Quarterly Report - Public

Date of Report: *3rd Quarterly Report – June 30, 2023*

Contract Number: *693JK32210010POTA*

Prepared for: *DOT PHMSA*

Project Title: ***Risk-Based Decision Support for Rehabilitation of Natural Gas Distribution Pipelines***

Prepared by: *GTI Energy*

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For quarterly period ending: *June 30, 2023*

1: Work Performed During this Quarterly Period

Completed Task 1 - Kick-off Meeting and Technical Advisory Panel: This task included identifying current pipeline rehabilitation systems and related material properties and performance. The Interim Report on this task was submitted last quarter.

Working on Task 2 – Identify Threats and Relative Importance. This work includes the evaluation of outside force, natural force, excavation damage, and corrosion threats on aged pipelines. Outside and natural forces mainly include earth movement, flooding, and thermal loads.

The 3rd quarterly deliverable is this quarterly report as shown in Figure 1.

Technical and Deliverable Milestone Schedule								
Item No.	Task No. (per proposal)	Activity/Deliverable ACTIVITY/DELIVERABLE	Quarter No.	Expected Completion Date/Mos	Payable Milestone TITLE	Federal Payment	Resource-Share	*Total
5	8	Quarterly Status Report	3	9 months	Submit 3rd quarterly report	3,441.00	1,820.00	5,261.00
		Third Payable Milestone	**3**	**9 months**	**SUBTOTAL**	**3,441.00**	**1,820.00**	**5,261.00**

Figure 1 – 3rd Quarterly Deliverable – June 30, 2023

2: Project Financial Tracking During this Quarterly Period

Figure 2 shows the project expenditures at the end of the 3rd Quarter.

3: Project Technical Status

An Interim Report, in the Attachment, includes the quarterly technical report.

4: Project Schedule

Figure 3 shows the project schedule and progress as of the end of third quarter. No time-related issues are reported in this quarter.

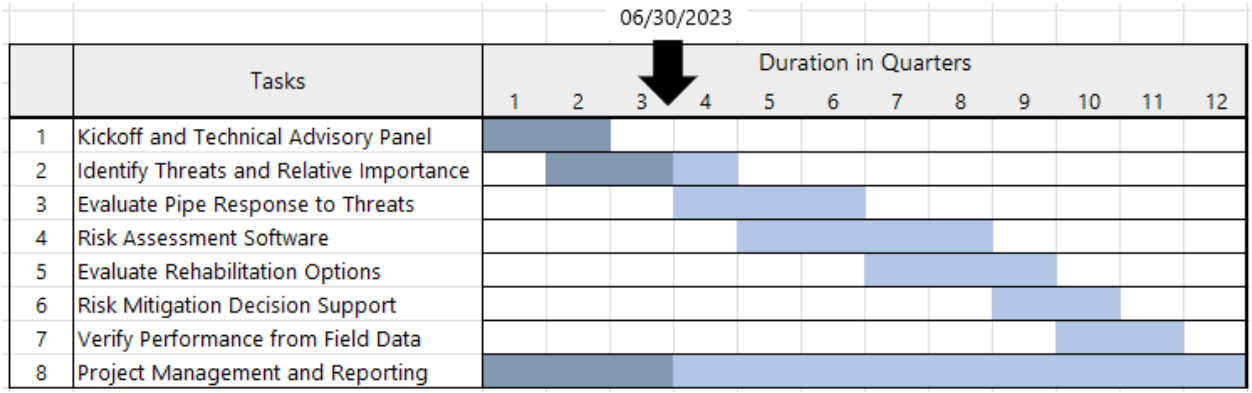


Figure 3 - Project time schedule

Task 2 - Identify Threats and Relative Importance

Identify Threats and Relative Importance: Outside force, natural forces, excavation damage, and corrosion are main threats to aged pipelines. Outside and natural forces mainly include earth movement, flooding, and thermal loads.

For cast iron pipes, damage due to these forces mostly occurs at the joints. Table 1 shows the root causes and damage indicators from these threats. Soil deformations imposed by these forces are typically unrecoverable, causing pipe breakage and permanent deformations at the joints.

