Puget Sound Energy
Pipeline Replacement
Program Plan
June 2023

Docket No. UG-120715

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1. Introduction

On December 31, 2012, the Washington Utilities and Transportation Commission (UTC) issued a policy statement under UG-120715 for the accelerated replacement of natural gas pipeline facilities with elevated risk. This policy statement requires each gas company, whether requesting a special pipe replacement cost recovery mechanism (CRM) or not, to file with the Commission a pipe replacement program plan containing the following elements:

1. A "master" plan for replacement or remediation of pipeline facilities that are demonstrated to have an elevated risk of failure
2. A two-year plan that specifically identifies the pipeline facility remediation goals for the upcoming two year period
3. A plan for identifying the location of pipe that presents elevated risk of failure

In accordance with this policy statement, Puget Sound Energy (PSE) prepared pipeline replacement program (PRP) plans beginning in 2013 for pipe that poses an elevated risk of failure. Through PSE's Distribution Integrity Management Program (DIMP), performance of the distribution system is continually analyzed and detailed analysis is conducted to identify those facilities considered high risk.

On January 21, 2021, PSE announced its Beyond Net Zero Carbon pledge, setting an aspirational goal to reach net zero carbon emissions for natural gas sales by 2045, with an interim target of a 30% emissions reduction by 2030. PSE's 2021 PRP was expanded to include actions that aid in the reduction of methane emissions as envisioned by RCW 80.28.420[1]. Subsequently, PSE was approved for a multi-year rate plan (MYRP) beginning in 2022 and is no longer using the Cost Recovery Mechanism (CRM) allowed in the policy statements. The methane emission programs that were included in PSE's 2021 PRP are incorporated into the MYRP. PSE's 2023 PRP removes the methane tactics and reports on the pipeline assets and programs with the highest risk of failure. The methane tactics are being addressed outside of the PRP.

2. PSE's Distribution Integrity Management Program (DIMP)

As required by the DIMP regulations, PSE analyzes many aspects of system performance including trends on identified system threats. The threats that are identified and evaluated in DIMP include:

- Corrosion Failure
- Natural force Damage
- Excavation Damage
- Other Outside Force Damage
- Pipe, Weld or Joint Failure
- Equipment Failure
- Incorrect Operations
- Other Cause

[1] On June 11, 2020, the Washington Legislature passed House Bill 2518 for natural gas transmission and distribution that added a new section to chapter 80.28 of the Revised Code of Washington (RCW). The intent of the new code is to encourage safer and more efficient natural gas transmission and distribution system through investments that address and minimize leaks in the natural gas pipeline system. The new code allows a natural gas company to seek interim recovery between rate cases as part of a commission-approved interim rate treatment mechanism for equipment and new facilities that aid in the reduction of methane emissions including a list of projects and changes to operational procedures including, but not limited to, venting, blowdowns, and others, to expedite the replacement of pipeline facilities that present an elevated risk of failure and expedite the repairs of hazardous leaks and nonhazardous leaks. Requirements of this new section of the RCW include:

1. A list of projects ranked according to risk, severity, complexity, and impact to the environment and public health
2. A proposed spending cap using percent of rate base, percent of revenues, or total expenditures

The analysis includes reviewing active and repaired leak data, failure analysis information, and system condition reports to identify trends affecting the distribution system. Results and conclusions of the review are reported in PSE's Continuing Surveillance Annual Report. A copy of the report is provided to the UTC after each annual update. The analysis provides insight into the risks associated with pipe and assets identified as having an elevated risk of failure that are included in the PRP plan. In addition, PSE reviews the emissions from natural gas facilities to report out the estimated methane emissions amounts from repaired and active leaks. A report is provided to the UTC per RCW 81.88.420. PSE is currently evaluating the impact of methane emissions to the environment and public health and determining how it will be incorporated into DIMP.

PSE continues to improve pipeline safety and system reliability through the ongoing iterations of its integrity management activities. The assessment, prioritization, and mitigation of system risks continue to be refined as new and additional risk knowledge is incorporated into DIMP through normal O&M and DIMP activities. Activities related to DIMP include gathering data, conducting targeted inspections, and completing remediation and replacement work associated with integrity management driven programs. Based on additional risk knowledge and the results of the system trends analysis, the Master Plan may be modified to further accelerate or decelerate pipe replacement and mitigation schedules consistent with the identified risk. Additionally, PSE is actively monitoring system threats and performance and may identify additional materials or assets that have an elevated risk of failure. If any material changes are made to the PRP plan, PSE will submit the changes to the Commission as required by the Commission's Policy Statement.

