

# Gas Pipeline Safety: Better Data and Planning Would Improve Implementation of Regulatory Changes

GAO-24-106690 (Accessible Version)  
Q&A Report to Congressional Committees

April 3, 2024

## Why This Matters

About 300,000 miles of natural gas transmission pipelines across the United States carry products from processing facilities to communities and other large-volume customers. Pipelines are a relatively safe mode for transporting natural gas, but incidents can still occur that result in death, injury, and property and environmental damage.

The Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) sets the federal minimum safety standards for these pipelines. In 2003, PHMSA established integrity management—a risk-based approach to managing certain gas transmission pipelines—as an addition to its existing pipeline safety regulations. Under this approach, operators are required to assess pipelines in high consequence areas (HCA)—generally, areas where an incident could have the greatest impact to public safety or property—to identify threats and mitigate risks. In October 2019 and August 2022, PHMSA issued final rules that both strengthened its gas transmission pipeline safety regulations and expanded some integrity assessment requirements beyond HCAs, including to newly defined moderate consequence areas (MCA).

The Protecting our Infrastructure of Pipelines and Enhancing Safety Act of 2016 includes a provision for us to examine gas transmission integrity management programs following PHMSA's completion of a specific pipeline safety rulemaking.<sup>1</sup> We are providing information on potential changes to the methods operators use to identify HCAs; how selected stakeholders, including pipeline operators and state inspectors, view the regulatory changes to gas transmission pipeline safety; and how PHMSA is overseeing the implementation of the 2019 and 2022 final rules stemming from the rulemaking.

## Key Takeaways

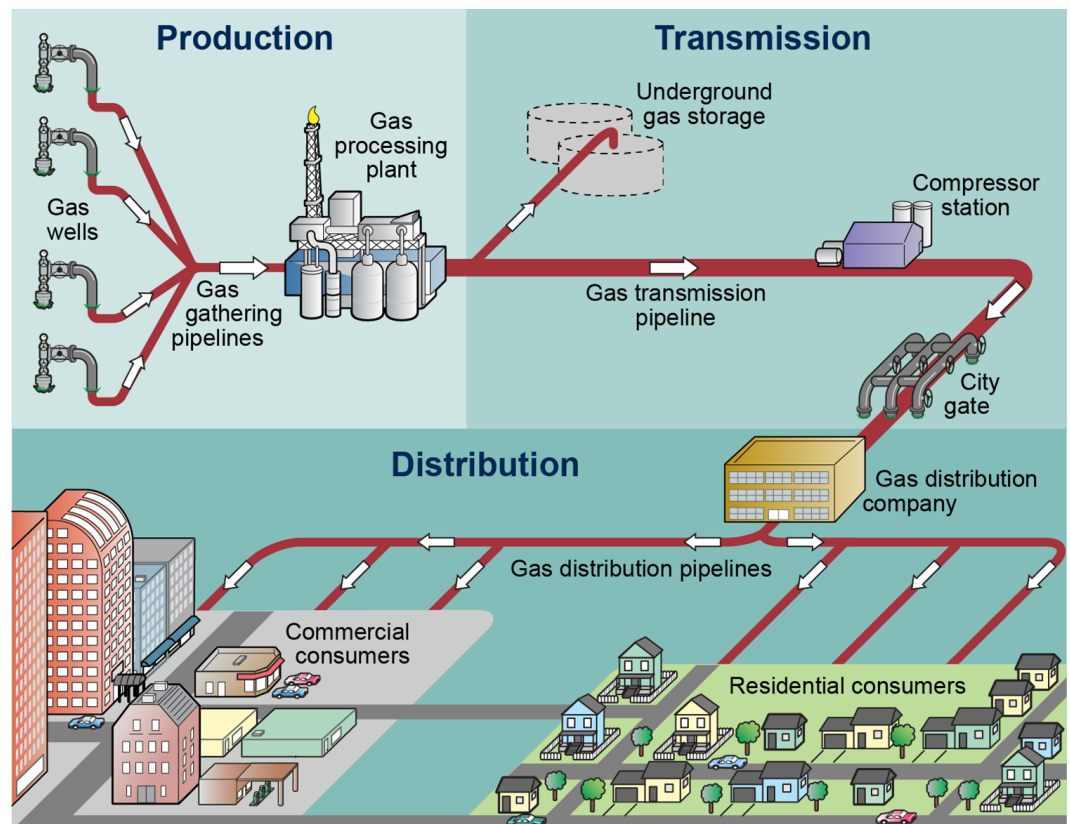
- PHMSA officials told us they are considering regulatory changes to the calculation of a pipeline's potential impact radius. However, when a pipeline incident occurs, PHMSA does not collect detailed data comparing the actual impact of the incident with the potential impact radius that the operator had calculated for the pipeline. Without data on the full impact of these pipeline incidents, PHMSA may find it more difficult to assess the method's accuracy.
- Selected stakeholders identified key changes in the 2019 and 2022 final rules that they expect will improve gas transmission pipeline safety by increasing the pipeline mileage assessed, improving data and information, and strengthening requirements for operators to take preventative and remedial actions.

- PHMSA has largely implemented the 2019 final rule and is in the process of implementing the 2022 rule; however, it has not created an implementation plan that includes timelines and objectives for the 2022 final rule. Without a plan, PHMSA may not be able to ensure that the agency accomplishes its remaining activities in a timely manner and conducts outreach to the appropriate audiences.
- PHMSA's Final Rule Implementation web pages do not include complete information and guidance for both rules. Without action from PHMSA to update the web pages, operators and inspectors may have difficulties when trying to find information on the rules.
- We are recommending that PHMSA evaluate what additional data are needed from operators to better understand the actual impact of pipeline incidents, as the agency considers changes to the potential impact radius calculation. We are also recommending that PHMSA develop a plan for the remaining activities to implement the 2022 final rule and include all relevant information and guidance on its Final Rule Implementation web pages.

### What are gas transmission pipelines?

Natural gas transmission pipelines carry gas, sometimes over hundreds of miles, to communities and large-volume users (e.g., factories).<sup>2</sup> In 2023, PHMSA officials estimated that the United States has over 300,000 miles of onshore gas transmission pipelines. Roughly two-thirds of these miles were *interstate* pipelines, or pipelines that generally cross state boundaries. The remaining third were *intrastate* pipelines, or pipelines that tend to operate within a single state.<sup>3</sup> Transmission pipelines tend to have larger diameters and operate at higher pressures than other types of pipelines (see fig. 1).

Figure 1: Transmission Pipelines within a Natural Gas Pipeline System



Source: GAO analysis of Energy Information Administration and Natural Gas Council documents; GAO (illustration). | GAO-24-106690

