2025 Risk Assessment Mitigation Phase

(Chapter SDG&E-Risk-3)

Medium Pressure Gas System

May 15, 2025

TABLE OF CONTENTS

I. INTRODUCTION

The purpose of this chapter is to present San Diego Gas & Electric Company's (SDG&E or Company) risk control and mitigation plan for the Medium Pressure Gas System (MP System Risk). This chapter contains information and analysis for this risk that meet the requirements of the California Public Utilities Commission's (Commission or CPUC) Risk-Based Decision-Making Framework (RDF),[1] including the requirements adopted in Decision (D.) 22-12-027 (the Phase 2 Decision)[2] and D.24-05-064 (Phase 3 Decision).[3] MP System Risk is included in the 2025 RAMP Report based on a safety risk assessment, further informed by its reliability and financial consequence attributes, consistent with RDF guidance. This risk chapter describes the basis for selection of MP System Risk, the controls and/or mitigations put forth to reduce the likelihood or consequence of this risk, a discussion of alternative mitigations considered but not selected, and a graphic to show historical progress. This chapter presents cost and unit forecasts for the risk mitigating activities, but it does not request funding. Any funding requests for this risk will be made through the Company's Test Year (TY) 2028 General Rate Case (GRC) application. Finally, this chapter describes the methods applied to estimate the risk's monetized, pre-mitigated risk, the estimated risk-reduction benefits of each included control and mitigation, and the calculation of Cost-Benefit Ratios (CBRs) for each control and mitigation consistent with the method and process prescribed in the RDF.

A. Risk Definition and Overview

1. Risk Definition

For the purposes of this RAMP Report, SDG&E's MP System Risk is defined as "the risk of failure of a medium pressure pipeline (including appurtenances to and at the meter) which results in serious injuries, fatalities, and/or damages to the infrastructure."

---

1 As discussed in Volume 1, Chapter RAMP-1, the RDF Framework broadly refers to the recent modifications to the Commission's Rate Case Plan adopted in Rulemaking (R.) 13-11-006, Safety Model Assessment Proceeding A.15-05-002 et al. (cons.), and R.20-07-013 (the Risk OIR), including D.24-05-064, Appendix A.

2 D.22-12-027 is the "Phase II Decision Adopting Modifications to the Risk-Based Decision-Making Framework Adopted in Decision 18-12-014 and Directing Environmental and Social Justice Pilots" (December 21, 2022).

3 D.24-05-064 is the "Phase III Decision" (June 6, 2024).

Medium pressure gas systems consist of an interconnected network of mains that feed service lines. The system includes regulator stations, meters, and other appurtenances (such as couplings, joints, risers that connect service lines to meters, and meter set assemblies). Main lines are defined by PHMSA as distribution lines that serve as a common source of supply for more than one service line.[4] Service lines are typically smaller diameter pipes which feed customer homes, businesses, some industrial, and commercial applications and end at the customer meter or at the connection to a customer's piping, whichever is further downstream, or at the connection to customer piping if there is no meter.[5] Medium pressure pipelines are made of steel or plastic material.

SDG&E currently operates approximately 15,100 miles of medium pressure mains and services with approximately 5,900 miles being steel and 9,200 miles being plastic. The medium-pressure pipelines serve over 920,000 SDG&E consumers. For safety and compliance, Title 49 of the Code of Federal Regulations (CFR) Part 192, General Order (GO) 58, and GO 112-F are the leading sources of requirements for SDG&E's gas distribution system pipelines (among other legal and regulatory provisions). Title 49 CFR Part 192 prescribes safety requirements for pipeline facilities and the transportation of gas at the federal level and is enforced by both the U.S. Department of Transportation's (DOT) Pipeline and Hazardous Material Safety Administration (PHMSA) and the CPUC. GO 112-F and GO 58 complement and enhance the requirements of 49 CFR 192 at the state level and are enforced by the CPUC.

Certain controls and mitigations presented in this chapter are subject to compliance mandates beyond RDF reporting requirements, such as those from the CPUC's GO 112-F and PHMSA including but not limited to subparts of Rule 49 CFR. A list of compliance requirements applicable to MP System Risk in Attachment A. Certain mitigation programs have value beyond the estimated risk reduction calculated under the RDF, such as enhancing operations and/or preparing for future capacity needs (such as driven by electrification or climate impacts).

---

4 9 C.F.R. § 192.3.

5 *Id.*

B. Risk Scope

SDG&E's MP System Risk analysis considers the risk of failure of a medium pressure pipeline (including appurtenances to and at the meter) which results in serious injuries, fatalities, and/or damages to the infrastructure.

SDG&E notes that when the loss of gas cannot be resolved by lubing, tightening, or adjusting, it is defined as a "leak." A leak in and of itself may cause little-to-no risk of serious injury or fatality. Risk to the public and employees can increase when leaks are in close proximity to an ignition source and/or where there is a potential for gas to migrate and accumulate in a confined space. The safety concern of the leak is addressed by SDG&E's leak indication prioritization and repair schedule procedures. In most cases, where leaks are non-hazardous, a pipe with a leak will continue to transport natural gas and therefore is not considered a pipeline "failure" using the definition in American Society of Mechanical Engineering B31.8S.[6] However, SDG&E actively monitors and prioritizes such leaks in accordance with 49 CFR 192.723, which requires leakage surveys to be conducted at least once annually in business districts and at least once every five years outside of business districts.

C. Data Sources Used to Quantify Risk Estimates[7]

SDG&E utilized internal data sources to determine MP System Pre-Mitigation Risk Value and calculate risk reduction estimates for mitigation activities (which enables estimation of Post Mitigation Monetized Risk Values and Cost Benefit Ratios). Where internal data is deemed insufficient, supplemental industry or national data is used, as appropriate and adjusted to account for the risk characteristics associated with the Company's specific operating locations and service territory. For example, certain types of incident events have not occurred within the SoCalGas and SDG&E service territories. Expanding the quantitative data sources include industry data where such incidents have been recorded is appropriate to establish a baseline of

---

[6] American Society of Mechanical Engineering standard B31.8S: Managing System Integrity of Gas Pipelines. AMSE B31.8S is specifically designed to provide the operator with the information necessary to develop and implement an effective integrity management program utilizing proven industry practices and processes. Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding.

[7] Copies and/or links to these data resources are provided in the workpapers served with this Report on May 15, 2025.

risk and risk addressed by mitigative activities. Attachment B provides additional information regarding these data resources.

II. RISK ASSESSMENT

In accordance with Commission guidance, this section provides a qualitative description of MP System Risk, including a risk Bow Tie, which delineates potential Drivers/Triggers and potential Consequences, followed by a description of the Tranches determined for this risk and the risk's Pre-Mitigated Risk Value.

A. Risk Selection

The MP System Risk was included as a risk in SDG&E's 2021 RAMP and was included in the 2022, 2023 and 2024 Enterprise Risk Registries SDG&E's (ERR)[8]. SDG&E's ERR evaluation and selection process is summarized in Chapter RAMP-2: Enterprise Risk Management Framework.

SDG&E selected this risk in accordance with RDF Row 9.[9] Specifically, SDG&E assessed top risks from the Company's 2024 Enterprise Risk Registry based on the Consequence of a Risk Event (CoRE) Safety attribute. The MP System Risk was among the risks presented in SDG&E's list of Preliminary 2025 RAMP Risks at the December 17, 2024 Pre-Filing Workshop. MP System Risk was selected based on the qualification of its Safety risk attribute, as required under the RDF. At the pre-filing workshop, no party expressed opposition to inclusion of this risk in SDG&E's 2025 RAMP Report.

B. Risk Bow Tie

In accordance with Commission requirements, this section describes the risk Bow Tie, possible Drivers, potential Consequences, and a mapping of the elements in the Bow Tie to the mitigation(s) that addresses it.[10] As illustrated in the risk Bow Tie shown below in Figure 1, the Risk Event (center of the Bow Tie) is a MP System failure that could leads to gas release that may cause fatalities and injuries to employees and/or the public, the left side of the Bow Tie illustrates Drivers/Triggers that could lead to the MP System failure, and the right side shows the

---

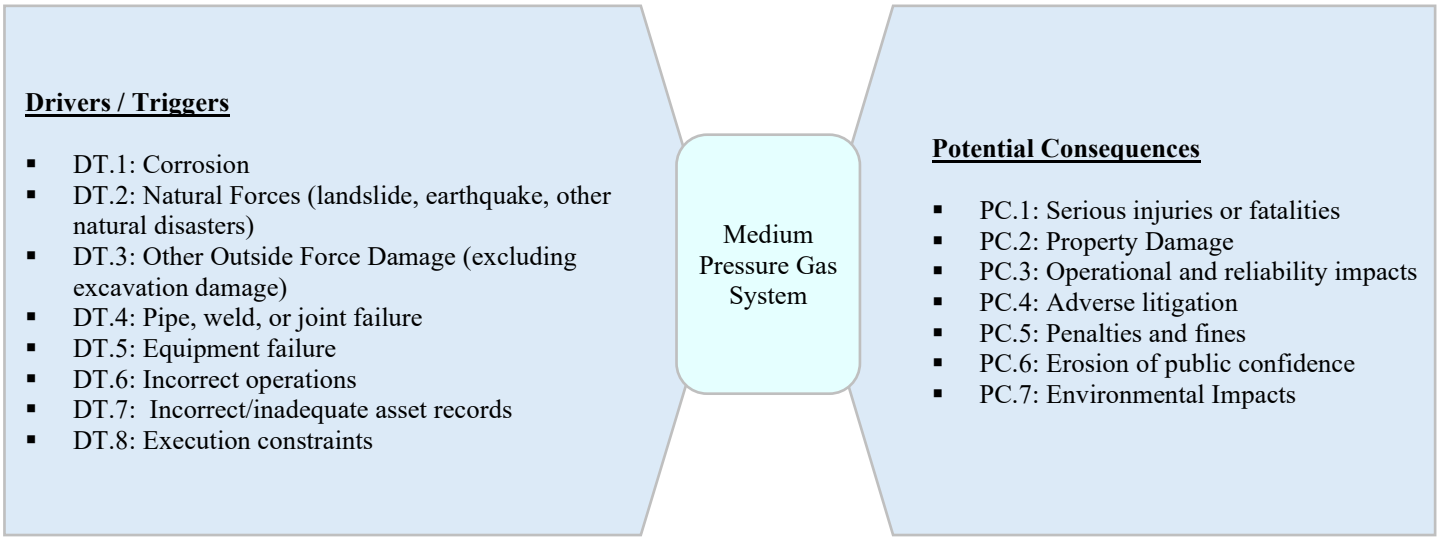
[8] In the 2021 RAMP Report this risk was called Incident Related to the Medium Pressure System (Excluding Dig-In). The risk definition and elements are unchanged.

