



April 25, 2024

Mr. Reice Haase  
Deputy Executive Director  
North Dakota Industrial Commission  
600 East Boulevard Avenue, Department 405  
State Capitol, 14th Floor  
Bismarck, ND 58505-0840

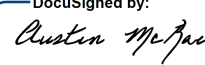
Dear Mr. Haase:

Subject: Quarterly Progress Report Entitled “iPIPE 1.0: intelligent Pipeline Integrity Program,”  
Contract No. G-046-88; UND Project – Fund 43500-UND0022445; EERC Funds  
23121 and 24817

Attached is the quarterly progress report on the subject project for the period of January 1,  
2024 – March 31, 2024.

If you have any questions, please contact me by phone at (701) 777-5402 or by email at  
amcrae@undeerc.org.

Sincerely,

DocuSigned by:  
  
2CF0ADB88C44D7...

T. Austin McRae  
Oilfield Operations Specialist

TAM/rlo

Attachment

c: Brent Brannan, North Dakota Industrial Commission  
Erin Stieg, North Dakota Industrial Commission



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# IPIPE – INTELLIGENT PIPELINE INTEGRITY PROGRAM

Quarterly Progress Report

*(for the period of January 1, 2024 – March 31, 2024)*

*Prepared for:*

Reice Haase

North Dakota Industrial Commission  
600 East Boulevard Avenue, Department 405  
State Capitol, 14th Floor  
Bismarck, ND 58505-0840

Contract No. G-046-88

*Prepared by:*

T. Austin McRae  
Michelle R. Olderbak  
Darren D. Schmidt

Energy & Environmental Research Center  
University of North Dakota  
15 North 23rd Street, Stop 9018  
Grand Forks, ND 58202-9018

April 2024

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**iPIPE – INTELLIGENT PIPELINE INTEGRITY PROGRAM**  
**Quarterly Progress Report**  
**January 1 – March 31, 2024**

**EXECUTIVE SUMMARY**

This document is a quarterly report for activity conducted by the intelligent Pipeline Integrity Program (iPIPE), led by the Energy & Environmental Research Center, for the North Dakota Industrial Commission’s Oil and Gas Research Program. The goal of iPIPE is to develop and demonstrate cutting-edge technology that can prevent and/or detect pipeline leaks.

Activity in Quarter 1 2024 focused on one remaining project:

Dedicated space-based hyperspectral imaging – Orbital Sidekick (OSK) is a company that is providing unmatched resolution for hyperspectral imaging from space to identify right-of-way threats and hydrocarbons including methane. iPIPE supported OSK in the first launch of its Aurora satellite via SpaceX rideshare in 2021. The learnings from the Aurora program in 2022 were applied to OSK’s GHOS—Global Hyperspectral Observation Satellite— constellation, which launched and commissioned the first three of a planned six satellites in 2023. OSK vertically integrates satellite technology to better service commercial clients.

OSK continued to focus attention on the deployment of the GHOS constellation and services into 2024. The fourth and fifth GHOS satellites were launched on March 4, 2024, with more robust design elements incorporated based on the experience from the iPIPE-supported Aurora launch and commissioning process in 2021–2022 and the first three GHOS satellites launched in 2023. Processes and methodologies for capturing, downlinking, and processing hyperspectral imagery from the initial GHOS satellites were continually refined and streamlined through the quarter. iPIPE and OSK have continued to work collaboratively through the difficulties of demonstrating emerging space-based technologies in the midstream industry.

The OSK subcontract was extended to the end of 2024 to accommodate up to 10 data captures over an area of interest defined by iPIPE. OSK is presently collecting the first data capture. The frequency of data capture is yet to be shown and is a potential risk to completing the project by year’s end.

