# **Internal Quarterly Report**

**Date of Report:** 4<sup>th</sup> Quarterly Report – September 30, 2022

Contract Number: #693JK3211RA0001

**Prepared for: PHMSA DOT** 

Project Title: Assessment of Nondestructive Examination (NDE) and Condition Monitoring

Technologies for Defect Detection in Non-Metallic Pipe

Prepared by: EWI

Contact Information: Meghan Harley Yugulis MYugulis@ewi.org 614-688-5279

For quarterly period ending: September 30, 2022

### 1: Items Completed During this Quarterly Period:

The fourth quarterly update was completed during Quarter four.

Item	Task	Activity/Deliverable	Title	Federal	Cost
#	#			Cost	Share
9	10	Submit 4 <sup>th</sup> Quarterly Report	4 <sup>th</sup> Quarterly Status	\$89,299.50	0.00
		-	Report & Quarterly		
			collaboration		
			meeting		

#### 2: Items Not Completed During this Quarterly Period:

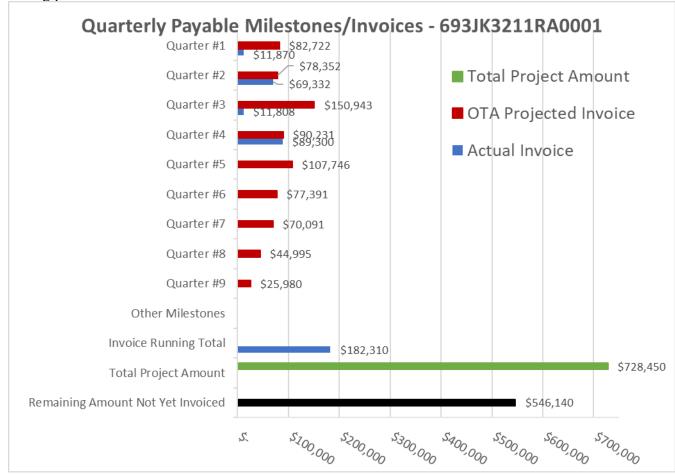
The NMP Sample matrix had been internally completed, however we received additional pipes June 20<sup>th</sup> and June 24<sup>th</sup>, those pipe details were added to the matrix. The pipes were sent off to CT scan in the last quarter and results will be used to determine further testing plans. EWI has drafted the NDE procedures for all the internal methodologies and has requested quotes a second time from vendors for NDE methodologies we will be hiring out. Those POs need to be finalized before we receive their procedure paperwork. These will be evaluated and added to our procedures before submission.

Item	Task	Activity/Deliverable	Title	Federal	Cost
#	#			Cost	Share
3*	2	NMP sample matrix detailing type of	Prepare detailed	\$30,540.73	\$66,782.84
		pipe and defects, anomalies or damage	matrix of NMP		
		per sample	samples		
4*	3	Develop NDE procedures for inspection	Completion of		
		of NMP samples using non-contact and	written NDE	\$49,331	\$20,310
		3 coupled UT methods, microwave	procedures		
		inspection method and 2 thermography			
		methods			

#### 3: Project Financial Tracking During this Quarterly Period:

The actual spend is behind planned.

- Task 2 As of 6/24/2022 EWI has all the pipes from current project partners and has updated the Matrix to include these later arrivals. These pipes are currently in Buffalo New York where they were CT scanned.
- Task 3 EWI has drafted NDE procedures. Our requests for quote for Microwave Imaging and Air Coupled UT were sent in April, after addressing several questions we received multiple no bids and what bids we did receive were six times larger than the bids these same companies provided during our 2021 proposal process. EWI has done their due diligence to reach back out to companies who have now agreed to bid and are awaiting quotations back. Once purchase orders are provided to the vendors, EWI will finalize procedures including both internal NDE testing procedures.



#### 4: Project Technical Status –

Item	Task	Activity/Deliverable	Title			
1	10	Submit 1st quarterly report	1st Quarterly Status Report & Quarterly collaboration meeting			
2	1	Task report summarizing findings of literature review	Literature review of recent research on NDE of polymers & composites - issue task report			
3*	2	NMP sample matrix detailing type of pipe and defects, anomalies, or damage per sample	Prepare detailed matrix of NMP samples			
4*	3	Develop NDE procedures for inspection of NMP samples using non-contact and 3 coupled UT methods, microwave inspection method and 2 thermography methods	Completion of written NDE procedures			
5	10	Submit 2 <sup>nd</sup> Quarterly Report	2 <sup>nd</sup> Quarterly Status Report & Quarterly collaboration meeting			
6	6	Task 6 Test Procedures and Chamber Assembly	Prepare & Provide a Written Test Procedure for Erosion Tests			
7	4	NDE Review Progress to date (samples. procedures, early inspection data)	Task 4 NDE Project Review			
8	10	Submit 3 <sup>rd</sup> quarterly report	3 <sup>rd</sup> Quarterly Status Report & Quarterly collaboration meeting			
9	10	4 <sup>th</sup> Quarterly Status Report	4 <sup>th</sup> Quarterly Status Report & Quarterly collaboration meeting			
10	6	Perform inner linear erosion tests & assess NDE detection	Task report summarizing erosion test procedure and results, and NDE inspection results			
28	10	Annual Review	Review Meeting (virtual)			

