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December 11, 2023

Electronic Filing

Sherri L. Golden, Secretary of the Board
New Jersey Board of Public Utilities
44 South Clinton Avenue
P. O. Box 350
Trenton, NJ 08625-0350

Re: In the Matter of the Petition of Elizabethtown Gas Company to Implement An Infrastructure Investment Program ("IIP") And Associated Recovery Mechanism Pursuant to *N.J.S.A.* 48:2-21 and *N.J.A.C.* 14:3-2A
BPU Docket No. _____

Dear Secretary Golden:

Enclosed herewith is Elizabethtown Gas Company's Petition to implement an Infrastructure Investment Program ("IIP") and associated recovery mechanism, which has been filed electronically today utilizing the Board's e-filing Program. In accordance with the New Jersey Board of Public Utilities ("BPU") March 19, 2020 and June 10, 2020 Orders issued in BPU Docket No. EO20030254, hard copies are not being submitted at this time, but can be provided at a later time, if needed.

Please do not hesitate to contact me with any questions you may have. Thank you for your attention to this matter.

Respectfully Submitted,

Dominick DiRocco

DD:slp
Enclosures

cc: Service list (electronic only)

IN THE MATTER OF THE PETITION OF ELIZABETHTOWN GAS COMPANY TO IMPLEMENT AN INFRASTRUCTURE INVESTMENT PROGRAM ("IIP") AND ASSOCIATED RECOVERY MECHANISM PURSUANT TO *N.J.S.A.* 48:2-21 AND *N.J.A.C.* 14:3-2A
BPU DOCKET NO. GR_____

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STATE OF NEW JERSEY
BOARD OF PUBLIC UTILITIES

IN THE MATTER OF THE PETITION OF ELIZABETHTOWN GAS COMPANY TO IMPLEMENT AN INFRASTRUCTURE INVESTMENT PROGRAM ("IIP") AND ASSOCIATED RECOVERY MECHANISM PURSUANT TO *N.J.S.A.* 48:2-21 AND *N.J.A.C.* 14:3-2A	:	**BPU DOCKET NO. _____**
		CASE SUMMARY

Elizabethtown Gas Company ("Elizabethtown" or "Company") files this Petition with the New Jersey Board of Public Utilities ("Board") seeking authorization to implement an Infrastructure Investment Program 2 ("IIP 2" or "Program"), and related cost recovery mechanism through the existing Rider F to the Company's Tariff, pursuant to *N.J.S.A.* 48:2-21 and *N.J.A.C.* 14:3-2A.

The Board has recognized the prudence and need for accelerating the replacement of aging and leak prone materials to enhance natural gas distribution safety and reliability by approving multiple accelerated infrastructure replacement programs throughout the State since 2009, including Elizabethtown's Infrastructure Investment Program ("IIP") approved in 2019.

Under the IIP 2, Elizabethtown proposes a five-year program to modernize and enhance the safety and reliability of its gas distribution system by (i) installing approximately 250 miles of new main, and retiring approximately 274 miles of vintage, at-risk facilities, which include low pressure cast iron pipe, vintage plastic pipe and vintage steel pipe and associated services; (ii) continuing to upgrade the Company's legacy low pressure system to elevated pressure; and (iii) installing approximately 35,000 excess flow valves. The projected total expenditures associated with the IIP 2 are approximately $625 million, excluding Allowance for Funds Used During Construction and Independent Monitor costs, over the five-year Program. Elizabethtown is not proposing a rate change at this time and therefore, there is no immediate rate impact associated

with this Petition. Elizabethtown is requesting that the Board approve the proposed cost recovery mechanism for IIP 2. The rates associated with IIP 2 to be established under Rider F to the Company's Tariff will be determined in future proceedings before the Board.

STATE OF NEW JERSEY
BOARD OF PUBLIC UTILITIES

IN THE MATTER OF THE PETITION OF ELIZABETHTOWN GAS COMPANY TO IMPLEMENT AN INFRASTRUCTURE INVESTMENT PROGRAM ("IIP") AND ASSOCIATED RECOVERY MECHANISM PURSUANT TO *N.J.S.A.* 48:2-21 AND *N.J.A.C.* 14:3-2A	:	**VERIFIED PETITION** **BPU DOCKET NO. _____**

TO THE HONORABLE BOARD OF PUBLIC UTILITIES:

Petitioner, Elizabethtown Gas Company ("Elizabethtown," "Petitioner," or "Company"), a public utility corporation of the State of New Jersey, with its principal office at 520 Green Lane, Union, New Jersey, hereby petitions the Board of Public Utilities ("BPU" or "Board") for authorization to implement an Infrastructure Investment Program 2 ("IIP 2" or "Program") and associated cost recovery mechanism through the existing Rider F to the Company's Tariff, pursuant to *N.J.S.A.* 48:2-21 and *N.J.A.C.* 14:3-2A. In support thereof, Petitioner states as follows:

I. INTRODUCTION

1. Elizabethtown is engaged in the sale, transmission and distribution of natural gas to approximately 314,000 customers located within its service territory, including Hunterdon, Mercer, Middlesex, Morris, Sussex, Union and Warren Counties.

2. Elizabethtown is subject to regulation by the Board for the purposes of setting its retail distribution rates and ensuring that safe, adequate and proper natural gas service is provided to its customers in accordance with Title 48 of New Jersey's Statutes.

3. Elizabethtown operates its system safely, but prudence dictates the replacement of aging infrastructure in a timely manner. A significant portion of Elizabethtown's infrastructure is comprised of aging cast iron, vintage steel and certain vintage plastic distribution mains and

services that are susceptible to corrosion and/or cracking. A proactive, systematic replacement program for these facilities will allow for the continued efficient deployment of resources, less disruption of municipal, county and State roads, and a reduction in greenhouse gas emissions.

4. The Board has recognized the prudence and need for accelerating the replacement of these aging and leak prone materials in a number of gas accelerated infrastructure replacement programs that have been approved throughout the State since 2009, including Elizabethtown's Infrastructure Investment Program ("IIP") approved in 2019 [1] two Utility Infrastructure Enhancement [2] programs, the Elizabethtown Natural Gas Distribution Reinforcement Effort [3] program, and the Company's Accelerated Infrastructure Replacement [4] program. Indeed, over the past 17 years as a result of these and other capital programs Elizabethtown has successfully replaced approximately 800 miles of vintage cast iron and steel facilities with modern plastic materials that have created a safer and more reliable distribution system that experiences significantly lower volumes of gas leaks and their related emissions.

[1] I/M/O the Petition of Elizabethtown Gas Company to Implement an Infrastructure Investment Program and Associated Recovery Mechanism Pursuant to N.J.S.A. 48:2-21 and N.J.A.C. 14:3-2A, BPU Docket No. GR18101197, Final Decision and Order Approving Stipulation (June 12, 2019) ("June 2019 Order").

[2] I/M/O In the Matter of the Petition of Pivotal Utility Holdings, Inc. d/b/a Elizabethtown Gas to Extend its Utility Infrastructure Enhancement Program and Revise its Utility Infrastructure Enhancement Rate BPU Docket No. GO101209696, and I/M/O the Petition of Pivotal Utility and Holdings, Inc. d/b/a Elizabethtown Gas for Approval of Increased Base Tariff Rates and Charges for Gas Services and Other Tariff Revisions, BPU Docket No. GR09030195, Decision and Order Approving Final Stipulation (May 16, 2011); I/M/O the Petition of Pivotal Utility and Holdings, Inc. d/b/a Elizabethtown Gas for Approval of Increased Base Tariff Rates and Charges for Gas Services and Other Tariff Revisions, BPU Docket No. GR09030195, Order (April 28, 2009).

[3] I/M/O the Board's Establishment of a Generic Proceeding to Review the Costs, Benefits and Reliability Impacts of Major Storm Event Mitigation Efforts, BPU Docket No. AX13030197, and I/M/O the Petition of Pivotal Utility Holdings, Inc. d/b/a Elizabethtown Gas for Approval of the Elizabethtown Natural Gas Distribution Utility Reinforcement Effort Program and Deferred Accounting Treatment, BPU Docket No. GO13050434, Decision and Order Approving Stipulation (July 23, 2014).

[4] I/M/O the Petition of Pivotal Utility Holdings, Inc. d/b/a Elizabethtown Gas for Approval of an Accelerated Infrastructure Replacement Program and an Associated Cost Recovery Mechanism, BPU Docket No. GO12070693, Order (August 21, 2013).

5. Elizabethtown proposes to invest and recover the cost of the Program in accordance with the Board's Infrastructure Investment and Recovery regulations, *N.J.A.C.* 14:3-2A.1 *et seq.,* ("IIP Regulations"). These regulations encourage the implementation of infrastructure investment programs and provide for an associated recovery mechanism to allow a utility to accelerate its investment in the construction, installation and rehabilitation of certain non-revenue producing utility plant and facilities that enhance safety, reliability and/or resiliency.

6. By this Petition, Elizabethtown seeks the approval of the Board to commence a five year Program to: (i) install approximately 250 miles of new main and retire approximately 274 miles of at-risk cast iron, vintage steel (including less than ½ mile of copper lined steel) and vintage plastic mains and associated services; (ii) continue to upgrade the Company's legacy low pressure system to elevated pressure and (iii) install approximately 35,000 excess flow valves where appropriate on services on the upgraded system. The Company is also relocating inside meter sets to outside, where applicable, but these costs, like all other meter costs, will not be recovered through the IIP 2. The Company proposes to commence the Program on July 1, 2024 and to invest a total of $625 million (excluding Allowance for Funds Used During Construction ("AFUDC") and Independent Monitor costs) in this Program.

7. Although Elizabethtown is not proposing any rate adjustment associated with the IIP 2 at this time, the Company is requesting that the Board approve the proposed cost recovery mechanism for the IIP 2, as described herein, pursuant to the aforementioned statutory authority.

II. IIP 2 PROPOSAL

A. The Proposed IIP 2 Is Consistent With Federal And State Policy Objectives

8. The Company's proposed IIP 2 is consistent with Federal and State policy objectives to reduce greenhouse gas methane emissions. Specifically, it is consistent with the Biden Administration's U.S. Methane Emissions Reduction Action Plan ("Plan") released in

November 2022. The Plan refers to an estimated 2.3 million miles of gas distribution pipelines that extend into cities and towns throughout the United States. The report found that many of these pipelines are old, leaking and susceptible to rupture and when gas distribution pipelines fail, such failure can generate enormous emissions. The report also found that when aging or damaged gas distribution pipelines are repaired or replaced, methane emissions can be cut by up to 90%.[5] Older distribution facilities such as cast iron, vintage steel and vintage plastic are particularly vulnerable to failure and over pressurization and much of these materials are disproportionately concentrated in older, residential (often urban) areas with historically underserved and disadvantaged populations. The Plan represents the latest in a series of federal pronouncements that encourage the replacement of aging gas distribution pipelines. In this regard, in April 2011, U.S. Secretary of Transportation Ray LaHood announced a national initiative to repair and replace aging pipelines called the "Pipeline Safety Action Plan."[6] In furtherance of the Pipeline Safety Action Plan, Secretary LaHood issued a "Call to Action" to natural gas pipeline operators, utility regulators and other State and Federal officials, charging them with accelerating the repair and replacement of pipeline infrastructure. Similarly, in a December 2011 letter to the National Association of Regulatory Utility Commissioners, PHMSA recommended that state public utility commissions consider accelerating work on high-risk gas infrastructure, including cast iron and unprotected bare steel gas mains and other older pipe that is subject to corrosion.

9. In New Jersey, the most recent Energy Master Plan ("EMP") update also supports investments in natural gas infrastructure as a way to reduce energy costs and enhance energy security.[7] Elizabethtown recognizes the importance of New Jersey's environmental goals,

[5] U.S. Methane Emissions Reduction Action Plan (whitehouse.gov).

[6] Call to Action | PHMSA (dot.gov).

[7] http://d31hzlhk6di2h5.cloudfront.net/20200127/84/84/03/b2/2293766d081ff4a3cd8e60aa/NJBPU_EMP.pdf.

including reducing carbon emissions, and the Company is committed to the State's objectives. Most recently, South Jersey Industries ("SJI"), the parent of Elizabethtown, announced a comprehensive plan, including the establishment of benchmarks to achieve a 70% carbon reduction of operational emissions and consumption by the year 2030 and 100% carbon neutrality by 2040. This proposed IIP 2 will significantly advance SJI's goals, as the targeted vintage pipe is the most leak-prone infrastructure in the Company's inventory. Furthermore, the Company plans to administer multiple Advanced Leak Detection ("ALD") surveys to measure the quantity of emissions from pipelines and then use the data to target and prioritize the largest emissions facilities. Additionally, Elizabethtown's IIP 2 is consistent with EMP policies. The EMP emphasizes investment in gas infrastructure overall as a means of lowering energy costs, decreasing carbon emissions and enhancing energy security. Specifically, the EMP states that New Jersey has benefitted from the enhancement and expansion of its gas distribution system, which "will help further lower the cost of energy to New Jersey's homeowners and businesses and reduce emissions."[8] The most recent EMP update specifically notes that "[the] BPU has approved almost $1 billion for natural gas utility infrastructure upgrades and mitigation projects", and that "[a]n additional $280 million in proposed projects is pending".[9] Finally, Elizabethtown's proposed investment in gas infrastructure modernization is consistent with these EMP policies and the proposed IIP 2 aligns directly with Strategy 5 of the EMP, "Decarbonize and Modernize New Jersey's Energy System." Specifically, Goal 5.4 focuses on and calls for New Jersey to "[m]aintain existing gas pipeline system reliability and while planning for future reductions in natural gas consumption." A critical component of Goal 5.4 is the directive in clause 5.4.4 to "identify and

[8] *Id*. at p. 5.

[9] *Id.* at p. 5.

prioritize the replacement of pipelines leaking methane." Consistent with Strategy 5, the proposed IIP 2 accelerates the reduction of methane leaks and eliminates Elizabethtown's most leak-prone pipe.

10. In addition, the 2020 the New Jersey Global Warming Response Act ("GWRA") 80 x 50 Report includes a goal of reducing New Jersey greenhouse gas emissions 80% below 2006 levels by 2050.[10] Consistent with the goals of GWRA, IIP 2 will effectuate a direct and substantial reduction of methane emissions from the gas distribution system. Service line excess flow valves will be installed which will prevent the release of methane from service lines in the event of excavation damage. Moreover, the Program will replace low pressure, leak prone cast iron pipelines with elevated pressure pipe. Elevated pressure allows for the increased ability to use higher efficiency appliances, allowing for decreased total energy consumption. Polyethylene pipe has also been proven to be compatible with hydrogen blends, preparing for the potential introduction of a low, and potentially zero, carbon fuel source to the Company's gas distribution system. As New Jersey focuses on the most cost-effective means to achieve its clean energy goals, the safe delivery of natural gas represents a reliable, affordable and clean solution for the State's energy strategy.

11. Additionally, Elizabethtown's proposal conforms with Executive Order No. 317 ("EO 317"), issued by Governor Murphy on February 15, 2023. EO 317 initiated proceedings concerning, *inter alia*, "the development of natural gas utility plans that reduce emissions from the natural gas sector." While the proceedings required under EO 317 are not yet complete as of the date of this Petition, Elizabethtown's proposal, if approved and implemented, will reduce methane leaks in substantial portions of Elizabethtown's gas system (including overburdened communities

[10] nj-gwra-80x50-report-2020.pdf.

("OBCs")), and will therefore "reduce emissions from the natural gas sector" and combat climate change. As EO 317 itself recognizes, and as acknowledged by BPU officials both during the EO 317 proceedings to date and at other times, New Jersey will continue to rely on the natural gas system for the foreseeable future. Accordingly, Elizabethtown's proposal to reduce emissions from its system, as set forth in more detail below, is consistent with the State's policy and its emissions reduction goals.

12. The Company's proposed IIP 2 is also consistent with Federal and State policy objectives to ensure system integrity and the provision of safe and reliable gas distribution service. In the wake of several major pipeline incidents in recent years, national focus on pipeline safety has increased. Of particular relevance, in 2023, the Pipeline and Hazardous Materials Safety Administration ("PHMSA") issued two Notices of Proposed Rulemaking ("NPRM") on Safety of Gas Distribution Pipelines and Other Pipeline Safety Initiatives. Published May 4, 2023, the NPRM Gas Pipeline Leak Detection and Repair [11] contemplates increased leak survey requirements for materials "known to leak," *i.e.* cast/wrought/ductile irons, bare/unprotected steel and vintage plastics; and would require (i) written ALD programs thereby increasing the sensitivity of leak detection equipment and likely leading to more leaks identified; (ii) grading of all leaks with specific timeframes for repair, including grade 3 leaks which currently do not have repair requirements; and (iii) a post repair recheck on all leak repairs, which currently is not required. In addition, NPRM Safety of Gas Distribution Pipelines and Other Pipeline Safety Initiatives published September 7, 2023 [12] would require all new, replaced, or changed district regulator stations serving LP systems to have a least 2 methods of over pressure protection and would require

[11] Federal Register: Pipeline Safety: Gas Pipeline Leak Detection and Repair, 88 FR 31890.

[12] Federal Register: Pipeline Safety: Safety of Gas Distribution Pipelines and Other Pipeline Safety Initiatives, 88 FR 61746.

real-time monitoring devices at all times downstream of the station. Adoption of the NPRMs will require Elizabethtown to update its Distribution Integrity Management Plan ("DIMP") to include age, certain material types and over pressurization as a threat considered by the DIMP. Though Elizabethtown already considers these factors in its DIMP, all risks will be required to be addressed through "accelerated actions." The proposed IIP 2 filing is the Company's "accelerated action" to address and eliminate said risks. The requirements that will be created by the NPRMs are directly applicable to Elizabethtown's gas distribution system and fully justify its proposal to ensure safety through an accelerated program to replace its highest risk facilities. Indeed, PHMSA has found that proactive management of the integrity of aging pipe infrastructure enhances safety and reliability, contributes to cost savings over the longer term, and can be less disruptive to customers and communities than a reactive approach.[13]

13. On January 16, 2018, the Board promulgated the IIP Regulations, encouraging utilities to implement infrastructure investment programs like Elizabethtown's proposed IIP 2. Specifically, the IIP Regulations were adopted by the BPU to (1) allow a utility to accelerate its investment to construct, install or remediate utility plant and facilities related to enhanced reliability, resiliency and/or safety to provide safe and adequate service, and (2) to provide a rate recovery mechanism that encourages and supports necessary investments. Thus, the IIP Regulations and related programs were intended to create a financial incentive for utilities to accelerate the level of investment needed to promote the timely rehabilitation and replacement of certain non-revenue producing components that enhance reliability, resiliency and/or safety. The proposed IIP 2 has been designed in conformance with the Board's IIP Regulations, the EMP, the

[13] Pipeline Replacement Background | PHMSA (dot.gov).

GWRA and Federal regulations. Exhibit A attached hereto includes a summary of the Minimum Filing Requirements ("MFRs") and the location of all such MFRs in this Petition.

B. Program Proposal

14. With the IIP 2, Elizabethtown proposes to build on its previous efforts by investing up to $625 million, excluding AFUDC and Independent Monitor costs, over a five-year period for the projects described below. These projects are detailed further in the Direct Testimonies of Company witnesses Christie McMullen and Michael P. Scacifero, and Kevin Garrity of the Mears Group, Inc. ("Mears"), a corrosion engineering and integrity service provider with over 400 employees, and include:[14]

- installation of approximately 250 miles of new main, and associated services, and retirement of approximately 274 miles of vintage facilities that include: (i) low pressure cast iron pipe that is prone to leaking and breakage; (ii) vintage plastic pipe that includes Adyl-A and Drisco 8000 pipe that was installed prior to 1984 and has been found to be prone to cracking and embrittlement (hereinafter "Vintage Plastic"); and (iii) pre-code[15] coated or bare carbon steel pipe that was installed prior to 1971 and is subject to failure in an unpredictable manner (hereinafter "Vintage Steel");
- the continued upgrade of the Company's legacy low pressure system to elevated pressure; and

[14] Mears is a wholly owned subsidiary of Quantum Services. Mears has over 50 years of experience providing engineering, construction and maintenance services to the natural gas, electric, telecommunications and wastewater industries.

[15] The term "pre-code" refers to the fact that the pipe facilities were installed before the enactment of pipeline safety regulations by the U.S. Department of Transportation's Office of Pipeline Safety in 1971.

- the installation of approximately 35,000 excess flow valves where appropriate on services on the upgraded system.

15. Elizabethtown's proposed IIP 2 has been developed by identifying the highest system risks for pipeline failure through the application of its DIMP. This approach has identified cast iron mains break, pre-code steel failure, and failure of vintage plastic pipelines as the most significant threats to pipeline facilities that comprise the Company's distribution system. Elizabethtown's proposed IIP 2 has also been subject to an expert evaluation by Mears, as described in the Direct Testimony of Kevin Garrity and the expert report he sponsors.

C. Proposed Cost Per Mile for IIP 2

16. Elizabethtown is proposing a cost per mile for IIP 2 of $2.5 million. This cost per mile is based, in part, upon knowledge and experience that the Company acquired during the first four years of the current IIP. Specifically, Elizabethtown has incurred costs well in excess of the $1.2 million cost per mile authorized for the current IIP, due to (but not limited to) increased diesel fuel costs, installation of wider diameter pipe, increased costs for police presence and additional traffic control measures and additional townships requiring curb-to-curb paving. In addition, other factors contributing to the proposed $2.5 million cost per mile for IIP 2 include: (i) an increase in the number of services per mile; (ii) increased costs due to the necessity of work done in densely populated urban areas; (iii) increased costs necessitated by the Office of Pipeline Management's updated requirements; and (iv) escalation of year over year costs including, but not limited to, labor and materials, environmental and linear construction costs. Company witness Michael P. Scacifero discusses the reasons that Elizabethtown costs of replacing pipe have increased as well as the Company's efforts to mitigate such increases.

17. The initiatives included in the IIP 2 are significant in scale and scope and, therefore, flexibility in budgeting the Program is necessary and appropriate. Accordingly, consistent with the provisions of N.J.A.C. 14:3-2A.4(f), it is the Company's proposal that year-to-year variations in the IIP 2 annual budget of up to 10 percent will be permitted, provided that the total IIP 2 budget is not exceeded. To the extent that year-to-year variations in the IIP 2 budget exceed the 10 percent variation level, the Company would seek Board approval of any variations in excess of 10 percent.

D. Proposed Baseline Spending for IIP 2

18. As part of the Program, the Company commits to capital expenditures on projects similar to those proposed within the IIP 2 in an amount of at least ten percent (10%) of total program spending. These capital expenditures will be recovered in a future base rate proceeding and will not be subject to the cost recovery mechanism set forth herein consistent with *N.J.A.C.* 14:3-2A.2(c). The $62.5 million proposed IIP 2 baseline spending satisfies the objectives and goals of the IIP Regulations and may be approved within the Board's discretion.

19. In addition, as required by the IIP Regulations, the Company must continue to invest capital annually on non-replacement infrastructure projects, to be recovered in the utility's next base rate case. Pursuant to *N.J.A.C.* 14:3-2A.3, in approving annual total capital baseline spending levels, the Board has the flexibility to consider a number of factors including historic and projected capital expenditure budgets, depreciation expense and "and any other data deemed relevant by the Board in establishing the annual baseline spending levels." In this case, Elizabethtown proposes total capital baseline spending of an average annual amount of $93 million per IIP year or $465 million over the 5-year Program period from July 1, 2024 through June 30, 2029. New business expenditures included in this total capital baseline spending will not exceed $105 million of the $465 million total, or an average of $21 million per IIP year. Elizabethtown's

level of actual total capital baseline spending for calendar years 2019 through 2022 and forecast total capital baseline spending for 2023 total $734.0 million over the 5-year period, or an average of $146.8 million per year. These amounts include new business expenditures totaling $213.6 million during this 5-year period, or an average of $42.7 million per year. The proposed level of baseline capital expenditures is derived from the Company's historic level of capital expenditures, as calculated on Schedule MPS-2 included with the testimony of Michael P. Scacifero attached hereto. The Company's projected capital expenditure budgets as shown on Schedule MPS-1, also included with Mr. Scacifero's testimony, are based on and contingent upon the approval of this proposed Program.

E. Proposed Cost Recovery for IIP 2

20. Elizabethtown proposes to recover costs of the IIP 2 through the existing Rider F to the Company's Tariff, which provides a rate mechanism to recover the revenue requirements associated with the IIP 2 based on actual plant in-service for annual periods consistent with *N.J.A.C.* 14:3-2A.6(a).

21. As detailed in the Direct Testimony of Thomas Kaufmann, Manager Rates and Tariffs, Elizabethtown proposes to make annual rate adjustment filings on April 30th and July 15th of each year of the five-year Program.

22. Consistent with the IIP Regulations, Elizabethtown proposes to file rate adjustments annually when eligible in-service amounts exceed ten (10) percent of the total proposed program spending. Therefore, based on the Company's current 5-year capital expenditure forecast, the first rate adjustment filing will occur on April 30, 2025 based on actual plant in-service through March 31, 2025 and projections through June 30, 2025, with an update

filed on July 15, 2025 based on actual plant in-service through June 30, 2025. There would be no rate adjustment or customer bill impacts from the Program until October 1, 2025.

23. Assuming approval of the IIP 2 on or prior to July 1, 2024, the proposed IIP 2 investments are scheduled to be completed by June 30, 2029, except for certain residual close-out work that may occur following the conclusion of the Program. As such, to close out the IIP 2 projects, the Company proposes a rate adjustment filing on April 30, 2030 based on actual plant in-service through March 31, 2030 and projections through June 30, 2030, with an update filed on July 15, 2030 based on actual plant in-service through June 30, 2030. Given the nature of the work, the April 30, 2030 and July 15, 2030 filings may be less than 10% of total program spending.

24. Elizabethtown proposes that the costs to be included in rates will include: (1) depreciation expense providing for the recovery of the invested capital over its useful book life and (2) a return on the net investment, which will be calculated as the gross investment, plus AFUDC and Independent Monitor costs, less depreciation expense and deferred income taxes. The return on this net investment will be calculated utilizing the after-tax Weighted Average Cost of Capital ("WACC") which is predicated on the rate of return ("ROR") approved in the Company's most recent base rate case in BPU Docket No. GR21121254.[16] The ROR is 6.83% while the after-tax WACC is 6.31%, both of which are based on a return on equity ("ROE") of 9.60% and an equity component of 52%. Any change in the ROR (and resulting after-tax WACC) authorized by the Board in a future base rate case will be reflected in the subsequent monthly revenue requirement calculations.

[16] In the Matter of the Petition of Elizabethtown Gas Company for Approval of Increased Base Tariff Rates and Charges for Gas Service, Changes to Depreciation Rates, and Other Tariff Revisions, Docket No. GR21121254, "Decision and Order Approving Initial Decision and Stipulation" (August 17, 2022).

25. Board Staff and the New Jersey Division of Rate Counsel ("Rate Counsel") will have an opportunity to review each IIP 2 cost recovery filing to ensure that the revenue requirements and proposed rates are calculated in accordance with the Board's order approving the Program. The actual prudence of the Company's IIP 2 expenditures will be reviewed as part of Elizabethtown's subsequent base rate case(s). The Company proposes that it will file a base rate case no later than five years after the commencement of the IIP 2.

26. In addition, the IIP 2 will be subject to an earnings test on ROE. Consistent with the current IIP, if the Company exceeds the allowed ROE from the utility's last base rate case by fifty (50) basis points or more, the pending rate adjustment shall not be allowed for the applicable filing period. Details regarding application of the earnings test are set forth in the Direct Testimony of Thomas Kaufmann, submitted herewith.

F. IIP 2 Rate Impact

27. The revenue requirement and customer bill impacts associated with each rate adjustment will be set forth in each of the Company's annual filings. The first rate adjustment associated with the IIP 2 will not take place until October 1, 2025.

28. Based upon the proposed Program spending, it is estimated that the monthly increase to the average residential heating customer using 100 therms will be approximately $3.81, or 3.1%, at the time of the first rate adjustment on October 1, 2025. This 3.1% increase is based on a current bill as of December 1, 2023, adjusted to include an estimate of year 5 of the current IIP which will be filed in July 2024 based on actuals through June 30, 2024 and proposed to be implemented also on October 1, 2025.

29. Because the initial rate change associated with IIP 2 will not occur until October 1, 2025, no public comment hearings are required. Nevertheless, Elizabethtown provided a proposed

form of public notice of filing and public hearings, attached hereto as Exhibit B, including the proposed incremental rates and bill impacts attributable to the implementation of the Program.

G. IIP 2 Reporting Mechanism

30. Elizabethtown proposes to provide Board Staff and Rate Counsel with semi-annual status reports detailing the following information in accordance with *N.J.A.C.* 14:3-2A.5(e): (i) forecasted and actual costs of the Program by major category; (ii) estimated total quantity of work completed under the Program by major category; (iii) estimated completion dates for the Program and each major category; (iv) anticipated changes to Program projects, if any; and (v) any other performance metrics required by the Board.

III. NEED FOR IIP 2 AND PROGRAM BENEFITS

31. The proposed IIP 2 will produce benefits for Elizabethtown's customers, its gas distribution system as a whole, the State of New Jersey and the environment. Customers will benefit from a safer, more modern system that accommodates newer technologies and appliances. The replacement of mains and associated services and the installation of approximately 35,000 excess flow valves will enhance the safety and reliability of the Company's gas distribution system through the use of more modern materials and construction. An additional benefit of the IIP 2 is an accelerated reduction of greenhouse gas emissions from legacy facilities. Methane emission reduction from the Program is estimated at approximately 177 metric tons per year.

32. Elizabethtown's customers and the State will also benefit from the efficiencies of cost-effective construction under the Program. The replacement of aging mains on the Company's system is consistent with and supports the Board's longstanding approach to proactively addressing aging infrastructure for New Jersey utilities. The systematic, long-term approach taken by Elizabethtown in the IIP 2 allows the Company to take advantage of economies of scale, reduce

municipal disruption and institute a more efficient workflow. Indeed, since the adoption of the IIP Regulations in 2018, the Board has approved IIPs for a number of the State's utilities that have supported the accelerated replacement of cast iron,[17] Vintage Steel[18] and Vintage Plastic facilities.[19]

33. Elizabethtown also anticipates that implementation of the proposed IIP 2 will support economic development and enhanced employment opportunities in New Jersey. In the Board's Job Impact statement to the IIP rule proposal, it cited a Rutgers University study that reported for every $1 million of utility infrastructure project spending, a total of 6.5 to 7.9 full year jobs are created in New Jersey.[20] Based upon this study, the Company anticipates that the IIP 2 will support the employment of approximately 900 full time jobs per year using the average of the jobs per million above. IIP 2 also has the added benefit of a significant amount of system upgrades in many of New Jersey's OBCs. A significant amount of system upgrade work is planned in OBCs as outlined in further detail in the testimony of Michael P. Scacifero attached hereto. These positive benefits, which will be realized through implementation of the IIP 2, more than justify the need for the Program and the associated cost recovery mechanism.

IV. DIRECT TESTIMONY AND PROCEDURAL MATTERS

34. Attached to this Petition in support of the requests made herein are the following Direct Testimony exhibits:

[17] See, e.g., June 2019 Order; I/M/O the Petition of Public Service Electric and Gas Company for Approval of the Next Phase of the Gas System Modernization Program and Associated Cost Recovery Mechanism ("GSMP II"), BPU Docket No. GR17070776, Decision and Order Approving Stipulation (May 22, 2018).

[18] I/M/O the Petition of South Jersey Gas Company to Implement an Infrastructure Investment Program ("IIP") and Associated Cost Recovery Mechanism Pursuant to N.J.S.A. 48:2-21 and N.J.A.C. 14:3-2A, BPU Docket No. GR20110726, Decision and Order Approving Stipulation (June 8, 2022) ("SJG IIP Order").

[19] SJG IIP Order.

[20] 49 *N.J.R.* 2489, at 2490.

Exhibit P-2: Direct Testimony of Christie McMullen, President and Chief Operating Officer

Exhibit P-3: Direct Testimony of Michael P. Scacifero, Sr. Director Engineering Services

Exhibit P-4: Direct Testimony of Thomas Kaufmann, Manager Rates & Tariffs

Exhibit P-5: Direct Testimony of Kevin Garrity, Executive Vice President, Mears Group, Inc.

35. Given the need for the infrastructure investment included in the proposed IIP 2 and the high priority that the State places on such investment and the continued safe, adequate and reliable operation of natural gas distribution systems, it is important for Elizabethtown to receive Board approval for the Program in time to begin planning for, designing and making the capital investments described herein for a program commencing July 1, 2024. Therefore, the Company respectfully requests that the Board retain this matter and utilize a schedule similar to the following procedural schedule:

Petition and Direct Testimony Filed
Prehearing Conference
Complete all Discovery on Elizabethtown Filing
Non-Petitioner Direct Testimony Due
Complete all Discovery on Non-Petitioner Testimony
Rebuttal Testimony – All Parties
Discovery Requests on Rebuttal Testimony
Settlement Conferences
Hearings
Initial Briefs
Reply Briefs
BPU Decision and Order

36. The Company is serving notice of this Petition and supporting documentation on the Director, Rate Counsel via electronic mail in lieu of providing hard copies. In accordance with

the Board's March 19, 2020 and June 10, 2020 Orders issued in BPU Docket No. EO20030254, hard copies are not being submitted at this time, but can be provided at a later time, if needed.

V. CONCLUSION AND REQUEST FOR RELIEF

37. For the foregoing reasons, and the reasons set forth in the Direct Testimonies attached to this Petition, Elizabethtown respectfully requests that the Board issue an Order or Orders as follows:

1. Finding that the IIP 2 is in the public interest, is reasonable and is prudent;

2. Approving the IIP 2, as set forth herein and in the attached Direct Testimonies and Schedules, for a period of (5) years with authorized investments of $625 million, excluding AFUDC and Independent Monitor costs;

3. Approving the IIP 2 cost recovery mechanism, as proposed herein and detailed in the attached Direct Testimonies and Schedules.

Respectfully submitted,
ELIZABETHTOWN GAS COMPANY

By: Dominick DiRocco
VP, Rates & Regulatory Affairs

Date: December 11, 2023

Communications addressed to Petitioner
in this case are to be sent to:

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Director, Rates
SJI Utilities, Inc.
1 South Jersey Place
Atlantic City, NJ 08401
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ccapozzoli@sjindustries.com

VERIFICATION

I, Dominick DiRocco, Esq., of full age, being duly sworn according to law, upon my oath, depose and say:

1. I am VP/Rates & Regulatory Affairs of SJI Utilities, Inc., the parent company to Elizabethtown Gas Company ("Company") and I am authorized to make this verification on behalf of the Company.

2. I have reviewed the within petition and the information contained therein is true according to the best of my knowledge, information and belief.

Dominick DiRocco

Dominick DiRocco, Esq.
VP/Rates & Regulatory Affairs

Sworn to and subscribed
before me this 11th day
of December 2023

Carolyn A. Jacobs

Carolyn A. Jacobs
NOTARY PUBLIC
State of New Jersey
My Commission Expires
October 28, 2028

Exhibit A

IN THE MATTER OF THE PETITION OF ELIZABETHTOWN GAS COMPANY TO IMPLEMENT AN INFRASTRUCTURE INVESTMENT PROGRAM ("IIP") AND ASSOCIATED RECOVERY MECHANISM PURSUANT TO *N.J.S.A.* 48:2-21 AND *N.J.A.C.* 14:3-2A
BPU Docket No. _____

MINIMUM FILING REQUIREMENTS (MFRs) INDEX

Minimum Filing Requirement	Location in Filing
14:3-2A.2 Project eligibility	
a) The projects within an Infrastructure Investment Program shall be: 1. Related to safety, reliability, and/or resiliency; 2. Non-revenue producing; 3. Specifically identified by the utility within its petition in support of an Infrastructure Investment Program; and 4. Approved by the Board for inclusion in an Infrastructure Investment Program, in response to the utility's petition.	Petition, paras. 14, 15 M. Scacifero Testimony, pages 4-5, 17-24 Schedule KCG-1
b) Projects within an Infrastructure Investment Program may include: 5. The replacement of gas Utilization Pressure Cast Iron mains with elevated pressure mains and associated services; 6. The replacement of mains and services that are identified as high risk in a gas utility's Distribution Integrity Management Plan; 7. The installation of gas Excess Flow Valves where existing gas service line replacements require them, excluding Excess Flow Valves installed upon customer request pursuant to 49 CFR 192.383; 8. Electric distribution automation investments, including, but not limited to, Supervisory Control and Data Acquisition equipment, cybersecurity investments, relays, reclosers, Voltage and Reactive Power Control, communications networks, and Distribution Management System Integration; 9. The installation of break-predictive water sensors and wastewater sensors to curtail combined sewer overflows; and 10. Other projects deemed appropriate by the Board.	Petition, paras. 14, 15 M. Scacifero Testimony, pages 4-5, 17-24 Schedule KCG-1
c) A utility shall maintain its capital expenditures on projects similar to those proposed within the utility's Infrastructure Investment Program. These capital expenditures shall amount to at least ten (10) percent of any approved Infrastructure Investment Program. These capital expenditures shall be made in the normal course of business and recovered in a base rate proceeding, and shall not be subject to the recovery mechanism set forth in N.J.A.C. 14:3-2A.6.	Petition, para. 18 M. Scacifero Testimony, pages 33-34 Schedule MPS-3

Exhibit A

IN THE MATTER OF THE PETITION OF ELIZABETHTOWN GAS COMPANY TO IMPLEMENT AN INFRASTRUCTURE INVESTMENT PROGRAM ("IIP") AND ASSOCIATED RECOVERY MECHANISM PURSUANT TO *N.J.S.A.* 48:2-21 AND *N.J.A.C.* 14:3-2A
BPU Docket No. _____

MINIMUM FILING REQUIREMENTS (MFRs) INDEX

14:3-2A.3 Annual baseline spending levels	
a) A utility seeking to establish an Infrastructure Investment Program shall, within its petition, propose annual baseline spending levels to be maintained by the utility throughout the length of the proposed Infrastructure Investment Program. These expenditures shall be recovered by the utility in the normal course within the utility's next base rate case.	Petition, paras. 18-19 M. Scacifero Testimony, pages 33-35 Schedule MPS-2
b) In proposing annual baseline spending levels, the utility shall provide appropriate data to justify the proposed annual baseline spending levels, which may include historical capital expenditure budgets, projected capital expenditure budgets, depreciation expenses, and/or any other data relevant to the utility's proposed baseline spending level	Petition, paras. 18-19 M. Scacifero Testimony, pages 33-35 Schedule MPS-2
14:3-2A.4 Infrastructure Investment Program length and limitations	
a) A utility may petition the Board for approval of an Infrastructure Investment Program extending for a period of five years or less.	Petition, paras. 6, 14 M. Scacifero Testimony, pages 4-5 and throughout Schedule TK-1
e) Allowance for Funds Used During Construction (AFUDC) shall be permitted under an Infrastructure Investment Program, but a utility shall not utilize AFUDC once Infrastructure Investment Program facilities are placed in service.	T. Kaufmann Testimony, pages 6-7, 9
f) Year-to-year variations in an Infrastructure Investment Program's approved annual budget of up to 10 percent shall be permitted, provided that the total Program budget is not exceeded. Variations in excess of 10 percent shall require Board approval.	Petition, para 17 M. Scacifero Testimony, pages 5-6
14:3-2A.5 Infrastructure Investment Program minimum filing and reporting requirements	
b) A utility requesting approval of an Infrastructure Investment Program shall include within its petition:	
1) Projected annual capital expenditure budgets for a five (5) year period, identified by major categories of expenditures	Schedule MPS-1
2) Actual annual capital expenditures for the previous five (5) years, identified by major categories of expenditures	Schedule MPS-2

IN THE MATTER OF THE PETITION OF ELIZABETHTOWN GAS COMPANY TO IMPLEMENT AN INFRASTRUCTURE INVESTMENT PROGRAM ("IIP") AND ASSOCIATED RECOVERY MECHANISM PURSUANT TO *N.J.S.A.* 48:2-21 AND *N.J.A.C.* 14:3-2A
BPU Docket No. _____

MINIMUM FILING REQUIREMENTS (MFRs) INDEX

3) An engineering evaluation and report identifying the specific projects to be included in the proposed Infrastructure Investment Program, with descriptions of project objectives, detailed cost estimates, in-service dates, and any applicable cost-benefit analysis for each project	Schedule KCG-1
4) An Infrastructure Investment Program budget setting forth annual budget expenditures	Schedule MPS-1 and MPS-3
5) A proposal addressing when the utility intends to file its next base rate case, consistent with N.J.A.C. 14:3-2A.6(f)	Petition, para. 25 T. Kaufmann Testimony, page 12
6) Proposed annual baseline spending levels, consistent with N.J.A.C. 14:3-2A.3(a) and (b)	Petition, paras. 18-19 Schedules MPS-2 and MPS-3
7) The maximum dollar amount, in aggregate, the utility seeks to recover through the Infrastructure Investment Program; and	Schedule TK-1
8) The estimated rate impact of the proposed Infrastructure Investment Program on customers	T. Kaufmann Testimony, page 14 Schedule TK-1
(d) Before the Board approves an Infrastructure Investment Program, the Board shall conduct a public hearing. Notice of the public hearing shall contain the maximum dollar amount the utility seeks to recover through its Infrastructure Investment Program and the utility's estimated rate impact.	Exhibit B
14:3-2A.6 Infrastructure Investment Program expenditure recovery	
a) A utility may file for annual or semi-annual rate recovery for facilities constructed and placed in service under an Infrastructure Investment Program. "In service" means when a project approved for inclusion in an Infrastructure Investment Program is functioning in its intended purpose, is in use (that is, not under construction) and useful (that is, actively helping the utility provide efficient service).	Petition, paras. 20-23 T. Kaufmann Testimony, pages 5, 10 Schedule TK-1
b) Each filing made by a utility seeking accelerated recovery under an Infrastructure Investment Program shall seek recovery, at a minimum, of at least 10 percent of overall Infrastructure Investment Program expenditures.	Petition, paras. 22-23 T. Kaufmann Testimony, page 10
c) A utility's expenditures made prior to the Board's approval of an Infrastructure Investment Program shall not be eligible for accelerated recovery.	T. Kaufmann Testimony, pages 8-9
d) Rates approved by the Board for recovery of expenditures under an Infrastructure Investment Program shall be accelerated, and recovered through a separate clause of the utility's Board-approved tariff.	T. Kaufmann Testimony, page 5 Schedule TK-11

IN THE MATTER OF THE PETITION OF ELIZABETHTOWN GAS COMPANY TO IMPLEMENT AN INFRASTRUCTURE INVESTMENT PROGRAM ("IIP") AND ASSOCIATED RECOVERY MECHANISM PURSUANT TO *N.J.S.A.* 48:2-21 AND *N.J.A.C.* 14:3-2A
BPU Docket No. _____

MINIMUM FILING REQUIREMENTS (MFRs) INDEX

e) Rates approved by the Board for recovery of expenditures under an Infrastructure Investment Program shall be provisional, subject to refund and interest. Prudence of Infrastructure Investment Program expenditures shall be determined in the utility's next base rate case.	T. Kaufmann Testimony, page 11
f) A utility shall file its next base rate case not later than five years after the Board's approval of the Infrastructure Investment Program, although the Board, in its discretion, may require a utility to file its next base rate case within a shorter period.	Petition, para. 25 T. Kaufmann Testimony, page 12
g) A utility may continue to file for accelerated recoveries during the approved Infrastructure Investment Program period notwithstanding the filing of the utility's next base rate case.	T. Kaufmann Testimony, page 11
h) An earnings test shall be required, where Return on Equity (ROE) shall be determined based on the actual net income of the utility for the most recent 12-month period divided by the average of the beginning and ending common equity balances for the corresponding period.	T. Kaufmann Testimony, page 11
i) For any Infrastructure Investment Program approved by the Board, if the calculated ROE exceeds the allowed ROE from the utility's last base rate case by 50 basis points or more, accelerated recovery shall not be allowed for the applicable filing period.	T. Kaufmann Testimony, page 11
IIF Merger Order – BPU Docket GM22040270	
73. In any filing to establish a new Infrastructure Investment Program, ETG will include testimony explaining why the filing is consistent with the Energy Master Plan (EMP) and the New Jersey Global Warming Response Act.	Petition, paras. 9-10 M. Scacifero Testimony, pages 12-14

Exhibit B

NOTICE OF PUBLIC HEARINGS
IN THE MATTER OF THE PETITION OF ELIZABETHTOWN GAS COMPANY TO IMPLEMENT AN INFRASTRUCTURE INVESTMENT PROGRAM ("IIP") AND ASSOCIATED RECOVERY MECHANISM PURSUANT TO *N.J.S.A.* 48:2-21 AND *N.J.A.C.* 14:3-2A
BPU Docket No. _____

PLEASE TAKE NOTICE that, on December 11, 2023, Elizabethtown Gas Company ("Company" or "Elizabethtown") filed a petition ("Petition") with the New Jersey Board of Public Utilities ("Board" or "BPU") requesting approval to implement an Infrastructure Investment Program ("IIP 2") and to permit Elizabethtown to recover the costs of the proposed IIP 2's costs under the existing Rider F to the Company's Tariff. The Company currently has an Infrastructure Investment Program ("IIP") that was approved by Board Order dated June 12, 2019 in BPU Docket No. GR18101197 and which is ending on June 30, 2024.

Elizabethtown is requesting Board approval to commence a five-year period effective July 1, 2024 in order to continue to modernize and enhance the reliability and safety of its gas distribution system by replacing vintage, at-risk cast iron, steel and plastic mains and associated services. Elizabethtown also proposes to continue to upgrade its legacy low pressure system to an elevated pressure system and to install excess flow valves where appropriate on services on the upgraded system.

The total expenditures associated with the IIP 2 are projected to approximate $625 million, excluding Allowance for Funds Used During Construction and Independent Monitor costs. Elizabethtown projects that these expenditures will enable the Company to (i) install approximately 250 miles of new main and associated services; (ii) continue to upgrade the Company's legacy low pressure system to elevated pressure; and (iii) install approximately 35,000 excess flow valves.

In conjunction with the implementation of the IIP 2, Elizabethtown proposes to follow the current filing and reporting requirements of its current IIP and to recover the costs of IIP 2 investments placed in service during the five-year program period commencing on July 1, 2024. The Rider F rate would be assessed to all of Elizabethtown's firm customers as noted in the Company's Tariff

Elizabethtown is not seeking to increase rates to recover IIP 2 costs at this time. Nonetheless, Elizabethtown forecasts that the initial IIP 2 rate increase anticipated to take effect October 1, 2025 would be designed to recover $13.6 million of IIP 2 costs for the period July 1, 2024 through June 30, 2025. This rate change would increase the annual bill of a residential heating customer using 1,000 therms by $38.10 or 3.1% as compared to the total annual bill before such change, adjusted to include an estimate of the last year of the current IIP.

Based on current projections and assuming implementation of the IIP 2 as proposed by the Company, the estimated incremental IIP 2 rates per therm and the impacts on the annual bill of a residential heating customer using 1,000 therms are as follows:

Effective Date	IIP 2 Incremental Residential Rate Per Therm	Annual Incremental Increase	Incremental % Change
10/1/25	$0.0381	$38.10	3.1%
10/1/26	$0.0382	$38.20	3.0%
10/1/27	$0.0382	$38.20	2.9%
10/1/28	$0.0382	$38.20	2.9%
10/1/29	$0.0382	$38.20	2.8%

These incremental residential rates per therm are only estimates. The actual rates per therm would be subject to Board approval and could be higher or lower depending on the Board's final determination of annual filings submitted by the Company.

Pursuant to N.J.S.A. 48:3-1, the Board may set these rates at levels it finds just and reasonable and establish the effective date of such rates. Therefore, the Board may establish these rates at levels and/or an effective date other than those proposed by Elizabethtown.

Any assistance required by customers in ascertaining the impact of the proposed incremental rates per therm will be provided by the Company upon request.

Copies of Elizabethtown's Petition can be reviewed on the Company's website at www.elizabethtowngas.com under "regulatory information". The Petition is also available to review online through the Board's website at https://publicaccess.bpu.state.nj.us where you can search by the above-captioned docket number. In addition, the Petition and Board file may be reviewed at the Board located at 44 South Clinton Avenue, 1st Floor, Trenton, NJ by appointment. To make an appointment, please call (609) 913-6298.