[9] RDF Row 9 states that risks to be included in the RAMP Report, at minimum, are those identified in the Company's ERR comprising "the top 40% of ERR risks with a Safety Risk Value greater than zero dollars."

[10] D.24-05-064, RDF Row 15.

potential consequences of the MP System failure. SDG&E applies this framework to identify and summarize the information provided in Figure 1. A mapping of each mitigation to the element(s) of the risk Bow Tie is provided in Attachment C.

Figure 1
Medium Pressure Gas System: Risk Bow Tie



C. Potential Risk Event Drivers/Triggers[11]

When performing a risk assessment for the MP System Risk, SDG&E identifies potential leading indicators, referred to as Drivers or Triggers, that reflect current and/or forecasted conditions and may include both external actions as well as characteristics inherent to the asset.[12] These Bow Tie Drivers/Triggers inform the Likelihood of a Risk Event (LoRE) component of the risk value. These include:

- **DT.1 – Corrosion**: This Driver includes external corrosion, which is a naturally occurring phenomenon commonly defined as the deterioration of a material (usually a metal) that results from a chemical or electrochemical reaction with its environment. This Driver also includes internal corrosion which is the deterioration of the interior of an asset as a result of the environmental conditions

[11] An indication that a risk could occur. It does not reflect actual or threatened conditions.

[12] D.24-05-064, RDF Row 10-11.

on the inside of the pipeline.[13] In pipelines, corrosion can occur internally and/or externally, both potentially resulting in a pipeline incident; therefore, both internal and external corrosion will be referred to as "corrosion" in the remainder of this chapter, unless otherwise indicated.

- **DT.2 – Natural Forces (landslide, earthquake, other natural disasters)**: This Driver includes forces attributable to causes not involving humans, but includes effects of climate change such as earth movement, earthquakes, landslides, subsidence, heavy rains/floods, lightning, temperature, thermal stress, frozen components, wildfires, and high winds.
- **DT.3 – Other Outside Force Damage (excluding excavation damage)**: This Driver includes forces attributable to outside damage other than excavation damage or natural forces, such as damage by car, truck, or motorized equipment not engaged in excavation.
- **DT.4 – Pipe, weld, or joint failure**: This Driver includes materials defect within the pipe, component or joint due to faulty manufacturing procedures, design defects, improper construction or fabrication, or in-service stresses such as vibration, fatigue, and environmental cracking.
- **DT.5 – Equipment failure**: This Driver is similar to DT.4, but unrelated to pipe (main and services). These failures are attributable to the malfunction of a component including, but not limited to, regulators, filters, valves, meters, flanges, gaskets, collars, and couplings. This Driver is specific to the material properties related to the manufacturing process or post installation of the equipment.
- **DT.6 – Incorrect operations**: This Driver includes a pipeline incident attributed to insufficient or incorrect operating procedures or the failure to follow a procedure.
- **DT.7 – Incorrect/inadequate asset records**: This Driver includes forces attributable the use of inaccurate or incomplete information that could result in the

[13] ASME B31.8S, "Managing System Integrity of Gas Pipelines."

failure to: (1) construct, operate, and maintain SDG&E's pipeline system safely and prudently; or (2) to satisfy regulatory compliance requirements.

- **DT.8 – Execution constraints**: This Driver includes constraints including third-party vendor issues, Quality Assurance/Quality Control issues related to materials and operational oversight, resource constraints (e.g., workforce, material), re-allocation or unexpected maintenance or regulatory requirements, or the inability to complete projects initiatives or meet operational compliance.

D. Potential Consequences of Risk Event (CoRE)

Potential Consequences are listed to the right side of the risk Bow Tie. SDG&E identifies the Potential Consequences of this Risk by analyzing internal data sources where available, industry data, and subject matter expertise (SME).[14] These Bow Tie Consequences inform the CoRE component of the risk value. If one or more of the drivers listed above were to result in an incident, the Potential Consequences, in a plausible reasonable worst-case scenario, could include:

- **PC.1: Serious injuries or fatalities**
- **PC.2: Property Damage**
- **PC.3: Operational and reliability impacts**
- **PC.4: Adverse litigation**
- **PC.5: Penalties and fines**
- **PC.6: Erosion of public confidence**
- **PC.7: Environmental Impacts**

These potential consequences were used by SDG&E in the scoring of the MP System Risk during the development of SDG&E's 2024 ERR.

E. Evolution of Its Drivers and Consequences

As specified in the Phase 3 Decision,[15] the following changes to the previous ERR and/or the 2021 RAMP include:

[14] D.24-05-064, RDF Row 10.

[15] D.24-05-064, RDF Row 8.

- The title of *Medium Pressure Gas System* was changed from *Incident Related to the Medium Pressure System (Excluding Dig-In)* to align SoCalGas's Medium Pressure Gas RAMP risk title.
- The scope of *Medium Pressure Gas System* has been narrowed. In the 2021 RAMP, *Incident Related to the Gas Distribution System (Excluding Dig-In)* and was a combination of two separate risks: (a) Incident Related to the Gas Distribution System (Excluding Dig-In), and (b) Customer and Public Safety – After Meter Gas Incident. *Customer and Public Safety – After Meter Gas Incident* is a standalone risk in the 2024 ERR, which is not included in the 2025 RAMP.

1. Changes to Drivers/ Triggers of the Risk Bow Tie

- None

2. Changes to Potential Consequences of the Risk Bow Tie

The following change from the 2021 RAMP was made:

- PC.7 – Added "Environmental Impacts"

F. Summary of Tranches

To determine groups of assets or systems with similar risk profiles, or Tranches, and in accordance with Row 14 of the RDF, SDG&E applied the Homogeneous Tranching Methodology (HTM) as outlined in Volume 1, Chapter RAMP - 3: Risk Quantification Framework. As a result, the following classes, LoRE-CoRE pairs, and resulting number of Tranches were determined:

Table 1: Medium Pressure Gas System Risk Tranche Identification

Class	Number of LoRE-CoRE Pairs	Number of Resulting Tranches
Above Ground	60	14
Below Ground	570	33
TOTAL	**630**	**47**

Attachment D illustrates the derivation of the Tranches, as shown in Table 1 above, in accordance with the HTM. The classes were identified by SDG&E as logical groups of assets and systems based on the Company's operations. These classes also align risk treatments with asset risk profiles reflective of SDG&E's operations. More detailed Tranche information,

including risk quantification by LoRE-CoRE pair, Tranche names, and mitigation associations (*i.e.*, cost mapping and risk reduction) to Tranches, are provided in workpapers.

III. PRE-MITIGATION RISK VALUE

In accordance with the RDF Row 19, the table below provides the pre-mitigation risk values for the MP System Risk. Further details, including pre-mitigation risk values by tranche, are provided workpapers. Explanations of the risk quantification methodology and other higher-level assumptions are provided in Chapter RAMP-3: Risk Quantification Framework.

Table 2: Medium Pressure Gas System Risk
Monetized Risk Values
(Direct, in 2024 $ millions)

LoRE	CoRE [Risk-Adjusted Attribute Values]			Total CoRE	Total Risk [LoRE x Total CoRE]
	Safety	Reliability	Financial		
4,932.73	<0.000	<0.000	0.001	0.002	$8.97

A. Risk Value Methodology

SDG&E's risk modeling for the MP System Risk follows RDF guidance[16] for implementing a Cost Benefit Approach, as described below:

1. **Cost Benefit Approach Principle 1 – Attribute Hierarchy (RDF Row 2):** MP System Risk is quantified in a combined attribute hierarchy as shown in the table above, such that Safety, Reliability, and Financial are presented based one available, observable and measurable data.
2. **Cost Benefit Approach Principle 2 – Measured Observations (RDF Row 3):** MP System Risk used observable and measurable data in the estimation of CoRE values. SDG&E utilized a combination of internal and external data to estimate consequences in terms of natural units, (e.g. fatalities, serious injuries, and meters out) that occur as the result of a risk event on the MP System.
3. **Cost Benefit Approach Principle 3-Comparison (Row 4):** The MP System Risk quantification did not include any attributes that are not directly measurable, so proxy data, as described in the RDF, was not necessary.

[16] D.24-05-064, RDF Rows 2-7.

4. **Cost Benefit Approach Principle 4-Risk Assessment (RDF Row 5):** The data sources used for MP System Risk – as described in the preceding paragraphs – were sufficient to model probability distributions for use in estimating risk values.
5. **Cost Benefit Approach Principle 5-Monetized Levels of Attributes (RDF Row 6):** In accordance with D.22-12-027 and D.24-05-064, RDF Row 6, SoCalGas and SDG&E used a California-adjusted Department of Transportation monetized equivalent to calculate the Safety CoRE attribute at a monetized equivalent of $16.2 million per fatality, and $4.1 million per serious injury; the Gas Reliability CoRE attribute is valued at a monetized equivalent of $3,868 per gas meter outage; and the Financial CoRE attribute is valued at $1 per dollar.[17] Further information regarding SDG&E's quantitative risk analyses, including raw data, calculations, and technical references, are provided in workpapers.
6. **Cost Benefit Approach Principle 6-Adjusted Attribute Level (RDF Row 7):**

Table 3: Medium Pressure Gas System
Risk Scaled vs Unscaled Value by CoRE Attribute
(Direct, in 2024 $ millions)

	Safety	Reliability	Financial	Total
Unscaled Risk Value	$0.79	$0.56	$7.32	$8.67
Scaled Risk Value	$1.01	$0.56	$7.40	$8.97

The values in the table above are the result of SDG&E applying the risk scaling methodology described in Chapter RAMP-3 to the CoRE attributes for the MP System Risk. The MP System Risk does not feature a significant risk aversion scaling impact because a relatively small proportion of the observed events rise to the level at which scaling is applicable, and the magnitudes of the consequences are not as high (e.g., multiple-fatality event) as can occur with other risks, such as High Pressure.

For further information regarding the risk scaling function, including the risk scaling factor and the loss threshold at which the risk scaling factor begins to apply, is provided in Chapter-RAMP-3.

[17] *See* Chapter RAMP-3: Risk Quantification Framework, Section II.