3. PSE's Master Plan and Progress

Master Plan

The following programs/assets were identified through PSE's risk modeling to have an elevated risk of failure relative to other assets in its system:

Table 1. Pipeline Integrity Risk Programs/Assets

Program/Asset	Pipeline Integrity Risk	Program Status
DuPont Aldyl "HD" Plastic Pipe	High consequence of fusion failure and brittle like cracking	Master Plan Active
Buried Meters	High consequence of external corrosion failure in close proximity to a building wall	Master Plan Active
Sewer Cross Bores	High likelihood of failure and consequence of gas migration directly into a structure	Master Plan Active
No Record Facilities	High likelihood of outside force damage failure in close proximity to building wall	New
Older Vintage wrapped steel mains	Elevated risk reduced through implementation of master plan	Removed from PRP
Older Vintage wrapped steel services	Elevated risk reduced through implementation of master plan	Removed from PRP

PSE's 2021 PRP also identified programs/assets with an elevated risk of methane emissions in accordance with RCW 80.28.420. These programs were removed from this PRP and are incorporated into the MYRP.

Table 2. Methane Emission Risk Programs/Assets

Program/Asset	Methane Emission Risk	Pipeline Integrity Risk	Program Status
Active Leak Reduction Program	Nonhazardous belowground leaks (Grade B & C)	Low	Removed from PRP and incorporated into MYRP
Damage Prevention Program	Excavation Damage from improper excavation practices and from unmapped facilities	High	Removed from PRP and incorporated into MYRP
Above Ground Meter Set Remediation	Nonhazardous releases of gas (NARG)	Low	Removed from PRP and incorporated into MYRP

Master Plan Progress

The following table summarizes the miles of pipe, number of meters, number of cleared sewer segments, and the number of services replaced under the replacement programs according to the Master Plan since 2013.

Table 3. Summary of Programs from 2013-2022

	DuPont Aldyl "HD" Plastic Pipe (Active)		Buried Meter Remediation (Active)		Sewer Cross Bore Remediation (Active)		Older Vintage Wrapped Steel Mains (Removed)		Older Vintage Wrapped Steel Services (Removed)	
Program (Calendar) Year	Miles of Pipe	Expenditures (Millions)	Number of Meters	Expenditures (Millions)	Cleared Sewer Segments	Expenditures (Millions)	Miles of Pipe	Expenditures (Millions)	Services	Expenditures (Millions)
2013	6.5	$6.9					3.2	$3.7	163	$1.6
2014	10.5	$13.5					4.5	$7.1	187	$2.1
2015	28.6	$41.4					4.0	$6.5	208	$2.7
2016	27.4	$32.7					5.0	$7.9	215	$2.8
2017	27.9	$41.9					5.2	$10.3	212	$3.3
2018	38.8	$64.5								
2019	27.7	$62.8								
2020	14.6	$44.5	7,525	$5.3	8,009	$3.3				
2021	15.5	$42.0	8,505	$5.0	9,316	$3.5				
2022	13.0	$38.2	8,446	$6.1	7,180	$3.6				
Total	**210.5**	**$388.4**	**24,476**	**$16.4**	**24,505**	**$ 10.4**	**21.9**	**$35.5**	**985**	**$12.5**

The following table summarizes the leak repairs, avoided damages, NARG repairs, and emission reduction under the methane emission programs as part of PSE's Master Plan. These programs were removed from the 2023 PRP and incorporated into the MYRP. PSE will continue to report on this information through 2023.

