CASCADE NATURAL GAS CORPORATION
A Subsidiary of MDU Resources Group, Inc.

8113 W. GRANDRIDGE BLVD., KENNEWICK, WASHINGTON 99336-7166
TELEPHONE 509-734-4500 FACSIMILE 509-737-9803
www.cngc.com

Date: December 14, 2017

Subject: API 1173 Gap Analysis Report

Sender: Christopher Grissom, Manager Standards and Compliance
Cascade Natural Gas Corporation

Mailing Address: 8113 W. Grandridge Blvd., Kennewick WA 99336-7166

Phone Number: (509) 531-6427

Email Address: christopher.grissom@cngc.com

Identification of Proceeding: PG-150120

Identification of Documents: 150120-CNG-LTR-API-1173-GAP-12-14-17

CASCADE NATURAL GAS CORPORATION
A Subsidiary of MDU Resources Group, Inc.

8113 W. GRANDRIDGE BLVD., KENNEWICK, WASHINGTON 99336-7166
TELEPHONE 509-734-4500 FACSIMILE 509-737-9803
www.cngc.com

December 14, 2017

Sean Mayo - Pipeline Safety Director
State of Washington Utilities and Transportation Commission
1300 S. Evergreen Park Dr. SW
P.O. Box 47250
Olympia, WA 98504-7250

Subject: Settlement Agreement PG-150120 Stipulation #7 – API 1173 Gap Analysis

Dear Mr. Mayo,

This submission is intended to comply with Section V(B)(7) of the Settlement Agreement approved in Docket PG-150120.

Jacobs Consultancy (Jacobs) completed the required third-party audit to determine baseline variance from the standards set forth in American Petroleum Institute Recommended Practice 1173, Pipeline Safety Management Systems. In summary, the audit comprehensively combined document review, personal interviews, direct field-work observations, and an employee survey which resulted in twenty-four (24) forward-looking recommendations intended to address identified gaps. All field work observed was noted to be "performed in compliance with code and in conformance with company and industry practices." A copy of the consultant's report is included with this letter.

As noted, although the report is very comprehensive, it was conducted over a period of just a few months. In that regard, there are subjective observations or characterizations in the report preceded by statements such as, "Cascade was found to lack…". It is left to the reader to interpret whether these statements mean there are no mechanisms or practices in place associated with these functional areas, or rather that the existing mechanisms or practices are deficient. While we recognize that gaps and deficiencies exist in our current operations that must be improved, we would disagree with an interpretation or observation that there were no mechanisms or practices in place associated with most or all of these functional areas. Importantly, we acknowledge the themes of deficiencies identified in the report, and recognize the significant opportunity the recommendations provide us in the development of a safety management system. We also echo Staff's statements in Docket PG-150120 – Narrative Supporting Settlement Agreement acknowledging this effort represents a preliminary step as we work toward improving our safety culture and that this is a continuous journey, not a discrete project or program.

The first principle of RP 1173 is the commitment, leadership, and oversight of top management for the success of a pipeline safety management system. As such, myself and the other Officers of our organization have made the commitment that we will align our operations with the standards of API Recommended Practice 1173. With this preliminary step complete, our next step is identifying the proper organizational framework to ensure success in this continuous improvement effort.

We will continue to provide an update on Section V(B)(8) of the Settlement Agreement at each 6-month interval.

If you have any questions, please do not hesitate to contact me directly.

Respectfully Submitted,

/s/ Eric Martuscelli
Eric Martuscelli
Vice President, Operations
Cascade Natural Gas Corporation
8113 W. Grandridge Blvd.
Kennewick, WA 99336-7166
eric.martuscelli@cngc.com

Enclosure: Jacobs Consultancy API 1173 Gap Analysis Report

JACOBS® Consultancy

Pipeline Safety Management System
Cascade Natural Gas Company
Gap Analysis

MDU Resources Group, Inc.

Prepared By

Christopher A Pioli, Study Manager and Principal Consultant

Lindsay D Robson, Principal Consultant

November 6, 2017 | Final

JACOBS Consultancy

Study No:	61TL0600
Document Title:	CNGC Pipeline Safety Management System Gap Analysis
Client Name:	MDU Resources Group, Inc.
Revision:	1
Date:	September 21, 2017
Study Manager:	Christopher A Pioli
Approved by:	Christopher A Pioli

Jacobs Consultancy Inc.
5995 Rogerdale Road
Houston, Texas 77072
United States
www.jacobsconsultancy.com
inquiries@jacobsconsultancy.com

Document History and Status

Revision	Date	Description	By	Reviewed	Approved
1	9.21.17	Draft Final Report	CAP		CAP
2	11.6.17	Final Report	CAP	CAP	LDR

Contents

Table of Figures

Executive Summary

In 2006, Montana-Dakota Utilities Resources Group, Inc. (MDU Group) acquired Cascade Natural Gas Corporation (CNGC). CNGC has a diverse service territory, covering more than 32,000 square miles and 700 highway miles from one end of the system to the other. The system includes 180 miles of gas transmission pipelines, 5,187 miles of gas distribution mains, and 211,591 service lines in Washington; and 36 miles of gas transmission pipelines, 1,576 miles of gas distribution mains, and 69,599 service lines in Oregon. CNGC's 350 employees serve 282,000 customers from three operating regions and twelve District Offices across its service area.

On July 12, 2016, the Washington Utilities and Transportation Commission (WUTC) initiated an adjudication against CNGC based upon the formal complaint filed by the Commission's regulatory staff. The complaint alleged that CNGC violated Order 01 in Docket PG-150120[1] when CNGC failed to file its maximum allowable operating pressure (MAOP) compliance plan by August 12, 2015. CNGC and WUTC Staff filed a Settlement Agreement on December 15, 2016, that purportedly resolved all of the issues in the Docket PG-150120 proceeding. On March 20, 2017, in Order 03, the Commission approved that Settlement with conditions. The Settlement conditions included CNGC submission to a third party audit report to determine baseline variance from the standards set forth by the American Petroleum Institute (API) Recommended Practice 1173, Pipeline Safety Management Systems (PSMS). MDU Group contracted with Jacobs Consultancy Inc. (Jacobs Consultancy) to perform an API RP 1173 Pipeline Safety Management System Gap Analysis of CNGC.

Pipeline Safety Management is about identifying, evaluating, and managing utility risks to ensure the risks identified are managed to prevent and mitigate threats, and not to just respond to events through remediation and repair actions.

This is validated through Quality Control and Quality Assurance to ensure preventive and mitigation procedures are in effect and are being followed, and consistent and continual performance evaluation of KPIs driving the performance is delivered by analyzing and trending electronic real-time data in a dashboard format.

To achieve this the operator needs, as key essential elements: leadership and management commitment; competent, aware, and trained people at all levels; consistent operational controls; a structure and willingness to learn from experiences and, as a result, continually improve processes and procedures, all of which are clear, usable, and documented.

[1] On February 2, 2015, WUTC Staff and CNGC executed a Stipulated Agreement under which the Company agreed to "submit to the Commission a written plan that Cascade intends to implement for the purpose of determining the MAOP of all its high pressure pipelines in Washington for which there is insufficient documentation to confirm the current MAOP." The Commission approved the Stipulated Agreement on February 12, 2015, in Docket PG-150120, Order 1. Pursuant to Order 01, CNGC was required to submit its MAOP compliance plan by August 12, 2015.

During this PSMS Gap Analysis audit, Jacobs Consultancy requested and received over 245 documents, and conducted 48 interviews with individuals having management and supervisory responsibilities for various aspects of PSMS, as well as staff and field personnel from the General Office and 12 District Offices across all three Regions. To further support information gained from interviews and data analysis, Jacobs Consultancy observed various field construction, operations, and maintenance work activities performed by company personnel and contractors in 8 of 12 CNGC Districts, and developed and administered an employee survey. During our field work, the activities observed were performed in compliance with code and in conformance with company and industry practices.

Based on interviews, document reviews, findings, survey results, and observations, Jacobs Consultancy sees the most significant gaps in the following PSMS Elements: Leadership/Management Commitment; Risk Management; Competency/Awareness/Training; Safety Assurance; and Management Review/Continuous Improvement. In Jacobs Consultancy's opinion, the ten most individually significant gaps are as follows:

Cascade was found to lack:

1. A strategic plan for pipeline safety to establish a proactive, forward-looking organization seeking to prevent and mitigate risk.
2. An internal communication plan to ensure understanding and effective two-way communication on pipeline safety management.
3. A risk management plan and risk register for pipeline safety.
4. Effective training for management specifically on understanding and evaluating risk and on managing to prevent and mitigate risk.
5. A strategic vision or detailed plan for training.
6. A process or procedure to train-the-trainer for directors, managers, and employees whose responsibilities including training others.
7. A structure or plan to implement CP799 (Quality Control), and while there is a serious effort at the quality assurance of documents, there is insufficient QA of work in the field.
8. A strategic utility IT plan and electronic data in an integrated, accessible, analyzable, and trendable format that allows management to understand and manage pipeline safety risks, and allows top management to be able to trend and improve pipeline safety responses.
9. Any form of dashboard showing key performance indicators, trends, and targets associated with the prevention and mitigation of risk and operational control measures through which Management can manage pipeline safety, as they do for personal safety.

10. A policy whereby investigations and subsequent lessons to be learned are universally or systemically shared across districts and the MDU Group.

This report contains 24 forward-looking recommendations to address gaps in CNGC's pipeline safety culture and management systems. These recommendations can be implemented independently of or as part of Montana-Dakota Utilities Group's initiative to implement PSMS. Below are 10 significant recommendations, in no specific order of importance.

1. Create and document a strategic plan for pipeline safety to establish a proactive, forward-looking organization seeking to prevent and mitigate risk.
2. Develop training for management specifically on understanding and evaluating risk and on managing to prevent and mitigate risk.
3. Include in each Company Procedure "why" it is necessary in terms of the threats (hazards) and consequences that will be prevented or mitigated, and the associated benefits.
4. Develop Company Procedures for Gas Emergency Crisis Plan to address escalating and cascading emergencies; Post Emergency Response to address activities not associated with "make safe" or repairs that include but are not limited to removal of failure, preservation of evidence, chain of custody, and corporate risk management; and Incident Command Structure to provide guidance and training.
5. Develop and document a Stakeholder Outreach Plan which encourages two-way internal communication of pipeline safety issues strengthens pipeline safety culture, as does, more importantly, the communication and sharing of how lessons learned were applied.
6. Develop and implement a strategic vision and plan for training.
7. Develop a quality assurance process to assure that all post incident investigations, evaluations and lessons learned are completed and shared with other Districts and the General Office (GO) in a timely manner.
8. Separate the activities of Quality Assurance and Quality Control, not necessarily organizationally/functionally; expand Quality Assurance to construction, operations, and maintenance activities, not just records; and require contractors to contractually provide resources and to be responsible for quality control.
9. Develop a dashboard of key performance indicators, trends, and targets associated with the prevention and mitigation of risk and operational control measure.
10. Develop and document a process for conducting management reviews and for continuous improvement.

Some of these recommendations could be implemented independently of MDU Utilities Group's initiative to implement PSMS; however, this would not be advisable.

The body of this report consists of the following sections:

Section 1 — Introduction

Provides a brief description of CNGC, the genesis for this audit, and the scope of the audit.

Section 2 — Approach and Timing

Describes how the audit was conducted.

Section 3 — Pipeline Safety Management Systems

Presents the foundational and operational elements of a PSMS.

Section 4 — PSMS Gap Analysis

Presents for each PSMS element the significance of the element, the CNGC current state, gap assessment, and Jacobs Consultancy's conclusions.

Section 5 — Field Validation Review

Presents key findings and conclusions associated with observed activities.

Section 6 — Recommendations

Presents prospective recommendations and the supporting conclusions from the gap analysis.

The Appendix contains a copy of the PSMS Survey Questions, Survey Results, and the Field Validation Review Summary.

1. Introduction

1.1 Cascade Natural Gas Corporation

Incorporated in 1953, Cascade Natural Gas Corporation (CNGC) began acquiring small manufactured gas plants and propane and butane air systems, and by the end of 1956, turned on the gas in 21 communities. In 2006, Montana-Dakota Utilities Resources Group, Inc. (MDU Group) acquired CNGC.

Today, CNGC, headquartered in Kennewick, WA, is the natural gas provider for more than 282,000 customers in 68 communities in Washington and 28 communities in Oregon. CNGC's 350 employees serve customers from three operating regions, comprised of twelve District Offices (see Figure 1):

- Northwest – Aberdeen, Bellingham, Bremerton, Longview, and Mt. Vernon
- Central – Kennewick, Walla Walla, Wenatchee, and Yakima
- Southern – Bend, Ontario, and Pendleton

Figure 1 – CNGC Service Area Map

CNGC's service territory is geographically diverse, covering more than 32,000 square miles and 700 highway miles from one end of the system to the other. The operating environments differ

greatly, with average annual precipitation of over 140 inches in the northwest and less than 20 inches on the eastern side of Washington.

CNGC transmission pipelines are located in 4 Washington Counties and 2 Oregon Counties. Local gas distribution facilities are located in 17 Washington Counties and 8 Oregon Counties (see Figure 2). Many of the gas communities and associated gas distribution system receive gas from only one pipeline. The network of pipes ranges in size from 1/2" to 20" in diameter and operating from 1/4 to 720 pounds per square inch (psi).

Figure 2 – CNGC Counties of Operation

As shown in Figure 3, in Washington, CNGC operates 180 miles of steel gas transmission pipelines, 5,187 miles of gas distribution mains (of which 59% are steel, and 41% are plastic), and 211,591 service lines (of which 52% are steel, and 48% are plastic).

In Oregon, CNGC operates 36 miles of steel gas transmission pipelines, 1,576 miles of gas distribution mains (of which 51% are steel, and 49% are plastic), and 69,599 service lines (of which 42% are steel, and 58% are plastic).

Figure 3 – Pipeline, Miles, Services and Meters

	WA	OR
Transmission Pipelines, Miles		
Steel	180	36
Distribution Mains, Miles		
Steel	3,049	807
Plastic	2,138	769
Total	5,187	1,576
Service Lines		
Steel	109,402	29,504
Plastic	102,189	40,095
Total	211,591	69,599
Meters		
All	241,189	62,409

1.2 Background

On July 12, 2016, the Washington Utilities and Transportation Commission (WUTC) initiated an adjudication against CNGC based upon the formal complaint filed by the Commission's regulatory staff. The complaint alleged that CNGC violated Order 01 in Docket PG-150120[2] when CNGC failed to file its maximum allowable operating pressure (MAOP) compliance plan by August 12, 2015. On December 15, 2016, CNGC and WUTC staff filed a Settlement Agreement that purported to resolve all of the issues in the proceeding in Docket PG-150120. On March 20, 2017, in Order 03, the Commission approved that Settlement with conditions.

As part of this settlement agreement, specifically Section V(B)(7):

> *"7. CNGC will submit to a third party audit to determine baseline variance from the standards set forth by the American Petroleum Institute (API) Recommended Practice 1173, Pipeline Safety Management Systems (PSMS). Commission Staff will provide input on the selection of the consultant. At a minimum, the audit will review the following company elements:*
>
> *a. Leadership and management commitment*
> *b. Stakeholder engagement*
> *c. Risk management*
> *d. Operational controls*
> *e. Incident investigation, evaluation, and lessons learned*
> *f. Safety assurance*

[2] On February 2,2015, Staff and CNGC executed a Stipulated Agreement under which the Company agreed to "submit to the Commission a written plan that Cascade intends to implement for the purpose of determining the MAOP of all its high pressure pipelines in Washington for which there is insufficient documentation to confirm the current MAOP." The Commission approved the Stipulated Agreement on February 12,2015, in Docket PG-150120, Order 1. Pursuant to Order 01, CNGC was required to submit its MAOP compliance plan by August 12,2015.

g. Management review and continuous improvement
h. Emergency preparedness and response
i. Competence, awareness, and training
j. Documentation and record keeping

Upon completion of the audit, CNGC will submit the consultant's report to the Commission. The third-party audit and written report will be completed by December 31, 2017. The Commission will impose a $500,000 suspended penalty if CNGC fails to submit the consultant's report by December 31, 2017. The results of the third-party audit shall not be the basis for Staff recommendations of additional penalties against CNGC and if the third-party audit identifies violations of code, CNGC shall have a reasonable opportunity to correct such violations."

1.3 Audit Scope

On May 1, 2017, MDU Group retained Jacobs Consultancy Inc. to conduct a Pipeline Safety Management System (PSMS) Gap Analysis comparing the current state of CNGC to that of API RP 1173 – Pipeline Safety Management System Recommended Practices (API 1173). The PSMS gap analysis covered the ten elements of API 1173, shown in Figure 4 below.

Figure 4 – API RP 1173 PSMS Essential Elements

- Leadership & Management Commitment
- Stakeholder Engagement
- Risk Management
- Competence, Awareness, and Training
- Management Review and Continuous Improvement
- Operational Controls
- Incident Investigation, Evaluation, and Lessons Learned
- Safety Assurance
- Emergency Preparedness and Response
- Documentation and Record Keeping

In concert with the CNGC PSMS gap analysis, Jacobs Consultancy conducted a field audit of CNGC in Washington to substantiate what was learned through interviews, document review, and the employee survey. The audit involved the field observations of construction, operations, and maintenance activities. The field functions reviewed and evaluated were aligned with several API RP 1173 PSMS Elements listed in Figure 4, above.

As part of the engagement, Jacobs Consultancy is required to provide the results of the PSMS gap analysis in a written report which CNGC will submit to the WUTC.

The following are not part of the audit scope:

- MDU Group alignment of its operations with the standards of API Recommended Practice 1173, including the development of an implementation road map.
- Any physical assessment by Jacobs Consultancy of pipeline assets, including but not limited to testing, inspection, calculation, or validation or review for defects or deficiencies in the physical assets, systems, or equipment.

2. Approach and Timing

2.1 Approach

Our approach to an audit of this nature involves three stages: (1) Project Initiation, (2) Project Execution, and (3) Project Closeout. The activities and deliverables for each stage are as shown in Figure 5. Our methods provide an in-depth, detailed, evidence-based assessment and understanding of the current policies, processes, and procedures. The outcome provides CNGC and MDU Group with confidence that the gaps are identified and understood, and recommendations achievable.

Figure 5 – PSMS Gap Analysis Audit Stages

Project Initiation / Kick-off	
- Set up a document management site	- Finalize district office visits
- Update project schedule	- Complete an expectation survey
- Provide an initial list of documents	
Project Execution	
- Prepare and conduct a PSMS employee survey	- Review company policies, process, procedures, and programs/plans
- Visit at least four different General/District	- Conduct interviews with senior leadership
- Interview directors, managers, supervisors, and employees	- Visit four CNGC locations in WA in connection with operations audit
- Document current state of pipeline safety management	- Document desired state of pipeline safety management
- Present findings before issuing final utility reports	- Document strengths, weaknesses, and gaps
- Report and document in the operations audit any non-compliances and non-conformances	- Bi-weekly updates and monthly project briefings
Project Close-out	
- Present consolidated findings before issuing the final report	- Submit written PSMS Gap Analysis Report

2.2 Meetings and Field Audit

On May 3, 2017, a kickoff meeting was held to introduce our audit team, discuss the scope of the Study, review the work plan, and discuss other project logistics. Figure 6 provides a list of participants.

Figure 6 – Kickoff Meeting Participants

MDU Group		
- Nicole Kivisto	- Scott Madison	- Eric Martuscelli
- Mike Eutsey	- Josh Sanders	- Lance Elroy
- Patrick Darras	- Hart Gilchrist	- Jay Skabo
- Jim Kaiser	- Robert Peterson	- Linda Murray
Jacobs Consultancy		
- Salvatore Marano	- Christopher Pioli	- Lindsay Robson

Document requests were made in the course of the Gap Analysis. In total, over 245 documents were requested and received.

Between June 12, 2017, and August 11, 2017, we conducted 48 interviews with individuals having management, supervisory and staff responsibilities for various aspects of pipeline safety management systems, as well as three group interviews with field personnel. These interviews included individuals from the following Regions and locations:

- **Northwest** — Bellingham, Mt. Vernon, Bremerton, Aberdeen, and Longview
- **Central** — Sunnyside (Training Center), Wenatchee/Moses Lake, Kennewick, and Yakima areas
- **Southern** — Pendleton, Bend, Ontario, and Baker City

On June 27, 2017, we met with WUTC pipeline safety officials in Olympia, WA, and on August 11, 2017, we held a conference call with an Oregon PUC pipeline safety official.

Between July 17, 2017, and August 4, 2017, we conducted field audit observations in the following Regions and locations, including both construction activities and service functions:

- **Northwest** — Bellingham, Mt. Vernon, Oak Harbor/Anacortes, Bremerton, Aberdeen, and Longview

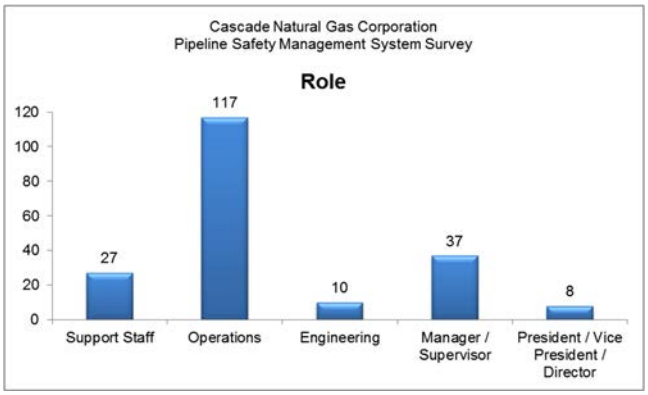
- **Central** — Kennewick, and Yakima
- **Southern** — Pendleton, and Hermiston

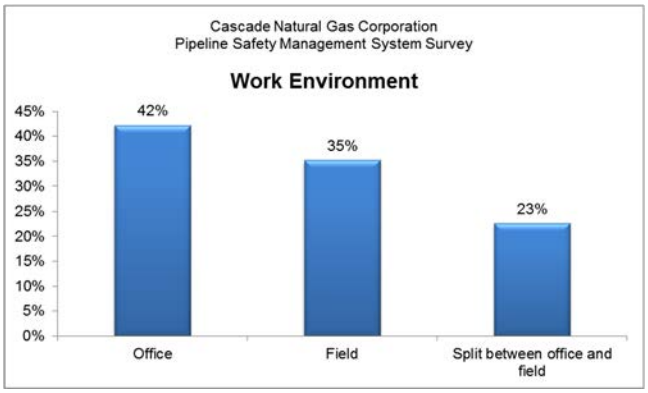
2.3 PSMS Survey

Jacobs Consultancy prepared and hosted a PSMS survey. The survey included 65 questions, covering all ten of the PSMS elements presented in API RP 1173. MDU Group sent an initial email and additional emails to all its employees asking them to complete the survey. The survey was completed on-line, using Jacobs Consultancy's third-party cloud-based service provider to provide anonymity.

A total of 199 CNGC employees responded to the PSMS Survey, which is a response rate of 56.4 percent. Figure 7 provides a breakdown of the number of responses by role and the percentage of responses by the work environment. Appendix A and Appendix B provide a list of the PSMS survey questions and a summary of the survey responses, respectively.

Figure 7 – PSMS Survey Response by Role and Work Environment





2.4 Field Validation Review

Jacobs Consultancy's team has significant operations experience and uses that knowledge and understanding to confirm though field observations the various information it gains from the interview, survey and document review process. To assist in the validation of CNGC's understanding of the PSMS elements, current practices, and subsequent gaps in PSMS, we completed a field review of various field functions and first-hand observances of various field tasks. The period available to conduct the field work limited the types of activities observed.

Figure 8 lists the activities Jacobs Consultancy observed in the field, which were performed by service technicians and construction crews.

Figure 8 – Field Audit Observed Activities

- Atmospheric Corrosion	- Leak Investigation
- Regulator Maintenance (includes odorizers)	- Facility Locations and Markouts
- Contractor Activities	- Meter reads
o Trenchless installation of service lines	- Service Line Replacing
o Installation of mains and service (open trench)	- AC riser replacement
o Directional Drilling of mains	- Scoping Service Relocation
o Butt Fusions (above ground and in trench)	- Valve Inspection
- Payment collection / Turnoff / Meter Removal	- Relocates

Many of the field observations and conclusions align and support the gaps identified from our interviews, survey and document reviews.

Appendix C provides details of the field observations and conclusions.

3. Pipeline Safety Management Systems

Safety Management Systems (SMS) help organizations continuously and comprehensively track and improve their safety performance. Organizations from many industries (e.g., chemical manufacturing, maritime, aviation, nuclear) use SMS to evolve, improve, and support their safety cultures.

In 2015, the pipeline industry completed development of a framework for Pipeline Safety Management Systems (PSMS), API Recommended Practice 1173. The new recommended practice for PSMS was developed in collaboration with the US Pipeline and Hazardous Materials Safety Administration (PHMSA), the US National Transportation Safety Board (NTSB), state regulators, and expert members of the public to help pipeline operators gain the safety benefits of an SMS.

PSMS brings a consistent, formal structure to safety management, ensuring operators incorporate learnings from industry trends, incident findings, and recommendations, regulatory notices and advisories, internal audits and evaluations, and/or changes in operations.

PSMS is more than compliance with Federal and State regulations, or company policies, processes, or procedures. It requires one to look at pipeline safety through multiple lenses, such as prevention and mitigation of risk associated with the loss of a pipeline's structural integrity, to achieving the goal of zero incidents.

- **Pipeline Safety** is the protection of the public, employees, and pipeline against the consequences of:
  - Physical failure (e.g., loss of structural integrity of an asset through which gas flows),
  - Human error,
  - Organizational failure (e.g., failure against some measure of performance, or failure to achieve a goal that is usually expected),
  - Damage,
  - Other undesirable events.
- **Management Systems** are the policies, processes, and procedures used by an organization to ensure that it can fulfill its obligations and meet the needs of customers and other stakeholders while meeting the company vision/mission/values, statutory requirements, and regulatory intent.

Attaining the goal of zero incidents requires learning from experience and pursuing continuous improvement. A tool for continuous improvement is the Plan-Do-Check-Act (PDCA) cycle. This cycle is central to the PSMS holistically, as well as to each of the elements of PSMS (see Figure 4 – API RP 1173 PSMS Essential Elements).

Figure 9 illustrates the three parts of PSMS: Leadership & Management, PDCA Cycle, and PSMS Elements.

Figure 9 – Three Parts of PSMS

Source: American Petroleum Institute

The PSMS with each of its discrete elements supports the safety culture, and that culture feeds back into the management system in a continuous process. The result is a strengthened safety culture and an increasingly mature safety performance improvement focus within the organization.

4. PSMS Gap Analysis

This section presents the results of our PSMS Gap Analysis. The gap analysis assesses each essential PSMS element separately. For each PSMS element, our assessment includes the element's significance, CNGC's current state, the gap assessment, and our conclusions. The gap assessment between CNGC's current state and API RP 1173 is based on information obtained from interviews, documents, field observations, and the PSMS survey responses.

4.1 Leadership and Management Commitment

API RP 1173 divides employees of a pipeline operator into three categories, but identifies them all as **Leaders**.

- **Employees** — Any person who works for the pipeline operator, including contractors, is an employee. Each employee is expected to be a champion for the SMS and lead by example.
- **Management** — Management is any person or group of people who direct and control all or part of a facility, location, department, or other function.
- **Top Management** — Top Management is a person or a group of people (e.g., committee), as defined by the company, who direct and control the organization at the highest level.

4.1.1 Element's Significance

Leadership and Management foster a positive pipeline safety culture when it demonstrates its commitment to pipeline safety improvement, not just through communication but also actions and decision-making. Management's allocation of resources to evaluate and manage risk visibly demonstrates that commitment.

Employees will understand that pipeline safety is valued if they see management in the constant practice of acting on assessments and evaluations, improving plans and processes, allocating resources, and maintaining connections between the objectives of pipeline safety-critical functions and findings.

Trust and openness of Management, and from Leadership, are essential for the success of a Pipeline SMS, and improved pipeline safety performance.

4.1.2 Current State

- Strong commitment to safety as it pertains to personal and public physical safety is demonstrated by top company management, creating a solid safety culture base from which to expand to incorporate pipeline safety.

- Top Management has begun talking about building a shared understanding of pipeline safety culture with employees. Top Management has begun to communicate its commitment to the pursuit of a PSMS to internal stakeholders.
- The company lacks a strategic governance plan to follow, causing Top Management to be reactive, not strategic, in its approach and in its impact. Most of what results are tactical responses to events.
- Top Management has not built a shared understanding or culture about quality and has not implemented the quality control procedure contained in CP799. Management has implemented a quality assurance process to assure the accuracy of compliance documents in CP800, but has not introduced QA processes regarding work performed on the CNGC system, as is required in the scope of CP800.
- Management has documented a process for addressing regulatory and legislative requirements through the Management of Change (MOC) process, though this is a lengthy process with some MOCs still unresolved 2 years after commencing.
- Management has not documented a process for budgeting and resource planning for the organization.
  - The engineering project budget provided was a list of projects containing FP_Numbers, a project name, budget amount covering a two-year period, and brief project explanation (e.g., due to growth, integrity issue, under capacity, relocation).
  - Consideration of the condition, threat, consequence, fiscal assessment, ranking, or grade associated with project risk is not formally documented in a manner that enables others to clearly understand the decision-making process.
- Management has not established nor documented high-level performance measures (KPIs) for pipeline safety.
- Top Management has not developed a procedure for communication within the organization. Most communication is by email which largely leaves it to the recipient to find the time to review. Important elements of the MOC process get caught up in this, to the detriment of the company.

4.1.3 Gap Assessment

- Leadership and Management are not committed to demonstrating through strong systematic methods to all forms of safety, not just personal and public physical safety. Attention needs to be applied just as effectively and loudly to system/pipeline safety. This has begun but needs to be continuous.

- Leaders need to ensure the entire workforce effectively learns from past incidents and approaches current operation from the perspective of preventing and mitigating what might go wrong. This type of mindset enables Employees to have a greater capacity to notice cascading events early on, and to take actions to prevent a catastrophic event.
- Leadership is not demonstrated through a clear vision and strategic direction, combined with plans and actions to establish a systematic approach to all forms of safety. Leaders' focus is just on simple compliance and not on prevention and mitigation of risk.
- Leadership and Management do not act proactively to identify and manage process safety using technology to create and evaluate data to measure, track, and trend performance, and to identify opportunities for improvement. The current approach to technology is piecemeal and tactical. Having systems that do not talk to each other adds stress on field operatives due to repetitive data inputs, and denies Management the data it needs to be able to manage pipeline safety and to be able to track results.
- Management's commitment is not yet evidenced by actions to support the safety vision and to enact and enforce a systematic approach to deliver the SMS.
- Management's commitment does not fully include active support for the development of policies and procedures and effective resourcing of utility needs in staffing, technology, equipment, and tools.
- The company lacks a comprehensive, integrated workforce plan matched to succession plans. A workforce study has not been developed for all levels of the organization. The workforce plan needed is developed from the bottom up to determine consistency and accuracy in numbers of FTEs required for field and management tasks.

4.2 Risk Management

Risk affects every aspect of an organization (see Figure 10). Risk management is a fundamental element of pipeline integrity management programs. The expanse of one's knowledge and understanding of risk management typically is dependent on whether you are an Employee, Management, or Top Management.