PLEASE TAKE FURTHER NOTICE that virtual public hearings will be conducted on the following date and times so that members of the public may present their views on the Petition:

DATE:

HEARING TIMES: 4:30 p.m. and 5:30 p.m.

LOCATION: Microsoft Teams Meeting

ID:

PASSCODE:

(Access the Microsoft Teams App or Microsoft Teams on the web. On the left side of the screen, click the "Teams" icon. Select "Join or 'create a team". Press "Join" and enter the Meeting ID and Passcode when prompted.)

or

Dial In:

Conference ID: followed by the # sign

A copy of this Notice is being served upon the clerk, executive or administrator of each municipality and county within the Company's service territory.

Representatives of the Company, Board Staff and the New Jersey Division of Rate Counsel will participate in the virtual public hearings. Members of the public are invited to participate by utilizing the Meeting ID or the Dial-In Number set forth above and may express their views on this Petition. All comments will be made part of the final record to be considered by the Board. In order to encourage full participation in this opportunity for public comment, please submit any requests for needed accommodations, such as interpreters or listening assistance, 48 hours prior to the above hearings to the Board Secretary at board.secretary@bpu.nj.gov.

The Board is also accepting written and electronic comments. Comments may be submitted directly to the specific docket listed above using the "Post Comments" button on the Board's Public Document Search tool at https://publicaccess.bpu.state.nj.us. Comments are considered public documents for purposes of the State's Open Public Records Act. Only documents that are intended to be public should be submitted using the "Post Comments" button on the Board's Public Document Search tool. Any confidential information should be submitted in accordance with the procedures set forth in N.J.A.C. 14:1-12.3. In addition to hard copy submission, confidential information may also be filed electronically vis the Board's e-filing system or by email to the Secretary of the Board, Sherri L. Golden. Please include "Confidential Information" in the subject line of any email. Instructions for confidential e-filing are found on the Board's webpage at https://www.nj.gove/bpu/agenda/efiling/.

Emailed and/or written comments may be submitted to:

Secretary of the Board
New Jersey Board of Public Utilities
44 South Clinton Avenue, 1st Floor
P.O. Box 350
Trenton, New Jersey 08625-0350
Phone: 609-923-6241
Email: board.secretary@bpu.nj.gov

Elizabethtown Gas Company
Christie McMullen, President and Chief Operating Officer

EXHIBIT P-2

STATE OF NEW JERSEY
BOARD OF PUBLIC UTILITIES

I/M/O THE PETITION OF ELIZABETHTOWN GAS COMPANY TO IMPLEMENT AN INFRASTRUCTURE INVESTMENT PROGRAM ("IIP") AND ASSOCIATED RECOVERY MECHANISM PURSUANT TO *N.J.S.A.* 48:2-21 AND *N.J.A.C.* 14:3-2A

DIRECT TESTIMONY

OF

CHRISTIE MCMULLEN
PRESIDENT AND CHIEF OPERATING OFFICER

ON BEHALF OF

ELIZABETHTOWN GAS COMPANY

December 11, 2023

DIRECT TESTIMONY OF CHRISTIE MCMULLEN

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME, AFFILIATION AND BUSINESS ADDRESS.

A. My name is Christie McMullen and I am the President and Chief Operating Officer for Elizabethtown Gas Company ("Elizabethtown" or "Company"). My business address is 520 Green Lane, Union, New Jersey 07083.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL RESPONSIBILITIES.

A. As President of Elizabethtown, I am responsible for the day-to-day operations of Elizabethtown including ensuring safety, compliance, operational excellence and financial integrity. In this capacity, I oversee all aspects of Elizabethtown's operations, including all infrastructure replacement efforts.

Q. PLEASE BRIEFLY SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND INDUSTRY-RELATED EXPERIENCE.

A. I am a graduate of the University of Maryland at College Park with a Bachelor of Science degree in electrical engineering. I also have a Masters of Business Administration from Loyola University Maryland. Prior to assuming my present responsibilities in December 2018, I was employed by Baltimore Gas & Electric Company ("BGE") where I served as Vice President of Gas Distribution from 2015-2018. I also served as the Vice President of Support Services and Chief Safety Officer (2011-2015) and Vice President of Business Transformation (2009-2011). I am a Six Sigma Master Black Belt with significant experience leading process improvement and business transformation programs. An active member of the American Gas

Association, I serve on the Leadership Council and Operations Section Managing Committee. I also serve on the Board of Directors for the Northeast Gas Association.

Q. HAVE YOU PREVIOUSLY TESTIFIED OR SUBMITTED TESTIMONY BEFORE THE NEW JERSEY BOARD OF PUBLIC UTILITIES ("BOARD" OR "BPU") OR OTHER REGULATORY COMMISSION?

A. Yes. I submitted testimony before the Board in Elizabethtown's past two rate cases in BPU Docket No. GR19040486[1] and in BPU Docket No. GR21121254.[2] I have also previously testified before the Maryland Public Service Commission regarding BGE's strategic infrastructure development and enhancement program.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to provide an overview of Elizabethtown's proposed Infrastructure Investment Program ("IIP 2" or "Program") and associated cost recovery mechanism. Specifically, the Company is seeking to implement a five-year program, commencing July 1, 2024, with a total investment level of $625 million (excluding Allowance for Funds Used During Construction ("AFUDC") and Independent Monitor costs), to enhance the safety, reliability and resiliency of Elizabethtown's distribution system. The Company proposes to recover the costs associated with IIP 2 through a

[1] In the Matter of the Petition of Elizabethtown Gas Company for Approval of Increased Base Tariff Rates and Charges for Gas Service, Changes to Depreciation Rates, and Other Tariff Revisions, Docket No. GR19040486, "Decision and Order Approving Initial Decision and Stipulation" (November 13, 2019).

[2] In the Matter of the Petition of Elizabethtown Gas Company for Approval of Increased Base Tariff Rates and Charges for Gas Service, Changes to Depreciation Rates, and Other Tariff Revisions, Docket No. GR21121254, "Decision and Order Approving Initial Decision and Stipulation" (August 17, 2022).

cost recovery mechanism in accordance with the Board's Infrastructure Investment and Recovery regulations, *N.J.A.C.* 14:3-2A.1 *et seq*. ("IIP Regulations"). The IIP Regulations specifically encourage a utility to construct, install or remediate utility plant and facilities in order to ensure continued distribution system reliability, resiliency and/or safety for the benefit of customers and other stakeholders. My testimony will provide an overview of Elizabethtown's distribution system and service territory, a summary of the proposed IIP 2, an overview of the need for the Program, and the anticipated benefits of the IIP 2.

II. IIP 2 PROPOSAL

Q. PLEASE PROVIDE AN OVERVIEW OF THE PROPOSED IIP 2.

A. With the IIP 2, the Company proposes to invest a total of $625 million, excluding AFUDC and Independent Monitor costs, over a five-year period commencing July 1, 2024 to (i) install approximately 250 miles of new main, and associated services, and retire approximately 274 miles of vintage facilities that include (a) at-risk cast iron mains; (b) vintage plastic pipe that includes Adyl-A and Drisco 8000 pipe that was installed prior to 1984 and has been found to be prone to cracking and embrittlement (hereinafter "Vintage Plastic"); and (c) pre-code[3] coated or bare carbon steel pipe that was installed prior to 1971 and subject to failure in an unpredictable manner (including less than ½ mile of copper lined steel)(hereinafter "Vintage Steel"), (ii) continue to upgrade the Company's legacy low-pressure ("LP") system to elevated pressure

[3] The term "pre-code" refers to the fact that the pipe facilities were installed before the enactment of the pipeline safety regulations by the U.S. Department of Transportation's Office of Pipeline Safety in 1971.

("EP"), and (iii) install approximately 35,000 excess flow valves ("EFVs") where appropriate on services on the upgraded system. The Company is also relocating inside meter sets to outside, where applicable, but these costs, like all other meter costs, will not be recovered through the IIP 2. The work to be undertaken in connection with the IIP 2 involves safety, reliability and resiliency projects that are non-revenue producing.

As required by the IIP Regulations, a utility must define and propose baseline spending that represents ongoing capital investments that the Company plans to make for IIP-like projects in an amount of at least ten percent (10%) of total program spending. These capital expenditures may be recovered through a traditional base rate case. As such, the Company proposes an IIP 2 baseline spending of an average of $12.5 million per year, or a total of $62.5 million, on IIP-like projects from July 1, 2024 through June 30, 2029, as discussed in further detail below.

Additionally, a utility must define and propose an overall baseline of total capital expenditures that represent total Company capital investments, excluding IIP 2 and IIP 2 baseline projects, which may be recovered through a traditional base rate case. In this case, Elizabethtown proposes total capital baseline spending of an average annual amount of $93 million per IIP year or $465 million over the five-year Program period from July 1, 2024 through June 30, 2029 as shown on Schedule MPS-1 to Company witness Michael P. Scacifero's testimony. New business expenditures included in total capital baseline spending will not exceed $105 million over the five-year term of the Program, an average of $21 million per IIP year. The proposed level of baseline capital expenditures is derived from Elizabethtown's historic level of capital expenditures over the 2019-2023 period.

Additional details concerning the scope, costs and justification for the proposed IIP 2 are described by Mr. Scacifero, Elizabethtown's Senior Director of Engineering Services and Kevin Garrity, Executive Vice President of Mears Group, Inc.

III. COMPANY OVERVIEW

Q. PLEASE PROVIDE AN OVERVIEW OF ELIZABETHTOWN'S DISTRIBUTION SYSTEM AND SERVICE TERRITORY.

A. Elizabethtown was founded in 1855 to fuel the 300 gaslights that then lined the streets of the City of Elizabeth. Today, Elizabethtown provides natural gas service to approximately 314,000 residential, commercial and industrial customers in seven counties in two areas of New Jersey: the Union and Northwest Divisions.

The Union Division, which encompasses the eastern portion of Elizabethtown's service territory, consists of 131 square miles and covers portions of Union and Middlesex Counties. The Union Division is a relatively mature service area where the majority of Elizabethtown's capital expenditures are made to replace and upgrade aging infrastructure. The Northwest Division, which encompasses the northwest portion of the Company's service territory, consists of 1,373 square miles and covers portions of Sussex, Warren, Hunterdon, Mercer and Morris counties. The Northwest Division contains relatively newer facilities and therefore, most of this area's capital expenditures are associated with new business and work required by municipalities and/or the New Jersey Department of Transportation.

Q. PLEASE DISCUSS ELIZABETHTOWN'S CURRENT OPERATIONS.

A. Elizabethtown's day-to-day operations are independently run with oversight from its parent company, SJI Utilities, Inc., a wholly owned subsidiary of South Jersey Industries, Inc. Elizabethtown's business model is based on three core values that include the provision of safe and reliable service at just and reasonable rates, a strong commitment to excellent customer service, and robust investment in regulated utility infrastructure. Elizabethtown's commitment to these values has yielded numerous positive operational results that include: (1) replacement of over 800 miles of gas distribution infrastructure in New Jersey through several BPU accelerated infrastructure recovery programs over the past 17 years, (2) a reduction in damage rates per 1,000 locates to an all-time low, (3) ongoing and continuous improvement in leak response time performance, and (4) recognition by J.D. Power and Associates customer satisfaction awards for the last eight consecutive years.

Q. PLEASE DISCUSS THE COMPANY'S CURRENT LEVEL OF CAPITAL EXPENDITURES.

A. Since the late 1990s, Elizabethtown has implemented programs to replace aging cast iron, bare steel and other related facilities in its distribution system. Most recently, through the Company's five-year IIP approved by the Board by Order dated June 12, 2019 in BPU Docket No. GR18101197, Elizabethtown installed 202 miles to replace LP cast iron and bare steel main through June 30, 2023. The Company expects to install 48 miles to replace LP cast iron and bare steel main during the last year of this program ending June 30, 2024 for total program main installations of 250 miles.

Prior to the current IIP, under a BPU approved four-year Accelerated Infrastructure Replacement program, the Company retired 94 miles of EP and LP cast iron and bare steel main. Similarly, under the Company's ENDURE program, the Company retired 12 miles of LP cast iron main located within designated Federal Emergency Management Agency flood zones.

To continue its investment on an accelerated basis for the benefit of its customers and the State of New Jersey, and as intended by the IIP Regulations, Elizabethtown is seeking approval of a five-year IIP 2 and related recovery mechanism in this proceeding to permit it to continue to proceed with the accelerated replacement of at-risk cast iron, Vintage Steel and Vintage Plastic facilities.

Q. WHY IS THE COMPANY REQUESTING RECOVERY OF IIP INVESTMENTS THROUGH THE IIP 2 INSTEAD OF A BASE RATE CASE?

A. The IIP 2 will allow the Company to continue making significant investments in non-revenue producing infrastructure and system improvements and recover the costs of those investments in a timely manner rather than through traditional base rate case filings. Without a cost recovery mechanism, the Company would need to file frequent, time consuming base rate cases to mitigate the delay in cost recovery and to ensure continued system safety, reliability and resiliency. Allowing timely cost recovery for the utility also eliminates the potential for rate shock to the customer. The appropriate price signals are given in real time rather than through a single, potentially significant rate increase due to cumulative multi-year investments.

Q. WHAT IS THE BASIS FOR THE COMPANY'S PROPOSED BASELINE SPENDING LEVELS?

A. Consistent with the IIP Regulations, the Company proposes two baseline spending levels. The first is in an amount that is at least 10 percent of the total program capital expenditures, to be recovered through a future base rate case, including capital expenditures on work similar to that proposed to be recovered under the IIP 2. The Company's proposal is IIP 2 baseline spending in the amount of $62.5 million over the five-year Program period from July 1, 2024 through June 30, 2029. In addition, the IIP Regulations require a utility to define an overall baseline of capital expenditures that represent total Company capital investments, excluding IIP 2 and IIP 2 baseline projects. The Company's proposal is to spend an average annual amount of $93 million per IIP year or $465 million over the five-year Program period from July 1, 2024 through June 30, 2029 for total capital baseline spending. New business expenditures included in total capital baseline spending will not exceed $105 million, an average of $21 million per IIP year. These expenditures do not include those associated with meeting the first baseline. This proposal is based on the Company's historic level of capital expenditures over the 2019-2023 period. Refer to the Direct Testimony of Company witness Michael P. Scacifero for additional details.

Q. HOW DOES THE COMPANY PROPOSE TO RECOVER COSTS ASSOCIATED WITH THE IIP?

A. Elizabethtown proposes to recover IIP 2 costs through Rider F to the Company's Tariff. The proposed cost recovery mechanism is discussed in further detail in the Direct Testimony of Company witness Thomas Kaufmann, Manager Rates and Tariffs.

Q. WHY IS IT APPROPRIATE TO UNDERTAKE THE PROPOSED IIP 2 AT THIS TIME?

A. The proposed IIP 2 represents a logical extension of Elizabethtown's efforts to replace non-revenue producing facilities that are leak prone and/or create a risk of unpredictable failure. As more fully described by Mr. Scacifero and Mr. Garrity, Elizabethtown presently operates approximately 737 miles of cast iron, Vintage Steel and Vintage Plastic facilities. These facilities represent the highest risk pipeline facilities on the Company's distribution system and the condition of these facilities is going to continue to deteriorate with further age. Eliminating the risks of the highest risk portions of these facilities through accelerated replacement will produce a safer and more reliable system for Elizabethtown's customers. Moreover, replacing these facilities in a proactive and systematic manner will be more beneficial and economical than a reactive approach for the Company's operations and customers and the communities that Elizabethtown serves.

In addition, the accelerated replacement of the Company's highest risk pipe is fully consistent with applicable governmental policies including the United States

Department of Transportation's Call to Action[4], the National Association of Regulatory Utility Commissioners' expanded emphasis on pipeline safety and infrastructure replacement, and the Pipeline and Hazardous Materials Safety Administration's pending Notice of Proposed Rulemaking on Safety of Gas Distribution Pipelines and Other Pipeline Safety Industries[5]. Finally, the proposed IIP 2 will achieve results that are consistent with the U.S. Methane Emissions Reduction Action Plan[6] the New Jersey Energy Master Plan[7] and Executive Order No. 317, issued by Governor Murphy on February 15, 2023, by assisting the Company in reducing methane emissions.

Q. IS THE COMPANY'S PROPOSED IIP 2 CONSISTENT WITH NEW JERSEY'S EFFORTS TO ADDRESS CLIMATE CHANGE AND PROMOTE ENVIRONMENTAL JUSTICE AS EMBODIED IN THE NEW JERSEY ENERGY MASTER PLAN AND THE GLOBAL WARMING RESPONSE ACT?

A. Yes. As noted above, the proposed IIP 2 will reduce methane emissions that result from leaks and breaks in the Company's most at-risk facilities. Many of these older facilities are located in Overburdened Communities and the citizens of these

[4] Call to Action | PHMSA (dot.gov).

[5] Federal Register :: Pipeline Safety: Safety of Gas Distribution Pipelines and Other Pipeline Safety Initiatives, 88 FR 61746.

[6] U.S. Methane Emissions Reduction Action Plan (whitehouse.gov)

[7] *See*, http://d31hzlhk6di2h5.cloudfront.net/20200127/84/84/03/b2/2293766d081ff4a3cd8e60aa/NJBPU_EMP.pdf. p. 5 and p.41.

communities will most certainly benefit from a reduction in system leaks and breakage. The Company's obligation to provide safe, reliable and resilient service to its customers has not been reduced or eliminated in any way by New Jersey's efforts to address climate change to date. Indeed, Goal 5.4.4 of the Energy Master Plan instructs gas utilities to "identify and prioritize the replacement of pipelines leaking methane". Moreover, the basic purpose of the New Jersey Global Warming Response Act 80 x 50 Report[8] is to implement cost-effective measures to reduce emissions of greenhouse gases. The systematic and economically efficient replacement of vintage, at-risk facilities represents the most effective way for the Company to comply with all of its ongoing service obligations while promoting New Jersey's environmental goals.

IV. PROGRAM BENEFITS

Q. HOW WILL THE CUSTOMER BENEFIT FROM THE IIP 2?

A. Elizabethtown's customers will benefit from the IIP 2 in several ways, including the following:

- Enhanced safety, reliability and resiliency associated with replacing aging infrastructure;
- Increased customer satisfaction due to a reduction in the frequency of leaks and breaks and the need for repair work;
- Increased ability to use higher-efficiency gas appliances for customers located on the current low-pressure system;

[8] nj-gwra-80x50-report-2020.pdf

- Conveniences and safety enhancements associated with outside meters; and
- Greater application of residential service line excess flow valves.

Q. HOW WILL THE COMMUNITIES SERVED BY THE COMPANY BENEFIT FROM IMPLEMENTATION OF THE IIP 2?

A. The communities served by the Company will benefit from continued safe, reliable service provided as a result of system enhancements, as well as the following:

- Minimized disruptions to counties, municipalities, businesses and residents resulting from a coordinated replacement approach;
- Reduction in the level of unplanned repair and maintenance work associated with leaks and aging infrastructure;
- Greater first responder access to above ground outside service shut-off valves and meter sets;
- Reduced greenhouse gas emissions; and
- Potential job growth and stimulation of the economy.

IIP 2 also has the added benefit of a significant amount of system upgrades in many of New Jersey's Overburdened Communities. These benefits are further discussed in the Direct Testimony of Michael P. Scacifero.

V. SUMMARY

Q. PLEASE SUMMARIZE WHY THE BOARD SHOULD APPROVE THIS PROGRAM.

A. The IIP 2 represents an effective continuation of the Company's ongoing efforts to ensure the safety and reliability of its distribution system by systematically replacing legacy facilities that are prone to leaks and material failures. The safety-related and other benefits resulting from the IIP 2 will be significant and the Program will be implemented in a manner that promotes cost efficiencies and minimizes the disruptions to the communities we serve. In summary, the IIP 2 provides for the modernization of Elizabethtown's infrastructure while reducing long term costs, enhancing safety and overall customer satisfaction, and reducing greenhouse gas emissions.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

EXHIBIT P-3

STATE OF NEW JERSEY
BOARD OF PUBLIC UTILITIES

I/M/O THE PETITION OF ELIZABETHTOWN GAS COMPANY TO IMPLEMENT AN INFRASTRUCTURE INVESTMENT PROGRAM ("IIP") AND ASSOCIATED RECOVERY MECHANISM PURSUANT TO *N.J.S.A.* 48:2-21 AND *N.J.A.C.* 14:3-2A

DIRECT TESTIMONY

OF

MICHAEL P. SCACIFERO
SENIOR DIRECTOR OF ENGINEERING SERVICES

ON BEHALF OF

ELIZABETHTOWN GAS COMPANY

December 11, 2023

EXHIBIT P-3

DIRECT TESTIMONY OF
MICHAEL P. SCACIFERO

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME, AFFILIATION AND BUSINESS ADDRESS.

A. My name is Michael P. Scacifero and I am the Senior Director of Engineering Services for Elizabethtown Gas Company ("Elizabethtown" or "Company"). My business address is 520 Green Lane, Union, New Jersey 07083.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL RESPONSIBILITIES.

A. As Senior Director of Engineering Services for Elizabethtown, I oversee engineering planning, design and budgeting for all of Elizabethtown's distribution system improvements, renewals, pressure improvements, United States Department of Transportation ("DOT") projects and large new business projects, as well as field operations associated with System Integrity and Measurement & Regulation. I am responsible for conducting system modeling and analysis and providing engineering support to Field Operations and Construction Operations. I am also involved with the development of Elizabethtown's capital budget and I am familiar with its components.

Q. WHAT ARE YOUR PROFESSIONAL AND EDUCATIONAL QUALIFICATIONS?

A. I received a B.S. in Civil Engineering from New Jersey Institute of Technology in 1988. I am a Licensed Professional Engineer in the State of New Jersey. I have been employed by Elizabethtown for 32 years in Engineering and Operations. Two of those years were spent as a Project Engineer, five years as a Division Engineer, and twenty-five years as Manager of Engineering, Manager of Operations, Director of Engineering

and, currently, Senior Director of Engineering Services. Prior to joining Elizabethtown, I was a Project Engineer for four years with Johnson Engineering Inc. specializing in highway and infrastructure design. Prior to that, I was employed for three years by the Township of Warren, New Jersey as a Staff Engineer specializing in municipal engineering. I am a member of the American Gas Association and New Jersey Utilities Association, as well as the National Society of Professional Engineers.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to support Elizabethtown's proposal to implement an Infrastructure Investment Program 2 ("IIP 2" or "Program") which will allow the Company to continue its strategic vision to modernize and enhance the reliability, resiliency and safety of its gas distribution system over a continuous five-year period and obtain timely recovery of the costs associated with the Program. Specifically, I will address the following:

- Overview of the proposed IIP 2;
- History of Elizabethtown's efforts to replace aging facilities to enhance the safety and reliability of its distribution system;
- Elizabethtown's proposal to accelerate the replacement of certain types of vintage, at-risk facilities in its service territory;
- Elizabethtown's Distribution Integrity Management Plan ("DIMP");
- the estimated costs of IIP 2; and
- the reasons and need for the IIP 2 and associated benefits.

Q. DO YOU SPONSOR ANY SCHEDULES AS PART OF YOUR DIRECT TESTIMONY?

A. Yes. I sponsor the following schedules that were prepared or compiled under my direction and supervision:

- Schedule MPS-1: Projected Company annual capital expenditure budgets during the five-year program, identified by major category;
- Schedule MPS-2: Actual Company annual capital expenditures for the previous five years, identified by major category; and
- Schedule MPS-3: Annual IIP 2 budgeted expenditures and proposed annual IIP 2 baseline spending levels.

II. IIP 2 PROPOSAL

Q. PLEASE PROVIDE AN OVERVIEW OF THE COMPANY'S PROPOSED IIP 2.

A. As part of IIP 2, the Company proposes to invest $625 million, excluding Allowance for Funds Used During Construction ("AFUDC") and Independent Monitor costs, to (i) install approximately 250 miles of new main and retire approximately 274 miles of at-risk cast iron, Vintage Steel and Vintage Plastic mains and associated services, (ii) continue to upgrade the Company's legacy low-pressure ("LP") system to elevated pressure ("EP"), and (iii) install approximately 35,000 excess flow valves ("EFVs") where appropriate on services on the upgraded system. The Company is also relocating inside meter sets to outside, where applicable, but these costs, like all other

meter costs, will not be recovered through the IIP 2. The Company proposes that IIP 2 will proceed over a period of five years commencing on July 1, 2024.

Q. PLEASE DEFINE THE TERM "VINTAGE STEEL" FACILITIES AS IT IS USED IN THE COMPANY'S TESTIMONY IN THIS CASE.

A. "Vintage Steel" facilities refers to coated or bare carbon steel facilities that were installed in the Company's system prior to the enactment of pipeline safety regulations by the U.S. Department of Transportation's Office of Pipeline Safety in 1971. These Vintage Steel facilities, which have been in operation for more than 50 years, are sometimes referred to as "pre-code" steel facilities. Elizabethtown's distribution system has 540 miles of Vintage Steel mains.

Q. PLEASE DEFINE THE TERM "VINTAGE PLASTIC" FACILITIES AS IT IS USED IN THE COMPANY'S TESTIMONY IN THIS CASE.

A. "Vintage Plastic" facilities refers to facilities constructed of pre-1984 plastic piping, including Aldyl-A and Phillips Driscopipe 8000. Elizabethtown's distribution system has 141 miles of Vintage Plastic mains.

Q. HOW IS THE COMPANY PROPOSING TO TREAT BUDGET VARIATIONS DURING THE TERM OF THE IIP 2?

A. The initiatives included in the IIP 2 are significant in scale and scope and, therefore, flexibility in budgeting the Program is necessary and appropriate. Consistent with the IIP regulations, it is the Company's proposal that year-to-year variations in the IIP 2

annual budget of up to 10 percent will be permitted, provided that the total IIP budget is not exceeded. To the extent that year-to-year variations in the IIP budget exceed the 10 percent variation level, the Company would seek Board approval of any variations in excess of 10 percent.

III. HISTORY AND POLICY

Q. HAS THE COMPANY PREVIOUSLY UNDERTAKEN PROGRAMS DESIGNED TO REPLACE AT-RISK FACILITIES?

A. Yes. In the late 1990s, the Company implemented a program to replace all EP cast iron mains that were six inches or less in diameter. In 2006, this program was expanded to include the replacement of 8-inch EP main, which was completed in 2009. In the first two phases of its Utility Infrastructure Enhancement ("UIE")[1] program, the Company completed the replacement of 29 miles of 10-inch and 12-inch EP cast iron main and 36 miles of 4-inch LP cast iron main.

At the conclusion of the UIE I and UIE II programs, Elizabethtown sought and received approval from the New Jersey Board of Public Utilities ("BPU" or "Board") by Order dated August 21, 2013 in BPU Docket No. GO12070693 to implement a four

[1] I/M/O In the Matter of the Petition of Pivotal Utility Holdings, Inc. d/b/a Elizabethtown Gas to Extend its Utility Infrastructure Enhancement Program and Revise its Utility Infrastructure Enhancement Rate BPU Docket No. GO101209696, and I/M/O the Petition of Pivotal Utility and Holdings, Inc. d/b/a Elizabethtown Gas for Approval of Increased Base Tariff Rates and Charges for Gas Services and Other Tariff Revisions, BPU Docket No. GR09030195, Decision and Order Approving Final Stipulation (May 16, 2011); I/M/O the Petition of Pivotal Utility and Holdings, Inc. d/b/a Elizabethtown Gas for Approval of Increased Base Tariff Rates and Charges for Gas Services and Other Tariff Revisions, BPU Docket No. GR09030195, Order (April 28, 2009).

year Accelerated Infrastructure Replacement ("AIR")[2] program to continue the replacement of cast iron, bare steel distribution and other related facilities. Under the AIR Program, the Company retired 94 miles of EP and LP cast iron, bare steel and transmission pipe.

In 2014, the Company commenced its Elizabethtown Natural Gas Distribution Reinforcement Effort[3] program which retired 12 miles of LP cast iron main located within designated Federal Emergency Management Agency flood zones.

Finally, in 2019, the Company entered into its initial Infrastructure Investment Program ("IIP"),[4] targeting its low pressure, primarily cast iron and bare steel system. The program was approved for the installation of 250 miles of replacement pipeline, associated services and excess flow valves at a cost of $300 million. The Company plans to complete this program in June 2024.

Q. IS THE PROPOSED PROGRAM CONSISTENT WITH FEDERAL AND STATE POLICIES?

A. Yes. The proposed IIP 2 is consistent with the safety and reliability goals identified in various Federal and State policies. Pipelines are regulated by both Federal and State

[2] I/M/O the Board's Establishment of a Generic Proceeding to Review the Costs, Benefits and Reliability Impacts of Major Storm Event Mitigation Efforts, BPU Docket No. AX13030197, and I/M/O the Petition of Pivotal Utility Holdings, Inc. d/b/a Elizabethtown Gas for Approval of the Elizabethtown Natural Gas Distribution Utility Reinforcement Effort Program and Deferred Accounting Treatment, BPU Docket No. GO13050434, Decision and Order Approving Stipulation (July 23, 2014).

[3] I/M/O the Petition of Pivotal Utility Holdings, Inc. d/b/a Elizabethtown Gas for Approval of an Accelerated Infrastructure Replacement Program and an Associated Cost Recovery Mechanism, BPU Docket No. GO12070693, Order (August 21, 2013).

[4] I/M/O the Petition of Elizabethtown Gas Company to Implement an Infrastructure Investment Program and Associated Recovery Mechanism Pursuant to N.J.S.A. 48:2-21 and N.J.A.C. 14:3-2A, BPU Docket No. GR18101197, Final Decision and Order Approving Stipulation (June 12, 2019) ("June 2019 Order").

agencies. The DOT is responsible for overseeing pipeline safety at the Federal level. The Pipeline and Hazardous Materials Safety Administration ("PHMSA"), a branch of DOT, establishes many of the regulations that apply to natural gas transmission and distribution systems. In New Jersey, the BPU administers pipeline safety requirements. Both State and Federal regulators have consistently indicated their support for the accelerated replacement of aging gas distribution infrastructure. As such, the Company's proposed IIP 2 is consistent with Federal and State objectives to ensure system integrity and the provision of safe and reliable gas distribution service and reduce greenhouse gas emissions. In the wake of several major pipeline incidents in recent years, national focus on pipeline safety has increased. Most recently, the PHMSA issued two Notices of Proposed Rulemaking ("NPRM"), one on Gas Pipeline Leak Detection and Repair[5] and the other on Safety of Gas Distribution Pipelines and Other Pipeline Safety Initiatives[6] Many of the factual findings that support issuance of the NPRMs are directly applicable to Elizabethtown's gas distribution system and its need to ensure safety through an accelerated program to replace its highest risk facilities.

[5] Federal Register: Pipeline Safety: Gas Pipeline Leak Detection and Repair, 88 FR 31890.

[6] Federal Register: Pipeline Safety: Safety of Gas Distribution Pipelines and Other Pipeline Safety Initiatives, 88 FR 61746.

Q. PLEASE DESCRIBE THE FACTUAL FINDINGS IN PHMSA'S TWO RECENT NPRMS THAT ARE DIRECTLY APPLICABLE TO ELIZABETHTOWN'S SYSTEM.

A. Some of the key factual underpinnings of the NPRMs that relate directly to Elizabethtown's distribution system include its findings that:

- Older cast-iron, Vintage Steel and Vintage Plastic gas distribution pipelines that are particularly vulnerable to failure and over pressurization are disproportionately concentrated in older, residential (often urban) areas with historically underserved and disadvantaged populations.
- While the overall trend in pipeline safety has steadily improved over the past two decades, much of the Nation's gas distribution piping has been in the ground for a long time. Per PHMSA's gas distribution operator database, more than 50 percent of the nation's pipelines were constructed before 1970 during the creation of the interstate pipeline network built in response to the demand for energy in the post-World War II economy. Historically, gas distribution pipelines were constructed from many different materials, including cast iron, steel and copper. However, material fabrication and installation practices have improved since much of the nation's gas distribution pipeline systems were installed, in acknowledgment that iron alloys like cast iron and steel degrade or corrode over time. Consequently, the age of a gas distribution system pipeline is a crucial factor in evaluating the risk it poses to public safety and the environment.

- PHMSA finds that proactive management of the integrity of aging pipe infrastructure enhances safety and reliability, contributes to cost savings over the longer term, and can be less disruptive to customers and communities than a reactive approach. Accelerating leak detection, repair, rehabilitation or replacement efforts also delivers the desired integrity and safety benefits more expeditiously, lowering maintenance requirements associated with the aging pipe that is being replaced.[7]

Q. PLEASE DESCRIBE PHMSA'S NPRM – GAS PIPELINE LEAK DETECTION AND REPAIR.

A. Published May 4, 2023, this NPRM would impose increased leak survey requirements for materials "known to leak," *i.e.* cast/wrought/ductile iron, bare/unprotected steel, and vintage plastic. It would also require:

(i) the use of advanced leak detection equipment, leading to more leaks identified;

(ii) the grading and establishment of repair timelines for all leaks including grade 3 leaks which currently do not have repair requirements; and

(iii) post repair checks on all leak repairs, which are currently not required.

[7] Pipeline Replacement Background | PHMSA (dot.gov).

Q. PLEASE DESCRIBE PHMSA'S NPRM – SAFETY OF GAS DISTRIBUTION PIPELINE.

A. Published September 7, 2023, this NPRM would require all new, replaced or changed district regulator stations serving LP stations to have at least two methods of overpressure protection and would require real time monitoring devices at all times downstream of the station.

Q. WHAT ARE THE IMPLICATIONS OF THESE NPRMS FOR ELIZABETHTOWN'S OPERATIONS?

A. The adoption of these NPRMs would require Elizabethtown to update its DIMP to address these risks through "accelerated actions." By proceeding with the IIP 2, Elizabethtown will avoid the need to engage in accelerated action with respect to the facilities replaced through the Program and will best ensure the ongoing safety and reliability of its distribution system.

Q. WILL THE PROPOSED IIP 2 ENABLE ELIZABETHTOWN TO BETTER SUPPORT OTHER FEDERAL AND STATE POLICY OBJECTIVES?

A. Yes. The Biden Administration's U.S. Methane Emissions Reduction Action Plan ("Plan") was released in November of 2022. The Plan refers to an estimated 2.3 million miles of gas distribution pipelines that extend into cities and towns throughout the United States. The report found that many of these pipelines are old, leaking and susceptible to rupture and when gas distribution pipelines fail, such failure can generate enormous emissions. The report also found that when aging or damaged gas

distribution pipelines are repaired or replaced, methane emissions can be cut by up to 90%.[8]

The Plan represents the latest in a series of federal pronouncements that encourage the replacement of aging gas distribution pipelines. For example, in 2011 the former Secretary of Transportation announced a Pipeline Safety Action Plan that included a call to accelerate the replacement of aging pipeline infrastructure.[9] With this "Call to Action" the then Secretary recommended that pipeline operators and other affected parties conduct a comprehensive review of their pipeline facilities and accelerate their repair and replacement efforts. In addition, on April 21, 2015, the White House released a New Agenda to Modernize Energy Infrastructure in the Quadrennial Energy Review and called for programs to accelerate pipeline replacement in natural gas distribution systems. Furthermore, PHMSA has issued a series of Advisory Bulletins, ADB-1999-01 and 02, ADB-07-02, and ADB-2012-03, identifying brittle-like cracking in certain polyethylene plastic pipe manufactured by various manufactures and used within Elizabethtown's distribution system.[10]

In New Jersey, the most recent Energy Master Plan ('EMP") supports investments in natural gas infrastructure as a way to reduce energy costs and enhance energy security. Also in New Jersey, the 2020 Global Warming Response Act ("GWRA") 80 x 50 Report was developed as part of an initiative to reduce New Jersey greenhouse gas emissions 80% below 2006 levels by 2050. In addition,

[8] U.S. Methane Emissions Reduction Action Plan (whitehouse.gov).

[9] Call to Action | PHMSA (dot.gov).

[10] 99-6013.pdf (govinfo.gov); 99-6013.pdf (govinfo.gov); 02-30055.pdf (govinfo.gov); 2012-5424.pdf (govinfo.gov).

Elizabethtown's proposal conforms with Executive Order No. 317 ("EO 317"), issued by Governor Murphy on February 15, 2023. EO 317 initiated proceedings concerning "the development of natural gas utility plans that reduce emissions from the natural gas sector." IIP 2 will reduce methane leaks in substantial portions of Elizabethtown's gas system (including overburdened communities) and will therefore "reduce emissions from the natural gas sector" and combat climate change. Finally, the BPU's Infrastructure Investment and Recovery regulations ("IIP Regulations") encourage a utility to construct, install or remediate utility plant and facilities related to reliability, resiliency and safety.

Q. HOW DOES IIP 2 ALIGN WITH THE EMP?

A. The EMP emphasizes investment in gas infrastructure overall as a means of lowering energy costs, decreasing carbon emissions and enhancing energy security. Specifically, the report states that New Jersey has benefitted from the enhancement and expansion of its gas distribution system, which "will help further lower the cost of energy to New Jersey's homeowners and businesses and reduce emissions." The most recent EMP update specifically notes that "[the] BPU has approved almost $1 billion for natural gas utility infrastructure upgrades and mitigation projects", and that "[a]n additional $280 million in proposed projects is pending." Against that backdrop, the Company's IIP 2 aligns directly with Strategy 5 of the EMP, "Decarbonize and Modernize New Jersey's Energy System." Within that Strategy, Goal 5.4 focuses on and calls for New Jersey to "[m]aintain existing gas pipeline system reliability while planning for future reductions in natural gas consumption." A critical component of

Goal 5.4 is the directive in clause 5.4.4 to "identify and prioritize the replacement of pipelines leaking methane." Elizabethtown's IIP 2 fully aligns with these objectives.[11]

Q. DOES IIP 2 ALIGN WITH THE GWRA?

A. Yes. The Program will have a direct and substantial impact on the reduction of methane emissions from the gas distribution system. Service line excess flow valves will be installed, which will prevent the release of methane from a service line in the event of excavation damage. Moreover, the Program will replace leak prone cast iron, Vintage Steel and Vintage Plastic pipes with new plastic and steel pipes that will not be prone to leaking. New Plastic and steel pipe has also been proven to be compatible with hydrogen blends, preparing for the potential introduction of a low, and potentially zero, carbon fuel source to the Company's gas distribution system.

Q. ARE YOU AWARE OF ANY OTHER INFRASTRUCTURE REPLACEMENT PROGRAMS CURRENTLY APPROVED IN NEW JERSEY?

A. Yes. New Jersey has been at the forefront of infrastructure replacement programs. Since the adoption of the IIP Regulations in 2018, the Board has approved infrastructure replacement programs for all the state's major gas utilities. By its June 2019 Order, the Board approved the Company's initial IIP targeting its low pressure, primarily cast iron and bare steel system. The program was approved for the installation of 250 miles of replacement pipeline, associated services and excess flow

[11] *See*, http://d31hzlhk6di2h5.cloudfront.net/20200127/84/84/03/b2/2293766d081ff4a3cd8e60aa/NJBPU_EMP.pdf. p. 5 and p.41.

valves at a cost of $300 million. The Company plans to complete this program in June 2024.

On June 8, 2021, in BPU Docket No. GR20110726, the Board approved a five-year IIP for South Jersey Gas Company ("South Jersey") commencing on July 1, 2022, pursuant to which South Jersey may invest up to $200 million for the replacement of 250 miles of pre-code coated steel and pre-1971 vintage Aldyl-A plastic mains and related services. The Board also approved an IIP for New Jersey Natural Gas ("NJNG") on October 28, 2020 in BPU Docket No. GR19020278, pursuant to which NJNG may spend up to $150 million on specified infrastructure projects over a five-year period beginning November 1, 2020. The Board approved the second phase of Public Service Gas and Electric Company's ("PSE&G") Gas System Modernization Program II ("GSMP II") by Order dated May 22, 2018 in BPU Docket No. GR17070776. The GSMP II is a five-year program commencing January 1, 2019 that allows PSE&G to invest up to $1.575 billion, representing the replacement of 875 miles of cast iron and unprotected steel main. On October 11, 2023, the Board approved an extension of GSMP II ("GSMP II Extension") and authorized PSE&G to spend $752 million to replace 400 miles of Utilization Pressure Cast Iron ("UPCI") mains (and associated services) and/or Unprotected Steel mains (and associated services). In addition, under the GSMP II Extension, PSE&G will maintain at least $225 million in baseline capital expenditures in gas investments. The Board has also authorized accelerated infrastructure programs for PSE&G that include both gas and electric components. PSE&G's Energy Strong II program, approved on September 11, 2019, in BPU Docket Nos. EO18060629 and GO18060630, authorized PSE&G to make

$50.5 million in upgrades to gas metering and regulating stations, in addition to $641 million in electric investments. In addition, PSE&G's Infrastructure Advancement Program, approved on June 29, 2022 in BPU Docket Nos. EO21111211 and GO21111212, authorized PSE&G to invest $69.8 million in a gas metering and regulating modernization subprogram, along with $281.2 million in electric subprograms.

IV. DISTRIBUTION INFRASTRUCTURE INVENTORY

Q. PLEASE DESCRIBE THE MATERIALS THAT MAKE UP ELIZABETHTOWN'S DISTRIBUTION SYSTEM.

A. Consistent with the age of the Company, Elizabethtown's distribution system is composed of cast iron, ductile iron, protected and unprotected steel, plastic and small amounts of copper main. The distribution system also includes steel, plastic and a small percentage of copper service lines.

The below chart sets forth the Company's projected mains pipe inventory at the beginning of the proposed IIP 2.

Category	Projected Inventory as of 6/30/2024
Low Pressure Cast Iron (Various Diameters)	44
Vintage Plastic	141
Vintage Steel	540
Elevated Pressure Cast Iron (Large Diameter)	12
Non-Vintage Plastic	2122
Non-Vintage Steel	450
TOTAL	3309

V. REASONS FOR THE IIP 2

Q. PLEASE SUMMARIZE THE REASONS FOR THIS FILING.

A. Aging cast iron and Vintage Steel and Vintage Plastic facilities exhibit significantly greater leak rates as compared to newer plastic and non-vintage steel pipe, and eventually require replacement or rehabilitation. Vintage Plastic facilities are also prone to unpredictable failure due to cracking. The IIP 2 and its associated cost recovery mechanism represent a prudent response to Elizabethtown's long-term system needs. The safety-related, customer, economic, environmental and other benefits attributable to the Program, as discussed below, are compelling.

Q. IS IT APPROPRIATE FOR THE COMPANY TO MOVE FORWARD, AT THIS TIME, WITH A LONG-TERM APPROACH TO GAS INFRASTRUCTURE REPLACEMENT?

A. Yes. The Company's prior IIP replacement levels supported safe and adequate service. IIP 2 will expedite the replacement above and beyond replacement levels approved for the IIP, making the system safer, more reliable and less leak prone. This will result in operations and maintenance expense savings and emissions reductions that will significantly impact the amount of methane escaping into the atmosphere year over year. Elizabethtown's distribution system is aging and while the Company manages the risks posed by its legacy system, all cast iron and Vintage Steel and Vintage Plastic will eventually require replacement or rehabilitation. Moreover, since the costs associated with the ongoing management of the legacy systems will increase as the system continues to age, now is the time to continue with the proposed infrastructure replacements.

Q. PLEASE DESCRIBE THE POTENTIAL IMPACTS OF AGING MATERIALS IN ELIZABETHTOWN'S DISTRIBUTION SYSTEM.

A. Cast iron pipe, Vintage Steel and Vintage Plastic are prone to leaks. Cast iron pipe and Vintage Plastic are also subject to breaks. The amount of cast iron, Vintage Steel and Vintage Plastic that remains in service today represents a current and future concern for Elizabethtown. Additionally, from a leak perspective, these materials create the bulk of the Company's leak investigations and repairs, particularly in the winter, and consumes a significant percentage of the Company's annual operations and

maintenance budget. The Study of Vintage Steel, Vintage Plastic and Cast Iron Mains and Associated Services Report dated 11/21/2023 ("Mears Report"), as well as the Direct Testimony of Kevin Garrity, outline in detail the impacts and risks of aging materials in Elizabethtown's distribution system.

Q. PLEASE DESCRIBE IN MORE DETAIL THE ISSUES ASSOCIATED WITH VARIOUS VINTAGE PIPE MATERIALS.

A. **Cast iron pipe:** has little inherent flexibility and is susceptible to breakage due to surface pressures and ground movement, which is most frequently caused by frost or, nowadays, ever increasing construction activity in the vicinity of the pipes. Ground movement creates an excessive bending stress in the pipe that may cause it to fail in an unpredictable circumferential break resulting in a relatively large release of gas at the point of failure. Cast iron pipes with diameters of 12 inches or less are more susceptible to these unpredictable breaks.

Also, when originally installed in rigid 12 or 18 foot lengths, pipe sections were joined either with bell and spigot type connections or mechanical joints. With time, ground movement and/or drying action of gas can cause a joint to leak. Remedial action in the form of external clamps or internal seals then becomes necessary. For Elizabethtown, the occurrence of cast iron joint leaks is 4 to 5 times greater than cast iron breaks. The larger the diameter of a cast iron pipe, the less susceptible it is to breaks, with joint leaks being most likely.

Vintage Steel: will corrode and develop leaks over time. Specifically, steel pipe deteriorates due to contact with the soil. The rate of corrosion varies depending on a

number of characteristics of the soil, including moisture and acidity ("pH"). Uncontrolled corrosion will ultimately result in numerous, relatively small gas leaks.

Initially, a corrosion leak on a steel pipe usually starts as a small leak. Over time metal loss will increase in size and location, allowing more gas to escape, eventually resulting in numerous relatively small gas leaks. Eventually, these small leaks multiply and can grow to the point where they threaten the integrity of the pipe.

As set forth in the Mears Report, Elizabethtown has sustained continuing leaks in its Vintage Steel and associated services. Using the DOT annual statistics of reportable gas incidents, compared against operating companies across the industry, The Company ranks 6th highest in recordable leaks-per-mile compared with twenty-one operating companies. Elizabethtown ranks just behind sister company South Jersey Gas which ranked 4th and recently had an IIP application approved for replacing pre-code steel mains and associated services. Although supplemental cathodic protection continues to be installed on the Company's Vintage Steel facilities on an annual basis, these measures will not preclude the development of future leaks in mains and services with aged and degraded vintage coating systems as leaks continue to be recorded despite the presence of a functioning cathodic protection systems that is meeting regulatory requirements for effective corrosion control. Moreover, much of the remaining cast iron mains see little to no benefit from cathodic protection and instead continue to corrode through graphitization elevating the risk of failures.

Vintage Plastic pipe: Some of the early plastic products found in systems have an oxidized inner surface that predisposes the inner surface to initiate cracks faster when certain stresses are applied. The resulting shortened crack initiation time leads to

dramatically reduced overall pipeline longevity through a predominant failure mechanism known as slow crack growth. This unpredictable failure mode can have catastrophic consequences and was the cause of an incident involving multiple fatalities in Puerto Rico in 1996. Incidents in California led to the California Public Utilities Commission identifying Aldyl-A pipes as a major potential hazard that is not manageable by leak surveying. The DOT has issued various PHMSA advisory bulletins about this vintage Aldyl-A and Driscopipe 8000 plastic pipe. As outlined in the Mears Report, a significant body of information exists on failures of pre-1984 Aldyl-A and Driscopipe 8000 plastic piping with known formulation deficiencies that increase the risk of leaks and failures due to cracking and splits. Tragically, many of these incidents resulted in fatalities, injuries, and significant property damage. Brittle failure modes in these vintage plastic pipes often result in larger volumes of gas releases than leaks in steel elevating the potential consequences of such failures. Specifically, PHMSA has issued similar advisory bulletins on Aldyl-A Plastic pipes installed between 1960 and the early 1980s warning of potential susceptibility to brittle-like cracking. Advisories further warn that rupture testing standards may have overrated the long-term resistance to brittle-like cracking.

Copper pipe: The couplings utilized on copper pipe are susceptible to failure. As part of IIP 2, the Company intends to target a very small amount of copper main (0.3 miles) that is lined inside Vintage Steel. Since Vintage Steel replacement is being replaced in the Program, the incorporated copper will also be replaced.

Q. WHAT IS THE GREATEST THREAT TO THE CONTINUED SAFE OPERATION OF THE COMPANY'S DISTRIBUTION SYSTEM, AND WHAT IS YOUR RECOMMENDATION TO ADDRESS THIS THREAT?

