an industry-adopted standard for program auditing and certification. As part of this recommendation, NiSource recommends that management of change processes be used to prepare and implement a set of energy control and knowledge transfer procedures to use when performing configuration control operations on gas systems that have the potential to create over pressure situations. Additionally, NiSource recommends the integration of the Distribution Integrity Management Program (DIMP) and the Transmission Integrity Management Program (TIMP) in a single, over-arching risk analysis, risk prioritization, and risk remediation and elimination process.
3. Consistent with the recommendations of the Department of Transportation's Voluntary Information-Sharing System Recommendation Report of April 2019, NiSource recommends that the industry, in partnership with state and federal regulators, develop incentives for the voluntary sharing of information regarding near-miss events, unintentional compliance violations, and quantified risk-register items. The standards for the reporting of this information must assure both the security of the information provided and non-punitive responses, in order to effectively incentivize industry members to share information voluntarily with their fellow members and their regulators. This information-sharing protocol would align with best practices in other energy sectors.
4. NiSource recommends the adoption of the national incident command system for response to gas-related emergencies, to assure optimal coordination with first responders and local, state, and federal regulators and officials. NiSource further recommends that training in the workings of the national incident command system be required for all participants, and that frequent exercises be conducted, to verify the participants' knowledge and the effectiveness of the overall process.
5. NiSource recommends that all gas system operators make available their Emergency Response Plan to requesting emergency response and government entities and that each gas system operator's Emergency Response Plan include:
    a. Details on incident management, including an incident command system structure and methodology;
    b. Details on activating the emergency response system;
    c. Description of communication protocols following the declaration of an Emergency Event under the Plan;
    d. Description of the training required to inform employees of their respective roles under the incident command system.