**iPIPE – INTELLIGENT PIPELINE INTEGRITY PROGRAM**  
**Quarterly Progress Report**  
**January 1, 2024 – March 31, 2024**

**BACKGROUND**

During a May 2017 meeting with North Dakota pipeline operators, Governor Doug Burgum challenged industry to apply advanced technologies to eliminate pipeline leaks in North Dakota. In response to the governor's challenge, industry chose a proactive path and engaged in a 3½-year program, led by the Energy & Environmental Research Center (EERC), to advance the development and application of emerging technologies to prevent and detect pipeline leaks. The intelligent Pipeline Integrity Program (iPIPE) assists in the development of multiple emerging technologies to prevent and detect pipeline leaks by engaging with technology providers to refine not-yet-commercial products specifically for pipelines in North Dakota and demonstrate technology application. This goal is supported by accomplishment of the following objectives:

- Select the most promising emerging (near-commercial) technologies for demonstration.
- Assist technology providers in refining their products.
- Demonstrate multiple technologies on pipelines.
- Document results of technology demonstrations.
- Facilitate the adoption of technologies into North Dakota pipeline operations.

Multiple demonstrations of emerging technologies on working pipelines will simultaneously assist technology providers in refining designs, pave a path toward full commercialization in the North Dakota market, prepare pipeline operators to adopt the new tools, and improve pipeline integrity.

Members of the industry-led consortium that provided funding for iPIPE 1.0 include DCP Midstream, Enbridge, Energy Transfer Partners, Equinor, Goodnight Midstream, Hess Corporation, Marathon Petroleum Logistics (MPLx), Oasis Midstream, ONEOK, TC Energy, and Whiting Petroleum.

The following quarterly report summarizes the program activities from January 1, 2024, through March 31, 2024.

**ACCOMPLISHMENTS DURING REPORTING PERIOD**

- Program-level activities
  - Program management
    - ◆ No additional iPIPE 1.0-specific program activities outside of the routine occurred this quarter.
  - Program meetings

- ◆ On January 19 and March 15, 2024, iPIPE held monthly member meetings to update all members on program status. No significant motions were provided by the membership in relation to the OSK iPIPE 1.0 subcontract. No monthly member meeting occurred in February because of the iPIPE Member Forum held January 31–February 1, 2024.
- ◆ On January 31–February 1, 2024, iPIPE members gathered for the iPIPE Member Forum in Houston, Texas. Main topics included review and status updates for iPIPE 2.0 projects, discussion around common challenges and technology efforts, and goals for iPIPE 3.0.
  
- Technology selection
  - The EERC continues to engage with companies from around the globe, offering emerging (not yet commercial) technologies. Additional technology providers were sought through iPIPE 3.0.
  
- Demonstration execution – OSK
  - OSK launched GHOS<sub>t</sub> 4 and 5 aboard the SpaceX Transporter-10 mission on March 4, 2024.
  - OSK continued to develop and refine the data capture and spectral analysis capabilities of the three GHOS<sub>t</sub> satellites already in orbit.
  - The first data capture over the three iPIPE areas of interest (AOIs) continued.
  - OSK and iPIPE continued to meet biweekly throughout the quarter to discuss progress and upcoming events.
  
- Demonstration execution – Satelytics Phase IV
  - Satelytics completed its analysis of land movement detection using a current stereo pair of images and stereo pairs-generated historical data.
  - The independent EERC evaluation report for this task has been drafted and is under internal review.
  
- Demonstration execution – Pipeline-Risk
  - Pipeline-Risk delivered its final report, completed constructing a risk-learning system for gathering lines, and demonstrated its abilities using member-provided data.
  - The independent EERC evaluation report is being drafted.
  
- Demonstration execution – TOKU
  - TOKU has completed its demonstration of pipeline-monitoring equipment, analysis of leak simulation data, and refinement of algorithms and has submitted its final report.
  - The independent EERC evaluation report for this task has been drafted and is under internal review.

## MEMBERSHIP AND FINANCIAL INFORMATION

The original budget proposed to the North Dakota Industrial Commission (NDIC) Oil and Gas Research Program (OGRP) totaled \$3,714,000, as shown in Table 1. To demonstrate additional resources provided by new members, additional financial commitment from NDIC, and significantly increased in-kind cost share provided by technology providers and program members, an updated budget is presented in Table 2. This table demonstrates the rapid growth of this program. Table 3 presents greater detail on the expected budget and actual expenses incurred by the program to date.