A. As stated in the Company's DIMP, the greatest threats to the Company's distribution system are related to vintage steel, cast iron and plastic piping systems. A successful leak management program will help mitigate these risks, but the most prudent way to address these risks is to continue the accelerated replacement of vintage, at-risk facilities. Other threats that could occur while maintaining a vintage distribution system includes impacts to normal pipeline operations such as the inability to squeeze off and fuse Vintage Plastic when responding to emergencies or system expansions. Also, Vintage Plastic systems pose a difficult to locate risk due to either non-existent tracer wire or older type tracer wire that has degraded over time, leaving locating by records the only option which could be difficult due to measured alignment changing over time. Vintage Steel also poses a problem of location due to degradation of the steel over time. Furthermore, much of these vintage systems are located in older urban areas where 100% developed land with significant amounts of paved surfaces pose a threat of leaks migrating laterally instead of surfacing vertically through landscaped areas.

The accelerated replacement of this high-risk inventory on a prioritized, risk ranked basis, of legacy piping materials will provide important safety benefits to the customers and communities we serve. The acceleration of these replacements over a five-year period will allow the Company to achieve critical cost savings from a broad and proactive approach to infrastructure upgrades on a system-wide basis. Please refer

to Schedule MPS-3 for a breakdown of main and service replacements proposed under the IIP 2 by material.

Q. WILL ALL OF THE REMAINING CAST IRON BE REPLACED IN THIS PROGRAM?

A. Although only the 44 miles of vintage cast iron mains associated with the LP distribution system will be replaced and retired as part of this Program, the remaining 12 miles of large diameter (16-inch through 30-inch) cast iron associated with the EP system will be replaced during the same 5-year period as this Program. However, its replacement will be part of the Company's baseline capital budget.

Q. WOULD THE AMOUNT OF NEW MAIN TO BE INSTALLED BE THE SAME AS THE AMOUNT OF MAIN BEING RETIRED?

A. No. While the Company is proposing to install approximately 250 miles of new main in the five-year program, the Company proposes to retire approximately 274 miles. This difference of new main versus retired main is due to the fact that certain areas of the Company's remaining LP distribution system have existing redundant mains. Therefore, in some cases only customer service work will be performed on a particular street along with the vintage main being retired. The cost estimates for the IIP 2 reflect this assumption. In addition, all footages used in the estimate are based on pre-design projections based on the Company's main and service records and Geographic Information System ("GIS"). As the scope of the projects develops and plans are designed, the footage numbers will be adjusted accordingly.

Q. IN ADDITION TO REPLACING VINTAGE, AT-RISK MAIN AND ASSOCIATED SERVICES, WILL THE COMPANY ALSO BE REPLACING OTHER APPURTENANCES AS PART OF THE IIP 2?

A. Yes, as indicated earlier, as part of the Program, Elizabethtown proposes to install approximately 35,000 EFVs, where appropriate. The Company will also replace and relocate inside meters to an outside location as needed, but the associated costs, like all other meter costs, will not be recovered as part of the IIP 2.

Q. WHY IS THE COMPANY INSTALLING EXCESS FLOW VALVES AS PART OF THE IIP 2?

A. The installation of EFVs is mandated by the Pipeline Integrity, Protection, Enforcement and Safety Act of 2006, and its implementing regulations. By way of background, EFVs installed at the connection between the service line and the distribution main automatically cut off gas flow that exceeds a preset rate of flow. As a result, EFVs eliminate the potentially hazardous condition that may occur when gas escapes from customer facilities within the premise or Company facilities outside the premises resulting in gas build-up at the walls of the home or business.

The proposed Program includes installation of approximately 35,000 EFVs on all of the new services lines that will enable automatic shut-off in the event of a service line failure, reducing the potential risk for the Company's customers.

Q. WHERE ARE THE FACILITIES THAT ELIZABETHTOWN SEEKS TO REPLACE AND RETIRE THROUGH THE IIP 2 PRIMARILY LOCATED?

A. The IIP 2 will be conducted in both of the Company's Union and Northwest operating divisions. As set forth in further detail in my testimony below, IIP 2 also has the added benefit of a significant amount of system upgrades planned for many of New Jersey's overburdened communities ("OBCs").

VI. INTEGRITY MANAGEMENT PROGRAMS

Q. PLEASE DESCRIBE THE COMPANY'S CURRENT APPROACH TO PIPE REPLACEMENT AND ANY FUTURE IMPROVEMENTS TO THE APPROACH.

A. In the Company's current IIP, the overall approved approach to distribution replacement is to minimize risk to the public and employees by effectively understanding the condition of its assets and their probability of failure. This enables the Company to manage replacement of assets in a manner designed to avoid sudden or widespread failure within any asset class. Individual main segments are identified for replacement through a prioritization ranking methodology within the Company's DIMP, which will be explained in greater detail below. This methodology is based on a model that integrates breaks, leak history, and emissions rates with an area factor such as business districts which is comprised predominantly of concrete and pavement, thereby allowing leaks to migrate laterally instead of surfacing at the source location. Elizabethtown is currently exploring opportunities to improve its approach to prioritizing pipelines for replacement. The Company is working to implement a

probabilistic risk model with predictive capabilities, which would allow for prioritization of assets that are most likely to leak in the future. The Company is also scheduled to complete an emissions study of its entire distribution system by the end of 2023. Results of this study will be used in the risk model and for future prioritization of pipeline replacement projects. The Company will also consider other factors, such as the Center for Disease Control's Social Vulnerability Index and the NJ Department of Environmental Protection's Environmental Justice Areas to ensure the benefits of pipeline replacement are realized by the most vulnerable individuals and communities.

Q. PLEASE EXPLAIN THE REQUIREMENTS UNDER ELIZABETHTOWN'S DIMP.

A. The DIMP regulations mandate that a risk-based approach to distribution main and service integrity management plans be prepared by each operator. While the regulations prescribe a specific framework for documenting operating practices and procedures into a plan, the regulations provide significant operator flexibility to satisfy the requirements. At a minimum, each distribution pipeline operator's DIMP must address the seven major elements described below. Elizabethtown's DIMP reflects important documentation of the Company's risk-based approach to integrity management according to the required elements as follows:

(1) **Knowledge:** Knowledge entails the documentation of information pertaining to system design, materials, operating characteristics and environmental factors. The Company's DIMP references data contained in the Company's GIS, including leak and asset management and the corrosion control records system. The combination of these

tools allows the Company to maintain, store, report and analyze critical data related to its distribution infrastructure.

(2) **Identify threats**: Threat identification determines broad issues that may affect the safe operation of the distribution system. Potential threats follow the categories of potential operational hazards established by PHMSA. The Company relies on both internal and external data sources to identify threats. Internal data sources include various design and operating records contained in the systems noted previously. External data sources include industry-wide data, and data related to soil conditions or prepared by independent researchers.

(3) **Evaluate and rank risks:** The process of evaluating and ranking risks determines the relative importance of all identified risks. Importance takes into consideration both likelihood of occurrence and the consequences of occurrence. The Company relies on standard industry analyses such as population densities in specific areas to evaluate consequences of failure and ranks risks accordingly.

(4) **Identify and implement measures to address risks:** This element of the Company's DIMP documents measures to reduce risk of failure. Programs at Elizabethtown that address risks include leak management, damage prevention, corrosion control, public awareness and operator qualification programs. Specific actions include prevention, detection, repair, rehabilitation, and/or replacement and upgrade, depending on the risk-based probability of occurrence and consequences of the specific integrity threat.

(5) **Measure performance, monitor results, and evaluate effectiveness:** Monitoring and measurement activities allow Elizabethtown to evaluate the

effectiveness of actions implemented in order to address risks. The Company measures performance from a variety of information including the collection of data on leak causes and leaks repaired or eliminated. This data is reported and communicated within Elizabethtown for evaluating trends and to provide input for future planning purposes.

(6) **Periodic evaluation and improvement:** Periodic evaluation establishes a definitive feedback loop for the overall distribution integrity management process. The entire DIMP will be evaluated at least every five years. Additionally, as knowledge concerning the distribution system or information on potential threats is gained, elements of the DIMP or required actions may be revised to take into account the impact of the enhanced understanding as it impacts the Company's integrity management activities.

(7) **Report results:** Reporting on integrity management actions and results provides information to Elizabethtown's internal management and satisfies federal and state mandated reporting requirements.

Q. HOW WILL ELIZABETHTOWN PRIORITIZE THE REPLACEMENT PROJECTS TO BE COMPLETED UNDER THE IIP 2?

A. Elizabethtown will continue to utilize its DIMP as the foundation for prioritizing projects that will be undertaken through the IIP 2. The Company will employ the following considerations to identify replacement projects as part of the IIP 2, which include the DIMP and other factors:

- Prioritization of selected facilities for safety and reliability – DIMP;
- Incorporation of the latest technologies for system design and materials;

- Undertaking environmentally friendly construction where applicable;
- Assessment of the impact on customers and communities;
- Leveraging existing embedded system components instead of replacing them;
- Right sizing new facilities for cost effectiveness and to reduce impact as the new pipe will generally be smaller in diameter (LP systems only);
- Maximizing the retire/install ratio;
- Coordinating work with other Company programs; and
- Coordinating work with programs by other utilities and with municipal paving projects, where applicable, leading to a potential reduction in restoration costs.

Q. HOW WILL THE IIP 2 BENEFIT THE COMPANY'S LEAK MANAGEMENT PROGRAM?

A. Currently, Elizabethtown's leak management and asset protection programs emphasize prevention and mitigation activities within our operating policies and procedures. It includes instrument surveys for leaks and corrosion; patrolling for excavation activities; inspection of exposed pipe and facilities; preventive maintenance; repair, rehabilitation and replacement; inside safety inspections; damage prevention programs and emergency response.

Replacement of Elizabethtown's vintage, at-risk infrastructure will reduce leaks on mains and services and enable the Company to avoid greater costs associated with unplanned replacements of leaking or broken pipe. As significant amounts of the vintage, at-risk pipe is replaced, the Company should see a decline in costs associated with identifying, repairing and /or monitoring leaks. Additionally, greenhouse gas

emissions will be reduced significantly as leaks are reduced. As discussed by Company witness Thomas Kaufmann, the Company has included a $100,000 annual reduction in the costs of leak repairs in the revenue requirement formula that will be used to establish rates to permit the Company to obtain timely recovery of IIP 2 facilities.

VII. COST ESTIMATE

Q. HOW DID THE COMPANY DEVELOP ITS COST ESTIMATE FOR IIP 2?

A. The Company is estimating that under the IIP 2 it will invest approximately $625 million, excluding AFUDC and Independent Monitor costs, to achieve its intended goals. These costs were derived by analysis of costs from the Company's current pipeline replacement efforts and anticipated future cost escalations. The Program's types of mains and services replacements will generally be equivalent to the types of mains and services being replaced in the Company's current replacement initiatives.

Q. SPECIFICALLY, WHAT IS THE COST PER MILE FOR IIP 2?

A. The Company is requesting a cost of $2.5 million per mile for IIP 2 based, in part, upon knowledge and experience gained during the first four years of the current IIP. Specifically, the Company has experienced costs well in excess of the $1.2 million per mile authorized for the current IIP. In that filing, the Company estimated and requested a significantly higher cost per mile amount than was approved by the Board. Since then, costs have escalated annually and are expected to continue to escalate. These increased costs are due to (but not limited to): (i) increased diesel fuel costs; (ii) installation of wider diameter pipe; (iii) increased costs for police presence and

additional traffic control measures; (iv) additional townships requiring curb-to-curb paving; (v) an increase in the number of services per mile; (vi) increased costs due to the necessity of work done in densely populated urban areas; (vii) increased costs necessitated by Office of Pipeline Management's updated requirements; and (viii) escalation of year over year costs including, but not limited to, labor and materials, environmental and linear construction costs..

Q. HAS THE COMPANY MADE ANY EFFORTS TO MITIGATE THE COST INCREASES ASSOCIATED WITH THEIR PIPELINE REPLACEMENT PROGRAMS?

A. Yes. The Company continuously seeks opportunities to decrease costs associated with pipeline renewal work. Examples of ways the Company achieves substantial cost reductions include: partnering with jurisdictions and other utilities' projects to coordinate construction activities and share restoration costs and continuously changing construction scope to reduce cost, i.e. installation behind curb to eliminate restoration.

Q. WHAT RESOURCES ARE REQUIRED TO SUCCESSFULLY IMPLEMENT THE PROGRAM?

A. The Company will essentially use the same resources in Engineering Design, Contractor Construction and Program Management as have been utilized in its current IIP ending June 2024.

Q. WILL A MULTI-YEAR REPLACEMENT PROGRAM ENABLE THE COMPANY TO DEPLOY ITS INVESTMENT CAPITAL MORE EFFICIENTLY?

A. Yes. Implementing a multi-year program will allow Elizabethtown to address larger sections of pipe within a single construction project, which in turn can lead to lower costs per mile as the costs of engineering and construction mobilization efforts are spread over a larger project. Additionally, the Program will reduce the number of unplanned replacements, which have substantially higher costs per mile than planned replacements. As a result, the percentage of replacements that are unplanned should decrease, enhancing the efficient use of capital to address reliability risks associated with aging infrastructure.

The implementation of a multi-year program following the completion of the current IIP also offers important opportunities for outside contractors to continue to plan more effectively to meet the programs work requirements. Board approval of the Company's proposed five-year Program will allow Elizabethtown to continue to make a longer commitment to contractors, which has the potential to translate into lower costs for Elizabethtown and a more productive work effort, providing benefits to the New Jersey economy.

Q. WHAT HAVE YOU LEARNED FROM THE IIP?

A. The Company recognizes the impact that infrastructure replacement programs have on municipalities and communities. In order to reduce disruptions to roadways, the Company strives, where applicable, to work in conjunction with other utility

infrastructure replacement programs. The Company also continues to make progress in coordinating work with municipal, state, and county paving programs as well as with other local construction activities. This has enabled the Company to minimize delays to paving and reconstruction schedules as well as minimizing impacts to disruptions in travel along local thoroughfares. Continuous reliable and accurate communication with all stakeholders, *i.e.* Government Officials, Customers, Residents and other Utilities along the entire projects' timeline, has enabled the Company to manage the projects in most effective manner. In addition, when dealing with large numbers of main outages in tandem, there are challenges in coordination and logistics to ensure there is no impact to system reliability.

VIII. BASELINE SPENDING

Q. WHAT ARE THE COMPANY'S PROPOSED COMMITMENTS TO BASELINE SPENDING IN ITS IIP 2 FILING?

A. Consistent with the Board's regulations, the Company is proposing two baseline spending commitments. Such commitments reflect the Company's agreement to invest at certain levels but seek the recovery of the costs of the baseline investments in a future base rate case rather than through the cost recovery mechanism proposed in this case. The Company's two baseline spending commitments are as follows:

(i) over the five-year period of IIP 2, the Company will spend at least $62.5 million on the same types of projects as are proposed to be included in IIP 2, an amount equal to ten percent of the capital expenditures reflected in IIP 2 and shown on Schedule MPS-3; and

(ii) over the same five-year term, the Company will invest capital in its system in an amount equal to an annual average of $93 million or $465 million over the life of the program as shown on Schedule MPS-2.

Q. WHAT IS THE BASIS FOR THE COMPANY'S PROPOSED IIP 2 BASELINE SPENDING LEVEL?

A. Consistent with the IIP Regulations, the Company proposes IIP baseline spending levels in an amount that is at least 10 percent of the total program capital expenditures, to be recovered through a future base rate case. These capital expenditures will be for work similar to that proposed to be recovered under IIP 2, meaning projects consisting of the replacement of cast iron, Vintage Steel and Vintage Plastic main.

Q. WHAT IS THE BASIS FOR THE COMPANY'S PROPOSED TOTAL CAPITAL BASELINE SPENDING LEVEL?

A. In this case, Elizabethtown proposes total capital baseline spending of an average annual amount of $93 million per IIP year or $465 million over the 5-year Program period from July 1, 2024 through June 30, 2029. New business expenditures included in this total capital baseline spending will not exceed $105 million of the $465 million total, or an average of $21 million per IIP year. Elizabethtown's level of actual total capital baseline spending for calendar years 2019 through 2022 and forecast total capital baseline spending for 2023 total $734.0 million over the 5-year period, or an average of $146.8 million per year. These amounts include new business expenditures totaling $213.6 million during this 5-year period, or an average of $42.7 million per

year. The proposed level of baseline capital expenditures is derived from Elizabethtown's historic level of capital expenditures over the 2019-2023 period, as shown on Schedule MPS-1.

IX. REPORTING

Q. DOES THE COMPANY INTEND TO PROVIDE REGULAR REPORTS TO THE BOARD CONCERNING ITS PROGRESS?

A. Yes. In accordance with *N.J.A.C.* 14:3-2A.5((e), Elizabethtown will file supportive semi-annual status reports with the Board and the New Jersey Division of Rate Counsel for project management and oversight purposes. The reports will provide the following information, at a minimum: (i) forecasted and actual costs of the Program by major category; (ii) estimated total quantity of work completed under the Program by major category; (iii) estimated completion dates for the Program and each major category; (iv) anticipated changes to Program projects, if any; and (v) any other performance metrics required by the Board.

Q. WHY IS THE COMPANY PROPOSING TO UTILIZE AN INDEPENDENT MONITOR IN ADMINISTERING THE PROPOSED IIP 2?

A. The Company believes that having an independent monitor review the Company's IIP 2 reports will benefit the Company, its customers and other stakeholders. The Board's IIP regulations contemplate the use of an independent monitor and the Company has found that the monitor's evaluation assists the Company in administering the program.

Moreover, the Company believes that the Board and its Staff benefit from having an independent party review the Company's IIP reports on a relatively current basis.

X. PROGRAM BENEFITS

Q. PLEASE DESCRIBE THE BENEFITS TO CUSTOMERS AND THE GENERAL PUBLIC ASSOCIATED WITH THE PROPOSED IIP 2.

A. The proposed IIP 2 will result in a safer, more resilient, and more reliable distribution system. The benefits of replacing aging infrastructure are clear and compelling. First, if approved, the IIP 2 will enable Elizabethtown to retire portions of the Company's pipe inventory that are more susceptible to leaks and breaks over the five year period. Any leak increases the potential for an incident and leads to higher operating costs associated with leak management. Second, in addition to the elimination of a significant source of leaks and breaks, the IIP 2 would replace the existing at-risk vintage facilities with state-of-the-art materials that would provide reliability advantages. These advantages include reduced outages due to water infiltration and the ability to more readily isolate and shut off a smaller area of main when damage occurs, minimizing the impact on customers.

Q. WHAT ARE SOME OF THE BENEFITS ASSOCIATED WITH THE METER RELOCATIONS THAT WILL TAKE PLACE IN CONJUNCTION WITH THE IIP 2?

A. There are several benefits associated with an "all-outside" distribution system, including the potential to avoid water damage due to flooding to meter sets by

removing them from basements and relocating them outside. In addition, the Company will no longer have to coordinate appointment times to gain access to a premise for maintenance and inspection. As stated previously, the costs related to moving these meters from inside to out will not be recovered through the IIP 2.

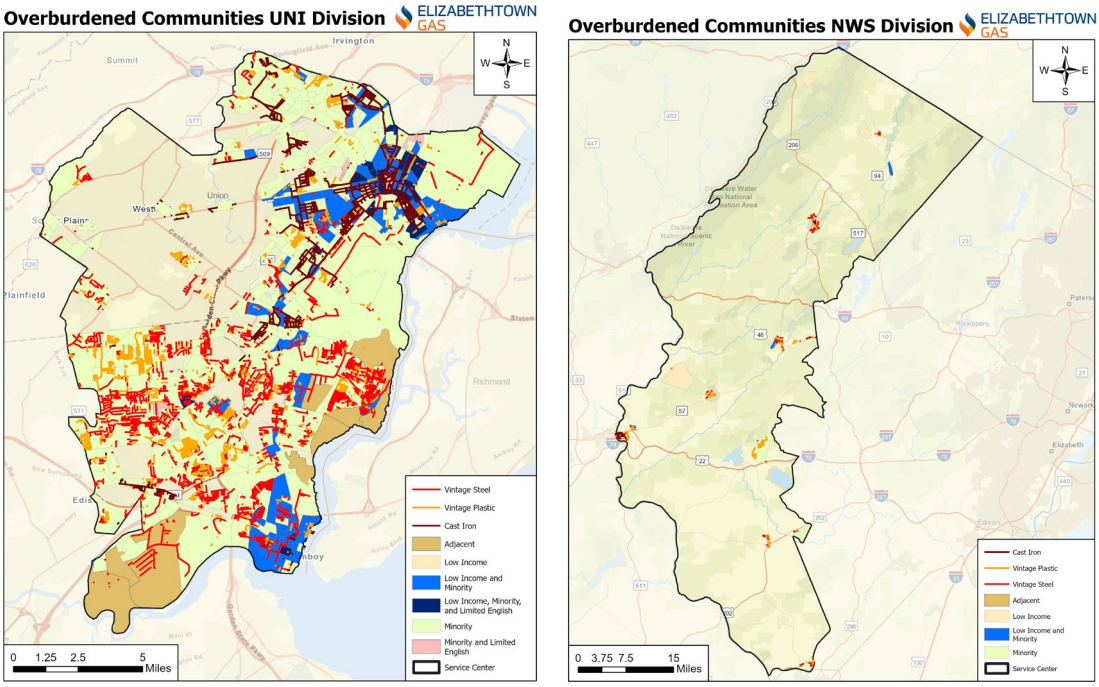
Q. HOW WILL CUSTOMERS AND COMMUNITIES BENEFIT FROM THE BOARD'S APPROVAL OF THE IIP 2?

A. In addition to the safety and reliability benefits discussed earlier, cost savings associated with approaching the work in a multi-year, planned program will continue to yield lower costs for infrastructure replacement, which will be reflected in future customer prices. In addition, a reduction in the frequency of leaks and the need for repair work will free up Company resources, improve customer satisfaction and reduce negative customer impacts. Lastly, the accelerated replacement of vintage infrastructure will enable customers located on the current LP system to have increased options when it comes to selecting appliances and higher efficiency gas utilization equipment.

Q. WILL THE PROPOSED IIP 2 PROVIDE SPECIFIC BENEFITS TO OBCS?

A. Yes. IIP 2 has the added benefit of a significant amount of system upgrades in many of New Jersey's OBCs. A significant amount of system upgrade work is planned in OBCs. The below maps show the Company's vintage pipelines within the OBCs that the Company serves. These areas account for approximately 59 percent of the overall vintage cast iron, steel and plastic within the Company's inventory and should account

for the reduction in methane emissions in these areas by approximately 104 metric tons per year.



As a result of IIP 2 OBCs will realize the benefit of both reduced GHG/Methane emissions and greater safety and reliability of the natural gas distribution system located in OBC communities.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

Elizabethtown Gas Company
Capital Financial Summary Report
5 Year Plan Capex
Calendar Years 2024-2028

	2024 Plan	2025 Plan	2026 Plan	2027 Plan	2028 Plan	2029 Plan *	IIP 2 Program
New Business	**$65.3**	**$68.5**	**$66.4**	**$67.9**	**$70.6**	**$0.0**	
Infrastructure Program	**$116.0**	**$131.7**	**$139.7**	**$146.7**	**$156.8**	**$82.7**	
Infrastructure Investment Program (No OH, No AFUDC)	$71.8	$3.0					
Infrastructure Investment Program (OH)	$7.0	$0.3					
Infrastructure Investment Program (AFUDC)	$0.3	$0.0					
Infrastructure Investment Program - Base Spend (No OH, No AFUDC)	$1.0						
Infrastructure Investment Program - Base Spend (OH)	$0.1						
Infrastructure Investment Program - Base Spend (AFUDC)	$0.0						
Infrastructure Investment Program II (No OH, No AFUDC)	$28.2	$109.8	$115.3	$121.0	$127.1	$66.7	$568.1
Infrastructure Investment Program II (OH)	$2.8	$11.0	$11.5	$12.1	$12.7	$6.7	$56.9
Infrastructure Investment Program II (AFUDC)	$0.1	$0.6	$0.6	$0.6	$0.6		
Infrastructure Investment Program II - Base Spend (No OH, No AFUDC)	$4.3	$6.4	$11.2	$11.7	$14.8	$8.5	$56.8
Infrastructure Investment Program II - Base Spend (OH)	$0.4	$0.6	$1.1	$1.2	$1.5	$0.8	$5.7
Infrastructure Investment Program II - Base Spend (AFUDC)	$0.0	$0.0	$0.0	$0.0	$0.0		
System Growth and Maintenance	**$99.3**	**$81.9**	**$88.1**	**$85.5**	**$72.0**	**$0.0**	
Total Capital	**$280.6**	**$282.1**	**$294.3**	**$300.2**	**$299.4**	**$82.7**	

* Shown for IIP 2 purposes only. No other forecasts available for 2029.

						5 Year Total	5 Year Avg
New Business	**$65.3**	**$68.5**	**$66.4**	**$67.9**	**$70.6**	**$338.7**	**$67.7**
System Growth and Maintenance	**$99.3**	**$81.9**	**$88.1**	**$85.5**	**$72.0**	**$426.9**	**$85.4**
Total Capital excluding Infrastructure Program	**$164.6**	**$150.4**	**$154.5**	**$153.4**	**$142.6**	**$765.7**	**$153.1**

Elizabethtown Gas Company
Capital Financial Summary Report
Actual 5 Year Capex in $M
Calendar Years 2019-2023

	2019 Actual	2020 Actual	2021 Actual	2022 Actual	2023 Actual/Forecast 9+3
New Business	**$30.2**	**$35.0**	**$43.9**	**$48.7**	**$55.8**
Infrastructure Program	**$29.9**	**$84.2**	**$85.6**	**$85.5**	**$110.6**
Infrastructure Investment Program (No OH, No AFUDC)	$25.5	$74.4	$69.4	$72.5	$93.5
Infrastructure Investment Program (OH)	$1.6	$3.8	$6.6	$7.9	$7.9
Infrastructure Investment Program (AFUDC)	$0.1	$0.2	$0.4	$0.5	$0.5
Infrastructure Investment Program - Base Spend (No OH, No AFUDC)	$2.6	$5.4	$8.3	$4.1	$8.0
Infrastructure Investment Program - Base Spend (OH)	$0.1	$0.3	$0.8	$0.4	$0.6
Infrastructure Investment Program - Base Spend (AFUDC)	$0.0	$0.0	$0.0	$0.0	$0.1
System Growth and Maintenance	**$137.0**	**$81.1**	**$96.1**	**$106.7**	**$99.6**
Total Capital	**$197.1**	**$200.3**	**$225.5**	**$240.9**	**$266.0**

						5 Year Total	5 Year Avg
New Business	**$30.2**	**$35.0**	**$43.9**	**$48.7**	**$55.8**	**$213.6**	**$42.7**
System Growth and Maintenance	**$137.0**	**$81.1**	**$96.1**	**$106.7**	**$99.6**	**$520.4**	**$104.1**
Total Capital Baseline	**$167.1**	**$116.1**	**$140.0**	**$155.4**	**$155.4**	**$734.0**	**$146.8**

New Business (approx. 50% of 5 year average)						**$105.0**	**$21.0**
System Growth and Maintenance [1]	**$89.5**	**$38.6**	**$69.5**	**$85.5**	**$78.9**	**$360.0**	**$72.0**
Total Capital Baseline						**$465.0**	**$93.0**

[1] Excludes one-time items related to LNG and IT

Schedule MPS-3

Elizabethtown Gas Company
Infrastructure Investment Program 2 ("IIP 2")
Annual Budget and Baseline Spending
Mains & Services, Excludes AFUDC
Program Year 12 Months Ending June 30th

Program Projects	Year ending June 30, 2025	Year ending June 30, 2026	Year ending June 30, 2027	Year ending June 30, 2028	Year ending June 30, 2029	
	Program Year 1	**Program Year 2**	**Program Year 3**	**Program Year 4**	**Program Year 5**	**Total**
LP Cast-iron Replacement						
Mileage	10	10	-	-	-	20
Cost	$ 25,000,000	$ 25,000,000	$ -	$ -	$ -	$ 50,000,000
Vintage Plastic EP Replacement						
Mileage	20	20	25	25	25	115
Cost	$ 50,000,000	$ 50,000,000	$ 62,500,000	$ 62,500,000	$ 62,500,000	$ 287,500,000
Vintage Steel EP Replacement						
Mileage	20	20	25	25	25	115
Cost	$ 50,000,000	$ 50,000,000	$ 62,500,000	$ 62,500,000	$ 62,500,000	$ 287,500,000
Summary						
Total Installed Mileage	50.0	50.0	50.0	50.0	50.0	250.0
Total Cost	$ 125,000,000	$ 125,000,000	$ 125,000,000	$ 125,000,000	$ 125,000,000	$ 625,000,000
10% Base Spend	$ 12,500,000	$ 12,500,000	$ 12,500,000	$ 12,500,000	$ 12,500,000	$ 62,500,000
IIP 2 In-Program + Base Spend	**$ 137,500,000**	**$ 137,500,000**	**$ 137,500,000**	**$ 137,500,000**	**$ 137,500,000**	**$ 687,500,000**
Cost Per Mile	**$ 2,500,000**	**$ 2,500,000**	**$ 2,500,000**	**$ 2,500,000**	**$ 2,500,000**	**$ 2,500,000**

EXHIBIT P-4

STATE OF NEW JERSEY
BOARD OF PUBLIC UTILITIES

I/M/O THE PETITION OF ELIZABETHTOWN GAS COMPANY TO IMPLEMENT AN INFRASTRUCTURE INVESTMENT PROGRAM ("IIP") AND ASSOCIATED RECOVERY MECHANISM PURSUANT TO *N.J.S.A.* 48:2-21 AND *N.J.A.C.* 14:3-2A

DIRECT TESTIMONY

OF

THOMAS KAUFMANN
MANAGER OF RATES AND TARIFFS

ON BEHALF OF

ELIZABETHTOWN GAS COMPANY

December 11, 2023

DIRECT TESTIMONY OF
THOMAS KAUFMANN

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME, AFFILIATION AND BUSINESS ADDRESS.

A. My name is Thomas Kaufmann and I am the Manager of Rates and Tariffs for Elizabethtown Gas Company ("Elizabethtown" or "Company"). My business address is 520 Green Lane, Union, New Jersey 07083.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL RESPONSIBILITIES.

A. I am responsible for designing and developing rates and rate schedules for regulatory filings with the New Jersey Board of Public Utilities ("BPU" or "Board") and internal management purposes. I also oversee daily rate department functions, including tariff administration, monthly parity pricing, competitive analyses and preparation of management reports.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL QUALIFICATIONS AND BUSINESS EXPERIENCE.

A. In June 1977, I graduated from Rutgers University, Newark, N.J. with a Bachelor of Arts degree in Business Administration, majoring in accounting and economics. In July 1979, I graduated from Fairleigh Dickinson University, Madison, N.J. with a Masters of Business Administration, majoring in finance.

My professional responsibilities have encompassed financial analysis, accounting, planning, and pricing in manufacturing and energy services companies in both regulated and unregulated industries. In 1977, I was employed by Allied Chemical Corp. as a staff accountant. In 1980, I was employed by Celanese Corp. as

a financial analyst. In 1981, I was employed by Suburban Propane as a Strategic Planning Analyst, promoted to Manager of Rates and Pricing in 1986 and to Director of Acquisitions and Business Analysis in 1990. In 1993, I was employed by Concurrent Computer as a Manager, Pricing Administration. In 1996, I joined NUI Corporation as a Rate Analyst. I was promoted to Manager of Regulatory Support in August 1997, Manager of Regulatory Affairs in February 1998, and named Manager of Rates and Tariffs in July 1998. South Jersey Industries, Inc. acquired Elizabethtown Gas on July 1, 2018.

II. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to support Elizabethtown's petition in this proceeding to establish an Infrastructure Investment Program 2 ("IIP 2") beginning July 1, 2024 to permit the Company to undertake a five-year program to modernize and enhance the reliability and safety of its gas distribution system and obtain timely recovery of the costs associated with IIP 2. Approval of this program will allow the Company to continue make investments in non-revenue producing facilities that enhance the safety and reliability of the Company's distribution system. The Company's proposal is consistent with previous infrastructure programs approved by the Board including the Company's current five-year Infrastructure Investment Program ("IIP") which was approved by Board Order dated June 12, 2019 in BPU Docket No. GR18101197 (the "IIP 2019 Order"). The proposed IIP 2 program would operate in the same way as the Company's current IIP for purposes of reporting and the determination of revenue

requirements. As part of my testimony, I will provide details for calculating the revenue requirement, the associated cost recovery mechanism, rate design and customer bill impacts associated with the proposed IIP 2.

Q. DOES YOUR TESTIMONY INCLUDE ANY SCHEDULES THAT ILLUSTRATE HOW THE IIP 2 RATE AND REVENUE REQUIREMENT WILL BE DETERMINED?

A. Yes. The following supporting schedules, which were prepared or compiled under my supervision and direction, are attached:

- Schedule TK-1: Forecasted Revenue Requirement and Residential Bill Impacts for years 1 through 5
- Schedule TK-2: Summary of Schedules TK-3, TK-4 and the Proposed Incremental IIP 2 Rates, inclusive of sales tax
- Schedule TK-3: Revenue Requirement Allocation
- Schedule TK-4: Proof of Revenue
- Schedule TK-5: Weather Normalization Clause ("WNC") Margin Revenue Factor for use in the Company's Conservation Incentive Program ("CIP")
- Schedule TK-6: Earnings Test, illustrative example
- Schedule TK-6.1: Earnings Test Rate Base, illustrative example
- Schedule TK-7: In-Service amounts for years 1 through 5
- Schedule TK-8: Depreciation Calculation for years 1 through 5
- Schedule TK-9: After-Tax Weighted Average Cost of Capital ("WACC")
- Schedule TK-10: Revenue Expansion Factor

- Schedule TK-11: Proposed Tariff sheets – clean and redline

III. IIP 2 COST RECOVERY

Q. PLEASE DESCRIBE HOW ELIZABETHTOWN PROPOSES TO RECOVER THE COSTS OF THE PROPOSED IIP 2.

A. Elizabethtown proposes to recover the IIP 2 costs through Rider F to the Company's tariff ("IIP Rider"), which will permit recovery of the revenue requirements associated with the IIP 2 based on actual plant in-service. As with the Company's IIP, the cost recovery process will be effectuated by annual rate adjustment filings ("Annual Filings") made in April with 9 months actual data and 3 months of estimated data ("9+3 filing"). Estimated data in the 9+3 filing is updated to actual data in a 12+0 filing made no later than July 15th of each year. With each Annual Filing, Elizabethtown will be seeking cost recovery of main and service investments that are placed in service during the program year plus other costs described below with IIP Rider rate adjustments to be effective October 1 of each year. As proposed, approximately $625 million of investments in mains, services and excess flow valves, excluding Allowance for Funds Used During Construction ("AFUDC") and Independent Monitor costs, will be made over the five-year program. The Company proposes to make its first filing on April 30, 2025, detailing eligible IIP 2 in-service projects during the period July 1, 2024 through June 30, 2025. Further details regarding the revenue requirement calculation and proposed timing of each annual filing are provided below.

Q. PLEASE EXPLAIN HOW THE COMPANY PROPOSES TO CALCULATE THE REVENUE REQUIREMENT FOR THE IIP 2 PROJECTS.

A. The revenue requirement is calculated using the following formula:

Revenue Requirements = ((IIP 2 Rate Base * After-Tax WACC) – O&M Credit + Depreciation Expense (net of tax)) * Revenue Factor

Projected revenue requirements for each IIP 2 roll-in are provided in Schedule TK-1.

Q. HOW DOES THE COMPANY PROPOSE TO CALCULATE THE IIP 2 RATE BASE?

A. The IIP 2 Rate Base is calculated as the filing period's gross plant-in-service plus the costs of an Independent Monitor and AFUDC, less book depreciation and Deferred Income Taxes.

Q. HOW DOES THE COMPANY PROPOSE TO CALCULATE AFUDC FOR IIP 2 PROJECTS?

A. The AFUDC rate proposed to be applied to IIP 2 projects will be determined by applying the Modified FERC Uniform System of Accounts methodology ("Modified FERC Method"), including compounding of AFUDC on a monthly basis. The Modified FERC Method is as follows: (a) if the Company's total Construction Work in Progress ("CWIP") balance, including all CWIP associated with IIP 2 projects, is less than or equal to the Company's outstanding short-term debt balance at each month-end, the applicable AFUDC rate is equal to the Company's monthly cost of short-term debt; (b) if the Company's total CWIP balance, including all CWIP associated with IIP

2 projects, is greater than the Company's outstanding short-term debt balance, the applicable AFUDC rate for IIP 2 projects is a monthly AFUDC calculation based on a blend of the short-term debt balance and the Company's after-tax WACC rate; or (c) if the Company has no short-term debt balance at month end, the AFUDC rate used is the after-tax WACC rate.

Q. HOW IS THE AFTER-TAX WACC CALCULATED?

A. The return on proposed IIP 2 Rate Base will be calculated utilizing the after-tax WACC which is predicated on the Rate of Return ("ROR") approved in the Company's most recent base rate case in Docket No. GR21121254 ("2021 Base Rate Case") The ROR is 6.83% while the after-tax WACC is 6.31%, both of which are calculated utilizing a 9.60% return on equity ("ROE") and an equity level in the capital structure of 52.00%. This calculation is included in Schedule TK-9.

Q. HOW WILL DEPRECIATION EXPENSE BE CALCULATED?

A. Depreciation expense is calculated on the IIP 2 investments by asset class multiplied by the associated depreciation rate applied to the same asset class in current base rates established in the Company's 2021 Base Rate Case. The depreciation calculation and associated depreciation rates are shown in Schedule TK-8.

Q. WHAT IS THE O&M CREDIT UTILIZED IN THE CALCULATION OF THE REVENUE REQUIREMENT?

A. The Company is proposing to continue, consistent with the IIP 2019 Order, the operations and maintenance ("O&M") credit of $100,000 per year, or $71,890 net of tax. This credit reflects an O&M savings associated with avoided leak repairs on facilities replaced in connection with the IIP 2. The total O&M credit net of tax is reflected in Schedule TK-1.

Q. WHAT IS THE REVENUE EXPANSION FACTOR UTILIZED IN THE CALCULATION OF THE REVENUE REQUIREMENT?

A. The revenue expansion factor adjusts the revenue requirement to reflect State and Federal income taxes, as well as the costs associated with Board and New Jersey Division of Rate Counsel Annual Assessments and uncollectibles. The Company is using the revenue factor that was utilized to set rates in the Company's 2021 Base Rate Case, which is 1.404475. The calculation of the revenue factor is reflected on Schedule TK-10.

Q. WHAT EXPENDITURES WILL BE INCLUDED IN IIP 2 PLANT-IN-SERVICE BALANCES?

A. The IIP 2 plant-in-service balances would include all capital expenditures associated with IIP 2 projects placed in service, including actual costs of engineering, design and construction (including actual labor, materials and overhead), property acquisitions, AFUDC and Independent Monitor costs. Company expenditures incurred prior to

Board approval of the IIP 2 shall not be eligible for accelerated recovery, except the Company is proposing to include certain engineering design, permitting and materials costs to allow it to have projects ready for a July 1, 2024 start date.

Q. WHEN ARE IIP 2 EXPENDITURES ELIGIBLE FOR AFUDC?

A. While IIP 2 projects are under construction, they will be recorded in a CWIP account and will accrue AFUDC on a monthly basis. The AFUDC will be capitalized and included in the balance to be recovered through the IIP Rider. At the time the respective project is deemed used and useful, it will be transferred to a utility plant in-service account and the booking of AFUDC will cease. The AFUDC rate on CWIP balances will be determined using the Modified FERC Method.

Q. HOW WILL DEFERRED INCOME TAXES BE CALCULATED?

A. Deferred income taxes will be calculated by multiplying the difference in the Company's tax depreciation expense and book depreciation expense for the plant subject to the IIP 2 by the effective income tax rate. The Company's tax depreciation expense would be adjusted for any bonus depreciation in accordance with Federal tax laws. The current tax rate used in the calculation of deferred taxes is 28.11% and includes New Jersey Corporate Business Tax. The Company's deferred income tax calculation and related factors are shown in Schedule TK-1.

Q. HOW DOES THE COMPANY PROPOSE TO ADJUST THE IIP 2 RATE?

A. The Company is proposing to recover the revenue requirement associated with the IIP 2 based on actual plant in-service on an annual basis. Consistent with the requirement contained in N.J.A.C. 14:3-2A.6(b), Elizabethtown would be permitted to make annual filings to recover IIP 2 costs when eligible in-service amounts exceed ten (10%) percent of the total proposed program spending. Assuming approval of the IIP 2 on or prior to July 1, 2024, the proposed IIP 2 investments are scheduled to be completed by June 30, 2029, except for certain residual close-out work that may occur following the conclusion of IIP 2. As such, the Company will make a 9+3 filing on April 30, 2030 based on actual plant-in-service through March 31, 2030 and projections through June 30, 2030, with a 12+0 filing made on July 15, 2030 based on actual plant-in-service through June 30, 2030 to close out the IIP 2 projects. Given the nature of the work, the April 30, 2030 and July 15, 2030 filings may be less than 10% of total program spending. The table below provides a proposed filing schedule for the IIP 2.

Filing Year	Initial 9+3 Filing	Program Year Ending Date	12+0 Update Filing	Rates Effective on or Before
1	April 30, 2025	June 30, 2025	July 15, 2025	Oct 1, 2025
2	April 30, 2026	June 30, 2026	July 15, 2026	Oct 1, 2026
3	April 30, 2027	June 30, 2027	July 15, 2027	Oct 1, 2027
4	April 30, 2028	June 30, 2028	July 15, 2028	Oct 1, 2028
5	April 30, 2029	June 30, 2029	July 15, 2029	Oct 1, 2029
Residual *	April 30, 2030	June 30, 2030	July 15, 2030	Oct 1. 2030

*Residual Filing for restoration spending occurring after June 30, 2029.

Q. ARE YOU PROPOSING ANY CUSTOMER SAFEGUARDS IN CONNECTION WITH THE PROPOSED COST RECOVERY MECHANISM?

A. Yes. The IIP 2 is subject to an earnings test on ROE. Accordingly, the Company will perform an earnings test calculation as illustrated on Schedule TK-6, consistent with the methodology of the current IIP. To the extent the calculated ROE exceeds the authorized ROE approved in the Company's most recent base rate case by 50 basis points or more, the Company will not seek accelerated recovery of the IIP 2 investments in the applicable filing period. To the extent that this prevents the Company from recovering IIP 2 program costs in any given annual filing period, such costs will be deferred and included in the next annual filing period, in which the earnings test is met.

Q. UNDER THE COMPANY'S PROPOSAL, WHAT OPPORTUNITY WILL THE BOARD HAVE TO REVIEW THE IIP 2 COSTS?

A. As discussed above, Elizabethtown proposes to make annual IIP 2 filings to recover IIP 2 investments placed in service during the five-year program period that would commence on July 1, 2024 and remain in effect until June 30, 2029. The Board and other interested parties will have the opportunity to review these filings to ensure that the proposed rates are calculated in accordance with the Board's order approving the IIP 2 and any other relevant Board orders. The IIP 2 rate will be adjusted on a provisional basis and will be deemed final when the IIP 2 project costs are rolled into base rates in the Company's next base rate proceeding.

Q. DOES THE COMPANY PLAN TO FILE A BASE RATE CASE IN CONNECTION WITH THE PROPOSED IIP 2?

A. Yes. In accordance with *N.J.A.C.* 14:3-2A.6(f), the Company will file a base rate case no later than five years after commencement of IIP 2, at which time the prudence of IIP 2 costs would be subject to review.

IV. RATE DESIGN AND CUSTOMER BILL IMPACTS

Q. TO WHICH CUSTOMER CLASSES AND CUSTOMERS DOES THE IIP RIDER APPLY?

A. The IIP Rider is assessed to all firm customers on a rate per service class to those served under Service Classifications RDS, SGS, GDS, NGV, LVD, EGF, and GLS including certain firm Board-approved special contract customers served under the Company's firm rate classes.

Q. HOW HAS THE COMPANY INCORPORATED YEAR 5 OF ITS CURRENT IIP INTO REVENUE REQUIREMENTS, RATES AND THE RESIDENTIAL BILL IMPACT FOR PRESENTING THE CHANGES RELATED TO IIP 2?

A. The Company has estimated the final year of its current IIP and added the estimated revenue amount for plant placed in service at June 30, 2024 into Schedules TK-2, TK-3, TK-4 and TK-5 in order to *pro forma* the changes resulting from IIP 2 and the residential bill impact shown on Schedule TK-1.

Q. HOW IS THE REVENUE REQUIREMENT BEING ALLOCATED TO FIRM RATE CLASSES AND FIRM SPECIAL CONTRACT CUSTOMERS?

A. As shown on Schedule TK-3, consistent with the IIP 2019 Order, the Company is allocating the revenue requirement to each applicable firm class and firm special contracts. The amounts being allocated to derive an estimated rate at October 1, 2025 consist of actuals for years 3 and 4 and an estimate of year 5 of the current IIP program, plus year 1 of IIP 2 based on the percentage of revenues approved in the Company's 2021 Base Rate Case. Note that years 1 and 2 of the current program were previously rolled into base rates. These amounts are divided by the respective therm billing determinants from the Company's 2021 Base Rate Case to derive the proposed rates, before Sales and Use Tax, as shown on Schedule TK-4. The revenue requirement allocation, proof of revenues and proposed rates by class, inclusive of taxes, are summarized on Schedule TK-2. In addition, the Margin Revenue Factor set forth in the Company's WNC tariff will also be revised to reflect the IIP 2 rate adjustments, as shown on Schedule TK-5 for use in the Company's annual CIP filing.

Q. PLEASE DESCRIBE THE DERIVATION OF THE RATES ON THE ILLUSTRATIVE TARIFF SHEETS ON SCHEDULE TK-11.

A. As shown on Schedule TK-2, the rates on the illustrative Tariff Sheets are based on the revenue requirements amounts from the current IIP for years 3, 4 and 5, plus year 1 of the proposed IIP 2. Current IIP years 3 and 4 are Board-approved amounts and year 5 is estimated to complete the current IIP at June 30, 2024. The proposed Year 1 revenue

requirement for IIP 2 was added to current IIP amounts to derive the rates presented on the illustrative Tariff Sheets on Schedule TK-11, summarized as follows:

Per Therm Rates with Tax:	Yrs. 3 & 4 Approved *	Yr. 5 Estimate **	Proposed Yr 1 IIP 2	Illustrative Tariff Sheet
Residential Delivery Service (RDS)	$0.0351	$0.0176	$0.0381	$0.0908
Small General Service (SGS)	$0.0375	$0.0190	$0.0408	$0.0973
General Delivery Service (GDS)	$0.0275	$0.0139	$0.0298	$0.0712
GDS SP#1 May-Oct	$0.0031	$0.0016	$0.0034	$0.0081
Natural Gas Vehicles (NGV)	$0.0644	$0.0325	$0.0701	$0.1670
Large Volume Demand (LVD)	$0.0099	$0.0050	$0.0108	$0.0257
Electric Generation Firm (EGF)	$0.0275	$0.0139	$0.0298	$0.0712
Gas Lights Service (GLS)	$0.0333	$0.0163	$0.0360	$0.0856
Firm Spec. Contracts	$0.0016	$0.0007	$0.0018	$0.0041

Notes:
* Current rate based on Years 3 and 4 approved effective on 10-1-22 and 10-1-23, respectively, by the Board's Order dated 9-28-22 in Docket. No. GR22040316 and the Board's Order dated 9-27-23 in Docket. No. GR23040270.

** Year 5 is based on the estimated amount to complete the current IIP program by June 30, 2024.

Q. PLEASE PROVIDE AN ESTIMATE OF THE POTENTIAL RATE IMPACT ON A TYPICAL RESIDENTIAL HEATING CUSTOMER OVER THE FIVE-YEAR TERM OF THE PROGRAM.

A. The initial estimated bill impact for a residential heating customer using 1,000 therms Annually, beginning on October 1, 2025, based on plant in service as of June 30, 2025, is $38.10 or 3.1% as shown on Schedule TK-1. As noted previously, bill impact calculations have been adjusted to include an estimate of year 5 of the current IIP. Schedule TK-1 also presents the estimated residential bill impacts for the remaining periods of the program.