Figure 10 – Enterprise Risk Management

4.2.1 Element's Significance

- The practice of pipeline (asset) risk management builds Employee confidence in Management's commitment to safety.
- Risk management, and particularly the thoroughness of the process and the responsiveness to Employee-identified risks, builds their understanding and confidence in Management's commitment to pipeline safety.
- Pipeline risk management is used to understand, evaluate, and reduce threats to a pipeline operator. Preventing and mitigating risks reduces the likelihood and consequences of an incident. As with personal safety, the goal should be zero!
- Risk is managed at all levels in an organization, and an understanding of risk and a plan to manage it is essential to an effective SMS.
  - To be manageable, risks need to be understood by those taking the decisions.
  - Risks arise and are measured against consequences of taking, or not taking, actions, so risks and consequences can arise from someone not keeping track of compliance dates, to someone at some distance denying additional resource.
- Risk management needs integrated electronic data to enable effective and timely Management decisions.
- Risk is also managed and measured by the application of QA/QC programs and data collection via appropriate metrics to validate actions and help determine steps to improvement.

4.2.2 Current State

- Pipeline safety risks are examined only through the application of CNGC's TIMP and DIMP, which are focused on remediation.
- Regulatory-required risks to pipeline safety are identified and managed through compliance.
- The company lacks a risk management procedure. While policy documents provide a mechanism to log changes, there is no similar mechanism like a risk register to address pipeline safety. A risk register is a powerful tool for capturing knowledge and lessons learned.
- Risk is managed by WUTC interventions and Notices of Potential Violations (NOPV). The Commission is being allowed by the company to manage it.
- Compliance risk arising through data accuracy from the Pipeline Inspection Management (PIM) system is managed by quality assurance oversight. Non-Conformance Reports (NCR) are issued to drive corrections. There has been a significant backlog of NCRs that are now getting attention. This is a non-compliance risk.
- Impact assessments are not developed before introducing new or changed procedures or rolling activities out to the districts so that additional stresses may be placed on those directly responsible for pipeline safety.
- Having electronic systems that do not 'talk to each other' adds unnecessary stresses on field staff who have to enter the same information multiple times. This is not what they signed up for and represents an unnecessary performance risk.
- Management at all levels do not have a clear understanding of the breadth and depth of risk management.

4.2.3 Gap Assessment

- While DIMP and TIMP exist as risk management programs, they are focused primarily on risk identification and remediation, to the exclusion of prevention and mitigation. Some in Management believe DIMP and TIMP are sufficient to manage pipeline safety.
- Beyond IMP, pipeline safety threats, hazards, and consequences are not typically analyzed, and preventive/mitigation solutions are not identified. Decisions on how to manage the risks through preventive controls, monitoring, and mitigation measures are absent.
- The application of pipeline safety risk is somewhat rudimentary. The prevailing approach is to create or amend procedures and conduct some QA to ensure compliance and carry

out, where needed, some form of remediation, but does not address prevention and mitigation of the threats, hazards, and consequences.

- Resource planning needs to be an integral part of the Risk Management process.
  - Impact analysis is not done when new requirements are introduced, or, for example, when decisions are taken to limit formal training. Typically work and risks are passed down through the organization until they can go no further. The risk this creates is not analyzed or understood.
- CNGC risk management does not deliver integrated data that are traceable, verifiable, and complete, to establish trendable metrics that drive continuous improvement.

4.3 Operational Controls

Natural gas system operators maintain written plans and procedures that address safe work practices when conducting design, construction, operations, maintenance, and emergency response activities.

4.3.1 Element's Significance

- The intentional commitment to safe operational controls enhances pipeline safety culture.
- Operating and maintenance procedures help minimize human error and promote consistently safe Employee actions. Quality control procedures ensure adherence to established standards for pipeline materials, equipment, and construction.
- Enable Employees to recognize and stop work when they believe following the procedure could cause an unsafe condition.
- Procedures must exist for the following, and should be reviewed optimally at least annually:
  - Design specifications, quality testing procedures, and construction procedures for manufacturing and construction of pipeline assets and require the generation of records to demonstrate conformance to the procedures.
  - Initial startup, normal operations, temporary operations, and emergency situations, and include safe operating limits.
  - Maintenance activities in a safe manner.
  - Testing and inspection of pipeline safety-related equipment and identifying the testing criteria to be used, what is and is not an acceptable result, and traceability of testing equipment to known standards.

- A Management of Change procedure that addresses changes in technology, equipment, procedures, and organization and requires documentation of the reason for the change, the authority for approving the change, analysis of the implications of the change, and qualifications/training for those affected by the change.
- A Contractor Management procedure that includes communicating the requirements of pipeline safety, training and orientation on safety policies, evaluating the contractor's safety performance, communicating risks at the work site, communicating the change management process, and incorporating lessons learned into operations.

4.3.2 Current State

- CNGC has a suite of Company Procedures (CP) covering materials, design, construction, testing & inspection, operation, maintenance, and retirement.
- The format, style, and content change significantly from one CP to another. This is largely dependent on when the procedure was written.
- From the style of writing, CPs are created with the primary focus on compliance.
- CPs are also quite lengthy, even when addressing simple tasks such as valve maintenance (CP 740).
- Constructions procedures with their multiple CP references have resulted in conflicting content.
- Ten percent of the PSMS survey participates feel they need to deviate from existing operating and maintenance processes and procedures for safety reasons. Note: failure to follow an applicable procedure is a non-conformance issue for the company and possibly non-compliant with pipeline safety regulations. (see Figure 11)
- Procedures empower Employees with authority to “stop work,” including that of a contractor. However, there is a fear of repercussion and reprisal. (see Figure 12)
- Procedures for the initial startup, for normal operations, temporary operations, and emergency situations do not include safe operating limits.
- CPs do not directly tie their purpose to MDU Group’s vision of a safe place to work and to the safety of its employees, its customers, and the public and protect property affected by its operations.
- The MOC process allows any CNGC employee to initiate an MOC in JIRA (a project management software).

Figure 11 – Deviate from O&M Procedures

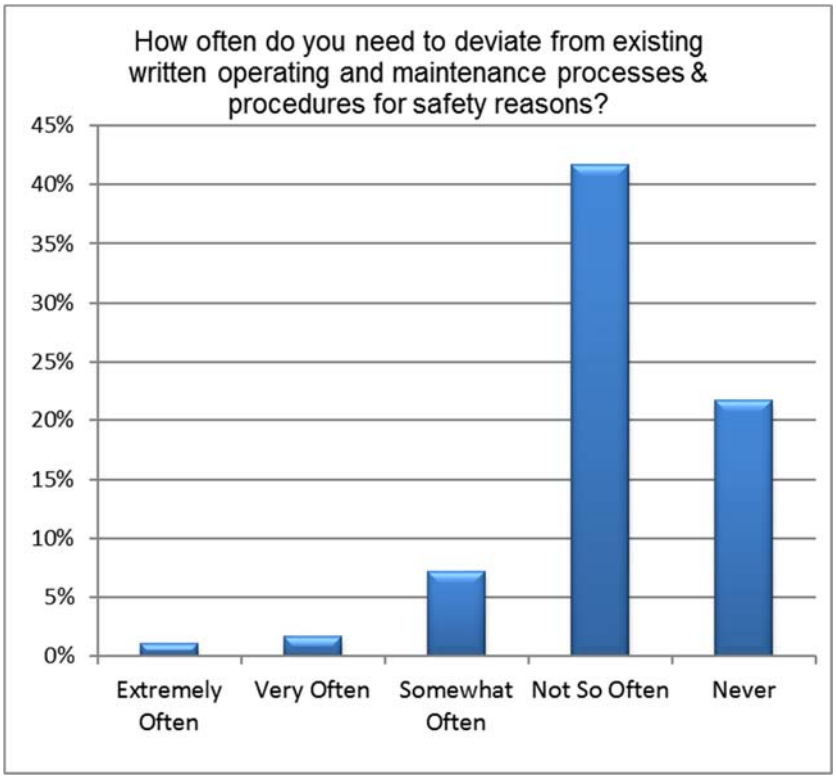
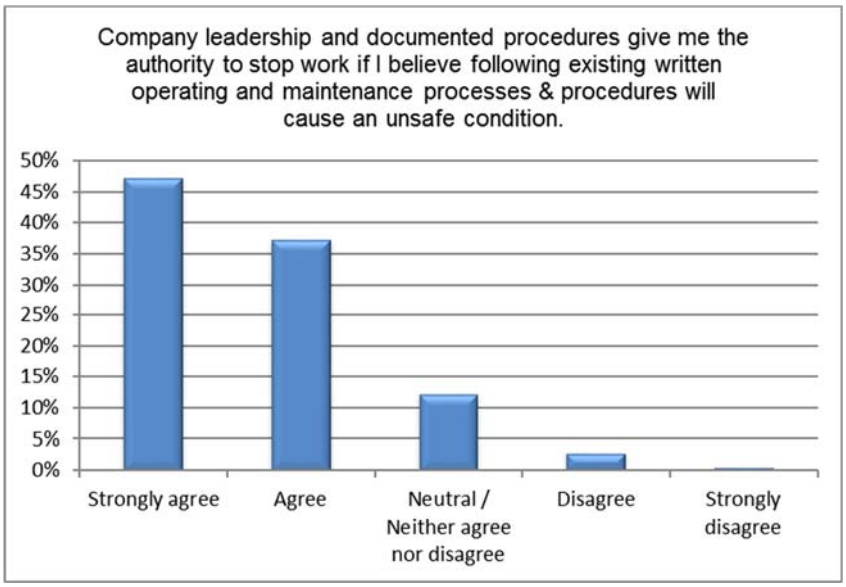


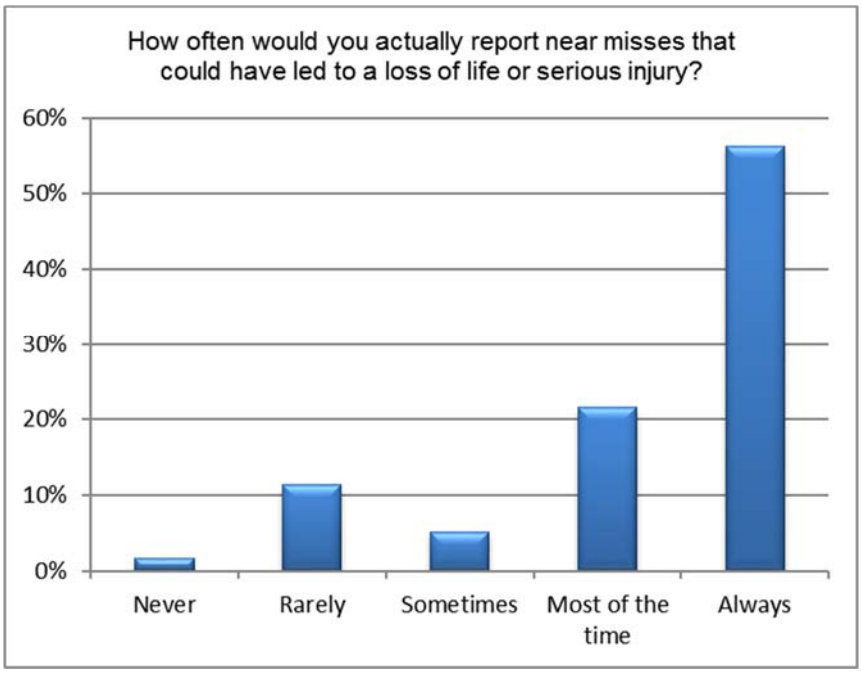
Figure 12 – Authority to Stop Unsafe Work



4.3.3 Gap Assessment

- Information in operating and maintenance is not necessarily easily accessible to the field workers who need to understand and work to the procedures, which can result in human error or actions not consistent with safe work practices.
- A “near miss” is typically associated with personal injury and not in terms of consequence to the public, system, or environment. (see Figure 13)
- Field workers feel pressure to complete their scheduled work, which can result in employees deviating from procedures, e.g., downgrading leaks, or walking a line-locate in one direction rather than two directions. Note that these examples are anecdotal, and Jacobs Consultancy did not observe this behavior in our field audits; however, failure to follow an applicable procedure is a non-conformance issue for the company and possibly non-compliant with pipeline safety regulations.
- Procedures do not clearly define accountabilities, authorities, and responsibilities.
- Procedures are compliance driven, but also need to identify the threats, hazards, or consequences they are addressing, so the user understands “why.”
- New or modified policies, processes, procedures, and programs should consider resource requirements during development.
- MOC process is hampered by the lack of performance measures, continuous evaluation and assessment, and quality assurance.
- A lack of communication of the status, particularly the cancellations of MOC submissions, undermines the process in the eyes of Employees who have submitted changes but never see or hear about their requests again. This inhibits and dampens the development of ideas and improvements.
- The process of ‘training’ on CPs, or ‘briefing’ as it often is, can result in procedures not being understood and not being institutionalized (and thereby ignored).

Figure 13 – Report Near Misses



4.4 Emergency Preparedness and Response

Effective operators appreciate planning for a full range of emergencies, especially when planning leads to a better understanding of potential emergency scenarios.

4.4.1 Element's Significance

- Even though the focus of pipeline safety needs to be on prevention and mitigation, operators cannot anticipate every event. Therefore, operators should maintain procedures for preparing for and effectively responding to events affecting the transmission and distribution systems.
- Preparation for potential incidents leads to a realistic sense and understanding of vulnerability and further describes the consequences of a safety performance failure, both of which enhance safety culture.
- Being prepared leads to good pipeline safety culture characteristics like resiliency and a realistic sense of vulnerability. Without a sense of vulnerability, it is much harder to maintain vigilance.
- Emergency preparedness and response procedures contain:
  - The regulatory-required elements
  - Identification of the potential types of emergencies

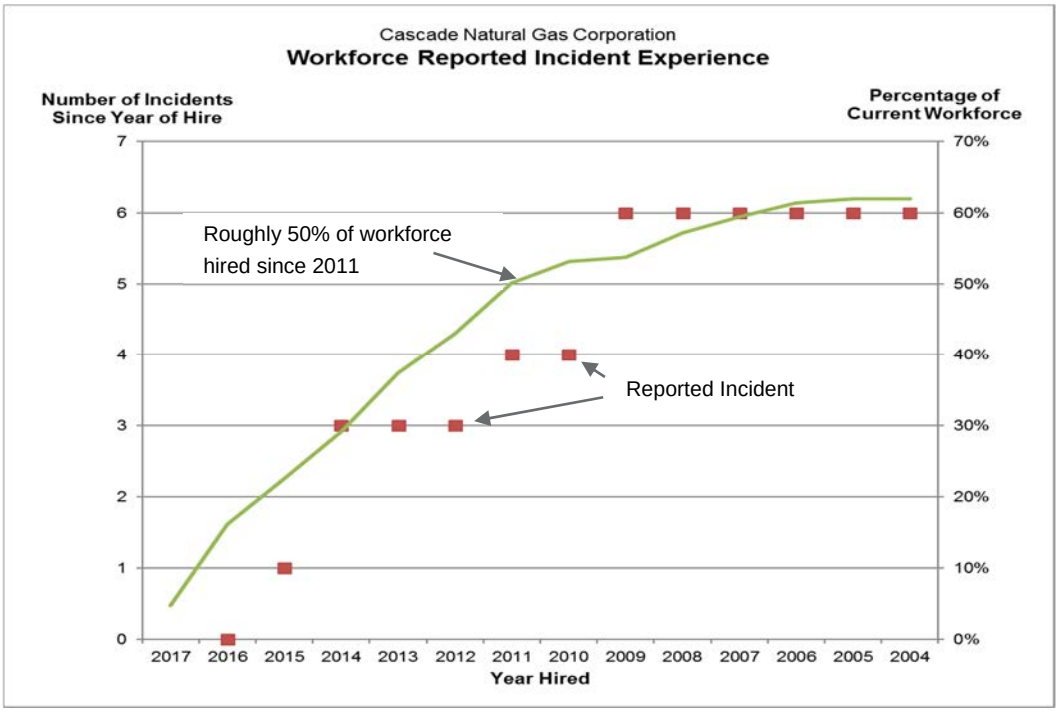
- Safety, health, and environmental protection processes
- Training and drills, including with external agencies
- Lessons learned and improvement process
- Periodic review and update of the plans

4.4.2 Current State

- CP 925 is a general emergency policy document. Each District develops a specific emergency plan. These individual plans address the isolation, shutdown, and startup of the system.
- The Emergency Policy defines what constitutes an emergency, including any condition which is judged potentially hazardous to people, property, or the environment by competent personnel.
- CNGC's emergency policy employs the Incident Command System, a recognized best practice.
- Emergency preparedness by CNGC includes the following:
  - Meet with emergency responders
  - Conduct Mock drills
  - Have equipment to effect response
  - Have designated Service Techs on-call as first responders
  - Develop District-specific emergency response plans to address system outages.
  - Identify types of emergencies
- Emergency response by CNGC includes the following:
  - Procedures for liaison with emergency command center
  - Customer Call Center Dispatch Service Tech
  - In some cases, county lines determine which District responds, which can result in additional time before the venting gas is controlled.
  - Undocumented, the goal cited for response to report of a gas escape is 2 hours or less, and make safe. The typical response averages 30 minutes or less.
- About 53% of CNGC's employees started with the company in or after 2010, and thus have seven or fewer years of service with the company. Since 2010, CNGC has repaired or eliminated about 530 leaks. Employees hired since 2010 have limited exposure to any

incidents, just four or fewer reported distribution incidents. None have experienced a failure of a high pressure transmission line. About 25% of the workforce have exposure to no more than one incident. (see Figure 14)

Figure 14 – Workforce Reported-Incident Experience



- MDU Resource Group Policy (CORP25.3) – Accident/Incident Response, Investigation calls for an internal evaluation of its safety procedures and to investigate accidents and incidents involving company operations, personnel, and property. Accident includes the notification of DOT. It is not clear if this includes PHMSA.

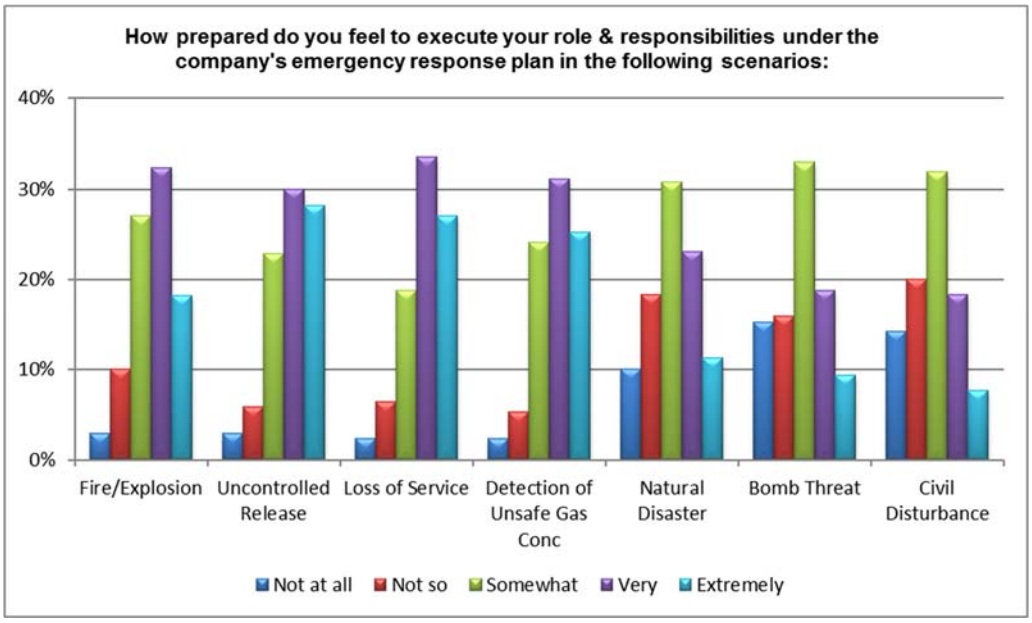
4.4.3 Gap Assessment

- Post emergency actions are not covered by CP 925 – Emergency Policy.
  - The company lacks procedures providing directions to address involvement of Claims, Legal, or Corporate communications
- The risk assessment of the decision to not have construction crews on-call during off-hours is insufficient.
- Emergency plans are not developed for:
  - Specific asset types

  - Non-release of gas events, e.g., damage to facilities, forest fires
  - Cascading emergencies

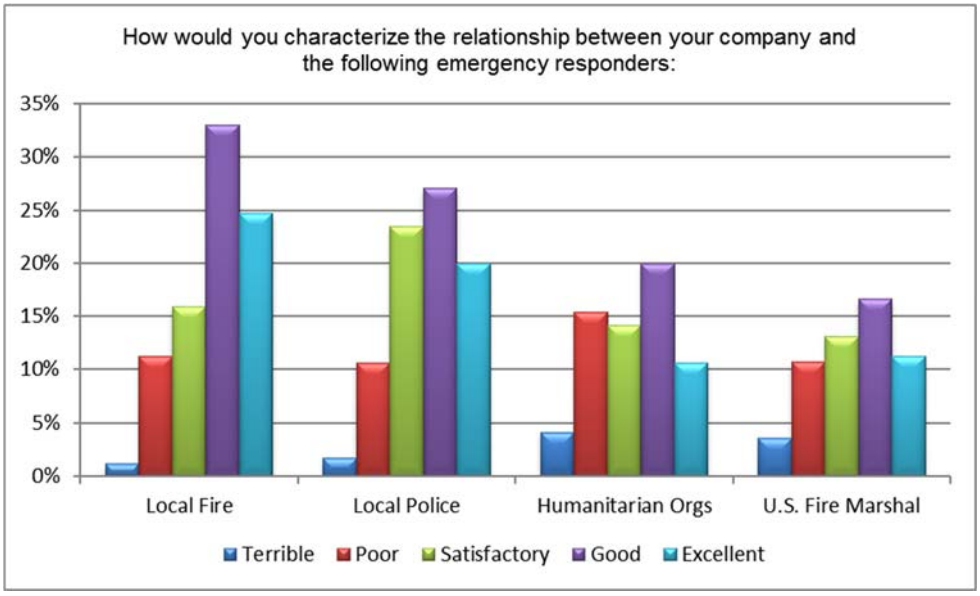
- The company lacks a Crisis Management Plan for gas emergencies. The Crisis Management Policy SF 404 provides guidance to Employees while at work in the event of fires, bomb threats, natural disasters, the threat of violence, active shooter, or other emergencies.
- While Employees feel extremely or very prepared to gas emergencies involving fire/explosions, uncontrolled release of gas, loss of service and detection of unsafe gas concentrations, Employees do not feel as prepared for natural disasters, bomb threats, or civil disturbance. (see Figure 15)

Figure 15 – Emergency Preparedness



- The inconsistent design and application of mock scenarios undermine their value. There is a tendency to not fully sharing lessons learned or to involve external stakeholders (e.g., regulators, emergency response agencies, the public).
- Managers are not trained to deliver mock emergencies so the result depends too much on the individual manager and his/her capabilities.
- While CNGC's relationship with local Fire and Policy are viewed internally as good or excellent, the same is not true with the other agencies and organization that CNGC will need to coordinate with when there are large scale emergencies. (see Figure 16)

Figure 16 – CNGC Relationship with Emergency Responders



- CNGC does not request in their outreach with emergency responders input on the needs of the emergency response agencies or how CNGC can improve its emergency response and coordination with the response agencies.

4.5 Stakeholder Engagement

Stakeholders exist internally and externally to an organization and are people or organizations who interact with, or impact, the company at all levels. Examples are the State Regulators, Emergency Responders, local officials, and customers.

4.5.1 Element's Significance

- An environment that encourages two-way communication of pipeline safety issues strengthens pipeline safety culture, as does, more importantly, the communication and sharing of how lessons learned were applied.
- Communication with internal and external stakeholders is needed to inform all stakeholders, identify risks, raise safety concerns, and generate additional recommendations for safety improvements. An operator has a process and a plan for communication and engagement with internal and external stakeholders.
- Through the engagement process, the operator is more thorough in its management of risk and more expansive in its partnerships for pipeline safety performance. Stakeholders

can help maintain a heightened sense of vigilance in identifying risk and contribute to their protection.

4.5.2 Current State

- Stakeholders groups are addressed in various company procedures (e.g., CP 500, CP 925).
- Contact with stakeholders is performed by various company personnel but is often pushed down to District Managers and to Engineering Associates (EA).
- Outside service providers develop lists of individuals in stakeholder groups for the Districts.
- There has been communication around the pipeline safety management process currently being undertaken with employees.
- Internal communication is mostly by email, with insufficient consideration given to the ability of the recipient to address, understand, and react to the volume of email.

4.5.3 Gap Assessment

- Most interviewed did not have a wide perception as to who might be a stakeholder, either internally or externally.
- The extent of engagement with stakeholders varies enormously across Districts and the GO. A few undertake extensive engagement, but the norm is very minimal. It often depends on the discretion and personality of the local managers.
- Lack of a stakeholder communication plan or process dedicated to engaging with stakeholders, internal or external. This communication plan should:
  - Address two-way communication with external stakeholders.
  - Document a high-level view of company pipeline safety operations, the current focus of risk management efforts and measures used to gauge safety performance.
- PSMS requires the broadest definition of stakeholders in the widest sense of pipeline safety to consider those having potential impact on CNGC facilities, and those impacted by CNGC.

4.6 Competence, Awareness, And Training

Employees and Management must have an appropriate level of competence regarding education, training, knowledge, and experience. Regular, continuous training and updates should assist

Employees' awareness of changes that affect their job requirements; newly emerging or changing risks; problems in the execution of the PSMS; opportunities to improve processes and procedures; and potential consequences of failure to follow processes or procedures.

4.6.1 Element's Significance

- Investment in training and building employee competency builds confidence that Management prioritizes safety for their Employees and the public.
- It is a key requirement of any organization to have competent Employees. Assuring competency at all levels is a form of investment in an organization's Employees.
- Where contractors are used, the operator assures that they also have the requisite competence and understanding of pipeline safety.
- When competencies are defined, identified gaps in qualifications are addressed, and skill sets are refreshed, Employees perceive that they are getting the support they need. They are then able to accept and carry out pipeline safety responsibilities.

4.6.2 Current State

- Crews' level of competence is ascertained through Operator Qualifications, which is often called training.
- Lack of a process to determine competence when appointing people to staff or management roles other than a new requirement for engineering degrees.
- District Managers are tasked with providing training on new procedures and changes to procedures, without any train-the-trainer training.
- On-the-job training is the primary means of training field personnel. Trainers do not receive train-the-trainer training.
- Knowledge is not able to be captured or transferred as new hires are typically not on-boarded until after a person retires.
- When hired into a position, some GO staff and District Management lack any field experience or the depth of field experience, to support district operations effectively.
- There is a lack of any formal pipeline safety training.
- Training to establish competence to complete job/procedures is based on, and limited to, Operator Qualifications training, which is task focused.
- There is a Training Center located in Sunnyside staffed by seasoned and knowledgeable trainers, and some training props are available (e.g., portable regulator trailer).

4.6.3 Gap Assessment

- Lack of a process or procedure for Management to determine and assure that Employees have, and continue to have, the appropriate level of competence for the job they do. This works to prevent and mitigate complacency. This should be applied to all Employee levels.
- There needs to be more pipeline safety training than just one-week orientation for all new Employees.
- District Managers, who conduct staff or crew briefings, mock drills, safety training, and other meetings, and request it, need to be provided Train-the-Trainer training.
- Individuals providing on-the-job training also need to be provided Train-the-Trainer training.
- Training provided to newly appointed supervisors and managers is inadequate. Additional training in management skills, particularly the management of people, performance assessments, and time is needed.

4.7 Documentation and Record Keeping

Documentation and record keeping refer to the identification, distribution, and control of documents and records required to fulfill the elements of the PSMS and other regulatory requirements. Procedures and work practices are essential documents. Work products of each PSMS element are essential records. Procedures should specify responsibilities for document approval and re-approval, and identify the controls needed to assure that the documents required, including new, revisions, and updates comply with the following:

- Review and approve for adequacy before issue and use
- Identify changes and revision status
- Remain legible and readily identifiable
- Readily available and accessible to workers performing an activity

"If something is not written down, it does not exist." *Attributed to PHMSA*

4.7.1 Element's Significance

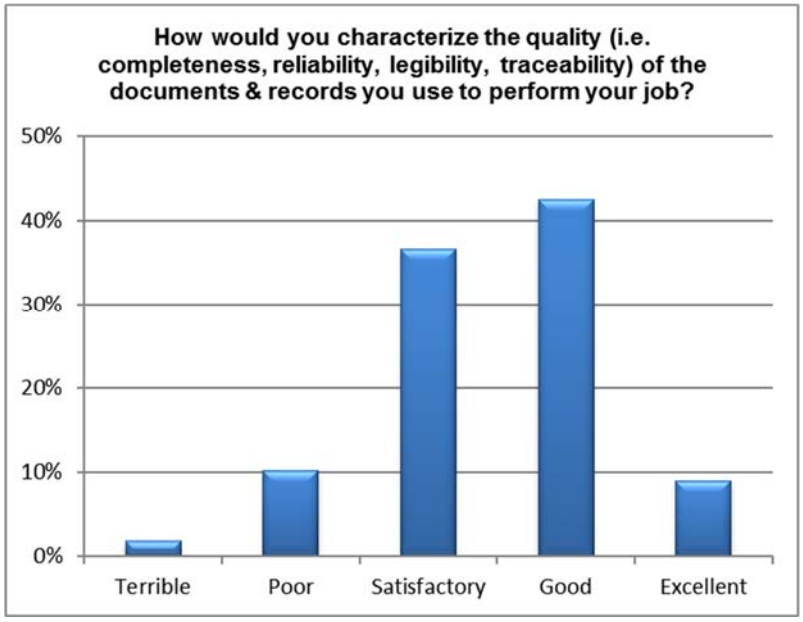
- Documentation and record keeping lead to greater certainty that safety is valued and the pipeline operator is taking action to improve safety.
- Heavily regulated industries have to comply with very detailed specifications for the types and content of records to be created and kept.

- A pipeline operator should identify, distribute, and control documents and records required to fulfill the elements of the PSMS. These documents should be easily retrievable and searchable as needed.
- Like the practice of other operational controls, this element leads to greater certainty that the pipeline system will perform as expected. This element is an opportunity to demonstrate commitment and discipline to stakeholders.
- There is a records management procedure that identifies the records that are necessary to demonstrate:
  - Conformance to the company procedures.
  - Where and for how long the records will be maintained.
  - How the records will be protected from damage or destruction?
  - Who is responsible for the generation of the record?
  - Record quality requirements.
  - How the record will be removed/destroyed?

4.7.2 Current State

- Document and record keeping are governed by several company procedures and standards (e.g., CP 7 – Records Management, CP 780 – Cover NPMS, WUTC or PHMSA annual reports or PHMSA reportable incidents).
- Record requirements are integrated into other CPs, which include document and records retention and storage.
- CNGC provides guidance as to the characteristics of a record regarding authentic, reliable, and usable, as well as its integrity.
- Better than 85% of Management, office and field personnel characterize the quality of documents and records to be satisfactory or better, with *quality* meaning the characteristics of completeness, reliability, legibility, and traceability. (see Figure 17)

Figure 17 – Document Quality



- Documents and records are found in hard-copy and electronic formats.
  - Electronic records include Pipeline Inspection Management System, GIS, Customer Care and Billing, JD Edwards Production, Power Plan, Energy U, and GIS. These systems are not linked, so the same data have to be entered multiple times.
  - Offices creating hardcopy records manage these records. Filing systems can vary from office to office. These records can include leak survey, AC Survey, CP survey, damage prevention, etc.
  - Some hardcopy records are scanned and uploaded into SharePoint Operation Services, CNGC's main electronic repository for scanned records. Some scanned copies are retained in GIS.
- Data in the GIS are improving but still experience inaccurate location of facilities. Measures of the system's completeness or accuracy are needed.