**Table 1. iPIPE Original Budget**

<b>Sponsors</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
NDIC – Cash	\$403,320	\$405,226	\$393,454	\$398,000	\$1,600,000
Industry – Cash	\$264,000	\$450,000	\$450,000	\$450,000	\$1,614,000
Industry and Technology Provider – In-Kind	\$125,000	\$125,000	\$125,000	\$125,000	\$500,000
<b>Total</b>	<b>\$792,320</b>	<b>\$980,226</b>	<b>\$968,454</b>	<b>\$973,000</b>	<b>\$3,714,000</b>

**Table 2. iPIPE Updated Budget**

<b>Sponsors</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
NDIC – Cash	\$565,909*	\$735,730*	\$438,772*	\$859,589	\$2,600,000
Industry – Cash	\$352,000*	\$700,000*	\$850,000*	\$675,000	\$2,577,000
Industry and Technology Provider – In-Kind	\$525,878*	\$1,074,077*	\$949,051*	\$500,000	\$3,049,006
<b>Total</b>	<b>\$1,443,787</b>	<b>\$2,509,807</b>	<b>\$2,237,823</b>	<b>\$2,034,589</b>	<b>\$8,226,006</b>

\* Reflects actuals for these years.

**Table 3. iPIPE Expected Budget and Expenses to Date**

<b>Sponsors</b>	<b>Expected Budget</b>	<b>Actual Expenses as of 3/31/2024</b>	<b>Balance Remaining of Expected Budget</b>
<b>NDIC Share – Cash</b>	\$2,600,000	\$2,440,258	<b>\$159,742</b>
<b>Industry Share – Cash</b>	\$2,577,000	\$2,431,712	<b>\$145,288</b>
<b>Industry – In-Kind</b>	\$375,000		
		<i>DCP</i>	\$60,500
		<i>Enbridge</i>	\$126,436
		<i>Equinor</i>	\$153,230
		<i>Goodnight</i>	\$37,135
		<i>Hess</i>	\$228,093
		<i>MPLx</i>	\$17,936
		<i>Oasis</i>	\$40,069
		<i>ONEOK</i>	\$5,000
		<i>Whiting</i>	\$9,042
		<i>TransCanada USA</i>	\$0
		<i>Dakota Access, LLC</i>	\$0
<b>TOTAL</b>	\$375,000	\$677,441	<b>\$0</b>
<b>Technology Providers – In-Kind</b>	3,076,597	<i>Satelytics</i>	\$1,713,450
		<i>Direct-C</i>	\$185,867
		<i>Ingu</i>	\$88,266
		<i>Orbital Sidekick</i>	\$1,321,061
		<i>TOKU</i>	\$190,990
		<i>Pipeline Risk</i>	\$50,000
<b>TOTAL</b>	\$3,076,597	\$3,549,634	<b>\$0</b>
<b>Total</b>	<b>\$8,628,597</b>	<b>\$9,099,046</b>	<b>\$305,030*</b>

\* This amount does not include industry in-kind contributions in excess of the expected budget.

Project progress is shown in Figure 1.

## FUTURE ACTIVITIES

The planned activities for the next quarter are detailed below:

- Program-level activities
  - The EERC will work with consortium members and stakeholders to continue iPIPE on its successful path beyond the original 2018–2021 timeline with iPIPE 2.0 and 3.0.
  - iPIPE will continue ongoing discussions while starting new ones with potential program members.