Q. WHY IS IT APPROPRIATE FOR THE BOARD TO AUTHORIZE THE COMPANY TO IMPLEMENT THE PROPOSED IIP 2 COST RECOVERY MECHANISM?

A. Approval of the IIP 2 is consistent with the ratemaking approach permitted under *N.J.A.C.* 14:3-2A. The Company must be permitted to adjust rates on a provisional basis to ensure current recovery of IIP 2 related costs. The proposed cost recovery mechanism will allow the Company to continue making significant incremental capital investments to improve the safety and reliability of its system, while recovering costs in a timely manner to ensure its ability to access the credit and capital markets is maintained. Additionally, by reflecting IIP 2 investments in rates on an annual basis, shortly after authorized investments are expended and prior to the Company's next base rate case, customer bills are impacted in smaller increments thereby reducing rate shock.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

ELIZABETHTOWN GAS COMPANY
Infrastructure Investment Program 2 ("IIP 2")
Revenue Requirement and Residential Bill Impact

		June 2025 Proposed Oct 1	June 2026 Proposed Oct 1	June 2027 Proposed Oct 1	June 2028 Proposed Oct 1	June 2029 Proposed Oct 1
Plant In Service (excl AFUDC)		$125,000,000	$125,000,000	$125,000,000	$125,000,000	$125,000,000
Monitor		$60,000	$60,000	$60,000	$60,000	$60,000
AFUDC		$807,888	$807,888	$807,888	$807,888	$807,888
Total Plant In Service		$125,867,888	$125,867,888	$125,867,888	$125,867,888	$125,867,888
Book Depreciation, half year		($1,368,032)	($1,368,032)	($1,368,032)	($1,368,032)	($1,368,032)
Deferred Income Tax		($942,251)	($942,251)	($942,251)	($942,251)	($942,251)
Rate Base		$123,557,605	$123,557,605	$123,557,605	$123,557,605	$123,557,605
Rate of Return - net of tax		6.31%	6.31%	6.31%	6.31%	6.31%
		$7,796,485	$7,796,485	$7,796,485	$7,796,485	$7,796,485
O&M Reduction for Leak Repairs - net of tax		($71,890)	($71,890)	($71,890)	($71,890)	($71,890)
Depreciation Exp, net of tax		$1,966,956	$1,966,956	$1,966,956	$1,966,956	$1,966,956
Allowable Net Income		$9,691,551	$9,691,551	$9,691,551	$9,691,551	$9,691,551
Revenue Factor		1.404475	1.404475	1.404475	1.404475	1.404475
Current Revenue Requirement		**$13,611,541**	**$13,611,541**	**$13,611,541**	**$13,611,541**	**$13,611,541**
Previous Periods		**$0**	**$13,611,541**	**$27,223,082**	**$40,834,623**	**$54,446,164**
Cumulative Revenue Requirement		**$13,611,541**	**$27,223,082**	**$40,834,623**	**$54,446,164**	**$68,057,705**
CBT Rate, see Sch 9		9.000%	9.000%	9.000%	9.000%	9.000%
FIT Rate, See Sch 9		21.000%	21.000%	21.000%	21.000%	21.000%
Net Tax Rate		28.110%	28.110%	28.110%	28.110%	28.110%
Average Book Depreciation Rate		2.17%	2.17%	2.17%	2.17%	2.17%
Tax Depreciation Rate		3.750%	3.750%	3.750%	3.750%	3.750%
Bonus Depreciation Rate		0%	0%	0%	0%	0%
Half Year Book Depreciation		$1,368,032	$1,368,032	$1,368,032	$1,368,032	$1,368,032
Tax Bonus Depreciation		$0	$0	$0	$0	$0
Tax Depreciation		$4,720,046	$4,720,046	$4,720,046	$4,720,046	$4,720,046
Deferred Income Tax Credit, (Bk - Tax)* Tax Rate		($942,251)	($942,251)	($942,251)	($942,251)	($942,251)
O&M Reduction for Leak Repairs - pre tax		($100,000)	($100,000)	($100,000)	($100,000)	($100,000)
Residential 1,000 Therm Current Period Bill Impact:						
Revenue Requirement % Sch TK-3 * Rev. Req.	66.325001%	$ 9,027,855	$ 9,027,855	$ 9,027,855	$ 9,027,855	$ 9,027,855
Rate Case Therms, Sch TK-4 / Pre Tax Rate	252,443,185	$0.0357	$0.0358	$0.0358	$0.0358	$0.0358
Rate Increase Per Therm w/ SUT, Year 1 Sch TK-2	106.625%	$0.0381	$0.0382	$0.0382	$0.0382	$0.0382
Annual Increase, w/tax	1,000	$38.10	$38.20	$38.20	$38.20	$38.20
Cumulative Increase		$38.10	$76.30	$114.50	$152.70	$190.90
1,000 therm Bill (as of 12/1/23) plus Yr. 5 Esti *	$1,221.20	$1,259.30	$1,297.50	$1,335.70	$1,373.90	$1,412.10
% Increase from Prior Bill		**3.1%**	**3.0%**	**2.9%**	**2.9%**	**2.8%**
Cumulative % Increase from Current Bill		**3.1%**	**6.2%**	**9.4%**	**12.5%**	**15.6%**
** Current Program Year 5 Estimate Included Above:*	$17.60					

ELIZABETHTOWN GAS COMPANY
Infrastructure Investment Program 2 ("IIP 2")
Estimated Proposed Rates - October 1, 2025
and
Incremental Year 1 IIP 2 Rate Changes

c	Current 5 Year Program: Yrs. 3 & 4 Approved Rates w/ Tax	Current 5 Year Program: Yr. 5 Estimate Rates w/ Tax	Current 5 Year Program: Sum of Yrs. 3-5 Rates w/ Tax	2021 Rate Case % of Base Revenues	Years 3-5 and Yr 1 IIP 2: Target Revenue Requirement	Years 3-5 and Yr 1 IIP 2: Revenue per Proof	2021 Rate Case Distribution Therms	Years 3-5 and Yr 1 IIP 2: Pre Tax Rates per Proof	Years 3-5 and Yr 1 IIP 2: Sales Tax 6.625%	Years 3-5 and Yr 1 IIP 2: Tariff Rates w/ Tax	IIP 2 Rate Changes w/ Tax
Residential Delivery Service (RDS	$0.0351	$0.0176	$0.0527	66.325001%	$21,505,715	$21,508,159	252,443,185	$0.0852	$0.0056	$0.0908	$0.0381
Small General Service (SGS)	$0.0375	$0.0190	$0.0565	6.693284%	$2,170,281	$2,171,117	23,780,038	$0.0913	$0.0060	$0.0973	$0.0408
General Delivery Service (GDS)	$0.0275	$0.0139	$0.0414	22.952551%	$7,442,307	$7,438,615	111,356,509	$0.0668	$0.0044	$0.0712	$0.0298
GDS SP#1 May -Oct	$0.0031	$0.0016	$0.0047	0.000769%	$249	$248	32,668	$0.0076	$0.0005	$0.0081	$0.0034
Natural Gas Vehicles (NGV)	$0.0644	$0.0325	$0.0969	0.022968%	$7,447	$7,447	47,552	$0.1566	$0.0104	$0.1670	$0.0701
Large Volume Demand (LVD)	$0.0099	$0.0050	$0.0149	3.846146%	$1,247,103	$1,245,406	51,676,578	$0.0241	$0.0016	$0.0257	$0.0108
Electric Generation Firm (EGF)	$0.0275	$0.0139	$0.0414	0.000000%	$0	$0	-	$0.0668	$0.0044	$0.0712	$0.0298
Gas Lights Service (GLS)	$0.0333	$0.0163	$0.0496	0.000660%	$214	$214	2,664	$0.0803	$0.0053	$0.0856	$0.0360
Firm Spec. Contracts	$0.0016	$0.0007	$0.0023	0.158620%	$51,432	$51,729	13,612,932	$0.0038	$0.0003	$0.0041	$0.0018
				100.0%	$32,424,748	$32,422,935					
Revenue Requirement rounding difference						*($1,813)*					

Notes:
Currrent IIP Years 1 & 2 were rolled into base rates effective on September 1, 2022 by Board Order dated August 17, 2022 in BPU Docket No. GR21121254 at which time IIP Rider F was set to zero.
Current IIP Years 3 & 4 Approved Rate: Docket. No. GR22040316, Dated 9-28-22 Effective on: 10-1-22 and Docket. No. GR23040270, Dated 9-27-23 Effective on: 10-1-23
Year 5 is the based on the estimated amount to complete the total IIP of 250 miles at $1.2 Million per mile through June 2024.

Schedule TK-3
IIP 2

ELIZABETHTOWN GAS COMPANY
Infrastructure Investment Program 2 ("IIP 2")
Revenue Requirement Allocation, Plant In-Service

June 2025
Approved Years 3&4 and Estimated Year 5 of the Current Program and Proposed Year 1 of IIP 2

Revenue Requirement, see below	**June 2025 $32,424,749**	**Allocation per 2021 Rate Case Base Revenues**	**Overall %**	**Allocation**
Residential Delivery Service (RDS)		$170,956,081	66.325001%	$21,505,715
Small General Service (SGS)		$17,252,282	6.693284%	$2,170,281
General Delivery Service (GDS)		$59,161,373	22.952551%	$7,442,307
GDS SP#1 May -Oct		$1,983	0.000769%	$249
Natural Gas Vehicles (NGV)		$59,202	0.022968%	$7,447
Large Volume Demand (LVD)		$9,913,639	3.846146%	$1,247,103
Electric Generation Firm (EGF)		$0	0.000000%	$0
Gas Lights Service (GLS)		$1,700	0.000660%	$214
Firm Spec. Contracts		$408,852	0.158620%	$51,432
Total Firm Revenues		$257,755,112	100.00000%	$32,424,748
Interruptible Revenues		$7,397,323		
Other Revenues		$995,456		
TOTAL REVENUES		$266,147,891		$32,424,748

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Revenue Requirements:			**Notes:**
June 2020	$0	$6,830,571	Docket No. GR20050327, Dated: 9-30-20, Effective 10-1-20 *
June 2021	$0	$7,063,912	Docket No. GR21040747, Dated: 9-14-21, Effective 10-1-21 *
June 2022	$6,300,195		Docket. No. GR22040316, Dated 9-28-22 Effective on: 10-1-22
June 2023	$6,208,542		Docket. No. GR23040270, Dated 9-27-23 Effective on: 10-1-23
June 2024	$6,304,471		Current program Yr. 5 for estimating Rider F IIP rate at 10-1-25
June 2025	$13,611,541		IIP 2 Year 1
June 2026			
June 2027			
June 2028			
June 2029			
June 2030			
Total	**$32,424,749**		

* Years 1& 2, June 2020 and 2021, rolled into base rates In BPU Docket No. GR21121254, Dated 8-22-22, Effective 9-1-22.

ELIZABETHTOWN GAS COMPANY

Infrastructure Investment Program 2 ("IIP 2")

Proof of Revenue Target:

		Current Program		Current Program Plus YR 1 IIP 2	
		Yrs. 3 & 4 Approved plus			
	2021 Rate Case	Estimated Yr 5 Pre Tax Rates		Proposed Rider Pre Tax Rates	
	Therms	Rates pre SUT	Revenue	Rates pre SUT	Revenue Proof
Residential Delivery Service (RDS)	252,443,185	$0.0494	$12,470,693	$0.0852	$21,508,159
Small General Service (SGS)	23,780,038	$0.0530	$1,260,342	$0.0913	$2,171,117
General Delivery Service (GDS)	111,356,509	$0.0388	$4,320,633	$0.0668	$7,438,615
GDS SP#1 May -Oct	32,668	$0.0044	$144	$0.0076	$248
Natural Gas Vehicles (NGV)	47,552	$0.0909	$4,322	$0.1566	$7,447
Large Volume Demand (LVD)	51,676,578	$0.0140	$723,472	$0.0241	$1,245,406
Electric Generation Firm (EGF) *	0	$0.0388	$0	$0.0668	$0
Gas Lights Service (GLS)	2,664	$0.0465	$124	$0.0803	$214
Firm Spec. Contracts	13,612,932	$0.0022	$29,948	$0.0038	$51,729
Total Firm Rate Class	**452,952,126**		**$18,809,678**		**$32,422,935**
Revenue Requirement rounding difference					*($1,814)*

* EGF at zero is set equal GDS.

ELIZABETHTOWN GAS COMPANY
Infrastructure Investment Program 2 ("IIP 2")
Weather Normalization Clause ("WNC") Margin Revenue Factor ("MRF")
For Conservation Incentive Program (CIP) to Determine Weather and Non-Weather Amounts

Classes	Distribution Charge, including taxes ($/ therm) a	less SUT tax 6.625% b	Margin Revenue, Distribution Charge excluding taxes, ($/ therm) c = a - b	Class Sales for period October through May (therms) * d	Ratio of Class Sales to Total Sales for Period e= d / sum of d	Weighted Margin Revenue in Distribution Rate ($/ therm) f = c * e
RDSH	$0.5797	$0.0360	$0.5437	223,716,712	63.902%	$0.3474
RDSNH	$0.5797	$0.0360	$0.5437	6,668,679	1.905%	$0.0104
RDS	$0.5797	$0.0360	$0.5437	230,385,391	65.807%	$0.3578
SGS	$0.4522	$0.0281	$0.4241	22,131,332	6.321%	$0.0268
GDS	$0.2895	$0.0180	$0.2715	97,580,084	27.872%	$0.0757
				350,096,807	100.00%	**$0.4603**
IIP Rider F Approved Years 3&4, Estimated Year 5 and Proposed IIP 2 Year 1 October 1, 2025:						
RDSH	$0.0908	$0.0056	$0.0852	223,716,712	63.902%	$0.0545
RDSNH	$0.0908	$0.0056	$0.0852	6,668,679	1.905%	$0.0016
RDS	$0.0908	$0.0056	$0.0852	230,385,391	65.807%	$0.0561
SGS	$0.0973	$0.0060	$0.0913	22,131,332	6.321%	$0.0058
GDS	$0.0712	$0.0044	$0.0668	97,580,084	27.872%	$0.0186
				350,096,807	100.00%	**$0.1366**
					Total	**$0.5969**

* Therms per 2019 Rate Case, post test year.

Schedule TK-6
IIP 2
EXAMPLE

ELIZABETHTOWN GAS COMPANY
Infrastructure Investment Program 2 ("IIP 2")
Earnings Test

	January-22	Through	December-22	
	Net Income:			
1	Net Income (including IIP and CIP margin revenue, net of tax)		$43,299,784	
	less: non-recurring items, income / (loss) net of tax (1)		$0	
	Net Income after adjustment		$43,299,784	
2	Less:			
	Non-firm Sales & Transportation margins, net of tax		$209,236	
	Off-system Sales & Capacity Release, net of tax		$105,458	
	Energy Efficiency Program margins, net of tax		$2,127,746	
			$2,442,440	
3	Regulated Jurisdictional Net Income (L1-L2)			$40,857,344
4	Common Equity Balances, per Rate Base			
		December-21	December-22	Average
	Rate Base	$1,288,021,906	$1,527,284,968	1,407,653,437
	Equity %, 2021 Rate Case			52.00%
	Average Equity			$731,979,787
5	ROE (L3/L4)			5.58%
	Rate of Return on Equity, 2021 Rate Case		9.60%	
	ROE Test: Rate Case plus 50 Basis Points		0.50%	10.10%

(1) no adjustments.

Schedule TK-6.1
IIP 2
EXAMPLE

ELIZABETHTOWN GAS COMPANY
Infrastructure Investment Program 2 ("IIP 2")
Statement of Rate Base

Line No.		December-21	December-22
1	Utility Plant In Service	$1,870,024,103	$2,129,710,048
2	Accumulated Depreciation, Utility Retirement WIP	($324,383,914)	($353,043,593)
3	Acquisition Adjustment	($160,000,000)	($160,000,000)
4	Amortization of Acquisition Adjustment	$33,999,992	$49,999,988
5	Net Utility Plant	$1,419,640,181	$1,666,666,443
6			
7	Pension/OPEB	$35,547,349	$34,558,342
8	Cash Working Capital [(1)]	$21,348,848	$28,234,763
9	Inventories [(2)]		
10	Natural Gas Stored Underground and LNG	$12,406,031	$26,790,542
11	Materials & Supplies incl. Fleet Fuel and Propane Inv.	$884,447	$451,402
12	Customer Deposits [(2)]	($4,508,539)	($4,842,610)
13	Customer Advances [(2)]	($1,788,930)	($1,779,506)
14	Deferred Income Taxes:		
15	Excess Protected ADIT	($78,584,399)	($77,679,017)
16	Federal Income Tax	($78,807,898)	($98,653,685)
17	NJ CBT	($37,115,184)	($46,461,706)
18	Consolidated Tax Adjustment [(1)]	($1,000,000)	$0
19			
20	Total Rate Base	$1,288,021,906	$1,527,284,968

[(1)] December 2021 Equals the approved level in Docket No. GR19040486.
December 2022 Equals the approved level in Docket No. GR21121254.

[(2)] Represents thirteen month averages of account balances.

Miles / Cost Per	per Yr MI & $$$	Total MI & $$$	ELIZABETHTOWN GAS COMPANY	Schedule TK-7
50	250	Infrastructure Investment Program 2 ("IIP 2")	IIP 2	
$2,500,000	$125,000,000	$625,000,000	Actual / Projected In-Service Expenditures	

-

	In-Service			In-Service		In-Service		*estimated*	In-Service
	60%	40%				Rate At	6.46%	10.00%	
Periods:	Mains	Services	IIP Program	Monitor	In-Service Pre AFUDC	AFUDC Mains	AFUDC Services	AFUDC Total	Total with AFUDC
12 mos Ending									
Jun-25	$75,000,000	$50,000,000	$ 125,000,000	$60,000	$125,060,000	$484,888	$323,000	$807,888	$125,867,888
Jun-26	$75,000,000	$50,000,000	$ 125,000,000	$60,000	$125,060,000	$484,888	$323,000	$807,888	$125,867,888
Jun-27	$75,000,000	$50,000,000	$ 125,000,000	$60,000	$125,060,000	$484,888	$323,000	$807,888	$125,867,888
Jun-28	$75,000,000	$50,000,000	$ 125,000,000	$60,000	$125,060,000	$484,888	$323,000	$807,888	$125,867,888
Jun-29	$75,000,000	$50,000,000	$ 125,000,000	$60,000	$125,060,000	$484,888	$323,000	$807,888	$125,867,888
Total	$375,000,000	$250,000,000	$625,000,000	$300,000	$625,300,000	$2,424,440	$1,615,000	$4,039,440	$629,339,440

ELIZABETHTOWN GAS COMPANY
Infrastructure Investment Program 2 ("IIP 2")
Annualized Depreciation

Schedule TK-8
IIP 2

		Rates		In-Service Depreciation			Depreciation	AFUDC Depreciation		Full Year Depreciation
		Mains 376	Services 380	Mains 376	Services 380	Monitor 376	Expense Pre AFUDC	Mains 376	Services 380	Expense W/ AFUDC
End Date	Yr									
Jun-25	1	1.67%	2.93%	1,252,500	1,465,000	1,002	2,718,502	8,098	9,464	2,736,064
Jun-26	2	1.67%	2.93%	1,252,500	1,465,000	1,002	2,718,502	8,098	9,464	2,736,064
Jun-27	3	1.67%	2.93%	1,252,500	1,465,000	1,002	2,718,502	8,098	9,464	2,736,064
Jun-28	4	1.67%	2.93%	1,252,500	1,465,000	1,002	2,718,502	8,098	9,464	2,736,064
Jun-29	5	1.67%	2.93%	1,252,500	1,465,000	1,002	2,718,502	8,098	9,464	2,736,064
Total				$6,262,500	$7,325,000	$5,010	$13,592,510	$40,490	$47,320	$13,680,320

Schedule TK-9
IIP 2

ELIZABETHTOWN GAS COMPANY
Infrastructure Investment Program 2 ("IIP 2")
Weighted Average Cost of Capital ("WACC")

			CBT at	9%
Rate Case Effective 9-1-22			**FIT at**	21%
	Capitalization Ratios	**Rate**	**Cost %**	**After Tax**
				28.110%
Long Term Debt	48.00%	3.830%	1.84%	1.32%
Common Equity	52.00%	9.600%	4.99%	4.99%
Total Capitalization	100.00%		**6.83%**	**6.31%**

ELIZABETHTOWN GAS COMPANY
Infrastructure Investment Program 2 ("IIP 2")
Revenue Expansion Factor

		Rate Case 9/1/2022
Revenue Increase		100.000%
Uncollectible Accounts Percentage		0.6858%
BPU Assessments / BPU & RC		0.2189%
RC Assessments		0.0538%
Income before Corporate Business Tax		99.0415%
NJ Corporate Business Tax @	9.0%	8.9137%
Income before Federal Income Taxes		90.1278%
Federal Income Taxes @	21.0%	18.9268%
Return		71.2010%
Revenue Factor (100% / Return %)		1.404475
Rounding to Settlement Factor		-
Settlement Revenue Factor		**1.404475**

ELIZABETHTOWN GAS COMPANY
B. P. U. NO. 18 – GAS REVISED SHEET NO. 111

RIDER "B"

WEATHER NORMALIZATION CLAUSE ("WNC") (continued)

METHOD OF DETERMINING WEATHER NORMALIZATION CHARGE: (continued)

I. Definition of Terms as Used Herein (continued)

6. Degree Day Consumption Factor ("DDCF") - the variable component (use per degree day) of the gas sendout for each month of the winter period normalized for weather and adjusted for lost and unaccounted for gas. The DDCF shall be updated annually in the Company's WNC reconciliation filing annualizing to reflect the change in number of customers that has occurred since the base rate proceeding that established the initial degree day consumption factor in base rate cases. The base number of customers used to establish the normalized use in therms per Customer and the calculated DDCF for purposes of calculating the weather-related portion of the CIP are as follows:

Month	Base Number of Customers	Therms per Degree Day
October	293,159	51,818
November	293,834	62,593
December	294,633	69,064
January	295,059	68,081
February	295,322	67,808
March	295,477	63,693
April	295,126	52,489
May	294,483	54,279

7. Margin Revenue Factor - the weighted average of the Distribution Charges as quoted in the individual service classes to which this clause applies net of applicable taxes and other similar charges and any other revenue charge not retained by the Company that these rates may contain in the future. The weighted average shall be determined by multiplying the margin revenue component of the Distribution Charges from each service class to which this clause applies by each class's percentage of total consumption of all the classes to which this clause applies for the winter period and summing this result for all the classes to which this clause applies. The Margin Revenue Factor shall be redetermined each time base rates or IIP rates are adjusted. The current Margin Revenue Factor is $0.5969 per therm pre taxes for purposes of calculating the weather-related portion of the CIP.

Dated XXX3 in Docket No. XXX4

ELIZABETHTOWN GAS COMPANY
B. P. U. NO. 18 – GAS REVISED SHEET NO. 126

RIDER "F"

INFRASTRUCTURE INVESTMENT PROGRAM ("IIP")

Applicable to all RDS, SGS, GDS, NGV, LVD, EGF and GLS classes and Firm Special Contract customers receiving service through the Company's distribution system. The IIP rate shall be collected on a per therm basis and shall remain in effect until changed by order of the NJBPU.

		Per Therm
RDS	Residential	$0.0908
SGS	Small General Service	$0.0973
GDS	General Delivery Service	$0.0712
GDS	Seasonal SP#1 May-Oct	$0.0081
NGV	Natural Gas Vehicles	$0.1670
LVD	Large Volume Demand	$0.0257
EGF	Electric Generation	$0.0712
GLS	Gas Lights	$0.0856
Firm Special Contracts		$0.0038

The charges applicable under this Rider include provision for the New Jersey Sales and Use Tax, and when billed to customers exempt from this tax shall be reduced by the amount of such tax included therein.

The IIP is a program to modernize and enhance the reliability and safety of the Company's gas distribution system by replacing its vintage, at-risk facilities which include aging cast iron mains, unprotected and bare steel mains and services, ductile iron and vintage plastic mains and vintage plastic and copper services. As part of the IIP, Elizabethtown is upgrading its legacy low pressure system to an elevated pressure system, and installing excess flow valves and retiring district regulators that are presently required to operate the existing low pressure system. The costs recovered through the IIP Rider rate include the Company's after-tax weighted average cost of capital as adjusted upward for the revenue expansion factor, depreciation expense and applicable taxes.

Cost recovery under the IIP is contingent on an earnings test. If the product of the earnings test calculation exceeds the Company's most recently approved ROE by fifty (50) basis points or more, cost recovery under the IIP shall not be allowed. Any disallowance resulting from the earnings test will not be charged to customers in a subsequent IIP filing period, but the Company may seek such recovery in a subsequent base rate case.

REDLINE

ELIZABETHTOWN GAS COMPANY
B. P. U. NO. 18 – GAS ~~2nd~~ REVISED SHEET NO. 111

RIDER "B"

WEATHER NORMALIZATION CLAUSE ("WNC") (continued)

METHOD OF DETERMINING WEATHER NORMALIZATION CHARGE: (continued)

I. Definition of Terms as Used Herein (continued)

6. Degree Day Consumption Factor ("DDCF") - the variable component (use per degree day) of the gas sendout for each month of the winter period normalized for weather and adjusted for lost and unaccounted for gas. The DDCF shall be updated annually in the Company's WNC reconciliation filing annualizing to reflect the change in number of customers that has occurred since the base rate proceeding that established the initial degree day consumption factor in base rate cases. The base number of customers used to establish the normalized use in therms per Customer and the calculated DDCF for purposes of calculating the weather-related portion of the CIP are as follows:

Month	Base Number of Customers	Therms per Degree Day
October	293,159	51,818
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January	295,059	68,081
February	295,322	67,808
March	295,477	63,693
April	295,126	52,489
May	294,483	54,279

7. Margin Revenue Factor - the weighted average of the Distribution Charges as quoted in the individual service classes to which this clause applies net of applicable taxes and other similar charges and any other revenue charge not retained by the Company that these rates may contain in the future. The weighted average shall be determined by multiplying the margin revenue component of the Distribution Charges from each service class to which this clause applies by each class's percentage of total consumption of all the classes to which this clause applies for the winter period and summing this result for all the classes to which this clause applies. The Margin Revenue Factor shall be redetermined each time base rates or IIP rates are adjusted. The current Margin Revenue Factor is $~~0.4914~~ 0.5969 per therm pre taxes for purposes of calculating the weather-related portion of the CIP.

ELIZABETHTOWN GAS COMPANY
B. P. U. NO. 18 – GAS ~~2nd~~ REVISED SHEET NO. 126

RIDER "F"

INFRASTRUCTURE INVESTMENT PROGRAM ("IIP")

Applicable to all RDS, SGS, GDS, NGV, LVD, EGF and GLS classes and Firm Special Contract customers receiving service through the Company's distribution system. The IIP rate shall be collected on a per therm basis and shall remain in effect until changed by order of the NJBPU.

		Per Therm
RDS	Residential	$0.0908 ~~$0.0351~~
SGS	Small General Service	$0.0973 ~~$0.0375~~
GDS	General Delivery Service	$0.0712 ~~3~~$0.0275
GDS	Seasonal SP#1 May-Oct	$0.0081 ~~$0.0031~~
NGV	Natural Gas Vehicles	$0.1670 ~~3~~$0.0644
LVD	Large Volume Demand	$0.0257 ~~$0.0099~~
EGF	Electric Generation	$0.0712 ~~3~~$0.0275
GLS	Gas Lights	$0.0856 ~~$0.0333~~
	Firm Special Contracts	$0.0041~~$0.0016~~

The charges applicable under this Rider include provision for the New Jersey Sales and Use Tax, and when billed to customers exempt from this tax shall be reduced by the amount of such tax included therein.

The IIP is a ~~five-year~~ program to modernize and enhance the reliability and safety of the Company's gas distribution system by replacing its vintage, at-risk facilities which include aging cast iron mains, unprotected and bare steel mains and services, ductile iron and vintage plastic mains and vintage plastic and copper services. As part of the IIP, Elizabethtown is upgrading its legacy low pressure system to an elevated pressure system, and installing excess flow valves and retiring district regulators that are presently required to operate the existing low pressure system. The costs recovered through the IIP Rider rate include the Company's after-tax weighted average cost of capital as adjusted upward for the revenue expansion factor, depreciation expense and applicable taxes.

Cost recovery under the IIP is contingent on an earnings test. If the product of the earnings test calculation exceeds the Company's most recently approved ROE by fifty (50) basis points or more, cost recovery under the IIP shall not be allowed. Any disallowance resulting from the earnings test will not be charged to customers in a subsequent IIP filing period, but the Company may seek such recovery in a subsequent base rate case.

Date of Issue: ~~September 29, 2023~~XXX1

Effective: Service Rendered on and after ~~October 1, 2023~~XXX2

Issued by: Christie McMullen, President
520 Green Lane
Union, New Jersey 07083

Filed Pursuant to Order of the Board of Public Utilities
Dated September ~~27, 2023~~XXX3 in Docket No. ~~GR23040270~~XXX4

EXHIBIT P-5

STATE OF NEW JERSEY
BOARD OF PUBLIC UTILITIES

I/M/O THE PETITION OF ELIZABETHTOWN GAS COMPANY TO IMPLEMENT AN INFRASTRUCTURE INVESTMENT PROGRAM ("IIP") AND ASSOCIATED RECOVERY MECHANISM PURSUANT TO *N.J.S.A.* 48:2-21 AND *N.J.A.C.* 14:3-2A

DIRECT TESTIMONY

OF

KEVIN C. GARRITY

EXECUTIVE VICE PRESIDENT,
MEARS GROUP, INC.

ON BEHALF OF

ELIZABETHTOWN GAS COMPANY

December 11, 2023

EXHIBIT P-5

DIRECT TESTIMONY OF KEVIN C. GARRITY

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Kevin C. Garrity. My business address is 9017 Heritage Drive, Plain City, Ohio 43064.

Q. BY WHO ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am an Executive Vice President of Mears Group, Inc. ("Mears").

Q. PLEASE DESCRIBE MEARS.

A. Mears is a corrosion engineering and integrity service provider with over 400 employees in the United States. Mears was retained by Elizabethtown Gas Company ("Elizabethtown" or "Company") to review the operating history and underlying data that led Elizabethtown to the conclusion that an accelerated facilities replacement program of certain cast iron, Vintage Steel and Vintage Plastic facilities installed in Elizabethtown's service territory should be undertaken to ensure the safety and reliability of the Company's distribution system. I supervised and have overall responsibility for the investigation conducted by Mears of Elizabethtown's history and data concerning its cast iron, Vintage Steel and Vintage Plastic facilities and the preparation of the report that summarized that investigation is attached to my direct testimony as Schedule KCG-1.

DIRECT TESTIMONY OF
KEVIN C. GARRITY

Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS AND EXPERIENCE.

A. I am a graduate of New York University – Polytechnic University in Brooklyn, New York with a Bachelor of Science degree in Electrical Engineering. I have over 49 years of professional experience in corrosion engineering. I am certified as a Cathodic Protection Specialist by the National Association of Corrosion Engineers International ("NACE") and first registered as a Professional Engineer in 1981. I was named a NACE Fellow in 2015 and served as President of NACE in 2012-2013 and President of the NACE Institute, which administers education and training and provides Certification and Accreditation for over 40,000 professionals working in various areas involving corrosion and corrosion control. I am a lead instructor for the NACE Cathodic Protection Certification program. Additional information concerning my qualifications can be found in Schedule KCG-1.

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?

A. The purpose of my direct testimony is to describe the investigation that Mears undertook for Elizabethtown and summarize the findings of that investigation. I will first briefly discuss the background of the Company's gas distribution system as relevant to Mears' investigation and describe the materials and information reviewed by Mears. I will then briefly discuss the fundamentals of corrosion and the corrosivity of the soil where the Company's distribution system has been installed. I will then discuss various aspects of the Company's operating history and relevant industry experience. Finally, I will provide a summary of Mears' findings, explaining why

Mears has concluded that the Company's request for an accelerated replacement program is both justified and necessary as it represents the most reasonable way of addressing the condition of the cast iron, Vintage Steel and Vintage Plastic facilities that are likely to deteriorate in an unpredictable manner over time.

Q. DO YOU SPONSOR ANY SCHEDULES AS PART OF YOUR DIRECT TESTIMONY?

A. Yes. As I noted previously, as Schedule KCG-1, I am sponsoring a report entitled "Elizabethtown Gas – Study of Vintage Steel, Vintage Plastic and Cast Iron Mains And Associated Services Report – 11/21/2023." This report was prepared under my direction and supervision and sets forth Mears' analysis of Elizabethtown's need to replace vintage cast iron, pre-code steel and plastic facilities on an accelerated basis in order to enhance the safety and reliability of the Company's gas distribution system.

Q. PLEASE DEFINE THE TERM "VINTAGE STEEL" FACILITIES AS IT IS USED IN YOUR TESTIMONY IN THIS CASE.

A. "Vintage Steel" facilities refers to coated or bare carbon steel facilities installed and placed into operation before the enactment of pipeline safety regulations by U.S. Department of Transportation's Office of Pipeline Safety in 1971. These Vintage Steel facilities, which have been in operation for more than 50 years, are sometimes referred to as "pre-code" steel facilities. Elizabethtown's distribution system has 540 miles of Vintage Steel mains.

Q. PLEASE DEFINE THE TERM "VINTAGE PLASTIC" FACILITIES AS IT IS USED IN YOUR TESTIMONY IN THIS CASE.

A. "Vintage Plastic" facilities are facilities constructed of pre-1984 plastic pipe, including Aldyl-A and Driscopipe 8000. Elizabethtown's distribution system has 141 miles of Vintage Plastic mains.

Q. PLEASE DESCRIBE YOUR UNDERSTANDING OF ELIZABETHTOWN'S DISTRIBUTION SYSTEM AS IT RELATES TO THE SCOPE OF MEARS' ANALYSIS.

A. Elizabethtown operates 3,310 miles of distribution lines in two service areas designated as (i) the Union service territory which is generally located in Union and Middlesex Counties in New Jersey and (ii) the Northwest service territory which is located in Mercer, Hunterdon, Warren, Morris and Sussex Counties. Approximately 737 miles of the Company's gas distribution mains and associated services consist of vintage facilities including:

(i) 56 miles of cast iron;

(ii) 141 miles of Vintage Plastic; and

(iii) 540 miles of Vintage Steel.

Elizabethtown has determined that these mains and services represent a high risk for either corrosion induced leaks in the case of the Vintage Steel and cast iron facilities, or are subject to an elevated risk of cracking in the case of the Vintage Plastic facilities, and therefore an accelerated replacement program should be undertaken to ensure the safety and operational reliability of its distribution system. It is my understanding that

the New Jersey Board of Public Utilities' ("BPU") regulations afford utilities the opportunity to propose accelerated capital investment and cost recovery programs for the purpose of enhancing safety and reliability.

Q. WHAT DATA DID MEARS REVIEW IN CONDUCTING ITS ANALYSIS OF ELIZABETHTOWN'S CAST IRON, VINTAGE STEEL AND VINTAGE PLASTIC FACILITIES?

A. The data reviewed by Mears is described in detail on pages 3 and 4 of Schedule KCG-1 and includes cathodic protection and corrosion inspection reports filed with the BPU, Elizabethtown's Distribution Integrity Management Program and corrosion plan, system maps and photos, soil information and a variety of third party publications and materials that address various aspects of the maintenance of these facilities.

Q. PLEASE DESCRIBE HOW CORROSION AFFECTS ELIZABETHTOWN'S VINTAGE STEEL AND CAST IRON MAINS AND SERVICES.

A. Corrosion occurs in metals as a result of the energy that is introduced into the metal during the refining process. A raw material like iron ore is mined and refined to create a finished product of cast iron or steel that is used in the fabrication of pipelines. During the refining process the energy state of the raw material is significantly altered. Over the life of the refined product, energy introduced in the refining process is shed in the form of corrosion. With corrosion being a time dependent mechanism, the refined materials will revert to its original state, and in the case of steel, revert to iron oxide. Cast iron undergoes a similar process when selective leaching of the iron from the cast

iron matrix occurs. As the iron oxidizes graphitization occurs and the cast iron becomes brittle and susceptible to cracks and fractures.

Environmental factors that can influence and accelerate corrosion rates for buried steel and cast iron pipelines include:

1) Non-homogeneous environments (dissimilar soil conditions),

2) Differential aeration (differential oxygen conditions), and

3) Environment acidity or ("pH") (As discussed more fully in Schedule KCG-1, pH of less than 7 can accelerate corrosion of carbon steel).

Virtually all soil environments represent dissimilar conditions that promote the establishment of anodic (corroding) and cathodic (non-corroding) regions along buried pipelines.

Q. DOES ELIZABETHTOWN'S OPERATING ENVIRONMENT CREATE CONDITIONS THAT CREATE RELATIVELY HIGH RISKS OF CORROSION FOR THE COMPANY'S VINTAGE STEEL AND CAST IRON FACILITIES?

A. Yes. As described in detail in Schedule KCG-1, in an effort to assess the potential corrosivity of the soils across Elizabethtown's service territory, Mears performed an assessment of the soil in each of the Company's operating divisions. That analysis showed that the overall corrosivity of the soil in Elizabethtown's Union and Northeast service territories ranged from moderate to highly corrosive for the majority of the Company's Vintage Steel and cast iron mains. Soil that exhibits moderate-to-high

corrosivity creates the type of environment where corrosion can significantly affect the safety of steel and cast iron facilities.

Q. PLEASE DESCRIBE THE SAFETY/RELIABILITY ISSUES THAT HAVE ARISEN WITH VINTAGE PLASTIC MAINS AND ASSOCIATED SERVICES.

A. Plastic piping for use in natural gas distribution facilities is reported to have begun in 1959. Polyethylene pipes manufactured by Dupont as Aldyl-A and Phillips Driscopipe 8000 were introduced in the early 1970s. Subsequently, these pipes and fittings were found to suffer from a failure mechanism involving the development of cracks and embrittlement leading to catastrophic events.

Unlike steel or cast iron pipelines where corrosion damage leading to a potential leak can be seen and then risk of failure characterized and estimated, visual examination of plastic facilities is unlikely to distinguish facilities susceptible to slow crack growth until an actual crack develops. Studies have identified three possible failure modes for Vintage Plastic facilities:

1. rapid crack propagation due to an outer force;
2. ductile rupture due to over pressurization; and
3. slow crack growth.

Failures of plastic pipe often result in larger volumes of gas releases than leaks in steel or cast iron, elevating the potential consequences of such failure.

Q. HAVE PIPELINE SAFETY REGULATORS RECOGNIZED THE SAFETY RISKS ASSOCIATED WITH VINTAGE PLASTIC FACILITIES?

A. Yes. In April 1998, the National Transportation Safety Board ("NTSB") issued a report entitled "Brittle-like Cracking in Plastic Pipe for Gas Service," in which the NTSB summarized a number of accidents that occurred with such facilities and made three key findings:

1. Plastic Pipeline manufactured from the 1960s through the early 1980s may be susceptible to brittle-like cracking;
2. Failures represent a potential public safety hazard; and
3. Manufacturers may have overrated the strength and resistance to brittle-like cracking in plastic piping.

In March 2012, PHMSA issued a safety advisory with respect to Driscopipe 8000 pipe that concluded, "All operators using Driscopipe 8000 pipe are encouraged to work with all stakeholders to determine how to address discovery and repair within their systems, taking the most conservative approach and keeping pipeline integrity and public safety a priority."

Finally, in 2022, the Plastic Pipe Database Committee of the American Gas Association issued a status report that indicated that historical information suggested, *inter alia*, that Aldyl-A pipe exhibited significantly lower resistance to brittle failure during stress intensification.

Q. HAS ELIZABETHTOWN EXPERIENCED A SIGNIFICANT NUMBER OF LEAKS ON ITS VINTAGE STEEL AND VINTAGE PLASTIC FACILITIES?

A. Yes. Elizabethtown has sustained continuing corrosion leaks on its Vintage Steel and Vintage Plastic facilities with over 1,250 leaks having been recorded on these facilities for the period 2017-2022. The Company's leak data demonstrates the corrosive nature of Elizabethtown's service territory and the detrimental effects of corrosion on aging coatings on Vintage Steel facilities that degrade with time, as well as the continued impact of brittle-like cracking on Vintage Plastic facilities. Industry experience indicates that coating holidays on Vintage Steel facilities develop during initial handling and construction and that coating flaws from other causes occur at random times, or in the case of coating degradation, will occur with increasing frequency over time and continue to cause leaks.

Q. IS THE INSTALLATION AND MAINTENANCE OF CATHODIC PROTECTION ON ELIZABETHTOWN'S VINTAGE STEEL FACILITIES SUFFICIENT TO ENSURE THE CONTINUED SAFETY AND INTEGRITY OF THE FACILITIES?

A. No. Although supplemental cathodic protection continues to be installed on an annual basis, these measures will not preclude the development of future leaks in mains and services with aged and degraded vintage coating systems. Leaks continue to be recorded despite the presence of a functioning cathodic protection system that is meeting the regulatory requirements for effective corrosion control. In the presence of

aging and deteriorating coatings, corrosion induced leaks are expected to increase at an exponential rate unless an accelerated replacement program is undertaken.

Q. DOES INDUSTRY EXPERIENCE INDICATE THAT VINTAGE STEEL MAINS AND SERVICES ARE AT RISK FOR CONTINUING FAILURE DUE TO LEAKS?

A. Yes. As discussed in Schedule KCG-1, a review of PHMSA's database indicates that 24 significant incidents involving Vintage Steel facilities have been recorded nationwide since 2005. These incidents have resulted in 13 injuries and 2 fatalities. Moreover, as also reflected in KCG-1, regulators in other jurisdictions have recognized the need to replace Vintage Steel facilities on an accelerated basis in order to promote safety.

Q. DOES INDUSTRY EXPERIENCE INDICATE THAT VINTAGE PLASTIC FACILITIES ARE AT RISK FOR CONTINUING FAILURE DUE TO THE POTENTIAL FOR BRITTLE-LIKE CRACKING?

A. Yes. As I noted previously, safety regulators have repeatedly recognized the safety issues that are created by Aldyl-A and Driscopipe 8000 plastic facilities. As described in Schedule KCG-1 there have been a number of serious accidents involving the failure of Vintage Plastic pipeline facilities. Safety regulators have urged the industry to "take the most conservative approach to managing plastic facilities for the benefit of the public."

Q. HAS MEARS FORMED AN OPINION AS TO WHETHER ELIZABETHTOWN'S REQUEST FOR APPROVAL OF AN ACCELERATED REPLACEMENT PROGRAM FOR ITS CAST IRON, VINTAGE STEEL AND VINTAGE PLASTIC FACILITIES IS JUSTIFIED?

A. Yes. In consideration of the totality of the information reviewed and relied upon as described in Schedule KCG-1, and in conjunction with industry experience and scientific and engineering principles, it is Mears' opinion that Elizabethtown's cast iron, Vintage Steel and Vintage Plastic mains and services are at risk of continuing failure due to leaks and cracks. Accordingly, Mears believes that the Company's request for approval of an accelerated replacement program is both justified and necessary as it represents the most reasonable way of addressing a situation that is likely to worsen in an unpredictable manner over time.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes. It does.

Study of Vintage Steel, Plastic and Cast Iron Mains and Associated Services

Report

11/21/2023

Prepared for:

Elizabethtown Gas

Prepared by:

Mears Group, Inc.

Executive Summary

Elizabethtown Gas (ETG) provides regulated natural gas and delivery services to approximately 300,000 residential, commercial, and industrial customers in parts of Union, Middlesex, Sussex, Warren, Morris, Hunterdon, and Mercer counties in New Jersey. As of January 2023, the Company operates approximately 3,310 miles of distribution pipelines and approximately 234,000 associated services in two service areas in Central and Western New Jersey. The two service areas are designated as the Union and Northwest Service areas.

As of the conclusion of ETG's current Infrastructure Investment Program ("IIP") (June 30, 2024) approximately 44 miles of vintage cast iron gas distribution mains as targeted in IIP will be remaining as well as an additional 12 miles of large diameter vintage cast iron that was not included in IIP. Currently, approximately 540 miles of distribution mains and associated services are coated, or bare carbon steel piping installed and placed into operation before the enactment of pipeline safety regulations by the US Department of Transportation Office of Pipeline Safety in 1971. An additional approximate 141 miles of mains are constructed of pre-1984 plastic piping, including Aldyl-A and Driscopipe 8000.

The mains and associated services considered in this study are vintage materials that pose a significant risk of leakage and failures due to the impact of age, environment and, in the case of the Aldyl-A and Driscopipe 8000 plastic pipe, flaws in the resin formulation leading to leaks, cracks and failures. ETG has determined that these mains and associated services represent a high risk for steel corrosion induced leaks or plastic brittle failures, and has determined that an accelerated replacement program is necessary to ensure safety and operational reliability.

Mears Group, Inc. (Mears) has been retained to review the history and underlying data provided by ETG, to consider relevant industry experience and practices and to offer opinions to a reasonable degree of scientific and engineering certainty regarding the need for an accelerated replacement program for the identified high-risk piping.

In consideration of the totality of the information reviewed and relied upon, in conjunction with industry experience and scientific and engineering principles, it is our opinion that at the conclusion of the current IIP, approximately 737 miles of vintage piping is at risk of continuing failure due to leaks and breaks. An accelerated replacement program for ETG's remaining vintage cast iron, steel and plastic piping will enhance safety and reliability. It will also satisfy many of the

stated objectives and expectations of the Pipeline and Hazardous Materials Safety Administration's (PHMSA's) proposed rulemaking related to gas distribution safety enhancements. We believe that ETG's application for an accelerated replacement program is both justified and necessary as it represents the most reasonable way of addressing a situation that is likely to worsen in an unpredictable manner over time.

ETG has sustained continuing leaks in the vintage piping with 1,264 leaks having been recorded and repaired in the period from 2017-2022 in its vintage steel and vintage plastic mains and associated services. Using the US DOT Pipeline and Hazardous Materials Administration (PHMSA) annual reporting statistics on reportable leaks, compared against operating companies across the industry, ETG ranks 6th highest in reportable leaks/mile compared with twenty-one operating companies. ETG ranks just behind sister company South Jersey Gas, which ranked 4th and recently had an IIP application approved for replacing Pre-Code Steel and Aldyl-A Plastic Mains and associated services.

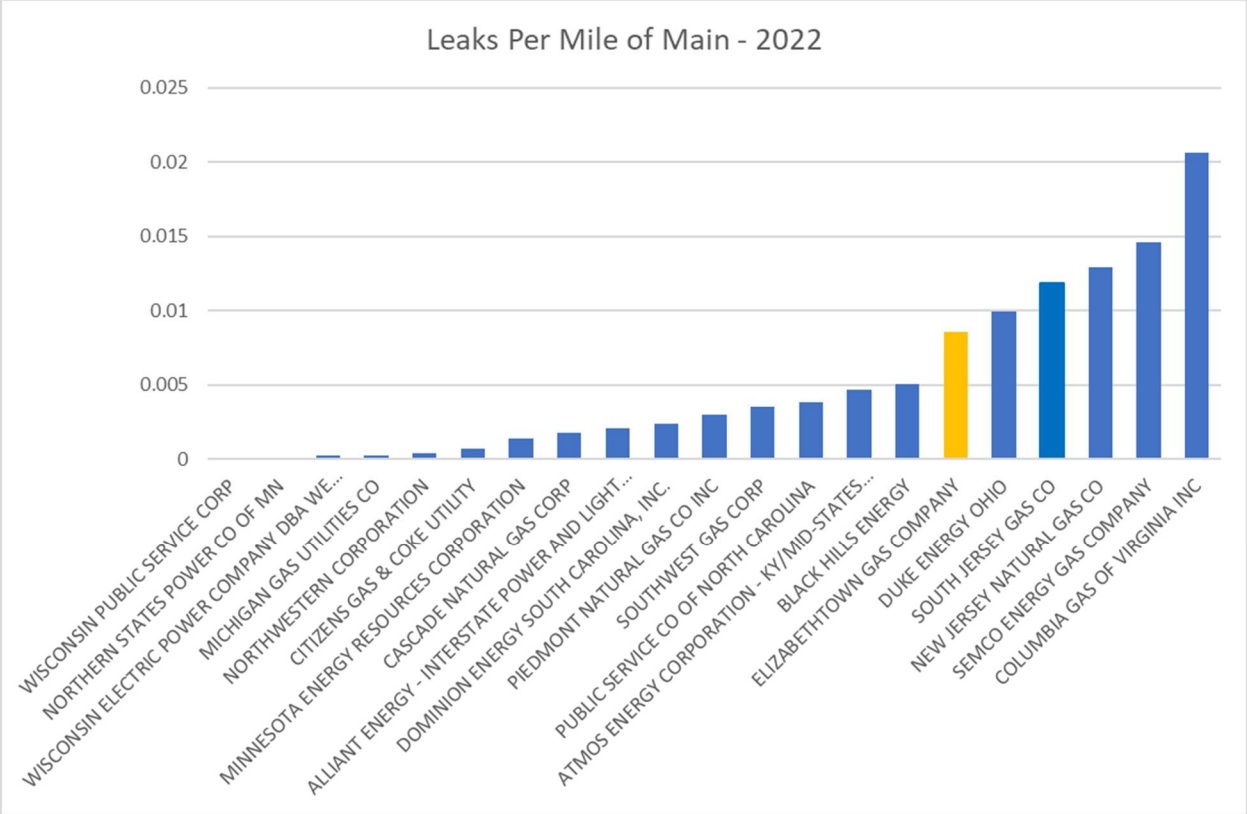

Figure 1: Comparison of Industry Reportable Leak Rates per Mile-2022

Although supplemental cathodic protection continues to be installed on an annual basis, these measures will not preclude the development of future leaks in mains and services with aged and degraded vintage coating systems as leaks continue to be recorded despite the presence of a functioning cathodic protection systems that is meeting regulatory requirements for effective corrosion control. Moreover, much of the remaining cast iron mains see little to no benefit from cathodic protection and instead continue to corrode through graphitization elevating the risk of failures.