4.7.3 Gap Assessment

- Documents and records are not differentiated. Documents refer to procedures. Records refer to information collected on forms or electronically. A non-searchable file — be it a document or record — provides diminished value and usefulness.

- Integration of data in an electronic system is not available and is hindered by access to hardcopy records managed by the local offices.
  - Regulators expect electronic data not records and are looking to integration, analysis and trending.
  - Furthermore, it is not possible to search across documents for key terms in SharePoint.
  - Procedure format is not consistent.
  - Some procedures focus on policy ahead of work procedures, making it difficult for users to follow.
  - Responsibly, authorities and accountabilities are not defined in procedures.
  - Changes to one procedure can and have led to inconsistences in other procedures as other procedures are not searched for common references.
  - The company lacks a list of what records which must be created to comply with regulations.
- There needs to be an overarching records management program.
  - While the relevance of documents and records to regulatory compliance is clear, the same cannot be said about their relevance to risk management and pipeline safety.
  - The CPs are not substitute for a manual or set of procedures for records management.
  - Some documents and records remain in silos.
- Records received by outside service providers are not addressed by existing CPs.

4.8 Incident Investigation, Evaluation, and Lessons Learned

This element provides the opportunity to emphasize the discovering, communicating, and acting upon safety lessons up, down, and across the organization.

4.8.1 Element's Significance

- Safety culture is enhanced through the discovering, communicating, and acting upon safety lessons. These activities also contribute to an environment where personnel are comfortable about identifying and speaking up about risk and safety concerns, knowing that their actions will result in safety improvements.

- Learning from experience is a core value within the pipeline industry and a vital component of improving pipeline safety and risk performance through a PSMS.
- Taking a more robust approach to this element invests more organizational effort into assuring that the right information is gathered from events and is applied to managing risk.
- "Lessons learned" is an integral part of the organization's PSMS. The timeliness of sharing information and tracking corrections demonstrates the positive sense that pipeline safety is a top priority and complacency about risk is unacceptable. Employees understand the importance of learning and making improvements throughout the organization.
- Equally important is the understanding that Management encourages and insists on the sharing of pipeline safety concerns. This contributes to an environment in which Employees and contractor personnel are comfortable about identifying and speaking up about risk.

4.8.2 Current State

- Districts perform post-incident reviews, although there does not appear to be a standard format or procedure. External parties are not routinely engaged in these reviews.
- The investigation procedure requires the identification of the cause(s), contributing factors, lessons learned, and recommendations or actions to prevent recurrence. The procedure should include investigating, pipeline safety-related near misses.
- Near misses are reported, and Root Cause Analyses are periodically prepared, but there does not appear to be a registry of these lessons, nor Plan, Do, Check, Act process.
- Near misses and post-incident reviews are often communicated in safety meetings. However, about 30% of Management, office, and field personnel only feel the most serious near-misses are reported. (see Figure 18)
- The lessons learned are not shared beyond regions and often not beyond districts. Others do not, therefore, have a chance to introduce preventive measures, heightening the risks that they may make the same mistakes. An estimated 52% of Management, office, and field personnel feel communication of incident investigations is "not at all," "not so," or somewhat effective. (see Figure 19)

Figure 18 – Actually Reported Near Misses

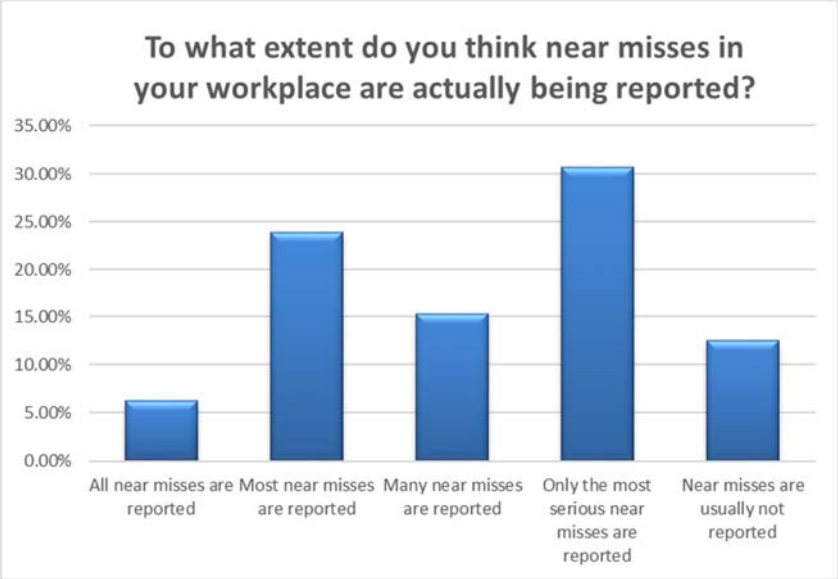
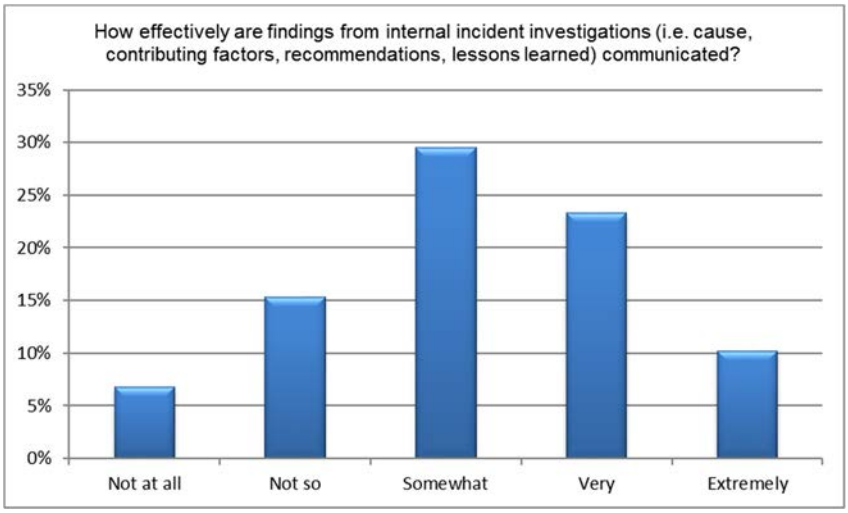


Figure 19 – Communication of Incident Investigations



4.8.3 Gap Assessment

- There needs to be a documented process and procedure for evaluating external events to identify opportunities to learnings for improving pipeline safety.
- There needs to be a lessons learned repository, reviewed by Management as part of pipeline safety continuous improvement and available to all across the organization. There are industry examples of such a registry.

- Greater efforts need to be made to involve external parties in post-incident investigations. Service provider contracts should stipulate their participation. CNGC can participate in external first responder post-incident investigations or conduct a debrief with external parties.
- The investigations and subsequent lessons to be learned are not universally or systemically shared across districts and the MDU Group.
- Root cause analysis (RCA) reports will be more constructive and effective if individuals' names and location specifics are left out.

4.9 Safety Assurance

Safety Assurance demonstrates both the proper application of CNGC's PSMS to its practices and how these practices improve risk management and pipeline safety performance.

4.9.1 Element's Significance

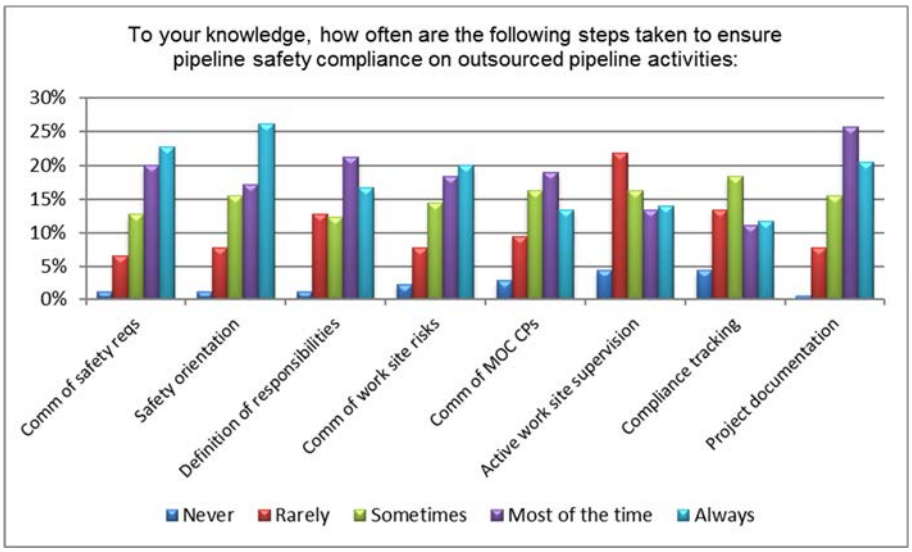
- The quality of audits, evaluations, and the seriousness of response to their findings enforces the priority of pipeline safety.
- This element demonstrates both the proper application of an operator's PSMS to its practices and how these practices improve operational quality, risk management, and pipeline safety performance.
- This element assures the operator checks and validates that risk management processes are systematic and disciplined, and specifically speak to the critical nature of Employee engagement, reporting, and feedback on issues of concern.
- The quality and independence of the safety assurance process conveys vigilance in general and shows responsiveness to concerns about safety.
- Particular emphasis is placed on increased proactive thinking of what can go wrong in a systemic manner, clarifying safety responsibilities throughout the pipeline operator's organization (including contractor support), emphasizing the important role of top management and leadership at all levels, encouraging the non-punitive reporting of and response to safety concerns, and providing safety assurance by regularly evaluating operations to identify and address risks.

4.9.2 Current State

- Audits are used to examine regulatory compliance and conformity to company procedures, and CNGC has engaged in AGA Peer to Peer Reviews, which has identified CNGC's use of accepted industry practice.

- Surveys are conducted to evaluate the safety culture of the organization.
- CNGC has established and staffed a pipeline quality assurance group within Operations who review the quality of records produced in the field. A quarterly compliance report is prepared by the Standards and Compliance Manager.
- An effectiveness evaluation process is established on the Quality Assurance Program (CP 800). This CP is directed at records and not the planning, conducting, and documenting of company crew or service provider work.
- The company lacks a documented process for reporting new and emerging risks and providing feedback to Employees and service providers. Many employees have expressed concerns about punitive consequences reporting safety concerns.
- The company lacks a procedure to identify key performance indicators, and no KPIs have been identified to measure the effectiveness of risk management and the effectiveness and adequacy of pipeline safety. Likewise, a procedure for the identification, collection, and analysis of data for the key performance indicators is lacking.
- QC is not carried out as a routine operation. Typically, it is an add-on task for the EA, some of whom have no industry field experience and are unlikely to know what they are observing. Activities which Management, office, and field personnel feel are rarely taken to ensure pipeline safety compliance on outsourced pipeline activities are active work site supervision and compliance tracking, followed by definition of responsibilities. (see Figure 20)

Figure 20 – Pipeline Safety on Outsourced Pipeline Activities



4.9.3 Gap Assessment

- Crew (company and contractor) oversight is inadequate. Where there is some oversight, it is either ineffective (drive by) or is performed by outside service provider inspectors. This is often of limited value as one inspector cannot see all that is going on.
- Since audits are performed by staff under Operations, this calls into question the independence of the audit.
- Particular emphasis needs to be placed on increasing proactivity, thinking of what can go wrong in a systemic manner and encouraging the non-punitive reporting of and response to safety concern.
- While CNGC evaluates their safety culture, it must perform evaluations to assess the effectiveness of its risk management and progress made toward improving pipeline safety performance. Such evaluations should include input from stakeholders.
- An anonymous and non-punitive reporting and feedback process for Employees and contractors is necessary to obtain data/information on new and emerging risks.
- The company lacks performance measures to determine the effectiveness of any oversight, and data collection to enable performance to be tracked.

4.10 Management Review and Continuous Improvement

Management's review of the PSMS and safety performance results is necessary to provide Management awareness of progress in achieving performance goals and objectives. Top Management should, at least annually, review and approve the output of PSMS Management reviews.

4.10.1 Element's Significance

- Pipeline safety culture is enhanced with Management attention to pipeline safety improvement and actions correcting and preventing pipeline safety issues.
- While perhaps less visible to all Employees than the practice of the other elements, this element is nonetheless essential to the visibility of commitment and is a reflection of the importance of accountability for pipeline safety.
- Top Management defines opportunities for continuous improvement. The sense of discipline from the practice of the element, following up on the other elements of the SMS, is exemplified by Management and, as a result, conveys a sense of pipeline safety as a priority—the actions executives exhibit in their performance is noticed by Employees.
- Management review is where performance is evaluated against metrics (KPIs) designed to drive the performance. The metrics are developed and applied to key/critical

deliverables to determine how well the utility's risks are being managed. They will vary as data obtained show risk is being effectively controlled.

- Continuous Improvement is the output of Management review, where opportunities present to improve processes and procedures, consider new technology to assist and to introduce new metrics to measure different activities/inputs.

4.10.2 Current State

- Reviews of performance are directed at regulatory compliance and typically follow NOPV.
- The company lacks a procedure for setting pipeline safety directed KPIs and conducting management reviews of KPIs, for the purpose of continuously improving pipeline safety.
- There is a lack of a documented process for Management to evaluate risk management effectiveness.
- The MOC is the only documented process for Management to evaluate new technology that enhances pipeline safety. This is carried out only periodically.
- CNGC does not access electronic data that can be used to determine the effectiveness of management efforts to prevent and mitigate risks or to trend their continued success.
- Management's efforts are, for the most part, reactive and compliance focused. Opportunities to learn from lessons are not taken anywhere in the organization.

4.10.3 Gap Assessment

- Insufficient review process to determine if the systematic application of procedures, technology, and tools, etc. is achieving the desired results.
- There is a lack of a clear process for integrating improvements identified from after-incident reviews or from NOPVs, other than procedure changes.
- Lessons learned are not typically shared across districts unless there is an MOC, and are typically not shared across the MDU Group.
- The company lacks a documented process for conducting management reviews, and a defined process for continuous improvement.
- The company lacks meaningful KPIs to measure the effectiveness of pipeline safety actions, reactions, or lessons learned.
- Electronic data does not exist in an integrated, accessible, analyzable, and trendable format that allows Management to understand and manage pipeline safety risks, and does not allow Top Management to be able to trend and improve pipeline safety responses.

5. Field Validation Review

Several field tasks were reviewed in eight Districts, and there was considerable time spent in the field with service technicians, Engineering Associates, construction crews, and contractors. In general, these observations and associated discussions with CNGC staff (both union and management) further support our conclusions and recommendations and are aligned with the findings and conclusions noted in other aspects of our gap assessment process.

The activities observed were performed in compliance with code and in conformance with company and industry practices.

Below are the key findings and conclusions associated with each task.

5.1 Training

- Findings
  - Brick and mortar training facilities are available in Sunnyside.
  - Some props like portable regulator trailer have been developed.
  - Training consists primarily of one-week orientation for new employees.
  - Generally training is left to District Managers and On-Job-Training.
  - Operator Qualifications is done for regulatory compliance.
  - MOC training is provided via a PowerPoint presentation and left to District Managers who are not skilled trainers.
- Conclusions
  - Training in infancy stage.
  - A formal plan needs to be put in place to implement a training program.
  - Knowledge of how to perform tasks is transferred by other longer-term employees, and is not necessarily aligned with company procedures.
  - Management-level training is insufficient.

5.2 District Regulator Maintenance

- Findings
  - There are a significant number of regulator stations; some districts have 100–150.
  - Service techs perform this task.

  - The task is a methodical process, and information is recorded in detail manually and scanned into the system.
  - There is a mobile training rig used for training in the districts.
- Conclusions
  - Process is thorough, and followed in detail.
  - All service techs are required to perform this function.
  - Regulator station design is a typical design found in many companies and adequate for the safety of the system.

5.3 Leak Investigation

- Findings
  - Leak survey not a specialist assignment.
  - First responders will in most cases grade leaks.
  - Service techs will normally repair easy above-ground leaks.
  - Little to no leak backlog of grade 1-2 leaks.
  - In some districts there is a backlog of grade 3, but not significant.
  - Shadow survey done by Heath in Mount Vernon, yielding numerous leaks not picked up by company survey.
- Conclusions
  - Leak survey is a specialist trained function in most utilities and should not be treated as a job that an employee with limited training and experience can perform.
  - The investigation and grading of leaks in some cases is performed by employees with few years of experience and only OJT.

5.4 Atmospheric Corrosion

- Findings
  - Task done on an annual basis in compliance with regulatory requirements.
  - Inspector receives a week of classroom orientation and OJT.
  - Summer help limited in what they can do.
- Conclusions

- Issue more prevalent in western regions.

5.5 Emergency Response

- Findings
  - On-call employees can have extensive travel times to location.
  - Utility crews are not on call out.
  - There are ad hoc drills but when mock scenarios are drilled they are desk top.
  - There are ad hoc training and updates with local fire, police, and other first responders, but it varies widely if and when.
  - There is an ad hoc critique of incidents in some districts.
- Conclusions
  - Not having utility crew available needs to be reevaluated.
  - Lack of a structured/compliance plan for communications and training with local responders.
  - A means to share best practices and lessons learned with other Districts is lacking.

5.6 Locations and Surveillance

- Findings
  - This task is represented as 50–80% of a service tech's daily work based on the district and time of the year.
  - The main and service records are generally good.
  - There is a requirement for locates for realty lawn signs.
  - Surveillance of facilities seems to vary by the district. The procedures recently changed, leaving more to the discretion of the District Manager, generally required on HP mains.
- Conclusions
  - Locations are a major and critical task each service tech must perform daily among other priorities which in many other utilities is either a specialist function or outsourced to a specialty contractor.
  - Surveillance requirements are inconsistent depending on the workload and availability of staff rather than the critical nature of the requirement.

6. Recommendations

These recommendations are forward-looking and are intended to address gaps noted in this report in CNGC's pipeline safety culture and management systems. Some of these recommendations could be implemented independently of Montana-Dakota Utilities Group initiative to implement pipeline safety management systems; however, this would not be advisable.

The recommendation number is for reference purposes and does not denote the significance of importance, priority, or order.

Leadership and Management Commitment

1. Create and document a strategic plan for pipeline safety to establish a proactive, forward-looking organization seeking to prevent and mitigate risk. Establish plans to deliver the strategic plan, such as an integrated work plan to staff the proactive organization and a technology plan to integrate data electronically and make it available to management.
2. Develop and document an internal communication plan to ensure understanding and effective two-way communication on pipeline safety management.

Risk Management

3. Create and document a risk management plan and a risk register for pipeline safety.
4. Develop training for management specifically on understanding and evaluating risk and on managing to prevent and mitigate risk.

Operational Controls

5. Include in each Company Procedure "why" it is necessary in terms of the threats (hazards) and consequences that can be prevented or mitigated, and the associated benefits.
6. Modify or create a document structure for Company Procedure to distinguish Policy, Procedures/Standards, and Work Instructions looking to provide performance measures and clear functional separation of responsibilities and expectations.

Emergency Preparedness and Response

7. Develop three Company Procedures:
    - Gas Emergency Crisis Plan to address escalating and cascading emergencies

- Post Emergency Response to address activities not associated with “make safe” or repairs that include but not limited to removal of failure, preservation of evidence, chain of custody, and corporate risk management
- Incident Command Structure to provide guidance and training

8. Develop a guidance document on creating emergency simulations and conducting mock emergency scenarios/drills for solo significant events such large uncontrolled release of gas, natural disasters, bomb (or other terrorist) threats, civil disturbances involving either distribution and transmission systems; and cascading gas emergencies, e.g., a forest fire with subsequent pipeline failure in the fire zone and leads to downstream system outage.
9. As part of CNGC’s outreach to emergency responders, solicit what emergency responders need and expect from CNGC, include secondary organization relied upon in large emergencies, such as humanitarian organizations, small business administration, CNGC contractors in the outreach, and require meeting notes documenting the meetings be circulated to the Districts and GO.

Stakeholder Engagement

10. Develop and document a stakeholder outreach plan which encourages two-way internal communication of pipeline safety issues strengthens pipeline safety culture, as does, more importantly, the communication and sharing of how lessons learned were applied.
11. Expand plan to include external stakeholders towards the same end.

Competency, Awareness, and Training

12. Develop and implement a strategic vision and plan for training.
13. Develop a process and procedure to train-the-trainer for directors, managers, and employees whose responsibilities include training others.
14. Develop an apprentice program for field staff.

Documentation and Record Keeping

15. Continue to develop and implement digital data collection, and document and information systems to reduce silos of information, that are easily retrievable and searchable, and integrate with asset, geographic, and risk information management systems.

Incident Investigation, Evaluation, and Lessons Learned

16. Engage all internal groups in post incident reviews, as well as external parties involved in the incident.
17. Develop a quality assurance process to assure that all post incident investigations, evaluations, and lessons learned are completed and shared with other Districts and the GO promptly.

Safety Assurance

18. Separate the activities of Quality Assurance and Quality Control, not necessarily organizationally/functionally, expand quality assurance to construction, operations, and maintenance activities, not just records, and contractually require contractors to provide resources for, and to be responsible for, quality control.
19. Make Quality Assurance a direct report to a reporting line independent of the organization they oversee.
20. Develop a Company Policy that addresses when CNGC can insource and outsource quality control.

Management Review and Continuous Improvement

21. Develop and document a process for conducting management reviews and for continuous improvement.
22. Establish meaningful KPIs to measure the effectiveness of pipeline safety actions, reactions and/or lessons learned.
23. Develop electronic data in an integrated, accessible, analyzable and trendable format that allows management to understand and manage pipeline safety risks, and allows top management to be able to trend and improve pipeline safety responses.
24. Develop a dashboard of key performance indicators, trends, and targets associated with the prevention and mitigation of risk and operational control measures.

Many of the recommendations above can affect other PSMS elements. Figure 21 identifies the primary (P) and secondary (S) PSMS elements influenced by a recommendation.

Figure 21 – Recommendation PSMS Elements Matrix

Recommendations	Leader. and Mgmt. Com.	Risk Management	Operational Controls	Emer. Prep. and Response	Stakeholder Engagement	Comp., Aware., and Training	Doc. and Records Keeping	Incident Invest., Eval. & LL	Safety Assurance	Mgmt. Rev. and Cont. Improv.
1. Strategic plan for pipeline safety	**P**	P	S	S	S	S	S	S	S	S
2. Internal communication plan	**P**									
3. Risk management plan and a risk register	**P**	**P**					S	S	S	S
4. Training for management		**P**				S				
5. "why" CP is necessary		S	**P**			S		S	S	
6. Distinguish policy, procedures/standards, and work instructions			**P**			S		S	S	
7. Emergency company procedures				**P**						
8. Emergency simulations guidance document				**P**		S		S		S
9. Emergency responders outreach				**P**	S					S
10. Stakeholder outreach plan	**P**				**P**					
11. External stakeholders outreach					**P**					
12. Strategic vision and plan for training	**P**					**P**				
13. Train-the-trainer				S		**P**		S		
14. Apprentice program						**P**				
15. Digital data collection	**P**	S					**P**			S
16. Post incident reviews								**P**		
17. Post incident review quality assurance								**P**	S	
18. Quality Assurance and Quality Control									**P**	
19. Quality Assurance reporting line independent of organization overseen	S								**P**	
20. Insource and outsource Quality Control						S			**P**	
21. Conducting management reviews and for continuous improvement	**P**									**P**
22. KPIs to measure the effectiveness of pipeline safety actions	**P**	S	S							**P**
23. Integrated, accessible, analyzable and trendable data	**P**	S					S			**P**
24. Dashboard of KPIs	**P**	S	S						**P**	**P**

Changing the pipeline safety culture of an organization does not happen overnight. It is often an evolutionary process that involves steadfast leadership from the top, commitment of organizational resources, and time.

The next step, the development of a strategic “road map” to manage this endeavor, requires a clearly articulated vision, mission, and values; knowledge of pipeline safety management systems; a strategic plan to deliver it and its component parts; and an organizational structure conducive to the culture of pipeline safety management.

The development of a “road map” is an effective tool for managing the implementation and execution of the long-term aim of the program.

Appendix A. PSMS Survey Questions

Overview

Welcome!

Thank you for choosing to participate in this Pipeline Safety Survey - conducted by Jacobs Consultancy - as part of our API Recommended Practice (RP) 1173 Gap Analysis. Your input on this company's safety program & culture is extremely valuable because it will help us evaluate what we are doing well and reflect on areas where we can improve.

API RP 1173 was created in 2014 at the recommendation of the U.S. National Transportation Safety Board (NTSB) and developed in collaboration with the U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA), state regulators, and industry experts. The purpose of RP 1173 is to provide guidance to pipeline operators, such as MDU Resources Group, Inc and its subsidiaries, on the development and maintenance of an effective pipeline safety management system.

Managing the safety of a complex pipeline network requires a system of efforts to address multiple, dynamic activities and circumstances. Major accidents with high consequences rarely occur due to a safety breakdown of a single activity, but instead occur because of an alignment of weaknesses across multiple activities. This Pipeline Safety Survey will ask you 64 questions related to your company's safety program, objectives, and performance in order to identify any potential weaknesses. Please answer each question as best you can from the responses that have been provided.

Estimated Time to Complete
25-30 minutes

General Information

Key terminology used in the following section:
'Pipeline' refers to all pipe, valves, fittings, flanges, regulators, pressure vessels, pulsation dampeners, relief equipment, pumps, compressors, metering stations, regulator stations, and other associated facilities related to gas transmission & distribution.
'Company' refers to your specific utility brand within MDU Resources Group, Inc.

1. Which utility brand within MDU Resources Group, Inc. do you currently work for?

- ◯ Cascade Natural Gas Corporation (Subsidiary)
- ◯ Intermountain Gas Company (Subsidiary)
- ◯ Great Plains Natural Gas Co. (Subsidiary)
- ◯ Montana-Dakota Utilities Co. (Subsidiary)
- ◯ MDU Resources Group, Inc. (Parent Company)

2. Which of the following best describes your current role?

- ◯ President / Vice President / Director
- ◯ Manager / Supervisor
- ◯ Engineering
- ◯ Operations
- ◯ Support Staff
- ◯ Contractor

3. Which of the following best describes your primary work environment?

- ◯ Office
- ◯ Field
- ◯ Split between office and field

4. How much experience do you have working for natural gas system operators?

- ○ 5 years or less
- ○ More than 5, but less than 10 years
- ○ More than 10, but less than 20 years
- ○ 20 years or more

5. How connected do you feel your job is to pipeline safety?

- ○ Extremely connected
- ○ Very connected
- ○ Somewhat connected
- ○ Not so connected
- ○ Not at all connected

6. I am satisfied with my overall job security.

- ○ Strongly agree
- ○ Agree
- ○ Neutral / Neither agree nor disagree
- ○ Disagree
- ○ Strongly disagree

7. I have adequate time to complete my day-to-day job duties in a safe manner.

- ○ Strongly agree
- ○ Agree
- ○ Neutral / Neither agree nor disagree
- ○ Disagree
- ○ Strongly disagree

8. I have adequate training & resources to ensure that my work is completed according to company procedures.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neutral / Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

Leadership & Management Commitment

Key terminology used in the following section:
'Pipeline' refers to all pipe, valves, fittings, flanges, regulators, pressure vessels, pulsation dampeners, relief equipment, pumps, compressors, metering stations, regulator stations, and other associated facilities related to gas transmission & distribution.
'Company' refers to your specific utility brand within MDU Resources Group, Inc.

9. How important do you feel pipeline safety is to senior management?

- ◯ Extremely important - It is an essential priority and integral to every company decision.
- ◯ Very important - It is a high priority and receives significant consideration in company decisions.
- ◯ Somewhat important - It is a medium priority and receives equal consideration in company decisions.
- ◯ Not so important - It is a low priority and receives little consideration in company decisions.
- ◯ Not at all important - It is not a priority and receives no consideration in company decisions.

10. How often have you heard senior management talk about pipeline safety?

- ◯ Extremely often - More than once a week
- ◯ Very often - Once a week
- ◯ Somewhat often - Once a month
- ◯ Not so often - Once every 3 months
- ◯ Not at all often - Less than once every 3 months

11. Senior management has clearly communicated organizational pipeline safety goals as they relate to my day-to-day activities.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neutral / Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

12. Senior management has clearly communicated organizational personnel safety goals as they relate to my day-to-day activities.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neutral / Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

13. How satisfied are you with senior management's commitment to the safety of its:

	Extremely dissatisfied	Dissatisfied	Neutral / Neither satisfied nor dissatisfied	Satisfied	Extremely satisfied	Don't know
employees?	◯	◯	◯	◯	◯	◯
contractors?	◯	◯	◯	◯	◯	◯
neighboring communities?	◯	◯	◯	◯	◯	◯
pipelines & associated facilities?	◯	◯	◯	◯	◯	◯

14. In your opinion, how adequate are the resources (e.g. budget, labor, equipment, materials) allocated towards ensuring the safety of company personnel, contractors, and/or the public in the following categories?

	Extremely inadequate	Inadequate	Neither adequate nor inadequate	Adequate	Extremely adequate	Don't know
Staffing	◯	◯	◯	◯	◯	◯
Training	◯	◯	◯	◯	◯	◯
Audits	◯	◯	◯	◯	◯	◯
Maintenance	◯	◯	◯	◯	◯	◯
Asset upgrades	◯	◯	◯	◯	◯	◯
Incident investigation	◯	◯	◯	◯	◯	◯
Operational controls	◯	◯	◯	◯	◯	◯
IT systems	◯	◯	◯	◯	◯	◯

Stakeholder Engagement

Key terminology used in the following section:
'Pipeline' refers to all pipe, valves, fittings, flanges, regulators, pressure vessels, pulsation dampeners, relief equipment, pumps, compressors, metering stations, regulator stations, and other associated facilities related to gas transmission & distribution.
'Company' refers to your specific utility brand within MDU Resources Group, Inc.

15. My supervisor clearly communicates the company's pipeline safety expectations as they relate to my work.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neutral / Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

16. My coworkers and I have a good working relationship.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neutral / Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

17. Senior management and employees trust each other.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neutral / Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

18. How often are pipeline safety meetings held in the workplace?

- ◯ Extremely often - More than once a week
- ◯ Very often - Once a week
- ◯ Somewhat often - Once every 2 weeks
- ◯ Not so often - Once a month
- ◯ Not at all often - Less than once a month
- ◯ Don't know

19. How effective are <u>two-way communications</u> between your utility company and the following **stakeholders** on important pipeline safety matters?

	Terrible	Poor	Satisfactory	Good	Excellent	Don't know or not applicable
employees?	◯	◯	◯	◯	◯	◯
contractors?	◯	◯	◯	◯	◯	◯
customers or members of the public?	◯	◯	◯	◯	◯	◯
law enforcement?	◯	◯	◯	◯	◯	◯
emergency responders?	◯	◯	◯	◯	◯	◯
industry safety organizations?	◯	◯	◯	◯	◯	◯
regulatory agencies?	◯	◯	◯	◯	◯	◯

20. How would you characterize your understanding of company pipeline safety policies & procedures (P&P's) as they relate to your day-to-day activities?

- ◯ Extremely clear - I am well-versed in the relevant P&P's and fully incorporate them in day-to-day activities.
- ◯ Clear - I am familiar with the relevant P&P's and generally incorporate them in day-to-day activities.
- ◯ Neutral / Neither clear nor poor - I am aware of the relevant P&P's and am seeking to incorporate them in day-to-day activities.
- ◯ Poor - I am aware of the relevant safety P&P's but rarely incorporate them in day-to-day activities.
- ◯ Extremely poor - I am unaware of any relevant safety P&P's nor have I received any communications on this topic.