Table 4. Summary of Programs Addressing Methane Emissions starting in 2022

	Active Leak Reduction			Excavation Damage Prevention Measures			NARG Repairs		
Program (Calendar) Year	Leak Repairs	Emission Reduction (tCO2e)	Expenditures (millions)	Avoided Damages	Emission Reduction (tCO2e)	Expenditures (millions)	NARG Repairs	Emission Reduction (tCO2e)	Expenditures (millions)
2022	258	925	$3.4	35	490	$0.4	0	0	$0
2023	TBD			TBD			TBD		
Total	**258**	**925**	**$3.4**	**35**	**490**	**$0.4**	**0**	**0**	**$0**

4. DuPont Aldyl "HD" Plastic Pipe

Master Plan

Pipeline Integrity Risk Assessment

PSE identified an increased risk of premature, brittle-like cracking of the larger diameter (1-1/4" and larger) Aldyl "HD" plastic pipe manufactured by DuPont. PSE installed this pipe in the 1970s and early 1980s and originally estimated there to be approximately 400 miles remaining in service as of 2013. After further review, PSE estimates the total to be nearly 435 miles in service at the beginning of 2013, prior to any pipe replacement completed under the PRP plan.

The brittle-like cracking is due to slow crack growth (SCG) at locations where there is a stress concentration. Based on PSE's experience, the brittle-like cracking is primarily due to rock impingement but also occurs where the pipe has been squeezed or where other stress concentrations have been introduced due to inconsistent joining practices. The failure is referred to as brittle-like cracking because it occurs without any localized plastic deformation. While the failure occurs without plastic deformation, the pipe is not brittle. Even when a failure occurs due to SCG, the PE pipe is still resistant to crack propagation preventing it from becoming a larger crack. A study by GTI (Gas Technology Institute) performed at PSE's request provides additional insight into how installation and operating practices, environmental conditions, and operating pressures impact the life expectancy of the pipe.

PSE developed and implemented a program in 2010 to prioritize larger diameter DuPont Aldyl "HD" plastic pipe for replacement based on the likelihood and consequence of failure. The program was incorporated into DIMP and evaluates the risk of brittle-like cracking based on installation and operating practices and environmental conditions. These segments of larger diameter DuPont Aldyl "HD" plastic pipe have an elevated risk of failure as validated by DIMP system performance data.

Industry Experience

PSE's experience with the larger diameter DuPont Aldyl "HD" material is similar to industry experience with many of the older PE materials. This is highlighted by many of the Safety Recommendations issued by the National Transportation Safety Board (NTSB) on April 30, 1998. These recommendations were based on findings from NTSB's investigation of PE pipe following several natural gas distribution accidents that involved plastic piping that

cracked in a “brittle-like” manner. The following summarizes many of the issues identified in the NTSB’s investigation that correlate to PSE’s experience with the DuPont Aldyl “HD” material:

- Nationally, brittle-like failures represent a frequent failure mode for older plastic piping.
- The procedure used to rate PE materials from the 1960s through the early 1980s may have overrated the materials long term strength and resistance to brittle-like cracking.
- The test methods used at the time did not reveal the susceptibility of many early PE materials to brittle-like cracking.
- Plastic pipe was assumed to perform in a ductile manner; therefore, plastic pipe design focused primarily on stress due to operating pressure. As a result, little consideration was given to stress due to external loading as it was assumed that these stresses would be reduced by localized yielding.
- Experts in gas distribution plastic piping indicate that some of the PE pipe manufactured from the 1960s through the early 1980s has demonstrated poor resistance to brittle-like cracking. There is evidence that some early vintage PE materials have a lower SCG resistance than other PE materials. Newer test methods more accurately predict the pipe’s resistance to SCG.

Aldyl “HD” vs Aldyl “A”

In addition to the Aldyl “HD”, DuPont also manufactured a medium density PE pipe marketed under the name Aldyl “A”. While PSE only purchased and installed the Aldyl “HD” pipe, information on both Aldyl “A” and Aldyl “HD” pipe is included to highlight the similarities and differences in the risks of these two materials. Similar to PSE’s experience with Aldyl “HD”, the Aldyl “A” pipe has been found to be susceptible to brittle-like cracking.

The Aldyl “A” pipe manufactured from 1970 through early 1972 had a manufacturing issue that resulted in a brittle inside surface also referred to as low ductile inner wall (LDIW). This characteristic resulted in premature failures. In early 1972, DuPont changed the manufacturing process to address the LDIW phenomena. While only early 1970s vintage Aldyl “A” pipe had the LDIW inner surface, both Aldyl “HD” and later vintage Aldyl “A” have exhibited brittle-like cracking failure characteristics in pipes 1 ¼” and larger in diameter. The smaller diameter piping is more flexible and not as susceptible to the brittle-like cracking experienced in larger diameters.