A significant body of information exists on failures of pre-1984 Aldyl-A and Driscopipe 8000 plastic piping with known formulation deficiencies that increase the risk of leaks and failures due to cracking and splits. Tragically, many of these incidents occur suddenly, without notice and resulted in fatalities, injuries, and significant property damage. Brittle failure modes in these vintage plastic pipes often result in larger volumes of gas releases than leaks in steel elevating the potential consequences of such failures.

The National Transportation Safety Board recently reported (preliminary) that a longitudinal fracture was found in a service tee tower (Figure 2) involved in a natural gas explosion in West Reading, Pennsylvania on March 24, 2023, that resulted in seven fatalities. This form of cracking is typical of the kinds of failures reported in Pre-1984 vintage plastic mains and services. This failure is reported to have occurred in DuPont Aldyl-A Service Tee installed in 1982.

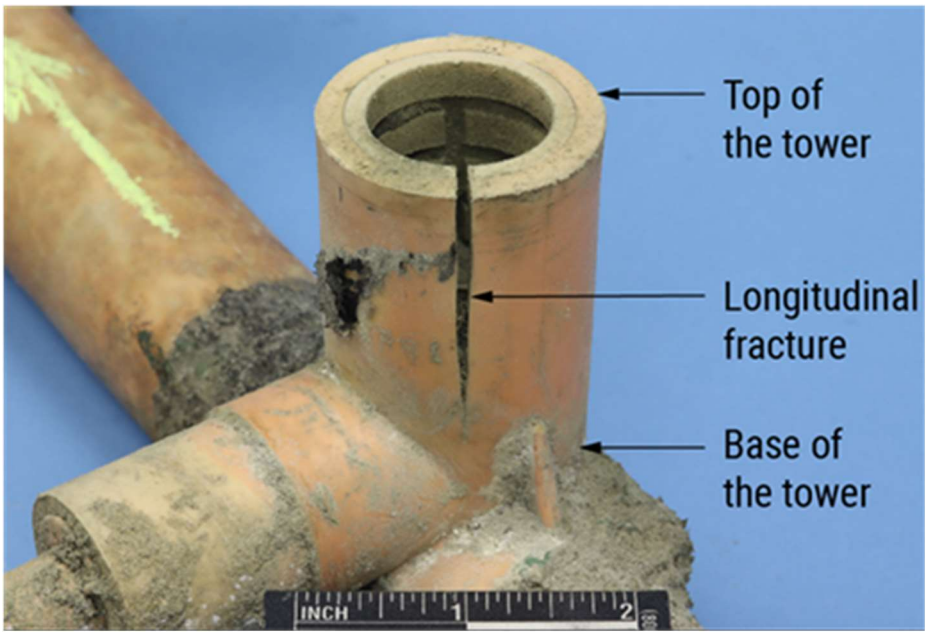

Figure 2: NTSB Preliminary Report Update Issued July 18, 2023 - DuPont Aldyl-A Service Tee Installed in 1982 - Longitudinal Fracture Along Tower

An extensive analysis of the soil environment across the ETG service area that both the National Cooperative Soil Survey (NCSS) classification and independent work by National Bureau of Standards (NBS) confirm, indicates that the soils range from corrosive to extremely corrosive, which is further substantiated through an analysis of the associated leak history. This combination of corrosive soils, aging coatings, and ongoing corrosion presents significant challenges for ETG in its goal to provide safe and reliable natural gas service.

Despite the fact that leak surveys are required across the gas distribution industry under Part 49 CFR Part 192 to aid in managing system integrity, a review of the PHMSA Industry Incident database indicates that 24 significant incidents due to external corrosion have been recorded since 2005. These incidents resulted in tragic consequences including injuries and fatalities. The only methodology for satisfactorily reducing the consequence of gas distribution system leaks and failures is replacement of highest risk vintage piping systems.

In the aftermath of the February 9, 2011 natural gas explosion in Allentown, PA involving cast iron distribution pipe installed in 1928 and 1942, PHMSA issued an update to two existing advisory bulletins covering the continued use of cast iron in gas distribution systems. The advisories encouraged assessments of the need for accelerated repair /replacement of high-risk pipelines. Specifically, in ADB-2012-05, PHMSA asked owners and operators of cast-iron distribution

pipelines and state safety representatives to consider the following where improvements in safety are necessary:

1.Review current cast-iron replacement programs and consider establishing mandated replacement programs.
2.Establish accelerated leakage survey frequencies or leak testing.
3.Focus pipeline safety efforts on identifying the highest risk pipe.
4.Use rate adjustments to incentivize pipeline rehabilitation, repair, and replacement programs.

PHMSA has issued similar advisory bulletins on Aldyl-A Plastic pipes installed between 1960 and the early 1980s warning of potential susceptibility to brittle cracking. Advisories further warn that rupture testing standards may have overrated the long‐term resistance to brittle‐like cracking.

An accelerated replacement program for ETG's remaining vintage cast iron, steel and plastic piping will enhance safety and reliability. It will also satisfy many of the stated objectives of PHMSA's Notice of Proposed Rulemaking ("NPRM"), and the Biden administration's Emission Reduction Plan and have a positive impact on socially vulnerable underserved communities that are at the greatest risk from an aging natural gas infrastructure.

On August 24th, 2023, PHMSA issued a NPRM on Safety of Gas Distribution Pipelines and Other Pipeline Safety Initiatives. Many aspects of the NPRM are directly applicable to ETG's gas distribution system and its need to ensure safety through an accelerated infrastructure investment program to replace its highest risk piping.

Some of the key aspects of the NPRM that directly relate to the proposed program are excerpted below (underlining provided for emphasis):

- PHMSA anticipates these proposed regulatory amendments will <u>improve public safety</u>, while also reducing threats to the environment (including, but not limited to, <u>reduction of greenhouse gas emissions during incidents on gas pipelines</u>), and <u>promoting environmental justice for minority populations, low-income populations, or other underserved and disadvantaged communities, or others who are particularly likely to live and work near higher risk gas distribution pipeline systems.</u>

- PHMSA also expects the proposed amendments to reduce the frequency of, as well as public and environmental consequences from, failure mechanisms on gas distribution pipeline systems and other pipeline facilities.
- Older cast-iron or bare-steel gas distribution pipelines—a type of gas distribution pipeline particularly vulnerable to failure and over pressurization—are disproportionately concentrated in older, residential (often urban) areas with large minority, low- income, and other historically underserved and disadvantaged populations.
- In addition, the reduced frequency and severity of incidents on gas pipelines anticipated from this rulemaking would have the benefit of minimizing the release of greenhouse gases from pipeline incidents—in particular, methane—to the atmosphere.
- While the overall trend in pipeline safety has steadily improved over the past two decades, gas distribution pipelines are still involved in a majority of serious gas pipeline incidents.
- Much of the nation's gas distribution piping has been in the ground for a long time. Per PHMSA's gas distribution operator database, more than 50 percent of the nation's pipelines were constructed before 1970 during the creation of the interstate pipeline network built in response to the demand for energy in the post-World War II economy. Historically, gas distribution pipelines were constructed from many different materials, including cast iron, steel, and copper. However, material fabrication and installation practices have improved since much of the nation's gas distribution pipeline systems were installed, in acknowledgment that iron alloys like cast iron and steel degrade or corrode over time. Consequently, the age of a gas distribution system pipeline is an important factor in evaluating the risk it poses to public safety and the environment.
- PHMSA understands that both cost and practical barriers, such as urban excavation and disruption of gas supplies, can also limit replacement efforts. However, PHMSA finds that proactive management of the integrity of aging pipe infrastructure enhances safety and reliability, contributes to cost savings over the longer term, and can be less disruptive to customers and communities than a reactive approach. Accelerating leak detection, repair, rehabilitation, or replacement efforts also delivers the desired integrity and safety benefits more expeditiously, lowering maintenance requirements associated with the aging pipe that is being replaced.
- This rule also builds on other national and international actions advanced by Congress and the Biden-Harris Administration to reduce methane emissions—a greenhouse gas with more than 25 times the global warming potential of carbon dioxide.

The U.S Methane Emissions Reduction Action Plan was released in November of 2022. The plan refers to an estimated 2.3 million miles of gas distribution pipelines that extend into cities and towns throughout the United States. “Many of these pipelines are old, leaking, and susceptible to rupturing.” The report uses a chart shown in Figure 3 to demonstrate the chronic leakage problems in gas distribution pipelines.

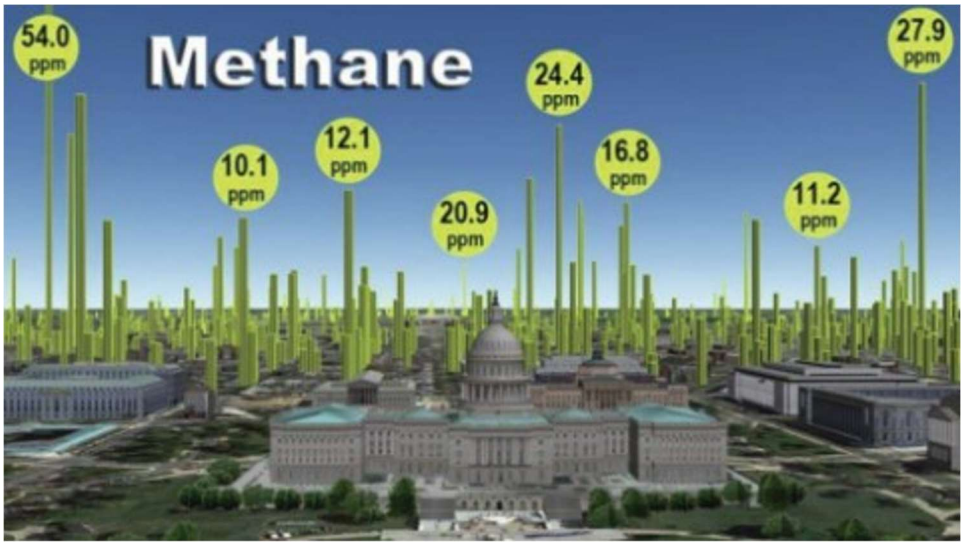

Figure 3: Testing Results of Gas Distribution Leaks - Washington, DC.

The report further states, “*In addition to on-going leaks, gas distribution pipelines can fail and generate enormous emissions. A single catastrophic incident in 2018 in Merrimack Valley, for example, released an estimated 13 metric tons of methane. Despite this challenging fact pattern, when aging or damaged gas distribution pipelines are repaired or replaced, methane emissions can be cut by up to 90%.”*

The report also states, “These *improvements are good for consumers, safety, and the climate. That is why the Biden-Harris Administration is confronting the serious environmental and safety issues associated with methane emissions and ruptures in distribution pipelines:”*

The proposed ETG accelerated replacement program will have a direct impact on reducing methane emissions consistent with the Biden Administration Plan.

In preparing this report ETG’s historical leak counts for the period of 2017-2022 were compiled and reviewed. Many of the leaks were recorded in the Union Service area. The Union Service area has a much higher population density and thus, a higher risk of the consequences of a gas

leak incident. The number of leaks also equates to a greater impact on methane emissions. Moreover, the table of Social Vulnerability[1] indices shown in Table 1 and Figure 4 identifies Union County as having a "High" Category Rank with an index of 0.7950 on a scale of 0-1 where 1 equates to the most vulnerable category.

Table 1: Social Vulnerability Index

COUNTY	National	
	SVI Score	Category Rank
Hunterdon	0.0353	Low
Mercer	0.7104	Medium to High
Middlesex	0.6391	Medium to High
Morris	0.1633	Low
Sussex	0.0484	Low
Union	0.7950	High
Warren	0.2454	Low

[1] The Agency for Toxic Substances and Disease Registry Website States *Natural disasters and infectious disease outbreaks can pose a threat to a community's health. Socially vulnerable populations are especially at risk during public health emergencies because of factors like socioeconomic status, household characteristics, racial and ethnic minority status, or housing type and transportation. To help public health officials and emergency response planners meet the needs of socially vulnerable populations in emergency response and recovery efforts, the Geospatial Research, Analysis, and Services Program (GRASP) created and maintains the CDC/ATSDR Social Vulnerability Index (CDC/ATSDRSVI).* https://www.atsdr.cdc.gov/placeandhealth/svi/.

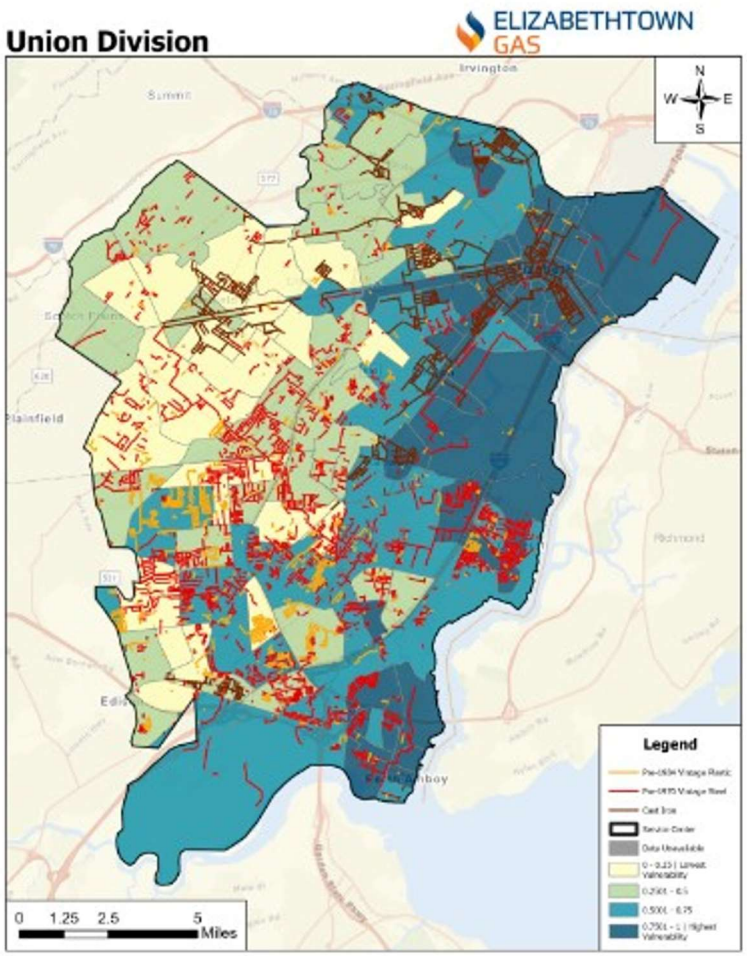

Figure 4: Social Vulnerability Index- Union Service Area

The proposed accelerated replacement program will have a direct beneficial impact on areas of high social vulnerability.

On the basis of the findings and conclusions in consideration of the totality of the information reviewed and relied upon, in conjunction with industry experience and scientific and engineering principles, it is our opinion that the ETG's cast iron, Pre-Code steel and vintage plastic mains and associated services are at risk of continuing failure due to leaks and cracks. We believe that ETG's request for approval of an accelerated replacement program is both justified and necessary to enhance public safety and system reliability.

ETG should continue with the accelerated replacement of approximately 44 miles of cast iron remaining at the conclusion of the current IIP and should also consider the remaining 12 miles of large diameter cast iron mains.

ETG should proceed with the accelerated replacement of approximately 540 miles of vintage steel mains and associated services (including mains lined with copper).

ETG should proceed with the accelerated replacement of approximately 141 miles of pre-1984 vintage plastic mains and associated services.

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1.0 INTRODUCTION

Elizabethtown Gas (ETG or Company) provides regulated natural gas and delivery services to approximately 300,000 residential, commercial, and industrial customers in parts of Union, Middlesex, Sussex, Warren, Morris, Hunterdon, and Mercer counties in New Jersey. The Company operates approximately 3,310 miles of distribution pipelines and approximately 234,000 services in two service areas in Eastern and Western New Jersey. The two service areas are designated as the Union and Northwest Service areas as shown in Figure 5.

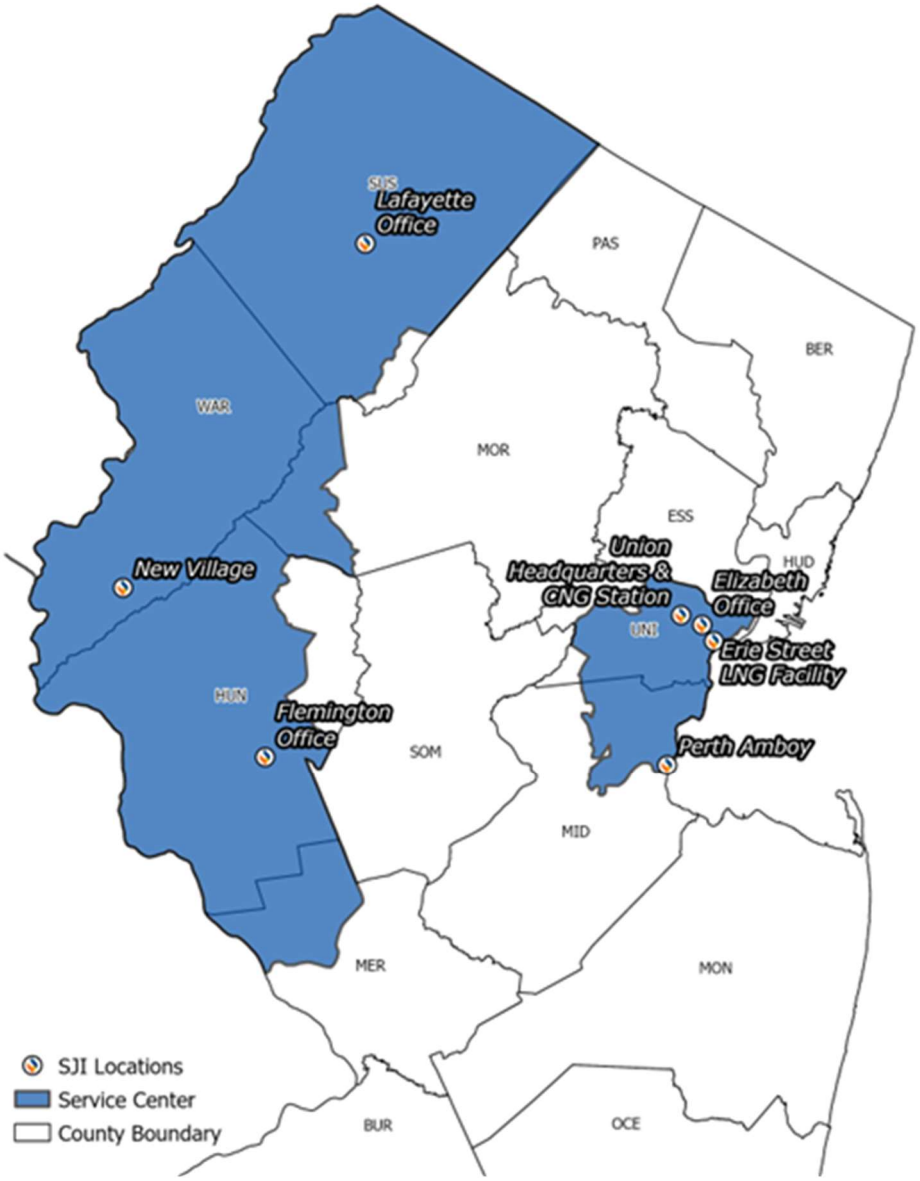


Figure 5: ETG Union and Northwest Service Areas

At the conclusion of the current IIP, the Company will own and operate approximately 737 miles of vintage mains and associated services consisting of 56 miles of cast iron, 141 miles of pre-1984 plastic and 540 miles of coated or bare carbon steel piping[2]. The majority of these mains and associated services were installed and placed into service before the enactment of pipeline safety regulations issued by the US Department of Transportation Office of Pipeline Safety in 1971. These regulations reauthorized by Congress under the Pipeline Safety Act are codified under Code of Federal Regulations (CFR) Title 49 Part 192. The regulations provide for specific requirements regarding the installation, operation, and integrity verification of regulated pipelines and related assets. Since 1971, these regulations require that all newly installed regulated natural gas steel pipelines be protected from corrosion through the use of an external protective coating supplemented with cathodic protection.

Mears Group, Inc. (Mears) has been retained to review the operating history and underlying data leading to the conclusion that an accelerated replacement program is necessary to ensure safety and reliability for such vintage distribution pipelines and services.

All pertinent data and supporting materials are included in this report and related Appendices. Any reuse of this report or its findings, conclusions, or recommendations presented herein are at the sole risk of the user. The opinions and comments formulated during this assessment are based on fundamental science and engineering, as well as education, training, general knowledge, and review of literature, records, and pertinent documents during the investigation. The opinions presented herein are made to a reasonable degree of scientific and engineering certainty. Mears has made every effort to accurately and completely investigate all areas of concern identified during the investigation. The opinions are subject to change in the event of newly received information and Mears reserves the right to amend this report accordingly.

2.0 CORPORATE QUALIFICATIONS AND RESUME OF EXPERIENCE

Mears is a corrosion engineering and integrity service provider with over 400 employees in the US. Mears work on behalf of ETG has been carried out under the direction of Kevin C. Garrity, Executive Vice President. During the execution of this work, staff from Mears working under Mr. Garrity's direction assisted in reviewing documents and in the preparation of tables, figures, and graphs. Mr. Garrity has 49 years of professional experience in corrosion engineering. Mr. Garrity

[2] Including steel pipe lined with copper.

is a graduate of New York University-Polytechnic University where he earned a BS in Electrical Engineering. He is certified as a Cathodic Protection Specialist by NACE International (now the Association for Materials Preservation and Protection (AMPP), was first registered as a Professional Engineer in 1981 and was named a NACE Fellow in 2015.

Mr. Garrity began his professional career in the corrosion engineering field in 1974 under the mentorship of A.W. Peabody, author of the authoritative book Control of Pipeline Corrosion (First Edition NACE 1969). His experience includes the study of corrosion mechanisms, corrosion induced failure modes, corrosion control measures and integrity management for a wide variety of structures and facilities including oil and gas pipelines and facilities, power generation and transmission and distribution facilities, marine facilities and bridges and concrete structures. He has published over 35 technical papers on the subject of corrosion and corrosion control and has authored chapters in books on corrosion engineering and control.

Mr. Garrity has served six terms on the Board of the Association for Materials Protection and Preservation (AMPP), formerly NACE International (The National Association of Corrosion Engineers), and served as chairman of several NACE (an organization with 35,000 worldwide members involved in the field of materials and corrosion) standards development committees including NACE Group Committee T-10 (1999-2001) which developed standards and technical reports in five key areas:

T-10A – Cathodic Protection
T-10B – Stray Current Corrosion
T-10C – Electric Utility Corrosion
T-10D – Protective Coatings
T-10E – Internal Corrosion in Oil and Gas Pipelines

Mr. Garrity served as President of NACE International from 2012-2013 and as President of the NACE Institute administering education and training and Certification and Accreditation for over 40,000 professionals working in various areas involving corrosion and corrosion control. He is a lead instructor for the NACE Cathodic Protection Certification Program.

3.0 MATERIALS AND INFORMATION REVIEWED

The materials, data, publications, and resources reviewed and relied upon in the performance of this study include:

- Cathodic Protection ("CP") and Corrosion Inspection Reports and Documents
  - 2022 Q4 BPU Report
  - CP Pipe to Soil Readings (Maximo Report) (Date range 10/1972 to 06/2023)
  - Rectifier Gauge Meter Readings Report 01/2018 – 12/2022
  - Maximo Corrosion Remediation Work Orders
  - CP Design Analysis and CP Plans
    - Fox Hunt Road
    - Valley Road
    - Woosamonsa Road
  - OPM Division II Section 8 – Corrosion Control Monitoring
  - OPM Division III Section 7 – Corrosion Control Design
  - Historic Standards and Procedures Manual - Corrosion Procedures 1
  - Historic Standards and Procedures Manual - Corrosion Procedures 2
- DIMP & Corrosion Plans
  - ETG DIMP 2022
  - ETG DIMP Appendices 2022
- DOT Summary Reports 2010-2022
- System Maps
  - Union Service Area 03/2023
  - Northwest Service Area 03/2023
- Photos
  - Distribution Corrosion & Couplings
  - Transmission Corrosion
- NCSS Geology, Soil Classification, and Characteristics of System Areas
- Historical Records on Materials of Construction
  - Gas Main Extensions 04/1969
  - Gas Services 05/1961
- Pipe Information Sheets
  - Cast Iron
  - Plastic

  - Steel
  - Service Asset Data
- Leak Repairs for Vintage Mains and Services - Years 2018 & Prior, 2019, 2020, 2021, and 2022
- Cathodic Protection Upgrades
- US-Methane-Emissions-Reduction-Action-Plan-Update 11/22
- Centers for Disease Control/Agency for Toxic Substances and Disease Registry Social Vulnerability Index 2020 Documentation 08/22
- Control of Pipeline Corrosion *AW Peabody.*
- NACE SP0169 "Control of External Corrosion on Underground or Submerged Metallic Piping Systems".
- PHMSA 49 CFR Part 192.
- NBS Circular C450 “Underground Corrosion” 1945.
- National Bureau of Standards Circular 579 Underground Corrosion and "Performance of Ductile Iron Pipe in Soils - An 8-year Progress Report 1967.
- William A. Pennington, "Corrosion of some ferrous metals in soil with emphasis on mild steel and on gray and ductile cast iron." AGA Distribution Conference, St. Louis, Missouri, 1967.
- PHMSA Notice of Proposed Rulemaking August 24, 2023
- Hazard Analysis and Mitigation Report Aldyl-A Polyethylene Gas Pipelines – June 11, 2014 -Public Utilities Commission State of California
- National Transportation Safety Board issued a report entitled “Brittle- Like Cracking in Plastic Pipe for Gas service.”
- “Corrosion Control Considerations for Ductile Iron Pipe – A Consultants Perspective” - William S. Spickelmire-AUCSC May 15, 2012.
- https://geoapps.nj.gov/dot_gdms/
- IEEE Std 142-1982 “Grounding of Industrial and Commercial Power Systems”
- New Jersey Geotechnical Data Management System (GDMS)
- Plastic Piping Data Collection Initiative Status Report – October 2022 - Administered by American Gas Association 400 North Capitol Street, N.W.
- NTSB Preliminary Report – UGI Natural Gas Fueled Explosion and Fire - July 18, 2023.

4.0 BACKGROUND

The ETG natural gas distribution system operates across two service areas designated as Union and Northwest. The distribution system consists of approximately 3,310 miles of main distribution pipe and approximately 234,000 service connections averaging 52 feet in length. Just over half of those service connections (123,528) are fitted with Excess Flow Valves ("EVF") as of the end of 2022. The piping network is constructed with pipe made of various materials including Steel, Ductile Iron, Copper, Cast Iron, and Plastic.

There are three main vintage pipeline materials that are the subject of this report:

- Vintage or Pre-Code Steel installed prior to the DOT regulatory requirements implemented in 1971,
- Vintage plastic installed pre-1984 after which time there was an improved material specification or formulation, and
- Vintage Cast Iron.

The Vintage piping is shown in Figure 6 (Union Service area) and Figure 7 (Northwest Service area).

The Company is presently in the final year of an accelerated infrastructure investment program to replace vintage small diameter cast iron facilities after which approximately 44 miles will remain.

The Pre-Code steel mains and associated services comprise approximately 540 miles of coated and bare carbon steel pipe. Approximately ninety seven percent (97%) of this pipe was installed between the years 1955 and 1971 and ninety-point four percent (90.4%) of that was installed with a protective coating, however, some may not have been installed with cathodic protection. Eighty seven percent (87%) of the Pre-Code steel has a nominal diameter of between 2-inch and 6-inch and was manufactured with wall thicknesses between 0.154 and 0.280 inches. The average manufactured wall thickness for all ETG Pre-Code carbon steel pipe within the 2-inch to 6-inch diameter range is 0.160 inch. There are approximately 141 miles of Vintage plastic of sizes ranging from 2-inch through 8-inch in operation.

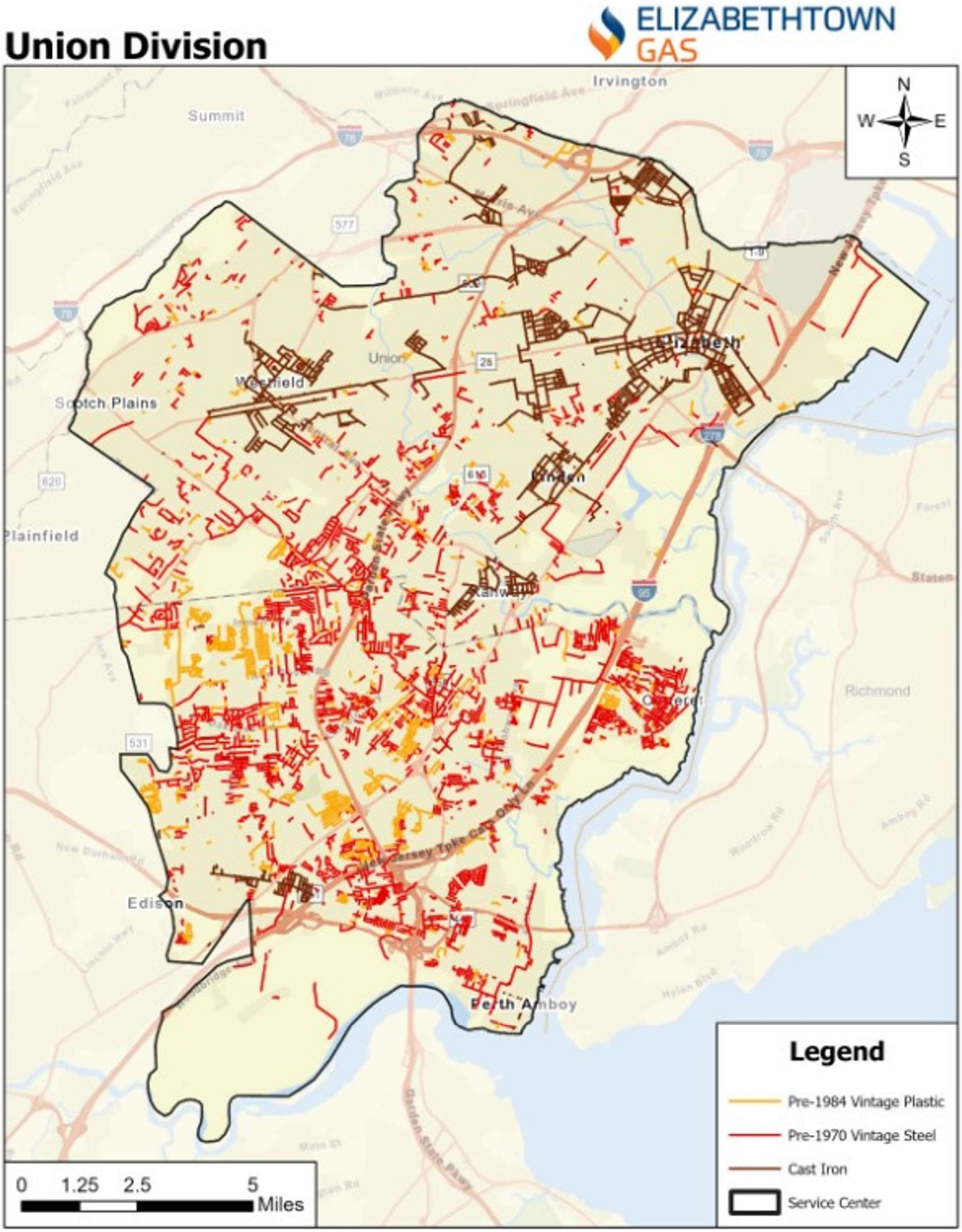


Figure 6: ETG Union Service Area – Vintage Pipe

Northwest Division

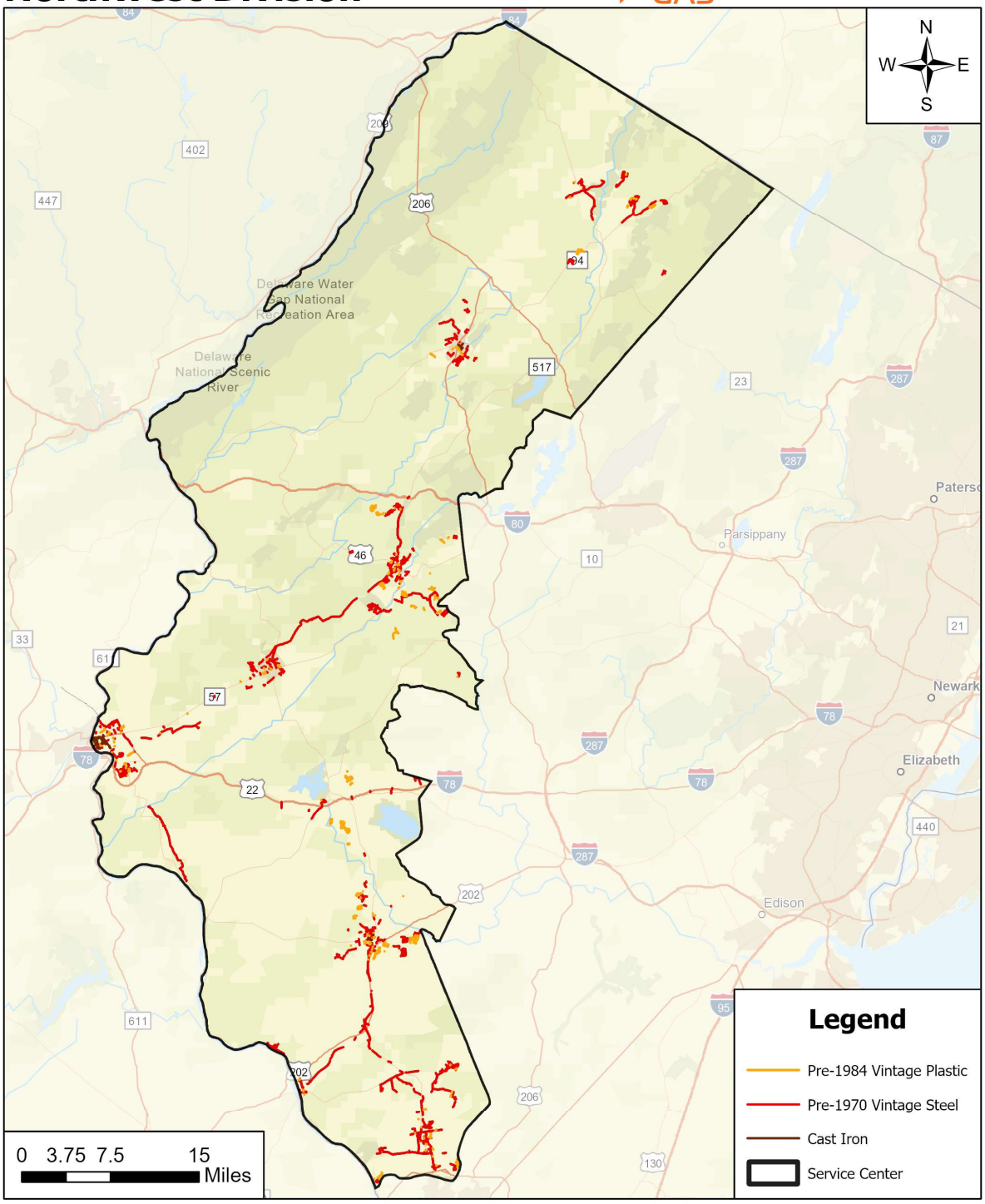


Figure 7: ETG Northwest Service Area – Vintage Pipe

5.0 DEGRADATION AND AGING OF VINTAGE GAS DISTRIBUTION PIPING SYSTEMS

The gas distribution system operated by ETG is predominantly comprised of three vintage materials of construction, each with varying but related degradation and aging mechanism that have a direct impact on the safety and reliability of the ETG operating system. It is these three materials of construction that pose the greatest risk to life, property, and the environment. The piping materials include:

1. Cast Iron piping,
2. Pre-Code Coated and bare carbon steel, and
3. Polyethylene (Plastic) piping.

An understanding of the fundamentals of how Pre-Code Coated and bare carbon steel, and Polyethylene (Plastic) piping degrade resulting in leaks and failures is paramount when studying an accelerated program to enhance the safety of the ETG system.

5.1 Factors that Influence Failure in Pre-Code Coated Vintage Carbon Steel Pipelines

The ETG Pre-Code coated steel mains and associated services were initially installed with a protective coating applied to the external surface of buried steel pipelines as the first line of defense against the harmful effects of corrosion. Protective coatings serve the purpose of providing a barrier between the steel and the aggressive species in the soil and water environment (the electrolyte) surrounding the pipe. All coatings develop flaws or breaches in the coating film known as “holidays” due to a variety of factors including, handling, backfilling, soil stress, and the expected aging process of the coating. Holidays in a coating serve to expose the pipeline steel to the corrosive effects of the electrolyte resulting in wall loss and full penetration of the steel resulting in leaks. Since 1971, regulations require that all coated steel pipelines must also Cathodic Protection (CP) applied as a secondary or supplemental form of protection such that the coating and the CP work in tandem to mitigate corrosion and reduce the risk of leaks.

The ETG Pre-Code coated steel mains and associated services were installed before regulations were enacted that required monitoring of CP effectiveness and the retention of such records. ETG’s monitoring records have been maintained since 1971. Despite the presence of a coating, all coatings degrade with age thereby exposing the steel to corrosive effects of the environment.

Under these conditions, once initiated, corrosion can progress at a concentered rate in the areas of the holidays in the coating.

Corrosion of a metal is the electrochemical degradation of a metal as a result of a reaction with its environment. Corrosion of a metal is an electrochemical process governed by electrical laws. A corrosion cell is comprised of four elements:

1. An anode which is a metal that gives up electrons,
2. A cathode which is a metal that receives electrons,
3. An electrolyte which is an ionized solution capable of conducting electricity, and
4. A metallic path that can support electron flow.

When these four elements exist, there will be a migration of electrons from the anode to the cathode through the metallic path. At the anode surface the loss of electrons creates a surplus of positively charged iron atoms which combine with negatively charged hydroxyl ions (OH^-) to form ferrous hydroxide ($Fe(OH)_2$) and ferric hydroxide ($Fe_2(OH)_3$). This is easily recognizable in the form of rust. At the cathode, a surplus of electrons combines with positively charged hydrogen ions from the electrolyte to form hydrogen (H_2).

A typical corrosion cell represented in a buried pipeline is shown in Figure 8.

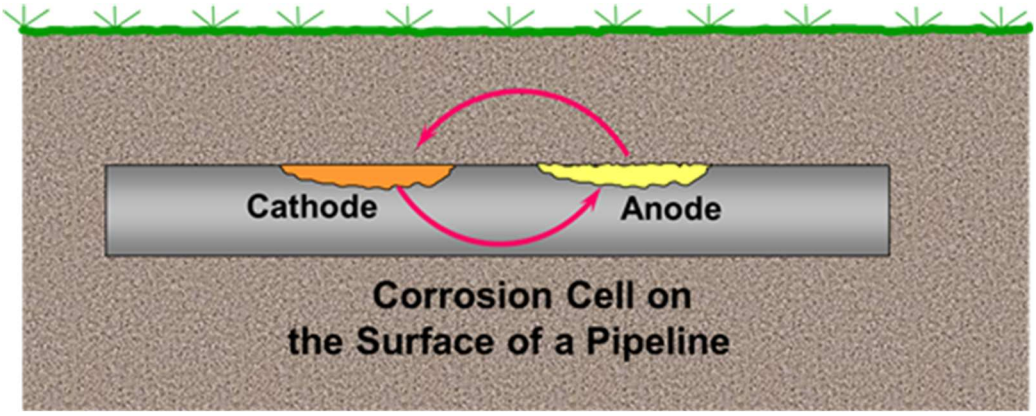


Figure 8: Corrosion Cell in Steel Pipelines

Environment factors that can influence and accelerate corrosion rates for buried steel pipelines include:

1. Non-homogeneous environments (dissimilar soil conditions),
2. Differential aeration (differential oxygen conditions),
3. Environment pH (pH < 7 can accelerate corrosion of carbon steel), and
4. Corrosion under disbonded coatings.

Virtually all soil environments are comprised of dissimilar conditions that promote the establishment of anodic (corroding) and cathodic (non-corroding) regions along buried pipelines. As shown in Figure 9 soil conditions with differing soil types, compaction, electrical conductivity/resistivity, chemical characteristics, and moisture content create corrosion cells on pipelines.

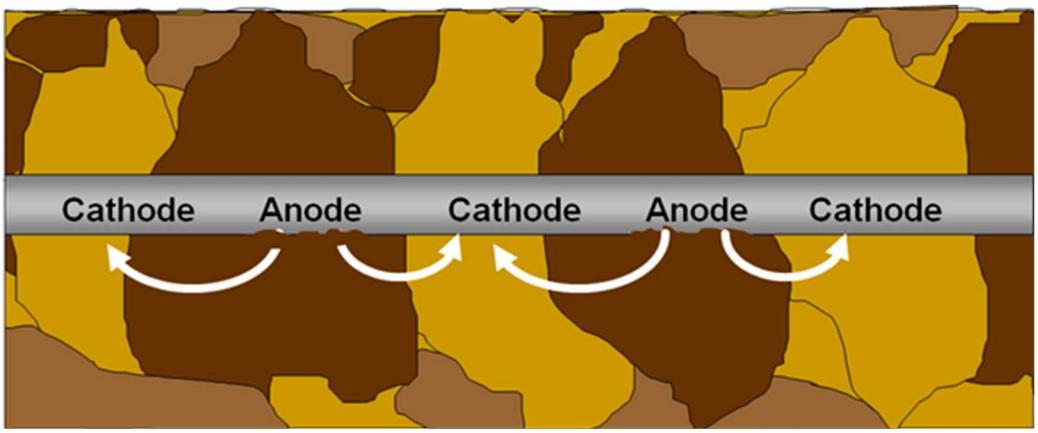


Figure 9: Dissimilar Soil Corrosion on Pipelines

Conditions that promote differential oxygen (aeration) corrosion cells on pipelines are shown in Figure 10.

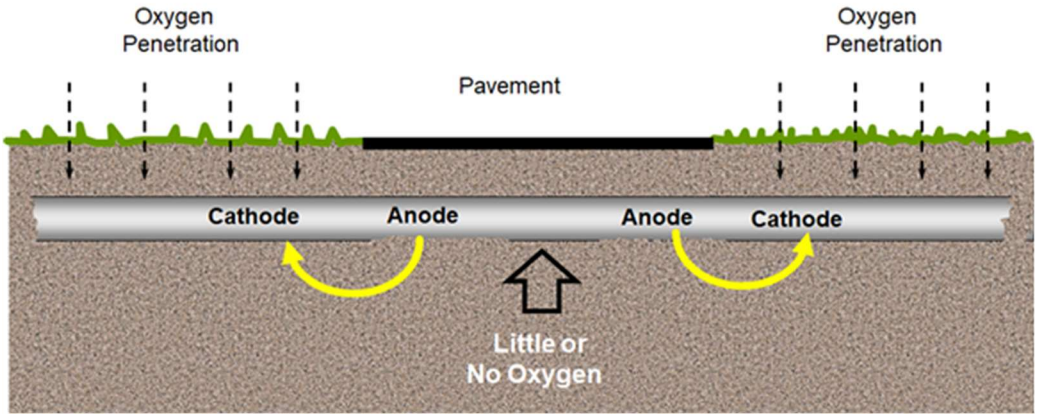


Figure 10: Deferential Oxygen Corrosion on Pipelines

The pH of a solution including soil and water is a measure of the degree of acidity or alkalinity of the solution. A pH of 7 is considered neutral and indicates that the hydrogen ion concentration and hydroxyl ion concentration are equal in solution with no tendency to accelerate corrosion reactions. Values of pH that are less than 7 are considered acidic and promote higher corrosion rates of steel in soil environments as the pH decreases. Each unit of pH change (e.g., pH 7 to pH 6) results in a factor of 10 increase in reactivity resulting in accelerated corrosion rates for steel.

Typical examples of corrosion induced leaks in steel mains and associated services are shown in Figure 11 and 12.

ETG currently operates approximately 540 miles of vintage steel that continue to represent a safety and reliability issue.

Figure 11. Puget Sound Energy - Coated Steel Services – Corrosion and Leak

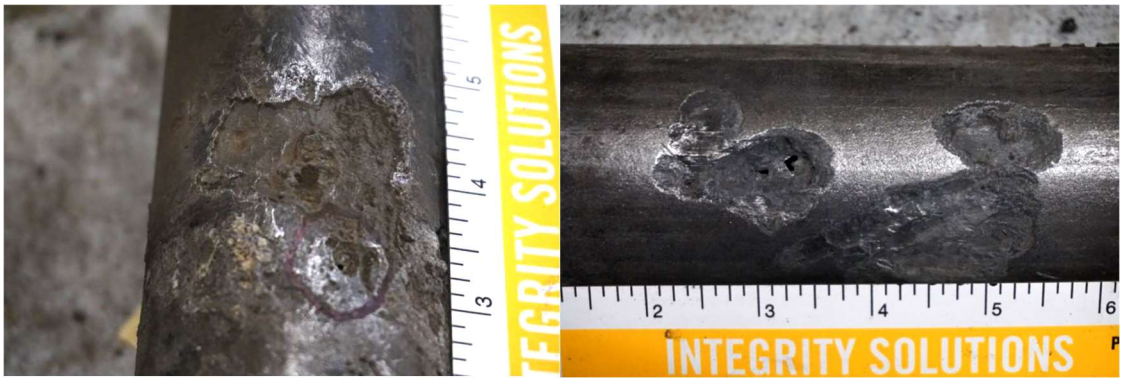


Figure 12. South Jersey Gas - Steel Mains - Corrosion Leaks

5.2 Factors that Influence Failure in Vintage Plastic Mains and Associated Services

Plastic piping for use in natural gas distribution systems is reported to have begun in 1959 with gas utilities transitioning to alternatives for cast iron and steel. Polyethylene pipe manufactured by Dupont as Aldyl-A and Phillips Driscopipe 8000 was introduced in the early 1970's. These pipes and fittings were found to suffer from a failure mechanism involving the development of cracks and embrittlement leading to catastrophic incidents.

Unlike steel pipelines where corrosion damage leading to a potential leak can be seen and the risk of failure characterized, visual examination is unlikely to distinguish susceptible and non-susceptible piping and fittings to the mechanism of slow crack growth until an actual crack develops and propagates through the wall leading to leakage and failure. Studies[3] have identified three possible failure modes:

1. Rapid Crack Propagation (Outside Force,
2. Ductile Rupture (Over pressurization), and
3. Slow Crack Growth (Crack initiation and propagation).