**Accessible Text for Figure 1: Transmission Pipelines within a Natural Gas Pipeline System**

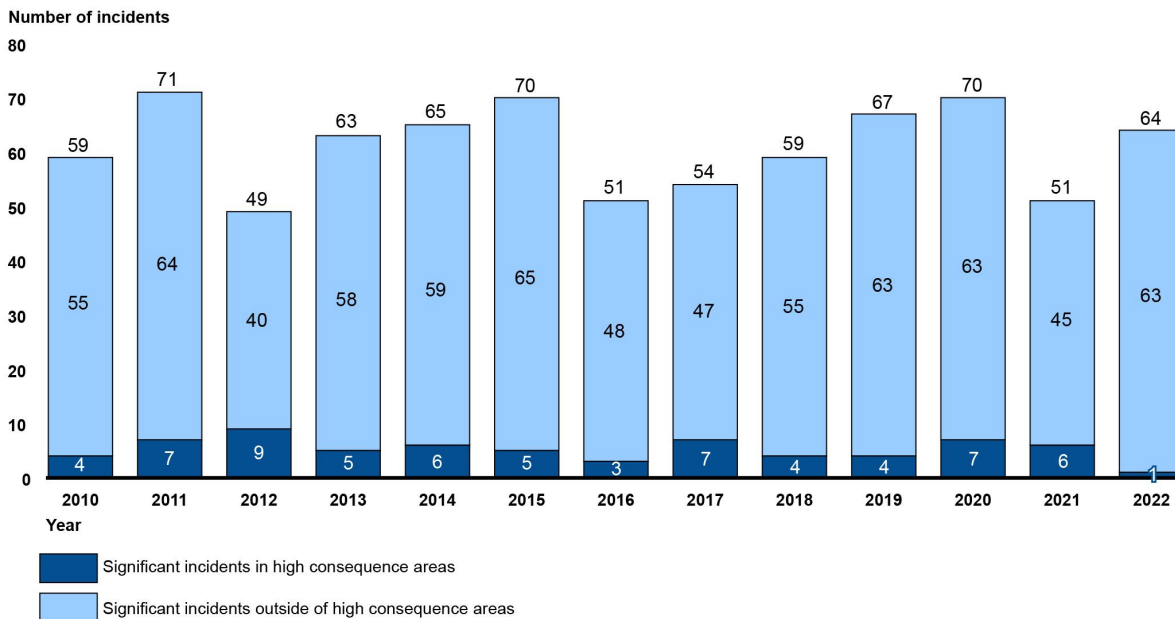
Category	Level	Level information
Production	One	Gas wells
Production	Two	Gas gathering pipelines
Production	Three	Gas processing plant
Transmission	Four	<ul style="list-style-type: none"> <li>Underground gas storage</li> <li>Gas transmission pipeline</li> </ul>
Transmission	Five	Compressor station
Transmission	Six	City gate
Distribution	Seven	Gas distribution company
Distribution	Eight	Gas distribution pipelines
Distribution	Nine	<ul style="list-style-type: none"> <li>Commercial consumers</li> <li>Residential consumers</li> </ul>

Source: GAO analysis of Energy Information Administration and Natural Gas Council documents; GAO (illustration). | GAO-24-106690

**How frequent and what are the causes of significant gas transmission pipeline incidents?**

PHMSA data show that significant onshore gas transmission pipeline incidents have averaged 61 incidents per year from 2010-2022 (see fig. 2). Few of these occurred in HCAs—generally, where incidents could have the greatest impact to public safety or property. PHMSA defines a significant incident as one that results in a fatality, an injury requiring hospitalization, or property damage that exceeds \$50,000 in total costs (in 1984 dollars).

**Figure 2: Significant Onshore Gas Transmission Pipeline Incidents Reported by Operators 2010-2022**



Source: GAO analysis of Pipeline and Hazardous Materials Safety Administration data. | GAO-24-106690

**Accessible Data for Figure 2: Significant Onshore Gas Transmission Pipeline Incidents Reported by Operators 2010-2022**

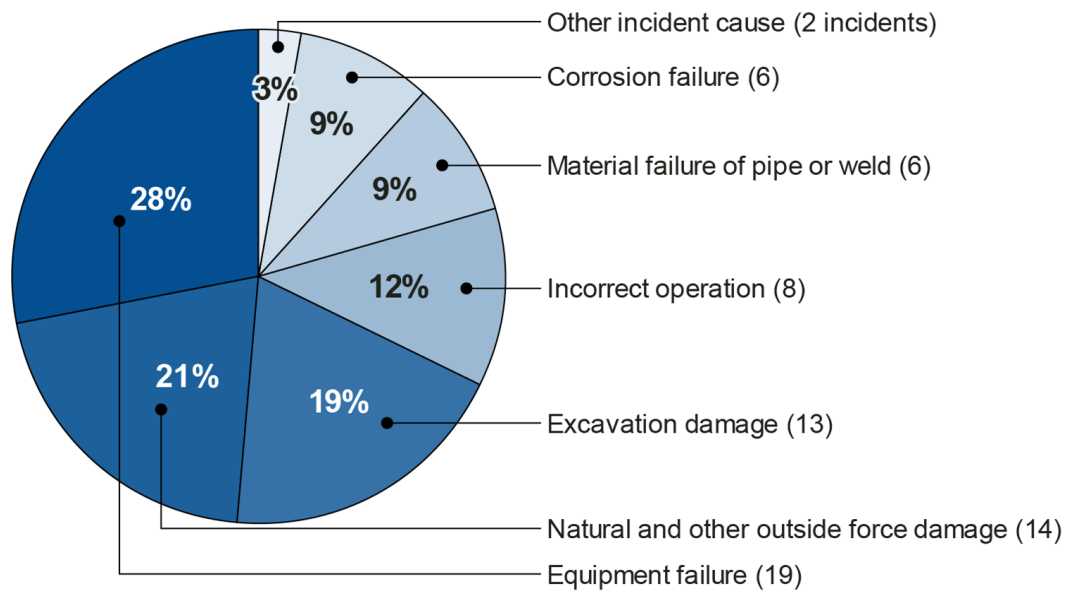
Year	High Consequence Area Incidents	Other incidents
2010	4	55
2011	7	64
2012	9	40
2013	5	58
2014	6	59
2015	5	65
2016	3	48
2017	7	47
2018	4	55
2019	4	63
2020	7	63
2021	6	45
2022	1	63

Source: GAO analysis of Pipeline and Hazardous Materials Safety Administration data. | GAO-24-106690

A variety of factors—including mechanical failure, corrosion, and excavation damage—cause pipeline incidents. From 2010-2022, PHMSA data show that nearly half (43 percent) of significant onshore gas transmission pipeline incidents were caused by equipment or material failure, followed by corrosion failure (16 percent).

Significant pipeline incidents in HCAs had slightly different causes (see fig. 3). Operators reported that approximately 37 percent of these incidents were caused by equipment or material failure, and approximately 19 percent of incidents were the result of excavation damage.

**Figure 3: Reported Causes of Significant Onshore Gas Transmission Pipeline Incidents in High Consequence Areas, 2010-2022**



Source: GAO analysis of Pipeline and Hazardous Materials Safety Administration data. | GAO-24-106690

**Accessible Data for Figure 3: Reported Causes of Significant Onshore Gas Transmission Pipeline Incidents in High Consequence Areas, 2010-2022**

Cause of incident	Number	Percentage
Other incident cause	2	3
Corrosion failure	6	9
Material failure of pipe or weld	6	9
Incorrect operation	8	12
Excavation damage	13	19
Natural and other outside force damage	14	21
Equipment failure	19	28

Source: GAO analysis of Pipeline and Hazardous Materials Safety Administration data. | GAO-24-106690

Note: Percentages above are rounded to the nearest percentage point.

According to PHMSA, pipeline equipment and materials can fail due to malfunction of equipment like valves or compressors or design defects. In HCAs, excavation damage by the operator or a third party is a more common cause of a pipeline incident than in non-HCAs.

**How does PHMSA oversee gas transmission pipeline safety?**

PHMSA sets the federal minimum safety standards for interstate and intrastate gas transmission pipelines, including requirements for their design, construction, testing, inspection, operation, and maintenance.<sup>4</sup> The agency also oversees pipeline safety through enforcing these regulations, conducting inspections, and other efforts, including requiring operators to submit annual and incident reports.<sup>5</sup> PHMSA conducts pipeline inspections primarily through its five regional and two district offices.

