Energy & Environmental Research Center

Pipeline Study, Phase III

Responding to the North Dakota Legislature's Mandate Set Forth in HB1347

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Language of HB 1347

SECTION 3. OIL AND GAS RESEARCH FUND - CONTINUATION OF PIPELINE LEAK DETECTION STUDY - EXEMPTION - REPORT TO THE LEGISLATIVE MANAGEMENT.

The industrial commission shall use $500,000, or so much of the sum as may be necessary, from the oil and gas research fund to contract with the energy and environmental research center to continue a study regarding pipeline leak detection technology, for the biennium beginning July 1, 2017, and ending June 30, 2019. The study must include an analysis of leak detection and monitoring technology and a risk assessment of new and existing pipeline systems. Notwithstanding any oil and gas research program policies, the contract does not require matching funds. The energy and environmental research center shall provide a report to the industrial commission and the legislative management by September 30, 2018, regarding the results and recommendations of the study.

Proposed Phase III Is an Extension of Phases I and II

Project Prescribed by HB 1358 *(2015)*

Project focused on conducting analysis of crude oil and produced water (gathering) pipelines.

Phase I – Study

- Analyze existing regulations.
- Determine feasibility and cost-effectiveness of leak detection technology.
- Report to Industrial Commission and Legislature.

Phase II – Demonstration Project

- Evaluate pipeline leak detection and monitoring systems.
- Three operators in this room participated.

EERC

Critical Challenges. Practical Solutions.

Goals and Objectives of Phase III

- Goal
  - Reduce frequency and total volume of leaks and spills from ND liquid gathering pipeline systems.
- Objectives
  - Improve industry and state knowledge of the factors influencing leaks and spills.
  - Determine risk factors that increase the likelihood and severity of impact of a pipeline leak.
  - Create a process template that enables operators to evaluate and prioritize risks.
  - Assess known mitigation options & identify risk factors they are suited to address.
  - Identify continuous improvement methodologies for use in the liquid gathering pipeline sector & suggest mechanisms for measuring success in CI protocols.

Proposed Scope of Work of Phase III

$500k Base Tasks

- Task 1 – Pipeline Stakeholder Group Recruitment, Definition, and Leadership
- Task 2 – Assessment of Risk Factors
- Task 3 – Analysis of Possible Strategies for Continuous Improvement

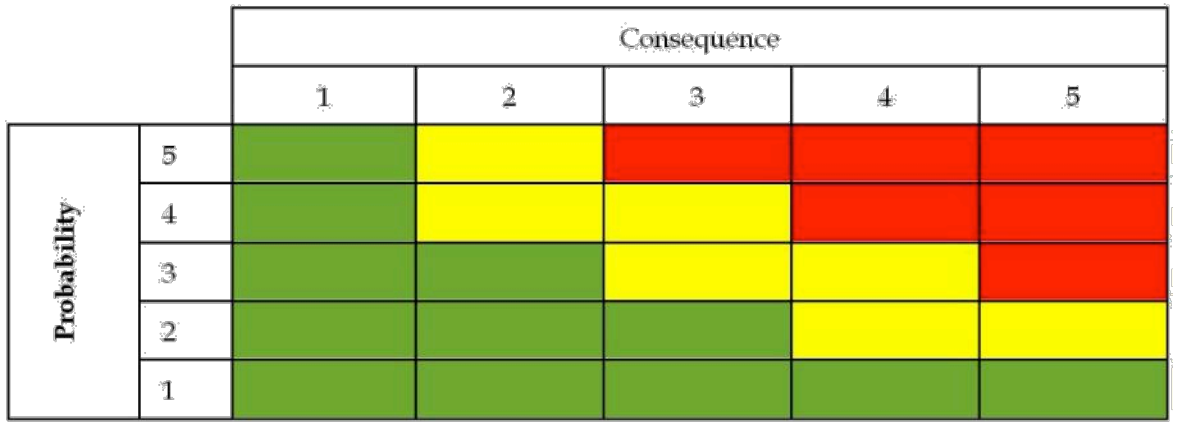
$354k Optional Tasks

- Task 4 – Analysis of the Effects of Mixed-Composition Flowback within Liquid Gathering Pipelines
- Task 5 – Analysis of the Use of Polyethylene Risers
- Task 6 – Investigation of the Use of Pinch-Off to Temporarily Stop Flow During Pipeline Repairs
- Task 7 – Assessment of the Potential for Frost Heave to Damage Liquid Gathering Pipelines in North Dakota