Figures 13 and 14 show slit fractures on pipe manufactured by Dupont. A rock pressing against the plastic pipe generated long-term stress intensification that led to the formation of the brittle-like crack. Slit failures in polyethylene, whether occurring during stress rupture testing or under actual service conditions, result from crack initiation and slow crack growth and are similar to brittle cracks in other materials in that they can occur with little or no visible deformation.[4]

[3] Hazard Analysis and Mitigation Report Aldyl A Polyethylene Gas Pipelines – June 11, 2014 -Public Utilities Commission State of California.
[4] Mruk, S. and Palermo, E., "The Notched Constant Tensile Load Test: A New Index of the Long Term Ductility of Polyethylene

Figure 13: Slit Fracture on Plastic Pipe Manufactured by DuPont

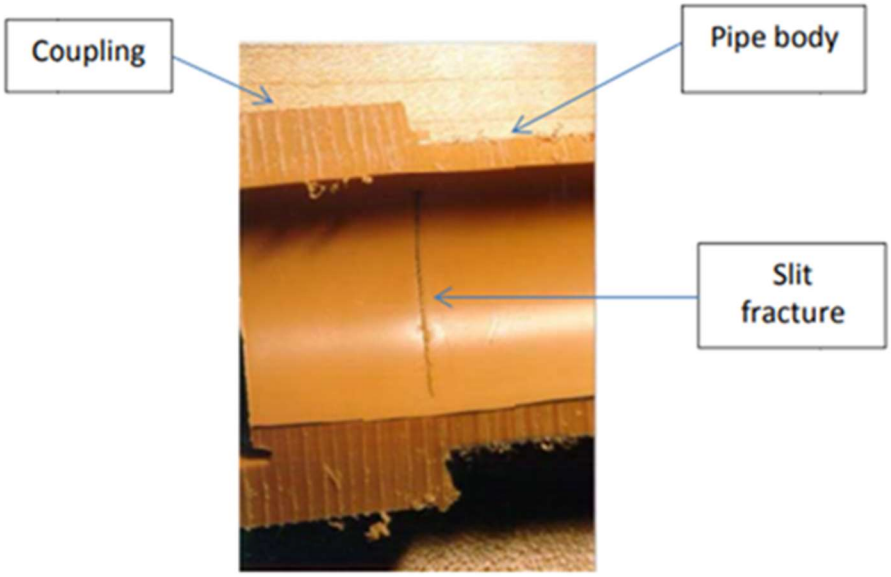


Figure 14: Slit Fracture on Interior of Aldyl-A Service Pipe Involved in San Juan, PR Incident[5].

[5] NTSB Report PB97-916501 – SAN JUAN GAS COMPANY, INC./ENRON CORP. PROPANE GAS EXPLOSION IN SAN JUAN, PUERTO RICO, ON NOVEMBER 21, 1996 6789C

The mechanism of slow crack growth initiates in localized areas of stress concentrations and the crack propagates over time due to applied stresses. Applied stresses may be introduced from soil stress, rock damage, outside force and stresses created during fusing. In 1983, DuPont modified the resin formulation for its PE Pipe that is reported to have resulted in an order of magnitude improvement in slow crack growth and long-term performance offered an order of magnitude improvement in resistance to slow crack growth and long-term performance.

5.2.1 NTSB investigative report

In April of 1998, the National Transportation Safety Board issued a report entitled “Brittle- Like Cracking in Plastic Pipe for Gas service[6].”

The report summarized several tragic incidents involving failure of plastic gas piping. The reported incidents are shown in Table 2.

[6] National Transportation Safety Board, “Brittle-Like Cracking in Plastic Pipe For Gas Service”, April 23, 1998.

Table 2. Summary of Incidents Reported in 1998 NTSB Report - "Brittle- Like Cracking in Plastic Pipe for Gas service."

Date	Location	Cause	Consequences
Oct 1974	Waterloo, Iowa	Stress intensification, primarily generated by soil settlement at a connection to a steel main, on a 1/2-inch polyethylene pipe that had poor resistance to brittle-like cracking. Continental Industries pipe.	6 Fatalities, 1 serious injury
1996	San Juan, PR	Differential settlement generated long-term stress intensification that led to the formation of brittle-like circumferential cracks on the pipe.	33 deaths, 69 injuries
Aug 1997	Lake Dallas, TX	Metal pipe pressing against a plastic pipe generated stress intensification that led to a brittle-like crack in the plastic pipe.	
1971	TX	Natural gas migrated into a house from a brittle-like crack at the connection of a plastic service line to a plastic main.	1 Person Injured
1973	MD	Brittle-like crack occurred in a plastic pipe as a result of an occluded particle that created a stress point.	3 Fatalities, 1 injury
1975	NC	A concrete drain pipe resting on a plastic service pipe had precipitated two cracks in the plastic pipe. Available documentation suggests that these cracks were brittle-like.	3 Fatalities
1978	AZ	Gas line crack that caused the accident was brittle-like.	1 Fatality, 5 Injuries
1978	NE	Inadequate support under the plastic fitting resulted in long-term stress intensification that led to the formation of a circumferential crack in the fitting. Available documentation indicates that the crack was brittle-like. Continental Industries pipe.	1 house destroyed, three others damaged
1981	AZ	Assorted debris, rocks, and chunks of concrete in the excavation backfill generated stress intensification that resulted in a circumferential crack in a plastic pipe at a connection to a plastic fitting. Available documentation indicates that the crack was brittle-like.	Destroyed an apartment, damaged five other apartments in the same building, damaged nearby buildings, and injured three occupants.
July 1982	CA	A longitudinal crack in a plastic pipe as the source of the gas leak - crack was brittle-like.	Destroyed a store and two residences, severely damaged nearby commercial and residential structures, and damaged automobiles
Sept 1983	MN	Rock impingement generated stress intensification that resulted in a crack in a plastic pipe - Continental Industries pipe.	Destroyed one house and damaged several others, and injured five persons.
Dec 1983	TX	A brittle-like crack that had resulted from damage to the plastic pipe during an earlier squeezing operation to control gas flow.	One woman was killed and her 9-month-old daughter injured
Sept 1984	AZ	A reaction between a segment of plastic pipe and some liquid trapped in the pipe weakened the pipe and led to a brittle-like crack.	Five fatalities, seven injuries, and two destroyed apartments

These data substantiate that the issues associated with vintage plastic pipe represent an industrywide elevated risk of failure for vintage plastic that remains in natural gas service.

Three key findings from the NTSB Report were:

1. Plastic Pipelines manufactured from the 1960's through the early 1980's may be susceptible to brittle-like cracking,
2. Failures represent potential public safety hazard, and
3. Manufacturers may have overrated the strength and resistance to brittle-like cracking in plastic piping.

The NTSB recommended that PHMSA determine how susceptible older plastic piping materials are to premature brittle-like cracking.

5.2.2 PHMSA Safety Advisories

Following the release of the NTSB report, PHMSA issued a series of safety advisories on brittle cracking in plastic pipes manufactured in the 1960's to 1983. Example of cracking in plastic pipe is shown in Figures 15.

Figure 15: ETG Plastic Pipe Leaks at Joint and Split

Another advisory was issued by PHMSA in March 2012 specific to operators of Driscopipe 8000. The advisory indicated the potential for degradation of this product and urged all operators using Driscopipe 8000 "*to consider the use of accelerated and more frequent leak surveys in those areas where degraded pipe is known or suspected to exist. All operators using Driscopipe 8000 pipe are encouraged to work with all stakeholders to determine how to address discovery and repair within their systems, taking the most conservative approach and keeping pipeline integrity and public safety a priority.*"

In 2022, the Plastic Pipe Database Committee (PPDC) of the American Gas Association (AGA) issued a status report on Plastic Piping Data Collection. The report indicated that there were approximately 802,937 miles of plastic main and over 53.4 million plastic services installed in distribution systems in the U.S. at the end of 2021. The report also indicated that historical information suggests that the following plastic piping and components exhibit significantly lower resistance to brittle failure during stress intensification:

- Century Utility Products polyethylene (PE) pipe produced from 1970 through 1974.
- DuPont Aldyl® A low ductile inner wall PE pipe manufactured from 1970 through 1972.

- PE pipe manufactured from PE 3306 resin such as Swanson, Orangeburg, and Yardley.
- DuPont Aldyl® service tee with a white Delrin® polyacetal threaded insert.
- Plexco service tee with Celcon® polyacetal threaded cap.

ETG currently operates 141 miles of pre-1984 Aldyl-A plastic and Driscopipe 8000 that has been shown to present significant risk of failure. Moreover, there are no currently available non-destructive test methods to identify the at-risk plastic piping.

6.0 SOIL CORROSIVITY AND ITS IMPACT ON VINTAGE GAS MAINS AND ASSOCIATED SERVICES

During the early 1900s, corrosion was attributed to stray current from rail traction systems like trolley cars and subways. In 1910, Congress authorized the National Bureau of Standards (NBS) to begin a study on “stray current electrolysis” and by 1920, NBS concluded that soil corrosion was equally as serious as corrosion caused by stray current. In 1922, the original study was expanded to:

- Determine the causes of soil corrosion since previous findings indicated that some soils were more corrosive than others, and
- Determine what soil parameters were responsible for the corrosion of metals.

The results were presented in Circular C450 “Underground Corrosion” in 1945 written by K.H. Logan. The study concluded that soil corrosion was too complex to permit correlation with any one parameter. The study indicated that corrosivity of a particular soil is based on the interaction of several parameters: resistivity, dissolved salts, moisture, pH, presence of bacteria, amount of oxygen, and others.

During the 1950s and 1960s, a significant amount of work was produced by Gordon Scott and W.J. Schwerdtfeger. The main factors that were considered in the study and their findings are shown in Table 3.

Table 3: Factors Considered by Scott and Schwerdtfeger

Factors	Considerations	Findings
Soil Type	Clay, sand, silt, rocky, etc.	Clay soils tend to have a lower resistivity while unsaturated dry sandy soils exhibit higher resistivity.
Soil Resistivity	Measured using the Wenner four-pin method during field testing and the soil box method during laboratory testing procedures.	The lower the resistivity, the more corrosive the soil.
Moisture	To determine moisture content in each type of soil	As moisture content increases, resistivity decreases.
Soil Chemistry	Performed by chemical analysis to determine soil compounds.	Identification of various elements and compounds prevalent in soils can help determine possible mechanisms of corrosion.
Soil Environment	Evaluate presence of bacteria	Organisms present in the soil can cause corrosion to occur.

Peabody[7] published corrosion indices for soil resistivity and soil pH as shown in Table 4 and Table 5.. Peabody relates pH value ranges to a degree of corrosion severity, clearly demonstrating that values less than pH 5.5 are severely corrosive.

[7] AW Peabody “Control of Pipeline Corrosion”, NACE First Edition 1969

Table 4: Resistivity Ranges for Levels of Soil Corrosivity

Resistivity (ohm-cm)	Degree of Corrosivity
< 500	Very Corrosive
500- 1,000	Corrosive
1,000 – 2,000	Moderately Corrosive
2,000 – 10,000	Mildly Corrosive
> 10,000	Progressively Less Corrosive

Table 5: Effect of pH on Soil Corrosivity

pH	Degree of Soil Corrosivity
< 5.5	Severe
5.5 – 6.5	Moderate
6.5 – 7.5	Neutral
> 7.5	None (alkaline)

It should be noted that pH is determined on a logarithmic scale and each unit of change equates to a factor of 10 increase or decrease in reactivity.

6.1 Soil Corrosivity Analysis across ETG Service Areas

A corrosivity assessment has been completed to evaluate the likelihood of corrosion due to the soil environment surrounding the buried metal structures. The assessment is intended to determine what soil parameters may contribute to the corrosion of metal. In the course of this evaluation a review of 35,000 pipe segments was completed to correlate a level of corrosivity with referenced soil types and characteristics.

The New Jersey Geotechnical Data Management System (GDMS) and the USDA National Cooperative Soil Survey Database (NCSS) were reviewed with respect to steel and cast-iron piping locations within the Union and Northwest Service areas. The review of the soil corrosivity included the following:

- Soil Type and Description
- Soil Resistivity
- Soil pH
- Soil Corrosivity

6.2 Soil Type and Description

Soil types and descriptions are based on characteristics such as particle size and moisture content. Soil types are classified in ASTM D2487 based on coarseness. An overview summary is provided in the figure below.

The ability to maintain moisture increases from left to right across the chart, with organic soils being capable of the highest moisture content. The relationship between particle size and moisture content relate to the relative resistivity of the soil, implying that gravel would be more resistive (dry) than organic soil (moist).

6.3 Soil Resistivity

Soil resistivity is a property to evaluate the likelihood of electrical current flow through the measured soil. In addition, resistivity can be used to assess the corrosivity of the soil with respect to buried pipelines.

The variation in resistivities may be a good predictor of the likelihood of corrosion activity, where there is good correlation between pipe-to-electrolyte potentials and soil resistivity.

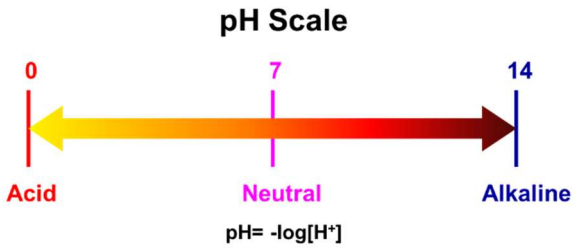
- High Soil Resistivity = Lower (Less Negative) Pipe-to-Electrolyte Potentials
- Low Soil Resistivity = Higher (More Negative) Pipe-to-Electrolyte Potentials

6.4 Soil pH

The pH of soil is a measurement of the concentration of free hydrogen ions within the soil solution. Soil pH is the measure of how acidic or how alkaline the soil is. As described in *Corrosion Control of Pipelines – AW Peabody* "The lower the pH (the more acidy the environment), the greater the corrosivity with respect to buried metallic structures."

Alkaline conditions do not create an environment that is aggressive towards steel; whereas acidic conditions around the pipe generally make it difficult to polarize the line to protective potentials when cathodic protection is applied.

An example of the pH scale is shown in the figure below representing a range from 0 (most acidic) to 14 (most basic).



6.5 Corrosion of Steel with Applicability to Cast Iron

The NCSS[8] provides soil rating for the "Corrosion of Steel," and defines corrosion risk as follows:

- "Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel in installations that are entirely within one kind of soil or within one soil layer. The risk of corrosion is expressed as "low," "moderate," or "high.".

The soil rating for steel is deemed to be equally applicable to corrosion mechanisms affecting cast and ductile iron pipelines in the ETG system.

[8] USDA National Cooperative Soil Survey (NCSS).

6.6 Evaluation of Soil Corrosivity

Soil environments have been related to a degree of corrosivity based on its characteristics. The characteristics for this assessment have included a review of the soil type, soil pH and soil resistivity. While the NCSS soil classification mapping was available for pH and corrosivity classification in the Union and Northwest service areas, data did not exist to classify resistivity from the NCSS mapping system. To obtain this information, a statistical sampling of soil bore logs were collected from the New Jersey Geotechnical Data Management System[9]. These logs provided a summary of the soil type classification from each boring log. The soil classifications were then cross referenced to an estimated resistivity then using the Institute of Electrical and Electronics Engineers guide on resistivity[10] as shown in Figure 16.

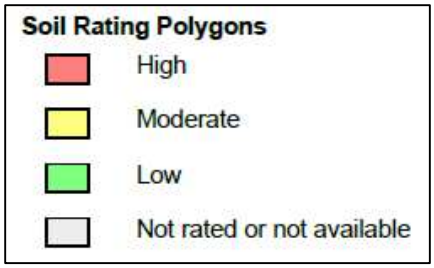
Table 5
Resistivity of Soils and Resistances of Single Rods

Soil	Resistivity (Ω · cm) Avg	Min	Max	Resistance of $\frac{5}{8}$ in (16 mm) × 10 ft (3 m) Rod (Ω) Avg	Min	Max
Fills, ashes, cinders, brine waste, salt marsh	2370	590	7000	8	2	23
Clay, shale, gumbo, loam	4060	340	16 300	13	1.1	54
Same, with added sand and gravel	15 800	1020	135 000	52	4	447
Gravel, sand, stones, with little clay or loam	94 000	59 000	458 000	311	195	1516

Figure 16: Resistivity of Soils - IEEE

The NCSS provides the following rating system for the “Corrosion of Steel” index:

[9] https://geoapps.nj.gov/dot_gdms/
[10] IEEE Std 142-1982 *“Grounding of Industrial and Commercial Power Systems”*



The degrees of corrosivity presented for soil resistivity, pH and NCSS Corrosion of Steel are summarized in Table 6. These degrees have been consolidated to a final degree of corrosivity index to allow for a summary of pipeline footage and their associated ranking of risk.

Table 6: Consolidated Corrosion Indices

Soil Resistivity Degree of Corrosion	pH Degree of Corrosion	NCSS Corrosion of Steel	Final Degree of Corrosivity
Very Corrosive	Severe	High	Highly Corrosive
Corrosive			
Moderately Corrosive	Moderate	Moderate	Moderately Corrosive
Mildly Corrosive	Neutral	Low	Low Corrosivity
Progressively Less Corrosive	None (Alkaline)		

6.7 Union Service Area

The evaluation of Union Service area included the analysis of data from 13 soil borings located throughout the geographical area. An overview of the selected locations is shown in Figure 17.

Figure 17: Union Service Area Soil Boring Logs Considered

The review of the soil bore logs is included in Table 7. The soil type determined from the review consisted of sands, silts, and gravel. The information provided in the bore logs was compared to the IEEE Std 142-1982 Resistivity of Soils table to assign a soil resistivity range to compare to a degree of corrosivity. A population of 29 locations were studied and analyzed against the soil boring logs from the Union and Northwest service area to ensure a statistically significant sample size.

Table 7: Soil Boring Analysis Results - Union Service Area

Bore Sample ID	Approximate Location	Summary of Surface Soil Types	Referenced Soil Resistivity (ohm-cm)	Degree of Corrosivity	Approx. Latitude	Approx. Longitude
#1	Park Ave, Linden, NJ	Red Brown CF Sand, Silt, Gravel	1,020 – 135,000	Moderately Corrosive	40.649610	-74.232090
#2	St. Georges Ave, Avenel, NJ	Topsoil, Red Brown Sand, Clayey Silt, Trace Gravel	340 – 16,300	Corrosive	40.592070	-74.292264
#3	Middlesex Reservoir, Clark NJ	Dark Brown Organic Silt, L.P.I, MF Sand	340 – 16,300	Corrosive	40.619017	-74.311293
#19	Route 78, Springfield Ave	Topsoil, Red/Brown Sandy Silt, Tr Gravel	1,020 – 135,000	Moderately Corrosive	40.713652	-74.281470
#20	I-78	Brown Clayey Silt, cf Sand, Trace Gravel	340 – 16,300	Corrosive	40.687992	-74.382317
#21	Rt 444	Brown cf Sand, Some Organic Silt, Reddish Brown Sand, Clay, Silt, Gravel	340 – 16,300	Corrosive	40.642188	-74.287894
#22	Garden State Parkway (Rt 444)	Red Silt, Little Sand, Trace f. Gravel, Fractured Silty Shale	1,020 – 135,000	Moderately Corrosive	40.570340	-74.325532
#23	Grove Ave over Conrail, Metuchen	Dull Red cf Sand, Some Silt, Trace f. Gravel	1,020 – 135,000	Moderately Corrosive	40.551861	-74.355888
#24	State Rt 9, Woodbridge Maintenance Facility	Blue Grey Gravel, cf Sand, Little Silt, Little Gravel	1,020 – 135,000	Moderately Corrosive	40.544765	-74.291714
#25	Carteret Industrial Rd	Gray/Brown cf Gravel, little Silt, Little cf Sand, Little Fibers, MF Gravel	1,020 – 135,000	Moderately Corrosive	40.574007	-74.217929
#26	Crows Mill Rd over Conrail	Brown cf Sand, Little Silt, Little MF Gravel, Grey/Brown Silt and Clay	340 – 16,300	Corrosive	40.524573	-74.305594
#27	Rt 35, Victory Bridge over Raritan River	Reddish Brown Silt, little mf Gravel, trace of Sand, Reddish Brown Clayey Silt	340 – 16,300	Corrosive	40.513711	-74.286585
#28	North Avenue Allied Chemical	Brown CF Sand, Some Silt, Some CF Gravel	1,020 – 135,000	Moderately Corrosive	40.665374	-74.167713

(**cf:** Coarse to Fine; **LPI:** Liquefaction Potential Index; **MF:** Medium to Fine; **Tr:** Trace; **f:** Fine)

The soil pH map for the Union Service area is shown in Figure 18, which shows that the soils range from Very Strongly Acidic to Moderately Acidic. The NCSS soil corrosivity classification is shown in Figure 19.

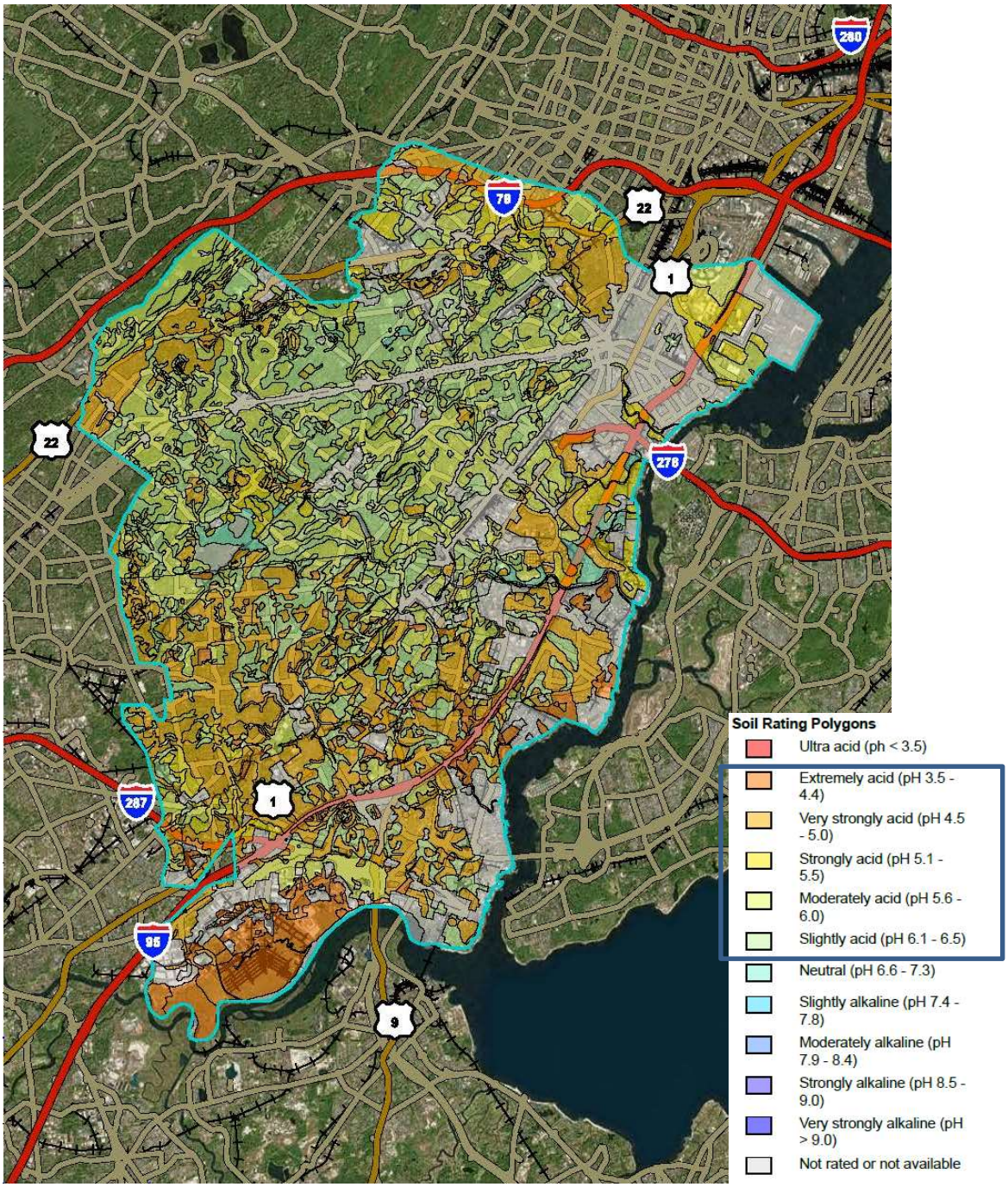


Figure 18: NCSS Union Service Area Soil pH Classifications

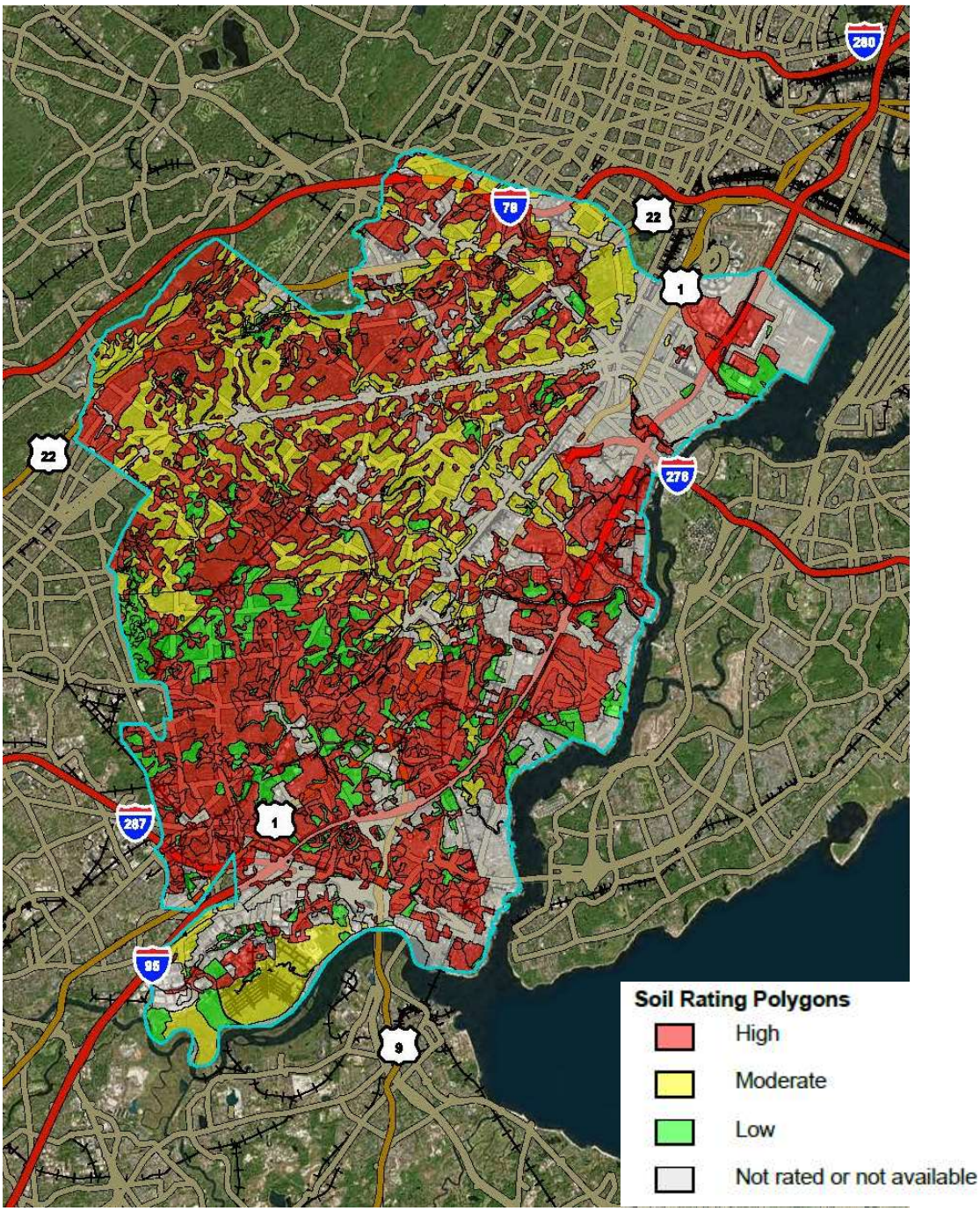


Figure 19: NCSS Union Service Area Soil Corrosivity Classification

The consolidated corrosivity ranking for the mileage of Vintage steel mains and associated services in the Union Service area is shown in Table 8. The percentage of Vintage Steel mileage by corrosion severity is shown in Figure 20.

Table 8: Corrosivity Risk Ranking - Union Service Area - Vintage Steel Mains and Associated Services

Service Area	Vintage Steel	Line Type	Corrosivity Rating	Mileage
Union	Pre-Code	Main	Low to Moderately Corrosive	2.276
			Moderate to Highly Corrosive	139.672
			Highly Corrosive	140.213
		Service	Low to Highly Corrosive	0.394
			Moderate to Highly Corrosive	0.846
			Highly Corrosive	2.512

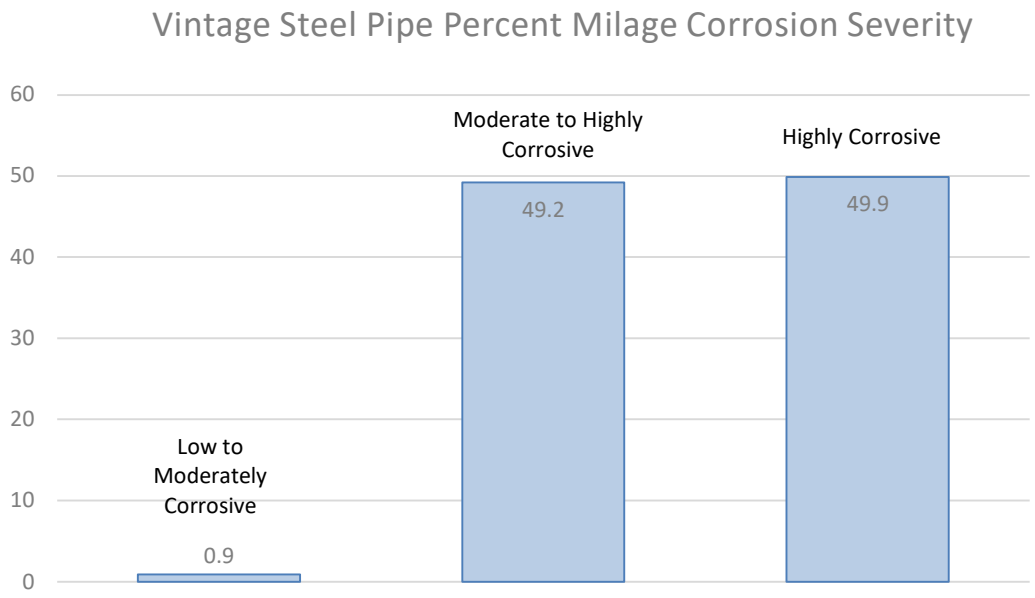


Figure 20: Percent Vintage Steel by Corrosion Severity-Union Service Area

This analysis clearly demonstrates that the majority (99.1%) of the vintage steel piping studied in the Union service area can be classified as installed in moderately to highly corrosive soils and further justifies the need for an accelerated replacement program to enhance safety and reliability.

6.8 Northwest Service Area

The evaluation of the Northwest Service area included analysis of data from 16 soil bores located throughout the geographical area. An overview of the selected locations is shown in Figure 21 below.

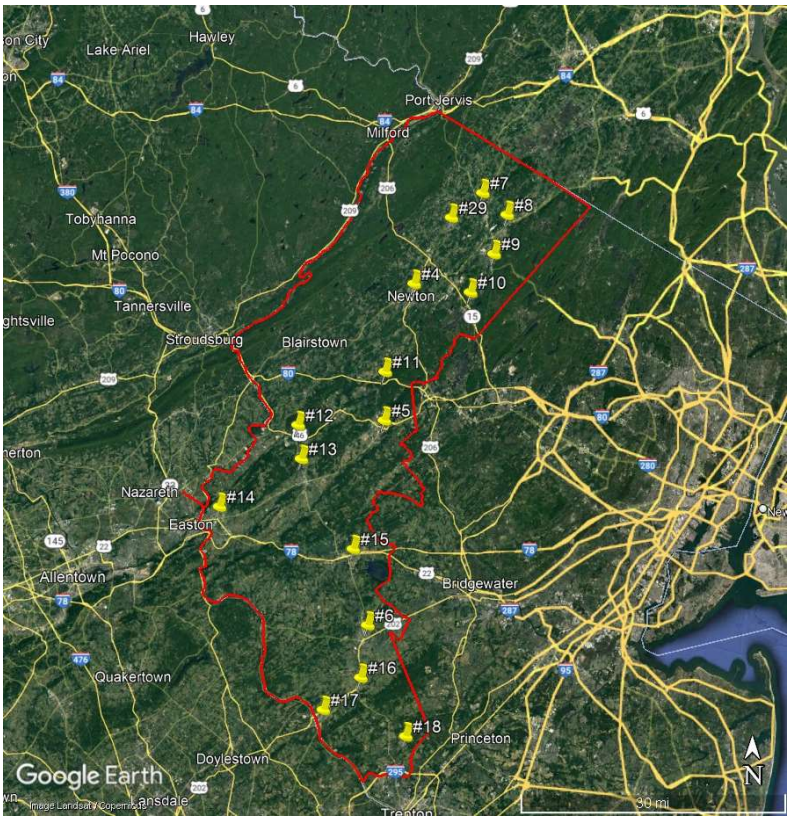


Figure 21: Northwest Service Area Soil Boring Logs Considered

The review of the soil bore logs is included in Table 8 below. The soil type determined from the review consisted of sand, silt, and gravel. The information provided in the bore logs was compared to the IEEE Std 142-1982 Resistivity of Soils table to assign a soil resistivity range to compare to a degree of corrosivity. A population of 29 locations[11] was studied and analyzed against the soil boring logs from the Union and Northwest service area to ensure a statistically significant sample size.

[11] Table 7 and Table 9 show the combined population of 29 sites considered.

Table 9: Soil Boring Analysis Results – Northwest Service Area

Bore Sample ID	Approximate Location	Summary of Surface Soil Types	Referenced Soil Resistivity (ohm-cm)	Degree of Corrosivity	Approx. Latitude	Approx. Longitude
#4	Route 206, Newton, NJ	Sand, Trace Silt, Trace Gravel	1,020 – 135,000	Moderately Corrosive	41.059514	-74.753038
#5	Route 57, Hackettstown, NJ	Coarse to Fine Sand and Silt, Some Course to Fine Gravel	1,020 – 135,000	Moderately Corrosive	40.838734	-74.816752
#6	Route 31, Flemington, NJ	Brown Silt, Some Fine Sand	340 – 16,300	Corrosive	40.508122	-74.851056
#7	Rt 23 Bypass	Brown cmf, Sand, little cmf, Gravel, trace silt.	1,020 – 135,000	Moderately Corrosive	41.206207	-74.605262
#8	Route 94	Grayish Brown CMF Sand, some mf Gravel, Tan Brown CMF Sand, Little Silt	1,020 – 135,000	Moderately Corrosive	41.170930	-74.552799
#9	Route 23	Brn. CF Sand, Trace Silt, Some Gravel Greenish Brn CF Sand, some Silt, MF Gravel Grey Varied Clay	340 – 16,300	Corrosive	41.107675	-74.581293
#10	Route 517/Rt 15	Grey moderately to highly fractured Limestone	59,000 - 458,000	Progressively Less Corrosive	41.045546	-74.632173
#11	Rt 517 @ I-80	Topsoil, Brown Clay, Silt, Gravel	340 – 16,300	Corrosive	40.917241	-74.815054
#12	Rt 31	Dark Brown Sand, Fine Gravel, Silt	1,020 – 135,000	Moderately Corrosive	40.831021	-75.000708
#13	Mine Hill Rd Bridge	Brown Sand, Silt, Gravel	1,020 – 135,000	Moderately Corrosive	40.776451	-74.993486
#14	Roseberry St, Route 24	Brown Fine Dry Sand, Limestone	59,000 - 458,000	Progressively Less Corrosive	40.698896	-75.167308
#15	Flemington Circle to Rt 78	Brn Silt, cf Sand, Blk & Gray Gravel	1,020 – 135,000	Moderately Corrosive	40.631181	-74.882370
#16	Rt 69-202	Brown Sand & Clay, Red Shale	340 – 16,300	Corrosive	40.423378	-74.865365
#17	West Amwell & Lambertville	Black cf Gravel and cf Sand	1,020 – 135,000	Moderately Corrosive	40.371267	-74.944708
#18	I-95, Blackwell Rd	Red Brown Silt, cf Sand, Red F Gravel, cf Sand	1,020 – 135,000	Moderately Corrosive	40.328456	-74.769473
#29	Rt 565	Dark Brown/Black cf Sand, Some Silt, Some MF Gravel, Grey/Brown cf Sand	1,020 – 135,000	Moderately Corrosive	41.166429	-74.672753

(**cf:** Coarse to Fine; **LPI:** Liquefaction Potential Index; **MF:** Medium to Fine; **Tr:** Trace; **f:** Fine)

The soil pH map for the Northwest Service area is below in Figure 22, which shows that the soils range from Very Strongly Acidic to Moderately Acidic.

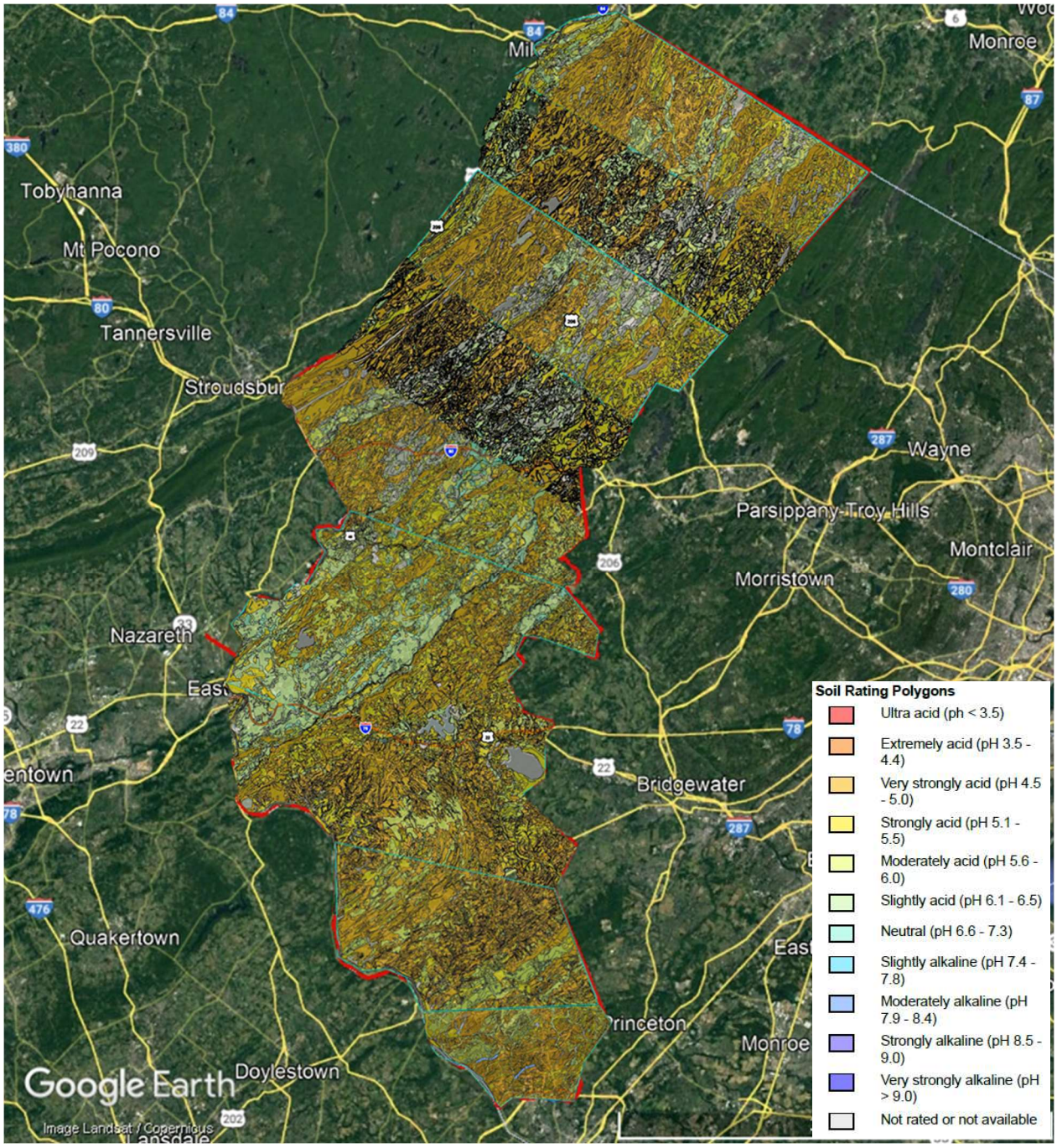


Figure 22: NCSS Northwest Service Area Soil pH Classifications

The NCSS soil corrosivity classification is shown in Figure 23 and the corrosivity risk ranking by milage is shown in Table 10. The percentage of Vintage Steel mileage by corrosion severity is shown in Figure 20.

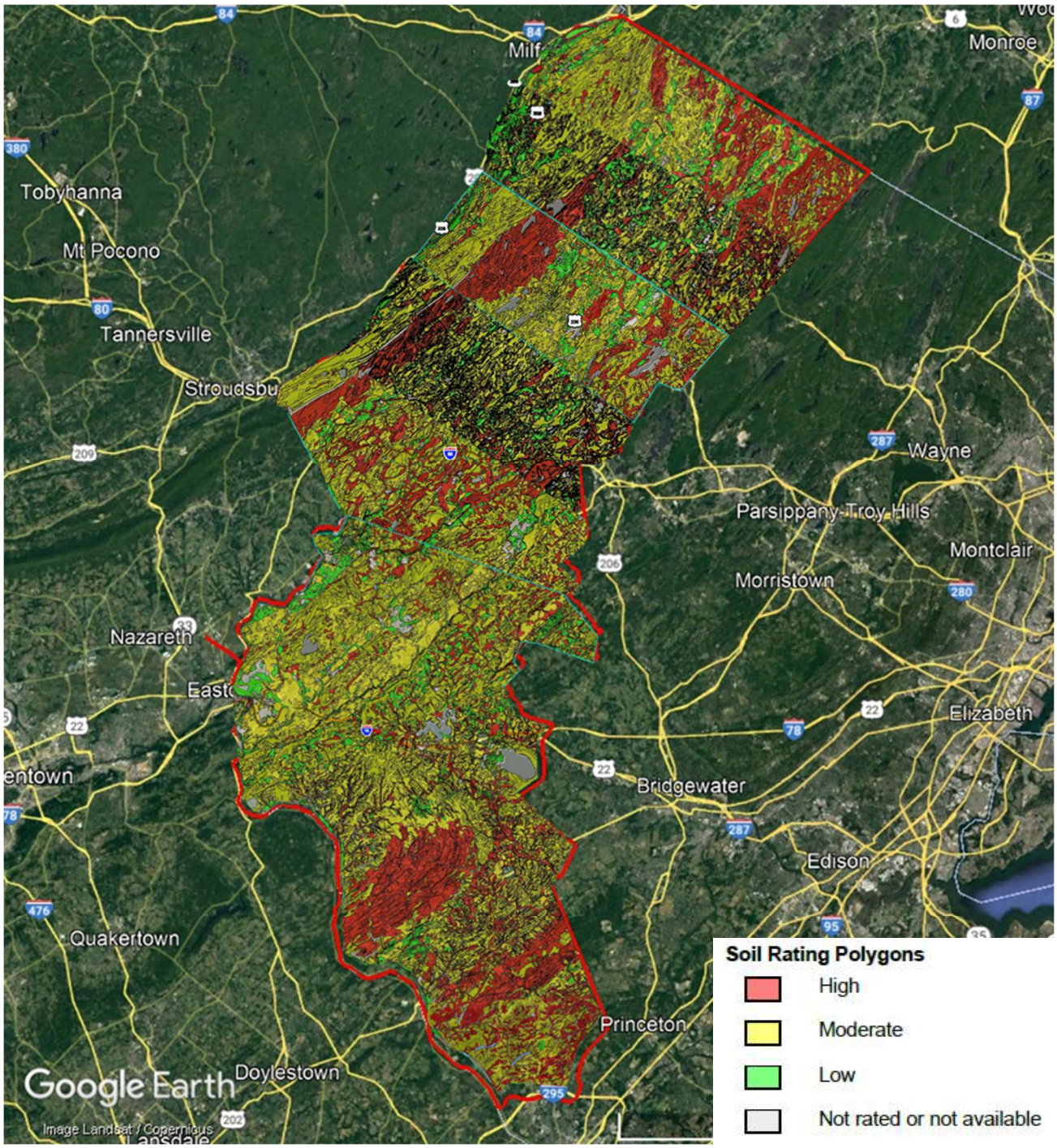


Figure 23: NCSS Northwest Service Area Soil Corrosivity Classification

Table 10: Corrosivity Risk Ranking – Northwest Service Area – Vintage Steel Mains and Associated Services

Service Area	Vintage Steel	Line Type	Corrosivity Rating	Mileage
Northwest	Pre-Code	Mains	Low to Moderately Corrosive	21.587
			Moderate to Highly Corrosive	152.596
			Highly Corrosive	15.329
		Service	Low to Moderately Corrosive	0.419
			Moderate to Highly Corrosive	0.929

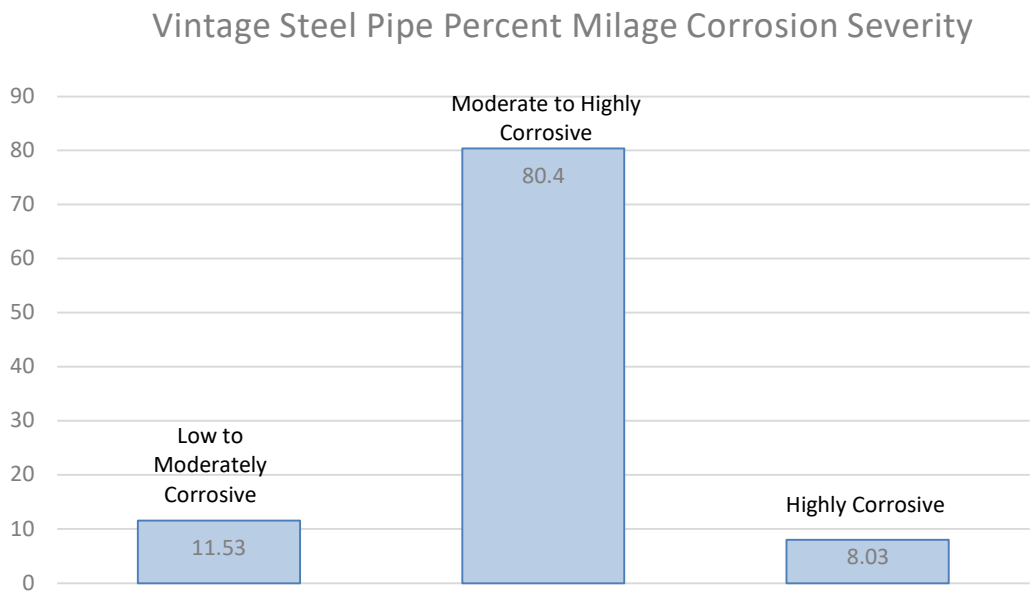


Figure 24: Percent Vintage Steel by Corrosion Severity-Northwest Service Area

The results of this analysis are similar to that of the Vintage steel piping in the Union service area. The majority (88.7%) of the Vintage steel piping studied in the Northwest service area can be classified as installed in moderately to highly corrosive soils and further justifies the need for an accelerated replacement program to enhance safety and reliability.

The assessment of soil corrosivity as a contributor to leaks is equally applicable to both vintage cast iron and steel in the ETG system.

6.9 NBS Study of Soil Corrosivity – New Jersey Test Sites

The most comprehensive source of corrosion data is contained in the National Bureau of Standards Circular's C401 (Stray Current Electrolysis), C450 (Underground Corrosion) and C579 (Underground Corrosion). Other sources include the Unified Soil Classification System or USDA Soil Survey Manual.

A review of a study of underground corrosion was completed, and information for three soil sample test sites located in New Jersey was assessed to aid in determining corrosivity based on sample data.

Table 11 provides a breakdown of the three New Jersey test sites that were a part of the underground corrosion study, in Camden, Elizabeth, and Atlantic City, NJ. The results from the Elizabeth test site demonstrate an extremely corrosive environment (very acidic pH, extremely low resistivity, very high moisture content, poorly aerated and poorly drained) further corroborating the findings of the soils analysis performed for this study.