IV. 2024-2031 CONTROL & MITIGATION PLAN

This section identifies and describes the controls and mitigations comprising the portfolio of mitigations for MP System Risk and reflects changes to the portfolio expected to occur from the last year of recorded costs at the time of filing this RAMP Report (2024) through the 2028 GRC cycle (2031). For clarity, a current activity that is included in the plan may be referred to as either a control and/or a mitigation. Table 4 below shows which control activities are in place in 202 and which are expected to be on-going, completed, or new during the 2025-2031 time periods. Because the TY 2024 GRC proceeding established rates through 2027,[18] information through 2027 is calculated as part of the baseline risk, in accordance with D.21-11-009.[19] For the TY 2028 GRC, SDG&E calculated CBRs beginning with TY 2028 and for each Post-Test Year (2029, 2030, and 2031).[20]

Table 4: Medium Pressure Gas System Risk
2024-2031 Control and Mitigation Plan Summary

ID	Control/Mitigation Description	2024 Control	2025-2031 Plan
C005	Gas Distribution Emergency Department	X	Ongoing
C007	Underperforming Mains and Services	X	Ongoing
C101	Cathodic Protection Program – O&M	X	Ongoing
C107	Cathodic Protection Program – Capital	X	Ongoing
C115	Regulator Station, Valve, Large Meter Set Inspections	X	Ongoing
C124	Regulator Station Installation, Replacement, and Enhancement	X	Ongoing
C131	Leak Repair (O&M/Capital)	X	Ongoing
C134	Pipeline Monitoring	X	Ongoing
C139	Gas Distribution Safety Relocations	X	Ongoing
C144	Human Factors Mitigation – QA/QC Program – Mandated Compliance Activities	X	Ongoing
C150	Code Compliance Mitigation	X	Ongoing

[18] *See* D.24-12-074.

[19] D.21-11-009 at 136 (Conclusion of Law (COL) 7) (providing a definition for "baselines" and "baseline risk").

[20] In the TY 2028 GRC, the last year of recorded costs, or base year, will be 2025. SoCalGas and SDG&E will forecast information for 2026 through 2031, in accordance with the Rate Case Plan.

C169	Human Factors Mitigations – OpQual Training	X	Ongoing
C175	Residential Meter Protection	X	Ongoing
C182	Distribution Risk Evaluation & Monitoring System (DREAMS)	X	Ongoing

A. Control Programs

In accordance with Commission guidance, this section "[d]escribe[s] the controls or mitigations currently in place,"[21] (*i.e.*, activities in this section were in place as of December 31, 2024). Controls that will continue as part of the risk mitigation plan are identified in Table 4 above.

- **C005: Gas Emergency Department**

  When SDG&E is notified of a gas emergency it is critical to respond immediately and take measures to control escaping gas to help mitigate the risk to public safety. To improve gas emergency response time SDG&E established the Gas Distribution Emergency Department (GED), which is an organization consisting of two person crews dedicated to responding to gas emergencies. The GED operates 24/7 in overlapping shifts to provide ample coverage during peak periods of gas emergencies and rapid response regardless of the time or day, which allows them to control escaping gas quickly. These dedicated "specialist" crews responding to gas emergencies reduce the risk of injuries and property damage to both the public and those responding to the incident.

- **C007 Underperforming Mains and Services**

  SDG&E's Underperforming Mains and Services program for pipelines and components encompasses and addresses the following elements, including but not limited to: threaded steel pipe, pipe wrap disbondment cathodic protection performance and components to include oil drip piping removal, Dresser mechanical coupling removal, removal of closed valves between high/medium pressure zones, and removal of pipe in vaults. The evaluation process for identifying underperforming pipelines requiring replacement is based on a risk-

[21] D.18-12-014 at 33.

ranking system. This system considers the following, among other factors: leakage history, pipe age, pipe operating pressure, cathodic protection history and performance, discontinued installation practices, known defects, pipe location relative to population density, among others. Planned pipeline replacements processed under this methodology will culminate in a prioritized list of recommended pipeline replacements. Pipeline replacements will be subsequently planned, with an emphasis on removing pipes with a history of recurring leaks, thereby reducing the highest risk to public safety from pipeline leakage. Although considered best practice at the time, some of the vintage materials and construction practices are known to be more prone to leakage today and are prioritized for replacement. Some of these conditions are described below:

- Prior to 1934, a certain piping in the gas distribution system was joined using threaded couplings. Such threaded pipe exhibits increased susceptibility to leaks at joint connections and a heightened potential for joint failure during seismic events, due to wall thickness reduction caused by thread cutting.
- Steel pipes installed prior to 1955 utilized coal tar asphaltic pipe wrap as the initial layer of corrosion protection. Over time, this early-generation pipe wrap degrades and disbonds from the pipe, resulting in cathodic protection current leaving the pipe around the disbonded coating, thus failing to provide adequate corrosion protection. This lack of protection ultimately leads to increased corrosion and leakage.
- Pipeline oil drip facilities are at risk of excavation damage, as their location and configuration were historically not captured with sufficient detail to identify them precisely on facility maps, leading to potential strikes during nearby work activities.
- Dresser mechanical couplings are susceptible to lateral movement, and over time, the rubber pressure-containing seal degrades. These couplings require lateral support and are not as robust as modern mechanical couplings with rubber mechanical seals. In the event of land movement, pipe separation or rupture may occur, resulting in an incident.

- Block valves between high and medium pressure systems pose an inherent risk if operated erroneously, in an act of sabotage, or if the valve leaks high-pressure gas downstream to the lower maximum allowable operating pressure (MAOP) system, potentially causing an overpressure condition in the downstream system.
- SDG&E has pipelines buried in vaults that may experience corrosion from above-ground facilities, leading to pitting of below-ground piping. SDG&E will assess the coating and the condition of both above-ground and below-ground facilities within the vaults.

- **C101: Cathodic Protection Program – O&M**

  Corrosion is a natural process that can deteriorate steel assets and potentially lead to leaks or asset failure. If a leak migrates to and accumulates in a confined space and a potential ignition source is present or introduced, there is the potential for injuries. Although SDG&E operation groups respond immediately to these leak situations, such conditions have the potential to lead to a pipeline incident. Cathodic protection (CP) coating and monitoring can protect and extend the life of a steel pipeline asset by mitigating corrosion. The application of a CP related low electric current is necessary to overcome local inductive corrosion currents along the pipeline, that left unabated would result in localized corrosion on the pipeline. Cathodic protection can be achieved by the installation of sacrificial anodes[22] or impressed current systems.[23]

  The directives prescribed by state and federal pipeline corrosion control standards[24] include the monitoring of CP areas, remediation of CP areas that are

---

[22] A sacrificial anode is designed to be more electronegative than the pipe it is protecting and will "sacrifice" itself to prevent corrosion on the carbon steel pipe.

[23] SDG&E utilizes both impressed current and magnesium anode (galvanic) systems to provide CP to existing pipelines. Impressed current systems utilize a rectifier for the generation of the direct current. Both systems utilize sacrificial anodes (more electronegative than the pipe causing the anode to corrode vs the pipe) as a primary component in the system. Anodes are installed in wells drilled into the surrounding soil by third-party drilling contractors. Each protected pipe segment requires multiple anodes, collectively referred to as an "anode bed." The number of anodes needed to achieve the desired level of protection, and the average life of the anode bed can vary based on pipeline length, coating effectiveness, soil conditions and interference that may occur on the system.

[24] 49 C.F.R. § 192, Subpart I–Requirements for Corrosion Control; GO 112-F.

out of tolerance,[25] and preventative installations to avoid out of tolerance areas. The work in this CP Program constitutes the O&M activities that provide compliance with these regulations, supports the safety and integrity of the gas system, and mitigates risks defined in this RAMP chapter.

- **C107: Cathodic Protection Program - Capital**

  This project represents the capital expenditures associated with the installation of new and replacement CP infrastructure systems and equipment in accordance with state and federal pipeline corrosion control standards.[26] Examples include the installation of impressed current stations, deep well anode beds, magnesium anode systems, installation of isolation joints between pressure districts and the purchase, installation, and maintenance of CP instrumentation and monitoring equipment.

  CP system shorts and current interference typically occur as SDG&E's pipeline components come into contact with water lines or third-party grounding systems that can drain electric current from the pipeline. Other instances of interference include instances near customer meter set assemblies and risers in which a customer may have improperly grounded their own electrical systems or maybe have wrapped a dog or bicycle chain around the riser and meter set. This has the potential to reduce the level of protection and increase depletion of anodes. SDG&E continues to identify necessary modifications to CP systems to shorts and current interference caused by factors. Associated work includes the installation of insulating unions separating CP systems, new rectifiers, anode beds, and test points allowing the CP technician to take CP reads. This control also installs the isolation joints that provide the separation of the CP systems between pressure districts. CP isolation of high and medium pressure systems, as well as conducting specialty CP surveys will reduce the risk of corrosion and subsequent corrosion caused leaks in the distribution pipeline system.

---

[25] Out of tolerance areas are defined as areas where CP measures are not efficiently mitigating the effect of the corrosive environment on steel assets.

[26] 49 C.F.R. § 192, Subpart I–Requirements for Corrosion Control; GO 112-F.

Adding to or improving the current CP infrastructure with work activities and expenses will reduce exposure of corrosion to the SDG&E steel pipeline system thus enhancing the integrity of the gas system and mitigating the risks defined in this RAMP chapter.

- **C115: Regulator Station, Valve, Large Meter Set Inspection**

  This project is for inspections and maintenance to regulator stations, critical valves, and large meter sets. Regulator stations reduce the pressure of gas entering the distribution system from high-pressure pipelines to provide a lower pressure used on the distribution pipeline system. A failure of a regulator station due to mechanical failure, corrosion, contamination, or other cause could result in over-pressurization of the gas distribution system, which may compromise the integrity of medium-pressure pipelines and result in a public safety situation as evidenced by recent over-pressure events[27] in the industry.

  Regulator stations are critical control elements in the gas distribution system. Federal regulation 49 CFR § 192.739 requires inspections/tests to be conducted annually, and not to exceed 15 months between inspections, to determine if these devices in good mechanical condition. Functional tests of regulator stations are performed as part of inspections. The pressure checks are done to verify that the station's pressure protection devices perform as designed. If a station does not perform properly, internal maintenance and inspections are conducted. This consists of disassembling the regulator devices and inspecting the internal components for worn or damaged parts. The regulator is cleaned and inspected for corrosion and any faulty parts are replaced.

  SDG&E's O&M practices allow the useful lives of regulator stations to be extended. However, it is prudent to proactively replace regulator stations prior to the end of their useful life to reduce overall system risk. This risk reduction is achieved through improved station design of dual-run regulators which will

[27] For example, the 2018 Merrimack Valley over-pressurization event, *see* National Transportation Safety Board (NTSB), *Overpressurization of Natural Gas Distribution System, Explosions, and Fires, in Merrimack Valley, Massachusetts* (September 13, 2018), *available at:* https://www.ntsb.gov/news/events/Pages/2019-PLD18MR003-BMG.aspx.

reduce the risk of over-pressure and the station's location can be evaluated to reduce the risk of vehicular damage (outside force) or vandalism.