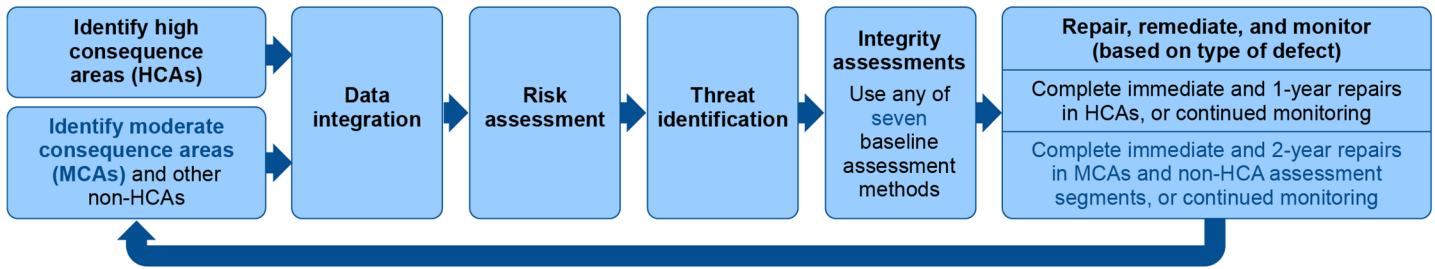
States may assume regulatory, inspection, and enforcement responsibilities for *intrastate* transmission pipelines within their borders, provided that the state certifies to PHMSA that it has adopted all applicable federal safety standards and is enforcing them as state laws, among other things.<sup>6</sup> Though PHMSA is exclusively responsible for enforcing its regulations for interstate pipelines, the agency may also authorize states holding certifications to assist with its oversight and inspections of these pipelines as “interstate agents” of PHMSA. As of 2022, eight states are authorized to act as interstate agents of PHMSA for gas pipelines.<sup>7</sup>

PHMSA also oversees the risk-based regulatory program known as integrity management.<sup>8</sup> Under PHMSA’s regulations, operators with pipelines in HCAs are required to develop their own integrity management programs.<sup>9</sup> These programs must identify all HCAs, integrate relevant pipeline data, and include a risk assessment to identify potential threats to pipelines in those areas. The regulations require operators to conduct regular integrity assessments of those pipelines and correct any defects they find.

**What recent changes has PHMSA made to gas transmission pipeline safety regulations?**

PHMSA recently amended its gas transmission pipeline safety regulations, including parts of its integrity management program regulations, through two final rules issued in October 2019 and August 2022.<sup>10</sup> The rules required operators to improve their data and records of pipeline characteristics and reconfirm the maximum allowable operating pressure of certain pipelines, and adjusted repair criteria for addressing pipeline defects in HCAs, among other things. The rules also changed or established requirements related to operators’ integrity assessments of pipelines in HCAs, MCAs, and other specific areas (see fig. 4).

**Figure 4: Steps Operators Take to Assess Gas Transmission Pipelines, with Selected Regulatory Changes Made by PHMSA's 2019 and 2022 Final Rules**



**Black text:** Steps existing before the 2019 final rule  
**Blue text:** Change made by the 2019 or 2022 final rule

Source: GAO analysis of Pipeline and Hazardous Materials Safety Administration (PHMSA) regulations; GAO (diagram). | GAO-24-106690

**Accessible Text for Figure 4: Steps Operators Take to Assess Gas Transmission Pipelines, with Selected Regulatory Changes Made by PHMSA's 2019 and 2022 Final Rules**

Level	Level information
One	<ul style="list-style-type: none"> <li>Identify high consequence areas (HCAs)</li> <li>Identify moderate consequence areas (MCAs) and other non-HCAs</li> </ul>
Two	Data integration
Three	Risk assessment
Four	Threat identification
Five	Integrity assessments (Use any of seven baseline assessment methods)
Six	<ul style="list-style-type: none"> <li>Repair, remediate, and monitor (based on type of defect)</li> <li>Complete immediate and one-year repairs in HCAs, or continued monitoring</li> <li>Complete immediate and two-year repairs in MCAs and non-HCA assessment segments, or continued monitoring</li> </ul>

Source: GAO analysis of Pipeline and Hazardous Materials Safety Administration (PHMSA) regulations; GAO (diagram). | GAO-24-106690

Notes: See Pipeline Safety: Safety of Gas Transmission Pipelines: MAOP Reconfirmation, Expansion of Assessment Requirements, and Other Related Amendments, 84 Fed. Reg. 52180 (Oct. 1, 2019); Pipeline Safety: Safety of Gas Transmission Pipelines: Repair Criteria, Integrity Management Improvements, Cathodic Protection, Management of Change, and Other Related Amendments, 87 Fed. Reg. 52224 (Aug. 24, 2022).

While PHMSA's integrity assessment requirement applies to all gas transmission pipelines in HCAs, it applies only to these pipelines in MCAs that can accommodate in-line inspection tools, as well as such pipelines operating at or above 30 percent of the specified minimum yield strength in certain other non-HCAs.

Prior to the 2019 final rule, gas transmission pipeline operators could choose from three specific methods to conduct baseline integrity assessments of pipelines in HCAs and four specific methods for subsequent integrity assessments. Operators could also choose to use an alternative assessment method under certain conditions for both assessments.

The 2019 final rule went into effect on July 1, 2020, with additional compliance deadlines specified for various provisions of the rule. The 2022 final rule went into effect on May 24, 2023. However, prior to the rule's effective date, PHMSA notified operators that it would not enforce most of the rule's provisions until February 24, 2024, with certain limited exceptions. The agency did this to facilitate operator compliance and implementation efforts.<sup>11</sup> According to officials, PHMSA used this period to make several technical clarifications to the 2022 final rule, and as a result officials expect improved operator compliance with the regulatory changes.

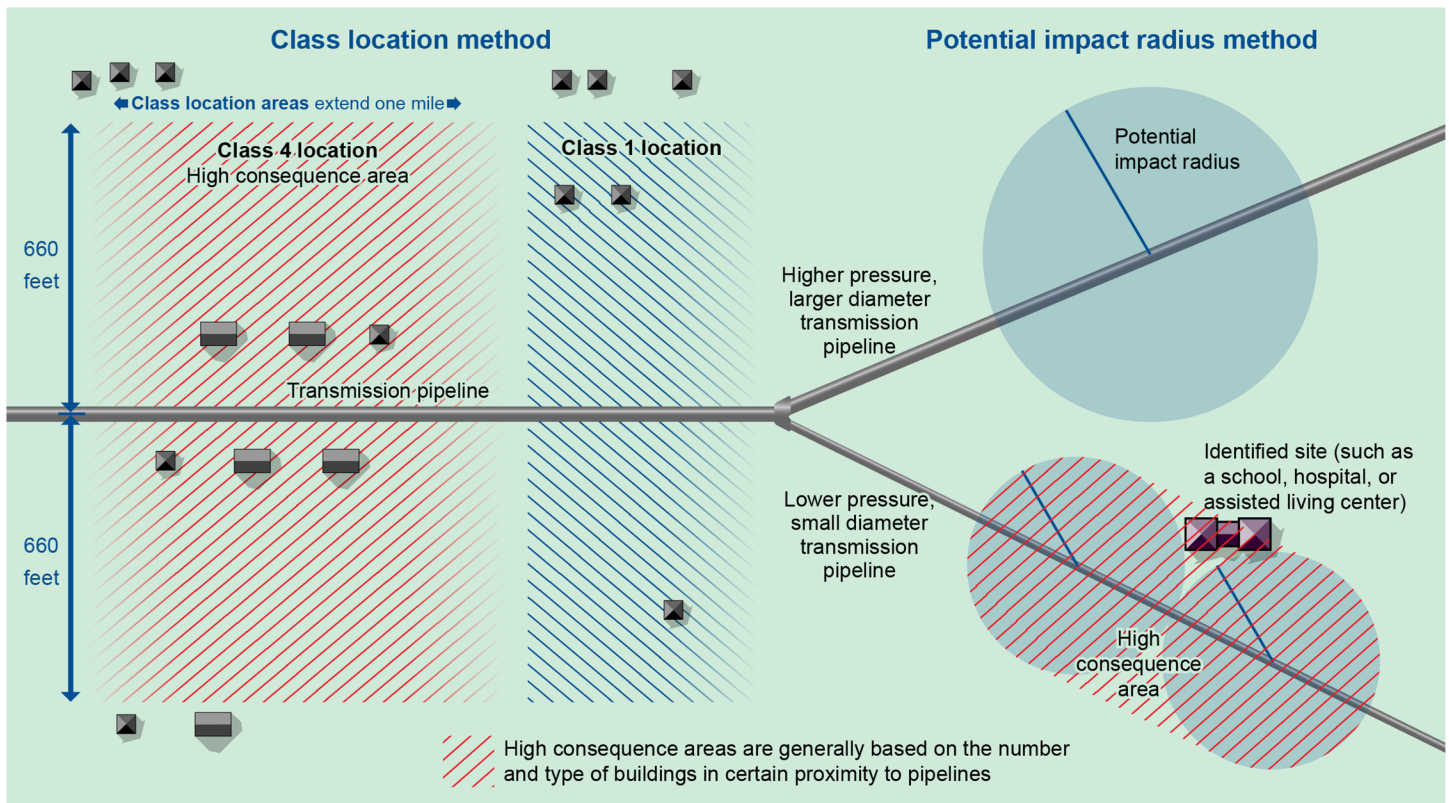
**What methods can operators use to identify HCAs and MCAs on their pipelines?**