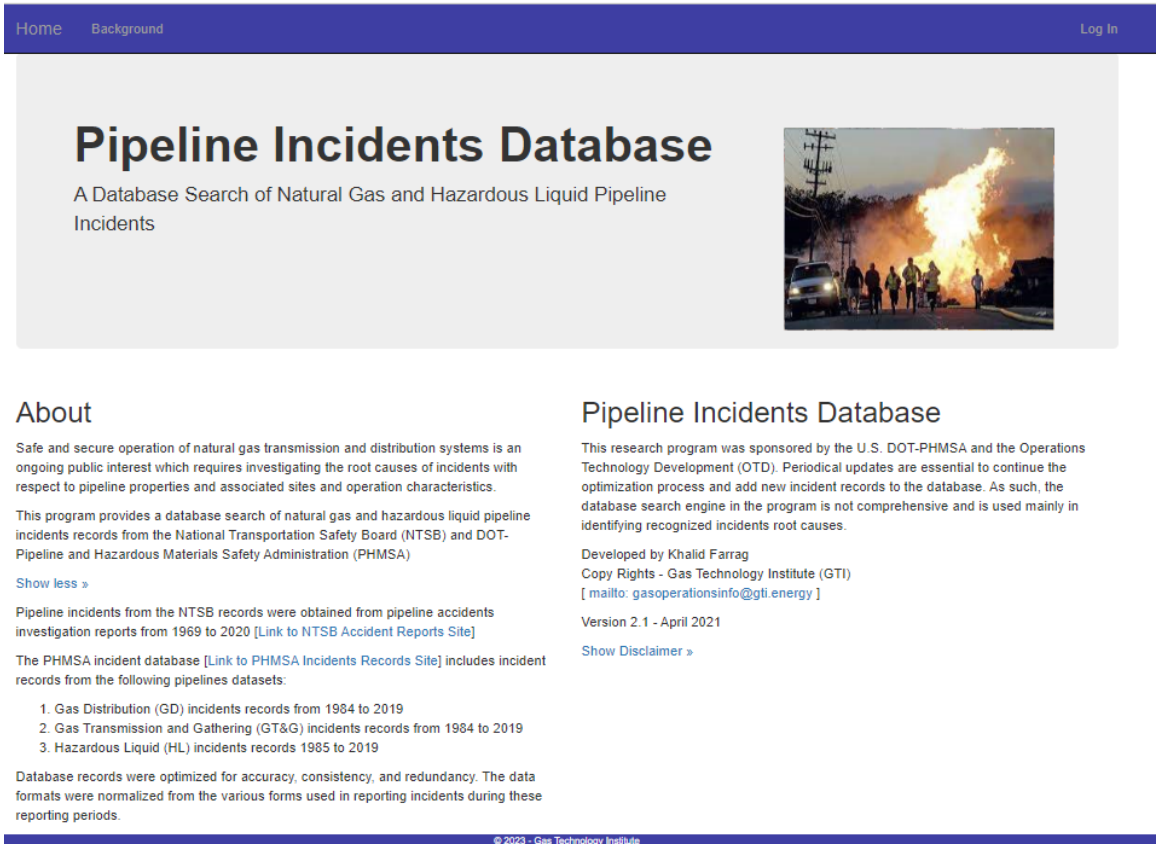
Work in this task identify the threats and consequences of these root causes. Data for this analysis will be obtained from PHMSA and utility records and geographical data to identify probabilities of failure from pipe and site characteristics.