Task 1 – Stakeholder Group

- Project requires input from pipeline operators (similar to Phase I).
- Stakeholder group will be convened to contribute industry knowledge of semi-quantitative risk assessment of pipelines.
  - The EERC will begin with an informational day intended to ensure a common starting point for all participants.
  - The EERC will facilitate a period of problem definition with stakeholders.
- Regular stakeholder meetings and one-on-one discussions with individual stakeholders will advance the discussion and provide opportunities to exchange information and share lessons learned.

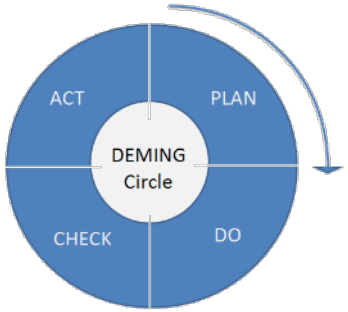
Task 2 – Assessment of Risk Factors

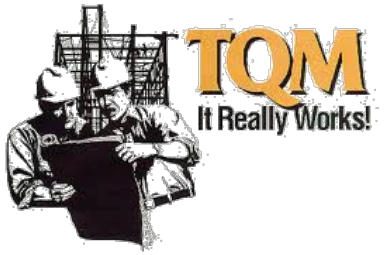


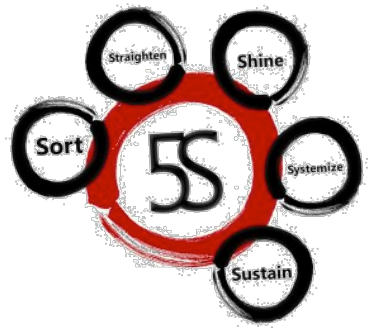
- Identify and adapt possible options for risk assessment architectures.
- Investigate specific candidate risk factors for inclusion in generating semi-quantitative risk scores.
  - Equipment-specific factors and situational factors will be evaluated.
  - Industry and the EERC will determine relative weights to apply to these risk factors for use in a semi-quantitative risk scoring formula.
- Summarize technologies that may be layered to mitigate the risks presented.

Task 3 – Continuous Improvement

- Examine approaches to CI for compatibility with the gathering pipeline industry.
- Investigate available methodologies to measure CI in the pipeline operations sector.
- Recommendations potential applications of these principles to industry and state.







Task 4 – Analysis of Effects of Mixed-Composition Flowback

- Investigate available literature on this topic to determine known frequency of occurrence, known resulting issues, and available mitigation steps to either avoid or rectify the potential issues.
- Survey industry to determine frequency of practice specific to Bakken operations.
- Solicit information from industry to conduct case studies to further detail results of this practice.
- Perform modeling to predict possible limits of the practice before adverse effects are realized in pipeline flow and pipeline operations.

Task 5 – Analysis of the Use of Polyethylene Risers

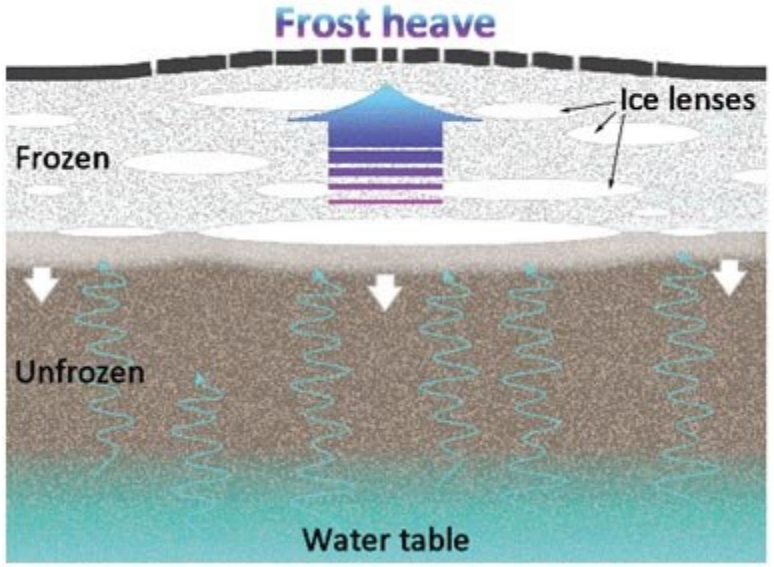
- Query pipeline operators to derive a statistical approximation of the frequency of use of this practice and any known effects.
- Document any known failures and summarize any potential risks and benefits in a report to NDDMR and NDIC.
- Recommend situational employment, depending upon the results of the investigation.