Valve maintenance allows the opportunity to validate that the valves within the system operate at optimum effectiveness which enhances public safety by providing SDG&E with the ability to control the pressure and flow of gas in the system. The maintenance activities may include flushing, lubrication, parts replacement, cleaning, and testing of operability. Valves are installed for control of pressure and flow of gas. Their location and purpose determine their criticality: inlet (aka "fire") valves to regulator stations isolate the high- and medium-pressure systems; emergency valves isolate segments of pipelines in case of pipe damage or for operational purposes; and isolation valves sequester portions of the system in the event of a widespread emergency, such as an earthquake and reduce the impact of resulting pipeline damage.

A valve that is operating appropriately means that, for example, in the case of an earthquake or fire where an area needs to be isolated to reduce the risk of further damage, these valves will operate as intended and fully isolate the area. A second example, which occurs more frequently, is when a pipeline is hit caused by third-party damage, releasing the uncontrolled release of gas; in such cases, these valves can be operated to suspend the flow of gas to the release point to allow completion of the repairs to the pipeline,

Meter set assemblies (MSA) reduce the pressure of natural gas and measure the volume of natural gas delivered to the customer. GO 58-A requires that meters, regulators, and other components be maintained, repaired, and tested periodically to meet customers' capacity requirements, measure gas volume accurately, and deliver natural gas at an adequate pressure for the houseline and home appliances. Additionally, if MSAs are housed in vaults, the vaults must be inspected and repaired, if necessary, to protect the MSA. Should the regulators fail, a household could potentially see a higher pressure of natural gas than intended for end-use infrastructure (*e.g.*, water heater), which could lead to an incident. Scheduled

inspections of MSAs proactively target and reduce the risk of equipment failures, corrosion, and outside force before operation and safety issues arise.

As required by 49 CFR § 192.481, above ground piping facilities must be inspected for atmospheric corrosion no less than once every three calendar years and at intervals not to exceed 39 months. If severe corrosion is found, the piping is replaced. This additional activity reduces the risk of consequent leakage due to the atmospheric corrosion.

- **C124 Regulator Station Installation, Replacement, and Enhancement**
  Regulator stations reduce the pressure of gas entering the distribution system from high pressure supply pipelines to the lower pressures used in the distribution pipeline network. SDG&E has approximately 460 regulator stations. SDG&E's O&M practices help extend the useful lives of regulator stations through annual inspection and maintenance; however, it remains prudent to proactively replace regulator stations prior to the end of their useful life in order to reduce overall system risk. This risk reduction is achieved through improved replacement station design, including the addition of dual-run regulators providing redundancy which will reduce the risk of over-pressure. In addition, the stations' location can be evaluated to reduce the risk of vehicular damage (outside force), vandalism, and risk to employee safety during maintenance due to high traffic levels near the station. Regulator stations are critical control elements in the gas distribution system. Failure of a regulator station could result in under- or over-pressurization of the gas distribution system, resulting in reduced service to customers and/or jeopardizing public safety. Regulator stations are part of SDG&E's continually-aging infrastructure. Presently over 70 percent of the Company's operating regulator stations are 24 years or older. SDG&E prioritizes its older regulator stations for replacement based on risk criteria, some of which are described above. Approximately 3 to 5 stations are replaced on an annual basis.

  In addition to the work described above the Control Center Modernization (CCM) organization is deploying remote control and real-time monitoring at distribution regulator stations, which will provide Gas Control visibility into the dynamic pressures and flows across the gas distribution system. This work includes the

installation of remote real-time automated control valves, pressure sensing equipment, flow measurement, and communication devices. These enhancements will provide Gas Control personnel with comprehensive operational awareness by receiving information from the regulator stations through a centralized data management system to the Gas Control Room. With these enhancements, Gas Control personnel will have improved visibility and control over assets within the distribution system, enabling them to more quickly identify, respond, and remediate abnormal operating pressures. This is intended to help prevent overpressure situations by providing earlier awareness that, in turn, facilitates more timely response.

- **C131: Leak Repair O&M/Capital**

  SDG&E proactively surveys its gas distribution system for leakage at frequencies determined based on the pipe material involved, the operating pressure, whether the pipe is under cathodic protection, and the proximity of the pipe to various population densities as prescribed within 49 CFR § 192.723. A routine leak survey includes surveys at intervals of one or three years for steel and plastic mains. The frequency of this survey is determined by the pipe material and date of installation involved. Annual surveys are scheduled on pipeline infrastructure which are pre-1950 steel and pre-1986 plastic (Aldyl-A) and in business districts, and near public service establishments, such as schools, churches, and hospitals. Three-year survey cycles are typically used for plastic and cathodically protected steel mains and services installed in residential areas.

  If a leak is found during a survey of the gas distribution system, SDG&E takes steps to either remediate or monitor the situation depending on the type of leak classification. A leak will be remediated immediately if the qualified technician conducting the survey determines there is a hazardous condition. If the leak does not create a hazardous situation, SDG&E will monitor the leak. SDG&E has shortened the prescribed timeframe for which leaks will be monitored and scheduled for remediation. The leak survey program has accelerated due to the increased footage to align with SB 1371 based funding and requirements.

- **C134: Pipeline Monitoring**

  SDG&E conducts pipeline monitoring and inspection activities to proactively target risk factors before operation and safety issues arise. These monitoring activities include pipeline patrols, leak surveys, bridge and span inspections, and unstable earth inspections. These inspections are critical since they are intended to observe assets over time to determine if abnormal conditions exist prior to becoming a concern. For example, a span that is no longer coated appropriately due to recent weather conditions can be identified for re-coating before corrosion that could lead to a leak begins. The leak survey monitoring identifies leaks that require repair.

  The monitoring and inspections must follow certain prescribed processes included in Title 49 of the CFR Part 192, and GO 112-F.

- **C139 Gas Distribution Safety Relocations**

  The Gas Distribution Safety Relocations activity addresses the relocation of gas services and gas meters on gas distribution lines due to abnormal operating conditions, such as shallow/exposed services and out-of-compliance gas meter locations, such as meters that are not enclosed. This activity will also assist in managing encroachment infractions for gas distribution pipelines within the Company's pipeline rights of way in compliance with GO 112-F § 143.5 or otherwise affecting the operation and maintenance of the Company's pipeline facilities.

- **C144: Human Factors Mitigation – QA/QC Program – Mandated Compliance Activities**

  In addition to SDG&E's Operator Qualification program that promotes safe and proficient operations, SDG&E performs quality control checks for various pipeline operational activities as mandated by 49 CFR § 192.605 (b8)(c4). During these quality control checks, internal assessors review the work performed by gas pipeline personnel to assess the effectiveness and adequacy of the procedures used in normal operations and maintenance. In addition, the assessors evaluate the conformance of employees to these policies and procedures. The assessors identify if abnormal operating conditions (AOCs) are present and

document whether the employees respond to the AOCs and take appropriate corrective actions.

SDG&E performs quality control assessments on the Company's regulator station, valve, and large meter set inspection and maintenance activities, as well as on pipeline monitoring activities, and cathodic protection activities. These assessments are tracked to communicate lessons learned and to help develop refresher training. Adherence to proper company policies and procedures is intended to mitigate the risk of hazardous conditions developing and also helps increase the overall awareness and response to unsafe activities.

- **C150 Code Compliance Mitigation**

  This project consists of upgrades or additions to facilities to maintain compliance with minimum federal safety standards for gas pipelines in 49 C.F.R. § 192 and state safety standards in GO 112-F. The primary components of this activity are the replacements of Type K-Regulators, replacement of inoperable valves, and installation/replacement of Electronic Pressure Monitors (EPM). Type K-Regulators are regulators that do not have relief valves and for which pressure downstream of the regulator can increase due to either corrosion on the copper washer or the presence of small debris that prevents the regulator from operating properly.

  When a valve has been discovered inoperable through normal maintenance and inspections, it will be reported and then replaced with an operable valve. A valve that is operating properly can mitigate several safety risks. For example, in the case of an earthquake or fire, valves can provide isolation of an area to reduce the risk of the incident. A second more frequently occurring example is when a pipeline incurs damage caused by third-party contact, causing the uncontrolled escape of gas. Valves can be operated to allow for a safe environment, allowing completion of repairs to the pipeline, and minimize the risk of furthering the incident.

  Installations/replacements of EPMs are needed in order to provide warning if a particular gas area is being affected by low- or high-pressure events. EPMs work

by sensing pressure in a main and logging that information. They then relay that information at a regular interval to an internal database giving SDG&E the ability to see the fluctuations in gas pressure throughout the seasons. EPMs also have the ability to send alarm messages to SDG&E's emergency and on call departments if a particular high- or low-pressure threshold is met. This allows SDG&E response crews and on-call gas engineers to know there are potential problems in the system and allows a timely response. As the gas system grows and changes, periodic reviews of existing EPM locations are evaluated to see if a particular EPM should be added, moved, or removed from the system.

- **C169: Human Factors Mitigation – Op Qual**

  All gas pipeline operators are required to create and maintain a written Operator Qualification (Op Qual) program to establish compliance policies for the DOT Operator Qualification Program as required by 49 CFR Subpart N – Qualification of Pipeline Personnel. All employees and contractors performing DOT-covered tasks are required to be pre-qualified under this Op Qual program. This program is reviewed by the Op Qual department prior to performing work on pipelines or pipeline facilities. The Op Qual program requires that employees are trained, initially qualified and subsequently re-qualified every three or five years depending on the task. SDG&E's training frequency conforms to these requirements and the results of the evaluations are recorded, demonstrating employees' knowledge, skills, and abilities of the job requirements and that they are qualified to perform the required tasks. Qualification promotes adherence to proper company policy and procedures and therefore mitigates the risk of hazardous conditions developing and increases the overall awareness and response to unsafe activities.

- **C175 Residential Meter Protection**

  Residential Meter Protection (RMP) addresses the prevention of potential vehicular damage associated with above-ground distribution facilities at residential properties in accordance with 49 C.F.R. § 192.353(a) and GO 112-F. This control minimizes the potential for vehicular damage for above ground gas equipment (*e.g.*, MSA) by placing various forms of physical devices or barriers to mitigate damage in case of a

potential collision. Barriers are intended to be visual, not structural, deterrents and are not intended or capable of stopping all vehicular traffic (especially large vehicles). Where adequate mitigation cannot be achieved, gas equipment can be relocated or removed. Additionally, RMP addresses the concerns PHMSA expressed under its regulations that require operators to address identified threats of low frequency but potentially high consequence events. RMP anticipates there are more than 19,000 additional locations where this mitigation is warranted. To address these 19,000 locations, RMP is expected to last as a project for approximately 20 years.