Table 11: Chemical and physical properties of NJ soil sample test sites, Table 101, Table 20, Table 23, Table 21, Table 5, np = not provided

Test Site		38: Camden, NJ	43: Elizabeth, NJ	American Gas Association 4: Atlantic City, NJ
Soil Profile		Sassafras gravelly sandy loam	Tidal marsh	Tidal marsh
pH		4.5	3.1	3.0 (average)
Resistivity at 60°F (Ohm-cm)		38,600	60	32
Composition of water extract (mg-eq per 100g of soil)	**Cl**	-	43.30	np
	SO_4	-	37.00	np
Moisture Equivalent (%)		3.0	55.4	93.7
Aeration		np	Very poor	np
Internal Drainage of Test Site		Good	Very poor	Poor to very poor

7.0 DISCUSSION OF ETG OPERATING HISTORY AND RELATED FACTORS

The distribution system consists of approximately 3,310 miles of main distribution pipe and over approximately 234,000 service connections averaging 52 feet in length. The piping network is constructed with pipe made of various materials including Steel, Ductile Iron, Cast Iron, Plastic, and Copper.

Vintage piping systems are comprised of Pre-Code Steel, Vintage plastic installed pre-1984 and cast iron. The Pre-Code steel mains and associated services comprise approximately 540 miles of coated and bare carbon steel pipe. Ninety seven percent (97%) of this pipe was installed between the years 1955 and 1971 and Ninety four percent (90.4%) of that was installed with a protective coating.

There are approximately 141 miles of Vintage plastic utilized in operation and as of the end of the current IIP program there will be approximately 56 miles of vintage cast iron remaining in service.

Leaks repaired in Vintage Steel and Plastic for the period 2017-2022 are shown in Figures 25-27.

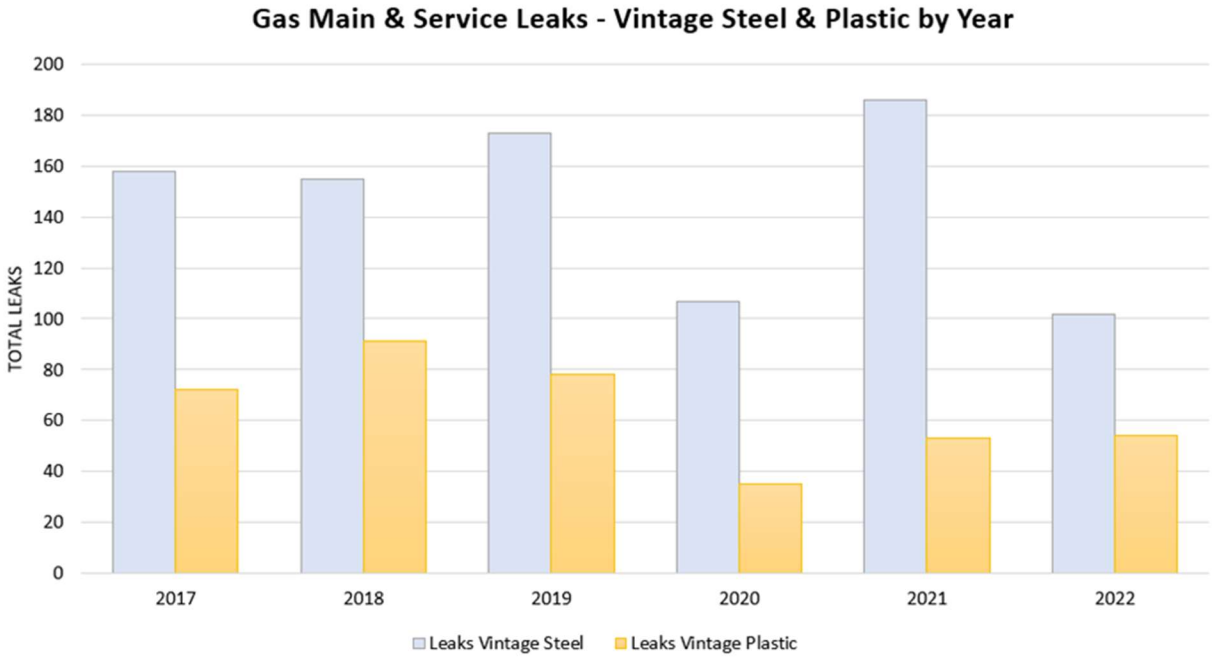


Figure 25: ETG Leaks Repaired - Vintage Steel and Plastic (2017-2022).

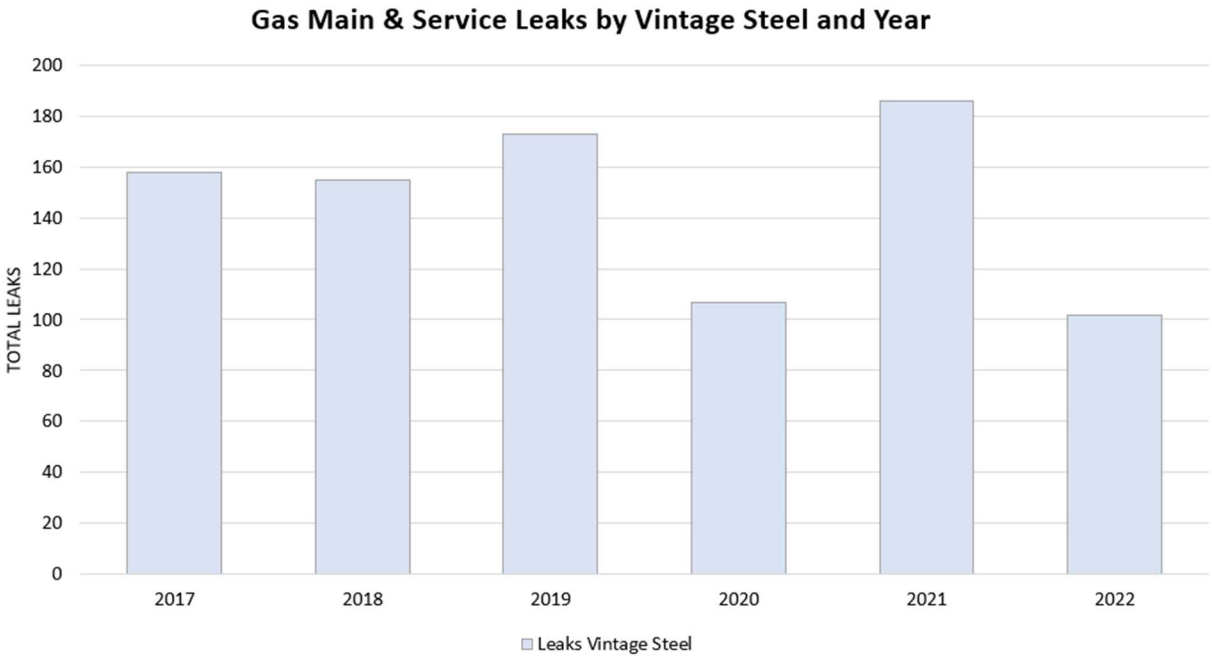


Figure 26: Leaks Repaired in Vintage Steel (2017-2022).

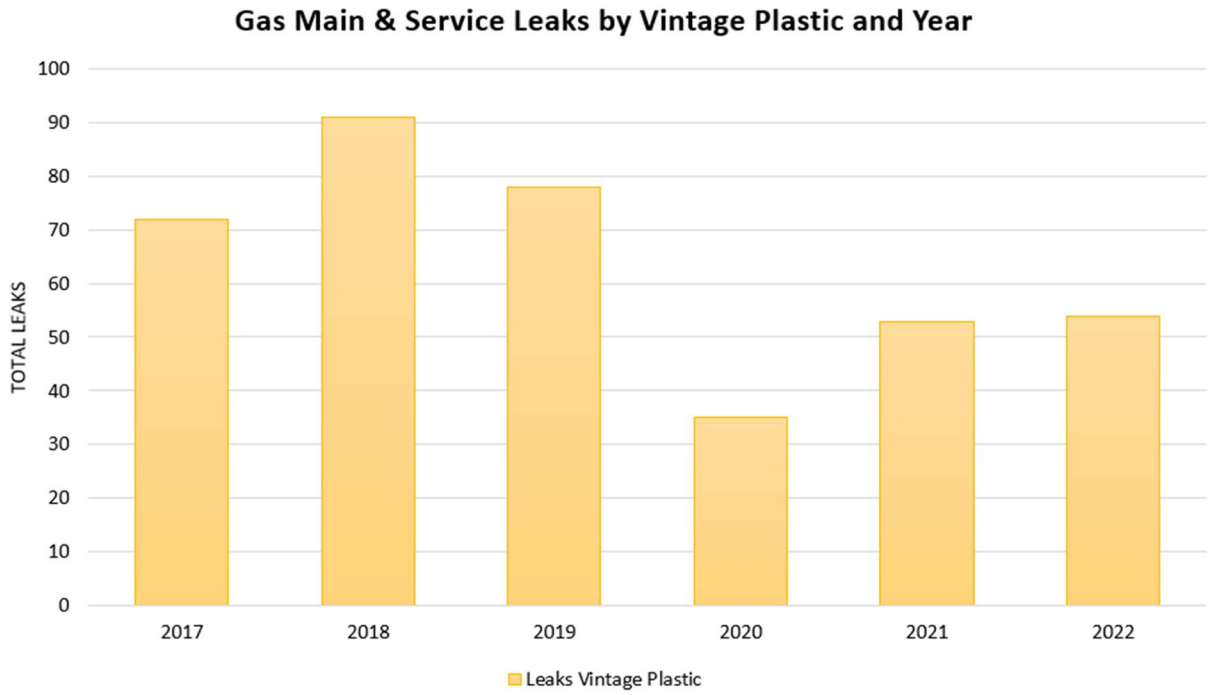


Figure 27: Leaks Repaired in Vintage Plastic (2017-2022).

Figure 28 illustrates the benefits of the existing accelerated infrastructure improvement program as recorded leaks decrease through the implementation of an organized accelerated replacement program of replacing cast iron main with modern plastic.

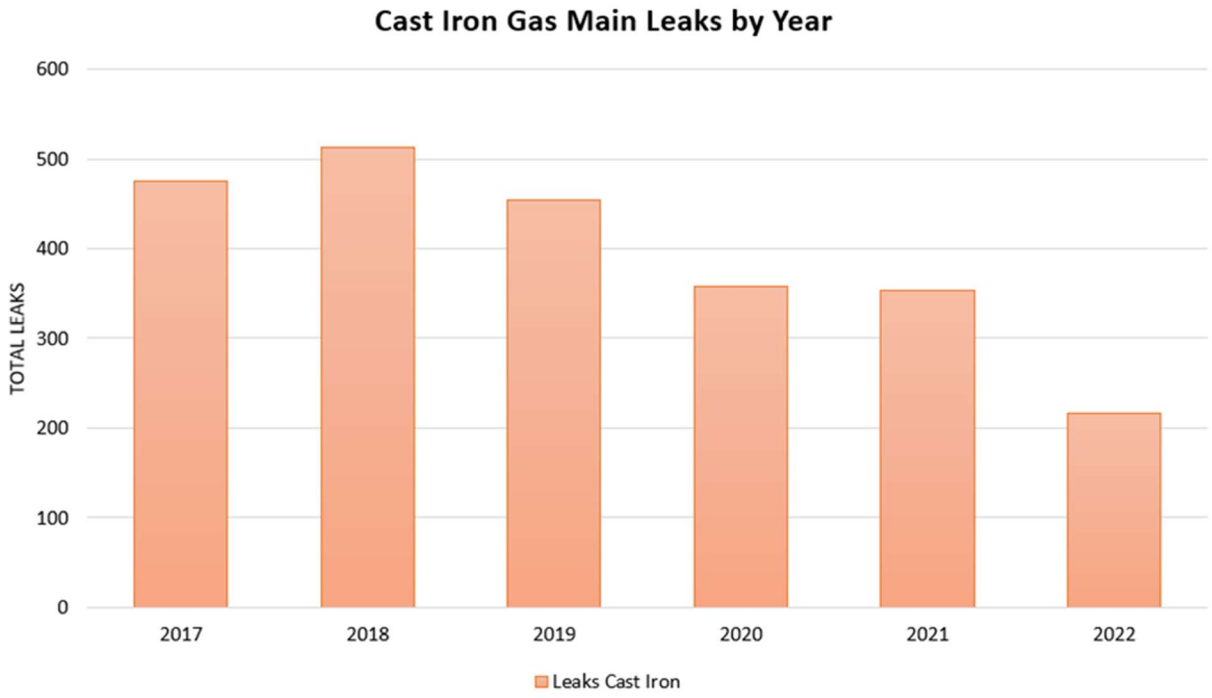


Figure 28: Leaks Repaired in Cast Iron Mains (2017-2022).

Leak rates per mile are shown for Vintage Steel and Vintage Plastic for the period 2017-2022 in Figure 29

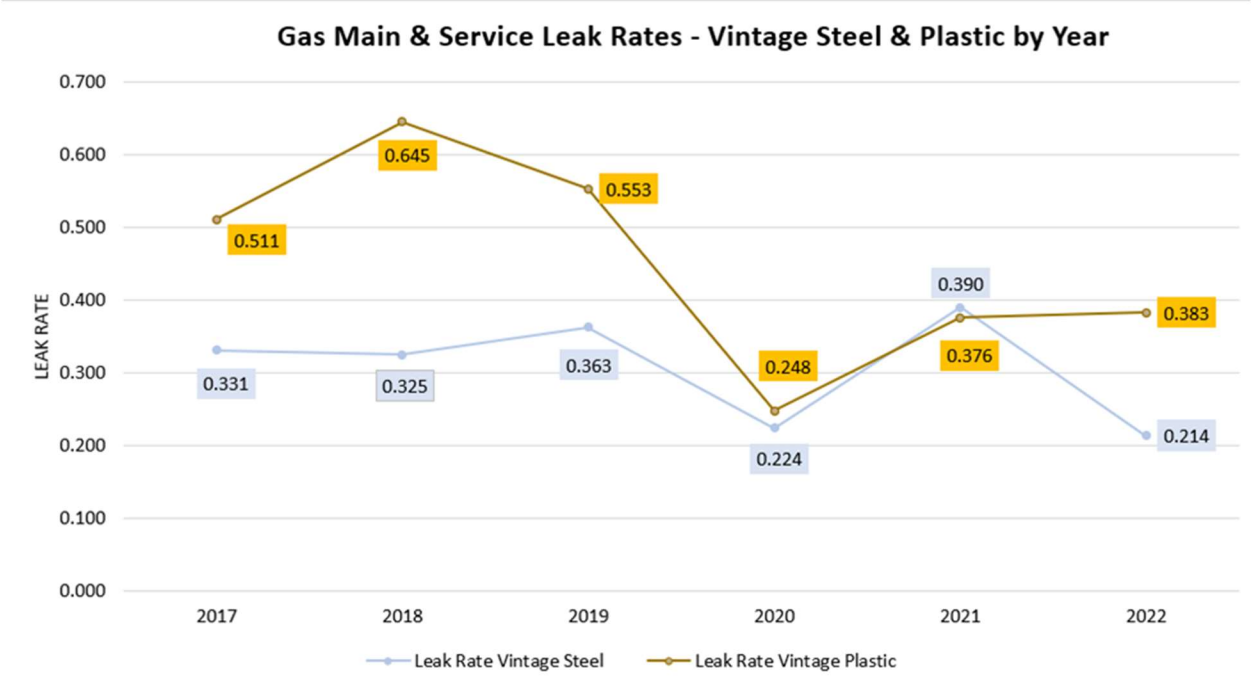


Figure 29: Leak Rates Per Mile Vintage-Steel and Vintage Plastic (2017-2022).

Leaks can be expected to continue as vintage coatings on the steel continue to degrade and corrosion control effectiveness declines.

A table of recorded leaks by service area for the period of 2017-2022 is shown in Table 11 while the total leaks curves for the same period are shown in Figure 30.

Table 12: ETG Leak History - 2017-2022

Year	Asset Type	Target Pipe Material		ETG Total
		Vintage Steel	Plastic	
2017	Main	49	6	55
	Service	109	66	175
2018	Main	42	6	48
	Service	113	85	198
2019	Main	65	5	70
	Service	108	73	181
2020	Main	53	5	58
	Service	54	30	84
2021	Main	95	8	103
	Service	91	45	136
2022	Main	70	7	77
	Service	32	47	79
Total		881	383	1264

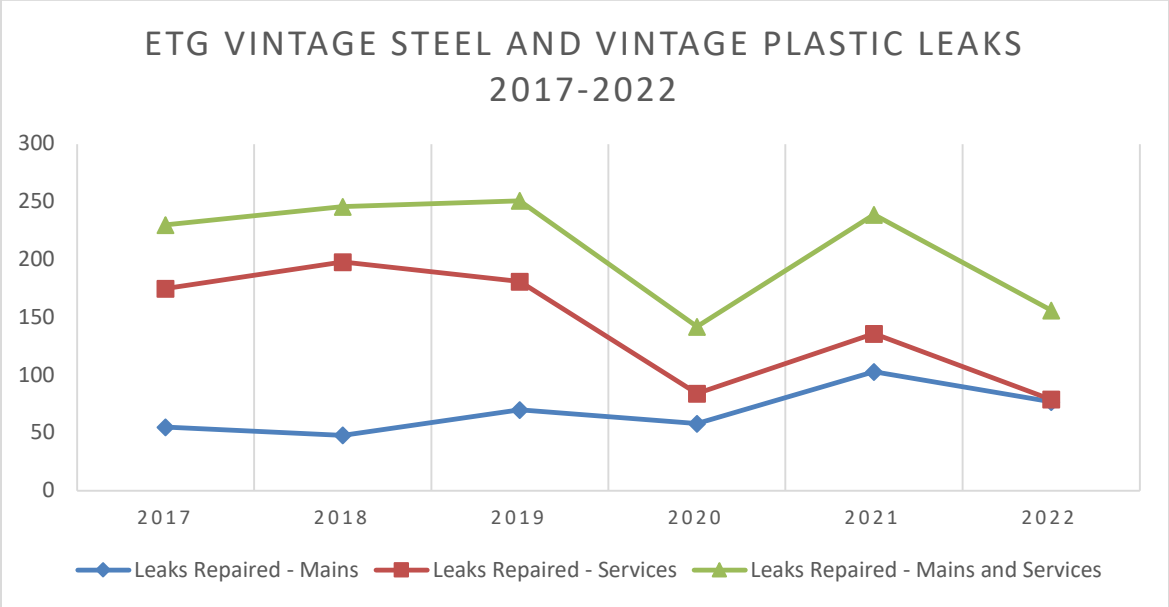


Figure 30: ETG Leak History Vintage Steel and Plastic Mains and Services

During the period of 2017-2022, ETG experienced 1,264 leaks in its vintage steel and vintage plastic natural gas distribution system. More than 700 miles of the system consists of vintage cast iron, steel and plastic pipe which is prone to leakage due to corrosive soil and brittle-like cracks in plastic and represents a significant safety concern.

8.0 IMPACT OF SYSTEM AGE

The Vintage cast iron, steel and plastic piping comprising the EGT distribution system will continue to experience leaks with an increasing trend in leak rates. Leaks are expected to continue in an unpredictable manner until the system is upgraded through an accelerated replacement program.

8.1 Age-Related Coating Degradation and Corrosion Risk

A history of pipe coatings in use in North America from 1940 to the present is shown in Figure 31.

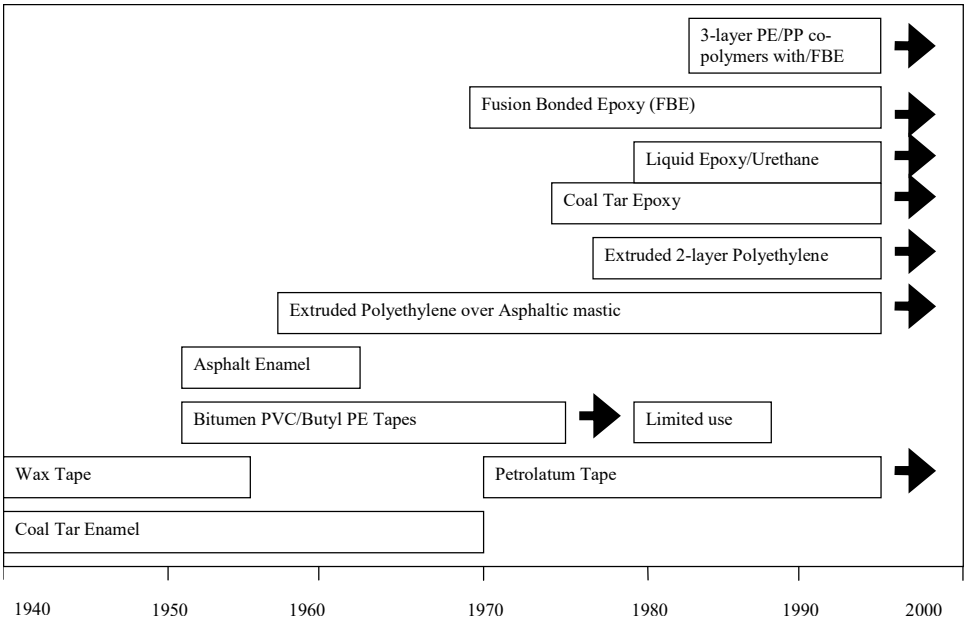


Figure 31: History of North American Pipe Coatings 1940-Present

The vintage coated steel mains and services would have historically utilized coal tar and mastic-based formulations along with tape wrap and extruded polyethylene. Corrosion coatings are utilized as the first line of defense in reducing the risk of metal loss due to corrosion on buried pipelines. As coatings age, they tend to degrade and lose their integrity, increasing the risk of corrosion. Various types of coating have been utilized to protect buried vintage pipelines from corrosion, and most have reported instances of degradation with time.

In a study conducted by the Gas Research Institute (GRI) on vintage pipeline anti-corrosion coatings, it was found that the most common issue attributed to asphalt-based mastic and enamel coatings is moisture absorption, due to the increasing porosity with age of these coating types[12].

Asphalt-based coating also tends to lose flexibility with age and experiences cracking that compromises the integrity of the coating. Cracking occurs because of circumferential soil stresses caused by shrinking and swelling of soils from varying moisture content during seasonal variation.

Coal tar enamel, while less porous than asphalt-based enamel coating, is also susceptible to cracking from soil stresses. Fusion bonded epoxy (FBE) and extruded polyethylene type coatings both exhibit good to excellent resistance to soil stresses and are therefore somewhat less susceptible to degradation due to soil stress.

Age-related degradation of all the above-mentioned coating types must be considered along with the most common problem identified for all coating types: improper application in the field. According to the GRI study, 1 in 3 coating users at the time of survey did not specify requirements for managing the quality of the coating materials, and the coatings were not routinely subjected to quality assurance inspections during application. In many instances, this inadequate preparation of the vintage pipe surface prior to coating has led to a faulty adhesive bond between the pipeline and the coating. This is prevalent when considering asphalt coatings, as it was reported that a majority of these coatings were applied in the field, and the quality of surface preparation was minimal compared to the standards that are followed today. The generally poor quality of surface preparation was reported to contribute significantly to problems associated with asphalt coatings.

Due to the combination of the issue of improper application and age-related degradation, coatings on vintage pipe tend to become less effective over time. To combat this problem, cathodic protection is applied to attempt to offset the risk of corrosion. However, when coatings lose their integrity as they age, the need for supplemental cathodic protection to adequately protect the

[12] Hancock, James R., Lukezich, Stephen J., Werner, Daniel P., Yen, Bing C., “Results of the GRI Survey on Pipeline Anti-Corrosion Coating Selection and Use,” NACE Corrosion/92, Paper 366, 1-15, 1992.

vintage pipe increases and corrosion under disbonded coating occurs at an accelerated rate that often cannot be mitigated by cathodic protection.

Figure 32 shows the cumulative weight of magnesium anodes added per year by ETG since 2019. This graph shows that, in the past four years, the general trend is the installation of an increasing number of magnesium anodes to maintain compliant CP levels and overcome the coating degradation.

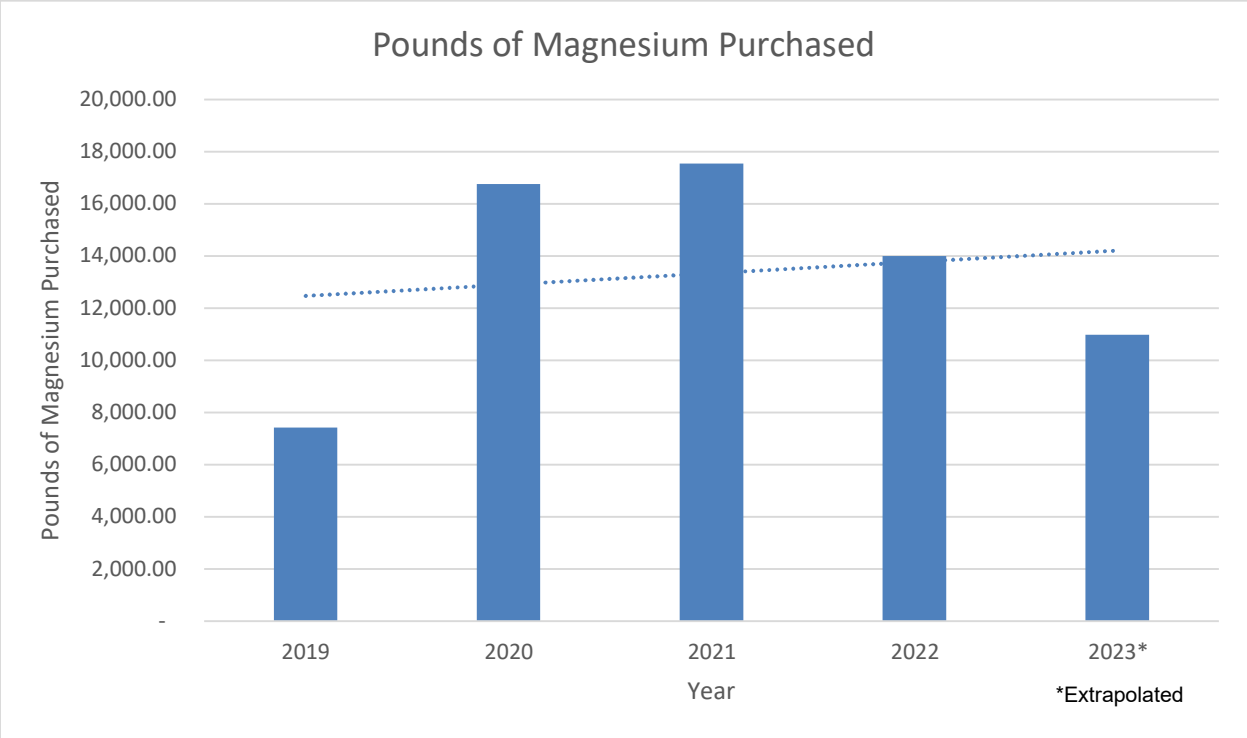


Figure 32: Cumulative Weight of Magnesium Anodes per Year (2019-2022)

As the coating becomes less effective over time, the risk of corrosion increases, and the constant addition of magnesium anodes is a necessity in attempting to maintain effective corrosion control of the older pipe.

Similarly, ETG has been experiencing the need for increased CP current output from its impressed current CP systems for the same reasons. ETG currently has 31 CP rectifiers and associated ground beds throughout its operating area. The average annual current output of these sources is shown in Figure 33. The trending increase in required CP output also suggests that as the coating becomes less effective over time, the risk of corrosion increases, and the

constant addition of CP current is a necessity in an effort to control corrosion and reduce potentially injurious leaks.

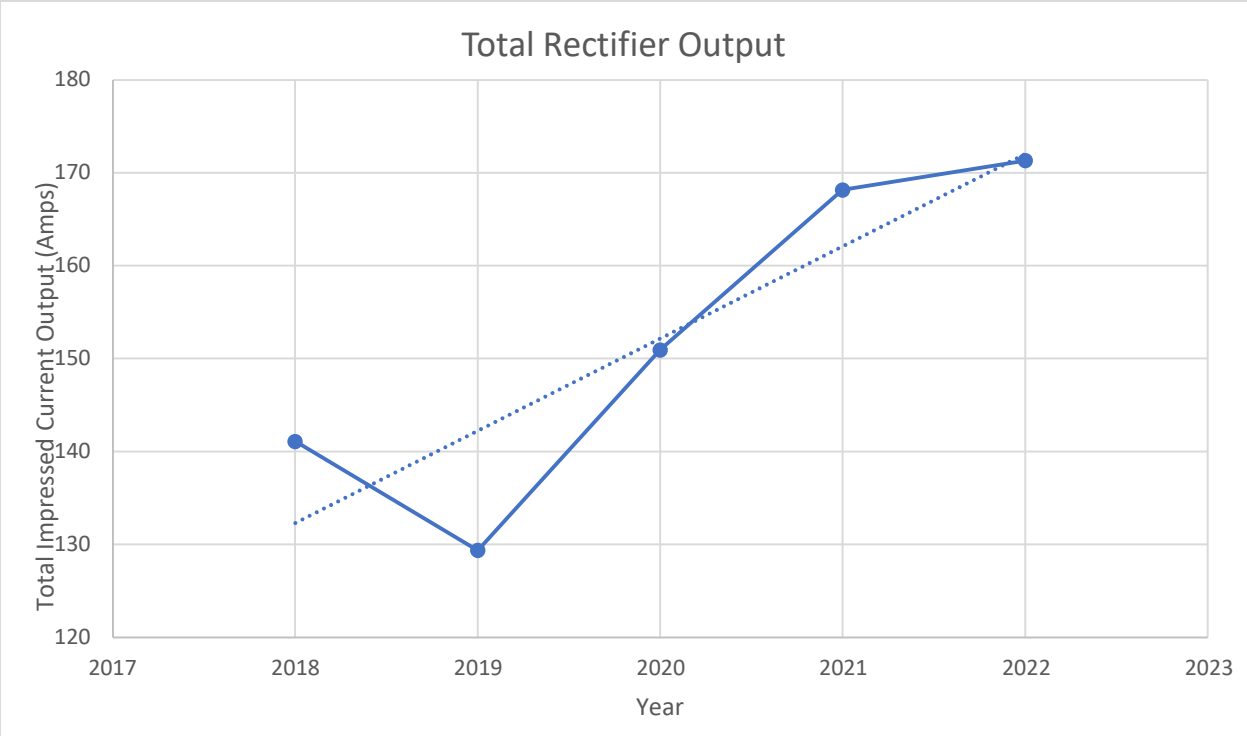


Figure 33. Average Total Impressed Current Output 2018 to 2022.

Data from a study of Canadian Gas pipelines over the twenty-year life of the coating is shown in **Error! Reference source not found.** 34. The data reinforces the increasing current demand required to maintain cathodic protection levels in an attempt to maintain effective corrosion protection as coatings age and degrade.

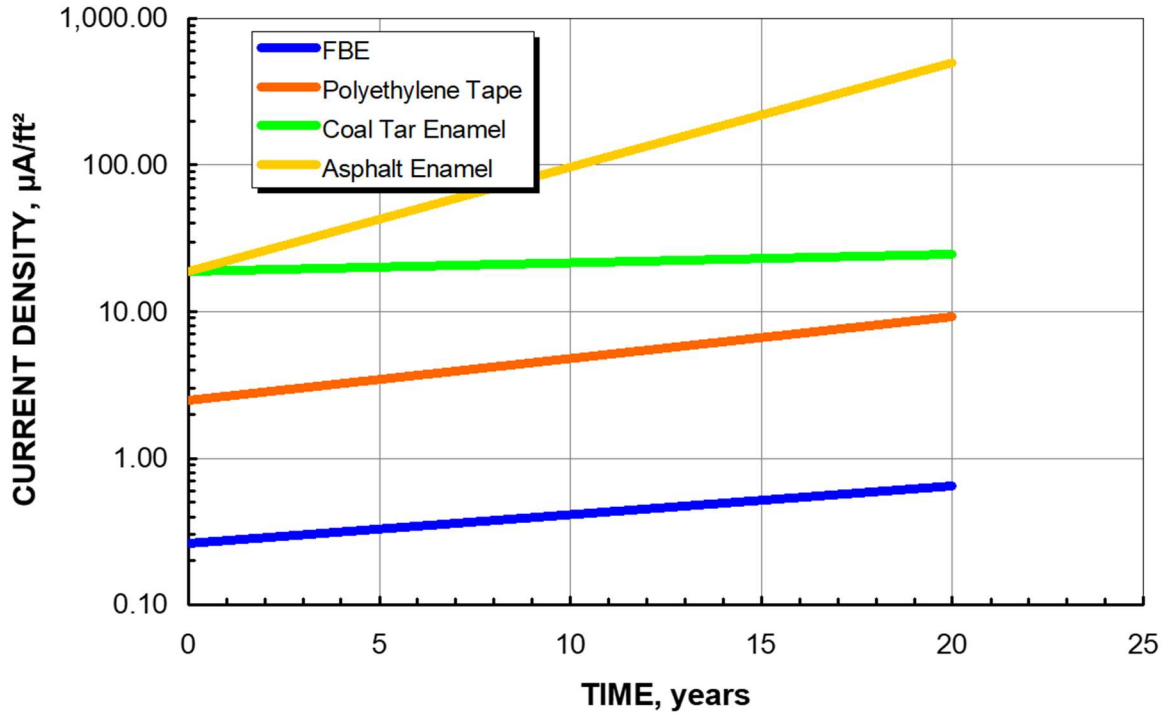


Figure 34: Increasing CP Current Demand with Aging Coatings

Similarly, the aging of cast iron mains in the ETG system increases the susceptibility to graphitization and the associated reduction in material strength leading to failures due to soil stress and outside forces. Frost heave has been responsible for complete circumferential breaks of cast iron mains.

9.0 INDUSTRY EXPERIENCE – VINTAGE STEEL AND PLASTIC PIPLINES

The following discussion is intended to demonstrate an example of industry experience with vintage Pre-Code gas distribution system where a detailed analysis was conducted into the root cause of a service failure.

9.1 Puget Sound Energy[13]

On September 2, 2004, an explosion and fire destroyed a home located at 16445 SE 26th Place in Bellevue, Washington. The incident in the community of Spirit Ridge was reported to have

[13] Representatives of Mears carried out a Root Cause Analysis and completed an in-depth assessment leading to the replacement of similar Pre-Code gas services over a 10-year period.

occurred as a result of gas leaking from an underground natural gas line servicing the residence. Tragically, the resident sustained fatal injuries in the incident.

A nominal ¾-inch coated steel gas service line was installed by Puget Sound Energy (PSE) in 1963. The original service installation records indicate that the service extended sixty feet from a 2-inch intermediate pressure coated steel gas main. Cathodic protection was applied to the gas mains and services in the vicinity of the incident during the early 1980's. The analysis determined that the leak initiated at a flaw in the coating and was caused by external corrosion. Figures 35 and 36 show the damaged coating and external corrosion holes in the service line.

Figure 35: PSE Spirit Ridge Service Failure-External Corrosion

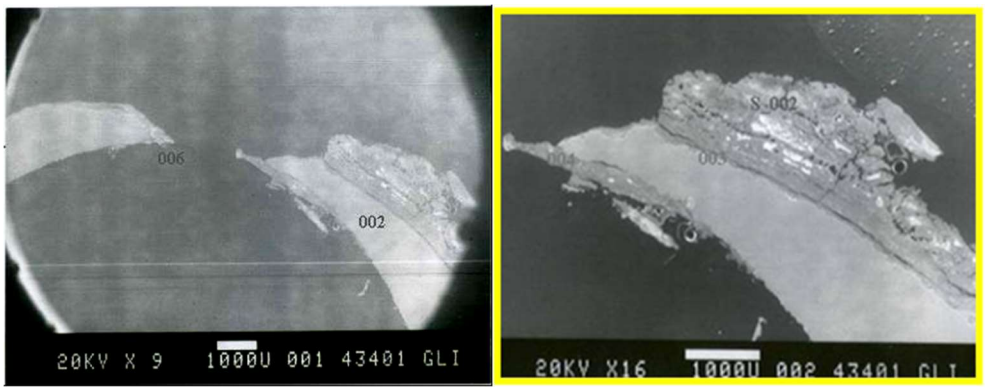


Figure 36: Photomicrograph of Cross Section of the Leak and Internal Corrosion at the Opening

The Internal surface of the service at the leak site shows evidence of internal corrosion indicating that the leak existed for a period of time before the incident. The internal corrosion developed from condensation caused by the escaping gas and the Joule-Thompson effect.

The Root Cause analysis concluded that the majority of the corrosion wall loss occurred from the period of 1963 to the early 1980s when cathodic protection was known to have been installed.

In the aftermath of the incident PSE sought to risk rank vintage services in the Spirit Ridge community for the purposes of examining and replacing the high-risk services. These services were installed with an external coating in the early 1960s. Figures 37 and 38 show examples of coating damage and corrosion discovered in services coated with extruded polyethylene ("yellow jacket"). The photo micrographs show cross sections of the pipe and wall loss due to corrosion.

Figure 37: Photograph of Coating Holiday and Corrosion Damage (PSE)

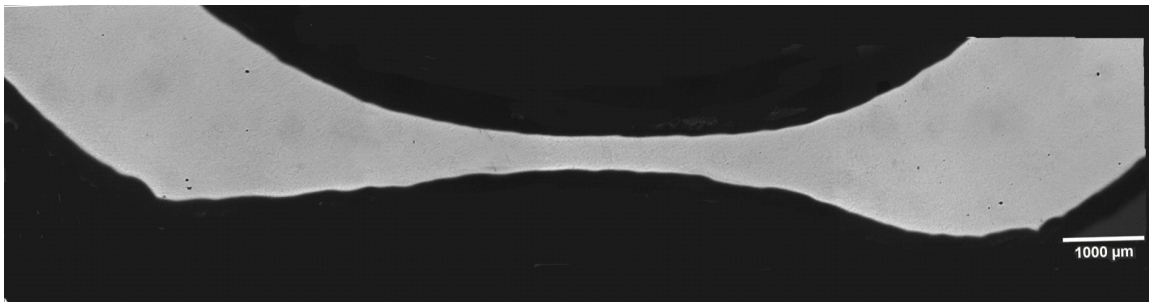


Figure 38: Photomicrograph showing corrosion wall loss.

The results of the investigation served as the basis for remedial actions in the form of a replacement program.

9.2 NTSB Investigation UGI Gas Explosion - West Reading, PA.

The National Transportation Safety Board issued a preliminary report[14] from its investigation into the natural gas explosion at the R.M. Palmer Company building 2 in West Reading on March 24, 2023. Tragically, that incident resulted in seven fatalities.

The preliminary report indicated that a longitudinal fracture was found in a service tee shown in Figure 39. This form of cracking is typical of the kinds of failures reported in Pre-1984 vintage plastic mains and services. This failure is reported to have occurred in DuPont Aldyl-A Service Tee installed in 1982.

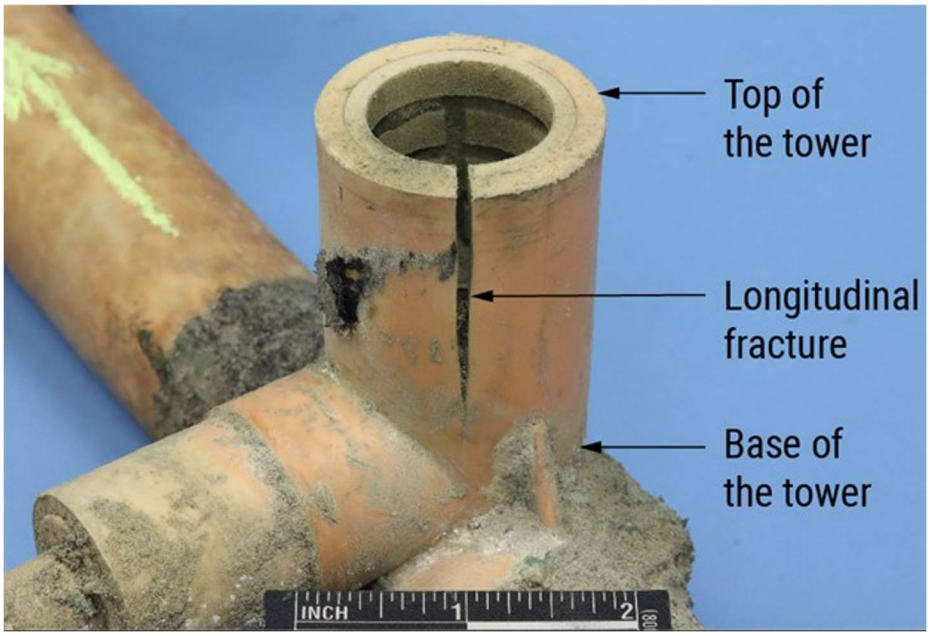


Figure 39: NTSB Preliminary Report Update - Issued July 18, 2023 - DuPont Aldyl-A Service Tee Installed in 1982 - Longitudinal Fracture Along Tower

[14] UGI Corporation Natural Gas–Fueled Explosion and Fire

According to the NTSB the tower consisted of an outer shell and a Dupont Delrin insert. The insert fractured in the transverse direction near its base. Fractographic examination indicated that the fracture in the tower started on its inner diameter surface.

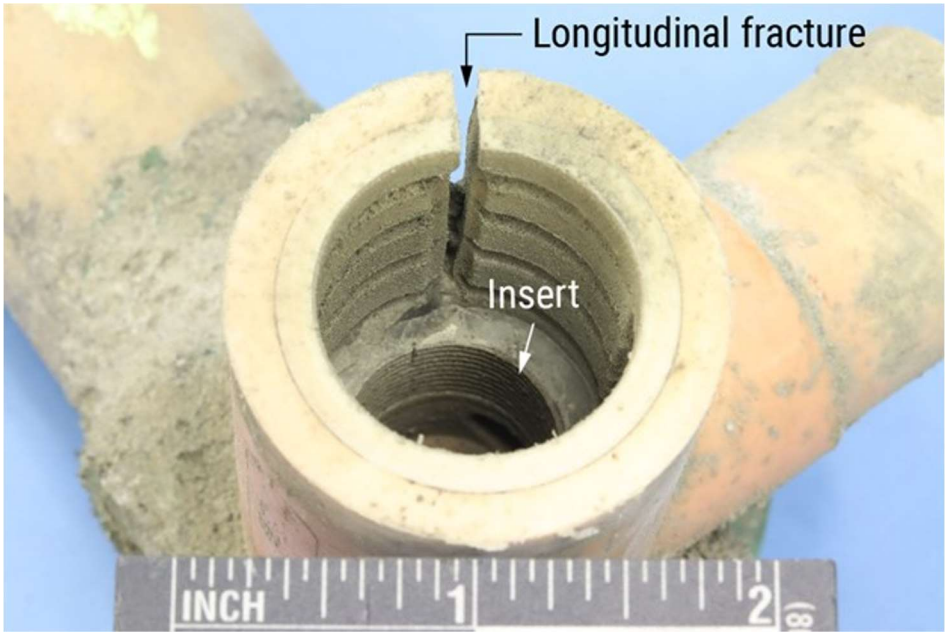


Figure 40: NTSB Preliminary Report Update – Issued July 18, 2023 - Remaining insert at the Base of the 1982 DuPont Aldyl-A Service Tee Tower

The Pipeline and Hazardous Materials Safety Administration (PHMSA) added Aldyl A service tees with Delrin inserts to their list of pipe materials with "poor performance histories relative to brittle-like cracking" on September 6, 2007.

Additionally, industry guidance in ANSI/GPTC Z380.1, The Guide for Gas Transmission, Distribution, and Gathering Pipeline Systems discusses previous experience with DuPont polyethylene service tees with Delrin polyacetal inserts that were installed in the late 1960s to early 1980s.

9.3 Additional Industry Experience-Replacement Programs

Additional relevant industry experience exists in the form of a significant body of information regarding utilities who have received approval to implement replacement programs for vintage Pre-Code coated steel and vintage plastic mains and services. Table 13 provides a summary of available information regarding accelerated replacement programs for various gas distribution

system operators of vintage steel and plastic pipelines. As in the case of ETG, the underlying basis for replacement was safety and reliability of vintage steel and plastic pipelines.

Table 13: Summary of Relevant Industry Experience – Approved Replacement Programs

State	Docket	Date	Notes
Florida	20290029	8/15/23	Commission approved Florida Public Utilities Company (FPUC) GUARD program, which included the replacement of pre-1982 **Aldyl-A pipe** at a cost of $10.4 million. FPUC noted that first generation plastic (typically installed between 1970 and 1981) is more brittle than today's material composition of plastic pipe and has demonstrated itself to be prone to stress propagation cracking under some circumstances due to the different composition of the base plastic material.
Georgia	29950	8/28/13	Commission approved Atlanta Gas Light Company's proposal to create an Integrated Vintage Plastic Replacement Program. The program would replace **756 miles of plastic pipe installed prior to 1984.** The Company used PHMSA bulletins, as well as several significant incidents in the gas industry, as justification for the request.
Kentucky	2018-00086	8/21/18	Commission authorized Delta Natural Gas Co. to include **pre-1983 Aldyl-A pipe in** its Pipeline Replacement Program and replace pipe over 15-year time frame despite objection from KY AG. Commission relied in part on 2007 PHMSA bulletin warning about premature cracking for Aldyl-A pipe.
Kentucky	2015-00360	1/28/16	Commission authorized Louisville Gas & Electric to add a new program to its Gas Line Tracker to replace Aldyl-A plastic pipe manufactured between 1965 and 1991. Louisville G&E proposed the removal of 11.5 miles of **Aldyl-A mains and 1,126 services** over two years at a cost of $7.6 million. The Company used NTSB and PHMSA studies, as well as several significant incidents in the gas industry as justification for the request.
Kentucky	2014-00274	10/10/14	Commission authorized Atmos's infrastructure replacement program, a portion of which included the replacement of **coated, cathodically protected pipe that was over fifty years old**. The Commission found this project was appropriate for recovery.
Kentucky	2009-00354	5/28/10	Commission authorized Atmos's PRP program, which applied to **"ineffectively coated steel (whether or not cathodically protected)."** The testimony in this case was used in part as justification for the Atmos program listed above.
Kentucky	2009-00141	10/26/09	Commission authorized, as part of a rate case, infrastructure replacement investments by Columbia Gas that included the replacement of **ineffectively coated steel pipe,** which the company described in testimony as main and service pipelines deemed to have ineffective coatings or were unable to electrically isolated in a practical way such that they have the same basic corrosion issues as bare steel.
Kentucky	2021-00214	5/19/22	Atmos proposed to include the replacement of **Aldyl-A pipe installed in the mid-1960's** in its Pipe Replacement Program (PRP). The proposed cost was $2.794 million. Atmos stated that leaks on Aldyl-A average 35% higher per 100 miles than leaks on other types of polyethylene pipe and 250% higher per 100 miles of pipe when compared to coated steel pipes. The Commission did not agree that these costs should be included in the PRP but approved the costs as part of Atmos's revenue requirement in its rate case. The

			Commission noted that "the inclusion of future Aldyl-A pipelines will be determined on a case-by-case basis and any PRP applications including Aldyl-A projects should at minimum include safety justifications for such projects."
Kentucky	2022-00222	5/25/23	Following the case above, Atmos proposed to include three projects to replace **pre-1973 Aldyl-A pipe** in its PRP. Atmos stated that the tracer wire in this pipe had degraded to the extent that third-party damage risk was higher than bare steel. The Commission authorized inclusion of the projects in Atmos's PRP.
Maryland	9960	9/4/21	The Commission approved Elkton Gas Company's STRIDE program, which included 13 replacement projects related to **Aldyl-A pipe** over the accelerated period of 2021-2023. The total amount of Aldyl-A pipe to be replaced is 4.68 miles at a cost of approximately $3.792 million. In support of the STRIDE filing, Elkton relied on a study prepared on its behalf, which found cracking/splitting and brittleness of Aldyl-A pipe, evidence of butt fusion failures, and a correlation between the lack of tracer wire and third-party damage (the study is included in attached filing materials).
Massachusetts	21-GSEP-03	4/28/22	DPU approved Boston Gas Company Gas System Enhancement Plan, which included a number of projects to replace **pre-1985 Aldyl-A main.**
New Jersey	GR20110726	6/8/22	BPU approved South Jersey Gas Company program to replace 250 miles of **pre-code coated steel and pre-1971 vintage Aldyl-A plastic mains and related services**. The approved program included a term of 5 years and a total cap of $200 million.
Ohio	11-5515-GA-ALT	11/28/12	Commission authorized Columbia Gas of Ohio to increase the scope of its infrastructure replacement program to include **older plastic pipe and ineffectively coated steel mains** under certain conditions. For the coated pipe, Columbia was authorized to recover for the replacement of any pre-1955 pipe, and for 1955 and later, Columbia could replace the pipe if it was cathodically tested and found to be ineffectively coated.
Ohio	13-1571-GA-ALT	2/19/14	Commission authorized Vectren to implement an infrastructure replacement program. Vectren was allowed to recover the cost of **pre-1955 field-coated steel pipe**, and the cost of **pre-1971 coated pipe** if such pipe failed a cathodic-protection test.
Pennsylvania	P-2022-3037388	4/20/23	Commission approved Columbia Gas's Long-Term Infrastructure Improvement Plan, which included the replacement of **first-generation plastic pipe (installed between 1960 and 1981) and pre-1971 coated steel.** Columbia noted that although it performs routine monitoring and inspecting activities to ensure that pre-1971 coated steel pipe will continue to operate safely, Columbia has a long-term concern that field-applied coatings used between 1955-1970 have or will become ineffective over time. There is a reference in testimony to the fact that Columbia retrofitted all of its unprotected coated steel facilities with cathodic protection systems, but that is not discussed in detail.
Tennessee	20-00131	6/2/21	Commission authorized Chattanooga Gas Co. to include **pre-1983 Aldyl-A pipe** in its Pipeline Replacement Program and replace the pipe over a 5 to 7 year timeframe at an estimated cost of $118 million. The addition of this pipe to the program was based on Commission staff requesting the company identify the older Aldyl-A pipe in its system and

			develop a plan for its removal. Staff used PHMSA Advisory Bulletin ABD-02-07 as justification for its request.
Virginia	PUE-2011-00049	11/28/11	Commission authorized Columbia Gas of Virginia to implement an infrastructure replacement plan that included **pre-1971 coated steel mains and services and first-generation plastic pipe.** As it relates to the coated steel main, the company's testimony detailed that pre-1971 facilities are corroded because they were installed without active cathodic protection, so even after cathodic protection was installed, there are still corrosion "hot spots" that require replacement.
Virginia	PUE-2012-00012	6/25/12	Commission approved VNG's infrastructure replacement plan, which included the replacement of **first-generation plastic pipes, and ineffectively coated steel mains and services.** In the Company's testimony, VNG explained that pre-1971 coated pipelines, even if cathodically protected, experience leakage due to their ineffective coating and therefore should be prioritized for replacement.
Virginia	PUR-2019-00061	9/25/19	Commission authorized Virginia Natural Gas to increase its infrastructure replacement program to include **Aldyl-A and other plastic pipe prior to 1985 and bare and ineffectively coated steel main installed prior to 1971.** Staff relied on NTSB, PHMSA, and California PUC guidance on Aldyl-A pipe in its report.
West Virginia	18-0780-G-390P	10/29/18	Commission approved Hope's infrastructure program that included unprotected and **ineffectively coated steel distribution mains.** From a review of the petition and company testimony, it is unclear whether these mains were cathodically protected subsequent to their installation.