Task 6 – Investigation of the Use of Pinch-Off to Temporarily Stop Flow During Pipeline Repairs

- Summarize discussions held on the topic to date and summarize ASTM's work.
- Seek to engage with the ASTM committee reviewing existing standard practice documents in an effort to contribute to efforts to revise the documents.
- Perform independent mechanical evaluation testing of pinch-off procedures prescribed by the ASTM documents to assess potential effects of the procedures on pipeline integrity.
- Design and build a mechanical test cell to perform this testing.
- Deviation to the codified procedures will be explored to determine sensitivity of pipeline integrity to procedural mistakes in the field.

Task 7 – Assessment of the Potential for Frost Heave to Damage Liquid Gathering Pipelines in North Dakota

- Conduct a preliminary assessment of the threat of upheaval based on geotechnical knowledge and study of documented analog events.
- Determine whether cause exists to warrant further investigation.



Anticipated Results

Base Tasks

- Inform state and industry entities on possible approaches to risk assessment
- Provide a rubric that can be used to generate semi-quantitative risk scores
- Recommend appropriate layering of risk mitigation steps
- Match technologies to various risk situations, and highlight risk categories in need of additional technological mitigation options
- Investigate approaches to continuous improvement processes

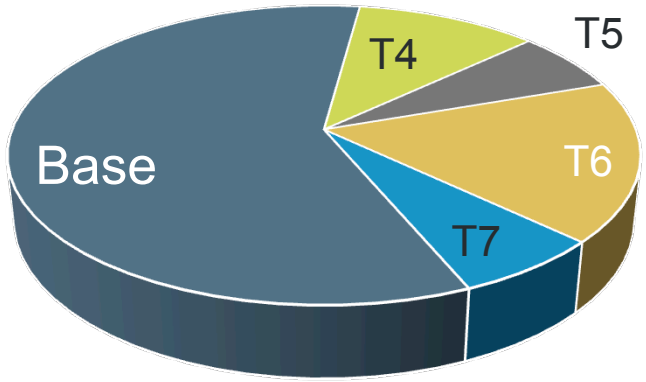
Options

- Greater knowledge of the potential risks associated with these practices of concern

Big Picture

- Layered approach to risk mitigation in high-risk areas will result in fewer pipeline leaks, improved public relations, decreased environmental impact, decreased cleanup costs, and improved media narrative.