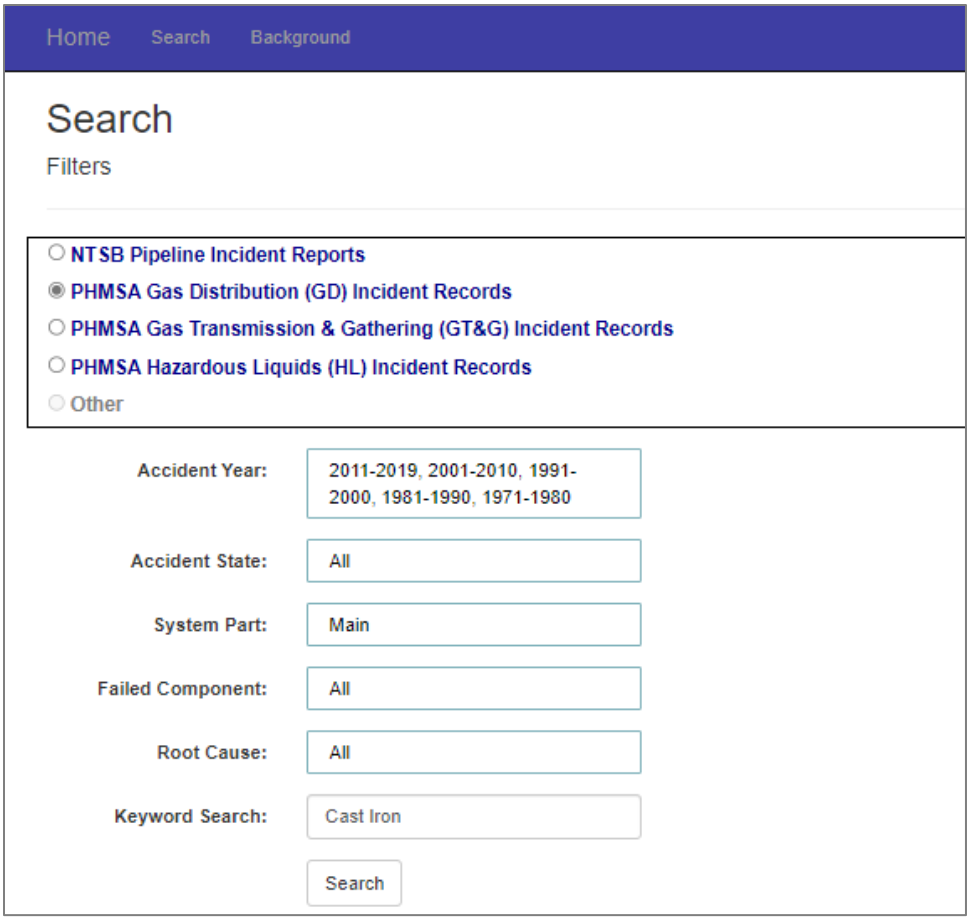
This task investigates PHMSA Incident data and reports for natural gas distribution pipelines from 1970 to 2019. These records were stored in an SQL database in Azure cloud server for access and analysis. A web-based data management program was developed for searching, processing, and displaying records of these incidents. The relationships and distributions of the incidents' parameters are investigated using a reporting tool in Microsoft Power BI to customize data display and run queries.

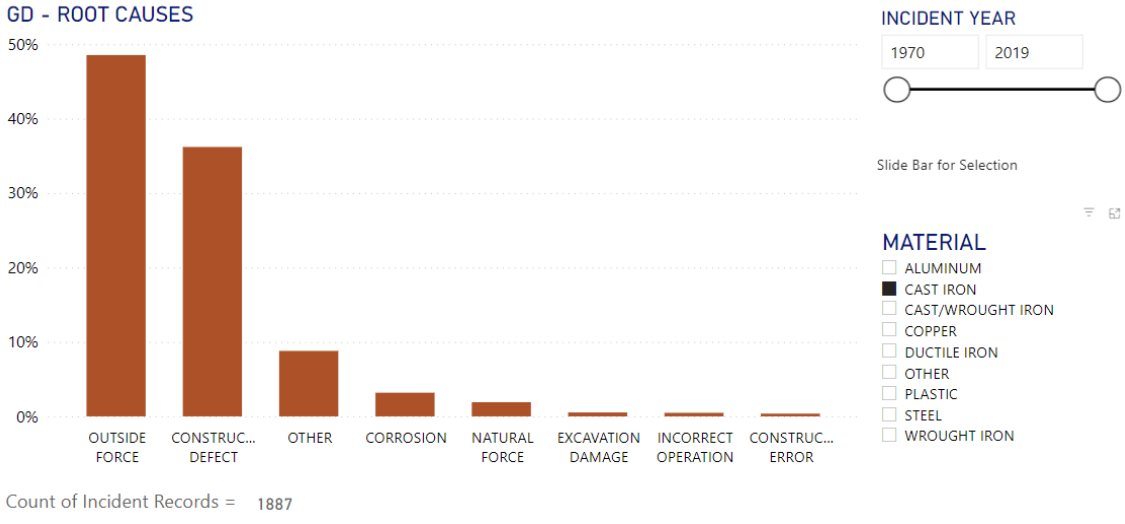
The following figures show the web-based program and search engine used in identifying pipeline incident threats.

Table 1. Main Threats and Damage Indicators in Cast Iron Pipes

Failure Type	Root Cause of Failure	Damage Indicators
Structural Failure	Pitting and graphitization corrosion	Coating damage, wall loss, graphitization, pitting leaks, and pressure loss
	Manufacturing defects	Cracks on pipe body and bell joints
	Soil movement, seismic loads, loss of bedding, thermal contraction	Circumferrential cracks, pipe uplift, frost regions, crack leaks
	Internal Pressure, external loading	Longitudinal cracks
Leaks	Soil movment, seismic loads, loss of bedding, thermal contraction	Pipe movement, loss of support, joint leaks







Count of Incident Records = 1887

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