Under integrity management regulations, pipeline operators can use two methods—class location and the potential impact radius (PIR)—to identify HCAs

within their gas transmission pipeline system (see fig. 5). PHMSA's 2019 final rule required operators to use the PIR method to identify MCAs.

- Class location.** A pipeline's class location is generally based on the population density within a specified distance of the pipeline's centerline. Using this method, operators generally count the number of buildings within 660 feet of a pipeline that are intended for human occupancy or occupied by a certain number of people for a specific amount of time. Since 1970, PHMSA has categorized the areas around gas pipelines into four classes. In general, Class 1 locations are in less populated areas, while Class 4 locations are in the most densely populated areas.
- PIR.** The PIR method is also generally based on the population density of the area around the pipeline, but the size of that area is determined by calculating the individual pipeline's potential impact circle, rather than using a specific distance around the pipeline.<sup>12</sup> The PIR is the radius of this circle. The PIR is calculated using a regulatory formula that includes the diameter and maximum allowable operating pressure of the gas transmission pipeline as factors.

**Figure 5: Methods to Identify High Consequence Areas for Gas Transmission Pipelines**



Source: GAO analysis of Pipeline and Hazardous Materials Safety Administration regulations; GAO (illustration). | GAO-24-106690

**Accessible Text for Figure 5: Methods to Identify High Consequence Areas for Gas Transmission Pipelines**

Methods	Information
<ul style="list-style-type: none"> <li>Class location method</li> <li>Potential impact radius method</li> </ul>	<ul style="list-style-type: none"> <li>Class location areas extend one mile</li> <li>High consequence areas are generally based on the number and type of buildings in certain proximity to pipelines</li> <li>Higher pressure, larger diameter transmission pipeline</li> <li>Lower pressure, small diameter transmission pipeline</li> <li>Identified site (such as a school, hospital, or assisted living center)</li> </ul>

Notes: These are examples of high consequence areas identified using each method. Under both methods, other areas may be identified as high consequence areas. An identified site is: (1) an outside area or open structure that is occupied by 20 or more persons at a specific minimum time frequency; (2) a building that is occupied by 20 or more persons at a specific minimum time frequency; or (3) a facility occupied by persons who are confined or of impaired mobility or would be difficult to evacuate. See 49 C.F.R. § 192.903.

### **Which methods are operators using to identify HCAs on their gas transmission pipelines?**

Operators who reported complete data to PHMSA predominantly used the PIR method for most of their transmission pipeline mileage. PHMSA began collecting annual report data about the methods operators use to identify HCAs in 2022. PHMSA's data show that operators used the PIR method for over 16,000 HCA transmission miles in 2022, compared to approximately 4,500 HCA miles with the class location method.

However, PHMSA's data on which method operators use are not complete. Our analysis of PHMSA's annual report data showed that nearly 40 percent of operators reported incomplete data on the methods they used in 2022. As a result, we are only reporting data for operators who submitted complete data to the agency. When we asked PHMSA officials about this issue, they told us that these inconsistencies were caused by an error in the agency's report submission system. PHMSA officials told us that the error was corrected in December 2023, before operators submitted their 2023 annual reports.

We found that operators' choice of which method to use to identify HCAs generally varies by the type of pipeline. For instance, interstate operators or operators who have both interstate and intrastate pipelines tend to use the PIR method. These operators reported using the PIR method for over 7,500 HCA transmission miles and used the class location method for 615 HCA miles. When asked why they use the PIR method, one operator told us that it more accurately determines HCAs, because the method allows operators to more precisely identify higher risk pipeline segments. Another operator added that the PIR method helps focus resources on areas where they are most needed.

Operators who only have intrastate pipelines used the class location method more often than other operators. Intrastate operators who reported complete data in 2022 used the class location method for over 3,600 HCA pipeline miles, compared to 615 miles for interstate operators and those who have both interstate and intrastate pipelines. Operators of intrastate pipelines tend to be smaller (operate fewer pipeline miles) than interstate operators.

Three of 22 selected stakeholders told us that smaller operators, or those with fewer resources, may prefer to use the class location method over the PIR calculation. According to one operator, class location uses a simpler methodology and requires less data than using the PIR method. However, over half of the operators (six of 10) we spoke to said that the choice between the methods can be a strategic one. For instance, one operator said that using the class location method's more conservative approach fit better with the company's overall approach to safety.

### **What changes is PHMSA considering to the class location and potential impact radius methods?**

PHMSA proposed regulatory changes in 2020 to safety requirements for certain gas transmission pipeline segments when the class location of the pipeline has changed. Officials said PHMSA is also considering whether to initiate a rulemaking on changes to the PIR method, but we found the agency does not collect data that allows it to assess the accuracy of that method.



## Class Location Method

PHMSA issued a notice of proposed rulemaking to amend the class location change regulations in 2020. Among other changes, the proposed rule would offer operators an alternative for managing class location changes that is based on integrity management.<sup>13</sup> Specifically, this alternative would be available when an eligible gas transmission pipeline segment changes from a less populated Class 1 location to a more populated Class 3 location. The proposed rule would also modify the definition of an HCA to include these pipeline segments, so that integrity management program requirements would apply to them. Under the existing regulations, operators must reduce a gas transmission pipeline's operating pressure, replace the pipe, or pressure test to higher standards when the class location around it increases. PHMSA officials told us that the proposed rule is scheduled to be discussed with stakeholders at the March 2024 meeting of the Gas Pipeline Advisory Committee.

## PIR Method

According to PHMSA officials, PHMSA is also considering changes to the PIR calculation in response to a recent National Transportation Safety Board (NTSB) recommendation. In 2022, NTSB found that PHMSA's equation for determining the PIR of a pipeline rupture does not match findings from investigations of recent gas ruptures and is based on assumptions that may not be realistic. For example, NTSB found that the equation assumes that an individual near a rupture would be able to evacuate or find shelter in 30 seconds. This assumption may not be accurate for individuals with mobility impairments or pre-existing medical conditions. Since NTSB's findings, PHMSA held a public meeting with a series of presentations on the PIR in December 2022, seeking input from industry and public stakeholders. In October 2023, PHMSA officials told us that the agency established a team to review the PIR calculation after the public meeting, and that PHMSA is evaluating whether changes may be needed to the PIR.

PHMSA does not collect detailed data comparing the PIR calculation to the actual impact of an incident on that pipeline, because the agency's incident form is not designed to collect that information. For each of the three questions on the form related to damage occurring outside of a pipeline's PIR, PHMSA asks operators to indicate *if* damage occurred via a yes/no response; however, it does not ask operators *how far* outside the PIR any damage occurred. As a result, PHMSA cannot analyze these incident characteristics in its database.