- **C182: Distribution Risk Evaluation & Monitoring System (DREAMS)**
  The Distribution Risk Evaluation & Monitoring System (DREAMS) was developed to manage the replacement of NSOTA pipes with State-Of-The-Art (SOTA) pipes, pipes, which SoCalGas has undertaken to comply with the DIMP requirements mandated by 49 CFR Part 192, Subpart P to reduce the risk of serious incidents and enhance the overall safety and reliability of the natural gas distribution system. The NSOTA pipe population consists of vintage Aldyl-A pipe, which has been recognized by federal and state regulators as high-risk pipes that necessitate action by pipeline operators.[28] The slow crack growth associated with this Aldyl-A material fundamentally poses a higher level of risk due to the nature of leaks created by this mode of failure.[29] Leak surveys do not completely mitigate the risk as leaks can occur suddenly and result in risk events.[30]

  SoCalGas mitigates the risk associated with vintage Aldyl-A pipe through the execution of pipe placement projects informed by the DREAMS model. The DREAMS model was recently updated with the use of a segment-specific quantitative risk assessment (QRA) algorithm that combines internal datasets and external publicly available data sources, and includes pipe attributes, operational conditions, and potential impact of an incident on the general population, to

[28] CPUC, *Hazard Analysis and Mitigation Report – Aldyl A Polyethylene Gas Pipelines* (June 11, 2014) at 11, *available at:* https://www.cpuc.ca.gov/regulatory-services/safety/gas-safety-and-reliability-branch/pipeline-documents.

[29] *Id.* at 25.

[30] *Id.* at 26.

estimate the safety risk of vintage distribution main pipelines. SDG&E currently has over 1,500 miles of plastic pipe manufactured and used for gas service from the 1960s through the early 1980s that can exhibit a brittle-like cracking characteristic that is associated with a higher risk of failure that could lead to serious incidents and/or fatalities.[31]

The DREAMS model and its results are used to determine appropriate action to address risk for each segment and inform the prioritization of replacement investments. In the absence of an established safety risk threshold from PHMSA and other regulatory bodies, SDG&E has established a threshold of an annual probability greater than 6×10^{-6} of a serious incident for medium pressure distribution main locations. Vintage plastic distribution mains with QRA results that exceed this threshold are targeted for replacement under the DREAMS program.

As SDG&E's gas infrastructure continues to age and more data is accumulated through inspections and other pipeline activities, SDG&E plans to continuously improve risk evaluations to consider not just the current state of risk in the system but also the projected long-term risks. SDG&E monitors the performance of DREAMS pipeline replacements by reviewing benefits and risk reduction achieved through indicators such as leak repair and incident rates related to vintage pipe. Program metrics will be monitored on a continual basis and SDG&E plans to increase or decrease replacement rates based on findings.

B. Changes from 2024 Controls

SDG&E plans to continue each of the existing controls discussed above, and reflected in Table 1, through the 2025-2031 period without any significant changes.

C. Mitigation Programs

SDG&E does not currently foresee implementing new mitigations not described above during the 2025-2031 period.

---

[31] CPUC, *Hazard Analysis and Mitigation Report – Aldyl A Polyethylene Gas Pipelines* (June 11, 2014), *available at:* https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/r/8947-ra-doc-10-aldyla.pdf.

D. Climate Change Adaptation

Pursuant to Commission decisions[32] in the Climate Adaptation OIR (R.18-04-019), SDG&E performed a Climate Adaptation Vulnerability Assessment (CAVA) focused on years 2030, 2050, and 2070, with the aim of identifying asset and operational vulnerabilities to climate hazards across the SDG&E system. SDG&E recognizes the need to address climate vulnerabilities to promote safety and reliability of its services and mitigate the increasing climate-related hazards through innovative and community-centric approaches. Some of the climate hazards that will have short- and long-term ramifications in the San Diego region include extreme temperatures, wildfire, inland flooding, coastal flooding and erosion, and landslides. Climate change is recognized as a factor that can drive, trigger, or exacerbate multiple RAMP risks. Implementing climate change adaptation measures and integrating climate vulnerability considerations into RAMP controls and mitigations can enhance system infrastructure longevity and reduce the severity of long-term negative climate impacts. The controls and mitigations described in further detail in this chapter, as shown below, align with the goal of increasing SDG&E's physical and operational resilience to the increasing frequency and intensity of climate hazards. Additional information on the CAVA and a list of climate-relevant controls and mitigations included in RAMP, are provided in Chapter RAMP-5: Climate Change Adaptation.

Table 5: Medium Pressure Gas System Risk
Controls and Mitigations that Align with Increasing Resilience to Climate Hazards

Relevant ID	Relevant Control/Mitigation	Potential Climate Hazard(s)
C134	Pipeline Monitoring	Inland Flooding and Landslides
C139	Gas Distribution Safety Relocations	Inland Flooding and Landslides

E. Foundational Programs

Foundational Programs are "[i]nitiatives that support or enable two or more Mitigation programs or two or more Risks but do not directly reduce the Consequences or reduce the Likelihood of safety Risk Events."[33] SDG&E has one foundational program, Human Factors Mitigations – Op Qual Training. All employees and contractors performing DOT-covered tasks are required to be Operator Qualified to work on SDG&E's gas system per 49 CFR Subpart N –

[32] D.19-10-054; D.20-08-046.

[33] D.24-05-064, Appendix A at A-4.

Qualification of Pipeline Personnel. These DOT-covered tasks prescribe how employees and contractors are to perform their tasks for each of the controls listed in Table 6 below. Below in Table 6 are the foundational programs that are applicable to the MP System Risk and the mitigation activities that are supported.

Below in Table 6 are the Foundational Programs that are applicable to the MP System Risk and the mitigation activities that are supported.

Table 6: Medium Pressure Gas System Risk
Foundational Activities
(Direct, in 2024 $ millions)

ID	Foundational Activity Name	Enabled Control/Mitigation	2025 O&M Costs	2025-2031 Capital Costs
C169	Human Factors Mitigation – Op Qual Training	C005: Gas Emergency Department C007: Underperforming Mains and Services C101: Cathodic Protection Program – O&M C107: Cathodic Protection Program – Capital C115: Reg Station, Valve, Large Meter Set Inspections C124: Regulator Station Repair, Replace, Enhance C131: Leak Repair C134: Pipeline Monitoring C139: Gas Distribution Relocations C144: Human Factor Mitigation – QA/QC Program – Mandated Compliance Activities C150: Code Compliance Mitigation C182: Distribution Risk Evaluation & Monitoring System (DREAMS)	2.116	0

F. Estimates of Costs, Units, and Cost-Benefit Ratios (CBRs)

The tables in this section provide a quantitative summary of the risk control and mitigation plan for MP System Risk, including the associated costs, units, and CBRs. Additional information by Tranche is provided in workpapers. The costs shown are estimated using assumptions provided by SMEs and available data. In compliance with the Phase 3 Decision,[34] for each enterprise risk, SDG&E uses actual results and industry data and when that is not available, supplements the data with SME input. For additional details regarding the data and expertise relied upon in developing these estimates is provided in Attachment B.

Table 7: Medium Pressure Gas System Risk Control and Mitigation Plan – Recorded and Forecast Costs Summary (Direct, in 2024 $000)

ID	Control/Mitigation Name	Recorded Costs		Forecast Costs			
		2024 Capital	2024 O&M	2028 O&M	2025-2028 Capital	PTY Capital	PTY O&M
C005	Gas Emergency Department	0	1,555	1,641	0	0	4,923
C007	Underperforming Mains and Services	18,268	0	0	36,984	27,738	0
C101	Cathodic Protection Program – O&M	0	2,278	2,258	0	0	6,774
C107	Cathodic Protection Program – Capital	7,293	0	0	19,826	13,656	0
C115	Reg Station, Valve, Large Meter Set Inspections	0	3,117	3,436	0	0	10,826
C124	Regulator Station Repair, Replace, Enhance	5,091	0	0	18,924	12,996	0
C131	Leak Repair (O&M/Capital)	16,466	3,313	3,313	55,163	43,721	9,939
C134	Pipeline Monitoring	0	4,173	4,173	0	0	12,519
C139	Gas Distribution Safety Relocations	1,820	0	0	6,578	201	0
C144	Human Factors Mitigation – QA/QC Program – Mandate Compliance Activities	0	142	142	0	0	426

[34] D.24-05-064, RDF Row 10.

ID	Control/Mitigation Name	Recorded Costs		Forecast Costs			
		2024 Capital	2024 O&M	2028 O&M	2025-2028 Capital	PTY Capital	PTY O&M
C150	Code Compliance Mitigation	3,104	0	0	16,690	11,907	0
C169	Human Factors Mitigation – Op Qual Training	0	2,077	2,337	0	0	7,011
C175	Residential Meter Protection	2,362	0	0	6,744	8,471	0
C182	Distribution Risk Evaluation & Monitoring System (DREAMS)	82,375	660	1,034	199,918	193,008	3,418

Table 8: Medium Pressure Gas System Risk Control & Mitigation Plan – Units Summary

ID	Control/Mitigation Name		Recorded Units		Forecast Units			
	Name	Unit of Measure	2024 Capital	2024 O&M	2028 O&M	2025-2028 Capital	PTY Capital	PTY O&M
C005	Gas Emergency Department	Responses	0	1,591	1,483	0	0	4,449
C007	Underperforming Mains and Services	Feet	49,218	0	0	102,832	77,124	0
C101	Cathodic Protection Program – O&M	CP and follow up reads	0	23,376	25,520	0	0	76,560
C107	Cathodic Protection Program – Capital	Projects	73	0	0	151	104	0
C115	Reg Station, Valve, Large Meter Set Inspections	Inspections	0	5,673	6,254	0	0	19,702
C124	Regulator Station Repair, Replace, Enhance	Projects	3	0	0	83	57	0
C131	Leak Repair (O&M/Capital)	Leaks Repaired	472	860	860	2,608	2,067	2,580
C134	Pipeline Monitoring	Inspections & Surveys	0	972	972	0	0	2,916
C139	Gas Distribution Safety Relocations	Projects	34	0	0	197	6	0

ID	Control/Mitigation Name		Recorded Units		Forecast Units			
	Name	Unit of Measure	2024 Capital	2024 O&M	2028 O&M	2025-2028 Capital	PTY Capital	PTY O&M
C144	Human Factors Mitigation – QA/QC Program – Mandate Compliance Activities	Employees	0	4	4	0	0	12
C150	Code Compliance Mitigation	Projects	1,622	0	0	7,789	5,557	0
C169	Human Factors Mitigation – Op Qual Training	Op Quals Trained	0	899	1,056	0	0	3,168
C175	Residential Meter Protection	Projects	2,908	0	0	4,784	6,008	0
C182	Distribution Risk Evaluation & Monitoring System (DREAMS)	Miles	58	0	0	168	123	0

In the table below, CBRs are presented in summary at the mitigation or control level for the Test Year 2028 GRC cycle. CBRs are calculated based on scaled, expected values unless otherwise noted and are calculated for each of the three required discount rates[35] in each year of the GRC cycle and for the Post-Test Years in aggregate (2029-2031). Costs and CBRs for each year of the GRC cycle and the aggregated years are provided in workpapers.