Both Aldyl “HD” and Aldyl “A” were made with state-of-the-art PE resins at the time of manufacture and met applicable industry standards and complied with federal regulations. However, by today’s standards they both have low resistance to SCG and are susceptible to SCG field failures. This is particularly true when these pipes are subjected to secondary loads, such as rock impingement and squeeze-off.

Predictions on the Remaining Useful Life Expectancy

PSE consulted with Gas Technology Institute (GTI) to develop data, information, and predictions on the remaining useful life expectancy based on samples of DuPont Aldyl “HD” plastic pipe extracted from PSE’s distribution system. The purpose for the evaluation performed by GTI is to provide additional risk knowledge into the failure mode of DuPont Aldyl “HD” plastic pipe and information on the pipe characteristics, operating conditions, and environmental factors that may impact the material’s performance. This study also provides a means to predict the remaining useful life expectancy of the pipe to validate the current remediation schedule or determine the appropriate remediation timeframe. Based on the testing and analysis performed, the study concludes that the expected useful life is impacted by temperature, operating pressure, and the severity of stress risers.

Based on the evaluation, there may be specific pipelines operating at relatively low pressures that even under extreme stress risers pose minimal risk. These facilities may be deemed to be low risk and not replaced as part of

the Master Plan. The overall pipe replacement strategy will continue to prioritize based on the highest risk pipe from historical performance, however may be adjusted considering the new risk knowledge.

DuPont Aldyl "HD" Plastic Pipe Replacement Program Plan

PSE is actively replacing the larger diameter DuPont Aldyl "HD" plastic pipe that poses an elevated risk of failure. The current plan is to replace this pipe within 20 years beginning in 2013. PSE will continue monitoring the performance of larger diameter DuPont Aldyl "HD" pipe. By acquiring new risk knowledge through DIMP, PSE will update the replacement schedule and timeframe as necessary.

Based on current risk knowledge and historical performance, PSE currently plans to replace approximately 245 miles of larger diameter DuPont Aldyl "HD" plastic pipe within the first 12 years of the 20-year plan beginning in 2013. The plan was updated from 10 years to 12 years due to rising unit costs increasing the time needed to replace 245 miles. The pipe replacement in the first 12 years targets the higher risk population with a history of brittle-like cracking and fusion failures. The schedule should not create an undue burden on rate payers. Throughout the program duration, PSE is able to secure valuable contractor resources to keep a normalized work load while reducing the overall risk. Upon completion of the high risk population, the Master Plan will be reviewed to determine the appropriate replacement schedule for the remaining pipe in service. The current replacement schedule is provided in the Table 5 and Figure 1.

Table 5. DuPont Aldyl "HD" Plastic Pipe Replacement Schedule, Miles, and Estimated Expenditures

Program Years	Total Planned Replacement Miles	Estimated Expenditures[1]
1 – 12	245 Miles	$500.4 million
12 – 20	190 Miles	$547.6 million
Total	**435 Miles**	**$1,048.0 million**