In addition, operator incident reports do not always provide detailed explanations for any injuries and fatalities that occur outside of the pipeline's PIR. For example, NTSB's 2022 report described how and where a fatality occurred outside of a Kentucky pipeline's calculated potential impact circle. In the incident report submitted to PHMSA, the operator indicated that the fatality occurred but did not include many of these details.

PHMSA officials told us that the agency typically conducts safety investigations following reportable incidents to ensure that operators determine the root cause of the failure and are operating in compliance with all regulations. Officials said the incident report forms are used as a catalyst for initiating those investigations.

According to *Standards for Internal Control in the Federal Government*, to best achieve their objectives, agencies should obtain relevant data from reliable external sources.<sup>14</sup> As PHMSA is considering changes to the PIR calculation, determining what additional data are needed from operators could improve the quality of PHMSA's initial data on actual pipeline incidents and assist the agency in evaluating operator methods to determine HCAs over time.

Without incident forms that allow PHMSA to assess the full impact of certain pipeline incidents, the agency may find it more difficult to assess whether a particular method is accurate for operators identifying HCAs. Having such information would provide PHMSA with additional data it could use as it considers whether to propose regulatory changes to the PIR equation.

### **Which changes in the 2019 and 2022 final rules do stakeholders think will have the largest impact on pipeline safety?**

Selected stakeholders and officials from PHMSA regional offices said that they expect several key changes in the 2019 and 2022 final rules will improve pipeline safety by increasing the miles of pipeline assessed, improving operator data and information, and strengthening preventative and remedial requirements for operators.<sup>15</sup> These stakeholders included representatives from pipeline industry and safety groups, state regulatory officials, and gas transmission pipeline operators. In addition, given the long time frames involved with the rules, some stakeholders (eight of 22) and officials from several PHMSA regional offices (three of five) noted that it may be too early to estimate the extent of safety benefits.<sup>16</sup>

Stakeholders and PHMSA regional officials identified the following key changes from the 2019 rule:

#### **Increasing miles of pipeline assessed**

- **Assessing Areas Outside of HCAs (17 of 22 stakeholders, four of five PHMSA regional offices).** The rule changes included establishing the MCA definition and requiring operators to conduct integrity assessments of certain gas transmission pipelines in MCAs and specific class locations using the same assessment methods adopted for HCAs.<sup>17</sup> In 2022, PHMSA's data show that this requirement added an additional 24,000 miles to operators' total assessed mileage, increasing the total assessed mileage by 115 percent to nearly 46,000 miles. Five operators said they were already assessing mileage beyond HCAs on their own before the final rule established the requirement to assess MCA and certain class location mileage; they said requiring all operators to do so was beneficial. One operator said that expanding the integrity assessment requirements beyond HCAs requires operators to know more about their pipelines; another said that having greater knowledge of their pipeline system makes it safer.

#### **Improving data and information**

- **Maximum Allowable Operating Pressure Reconfirmation (15 of 22 stakeholders, four of five PHMSA regional offices).** The rule required operators to reconfirm their pipelines' maximum allowable operating pressure under certain conditions; it provided six methods that operators could use to do so. Affected pipelines include those in HCAs and certain pipelines in Class 3 or 4 locations that have not previously been subject to a pressure test or that lack the traceable, verifiable, and complete records needed to establish the pipeline's maximum allowable operating pressure. An operator said that having additional methods to reconfirm the maximum allowable operating pressure is helpful if records are not complete, because it gives them more options to test their pipelines, rather than having to replace the pipe.
- **Verification of Pipeline Material Properties and Attributes (11 of 22 stakeholders, three of five PHMSA regional offices).** The rule established a requirement for operators to review the property and material records for steel pipelines to ensure the records are traceable, verifiable, and complete. Two industry stakeholders said this change was important because it

required operators to ensure that their records matched the pipe in the ground. One operator said this change was beneficial for pipeline safety, because the company had recently acquired pipelines with poor records.

Stakeholders and PHMSA regional officials identified the following key changes from the 2022 rule:

### Strengthening preventative and remedial requirements

- **Repair Criteria (10 of 22 stakeholders, four of five PHMSA regional offices).** The rule required immediate repairs of additional pipeline defects in HCAs, which an operator must repair upon discovery. Defects could include a dent, crack, or certain types of metal loss. The rule also establishes repair criteria for defects found in MCAs and other non-HCA areas, which will require certain repairs within 2 years of discovery or continued monitoring. One stakeholder said this change is beneficial because it expands the number of miles of pipeline subject to repair criteria and requires operators to address issues sooner.
- **Corrosion Control (10 of 22 stakeholders).** The rule strengthened regulations for corrosion control with new requirements for pipe coating assessments and protective coating strength, among other things. One stakeholder told us this was a critical change because it prescribes the steps operators must take to comply with the rule.

### What challenges have pipeline operators and inspectors faced in applying the final rules?

Some selected stakeholders said that the timeliness and clarity of PHMSA's guidance for the 2019 final rule posed a challenge for operators and inspectors applying the final rule changes (i.e., complying with the final rules and evaluating operator compliance). In addition, some stakeholders said that allocating resources to comply with the 2019 final rule was challenging due to the additional time and resources needed to make the changes, which stakeholders said PHMSA underestimated when it developed the rule. PHMSA postponed enforcing the 2022 final rule until February 2024 to help improve operator compliance and implementation efforts, according to PHMSA officials.

### Timeliness and Clarity of Guidance

- **Timely and Clear FAQs (12 of 22 stakeholders).** Over half of the stakeholders said the FAQs PHMSA issued for the 2019 final rule were not timely or clear.<sup>18</sup> For example, PHMSA published the first set of FAQs 2 months after the 2019 final rule went into effect and published the second set of FAQs more than 2 years later. An operator said that it was difficult to understand which pipeline segments fell under specific regulations, for example, which pipelines were required to get material verification or reconfirm the maximum allowable operating pressure; the FAQs did not provide further clarity.

According to PHMSA officials, the timing of FAQs was affected by the length of the comment period for the draft FAQs and operational delays from the COVID-19 pandemic. In addition, they noted that FAQs explain existing regulations but do not further restrict operators or alter the rules they are based on.

- **Consistency in Evaluating Final Rule Compliance (nine of 22 stakeholders).** Some stakeholders noted a need for consistency between federal and state inspectors when applying changes to the regulations. One operator said that a lack of consistency among inspectors has led to

confusion for operators on how to comply with the changes made by the 2019 final rule. According to one official from a state pipeline agency, state inspectors also experience challenges during inspections. The official estimated that some inspectors can spend hours trying to figure out which regulations apply during an inspection and specifically noted a lack of clarity around operating pressure records requirements.

PHMSA officials told us that consistency in applying the changes to the regulations is a top priority. According to officials, PHMSA established a small team with federal and state inspectors for several initial inspections to test and retool their inspection approach to help ensure a more consistent approach for the 2019 rule. PHMSA officials said they will continue this approach for the 2022 final rule.

### Resource Allocation

- **Additional time and resources (11 of 22 stakeholders).** Half of the selected stakeholders said the new requirements established by the final rules will require additional time and resources for operators, such as additional personnel. For example, one operator said that the compliance deadlines for the rule have been difficult for operators to meet due to the large-scale changes they needed to make to their operations. However, the operator also noted that PHMSA postponed enforcement of the 2022 final rule to give operators more time. In addition, a smaller operator said that the company did not have the resources for in-house experts on integrity management and would need to hire outside experts for guidance on compliance with the changes in the final rules.
- **Underestimated Costs (seven of 22 stakeholders).** Some stakeholders said PHMSA's cost-benefit analysis in the regulatory impact assessments for the final rules did not capture the full extent of costs for operators. One operator said that the assessments made simplistic assumptions for a highly complex rule.