Table 9: Medium Pressure Gas System Risk
Cost Benefit Ratio Results Summary (2028-2031)
(Direct, in 2024 $millions)

ID	Control/Mitigation Name	Capital (2028-2031)	O&M (2028-2031)	CBR (Societal)	CBR (Hybrid)	CBR (WACC)
C005	Gas Emergency Department	0	$6.6	0.06	0.06	0.06
C007	Underperforming Mains and Services	$37	0	0.37	0.04	0.04

[35] *See* Chapter RAMP-3: for definitions of discount rates, as ordered in the Phase 3 Decision.

ID	Control/Mitigation Name	Capital (2028-2031)	O&M (2028-2031)	CBR (Societal)	CBR (Hybrid)	CBR (WACC)
C101	**Cathodic Protection Program – O&M**	0	$9	11.36	11.38	11.32
C107	**Cathodic Protection Program – Capital**	$18.1	0	32.53	18.10	17.82
C115	**Reg Station, Valve, Large Meter Set Inspections**	0	$14.3	0.07	0.08	0.07
C124	**Regulator Station Repair, Replace, Enhance**	$17.8	0	0.12	0.05	0.05
C131	**Leak Repair (O&M/Capital)**	$57.8	$13.3	0.44	0.45	0.44
C134	**Pipeline Monitoring**	0	$16.7	0.03	0.03	0.03
C139	**Gas Distribution Safety Relocations**	$0.3	0	0.11	0.02	0.02
C144	**Human Factors Mitigation – QA/QC Program – Mandate Compliance Activities**	0	$0.6	0.07	0.08	0.07
C150	**Code Compliance Mitigation**	$15.7	0	0.01	~0.00	~0.00
C169	**Human Factors Mitigation – Op Qual Training**	0	$9.3	~0.00	~0.00	~0.00
C175	**Residential Meter Protection**	$11.2	0	0.01	~0.00	~0.00
C182	**Distribution Risk Evaluation & Monitoring System (DREAMS)**	$257.3	$4.5	0.19	0.03	0.03

Bold *indicates a mandated program.*

Tranche-level CBRs by year and in aggregate for each mitigation are provided in workpapers.

V. ALTERNATIVE MITIGATIONS

Pursuant to D.14-12-025 and D.16-08-018,[36] SDG&E considered two alternatives to the Risk Mitigation Plan for the MP System Risk. Typically, analysis of alternatives occurs when implementing activities to obtain the best result or product for the cost. The alternatives analysis for this plan considers changes in risk reduction, cost, reasonableness, current conditions, modifications to the plan and constraints, such as budget and resources.

Table 10: Medium Pressure Gas System Risk
Alternative Mitigation Plan – Forecasted Costs Summary
(Direct, in 2024 $millions)

ID	Alternative Mitigation Name	Forecast Costs			
		2025-2028 Capital	PTY Capital	2025-2028 O&M	PTY O&M
A106	CP10 Service Replacement	72	54	0	0
A118	Strategic Valve Replacement	19.2	14.4	0	0

Table 11: Medium Pressure Gas System Risk
Alternative Mitigation Cost Benefit Ratio Results Summary
(Direct, in 2024 $millions)

ID	Alternative Mitigation Name	Capital TY 2028	O&M TY 2028	CBR (Societal)	CBR (Hybrid)	CBR (WACC)
A106	CP10 Service Replacement	72	0	0.43	0.04	0.04
A118	Strategic Valve Replacement	19.2	0	0.71	0.18	0.17

A. Alternative 1: CP 10 – Service Replacements

SDG&E considered replacing approximately 20,000 CP10 services rather than continuing to monitor, inspect and maintain them on a ten-year cycle. CP10 services are separately protected service lines that are surveyed on a sampling basis where at least 10% of system inventory is sampled each year, so that the entire system is tested in a 10-year period. However, due to the number of CP10 services in the system, a program targeting complete replacement of CP10 services would exceed $400 million and likely take several decades to complete. As complete replacement of all CP10s is currently infeasible, SDG&E plans to evaluate and quantify the risk

[36] D.18-12-014 at 33-35.

reduction benefits of a risk-based targeted CP10 replacement program. In the interim, CP10s will be replaced based on performance history and current protection levels.

B. Alternative 2: Strategic Valve Placement/Installation

Valves are a critical part of a medium pressure gas system. Valves provide the operator with a means of maintaining the pipeline system through creating temporarily isolated sections of the system and also provide alternative choices in how the operator can operate a pipeline system. Importantly, valves also provide the ability to stop the unintended escape of gas from the pipeline system in an emergency. When properly located, valves can greatly reduce the response time to control escaping gas, thus minimizing the risk to Company employees and the public from the potential consequences of an uncontrolled release of gas. Valves, specified in the design process, are installed in the gas pipeline system in new segments of pipe added over time as a result of customer growth. Each segment of added pipeline is analyzed for the best placement of valves, which is primarily determined through an evaluation of the benefits as described above. However, the valves currently installed on the MP System were based on evaluations conducted when installing pipe. This alternative consists of a comprehensive review of the integrated gas system to look at the possible need for additional valves to expedite emergency response or minimize customer interruptions, as well as the resulting valve installations.

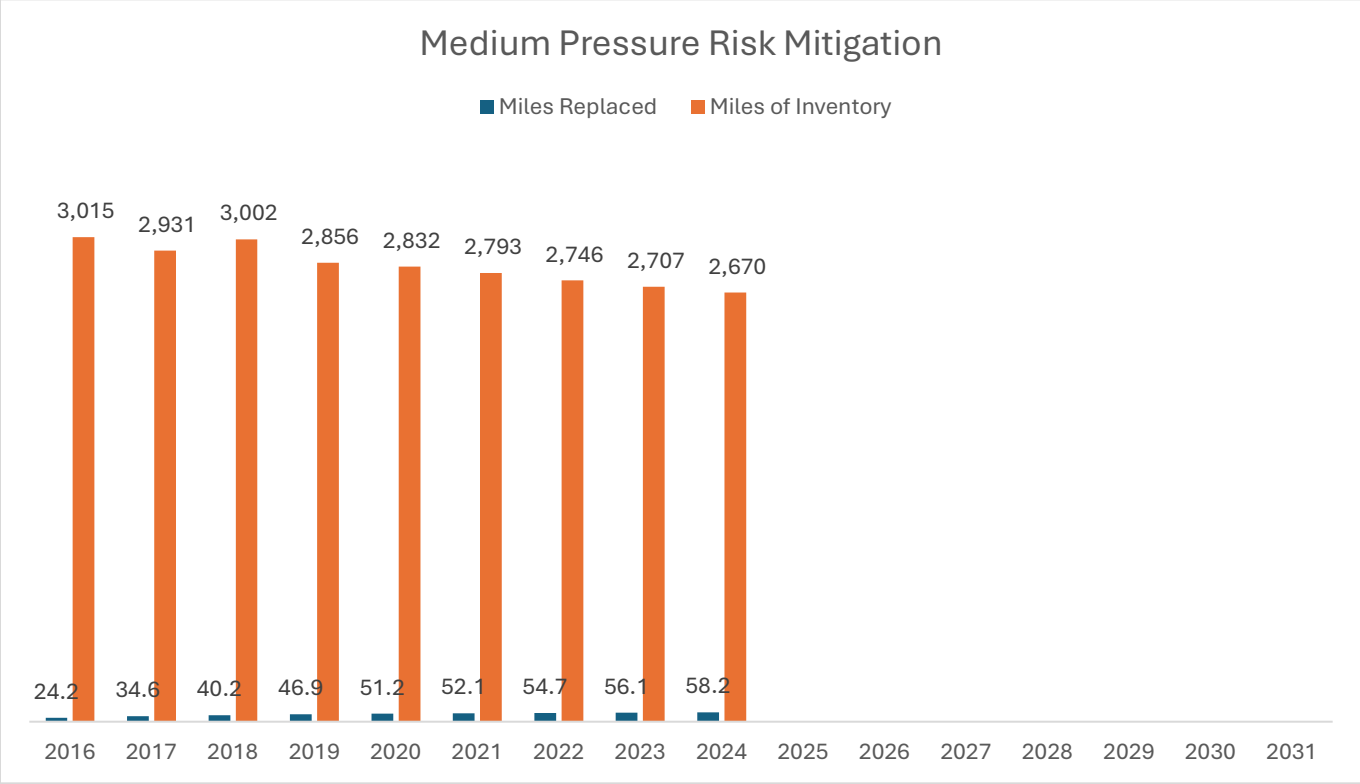
A comprehensive analysis of SDG&E's MP System would use current system maps and modeling tools to identify potential locations for added valves. These additions would enhance safety by reducing the response time to control and isolate gas flow in an emergency, with the added benefit of improved flexibility for pipeline maintenance. Elements of the analysis that would be included are size and pressure of the pipeline, pipeline network considerations such as back-ties and single feeds, long existing back-ties between stranded areas, estimated amount of reduction in the number of customers affected, valve access considerations, and usefulness in aiding the repair and isolation of critical SDG&E gas assets.

However, given the magnitude of this undertaking and the uncertainty of when or if an added valve would be utilized, and the increased risk of 3rd party Non-Op Qualed individuals operating SDG&E valves, SDG&E has elected not to pursue this mitigation. Instead, SDG&E will continue to focus on targeted application of available tooling that can be used where specifically needed on the system to stop the flow of gas at a fraction of the cost.

VI. HISTORICAL GRAPHICS

As directed by the Commission in D.22-10-002, this section illustrates the accomplishments in safety work and the progress in mitigating safety risks over the two immediately preceding RAMP cycles. A bar chart graphic is employed to depict historical progress. This graphic uses a key DIMP metric that aligns with Company safety goals to illustrate trends in historical progress and identify remaining tasks necessary to continue mitigating risks.

Figure 2
Medium Pressure Gas System: Safety Progress 2016-2024



As described in Section III.A., the DREAMS is a PAAR developed by SDG&E to replace NSOTA pipes with SOTA pipes. The recently updated DREAMS model uses a QRA algorithm that integrates various data sources to estimate the safety risks associated with vintage plastic and bare steel pipelines. Prioritizing pipeline replacements using this model, SDG&E aims to enhance the safety and reliability of the natural gas distribution system.

From 2016 to 2024, SDG&E successfully completed pipeline replacements, improved data tracking, and advanced risk evaluations through DREAMS. The scope of DREAMS has evolved over time with improvements made in data tracking and management, as well as the

execution of pipeline work across the company. With these efforts, combined with improvements to the DREAMS model, SDG&E is enhancing the accuracy of risk assessments, allowing for more precise prioritization of pipeline replacement projects based on identified threats and risks.