1 Estimated expenditures are in 2023 dollars and do not include AFUDC

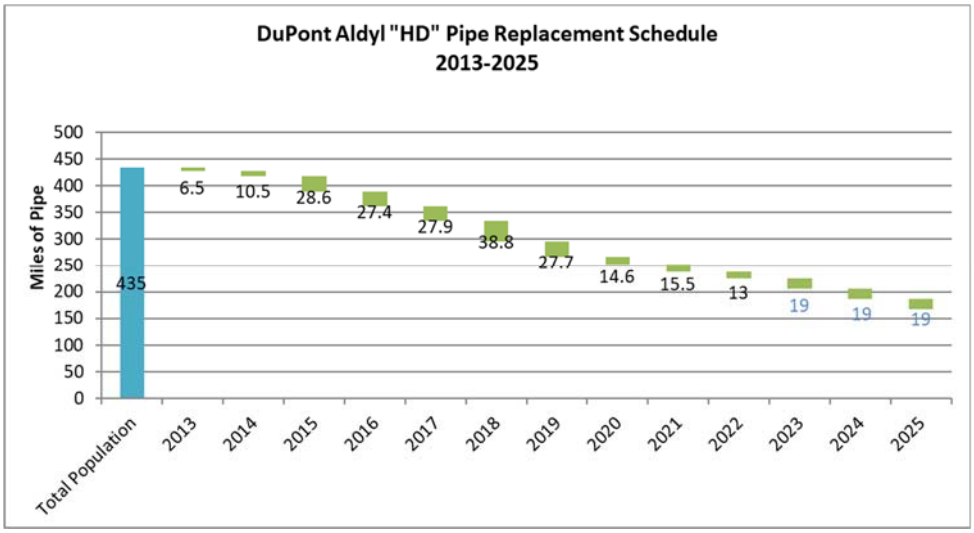

Figure 1. DuPont Aldyl "HD" Plastic Pipe Replacement Schedule
(Black – actuals, Blue – proposed)

Two-Year Plan

The two-year plan is to continue replacing DuPont Aldyl "HD" plastic pipe according to the Master Plan. The following table shows the planned replacement miles and expenditures of DuPont Aldyl "HD" plastic pipe for the current year and in calendar years 2024 and 2025.

Table 6. Planned Replacement Miles and Expenditures

Year	Planned Replacement Miles	Planned Expenditures[1]
2024	19 Miles	$56.4 million
2025	19 Miles	$57.6 million
Total	38 Miles	$110.4 million

1 Estimated expenditures are in 2023 dollars and do not include AFUDC

Adjustments to projects and specific locations will be made as required while managing to the Master Plan and overall system risk.

Identification Plan

PSE purchased and installed DuPont Aldyl "HD" plastic pipe in the 1970s and early 1980s. During this timeframe, PSE also purchased and installed Phillips Driscopipe M8000 and Plexco pipe. PSE's historical construction records did not capture the pipe manufacturer and only indicated the location of the pipe, material type, pipe size, and date the pipe was installed. As a result, PSE developed and implemented a plan in 2013 to identify the manufacturer of larger diameter HDPE pipe installed in the 1970s and early 1980s. The plan focused only on identifying candidate pipe installations that may pose an elevated risk of failure.

Completion of Targeted Excavations

By the end of 2016, PSE completed the targeted excavations to identify locations of DuPont Aldyl "HD" plastic pipe in the system. Locations of the targeted excavations were strategically selected to identify all original installation jobs that potentially contain DuPont Aldyl "HD" plastic pipe. The identification effort confirmed that approximately 2,700 original installation jobs contain some amount of DuPont Aldyl "HD" plastic pipe and finalize the total population.

Ongoing Verification through Routine Operations and Planned Projects

PSE currently captures information on the pipe manufacturer through the Exposed PE Pipe Report whenever plastic pipe is exposed during routine operations and maintenance activities. Additional information is also gathered from confirmation excavations when refining the scope of DuPont Aldyl "HD" pipe replacement projects and opportunities through other planned pipe replacement projects. The information is used to further refine and verify the amount and location of DuPont Aldyl "HD" pipe remaining in service.

5. Buried Meters

Master Plan

Pipeline Integrity Risk Assessment

PSE has identified an increased risk on meter set assembly (MSA) piping where pipe, fittings, or equipment intended for above ground exposure are unintentionally buried. Referred to as "Buried Meters", this condition

occurs when the homeowner/building owner makes changes to the ground elevation in the area of the MSA and may result in hazardous leaks due to corrosion occurring at or near a building wall. Buried meters are identified from routine leak surveys and subsequent field inspections. The remediation strategy may include recontouring the landscaping around the MSA, or complete pipe replacement/MSA relocation, depending on the situation. There are approximately 40,000 reports of buried MSAs in the system and approximately 5,000 new reports are identified each year.

The Buried MSA Remediation Program was first initiated in 2007 in response to increased reports of buried meters through the Abnormal or Unusual Operation Condition Report (Blue Card) as they were identified during routine leak surveys. Through the implementation of DIMP in 2010 the program was identified as a moderate risk relative to other assets in the distribution system. In recent years, there has been an increase in buried meter reports through continuing surveillance activities. Also, more hazardous leaks have occurred due to corroded meter set components over the same time period. In 2018, the risk model identified the buried meter program as a high risk and a new program strategy was developed to reduce the backlog of buried meters. A taller riser design was developed with greater ground clearance to prevent the burial of additional meter sets.