Risk Management

Key terminology used in the following section:
'Pipeline' refers to all pipe, valves, fittings, flanges, regulators, pressure vessels, pulsation dampeners, relief equipment, pumps, compressors, metering stations, regulator stations, and other associated facilities related to gas transmission & distribution.
'Company' refers to your specific utility brand within MDU Resources Group, Inc.
'Risk management' refers to a systematic application of management policies, processes, procedures, finite financial & human resources, and practices to the tasks of identifying, analyzing, preventing, and mitigating risk in order to protect employees and contractor personnel, the general public, the environment, and the pipeline.

21. In your day-to-day activities, how often do you consider what could go wrong and the potential consequence(s) to public, personal, and/or pipeline safety?

- ◯ Extremely often - More than once a day
- ◯ Very often - Once a day
- ◯ Somewhat often - Several times a week
- ◯ Not so often - Once a week
- ◯ Not at all often - Less than once a week

22. How effective do you feel existing data collection efforts are in supporting operational monitoring, maintenance, and integrity assessment efforts?

- ◯ Extremely effective - Inventories of pipeline assets & facilities are extremely well-maintained; data is always collected and reviewed to confirm completeness & quality.
- ◯ Effective - Inventories of pipeline assets & facilities are reasonably well-maintained; data is generally collected and reviewed to confirm completeness & quality.
- ◯ Neither effective nor ineffective - Inventories of pipeline assets & facilities are somewhat well-maintained; data is sometimes collected and reviewed to confirm completeness & quality.
- ◯ Ineffective - Inventories of pipeline assets & facilities are not very well-maintained; data is rarely collected nor reviewed to confirm completeness & quality.
- ◯ Extremely ineffective - Inventories of pipeline assets & facilities are not at all well-maintained; data is never collected nor reviewed to confirm completeness & quality.
- ◯ Don't know

23. How well do you feel existing risk assessment processes & procedures facilitate the identification of potential pipeline threats prior to an operational upset or unintended release?

- Extremely well - Systematic approach with data requirements & safe operating limits (SOL's) clearly defined. Objectives, methodologies, and metrics are easy to understand.
- Well - Systematic approach with data requirements & safe operating limits (SOL's) reasonably well defined. Objectives, methodologies, and metrics are relatively easy to understand.
- Neither well nor poorly - Systematic approach with data requirements & safe operating limits (SOL's) defined. Objectives, methodologies, and metrics are acceptable.
- Poorly - Somewhat systematic approach with data requirements & safe operating limits (SOL's) loosely defined. Objectives, methodologies, and metrics are relatively difficult to understand.
- Extremely poorly - Somewhat systematic approach with data requirements & safe operating limits (SOL's) minimally defined. Objectives, methodologies, and metrics are very difficult to understand.
- Don't know

24. How well do you feel existing risk management processes & procedures facilitate the selection of appropriate prevention & mitigation measures to address potential pipeline threats?

- Extremely well - Systematic approach for evaluating risk at routine intervals. Selected measures consider all available data & circumstances and significantly reduce the likelihood of occurrence and/or severity of consequences for all threats.
- Well - Systematic approach for evaluating risk at somewhat frequent intervals. Selected measures consider most available data & circumstances and significantly reduce the likelihood of occurrence and/or severity of consequences for most threats.
- Neither well nor poorly - Systematic approach for evaluating risk at acceptable intervals. Selected measures consider available data & circumstances and significantly reduce the likelihood of occurrence and/or severity of consequences for major threats only.
- Poorly - Somewhat systematic approach for evaluating risk at somewhat infrequent intervals. Selected measures consider some available data & circumstances and significantly reduce the likelihood of occurrence and/or severity of consequences for some threats.
- Extremely poorly - Somewhat systematic approach for evaluating risk at infrequent intervals. Selected measures consider little available data & circumstances and significantly reduce the likelihood of occurrence and/or severity of consequences for very few threats.
- Don't know

Operational Controls

Key terminology used in the following section:
'Pipeline' refers to all pipe, valves, fittings, flanges, regulators, pressure vessels, pulsation dampeners, relief equipment, pumps, compressors, metering stations, regulator stations, and other associated facilities related to gas transmission & distribution.
'Company' refers to your specific utility brand within MDU Resources Group, Inc.

25. How adequate do you feel existing written operating and maintenance processes & procedures are in establishing safe operating limits, addressing safe work practices, and instructing key personnel how to perform critical activities during the following phases of pipeline operation:

	Extremely inadequate	Inadequate	Neither adequate nor inadequate	Adequate	Extremely adequate	Don't know
Initial start-up?	○	○	○	○	○	○
Normal operation?	○	○	○	○	○	○
Abnormal operating condition (AOC)?	○	○	○	○	○	○
Emergency operation?	○	○	○	○	○	○
Normal shutdown?	○	○	○	○	○	○
Start-up following maintenance/outage?	○	○	○	○	○	○

26. How often do you need to deviate from existing written operating and maintenance processes & procedures for safety reasons?

- ○ Extremely often - Written procedures are very incomplete and following them would undoubtedly compromise the safety of myself and those around me.
- ○ Very often - Written procedures are fairly incomplete and following them would potentially compromise the safety of myself and those around me.
- ○ Somewhat often - Written procedures are somewhat incomplete and following them would sometimes compromise the safety of myself and those around me.
- ○ Not so often - Written procedures are fairly complete and following them would rarely compromise the safety of myself and those around me.
- ○ Never - Written procedures are very complete and following them would never compromise the safety of myself and those around me.
- ○ Don't know or not applicable

27. Company leadership and documented procedures give me the authority to stop work if I believe following existing written operating and maintenance processes & procedures will cause an unsafe condition.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neutral / Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

28. How routinely are Management of Change (MOC) procedures followed when there is a change in:

	Never	Rarely	Sometimes	Most of the time	Always	Don't know
Organizational structure?	◯	◯	◯	◯	◯	◯
Company procedures?	◯	◯	◯	◯	◯	◯
Technology?	◯	◯	◯	◯	◯	◯

29. How confident are you that the company's quality control processes & procedures ensure all pipeline materials are manufactured and fabricated in accordance with design & purchase specifications and/or company standards?

- ◯ Extremely confident
- ◯ Very confident
- ◯ Moderately confident
- ◯ Not so confident
- ◯ Not at all confident
- ◯ Don't know

30. How confident are you that the company's quality control processes & procedures ensure all pipe and equipment is installed in accordance with manufacturer's instructions and company standards prior to start-up?

- ◯ Extremely confident
- ◯ Very confident
- ◯ Moderately confident
- ◯ Not so confident
- ◯ Not at all confident
- ◯ Don't know

31. How confident are you that the company's inspection and testing processes & procedures ensure all pipeline assets & facilities are operated and maintained in a safe manner consistent with all requirements, regulations, and standards?

- ◯ Extremely confident
- ◯ Very confident
- ◯ Moderately confident
- ◯ Not so confident
- ◯ Not at all confident
- ◯ Don't know

32. To your knowledge, how often are the following steps taken to ensure pipeline safety compliance on **outsourced** pipeline activities:

	Never	Rarely	Sometimes	Most of the time	Always	Don't know
Safety requirements for contractor scope of work are fully communicated.	◯	◯	◯	◯	◯	◯
Safety training & orientation on company policies is provided.	◯	◯	◯	◯	◯	◯
Mutual responsibilities, accountability, and authority for tasks & activities are clearly defined.	◯	◯	◯	◯	◯	◯
Risks at each work site are fully communicated.	◯	◯	◯	◯	◯	◯
Management of change (MOC) procedures are fully communicated.	◯	◯	◯	◯	◯	◯
Work site is actively supervised by a designated company employee.	◯	◯	◯	◯	◯	◯
Contractor compliance is tracked and evaluated on a regular basis.	◯	◯	◯	◯	◯	◯
Project documentation is reliable, traceable, verifiable, and complete.	◯	◯	◯	◯	◯	◯

Incident Investigation, Evaluation, and Lessons Learned

Key terminology used in the following section:
'Pipeline' refers to all pipe, valves, fittings, flanges, regulators, pressure vessels, pulsation dampeners, relief equipment, pumps, compressors, metering stations, regulator stations, and other associated facilities related to gas transmission & distribution.
'Company' refers to your specific utility brand within MDU Resources Group, Inc.

33. How comfortable would you feel about reporting an unsafe situation:

	Extremely uncomfortable	Uncomfortable	Neutral / Neither comfortable nor uncomfortable	Comfortable	Extremely comfortable
involving yourself?	○	○	○	○	○
involving another employee?	○	○	○	○	○
involving a contractor?	○	○	○	○	○
involving a customer or member of the public?	○	○	○	○	○

34. How often would you actually report near misses that could have led to a loss of life or serious injury?

- ○ Always
- ○ Most of the time
- ○ Sometimes
- ○ Rarely
- ○ Never
- ○ Don't know

35. To what extent do you think near misses in your workplace are actually being reported?

- ◯ All near misses are reported
- ◯ Most near misses are reported
- ◯ Many near misses are reported
- ◯ Only the most serious near misses are reported
- ◯ Near misses are usually not reported
- ◯ Don't know

36. How rigorous are investigations into incidents in ensuring that:

	Not at all rigorous	Not so rigorous	Somewhat rigorous	Very rigorous	Extremely rigorous	Don't know
the incident scene is properly secured (if necessary)?	◯	◯	◯	◯	◯	◯
important evidence & testimony are recovered?	◯	◯	◯	◯	◯	◯
the root cause & contributing factors are identified?	◯	◯	◯	◯	◯	◯
emergency response processes & procedures are updated (if necessary)?	◯	◯	◯	◯	◯	◯
actionable recommendations for safety improvement are identified?	◯	◯	◯	◯	◯	◯
lessons learned are incorporated into the risk assessment process?	◯	◯	◯	◯	◯	◯

37. How prompt is your company in taking action (i.e. initiating an incident investigation, implementing preventive/mitigating measures) when unsafe conditions are raised?

- ◯ Extremely prompt - Always occurs within a reasonable time frame
- ◯ Prompt - Usually occurs within a reasonable time frame
- ◯ Neither prompt nor slow - Sometimes occurs within a reasonable time frame
- ◯ Slow - Rarely occurs within a reasonable time frame
- ◯ Extremely slow - Never occurs within a reasonable time frame
- ◯ Don't know

38. How often are post-incident reviews:

	Never	Not so often	Somewhat often	Very often	Extremely often	Don't know
conducted with those who responded to the incident?	○	○	○	○	○	○
shared with others in the company?	○	○	○	○	○	○
conducted with external first responders or safety agencies?	○	○	○	○	○	○

39. How effectively are findings from internal incident investigations (i.e. cause, contributing factors, recommendations, lessons learned) communicated?

- ○ Extremely effectively
- ○ Very effectively
- ○ Somewhat effectively
- ○ Not so effectively
- ○ Not at all effectively
- ○ Don't know

40. How well does your company learn from its mistakes?

- ○ Extremely well - Recommendations are fully implemented and lessons learned are disseminated to all appropriate stakeholders.
- ○ Very well - Recommendations are mostly implemented and lessons learned are disseminated to most stakeholders.
- ○ Somewhat well - Recommendations are partially implemented and lessons learned are disseminated to some stakeholders.
- ○ Not so well - Recommendations are minimally implemented and lessons learned are disseminated to few stakeholders.
- ○ Not at all well - Recommendations are not implemented and lessons learned are ignored.
- ○ Don't know

41. How well does your company learn from the mistakes of other MDU Resources Group subsidiaries?

- Extremely well - Relevant external recommendations are fully implemented and lessons learned are disseminated to all appropriate stakeholders.
- Very well - Relevant external recommendations are mostly implemented and lessons learned are disseminated to most stakeholders.
- Somewhat well - Relevant external recommendations are partially implemented and lessons learned are disseminated to some stakeholders.
- Not so well - Relevant external recommendations are minimally implemented and lessons learned are disseminated to few stakeholders.
- Not at all well - Relevant external recommendations are not implemented and lessons learned are ignored.
- Don't know

42. How well does your company learn from the mistakes of other utility companies external to MDU Resources Group?

- Extremely well - Relevant external recommendations are fully implemented and lessons learned are disseminated to all appropriate stakeholders.
- Very well - Relevant external recommendations are mostly implemented and lessons learned are disseminated to most stakeholders.
- Somewhat well - Relevant external recommendations are partially implemented and lessons learned are disseminated to some stakeholders.
- Not so well - Relevant external recommendations are minimally implemented and lessons learned are disseminated to few stakeholders.
- Not at all well - Relevant external recommendations are not implemented and lessons learned are ignored.
- Don't know

Safety Assurance

Key terminology used in the following section:
'Pipeline' refers to all pipe, valves, fittings, flanges, regulators, pressure vessels, pulsation dampeners, relief equipment, pumps, compressors, metering stations, regulator stations, and other associated facilities related to gas transmission & distribution.
'Company' refers to your specific utility brand within MDU Resources Group, Inc.

43. How effective are existing safety policies, processes & procedures at identifying, evaluating, and mitigating potential threats in the following phases of a pipeline's life cycle:

	Not at all effective	Not so effective	Somewhat effective	Very effective	Extremely effective	Don't know
Routing	○	○	○	○	○	○
Design	○	○	○	○	○	○
Construction	○	○	○	○	○	○
Commissioning	○	○	○	○	○	○
Operation	○	○	○	○	○	○
Maintenance	○	○	○	○	○	○

44. Approximately when was the last time your department/district/office was subjected to a pipeline operations safety audit by:

	More than 3 years ago	3 years ago	2 years ago	1 year ago	Less than 1 year ago	Don't know or not applicable
An internal audit?	○	○	○	○	○	○
Self audit?	○	○	○	○	○	○
A third party via *American Gas Association (AGA) Peer Review*?	○	○	○	○	○	○
A separate subsidiary of MDU Resources Group?	○	○	○	○	○	○
A federal or state pipeline safety agency?	○	○	○	○	○	○

45. How typical is it that the following safety performance measures or key performance indicators (KPI's) are established for the type of work you do?

	Not at all typical	Not very typical	Somewhat typical	Very typical	Extremely typical	Don't know
Proactive measures that demonstrate safety improvement efforts? *(e.g. # of improvement initiatives planned and/or completed, # of processes improved, # of procedures improved)*	○	○	○	○	○	○
Leading measures that demonstrate risk reduction efforts? *(e.g. # of integrity evaluations completed, # of immediate & planned repairs, # of preventive & mitigating actions implemented)*	○	○	○	○	○	○
Lagging measures that identify areas where improvement is needed? *(e.g. # of fatalities, # of injuries, amount of property damage resulting from incidents)*	○	○	○	○	○	○

46. How motivated do you feel to help the company meet its safety goals?

- ○ Extremely motivated - My safety performance significantly affects my performance rating and pay.
- ○ Very motivated - My safety performance generally affects my performance rating and pay.
- ○ Somewhat motivated - My safety performance moderately affects my performance rating and pay.
- ○ Not so motivated - My safety performance rarely affects my performance rating and pay.
- ○ Not at all motivated - My safety performance in no way affects my performance rating and pay.
- ○ Don't know or not applicable

47. To what extent do you think managers (i.e. supervisor, foreman, superintendent, team leader, etc.) in your workplace are held accountable for incidents in their areas?

- Managers are held fully accountable for preventing incidents in their area.
- Managers are held accountable for preventing incidents in their area but safety performance does not generally affect their performance rating and pay.
- Managers are held accountable for incidents but only in a general way.
- Managers are responsibility for incidents in their areas. However, most injuries are attributed to individual error, bad luck, or unfortunate circumstances.
- Incidents are almost always blamed on individual error, bad luck, or unfortunate circumstances.
- Don't know

48. In your opinion, how has disciplinary action been used in your workplace for safety infractions (i.e. breaking a safety rule or not following a standard practice)? *Disciplinary action refers to a range of actions from a cautionary conversation or warning through to more severe action such as termination.*

- Disciplinary action is proportional to the seriousness of the infraction, and is taken for all safety infractions.
- Disciplinary action is only taken for serious safety infractions.
- Disciplinary action is applied arbitrarily and inconsistently.
- Disciplinary action is seldom taken for any safety infractions.
- Don't know

Management Review and Continuous Improvement

Key terminology used in the following section:
'Pipeline' refers to all pipe, valves, fittings, flanges, regulators, pressure vessels, pulsation dampeners, relief equipment, pumps, compressors, metering stations, regulator stations, and other associated facilities related to gas transmission & distribution.
'Company' refers to your specific utility brand within MDU Resources Group, Inc.

49. How well do you feel this company meets its stated safety performance goals and objectives?

- ◯ Extremely well
- ◯ Well
- ◯ Neutral / Neither well nor poorly
- ◯ Poorly
- ◯ Extremely poorly
- ◯ Don't know

50. How would you best describe your company's approach towards understanding, evaluating, and mitigating risks throughout the pipeline's life cycle; does it:

	Extremely reactive	Reactive	Neither proactive nor reactive	Proactive	Extremely proactive	Don't know
Routinely invest in the modernization of aging infrastructure?	◯	◯	◯	◯	◯	◯
Promote the use of automated equipment?	◯	◯	◯	◯	◯	◯
Take advantage of advancements in inspection technology?	◯	◯	◯	◯	◯	◯
Adopt industry best practices & safety recommendations?	◯	◯	◯	◯	◯	◯

51. How well does MDU Resources Group share institutional knowledge & experienceacross its utility brands?

- Extremely well
- Very well
- Somewhat well
- Not so well
- Not at all well
- Don't know

Emergency Preparedness and Response

Key terminology used in the following section:
'Pipeline' refers to all pipe, valves, fittings, flanges, regulators, pressure vessels, pulsation dampeners, relief equipment, pumps, compressors, metering stations, regulator stations, and other associated facilities related to gas transmission & distribution.
'Company' refers to your specific utility brand within MDU Resources Group, Inc.

52. How would you characterize the relationship between your company and the following emergency responders:

	Terrible	Poor	Satisfactory	Good	Excellent	Don't know
local fire department?	○	○	○	○	○	○
local police department?	○	○	○	○	○	○
humanitarian organizations (e.g. Red Cross)?	○	○	○	○	○	○
U.S. Fire Marshal(s)?	○	○	○	○	○	○

53. How well do you understand your role & responsibilities under the company's emergency response plan in the following scenarios:

	Not at all well	Not so well	Somewhat well	Very well	Extremely well	Not applicable
Fire or explosion?	○	○	○	○	○	○
Uncontrolled release of gas?	○	○	○	○	○	○
Loss of gas service?	○	○	○	○	○	○
Detection of unsafe gas concentration inside/near a facility?	○	○	○	○	○	○
Natural disaster (e.g. earthquake, flood, landslide, volcanic eruption)?	○	○	○	○	○	○
Bomb threat?	○	○	○	○	○	○
Civil disturbance (e.g. riots, demonstrations)?	○	○	○	○	○	○

54. How prepared do you feel to execute your role & responsibilities under the company's emergency response plan in the following scenarios:

	Not at all prepared	Not so prepared	Somewhat prepared	Very prepared	Extremely prepared	Not applicable
Fire or explosion?	○	○	○	○	○	○
Uncontrolled release of gas?	○	○	○	○	○	○
Loss of gas service?	○	○	○	○	○	○
Detection of unsafe gas concentration inside/near a facility?	○	○	○	○	○	○
Natural disaster (e.g. earthquake, flood, landslide, volcanic eruption)?	○	○	○	○	○	○
Bomb threat?	○	○	○	○	○	○
Civil disturbance (e.g. riots, demonstrations)?	○	○	○	○	○	○

55. How well do you understand communication protocols defined by the company's emergency response plan in the following emergency scenarios:

	Not at all well	Not so well	Somewhat well	Very well	Extremely well	Not applicable
Fire or explosion?	○	○	○	○	○	○
Uncontrolled release of gas?	○	○	○	○	○	○
Loss of gas service?	○	○	○	○	○	○
Detection of unsafe gas concentration inside/near a facility?	○	○	○	○	○	○
Natural disaster (e.g. earthquake, flood, landslide, volcanic eruption)?	○	○	○	○	○	○
Bomb threat?	○	○	○	○	○	○
Civil disturbance (e.g. riots, demonstrations)?	○	○	○	○	○	○

56. How confident are you in the adequacy & mobilization time of internal & external response resources in the following emergency scenarios:

	Not at all confident	Not so confident	Somewhat confident	Very confident	Extremely confident	Don't know or not applicable
Fire or explosion?	○	○	○	○	○	○
Uncontrolled release of gas?	○	○	○	○	○	○
Loss of gas service?	○	○	○	○	○	○
Detection of unsafe gas concentration inside/near a facility?	○	○	○	○	○	○
Natural disaster (e.g. earthquake, flood, landslide, volcanic eruption)?	○	○	○	○	○	○
Bomb threat?	○	○	○	○	○	○
Civil disturbance (e.g. riots, demonstrations)?	○	○	○	○	○	○

Competence, Awareness, and Training

Key terminology used in the following section:
'Pipeline' refers to all pipe, valves, fittings, flanges, regulators, pressure vessels, pulsation dampeners, relief equipment, pumps, compressors, metering stations, regulator stations, and other associated facilities related to gas transmission & distribution.
'Company' refers to your specific utility brand within MDU Resources Group, Inc.

57. How important are the company's pipeline safety vision and goals to you?

- ◯ Extremely important
- ◯ Important
- ◯ Neutral / Neither important nor unimportant
- ◯ Unimportant
- ◯ Extremely unimportant

58. To what extent have you received training on the following topics in the last two years? Training includes both formal courses away from the job and organized training on the job.

	No training	Little training	Some training	Considerable training	Extensive training	Don't know or not applicable
personal safety?	◯	◯	◯	◯	◯	◯
office safety?	◯	◯	◯	◯	◯	◯
regulatory pipeline compliance?	◯	◯	◯	◯	◯	◯
technology?	◯	◯	◯	◯	◯	◯
leadership / management?	◯	◯	◯	◯	◯	◯
how to do your job?	◯	◯	◯	◯	◯	◯

59. How satisfied are you with the situational awareness & incident response training provided by your company?

	Extremely dissatisfied	Dissatisfied	Neutral / Neither satisfied nor dissatisfied	Satisfied	Extremely satisfied	Didn't have any
Amount of training provided?	○	○	○	○	○	○
Quality of training provided?	○	○	○	○	○	○

60. How frequently do you participate in pipeline safety improvement activities such as serving on a committee, participating in an incident investigation, or helping update pipeline safety rules & procedures?

- ○ Extremely frequently
- ○ Frequently
- ○ Neither frequently nor infrequently
- ○ Infrequently
- ○ Never

61. Please rank how important you think the following priorities have been in your current workplace:

- ⋮⋮ ▲▼ Keeping operating costs down
- ⋮⋮ ▲▼ Supporting customer growth
- ⋮⋮ ▲▼ Doing more with less
- ⋮⋮ ▲▼ Providing a quality service
- ⋮⋮ ▲▼ Ensuring a safe workplace

Documentation and Record Keeping

Key terminology used in the following section:
'Pipeline' refers to all pipe, valves, fittings, flanges, regulators, pressure vessels, pulsation dampeners, relief equipment, pumps, compressors, metering stations, regulator stations, and other associated facilities related to gas transmission & distribution.
'Company' refers to your specific utility brand within MDU Resources Group, Inc.

62. How difficult is it for you to find and access pertinent documents & records related to company pipelines when required:

	Extremely difficult	Somewhat difficult	Neutral / Neither easy nor difficult	Somewhat easy	Extremely easy	Don't know
Design?	○	○	○	○	○	○
Construction?	○	○	○	○	○	○
Operation?	○	○	○	○	○	○
Maintenance?	○	○	○	○	○	○
Surrounding environment?	○	○	○	○	○	○

63. How would you characterize the quality (i.e. completeness, reliability, legibility, traceability) of the documents & records you use to perform your job?

- ○ Excellent
- ○ Good
- ○ Satisfactory
- ○ Poor
- ○ Terrible

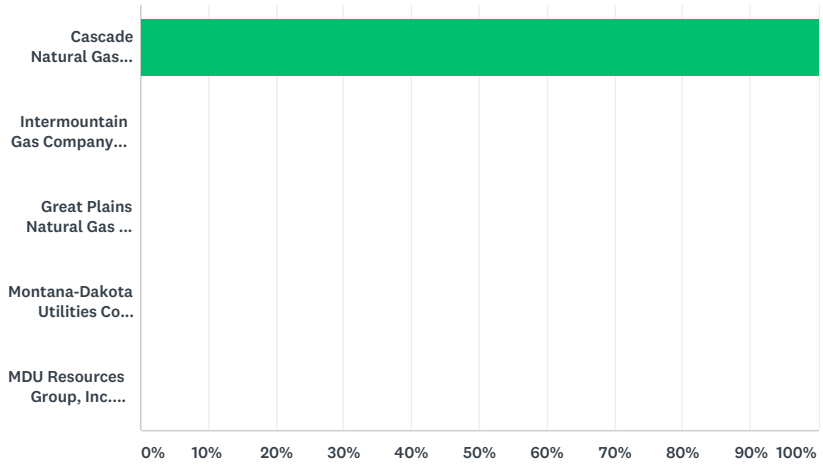
64. How would you characterize the documentation & record keeping technology currently used by your company?

- ◯ Extremely modern
- ◯ Somewhat modern
- ◯ Neutral / Neither modern nor obsolete
- ◯ Somewhat obsolete
- ◯ Extremely obsolete
- ◯ Don't know

Appendix B. PSMS Survey Summary

Q1 For which utility brand within MDU Resources Group, Inc. do you currently work?

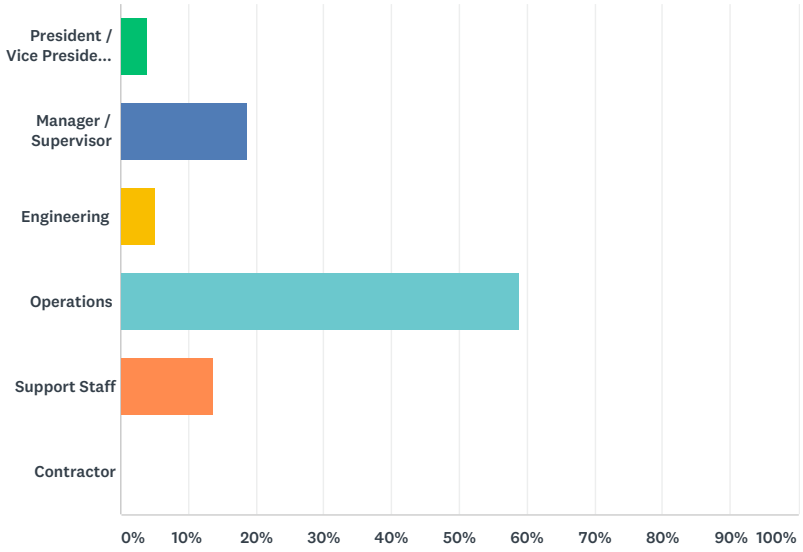
Answered: 199 Skipped: 0



ANSWER CHOICES	RESPONSES	
Cascade Natural Gas Corporation (Subsidiary)	100.00%	199
Intermountain Gas Company (Subsidiary)	0.00%	0
Great Plains Natural Gas Co. (Subsidiary)	0.00%	0
Montana-Dakota Utilities Co. (Subsidiary)	0.00%	0
MDU Resources Group, Inc. (Parent Company)	0.00%	0
TOTAL		199

Q2 Which of the following best describes your current role?

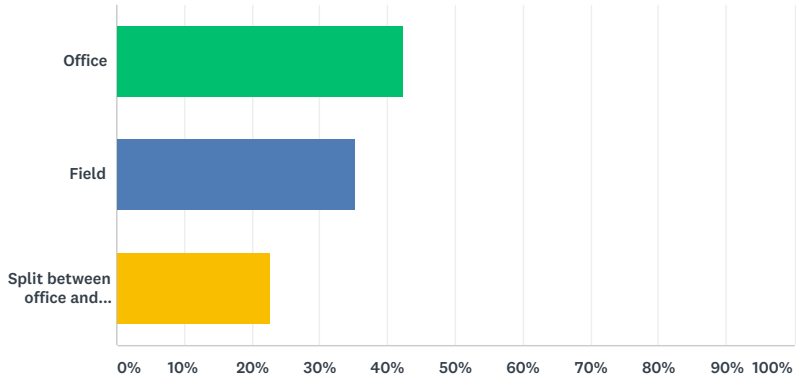
Answered: 199 Skipped: 0



ANSWER CHOICES	RESPONSES	
President / Vice President / Director	4.02%	8
Manager / Supervisor	18.59%	37
Engineering	5.03%	10
Operations	58.79%	117
Support Staff	13.57%	27
Contractor	0.00%	0
TOTAL		199

Q3 Which of the following best describes your primary work environment?

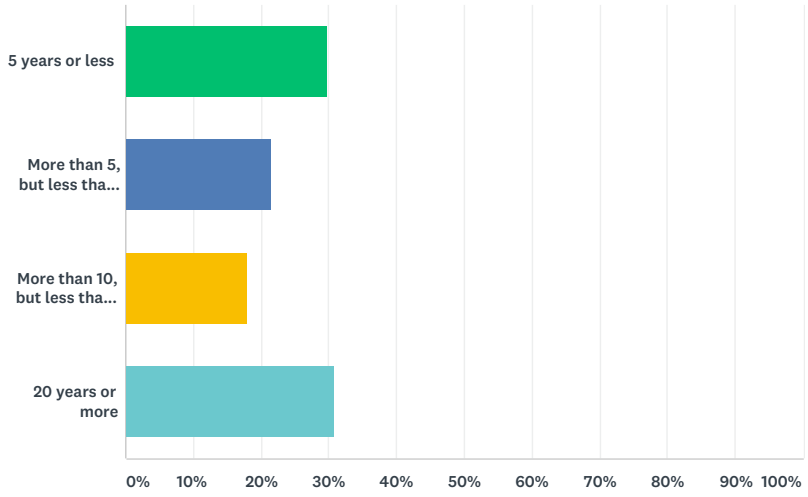
Answered: 199 Skipped: 0



ANSWER CHOICES	RESPONSES	
Office	42.21%	84
Field	35.18%	70
Split between office and field	22.61%	45
TOTAL		199

Q4 How much experience do you have working for natural gas system operators?

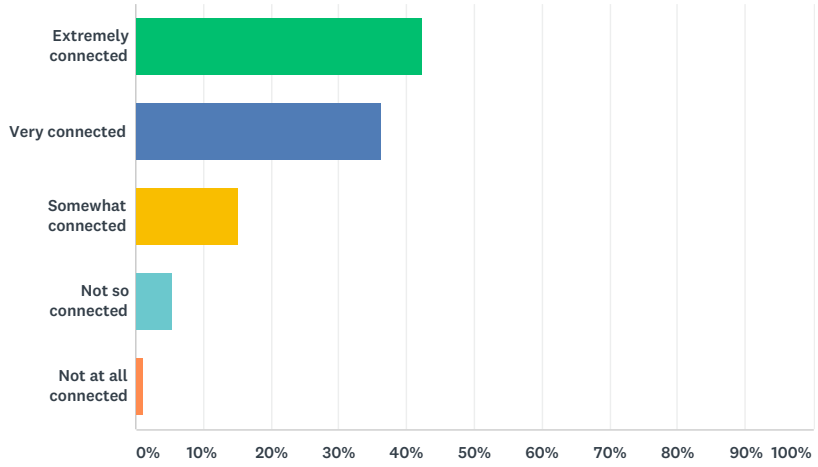
Answered: 199 Skipped: 0



ANSWER CHOICES	RESPONSES	
5 years or less	29.65%	59
More than 5, but less than 10 years	21.61%	43
More than 10, but less than 20 years	18.09%	36
20 years or more	30.65%	61
TOTAL		199

Q5 How connected do you feel your job is to pipeline safety?