### What steps has PHMSA taken to implement the 2019 and 2022 final rules?

PHMSA has largely implemented the 2019 final rule. PHMSA officials said they are in the process of implementing the 2022 final rule, but they have not fully documented their activities by creating an implementation plan.

### 2019 Final Rule Implementation Activities

Shortly after issuing the 2019 final rule, PHMSA officials said they formed a temporary implementation team to carry out activities, such as holding workshops with state and federal inspectors and issuing guidance to communicate the rule changes to inspectors and the pipeline industry. According to PHMSA officials, these activities were designed to prepare inspectors to conduct assessments and help operators understand how to comply with the final rule changes.

PHMSA performed the following activities to implement the 2019 final rule:

- Hosted a public meeting covering early rule implementation activities in February 2020 for industry, state agencies, and the general public;
- Held in-person trainings and workshops and hosted virtual webinars for federal and state inspectors from 2020-2023, according to PHMSA officials;
- Issued the first set of FAQs in September 2020 and the second set in April 2023;

- Issued a public inspection question set in July 2021, intended to educate PHMSA and state pipeline safety inspectors on pipeline safety standards amended by the final rule, and according to PHMSA officials, conducted pilot and post-pilot inspections;
- Hosted a Gas Pipeline Advisory Committee meeting for industry in October 2021 to provide an update on the implementation of the rule.

In 2021, while PHMSA was implementing the 2019 final rule, PHMSA's Office of Program Development created the *Fundamental Guide for Pipeline Safety Final Rule Implementation* (Implementation Guide), an internal document that provides guidelines for implementing final rules. During this time, PHMSA's temporary implementation team went through organizational changes, and PHMSA officials could not provide an implementation plan for the 2019 final rule. However, PHMSA officials provided a task list documenting the key activities the agency completed to implement the 2019 final rule. As of February 2024, PHMSA has largely finished implementing the 2019 final rule.

### 2022 Final Rule Implementation Activities

According to PHMSA officials, in 2022 the agency formed a new implementation division to implement the 2022 final rule and future rules. Officials said that PHMSA recognized a need for a dedicated team to facilitate the implementation of rules that are increasingly complex. In January 2024, officials said that this division was in the process of implementing the 2022 final rule and following an updated draft version of the Implementation Guide but has not created an implementation plan for the 2022 rule.<sup>19</sup>

According to *Standards for Internal Control in the Federal Government*, agencies should internally and externally communicate the necessary quality information to achieve their objectives.<sup>20</sup> Agencies should also consider factors including the purpose of the information, the intended recipients of the information, and when the audience needs to receive the information. PHMSA includes these considerations in its Implementation Guide. The updated version of the Implementation Guide states that a team implementing a final rule should develop an implementation plan that communicates, among other things, what the implementation team intends to achieve, time frames when deliverables will be complete, and a communication strategy to relay information to the right audience.

PHMSA officials said they do not intend to develop an implementation plan as described in the Implementation Guide, because the Guide was being updated at the time and some implementation tasks, such as one set of FAQs, have already been completed.

Instead of an implementation plan, officials created an internal task list to document their implementation activities and keep track of timelines. However, our review of PHMSA's task list for the 2022 final rule found that the list was a summary of actions, rather than an implementation plan with clear objectives, time frames, and an outreach strategy. The task list documents certain milestone dates such as the publication of the final rule and its effective dates, but not timelines for when other implementation activities, such as updates to PHMSA's enforcement manual, must be accomplished. In addition, the task list does not include the purpose of the activities, the intended audience for each activity, or how PHMSA will communicate with that audience.

PHMSA's remaining activities for the 2022 final rule include inspection questions and training for federal and state inspectors, according to PHMSA officials. PHMSA officials said they will not implement these activities until February 2024, when the agency will begin enforcing all provisions of the 2022 final rule. PHMSA

also intends to issue other sets of FAQs for the 2022 final rule, among other activities. Officials said some of their activities have been delayed due to legal challenges and PHMSA's notices of enforcement discretion.<sup>21</sup> For example, PHMSA explained that they waited to issue the first set of FAQs for the rule until January 2024, in part due to ongoing litigation in federal court challenging certain provisions of the 2022 final rule.<sup>22</sup> According to PHMSA officials, they do not have formal requirements to issue FAQs, but officials acknowledged that they have become expected by the industry in light of the increasing complexity of pipeline safety regulations.<sup>23</sup>

However, the remaining activities are key to helping stakeholders understand the requirements of the 2022 final rule. As implementation activities are still ongoing, the agency has an opportunity to develop an implementation plan that could help ensure it accomplishes the remaining activities and conducts outreach to the appropriate audiences in a timely manner. With a robust implementation plan, PHMSA would be in a better position to provide relevant guidance and information to operators and inspectors.

### **To what extent do PHMSA's web pages provide complete information about the 2019 and 2022 final rules?**

In 2023, PHMSA created rule implementation web pages with information about the 2019 and 2022 final rules. However, PHMSA's resources and information relevant to rule implementation and compliance are not always linked to PHMSA's rule implementation web pages, which officials told us are meant to provide easy-to-find information and guidance on the recent rulemakings.

We found that the web pages for the 2019 and 2022 final rules do not include the full scope of PHMSA's outreach activities. Information about the final rules is in several places on PHMSA's website, where it may not be easily accessible to operators or state inspectors. PHMSA has a guidance portal for operators on its website, in addition to the rule implementation web pages. PHMSA officials said the portal is designed to serve as a resource for industry and the public. The portal provides a variety of compliance resources, guidance manuals, and FAQs, among other resources. However, the portal does not help operators identify additional presentations or resources on the 2019 and 2022 final rules not linked on PHMSA's implementation web pages. For example, to find the industry meeting where PHMSA officials discussed the implementation of the 2019 final rule and the results of PHMSA's pilot inspections, a user would need to navigate through the agency's Meetings and Events web page and know the date of the meeting that covered the 2019 final rule. Alternatively, the user would need to download and review the agendas for each meeting.

According to *Standards for Internal Control in the Federal Government*, agencies should communicate externally the necessary quality information to help achieve their objectives.<sup>24</sup> In addition, PHMSA's Implementation Guide states that developing an outreach strategy that provides clear information to a targeted audience is a key component of an implementation plan. When asked about the goal and intended audience of the Final Rule Implementation web pages, PHMSA officials stated that the web pages are intended to provide complete information on the recent final rules for anyone interested. In addition, the Pipeline Rulemaking Implementation homepage states that the "information is oriented primarily toward operators to provide information useful for complying with the pipeline safety regulations." Having complete information on these web pages would better ensure that they are useful for gas transmission operators trying to comply with PHMSA's pipeline safety regulations.

Without action from PHMSA to update its Final Rule Implementation web pages, operators and inspectors may have difficulties when trying to find information on the 2019 and 2022 final rules.

## Conclusions

If PHMSA decides to propose regulatory changes to the PIR calculation, it could affect how operators identify HCAs and MCAs in the future. Without specific data comparing the calculated potential impact of a pipeline incident to the actual impact that occurred, PHMSA will not be able to fully evaluate how the PIR calculation could be changed to more accurately predict the impact of incidents and improve safety outcomes for the people involved. Assessing what additional data are needed from operator incident reports could improve the quality of PHMSA's data on actual pipeline incidents to help strengthen its analysis as it considers potential regulatory changes.

Stakeholders and PHMSA regional officials generally concurred that PHMSA's 2019 and 2022 final rules hold promise to improve the safety of gas transmission pipelines by strengthening operator requirements and extending assessment requirements to pipelines beyond HCAs. While the agency has largely implemented the 2019 final rule, developing a plan for the 2022 rule would help ensure that PHMSA accomplishes its remaining planned activities and conducts outreach to the appropriate audiences in a timely manner. Further, having complete information on the 2019 and 2022 final rules on PHMSA's Final Rule Implementation web pages would better ensure that these web pages are useful for operators and inspectors.