Buried Meter Replacement Program Plan

PSE is actively remediating/replacing buried meters that pose an elevated risk of failure. PSE will continue monitoring the performance of buried meters through DIMP and appropriately update the replacement schedule and timeframe as necessary. For meter sets currently not identified as having an elevated risk of failure, PSE will continue to incorporate new risk knowledge and evaluate whether this population warrants replacement under PRP in the future.

Based on current risk knowledge and historical performance, PSE will remediate approximately 40,000 buried meters within 6 years beginning in 2020. The 6 year term was chosen based on prioritizing higher risk locations first and remediating the remaining identified locations at an accelerated rate. New reports of buried meters will be added to the program as they are found, but adjustments to the program will be made as the impacts of installing the new taller riser are realized to reduce the number of new reports of riser burial or re-burial. The schedule should not create an undue burden on rate payers. Throughout the program duration, PSE is able to secure valuable contractor resources to keep a normalized work load while reducing the overall risk. The current replacement schedule is provided in Table 7.

Table 7. Buried Meter Replacement Schedule, Quantity, and Estimated Expenditures

Program Years	Number of Meters	Estimated Expenditures[1]
1-6	40,000	$35 million

1 Estimated expenditures are in 2023 dollars and do not include AFUDC

Two-Year Plan

The two-year plan is to continue to replace/remediate buried meters according to the Master Plan. The following table shows the planned buried meter remediation and expenditures for 2024 and 2025.

Table 8. Planned Buried Meter Remediation and Estimated Expenditures

Year	Number of Meters	Planned Expenditures[1]
2024	7,000	$6.2 million
2025	7,000	$6.5 million
Total	14,000	$12.7 million

1 Estimated expenditures are in 2023 dollars and do not include AFUDC

Adjustments to projects will be made as required while managing to the Master Plan and overall system risk.

Identification Plan

Meter set assemblies that present an elevated risk of failure are continually monitored by reviewing system information that includes leak survey and patrol data. The population of 40,000 buried meters with an elevated risk of failure was identified in 2019 through continuing surveillance activities. In conjunction with reviewing system performance data, PSE's geographic information system (GIS) is being utilized to proactively identify any new areas that may present an elevated risk of failure. Upon completion of the original population of 40,000 buried meters, the program will be expanded to remediate the new population of buried meters that have been identified since 2019. As of year-end 2022, the population of newly identified buried meters is approximately 53,000.

6. Sewer Cross Bores

Master Plan

Pipeline Integrity Risk Assessment

The threat of sewer cross bores was identified through DIMP as an elevated risk to certain pipe installations. A sewer cross bore is a gas pipeline that has been inadvertently installed through an unmarked sewer pipe. Sewer cross bores occur when trenchless construction methods are utilized to install new natural gas pipe in areas where unmarked sewer lines exist. The state of Washington Damage Prevention Law requires excavators to use a One-call number locator service to alert underground facility owners of intended excavation activities and requires the marking of underground facilities in the area. However, sewer lines, and in particular, sewer laterals have proven to be difficult to locate. Sewer systems are often comprised of pipe that is not electronically locatable and sewer records are lacking in many areas. In addition, sewer lines on private property are the responsibility of the property owner, who does not possess the technology or records to be able to locate their sewer line. Sewer cross bores pose an elevated risk of failure due to the high consequence that would result if damage to the pipe occurs causing gas to leak into the sewer. If there is a sewer cross bore and it causes a blocked sewer, plumbers typically use a drain cleaning machine to clear the blocked sewer which could damage the gas line endangering people and property. Based on PSE's experience, it is more likely for plastic service lines in residential urban areas to be cross bored through sewers. Since 2013, more than 871 cross bores have been found in PSE's system.

A sewer cross bore pilot program was conducted in 2012 and in 2013 the Sewer Cross Bore Program was officially established. Hydromax USA ("HUSA") was selected as PSE's service provider to conduct sewer inspections that would help identify and remediate cross bores associated with new construction as well as sewer cross bores from legacy installations. A public awareness program was also launched to publicize PSE's cross bore safety program to make customers and plumbers aware of the sewer cross bore issue and to call PSE before clearing a sewer. The

Sewer Cross Bore Program activity is tracked in the Continuing Surveillance Annual Report and has identified sewer cross bore as one of the highest risks in PSE's distribution system.