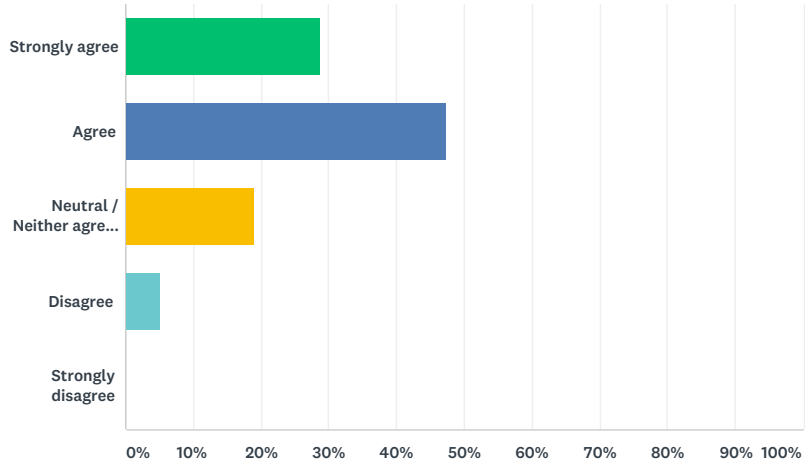
Answered: 199 Skipped: 0



ANSWER CHOICES	RESPONSES	
Extremely connected	42.21%	84
Very connected	36.18%	72
Somewhat connected	15.08%	30
Not so connected	5.53%	11
Not at all connected	1.01%	2
TOTAL		199

Q6 I am satisfied with my overall job security.

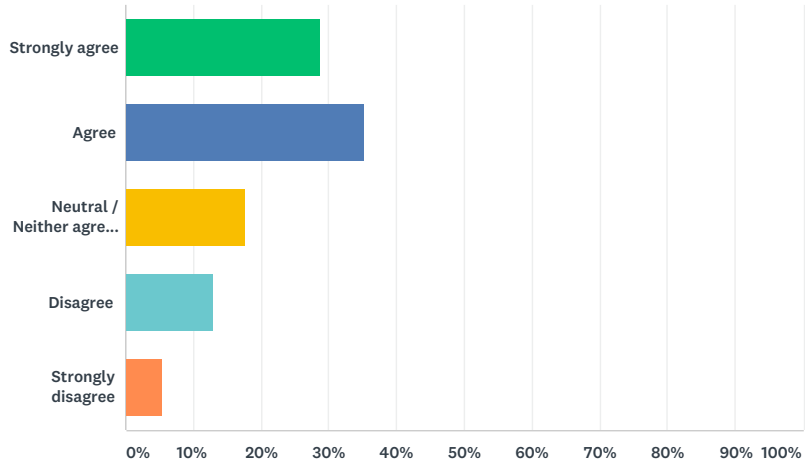
Answered: 199 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly agree	28.64%	57
Agree	47.24%	94
Neutral / Neither agree nor disagree	19.10%	38
Disagree	5.03%	10
Strongly disagree	0.00%	0
TOTAL		199

Q7 I have adequate time to complete my day-to-day job duties in a safe manner.

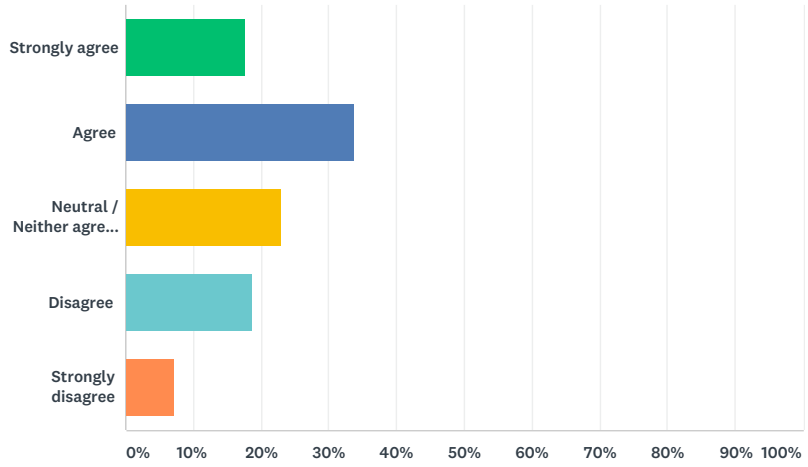
Answered: 199 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly agree	28.64%	57
Agree	35.18%	70
Neutral / Neither agree nor disagree	17.59%	35
Disagree	13.07%	26
Strongly disagree	5.53%	11
TOTAL		199

Q8 I have adequate training & resources to ensure that my work is completed according to company procedures.

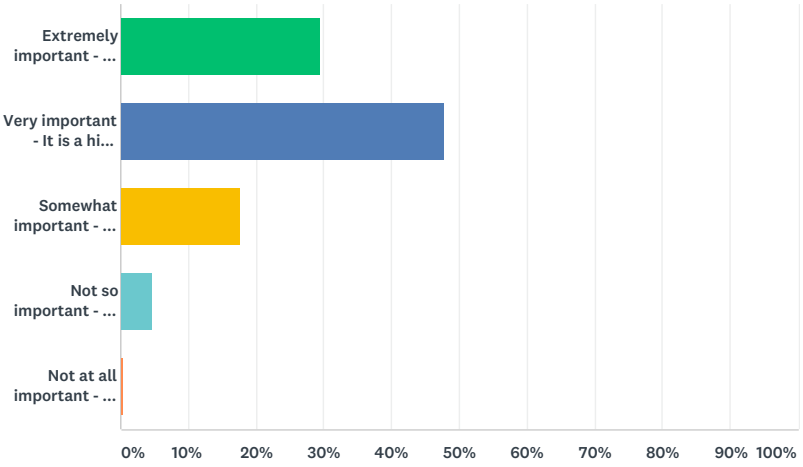
Answered: 199 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly agree	17.59%	35
Agree	33.67%	67
Neutral / Neither agree nor disagree	23.12%	46
Disagree	18.59%	37
Strongly disagree	7.04%	14
TOTAL		199

Q9 How important do you feel pipeline safety is to senior management?

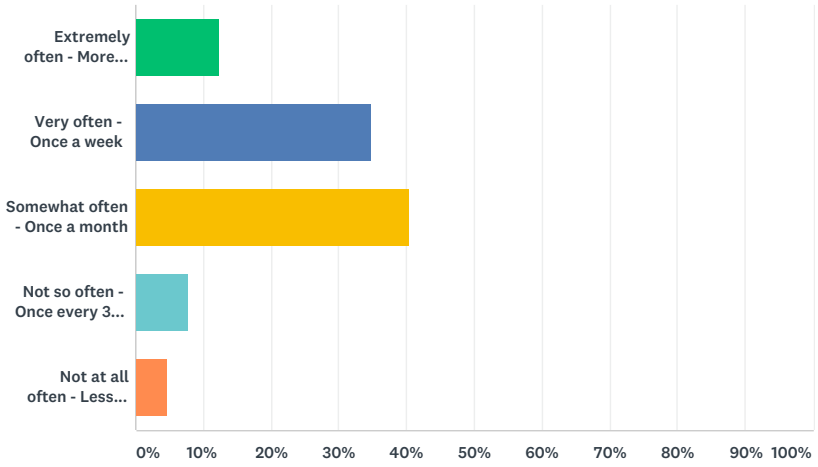
Answered: 193 Skipped: 6



ANSWER CHOICES	RESPONSES	
Extremely important - It is an essential priority and integral to every company decision.	29.53%	57
Very important - It is a high priority and receives significant consideration in company decisions.	47.67%	92
Somewhat important - It is a medium priority and receives equal consideration in company decisions.	17.62%	34
Not so important - It is a low priority and receives little consideration in company decisions.	4.66%	9
Not at all important - It is not a priority and receives no consideration in company decisions.	0.52%	1
TOTAL		193

Q10 How often have you heard senior management talk about pipeline safety?

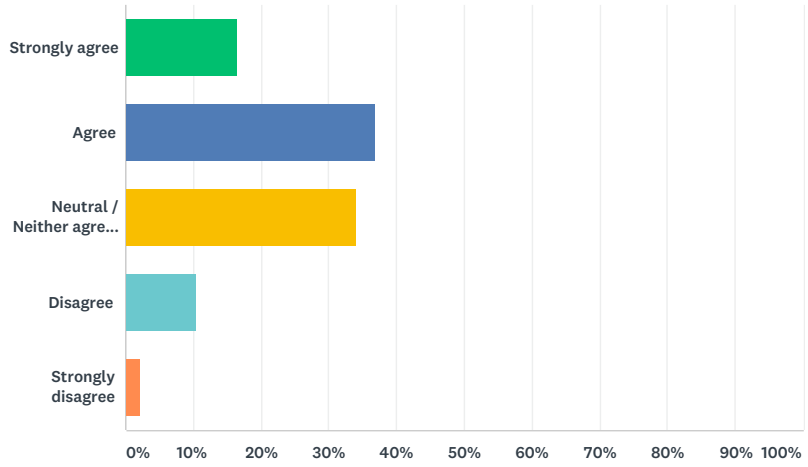
Answered: 193 Skipped: 6



ANSWER CHOICES	RESPONSES	
Extremely often - More than once a week	12.44%	24
Very often - Once a week	34.72%	67
Somewhat often - Once a month	40.41%	78
Not so often - Once every 3 months	7.77%	15
Not at all often - Less than once every 3 months	4.66%	9
TOTAL		193

Q11 Senior management has clearly communicated organizational pipeline safety goals as they relate to my day-to-day activities.

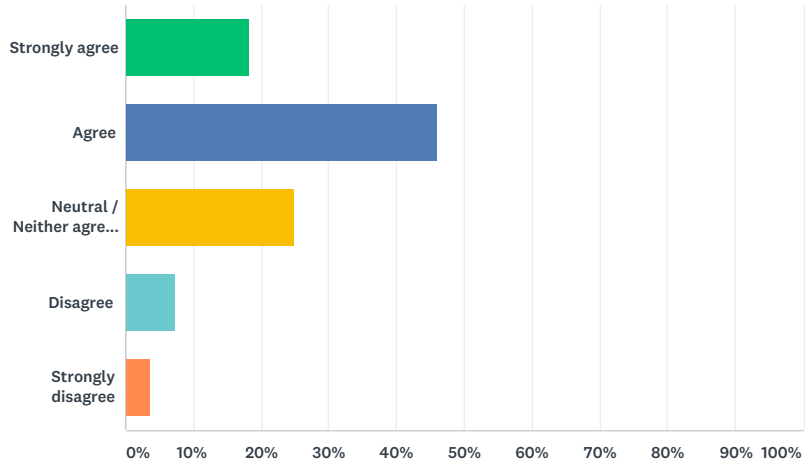
Answered: 193 Skipped: 6



ANSWER CHOICES	RESPONSES	
Strongly agree	16.58%	32
Agree	36.79%	71
Neutral / Neither agree nor disagree	34.20%	66
Disagree	10.36%	20
Strongly disagree	2.07%	4
TOTAL		193

Q12 Senior management has clearly communicated organizational personnel safety goals as they relate to my day-to-day activities.

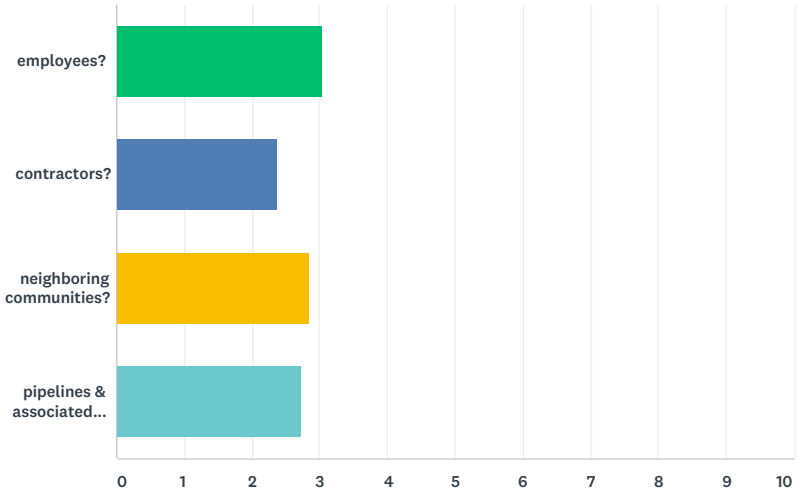
Answered: 193 Skipped: 6



ANSWER CHOICES	RESPONSES	
Strongly agree	18.13%	35
Agree	46.11%	89
Neutral / Neither agree nor disagree	24.87%	48
Disagree	7.25%	14
Strongly disagree	3.63%	7
TOTAL		193

Q13 How satisfied are you with senior management's commitment to the safety of its:

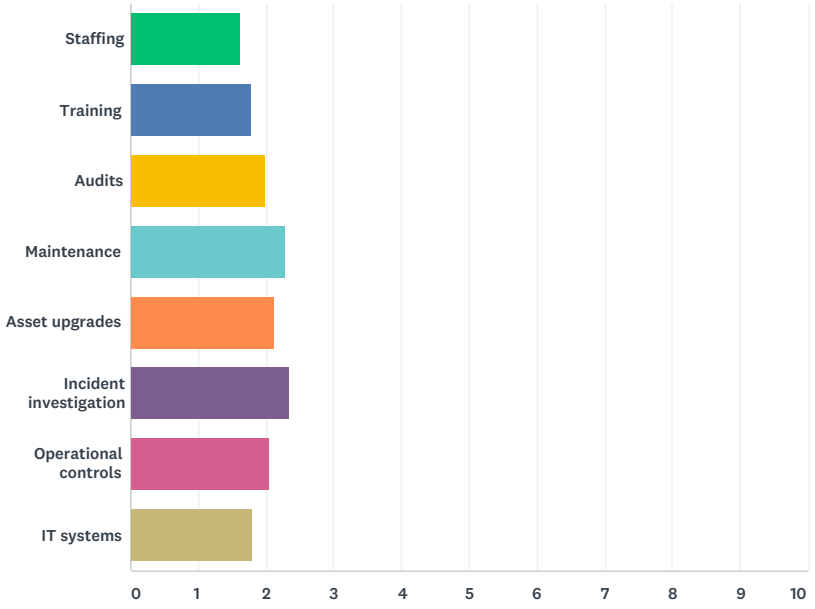
Answered: 193 Skipped: 6



	EXTREMELY DISSATISFIED	DISSATISFIED	NEUTRAL / NEITHER SATISFIED NOR DISSATISFIED	SATISFIED	EXTREMELY SATISFIED	DON'T KNOW	TOTAL	WEIGHTED AVERAGE
employees?	3.11% 6	7.25% 14	8.81% 17	44.04% 85	36.79% 71	0.00% 0	193	3.04
contractors?	2.63% 5	7.89% 15	22.63% 43	32.11% 61	21.58% 41	13.16% 25	190	2.36
neighboring communities?	2.09% 4	7.85% 15	16.75% 32	37.70% 72	32.46% 62	3.14% 6	191	2.84
pipelines & associated facilities?	2.62% 5	10.47% 20	15.71% 30	36.65% 70	30.37% 58	4.19% 8	191	2.73

Q14 In your opinion, how adequate are the resources (e.g. budget, labor, equipment, materials) allocated toward ensuring the safety of company personnel, contractors, and/or the public in the following categories?

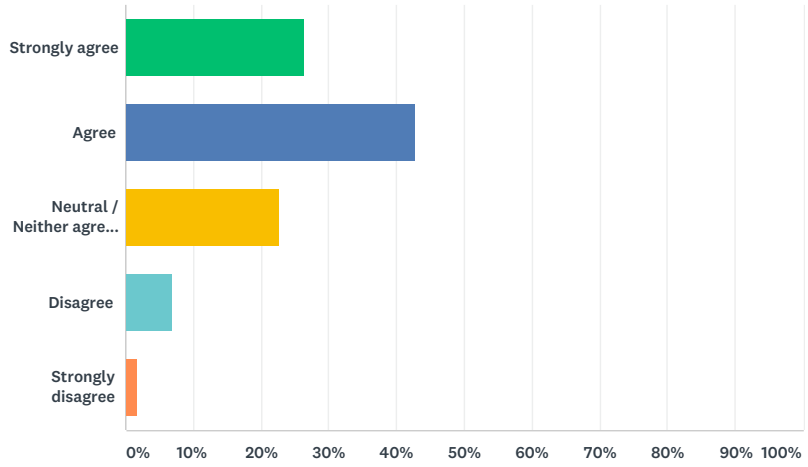
Answered: 193 Skipped: 6



	EXTREMELY INADEQUATE	INADEQUATE	NEITHER ADEQUATE NOR INADEQUATE	ADEQUATE	EXTREMELY ADEQUATE	DON'T KNOW	TOTAL	WEIGHTED AVERAGE
Staffing	15.54% 30	36.79% 71	10.88% 21	23.32% 45	8.29% 16	5.18% 10	193	1.62
Training	12.57% 24	30.37% 58	16.75% 32	27.23% 52	7.85% 15	5.24% 10	191	1.77
Audits	3.66% 7	12.04% 23	19.90% 38	36.65% 70	9.42% 18	18.32% 35	191	1.99
Maintenance	4.71% 9	14.14% 27	15.71% 30	44.50% 85	12.57% 24	8.38% 16	191	2.29
Asset upgrades	3.14% 6	16.23% 31	20.42% 39	35.60% 68	12.04% 23	12.57% 24	191	2.12
Incident investigation	5.73% 11	9.90% 19	15.63% 30	36.98% 71	20.83% 40	10.94% 21	192	2.35
Operational controls	3.65% 7	10.94% 21	21.88% 42	35.42% 68	10.94% 21	17.19% 33	192	2.05
IT systems	5.21% 10	13.54% 26	19.79% 38	31.77% 61	7.81% 15	21.88% 42	192	1.80

Q15 My supervisor clearly communicates the company's pipeline safety expectations as they relate to my work.

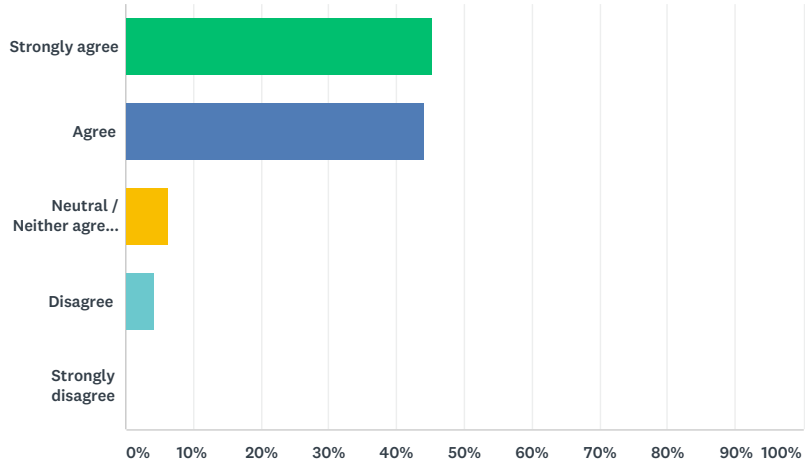
Answered: 190 Skipped: 9



ANSWER CHOICES	RESPONSES	
Strongly agree	26.32%	50
Agree	42.63%	81
Neutral / Neither agree nor disagree	22.63%	43
Disagree	6.84%	13
Strongly disagree	1.58%	3
TOTAL		190

Q16 My coworkers and I have a good working relationship.

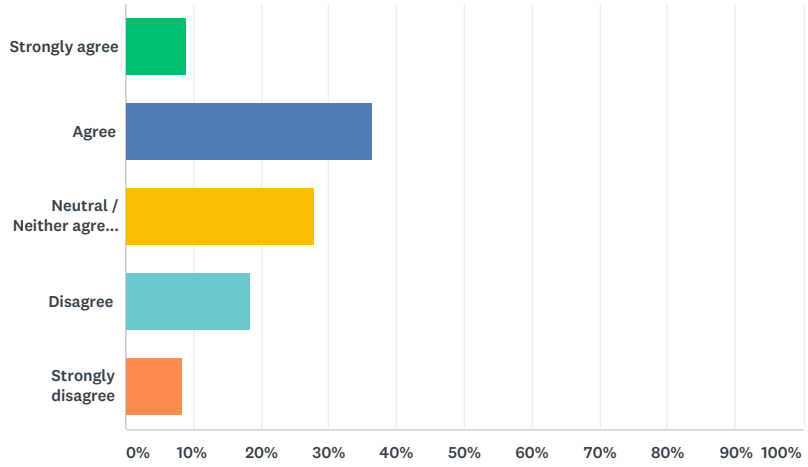
Answered: 190 Skipped: 9



ANSWER CHOICES	RESPONSES	
Strongly agree	45.26%	86
Agree	44.21%	84
Neutral / Neither agree nor disagree	6.32%	12
Disagree	4.21%	8
Strongly disagree	0.00%	0
TOTAL		190

Q17 Senior management and employees trust each other.

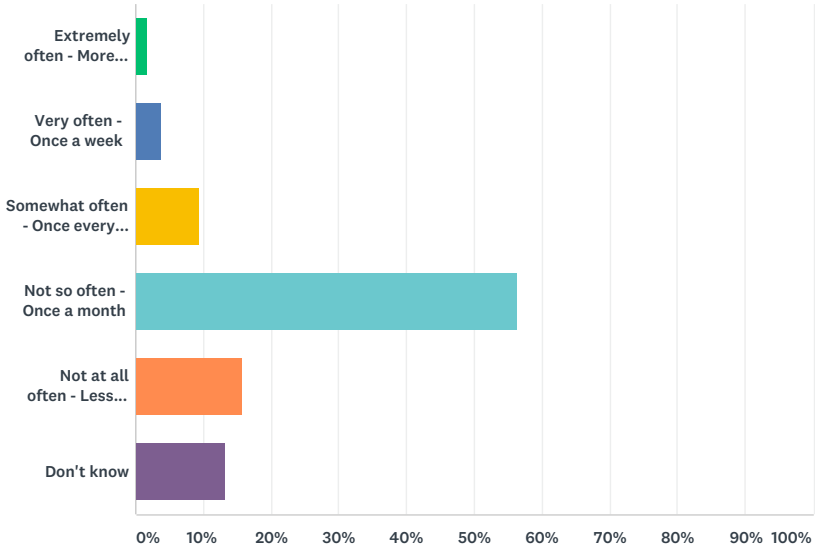
Answered: 190 Skipped: 9



ANSWER CHOICES	RESPONSES	
Strongly agree	8.95%	17
Agree	36.32%	69
Neutral / Neither agree nor disagree	27.89%	53
Disagree	18.42%	35
Strongly disagree	8.42%	16
TOTAL		190

Q18 How often are pipeline safety meetings held in the workplace?

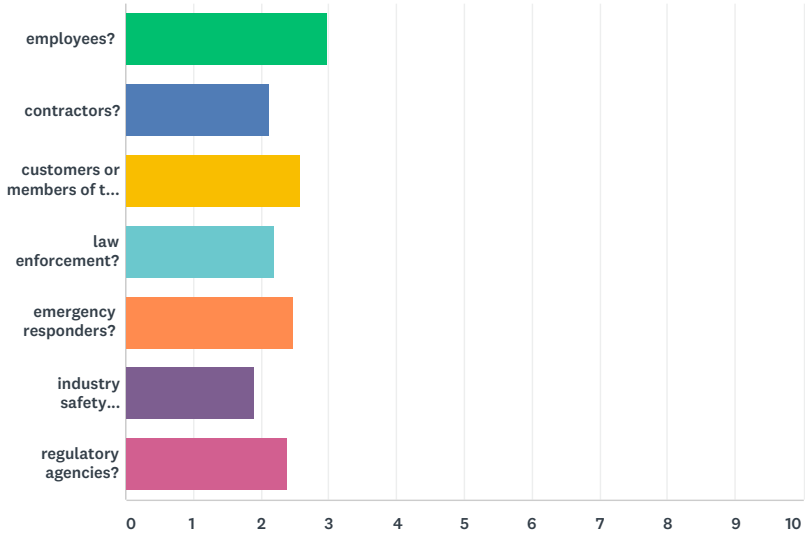
Answered: 190 Skipped: 9



ANSWER CHOICES	RESPONSES	
Extremely often - More than once a week	1.58%	3
Very often - Once a week	3.68%	7
Somewhat often - Once every 2 weeks	9.47%	18
Not so often - Once a month	56.32%	107
Not at all often - Less than once a month	15.79%	30
Don't know	13.16%	25
TOTAL		190

Q19 How effective are two-way communications between your utility company and the following stakeholders on important pipeline safety matters?

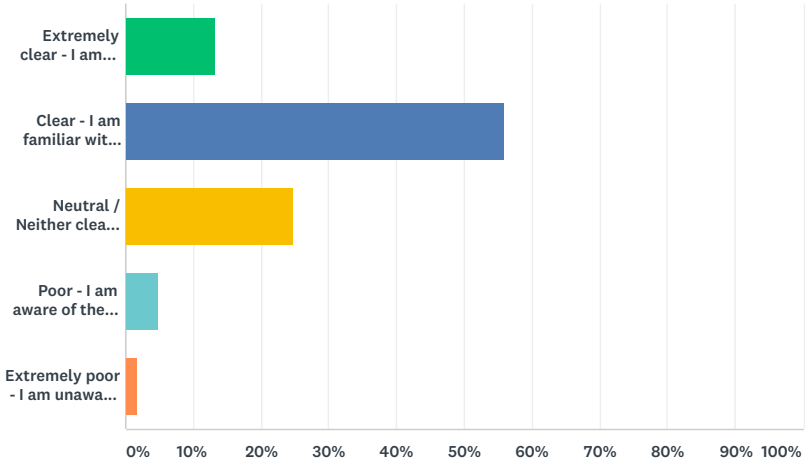
Answered: 190 Skipped: 9



	TERRIBLE	POOR	SATISFACTORY	GOOD	EXCELLENT	DON'T KNOW OR NOT APPLICABLE	TOTAL	WEIGHTED AVERAGE
employees?	1.58% 3	18.42% 35	29.47% 56	28.42% 54	11.58% 22	10.53% 20	190	2.98
contractors?	1.60% 3	13.83% 26	23.94% 45	20.74% 39	5.32% 10	34.57% 65	188	2.11
customers or members of the public?	1.58% 3	12.63% 24	33.16% 63	22.11% 42	8.42% 16	22.11% 42	190	2.57
law enforcement?	1.05% 2	15.79% 30	24.21% 46	17.37% 33	8.95% 17	32.63% 62	190	2.19
emergency responders?	1.59% 3	16.40% 31	22.75% 43	20.63% 39	12.17% 23	26.46% 50	189	2.46
industry safety organizations?	1.58% 3	13.16% 25	22.63% 43	15.26% 29	6.84% 13	40.53% 77	190	1.91
regulatory agencies?	0.53% 1	7.89% 15	24.21% 46	23.16% 44	11.58% 22	32.63% 62	190	2.39

Q20 How would you characterize your understanding of company pipeline safety policies & procedures (P&P's) as they relate to your day-to-day activities?

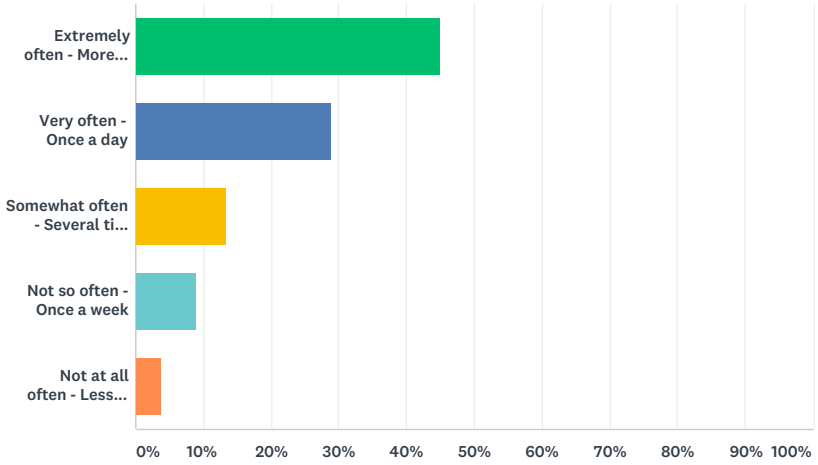
Answered: 190 Skipped: 9



ANSWER CHOICES	RESPONSES	
Extremely clear - I am well-versed in the relevant P&P's and fully incorporate them in day-to-day activities.	13.16%	25
Clear - I am familiar with the relevant P&P's and generally incorporate them in day-to-day activities.	55.79%	106
Neutral / Neither clear nor poor - I am aware of the relevant P&P's and am seeking to incorporate them in day-to-day activities.	24.74%	47
Poor - I am aware of the relevant safety P&P's but rarely incorporate them in day-to-day activities.	4.74%	9
Extremely poor - I am unaware of any relevant safety P&P's nor have I received any communications on this topic.	1.58%	3
TOTAL		190

Q21 In your day-to-day activities, how often do you consider what could go wrong and the potential consequence(s) to public, personal, and/or pipeline safety?

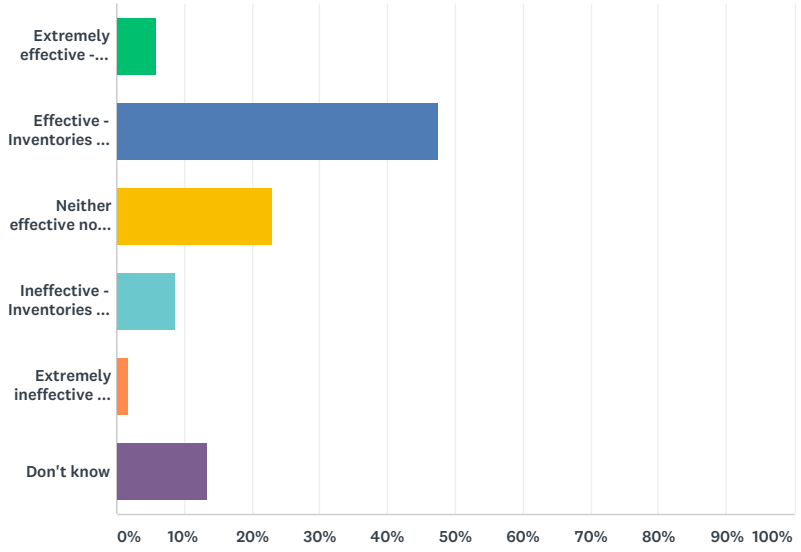
Answered: 187 Skipped: 12



ANSWER CHOICES	RESPONSES	
Extremely often - More than once a day	44.92%	84
Very often - Once a day	28.88%	54
Somewhat often - Several times a week	13.37%	25
Not so often - Once a week	9.09%	17
Not at all often - Less than once a week	3.74%	7
TOTAL		187

Q22 How effective do you feel existing data collection efforts are in supporting operational monitoring, maintenance, and integrity assessment efforts?