From 2025 to 2031, SDG&E plans to continue replacements of vintage plastic and bare steel pipelines to mitigate safety risks.

ATTACHMENTS

ATTACHMENT A

CONTROLS AND MITIGATIONS WITH REQUIRED COMPLIANCE DRIVERS

The table below indicates the compliance drivers which underpin identified controls and mitigations.

ID	Control/Mitigation Name	Compliance Driver
C007	Underperforming Main & Services	49 CFR § 192
C101	Cathodic Protection Program – O&M	49 CFR Subpart I
C107	Cathodic Protection Program – Capital	49 CFR Subpart I
C115	Reg Station, Valve, Large Meter Set Inspections	PHMSA, CPUC GO 58A-13B
C124	Regulator Station Repair, Replace, Enhance	49 CFR § 192
C131	Leak Repair (O&M/Capital)	49 CFR § 192
C134	Pipeline Monitoring	49 CFR § 192
C139	Gas Distribution Safety Relocations	49 CFR § 192
C144	Human Factors Mitigation – QA Programs	49 CFR § 192
C150	Code Compliance	49 CFR § 192, GO 112-F
C169	Human Factors Mitigation – Op Qual	GO 112-F
C175	Residential Meter Protection	49 CFR § 192
C182	Distribution Risk Evaluation & Monitoring System (DREAMS) (O&M/Capital)	49 CFR § 192

ATTACHMENT B

MEDIUM PRESSURE GAS SYSTEM - REFERENCE MATERIAL FOR QUANTITATIVE ANALYSES

The Phase 3 Decision RDF Row 10 and Row 29 directs each utility to identify Potential Consequences of a Risk Event using available and appropriate data.[37] Appropriate data may include Company specific data or industry data supplemented by the judgment of the subject matter experts. Provided below is a listing of the inputs utilized as part of this assessment and the description of the data.

Risk Data	**Source Type**	**Source Information**
Likelihood of failure and probability failure results in safety consequence	Internal Model results	Source: Internal DIMP models Definition: Integrity Management Department Internal model that uses internal and industry data
Business District Location Type	External Data	Source: Google maps Definition: Used to determine if national medium pressure incidents occurred in a business district or not to inform consequence modelling
Population Density	External	Agency: US Census Bureau Link: https://www.census.gov/programs-surveys/decennial-census/decade/2020/2020-census-results.html Definition: Used to determine population density in SoCalGas and SDG&E's service territories and locations where national incidents were reported to PHMSA to inform consequence modelling

[37] D.24-05-064, RDF Row 10 and Row 29.

Risk Data	Source Type	Source Information
National Pipeline Incidents (2010-2024)	External Data	Agency: PHMSA Link: https://www.phmsa.dot.gov/data-and-statistics/pipeline/distribution-transmission-gathering-lng-and-liquid-accident-and-incident-data Definition: Due to lack of internal data, national data was used to model the number of fatalities and serious injuries from an incident on the medium pressure system.
Meter Outages	Internal Data	Source: GO 112-F quarterly reports and internal database. Definition: Historical data for SoCalGas was used to model likelihood and number of outages as a result of an incident on the medium pressure system.
National Medium Pressure Incident Cost data	External Data	Agency: PHMSA Link: https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-incident-flagged-files Definition: National data was used to estimate costs such as property damage in current year (2024) dollars because internal data was not available
Leak Repair Costs	Internal Data	Source: Distribution Department and SoCalGas SB 1371 filing Link: https://www.socalgas.com/sites/default/files/2022-SoCalGas-SB-1371-Compliance-Plan.pdf Definition: Internal data for leak repair on aboveground assets was available however costs associated with main and service repair were not readily available so previous analysis from SB 1371 Filing was used.

Risk Data	Source Type	Source Information
Average cost of a fatality	External Data	Agency: National Safety Council (NSC) Link: https://injuryfacts.nsc.org/work/costs/work-injury-costs/ Definition: Costs include wage losses, medical expenses, administrative expenses and employer costs, which are not included in the PHMSA costs.
Average Cost of a serious injury	External Data	Agency: CDC Link: WISQARS Cost Of Injury Definition: Wage loss and medical costs associated with non-fatal injuries that require hospitalization that are not included in PHMSA costs.

ATTACHMENT C

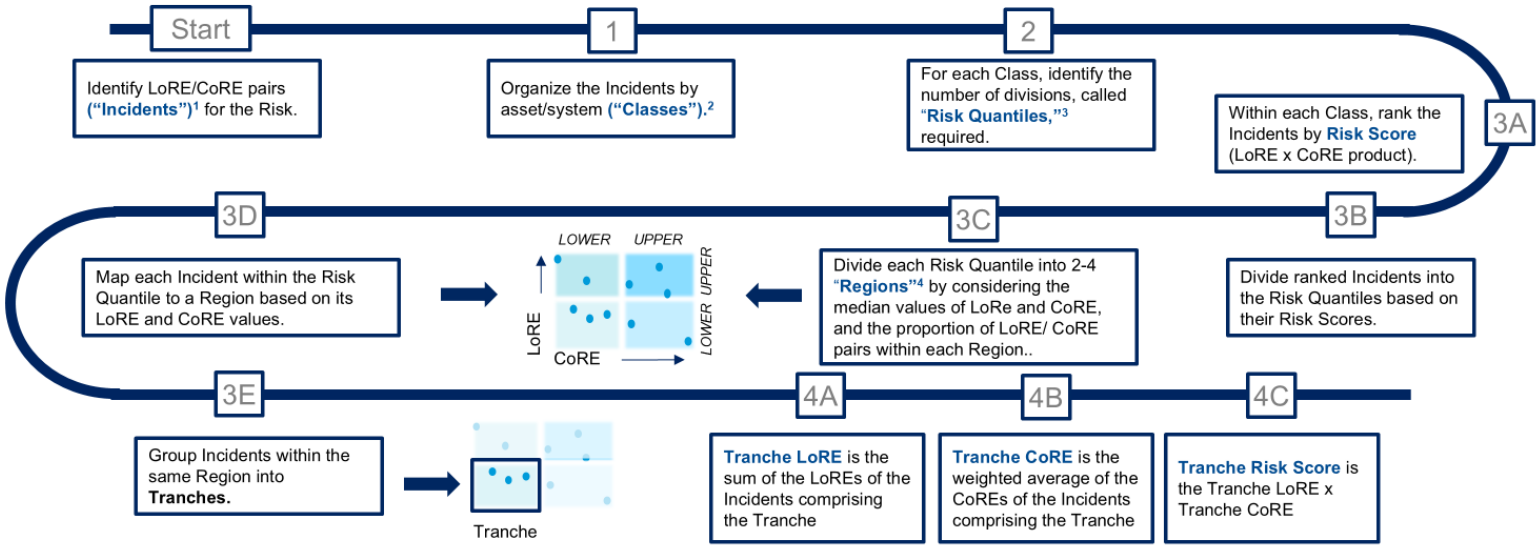
MEDIUM PRESSURE GAS SYSTEM - SUMMARY OF ELEMENTS OF BOW TIE

SUMMARY OF ELEMENTS OF BOW TIE			
ID	**Control/Mitigation Name**	**Drivers Addressed**	**Consequences Addressed**
C005	Gas Emergency Department		PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C007	Underperforming Main & Services	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.8	PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C101	Cathodic Protection Program – O&M	DT.1, DT.4, DT.5	PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C107	Cathodic Protection Program – Capital	DT.1, DT.4, DT.5	PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C115	Reg Station, Valve, Large Meter Set Inspections	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.8	PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C124	Regulator Station Repair, Replace, Enhance	DT.1, DT.2, DT.3, DT.4, DT5, DT.6	PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C131	Leak Repair (O&M/Capital)	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.8	PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C134	Pipeline Monitoring	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6	PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C139	Gas Distribution Safety Relocations	DT.1, DT.2, DT3, DT.4, DT.5, DT.6, DT.7	PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C144	Human Factors Mitigation – QA Programs	DT.1, DT.4, DT.5, DT.6, DT.7	PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C150	Code Compliance	DT.1, DT.2, DT.3, DT.5, DT.6, DT.8	PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C169	Human Factors Mitigation - OpQual	DT.1, DT.4, DT.5, DT.6, DT.7	PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C175	Residential Meter Protection	DT.3, DT.7	PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C182	Distribution Risk Evaluation & Monitoring System (DREAMS) (O&M/Capital)	DT.1, DT.2, DT.4, DT.6, DT.7	PC.1, PC.2, PC.3, PC.4, PC.5, PC.6, PC.7

ATTACHMENT D

MEDIUM PRESSURE GAS SYSTEM - APPLICATION OF TRANCHING METHODOLOGY

A sample walkthrough of the Homogeneous Tranching Methodology (HTM) as outlined in Volume 1, Chapter RAMP-3: Risk Quantification Framework is provided.