Sewer Cross Bore Replacement Program Plan

PSE is actively remediating pipe that poses an elevated risk from sewer cross bore. Based on detailed analysis of the characteristics associated with previously identified sewer cross bores, PSE, in concert with HUSA, has developed a computer model which assesses the likelihood that a sewer cross bore exists in an area. Utilizing the output of this model, PSE has developed a prioritized and systematic approach for alleviating the elevated risk that sewer cross bores pose. PSE will remediate the risk of sewer cross bore at the identified locations by documenting through inspection that no pipe is installed in the sewer and remediating any pipe that is found to have been cross bored through the sewer. PSE is also reducing the risk of future occurrences of new sewer cross bores being installed by contracting with HUSA to inspect sewer lines at a location after installation of any new gas line by trenchless methods.

The computer model utilizes machine learning algorithms to predict the likelihood that a cross bore exists. The model adjusts and learns as individual locations are confirmed and remediated. Additional locations are incorporated into the model as information is gathered on new side sewer segments, and the highest risk locations are recalibrated by the model. Using the model, PSE identified the top 10% of the model results to clear of risk, which is a population of 60,000 areas where the likelihood of a cross bore is higher. PSE revised the master plan to incorporate information learned during the last two years that a parcel may have multiple sewer segments. The original plan accounted for each parcel having one sanitary sewer. PSE will continue to focus on individual sewer segments and not whole parcels due to the lack of sewer lateral information in many areas. PSE has developed a plan to remediate the risk of sewer cross bore at these identified locations within 9 years beginning in 2019. The schedule should not create an undue burden on rate payers. Throughout the program duration, PSE will continue to incorporate new information to refine the program and adjust the plan as needed. The current schedule is provided in Table 9.

Table 9. Sewer Cross Bore Remediation Schedule, Units, and Estimated Expenditures

Program Years	Cleared Sewer Segments	Estimated Expenditures
1-9	60,000	$40.9 million

Two-Year Plan

The two-year plan will continue to prioritize the highest risk identified locations to remediate the risk of sewer cross bore. The following table shows the planned sewer cross bore remediations and expenditures for calendar years 2024 and 2025.

Table 10. Planned Sewer Cross Bore Remediations

Year	Cleared Sewer Segments	Estimated Expenditures
2024	7,300	$4.7 million
2025	7,300	$4.7 million
Total	14,600	$9.4 million

Adjustments to projects and specific locations will be made as required while managing to the Master Plan and overall system risk.

Identification Plan

The identification of the location of sewer cross bores utilizes a computer model to identify the higher risk pipe segments. Model inputs include pipe installation year, manufacturer, nominal diameter, material, pressure, install method, actual length, and who installed the pipe. Those inputs are then used along with sewer cross bores found in the gas system to identify the higher likelihood pipe segments for cross bore risk. Those segments are the identified locations with higher sewer cross bore risk.

Remediating the risk of a sewer cross bore is performed with a camera inserted in the sewer pipe and then repair or replacement of pipe when a cross bore is found. The program includes sewers in proximity to new gas trenchless installations to confirm that new cross bores are not created and at risk sewers in proximity to legacy trenchless gas installations are identified through the risk model.

7. No Record Facilities

Master Plan

Pipeline Integrity Risk Assessment

No Record Facilities (NRFs) are services that are shown as being active in the mapping system but the aboveground portion cannot be found in the field. If the aboveground portion of the service is not able to be located during leak surveys and patrols then the facility is mapped as "NR" to indicate that no record exists for the cut and cap. NRF's were predominantly identified through the SKIP Program starting in 2016 where the inspection was "skipped" when nothing was found. The remaining ones were identified through the Deactivated Gas Line Inspection Program (DGLI). Through SKIP and DGLI inspections, many NRFs were investigated and found to be live idle risers in very difficult to locate locations or unintentionally bent over and buried. Many of these facilities may still be active and in unknown condition, which poses an elevated risk for Outside Force Damage, and Corrosion adjacent to the building wall.