- **Task 1** Literature Review was completed by EWI and NDE4zero's Mark Lozev. The report was supplied to the project team on 3/31/2022
- **Task 2** NMP Sample Matrix. EWI received additional pipes in late June and is further updating the Matrix pending CT results.
- **Task 3** The internal NDE procedures have been developed. NDE procedures for external technologies is awaiting procurement activities.
- Task 4 CT scanning was completed in mid-June on pipe samples that had been received by the project. New pipe samples were received late June and are getting scanned now (9/30/2022). After scans are analyzed EWI NDE testing will begin on selected pipe samples from this batch of material. The NDE testing, and analysis is underway, initial data and images were shared at the Q4 meeting on 9/21/22. Testing will continue for several months with EWI completing multiple forms of NDE and then sending pipe to subcontracts for additional methods (air coupled UT and Microwave).
- **Task 6** The cost share portion of this task has been completed (Item #6 Task 6): test cells have been built and a test method developed (5/31/2022). The task began in December 2021 and has been completed in June 2022. The federally funded portion of this work began in August 2022. Tests are currently being run and will be billed under item #10 Task 6. The weeklong erosion trial has ended and EWI found that the sand polished the internal diameter of the pipe, the sharp leading edges of the impeller were dulled, so its lifetime may only be several months before replacement is necessary, and finally the sand did not stay suspended well in the water. It was found to be mostly packed on the

bottom. EWI will experiment with less sand (lower concentration) and/or smaller particle size to mitigate these concerns in additional trials.

**Task 10** – The 1<sup>st</sup> quarterly status report was provided on 1/4/22. The 2<sup>nd</sup> quarterly status report was provided on 3/31/2022. The 3<sup>rd</sup> quarterly status report was provided on 6/30/2022. The 4<sup>th</sup> quarterly status report was provided on 9/30/2022. The fourth quarterly collaborative meeting occurred on 9/21/2022. This meeting ran long, and an optional extra hour will be offered to finish reviewing thermography data. The next quarterly TAP meeting will occur in October 2022 pending Doodle poll feedback. The next collaborative meeting is anticipated to occur in the first two weeks December, it will be scheduled for a longer period of time ~2 hours, please see upcoming Doodle calendar poll. The Annual Review meeting will be scheduled with PHMSA DOT keeping in mind our award was 9-30-2022, but our kickoff was 11-9-2021.

While not tied to a specific milestone during the third quarter, the following activities were undertaken: (1) EWI heard back from BP that they verbally intend to join the project team. EWI is waiting on NDA/Agreement forms to be completed these were provided on 8/30/2022 and again on 9/14/2022 with a follow up reminder about the upcoming September 21<sup>st</sup> meeting in case they were able to move the forms through legal.

## 5: Project Schedule -

The delay of both pipe matrix details, and physical arrival of the pipes has hindered completion of Task 2 (identification of pipe samples and associated damage features). The questions from our Microwave Imaging and Air Coupled UT vendors have delayed purchase orders and completing the NDE procedural documents. The adjustments to our schedule are highlighted in yellow below.

Task	Description	Quarter								
	Description		2	3	4	5	6	7	8	9
1	Literature Review & Report	X	X							
2	Selection, Procurement & Preparation of Pipe Samples	X	X	X						
3	Draft NDE Procedures		X	X	X	X				
4	NDE Trials			X	X	X	X			
5	NDE Validation & Assessment					X	X	X		
6	Characterization of Erosion Properties and Detectability		X	X	X	X				
7	Development of NDE Procedures and Best Practice Guide						X	X		
8	Establish Field Inspection Requirements							X		
9	Virtual Workshop							X	X	
	Progress Meetings (virtual and in-person)			X			X		X	
10	Annual Review				X				X	
	Quarterly Progress Reports	X	X	X	X	X	X	X	X	
	Final Report								X	X
PM	Program Management	X	X	X	X	X	X	X	X	X