10.0 REVIEW OF ETG DIMP AND ANNUAL SURVEY DATA

10.1 Review of ETG DIMP

A review of the ETG Distribution Integrity Management Plan (DIMP) and Appendices indicates that the plan satisfies the requirements of 49 CFR Part 192, Subpart P.

The plan includes the necessary guidance for ETG to perform integrity management consistent with the regulatory expectations. Details of the review are provided in the attached excel Table (Appendix A).

The ETG DIMP contains detailed processes for implementing the following important elements as per §192.1007:

1. Knowledge and understanding of their gas distribution system,
2. Identification of Threats,
3. Evaluate and Rank Risk,
4. Identify and Implement Measures to Address Risk, and
5. Measure Performance,

As per 49 CFR Part 192, Subpart P, ETG's DIMP program details the necessary components for effective integrity management program including the following sections:

- Understand system design & material characteristics, operating conditions & environment, and maintenance of operating history (included in Section 1. E. i, 1.E.ii, 2.D, 2.E, 2.F, 2.G, 2.H, 2.I and Appendix A and B of the ETG IM Program.
- Identify existing & potential threats (included in Section 3A, 3B, 3C, and Appendix A.3 of the ETG IM Program)
- Evaluate and rank risks (included in Section 4, and Appendix D of the ETG IM Program)
- Identify and implement measures to address risk (included in Section 5 of the ETG IM Program)
- Measure IM program performance, monitor results, and evaluate effectiveness (included in section 6, Appendix D, E, and F. of the ETG IM Program)
- Periodically assess and improve the IM program (included in section 6 and 7, Appendix D, E, F, and G. of the ETG IM Program)

- Report performance results to PHMSA and, where applicable, also to States (included in Section 8 of the ETG IM Program)
- Roles and responsibilities are well described in the document which helps provide ownership of the different activities that are required within a DIMP program.

10.2 Review of ETG Annual Survey Data

Cathodic Protection is supplied by a combination of 31 CP rectifiers and an undisclosed number of galvanic anodes operating within the ETG system. A total of 17 of the rectifiers are in the Northwest Service Area and 14 are within the Union Service Area. ETG performs annual surveys of CP effectiveness at approximately 7,000 test locations throughout the system. The effectiveness of the CP system is monitored during routine inspections and is summarized in Figure 41.

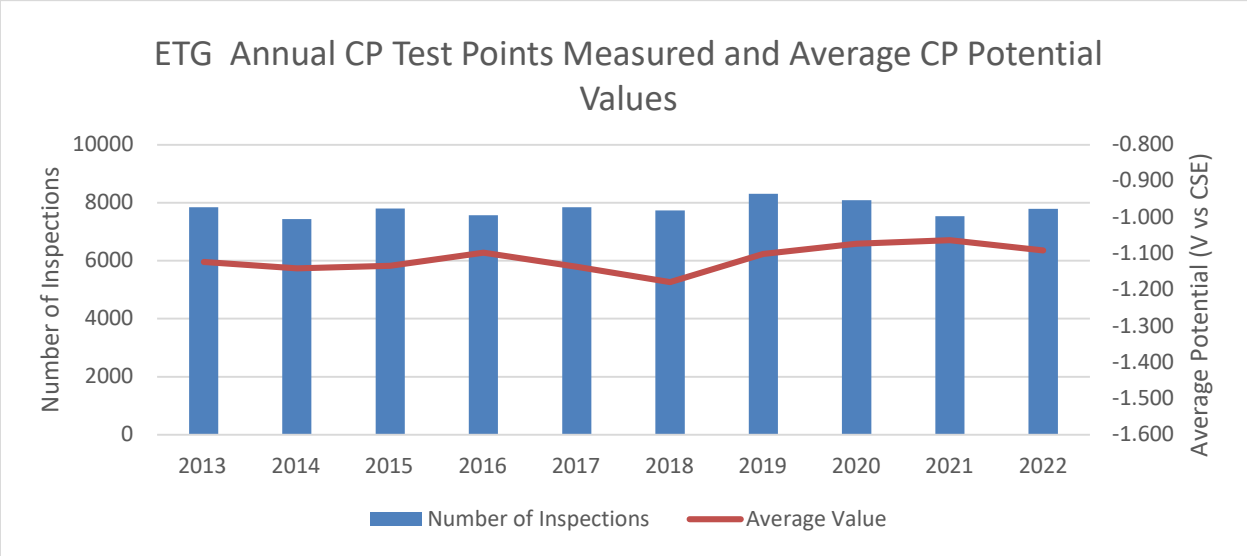


Figure 41: ETG Summary of Annual Survey Data - 2013-2022

The Corrosion Department Compliance Overview Fourth Quarter Report 2022 (See Figure 42) is an example of the oversite assurance provided to the regulatory bodies.

ELIZABETHTOWN GAS

Corrosion Department
Compliance Overview
Fourth Quarter Report 2022

Periodic System Inspections:

	Northwest Division	Union Division	Total Elizabethtown Gas
Systems Read:	688	1714	2402
Total Systems:	688	1714	2402
% Read:	100.00%	100.00%	100.00%

Short Section Inspections:

	Northwest Division	Union Division	Total Elizabethtown Gas
Systems Read:	27	37	64
Total Reads Required (per year):	8	27	35
Total Systems:	74	266	340
% Read:	337.50%	137.04%	182.86%

Isolated Services Inspections:

	Northwest Division	Union	Total Elizabethtown Gas
Systems Read:	76	450	526
Total Reads Required (per year):	54	364	418
Total Systems:	537	3638	4175
% Read:	140.74%	123.63%	125.84%

Rectifier/Bonds Inspections:

	Northwest Division	Union Division	Total Elizabethtown Gas
Total Rectifiers:	17	14	31
# of Times Read:	6	6	6
Total Inspections (YTD):	102	84	186
Total Reads Required (per year):	102	84	186
% Read:	100.00%	100.00%	100.00%

Figure 42: Summary of CP Inspections by Type 2022

11.0 ADDITIONAL CONSIDERATIONS IN SUPPORT OF AN ACCELERATED REPLACMENT PROGRAM

In accordance with its integrity management program, ETG assesses risks and determines appropriate measures to mitigate such risks. Leak surveys are a tool utilized by the industry to classify leaks and implement repairs. Despite implementing enhanced leak surveys, vintage piping systems will continue to degrade and the associated risks of an incident with tragic consequences increases in an unpredictable manner.

ETG has determined that its highest risk systems are the vintage cast iron, steel and plastic comprising over 700 miles of its system. In its recent Notice of Proposed Rule Making, PHMSA is attempting to address the same or similar high-risk issues.

11.1 Social Vulnerability Index-ETG Service Areas

The historical leak counts for the period of 2017-2022 were previously shown in Table 10. Many of the leaks were recorded in the Union Service area while. The Union Service area has a much higher population density and thus, a higher risk of the consequences of a gas leak incident. The number of leaks also equates to a greater impact on methane emissions. Moreover, the table of Social Vulnerability indices shown in Table 14 identifies Union County as having a "High" Category Rank with an index of 0.7950 on a scale of 0-1 where 1 equates to the most vulnerable category.

Table 14: Social Vulnerability Index

COUNTY	National	
	SVI Score	Category Rank
Hunterdon	0.0353	Low
Mercer	0.7104	Medium to High
Middlesex	0.6391	Medium to High
Morris	0.1633	Low
Sussex	0.0484	Low
Union	0.7950	High
Warren	0.2454	Low

Social Vulnerability Index maps in the Union and Northwest Service areas are shown in Figures 43 and 44.

Union Division

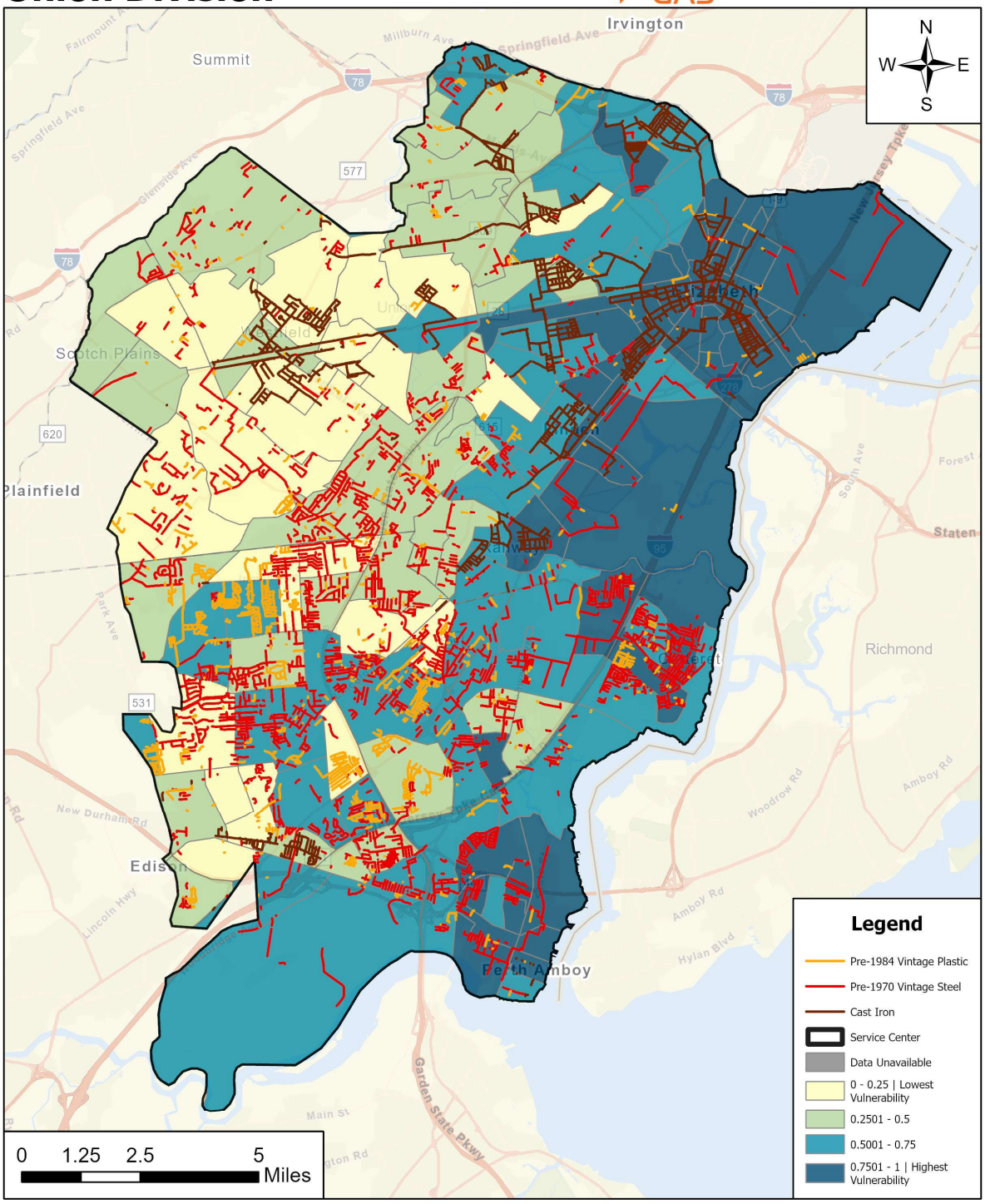


Figure 43: Social Vulnerability Index Map-Union Service Area

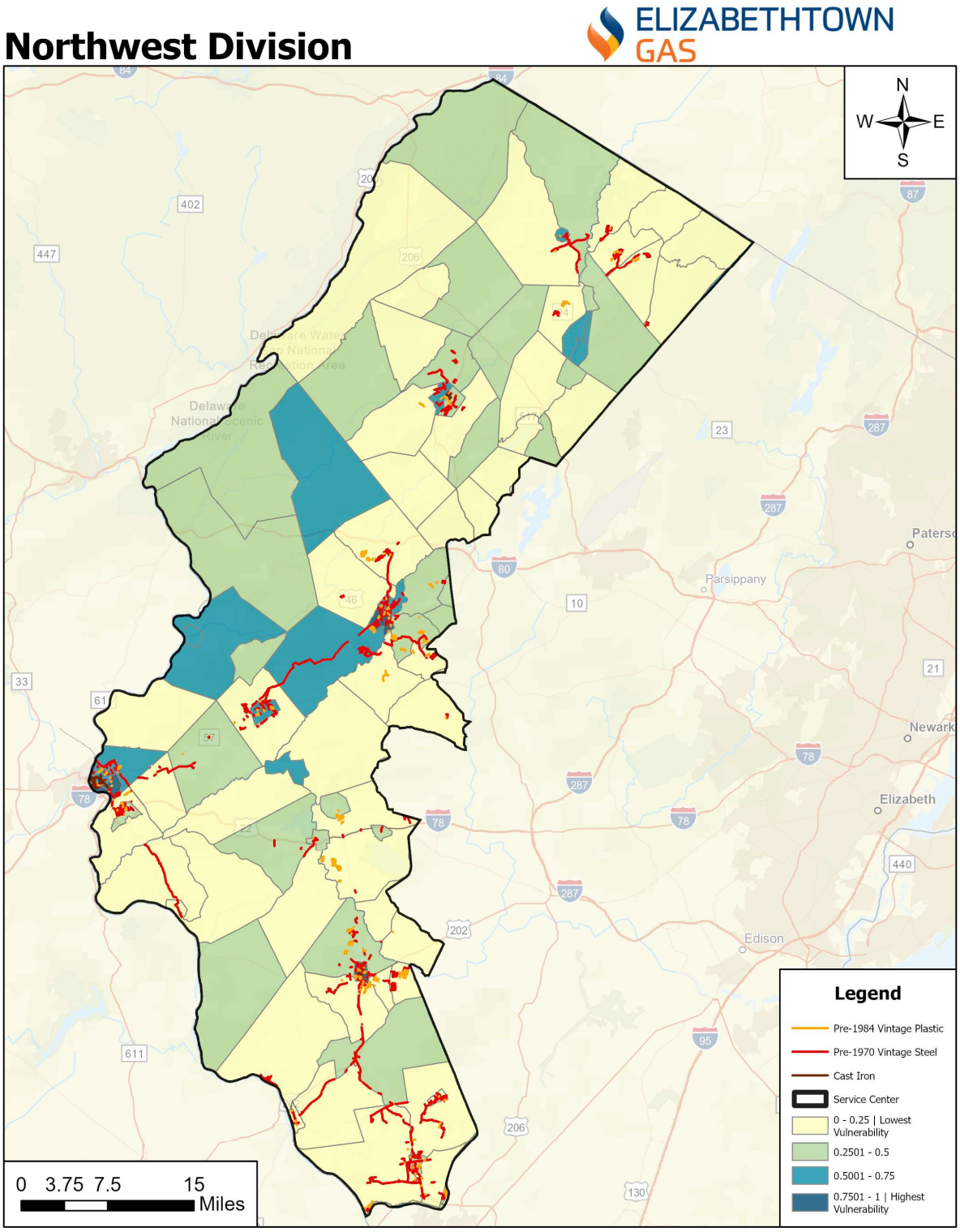


Figure 44: Social Vulnerability Index Map-Northwest Service Area

11.2 PHMSA Notice of Proposed Rulemaking

On August 24th, 2023, PHMSA issued a NPRM on Safety of Gas Distribution Pipelines and Other Pipeline Safety Initiatives. As set forth in the Summary shown below, many aspects of the NPRM are directly applicable to ETG's gas distribution system and its need to ensure safety through an accelerated infrastructure investment program to replace its highest risk piping.

Some of the key aspects of the NPRM that directly relate to the proposed program are excerpted below:

- PHMSA anticipates these proposed regulatory amendments will improve public safety, while also reducing threats to the environment (including, but not limited to, reduction of greenhouse gas emissions during incidents on gas pipelines), and promoting environmental justice for minority populations, low-income populations, or other underserved and disadvantaged communities, or others who are particularly likely to live and work near higher risk gas distribution pipeline systems.
- PHMSA also expects the proposed amendments to reduce the frequency of, as well as public and environmental consequences from, failure mechanisms on gas distribution pipeline systems and other pipeline facilities.
- Older cast-iron or bare-steel gas distribution pipelines—a type of gas distribution pipeline particularly vulnerable to failure and over pressurization—are disproportionately concentrated in older, residential (often urban) areas with large minority, low- income, and other historically underserved and disadvantaged populations.
- In addition, the reduced frequency and severity of incidents on gas pipelines anticipated from this rulemaking would have the benefit of minimizing the release of greenhouse gases from pipeline incidents—in particular, methane—to the atmosphere.
- While the overall trend in pipeline safety has steadily improved over the past two decades, gas distribution pipelines are still involved in a majority of serious gas pipeline incidents.
- According to PHMSA's data, between 2003 and 2022, excavation damage was the leading cause of serious incidents along gas distribution pipelines (28 percent), followed by other outside force damage (23 percent) and incorrect operation (14 percent).
- Much of the Nation's gas distribution piping has been in the ground for a long time. Per PHMSA's gas distribution operator database, more than 50 percent of the nation's pipelines were constructed before 1970 during the creation of the interstate pipeline

network built in response to the demand for energy in the post-World War II economy. Historically, gas distribution pipelines were constructed from many different materials, including cast iron, steel, and copper. However, material fabrication and installation practices have improved since much of the Nation's gas distribution pipeline systems were installed, in acknowledgment that iron alloys like cast iron and steel degrade or corrode over time. Consequently, the age of a gas distribution system pipeline is an important factor in evaluating the risk it poses to public safety and the environment.

- PHMSA understands that both cost and practical barriers, such as urban excavation and disruption of gas supplies, can also limit replacement efforts. However, PHMSA finds that proactive management of the integrity of aging pipe infrastructure enhances safety and reliability, contributes to cost savings over the longer term, and can be less disruptive to customers and communities than a reactive approach. Accelerating leak detection, repair, rehabilitation, or replacement efforts also delivers the desired integrity and safety benefits more expeditiously, lowering maintenance requirements associated with the aging pipe that is being replaced.
- This rule also builds on other national and international actions advanced by Congress and the Biden-Harris Administration to reduce methane emissions—a greenhouse gas with more than 25 times the global warming potential of carbon dioxide.

11.3 U.S. Methane Emissions Reduction Action Plan and Regulatory, Disclosure, And Partnership Initiatives to Reduce Methane Leaks and Ruptures on Distribution Lines

The U.S Methane Emissions Reduction Action Plan was released in November of 2022. The plan refers to an estimated 2.3 million miles of gas distribution pipelines that extend into cities and towns throughout the United States. "Many of these pipelines are old, leaking, and susceptible to rupturing." The report uses a chart shown in Figure 42 to demonstrate the chart chronic leakage problems in gas distribution pipelines.

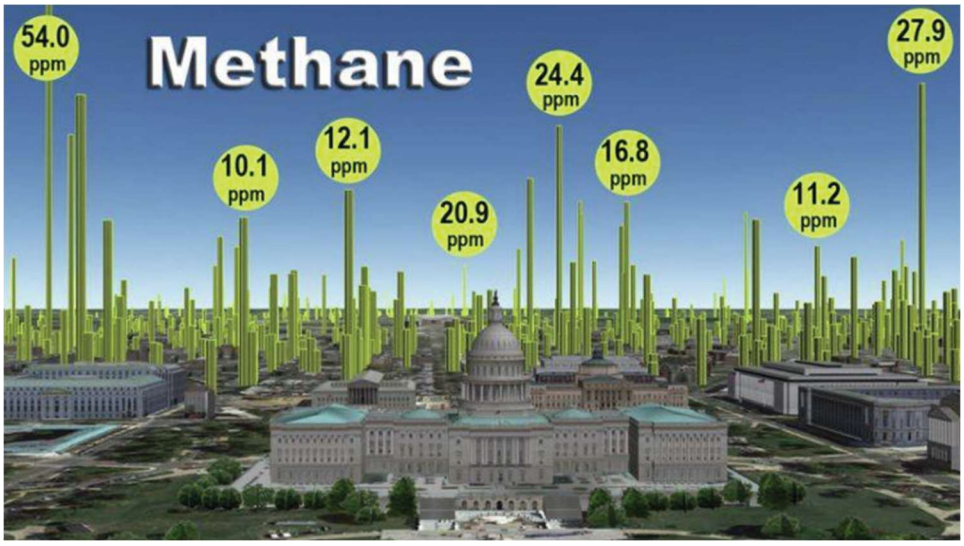


Figure 45: Testing Results of Gas Distribution Leaks - Washington, DC.

The report further states, "*In addition to on-going leaks, gas distribution pipelines can fail and generate enormous emissions. A single catastrophic incident in 2018 in Merrimack Valley, for example, released an estimated 13 metric tons of methane. Despite this challenging fact pattern, when aging or damaged gas distribution pipelines are repaired or replaced, methane emissions can be cut by up to 90%.*"

The report also states, "These *improvements are good for consumers, safety, and the climate. That is why the Biden-Harris Administration is confronting the serious environmental and safety issues associated with methane emissions and ruptures in distribution pipelines:*"

The proposed ETG accelerated replacement program will have a direct impact on reducing methane emissions consistent with the Biden Administration Plan.

11.4 NTSB Report Atmos Energy - Atmos Energy Corporation Natural Gas-Fueled Explosion, Dallas, Texas - February 23, 2018

On February 23, 2018, a natural gas explosion occurred on a 71-year-old natural gas main operating in the Atmos Energy Natural gas distribution system. The leak was caused by a through wall crack. The incident resulted in four injuries and one fatality. The NTSB investigative report noted several findings that directly support the proposed accelerated replacement program.

- Although the Atmos Integrity management program was generally consistent with regulatory requirements and industry practice the program did not adequately evaluate and address the risk of its 71-year-old system.
- Atmos did not adequately consider or mitigate against threats that were degrading its pipeline system, the likelihood of failure associated with these threats, or the potential consequences of such a failure as required by gas distribution integrity management requirements.
- While Atmos Energy's periodic leak survey methodology and frequency complied with the minimum state and federal requirement, it did not identify the degraded system that was found after the explosion.

In stark contrast to the NTSB findings, ETG has evaluated the risk of failure in its vintage pipeline systems and the possible consequences of such a failure(s). ETG has identified these risks and has proposed an accelerated replacement program that will address these risks.

12.0 SUMMARY OF FINDINGS

An extensive study of operating history, environment factors, geology, soil corrosivity, cathodic protection operating history and site characteristics has been completed in an effort to assess the risk of failures and leaks in the two operating service areas of the ETG's service area. On the basis of the review, it is apparent that the Vintage cast iron, steel and plastic mains and services are at a continuing risk for leaks and that an accelerated replacement program is fully justified.

Specific findings include:

1. ETG has sustained continuing leaks in the subject piping with 1,264 leaks having been recorded and repaired in the period from 2017-2022 in its vintage steel and vintage plastic mains and associated services. Using the DOT annual statistics of reportable gas incidents, compared against operating companies across the industry, ETG ranks 6th highest in recordable leaks/mile compared with twenty-one operating companies. ETG ranks just behind sister company South Jersey Gas which ranked 4th and recently had an IIP application approved for replacing Pre-Code Steel Mains and associated services.

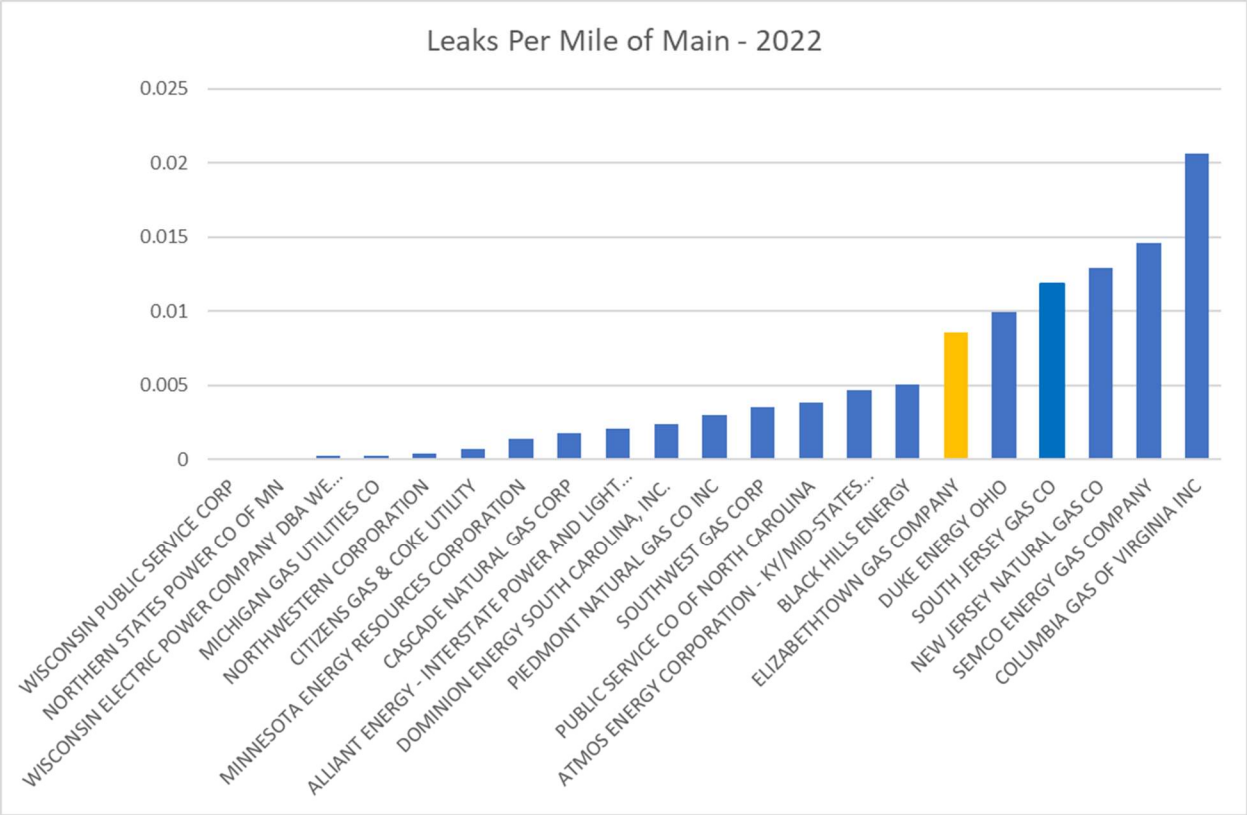


Figure 46: Comparison of Reportable Industry Leak Rates per Mile-2022

2. Although supplemental cathodic protection continues to be installed on an annual basis, these measures will not preclude the development of future leaks in mains and services with aged and degraded vintage coating systems as leaks continue to be recorded despite the presence of a functioning cathodic protection systems that is meeting regulatory requirements for effective corrosion control. Moreover, much of the remining cast iron mains see little to no benefit from cathodic protection and instead continue to corrode through graphitization elevating thew risk of failures.
3. A significant body of information exists on failures of pre-1984 Aldyl-A and Driscopipe 8000 plastic piping with known formulation deficiencies that increase the risk of leaks and failures due to cracking and splits. Tragically, many of these incidents resulted in fatalities, injuries, and significant property damage. Brittle failure modes in these vintage plastic pipes often result in larger volumes of gas releases than leaks in steel elevating the potential consequences of such failures.
4. An extensive analysis of the soil environment across the ETG service area indicates that both the NCSS classification and independent work by NBS confirm, that the soils range from corrosive to extremely corrosive, which is further substantiated through an analysis of the

associated leak history. This combination of corrosive soils, aging coatings, and ongoing corrosion presents significant challenges for ETG in its goal to provide safe and reliable natural gas service.

5. While leak surveys are required under Part 49 CFR Part 192 to aid in managing system integrity, a review of the PHMSA Industry Incident database indicates that 24 significant incidents due to external corrosion have been recorded since 2005. These incidents resulted in tragic consequences including injuries and fatalities. The only methodology of satisfactorily reducing the consequence of gas distribution system leaks is replacement of highest risk vintage piping systems.
6. In the aftermath of the Allentown, PA incident involving cast iron distribution pipe installed in 1928 and 1942, PHMSA issued an update to two existing advisory bulletins covering the continued use of cast iron in gas distribution systems. The advisories encouraged assessments of the need for accelerated repair /replacement of high-risk pipelines. Specifically, in ADB-2012-05, PHMSA asked owners and operators of cast-iron distribution pipelines and State safety representatives to consider the following where improvements in safety are necessary:
    1. Review current cast-iron replacement programs and consider establishing mandated replacement programs.
    2. Establish accelerated leakage survey frequencies or leak testing.
    3. Focus pipeline safety efforts on identifying the highest risk pipe.
    4. Use rate adjustments to incentivize pipeline rehabilitation, repair, and replacement programs.
7. PHMSA has issued similar advisory bulletins on Aldyl-A Plastic pipes installed between 1960 and the early 1980s Warns of potential susceptibility to brittle‐like cracking. Advisory further warns that rupture testing standards may have overrated the long‐term resistance to brittle‐like cracking.
8. An accelerated replacement program for ETG's remaining vintage cast iron, steel and plastic piping will enhance safety and reliability. It will also satisfy many of the stated objectives of PHMSA's NPRM, The Biden administration Emission Reduction Plan and have a positive impact on socially vulnerable underserved communities that at the greatest risk from an aging natural gas infrastructure.
9. In consideration of the totality of the information reviewed and relied upon, in conjunction with industry experience and scientific and engineering principles, it is our opinion that the ETG cast iron, Pre-Code steel and vintage plastic mains and associated services are at risk of

continuing failure due to leaks. We believe that ETG's request for approval of an accelerated replacement program is both justified and necessary.

13.0 RECOMMENDATIONS

On the basis of the findings and conclusions of this study we offer the following recommendations:

1. Continue with the accelerated replacement of approximately 44 miles of cast iron mains and associated services that will be remaining at the conclusion of the current IIP and consider continuing the replacement of the remaining 12 miles of large diameter cast iron mains.
2. Proceed with the accelerated replacement of approximately 540 miles of vintage steel mains and associated services (including mains lined with copper).
3. Proceed with the accelerated replacement of approximately 141 miles of pre-1984 vintage plastic mains and associated services.

Appendix A – ETG DIMP Review

Section	Subpart	Code	Addressed in Document	Comments
ETG DIMP Plan Review (PRIVILEGED AND CONFIDENTIAL)				
192.1	P	**Subpart P—Gas Distribution Pipeline Integrity Management (IM)**		
192.1001	P	**§192.1001 What definitions apply to this sub [1]part?**		
192.1001	P	The following definitions apply to this subpart: *Excavation Damage* means any impact that results in the need to repair or replace an underground facility due to a weakening, or the partial or complete destruction, of the facility, including, but not limited to, the protective coating, lateral support, cathodic protection or the housing for the line device or facility.	Yes. Addressed in Section 1. A.i.	
192.1001	P	*Hazardous Leak* means a leak that represents an existing or probable hazard to persons or property and requires immediate repair or continuous action until the conditions are no longer hazardous.	Yes. Addressed in Section 1. A.i.	
192.1001	P	*Integrity Management Plan or IM Plan* means a written explanation of the mechanisms or procedures the operator will use to implement its integrity management program and to ensure compliance with this subpart.	Yes. Addressed in Section 1. A.i.	

Section	Subpart	Code	Addressed in Document	Comments
ETG DIMP Plan Review (PRIVILEGED AND CONFIDENTIAL)				
192.1001	P	*Integrity Management Program or IM Program* means an overall approach by an operator to ensure the integrity of its gas distribution system.	Yes. Addressed in Section 1. A.i.	
192.1001	P	*Mechanical fitting* means a mechanical device used to connect sections of pipe. The term "Mechanical fitting" applies only to: (1) Stab Type fittings; (2) Nut Follower Type fittings; (3) Bolted Type fittings; or (4) Other Compression Type fittings.	Yes. Addressed in Section 1. A.i.	
192.1001	P	*Small LPG Operator* means an operator of a liquefied petroleum gas (LPG) distribution pipeline that serves fewer than 100 customers from a single source. [Amdt. 192-113, 74 FR 63905, Dec. 4, 2009, Amdt. 192-116, 76 FR 5494, February 1, 2011]	Yes. Addressed in Section 1. A.i.	
192.1003	P	**§192.1003 What do the regulations in this subpart cover?**		

Section	Subpart	Code	Addressed in Document	Comments
ETG DIMP Plan Review (PRIVILEGED AND CONFIDENTIAL)				
192.1003	P	**General.** This subpart prescribes minimum requirements for an IM program for any gas distribution pipeline covered under this part, including liquefied petroleum gas systems. A gas distribution operator, other than a master meter operator or a small LPG operator, must follow the requirements in Sec. §192.1005-192.1013 of this subpart. A master meter operator or small LPG operator of a gas distribution pipeline must follow the requirements in §192.1015 of this subpart. [Amdt. 192-113, 74 FR 63905, Dec. 4, 2009]	Yes, Addressed in section 1.A.iii.	
192.1005	P	**§192.1005 What must a gas distribution operator (other than a master meter or small LPG operator) do to implement this subpart?**	Yes. Addressed on the front page of their IMP Plan and subsequent signed pages. Also addressed in section 1. A.v.	
192.1005	P	No later than August 2, 2011, a gas distribution operator must develop and implement an integrity management program that includes a written integrity management plan as specified in §192.1007. [Amdt. 192-113, 74 FR 63905, Dec. 4, 2009]	Addressed in section 1. A.v.	

Section	Subpart	Code	Addressed in Document	Comments
ETG DIMP Plan Review (PRIVILEGED AND CONFIDENTIAL)				
192.1007	P	**§192.1007 What are the required elements of an integrity management plan?**	Addressed in sections 1.E. i, 1.E.ii, and complete 2.	
192.1007	P	A written integrity management plan must contain procedures for developing and implementing the following elements:		
192.1007	P	**(a) Knowledge**. An operator must demonstrate an understanding of its gas distribution system developed from reasonably available information. (1) Identify the characteristics of the pipeline's design and operations and the environmental factors that are necessary to assess the applicable threats and risks to its gas distribution pipeline. (2) Consider the information gained from past design, operations, and maintenance. (3) Identify additional information needed and provide a plan for gaining that information over time through normal activities conducted on the pipeline (for example, design, construction, operations, or maintenance activities). (4) Develop and implement a process by which the IM program will be reviewed periodically and refined and improved as needed. (5) Provide for the capture and retention of data on any new pipeline installed. The data must include, at a minimum, the location where the new pipeline is installed and the material of which it is constructed.	Addressed in section 1.E. i, 1.E.ii, 2.D, 2.E, 2.F, 2.G, 2.H, and 2.I and Appendix A and B.	The information referenced in this section is found in Appendix B. TGE IMP also includes a very detailed section with schedules, roles, and responsibilities to cover all the activities. TGE also have an asset management system called Maximo that is used to capture information on all company assets and locations, including new construction records, pipeline maintenance activities, leak repairs, regulatory station inspections, cathodic protection inspections and remediation work orders., test points, foreign bonds and rectifiers, and many other activities related to a distribution system.

Section	Subpart	Code	Addressed in Document	Comments
ETG DIMP Plan Review (PRIVILEGED AND CONFIDENTIAL)				
192.1007	P	(**b) Identify threats.** The operator must consider the following categories of threats to each gas distribution pipeline: Corrosion, natural forces, excavation damage, other outside force damage, material, or welds, equipment failure, incorrect operations, and other concerns that could threaten the integrity of its pipeline. An operator must consider reasonably available information to identify existing and potential threats. Sources of data may include, but are not limited to, incident and leak history, corrosion control records, continuing surveillance records, patrolling records, maintenance history, and excavation damage experience.	Addressed in section 3A, 3B, 3C, and Appendix A.3	ETG considers the following threats in their distribution system: Corrosion failure, Natural Force Damage, Excavation damage, other outside force damage, pipe/weld/Joint failure, equipment failure, incorrect operation, other cause not attributable not already mentioned. Ample description of each threat is provided in section 3.B.C.D.F.G.H.I.J.K.L.M.N.O.
192.1007	P	**(c) Evaluate and rank risk.** An operator must evaluate the risks associated with its distribution pipeline. In this evaluation, the operator must determine the relative importance of each threat and estimate and rank the risks posed to its pipeline. This evaluation must consider each applicable current and potential threat, the likelihood of failure associated with each threat, and the potential consequences of such a failure. An operator may subdivide its pipeline into regions with similar characteristics (e.g., contiguous areas within a distribution pipeline consisting of mains, services, and other appurtenances; areas with common materials or environmental factors), and for	Addressed in section 4. Appendix D.	ETG uses a risk analysis approach using a hierarchy approach to identify and address threats throughout the system. The process consists on a: System Level Threat Assessment that identify top threats throughout the system. SME Risk Assessment which consists on an ongoing process of understanding what factors affect those risks. PHMSA Audit Risk where a list is created of the top 10 risk to the system which ensures that leak volumes and SME expertise is considered when determining the top 10 risks. All these levels are updated on an annual basis.

Section	Subpart	Code	Addressed in Document	Comments
ETG DIMP Plan Review (PRIVILEGED AND CONFIDENTIAL)				
		which similar actions likely would be effective in reducing risk.		
192.1007	P	**(d) Identify and implement measures to address risks.** Determine and implement measures designed to reduce the risks from failure of its gas distribution pipeline. These measures must include an effective leak management program (unless all leaks are repaired when found).	Addressed in section 5.	A system level action gets implemented. This system A/A actions consists on: Bare Steel/Cast Iron replacement program, enhanced Leak Survey program and Meter Protection program, as well as, pipeline replacement prioritization and accelerated leak surveys. A Leak Management Program is included in ETG Division II Section 4 of their Operation Procedures Manual and it consists on the following key levels: Leak Detection, Leak Grading/Classification, Leak Compliance, Evaluation of each Survey, and Leak Detection Tool Calibration. A pipeline will be survey on 1 to 5 years intervals based on material, type, condition, location, and other characteristics of the pipeline.

Section	Subpart	Code	Addressed in Document	Comments
ETG DIMP Plan Review (PRIVILEGED AND CONFIDENTIAL)				
192.1007	P	**(e) Measure performance**, monitor results, and evaluate effectiveness. (1) Develop and monitor performance measures from an established baseline to evaluate the effectiveness of its IM program. An operator must consider the results of its performance monitoring in periodically reevaluating the threats and risks. These performance measures must include the following:(i) Number of hazardous leaks either eliminated or repaired as required by §192.703(c) of this subchapter (or total number of leaks if all leaks are repaired when found), categorized by cause;(ii) Number of excavation damages;(iii) Number of excavation tickets (receipt of information by the underground facility operator from the notification center);(iv) Total number of leaks either eliminated or repaired, categorized by cause;(v) Number of hazardous leaks either eliminated or repaired as required by §192.703(c) (or total number of leaks if all leaks are repaired when found), categorized by material; and vi) Any additional measures the operator determines are needed to evaluate the effectiveness of the operator's IM program in controlling each identified threat.(f) Periodic Evaluation and Improvement. An operator must re-evaluate threats	Addressed in section 6 and 7. Appendix D, E, and F.	Roles and Responsibilities are clearly defined. The Manager of System Integrity is responsible for the accuracy of numbers displayed in the metrics and the DIMP Team is responsible for completing the performance metrics in the DIMP Appendix F.

Section	Subpart	Code	Addressed in Document	Comments
ETG DIMP Plan Review (PRIVILEGED AND CONFIDENTIAL)				
		and risks on its entire pipeline and consider the relevance of threats in one location to other areas. Each operator must determine the appropriate period for conducting complete program evaluations based on the complexity of its system and changes in factors affecting the risk of failure. An operator must conduct a complete program reevaluation at least every five years. The operator must consider the results of the performance monitoring in these evaluations.(g) Report results. Report, on an annual basis, the four measures listed in paragraphs (e)(1)(i) through (e)(1)(iv) of this section, as part of the annual report required by §191.11. An operator also must report the four measures to the state pipeline safety authority if a state exercises jurisdiction over the operator's pipeline.[Amdt. 192-113, 74 FR 63905, Dec. 4, 2009, Amdt. 192-116, FR 76 5494, Feb 1,2011]		
192.1009	P	**§192.1009 What must an operator report when compression couplings fail?**		

Section	Subpart	Code	Addressed in Document	Comments
ETG DIMP Plan Review (PRIVILEGED AND CONFIDENTIAL)				
192.1009	P	(a) Except as provided in paragraph (b) of this section, each operator of a distribution pipeline system must submit a report on each mechanical fitting failure, excluding any failure that results only in a nonhazardous leak, on a Department of Transportation Form PHMSA F-7100.1-2. The report(s) must be submitted in accordance with § 191.12.	Addressed in section 8.C.	Information related to failure of mechanical fittings, excluding those that result only in non-hazardous leaks is reported to PHMSA as part of the annual required by §192.12 beginning with the report submitted March 15, 2012. The information includes location of the failure in the pipeline, nominal pipe size, material type, nature of the failure including local pipeline environment, coupling manufacturer, lot number and date of manufacture, and other information provided in the markings of the failed coupling.
192.1009	P	(b) The mechanical fitting failure reporting requirements in paragraph (a) of this section do not apply to the following: (1) Master meter operators; (2) Small LPG operator as defined in §192.1001; or (3) LNG facilities. [Amdt. 192-116. 76 FR 5494, Feb. 1, 2011]		
192.1011	P	**§192.1011 What records must an operator keep?**		
192.1011	P	An operator must maintain records demonstrating compliance with the requirements of this subpart for at least 10 years. The records must include copies of superseded integrity management plans developed under this subpart. [Amdt. 192-113, 74 FR 63905, Dec. 4, 2009]	Covered in D.5, D.6, and section 9. Appendix B and H.	Section 9.B. provides a list of all records that ETG will retain in the DIM Program files.

Section	Subpart	Code	Addressed in Document	Comments
ETG DIMP Plan Review (PRIVILEGED AND CONFIDENTIAL)				
192.1013	P	**§192.1013 When may an operator deviate from required periodic inspections under this part?**	Section 1.E.ii, section 3.O, and 4D. Appendix E.	
192.1013	P	(a) An operator may propose to reduce the frequency of periodic inspections and tests required in this part on the basis of the engineering analysis and risk assessment required by this subpart.		
192.1013	P	(b) An operator must submit its proposal to the PHMSA Associate Administrator for Pipeline Safety or, in the case of an intrastate pipeline facility regulated by the State, the appropriate State agency. The applicable oversight agency may accept the proposal on its own authority, with or without conditions and limitations, on a showing that the operator's proposal, which includes the adjusted interval, will provide an equal or greater overall level of safety.		
192.1013	P	(c) An operator may implement an approved reduction in the frequency of a periodic inspection or test only where the operator has developed and implemented an integrity management program that provides an equal or improved overall level of safety despite the reduced frequency of periodic inspections. [Amdt. 192-113, 74 FR 63905, Dec. 4, 2009]		

Section	Subpart	Code	Addressed in Document	Comments
ETG DIMP Plan Review (PRIVILEGED AND CONFIDENTIAL)				
192.1015	P	**§192.1015 What must a master meter or small liquefied petroleum gas (LPG) operator do to implement this subpart?**		The complete section 192.1015 has been removed from the regulations as per Pipeline and Hazardous Materials Safety Administration 49 CFR Parts 191, 192, and 198 [Docket No. PHMSA-2021-0046] RIN 2137-AF53 Pipeline Safety: Safety of Gas Distribution Pipelines and Other Pipeline Safety Initiatives
192.1015	P	**(a) General.** No later than August 2, 2011, the operator of a master meter system or a small LPG operator must develop and implement an IM program that includes a written IM plan as specified in paragraph (b) of this section. The IM program for these pipelines should reflect the relative simplicity of these types of pipelines.		
192.1015	P	**(b) Elements**. A written integrity management plan must address, at a minimum, the following elements: **(1) Knowledge**. The operator must demonstrate knowledge of its pipeline, which, to the extent known, should include the approximate location and material of its pipeline. The operator must identify additional information needed and provide a plan for		

Section	Subpart	Code	Addressed in Document	Comments
ETG DIMP Plan Review (PRIVILEGED AND CONFIDENTIAL)				
		gaining knowledge over time through normal activities conducted on the pipeline (for example, design, construction, operations, or maintenance activities). **(2) Identify threats.** The operator must consider, at minimum, the following categories of threats (existing and potential): Corrosion, natural forces, excavation damage, other outside force damage, material or weld failure, equipment failure, and incorrect operation. **(3) Rank risks**. The operator must evaluate the risks to its pipeline and estimate the relative importance of each identified threat. **(4) Identify and implement measures to mitigate risks.** The operator must determine and implement measures designed to reduce the risks from failure of its pipeline. **(5) Measure performance, monitor results, and evaluate effectiveness.** The operator must monitor, as a performance measure, the number of leaks eliminated or repaired on its pipeline and their causes. **(6) Periodic evaluation and improvement.** The operator must determine the appropriate period for conducting IM program evaluations based on the complexity of its pipeline and changes in factors affecting the risk of failure.		

Section	Subpart	Code	Addressed in Document	Comments
ETG DIMP Plan Review (PRIVILEGED AND CONFIDENTIAL)				
192.1015	P	An operator must re-evaluate its entire program at least every five years. The operator must consider the results of the performance monitoring in these evaluations.		
192.1015	P	**(c) Records.** The operator must maintain, for a period of at least 10 years, the following records: (1) A written IM plan in accordance with this section, including superseded IM plans; (2) Documents supporting threat identification; and (3) Documents showing the location and material of all piping and appurtenances that are installed after the effective date of the operator's IM program and, to the extent known, the location and material of all pipe and appurtenances that were existing on the effective date of the operator's program. [Amdt. 192-113, 74 FR 63905, Dec. 4, 2009]		