No Record Facilities Program Plan

An initial population was established based on leak survey and patrols and subsequent inspections through the SKIP and DGLI programs. The program strategy is to excavate at the tie-in to perform a cut and cap or to verify that a previous cut and cap was completed. The current schedule is provided in Table 11.

Table 11. No Record Facilities Remediation Schedule, Units, and Estimated Expenditures

Program Years	Number of Remediations	Estimated Expenditures
1-5	3,000	$15 million

Two-Year Plan

The two-year plan will continue to prioritize the highest risk identified locations to remediate the risk of no record facilities. The following table shows the planned no record facility remediations and expenditures for calendar years 2024 and 2025.

Table 12. Planned No Record Facilities Remediations

Year	Number of Remediations	Estimated Expenditures
2024	100	$0.5 million
2025	400	$2.0 million
Total	500	$2.5 million

Adjustments to projects and specific locations will be made as required while managing to the Master Plan and overall system risk.

Identification Plan

The original population of 3,000 NRFs was identified based on the results of SKIP and DGLI inspections. The ongoing identification of NRFs will also be from the SKIP program when aboveground piping cannot be found during leak survey.

8. Active Leak Reduction

Master Plan – Removed from 2023 PRP

Methane Emissions Risk Assessment

PSE has identified nonhazardous leaks, which include Grade "B" and "C" leaks, occurring in the natural gas distribution system as a high risk for methane emissions due to a potentially longer time leaking. A Grade "B" leak is a leak recognized as being not hazardous at the time of detection, but that justifies scheduled repair based on the potential for creating a future hazard. A Grade "C" leak is a leak that is not hazardous at the time of detection and can reasonably be expected to remain nonhazardous. PSE is committed to eliminating its backlog of active Grade "C" leaks and to reduce the time needed for repairing Grade "B" leaks in order to reduce methane emissions from nonhazardous leaks.

Active Leak Reduction has been removed from the 2023 PRP. The program will continue to be implemented through the multi-year rate plan.

9. Excavation Damage Prevention Measures

Master Plan – Removed from 2023 PRP

Methane Emissions Risk Assessment

Excavation Damage is PSE's leading cause of natural gas leaks and methane emissions in the distribution system and the highest risk from PSE's DIMP risk model. Approximately 800-900 damages occur each year to the gas system, releasing approximately 12,000 metric tons of CO_2e in 2020. The majority of the tactics to reduce damage prevention are not asset based, so they have been removed from the plan but continue to be a focus for PSE.

Excavation Damage Prevention Measures has been removed from the 2023 PRP. The program will continue to be implemented through the multi-year rate plan.

10. Aboveground Meter Set Remediation

Master Plan – Removed from 2023 PRP

Methane Emissions Risk Assessment

PSE has found that the common construction practice of using threaded joints at natural gas meter sets may create more methane release opportunities. In an effort to reduce methane releases, PSE has targeted repair of nonhazardous releases of gas (NARGs) occurring at meter set threaded joints and unions. The gas release is very small and typically only produces small bubbles when leak detection soap is applied. Very sensitive leak detection instruments can also detect the NARG, but normally they are not detectable by people in the area. NARGs are transient based on air temperature and rain can also affect their detection. PSE currently has two leak grades for aboveground facilities, Grade "A" hazardous leaks, and NARG for nonhazardous releases of gas.

Aboveground Meter Set Remediation has been removed from the 2023 PRP. The program will continue to be implemented through the multi-year rate plan.

11. Public Interest

The pipe replacement plans for the materials that pose an elevated risk of failure included in this PRP plan have been developed considering many factors. These factors include:

- Improving the safety of the distribution system by replacing pipe based on the relative level of risk presented for each material and location
- Minimizing the replacement costs by maximizing efficiencies and productivity
- Minimizing the impacts to municipalities and the general public
- Minimizing the methane emissions to protect the environment and public health

12. Rates Impact

There is no immediate incremental impact on rates from this plan as the Company is not asking for a cost recovery mechanism for the identified programs. While there is no immediate impact on rates, future impacts could occur due to identification and replacement of pipelines with an elevated risk of failure and would be incorporated into a future Multi-Year Rate Plan.