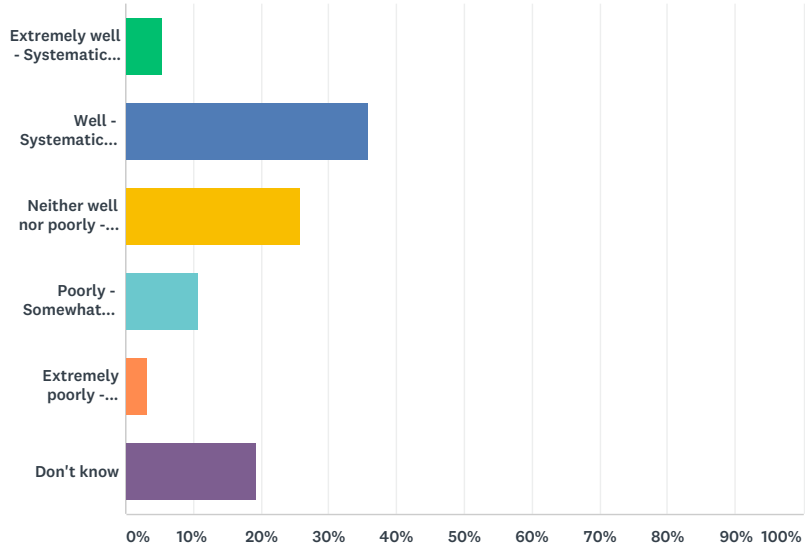
Answered: 187 Skipped: 12



ANSWER CHOICES	RESPONSES	
Extremely effective - Inventories of pipeline assets & facilities are extremely well-maintained; data is always collected and reviewed to confirm completeness & quality.	5.88%	11
Effective - Inventories of pipeline assets & facilities are reasonably well-maintained; data is generally collected and reviewed to confirm completeness & quality.	47.59%	89
Neither effective nor ineffective - Inventories of pipeline assets & facilities are somewhat well-maintained; data is sometimes collected and reviewed to confirm completeness & quality.	22.99%	43
Ineffective - Inventories of pipeline assets & facilities are not very well-maintained; data is rarely collected nor reviewed to confirm completeness & quality.	8.56%	16
Extremely ineffective - Inventories of pipeline assets & facilities are not at all well-maintained; data is never collected nor reviewed to confirm completeness & quality.	1.60%	3
Don't know	13.37%	25
TOTAL		187

Q23 How well do you feel existing risk assessment processes & procedures facilitate the identification of potential pipeline threats prior to an operational upset or unintended release?

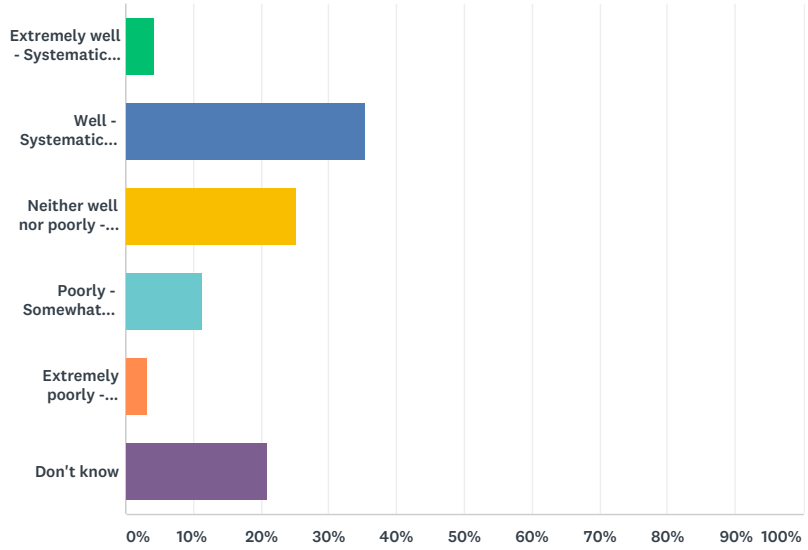
Answered: 187 Skipped: 12



ANSWER CHOICES	RESPONSES	
Extremely well - Systematic approach with data requirements & safe operating limits (SOL's) clearly defined. Objectives, methodologies, and metrics are easy to understand.	5.35%	10
Well - Systematic approach with data requirements & safe operating limits (SOL's) reasonably well defined. Objectives, methodologies, and metrics are relatively easy to understand.	35.83%	67
Neither well nor poorly - Systematic approach with data requirements & safe operating limits (SOL's) defined. Objectives, methodologies, and metrics are acceptable.	25.67%	48
Poorly - Somewhat systematic approach with data requirements & safe operating limits (SOL's) loosely defined. Objectives, methodologies, and metrics are relatively difficult to understand.	10.70%	20
Extremely poorly - Somewhat systematic approach with data requirements & safe operating limits (SOL's) minimally defined. Objectives, methodologies, and metrics are very difficult to understand.	3.21%	6
Don't know	19.25%	36
TOTAL		187

Q24 How well do you feel existing risk management processes & procedures facilitate the selection of appropriate prevention & mitigation measures to address potential pipeline threats?

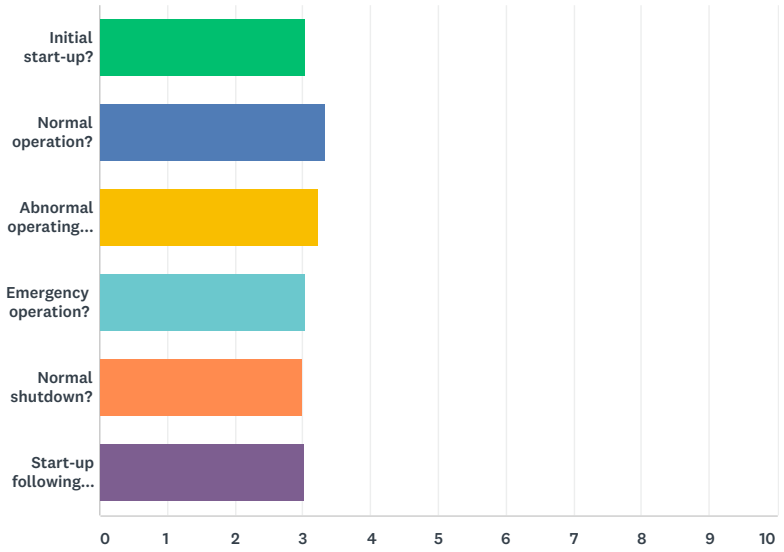
Answered: 187 Skipped: 12



ANSWER CHOICES	RESPONSES	
Extremely well - Systematic approach for evaluating risk at routine intervals. Selected measures consider all available data & circumstances and significantly reduce the likelihood of occurrence and/or severity of consequences for all threats.	4.28%	8
Well - Systematic approach for evaluating risk at somewhat frequent intervals. Selected measures consider most available data & circumstances and significantly reduce the likelihood of occurrence and/or severity of consequences for most threats.	35.29%	66
Neither well nor poorly - Systematic approach for evaluating risk at acceptable intervals. Selected measures consider available data & circumstances and significantly reduce the likelihood of occurrence and/or severity of consequences for major threats only.	25.13%	47
Poorly - Somewhat systematic approach for evaluating risk at somewhat infrequent intervals. Selected measures consider some available data & circumstances and significantly reduce the likelihood of occurrence and/or severity of consequences for some threats.	11.23%	21
Extremely poorly - Somewhat systematic approach for evaluating risk at infrequent intervals. Selected measures consider little available data & circumstances and significantly reduce the likelihood of occurrence and/or severity of consequences for very few threats.	3.21%	6
Don't know	20.86%	39
TOTAL		187

Q25 How adequate do you feel existing written operating and maintenance processes & procedures are in establishing safe operating limits, addressing safe work practices, and instructing key personnel how to perform critical activities during the following phases of pipeline operation:

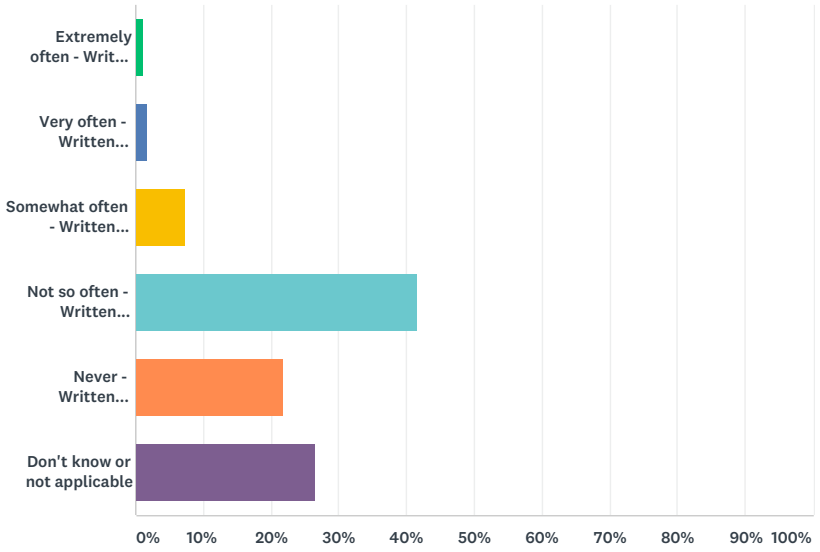
Answered: 180 Skipped: 19



	EXTREMELY INADEQUATE	INADEQUATE	NEITHER ADEQUATE NOR INADEQUATE	ADEQUATE	EXTREMELY ADEQUATE	DON'T KNOW	TOTAL	WEIGHTED AVERAGE
Initial start-up?	3.33% 6	10.56% 19	13.89% 25	42.78% 77	13.33% 24	16.11% 29	180	3.04
Normal operation?	2.23% 4	10.06% 18	11.17% 20	49.72% 89	15.64% 28	11.17% 20	179	3.33
Abnormal operating condition (AOC)?	5.03% 9	8.94% 16	13.41% 24	44.69% 80	16.20% 29	11.73% 21	179	3.23
Emergency operation?	5.03% 9	15.08% 27	15.08% 27	37.43% 67	14.53% 26	12.85% 23	179	3.03
Normal shutdown?	1.68% 3	10.06% 18	13.41% 24	41.34% 74	14.53% 26	18.99% 34	179	3.00
Start-up following maintenance/outage?	3.35% 6	10.61% 19	13.97% 25	41.90% 75	13.41% 24	16.76% 30	179	3.01

Q26 How often do you need to deviate from existing written operating and maintenance processes & procedures for safety reasons?

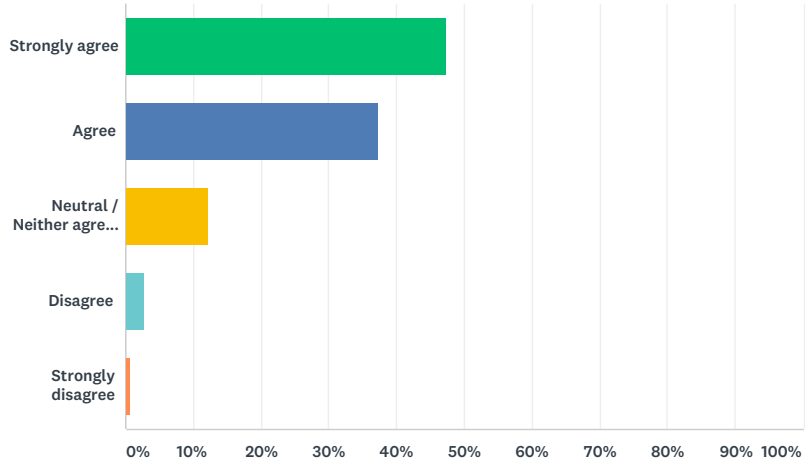
Answered: 180 Skipped: 19



ANSWER CHOICES	RESPONSES	
Extremely often - Written procedures are very incomplete and following them would undoubtedly compromise the safety of myself and those around me.	1.11%	2
Very often - Written procedures are fairly incomplete and following them would potentially compromise the safety of myself and those around me.	1.67%	3
Somewhat often - Written procedures are somewhat incomplete and following them would sometimes compromise the safety of myself and those around me.	7.22%	13
Not so often - Written procedures are fairly complete and following them would rarely compromise the safety of myself and those around me.	41.67%	75
Never - Written procedures are very complete and following them would never compromise the safety of myself and those around me.	21.67%	39
Don't know or not applicable	26.67%	48
TOTAL		180

Q27 Company leadership and documented procedures give me the authority to stop work if I believe following existing written operating and maintenance processes & procedures will cause an unsafe condition.

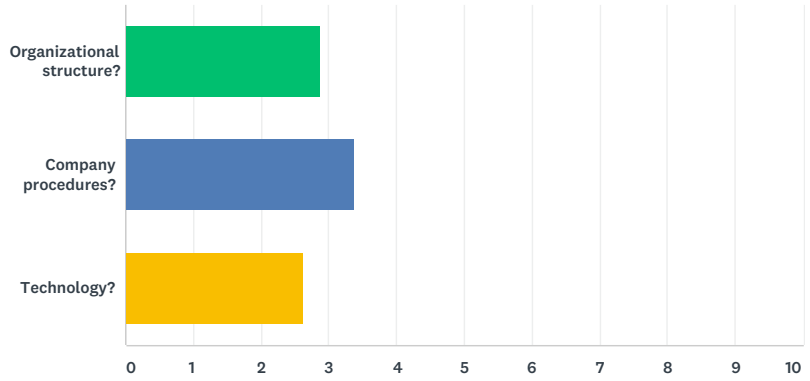
Answered: 180 Skipped: 19



ANSWER CHOICES	RESPONSES	
Strongly agree	47.22%	85
Agree	37.22%	67
Neutral / Neither agree nor disagree	12.22%	22
Disagree	2.78%	5
Strongly disagree	0.56%	1
TOTAL		180

Q28 How routinely are Management of Change (MOC) procedures followed when there is a change in:

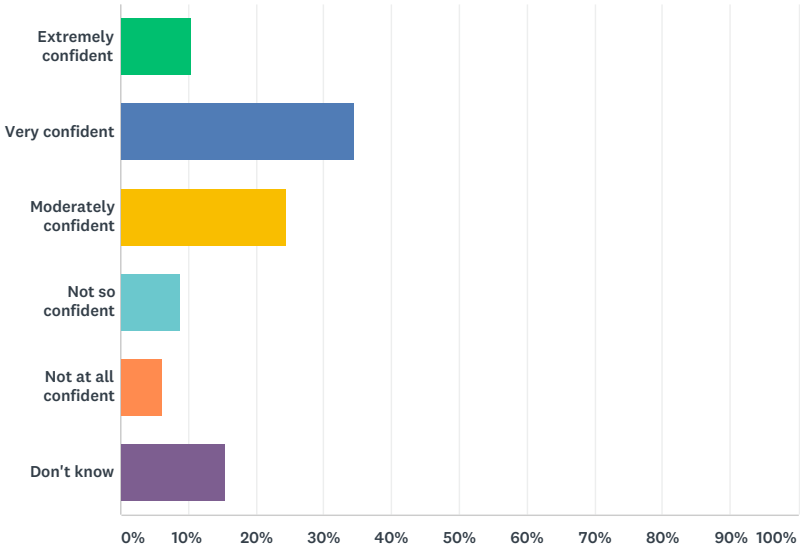
Answered: 180 Skipped: 19



	NEVER	RARELY	SOMETIMES	MOST OF THE TIME	ALWAYS	DON'T KNOW	TOTAL	WEIGHTED AVERAGE
Organizational structure?	2.78% 5	6.67% 12	8.89% 16	28.33% 51	26.11% 47	27.22% 49	180	2.87
Company procedures?	0.56% 1	6.74% 12	6.18% 11	30.90% 55	35.96% 64	19.66% 35	178	3.36
Technology?	0.56% 1	7.30% 13	11.80% 21	25.28% 45	21.91% 39	33.15% 59	178	2.61

Q29 How confident are you that the company's quality control processes & procedures ensure all pipeline materials are manufactured and fabricated in accordance with design & purchase specifications and/or company standards?

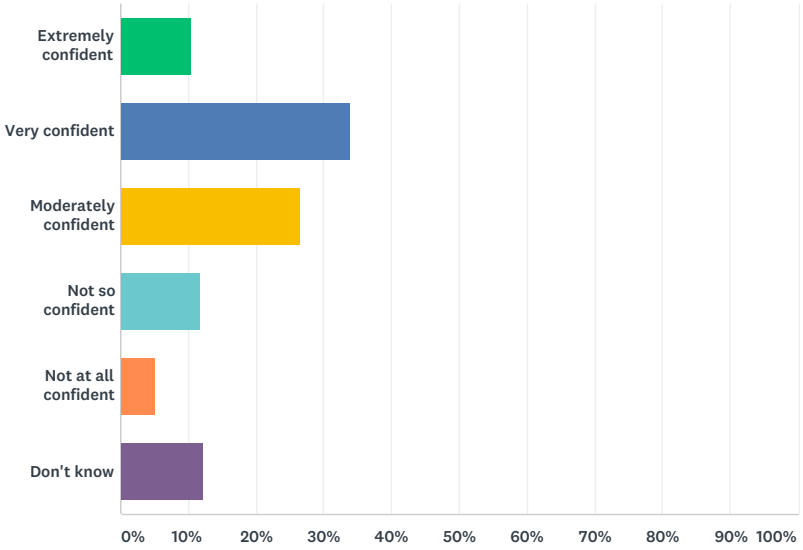
Answered: 180 Skipped: 19



ANSWER CHOICES	RESPONSES	
Extremely confident	10.56%	19
Very confident	34.44%	62
Moderately confident	24.44%	44
Not so confident	8.89%	16
Not at all confident	6.11%	11
Don't know	15.56%	28
TOTAL		180

Q30 How confident are you that the company's quality control processes & procedures ensure all pipe and equipment is installed in accordance with manufacturer's instructions and company standards prior to start-up?

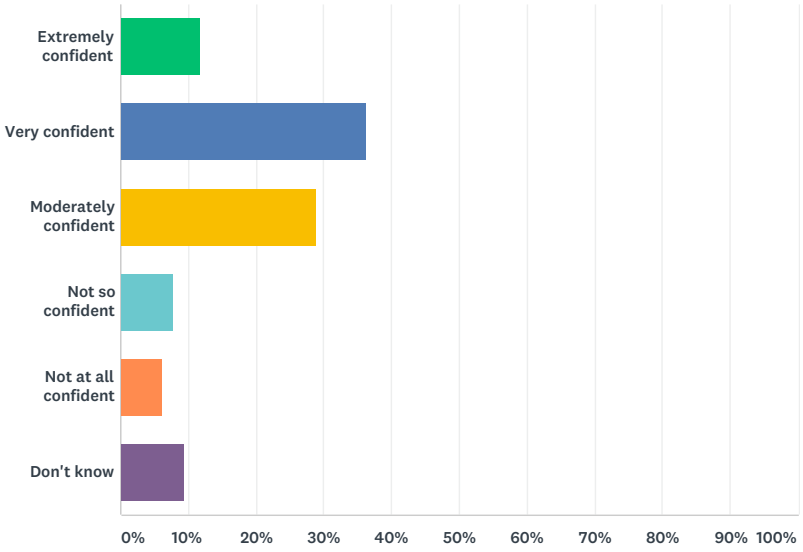
Answered: 180 Skipped: 19



ANSWER CHOICES	RESPONSES	
Extremely confident	10.56%	19
Very confident	33.89%	61
Moderately confident	26.67%	48
Not so confident	11.67%	21
Not at all confident	5.00%	9
Don't know	12.22%	22
TOTAL		180

Q31 How confident are you that the company's inspection and testing processes & procedures ensure all pipeline assets & facilities are operated and maintained in a safe manner consistent with all requirements, regulations, and standards?

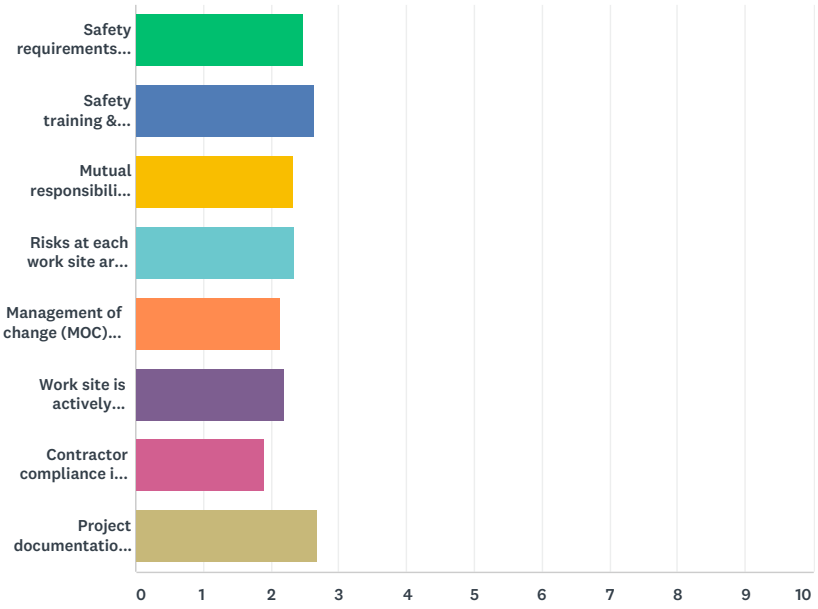
Answered: 180 Skipped: 19



ANSWER CHOICES	RESPONSES	
Extremely confident	11.67%	21
Very confident	36.11%	65
Moderately confident	28.89%	52
Not so confident	7.78%	14
Not at all confident	6.11%	11
Don't know	9.44%	17
TOTAL		180

Q32 To your knowledge, how often are the following steps taken to ensure pipeline safety compliance on outsourced pipeline activities:

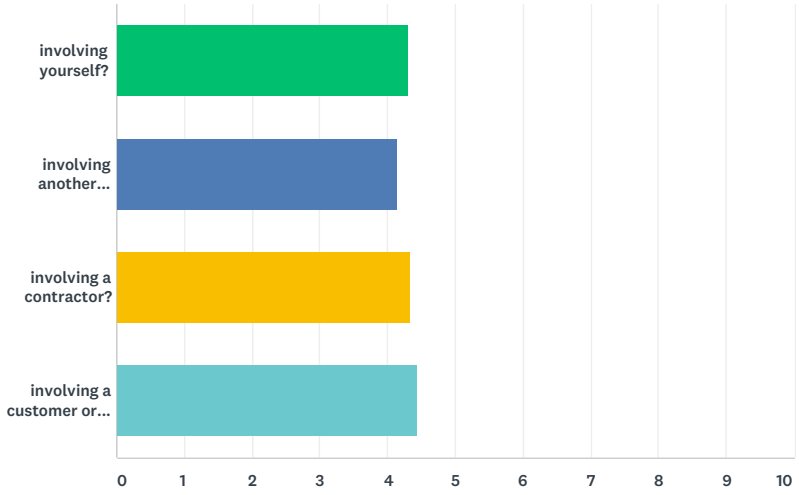
Answered: 180 Skipped: 19



	NEVER	RARELY	SOMETIMES	MOST OF THE TIME	ALWAYS	DON'T KNOW	TOTAL	WEIGHTED AVERAGE
Safety requirements for contractor scope of work are fully communicated.	1.11% 2	6.67% 12	12.78% 23	20.00% 36	22.78% 41	36.67% 66	180	2.47
Safety training & orientation on company policies is provided.	1.11% 2	7.78% 14	15.56% 28	17.22% 31	26.11% 47	32.22% 58	180	2.63
Mutual responsibilities, accountability, and authority for tasks & activities are clearly defined.	1.12% 2	12.85% 23	12.29% 22	21.23% 38	16.76% 30	35.75% 64	179	2.32
Risks at each work site are fully communicated.	2.22% 4	7.78% 14	14.44% 26	18.33% 33	20.00% 36	37.22% 67	180	2.34
Management of change (MOC) procedures are fully communicated.	2.79% 5	9.50% 17	16.20% 29	18.99% 34	13.41% 24	39.11% 70	179	2.13
Work site is actively supervised by a designated company employee.	4.47% 8	21.79% 39	16.20% 29	13.41% 24	13.97% 25	30.17% 54	179	2.20
Contractor compliance is tracked and evaluated on a regular basis.	4.47% 8	13.41% 24	18.44% 33	11.17% 20	11.73% 21	40.78% 73	179	1.90
Project documentation is reliable, traceable, verifiable, and complete.	0.56% 1	7.78% 14	15.56% 28	25.56% 46	20.56% 37	30.00% 54	180	2.68

Q33 How comfortable would you feel about reporting an unsafe situation:

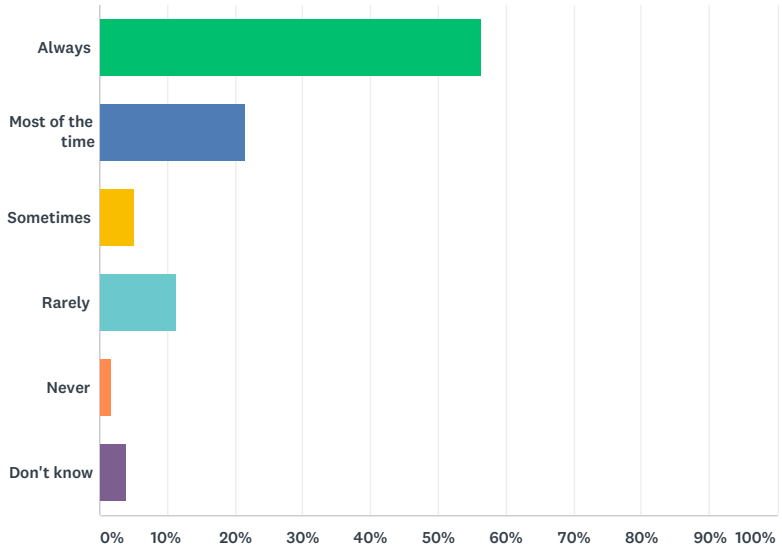
Answered: 176 Skipped: 23



	EXTREMELY UNCOMFORTABLE	UNCOMFORTABLE	NEUTRAL / NEITHER COMFORTABLE NOR UNCOMFORTABLE	COMFORTABLE	EXTREMELY COMFORTABLE	TOTAL	WEIGHTED AVERAGE
involving yourself?	0.57% 1	3.98% 7	5.68% 10	42.61% 75	47.16% 83	176	4.32
involving another employee?	2.31% 4	3.47% 6	10.98% 19	43.35% 75	39.88% 69	173	4.15
involving a contractor?	1.15% 2	1.15% 2	5.17% 9	47.70% 83	44.83% 78	174	4.34
involving a customer or member of the public?	0.00% 0	0.00% 0	5.17% 9	47.13% 82	47.70% 83	174	4.43

Q34 How often would you actually report near misses that could have led to a loss of life or serious injury?

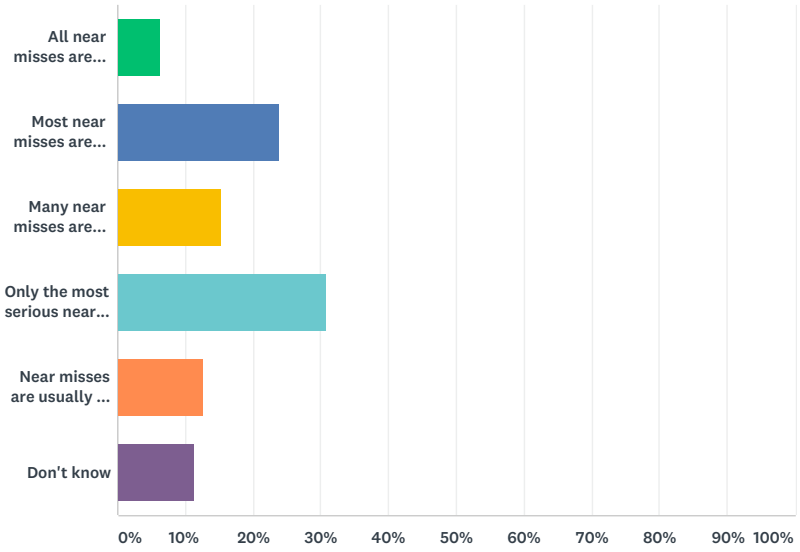
Answered: 176 Skipped: 23



ANSWER CHOICES	RESPONSES	
Always	56.25%	99
Most of the time	21.59%	38
Sometimes	5.11%	9
Rarely	11.36%	20
Never	1.70%	3
Don't know	3.98%	7
TOTAL		176

Q35 To what extent do you think near misses in your workplace are actually being reported?

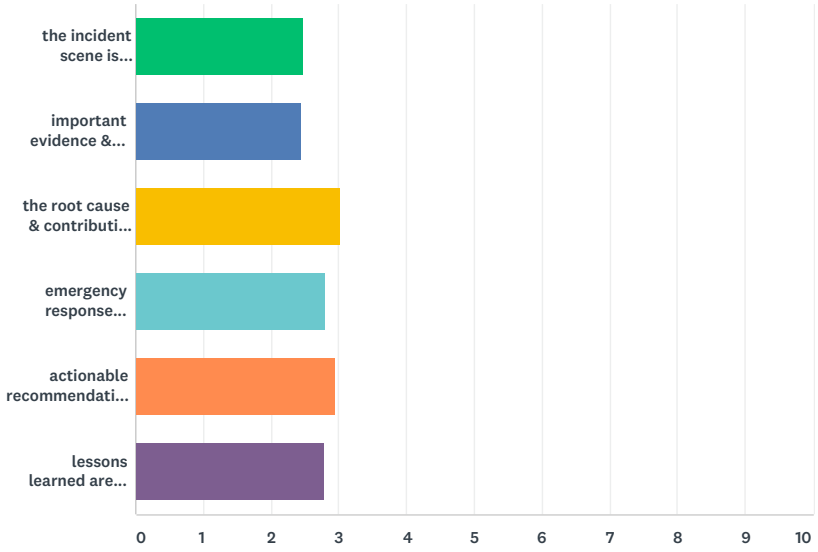
Answered: 176 Skipped: 23



ANSWER CHOICES	RESPONSES	
All near misses are reported	6.25%	11
Most near misses are reported	23.86%	42
Many near misses are reported	15.34%	27
Only the most serious near misses are reported	30.68%	54
Near misses are usually not reported	12.50%	22
Don't know	11.36%	20
TOTAL		176

Q36 How rigorous are investigations into incidents in ensuring that:

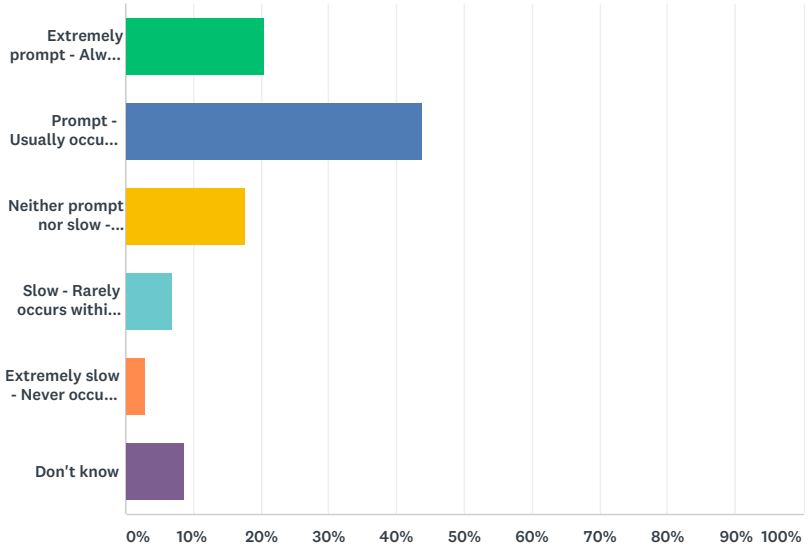
Answered: 176 Skipped: 23



	NOT AT ALL RIGOROUS	NOT SO RIGOROUS	SOMEWHAT RIGOROUS	VERY RIGOROUS	EXTREMELY RIGOROUS	DON'T KNOW	TOTAL	WEIGHTED AVERAGE
the incident scene is properly secured (if necessary)?	4.00% 7	5.71% 10	26.29% 46	29.71% 52	6.86% 12	27.43% 48	175	2.47
important evidence & testimony are recovered?	2.84% 5	10.80% 19	24.43% 43	29.55% 52	5.68% 10	26.70% 47	176	2.44
the root cause & contributing factors are identified?	3.43% 6	7.43% 13	21.71% 38	37.14% 65	13.71% 24	16.57% 29	175	3.01
emergency response processes & procedures are updated (if necessary)?	3.41% 6	8.52% 15	25.00% 44	31.25% 55	11.93% 21	19.89% 35	176	2.80
actionable recommendations for safety improvement are identified?	2.27% 4	8.52% 15	27.27% 48	30.68% 54	14.20% 25	17.05% 30	176	2.95
lessons learned are incorporated into the risk assessment process?	3.98% 7	10.80% 19	24.43% 43	28.41% 50	13.07% 23	19.32% 34	176	2.78

Q37 How prompt is your company in taking action (i.e. initiating an incident investigation, implementing preventive/mitigating measures) when unsafe conditions are raised?