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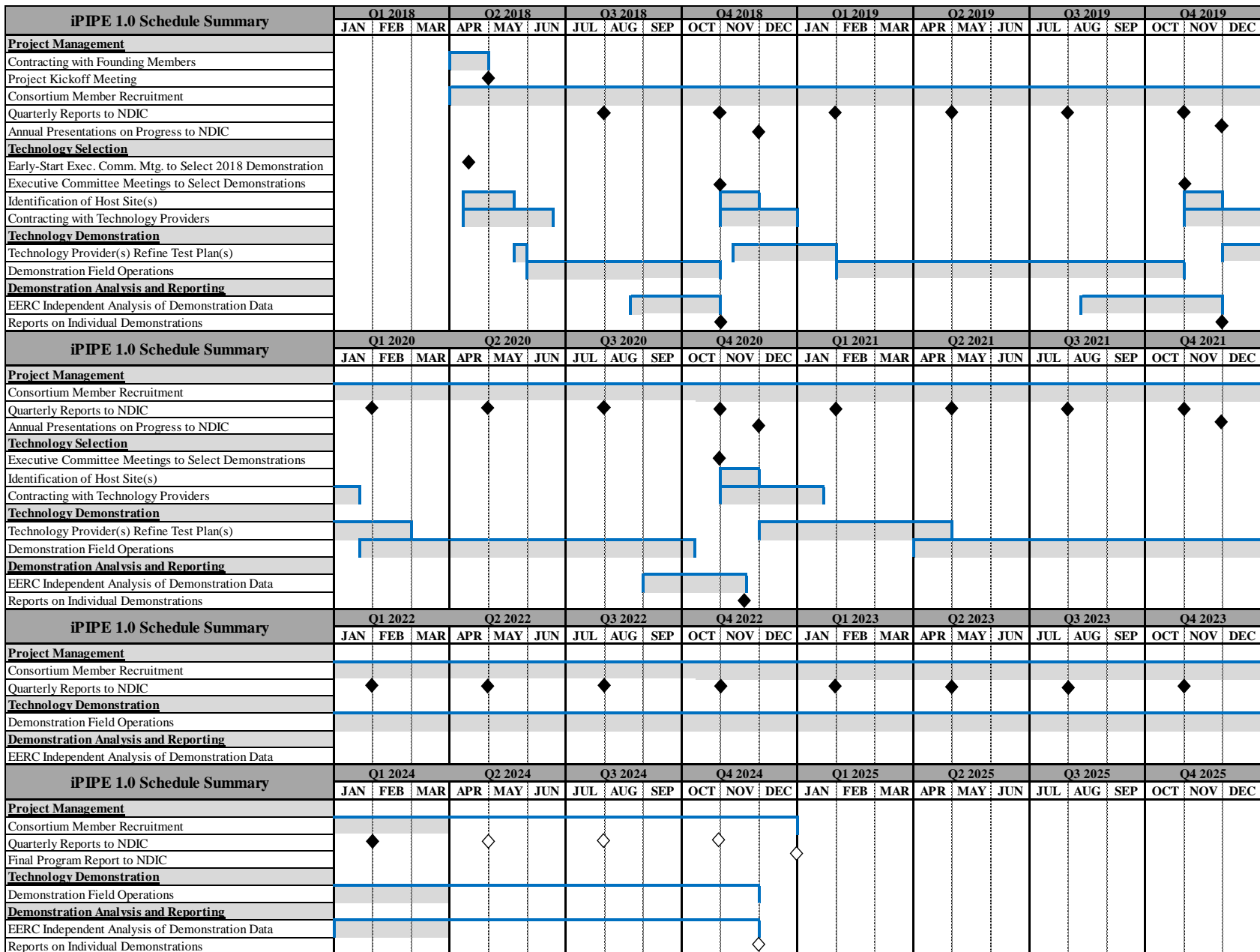


Figure 1. Project progress.

- Technology selection
  - The EERC will remain engaged with and on the lookout for providers of relevant, promising, emerging technology as iPIPE continues beyond its original 3½-year timeline with iPIPE 3.0.
  
- Demonstration execution – OSK
  - Proof of commissioning for the second GHOSSt satellite is expected early in Quarter (Q)2 2024.
  - The first full data capture over iPIPE AOIs is now expected in Q2 2024, with the hope the second data capture can also be completed then.
  - GHOSSt 6 is still tentatively scheduled for launch in Q3–Q4 2024. The additional satellite will ideally increase data capture frequency.
  
- Demonstration execution – Satelytics Phase IV
  - The EERC will complete and distribute its independent review of this project. This will result in full project completion.
  
- Demonstration execution – Pipeline-Risk
  - The EERC will complete and distribute its independent review of this project. This will result in full project completion.
  
- Demonstration execution – TOKU
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