## Recommendations for Executive Action

We are making the following three recommendations to PHMSA:

- The Administrator of PHMSA should, as PHMSA considers possible changes to the potential impact radius calculation, evaluate what additional data are needed from operators to better understand the actual impact of pipeline incidents. (Recommendation 1)
- The Administrator of PHMSA should develop an implementation plan for the remaining activities for the 2022 final rule that includes clear objectives, timelines, and an outreach strategy. (Recommendation 2)
- The Administrator of PHMSA should update the 2019 and 2022 Gas Transmission Final Rule Implementation web pages to increase accessibility to rule implementation information. (Recommendation 3)

## Agency Comments

We provided a draft of this report to the Department of Transportation for review and comment. In its comments, reproduced in appendix I, the agency concurred with our recommendations. The Department of Transportation also provided technical comments, which we incorporated as appropriate.

## How GAO Did This Study

To examine the methods operators use to identify their HCAs and assess the extent to which PHMSA is planning any changes to the methods, we reviewed PHMSA's regulations governing these methods and interviewed PHMSA officials. We analyzed PHMSA's gas transmission pipeline incident data from 2010 through 2022, which includes data on the actual impact and characteristics of pipeline incidents. In addition, we analyzed PHMSA's 2022 gas transmission pipeline annual report data submitted in 2023, including data on HCA mileage and the methods operators used to identify their HCAs.

We assessed data reliability using several methods, including reviewing related documentation, interviewing officials, and conducting several data checks. During our analysis, we found that nearly 40 percent of operator reports submitted inconsistent annual report data when reporting HCA mileage by method.<sup>25</sup> To account for this limitation, we acknowledged these inconsistencies and only reported complete data. PHMSA officials told us they planned to correct this error in their system before operators began submitting 2023 pipeline data. Outside of this limitation, we found both datasets to be sufficiently reliable for the purposes of our report.

To identify key regulatory changes that stakeholders believe will impact gas transmission pipeline safety, we collected a range of perspectives by interviewing a non-generalizable sample of four industry associations, three pipeline safety stakeholders, five state pipeline safety agencies, and 10 gas transmission pipeline operators identified through PHMSA's 2022 annual report data.<sup>26</sup> For the state agencies, we selected one state from each PHMSA geographic region—Central, Eastern, Southern, Southwestern, and Western. We selected states that had a significant amount of transmission pipeline mileage, along with variation in (1) whether the state assumed jurisdiction over the intrastate or interstate pipelines within its borders, and (2) the number of gas transmission pipeline incidents in the state from January 2018 through May 2023. In each selected state, we interviewed officials from the designated gas pipeline safety agency and two pipeline operators that were randomly selected to allow for variation in the amount of HCA pipeline mileage they reported to PHMSA, whether the operator had multiple pipeline commodities, and whether they operated intra- or interstate pipelines.<sup>27</sup> One of the operators provided written responses in lieu of an interview.

To examine PHMSA's recent regulatory changes to gas transmission pipeline safety and assess the extent to which PHMSA is overseeing the implementation of the 2019 and 2022 rules, we reviewed relevant statutes, regulations, and PHMSA rulemakings and documents. These documents included the 2019 and 2022 final gas transmission pipeline safety rules, PHMSA's guidance documents related to the rules and rule implementation, and PHMSA's annual report and incident forms. We also reviewed PHMSA documentation on the agency's implementation activities related to the final rules and interviewed agency officials and officials from the five PHMSA regional offices about these activities. We compared PHMSA's activities to criteria identified in *Standards for Internal Controls in the Federal Government*.<sup>28</sup>

We conducted this performance audit from March 2023 to April 2024 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

### List of Addressees

The Honorable Maria Cantwell  
Chair

The Honorable Ted Cruz  
Ranking Member  
Committee on Commerce, Science, and Transportation  
United States Senate

The Honorable Cathy McMorris Rodgers  
Chair



The Honorable Frank Pallone, Jr.  
Ranking Member  
Committee on Energy and Commerce  
House of Representatives

The Honorable Sam Graves  
Chairman  
The Honorable Rick Larsen  
Ranking Member  
Committee on Transportation and Infrastructure  
House of Representatives

We are sending copies of this report to the appropriate congressional committees, the Secretary of Transportation, and other interested parties. In addition, the report is available at no charge on the GAO web site at <https://www.gao.gov>.

### **GAO Contact Information**

For more information, contact: Elizabeth Repko, Director, Physical Infrastructure, [RepkoE@gao.gov](mailto:RepkoE@gao.gov), (202) 512-2834.

Chuck Young, Managing Director, Public Affairs, [YoungC1@gao.gov](mailto:YoungC1@gao.gov), (202) 512-4800.

A. Nicole Clowers, Managing Director, Congressional Relations, [ClowersA@gao.gov](mailto:ClowersA@gao.gov), (202) 512-4400.

**Staff Acknowledgments:** Sara Vermillion (Assistant Director), Melissa Greenaway (Analyst-in-Charge), Madeline Barch, Joshua Ormond, Mary Catherine P. Overcash, Kristin Petroff, Jack Wang, and Amelia Michelle Weathers.

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## Appendix I: Comments from Department of Transportation



U.S. Department of  
Transportation  
Office of the Secretary  
of Transportation

Assistant Secretary  
for Administration

1200 New Jersey Avenue, SE  
Washington, DC 20590

March 18, 2024

Ms. Elizabeth Repko  
Director, Physical Infrastructure  
U.S. Government Accountability Office  
441 G Street NW  
Washington, DC 20548

Dear Ms. Repko:

The mission of the Pipeline and Hazardous Materials Safety Administration (PHMSA) is to protect people and the environment by advancing the safe transportation of energy and other hazardous materials that are essential to our daily lives. To do this, the agency establishes national policy, sets and enforces standards, educates, and conducts research to prevent incidents. As a part of its mission, PHMSA has responsibility for ensuring the safety of the nation's pipeline system in partnership with other state and Federal agencies and pipeline owners and operators. PHMSA will resolve any outstanding issues on the implementation plan for the 2022 final rule "Pipeline Safety: Safety of Gas Transmission Pipelines: Repair Criteria, Integrity Management Improvements, Cathodic Protection, Management of Change, and Other Related Amendments" once litigation concerning the final rule is resolved. In addition, PHMSA is evaluating available information regarding modification of existing regulations for calculating potential impact radius and continues to update our webpages to improve accessibility.

Upon review of the draft report, PHMSA concurs with the Government Accountability Office's (GAO's) recommendation to evaluate what additional data is needed from operators to better understand the actual impact of pipeline incidents as PHMSA considers updating the potential impact radius calculation, and the recommendation to update the 2019 and 2022 Gas Transmission Final Rule Implementation webpages to increase accessibility to rule implementation information. PHMSA also concurs with the recommendation to develop an implementation plan for the remaining activities for the 2022 final rule that includes clear objectives, timelines, and an outreach strategy. PHMSA appreciates the opportunity to respond to the GAO draft report and will provide a detailed response to each recommendation within 180 days of the final report's issuance.

Please contact Gary Middleton, Director of Audit Relations and Program Improvement at (202) 366-6512 or [gary.middleton@dot.gov](mailto:gary.middleton@dot.gov) with any questions or if GAO would like additional information.

Sincerely,

Philip McNamara  
Assistant Secretary for Administration

## Accessible Text for Appendix I: Comments from Department of Transportation

March 18, 2024

Ms. Elizabeth Repko  
Director, Physical Infrastructure  
U.S. Government Accountability Office  
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Washington, DC 20548

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Sincerely,

Philip McNamara  
Assistant Secretary for Administration

## Endnotes

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<sup>1</sup>Pub. L. No.114-183, § 4, 130 Stat. 514, 517 (2016).