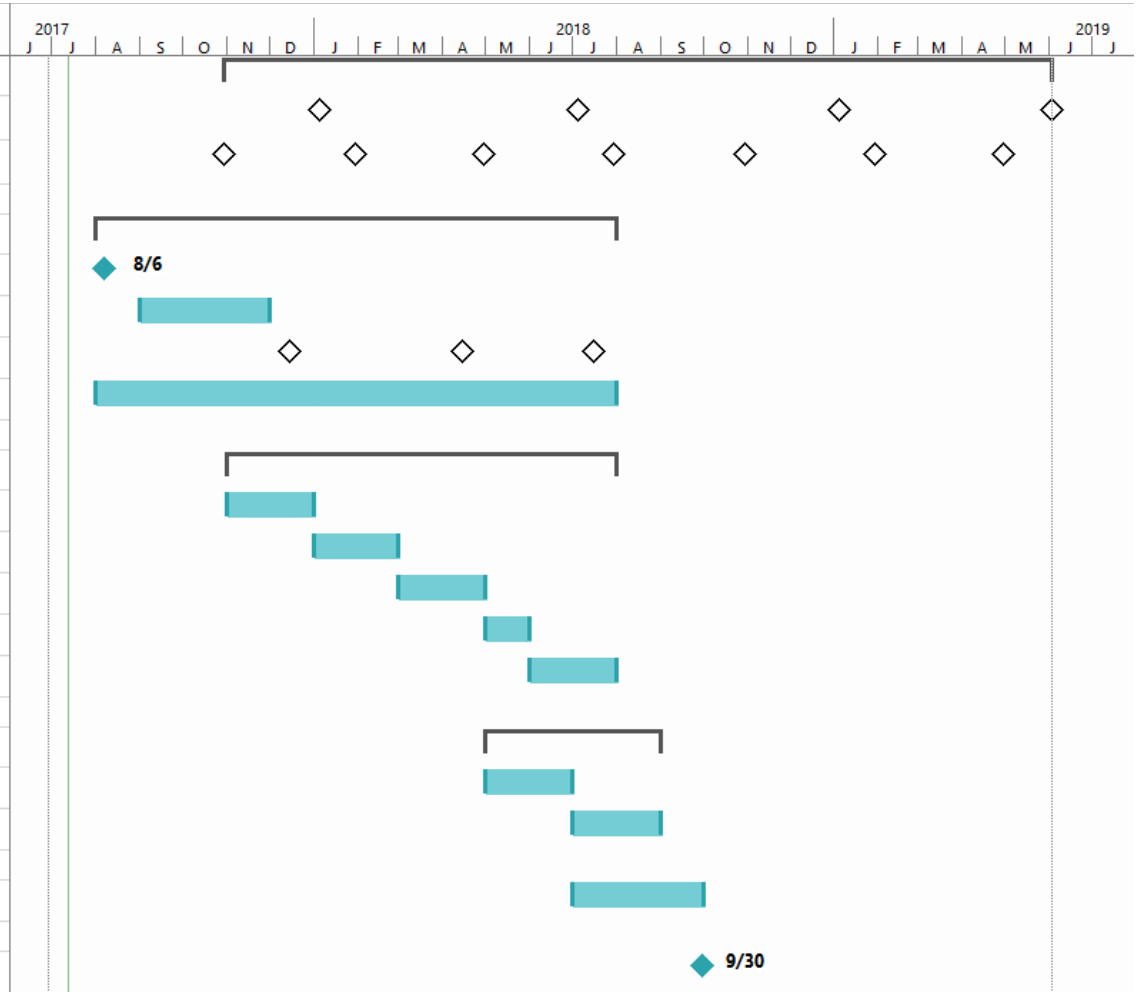
Proposed Budget



CATEGORY	CORE TASKS (1–3)	OPTIONAL				
		Flowback TASK 4	PE Risers TASK 5	Pinch-Off TASK 6	Heave TASK 7	TOTAL
Total Labor	$311,790	$59,304	$34,124	$71,824	$34,124	$199,376
Travel	$2,258	$ –	$944	$3,900	$944	$5,788
Equipment > $5000	$ –	$ –	$ –	$20,000	$ –	$20,000
Supplies	$3,979	$1,200	$780	$5,000	$780	$7,760
Communications	$750	$100	$100	$ –	$100	$300
Printing & Duplicating	$773	$200	$200	$200	$200	$800
Food	$1,000	$ –	$ –	$500	$ –	$500
Rents & Leases	$1,500	$ –	$ –	$ –	$ –	$ –
Laboratory Fees & Services						
Graphics Service	$10,176	$1,357	$1,357	$3,392	$1,357	$7,463
Total Direct Costs	$332,226	$62,161	$37,505	$104,816	$37,505	$241,987
Facilities & Admin. Rate – % of MTDC	$167,774	$31,391	$18,940	$42,832	$18,940	$112,103
Total Project Costs – U.S. Dollars	**$500,000**	**$93,552**	**$56,445**	**$147,648**	**$56,445**	**$354,090**

Proposed Schedule

Task Name
Project Management
Semi-Annual OGRC/NDIC Briefings
Quarterly Reports to NDIC
Task 1 -- Pipeline Stakeholder Group
Informational day with industry
Problem definition by industry stakeholders
Regular stakeholder meetings
Individual stakeholder engagement
Task 2 -- Assessment of Risk Factors
Develop options for risk assessment architecture
Investigate possible risk factor candidates
Analyze risk factor candidates
Formulate scoring approaches for risk assessment
Identify mitigations for individual risk factors
Task 3 -- Analysis of Possible Strategies for Continuous Improvement
Adapt established formal CI methodologies
Investigate mechanisms to measure CI
Final Reporting
Final Report Due



NOTE: Optional tasks, if approved, will overlap with this schedule

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