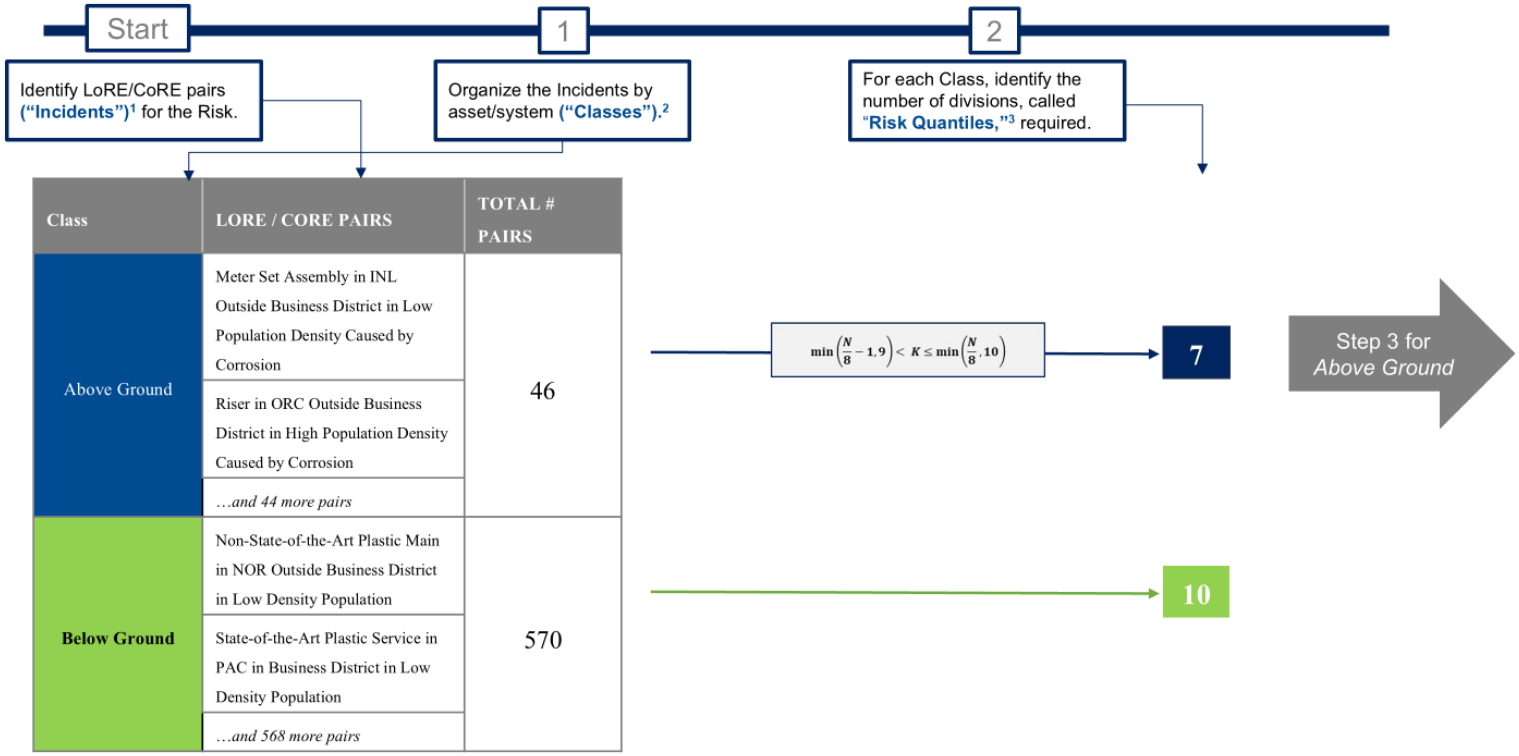
NOTES

[1]*For example, **Incidents (or "Risk Incidents")** for Medium Pressure are generally modes of failure of medium pressure assets in various environments such as low or high population densities.*

[2]*For example, **Classes (or "Asset Classes")** for Medium Pressure include Above-Ground and Below-Ground.*

[3]***Quantiles** are divisions of equal numbers of incidents (quartiles have 4 divisions, quintiles have 5, etc.) The number of incidents dictates the number of quantiles needed.*

[4]*The four **Regions** are: 1. Lower LoRE-Lower CoRE (LL-LC), 2. Lower LoRE-Upper CoRE (LL-UC), 3. Upper LoRE-Lower CoRE (UL-LC), and 4. Upper LoRE-Upper CoRE (UL-UC).*


Start
1
2
Identify LoRE/CoRE pairs ("Incidents")[1] for the Risk.
Organize the Incidents by asset/system ("Classes").[2]
For each Class, identify the number of divisions, called "Risk Quantiles,"[3] required.
Class
LORE / CORE PAIRS
TOTAL # PAIRS
Above Ground
Meter Set Assembly in INL Outside Business District in Low Population Density Caused by Corrosion
Riser in ORC Outside Business District in High Population Density Caused by Corrosion
…and 44 more pairs
46
Below Ground
Non-State-of-the-Art Plastic Main in NOR Outside Business District in Low Density Population
State-of-the-Art Plastic Service in PAC in Business District in Low Density Population
…and 568 more pairs
570
$\min\left(\frac{N}{8}-1,9\right) < K \leq \min\left(\frac{N}{8},10\right)$
7
10
Step 3 for Above Ground

Within each Class, rank the Incidents by **Risk Score** (LoRE x CoRE product).

3A

3B

Divide ranked Incidents into the Risk Quantiles based on their Risk Scores.

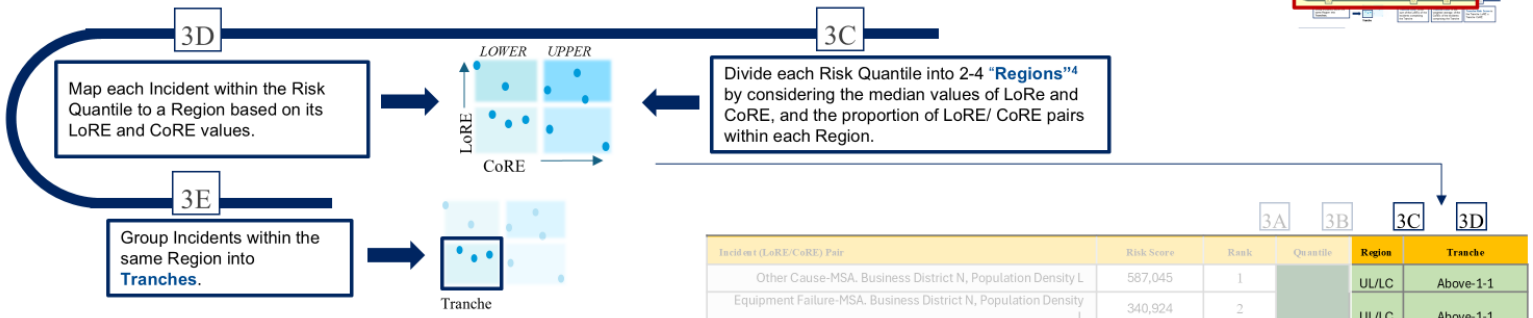
$$\min\left(\frac{N}{8}-1,9\right) < K \leq \min\left(\frac{N}{8},10\right)$$

7

From Step 2 for *Above Ground*

3A 3B

Incident (LoRE/CoRE) Pair	Risk Score	Rank	Quantile
Other Cause-MSA. Business District N, Population Density L	587,045	1	#1
Equipment Failure-MSA. Business District N, Population Density L	340,924	2	
Corrosion-RISER. Business District N, Population Density L	181,678	3	
Other Outside Force Damage-MSA. Business District N, Population Density L	169,875	4	
Other Cause-MSA. Business District Y, Population Density L	133,377	5	
Equipment Failure-MSA. Business District Y, Population Density L	106,731	6	
Corrosion-MSA. Business District N, Population Density L	103,507	7	
Overpressure Leak-Reg_Station. Business District None, Population Density None	93,209	8	
Other Outside Force Damage-RISER. Business District N, Population Density L	83,650	9	
Other Outside Force Damage-MSA. Business District Y, Population Density L	66,010	10	#2
Through MSA-Reg_Station. Business District None, Population Density None	61,628	11	
Other Outside Force Damage-RISER. Business District Y, Population Density L	53,325	12	
Other Cause-MSA. Business District N, Population Density H	50,604	13	
Pipe, Weld, or Joint Failure-MSA. Business District N, Population Density L	46,290	14	
Overpressure Leak-Reg_Station. Business District None, Population Density None	44,564	15	
Pipe, Weld, or Joint Failure-MSA. Business District Y, Population Density L	42,434	16	
…	…	17-44	…



3A 3B 3C 3D

Incident (LoRE/CoRE) Pair	Risk Score	Rank	Quantile	Region	Tranche
Other Cause-MSA. Business District N, Population Density L	587,045	1		UL/LC	Above-1-1
Equipment Failure-MSA. Business District N, Population Density L	340,924	2		UL/LC	Above-1-1
Corrosion-RISER. Business District N, Population Density L	181,678	3		LL/UC	Above-1-2
Other Outside Force Damage-MSA. Business District N, Population Density L	169,875	4		LL/UC	Above-1-2
Other Cause-MSA. Business District Y, Population Density L	133,377	5	#1	UL/LC	Above-1-1
Equipment Failure-MSA. Business District Y, Population Density L	106,731	6		UL/LC	Above-1-1
Corrosion-MSA. Business District N, Population Density L	103,507	7		UL/LC	Above-1-1
Overpressure Leak-Reg_Station. Business District None, Population Density None	93,209	8		LL/UC	Above-1-2
Other Outside Force Damage-RISER. Business District N, Population Density L	83,650	9		LL/UC	Above-1-2
Other Outside Force Damage-MSA. Business District Y, Population Density L	66,010	10		LL/UC	Above-2-3
				LL/UC	Above-2-3
Through MSA-Reg_Station. Business District None, Population Density None	61,628	11		LL/UC	Above-2-3
Other Outside Force Damage-RISER. Business District Y, Population Density L	53,325	12		UL/LC	Above-2-4
Other Cause-MSA. Business District N, Population Density H	50,604	13	#2	UL/LC	Above-2-4
Pipe, Weld, or Joint Failure-MSA. Business District N, Population Density L	46,290	14		LL/UC	Above-2-3
Overpressure Leak-Reg_Station. Business District None, Population Density None	44,564	15		UL/LC	Above-2-4
Pipe, Weld, or Joint Failure-MSA. Business District Y, Population Density L	42,434	16		UL/LC	Above-2-4
...	...	17-44		...	...

4A

Tranche LoRE is the sum of the LoREs of the Incidents comprising the Tranche

4B

Tranche CoRE is the weighted average of the CoREs of the Incidents comprising the Tranche

4C

Tranche Risk Score is the Tranche LoRE x Tranche CoRE

	4A	4B	4C	
Incident (LoRE/CoRE) Pair	**Tranche**	**Tranche LoRE**	**Tranche CoRE**	**Tranche Risk Score**
Other Cause-MSA. Business District N, Population Density L	Above-1-1	3165.86	402	1,271,585
Equipment Failure-MSA. Business District N, Population Density L	Above-1-1			
Other Cause-MSA. Business District Y, Population Density L	Above-1-1			
Equipment Failure-MSA. Business District Y, Population Density L	Above-1-1			
Corrosion-MSA. Business District N, Population Density L	Above-1-1			
Corrosion-RISER. Business District N, Population Density L	Above-1-2	211.15	2503	528,413
Other Outside Force Damage-MSA. Business District N, Population Density L	Above-1-2			
Overpressure Leak-Reg_Station. Business District None, Population Density None	Above-1-2			
Other Outside Force Damage-RISER. Business District N, Population Density L	Above-1-2			
Other Outside Force Damage-MSA. Business District Y, Population Density L	Above-2-3	27.41	8228	225,526
Through MSA-Reg_Station. Business District None, Population Density None	Above-2-3			
Other Outside Force Damage-RISER. Business District Y, Population Density L	Above-2-3			
Overpressure Leak-Reg_Station. Business District None, Population Density None	Above-2-3			
Other Cause-MSA. Business District N, Population Density H	Above-2-4	380.88	467	178,002
Pipe, Weld, or Joint Failure-MSA. Business District N, Population Density L	Above-2-4			
Pipe, Weld, or Joint Failure-MSA. Business District Y, Population Density L	Above-2-4			
Corrosion-RISER. Business District Y, Population Density L	Above-2-4			