<sup>2</sup>According to PHMSA data, gas pipelines in the United States primarily transport natural gas. However, other commodities such as hydrogen may also be transported via pipelines.

<sup>3</sup>The Pipeline Safety Laws, 49 U.S.C. § 60101 et seq., define interstate gas transmission pipelines to also be subject to the Federal Energy Regulatory Commission's (FERC) jurisdiction under the Natural Gas Act, 15 U.S.C. § 717 et seq., and intrastate gas transmission pipelines to also not be subject to FERC's jurisdiction under such act. See 49 U.S.C. § 60101(a)(6), (9).

<sup>4</sup>PHMSA's general authority is under the Pipeline Safety Laws. Its minimum safety standards for gas pipelines are located in 49 C.F.R. Part 192.

<sup>5</sup>PHMSA's reporting requirements for gas pipeline operators are located in 49 C.F.R. Part 191. These regulations require gas transmission pipeline operators to file annual reports that include information on pipeline characteristics such as location, age, and material, and submit reports on incidents. PHMSA's regulations define an incident to include any event involving a release of gas that (1) results in a fatality or injury requiring in-patient hospitalization; (2) results in estimated property damage that meets or exceeds a certain threshold; (3) results in an unintentional estimated gas loss that meets or exceeds a certain threshold; or (4) is significant in the judgment of the operator, even though the event did not meet the specific criteria under PHMSA's regulatory definition of an incident.

<sup>6</sup>If a federal minimum standard is issued within a certain time frame before a state submits its certification, the state must certify that it is taking steps to adopt that standard into its laws. States

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holding certifications may also adopt additional or more stringent requirements for these intrastate pipelines, so long as they are compatible with federal requirements. See 49 U.S.C. §§ 60104(c), 60105.

<sup>7</sup>As of 2022, the eight states authorized to act as interstate agents are Arizona, Connecticut, Iowa, Michigan, Minnesota, New York, Ohio, and Washington.

<sup>8</sup>PHMSA's integrity management program regulations, issued in 2003, are located in Subpart O of 49 C.F.R. Part 192. See *Pipeline Safety: Pipeline Integrity Management in High Consequence Areas (Gas Transmission Pipelines)*, 68 Fed. Reg. 69778 (Dec. 15, 2003).

<sup>9</sup>The definition of an HCA is located in 49 C.F.R. § 192.903.

<sup>10</sup>*Pipeline Safety: Safety of Gas Transmission Pipelines: MAOP Reconfirmation, Expansion of Assessment Requirements, and Other Related Amendments*, 84 Fed. Reg. 52180 (Oct. 1, 2019); and *Pipeline Safety: Safety of Gas Transmission Pipelines: Repair Criteria, Integrity Management Improvements, Cathodic Protection, Management of Change, and Other Related Amendments*, 87 Fed. Reg. 52224 (Aug. 24, 2022).

<sup>11</sup>Exercising its enforcement discretion, PHMSA issued three notices regarding certain onshore gas transmission pipeline operators' compliance with most provisions of the 2022 final rule. See *Notice of Limited Enforcement Discretion for Existing Onshore Gas Transmission Pipelines* (Dec. 6, 2022); *Notice of Limited Enforcement Discretion for New and Replaced Onshore Gas Transmission Pipelines* (April 17, 2023); *Notice of Limited Enforcement Discretion for Certain Onshore Gas Transmission Pipelines Conducting Remedial Actions Under 49 CFR 192.473(c)(4)* (Apr. 20, 2023). According to PHMSA, providing additional time can help facilitate more careful and comprehensive operator implementation efforts, and in some instances, for PHMSA to address preliminary implementation questions.

<sup>12</sup>Under PHMSA's regulations governing the designation of HCAs using the PIR method, an HCA is an area within a potential impact circle containing either: (1) 20 or more buildings intended for human occupancy; or (2) an identified site. An identified site is: (1) an outside area or open structure that is occupied by 20 or more persons at a specific minimum time frequency; (2) a building that is occupied by 20 or more persons at a specific minimum time frequency; or (3) a facility occupied by persons who are confined or of impaired mobility or would be difficult to evacuate.

<sup>13</sup>*Pipeline Safety: Class Location Change Requirements*, 85 Fed. Reg. 65142 (Oct. 14, 2020).

<sup>14</sup>GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: Sept. 10, 2014).

<sup>15</sup>Some of these key changes apply to gas transmission pipelines subject to integrity management program requirements, while most affect gas transmission pipelines not subject to these requirements, such as those located in MCAs.

<sup>16</sup>We conducted semi-structured interviews with stakeholders, and not all interviewees discussed certain topics. In our analysis of interview responses, we analyzed the number of interviewees that made a given statement; as such, interviewees who did not comment on a particular topic did not necessarily disagree.

<sup>17</sup>Specifically, the 2019 final rule requires integrity assessments of gas transmission pipelines that operate at a certain pressure and: (1) are located in an MCA and able to accommodate inspection using a certain tool; or (2) located in a Class 3 or 4 location.

<sup>18</sup>PHMSA issues FAQs to assist pipeline owners and operators in complying with regulatory changes.

<sup>19</sup>PHMSA's Office of Pipeline Safety issued an updated version of the Rule Implementation Guide in February 2024.

<sup>20</sup>[GAO-14-704G](#).

<sup>21</sup>These challenges included joint petitions for reconsideration of certain provisions of the 2022 final rule. See, e.g., *Petition for Reconsideration of the Interstate Natural Gas Association of America and the American Petroleum Institute*, Doc. No. PHMSA-2011-0023-0644 (received by PHMSA on Oct. 20, 2022). PHMSA and the petitioners met over several months to try to resolve the issues raised in these petitions, according to both PHMSA officials and industry association representatives.

<sup>22</sup>In July 2023, the Interstate Natural Gas Association of America (INGAA) filed a lawsuit challenging parts of the final rule. See *Petition for Review, INGAA v. PHMSA*, Docket No. 23-1173 (D.C. Cir.) (filed on June 10, 2023). According to PHMSA officials, INGAA made clear the specific provisions that it was disputing in its brief filed on December 5, 2023, and as a result, the agency issued the FAQs only on the undisputed provisions of the 2022 final rule. PHMSA officials told us

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that they did not want to issue guidance on the disputed provisions of the rule, as it might need to be amended or retracted depending on the outcome of the litigation.

<sup>23</sup>According to PHMSA, several factors impact the development and publication of FAQs, including the complexity of the regulation, any ongoing litigation challenging the final rule, public comments on the final rule or questions from operators, and compliance issues that are identified during state and federal inspections.

<sup>24</sup>[GAO-14-704G](#).

<sup>25</sup>PHMSA considers data in this field to be consistent if (1) operators with over 50 HCA miles report mileage by HCA method within 0.2 percent of total HCA mileage; or (2) operators with less than 50 HCA miles report mileage by HCA method within 0.1 miles of total HCA mileage.

<sup>26</sup>The industry associations we interviewed were the American Gas Association, American Public Gas Association, Interstate Natural Gas Association of America, and National Association of Pipeline Safety Representatives. The pipeline safety stakeholders we interviewed were the National Transportation Safety Board, Pipeline Safety Trust, and a pipeline safety consultant.

<sup>27</sup>The 10 pipeline operators we interviewed were DTE Gas Company, Energy Transfer Company, Empire Pipeline, Enmark Energy, Gulf South Pipeline Company/Boardwalk Pipelines, Michigan Gas Utilities, North Baja Pipeline/TC Energy, Seadrift Pipeline Corp/Dow Pipeline Company, Southern California Gas Company, and Valley Energy. The state pipeline agencies selected for an interview were the California Public Utilities Commission, Michigan Public Service Commission, Mississippi Public Service Commission, Pennsylvania Public Utility Commission, and the Railroad Commission of Texas.

<sup>28</sup>[GAO-14-704G](#).