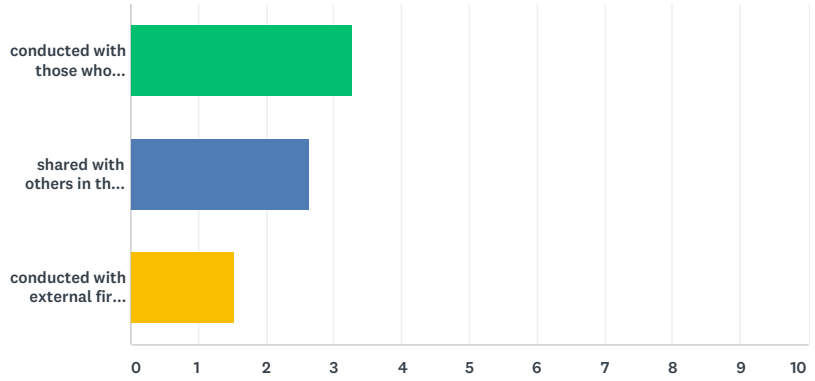
Answered: 176 Skipped: 23



ANSWER CHOICES	RESPONSES	
Extremely prompt - Always occurs within a reasonable time frame	20.45%	36
Prompt - Usually occurs within a reasonable time frame	43.75%	77
Neither prompt nor slow - Sometimes occurs within a reasonable time frame	17.61%	31
Slow - Rarely occurs within a reasonable time frame	6.82%	12
Extremely slow - Never occurs within a reasonable time frame	2.84%	5
Don't know	8.52%	15
TOTAL		176

Q38 How often are post-incident reviews:

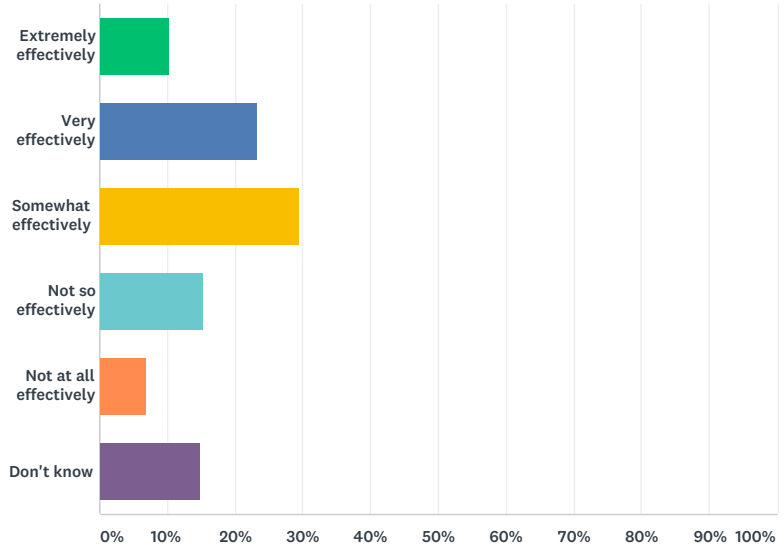
Answered: 176 Skipped: 23



	NEVER	NOT SO OFTEN	SOMEWHAT OFTEN	VERY OFTEN	EXTREMELY OFTEN	DON'T KNOW	TOTAL	WEIGHTED AVERAGE
conducted with those who responded to the incident?	1.14% 2	5.68% 10	15.91% 28	27.27% 48	31.25% 55	18.75% 33	176	3.26
shared with others in the company?	4.57% 8	25.14% 44	16.00% 28	18.86% 33	17.14% 30	18.29% 32	175	2.64
conducted with external first responders or safety agencies?	13.07% 23	17.05% 30	10.80% 19	9.09% 16	7.39% 13	42.61% 75	176	1.53

Q39 How effectively are findings from internal incident investigations (i.e. cause, contributing factors, recommendations, lessons learned) communicated?

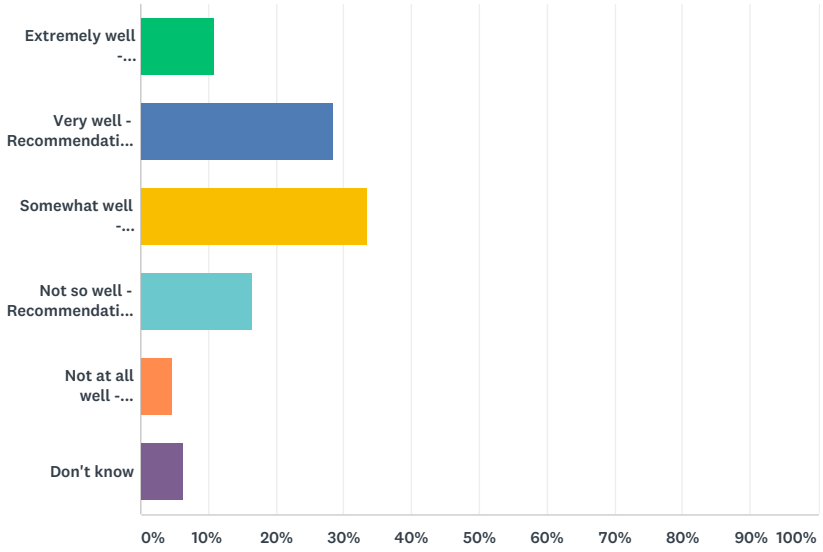
Answered: 176 Skipped: 23



ANSWER CHOICES	RESPONSES	
Extremely effectively	10.23%	18
Very effectively	23.30%	41
Somewhat effectively	29.55%	52
Not so effectively	15.34%	27
Not at all effectively	6.82%	12
Don't know	14.77%	26
TOTAL		176

Q40 How well does your company learn from its mistakes?

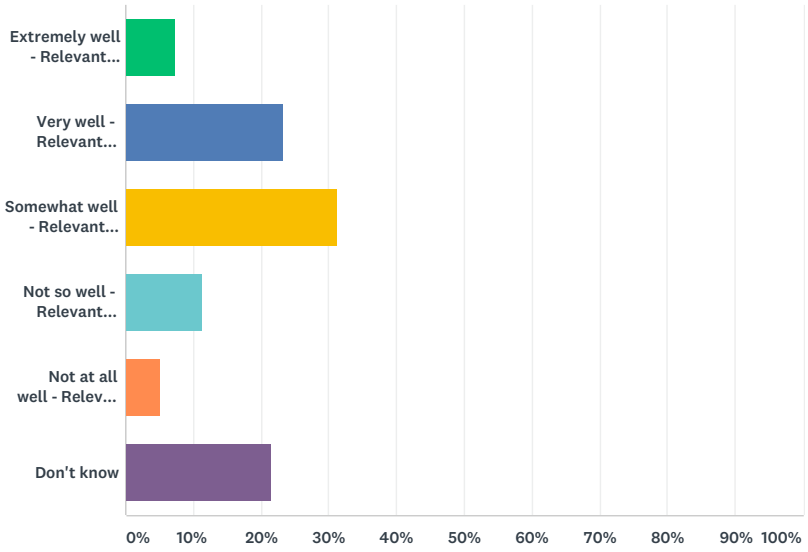
Answered: 176 Skipped: 23



ANSWER CHOICES	RESPONSES	
Extremely well - Recommendations are fully implemented and lessons learned are disseminated to all appropriate stakeholders.	10.80%	19
Very well - Recommendations are mostly implemented and lessons learned are disseminated to most stakeholders.	28.41%	50
Somewhat well - Recommendations are partially implemented and lessons learned are disseminated to some stakeholders.	33.52%	59
Not so well - Recommendations are minimally implemented and lessons learned are disseminated to few stakeholders.	16.48%	29
Not at all well - Recommendations are not implemented and lessons learned are ignored.	4.55%	8
Don't know	6.25%	11
TOTAL		176

Q41 How well does your company learn from the mistakes of other utility brands within MDU Resources Group?

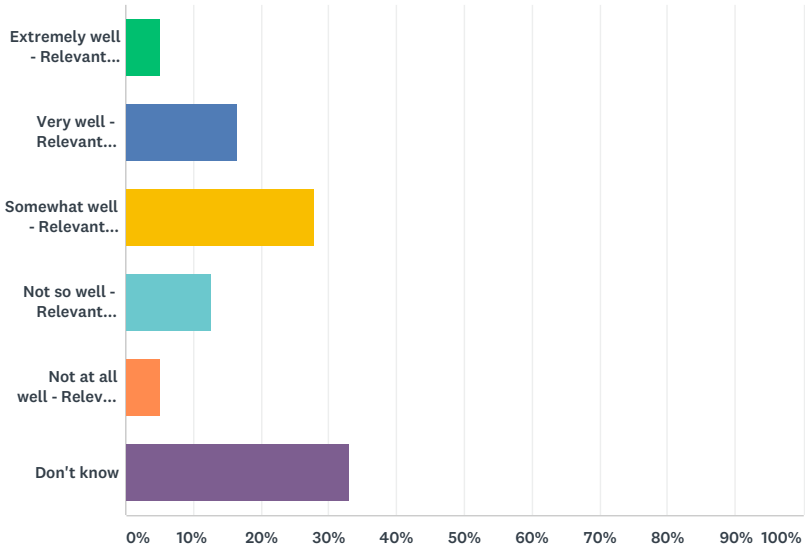
Answered: 176 Skipped: 23



ANSWER CHOICES	RESPONSES	
Extremely well - Relevant external recommendations are fully implemented and lessons learned are disseminated to all appropriate stakeholders.	7.39%	13
Very well - Relevant external recommendations are mostly implemented and lessons learned are disseminated to most stakeholders.	23.30%	41
Somewhat well - Relevant external recommendations are partially implemented and lessons learned are disseminated to some stakeholders.	31.25%	55
Not so well - Relevant external recommendations are minimally implemented and lessons learned are disseminated to few stakeholders.	11.36%	20
Not at all well - Relevant external recommendations are not implemented and lessons learned are ignored.	5.11%	9
Don't know	21.59%	38
TOTAL		176

Q42 How well does your company learn from the mistakes of other utility companies external to MDU Resources Group?

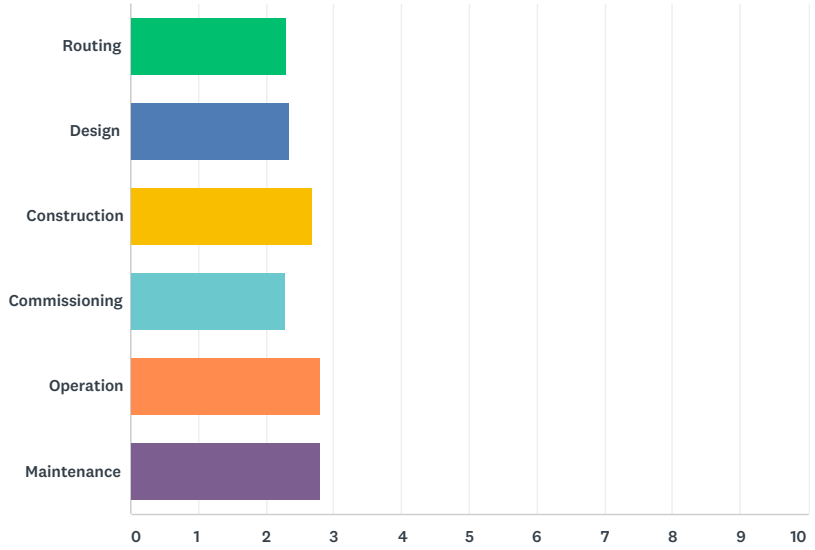
Answered: 176 Skipped: 23



ANSWER CHOICES	RESPONSES	
Extremely well - Relevant external recommendations are fully implemented and lessons learned are disseminated to all appropriate stakeholders.	5.11%	9
Very well - Relevant external recommendations are mostly implemented and lessons learned are disseminated to most stakeholders.	16.48%	29
Somewhat well - Relevant external recommendations are partially implemented and lessons learned are disseminated to some stakeholders.	27.84%	49
Not so well - Relevant external recommendations are minimally implemented and lessons learned are disseminated to few stakeholders.	12.50%	22
Not at all well - Relevant external recommendations are not implemented and lessons learned are ignored.	5.11%	9
Don't know	32.95%	58
TOTAL		176

Q43 How effective are existing safety policies, processes & procedures at identifying, evaluating, and mitigating potential threats in the following phases of a pipeline's life cycle:

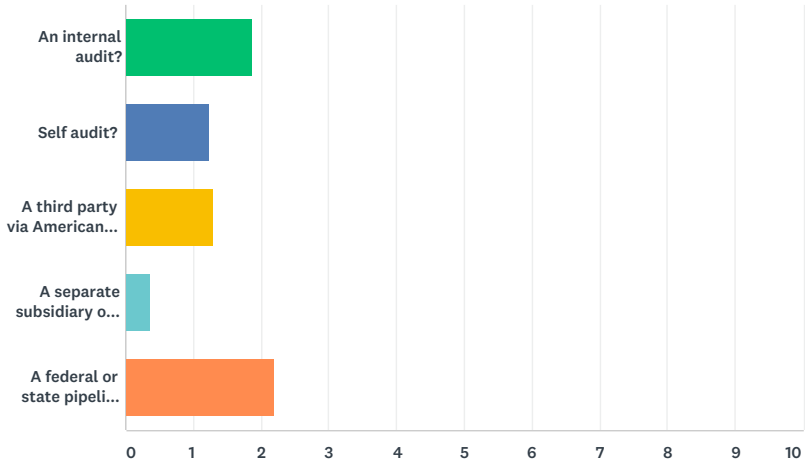
Answered: 172 Skipped: 27



	NOT AT ALL EFFECTIVE	NOT SO EFFECTIVE	SOMEWHAT EFFECTIVE	VERY EFFECTIVE	EXTREMELY EFFECTIVE	DON'T KNOW	TOTAL	WEIGHTED AVERAGE
Routing	1.74% 3	5.81% 10	26.16% 45	24.42% 42	8.14% 14	33.72% 58	172	2.30
Design	2.91% 5	5.23% 9	25.00% 43	26.16% 45	8.14% 14	32.56% 56	172	2.34
Construction	0.58% 1	4.07% 7	27.33% 47	29.07% 50	12.21% 21	26.74% 46	172	2.68
Commissioning	0.58% 1	3.49% 6	24.42% 42	27.33% 47	7.56% 13	36.63% 63	172	2.28
Operation	0.58% 1	4.65% 8	23.26% 40	34.30% 59	12.79% 22	24.42% 42	172	2.81
Maintenance	0.58% 1	5.23% 9	27.91% 48	31.98% 55	11.63% 20	22.67% 39	172	2.81

Q44 Approximately when was the last time your department/district/office was subjected to a pipeline operations safety audit by:

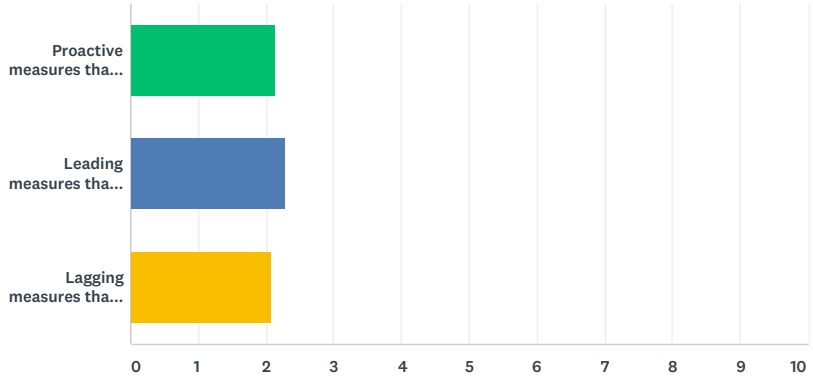
Answered: 172 Skipped: 27



	MORE THAN 3 YEARS AGO	3 YEARS AGO	2 YEARS AGO	1 YEAR AGO	LESS THAN 1 YEAR AGO	DON'T KNOW OR NOT APPLICABLE	TOTAL	WEIGHTED AVERAGE
An internal audit?	2.92% 5	1.75% 3	7.60% 13	12.28% 21	21.64% 37	53.80% 92	171	1.87
Self audit?	4.71% 8	0.59% 1	1.18% 2	5.88% 10	18.24% 31	69.41% 118	170	1.24
A third party via American Gas Association (AGA) Peer Review?	2.92% 5	0.58% 1	2.34% 4	7.60% 13	17.54% 30	69.01% 118	171	1.29
A separate subsidiary of MDU Resources Group?	4.68% 8	0.00% 0	0.58% 1	2.34% 4	4.09% 7	88.30% 151	171	0.36
A federal or state pipeline safety agency?	1.16% 2	4.07% 7	13.95% 24	17.44% 30	19.77% 34	43.60% 75	172	2.20

Q45 How typical is it that the following safety performance measures or key performance indicators (KPI's) are established for the type of work you do?

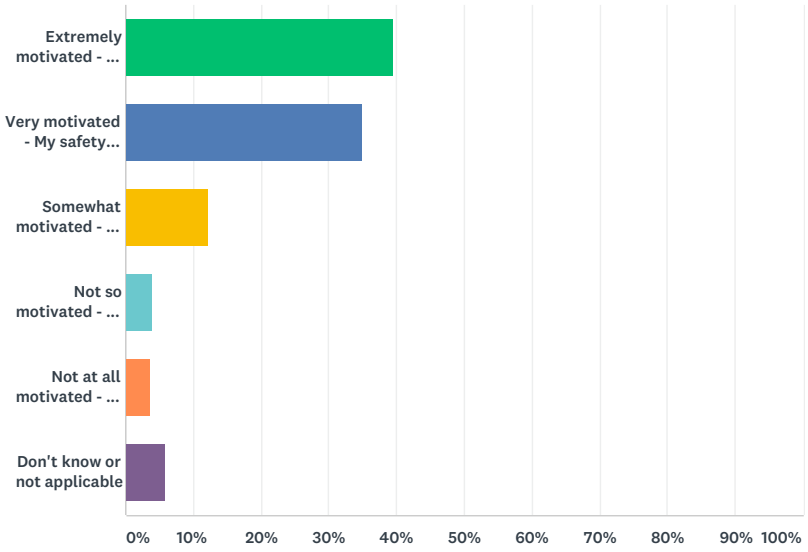
Answered: 172 Skipped: 27



	NOT AT ALL TYPICAL	NOT VERY TYPICAL	SOMEWHAT TYPICAL	VERY TYPICAL	EXTREMELY TYPICAL	DON'T KNOW	TOTAL	WEIGHTED AVERAGE
Proactive measures that demonstrate safety improvement efforts? (e.g. # of improvement initiatives planned and/or completed, # of processes improved, # of procedures improved)	13.37% 23	13.37% 23	17.44% 30	21.51% 37	6.98% 12	27.33% 47	172	2.13
Leading measures that demonstrate risk reduction efforts? (e.g. # of integrity evaluations completed, # of immediate & planned repairs, # of preventive & mitigating actions implemented)	9.88% 17	12.79% 22	19.77% 34	24.42% 42	6.98% 12	26.16% 45	172	2.27
Lagging measures that identify areas where improvement is needed? (e.g. # of fatalities, # of injuries, amount of property damage resulting from incidents)	9.30% 16	13.95% 24	18.60% 32	19.19% 33	7.56% 13	31.40% 54	172	2.08

Q46 How motivated do you feel to help the company meet its safety goals?

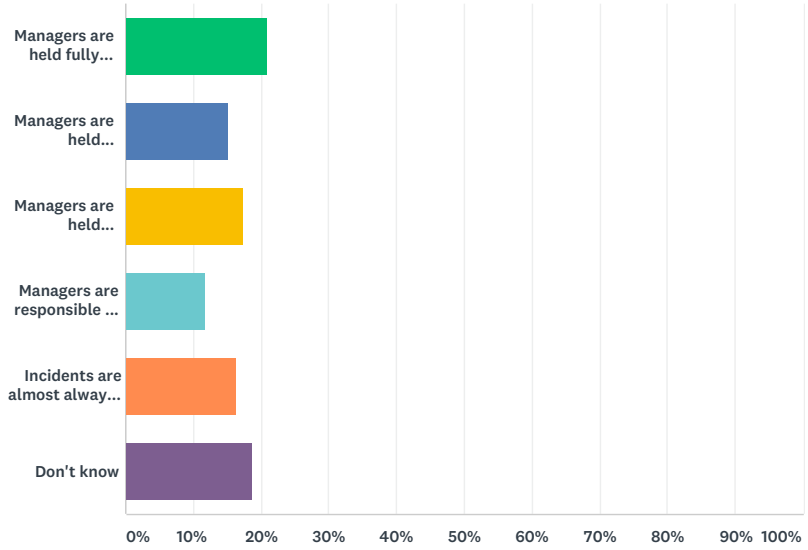
Answered: 172 Skipped: 27



ANSWER CHOICES	RESPONSES	
Extremely motivated - My safety performance significantly affects my performance rating and pay.	39.53%	68
Very motivated - My safety performance generally affects my performance rating and pay.	34.88%	60
Somewhat motivated - My safety performance moderately affects my performance rating and pay.	12.21%	21
Not so motivated - My safety performance rarely affects my performance rating and pay.	4.07%	7
Not at all motivated - My safety performance in no way affects my performance rating and pay.	3.49%	6
Don't know or not applicable	5.81%	10
TOTAL		172

Q47 To what extent do you think managers (e.g. supervisor, foreman, superintendent, team leader) in your workplace are held accountable for incidents in their areas?

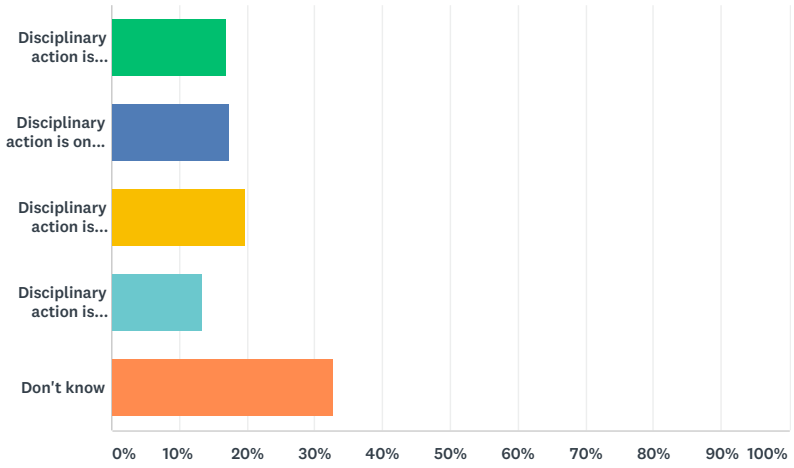
Answered: 172 Skipped: 27



ANSWER CHOICES	RESPONSES	
Managers are held fully accountable for preventing incidents in their area.	20.93%	36
Managers are held accountable for preventing incidents in their area but safety performance does not generally affect their performance rating and pay.	15.12%	26
Managers are held accountable for incidents but only in a general way.	17.44%	30
Managers are responsible for incidents in their areas. However, most injuries are attributed to individual error, bad luck, or unfortunate circumstances.	11.63%	20
Incidents are almost always blamed on individual error, bad luck, or unfortunate circumstances.	16.28%	28
Don't know	18.60%	32
TOTAL		172

Q48 In your opinion, how has disciplinary action been used in your workplace for safety infractions (i.e. breaking a safety rule or not following a standard practice)? Disciplinary action refers to a range of actions from a cautionary conversation or warning through to more severe action such as termination.

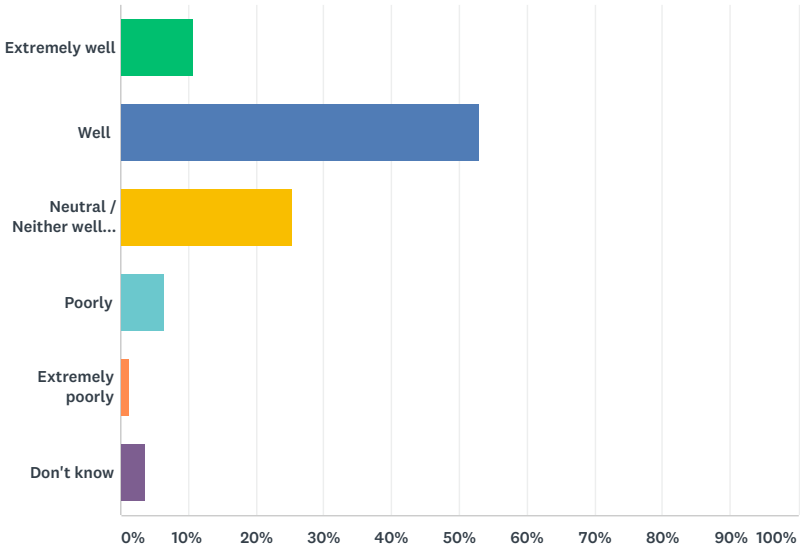
Answered: 172 Skipped: 27



ANSWER CHOICES	RESPONSES	
Disciplinary action is proportional to the seriousness of the infraction, and is taken for all safety infractions.	16.86%	29
Disciplinary action is only taken for serious safety infractions.	17.44%	30
Disciplinary action is applied arbitrarily and inconsistently.	19.77%	34
Disciplinary action is seldom taken for any safety infractions.	13.37%	23
Don't know	32.56%	56
TOTAL		172

Q49 How well do you feel this company meets its stated safety performance goals and objectives?

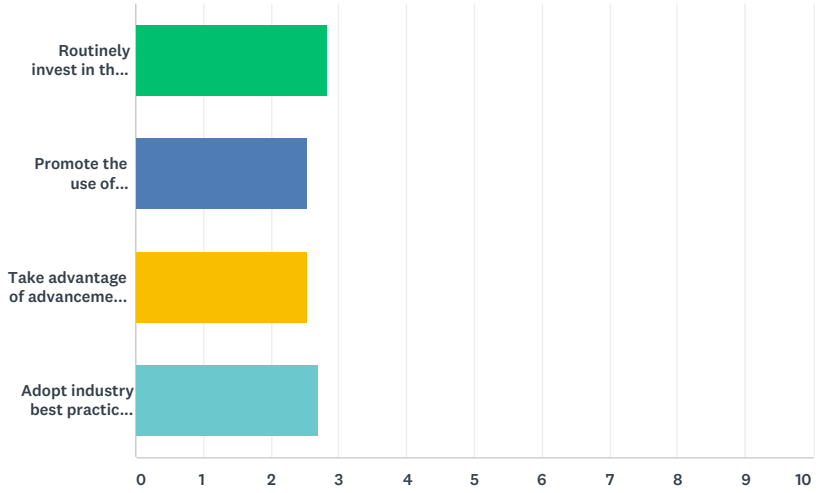
Answered: 170 Skipped: 29



ANSWER CHOICES	RESPONSES	
Extremely well	10.59%	18
Well	52.94%	90
Neutral / Neither well nor poorly	25.29%	43
Poorly	6.47%	11
Extremely poorly	1.18%	2
Don't know	3.53%	6
TOTAL		170

Q50 How would you best describe your company's approach toward understanding, evaluating, and mitigating risks throughout the pipeline's life cycle; does it:

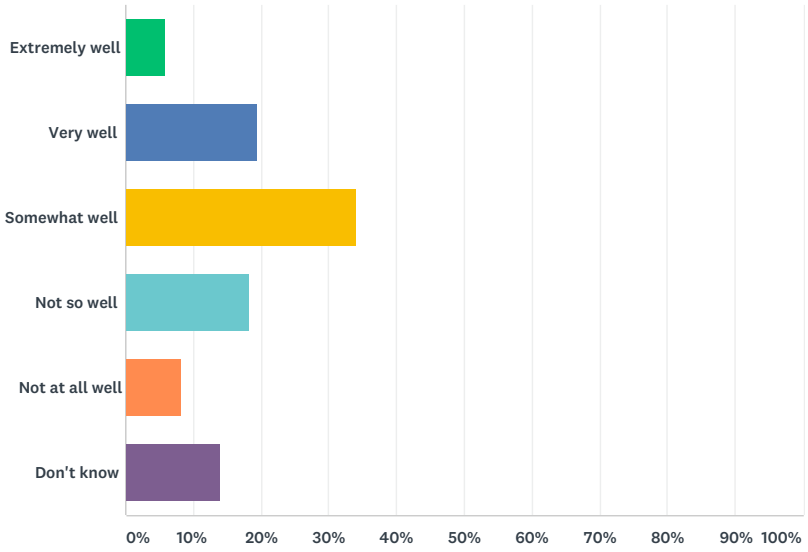
Answered: 170 Skipped: 29



	EXTREMELY REACTIVE	REACTIVE	NEITHER PROACTIVE NOR REACTIVE	PROACTIVE	EXTREMELY PROACTIVE	DON'T KNOW	TOTAL	WEIGHTED AVERAGE
Routinely invest in the modernization of aging infrastructure?	6.51% 11	20.12% 34	13.02% 22	34.91% 59	11.24% 19	14.20% 24	169	2.82
Promote the use of automated equipment?	7.65% 13	16.47% 28	21.76% 37	28.24% 48	7.06% 12	18.82% 32	170	2.54
Take advantage of advancements in inspection technology?	9.41% 16	18.82% 32	22.94% 39	27.06% 46	5.88% 10	15.88% 27	170	2.54
Adopt industry best practices & safety recommendations?	8.28% 14	18.34% 31	23.08% 39	28.40% 48	8.28% 14	13.61% 23	169	2.69

Q51 How well does MDU Resources Group share institutional knowledge & experience across its utility brands?

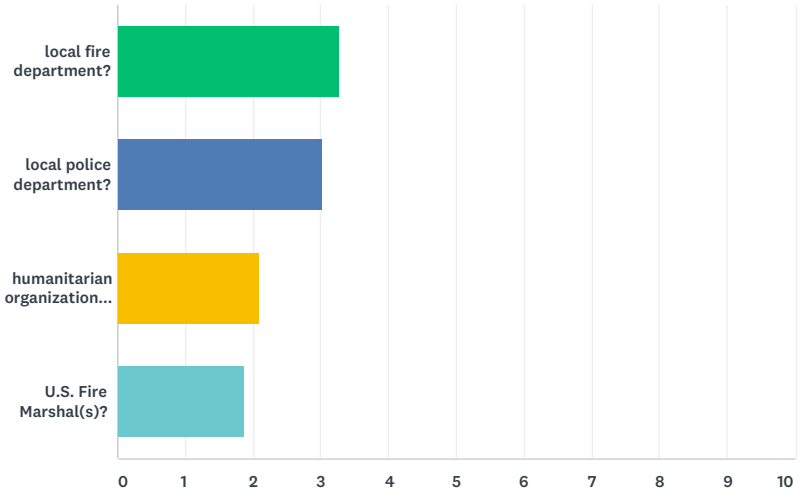
Answered: 170 Skipped: 29



ANSWER CHOICES	RESPONSES	
Extremely well	5.88%	10
Very well	19.41%	33
Somewhat well	34.12%	58
Not so well	18.24%	31
Not at all well	8.24%	14
Don't know	14.12%	24
TOTAL		170

Q52 How would you characterize the relationship between your company and the following emergency responders:

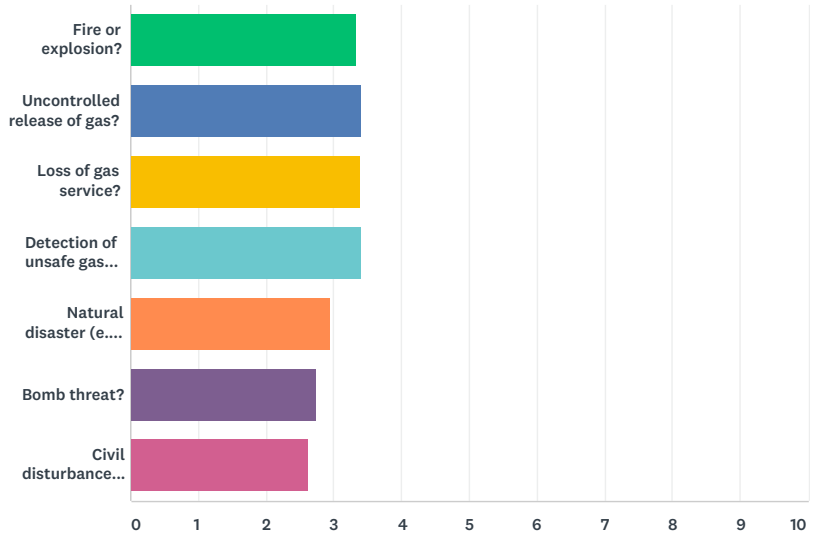
Answered: 170 Skipped: 29



	TERRIBLE	POOR	SATISFACTORY	GOOD	EXCELLENT	DON'T KNOW	TOTAL	WEIGHTED AVERAGE
local fire department?	1.18% 2	11.18% 19	15.88% 27	32.94% 56	24.71% 42	14.12% 24	170	3.26
local police department?	1.76% 3	10.59% 18	23.53% 40	27.06% 46	20.00% 34	17.06% 29	170	3.02
humanitarian organizations (e.g. Red Cross)?	4.12% 7	15.29% 26	14.12% 24	20.00% 34	10.59% 18	35.88% 61	170	2.10
U.S. Fire Marshal(s)?	3.55% 6	10.65% 18	13.02% 22	16.57% 28	11.24% 19	44.97% 76	169	1.86

Q53 How well do you understand your role & responsibilities under the company's emergency response plan in the following scenarios:

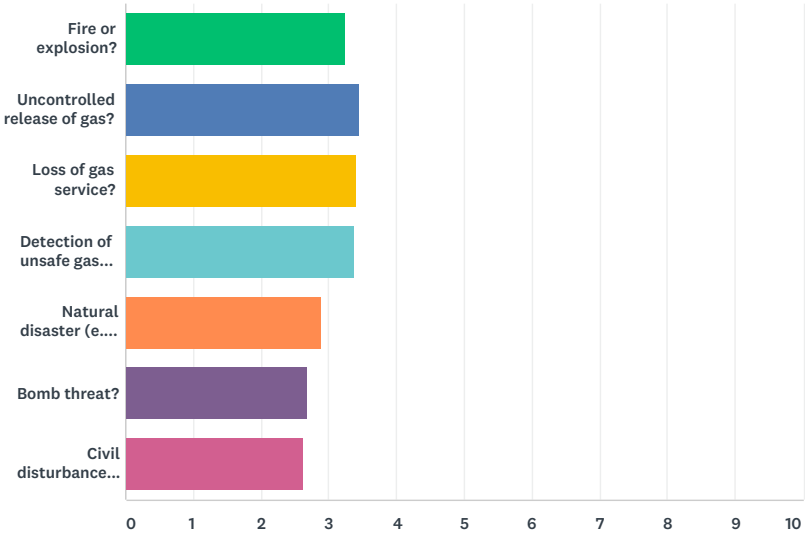
Answered: 170 Skipped: 29



	NOT AT ALL WELL	NOT SO WELL	SOMEWHAT WELL	VERY WELL	EXTREMELY WELL	NOT APPLICABLE	TOTAL	WEIGHTED AVERAGE
Fire or explosion?	4.12% 7	5.29% 9	24.12% 41	31.18% 53	24.12% 41	11.18% 19	170	3.32
Uncontrolled release of gas?	4.12% 7	4.12% 7	17.65% 30	31.76% 54	30.00% 51	12.35% 21	170	3.42
Loss of gas service?	3.53% 6	4.71% 8	17.65% 30	31.18% 53	29.41% 50	13.53% 23	170	3.38
Detection of unsafe gas concentration inside/near a facility?	3.53% 6	5.88% 10	16.47% 28	29.41% 50	31.76% 54	12.94% 22	170	3.41
Natural disaster (e.g. earthquake, flood, landslide, volcanic eruption)?	9.41% 16	14.12% 24	27.06% 46	25.29% 43	15.29% 26	8.82% 15	170	2.96
Bomb threat?	12.94% 22	16.47% 28	25.29% 43	23.53% 40	11.76% 20	10.00% 17	170	2.75
Civil disturbance (e.g. riots, demonstrations)?	13.61% 23	19.53% 33	25.44% 43	20.71% 35	10.06% 17	10.65% 18	169	2.62

Q54 How prepared do you feel to execute your role & responsibilities under the company's emergency response plan in the following scenarios:

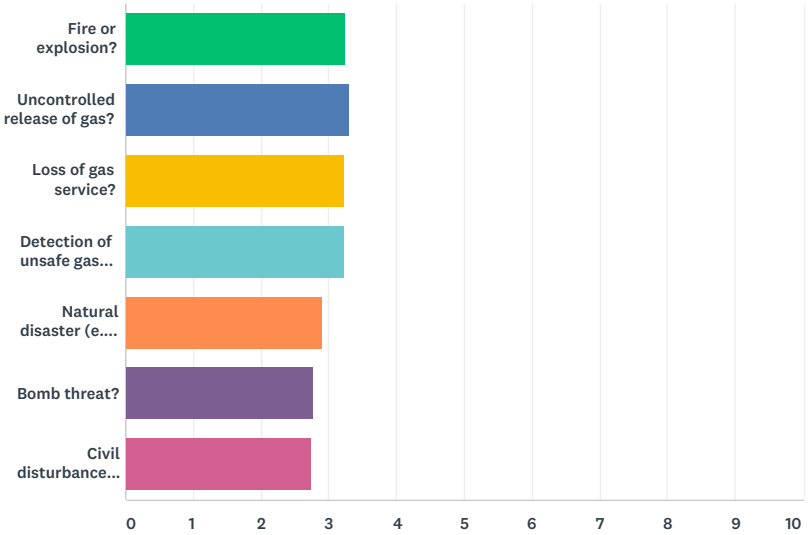
Answered: 170 Skipped: 29



	NOT AT ALL PREPARED	NOT SO PREPARED	SOMEWHAT PREPARED	VERY PREPARED	EXTREMELY PREPARED	NOT APPLICABLE	TOT
Fire or explosion?	2.94% 5	10.00% 17	27.06% 46	32.35% 55	18.24% 31	9.41% 16	1
Uncontrolled release of gas?	2.94% 5	5.88% 10	22.94% 39	30.00% 51	28.24% 48	10.00% 17	1
Loss of gas service?	2.35% 4	6.47% 11	18.82% 32	33.53% 57	27.06% 46	11.76% 20	1
Detection of unsafe gas concentration inside/near a facility?	2.35% 4	5.29% 9	24.12% 41	31.18% 53	25.29% 43	11.76% 20	1
Natural disaster (e.g. earthquake, flood, landslide, volcanic eruption)?	10.06% 17	18.34% 31	30.77% 52	23.08% 39	11.24% 19	6.51% 11	1
Bomb threat?	15.29% 26	15.88% 27	32.94% 56	18.82% 32	9.41% 16	7.65% 13	1
Civil disturbance (e.g. riots, demonstrations)?	14.20% 24	20.12% 34	31.95% 54	18.34% 31	7.69% 13	7.69% 13	1

Q55 How well do you understand communication protocols defined by the company's emergency response plan in the following emergency scenarios:

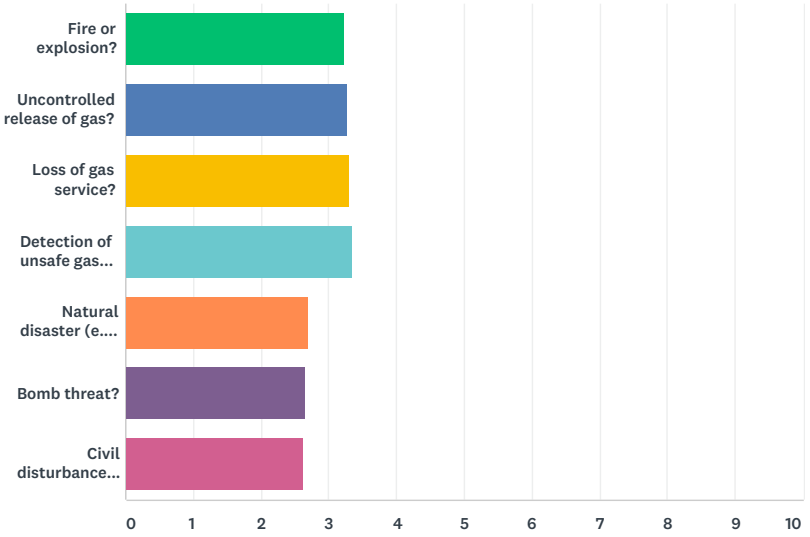
Answered: 170 Skipped: 29



	NOT AT ALL WELL	NOT SO WELL	SOMEWHAT WELL	VERY WELL	EXTREMELY WELL	NOT APPLICABLE	TOTAL	WEIGHTED AVERAGE
Fire or explosion?	4.12% 7	10.00% 17	23.53% 40	32.94% 56	19.41% 33	10.00% 17	170	3.24
Uncontrolled release of gas?	2.35% 4	10.59% 18	20.59% 35	34.12% 58	21.76% 37	10.59% 18	170	3.31
Loss of gas service?	3.53% 6	10.00% 17	21.76% 37	31.76% 54	21.18% 36	11.76% 20	170	3.22
Detection of unsafe gas concentration inside/near a facility?	3.53% 6	8.24% 14	21.76% 37	32.94% 56	21.18% 36	12.35% 21	170	3.23
Natural disaster (e.g. earthquake, flood, landslide, volcanic eruption)?	11.18% 19	14.71% 25	27.65% 47	20.59% 35	17.06% 29	8.82% 15	170	2.91
Bomb threat?	11.76% 20	17.65% 30	28.82% 49	18.82% 32	13.53% 23	9.41% 16	170	2.76
Civil disturbance (e.g. riots, demonstrations)?	11.76% 20	18.24% 31	29.41% 50	17.06% 29	14.12% 24	9.41% 16	170	2.75

Q56 How confident are you in the adequacy & mobilization time of internal & external response resources in the following emergency scenarios:

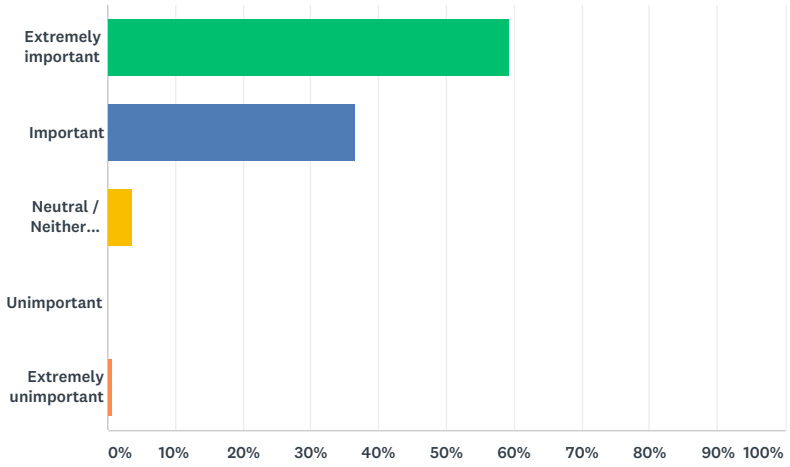
Answered: 170 Skipped: 29



	NOT AT ALL CONFIDENT	NOT SO CONFIDENT	SOMEWHAT CONFIDENT	VERY CONFIDENT	EXTREMELY CONFIDENT	DON'T KNOW OR NOT APPLICABLE	TOTAL	WEIGHTED AVERAGE
Fire or explosion?	2.35% 4	8.82% 15	26.47% 45	33.53% 57	17.65% 30	11.18% 19	170	3.22
Uncontrolled release of gas?	1.18% 2	7.65% 13	28.82% 49	31.76% 54	19.41% 33	11.18% 19	170	3.27
Loss of gas service?	0.59% 1	6.47% 11	28.24% 48	34.71% 59	18.82% 32	11.18% 19	170	3.31
Detection of unsafe gas concentration inside/near a facility?	0.59% 1	7.65% 13	23.53% 40	37.65% 64	19.41% 33	11.18% 19	170	3.34
Natural disaster (e.g. earthquake, flood, landslide, volcanic eruption)?	3.53% 6	19.41% 33	29.41% 50	22.94% 39	9.41% 16	15.29% 26	170	2.69
Bomb threat?	4.12% 7	19.41% 33	30.59% 52	22.35% 38	8.24% 14	15.29% 26	170	2.65
Civil disturbance (e.g. riots, demonstrations)?	4.71% 8	20.59% 35	30.59% 52	20.59% 35	8.24% 14	15.29% 26	170	2.61

Q57 How important are the company's pipeline safety vision and goals to you?

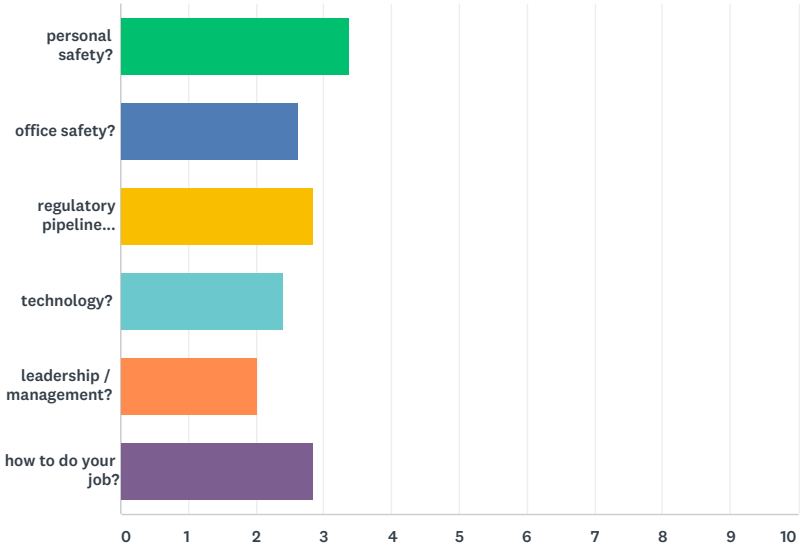
Answered: 167 Skipped: 32



ANSWER CHOICES	RESPONSES	
Extremely important	59.28%	99
Important	36.53%	61
Neutral / Neither important nor unimportant	3.59%	6
Unimportant	0.00%	0
Extremely unimportant	0.60%	1
TOTAL		167

Q58 To what extent have you received training on the following topics in the last two years? Training includes both formal courses away from the job and organized training on the job.

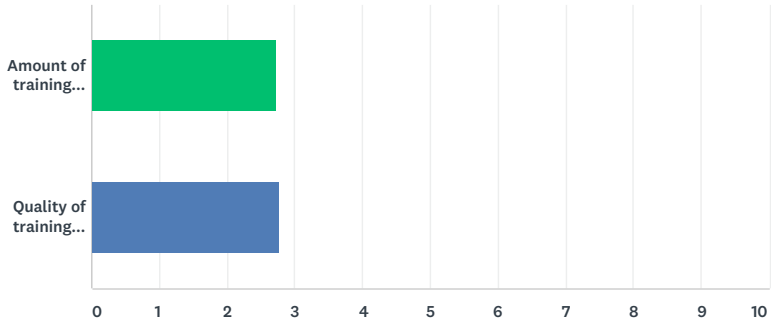
Answered: 167 Skipped: 32



	NO TRAINING	LITTLE TRAINING	SOME TRAINING	CONSIDERABLE TRAINING	EXTENSIVE TRAINING	DON'T KNOW OR NOT APPLICABLE	TOTAL	WEIGHTED AVERAGE
personal safety?	7.83% 13	15.06% 25	25.30% 42	33.73% 56	17.47% 29	0.60% 1	166	3.36
office safety?	19.28% 32	21.08% 35	28.92% 48	16.27% 27	9.64% 16	4.82% 8	166	2.61
regulatory pipeline compliance?	12.65% 21	20.48% 34	25.30% 42	25.30% 42	10.84% 18	5.42% 9	166	2.85
technology?	19.28% 32	32.53% 54	27.11% 45	13.25% 22	4.22% 7	3.61% 6	166	2.40
leadership / management?	33.13% 55	22.89% 38	21.08% 35	7.23% 12	6.02% 10	9.64% 16	166	2.01
how to do your job?	20.96% 35	17.37% 29	29.94% 50	17.37% 29	13.77% 23	0.60% 1	167	2.84

Q59 How satisfied are you with the situational awareness & incident response training provided by your company?

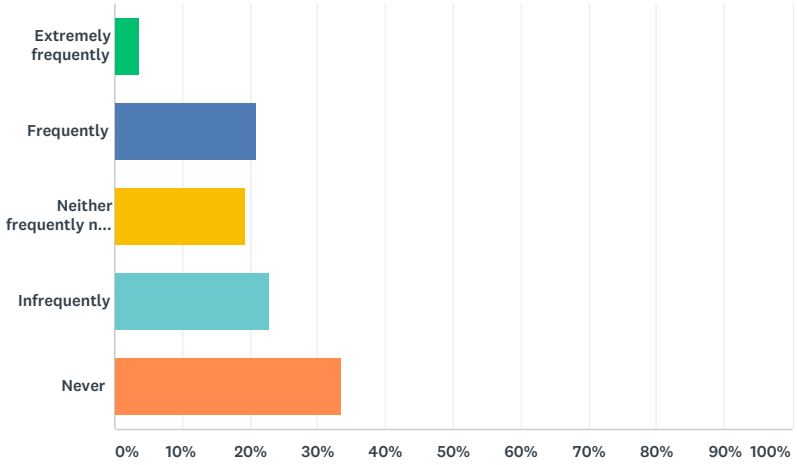
Answered: 167 Skipped: 32



	EXTREMELY DISSATISFIED	DISSATISFIED	NEUTRAL / NEITHER SATISFIED NOR DISSATISFIED	SATISFIED	EXTREMELY SATISFIED	DIDN'T HAVE ANY	TOTAL	WEIGHTED AVERAGE
Amount of training provided?	8.98% 15	28.14% 47	21.56% 36	26.95% 45	6.59% 11	7.78% 13	167	2.71
Quality of training provided?	10.24% 17	24.10% 40	22.29% 37	27.11% 45	8.43% 14	7.83% 13	166	2.76

Q60 How frequently do you participate in pipeline safety improvement activities such as serving on a committee, participating in an incident investigation, or helping update pipeline safety rules & procedures?

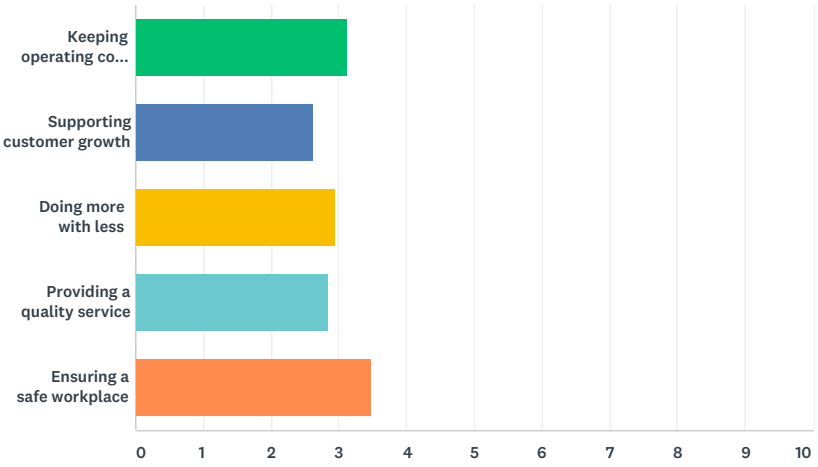
Answered: 167 Skipped: 32



ANSWER CHOICES	RESPONSES	
Extremely frequently	3.59%	6
Frequently	20.96%	35
Neither frequently nor infrequently	19.16%	32
Infrequently	22.75%	38
Never	33.53%	56
TOTAL		167

Q61 Please rank how important you think the following priorities have been in your current workplace:

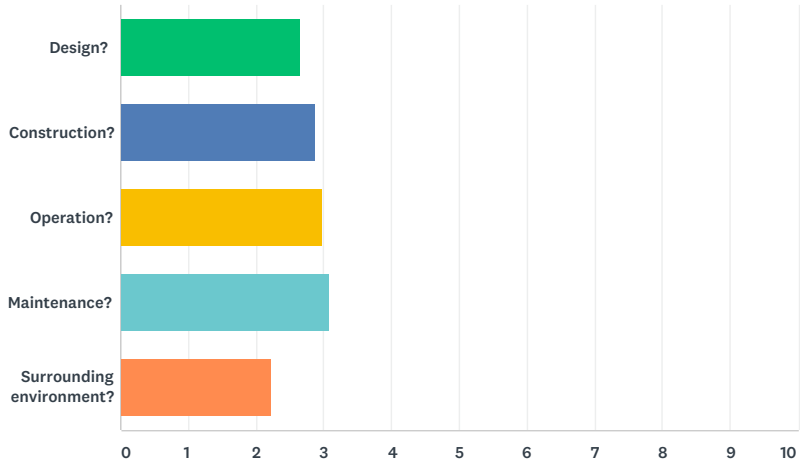
Answered: 167 Skipped: 32



	1	2	3	4	5	TOTAL	SCORE
Keeping operating costs down	23.95% 40	17.96% 30	17.96% 30	25.15% 42	14.97% 25	167	3.11
Supporting customer growth	5.99% 10	16.77% 28	32.34% 54	22.16% 37	22.75% 38	167	2.61
Doing more with less	26.35% 44	19.16% 32	11.38% 19	10.18% 17	32.93% 55	167	2.96
Providing a quality service	5.99% 10	29.94% 50	20.96% 35	28.74% 48	14.37% 24	167	2.84
Ensuring a safe workplace	37.72% 63	16.17% 27	17.37% 29	13.77% 23	14.97% 25	167	3.48

Q62 How difficult is it for you to find and access pertinent documents & records related to company pipelines when required:

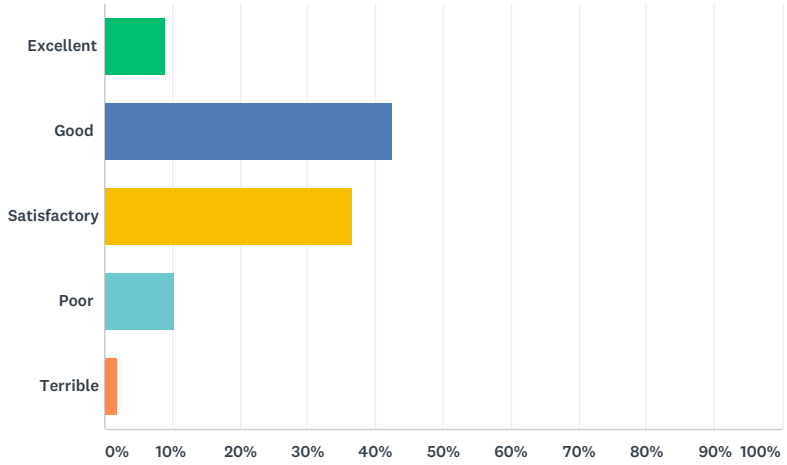
Answered: 167 Skipped: 32



	EXTREMELY DIFFICULT	SOMEWHAT DIFFICULT	NEUTRAL / NEITHER EASY NOR DIFFICULT	SOMEWHAT EASY	EXTREMELY EASY	DON'T KNOW	TOTAL	WEIGHTED AVERAGE
Design?	5.39% 9	14.37% 24	20.36% 34	26.35% 44	13.17% 22	20.36% 34	167	2.66
Construction?	3.01% 5	10.84% 18	23.49% 39	28.92% 48	15.06% 25	18.67% 31	166	2.86
Operation?	3.64% 6	8.48% 14	21.82% 36	33.94% 56	15.15% 25	16.97% 28	165	2.98
Maintenance?	2.41% 4	9.64% 16	16.27% 27	34.94% 58	19.28% 32	17.47% 29	166	3.07
Surrounding environment?	3.61% 6	12.05% 20	21.08% 35	22.29% 37	8.43% 14	32.53% 54	166	2.22

Q63 How would you characterize the quality (i.e. completeness, reliability, legibility, traceability) of the documents & records you use to perform your job?

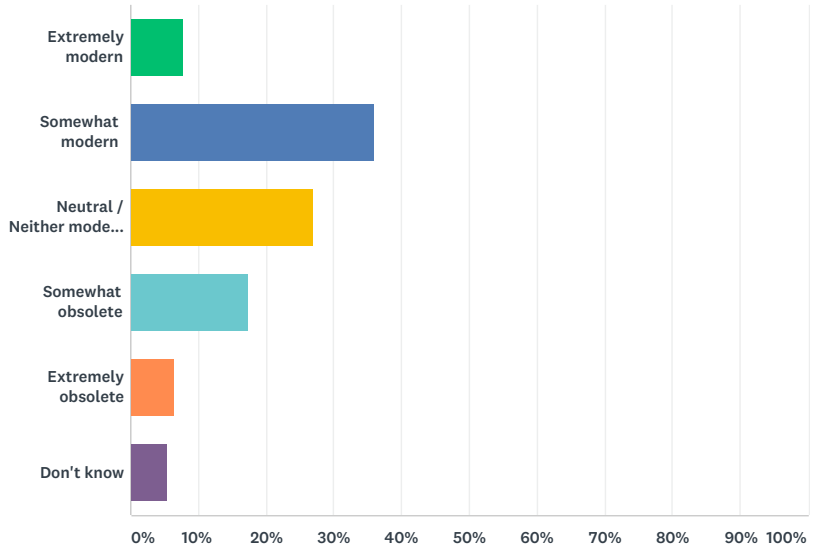
Answered: 167 Skipped: 32



ANSWER CHOICES	RESPONSES	
Excellent	8.98%	15
Good	42.51%	71
Satisfactory	36.53%	61
Poor	10.18%	17
Terrible	1.80%	3
TOTAL		167

Q64 How would you characterize the documentation & record keeping technology currently used by your company?

Answered: 167 Skipped: 32



ANSWER CHOICES	RESPONSES	
Extremely modern	7.78%	13
Somewhat modern	35.93%	60
Neutral / Neither modern nor obsolete	26.95%	45
Somewhat obsolete	17.37%	29
Extremely obsolete	6.59%	11
Don't know	5.39%	9
TOTAL		167

Q65 Do you have any other comments, questions, or concerns regarding the company's approach to pipeline safety?

Answered: 80 Skipped: 119

Appendix C. Field Audit

Training

- **Findings**
  -
  - Brick and mortar Facilities available in Sunnyside
  - Center staffed by seasoned and knowledgeable staff
  - Some props like portable regulator trailer developed
  - Training mostly one-week orientation for new employees
  - Generally training left to District Managers and OJT
  - Lack of a consistent program for training employees new to job
  - Safety training and meetings left to District Managers who are provided a topic
  - MOC training provided by a PowerPoint and left to District Managers
- **Conclusions**
  - Training in infancy stage
  - Need a strategic plan for program and function development
  - Serious concern on how knowledge and most important how to perform tasks are transferred, how we always did it?
  - Need a management level training both internal and external programs
  - OQ considered a fulfilment of compliance

Emergency Response

- **Findings**
  - Excessive Travel time a concern for on call employees
  - Utility crew are not on call out
  - Techs will make safe, make minor repairs
  - There are ad hoc drills but mostly scenarios are desk top
  - Ad hoc training and updates with local fire, police and other first responders
  - There have been no recent major incidences
  - There is an ad hoc critique of incidents locally in the district
- **Conclusions**
  - Not having a utility crew avail needs to be reevaluated
  - Lack of a structured/compliance plan for communications and training with local responders
  - A means to share best practices and lessons learned with other Districts is needed

Atmospheric Corrosion

- **Findings**
  - Done on an annual basis as required by regulatory mandate

  - Can find issues other than corrosion, like service under new building structures
  - Inspector receives a week of classroom orientation
  - Summer help limited in what they can do
- **Conclusions**
  - Issue more prevalent in western regions

Leak Investigation

- **Findings**
  - Leak survey not a specialist assignment
  - First responders, service techs, will in most cases will grade leaks
  - Service techs will normally repair easy above ground leaks
  - Sometimes service techs with drill/bar-hole
  - Little to no leak backlog of grade 1-2 leaks.
  - In some districts backlog of grade 3 but not significant
  - Consideration given to main replacement before grade 3 are repaired
  - Shadow survey done by Heath in Mount Vernon, yielding numerous leaks not picked up by company survey
- **Conclusions**
  - Leak survey is a specialist trained function in most utilities and should not be treated as a job an employee with limited training and experience can perform
  - The investigation and grading of leaks in some cases is performed by employees with few years of experience and only OJT

Regulator Maintenance (includes odorizers)

- **Findings**
  - Stations are inspected annually and torn down every 5 years There are numerous regulators in each district between 100-150 in many cases
  - Service techs perform this task
  - Now standardizing with Mooney rather Fisher
  - Task is performed in a methodical manner, and information is recorded in detail manually and scanned into system
  - If not working properly during annual inspection tear down is done and debris is removed
  - There is a mobile training rig used for training in the districts
- **Conclusions**
  - Process is thorough and followed in detail
  - All services techs are required to perform this function

- Regulator station design is a typical design found in many companies and adequate for the safety of the system

Facility Locations and Surveillance

- **Findings**
  - This task is represented as 50-80% of a service techs daily work based on the district and time of year
  - The records are generally good with few misallocates noted
  - There is a requirement for locates for realty lawn signs The process appears to be robust
  - Surveillance of contractors working in the area of critical facilities seems to vary by the district. The procedures recently changed leaving more to the discretion of the Manager
- **Conclusions**
  - Locations are a major and critical task each service tech must perform daily among other priorities like first responder which in many other utilities is either a specialist function or outsourced
  - Surveillance seems to be a hit or miss depending on the workload and availability of staff rather than the critical nature of the requirement